Bourns®

Trimpot® Product Catalog

Reliable Electronic Solutions
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Introduction

The Bourns Mission
Our goal is to satisfy customers on a global basis while achieving sound growth with technological products of innovative design, superior quality and exceptional value. We commit ourselves to excellence, to the continuous improvement of our people, technologies, systems, products and services, to industry leadership and to the highest level of integrity.

Bourns Corporate
Bourns, Inc. has been providing reliable and innovative solutions to the electronics industry for over 50 years. With manufacturing facilities and customer support teams located throughout the world, Bourns is uniquely positioned to serve the industrial, automotive, telecommunications, audio/visual, aerospace and other electronic industries. Most importantly, Bourns is firmly committed to quality, service, and innovation.

World-Class Manufacturing
Bourns® Trimpot® Division has manufacturing facilities in Logan Utah, Tijuana Mexico, Heredia Costa Rica, Cork Ireland, Taipei Taiwan and Xiamen China. All of our facilities are QS9000 accredited.

More than fifty-seven years ago co-founders Marlan and Rosemary Bourns set up shop in their tiny 384 square-foot garage in Altadena, California. Their idea to provide a method of accurately determining an aircraft’s vertical position solved a crucial problem for pilots. The invention of the first miniature linear motion and vane position potentiometers propelled their tiny business into a global corporation, manufacturing a range of products that impact almost every aspect of today’s electronics industry.

From its earliest days, Bourns established a benchmark for quality, value, and innovation. In 1952, Bourns patented the world’s first trimming potentiometer, trademarked Trimpot®. Bourns dedication to excellence ensures continuous improvement of its products and services to satisfy customer requirements on a global basis.

The company, with worldwide headquarters in Riverside, California and nine other facilities around the world has continued growing through acquisitions and start-ups. Product lines now include precision potentiometers, panel controls, encoders, resistor/capacitor networks, chip resistors/arrays, inductors, transformers, resettable fuses, thyristor-based overvoltage protectors, line feed resistors, gas discharge tubes, telephone station protectors, S-pin protectors, industrial signal, irrigation and petroleum protectors, CATV coax protectors, signal data protectors, indoor and outdoor POTS splitters, network interface devices, and integrated circuits.
Commitment to Quality
Bourns commitment to quality is embedded in every discipline of the corporation. Customer satisfaction is essential to every Bourns employee. All team members receive training in their specific area of responsibility to ensure the highest level of performance.

Technical Support
Trained sales representatives, account managers and distributor sales engineers are located conveniently throughout the U.S. and around the world. Our Application Engineers (AEs) are also strategically located to assist with technical support and to provide an interface between customer inquiries and our production facility. Our technical support team can provide you with solutions appropriately selected to satisfy your requirements for performance, cost and availability.

Customer Service
Bourns distributor network is the most extensive in the industry. Our distributors provide fast, localized delivery and service in all three geospheres. With 100% on-time delivery and world-class service as core business objectives, we ensure direct support for customers in all countries and market segments.

From innovative designs to on-time delivery, make Bourns® Trimpot® your first choice for reliable and cost-effective trimmers, switches, linear motion potentiometers, modular contacts and fuel cards.
**Fuel Cards**

Many of the world's leading manufacturers have long known Bourns as a company they can trust to deliver quality electronic components on-time and within target costs. At Bourns, we understand that automotive manufacturers need complete solutions, from simple substrates to complete substrate and cable assemblies. To achieve an optimum blend of price and quality, we are structured to be one of the world's most vertically integrated suppliers. Bourns® Trimpot® Division offers numerous solutions for fuel level sensing requirements.

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**Fuel Level Sender**

The fuel level in automotive applications is typically measured by a float and lever arm assembly that operates a variable resistor mechanism. In many cases, this assembly (known as a fuel sender or fuel level sender) is mounted in the fuel tank and integrated into the fuel delivery module. This module removes fuel from the tank and delivers pressurized fuel to the power train.

---

**Fuel Level Sender Design & Construction**

The variable resistor mechanism is comprised of a wiper and a resistor element printed on a ceramic substrate. The resistor element (also known as a fuel card) is mounted close to the pivot point of the float arm, which is attached to the wiper. As the float rises and falls with the fuel level, the wiper moves in a rotary motion across the tracks on the resistor element, translating the float position into a resistance value. This is converted into a voltage or current signal driving the indication system in the dashboard. Less common are linear type fuel level senders where a float moves within a tube, translating the fuel level into a linear wiper movement. This type of fuel level sender is mainly used in space-constrained tanks, as in motorcycles and scooters.

Most car models have custom designed fuel tanks, where the tank is molded to fit around other components and body frames. There is an increasing trend to use a more complex blow-molded plastic tank versus the traditional steel tank. On rear wheel drive and four wheel drive vehicles, a saddle tank is often used, where the two halves of the fuel tank straddle the rear drive shaft. These complex fuel tank geometries require specific fuel card resistor profiles so that the translation of the...
float height gives the appropriate fuel volume signal to the fuel gauge. For this reason, a custom fuel card is generally designed for each fuel tank model.

The first fuel senders were wirewound construction. However, in many instances these units suffered from wire wear and breakages. The resistance profile of the wirewound fuel sender also changed as the wire wore at different rates and positions of the float arm. These problems were overcome with the introduction of the thick-film fuel card. A variable resistor is achieved by tapping the resistor traces with segmented conductor tracks creating a step-function output as shown in Figure 6. If the wiper contact were to run directly on the cermet resistor, as in a potentiometer, the required product life specification of at least 1 million wet cycles would not be achieved. A tight resistance tolerance of each partial resistor is achieved by laser trimming.

As the fuel card (resistor element) is immersed in fuel, its chemical resistance is of great importance. The introduction of low-sulphur fuels for environmental reasons has placed additional demands on conductor metallurgies.

**Typical Fuel Card Designs**

![Figure 7: Fuel card design overview (Dual track design)](image)

![Figure 8: Dual track design](image)

![Figure 9: Single track design](image)

![Figure 10: Linear track design](image)

**Trends in the fuel level sender market**

Specifications are typical and dependent on the manufacturing method, materials, size and shape of the part.
Trends in the fuel level sender market

- Increased fuel sender accuracy and resolution requirements due to increased integration of dashboard electronics and driver information systems.
  Bourns is currently shipping fuel cards with up to 100 discrete resistance steps.
- Increased chemical resistance: The major driver for increased chemical resistance is driven by the introduction of low-sulphur fuels, particularly in the U.S. market. These fuels may contain reactive sulphur compounds, which react with traditional palladium silver conductor inks.
  Bourns offers a range of materials to meet this requirement, from increased palladium content inks to “silver free” gold inks.
- Increased product integration: An increasing number of customers are now requesting higher levels of product integration.
  Bourns offers fuel cards with leads attached, tinned pads and wiper contacts.

The Bourns Competitive Advantage

- Dedicated fuel card design and sample team for rapid sample turnaround
- Full fuel sender design capability
- Active fuel sender R&D program with several patents issued or pending
- Extensive corporate material science expertise and R&D facilities
- Internally developed, state of the art, thick-film print capability with outstanding print registration and in-line ink thickness measurement
- Competitive pricing for best cost/life benefit
- High volume manufacturing
- Manufacturing location QS9000 certified and TS16949 planned for Cork, Ireland in 2005
- Superior product quality through 100% end-of-line dynamic testing
- Extensive production experience in gold fuel cards for low-sulphur fuel applications
- Superior, vision assisted, laser trim capability
3-D MID Devices

Bourns is also applying our thick-film printing capabilities to manufacture 3-D Molded Interconnect Devices (MIDs), which integrate the housing with the circuit board. Two advantages are board size and reduction of piece parts. Applications include high frequency connectors, security housings, antennas and EMC screening.

Electrical Characteristics
Current Handling ................................................................. 3 A, track width 1 mm
ESD (Contact) ................................................................. ±8 kV, 10 times
ESD (Air) ................................................................. ±15 kV, 10 times
Conductivity .............................................................. 1.6 µΩ·cm, 1 oz copper
RF Capability ............................................................. up to 10 GHz

Environmental Characteristics
Temperature Cycling ...................................................... -40 °C/+100 °C
Air Temperature Low .................................................... -25 °C; 24 hrs
Air Temperature High .................................................... +70 °C; 24 hrs
Humidity ................................................................. +85 °C; 85 % RH; 96 hrs
Thermal Shock .......................................................... -40 °C to +85 °C; 24 cycles

Physical Characteristics
Vibration Shock ............................................................. 30 G
Wear Resistance .......................................................... 20,000 cycles, 0.8 N
Peel Test ................................................................. 20 N
Pull Test ................................................................. 10 kN
Shear Test ............................................................... 40 N (0805; SOD123)
Solderability ............................................................. ≥ 95 %
Lithium Salt Test .......................................................... Pass
Halt Test ................................................................. Pass
Wirebondable ............................................................... Yes
Weldable ................................................................. Yes
Recyclable ................................................................. Yes

Physical Characteristics
Min. Dimensions .............................................................. ≥ 5 mm
Wall Thickness .............................................................. ≥ 0.5 mm
Track Width ............................................................... ≥ 70 µm
Plating Composition ...................................................... Cu, Ni, Sn/Pb & Au
Plating Thickness ........................................................... 2 to 50 µm
3-D Shapes ................................................................. Yes

Specifications are typical and dependent on the manufacturing method, materials, size and shape of the part.
Thick-Film (Cermet) Devices

Using our thick-film printing expertise, Bourns® Trimpot® Division has many possible applications such as ceramic heaters for medical, industrial, military and commercial applications.

Features
- High temperature operation
- Improved high frequency performance
- Excellent thermal conductivity
- Reduced piece part and size
- Design flexibility
- Custom specific
- High life cycles
- Reduced time to market for new ideas

**Electrical Characteristics**

**Resistive**
- Standard Resistance Range: 10 Ω to 1 MΩ
- Resistance Tolerance (Untrimmed): ±10%
- Resistance Tolerance (Trimmed): ±0.5%
- Independent Linearity: Down to ±0.5%
- Resolution: Infinite
- Electrical Travel: Per Requirement
- Ratio Matching: 0.1%

**Conductive**
- Resistivity: Down to 3 µΩ-cm

**Environmental Characteristics**
- Power Rating: 0.5 W
- Temperature Range: -55 °C to +150 °C
- TCR: ±100 ppm/K
- Humidity (MIL-STD-202 Method 106): ±1% TRS
- Vibration (30 G): ±1% TRS
- Shock (100 G): ±1% TRS
- Load Life (1,000 h): ±2% TRS
- Rotational Life: Up to 1,000,000 cycles
- Thermal Shock (-55 °C/+150 °C): ±1% TRS

**Physical Characteristics**

**Substrate Materials**
- Alumina
- Aluminum Nitride

**Ink Materials**
- Resistive
- Dielectric
- Conductive (Au, Ag, AgPd)

**Conductor Line Width**
- 0.157 mm (0.0062")

**Conductor Line Thickness**
- min. 8 µm (0.3 µ")

**Conductor Line Spacing**
- 0.127 mm (0.005")

**Track Adhesion**
- 1.58 N/mm

**Solder Acceptance**
- 99% coverage

**Solder Leach Resistance**
- 5 cycles

**Additional Capabilities**
- Placement of Add-On Components
- RF Design
- Through-Hole Print
- Multi-Layer Print
- Double-Sided Print
- Custom Tapers
- Plating Operation
- Solder Paste Deposition

Specifications are typical and dependent on the manufacturing method, materials, size and shape of the part.
Polymer Thick-Film (PTF) Devices

Features
- Utilization of alternative substrate materials
- Solution for numerous position sensing applications
- Reduced piece part and size
- Design flexibility
- Custom specific
- High life cycles
- Reduced time to market for new ideas

Electrical Characteristics

Resistive
- Standard Resistance Range: 1 kΩ to 1 MΩ
- Resistance Tolerance (Untrimmed): ± 20 %
- Resistance Tolerance (Trimmed): ± 1 %
- Independent Linearity: Down to ± 2 %
- Contact Resistance Variation: 1 Ω or 1%
- Resolution: Infinite

Dielectric Strength
- Sea Level: 1,500 vac
- 70,000 feet: 500 vac
- Electrical Travel: Per requirement

Conductive
- Resistivity: 10 µΩ-cm

Environmental Characteristics
- Power Rating: 0.2 W
- Temperature Range: -10 °C to +125 °C
- Humidity (50 % RH): ±10 % TRS
- Vibration (15 G): ±2 % max. VRS, ±5 % max. VRS
- Shock (30 G): ±2 % max. VRS, ±5 % max. VRS
- Load Life (1,000 h): ±10 % TRS
- Rotational Life: 20,000 cycles
- Thermal Shock (-40 °C/+120 °C): ±2 % TRS

Specifications are typical and dependent on the manufacturing method, materials, size and shape of the part.

Physical Characteristics

Substrate Materials
- PCB (rigid/flexible)
- Plastics

Ink Materials
- Resistive
- Dielectric
- Conductive (Au, Ag, AgPd)

Track Adhesion: 1.58 N/mm
Solder Acceptance: 90 % coverage
Solder Leach Resistance: 5 cycles

Additional Capabilities
- Placement of Add-On Components
- Through-Hole Print
- Multi-Layer Print
- Double-Sided Print
- Custom Tapers
- Plating Operation
- Solder Paste Deposition

Environmental Characteristics

- Power Rating: 0.2 W
- Temperature Range: -10 °C to +125 °C
- Humidity (50 % RH): ±10 % TRS
- Vibration (15 G): ±2 % max. VRS, ±5 % max. VRS
- Shock (30 G): ±2 % max. VRS, ±5 % max. VRS
- Load Life (1,000 h): ±10 % TRS
- Rotational Life: 20,000 cycles
- Thermal Shock (-40 °C/+120 °C): ±2 % TRS

Specifications are typical and dependent on the manufacturing method, materials, size and shape of the part.
Trimmer Special Offerings

Bourns® Trimpot® Division offers the widest array of trimmers in the industry. Our product offering includes surface mount and through-hole sealed and open frame trimmers. Bourns is also the only trimmer manufacturer which offers military trimmers and product qualified to military drawings. Consult Bourns technical support for more detailed information.

Extended and short leads, shaft extensions, specialty knobs, long life resistance elements, tighter tolerances, audio tapers, high temperature plastic for through-hole products, etc.

A chart of the audio tapers and the options is shown to display the different tapers.
Linear Motion Potentiometer Special Offerings
In addition to our standard linear motion potentiometer offering, Bourns® Trimpot® Division offers custom shaft lengths, threads and hard pins.

Modular Contact Special Offerings
Modular contacts are available with special plating options, adaptors to raise the contact height, lead lengths and forming on through-hole modular contacts. This does not limit the special offering; consult Bourns technical support for more detailed information on the feasibility of a special modular contact.

Switch Special Offerings
Bourns® Trimpot® Division specializes in miniature switches, special switch configurations and markings. Consult with technical support personnel for availability.
RoHS Compliant Selection Guide

Cermet/Carbon Models listed below are only available with lead free terminals.

<table>
<thead>
<tr>
<th>Model</th>
<th>RoHS Compliant</th>
<th>Plating</th>
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<td>Yes</td>
<td>100 % Sn</td>
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</tr>
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<td>TC89</td>
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Cermet Models listed below will be offered in both lead free and tin-lead terminals. Tin-lead terminal part numbers (below left) will not change. Lead free product (below right) requires an LF suffix.

<table>
<thead>
<tr>
<th>Tin-lead part numbers</th>
<th>Lead free part numbers</th>
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<tr>
<td>Model</td>
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<tr>
<td>3386</td>
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Wirewound Models listed below are only available with tin-lead terminals. Military trimmers are governed by DSCC.

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<td>90/10 Sn/Pb</td>
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<tr>
<td>RJ22</td>
<td>No</td>
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<td>RJ24</td>
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<tr>
<td>RJR50</td>
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Wirewound Models listed below are only available with lead free terminals. Military trimmers are governed by DSCC.

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<tr>
<td>RT26</td>
<td>Yes</td>
<td>100 % Au</td>
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Cermet Models listed below are only available with lead free terminals.

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Switches

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Modular Contacts

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Linear Motion Potentiometers

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SMT Trimmers

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Note 1: Standard packaging; some options may require alternate packaging. Consult factory.
Note 2: T = Top Adjust, S = Side Adjust
See page 155 for processing information on lead free surface mount trimmers.

Commercial Trimmers

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Element Technology</th>
<th>Number of Turns</th>
<th>Size</th>
<th>Packaging Options</th>
<th>Adjust</th>
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Note 1: Standard packaging; some options may require alternate packaging. Consult factory.
Note 2: T = Top Adjust, S = Side Adjust

E = 7" Reel, G = 13" Reel, T = Tubes
T = Top Adjust, S = Side Adjust, B = Bottom Adjust
See page 155 for processing information on lead free surface mount trimmers.
## Consumer / Open Frame Trimmers

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Element Technology</th>
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Note 1: Standard packaging; some options may require alternate packaging. Consult factory.

Note 2: T = Top Adjust, S = Side Adjust, B = Bottom Adjust

---

## Military Trimmers

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<tr>
<th>Model Number</th>
<th>Element Technology</th>
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Note 1: Standard packaging; some options may require alternate packaging. Consult factory.

Note 2: T = Tube, B = Bulk

---

## Application Specific Products

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<th>Model Number</th>
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Note 1: Standard packaging; some options may require alternate packaging. Consult factory.

Note 2: T = Top Adjust, S = Side Adjust

*Indicates patented models

T = Tubes, B = Bulk

---

20
Optional Products
Optional Products

These optional trimmers are not recommended for new designs. However, a detailed data sheet can be found on the Bourns website.

<table>
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<tr>
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<th>Mounting</th>
<th>Size</th>
<th>Circuit Board Layout</th>
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<td><img src="image4.jpg" alt="Image" /></td>
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<td>1/2” Rectangular</td>
<td><img src="image6.jpg" alt="Image" /></td>
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</table>
3005
3/4" Rectangular Trimming Potentiometer

Features
- Multiturn / Wirewound / Industrial / Sealed
- Sealed to prevent contamination from fluxing, soldering and cleaning
- Low cost model
- Panel mount option available

Electrical Characteristics

- **Standard Resistance Range**
  - 10 to 50K ohms (see standard resistance table)
- **Resistance Tolerance**
  - ±10 % std. (tighter tolerance available)
- **Absolute Minimum Resistance**
  - 0.5 % or 1 ohms max.
  - (whichever is greater)
- **Noise**
  - 100 ohms ENR max.
- **Resolution**
  - See standard resistance table
- **Insulation Resistance**
  - 500 vdc.
  - 100 megohms min.
- **Dielectric Strength**
  - Sea Level: 1,000 vac
  - 80,000 Feet: 250 vac
- **Adjustment Travel**
  - 20 turns nom.

Environmental Characteristics

- **Power Rating**
  - 70 °C: 1 watt
  - 125 °C: 0 watt
- **Temperature Range**
  - -65 °C to +125 °C
- **Temperature Coefficient**
  - ±50 ppm/°C
- **Seal Test**
  - 85 °C Fluorinert*
- **Humidity**
  - MIL-STD-202 Method 106 96 hours
  - (5 % TR, 20 megohms IR)
- **Vibration**
  - 20 G (2 % TR; 2 % ΔVR)
- **Shock**
  - 50 G (2 % ΔTR; 2 % ΔVR)
- **Load Life**
  - 1,000 hours, 1 watt @ 70 °C
  - (3 % ΔTR)
- **Rotational Life**
  - 200 cycles
  - (4 % ΔTR)

Physical Characteristics

- **Torque**
  - 5.0 oz-in. max.
- **Mechanical Angle**
  - Wiper idles
- **Terminals**
  - Solderable pins
- **Weight**
  - 0.045 oz.
- **Marking**
  - Manufacturer's trademark, resistance code, wiring diagram, date code, manufacturer's model number and style
- **Standard Packaging**
  - 25 pcs. per tube

**Standard Resistance Table**

<table>
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<th>Resistance Code</th>
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<tr>
<td>1,000</td>
<td>102</td>
<td>0.5</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
<td>0.4</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
<td>0.3</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
<td>0.3</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
<td>0.2</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
<td>0.2</td>
</tr>
</tbody>
</table>

**How To Order**

- Model
- Style
- Standard or Modified
- Product Indicator
  - -1 = Standard Product
- Resistance Code
- Optional Suffix Letter
  - Z = Panel Mount (Factory Installed)

Consult factory for other available options.

“Fluorinert” is a registered trademark of 3M Co.

REV 09/04
3006 Trimpot® Trimming Potentiometer

Features
- 3/4" Rectangular / Multiturn / Cermet / Industrial / Sealed
- Low PC board profile - only 1/4" high
- Panel mount option available
- Transparent housing available, can be set visually without hook-up and instrumentation ("P" style only)
- RoHS compliant version available

Electrical Characteristics
- Standard Resistance Range
- Resistance Tolerance: ±10% std.
- Absolute Minimum Resistance: 1.0 % or 2 ohms max. (whichever is greater)
- Contact Resistance Variation: 1.0 % or 1 ohm max. (whichever is greater)
- Adjustability
  - Voltage: ±0.01 %
  - Resistance: ±0.05 %
  - Resolution: ±50 ppm/°C
- Insulation Resistance: 500 vdc.
- Voltage Tolerance: ±0.01 %

Environmental Characteristics
- Power Rating (400 volts max.)
  - 125 °C: 0.75 watt
  - 70 °C: 0 watt
- Temperature Range: -55 °C to +125 °C
- Humidity: MIL-STD-202 Method 103
  - Sea Level: 1,000 vac
  - 80,000 Feet: 250 vac
- Temperature Coefficient: ±100 ppm/°C
- Dielectric Strength: 1,000 megohms min.
- Flammability: U.L. 94V-0

Physical Characteristics
- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminals: Solderable pins
- Weight: 0.04 oz.
- Marking: Manufacturer’s trademark, resistance code, terminal numbers, date code, manufacturer’s model number and style of Wiper.
- Flammability: U.L. 94V-0
- Standard Packaging: 25 pcs. per tube
- Adjustment Tool: H-90

How To Order
- Model
- Model or Modified
- Product Indicator
- Optional Suffix Letter
- Terminations
- Consult factory for other available options.

Resistance Tolerance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
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</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>103</td>
</tr>
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<td>20,000</td>
<td>203</td>
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<td>25,000</td>
<td>253</td>
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<td>50,000</td>
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<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>250,000</td>
<td>254</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface. Special resistances available.

“Fluorinert” is a registered trademark of 3M Co.

REV 09/04
3009
3/4” Rectangular Trimming Potentiometer

Features
- Multiturn / Cermet / Industrial / Sealed
- Low temperature coefficient: ±100 ppm/°C
- Stable, infinite resolution cermet element
- CRV 1.0 % or 1 ohm
- Panel mount option available
- RoHS compliant† version available

Electrical Characteristics

<table>
<thead>
<tr>
<th>Standard Resistance Range</th>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 2 megarohms (see standard resistance table)</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>±10 % std. (tighter tolerance available)</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>1.0 % or 2 ohms max. (whichever is greater)</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>±100 ppm/°C</td>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>±0.05 %</td>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>±1 % or 1 ohm, whichever is greater, CRV</td>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>±0.01 %</td>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>±1 Ohm max. (whichever is greater)</td>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>±10 % std.</td>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>±2 %</td>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>±25 %</td>
<td>25,000</td>
<td>253</td>
</tr>
<tr>
<td>±50 %</td>
<td>50,000</td>
<td>503</td>
</tr>
<tr>
<td>±100 %</td>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>±200 %</td>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>±250 %</td>
<td>250,000</td>
<td>254</td>
</tr>
<tr>
<td>±500 %</td>
<td>500,000</td>
<td>504</td>
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<tr>
<td>±1000 %</td>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>±2000 %</td>
<td>2,000,000</td>
<td>205</td>
</tr>
<tr>
<td>±5000 %</td>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Environmental Characteristics

- Power Rating (400 volts max.)
  - 70 °C .................................................................0.75 watt
  - 150 °C .................................................................0 watt
- Temperature Range ..............-55 °C to +150 °C
- Temperature Coefficient ..............±100 ppm/°C
- Seal Test .........................85 °C Fluorinert®
- Humidity.............MIL-STD-202 Method 103
- Vibration .............20 G (2 % ΔTR; 2 % ΔVR)
- Shock ............50 G (2 % ΔTR; 2 % ΔVR)
- Load Life .............1,000 hours, 0.75 watt @ 70 °C
- Rotational Life ..........200 cycles (3 % ΔTR; 1 % or 1 ohm, whichever is greater, CRV)

Physical Characteristics

- Torque .........................5.0 oz-in. max.
- Mechanical Stops .......................Wiper idles
- Terminals ......................Solderable pins
- Weight .........................0.05 oz.
- Marking ......................Manufacturer’s trademark, resistance code, terminal numbers, date code, manufacturer’s model number and style
- Standard Packaging ..........25 pcs. per tube

How To Order

<table>
<thead>
<tr>
<th>Model</th>
<th>Style</th>
<th>Standard or Modified</th>
<th>Product Indicator</th>
<th>Resistance Tolerance</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>3009P</td>
<td>1</td>
<td>Standard Product</td>
<td>-11</td>
<td>5 % Resistance Tolerance</td>
<td></td>
</tr>
<tr>
<td>3009Y</td>
<td>3</td>
<td>Panel Mount (Factory Installed)</td>
<td>1 Z LF</td>
<td>Blank</td>
<td></td>
</tr>
</tbody>
</table>

Consult factory for other available options.

**Fluorinert** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
3057 Trimpot® Trimming Potentiometer

Features
- 1-1/4" Rectangular / Multiturn / Wirewound / Industrial / Sealed
- Panel mount option available
- Listed on the QPL for style RT12 per MIL-PRF-27208
- RoHS compliant

Electrical Characteristics
- Standard Resistance Range: 10 to 50K ohms (see standard resistance table)
- Resistance Tolerance: ±5 % std. (tighter tolerance available)
- Absolute Minimum Resistance: 0.1 % or 1 ohm max. (whichever is greater)
- Noise: 100 ohms ENR max.
- Resolution: See Resistance Table
- Insulation Resistance: 500 Vdc
- Temperature Coefficient: ±50 ppm/°C
- Temperature Range: -55 °C to +150 °C
- Power Rating @ 150 °C: 0 watt
- Power Rating @ 70 °C: 1 watt

Environmental Characteristics
- Humidity: MIL-STD-202 Method 106
- Temperature Coefficient: ±50 ppm/°C
- Temperature Range: -55 °C to +150 °C
- Power Rating @ 150 °C: 0 watt
- Power Rating @ 70 °C: 1 watt

Physical Characteristics
- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Mechanical Stops: Solderable pins and lugs
- Weight: 0.1 oz.
- Marking: Manufacturer's trademark, resistance code, terminal numbers, date code, manufacturer's model number and style
- Wiper: 50 % (Actual TR) ±10 %
- Flammability: U.L. 94V-0
- Standard Packaging: P&Y Style: 10 pcs. per tube
- L&J Style: 25 pcs. per bag
- Adjustment Tool: H-90

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>2.40</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>1.90</td>
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<td>50</td>
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<td>102</td>
<td>0.72</td>
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<td>2,000</td>
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<tr>
<td>5,000</td>
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<td>0.43</td>
</tr>
<tr>
<td>10,000</td>
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<td>0.31</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
<td>0.24</td>
</tr>
</tbody>
</table>

How To Order

3057 L - 1 - 103 M

Model
- 3057

Style
- Standard or Modified

Product Indicator
- 1 = Standard Product
- 2 = Optional Suffix Letter

Resistance Code
- "Fluorinert" is a registered trademark of 3M Co.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3059 Trimpot® Trimming Potentiometer

Features

- 1-1/4” Rectangular / Multiturn
- Cermet / Industrial / Sealed
- Panel mount option available
- Listed on the QPL for style RJ12 per MIL-PRF-22097
- RoHS compliant version available

**Electrical Characteristics**

- Standard Resistance Range
  - 10 to 2 megohms (see standard resistance table)
  - ±10% std.
  - (tighter tolerance available)
- Resistance Tolerance:
  - ±0.05% (pin styles only)
- Resolution:
  - Infinite
- Effective Travel:
  - 22 turns nom.
- Torque:
  - 5.0 oz-in. max.
- Dielectric Strength:
  - 70,000 Feet / 350 vac
  - Sea Level / 900 vac
- Insulation Resistance:
  - 500 vdc.
- Voltage:
  - ±0.01 %
  - ±0.01 %
- Tolerances:
  - ±.25/
  - ±.010

**Environmental Characteristics**

- Power Rating @ 70 °C (400 volts max.)
  - 1.0 watt
- Power Rating @ 150 °C:
  - 0 watt
- Temperature Range:
  - -55 °C to +150 °C
- Temperature Coefficient:
  - ±100 ppm/°C
- Seal Test:
  - 85 °C Fluorinert
- Humidity:
  - MIL-STD-202 Method 106
- Vibration:
  - 20 G (1 %
- Shock:
  - 50 G (1 %
- Load Life:
  - 1,000 hours 1.0 watt @ 70 °C
- Rotational Life:
  - 200 cycles
- Rotational Life:
  - 200 cycles
- Absolute Minimum Resistance

**Physical Characteristics**

- Torque:
  - 5.0 oz-in. max.
- Weight:
  - 0.1 oz.
- Marking:
  - Manufacturer’s trademark, resistance code, terminal numbers, date code, manufacturer’s model number and style
- Wiper:
  - 50 % (Actual TR) ±10 %
- Flammability:
  - U.L. 94V-0
- Standard Packaging
- P&Y Styles:
  - 10 pcs. per tube
- L&J Styles:
  - 25 pcs. per bag
- Adjustment Tool:
  - H-90

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Code</th>
<th>Resistance</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>1,000</td>
<td>103</td>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
<td>10,000</td>
<td>103</td>
</tr>
</tbody>
</table>

**How To Order**

- Model
- Style
- Standard or Modified
- Product Indicator
- -1 = Standard Product
- Resistance Code
- Optional Suffix Letter
- M = Panel Mount (Factory Installed)
- Terminations
- LF = 100 % Tin-plated (RoHS compliant)
- Blank = 90 % Tin / 10 % Lead-plated (Standard)

**“Fluorinert” is a registered trademark of 3M Co.**


Customers should verify actual device performance in their specific applications.

REV 09/04
3214 – 5-Turn Trimming Potentiometer

Features

- Surface Mount 4 mm Square / Multturn / Cermet / Industrial / Sealed
- Sealed to withstand board wash processing
- Pick and place centering design, with flush adjustment
- 4 mm design meets EIA/EIAJ/IPC/VECI SMD standard trimmer footprint
- Patent #5047746 advanced drive/wiper mechanism
- RoHS compliant – see page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

Standard Resistance Range ..10 to 2 megohms (see standard resistance table)
Resistance Tolerance .................. ± 10 % std.
Absolute Minimum Resistance .......... 1 % or 2.0 ohms (whichever is greater)
Contact Resistance Variation ......... ± 3 % or 3 ohms max.
Resolution .................................. Essentially Infinite
Thermal Shock ........................... 5 cycles TRS±2 %; VRS±1 %
Rotational Cycling .............................. 200 cycles
Load Life .............................. 85 °C rated power 1,000 hours
Shock .......................................... 100 G TRS±1 %; VRS±1 %
Vibration ............................ 20 G TRS±1 %; VRS±1 %
Humidity ............................. MIL-STD 202 Method 106
Temperature Coefficient ............. ±100 ppm/°C
Temperature Range ...................... -65 °C to +150 °C
Adjustment Angle ..................... 5 turns nom.
Dielectric Strength ................... Wiper idles
Insulation Resistance .................. 500 vdc.
Resolution .................................. Essentially Infinite
Contact Resistance Variation ............ 1 % or 2.0 ohms (whichever is greater)
Absolute Minimum Resistance ........ TRS 3 ohms or 3 % (whichever is greater)
Resistance Tolerance .................. ± 10 % std.
Standard Resistance Range ......... 10 to 2 megohms

Environmental Characteristics

Power Rating (300 volts max.) ......... 0.25 watt
Temperature Range .............. -65 °C to +150 °C
Humidity .............................. MIL-STD 202 Method 106
TRS ± 2 %; VRS ± 1 %
Vibration ............................ 20 G TRS±1 %; VRS±1 %
Shock ...................................... 100 G TRS±1 %; VRS±1 %
Load Life .............................. 85 °C rated power 1,000 hours
Rotational Cycling ...................... 200 cycles
TRS 3 ohms or 3 % (whichever is greater)
Thermal Shock ........................... 5 cycles TRS±2 %; VRS±1 %

Physical Characteristics

Mechanical Stop ..................... Wiper idles
Torque .................................. 180 g-cm max.
Weight .............................. Approximately 0.01 oz.
Marking .............................. Manufacturer’s code, resistance code and date code
Solderability .............................. Per MIL-STD-202 Method 108
Wiper ..................................... 50 % (Actual TR) ± 10 %
Flammability .............................. UL94V-0
W, X, Style W, X: 2.2 lbs.
Adjustment Tool ......................... H-91

How To Order

3214 J - 1 - 502 E

Model

3214J Side Adjust

3214W Top Adjust

3214G Side Adjust

3214X Top Adjust

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3214 – Packaging Specifications

J & G Styles

W Style

X Style

W & X Style Reel

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
</tr>
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<td>200</td>
<td>201</td>
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<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>103</td>
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<tr>
<td>20,000</td>
<td>203</td>
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<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
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<td>200,000</td>
<td>204</td>
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<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

Cover tape peel strength: Meets EIA specification 481.

* Embossed Tape Designator "E"
** Embossed Tape Designator "G"

(See How To Order chart for further information.)
3223 – 3 mm SMD Trimming Potentiometer

Features
- Surface Mount 3 mm Square / Multiturn / Cermet / Industrial / Sealed
- Sealed to withstand standard board wash processing
- Pick and place centering design for automated placement compatibility
- Flush adjustment screw
- Meets EIA/EIAJ/IPC/VECI SMD standard trimmer footprint
- Top adjust
- RoHS compliant† - see page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

### Standard Resistance Range
10 Ω to 2 MΩ (see standard resistance table)

### Resistance Tolerance
±20 % std.

### Absolute Minimum Resistance
1 % or 3 Ω max. (whichever is greater)

### Contact Resistance Variation
3 % or 3 Ω max. (whichever is greater)

### Resolution
Essentially infinite

### Insulation Resistance
500 VDC (100 MΩ min.)

### Dielectric Strength
- **Sea Level**: 600 VAC (1 minute)
- **Adjustment Angle**: 11 turns nom.

### Environmental Characteristics

#### Power Rating (200 volts max.)
- **70 °C**: 0.125 watt
- **150 °C**: 0 watt

#### Temperature Range
-45 °C to +150 °C

#### Temperature Coefficient
±100 ppm/°C

#### Humidity
- **MIL-STD-202 Method 106 TRS ±3 %; IR 10 MΩ**
- **Vibration**: 20 G TRS ±1 %; VRS ±1 %
- **Shock**: 100 G TRS ±1 %; VRS ±1 %

#### Load Life
@ 70 °C rated power 1000 hours

#### Rotational Cycling
200 cycles

#### Thermal Shock
5 cycles

### Physical Characteristics

#### Mechanical Stop
- Wiper idles
- Torque: 2.50 oz-in. max
- Weight: Approximately 0.01 oz
- Marking: Manufacturer's code, resistance code and date code
- Solderability: Per MIL-STD-202, Method 208
- Wiper: 50 % (Actual TR) ±10 %
- Flammability: UL94V-0
- Adjustment Tool: H-92-1

### Recommended Land Pattern

<table>
<thead>
<tr>
<th>Recommended Land Pattern</th>
<th>ELECTRICAL ADJUSTMENT SLOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 0.38 (0.014) mm</td>
<td>Deep: 0.30 (0.011) mm</td>
</tr>
</tbody>
</table>

### Recommended Land Pattern

<table>
<thead>
<tr>
<th>Recommended Land Pattern</th>
<th>ELECTRICAL ADJUSTMENT SLOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width: 0.38 (0.014) mm</td>
<td>Deep: 0.30 (0.011) mm</td>
</tr>
</tbody>
</table>

### Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Code</th>
<th>Ohms</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>20,000</td>
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<td>500,000</td>
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</tr>
<tr>
<td>1,000</td>
<td>102</td>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
<td>2,000,000</td>
<td>205</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
<td>5,000</td>
<td></td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface. Special resistances available.

How To Order

<table>
<thead>
<tr>
<th>Model</th>
<th>Style</th>
<th>Standard or Modified</th>
<th>Product Indicator</th>
<th>Resistance Code</th>
<th>Embossed Tape Designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>3223 W - 1</td>
<td>502 E</td>
<td>-1 = IR Reflow</td>
<td></td>
<td></td>
<td>E = 500 pcs./7” reel</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3224 4 mm SMD Trimming Potentiometer

Features

- Surface Mount 4 mm Square / Multturn / Cermet / Industrial / Sealed
- Sealed to withstand board wash processing
- Pick and place centering design, with flush adjustment
- 4 mm design meets EIA/EIAJ/IPC/VECI SMD standard trimmer footprint
- Low CRV - 1 %
- DESC selected material drawing #92021
- RoHS compliant - see page 155 for processing information on lead free surface mount trimmers

### Electrical Characteristics

- **Standard Resistance Range**: 3224 J Side Adjust
- **Resistance Tolerance**: ±5 % std.
- **Absolute Minimum Resistance**: ±1 % or 2 Ohms (whichever is greater)
- **Contact Resistance Variation**: ±1 % or 3 ohms max.
- **Resolution**: Essentially Infinite
- **Absolute Minimum Resistance**: 1 % or 2.0 Ohms (whichever is greater)
- **Resistance Tolerance**: ±1 % std.

### Environmental Characteristics

- **Power Rating (300 volts max.)**: 3224 J Side Adjust
- **Temperature Range**: -65°C to +150°C
- **Temperature Coefficient**: ±100 ppm/°C
- **Humidity**: MIL-STD 202 Method 106
- **Vibration**: TRS±2 %; VRS±1 %
- **Shock**: TRS±2 %; VRS±1 %
- **Humidity**: TSQ±2 %; VRS±1 %
- **Temperature Coefficient**: ±100 ppm/°C

### Physical Characteristics

- **Mechanical Stop**: Wiper idles
- **Torque**: 180 g-cm
- **Weight**: Approximately 0.01 oz.
- **Wiper**: 50 % (Actual TR) ±10 %
- **Flammability**: UL94V0
- **Pushover Strength**: G = Style W, X: 2 PLCS.
- **Solderability**: Per MIL-STD-202, Method 208

### How To Order

- **Model**: 3224 J - 1 - 502 E
- **Style**: Standard or Modified
- **Product Indicator**: 1 = IR Reflow (standard)
- **Resistance Code**: Essentially Infinite
- **Embosed Tape Designator**: E = Style J, G: 500 pcs./7” reel (standard)
- **Dimensions**: MM/INCHES
- **TOLERANCES**: ±25/±0.10

### Product Dimensions

#### 3224J Side Adjust

- **Adjustment Angle**: 11 turns nom.
- **ADJUSTMENT SLOT**: WIDE DEEP
- **TYP.**: 1.2 (010) 2 PLCS.
- **ADJUSTMENT SLOT**: 3.0 (114) 2 PLCS.

#### 3224G Side Adjust

- **ADJUSTMENT SLOT**: WIDE DEEP
- **TYP.**: 1.2 (007) 2 PLCS.
- **ADJUSTMENT SLOT**: 3.0 (114) 2 PLCS.

#### 3224W Top Adjust

- **ADJUSTMENT SLOT**: WIDE DEEP
- **TYP.**: 1.0 (004) 2 PLCS.
- **ADJUSTMENT SLOT**: 3.0 (114) 2 PLCS.

#### 3224X Top Adjust

- **ADJUSTMENT SLOT**: WIDE DEEP
- **TYP.**: 1.0 (004) 2 PLCS.
- **ADJUSTMENT SLOT**: 3.0 (114) 2 PLCS.

Specifications are subject to change without notice.


Customers should verify actual device performance in their specific applications.
3224 – Packaging Specifications

J & G Styles

W Style

X Style

W & X Style Reel

330.2 \( \pm 2.0 \) (13.00 \( \pm .079 \))

4.50 \( \pm .10 \) (.177 \( \pm .039 \))

178 \( \pm 2.0 \) (7.008 \( \pm .079 \))

13.0 \( \pm 0.5 \) (512 \( \pm .020 \))

Equal Spaced 3 Plcs.

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
</tr>
<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**.

Special resistances available.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

Cover tape peel strength: Meets EIA specification 481.

* Embossed Tape Designator "E"

** Embossed Tape Designator "G"

(See How To Order chart for further information.)

Cover tape peel strength: Meets EIA specification 481.

Additional Features

- Top and side adjust styles
- J-hook, and gull-wing
- Patent #5047746 advanced drive/wiper mechanism
1/2" Square Trimming Potentiometer

**Features**
- Multiturn / Wirewound / Sealed
- Listed on the QPL for style RT22 per MIL-R-27208 and RTR22 per High-Rel MIL-R-39015
- Panel Mount option available
- RoHS compliant

**Electrical Characteristics**
- Standard Resistance Range: 10 to 50K ohms (see standard resistance table)
- Resistance Tolerance: ±5 % std. (tighter tolerance available)
- Absolute Minimum Resistance: 0.1 % or 1 ohm max. (whichver is greater)
- Noise: 100 ohms ENR max.
- Resolution: See Resistance Table
- Noise: 100 ohms ENR max.
- Absolute Minimum Resistance (See standard resistance table)
- Tolerance: ±5 % std.
- Standard Resistance Range: 10 to 50K ohms

**Environmental Characteristics**
- Power Rating @ 85 °C: 1.0 watt
- Power Rating @ 150 °C: 0 watt
- Temperature Range: -65 °C to +150 °C
- Temperature Coefficient: ±50 ppm/°C
- Shock: 100 G (1 %)
- Seismic Vibration: 30 G
- Vibration: 30 G
- Shock Test: 85 °C Fluorinert* (pin styles only)
- Temperature Range: -65 °C to +150 °C
- Power Rating @ 150 °C: 0 watt
- Temperature Coefficient: ±50 ppm/°C

**Physical Characteristics**
- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminal Mounting: Flexible leads (7 strands of 30 AWG)
- Weight: 0.06 oz.
- Machine Screw Mounting: Solderable printed circuit pins
- Marking: Manufacturer’s trademark, resistance code, terminal numbers, date code, manufacturer’s model number and style
- Wiper: 50 % (Actual TR) ±10 %
- Machine Screw Mounting: 50 % (Actual TR) ±10 %
- Flammability: U.L. 94V-0
- Standard Packaging: Multi-strand leadwire (7 strands of 30 AWG)
- P&W Styles: 25 pcs. per tube
- L Style: 25 pcs. per tube
- Adjustment Tool: H-90

**How To Order**
- Model: 3250 L - 1 - 103 M
- Style: Standard or Modified
- Standard or Modified: Product Indicator
- Resistance Code: -1 = Standard Product
- Resistance Code: M = Panel Mount (Factory Installed)
- Optional Suffix Letter: Consult factory for other available options.

**3250P Common Dimensions (Pin Styles)**

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>1.30</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>1.00</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
<td>0.80</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
<td>0.90</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
<td>0.70</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
<td>0.60</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
<td>0.40</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
<td>0.30</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
<td>0.25</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
<td>0.19</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
<td>0.16</td>
</tr>
<tr>
<td>25,000</td>
<td>253</td>
<td>0.14</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
<td>0.13</td>
</tr>
</tbody>
</table>

**Dimensions:**

- MIN: 152.0 (5.98)
- MAX: 152.4 (6.00)
- TOLERANCES: ±.25 (.010) EXCEPT WHERE NOTED

---

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04

"Fluorinert" is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3252
1/2" Square Trimming Potentiometer

Features
- Multiturn / Cermet / Sealed
- Listed on the QPL for style RJ22 per MIL-R-22097
- Panel mount option available
- RoHS compliant version available

Electrical Characteristics
- Standard Resistance Range: 10 to 2 megohms (see standard resistance table)
- Resistance Tolerance: ±0.10 % std. (tighter tolerance available)
- Maximum Resistance: 1 % or 2 ohms max. (whichever is greater)
- Contact Resistance Variation: 0.05 %
- Resolution: Infinite
- Insulation Resistance: 500 vdc.
- Dielectric Strength:
  - 1,000,000 volts min.
  - 1,000,000 volts min.
- Rotational Life: 200 cycles
- Load Life: 1,000 hours 0.75 watt @ 85 °C
- Shock: 100 G (1 % or 2 ohms max. (whichever is greater)
- Vibration: 30 G (1 % or 2 ohms max. (whichever is greater)
- Absolute Minimum Resistance: 1,000,000 ohms
- Torque: 12 oz-in. max.
- Temperature Coefficient: ±100 ppm/°C
- Temperature Range: -65 °C to +150 °C
- Humidity:
  - MIL-STD-202 Method 103; Seal Test
  - 85 °C Fluorinert* (pin styles only)
- Power Rating @ 85 °C (400 volts max.):
  - Resistance: ±0.05 %
  - Voltage: ±0.01 %
  - Effective Travel: 25 turns nom.
- Dielectric Strength:
  - 1 % or 2 ohms max. (whichever is greater)
  - 1 % or 2 ohms max. (whichever is greater)
- Effective Travel: 25 turns nom.
- Terminal Terminal:
  - Solderable printed circuit pins
- Mechanical Stops:
  - Wiper idles
- Terminal Terminals:
  - Solderable printed circuit pins
- Flexibility:
  - Flexible leads (7 strands of 30 AWG)
- Weight:
  - 0.065 oz.
- Torque:
  - 12 oz-in. max.

Environmental Characteristics
- Power Rating @ 85 °C (400 volts max.):
  - 0.75 watt
- Power Rating @ 150 °C (1000 volts max.):
  - 1.0 watt
- Temperature Range: -65 °C to +150 °C
- Temperature Coefficient:
  - 85 °C Fluorinert* (pin styles only)
- Humidity:
  - MIL-STD-202 Method 103;
  - 96 hours (1 %)
- Vibration:
  - 30 G (1 %)
- Shock:
  - 100 G (1 %)
- Load Life:
  - 1,000 hours 0.75 watt @ 85 °C
- Rotational Life:
  - 200 cycles
- Sea Level:
  - 80,000 Feet: 1,000 vac
- Termination:
  - Terminals: Solderable printed circuit pins
  - Terminals: Solderable printed circuit pins

Physical Characteristics
- Torque:
  - 5.0 oz-in. max.
- Mechanical Stops:
  - Wiper idles
- Terminal Terminals:
  - Solderable printed circuit pins
- Flexible leads:
  - Flexible leads (7 strands of 30 AWG)
- Weight:
  - 0.065 oz.
- Wiper:
  - 50 % (Actual TR) ±10 %
- Flammability:
  - UL 94V-0
- Machine Screw Mounting
  - Torque:
    - 12 oz-in. max.
  - Mechanical Stops:
    - Wiper idles
  - Terminal Terminals:
    - Solderable printed circuit pins
  - Flexible leads:
    - Flexible leads (7 strands of 30 AWG)
  - Weight:
    - 0.065 oz.
  - Wiper:
    - 50 % (Actual TR) ±10 %
  - Flammability:
    - UL 94V-0

Adjustment Tool:
- H-90

Marking:
- Manufacturer’s trademark,
- Model,
- Style,
- Standard or Modified
- Product indicator:
  - -1 = Standard product
- Resistance Code
- Optional suffix letter:
  - M = Panel Mount (Factory Installed)
- Terminations:
  - LF = 100 % Tin-plated (RoHS compliant)
  - Blank = 90 % Tin / 10 % Lead-plated
  - (Standard)
- Consult factory for other available options.

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
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<tr>
<td>100</td>
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<td>2,000</td>
<td>202</td>
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<td>5,000</td>
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<tr>
<td>10,000</td>
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<td>104</td>
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<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

How to Order

Model
Style
Standard or Modified
Product indicator
Resistance Code
Optional Suffix Letter
M = Panel Mount (Factory Installed)
Terminations:
LF = 100 % Tin-plated (RoHS compliant)
Blank = 90 % Tin / 10 % Lead-plated
(Standard)
Consult factory for other available options.

How To Order

3252 L - 1 - 103 M LF

Trimmer Data Sheets

REV 09/04

“Fluorinert” is a registered trademark of 3M Co.
RoHS Directive 2002/95/EC Jan 27 2003 including Annex Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

DIMENSIONS: MILLINCHES
TOLERANCES: ±.25/(±.010) EXCEPT WHERE NOTED
3260
1/4” Square Trimming Potentiometer

Features
- Multiturn / Wirewound / Industrial / Sealed
- Listed on the QPL for style RT26 per MIL-R-27208
- RoHS compliant

Electrical Characteristics
Standard Resistance Range
10 to 25K ohms (see standard resistance table)
Resistance Tolerance ±5 % std. (tighter tolerance available)
Absolute Minimum Resistance 0.1 % or 1 ohm max.
(whichever is greater)
Noise 100 ohms ENR max.
Resolution See resistance table
Insulation Resistance 500 vdc. 1,000 megohms min.
Dielectric Strength Sea Level 600 vac 80,000 Feet 250 vac
Adjustment Angle 11 turns nom.

Environmental Characteristics
Power Rating
85 °C 0.25 watt
150 °C 0 watt
Temperature Range -65 °C to +150 °C
Temperature Coefficient ±70 ppm/°C
Seal Test 85 °C Fluorinert*
Humidity MIL-STD-202 Method 106 (2 % TR, 100 Megohms IR)
Vibration 30 G (1 % TR; 1 % resolution)
Shock 100 G (1 % TR; 1 % resolution)
Load Life 1,000 hours 0.25 watt @ 85 °C (2 % ATR; 500 ohms ENR)
Rotational Life 200 cycles (2 % ATR; 500 ohms ENR)

Physical Characteristics
Torque 3.0 oz-in. max.
Mechanical Stops Wiper idles
Terminals Solderable printed circuit pins
Weight 0.015 oz
Marking Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
Wiper 50 % (Actual TR) ±10 %
Flammability UL 94V-0
Standard Packaging 50 pcs. per tube
Adjustment Tool H-90

Product Dimensions
3260H
Common Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>1.02 ± .38</td>
</tr>
<tr>
<td>Height</td>
<td>2.54</td>
</tr>
<tr>
<td>Depth</td>
<td>1.27</td>
</tr>
<tr>
<td>ADJ. SLOT</td>
<td>90°</td>
</tr>
<tr>
<td>DIA.</td>
<td>51</td>
</tr>
<tr>
<td>X MMCX</td>
<td>51</td>
</tr>
<tr>
<td>X DEEP</td>
<td>51</td>
</tr>
</tbody>
</table>

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>1.30</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>1.00</td>
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<td>50</td>
<td>500</td>
<td>0.80</td>
</tr>
<tr>
<td>100</td>
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<tr>
<td>25,000</td>
<td>253</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface. Special resistances available.

How To Order
Model 3260 H - 1 - 502
Style
Standard or Modified Product Indicator -1 = Standard Product Resistance Code Consult factory for other available options.

**Fluorinert** is a registered trademark of 3M Co.

REV 09/04
3262
1/4˝ Trimming Potentiometer

Features
- Multiturn / Cermet / Industrial / Sealed
- Listed on the QPL for style RJ26 per MIL-R-22097 and RJR26 per High-Rel MIL-R-39035
- Patent #4427966 drive mechanism
- RoHS compliant† version available

Electrical Characteristics

Standard Resistance Range
- 10 to 1 meghom (see standard resistance table)
- ±10 % std. (tighter tolerance available)

Absolute Minimum Resistance
- 1 % or 2 ohms max. (whichever is greater)

Contact Resistance Variation
- 3.0 % or 3 ohms max. (whichever is greater)

Adjustability
- Voltage ±0.02 %
- Resistance ±0.05 %
- Resolution Infinite

Insulation Resistance
- 500 vdc. (1,000 megohms min.)

Dielectric Strength
- Sea Level 600 vac
- 80,000 Feet 250 vac
- Effective Travel 12 turns nom.

Environmental Characteristics

Power Rating (300 volts max.)
- 85 °C 0.25 watt
- 150 °C 0 watt

Temperature Range
- -65 °C to +150 °C
- ±100 ppm/°C
- 96 hours (2 % ΔTR, 100 Megohms IR)

Humidity
- MIL-STD-202 Method 103, 96 hours (2 % TR, 100 Megohms IR)

Temperature Coefficient
- ±100 ppm/°C

Load Life
- 1,000 hours 0.25 watt @ 85 °C
- 3 % or 3 ohms, whichever is greater, CRV

Rotational Life
- 200 cycles

Physical Characteristics

Torque
- 3.0 oz-in. max.

Weight
- 0.015 oz.

Flammability
- U.L. 94V-0

Standard Packing
- 50 pcs. per tube

How To Order

3262 P - 1 - 103 LF
- Model
- Style
- Standard or Modified
- Product Indicator
- Product Indicator
- Resistance Code
- Terminations
- Blank = 90 % Tin / 10 % Lead-plated (Standard)

Consult factory for other available options.

How To Order

3262 P - 1 - 103 LF
- Model
- Style
- Standard or Modified
- Product Indicator
- Product Indicator
- Resistance Code
- Terminations
- Blank = 90 % Tin / 10 % Lead-plated (Standard)

Consult factory for other available options.

**Fluorinert® is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3266
1/4” Square Trimming Potentiometer

Features
- Multiturn / Cermet / Industrial / Sealed
- Standoffs allow thorough PC board washing
- Tape and reel packaging available
- Patent #4427966 drive mechanism
- RoHS compliant* version available

Electrical Characteristics
Standard Resistance Range
10 to 1 megohm (see standard resistance table)
Resistance Tolerance ±10 % std.
Absolute Minimum Resistance
1 % or 2 ohms max. (whichever is greater)
Contact Resistance Variation
3.0 % or 3 ohms max. (whichever is greater)
Adjustability
Voltage ±0.02 %
Resistance ±0.05 %
Resolution Infinite
Dielectric Strength
Resistance Tolerance ±10 % std.
Voltage ±0.02 %
Power Rating (300 volts max.)
150 °C 0.25 watt
100 °C 0.25 watt
80,000 Feet 250 vac
Humidity MIL-STD-202 Method 103
Seal Test 85 °C Fluorinert*
Temperature Coefficient ±100 ppm/°C
Temperature Range -55 °C to +150 °C
Dielectric Strength
MIL-STD-202 Method 103
Sealed
Marking Manufacturer’strademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
Adjustment Tool H-90

Product Dimensions
3266W
Common Dimensions

3266X

Dimensions: MM(INCHES)
TOLERANCES: ±0.25(L.010) EXCEPT WHERE NOTED

Environmental Characteristics
Power Rating (300 volts max.)
70 °C 0.25 watt
150 °C 0.25 watt
Temperature Range -55 °C to +150 °C
Temperature Coefficient ±100 ppm/°C
Seal Test 85 °C Fluorinert*
Humidity MIL-STD-202 Method 103
96 hours (2 % ΔTR, 10 Megohms IR)
Vibration 30 G (1 % ΔTR, 1 % ΔVR)
Shock 100 G (1 % ΔTR, 1 % ΔVR)
Load Life 1,000 hours 0.25 watt 70 °C
(3 % ΔTR, 3 % CRV)
Rotational Life 200 cycles
(3 % ΔTR, 3 % or 3 ohms, whichever is greater, CRV)

Physical Characteristics
Torque 3.0 oz-in. max.
Mechanical Stops Wiper idles
Terminals Solderable pins
Weight 0.015 oz.
Marking Manufacturer’strademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
Wiper 50 % (Actual TR) ±10 %
Flammability U.L. 94V-0
Standard Packaging 50 pcs. per tube
Adjustment Tool H-90

“Fluorinert” is a registered trademark of 3M Co.

REV 09/04
3266 – Ordering Information and Packaging Specifications

### Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
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<tr>
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<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
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<td>5,000</td>
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<td>50,000</td>
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<td>100,000</td>
<td>104</td>
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<td>200,000</td>
<td>204</td>
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<td>250,000</td>
<td>254</td>
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<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

### How To Order

| 3226 W - 1 - 103 ___ LF |

- **Model:** 3226 W
- **Style:** 1
- **Standard or Modified:** 103
- **Product Indicator:** LF

**Resistance Code:**

- **Blank = Tube (Standard)**
- **R = Tape and Reel**
- **A = Ammo Pack**

- **Terminations:**
  - **LF = 100 % Tin-plated (RoHS compliant)**
  - **Blank = 90 % Tin / 10 % Lead-plated (Standard)**

Consult factory for other available options.

### Packaging Specifications

#### SIDE ADJUST

**3266Z-1**

**DIMENSIONS:** (INCHES)

- **REF. DIA.:** 4.32 ± .38 (.170 ± .015)
- **DIA. TYP.:** 3.81 ± .71 (.150 ± .028)

**ALL PINS IN-LINE ON CENTER: 2.54 (.100)**

**TOLERANCES:** ±.25/±.010 EXCEPT WHERE NOTED

Meets EIA Specification 468.

#### TOP ADJUST

**3266Y-1**

**DIMENSIONS:** (INCHES)

- **REF. DIA.:** 2.16 ± .25 (.085 ± .010)
- **DIA. TYP.:** 3.81 ± .71 (.150 ± .028)

**ALL PINS IN-LINE ON CENTER: 2.54 (.100)**

**TOLERANCES:** ±.25/±.010 EXCEPT WHERE NOTED

Meets EIA Specification 468.
3269
1/4” Square SMD Trimming Potentiometer

Features
- Stable, infinite resolution cermet element
- Vertical and horizontal adjust styles
- Optional packaging on embossed tape
- Compatible with surface mount manufacturing processes
- RoHS compliant – see page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics
- Standard Resistance Range: 10 ohms to 1 megohm
  (see standard resistance table)
- Resistance Tolerance: ±10 % std.
  (closer tolerance available)
- Absolute Minimum Resistance: 1 % or 2 ohms max.
  (whichever is greater)
- Contact Resistance Variation: 3.0 % or 3 ohms max.
  (whichever is greater)
- Adjustability
  - Voltage: ±0.02 %
  - Resistance: ±0.05 %
  - Resolution: Infinite
- Insulation Resistance: 500 vdc.
- Terminal Resistance Variation: 3.0 % or 3 ohms max.
- Torque: 3.0 oz-in. max.
- Humidity: MIL-STD-202 Method 106
- Temperature Coefficient: ±100 ppm/°C
- Temperature Range: -65 °C to +150 °C
- Power Rating (300 volts max.): 0.25 watt @ 85 °C
- Dielectric Strength
  - Sea Level: 600 vac
  - 80,000 Feet: 250 vac
  - Effective Travel: 12 turns nom.

Environmental Characteristics
- Power Rating (300 volts max.): 0.25 watt @ 150 °C
- Temperature Range: -65 °C to +150 °C
- Temperature Coefficient: ±100 ppm/°C
- Seal Test: 85 °C Fluorinert™
- Humidity: MIL-STD-202 Method 106
  - (2 % ΔTR; 1 % ΔVR)
- Vibration: 30 G (1 % ATR; 1 % ΔVR)
- Shock: 100 G (1 % ATR; 1 % ΔVR)
- Load Life: 1,000 hours 0.25 watt @ 85 °C
  - (3 % ΔTR; 3 % or 3 ohms whichever is greater, CRV)
- Rotational Life: 600 cycles
  - (2 % ΔTR; 3 % or 3 ohms, whichever is greater, CRV)

Physical Characteristics
- Torque: 3.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminals: Solderable pins
- Weight: 0.015 oz.
- Marking: Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
- Standard Packaging: 50 pcs. per tube
- Adjustment Tool: H-90
- Wiper: 50 % (Actual TR) ±10 %

Product Dimensions

**REV 09/04**
3269 – Packaging Specifications

**P Style**

-1 Meets EIA Specification 481.
Units packaged 750 pieces per reel.

**W and X Styles**

-2 Meets EIA Specification 481.
Units packaged 500 pieces per reel.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
3290
3/8” Square Trimming Potentiometer

Features
- Multiturn/ Wirewound / Industrial / Sealed
- Listed on the QPL for style RT24 per MIL-R-27208 and RTR24 per High-Rel MIL-R-39015
- Panel mount option available
- RoHS compliant†

Electrical Characteristics
- Standard Resistance Range: 10 to 50K ohms (see standard resistance table)
- Resistance Tolerance: ±5 % std. (tighter tolerance available)
- Absolute Minimum Resistance: 0.1 % or 1 ohm max. (whichever is greater)
- Noise: 100 ohms ENR max.
- Resolution: (see standard resistance table)
- Insulation Resistance: 500 vdc. 1,000 megohms min.
- Dielectric Strength: Sea Level 1,000 vac, 80,000 Feet 350 vac
- Adjustment Travel: 25 turns nom.

Environmental Characteristics
- Power Rating: 1.0 watt @ 85 °C
- Temperature Range: -65 °C to +150 °C
- Temperature Coefficient: ±50 ppm/°C
- Seal Test: 85 °C Fluorinert®
- Humidity: MIL-STD-202 Method 106 96 hours (2 % TR; 100 Megohms IR)
- Vibration: 30G (1 % TR; 0.5 % + resolution VR)
- Shock: 100G (1 % TR; 0.5 % + resolution VR)
- Load Life: 1,000 hours 1.0 watt @ 85 °C (2 % TR; 500 ohms ENR)
- Rotational Life: 200 cycles (2 % TR; 500 ohms ENR)

Physical Characteristics
- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminals: Solderable printed circuit pins
- Weight: 0.025 oz.
- Marking: Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
- Wiper: 50 % (Actual TR) ±10 %
- Flammability: U.L. 94V-0
- Standard Packaging: 50 pcs. per tube
- Adjustment Tool: H-90

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>1.11</td>
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<tr>
<td>20</td>
<td>200</td>
<td>0.93</td>
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<tr>
<td>50</td>
<td>500</td>
<td>0.62</td>
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<td>5,000</td>
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<tr>
<td>10,000</td>
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</tr>
<tr>
<td>50,000</td>
<td>503</td>
<td>0.11</td>
</tr>
</tbody>
</table>

How To Order

Model: 3290 H - 1 - 103 M
Style
Standard or Modified Product Indicator
-1 = Standard Product
Resistance Code
Optional Suffix Letter
M = Panel Mount (Factory Installed)
Consult factory for other available options.

**Fluorinert** is a registered trademark of 3M Co.

REV 09/04
3292
3/8" Square Trimming Potentiometer

Features
- Multiturn / Cermet / Industrial / Sealed
- Optional panel mount available
- Patent #4427966 drive mechanism
- Thin body profile
- RoHS compliant version available

Electrical Characteristics

Standard Resistance Range
0.10 to 1 megohm (see standard resistance table)

Resistance Tolerance ±0.01 %
(tighter tolerance available)

Absolute Maximum Resistance
1 % or 2 ohms max. (whichever is greater)

Contact Resistance Variation
3292 ±0.01 % of 3 ohms max. (whichever is greater)

Adjustability
Voltage ±0.01 %
(whichever is greater)

Resolution...

Insulation Resistance
500 vdc.

Humidity
MIL-STD-202 Method 103

Seal Test
85 °C Fluorinert* (pin styles only)

Temperature Coefficient
±100 ppm/°C

Temperature Range
-65 °C to +150 °C

Power Rating (400 volts max.)

Insulation Resistance
500 vdc.

Resolution
Infinite

Adjustability
- Absolute Minimum Resistance
- Resistance Tolerance ±0.01 % std.
- Standard Resistance Range
- Effective Travel 25 turns nom.

Dielectric Strength

Sea Level 1.000 megohms
8,000 Feet 350 vac

Environmental Characteristics

Power Rating (400 volts max.)
85 °C 0.5 watt
150 °C 0.2 watt

Temperature Range...-65 °C to +150 °C

Temperature Coefficient...±100 ppm/°C

Seal Test...85 °C Fluorinert* (pin styles only)

Humidity...MIL-STD-202 Method 103

Shock...100 G (1 % ΔTR; 1 % ΔVR)

Load Life...

Rotational Life...

Physical Characteristics

Torque...5.0 oz-in. max.

Mechanical Stops...

Wiper idles

Terminals...

Solderable printed circuit pins

Weight...

Machine Screw Mounting

Torque...

Marking...

Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style

Wiper...

Flammability...U.L. 94V-0

Standard Packaging

R, W & X Styles...50 pcs. per tube
L Style...

Adjustment Tool...H-90

Product Dimensions

3292L

Common Dimensions

3292P

*Common dimensions

3292W

3292X

Dimensions: MM/(INCHES)

TOLERANCES: ±25/±.010 EXCEPT WHERE NOTED

How To Order

Model
3292 W - 1 - 103 M LF

Style

Standard or Modified
-1 = Standard Product

Resistance Code

Optional Suffix Letter
-M = Panel Mount 3292L, W & X

(Factory Installed)

Terminations

LF = 100 % Tin-plated (RoHS compliant)
Blank = 90 % Tin / 10 % Lead-plated (Standard)

Consult factory for other available options

*"Fluorinert" is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
3296

3/8” Square Trimming Potentiometer

Features

- Multiturn / Cermet / Industrial / Sealed
- 5 terminal styles
- Tape and reel packaging available
- Chevron seal design

- Listed on the QPL for style RJ24 per MIL-R-22097 and RJR24 per High-Rel Mil-R-39035
- Mounting hardware available (H-117P)
- RoHS compliant version available

<table>
<thead>
<tr>
<th>Electrical Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Resistance Range</td>
</tr>
<tr>
<td>Resistance Tolerance</td>
</tr>
<tr>
<td>Absolute Minimum Resistance</td>
</tr>
<tr>
<td>Contact Resistance Variation</td>
</tr>
<tr>
<td>Adjustability</td>
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<tr>
<td>Resistance</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
<tr>
<td>Insulation Resistance</td>
</tr>
<tr>
<td>1,000 megohms min.</td>
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<tr>
<td>Dielectric Strength</td>
</tr>
<tr>
<td>70,000 Feet: 350 vac</td>
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<tr>
<td>Effective Travel</td>
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<table>
<thead>
<tr>
<th>Environmental Characteristics</th>
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</thead>
<tbody>
<tr>
<td>Power Rating (300 volts max.)</td>
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<tr>
<td>70 °C</td>
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<tr>
<td>125 °C</td>
</tr>
<tr>
<td>Temperature Range</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
</tr>
<tr>
<td>Seal Test</td>
</tr>
<tr>
<td>Vibration</td>
</tr>
<tr>
<td>Shock</td>
</tr>
<tr>
<td>Load Life</td>
</tr>
<tr>
<td>(3 % ΔTR, 3 % or 3 ohms, whichever is greater, CRV)</td>
</tr>
<tr>
<td>Rotational Life</td>
</tr>
<tr>
<td>(4 % ΔTR, 3 % or 3 ohms, whichever is greater, CRV)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque</td>
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<td>Mechanical Stops</td>
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<tr>
<td>Terminals</td>
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<td>Weight</td>
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<tr>
<td>Marking</td>
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<tr>
<td>Wiper</td>
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<tr>
<td>Flammability</td>
</tr>
<tr>
<td>Standard Packaging</td>
</tr>
<tr>
<td>Adjustment Tool</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Product Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Dimensions</td>
</tr>
<tr>
<td>3296P</td>
</tr>
<tr>
<td>3296W</td>
</tr>
<tr>
<td>3296X</td>
</tr>
<tr>
<td>3296Y (Commercial Only)</td>
</tr>
<tr>
<td>3296Z (Commercial Only)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Resistance Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
</tr>
<tr>
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<td>10,000</td>
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</table>

<table>
<thead>
<tr>
<th>How To Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>3296 W - 1 - 103 _ LF</td>
</tr>
</tbody>
</table>

How to Order:

- Model
- Style
- Standard or Modified
- Product Indicator
- Resistance Code
- Packaging Designator
- Blank = Tube (Standard)  
  R = Tape and Reel (X and W Pin Styles Only)  
  A = Ammo Pack (X and W Pin Styles Only)  
- Terminations
  LF = 100 % Tin-plated (RoHS compliant)  
  Blank = 90 % Tin / 10 % Lead-plated (Standard)  
- Consult factory for other available options.

**Fluorinert** is a registered trademark of 3M Co.  
Specifications are subject to change without notice.  
Customers should verify actual device performance in their specific applications.  
REV 09/04
# 3296 – Packaging Specifications

## SIDE ADJUST
**3296X-1**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Tolerance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIA.</td>
<td>4.83</td>
<td>+0.30/-0.25</td>
<td>(.190 ± .012/-.010)</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>±.76</td>
<td>(.709 ± .030)</td>
</tr>
<tr>
<td>2</td>
<td>2.54</td>
<td>.005 ± .010</td>
<td>(.100)</td>
</tr>
<tr>
<td>3</td>
<td>12.70</td>
<td>±.25</td>
<td>(.050 ± .012/-.010)</td>
</tr>
<tr>
<td>4</td>
<td>8.89</td>
<td>±.51</td>
<td>(.350 ± .030/-.020)</td>
</tr>
</tbody>
</table>

All pins in-line on center.

**1000/REEL/BOX**

Meets EIA Specification 468.

## TOP ADJUST
**3296W-1**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Tolerance</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIA.</td>
<td>4.83</td>
<td>+0.30/-0.25</td>
<td>(.190 ± .012/-.010)</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>±.76</td>
<td>(.709 ± .030)</td>
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<tr>
<td>2</td>
<td>2.41</td>
<td>±.25</td>
<td>(.095 ± .010)</td>
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<tr>
<td>3</td>
<td>14.0</td>
<td>±.03</td>
<td>(.157 ± .001)</td>
</tr>
<tr>
<td>4</td>
<td>29.59</td>
<td>±.76</td>
<td>(1.165 ± .030)</td>
</tr>
</tbody>
</table>

All pins in-line on center.

**1000/REEL/BOX**

Meets EIA Specification 468.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3296-LC2
3/8” Square Trimming Potentiometer

Features
- High Performance Series 3/8” Square / Multiturn / Cermet / Industrial / Sealed
- Thin body profile
- Sealed to withstand board washing processes
- Patent #4427966, #4732802, #4824694
- Low current applications <50 uA
- Mounting hardware available
- RoHS compliant† version available

**Electrical Characteristics**

- **Standard Resistance Range**
  - 500 ohms to 100K ohms (see standard resistance table)
- **Resistance Tolerance** ±10 % std.
- **Absolute Minimum Resistance** 2 ohms or 1 % max. (whichever is greater)
- **Contact Resistance Variation** 0.5 % max.
- **Contact Resistance (D.C. mode)** 0.3 % max.
- **D.C. Offset** 0.5 % max.
- **Adjustability** Voltage ±0.1 %
- **Resistance** ±0.2 %
- **Insulation Resistance** 500 vdc, 1,000 megohms min.
- **Dielectric Strength**
  - Sea Level 900 vac
  - 70,000 feet 350 vac
  - Adjustment Angle, Electrical 25 ±5 turns

**Environmental Characteristics**

- **Power Rating** (400 volts max.)
  - 85 °C 0.5 watt
  - 125 °C 0 watt
- **Temperature Range** -55 °C to +125 °C
- **Temperature Coefficient** ±100 ppm/°C
- **Humidity** 80-90 %, RH, 10 cycles
- **Seal Test** 85 °C Flourinert*
- **Vibration** 20 G - 0.5 % VRS
- **Shock** 100 G - 0.5 % VRS
- **Load Life @ 85 °C Rated Power** 1,000 hours
- **Rotational Life** 200 cycles
- **Thermal Shock** 5 cycles
- **Environmental Characteristics**
  - **Torque** 3.0 oz-in. max.
  - **Mechanical Stops** Wiper idles
  - **Terminals** Solderable PC pins
  - **Weight** 0.03 oz.
  - **Marking** Manufacturer’s trademark, resistance code and date code
  - **Wiper** 50 % (Actual TR) ±10 %
  - **Flammability** U.L. 94V-0
  - **Standard Packaging** 50 pcs. per tube
  - **Adjustment Tool** H-90

**Product Dimensions**

- **Common Dimensions**
  - **DIA.** 2.54 (100)
  - **MIN.** 1.52 (.060)
  - **MAX.** 2.36 (.093)
  - **ADJ. SLOT WIDE** 1.27 (.050)
  - **ADJ. SLOT DEEP** .76 (.030)

**Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
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<td>50,000</td>
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<tr>
<td>100,000</td>
<td>104</td>
</tr>
</tbody>
</table>

*Fluorinert* is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

**How To Order**

3296W - LC2 - 103 LF

- Model
- Style
- Product Indicator
- Resistance Code
- Terminations
- **Terminations**
  - LF = 100 % Tin-plated (RoHS compliant)
  - Blank = 90 % Tin / 10 % Lead-plated (Standard)
  - Consult factory for other available options.
3296-OT1
3/8” Square Trimming Potentiometer

Features

- 3/8” Square/ Multiturn / Cermet Industrial / Sealed
- Designed for operational amplifier offset voltage adjustment applications
- Reduces power supply drift errors
- Unique center tapped trimming potentiometer
- Vertical and horizontal adjust types available
- Patent #4427966 drive mechanism
- Mounting hardware available
- RoHS compliant version available

Electrical Characteristics

Standard Resistance Range
(Pin 1 to Pin 3) ...100 ohms to 1 megohm (see standard resistance table)
Resistance Tolerance ..............±20 % std.
Absolute Minimum Resistance
..................................................2 ohms max.
Voltage Output Variation ..............±0.25 %
Adjustability (VR) .....................±0.025 %
Insulation Resistance ..............500 vdc. 1,000 megohms min.

Diode Strength
Sea Level .......................................900 vac
70,000 Feet ....................................350 vac
Effective Electrical Travel, Nom. ....25 turns
Center Tap Resistance ..........2 ohms max.
Center Tap Electrical Center ....±5 %
Center Tap Dead Band ..............0.5 turn

Environmental Characteristics

Power Rating
70 °C ........................................0.5 watt
125 °C ......................................0 watt
Temperature Range .......-55 °C to +125 °C
Temperature Stability (AVR) ................±0.5 % max.
Seal Test ......................85 °C Fluorinert®
Humidity.............MIL-STD-202 Method 103
96 hours ......................10 megohms min.
Vibration, 20 G ..............±1 % ΔTR
Shock, 100 G ..............±1 % ΔTR
Load Life, 1,000 Hours ....±3 % ΔTR
Rotational Life, 200 cycles ....±4 % ΔTR

Physical Characteristics

Torque.................................3.0 oz-in. max.
Mechanical Stops......................Wiper idles
Terminals .......Solderable pins
Weight .................0.03 oz.
Marking .............Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style
Flammability ..............UL 94V-0
Standard Packaging
.........................................50 pcs. per tube/tray
Adjustment Tool ..........H-90

Also see Model 3386-OT1.

Suggested Offset Voltage Adjustment Circuit

Also see Model 3386-OT1.

“Fluorinert” is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
### 3299

3/8” Square Trimming Potentiometer

**Features**
- 3/8” Square / Multiturn / Cermet / Industrial / Sealed
- Five popular terminal styles
- Standoffs
- Patent #4427966 drive mechanism
- RoHS compliant version available

---

#### Electrical Characteristics

- **Standard Resistance Range**: 10 to 2 megohms (see standard resistance table)
- **Resistance Tolerance**: ±10 % std. (tighter tolerance available)
- **Absolute Minimum Resistance**: 1 % or 2 ohms max. (whichever is greater)
- **Contact Resistance Variation**: 1.0 % or 3 ohms max. (whichever is greater)
- **Adjustability**: Voltage tolerance ±0.01 %
- **Resistance**: ±0.05 %
- **Resolution**: 50 % (Actual TR) ±10 %
- **Mechanical Stops**: Wiper idles
- **Torque**: 3.0 oz-in. max.

#### Environmental Characteristics

- **Power Rating**: 300 volts max.
- **Temperature Range**: 70 °C to 125 °C
- **Humidity**: MIL-STD-202 Method 103
- **Seal Test**: 85 °C Fluorinert*
- **Temperature Coefficient**: ±100 ppm/°C
- **Temperature Range**: -55 °C to +125 °C
- **Power Rating (300 volts max.)**
  - 70 °C: 0.5 watt
  - 125 °C: 0 watt
  - 70,000 Feet: 350 vac

#### Physical Characteristics

- **Torque**: 3.0 oz-in. max.
- **Weight**: 0.035 oz.
- **Marking**: Manufacturer’s trademark
- **Dimensions**: MM [INCHES]
  - 3299P: 6.56 [0.256] 5.23 [0.206] 2.54 [1.00]
  - 3299W: 5.38 [0.212] 5.38 [0.212] 2.54 [1.00]
  - 3299X: 6.64 [0.262] 6.64 [0.262] 2.54 [1.00]
  - 3299Y: 5.38 [0.212] 5.38 [0.212] 2.54 [1.00]
  - 3299Z: 6.64 [0.262] 6.64 [0.262] 2.54 [1.00]

#### How To Order

- **Model**
- **Style**
- **Standard or Modified**
- **Product Indicator**
- **Resistance Code**
- **Terminations**
- **Resistance**
- **Code**

---

**Specifications are subject to change without notice.**

*Fluorinert* is a registered trademark of 3M Co.


Customers should verify actual device performance in their specific applications.

REV 09/04
3302 2 mm SMD Trimming Potentiometer

Features
- Single-Turn Cermet / Open Frame
- Recommended for reflow processing
- Rotor design compatible with automatic adjustment equipment
- Supplied in 8 mm embossed tape, compatible with automatic assembly equipment
- 2 mm size meets EIA/EIAJ standard trimmer footprint
- RoHS compliant – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics
- Standard Resistance Range 200 to 1 megohm (see standard resistance table)
- Resistance Tolerance 2.5% std.
- Absolute Minimum Resistance ≤1K 20 ohms max.
- >1K 5% max.
- Contact Resistance Variation 5% max.
- Resolution Infinite
- Rotational Cycling 10 turns
- Load Life @ 70 °C rated power 500 hours
- TRS ±15 %
- TRS ±5 %
- Humidity 95% RH (500 hours)
- Temperature Coefficient ±250 ppm/°C
- Temperature Range -40 °C to +85 °C

Packaging Specifications
- Standard Packaging 2000 pcs./7” reel
- Marking Part marking code
- Mechanical Angle Continuous
- Torque 10-150 g-cm max.

Physical Characteristics
- Torque 10-150 g-cm max.
- Mechanical Angle Continuous
- Resolution Infinite
- Adjustment Angle 260 ° ±20 °

Environmental Characteristics
- Power Rating (50 VDC max.) 70 °C 0.15 watt
- Temperature Range -40 °C to +85 °C
- Temperature Coefficient ±250 ppm/°C
- Humidity 95% RH (500 hours)
- Load Life @ 70 °C rated power 500 hours
- TRS ±5 %
- Rotational Cycling 10 turns
- TRS ±15 %

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Part Marking Code</th>
<th>Resistance Code</th>
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</thead>
<tbody>
<tr>
<td>200</td>
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<td>1,000,000</td>
<td>16</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface. Special resistances available.

Product Dimensions

Low Profile

3302W, X-3
3 Terminals for Automatic Trimming Adjustment
Low Profile

SUGGESTED PWB LAYOUT

Dimensions: (mm) (inches) Tolerances ±.25(±.010) EXCEPT WHERE NOTED

How To Order

Model 3302 X - 3 - 103 E

Style
- Orientation of Parts in Tape
- Style W = Terminals Toward Sprocket Holes

Standard or Modified
- Product Indicator = Continuous Rotation
- Resistance Code
- Embossed Tape Designator
- Consult factory for other available options.

Specifications are subject to change without notice.

REV 09/04
3303
3 mm SMD Trimming Potentiometer

Features

- Recommended for reflow processing
- Rotor design compatible with pick and place and automatic adjustment equipment
- Supplied in 8 mm embossed tape, compatible with automatic assembly equipment
- Rear adjust version available
- 3 mm size meets EIA/EIAJ standard trimmer footprint
- RoHS compliant† – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

- Standard Resistance Range .............................................100 ohms to 1 megohm
  (see standard resistance table)
- Resistance Tolerance ....................................................±25 % std.
- Absolute Minimum Resistance ≤ 1K Ohms ..................20 ohms max.
  >1K Ohms ..............................................2 % max. of TR
- Contact Resistance Variation .....................................5 % max.
- Resolution .....................................................................Infinite
- Adjustment Angle ........................................................260 ° ±20 °

Environmental Characteristics

- Resistance to Soldering Heat .................................................260 °C, 10 seconds, TRS max. 5 %
- Power Rating (50 VDC max.) ........................................70 °C ..................0.15 watt
- Temperature Range ..................................................-40 °C to +125 °C
- Temperature Coefficient ..............................................±250 ppm/°C
- Humidity ......................................................................95 % RH (500 hours)
- Load Life .........................................................@ 70 °C rated power 500 hours
  TRS ± 5 %
- Rotational Cycling ..................................................20 turns
  TRS ±15 %

Physical Characteristics

- Torque ...........................................................................20-200 g-cm max.
- Mechanical Angle .........................................................Continuous
- Marking ........................................................................Part marking code
- Standard Packaging ..................................................2000 pcs./7˝ reel
- Adjustment Tool ..........................................................H-90

Specifications are subject to change without notice.

REV 09/04
3303 – Ordering Information and Packaging Specifications

**Packaging Specifications**

- **Tape Reel**: Meets EIA 481

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<thead>
<tr>
<th>Dimensions</th>
<th>Tolerances</th>
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<tr>
<td>DIA.</td>
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<tr>
<td>MIN. DIA.</td>
<td>±0.10/0.004</td>
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**Standard Resistance Table**

<table>
<thead>
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<th>Resistance Code</th>
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<tr>
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<td>16</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

**How To Order**

- **Model**: 3303 X - 3 - 103 E
- **Style**: Orientation of Parts in Tape
  - Styles W & C: Terminals Toward Sprocket Holes
  - Styles X & D: Terminals Away from Sprocket Holes (preferred)
- **Product Indicator**
  - -1 = Single Slot
  - -3 = Cross Slot Low Profile* (Standard)
- **Resistance Code**: Embossed Tape Designator
- Consult factory for other available options.

*Not available in C and D styles.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
6 mm Round Trimming Potentiometer

Features
- 6 mm Round / Single-Turn / Cermet
- Industrial / Open Frame
- Cross slot adjustment options
- Horizontal and vertical mounting styles
- Dust resistant/splash resistant covers
- PC board stand-offs and retention feature
- Front and top adjust styles
- RoHS compliant

Electrical Characteristics

Standard Resistance Range
- 100 ohms to 1 megohm (see standard resistance table)

Resistance Tolerance
- ±25% std. (tighter tolerance available)

Absolute Minimum Resistance
- 2% max. (±2K = 30 ohms)

Contact Resistance Variation
- 3% max.

Resolution
- Essentially infinite

Adjustment Angle
- 215° nom.

Environmental Characteristics

Power Rating (100 volts max.)
- 70°C ...........................................0.2 watt

Temperature Range
- -25°C to +100°C

Temperature Coefficient
- ±250 ppm/°C

Load Life
- 1,000 hours 0.2 watt @ 70°C (5% TR)

Physical Characteristics

Mechanical Angle
- 260° ±20°

Torque (Operating)
- 4.5 oz-in. max.

Stop Strength
- 6.5 oz-in. min.

Terminals
- Solderable pins

Marking
- Manufacturer's trademark, resistance code

Standard Packaging
- 300 pcs. per bag

How To Order

Model
3306 W - 1 - 103

Style

Standard Product

Resistance Code

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
3309
9 mm Round Trimming Potentiometer

Features
- 9 mm Round / Single-Turn / Cermet / Industrial / Open Frame
- Both sides adjust
- Cross slot and hexagon adjustment designs
- Horizontal and vertical mounting styles
- Dust resistant/splash resistant covers
- PC board stand-offs and retention feature
- RoHS compliant

Electrical Characteristics
- Standard Resistance Range: 100 ohms to 2 megohms
- Resistance Tolerance: ±25 % std. (tighter tolerance available)
- Absolute Minimum Resistance: ±2K = 30 ohms
- Contact Resistance Variation: ±3 % max.
- Resolution: Essentially infinite
- Adjustment Angle: 235 ° nom.

Environmental Characteristics
- Power Rating: 0.5 watt @ 70 °C
- Temperature Range: -25 °C to +100 °C
- Temperature Coefficient: ±250 ppm/°C
- Load Life: 1,000 hours 0.5 watt @ 70 °C (5 % ATR)

Physical Characteristics
- Mechanical Angle: ±10 °
- Torque (Operating): 5 oz-in. max.
- Stop Strength: 11.0 oz - in. min.
- Terminals: Solderable pins
- Marking: Manufacturer's trademark, resistance code
- Standard Packaging: 200 pcs. per bag
- Adjustment Tool: H-90
- Aqueous cleaning not recommended

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3309 – Ordering Information and Packaging Specifications

Packaging Specifications

Side Adjust Common Dimensions

3309W

Dimensions:
- Side Adjust Common
- 3309W

3309W-1 Single Side (Front) Adjust

3309W-2 Both Sides Adjust - Cross Slot

3309W-3 Both Sides Adjust Hex

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms</td>
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<table>
<thead>
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<th>Resistance</th>
<th>Resistance Code</th>
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<tbody>
<tr>
<td>Ohms</td>
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</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

How To Order

Model:
- 3309 W - 2 - 103

Style:

Rotor Style:
- 2 = Cross Slot/Single Slot Rear Adjust
- 3 = 2 mm Hex Thru Hole

Resistance Code:

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3 mm Trimming Potentiometer

Features
- Surface Mount 3 mm Square Single-Turn / Cermet / Sealed
- Compatible with surface mount manufacturing processes
- Rotor stop for "in-circuit" adjustment
- 100 cycle rotational and seal life
- RoHS compliant – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

Standard Resistance Range
- 10 ohms to 2 megohms (see standard resistance table)
- End Resistance 1% or 3 ohms max. (whichever is greater)

Contact Resistance Variation
- 100 cycle rotational and seal life
- RoHS compliant
- - See page 155 for processing information on lead free surface mount trimmers

Dielectric Strength
- Sea Level 500 vac
- 70,000 Feet 275 vac

Adjustment Angle
- 220 ° nom.

Environmental Characteristics

Max. Soldering Exposure
- 260 °C/5 seconds
- 70 °C 125 °C 150 °C 180 °C

Power Rating (200 volts max.)
- 70 °C 0.125 watt
- 125 °C 0 watt

Operating Temp. Range
- -55 °C to +125 °C

Vibration
- 20 G TRS ±1 %; VRS ±1 %

Shock
- 100 G TRS ±1 %; VRS ±1 %

Load Life
- 1000 hours @ 70 °C Rated Power; TRS ±3 %

Rotational Life
- 100 cycles TRS ±3 %

Thermal Shock
- 5 cycles TRS ±3 %

Physical Characteristics

Mechanical Angle
- 250 ° nom.

Torque
- 50 g-cm max.

Stop Strength
- 200 g-cm min.

Pushover Strength (*S only)
- 1.6 Kilograms (3.5 lbs) minimum

Flammability
- U.L. 94V-0

Weight
- Approx. 0.01 oz.

Marking
- Resistance code and date code Wiper

Adjustment Tool
- H-91

Position Rotor As Shown
Within ±11° Of Centerline Of Terminal 2

**"Fluorinert" is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications. REV 09/04
Additional Features

- Patent #5043695 assembly for seal integrity
- Plastic housing for RF applications

3313 – Ordering Information and Packaging Specifications

**Packaging Specifications**

<table>
<thead>
<tr>
<th>J Style</th>
<th>S Style</th>
</tr>
</thead>
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**Standard Resistance Table**

<table>
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<th>Resistance (Ohms)</th>
<th>Part Marking Code</th>
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</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

**How To Order**

```
3313 J - 1 - 502 E
```

Model
Style
Standard or Modified Product Indicator
-1 = Standard Product
Resistance Code
Embossed Tape
1000 pcs. / 7” Reel (Standard)

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3314
4 mm Square Trimming Potentiometer

Features
- Surface Mount / Single Turn / Cermet Industrial / Sealed
- Compatible with surface mount manufacturing processes
- Compatible with popular vacuum pick-and-place equipment
- J-hook, gull-wing and pinned configurations
- Side adjust available
- RoHS compliant – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics
Standard Resistance Range
........................................10 ohms to 2 megohms (see standard resistance table)
Resistance Tolerance ....................±20 % std. (tighter tolerance available)
End Resistance ..................1 % or 2 ohms max. (whichever is greater)
Contact Resistance Variation
..................................................3 % or 3 ohms
Resolution ........................................Infinite
Insulation Resistance ...................500 vdc.
........................................100 megohms min.
Dielectric Strength
Sea Level ....................500 vac (1 minute)
Adjustment Angle ......................210 ° nom.

Environmental Characteristics
Power Rating (300 volts max.)
70 °C .........................................0.25 watt
125 °C ...........................................0 watt
Temperature Range ........-55 °C to +125 °C
Temperature Coefficient ..........±100 ppm/°C
Humidity ......................90-98 % RH,
.........................................90 cycles, 240 hours
TRS ±2 %; IR 10 megohms
Vibration ..................20 G TRS ±1 %; VRS ±1 %
Shock ...................100 G TRS ±1 %; VRS ±1 %
Load Life .................................(70 °C Rated Power 1000 Hours)
..................................................TRS ±3 %
Rotational Life ......................100 cycles
..................................................TRS ±3 %
Thermal Shock .......................5 cycles
..................................................TRS ±2 %; VRS ±1 %

Physical Characteristics
Mechanical Angle ....................240 ° nom.
Torque ..................Approximately 180 g-cm typical
Stop Strength ..................300 g-cm typical
Pushover Strength (Z Style)
.................................2 kilograms (4.4 lbs.) minimum
Weight ..................Approximately 0.01 oz.
Marking ..................Manufacturer’s code, resistance code and date code
Wiper ..................50 % (Actual TR) ±10 %
Flammability ..................U.L. 94V-0
Standard Packaging
J, G and R ..................500 pcs./7 ” reel
S and Z ..................200 pcs./7 ” reel
H .................................100 pcs./tube
Adjustment Tool ......................H-90

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
Additional Features

- Meets EIA/EIAJ/IPC/VECI SMD standard trimmer designs
- Model 3314 has been approved for use by DESC on drawings 88039 (3314J) and 90027 (3314G)

3314 – How to Order

Standard Resistance Table

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<tr>
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<td>204</td>
</tr>
<tr>
<td>250,000</td>
<td>254</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

How To Order

Model 3314 J - 1 - 502 E

Style

- Standard or Modified
  - Product Indicator (Styles J, G, R, H & S)
    - -1 = Single Slot
    - -2 = Cross Slot
    - -3 = Single Slot w/Reverse Marking
  - Product Indicator (Style Z only)
    - -GA4 = Single Slot
    - -1 = Cross Slot
    - -3 = Single Slot w/Reverse Marking

Resistance Code

- Embossed Tape Designator*
  - E = Styles J, G and R: 500 pcs./7” reel
    - Styles S and Z: 200 pcs./7” reel
  - G = Styles J and G: 3000 pcs./13” reel
    - Style R: 2500 pcs./13” reel
    - Styles S and Z: 1000 pcs./13” reel

*Style H is available in tube packaging only.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3314 – Product Dimensions and Packaging Specifications

Product Dimensions

3314R-1

3314H-1

(J, G Styles)

(R Style)

Tape

Reel

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3314 – Product Dimensions and Packaging Specifications

**Product Dimensions**

### 3314S-1
(Bourns Marking, Straight Slot)

- **ADJ. SLOT**: 2.41 (0.095) LONG
- **WIDE**: 0.51 (0.020)
- **DEEP**: 0.60 (0.0236)

**Dimensions**: MM/(INCHES)

**Tolerances**: ±0.25/(±0.010) EXCEPT WHERE NOTED

**Recommended PCB Layout**

- **ROTOR**: Positioned as shown within ±22° of centerline of terminal 2

### 3314S-2
(Bourns Marking, Cross Slot)

- **ADJ. SLOT**: 2.41 (0.095) LONG
- **WIDE**: 0.51 (0.020)
- **DEEP**: 0.60 (0.0236)

**Dimensions**: MM/(INCHES)

**Tolerances**: ±0.30/(±0.012) EXCEPT WHERE NOTED

**Recommended PCB Layout**

- **ROTOR**: Positioned as shown within ±22° of centerline of terminal 2

### 3314S-3
(Reverse Marking, Straight Slot)

- **ADJ. SLOT**: 2.41 (0.095) LONG
- **WIDE**: 0.51 (0.020)
- **DEEP**: 0.60 (0.0236)

**Dimensions**: MM/(INCHES)

**Tolerances**: ±0.25/(±0.010) EXCEPT WHERE NOTED

**Recommended PCB Layout**

- **ROTOR**: Positioned as shown within ±22° of centerline of terminal 2

**Packaging Specifications**

**S Style**

- **TAPE**: 1.5 ± 0.1/0.0 (0.39 ± 0.03) WIDE
- **DIA.:** 1.75 (0.069)

**Dimensions**: MM/(INCHES)

**Tolerances**: ±0.25/(±0.010) EXCEPT WHERE NOTED

**Reel**

- **DIA.:** 330.2 ± 2.0 (13.0 ± 0.08)
- **MAX.**: 21.01 ± 0.79 (0.83 ± 0.03)
- **MIN.**: 16.4 ± 0.62 (0.646 ± 0.025)

**Dimensions**: MM/(INCHES)

**Tolerances**: ±0.25/(±0.010) EXCEPT WHERE NOTED

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

Meets EIA specification 481.

* Embossed Tape Designator “E”
** Embossed Tape Designator “G”

(See How To Order chart for further information.)
### 3314 – Product Dimensions and Packaging Specifications

#### Product Dimensions

**3314Z-1-(RC) E**  
(Cross Slot)

- Cross adjustment slot:  
  - Long: 2.41 (0.095)  
  - Wide: 0.91 (0.036)  
  - Deep: 0.51 (0.020)

- Rotor positioned as shown within ± 22° of centerline of terminal 2

**3314Z-GA4-(RC) E**  
(Straight Slot)

- Straight adjustment slot:  
  - Long: 2.41 (0.095)  
  - Wide: 0.91 (0.036)  
  - Deep: 0.51 (0.020)

- Rotor positioned as shown within ± 22° of centerline of terminal 2

**3314Z-3**  
(Reverse Marking, Straight Slot)

- Straight adjustment slot:  
  - Long: 2.41 (0.095)  
  - Wide: 0.91 (0.036)  
  - Deep: 0.51 (0.020)

- Rotor positioned as shown within ± 22° of centerline of terminal 2

#### Packaging Specifications

**Z Style**

- **Tape**
  - Width: 0.40 (0.016) MAX
  - Length: 16.00 ± 0.3 (630 ± 0.012)
  - Diameter: 7.5 (0.295) TYP.
  - Embossed Tape Designator “G”

- **Reel**
  - Diameter: 177.8 ± 2.0 (7.00 ± 0.080)
  - Diameter: 13.0 ± 0.5 (0.512 ± 0.020) TYP.
  - Diameter: 21.01 ± 0.79 (0.827 ± 0.031) MIN.
  - Diameter: 16.4 ± 0.20 (0.646 ± 0.079) MIN.

- **Dimensions**: MM/(INCHES)
  - Tolerances: ± 0.25/(0.010) EXCEPT WHERE NOTED

- Meets EIA specification 481.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3318
6 mm Square Trimming Potentiometer

Features
- Single-Turn / Carbon / Commercial
  Open Frame
- Cross slot rotor design suitable for
  automatic adjustment equipment
- Board retention features
- Enclosed cover
- PC board stand-offs
- Adjustable front / back, top / bottom
- RoHS compliant

Electrical Characteristics
Standard Resistance Range
- 100 Ω to 1 MΩ (see standard resistance table)
Contact Resistance Variation
- ±10 % max.
Resolution
- Infinite
Adjustment Angle
- 210° ± 15˚

Environmental Characteristics
Power Rating
- 0.1 watt
Temperature Range
- -10 °C to +70 °C
Temperature Coefficient
- ±1,000 PPM/°C
Load Life
- 240 hours @ 50 °C (+20/-5 % DTR)

Physical Characteristics
Torque (Operating)
- 20~250 gf-cm
Stop Strength
- Knob Side: 800 gf-cm
- Reverse Side: 350 gf-cm
Terminals
- Solderable pins
Marking
- Resistance code
Standard Packaging
- 500 pcs. per bag

Recommended PCB Layout

DIMENSIONS: MM/(INCHES)
TOLERANCES: ±.25/±.010 EXCEPT WHERE NOTED

Specifications are subject to change without notice.
Customers should verify actual device performance in
their specific applications.

REV 09/04
3318 – Product Dimensions and Ordering Information

Product Dimensions

Model 3318B

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIA.</td>
<td>3.5 (1/32)</td>
<td></td>
</tr>
<tr>
<td>Mounting Surface</td>
<td>2.9 (1/16)</td>
<td></td>
</tr>
<tr>
<td>.05 ± .01/0</td>
<td>(.002 ± .004/0)</td>
<td></td>
</tr>
<tr>
<td>.020 ± .004/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.05 ± .01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>220</td>
<td>221</td>
</tr>
<tr>
<td>300</td>
<td>301</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>2,200</td>
<td>222</td>
</tr>
<tr>
<td>3,000</td>
<td>302</td>
</tr>
<tr>
<td>3,300</td>
<td>332</td>
</tr>
<tr>
<td>4,700</td>
<td>472</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>22,000</td>
<td>223</td>
</tr>
<tr>
<td>30,000</td>
<td>303</td>
</tr>
<tr>
<td>47,000</td>
<td>473</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
</tr>
<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>220,000</td>
<td>224</td>
</tr>
<tr>
<td>470,000</td>
<td>474</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

How To Order

Model 3318  P  -  1  -  103  A

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>3318</td>
</tr>
<tr>
<td>Style</td>
<td>P</td>
</tr>
<tr>
<td>Standard or Modified</td>
<td>1</td>
</tr>
<tr>
<td>Product Indicator</td>
<td>0</td>
</tr>
<tr>
<td>Resistance Code</td>
<td>A</td>
</tr>
<tr>
<td>Ammo Pak Designator</td>
<td>(G, S &amp; B only)</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3318 – Packaging Specifications

Ammo Pack Model 3318S

DIMENSIONS: MM/(INCHES)
TOLERANCES: ±0.25/(±.010) EXCEPT WHERE NOTED

Ammo Pack Model 3318G

Recommended PCB Layout

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3318 – Packaging Specifications

Ammo Pack Model 3318B

Recommended PCB Layout

DIMENSIONS: MM/(INCHES)
TOLERANCES: ±.25/(±.010) EXCEPT WHERE NOTED

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3318
6 mm Square Trimming Potentiometer

Features
- Single-Turn / Carbon / Commercial Open Frame
- Cross slot rotor design suitable for automatic adjustment equipment
- Board retention feature
- Enclosed cover
- PC board stand-offs
- Adjustable front/back, top/bottom
- RoHS compliant†

Electrical Characteristics

<table>
<thead>
<tr>
<th>Standard Resistance Range</th>
<th>100 to 1 megohm (see standard resistance table)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance Tolerance</td>
<td>±30 %</td>
</tr>
<tr>
<td>Contact Resistance Variation</td>
<td>10 % max.</td>
</tr>
<tr>
<td>Resolution</td>
<td>Infinite</td>
</tr>
<tr>
<td>Adjustment Angle</td>
<td>210 ° ±20 °</td>
</tr>
</tbody>
</table>

Environmental Characteristics

| Power Rating            | 100-500K ohms ................................50 V |
|                        | >500K ohms......................................25 V |
|                        | 50 °C ...........................................0.1 watt |
| Temperature Range       | -25 °C to +100 °C                            |
| Temperature Coefficient | ±1000 ppm/°C                                 |
| Load Life               | 1,000 hours 0.1 watt @ 70 °C (20 % ΔTR)      |

Physical Characteristics

| Torque (Operating)      | 20-250 g-cm                                  |
| Stop Strength           | Knob Side ......................................750 g-cm |
|                        | Reverse Side ...................................350 g-cm |
| Terminals               | Solderable pins                               |
| Marking                | Resistance code, date code                   |
| Standard Packaging     | 200 pcs. per bag                             |
| Adjustment Tool        | H-90                                         |

Aqueous cleaning not recommended

Standard Resistance Table

<table>
<thead>
<tr>
<th>Ohms</th>
<th>Code</th>
<th>Resistance</th>
<th>Code</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
<td>20,000</td>
<td>203</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>201</td>
<td>50,000</td>
<td>503</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>501</td>
<td>100,000</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
<td>200,000</td>
<td>204</td>
<td></td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
<td>500,000</td>
<td>504</td>
<td></td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
<td>1,000,000</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface.** Others are typically not stocked by distributors and are not recommended for new designs.

How To Order

3318 K - 1 - 103 A

Model
Style
Standard Product
Resistance Code
Ammo Pak Designator

Specifications are subject to change without notice. /RoHS Directive 2002/95/EC Jan 27 2003 including Annex.
Customers should verify actual device performance in their specific applications.

REV 09/04
3318 – Packaging Specifications

Ammo Pack Model 3318K

Recommended PCB Layout

Ammo Pack Model 3318F

Recommended PCB Layout

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3319
9 mm Round Trimming Potentiometer

Features
- 9 mm Round / Single-Turn / Carbon Commercial / Open Frame
- Both sides adjust
- Cross slot and hexagon adjustment designs
- Horizontal and vertical mounting styles
- Dust resistant/splash resistant covers
- PC board stand-offs and retention feature
- RoHS compliant

Electrical Characteristics

| Standard Resistance Range | 100 to 1 megohm |
| End Resistance | ±25 % std. |
| Contact Resistance Variation | ±2 % max. (±2K = 30 ohms) |
| Resolution | Infinite |

Environmental Characteristics

| Power Rating (200 volts max.) | 0.2 watt |
| Temperature Range | -25 °C to +100 °C |
| Temperature Coefficient | ±1000 ppm/°C |
| Load Life | 1,000 hours 0.2 watt @ 70 °C |

Physical Characteristics

| Torque (Operating) | 5 oz-in. max. |
| Stop Strength | 11.0 oz-in. min. |
| Terminals | Solderable pins |
| Marking | Manufacturer’s trademark, resistance code |

Product Dimensions

3319P Common Dimensions

| Adjust. Width | 9.0 ± 0.51 (354 ± 0.020) |
| Cross Slot | 2.0 ± 0.51 (0.079 ± 0.020) |

3319P-1 Top Adjust

| Wiper | 6.35 ± 0.51 (250 ± 0.020) |
| Terminal Width | 10.34 ± 0.51 (407 ± 0.020) |

3319P-2 Both Sides Adjust/Cross Slot

| Wiper | 5.8 ± 0.51 (228 ± 0.020) |
| Terminal Width | 10.34 ± 0.51 (407 ± 0.020) |

3319P-3 Both Sides Adjust/Hex

| Adjust. Width | 8.0 ± 0.51 (314 ± 0.020) |
| Cross Slot | 2.5 ± 0.51 (0.098 ± 0.020) |

3319 – Product Dimensions and Ordering Information

3319W-1

Side Adjust

3319W-2 Both Sides Adjust /Cross Slot

3319W-3 Both Sides Adjust/Hex

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
</tr>
<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**.

How To Order

3319 W - 2 - 103

Model
Pin Style
Rotor Style
-2 = Cross Slot/Single Slot Rear Adjust
-3 = 2 mm Hex Thru Hole

Resistance Code

CDW

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
### 3329 1/4” Round Trimming Potentiometer

**Features**
- 1/4” Round / Single-Turn / Cermet Industrial / Sealed
- 5 standard terminal styles
- Tape and reel packaging available
- Listed on the QPL for style RJ50 per MIL-PRF-22097 and RJR50 per High-Rel MIL-PRF-39035
- RoHS compliant version available

---

**Electrical Characteristics**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Resistance Range</td>
<td>10 to 1 meghohm</td>
</tr>
<tr>
<td>Resistance Tolerance</td>
<td>±10 % std.</td>
</tr>
<tr>
<td>Absolute Minimum Resistance</td>
<td>1 % or 2 ohms (whichever is greater)</td>
</tr>
<tr>
<td>Contact Resistance Variation</td>
<td>3.0 % or 3 ohms max. (whichever is greater)</td>
</tr>
<tr>
<td>Adjustment Angle</td>
<td>240 ° nom.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td></td>
</tr>
<tr>
<td>Sea Level</td>
<td>600 vac</td>
</tr>
<tr>
<td>Adjustment Angle</td>
<td>240 ° nom.</td>
</tr>
<tr>
<td><strong>Environmental Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Power Rating @ 85 °C (300 volts max.)</td>
<td>0.5 watt</td>
</tr>
<tr>
<td>Power Rating @ 150 °C</td>
<td>0 watt</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-55 °C to +150 °C</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±100 ppm/°C</td>
</tr>
<tr>
<td>Seal Test</td>
<td>85 °C Fluorinert®</td>
</tr>
<tr>
<td>Humidity</td>
<td>MIL-STD-202 Method 106</td>
</tr>
<tr>
<td>Vibration</td>
<td>30 G (1 %)</td>
</tr>
<tr>
<td>Shock</td>
<td>100 G (1 %)</td>
</tr>
<tr>
<td>Load Life</td>
<td>0.5 watt @ 85 °C</td>
</tr>
<tr>
<td>Rotational Life</td>
<td>200 cycles</td>
</tr>
<tr>
<td><strong>Physical Characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Mechanical Angle</td>
<td>260 ° nom.</td>
</tr>
<tr>
<td>Torque</td>
<td>5.0 oz-in. max.</td>
</tr>
<tr>
<td>Stop Strength</td>
<td>5.0 oz-in. min.</td>
</tr>
<tr>
<td>Terminals</td>
<td>Solderable pins</td>
</tr>
<tr>
<td>Weight</td>
<td>0.02 oz.</td>
</tr>
<tr>
<td>Marking</td>
<td>Manufacturer’s trademark, resistance code, date code, manufacturer’s model number and style</td>
</tr>
<tr>
<td>Wiper</td>
<td>50 % (Actual TR) ±10 % Standard Packaging 50 pcs. per tube Adjustment Tool H-90</td>
</tr>
</tbody>
</table>

**Dimensions**

- **3329P-DK9-RC**
  - DIA: 0.035
  - ADJ. SLOT: 0.035
  - WIDE: 0.180
  - DEEP: 0.017

- **3329H**
  - DIA: 0.040
  - ADJ. SLOT: 0.025
  - WIDE: 0.100
  - DEEP: 0.025

- **3329P**
  - DIA: 0.035
  - ADJ. SLOT: 0.018
  - WIDE: 0.088
  - DEEP: 0.051

- **3329S**
  - DIA: 0.035
  - ADJ. SLOT: 0.018
  - WIDE: 0.088
  - DEEP: 0.051

- **3329W**
  - DIA: 0.035
  - ADJ. SLOT: 0.018
  - WIDE: 0.088
  - DEEP: 0.051

- **3329X**
  - DIA: 0.035
  - ADJ. SLOT: 0.018
  - WIDE: 0.088
  - DEEP: 0.051

---

"Fluorinert®" is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

---

**Note:** The provided image includes diagrams and tables that are not transcribed here for brevity. The information is comprehensive and includes key specifications and dimensions for the 3329 1/4” Round Trimming Potentiometer.
3329 – Packaging Specifications and Ordering Information

Packaging Specifications

**SIDE ADJUST**
3329M-1

- **Dimensions (Inches):**
  - Referenced dimensions are 26.4 ± 0.3 (0.666 ± 0.008)
  - DIA.

- **TOLERANCES:**
  - 18 ± 1.0/ - 0.5
  - 12.70 ± 0.3/ - 0.25
  - 9.4 ± 0.5
  - 6.1 ± 0.25
  - 3.43 ± 0.25

- **ALL PINS IN-LINE ON CENTER**
- **DIMENSIONS:** 1000/REEL/BOX

Meets EIA Specification 468.

**TOP ADJUST**
3329U-1

- **Dimensions (Inches):**
  - Referenced dimensions are 24.38 ± 0.76 (0.960 ± 0.030)
  - DIA.

- **TOLERANCES:**
  - 18 ± 1.0/ - 0.5
  - 12.70 ± 0.3/ - 0.25
  - 6.35 ± 0.3

- **ALL PINS IN-LINE ON CENTER**
- **DIMENSIONS:** 1000/REEL/BOX

Meets EIA Specification 468.

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
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<td>200</td>
<td>201</td>
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<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
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<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

How To Order

- **Model:** 3329 M - 1 - 103 __ LF
- **Style:**
- **Standard or Modified**
- **Product Indicator:**
  - -1 = Standard Product
  - -DK9 = Plastic Spacer
- **Resistance Code**
- **Packaging Designator**
  - Blank = Tube (Standard)
  - R = Tape and Reel (M and U Pin Styles Only)
  - A = Ammo Pack (M and U Pin Styles Only)
- **Terminations**
  - LF = 100 % Tin-plated (RoHS compliant)
  - Blank = 90 % Tin / 10 % Lead-plated (Standard)

Consult factory for other available options.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
**3339**

5/16” Round Trimming Potentiometer

### Features
- Four-Turn / Cermet / Industrial / Sealed
- Unique planetary drive offers precise wiper setting of a multiturn in a single-turn package size
- Top and side adjust styles
- RoHS compliant* version available

### Electrical Characteristics
- Standard Resistance Range
  - 10 to 1 megohm (see standard resistance table)
- Resistance Tolerance ±10 % std.
- Absolute Minimum Resistance 1 % or 2 ohms max. (whichever is greater)
- Contact Resistance Variation 3 % or 3 ohms max. (whichever is greater)
- Adjustability
  - Voltage ±0.05 %
  - Resistance ±0.1 %
- Resolution Infinite
- Insulation Resistance 500 vdc.
- Effective Travel 4 turns nom.
- Environmental Characteristics
  - Power Rating (300 volts max.)
    - 0.5 watt at 150 °C
    - 0 watt at 85 °C
  - Temperature Range
    - -55 °C to +150 °C
  - Temperature Coefficient ±100 ppm/°C
  - Humidity MIL-STD-202 Method 103
    - 96 hours
  - Dielectric Strength
    - Sea Level 600 vac
    - 80,000 Feet 250 vac
    - Effective Travel 4 turns nom.
- Physical Characteristics
  - Termination Solderable pins
  - Weight 0.02 oz.
  - Marking Manufacturer’s trademark, model number and style
  - Wiper 50 % (Actual TR) ±10 %
- Torque 3 oz-in. max.
- Mechanical Stops Wiper idles
- Terminal Solderable pins
- Weight 0.02 oz.
- Marking Manufacturer’s trademark, model number and style
- Wiper 50 % (Actual TR) ±10 %
- Flammability U.L. 94V-0
- Standard Packaging 50 pcs. per tube

### Product Dimensions

#### 3339H
- Common Dimensions (Top Adjust)
- ADJ. CROSS SLOTTED LONG X WIDE X (2 PLACES)
- MIN.
- 2.54 X 105 (10.0 X 0.1)
- DIA.
- 300 (7.62)
- 90° ± 1°

#### 3339P
- Common Dimensions (Side Adjust)
- 375 (9.53)
- 2.54 X 105 (10.0 X 0.1)
- DIA.
- 300 (7.62)
- 43 ± 1 (1.10 ± 0.025)

#### 3339S
- Common Dimensions (Side Adjust)
- 375 (9.53)
- 2.54 X 105 (10.0 X 0.1)
- DIA.
- 300 (7.62)
- 43 ± 1 (1.10 ± 0.025)

### Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
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<tr>
<td>100</td>
<td>101</td>
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<tr>
<td>200</td>
<td>201</td>
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<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>103</td>
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<tr>
<td>20,000</td>
<td>203</td>
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<tr>
<td>25,000</td>
<td>253</td>
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<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
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<tr>
<td>200,000</td>
<td>204</td>
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<tr>
<td>250,000</td>
<td>254</td>
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<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

### How To Order

**3339 H - 1 - 103 LF**

**Model**
- Blank = 90 % Tin / 10 % Lead-plated (RoHS compliant)
- 1 = Standard Product
- **LF** = 100 % Tin-plated (RoHS compliant)
- Blank = 90 % Tin / 10 % Lead-plated (Standard)

Consult factory for other available options.

**TOLERANCES:** ±.25/(±.010) EXCEPT WHERE NOTED

**RoHS Directive 2002/95/EC Jan 27 2003 including Annex. Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.**

**REV 09/04**

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*Fluorinert®* is a registered trademark of 3M Co.

3342
2 mm Trimming Potentiometer

Features

- 2 mm Square / Surface Mount / Single-Turn / Sealed
- Compatible with surface mount manufacturing processes
- Miniature design for flexibility
- Constructed with lead free materials
- Rotor stop for "in circuit" adjustment
- RoHS compliant – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

Standard Resistance Range

- 100 ohms to 2 meghoms (see standard resistance table)
- Resistance Tolerance ±20 % std.
- End Resistance ±1 % or 3 ohms max.
- (whichever is greater)
- Contact Resistance Variation ±5 % or 3 ohms max.
- (whichever is greater)

Adjustability

- Voltage Divider ±0.4 %
- Rheostat ±0.4 %
- Resolution Essentially infinite

Insulation Resistance @ 500 VDC

- 100 meghoms min.

Environmental Characteristics

Power Rating (50 volts max.)

- 70 °C 0.1 watt
- 125 °C 0 watt

Operating Temperature Range

- -55 °C to +125 °C

Temperature Coefficient

- ≤ 100 Ohms ±150 ppm/°C
- > 100 Ohms ±100 ppm/°C

Seal Test

- 85 °C Fluorinert®

Humidity

- MIL-STD-202 Method 106 (no vibration) TRS ±3 %
- IR 10 megohms

Vibration

- TRS ±1 %; VRS ±1 %

Shock

- TRS ±1 %; VRS ±1 %

Load Life @ 70 °C Rated Power

- TRS ±3 %

Rotational Life

- 25 cycles

Thermal Shock

- 3 cycles

Thermal Shock

- TRS ±2 %; VRS ±1 %

Physical Characteristics

Mechanical Angle

- 250 ° nom.

Torque

- 0.7 oz-in. max.

Stop Strength

- 0.7 oz-in. min.

Flammability

- U.L. 94V-0

Weight

- Approximately 0.01 oz.

Marking

- Resistance code and date code

Wiper

- 50 % (Actual TR) ±10 %

Standard Packaging

- 1000 pcs./7” reel

Adjustment Tool

- H-92-1

Recommended Land Pattern

**Fluorinert® is a registered trademark of 3M Co.**


Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.
Additional Features

- Automated placement compatible

3342 – Packaging Specifications

Dimensions: MM/(INCHES)
Tolerances: ±.25/(±.010) except where noted.
**3345P**

1/2˝ Round Trimming Potentiometer

### Features
- Single-turn / Wirewound / Industrial / Sealed
- Industrial wirewound
- 1.0 watt power rating at 70°C
- Available with a thumbwheel and screwdriver slot adjustment
- RoHS compliant

### Electrical Characteristics

**Standard Resistance Range**
- 10 to 50K ohms (see standard resistance table)

**Resistance Tolerance**
- ±5 % std. (tighter tolerance available)

**Absolute Minimum Resistance**
- 1.0 % or 0.5 ohms max. (whichever is greater)

**Noise**
- 100 ohms ENR max.

**Resolution**
- See standard resistance table

**Dielectric Strength**
- Sea Level: 1,500 vac
- 70,000 Feet: 350 vac

**Insulation Resistance**
- 500 vdc.

**Adjustment Angle**
- 280 ° nom.

### Environmental Characteristics

**Power Rating**
- 70 °C: 1 watt
- 150 °C: 0 watt

**Temperature Coefficient**
- ±50 ppm/°C

**Seal Test**
- 85 °C Fluorinert*

**Humidity**
- MIL-STD-202 Method 106 (1 % TR, 10 megohms IR)

**Vibration**
- 30 G (1 % TR; 1 % VR)

**Shock**
- 100 G (1 % TR; 1 % VR)

**Load Life**
- 1,000 hours, 1 watt @ 70 °C

**Rotational Life**
- 200 cycles (2 % TR; 500 ohms ENR)

### Physical Characteristics

**Mechanical Angle**
- 310 ° nom.

**Torque**
- 5.0 oz-in. max.

**Stop Strength**
- 15 oz-in. min.

**Terminals**
- Solderable pins

**Weight**
- 0.04 oz.

**Marking**
- Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style

**Standard Packaging**
- 100 pcs. per bag

### Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
<td>0.94</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
<td>0.76</td>
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<tr>
<td>50</td>
<td>500</td>
<td>0.58</td>
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<td>100</td>
<td>101</td>
<td>0.49</td>
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<tr>
<td>200</td>
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<td>0.49</td>
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<tr>
<td>500</td>
<td>501</td>
<td>0.38</td>
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<tr>
<td>1,000</td>
<td>102</td>
<td>0.30</td>
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<tr>
<td>2,000</td>
<td>202</td>
<td>0.24</td>
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<tr>
<td>5,000</td>
<td>502</td>
<td>0.18</td>
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<tr>
<td>10,000</td>
<td>103</td>
<td>0.14</td>
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<tr>
<td>20,000</td>
<td>203</td>
<td>0.13</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Special resistances available from 10 to 50K ohms.

### How To Order

**Model**
- 3345 P - 1 - 502 T

**Style**
- Standard Product

**Resistance Code**
- T = Thumb Wheel

**Optional Suffix Letter**
- Consult factory for other available options.

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"Fluorinert" is a registered trademark of 3M Co.


Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

**REV 09/04**

**DIMENSIONS: MM/(INCHES)**

**TOLERANCES:** ±0.25/(±.010) EXCEPT WHERE NOTED
3352 3/8” Round Trimming Potentiometer

Features
- Single-Turn / Cermet / Industrial / Open Frame
- Stable cermet element offers infinite resolution
- Very low profile
- Seven standard pin styles
- Thumb and screwdriver adjustment
- RoHS compliant†

Electrical Characteristics

Standard Resistance Range
10 to 2 megohms (see standard resistance table)

Resistance Tolerance
±20 % std. (tighter tolerance available)

Absolute Minimum Resistance
2 ohms max.

Contact Resistance Variation
1.0 % or 1 ohm max. (whichever is greater)

Adjustability
Voltage
±0.05 %

Resolution
Infinite

Dielectric Strength
Sea Level
80,000 Feet

Temperature Coefficient
±100 ppm/°C

Temperature Range
-55 °C to +125 °C

Power Rating (250 volts max.)
80,000 Feet 350 vac

Contact Resistance Variation
125 °C

85 °C

Contact Strength
8 oz-in. min.

Torque
3.0 oz-in. max.

Mechanical Angle
250 ° nom.

Humidity
MIL-STD-202 Method 103

96 hours (2 % ΔTR, 10 Megohms IR)

Vibration
30 G (2 % ΔTR, 2 % ΔVR)

Shock
100 G (2 % ΔTR, 2 % ΔVR)

Load Life
1,000 hours 0.5 watt @ 85 °C

(3 % ΔTR)

Rotational Life
200 cycles

(10 % ΔTR)

Environmental Characteristics

Power Rating (250 volts max.)
85 °C
0.50 watt

125 °C
0 watt

Temperature Range
-55 °C to +125 °C

Temperature Coefficient
±100 ppm/°C

Humidity
Below 2K

Over 2K

Resistance
0.5 % or 1 ohm max.

Dimension: (°2 ± 0.015)

Marking
Manufacturer's trademark

Special resistances available.

Note: Specifications are subject to change without notice.


Customers should verify actual device performance in their specific applications.

Rev 09/04

Product Dimensions

3352

3352H Side Adjust

3352K

3352V

3352W

3352E Top Adjust

3352P

3352T

Adjustment Angle
205° nom.

Dielectric Strength
Sea Level
500 vac

85 °C
0.50 watt

Adjustability
Voltage
±0.05 %

Pulling Angle
±0.25 %

Voltage
±0.05 %

Tolerance
±20 % std.

Standard Resistance Range
(2 % TR)

3352 W - 1 - 103 LF

Model Style

Standard or Modified Product Indicator
-1 = Standard Product

Resistance Code

Terminations

LF = 100 % Tin-plated (RoHS compliant)
Blank = 90 % Tin / 10 % Lead-plated
(Standard)

Consult factory for other available options.

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms</td>
<td>Code</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
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<td>250</td>
<td>203</td>
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<tr>
<td>500</td>
<td>204</td>
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<tr>
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<td>205</td>
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<td>5,000</td>
<td>207</td>
</tr>
<tr>
<td>10,000</td>
<td>208</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface.
Special resistances available.
3360
6 mm Square Sealed Panel Control

Features
- Conductive plastic
- Linear and audio tapers
- PC board and bushing mount
- Plastic bushing and plastic shaft
- Withstands typical industrial washing processes
- RoHS compliant† version available

Electrical Characteristics

Standard Resistance Range
- Linear .................. 1K ohms to 1 megohm
- Linear Tapers .................. ±20 %
- Independent Linearity .................. ±5 %
- Absolue Minimum Resistance
- Contact Resistance Variation
- Dielectric Withstanding Voltage
  (MIL-STD-202 – Method 301)
- Sea Level .................. 900 VAC minimum
- Insulation Resistance .................. 1,000 meghms minimum
- Power Rating @ 70 °C
  (Derate to 0 at 125 °C – Voltage Limited By Power Dissipation or 200 VAC, Whichever is Less)
- Effective Electrical Angle ........ 240 ° nominal
- Total Resistance Tolerance
  Linear Tapers .................. ±20 %
  Independent Linearity .................. ±5 %
- Absolute Minimum Resistance
  2 ohms maximum
- Independent Linearity .................. ±5 %
- Absolute Minimum Resistance
  2 ohms maximum
- Temperature Coefficient
  Over Storage Temperature Range
- Vibration .................. 30 G
- Total Resistance Shift .... ±2 % maximum
- Voltage Ratio Shift ...... ±2 % maximum
- Shock .................. 100 G
- Total Resistance Shift .... ±2 % maximum
- Voltage Ratio Shift ...... ±2 % maximum
- Load Life .................. 1,000 Hours
- Rotational Life (No Load) ........ 50,000 Cycles
- Total Resistance Shift ........ ±10 % TRS maximum
- Contact Resistance Variation ........ ±5 % TRS maximum
- Load Life .................. 1,000 Hours
- Total Resistance Shift ........ ±10 % TRS maximum
- Absolute Minimum Resistance
- Moisture Resistance
  MIL-STD-303, Method 103, Condition B
- Total Resistance Shift ........ ±10 % TRS maximum
- IP Rating .................. IP 67

Environmental Characteristics

Operating Temperature Range
- Storage Temperature Range
- Temperature Coefficient
- Over Storage Temperature Range
- Vibration .................. 30 G
- Total Resistance Shift .... ±2 % maximum
- Voltage Ratio Shift ...... ±2 % maximum
- Shock .................. 100 G
- Total Resistance Shift .... ±2 % maximum
- Voltage Ratio Shift ...... ±2 % maximum
- Load Life .................. 1,000 Hours
- Total Resistance Shift ........ ±10 % TRS maximum
- Rotational Life (No Load) ........ 50,000 Cycles
- Total Resistance Shift ........ ±10 % TRS maximum
- Moisture Resistance
  MIL-STD-303, Method 103, Condition B
- Total Resistance Shift ........ ±10 % TRS maximum
- IP Rating .................. IP 67

Mechanical Characteristics

Stop Strength ........... 5.65 N-cm (8 oz.-in.)
Mechanical Angle ........... 310 ° nominal
Torque
- Starting .............. 3.53 N-cm (5.0 oz.-in.) maximum
- Running ............. 3.53 N-cm (5.0 oz.-in.) maximum
- Mounting (Torque on Bushing) ........ 17 N-cm (1.5 lb.-in.) maximum
- Weight (Single Section) ........ 4.5 grams
- Total Resistance Shift ........ ±10 % TRS maximum
- Voltage Ratio Shift ....... ±2 % maximum
- Hardware .................. One lockwasher and one mounting nut is shipped with each potentiometer, except where noted in the part number.
- Flammability ................ Conforms to UL94V-0
- Epoxy .................. Conforms to UL94V-1

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
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<tr>
<td>20,000</td>
<td>203</td>
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<td>50,000</td>
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<td>500,000</td>
<td>504</td>
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<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Standard Resistance Table

How To Order

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal Style Designator</th>
<th>Single Cup:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C = In-line Straight</td>
<td>(Standard)</td>
</tr>
<tr>
<td></td>
<td>P = 5.08 mm x 2.54 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Y = 5.08 mm x 5.08 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bushing Designator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T = Standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resistance Code</td>
<td></td>
</tr>
</tbody>
</table>

Popular distribution values listed in boldface.
Special resistances available.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
3360 – Product Dimensions

COMMON DIMENSIONS

3360C

3360P

3360Y

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3361
1/4” Square SMD Trimming Potentiometer

Features
- Single-Turn / Cermet / Industrial / Sealed
- Miniature package
- Rotor designed for automatic machine adjust interface
- Withstands harsh environments and immersion cleaning processes
- Compatible with surface mount manufacturing processes
- RoHS compliant version available – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics
- Standard Resistance Range: 10 to 2 meghoms (see standard resistance table)
- Resistance Tolerance: ±10 % std. (tighter tolerance available)
- Absolute Minimum Resistance: ...1 % or 2 ohms (whichever is greater)
- Contact Resistance Variation: ...1 % or 3 ohms max. (whichever is greater)
- Adjustability Voltage: ±0.05 %
- Resistance: ±0.15 %
- Resolution: Infinite
- Insulation Resistance: 500 vdc.
- Dielectric Strength: 1,000 meghoms min.
- Dielectric Strength: Sea Level: 900 vac
- Adjustment Angle: 240 ° nom.

Environmental Characteristics
- Maximum Soldering Exposure: (Temp/Time) +245 °C/10 Sec. Power Rating (300 volts max.) 70 °C: 0.50 watt 125 °C: 0 watt Temperature Range: -55 °C to +125 °C Temperature Coefficient: ±100 ppm/°C Seal Test: MIL-STD-202 Method 103 96 hours (2 % ΔTR; 10 Megohms IR) Vibration: 30 G (1 % ΔTR; 1 % ΔVR) Shock: 100 G (1 % ΔTR; 1 % ΔVR) Load Life: 1,000 hours 0.5 watt @ 70 °C (3 % ΔTR; 3 % or 3 ohms, whichever is greater, CRV) Rotational Life: 200 cycles (4 % ΔTR; 3 % or 3 ohms, whichever is greater, CRV)

Physical Characteristics
- Mechanical Angle: 270 ° nom.
- Torque: 3.0 oz-in. max.
- Stop Strength: 7.0 oz -in. min.
- Terminals: Solderable pins
- Weight: 0.02 oz.
- Marking: Resistance code, terminal numbers, manufacturer’s model number, style and date code
- Wiper: 50 % (Actual TR) ±10 % Flammability: UL 94V-0
- Standard Packing: “S” Style: 500 pcs./13” reel “P” Style: 750 pcs./13” reel
- Adjustment Tool: H-90

Product Dimensions

Recommended Land Pattern

**“Fluorinert” is a registered trademark of 3M Co.**

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3361 – Packaging Specifications and Ordering Information

**Packaging Specifications**

**P Style**

- **Tape**
  - 330.2 ±.50 (13.00 ±.02)
  - 16.41 ±.005 (.646 ±.004)

- **Reel**
  - 7.50 ±.10 (.295 ±.004)
  - 12.00 ±.10 (4.72 ±.004)
  - 1.5 +.10/–.00 (.059 +.004/–.000)
  - 4.00 ±.01 (157 ±.004)
  - 2.00 ± .05 (79 ±.002)

- **DIA.**
  - 1.75 ±.10 (.689 ±.004)
  - 16.0 ±.03 (.630 ±.001)

- **Equal Spaced 3 Plcs.**
  - 15.0 ±.02 (595 ±.005)
  - 18.69 ±.79 (736 ±.031)

Units packaged 750 pieces per reel.

**S Style**

- **Tape**
  - 330.2 ±.50 (13.00 ±.02)
  - 16.41 ±.005 (.646 ±.127)

- **Reel**
  - 7.50 ±.10 (.295 ±.004)
  - 12.00 ±.10 (4.72 ±.004)
  - 1.5 +.10/–.00 (.059 +.127/–.000)
  - 4.00 ±.01 (157 ±.004)
  - 2.00 ± .05 (79 ±.002)

- **DIA.**
  - 1.75 ±.10 (.689 ±.004)
  - 16.0 ±.03 (.630 ±.004)

- **Equal Spaced 3 Plcs.**
  - 17.78 ±.25 (700 ±.010)
  - 13.0 ±.51 (537 ±.037)
  - 18.69 ±.79 (736 ±.031)

Units packaged 500 pieces per reel.

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
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<tr>
<td>50</td>
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<tr>
<td>200</td>
<td>201</td>
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<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
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<td>25,000</td>
<td>253</td>
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<tr>
<td>50,000</td>
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<td>100,000</td>
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<td>200,000</td>
<td>204</td>
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<td>250,000</td>
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<tr>
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<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**. Special resistances available.

**How To Order**

<table>
<thead>
<tr>
<th>Model</th>
<th>3361 P - 1 - 502 G LF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td></td>
</tr>
<tr>
<td>Standard or Modified</td>
<td></td>
</tr>
<tr>
<td>Product Indicator</td>
<td>-1 = Standard Product</td>
</tr>
<tr>
<td>Resistance Code</td>
<td></td>
</tr>
<tr>
<td>Packaging Designator</td>
<td>G = Embossed Tape</td>
</tr>
<tr>
<td>&quot;S&quot; Style</td>
<td>= 500 pcs./13˝ reel</td>
</tr>
<tr>
<td>&quot;P&quot; Style</td>
<td>= 750 pcs./13˝ reel</td>
</tr>
<tr>
<td>Terminations</td>
<td>100 % Tin-plated (RoHS compliant)</td>
</tr>
<tr>
<td>Blank</td>
<td>90 % Tin / 10 % Lead-plated (Standard)</td>
</tr>
</tbody>
</table>

Consult factory for other available options.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3362
1/4” Square SMD Trimming Potentiometer

Features
- Single-Turn / Cement / Industrial / Sealed
- miniature package
- Rotor designed for automatic machine adjust interface
- Withstands harsh environments and immersion cleaning processes
- Available with a knob for finger adjust
- Available on tape and reel packaging
- RoHS compliant version available

Electrical Characteristics

<table>
<thead>
<tr>
<th>Standard Resistance Range</th>
<th>10 to 2 megohms (see standard resistance table)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance Tolerance</td>
<td>±0.15 % or 2 ohms (whichever is greater)</td>
</tr>
<tr>
<td>Absolute Minimum Resistance</td>
<td>1 % or 2 ohms (whichever is greater)</td>
</tr>
<tr>
<td>Contact Resistance Variation</td>
<td>1 % or 3 ohms max. (whichever is greater)</td>
</tr>
<tr>
<td>Adjustability</td>
<td>Voltage: ±0.05 %</td>
</tr>
<tr>
<td></td>
<td>Resistance: ±0.15 %</td>
</tr>
<tr>
<td></td>
<td>Resolution: Infinite</td>
</tr>
<tr>
<td></td>
<td>Insulation Resistance: 500 Vdc.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1,000 megohms min.</td>
</tr>
<tr>
<td>Sea Level</td>
<td>900 vac</td>
</tr>
<tr>
<td>Adjustment Angle</td>
<td>240 ° nom.</td>
</tr>
</tbody>
</table>

Environmental Characteristics

<table>
<thead>
<tr>
<th>Power Rating (300 volts max.)</th>
<th>0.50 watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range</td>
<td>-55 °C to +125 °C</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±100 ppm/°C</td>
</tr>
<tr>
<td>Seal Test</td>
<td>.85 °C Fluorinert</td>
</tr>
<tr>
<td>Humidity</td>
<td>MIL-STD-202 Method 103</td>
</tr>
<tr>
<td>96 hours (2 % ΔTR; 10 Megohms IR)</td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>30 G (1 % ΔTR; 1 % ΔVR)</td>
</tr>
<tr>
<td>Shock</td>
<td>100 G (1 % ΔTR; 1 % ΔVR)</td>
</tr>
<tr>
<td>Load Life</td>
<td>1,000 hours 0.5 watt @ 70 °C (3 % ΔTR; 3 % or 3 ohms, whichever is greater, CRV)</td>
</tr>
<tr>
<td>Rotational Life</td>
<td>200 cycles</td>
</tr>
<tr>
<td>Termination Angle</td>
<td>270 ° nom.</td>
</tr>
<tr>
<td>Torque</td>
<td>3.0 oz-in. max.</td>
</tr>
<tr>
<td>Stop Strength</td>
<td>7.0 oz -in. min.</td>
</tr>
<tr>
<td>Terminals</td>
<td>Solderable pins</td>
</tr>
<tr>
<td>Weight</td>
<td>0.02 oz</td>
</tr>
<tr>
<td>Marking</td>
<td>Resistance code, terminal numbers, manufacturer’s model number, style and date code</td>
</tr>
<tr>
<td>Wiper</td>
<td>50 % (Actual TR) ±10 %</td>
</tr>
<tr>
<td>Flammability</td>
<td>U.L. 94V-0</td>
</tr>
<tr>
<td>Standard Packaging</td>
<td>50 pcs. per tube</td>
</tr>
<tr>
<td>Adjustment Tool</td>
<td>H-90</td>
</tr>
</tbody>
</table>

Physical Characteristics

- Mechanical Angle: 270 ° nom.
- Torque: 3.0 oz-in. max.
- Stop Strength: 7.0 oz -in. min.
- Terminals: Solderable pins
- Weight: 0.02 oz
- Marking: Resistance code, terminal numbers, manufacturer’s model number, style and date code
- Wiper: 50 % (Actual TR) ±10 %
- Flammability: U.L. 94V-0
- Standard Packaging: 50 pcs. per tube
- Adjustment Tool: H-90

**Fluorinert** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
3362 – Product Dimensions, Packaging Specifications and Ordering Information

Product Dimensions

The Model 3362P is available with a knob for finger adjustment. Add suffix letter “T” to order code.

Packaging Specifications

SIDE ADJUST 3362M-1

SIDE VIEW

TOP ADJUST 3362U-1, 3362P-1

TOP VIEW

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>25,000</td>
<td>253</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>250,000</td>
<td>254</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface.** Special resistances available.

How To Order

Model

Style

Standard or Modified

Product Indicator

-1 = Standard Product

Resistance Code

Optional Suffix Letter

T = Knob*

Packaging Designator

Blank = Tube (Standard)

R = Tape and Reel

(M, U and P Pin Styles Only)

A = Ammo Pack

(M, U and P Pin Styles Only)

Terminations

LF = 100 % Tin-plated (RoHS compliant)

Blank = 90 % Tin / 10 % Lead-plated

(Standard)

*Knob option is available only in standard Tube packaging for terminal style P.

Consult factory for other available options.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3364
4 mm Square Trimming Potentiometer

Features
- SMD Single-Turn / Cermet / Industrial Open Frame
- Cross slot rotor designs suitable for automatic adjustment equipment
- Supplied in 12 mm embossed tape, compatible with automatic pick-and-place assembly equipment
- Recommended for reflow solder processing only
- RoHS compliant† – See page 155 for processing information on lead free surface mount trimmers

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

Revision 09/04

Electrical Characteristics
Standard Resistance Range
100 ohms to 1 meghm (see standard resistance table)
Resistance Tolerance ±25 % std.
End Resistance
<1K 20 ohms max.
>1K 2 %
Contact Resistance Variation
(Voltage Divider) 5 % max.
Resolution Infinite
Adjustment Angle 260 °±20 °

Environmental Characteristics
Power Rating (50 volts max.)
70 °C 0.2 watt
Temperature Range -40 °C to +100 °C
Temperature Coefficient ±250 ppm/°C
Humidity 500 hours (5 % TR)
Load Life 500 hours 0.2 watt @ 70 °C (5 % TR)
Rotational Life 20 cycles (15 % TR)

Physical Characteristics
Torque 20 to 200 g-cm
Mechanical Angle Continuous
Marking Resistance code, manufacturer’s full part number and date code on packaging
Terminals Solder coated
Standard Packaging 1000 pcs./7 ” reel
Adjustment Tool H-90
Reflow solder processing recommended

Product Dimensions
Common Dimensions
3364W, X 3-Terminal

SUGGESTED PWB LAYOUT

DIMENSIONS: MM/(INCHES)
TOLERANCES: ±25%(±010) EXCEPT WHERE NOTED

Specifications are subject to change without notice.
REV 09/04

Customers should verify actual device performance in their specific applications.
3364 – Packaging Specifications and Ordering Information

**Packaging Specifications**

- 2.00 ± 0.10 (0.079 ± 0.004)
- 5.51 ± 0.05 (0.217 ± 0.004)
- 4.00 ± 0.10 (0.157 ± 0.004)
- 2.00 ± 0.10 (0.079 ± 0.004)
- 1.75 ± 0.10 (0.069 ± 0.004)
- 1.20 ± 0.10 (0.047 ± 0.004)
- 12.00 ± 0.30 (0.472 ± 0.012)
- 0.60 (0.023)
- 1.00 (0.039)
- 2.20 ± 0.20 (0.087 ± 0.008)

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Part Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
<td>12</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
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<tr>
<td>1,000,000</td>
<td>105</td>
<td>16</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in *boldface*. Special resistances available.

**How To Order**

Model: 3364 X - 1 - 103 E

- **Model**
- **Style**
- **Orientation of parts in tape:** W,A = Terminals toward sprocket holes X,B = Terminals away from sprocket holes
- **Standard Product**
- **Resistance Code**
- **Embossed Tape Designator**
  - E = 1000 pcs./7” reel (-1 standard)
  - G = 5000 pcs./14.5” reel (-1 optional)
- Consult factory for other available options.

Conforms with EIA specification RS-481.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
### Trimmer Data Sheets

#### AVAILABLE THROUGH DISTRIBUTION

**3386**

**3/8" Square Trimming Potentiometer**

**Features**
- Single Turn / Cermet / Industrial / Sealed
- Available on tape and reel
- Available with a knob for finger adjust
- Available with extended shaft
- Available with cross-slot rotor
- Top and side adjust types (F, P, H, W, X most popular)
- High voltage types available (see page 88)
- RoHS compliant version available

**Electrical Characteristics**

**Standard Resistance Range**
- 10 to 2 megohms

**Resistance Tolerance**
- ±10 % std. (tighter tolerance available)

**Absolute Minimum Resistance**
- 2 ohms max.

**Contact Resistance Variation**
- 2 % or 3 ohms max. (whichever is greater)

**Adjustability**
- Voltage ±0.05 %
- Resistance ±0.15 %
- Resolution Infinite

**Insulation Resistance**
- 500 vdc.
- 1,000 megohms min.

**Dielectric Strength**
- Sea Level 900 vac
- 70,000 Feet 350 vac

**Adjustment Angle**
- 280 ° nom.

**Environmental Characteristics**

**Power Rating** (300 volts max.)
- 85 °C 0.5 watt
- 125 °C 0 watt

**Temperature Range**
- -55 °C to +125 °C

**Temperature Coefficient**
- ±100 ppm/°C

**Seal Test**
- 85 °C Fluorinert*

**Humidity**
- MIL-STD-202 Method 103
- 96 hours (2 % TR, 10 Megohms min.)

**Vibration**
- 30 G (1 % TR; 1 % VR)

**Shock**
- 100 G (1 % TR; 1 % VR)

**Load Life**
- 1,000 hours 0.5 watt @ 70 °C
- 0.5 watt @ 85 °C

**Rotational Life**
- 200 cycles

**Flammability**
- U.L. 94V-0

**Standard Packaging**
- 50 pcs. per tube

**Wiper**
- 50 % (Actual TR) ±10 %

**Adjustment Tool**
- H-90

**Physical Characteristics**

**Mechanical Angle**
- 310 ° nom.

**Torque**
- 5.0 oz-in. max.

**Stop Strength**
- 15.0 oz -in. min.

**Terminals**
- Solderable pins

**Weight**
- 0.03 oz.

**Marking**
- Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style

**Flammability**
- U.L. 94V-0

**Standard Packaging**
- 50 pcs. per tube

**Wiper**
- 50 % (Actual TR) ±10 %

**Adjustment Tool**
- H-90

**Fluorinert** is a registered trademark of 3M Co.


**REV 09/04**
### 3386 – Product Dimensions

#### Common Dimensions

- **Top Adjust**
  - **3386F**
    - **ADJ SLOT**
    - **WIDE**
    - **DEEP**
    - **LONG**
    - **COMMON TO 3386V**
  - **3386K**
    - **ADJ SLOT**
    - **2 PLCS.**
  - **3386M**
  - **3386P**
  - **3386R**

#### 3386T

- **ADJ SLOT**
  - **WIDE**
  - **DEEP**
  - **LONG**
  - **COMMON TO 3386V**

#### 3386U

- **ADJ SLOT**
  - **WIDE**
  - **DEEP**
  - **LONG**

#### 3386Y

- **ADJ SLOT**
  - **WIDE**
  - **DEEP**
  - **LONG**

The Model 3386 is available with a knob for finger adjustment. Add suffix letter “T” to order code for F, P and X terminal styles.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
3386 – Packaging Specifications and Ordering Information

Packaging Specifications

SIDE ADJUST
3386W-1

TOP ADJUST
3386U-1

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
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<tr>
<td>50</td>
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<tr>
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<tr>
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<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>103</td>
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<td>203</td>
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<tr>
<td>25,000</td>
<td>253</td>
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<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
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<td>200,000</td>
<td>204</td>
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<tr>
<td>250,000</td>
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</tr>
<tr>
<td>500,000</td>
<td>504</td>
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<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
<tr>
<td>2,000,000</td>
<td>205</td>
</tr>
</tbody>
</table>

Special resistances available.

Popular distribution resistance values listed in **boldface**.

How To Order

3386 P - 1 - 103 T LF

Model
Style
Standard or Modified
Product Indicator
-1 = Standard Product
-EY5 = Extended Shaft
Resistance Code
Optional Suffix Letter
T = Knob*
Packaging Designator
Blank = Tube (Standard)
R = Tape and Reel
(W and U Pin Styles Only)
A = Ammo Pack
(W and U Pin Styles Only)
Terminations
LF = 100 % Tin-plated (RoHS compliant)
Blank = 90 % Tin / 10 % Lead-plated
(Standard)

*Knob option is available only in standard Tube packaging
Consult factory for other available options.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

Meets EIA Specification 468.
TRIMMER DATA SHEETS

3386-HV2 / 3386-HV3
3/8” Trimming Potentiometer

Features
- 3/8” Square / Single-Turn / Cermet
- Industrial / Sealed High Voltage
- Focus Control
- Designed for electrostatic focus control applications on monochrome or color CRTs
- Rated at 1 KV D.C. and 600 VDC input voltage
- High stability cermet element
- Available with optional red knob
- RoHS compliant* version available

Electrical Characteristics

<table>
<thead>
<tr>
<th>Standard Resistance Range</th>
<th>2.5 and 5 megohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance Tolerance</td>
<td>±20 %</td>
</tr>
<tr>
<td>Contact Resistance Variation</td>
<td>2 % max.</td>
</tr>
<tr>
<td>Adjustability</td>
<td></td>
</tr>
<tr>
<td>Voltage Divider</td>
<td>±0.05 %</td>
</tr>
<tr>
<td>Rheostat</td>
<td>±0.15 %</td>
</tr>
<tr>
<td>Resolution</td>
<td>Infinite</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>1,000 megohms min.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>1.5 KV A.C. min.</td>
</tr>
<tr>
<td>Adjustment Angle</td>
<td>280 ° nom.</td>
</tr>
</tbody>
</table>

Environmental Characteristics

<table>
<thead>
<tr>
<th>HV2 Input Voltage</th>
<th>85 °C (1K VDC max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 °C</td>
<td>0 watt</td>
</tr>
<tr>
<td>HV3 Input Voltage</td>
<td>85 °C (600 VDC max.)</td>
</tr>
<tr>
<td>125 °C</td>
<td>0 watt</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-55 °C to +125 °C</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±400 ppm/°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>MIL-STD-202 Method 103 240 Hours (100 megohms min. IR)</td>
</tr>
<tr>
<td>Load Life</td>
<td>HV2 1,000 hours 1 KVDC</td>
</tr>
<tr>
<td></td>
<td>60 °C, 90 % R.H. (3 % max. ΔTR)</td>
</tr>
<tr>
<td></td>
<td>HV3 1,000 hours 600 VDC</td>
</tr>
<tr>
<td></td>
<td>60 °C, 90 % R.H. (3 % max. ΔTR)</td>
</tr>
<tr>
<td>Voltage Breakdown</td>
<td>(5,000 foot altitude) 1.5 KV min.</td>
</tr>
<tr>
<td>Seal Test</td>
<td>85 °C Fluorinert*</td>
</tr>
<tr>
<td>Vibration</td>
<td>No discontinuity 30 G</td>
</tr>
<tr>
<td>Shock</td>
<td>No discontinuity 100 G</td>
</tr>
<tr>
<td>Rotational Life</td>
<td>200 cycles min.</td>
</tr>
</tbody>
</table>

Physical Characteristics

| Mechanical Angle          | 310 ° nom.         |
| Torque                    | 5.0 oz-in. max.    |
| Stop Strength             | 15.0 oz-in. min.   |
| Terminatlas               | Solderable pins    |
| Weight                    | 0.04 oz.           |
| Marking                   | Manufacturer's trademark, resistance code, wiring diagram, date code, manufacturer's model number and style |
| Flammability              | U.L. 94V-0         |
| Standard Packaging        | 50 pcs. per tube   |
| Adjustment Tool           | H-90               |

How To Order

Model       Style
3386 N - HV2 - 505 T LF

Typical Focus Control Circuits

**Fluorinert** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 05/04
3386-OT1
3/8” Square Trimming Potentiometer

Features
- Single-Turn / Cermet / Industrial / Sealed
- Designed for operational amplifier offset voltage adjustment applications
- Reduces power supply drift errors
- Unique center tapped trimming potentiometer
- Vertical adjust type available
- RoHS compliant† version available

Electrical Characteristics
- Standard Resistance Range
  100 ohms to 1 megohm (see standard resistance table)
- Resistance Tolerance: ±20 % std.
- Voltage Output Variation: ±0.25 %
- Resolution: ±0.025 %
- Insulation Resistance @ 500 vdc: 1,000 megohms min.
- Dielectric Strength: Sea Level 900 vac, 70,000 Feet 350 vac
- Effective Electrical Travel: 280 ° nom.
- Center Tap Resistance: 2 ohms max.
- Center Tap Electrical Center: ±5 %
- Center Tap Dead Band: ±6 ° ±4 °

Environmental Characteristics
- Power Rating
  85 °C 0.5 watt, 150 °C 0 watt
- Temperature Range: -55 °C to +150 °C
- Temperature Stability (ΔVR): ±0.5 % max.
- Seal Test: 85 °C Fluorinert*
- Humidity: MIL-STD-202 Method 103 96 hours ±2 %
  TR 10 Megohms min.
- Vibration, 30 G ±1 % ΔTR
- Shock, 100 G ±1 % ΔTR
- Rotational Life: 200 cycles ±4 % ΔTR

Physical Characteristics
- Mechanical Angle: 310 ° nom.
- Torque: 5.0 oz-in. max.
- Stop Strength: 15.0 oz-in. min.
- Terminals: Solderable pins
- Weight: 0.03 oz.
- Marking: Manufacturer's trademark, resistance code, wiring diagram, date code, manufacturer's model number and style
- Flammability: UL 94V-0

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>202</td>
</tr>
<tr>
<td>5,000</td>
<td>502</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
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<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Suggested Offset Voltage Adjustment Circuit

How To Order
- Model: 3386 P - OT1 - 103 LF
- Style: LF = 100 % Tin-plated (RoHS compliant), Blank = 90 % Tin / 10 % Lead-plated (Standard)
- Catalog Product Resistant Code
- Terminations: LF = 100 % Tin-plated (RoHS compliant)

Also see Model 3296-OT1.
TC03 Trimming Potentiometer

Features

- High temperature plastic rotor
- Recommended for reflow processing
- Rotor design compatible with pick and place and automatic adjustment equipment
- Supplied in 8 mm embossed tape, compatible with automatic assembly equipment
- RoHS compliant† – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

Standard Resistance Range
100 to 1 megohm (see standard resistance table)

Resistance Tolerance ±25 \% std.

Absolute Minimum Resistance
≤ 1K Ohms 20 ohms max.
> 1K Ohms 2 \% max. of TR

Contact Resistance Variation 5 \% max.

Resolution Infinite

Adjustment Angle 270 ° ±20 °

Environmental Characteristics

Power Rating (50 VDC max.)
70 °C 0.10 watt

Resistance Code
Part Marking

Resistor Code

Resistance Code

Load Life
70 °C 500 hours

TRS ±5 %

Rotational Cycling 20 turns

TRS ±15 %

Physical Characteristics

Torque 20-200 g-cm max.

Mechanical Angle Continuous

Marking Part marking code

Standard Packaging 2000 pcs./7 " reel

Product Dimensions

TC03X-2
3 mm Open Frame for Reflow Soldering 3-Terminal

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Part Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
<td>12</td>
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<tr>
<td>200</td>
<td>201</td>
<td>22</td>
</tr>
<tr>
<td>500</td>
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</tr>
<tr>
<td>1,000</td>
<td>102</td>
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<td>202</td>
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<tr>
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<td>10,000</td>
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<td>20,000</td>
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<td>504</td>
<td>55</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
<td>16</td>
</tr>
</tbody>
</table>

How To Order

Model TC03 X - 2 - 103 E

Direction of parts in tape:
Style X Terminals away from sprocket holes

Standard or Modified

Product Indicator -2 Cross Slot Rotor (Standard Product)

Resistance Code

Embossed Tape Designator

Consult factory for other available options.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
TC22
2 mm SMD Trimming Potentiometer

Features
- Recommended for reflow processing
- Rotor design compatible with pick and place and automatic adjustment equipment
- 2 mm size meets EIA/EIAJ standard trimmer footprint
- RoHS compliant† – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics
Standard Resistance Range
100 ohms to 1 megohm (see standard resistance table)
Resistance Tolerance: ±25 % std.
Absolute Minimum Resistance
≤1 K Ohms: 20 ohms max.
>1 K Ohms: 2 % max. of TR
Contact Resistance Variation: .5 % max.
Resolution: Infinite
Adjustment Angle: 260 ° ±20 °

Environmental Characteristics
Power Rating (50 VDC max.)
70 °C: 0.1 watt
Temperature Range: -40 °C to +100 °C
Temperature Coefficient: ±250 ppm/°C
Humidity: 95 % RH
TRS: ±5 %
Load Life: 1000 hours @ 70 °C rated power
Rotational Cycling: 20 cycles

Physical Characteristics
Torque: 0.49-7.84 mN-m max.
Mechanical Angle: 270 ° ±20 °
Marking: Part marking code
Standard Packaging: 3000 pcs./7 " reel

Recommended Land Pattern

Recommended Land Pattern

Packaging Specifications

How To Order
TC22 X - 2 - 103 E

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Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
TC33
3 mm SMD Trimming Potentiometer

Features
- Recommended for reflow processing
- Rotor design compatible with pick and place and automatic adjustment equipment
- 3 mm size meets EIA/EIAJ standard trimmer footprint
- RoHS compliant – See page 155 for processing information on lead free surface mount trimmers

Electrical Characteristics

<table>
<thead>
<tr>
<th>Resistance Range</th>
<th>Ohms Code</th>
<th>Ohms Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
<td>20,000</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
<td>30,000</td>
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<td>300</td>
<td>301</td>
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<td>500</td>
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<td>1,000</td>
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<td>200,000</td>
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<tr>
<td>2,000</td>
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<td>1,000,000</td>
</tr>
<tr>
<td>10,000</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

Environmental Characteristics

Power Rating (50 VDC max.)
- 70 °C: 0.1 watt
- Temperature Range: -40 °C to +120 °C
- Temperature Coefficient: ±250 ppm/°C
- Humidity: 95 % RH
- TRS max.: ±5 %
- Load Life: @ 70 °C rated power 1000 hours
- Rotational Cycling: 20 cycles

Physical Characteristics

Torque: 0.98-11.76 mN-m max.
- Mechanical Angle: 270 ° ±20 °

Recommended Land Pattern

<table>
<thead>
<tr>
<th>0.000</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
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<tr>
<td>0.000</td>
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<td>0.000</td>
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<td>0.000</td>
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<tr>
<td>0.000</td>
</tr>
<tr>
<td>0.000</td>
</tr>
</tbody>
</table>

Recommended How To Order

TC33 X - 2 - 103 E

Model
Style
Standard Product Indicator
Resistance Code
Embosed Tape Designator

Popular distribution resistance values listed in **boldface**.
Special resistances available.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
TC73
Trimming Potentiometer

**Features**

- Recommended for reflow processing
- Rotor design compatible with pick and place and automatic adjustment equipment
- Supplied in 8 mm embossed tape, compatible with automatic assembly equipment
- Carbon element

**Electrical Characteristics**

- **Standard Resistance Range**
  
  - 500 to 1 megohm (see standard resistance table)

- **Resistance Tolerance** ±30 % std.
- **Absolute Minimum Resistance**
  - ≤1K Ohms: 20 ohms max.
  - >1K Ohms: 2 % max. of TR
- **Contact Resistance Variation** ≤5 % max.
- **Resolution** Infinite
- **Adjustment Angle** 260 ° ±20 ° (-2)

**Environmental Characteristics**

- **Power Rating (50 VDC max.)**
  - 50 °C: 0.05 watt
- **Temperature Range**
  - -25 °C to +85 °C
- **Temperature Coefficient** ±250 ppm/°C
- **Humidity** 95 %RH 500 hours
- **TRS max.** +15 % to -2 %
- **Load Life** @ 50 °C rated power 500 hours
- **Rotational Cycling** 20 turns
- **TRS ±5 %**
- **TRS ±20 %**

**Physical Characteristics**

- **Torque** 10-150 g-cm max.
- **Mechanical Angle** Continuous; 260 ° ± 20 °
- **Marking** Part marking code
- **Standard Packaging** 2000 pcs./7 ˝ reel

**Soldering Process**

- **Hand Soldering** Soldering iron of 20 W or less controlled at 280 °C for about 3 sec. while applying solder
- **Reflow Soldering** Peak temperature or reflow oven should be set to 240 °C max.

**TC73X/W-2**

**Product Dimensions**

- **TC73X/W-2**

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Part Marking</th>
<th>Part Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>52</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>13</td>
<td>102</td>
</tr>
<tr>
<td>2,000</td>
<td>23</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>53</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>14</td>
<td>103</td>
</tr>
<tr>
<td>20,000</td>
<td>24</td>
<td>203</td>
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<tr>
<td>50,000</td>
<td>54</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>15</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>25</td>
<td>204</td>
</tr>
<tr>
<td>500,000</td>
<td>55</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>16</td>
<td>105</td>
</tr>
</tbody>
</table>

**How To Order**

**TC73 X - 1 - 103 E**

- **Model**
- **Style**
  - Orientation of Parts in Tape:
  - Style X: Terminals Away From Sprocket Holes
  - Style W: Terminals In Direction to Sprocket Holes (Preferred)
- **Standard or Modified Product Indicator**
  - 1 = Mechanical Rotation Stop (Preferred)
  - 2 = Continuous
- **Resistance Code**
- **Embossed Tape Designator**

Consult factory for other available options.

Specifications are subject to change without notice.


Customers should verify actual device performance in their specific applications.

REV 09/04
TC86
6 mm Round Trimming Potentiometer

Features
- 6 mm Round / Single-Turn / Cermet
- Industrial / Open Frame
- Cross slot adjustment options
- Horizontal and vertical mounting styles
- Dust resistant/splash resistant covers
- Front and top adjust styles
- RoHS compliant

Electrical Characteristics
Standard Resistance Range
100 ohms to 1 megohm (see standard resistance table)
Resistance Tolerance ±20 % std. (tighter tolerance available)
Absolute Minimum Resistance
< 500 Ohms......10 ohms max.
> 500 Ohms......2 % max. of TR
Contact Resistance Variation......5 % max.
Resolution.................................Infinite
Adjustment Angle ..........240 ° ±20 °

Environmental Characteristics
Power Rating (100 VDC max.)
70 °C ...........................................0.3 watt
Temperature Range........-30 °C to +85 °C
Temperature Coefficient.......±250 ppm/°C
Humidity.................................95 % RH
Load Life.............................500 hours @ 70 °C
TR ±5 %
Rotational Cycling..................50 cycles
TR ±10 %

Physical Characteristics
Torque.................................30-300 gf-cm
Mechanical Angle ..........240 ° ±20 °
Marking..........................Part marking code
Standard Packaging ..........200 pcs./bag
Adjustment Tool .................H-90
Aqueous cleaning not recommended

Product Dimensions
Top Adjust
Common Dimensions

Side Adjust
Common Dimensions

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
TC86 – Suggested PCB Layout and Ordering Information

Suggested PCB Layout – Style F

Suggested PCB Layout – Styles K, P, W

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
<td>501</td>
</tr>
<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<tr>
<td>10,000</td>
<td>103</td>
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<tr>
<td>20,000</td>
<td>203</td>
</tr>
<tr>
<td>50,000</td>
<td>503</td>
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<tr>
<td>100,000</td>
<td>104</td>
</tr>
<tr>
<td>200,000</td>
<td>204</td>
</tr>
<tr>
<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in **boldface**.

How To Order

TC86 W - 1 - 103

Model

Style

Standard Product Indicator

Resistance Code

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
TC89
9 mm Round Trimming Potentiometer

Features
- 9 mm Round / Single-Turn / Cermet
- Industrial / Open Frame
- Both sides adjust
- Horizontal and vertical mounting styles
- Dust resistant/splash resistant covers
- PC board stand-offs
- RoHS compliant

Electrical Characteristics
Standard Resistance Range
100 ohms to 1 megohm (see standard resistance table)
Resistance Tolerance ±20 % std.
Absolute Minimum Resistance
≤500 Ohms 10 ohms max.
>500 Ohms 2 % max. of TR
Contact Resistance Variation ≤5 % max.
Resolution Infinite
Adjustment Angle 270° ±15°

Environmental Characteristics
Power Rating (250 VDC max.)
70°C 0.5 watt
Temperature Ranges -30°C to +100°C
Temperature Coefficient ±250 ppm/°C
Humidity 95 % RH
TRS ±5 %
Load Life 500 hours @ 70°C
TRS ±5 %
Rotational Cycling 50 cycles
TRS ±10 %

Physical Characteristics
Torque 50-350 gf-cm
Mechanical Angle 270° ±15°
Marking Part marking code
Standard Packaging 200 pcs./bag
Adjustment Tool H-90
Aqueous cleaning not recommended

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>101</td>
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<tr>
<td>200</td>
<td>201</td>
</tr>
<tr>
<td>500</td>
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<td>102</td>
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<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

Popular distribution resistance values listed in boldface.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

How To Order

Model
Style
Standard Product Indicator
Resistance Code

TC89 P - 1 - 103
Mil-Spec Numbering System – Defined

Non-Wirewound RJ Styles

<table>
<thead>
<tr>
<th>MIL-PRF-22097</th>
<th>RJ24</th>
<th>F</th>
<th>W</th>
<th>103</th>
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</thead>
<tbody>
<tr>
<td>Style</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient Max.</td>
<td>±100 ppm/°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Resistance Variation Max.</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Life</td>
<td>2 %</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Low Temperature</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Temperature</td>
<td>2 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational Life</td>
<td>2 %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Type</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Resistance Code</td>
<td>First Two Digits Significant</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last Digit = Number of Zeroes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(103 = 10,000 ohms)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Non-Wirewound RJR Styles – High Reliability

<table>
<thead>
<tr>
<th>MIL-PRF-39035</th>
<th>RJR24</th>
<th>F</th>
<th>W</th>
<th>102</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>Style</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient Max.</td>
<td>±100 ppm/°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact Resistance Variation Max.</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal Shock</td>
<td>1 %</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>1 %</td>
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</tr>
<tr>
<td>Vibration</td>
<td>1 %</td>
<td></td>
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</tr>
<tr>
<td>Load Life</td>
<td>3 %</td>
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<tr>
<td>2,000 Hours</td>
<td>3 %</td>
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</tr>
<tr>
<td>10,000 Hours</td>
<td>3 %</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Low Temperature</td>
<td>1 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Temperature</td>
<td>3 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational Life</td>
<td>2 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conditioning</td>
<td>1-1/2 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance Code</td>
<td>First Two Digits Significant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last Digit = Number of Zeroes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(102 = 1,000 ohms)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure Rate</td>
<td>(% Failures/1,000 Hours – 60 % Confidence)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M = 1.0 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P = 0.1 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R = .01 %</td>
<td></td>
<td></td>
<td></td>
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</table>

Wirewound RT Styles

<table>
<thead>
<tr>
<th>MIL-PRF-27208</th>
<th>RT24</th>
<th>C2</th>
<th>P</th>
<th>101</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C = Temperature Coefficient ±50 ppm/°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = 85 ° Rating Temperature, 150 ° Maximum Operating Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance Code</td>
<td>First Two Digits Significant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Last Digit = Number of Zeroes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(101 = 100 ohms)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

High-Rel Wirewound Specification

<table>
<thead>
<tr>
<th>MIL-PRF-39015 RTR Styles</th>
</tr>
</thead>
</table>

This specification has a procedure for ordering, processing, and marking parts entirely different than the other three specifications. IT DOES NOT USE THE TYPE DESIGNATION NUMBER AS THE PART NUMBER.

The number to order by consists of:

1. The individual specification sheet number
   M39015/2 (for style RTR22)  
   M39015/3 (for style RTR24)

2. A dash number from the specification sheet table for the resistance value

<table>
<thead>
<tr>
<th>Resistence Value</th>
<th>M39015/2</th>
<th>M39015/3</th>
</tr>
</thead>
<tbody>
<tr>
<td>-003 500</td>
<td>-006 500</td>
<td></td>
</tr>
<tr>
<td>-004 1K</td>
<td>-007 1K</td>
<td></td>
</tr>
<tr>
<td>-005 2K</td>
<td>-008 2K</td>
<td></td>
</tr>
<tr>
<td>-006 5K</td>
<td>-009 5K</td>
<td></td>
</tr>
<tr>
<td>-007 10K</td>
<td>-101 10K</td>
<td></td>
</tr>
<tr>
<td>-008 20K</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Terminal Type

4. Failure rate level M
   M = 1 %  
   % Failure/1,000 Hours – 60 % Confidence

Examples of Part Numbers

M39015/2 – 006LM  
5K Term. Type L – Failure Rate M

M39015/3 – 010XM  
10K Term. Type X – Failure Rate M

The table on the next page shows all part numbers covered by this specification, the conversion to the RTR type designation number required by the supplier to manufacture the part, and the number that will be marked on the units you receive (same as part number ordered but with the letter “J” in front of it). The letter “J” is a government mark and it is certification that the parts comply with the specification.

Information Notes:
1. M39015/3 was added to the MIL-SPEC after its original release.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
## Mil-Spec Numbering System – How to Order

### Bourns High Reliability Mil-Spec Part Numbers

<table>
<thead>
<tr>
<th>Order By</th>
<th>Process By*</th>
<th>Marked With</th>
<th>Terminal Types</th>
<th>Failure Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>M39015/2-003(TS)(FR)</td>
<td>RTR22D(TS)501(FR)</td>
<td>JM39015/2-003(TS)(FR)</td>
<td>L, P, W, X</td>
<td>M</td>
</tr>
<tr>
<td>M39015/2-004(TS)(FR)</td>
<td>RTR22D(TS)102(FR)</td>
<td>JM39015/2-004(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/2-005(TS)(FR)</td>
<td>RTR22D(TS)202(FR)</td>
<td>JM39015/2-005(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/2-006(TS)(FR)</td>
<td>RTR22D(TS)502(FR)</td>
<td>JM39015/2-006(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/2-007(TS)(FR)</td>
<td>RTR22D(TS)103(FR)</td>
<td>JM39015/2-007(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/2-008(TS)(FR)</td>
<td>RTR22D(TS)203(FR)</td>
<td>JM39015/2-008(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/3-004(TS)(FR)</td>
<td>RTR24D(TS)102(FR)</td>
<td>JM39015/3-004(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/3-005(TS)(FR)</td>
<td>RTR24D(TS)202(FR)</td>
<td>JM39015/3-005(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/3-007(TS)(FR)</td>
<td>RTR24D(TS)103(FR)</td>
<td>JM39015/3-007(TS)(FR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M39015/3-008(TS)(FR)</td>
<td>RTR24D(TS)203(FR)</td>
<td>JM39015/3-008(TS)(FR)</td>
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<td></td>
</tr>
</tbody>
</table>

*May also order using this part number.

### Qualified Part Numbers

#### RT/RTR22 (Commercial Model 3250)

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RT22C2</th>
<th>Nominal Resolution (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>20</td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>50</td>
<td>RT22C2L500</td>
<td>RT22C2P500</td>
</tr>
<tr>
<td>100</td>
<td>RT22C2L101</td>
<td>RT22C2P101</td>
</tr>
<tr>
<td>200</td>
<td>RT22C2L201</td>
<td>RT22C2P201</td>
</tr>
<tr>
<td>500</td>
<td>RT22C2L501</td>
<td>RT22C2P501</td>
</tr>
<tr>
<td>1K</td>
<td>RT22C2L102</td>
<td>RT22C2P102</td>
</tr>
<tr>
<td>2K</td>
<td>RT22C2L202</td>
<td>RT22C2P202</td>
</tr>
<tr>
<td>5K</td>
<td>RT22C2L502</td>
<td>RT22C2P502</td>
</tr>
<tr>
<td>10K</td>
<td>RT22C2L103</td>
<td>RT22C2P103</td>
</tr>
<tr>
<td>20K</td>
<td>RT22C2L203</td>
<td>RT22C2P203</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RTR22D</th>
<th>Nominal Resolution (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>20</td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>50</td>
<td>RTR22DL501M</td>
<td>RTR22DP501M</td>
</tr>
<tr>
<td>1K</td>
<td>RTR22DL102M</td>
<td>RTR22DP102M</td>
</tr>
<tr>
<td>2K</td>
<td>RTR22DL202M</td>
<td>RTR22DP202M</td>
</tr>
<tr>
<td>5K</td>
<td>RTR22DL502M</td>
<td>RTR22DP502M</td>
</tr>
<tr>
<td>10K</td>
<td>RTR22DL103M</td>
<td>RTR22DP103M</td>
</tr>
<tr>
<td>20K</td>
<td>RTR22DL203M</td>
<td>RTR22DP203M</td>
</tr>
</tbody>
</table>

Bourns reserves the right per MIL-PRF-39035 to substitute a higher grade temperature characteristic or failure rate (QPL) than requested.
## Qualified Part Numbers

### RT/RTR24 (Commercial Model 3290)

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RT24C2</th>
<th>RTR24D</th>
<th>Nominal Resolution (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P</td>
<td>W</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>RT24C2P100</td>
<td>RT24C2W100</td>
<td>RT24C2X100</td>
</tr>
<tr>
<td>20</td>
<td>RT24C2P200</td>
<td>RT24C2W200</td>
<td>RT24C2X200</td>
</tr>
<tr>
<td>50</td>
<td>RT24C2P500</td>
<td>RT24C2W500</td>
<td>RT24C2X500</td>
</tr>
<tr>
<td>100</td>
<td>RT24C2P101</td>
<td>RT24C2W101</td>
<td>RT24C2X101</td>
</tr>
<tr>
<td>200</td>
<td>RT24C2P201</td>
<td>RT24C2W201</td>
<td>RT24C2X201</td>
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<tr>
<td>500</td>
<td>RT24C2P501</td>
<td>RT24C2W501</td>
<td>RT24C2X501</td>
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<tr>
<td>1K</td>
<td>RT24C2P102</td>
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<tr>
<td>2K</td>
<td>RT24C2P202</td>
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<td>5K</td>
<td>RT24C2P502</td>
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<tr>
<td>10K</td>
<td>RT24C2P103</td>
<td>RT24C2W103</td>
<td>RT24C2X103</td>
</tr>
</tbody>
</table>

*Last letter in number is failure rate level. M = 1.0 %; P = 0.1 %; R = 0.01 %

### RT12 (Commercial Model 3057)

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RT12C2</th>
<th>Nominal Resolution (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>10</td>
<td>RT12C2L100</td>
<td>RT12C2P100</td>
</tr>
<tr>
<td>20</td>
<td>RT12C2L200</td>
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<tr>
<td>50</td>
<td>RT12C2L500</td>
<td>RT12C2P500</td>
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<tr>
<td>100</td>
<td>RT12C2L101</td>
<td>RT12C2P101</td>
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<tr>
<td>200</td>
<td>RT12C2L201</td>
<td>RT12C2P201</td>
</tr>
<tr>
<td>500</td>
<td>RT12C2L501</td>
<td>RT12C2P501</td>
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<tr>
<td>1K</td>
<td>RT12C2L102</td>
<td>RT12C2P102</td>
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<tr>
<td>2K</td>
<td>RT12C2L202</td>
<td>RT12C2P202</td>
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<tr>
<td>5K</td>
<td>RT12C2L502</td>
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<tr>
<td>10K</td>
<td>RT12C2L103</td>
<td>RT12C2P103</td>
</tr>
<tr>
<td>20K</td>
<td>RT12C2L203</td>
<td>RT12C2P203</td>
</tr>
</tbody>
</table>

### RT26 (Commercial Model 3260)

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RT26C2</th>
<th>Nominal Resolution (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>RT26C2W100</td>
<td>RT26C2X100</td>
</tr>
<tr>
<td>20</td>
<td>RT26C2W200</td>
<td>RT26C2X200</td>
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<tr>
<td>50</td>
<td>RT26C2W500</td>
<td>RT26C2X500</td>
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<tr>
<td>100</td>
<td>RT26C2W101</td>
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<td>RT26C2X201</td>
</tr>
<tr>
<td>500</td>
<td>RT26C2W501</td>
<td>RT26C2X501</td>
</tr>
<tr>
<td>1K</td>
<td>RT26C2W102</td>
<td>RT26C2X102</td>
</tr>
<tr>
<td>2K</td>
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</tr>
<tr>
<td>5K</td>
<td>RT26C2W502</td>
<td>RT26C2X502</td>
</tr>
</tbody>
</table>

### RJ22 (Commercial Model 3252)

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RJ22F</th>
<th>W</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>RJ22FL100</td>
<td>RJ22FP100</td>
<td>RJ22FW100</td>
</tr>
<tr>
<td>20</td>
<td>RJ22FL200</td>
<td>RJ22FP200</td>
<td>RJ22FW200</td>
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<tr>
<td>50</td>
<td>RJ22FL500</td>
<td>RJ22FP500</td>
<td>RJ22FW500</td>
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<tr>
<td>100</td>
<td>RJ22FL101</td>
<td>RJ22FP101</td>
<td>RJ22FW101</td>
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<tr>
<td>200</td>
<td>RJ22FL201</td>
<td>RJ22FP201</td>
<td>RJ22FW201</td>
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<tr>
<td>500</td>
<td>RJ22FL501</td>
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<td>RJ22FW501</td>
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<td>RJ22FW202</td>
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<tr>
<td>10K</td>
<td>RJ22FL103</td>
<td>RJ22FP103</td>
<td>RJ22FW103</td>
</tr>
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<td>20K</td>
<td>RJ22FL203</td>
<td>RJ22FP203</td>
<td>RJ22FW203</td>
</tr>
<tr>
<td>25K</td>
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<td>RJ22FW253</td>
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<td>50K</td>
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<td>500K</td>
<td>RJ22FL504</td>
<td>RJ22FP504</td>
<td>RJ22FW504</td>
</tr>
<tr>
<td>1 MEG</td>
<td>RJ22FL105</td>
<td>RJ22FP105</td>
<td>RJ22FW105</td>
</tr>
</tbody>
</table>

Bourns reserves the right per MIL-PRF-39035 to substitute a higher grade temperature characteristic or failure rate (QPL) than requested.
Qualified Part Numbers

**RJ24 (Commercial Model 3296 for P, W, X; Model 3292 for L)**

<table>
<thead>
<tr>
<th>Standard Values (ohms)</th>
<th>RJ24F</th>
<th>L</th>
<th>P</th>
<th>W</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>RJ24FL100</td>
<td>RJ24FP100</td>
<td>RJ24FW100</td>
<td>RJ24FX100</td>
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</tr>
<tr>
<td>20</td>
<td>RJ24FL200</td>
<td>RJ24FP200</td>
<td>RJ24FW200</td>
<td>RJ24FX200</td>
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</tr>
<tr>
<td>50</td>
<td>RJ24FL500</td>
<td>RJ24FP500</td>
<td>RJ24FW500</td>
<td>RJ24FX500</td>
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</tr>
<tr>
<td>100</td>
<td>RJ24FL101</td>
<td>RJ24FP101</td>
<td>RJ24FW101</td>
<td>RJ24FX101</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>RJ24FL201</td>
<td>RJ24FP201</td>
<td>RJ24FW201</td>
<td>RJ24FX201</td>
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<td>RJ24FP501</td>
<td>RJ24FW501</td>
<td>RJ24FX501</td>
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</tr>
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<td>RJ24FP102</td>
<td>RJ24FW102</td>
<td>RJ24FX102</td>
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</tr>
<tr>
<td>2K</td>
<td>RJ24FL202</td>
<td>RJ24FP202</td>
<td>RJ24FW202</td>
<td>RJ24FX202</td>
<td></td>
</tr>
<tr>
<td>10K</td>
<td>RJ24FL103</td>
<td>RJ24FP103</td>
<td>RJ24FW103</td>
<td>RJ24FX103</td>
<td></td>
</tr>
<tr>
<td>20K</td>
<td>RJ24FL203</td>
<td>RJ24FP203</td>
<td>RJ24FW203</td>
<td>RJ24FX203</td>
<td></td>
</tr>
<tr>
<td>25K</td>
<td>RJ24FL253</td>
<td>RJ24FP253</td>
<td>RJ24FW253</td>
<td>RJ24FX253</td>
<td></td>
</tr>
<tr>
<td>50K</td>
<td>RJ24FL503</td>
<td>RJ24FP503</td>
<td>RJ24FW503</td>
<td>RJ24FX503</td>
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</tr>
<tr>
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**RJR24F (Commercial Model 3296)**

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*RJR26 (Commercial Model 3262; Commercial Model 3266 for A & B)*

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*Last letter in number is failure rate level. M = 1.0 %; P = 0.1 %; R = 0.01 %
**Model RJ26FA commercial model is 3266W. Model RJ26FB commercial model is 3266X.

Bourns reserves the right per MIL-PRF-39035 to substitute a higher grade temperature characteristic or failure rate (QPL) than requested.
## Qualified Part Numbers

### RJ12 (Commercial Model 3059)

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*Last letter in number is failure rate level. M = 1.0%; P = 0.1%
RT12
Trimpot® Trimming Potentiometer

Features
- 1-1/4 " Rectangular / Multiturn Wirewound / Industrial / Sealed
- Panel mount option available
- Listed on the QPL per MIL-PRF-27208

Electrical Characteristics
Standard Resistance Range
(see standard resistance table)
Resistance Tolerance ..............±5 % std.
(After adjustment available)
Absolute Minimum Resistance
.........................0.1 % or 1 ohm max.
(whichever is greater)
Noise..........................00 ms ENR max.
Resolution..............See Resistance Table
Insulation Resistance ..............500 vdc.
1,000 megohms min.
Dielectric Strength
Sea Level..........................1,500 vac
70,000 Feet.........................400 vac
Adjustment Travel..........22 turns nom.

Environmental Characteristics
Power Rating @ 70 °C.................1 watt
Power Rating @ 150 °C..............0 watt
Temperature Range...........-55 °C to +150 °C
Temperature Coefficient...........±50 ppm/°C
Seal Test........................85 °C Fluorinert*
(pin styles only)
Humidity.........MIL-STD-202 Method 106
96 hours
(2 % ΔTR, 100 Megohms IR)
Vibration..................30 G (1 % ΔTR; 0.5 %
+ resolution ΔVR)
Shock..................100 G (1 % ΔTR; 0.5 %
+ resolution ΔVR)
Load Life.............1,000 hours 1 watt @ 70 °C
(2 % ΔTR)
Rotational Life...........200 cycles (2 % ΔTR)

Physical Characteristics
Torque..............................5.0 oz-in. max.
Mechanical Stops..............Wiper idles
Terminals..............Solderable pins and lugs
Flexible leads..............(7 strands of 30 AWG)
Weight......................0.10 oz.
Marking..............Manufacturer's trademark,
resistance code, terminal numbers,
date code, manufacturer's model
number and style
Wiper......................50 % (Actual TR) ±10 %
Flammability.............UL 94V-0
Standard Packaging
P&Y Style..............10 pcs. per tube
L Style..............25 pcs. per bag
Adjustment Tool.....................H-90

Product Dimensions
RT12C2P

Standard Resistance Table

<table>
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<th>Resistance (Ohms)</th>
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<th>Nominal Resolution (Percent)</th>
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How To Order
MIL-PRF-27208
RT12 C2 P 101

**Fluorinert** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in
their specific applications.
REV 09/04

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<td>(0.028 ± .001)</td>
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</table>
RT22/RTR22
1/2" Square Trimming Potentiometer

Features
- Multiturn / Wirewound / Sealed
- Listed on the QPL per MIL-R-27208 and High-Rel MIL-R-39015
- Panel Mount option available

Electrical Characteristics
Standard Resistance Range
RT22..................50 to 20K ohms
RTR22..................500 to 20K ohms
(see standard resistance table)
Resistance Tolerance........±5 % std.
(After finish and tolerance available)
Absolute Minimum Resistance
.........................0.1 % or 1 ohm max.
(whichever is greater)
Noise......................100 ohms ENR max.
Resolution.............See Resistance Table
Insulation Resistance........500 vdc.
Dielectric Strength
Sea Level..................1,000 vac
80,000 Feet..............400 vac
Adjustment Travel........25 turns nom.

Environmental Characteristics
Power Rating @ 85 °C...........0.75 watt
Power Rating @ 150 °C...........0 watt
Temperature Range........-65 °C to +150 °C
Humidity..................MIL-STD-202 Method 106
RT22..............(1 % ΔTR; 10 Megohms IR)
RTR22..............(1 % ΔTR; 100 Megohms IR)
Vibration..................30 G
(1 % ΔTR; 0.5 % + resolution ΔFR)
Shock..........................100 G
(1 % ΔTR; 0.5 % + resolution ΔFR)
Load Life
RT22..................1,000 hours 0.75 watt @ 85 °C
(2 % ΔTR; 2 % + resolution ΔFR)
RTR22..................10,000 hours 0.75 watt @ 85 °C
(3 % ΔTR; 2 % + resolution ΔTR)
Rotational Life..............200 cycles (2 % ΔTR)

Physical Characteristics
Torque......................5.0 oz-in. max.
Mechanical Stops...........50 % (Actual TR) ±10 %
Terminals
......................Flexible leads (7 strands of 30 AWG)
MIL-STD-202; Method 208
Weight........................0.06 oz.
Machine Screw Mounting
Torque..............12 oz-in. max.
Marking...................MIL-spec part number
Wiper...................50 % (Actual TR) ±10 %
Flammability...........U.L. 94V-0
Standard Packaging
P, W & X Styles ..........25 pcs. per tube
L Style....................25 pcs. per bag
Adjustment Tool...........H-90

**“Fluorinert” is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in
their specific applications.**

REV 09/04

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![Product Dimensions](image)

<table>
<thead>
<tr>
<th>Model</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
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</thead>
<tbody>
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<td>RT22 C2 P 501</td>
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<tr>
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</tr>
</tbody>
</table>

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![RTR22 – How To Order](image)

MIL-PRF-27208  RTR22  D P 501 M

Model
- Characteristic
  C = ±50 ppm/°C Temp. Coeff. Max.
  2 = 85 °C Rating Temp.
  150 °C Max. Operating Temp.
- Resistance Code

---

![RTR22 – Standard Resistance Table](image)

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
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</thead>
<tbody>
<tr>
<td>500</td>
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<tr>
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<tr>
<td>5,000</td>
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<tr>
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<td>103</td>
<td>0.19</td>
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<tr>
<td>20,000</td>
<td>203</td>
<td>0.16</td>
</tr>
</tbody>
</table>

---

![RTR22 – How To Order](image)

MIL-PRF-39015  RTR22  D P 501 M

Model
- Characteristic
- Terminal Style
- Resistance Code
- Failure Rate
  M = 1.0 %

---
RT24/RTR24
3/8” Square Trimming Potentiometer

Features
- Multiturn/Wirewound / Industrial / Sealed
- Listed on the QPL per MIL-R-27208 and High-Rel MIL-R-39015
- Panel mount option available
- RoHS compliant

Electrical Characteristics

<table>
<thead>
<tr>
<th>Standard Resistance Range</th>
<th>Resistance (Ohms)</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
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Environmental Characteristics

- Power Rating @ 85 °C: 0.75 watt
- Power Rating @ 150 °C: 0 watt
- Humidity: 85 °C Fluorinert®
- Load Life: 200 cycles

Physical Characteristics

- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminal Style: MIL-STD-202; Method 208
- Weight: 0.025 oz.
- Marking: Mil-spec part number
- Flammability: UL 94V-0
- Standard Packaging: 50 pcs. per tube
- Adjustment Tool: H-90

Environmental Characteristics

- Power Rating @ 150 °C: 0 watt
- Temperature Coefficient: ±50 ppm/°C
- Temperature Range: -65 °C to +150 °C
- Resolution: ±5 % std.
- Resolution: 1 ohm max. (whichever is greater)


Available Through Distribution

**Fluorinert®** is a registered trademark of 3M Co.
Customers should verify actual device performance in their specific applications.

**REV 06/04**
RT26
1/4” Square Trimming Potentiometer

Features
- Multiturn / Wirewound / Industrial / Sealed
- Listed on the QPL per MIL-R-27208
- RoHS compliant†

Electricity Characteristics
- Standard Resistance Range: 10 to 5K ohms (see standard resistance table)
- Resistance Tolerance: ±5 % std. (tighter tolerance available)
- Absolute Minimum Resistance: ≥0.25 % or 1 ohm max. (whichever is greater)
- Noise: 100 ohms ENR max.
- Resolution: See resistance table
- Insulation Resistance: 500 vdc, 1,000 megs min.
- Dielectric Strength
  - Sea Level: 600 vac
  - 80,000 Feet: 250 vac

Environmental Characteristics
- Power Rating
  - 85 °C: 0.25 watt
  - 150 °C: 0 watt
- Temperature Range: -55 °C to +150 °C
- Temperature Coefficient: ±50 ppm/°C
- Seal Test: 85 °C Fluorinert*
- Humidity: MIL-STD-202 Method 106 (1 % TR, 10 Megohms)
- Vibration: 20 G (1 % ΔTR; 1 % + resolution ΔVR)
- Shock: 100 G (1 % ΔTR; 1 % + resolution ΔVR)
- Load Life: 1,000 hours 0.25 watt θ @ 85 °C
- Rotational Life: 200 cycles θ (2 % ΔTR)

Physical Characteristics
- Torque: 3.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminals: MIL-STD-202; Method 208
- Weight: 0.015 oz.
- Marking: Mil-Spec part number
- Wiper: 50 % (Actual TR) ±10 %
- Flammability: UL 94V-0

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
<th>Nominal Resolution (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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<tr>
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<td>0.34</td>
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</table>

How To Order
- MIL-PRF-27208 RT26 C2 X 101
- Model
  - Terminal Style
  - Resistance Code

**Fluorinert**® is a registered trademark of 3M Co.
Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications. REV 09/04
RJ12 Trimpot® Trimming Potentiometer

**Features**
- 1-1/4˝ Rectangular / Multiturn
- Cermet / Industrial / Sealed
- Panel mount option available
- Listed on the QPL per MIL-PRF-22097
- RoHS compliant

**Electrical Characteristics**

**Standard Resistance Range**
- 10 to 1 megohm

**Resistance Tolerance**
- ±10 % std.
- (tighter tolerance available)

**Absolute Minimum Resistance**
- 1 % or 2 ohms max.
- (whichever is greater)

**Contact Resistance Variation**
- 1.0 % or 1 ohm max.
- (whichever is greater)

**Adjustability**
- Voltage
  - ±0.01 %
- Resistance
  - ±0.05 %
- Resolution
  - Infinite

**Insulation Resistance**
- 500 vdc.
- 1,000 megohms min.

**Dielectric Strength**
- Sea Level
  - 900 vac
- 70,000 Feet
  - 350 vac

**Effective Travel**
- 22 turns nom.

**Environmental Characteristics**

**Power Rating @ 70 °C (400 volts max.)**
- 1.0 watt

**Power Rating @ 150 °C**
- 0 watt

**Temperature Range**
- -55 °C to +150 °C

**Temperature Coefficient**
- ±100 ppm/°C

**Seal Test**
- 85 °C Fluorinert® (pin styles only)

**Humidity**
- MIL-STD-202 Method 106, 2 % TR, 10 Megohms IR

**Vibration**
- 20 G (1 % ΔTR, 1 % ΔVR)

**Shock**
- 50 G (1 % ΔTR, 1 % ΔVR)

**Load Life**
- 1,000 hours 1.0 watt @ 70 °C

**Rotational Life**
- 200 cycles

**Physical Characteristics**

**Torque**
- 5.0 oz-in. max.

**Mechanical Stops**
- Wiper idles

**Terminals**
- Solderable printed circuit pins

**Flexible leads**
- (7 strands of 30 AWG)

**Weight**
- 0.1 oz.

**Marking**
- Manufacturer’s trademark, resistance code, terminal numbers, date code, manufacturer’s model number and style

**Wiper**
- 50 % (Actual TR) ±10 %

**Flammability**
- U.L. 94V-0

**Standard Packaging**
- 10 pcs. per tube

**Adjustment Tool**
- H-90

**How To Order**

**MIL-PRF-22097**

**Model**

**Characteristic**
- F = ±100 ppm/°C Temp. Coeff. Max.

**Terminal Style**

**Resistance Code**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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**Product Dimensions**

**RJ12FP**

**RJ12FY**

**DIA. TYP.**

**Dimensions:** MM/(INCHES)

**TOLERANCES:** ±.25/(±.010) EXCEPT WHERE NOTED

**How To Order**

**MIL-PRF-22097**

**Model**

**Characteristic**
- F = ±100 ppm/°C Temp. Coeff. Max.

**Terminal Style**

**Resistance Code**

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</table>

**Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.**

REV 09/04

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**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
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</tr>
</thead>
<tbody>
<tr>
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</table>

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**How To Order**

**MIL-PRF-22097**

**Model**

**Characteristic**
- F = ±100 ppm/°C Temp. Coeff. Max.

**Terminal Style**

**Resistance Code**

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<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
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</tbody>
</table>

**Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.**

REV 09/04

---

**Fluorinert® is a registered trademark of 3M Co.**

---

**Technical Support**

**Phone:** 1-800-272-8677

**Fax:** 1-954-729-1226

**Email:** techsupp@bourns.com

**Website:** www.bourns.com
RJ22
1/2” Square Trimming Potentiometer

Features
- Multiturn / Cermet / Sealed
- Listed on the QPL per MIL-R-22097
- Panel mount option available

**Electrical Characteristics**

- Standard Resistance Range: 10 ohms to 1 megohm (see standard resistance table)
- Resistance Tolerance: ±10 % std.
- Absolute Minimum Resistance: 1 ohm max.
- Contact Resistance Variation: 0.05 % (whichever is greater)
- Adjustability:
  - Voltage: ±0.1 %
  - Resistance: ±0.05 %
- Resolution: Infinite
- Insulation Resistance: 500 vdc. 1,000 megohms min.
- Dielectric Strength:
  - Sea Level: 1,000 vac
  - 80,000 Feet: 400 vac
- Effective Travel: 25 turns nom.

**Environmental Characteristics**

- Power Rating @ 85 °C (400 volts max.): 0.50 watt
- Power Rating @ 150 °C: 0 watt
- Temperature Range: -65 °C to +150 °C
- Temperature Coefficient: ±100 ppm/°C
- Seal Test:
  - MIL-STD-202 Method 106 (1 % ! TR; 10 Megohms IR)
  - Vibration: 20 G (1 % ! TR; 1 % ! VR)
  - Shock: 100 G (1 % ! TR; 1 % ! VR)
- Rotational Life: 200 cycles
  - 2 % ΔTR

**Physical Characteristics**

- Torque: 5.0 oz-in. max.
- Mechanical Stops: Wiper idles
- Terminals: MIL-STD-202; Method 208
- Flexible leads: (7 strands of 30 AWG)
- Weight: 0.065 oz.
- 50 % (Actual TR) ±10 % Flammability: U.L. 94V-0

**Machine Screw Mounting**

- Torque: 12 oz-in. max.
- Marking: Mil-spec number
- Standard Packaging: X, P & W Styles: 25 pcs. per tube
- L Style: 25 pcs. per bag
- Adjustment Tool: H-90

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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</tbody>
</table>

**How To Order**

MIL-PRF-22097

RJ22 F W 103

Model

- Terminal Style: Resistance Code

REV 09/04
**RJ24/RJR24**

**3/8” Square Trimming Potentiometer**

**Features**
- Multiturn / Cermet / Industrial / Sealed
- Standoffs
- Patent #4427966 drive mechanism
- Listed on the QPL per MIL-R-22097 and High-Rel Mil-R-39035

---

**Electrical Characteristics**

**Standard Resistance Range**
- 10 to 1 megohm
- (see standard resistance table)

**Resistance Tolerance**
- ±10% std.

**Absolute Minimum Resistance**
- 1 ohm max.

**Contact Resistance Variation**
- 3.0% or 3 ohms max.
- (whichever is greater)

**Adjustability**
- Voltage: ±0.01%
- Resistance: ±0.05%
- Resolution: Infinite

**Insulation Resistance**
- 500 vdc

**Voltage**
- ±0.01%

**Dielectric Strength**
- 10 to 1 megohms

**Humidity**
- MIL-STD-202 Method 106

**Seal Test**
- 85 °C Fluorinert*

**Temperature Coefficient**
- ±100 ppm/°C

**Temperature Range**
- -55 °C to +150 °C

**Power Rating (300 volts max.)**

**Resolution**
- Infinite

**Effective Travel**
- 25 turns nom.

**Dielectric Strength**
- 3.0% or 3 ohms max.
- (whichever is greater)

**Environmental Characteristics**

**Power Rating (300 volts max.)**
- 85 °C: 0.5 watt
- 150 °C: 0.0 watt

**Temperature Range**
- -55 °C to +150 °C

**Seal Test**
- 85 °C Fluorinert*

**Humidity**
- MIL-STD-202 Method 106

**Rotation**
- 200 cycles

**Mechanical Stops**
- Wiper idles

**Load Life**
- RJ24: 1,000 hours 0.5 watt @ 85 °C
- RJ24: 10,000 hours 0.5 watt @ 85 °C

**Rotational Life**
- 200 cycles (2 % ΔTR)

**Physical Characteristics**

**Torque**
- 5.0 oz-in. max.

**Mechanical Stops**
- Wiper idles

**Weight**
- 0.25 oz.

**Marking**
- Mil-spec part number, date code

**Wiper**
- 50 % (Actual TR) ±10 %

**Flammability**
- U.L. 94V-0

**Standard Packaging**
- 50 pcs. per tube

**Adjustment Tool**
- H-90

**Available Through**
- Military Trimmers

*RJR24 – How To Order*

**RJR24**
- How To Order

**RJ24 – How To Order**

**RJR24FX/RJR24FX**

**RJ24FW/RJR24FW**

**RJ24FP/RJR24FP**

**Product Dimensions**

**Common Dimensions**

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
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<tbody>
<tr>
<td>10</td>
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<tr>
<td>20</td>
<td>200</td>
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<td>1,000</td>
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<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

---

**RJR24 – Failure Rate**

**RJR24 – Resistance Code**

**RJR24 – Model**

**RJR24 – Characteristic**

**RJR24 – Terminal Style**

**RJR24 – Resistance Code**

---

**“Fluorinert”** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

*REV 09/04*
**RJ26/RJR26**

1/4” Trimming Potentiometer

### Features
- Multiturn / Cermet / Industrial / Sealed
- Listed on the QPL per MIL-R-22097 and High-Rel MIL-R-39035
- Patent #4427966 drive mechanism

### Electrical Characteristics

**Standard Resistance Range**
- 10 to 1 megohm

**Resistance Tolerance**
- ±10 % std.
- (tighter tolerance available)

**Absolute Minimum Resistance**
- ±1% or 2 ohms max. ( whichever is greater)

**Contact Resistance Variation**
- ±3.0 % or 3 ohms max. ( whichever is greater)

**Adjustability**
- Voltage: ±0.02 %
- Resistance: ±0.05 %
- Resolution: Infinite

**Dielectric Strength**
- Sea Level: 600 vac
- 80,000 Feet: 250 vac

**Effective Travel**
- 12 turns nom.

### Environmental Characteristics

**Power Rating (200 volts max.)**
- 85 °C: 0.25 watt

**Temperature Range**
- -65 °C to +150 °C

**Temperature Coefficient**
- ±100 ppm/°C

**Humidity**
- RJ26: MIL-STD-202 Method 106
- RJ26: MIL-STD-202 Method 106
- RJR26: MIL-STD-202 Method 106

**Vibration**
- 20 G (1 % TR; 1 % VR)

**Shock**
- 100 G (1 % TR; 1 % VR)

### Physical Characteristics

**Torque**
- 3.0 oz-in. max.

**Mechanical Stops**
- Wiper idles

**Terminals**
- MIL-STD-202; Method 208

**Weight**
- 0.015 oz.

**Marking**
- Mil-spec part number

**Wiper**
- 50 % (Actual TR) ±10 %

**Flammability**
- UL 94V-0

**Standard Packaging**
- 50 pcs. per tube

**Adjustment Tool**
- H-90

---

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Specifications are subject to change without notice.

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REV 09/04

---

### Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
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<tr>
<td>20</td>
<td>200</td>
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<td>50</td>
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<td>500</td>
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<tr>
<td>1,000</td>
<td>102</td>
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<tr>
<td>2,000</td>
<td>202</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<td>20,000</td>
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<td>500,000</td>
<td>504</td>
</tr>
<tr>
<td>1,000,000</td>
<td>105</td>
</tr>
</tbody>
</table>

---

### RJ26 – How To Order

**MIL-PRF-22097**

Model
- RJ26 F W 202

**Characteristics**
- F = ±100 ppm/°C Temp. Coef. Max.

**Terminal Style**
- Resistance Code

---

### RJ26 – How To Order

**MIL-PRF-39035**

Model
- RJ26 F W 204 P

**Characteristics**
- F = ±100 ppm/°C Temp. Coef. Max.

**Terminal Style**
- Resistance Code

**Failure Rate**
- M = 1.0 %
- P = 0.1 %
- R = 0.01 %
**Military Trimmers**

**RJ50/RJR50**

**1/4˝ Round Trimming Potentiometer**

**Features**
- 1/4˝ Round / Single-Turn / Cermet
- Industrial / Sealed
- Listed on the QPL per MIL-PRF-22097 and High-Rel MIL-PRF-39035

**Electrical Characteristics**

- **Standard Resistance Range**
  - 10 to 1 megohm
  - (see standard resistance table)
- **Resistance Tolerance**
  - ±10 % std.
  - (closer tolerance available)
- **Absolute Minimum Resistance**
  - 1 % or 2 ohms
  - (whichever is greater)
- **Contact Resistance Variation**
  - 3.0 % or 3 ohms max.
  - (whichever is greater)
- **Adjustability**
  - Voltage: ±0.05 %
  - Resistance: ±0.15 %
  - Resolution: Infinite
- **Insulation Resistance**
  - 500 vdc
  - 1,000 megohms min.
- **Dielectric Strength**
  - Sea Level: 600 vac
  - 80,000 Feet: 250 vac
- **Adjustment Angle**
  - 240 ° nom.

**Environmental Characteristics**

- **Power Rating @ 85 °C**
  - 0.5 watt
- **Power Rating @ 150 °C**
  - 0 watt
- **Temperature Range**
  - -55 °C to +150 °C
- **Temperature Coefficient**
  - ±100 ppm/°C
- **Seal Test**
  - 85 °C Fluorinert®
- **Humidity**
  - MIL-STD-202 Method 106, 96 hours
- **Vibration**
  - 30 G (1 % TR; 1 % VR)
- **Shock**
  - 100 G (1 % TR; 1 % VR)
- **Load Life**
  - 1,000 hours 0.5 watt @ 85 °C
  - (3 % ΔTR; 3 % CRV)
- **Rotational Life**
  - 200 cycles
  - (4 % ΔTR; 4 % CRV)

**Physical Characteristics**

- **Mechanical Angle**
  - 260 ° nom.
- **Torque**
  - 5.0 oz-in. max.
- **Stop Strength**
  - 5.0 oz -in. min.
- **Terminals**
  - Solderable pins
- **Weight**
  - 0.02 oz.
- **Marking**
  - Manufacturer’s trademark, resistance code, date code, manufacturer’s model number and style
- **Wiper**
  - 50 % (Actual TR) ±10 %
- **Standard Packaging**
  - 50 pcs. per tube
- **Adjustment Tool**
  - H-90

**Standard Resistance Table**

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>200</td>
</tr>
<tr>
<td>50</td>
<td>500</td>
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<td>2,000</td>
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<tr>
<td>5,000</td>
<td>502</td>
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<td>500,000</td>
<td>504</td>
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<td>1,000,000</td>
<td>105</td>
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**RJ50 – How To Order**

<table>
<thead>
<tr>
<th>MIL-PRF-22097</th>
<th>RJ50 F P 103</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
<td>Resistance Code</td>
</tr>
<tr>
<td>Characteristic</td>
<td>F = ±100 ppm/°C Temp. Coeff. Max.</td>
</tr>
<tr>
<td>Terminal Style</td>
<td>Resistance Code</td>
</tr>
</tbody>
</table>

**RJR50 – How To Order**

<table>
<thead>
<tr>
<th>MIL-PRF-39035</th>
<th>RJR50 F P 203 P</th>
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</thead>
<tbody>
<tr>
<td>Model</td>
<td>Resistance Code</td>
</tr>
<tr>
<td>Characteristic</td>
<td>F = ±100 ppm/°C Temp. Coeff. Max.</td>
</tr>
<tr>
<td>Terminal Style</td>
<td>Resistance Code</td>
</tr>
<tr>
<td>Failure Rate</td>
<td>M = 1.0 % P = 0.1 %</td>
</tr>
</tbody>
</table>

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Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
Linear Motion Potentiometers
3046 Linear Motion Potentiometer

Features
- Compact
- Sealed
- Long life
- Infinite resolution
- Free shaft rotation
- AC or DC
- Shaft options available
- Flexible wire leads
- Economical
- RoHS compliant

Specifications*

Standard Electrical Travel
- 0.15, 0.25, 0.35 in. (3.81, 6.35, 8.89 mm)

Standard Resistances
- 1K to 50K ohms (±20%)

Independent Linearity
- ±5%

Resolution
- Infinite

Power Rating @ 70 °C (158 °F)
- 0.125 watt

Operating Temperature Range
- -55 °C to +125 °C

Temperature Coefficient
- 1000 PPM/°C

Insulation Resistance
- 50 megohms @ 500 VDC

Backlash
- Negligible

Shaft Actuating Force
- 2N max. @ 21 °C

Life
- 500,000 cycles

Shock
- 50 G for 7ms

Vibration
- 20 G, 10-2K Hz

Marking
- Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style

Specifications are typical. Contact factory for special requirements.

*Specifications applicable from 5% to 95% of electrical travel.

Product Dimensions

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
</tr>
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<tbody>
<tr>
<td>1,000</td>
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<td>2,500</td>
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How To Order

<table>
<thead>
<tr>
<th>3046 L - 2 - 502</th>
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</thead>
</table>

Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.

REV 09/04
3048 Linear Motion Potentiometer

Features
- Compact
- Lightweight
- Long life
- Infinite resolution
- Free shaft rotation
- AC or DC
- Shaft options available
- Flexible wire leads
- Economical
- RoHS compliant

Specifications*

Standard Electrical Travel
- 0.2, 0.3, 0.4, 0.5 in. (5.08, 7.62, 10.16, 12.70 mm)

Standard Resistances
- 1K ohms to 50K ohms (±20 %)

Independent Linearity
- ±5 %

Resolution
- Infinite

Power Rating @ 70 °C (158 °F)
- Range 2, 3 = 0.12 watt
- Range 4, 5 = 0.25 watt

Operating Temperature Range
- -55 °C to +125 °C

Temperature Coefficient
- 1000 PPM/°C

Insulation Resistance
- 50 megohms @ 500 VDC

Backlash
- Negligible

Shaft Actuating Force
- 4 oz. max. @ 70 °F

Life
- 500,000 cycles

Shock
- 50 G for 7 msec

Vibration
- 20 G, 10-2 kHz

Marking
- Manufacturer’s trademark, resistance code, wiring diagram, date code, manufacturer’s model number and style

Specifications are typical.
Contact factory for special requirements.

*Specifications applicable from 5% to 95% of electrical travel.

Standard Resistance Table

<table>
<thead>
<tr>
<th>Resistance (Ohms)</th>
<th>Resistance Code</th>
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<tbody>
<tr>
<td>1,000</td>
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<tr>
<td>50,000</td>
<td>503</td>
</tr>
</tbody>
</table>

How To Order

3048 L - 2 - 502

Model
Style
Range (Travel)
- 2 = 0.2” (5.08 mm)
- 3 = 0.3” (7.62 mm)
- 4 = 0.4” (10.16 mm)
- 5 = 0.5” (12.70 mm)

Resistance Code

Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.

REV 09/04
## 70AA/Female Modular Contact

### Features
- 2.54 mm pitch & height
- 2 to 6 precious metal contacts
- End-to-end stackable
- Twin hot contacts (symmetrical pad layout)
- Pick & place compatible
- High cycle life
- RoHS compliant†

### Applications
- Handheld communications – mobile phones, pagers, cordless phones, GPS, PICs, radios
- Portable consumer equipment – PDAs, HPCs, notebook PCs, cameras, dictaphones, PICs, games
- Component-to-board, SIM cards, etc.

### Materials & Finishes
- Insulator: Glass reinforced thermoplastic, UL 94V-0 rated, black
- Contact: Copper alloy
- Underplating: 30 µ˝ - 60 µ˝ nickel
- Contact Area: 30 µ˝ Au over nickel

### Operating Characteristics
- **Electrical**
  - Current Rating: 3 A/contact
  - Voltage Rating: 60 V
  - Contact Resistance: 30 mohms max.
  - Dielectric Voltage: AC 500 V
  - Insulating Resistance: 1000 Mohms min.
- **Mechanical**
  - Durability: 10,000 cycles min.
  - Temperature: -55 °C to 125 °C

### How To Order

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal Style</th>
<th>Number of Contacts (N)</th>
<th>Gender</th>
<th>Options</th>
<th>Packaging Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>70AA J - 4 - F 0 G</td>
<td>J = SMT</td>
<td>2 through 6</td>
<td>F = Female</td>
<td>0 = Standard</td>
<td>Tube (240/N pcs. or 240 contacts per tube)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = Locating Pins</td>
<td>Embossed Tape (750 pcs. per reel)</td>
</tr>
</tbody>
</table>

### Product Dimensions

<table>
<thead>
<tr>
<th>Number of Contacts</th>
<th>Dimension A</th>
<th>Dimension B</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>4.98 (.196)</td>
<td>2.54 (.100)</td>
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<tr>
<td>3</td>
<td>7.52 (.296)</td>
<td>5.08 (.200)</td>
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<tr>
<td>4</td>
<td>10.06 (.396)</td>
<td>7.62 (.300)</td>
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<tr>
<td>5</td>
<td>12.60 (.496)</td>
<td>10.16 (.400)</td>
</tr>
<tr>
<td>6</td>
<td>15.14 (.596)</td>
<td>12.70 (.500)</td>
</tr>
</tbody>
</table>

---

Specifications are subject to change without notice.
70AA/Male Modular Contact

**Features**
- 2.54 mm pitch & height
- 2 to 6 precious metal contacts
- End-to-end stackable
- Twin hot contacts (symmetrical pad layout)
- Pick & place compatible
- High cycle life
- RoHS compliant

**Applications**
- Handheld communications – mobile phones, pagers, cordless phones, GPS, PICs, radios
- Portable consumer equipment – PDAs, HPCs, notebook PCs, cameras, dictaphones, PICs, games
- Component-to-board, SIM cards, etc.

**Materials & Finishes**
- Insulator: Glass reinforced thermoplastic, UL 94V-0 rated, black
- Contact: Copper alloy
- Finish: Underplating: 30 µ” - 60 µ” nickel
- Contact Area: 30 µ” Au over nickel

**Operating Characteristics**

**Electrical**
- Current Rating: 3 A/contact
- Voltage Rating: 60 V
- Contact Resistance: 25 mΩ max.
- Dielectric Voltage: AC 500 V
- Insulating Resistance: 1000 MΩ min.
- Operating Temperature: -55 °C to 125 °C
- Mechanical Normal Force/Finger: 80 grams min.
- Durability: 10,000 cycles min.

**How To Order**

70AA J - 4 - M 0 G

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal Style</th>
<th>Number of Contacts (N)</th>
<th>Gender</th>
<th>Options</th>
<th>Packaging Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J = SMT</td>
<td>2 through 6</td>
<td>M = Male</td>
<td>0 = Standard</td>
<td>G = Tube</td>
</tr>
</tbody>
</table>

**Product Dimensions**

<table>
<thead>
<tr>
<th>Dimension (A)</th>
<th>Number of Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.09 (279)</td>
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<tr>
<td>3.79 (150)</td>
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</tr>
<tr>
<td>0.18 (307)</td>
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</tr>
<tr>
<td>2.54 (100)</td>
<td></td>
</tr>
</tbody>
</table>

**Recommended PWB Layout**

**Electrical Schematic**

**Specifications**
- Dimensions: MM/(INCHES)
- Tolerances: ±0.2 (±.012) except where noted

**REV 09/04**

Customers should verify actual device performance in their specific applications.

# 70AA/Male – Packaging Specifications

<table>
<thead>
<tr>
<th>Number of Contacts</th>
<th>Dimension A</th>
<th>Dimension B</th>
<th>Dimension C</th>
<th>Dimension D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16.0 (.630)</td>
<td>7.5 (.296)</td>
<td>5.64 (.222)</td>
<td>16.4 (.646)</td>
</tr>
<tr>
<td>3</td>
<td>16.0 (.630)</td>
<td>7.5 (.296)</td>
<td>8.19 (.323)</td>
<td>16.4 (.646)</td>
</tr>
<tr>
<td>4</td>
<td>24.0 (.945)</td>
<td>11.5 (.453)</td>
<td>10.4 (.409)</td>
<td>24.4 (.961)</td>
</tr>
<tr>
<td>5</td>
<td>24.0 (.945)</td>
<td>11.5 (.453)</td>
<td>12.95 (.510)</td>
<td>24.4 (.961)</td>
</tr>
<tr>
<td>6</td>
<td>24.0 (.945)</td>
<td>11.5 (.453)</td>
<td>15.5 (.610)</td>
<td>24.4 (.961)</td>
</tr>
</tbody>
</table>

### Diagram:
- **Tape**:
  - Dimension A: 16.0 (.630)
  - Dimension B: 7.5 (.296)
  - Dimension C: 5.64 (.222)
  - Dimension D: 16.4 (.646)

- **Reel**:
  - DIA: 330.2 (13.000)
  - DIA: 13.0 (.512)
  - DIA: 0.3 (.012)
  - DIA: 2.00 (.079)
  - DIA: 4.00 (.157)
  - DIA: 5.15 (.203)
  - DIA: 9.74 (.383)
  - DIA: 12.00 (.472)
  - DIA: 1.5 (.059)

- **Equal Spaced 3 Plcs.**:
  - DIA: 20.2 (.795)
  - DIA: 3.00 (1.18)
  - DIA: 39.06 (1.54)
  - DIA: 0.3 (.012)
70AD/Female Modular Contact

Features
- Rechargeable battery-pack applications
- Precious metal contacts
- Tape & reel packaging available
- RoHS compliant†

Materials & Finishes
- Insulator: Glass reinforced thermoplastic, UL 94V-0 rated, black
- Contact: Copper alloy
- Underplating: 30 µ" - 60 µ" nickel
- Contact Area: 30 µ" Au over nickel
- Termination: Tin alloy (meets MIL-STD-202, method 208)

Operating Characteristics
- Electrical
  - Current Rating: DC 3 A/contact
  - Voltage Rating: DC 30 V
  - Contact Resistance: 25 mΩ max.
  - Dielectric Voltage: AC 500 V
  - Insulating Resistance: 500 MΩ min.
  - Operating Temperature: -55 °C to 125 °C
- Mechanical
  - Durability: 5,000 cycles

How To Order

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal Style</th>
<th>Number of Contacts</th>
<th>Gender</th>
<th>Height</th>
<th>Options</th>
<th>Packaging Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>70AD</td>
<td>J = SMT</td>
<td>2 through 6</td>
<td>M = Male</td>
<td>L = Low Profile</td>
<td>0 = Standard</td>
<td>__ = Tube</td>
</tr>
<tr>
<td></td>
<td>H = Through-hole</td>
<td></td>
<td>F = Female</td>
<td></td>
<td>1 = Locator Pins</td>
<td>G = Embossed Tape</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Contacts</th>
<th>Dim. A</th>
<th>Dim. B</th>
<th>Dim. C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9.0 (.354)</td>
<td>4.0 (.157)</td>
<td>7.0 (.276)</td>
</tr>
<tr>
<td>3</td>
<td>12.0 (.472)</td>
<td>8.0 (.315)</td>
<td>11.0 (.433)</td>
</tr>
<tr>
<td>4</td>
<td>17.0 (.669)</td>
<td>12.0 (.472)</td>
<td>15.0 (.591)</td>
</tr>
<tr>
<td>5</td>
<td>21.0 (.827)</td>
<td>16.0 (.630)</td>
<td>19.0 (.748)</td>
</tr>
<tr>
<td>6</td>
<td>25.0 (.984)</td>
<td>20.0 (.787)</td>
<td>23.0 (.906)</td>
</tr>
</tbody>
</table>

Dimensions: MM/(INCHES)
TOLERANCES: ±.3/(±.012) EXCEPT WHERE NOTED

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
70AD/Male Modular Contact

Features
- Low profile
- Rugged design
- Vertical or horizontal entry
- Tape & reel packaging available
- RoHS compliant

Materials & Finishes
Insulator: Glass reinforced thermoplastic UL 94V-0 rated, black
Contact: Copper alloy
Finish: Underplating: 30 μm nickel, 30 μm Au over Ni
Termination: Tin alloy (meets MIL-STD-202, method 208)

Operating Characteristics
Electrical
- Current Rating: DC 3 A/contact
- Voltage Rating: DC 30 V
- Contact Resistance: 25 mΩ max.
- Dielectric Voltage: AC 500 V
- Insulating Resistance: 500 MΩ min.
- Operating Temperature: -55 °C to 125 °C

Mechanical
- Normal Force/Finger: 100 grams min.
- Durability: 5,000 cycles

How To Order
- Model: 70AD J - 3 - M L 0 G
- Terminal Style:
  - J = SMT
  - H = Through-hole
- Number of Contacts: 2 through 6
- Gender:
  - M = Male
  - F = Female
- Height:
  - L = Low Profile
- Options:
  - 0 = Standard
  - 1 = Locator Pins (J style only)
- Packaging Option:
  - __ = Tube (240/N pcs. or 240 contacts per tube)
  - G = Embossed Tape (500 pcs. per reel)


Product Dimensions

<table>
<thead>
<tr>
<th>Number of Contacts</th>
<th>Dimension A</th>
<th>Dimension B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>7.7 / (.303)</td>
<td>5.11 / (.201)</td>
</tr>
<tr>
<td>3</td>
<td>11.7 / (.461)</td>
<td>9.11 / (.359)</td>
</tr>
<tr>
<td>4</td>
<td>15.7 / (.618)</td>
<td>13.11 / (.516)</td>
</tr>
<tr>
<td>5</td>
<td>19.7 / (.776)</td>
<td>17.11 / (.674)</td>
</tr>
<tr>
<td>6</td>
<td>23.7 / (.933)</td>
<td>21.11 / (.831)</td>
</tr>
</tbody>
</table>

REV 09/04
7813
SMD 3 mm Square Sealed Rotary Switch

Features
- Single pole.double throw
- Compatible with most surface mount manufacturing processes
- 50 or 2000 cycle rotational life
- Tape & reel packaged
- Withstands 245 °C soldering heat

Features
- Single pole.double throw
- Compatible with most surface mount manufacturing processes
- 50 or 2000 cycle rotational life
- Tape & reel packaged
- Withstands 245 °C soldering heat

Electrical Characteristics
Contact Rating
Maximum Current ...............100 mA max.
Maximum Voltage .................16 V
Contact Timing................Non-shorting
Contact Resistance.............2 ohms max.
Insulation Resistance .............100 megohms min.
Dielectric Strength .............250 VAC

Product Dimensions

How To Order

Table:

Model  7813 J - 1 - 051 E
Terminal
Switch Type −1 = SPDT
Rotational Life −051 = 50 Cycles
−023 = 2000 Cycles
Embosed Tape Designator E = 1000 pcs./180 mm Reel (J Style)
200 pcs./180 mm Reel (S Style)

General Characteristics
Switch Type..........................SPDT
Operating Temperature Range
−55 °C to +125 °C
Storage Temperature Range
−55 °C to +125 °C
Seal Test...........................85 °C Fluorinert *

Mechanical Characteristics
Positions.....................................2
Adjustment Torque............. .5 N-cm max.
Stop Strength..................1.8 N-cm min.

Environmental Characteristics
Shock .............................................20 G
0.1 ms max. discontinuity
Vibration ....................................100 G
0.1 ms max. discontinuity
Thermal Shock ......................−55 °C to +125 °C
(5 cycles)
Humidity
Insulation Resistance .............10 megohms min.
Rotational Life
−051 = 50 Cycles
−023 = 2000 Cycles
Max. Soldering Heat .............245 °C,
5 seconds
Standard Packaging
J........................................1,000 pcs./reel
S ........................................200 pcs./reel

U.S. Patent No. 5043695
**Fluorinert** is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in
their specific applications.

REV 09/04
Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
7814
SMD 4 mm Square Sealed Rotary Switch

Features
- Single pole-double throw
- Compatible with most surface mount soldering processes
- 50 or 2000 cycle rotational life
- Compatible with popular vacuum pick-and-place equipment
- J-hook, gull-wing and through hole
- Meets EIA/EIAJ/IPC/VRCI SMD standard outline dimensions
- RoHS compliant

Electrical Characteristics
- Contact Rating
  - Maximum Current: 100 mA max.
  - Maximum Voltage: 16 V
- Contact Timing: Non-shorting
- Contact Resistance: 2 ohms max.
- Dielectric Strength: 250 VAC

General Characteristics
- Switch Type: SPDT
- Operating Temperature Range: -55 °C to +125 °C
- Storage Temperature Range: -55 °C to +125 °C
- Seal Test: -5 °C to +125 °C

Mechanical Characteristics
- Positions: 2
- Adjustment Torque: 1.8 N-cm max.
- Stop Strength: 2.5 N-cm min.
- Pushover Strength (Z Style): 2 kilograms minimum
- Weight: Approximately 0.2 gm.
- Marking: Manufacturer’s trademark, life code and date code

Environmental Characteristics
- Vibration: 20 G
- Shock: 100 G
- Thermal Shock (5 cycles): -55 °C to +125 °C
- Humidity: Insulation Resistance: 10 megoohms min.
- Rotational Life:
  - -051: 50 Cycles
  - -023: 2000 Cycles
- Max. Soldering Heat: 245 °C, 10 seconds
- Humidity: 85 °C Fluorinert™
- Thermal Shock (5 cycles): -55 °C to +125 °C
- Shock: 100 G
- Vibration: 20 G

How To Order

7814 J - 1 - 051 E

Model
- Terminal:
  - J = J-Hook
  - G = Gull Wing
  - H = Through-hole
  - Z = Right Angle
- Switch Type:
  - 1 = SPDT
  - 3 = 2 PLCs.
- Rotational Life:
  - -051 = 50 Cycles
  - -023 = 2000 Cycles
- Optional Embossed Tape Designator:
  - For pin styles J, G, Z only – omit for tube packaging

Product Dimensions

7814J
J-Hook

7814H
Through-hole

7814G
Gull Wing

7814Z
Right Angle

Dimensions: MM/(INCHES)
TOLERANCES: ±.2/(±.007) EXCEPT WHERE NOTED

Rev 09/04

"Fluorinert" is a registered trademark of 3M Co.
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
7814 – Packaging Specifications and Reflow Soldering Profile

Packaging Specifications

J Style

H Style

G Style

Z Style

Reflow Soldering Profile

Electrical Schematic

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
7829
6 mm Through-hole Sealed Rotary Switch

Features
- Single pole/double throw
- Vertical adjust
- Rugged construction
- Board washable
- Wave solderable
- RoHS compliant

Electrical Characteristics
- Contact Rating
  - Maximum Current ...............100 mA max.
  - Maximum Voltage ..................16 V
- Contact Timing......................Non-shorting
- Contact Resistance...........2 ohms max.

General Characteristics
- Switch Type..........................SPDT
- Operating Temperature Range .............-55 °C to +125 °C
- Storage Temperature Range ..........-55 °C to +125 °C
- Thermal Shock..........................5 cycles
  - -55 °C to +125 °C
- Seal Test ................................85 °C Fluorinert®

Mechanical Characteristics
- Stop Strength ..................3.5 N.cm
- Positions..........................2

Environmental Characteristics
- Vibration................................30 G
- Shock..................................100 G
- Thermal Shock.......................(5 cycles)
  - -55 °C to +125 °C
- Humidity Insulation Resistance
  - ..................................10 megarohms min.
- Rotational Life
  - -051 ..................................50 Cycles
  - -023 ..................................2000 Cycles
- Standard Soldering Heat .................245 °C
- Standard Packaging .................50 pcs/tube

How To Order
- Model 7829 H - 1 - 051
- Terminal
- Switch Type
  - -1 = SPDT
- Rotational Life
  - -051 = 50 Cycles
  - -023 = 2000 Cycles

Electrical Schematic

Product Dimensions

Contact Timing......................Non-shorting
- Contact Resistance...........2 ohms max.

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.
REV 09/04
7914 – 4 mm SMD & Through-hole Sealed Key Switch

Features
- Compatible with most surface mount soldering processes
- Compatible with popular vacuum pick-and-place equipment
- J-hook, gull-wing & pinned configurations
- Sealed for board washing
- Meets EIA/EIAJ/IPC/VRCI SMD standard outline dimensions
- Top or side actuated
- RoHS compliant

Electrical Characteristics
- Contact Rating
  - Maximum Current: 100 mA max.
  - Maximum Voltage: 16 V
- Contact Resistance: 100 milliohms max.
- Insulation Resistance: 100 megohms min.
- Dielectric Strength: 250 VAC

General Characteristics
- Switch Type: Normally open
- Operating Temp. Range: -55 °C to +125 °C
- Storage Temp. Range: -55 °C to +125 °C
- Seal Test: 85 °C Fluorinert®
- Vibration: 20 G
- Shock: 100 G

Mechanical Characteristics
- Actuator Force: 300 ±100 g
- Pushover Strength (S Style): 2 kG min.
- Cycle life, loaded: 100,000 actuations
- Contact resistance: 100 milliohms max.
- Terminal Material: Phosphor bronze
- Base Material: Thermoplastic, UL 94V-0
- Cover Material: Stainless steel
- Dielectric Strength: 250 VAC
- Insulation Resistance: 100 megohms min.
- Contact Resistance: 100 milliohms max.

Physical Characteristics
- Cover Material: Stainless steel
- Base Material: Thermoplastic, UL 94V-0
- Terminal Material: Phosphor bronze
- Dome Material: Stainless steel
- Actuator Material: High temperature silicon rubber
- Marking: Manufacturer’s code and date code

Packaging Options
- J & G: 500 pcs./reel; 50 pcs./tube
- H: 200 pcs./reel; 100 pcs./tube
- J: 200 pcs./reel; 50 pcs./tube

How To Order
- Model: 7914 J - 1 - 000 E
- Terminal: J = J-Hook, G = Gull Wing, H = Through-hole
- Switch Type: 1 = N.O. Au Contacts
- Product Code for Button Height
  - (For Styles J, G, and H)
  - -000 = 4.0 mm FMS
  - -032 = 2.4 mm FMS (Flush Actuator)
  - -032 = 2.4 mm FMS (Flush Actuator)
  - -050 = 5.0 mm FMS
  - (For Style S)
  - -000 = 2.4 mm FTS
  - -032 = 1.91 mm FTS
  - -024 = Flush Actuator
- Embossed Tape
  - (Option applicable to Styles J, G & S only – Consult Factory. Omit for Tube packaging.)
  - G, J = 500 pcs./reel, S = 200 pcs./reel

7914J
- J-Hook
- RECOMMENDED PCB LAYOUT

7914H
- Through-hole
- RECOMMENDED PCB LAYOUT

7914G
- Gull Wing
- RECOMMENDED PCB LAYOUT

7914S
- Right Angle
- RECOMMENDED PCB LAYOUT

Features
- “Fluorinert” is a registered trademark of 3M Co.
- Specifications are subject to change without notice.
- Customers should verify actual device performance in their specific applications.

REV 09/04
7914 – Packaging Specifications

J Style Reel

G Style Reel

S Style Reel

H Style Tube

Reflow Soldering Profile

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
SDHH Series
Half Pitch SMD DIP Switch

Features
- Eight and four positions available
- Gold plated contacts offer high reliability
- Low contact resistance
- Just 1.5 mm total height
- Half pitch of 1.27 mm (.050 in.)
- RoHS compliant

Electrical Characteristics
- Electrical Life: 1,000 operation cycles per switch min.
- Non-Switching Rating: 100 mA, 50 VDC
- Switching Rating: 25 mA, 24 VDC
- Contact Resistance: 100 mohms max.
- Insulation Resistance: 100 Mohms min.
- DC 100 V min.
- Dielectric Strength: AC 300 V for 1 minute
- Capacitance: 5 pF max. between adjacent closed switch

Environmental Characteristics
- Mechanical Life: 2,000 operations per switch min.
- Operation Force: 500 g max.
- Stroke: 0.6 mm
- Operating Temp. Range: -30 °C to +85 °C
- Storage Temperature: -40 °C to +85 °C
- Vibration Test: MIL-STD-202F, Method 201A
- Frequency: 10-50-10 Hz/1 minute
- Directions: X, Y, Z, three mutually perpendicular directions
- Time: 2 hours each direction, high reliability
- Shock Test: MIL-STD-202F, Method 213B, Condition A
- Gravity: 50 G (peak value), 11 msec
- Direction & Times: 6 sides and 3 times in each direction.
- High reliability

Physical Characteristics
- Cover Materials: Thermoplastic Nylon, UL 94V-0; black
- Base Materials: Thermoplastic Nylon, UL 94V-0; black
- Actuator Materials: Thermoplastic Nylon, UL 94V-0; white
- Contact Materials: Alloy Copper
- Contact Plating: 3 Micro inches gold over 40 micro inches nickel
- Terminal Materials: Brass with Gold plating
- Reflow Soldering: Peak temperature or reflow oven should be set to 240 °C max.
- 2 sec. while applying solder
- Packaging: All poles in the “off” position

Product Dimensions

SDHH Series Dimensions

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Pos.</th>
<th>Dim. A</th>
<th>Dim. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDHH-4</td>
<td>4</td>
<td>6.31 (.248)</td>
<td>3.81 (.15)</td>
</tr>
<tr>
<td>SDHH-8</td>
<td>8</td>
<td>11.39 (.448)</td>
<td>8.89 (.35)</td>
</tr>
</tbody>
</table>

How To Order

SDH H - 8 - T R

Model
Actuator
H = Recessed
Number of positions
-4 = 4 positions
-8 = 8 positions
Seal
-T = Top tape sealed (standard)
Packaging
R = Tape and reel

Reflow Soldering Profile

Specifications are subject to change without notice. 
Customers should verify actual device performance in 
their specific applications.

REV 09/04
SDHH Series – Packaging Specifications

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
**SDM Series – Surface Mount DIP Switch**

### Features
- Double contacts
- Low contact resistance
- Self-clean on contact area
- Vapor phase solderable, IR-reflow solderable
- Terminal plating by gold gives excellent results when soldering

### SDM Series Dimensions

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Pos.</th>
<th>Dim. A</th>
<th>Dim. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDM-12</td>
<td>12</td>
<td>31.42</td>
<td>27.94</td>
</tr>
<tr>
<td>SDM-10</td>
<td>10</td>
<td>26.34</td>
<td>22.86</td>
</tr>
<tr>
<td>SDM-8</td>
<td>8</td>
<td>21.26</td>
<td>17.78</td>
</tr>
<tr>
<td>SDM-6</td>
<td>6</td>
<td>16.18</td>
<td>12.70</td>
</tr>
<tr>
<td>SDM-4</td>
<td>4</td>
<td>11.10</td>
<td>7.62</td>
</tr>
<tr>
<td>SDM-2</td>
<td>2</td>
<td>6.02</td>
<td>2.54</td>
</tr>
</tbody>
</table>

### Packing Specifications

<table>
<thead>
<tr>
<th>Pole</th>
<th>Tape Size (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16 mm</td>
</tr>
<tr>
<td>4</td>
<td>24 mm</td>
</tr>
<tr>
<td>5</td>
<td>32 mm</td>
</tr>
<tr>
<td>9</td>
<td>44 mm</td>
</tr>
</tbody>
</table>

### Reflow Soldering Profile

![Reflow Soldering Profile](profile.png)

### How To Order

SDM R - 2 - T R

**Model**

- X = Raised
- T = Top Tape Sealed ("R" Actuator only)

**Actuator**

- X = Standard (Not Sealed)
- T = Top Tape Sealed ("R" Actuator only)

**Number of Positions**

1 = 1 Position  2 = 2 Positions  3 = 3 Positions  4 = 4 Positions  5 = 5 Positions  6 = 6 Positions

**Packaging Option**

-(Top Sealed, Recessed Only)
- T = Tape and Reel Packaging (900 pcs./reel)

Specifications are subject to change without notice. To RoHS Directive 2002/95/EC Jan 27 2003 including Annex. Customers should verify actual device performance in their specific applications.

REV 09/04
SDT Series – Tact Switch

Features
- Available sharp click feel with a positive tactile feedback
- Ultra-miniature and lightweight structure suitable for high density mounting
- Economical with high reliability
- Insert molding in the contact with special treatment prevents flux buildup during soldering and permits autodipping
- RoHS compliant

Specifications are subject to change without notice.

Contact Disc Materials: Phosphor bronze
Actuator Color: Black, brown, red
Actuator Materials: Duralcon POM
Cover/Base Color: Black
Base Materials: UL94V-0 PBT plus glass fiber reinforced
Cover Materials: Steel

Electrical Life
- 500,000 cycles min. for 260 g
- 1,000,000 cycles min. for 100 g, 160g

Contact Resistance: 100 milliohms max.
Dielectric Strength: 250 V AC for 1 minute
Insulation Resistance: 100 megohms, DC 500 V min.
Rating: DC 12 V 50 mA

Environmental Characteristics
- Operational Temperature Range: -20 °C to +70 °C
- Shock Test: MIL-STD-202F, Method 201A
- Vibration Test: MIL-STD-202F
- Method 213B, Condition A
- Frequency: 10-55-10 Hz/1 minute
- Directions: X,Y,Z, three mutually perpendicular directions
- Time: 2 hours each direction.
- High reliability

Physical Characteristics
- Cover Materials: Steel
- Base Materials: UL94V-0 PBT plus glass fiber reinforced
- Cover/Base Color: Duralcon POM plus glass fiber reinforced
- Actuator Color: Black, brown, red
- Contact Disc Materials: Phosphor bronze with silver cladding
- Terminal Materials: Brass with silver cladding
- Wave Soldering Process: Recommended solder temperature at 260 °C (500 °F) max., 5 seconds
- Hand Soldering Process: Use a soldering iron of 30 watts or less, controlled at 320 °C (608 °F) for approximately 2 seconds while applying solder

Packaging: 1,000 pieces per bag

Product Dimensions

SDTX-644/648

SDTX-644

<table>
<thead>
<tr>
<th>Dim.</th>
<th>mm/in (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.4 ±1/0</td>
</tr>
<tr>
<td>B</td>
<td>1.6 ±1/0</td>
</tr>
</tbody>
</table>

Dim. (max) (min)

Recommended PCB Layout

Circuit Diagram

DIMENSIONS: MM/(INCHES)

REV 09/04
SDT Series – Product Dimensions

**SDTA-610/620/630/650/660**

<table>
<thead>
<tr>
<th>Dim.</th>
<th>mm/in</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.4 +/−0.1</td>
<td>0.094 +/−0.004</td>
<td>0.934 +/−0.004</td>
</tr>
<tr>
<td>B</td>
<td>1.6 +/−0.1</td>
<td>0.063 +/−0.004</td>
<td>0.617 +/−0.004</td>
</tr>
</tbody>
</table>

**SDTA-644/648**

<table>
<thead>
<tr>
<th>Dim.</th>
<th>mm/in</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.8 +/−0.1</td>
<td>0.110 +/−0.004</td>
<td>1.094 +/−0.004</td>
</tr>
<tr>
<td>B</td>
<td>2.0 +/−0.1</td>
<td>0.079 +/−0.004</td>
<td>0.764 +/−0.004</td>
</tr>
</tbody>
</table>

**SDTX-210**

<table>
<thead>
<tr>
<th>Dim.</th>
<th>mm/in</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3.5 ±0.1</td>
<td>0.138 ±0.004</td>
<td>1.386 ±0.004</td>
</tr>
<tr>
<td>B</td>
<td>2.5 ±0.1</td>
<td>0.098 ±0.004</td>
<td>0.984 ±0.004</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
SDT Series – Product Dimensions, Packaging Specifications and Ordering Information

**Product Dimensions**

**SDTX-244**

**Packaging Specifications**

**SDTX-610/620/630/644/648/650 Ammo Pack**

**How To Order**

**SDT G - 6 10 - K AP**

**Specifications**

- Ø1.70 (0.067)
- Ø3.50 ± 0.50 (0.138 ± 0.020)
- Ø7.10 (0.280)
- Ø12.50 ± 0.10 (0.492 ± 0.004)
- Ø1.20 ± 0.05 (0.047 ± 0.002)

**Actuating Force**

- K = 100 g (black head – 6 mm only)
- N = 160 g (brown head)
- R = 260 g (red head)

**Packaging Option**

(SDTX only)

- AP = Ammo Pak

*Options available:

- SDTX-210
- SDTX-244

**Reflow Soldering Profile**

- Temperature (°C)
  - 240°C
  - 225°C
  - 210°C
  - 195°C
  - 180°C
  - 165°C
  - 150°C
  - 125°C
  - 100°C
  - 85°C
  - 60°C
  - 35°C
  - 25°C

- Time (Seconds)
  - 0-15 Sec.
  - 15-40 Sec.
  - 40-60 Sec.
  - 60-90 Sec.
  - 90-120 Sec.

**Dimensions:** MM/(INCHES)

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
SDTM Series – SMD Tact Switch

Features
- Available sharp click feel with a positive tactile feedback
- Ultra-miniature and lightweight structure suitable for high density mounting
- Very economical with high reliability
- Insert molding in the contact with special treatment prevents flux buildup during soldering and permits autodipping
- RoHS compliant†

Electrical Characteristics
- Electrical Life: 50,000 cycles min. for 260 g
  500,000 cycles min. for 100 g, 160 g
- Rating: DC 12 V, 50 mA
- Contact Resistance: 100 mohms max.
- Dielectric Strength: AC 250 V for 1 minute
- Contact Arrangement: 1 pole 1 position

Environmental Characteristics
- Operation Force: 100 g, 160 g, 260 g
  Tolerance: ±50 g
- Stop Strength: Place the switch vertical, a static load of 3 kg shall be applied in the direction of actuator operation for a period of 15 seconds
- Temperature Range: -25 °C to +70 °C
- Vibration Test: MIL-STD-202F, Method 201A
  Frequency: 10-50-10 Hz/1 minute
  Directions: X, Y, Z 3 mutually perpendicular directions
  Time: 2 hours each direction, high reliability
- Shock Test: MIL-STD-202F, Method 213A, Condition A
  Gravity: 50 g (peak value), 11 msec.
  Directions/Time: 6 sides and 3 times in each direction

Physical Characteristics
- Cover Materials: Steel, tin plated
- Base Materials: Thermoplastic Nylon FG 101, UL94V-0
- Actuator Materials: Thermoplastic Nylon UL94V-0
- Color: Black, brown, red
- Contact Disc. Materials: Phosphor bronze with silver cladding
- Terminal Materials: Brass with silver cladding

Product Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Code</th>
<th>Body Size</th>
<th>Actuating Force</th>
<th>Packaging Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDTM-610</td>
<td>620/630/650/660</td>
<td>6 mm</td>
<td>100 g (black)</td>
<td>TR = Embossed Tape*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 mm</td>
<td>160 g (brown)</td>
<td>610 = 1000 pcs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MAX. 9.5 mm</td>
<td>260 g (red)</td>
<td>620 = 900 pcs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.20 mm</td>
<td></td>
<td>630, 644, 648 = 500 pcs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.50 mm</td>
<td></td>
<td>650 = 380 pcs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.0 mm</td>
<td></td>
<td>_ = Tube</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.200 mm</td>
<td></td>
<td>All models = 77 pcs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.40 mm</td>
<td></td>
<td>*Not applicable to Model 660.</td>
</tr>
</tbody>
</table>

How To Order

SDT M - 6 10 - K TR
Model
Product Code
M = SMD
Body Size
8 = 8 mm
Height
10 = 4.3 mm
20 = 5.0 mm
30 = 7.0 mm
44 = 7.3 mm (square head)
48 = 7.3 mm (square head)
50 = 9.5 mm
60 = 13 mm
Actuating Force
K = 100 g (black)
N = 160 g (brown)
R = 260 g (red)
Packaging Option
TR = Embossed Tape*
610 = 1000 pcs.
620 = 900 pcs.
630, 644, 648 = 500 pcs.
650 = 380 pcs.
__ = Tube
All models = 77 pcs.
*Not applicable to Model 660.

CIRCUIT DIAGRAM

DIMENSIONS: MM/(INCHES)
TOLERANCES: ±0.2/(±.008) EXCEPT WHERE NOTED

Specifications are subject to change without notice.

REV 09/04
## SDTM Series – Packaging Specifications

### Packaging Specifications

**SDTM-610/620/630/644/648/650(TR)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 ± 0.10</td>
<td>±0.030</td>
</tr>
<tr>
<td>4.00 ± 0.10</td>
<td>±0.030</td>
</tr>
<tr>
<td>12.00 ± 0.10</td>
<td>±0.040</td>
</tr>
<tr>
<td>16.00 ± 0.10</td>
<td>±0.020</td>
</tr>
</tbody>
</table>

**SDTM-630, 644, 648**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.40</td>
<td>±0.040</td>
</tr>
</tbody>
</table>

**SDTM-650, 660**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.9 ± 0.1</td>
<td>±0.004</td>
</tr>
</tbody>
</table>

**SDTM-610, 620**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>±0.021</td>
</tr>
</tbody>
</table>

**Dimensions:** MM/(INCHES)  
**Tolerances:** ±0.2/(±.008) EXCEPT WHERE NOTED

### Reflow Soldering Profile

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Time (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>225</td>
<td>125</td>
</tr>
<tr>
<td>240</td>
<td>180</td>
</tr>
<tr>
<td>250</td>
<td>200</td>
</tr>
</tbody>
</table>

**Specifications are subject to change without notice.**  
Customers should verify actual device performance in their specific applications.
SND Series – DIP Switch (Machine Insertable Type)

Features
- Double contacts offer high reliability
- Low contact resistance
- Self-clean on contact area
- Splay terminals allow for automatic insertion by IC insertion machine
- Straight terminals are available for manual insertion
- RoHS compliant

Electrical Characteristics
- Electrical Life: 2,000 operations min. per switch, 24 VDC, 25 mA
- Non-Switching Rating: 100 mA, 50 VDC
- Switching Rating: 25 mA, 24 VDC
- Contact Resistance: 500 VDC/minute
- Dielectric Strength: 500 VDC
- Insulation Resistance: 100 megohms min. at 500 ±15 VDC
- Switching Rating: 25 mA, 24 VDC
- Non-Switching Rating: 100 mA, 50 VDC
- Electrical Life: 2,000 operations per switch

Environmental Characteristics
- Mechanical Life: 2,000 operations per switch
- Operation Force: 1,000 g max.
- Stroke: 1.0 mm
- Operation Force: 1,000 g max.
- Switching Life: 2,000 operations per switch
- Non-Switching Life: 2,000 operations per switch
- Operating Temp. Range: -20 °C to +70 °C
- Storage Temperature: -40 °C to +85 °C
- Shock Test: Method 213B, Condition A
- Vibration Test: Method 201A
- Time: 2 hours each direction

Physical Characteristics
- Base and Cover Materials: UL 94V-0 high-temperature thermoplastic PPS
- Actuator Materials: UL 94V-0 nylon thermoplastic
- Contact Materials: Alloy copper
- Terminal Materials: Brass
- Actuator Materials: UL 94V-0 nylon
- Contact Materials: Alloy copper
- Terminal Materials: Brass
- Actuator Materials: UL 94V-0 nylon
- Contact Materials: Alloy copper
- Terminal Materials: Brass
- Actuator Materials: UL 94V-0 nylon
- Contact Materials: Alloy copper
- Terminal Materials: Brass
- Actuator Materials: UL 94V-0 nylon
- Contact Materials: Alloy copper
- Terminal Materials: Brass

How To Order

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Pos.</th>
<th>Dim. A</th>
<th>Dim. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SND-12</td>
<td>12</td>
<td>31.42</td>
<td>26.94</td>
</tr>
<tr>
<td>SND-10</td>
<td>10</td>
<td>26.34</td>
<td>22.86</td>
</tr>
<tr>
<td>SND-9</td>
<td>9</td>
<td>23.80</td>
<td>20.32</td>
</tr>
<tr>
<td>SND-8</td>
<td>8</td>
<td>21.26</td>
<td>17.78</td>
</tr>
<tr>
<td>SND-7</td>
<td>7</td>
<td>18.72</td>
<td>15.24</td>
</tr>
<tr>
<td>SND-6</td>
<td>6</td>
<td>16.18</td>
<td>12.70</td>
</tr>
<tr>
<td>SND-5</td>
<td>5</td>
<td>13.64</td>
<td>10.16</td>
</tr>
<tr>
<td>SND-4</td>
<td>4</td>
<td>11.10</td>
<td>7.62</td>
</tr>
<tr>
<td>SND-3</td>
<td>3</td>
<td>8.56</td>
<td>5.08</td>
</tr>
<tr>
<td>SND-2</td>
<td>2</td>
<td>6.02</td>
<td>2.54</td>
</tr>
<tr>
<td>SND-1</td>
<td>1</td>
<td>3.48</td>
<td>-</td>
</tr>
</tbody>
</table>

SND Series Dimensions

How To Order

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Pos.</th>
<th>Dim. A</th>
<th>Dim. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SND-12</td>
<td>12</td>
<td>31.42</td>
<td>26.94</td>
</tr>
<tr>
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<td>10</td>
<td>26.34</td>
<td>22.86</td>
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<td>SND-9</td>
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<td>7</td>
<td>18.72</td>
<td>15.24</td>
</tr>
<tr>
<td>SND-6</td>
<td>6</td>
<td>16.18</td>
<td>12.70</td>
</tr>
<tr>
<td>SND-5</td>
<td>5</td>
<td>13.64</td>
<td>10.16</td>
</tr>
<tr>
<td>SND-4</td>
<td>4</td>
<td>11.10</td>
<td>7.62</td>
</tr>
<tr>
<td>SND-3</td>
<td>3</td>
<td>8.56</td>
<td>5.08</td>
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<tr>
<td>SND-2</td>
<td>2</td>
<td>6.02</td>
<td>2.54</td>
</tr>
<tr>
<td>SND-1</td>
<td>1</td>
<td>3.48</td>
<td>-</td>
</tr>
</tbody>
</table>

SNDX Series Dimensions

How To Order

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Pos.</th>
<th>Dim. A</th>
<th>Dim. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>SND-12</td>
<td>12</td>
<td>31.42</td>
<td>26.94</td>
</tr>
<tr>
<td>SND-10</td>
<td>10</td>
<td>26.34</td>
<td>22.86</td>
</tr>
<tr>
<td>SND-9</td>
<td>9</td>
<td>23.80</td>
<td>20.32</td>
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<td>SND-8</td>
<td>8</td>
<td>21.26</td>
<td>17.78</td>
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<td>SND-7</td>
<td>7</td>
<td>18.72</td>
<td>15.24</td>
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<tr>
<td>SND-6</td>
<td>6</td>
<td>16.18</td>
<td>12.70</td>
</tr>
<tr>
<td>SND-5</td>
<td>5</td>
<td>13.64</td>
<td>10.16</td>
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<tr>
<td>SND-4</td>
<td>4</td>
<td>11.10</td>
<td>7.62</td>
</tr>
<tr>
<td>SND-3</td>
<td>3</td>
<td>8.56</td>
<td>5.08</td>
</tr>
<tr>
<td>SND-2</td>
<td>2</td>
<td>6.02</td>
<td>2.54</td>
</tr>
<tr>
<td>SND-1</td>
<td>1</td>
<td>3.48</td>
<td>-</td>
</tr>
</tbody>
</table>

RECOMMENDED PCB LAYOUT

Dimensions: MM/(INCHES)

Specifications are subject to change without notice.

2 Customers should verify actual device performance in their specific applications.
SND Series – Packaging Specifications

Product Dimensions

Reflow Soldering Profile

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
ST(H,M,J)W Series – Sealed Tact Switch

Features
- Through-hole and SMD styles available
- Available sharp click feel with a positive tactile feedback
- Ultra-miniature and lightweight structure suitable for high density mounting
- Designed for washing after soldering
- Insert molding in the contact with special treatment prevents flux buildup during soldering and permits autodipping
- RoHS compliant

Electrical Characteristics
- Electrical Life...............100,000 cycles min.
- Contact Resistance........100 mohms max.
- Insulation Resistance.....100 Mohms min.
- DC 500 V min.
- Insert molding in the contact with special treatment
  prevents flux buildup during soldering and permits autodipping
- RoHS compliant†

Environmental Characteristics
- Mechanical Life..............100,000 cycles min.
- Operation Force...............160 g, 260 g
- Stop Strength..................4 PLS.
- Stroke.........................0.25 mm (+0.2 mm, -0.1 mm)
- Operating Temperature Range
  -25 °C to +70 °C
- Storage Temperature Range
  -30 °C to +80 °C
- Vibration Test..................MIL-STD-202F, Method 201A
  Directions.....................X,Y,Z 3 mutually perpendicular directions
- Time..........................2 hours each direction, high reliability
- Shock Test.....................MIL-STD-202F, Method 213B, Condition A
  Gravity.........................50 g (peak value), 11 msec.
  Directions/Time..............6 sides and 3 times in each direction

Physical Characteristics
- Cover Materials...............Stainless steel
- Base Materials...............Thermoplastic LCP
- Actuator Materials.............Thermoplastic Nylon UL 94V-0 (680, 690)
- Color..........................Brown (Silver 680 type)
- Contact Disc. Materials........Phosphor bronze with gold cladding
- Terminal Materials............Brass with silver cladding

Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.

REV 09/04
ST(H,M,J)W Series – Packaging Specifications and Ordering Information

### Packaging Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 ± 0.10</td>
<td>4.00 ± 0.10</td>
</tr>
<tr>
<td>(.079 ± .003)</td>
<td>(.157 ± .003)</td>
</tr>
<tr>
<td>16.00 ± 0.30/-0.10</td>
<td>8.00 ± 0.10</td>
</tr>
<tr>
<td>(.630 ± .012/-0.003)</td>
<td>(.314 ± .003)</td>
</tr>
<tr>
<td>1.50 ± 0.25/-0.00</td>
<td></td>
</tr>
<tr>
<td>(.059 ± .010/-0.00)</td>
<td></td>
</tr>
<tr>
<td>1.50 ± 0.10/-0.00</td>
<td></td>
</tr>
<tr>
<td>(.059 ± .003/-0.00)</td>
<td></td>
</tr>
</tbody>
</table>

### How To Order

**STM W - 6 60 - N TR**

- **Model**
  - STM = SMD “G” Style
  - STH = Through-hole
  - STJ = SMD J-Hook
- **Product Type**
  - W = Washable
- **Size**
  - -6 = 6 mm
- **Height**
  - 60 = 3.1/(0.12) (N)
  - 67 = 5.2/(0.20) (N)
  - 80 = 2.30/(0.09) (S)
  - 90 = 3.7/(0.15) (N, R)
- **Actuating Force**
  - -S = 160 g (Silver)
  - -N = 160 g (Brown)
  - -R = 260 g (Red)
  - -V = 300 g (Clear)
- **Packaging Option**
  - (Type M, J only)
  - TR = Embossed tape
    - 690 = 1900 pcs.

### Reflow Soldering Profile

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Time (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>240</td>
<td>15-15 Sec.</td>
</tr>
<tr>
<td>225</td>
<td>35-60 Sec.</td>
</tr>
<tr>
<td>200</td>
<td>60-90 Sec.</td>
</tr>
<tr>
<td>180</td>
<td>90-90 Sec.</td>
</tr>
<tr>
<td>120</td>
<td>80-90 Sec.</td>
</tr>
<tr>
<td>75</td>
<td>30-40 Sec.</td>
</tr>
<tr>
<td>50</td>
<td>20-30 Sec.</td>
</tr>
</tbody>
</table>

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.
STJN-4 – SMD Super-Thin Tact Switch

Features
- Super-thin 4.5 mm square SMD
- Two different operating forces
- 0.55 mm height without knob
- Compatible with surface mount reflow soldering processes
- RoHS compliant†

Electrical Characteristics
Max. Power Rating...12 VDC max., 20 mA
Contact Resistance ...100 milliohms max.
Insulation Resistance ....50 megohms min., 100 VDC
Dielectric Strength...AC 100 V for 1 minute
Bounce
On............................................3 ms max.
Off..........................................10 ms max.
Circuit ........................................N.O. SPST

Mechanical Characteristics
Mechanical Life...........50,000 cycles min.
Actuation Force
- 160 gf ±50 gf (1.6 N ± 0.5 N)
- 240 gf ±60 gf (2.4 N ± 0.6 N)
Stroke .........................0.2 mm ±0.1 mm

General Characteristics
Switch Type ..............(N.O.) SPST
Operating Temperature Range ..............-20 °C to +70 °C
Storage Temperature Range ..........-40 °C to +85 °C

Product Dimensions

How To Order
STJ N  -  4 05  -  N TR
Model
Thin SMD Tact Switch
Product Code
N = Non-washable
Size
-4 = 4.5 mm
Height
05 = 0.55 mm (without knob)
Actuating Force
-N = 160 gf (1.6 N)
-P = 240 gf (2.4 N)
Packaging Option
TR = Embossed tape
10,000 pcs./reel

Reflow Soldering Profile

Specifications are subject to change without notice.

REV 09/04
STJN-5 – SMD Thin Tact Switch

Features
- Thin 5 mm square SMD
- Three different operating forces
- 0.8 mm height without knob (1.5 mm with knob)
- Compatible with surface mount reflow soldering processes
- RoHS compliant†

Electrical Characteristics
Max. Power Rating...12 VDC max., 50 mA
Contact Resistance ....100 milliohms max.
Insulation Resistance ..........100 megoohms min., 100 VDC
Dielectric Strength...AC 250 V for 1 minute
Bounce
On.................................3 ms max.
Off.................................10 ms max.
Circuit.............................N.O. SPST

Mechanical Characteristics
Mechanical Life
100 gf + 160 gf......500,000 cycles min.
260 gf.......................200,000 cycles min.
Actuation Force
100 gf ±50 gf (1.0 N ±0.5 N)
160 gf ±50 gf (1.6 N ±0.5 N)
260 gf ±60 gf (2.6 N ± 0.6 N)
Stroke.................0.25 mm +0.10/-0.20

General Characteristics
Switch Type .......................(N.O.) SPST
Operating Temperature Range
.............................-20 °C to +70 °C
Storage Temperature Range
.............................-40 °C to +85 °C

How To Order
STJ N  -  5  08  -  N TR
Model
Thin SMD Tact Switch
Product Code
N = Non-washable
Size
-5 = 5 mm
Height
08 = 0.8 mm (without knob)
15 = 1.5 mm (with knob)
Actuating Force
-K = 100 gf (1.0 N)
-N = 160 gf (1.6 N)
-R = 260 gf (2.6 N)
Packaging Option
TR = Embossed tape
5,000 pcs./reel

Reflow Soldering Profile

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.  REV 09/04
STSM – Ultraminiature Tactile Switch

Features
- Available sharp click feel with a positive tactile feedback
- Ultraminiature and lightweight structure suitable for high density mounting
- Economical
- Reliable
- RoHS compliant†

Electrical Characteristics

<table>
<thead>
<tr>
<th>Electrical Life</th>
<th>50,000 Cycles for 160 gf, 320 gf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>50 mA, 12 VDC</td>
</tr>
<tr>
<td>Contact Resistance</td>
<td>100 mΩ max.</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>100 MΩ min.</td>
</tr>
<tr>
<td>Dielectric Strength</td>
<td>250 VAC/1 minute</td>
</tr>
</tbody>
</table>

Environmental Characteristics

Operation Temperature Range
-25 °C to +70 °C
Storage Temperature Range
-30 °C to +80 °C

Vibration Test
MIL-STD-202F Method 201A
Frequency: 10-55-10 Hz/1 minute
Directions: X, Y, Z, three mutually perpendicular directions
Time: 2 hours each direction
Shocked Test
MIL-STD-202F Method 213B
Condition A
Gravity: 50 G (peak value), 11 msec
Direction and Times: 6 sides and 3 times in each direction

Physical Characteristics

Cover Materials: Stainless Steel
Base Materials: UL 94V-0 Nylon or PPA High-Temperature Thermoplastic
Actuator: UL 94V-0 Nylon High-Temperature Thermoplastic
Contact Disc: Stainless steel with silver cladding
Terminals: Brass with silver cladding

Product Dimensions

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>6.0</td>
</tr>
<tr>
<td>Length</td>
<td>3.5</td>
</tr>
<tr>
<td>Height</td>
<td>3.0</td>
</tr>
<tr>
<td>MAX.</td>
<td>3.5</td>
</tr>
</tbody>
</table>

How To Order

Model: STS M - 3 1 - S TR
Style: M = Surface mount
Product Size: -3 = 3.5 mm wide x 6 mm long
Height: 1 = 4.3 mm, 2 = 5.0 mm
Color: N = Brown, 160 g, S = Salmon, 320 g
Packaging Option: _ = Standard Packaging, TR = Tape & Reel Packaging

Circuit Diagram

REFLOW SOLDERING PROFILE

Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 09/04
How to Use This Section
This Applications/Processing Guide is intended to provide you with points to consider for designing circuits, selecting trimmers and arranging board layouts, to achieve maximum performance and long life for your circuits and systems. We have also included information on steps your manufacturing engineers can take to preserve circuit reliability.

For example, are you aware that the trimmers and other mechanical components on your boards may face a more extreme environment during boardwashing on your own production line, than they ever will in use? For those trimmers that may need to be reset, are you remembering to select and mount the trimmers to provide easy accessibility?

In this section, you’ll find dozens of pointers, reminders and useful facts that will help you be more knowledgeable and successful in using trimmers.

Trimmer Basics
In its most common form, a trimmer is simply a device containing a resistive element, and a wiper, or adjustable tap, contacting the element. The wiper can be mechanically moved to vary the amount of voltage or resistance in the circuit. The resistive element is usually laid out in linear or a circular configuration.

The Resistive Element
Trimmers for commercial applications typically have a resistive element made of carbon or cermet (a combination of CERamic and METal), or of resistance wire wound on an insulated copper mandrel.

The main advantages of wirewound trimmers are their low temperature coefficient, higher power dissipation, lower noise, tighter resistance tolerance, and, when used as a variable resistor, the excellent current-carrying capacity through the wiper due to the lower contact resistance. Also, their long-term resistance stability with time and temperature is slightly better than cermet.

Cermet trimmers provide a wider resistance range (10 ohms to 5 megohms, versus a maximum of 50K ohms for wirewound). Also, the wiper output can be set closer to the desired value since the resistive element presents a continuous contact surface for the wiper, as opposed to the discrete turns (resolution) of the wirewound. Other advantages with cermet are the lower reactance in high-frequency applications, the smaller sizes available, and the generally lower price than wirewound types.
Trimming Potentiometers and Definitions

The following terms and definitions have been edited from the Industrial Standard published by the Variable Electronics Components Institute. It is intended to encourage standardization in communication and understanding between the manufacturer and user. The complete standard, including detailed test procedures, is available upon request.

**General Terms**

**TRIMMING POTENTIOMETER:** An electrical mechanical device with three terminals. Two terminals are connected to the ends of a resistive element and one terminal is connected to a movable conductive contact which slides over the element, thus allowing the input voltage to be divided as a function of the mechanical input. It can function as either a voltage divider or rheostat.

**WIREWOUND TRIMMING POTENTIOMETER:** A trimming potentiometer characterized by a resistance element made up of turns of wire on which the wiper contacts only a small portion of each turn.

**NON-WIREWOUND TRIMMING POTENTIOMETER:** A trimming potentiometer characterized by the continuous nature of the surface area of the resistance element to be contacted. Contact is maintained over a continuous, unbroken path. The resistance is achieved by using material compositions other than wire such as carbon, conductive plastics, metal film and cermet.

**RESISTANCE ELEMENT:** A continuous, unbroken length of resistive material without joints, bonds or welds except at the junction of the element and the electrical terminals connected to each end of the element, or at an intermediate point such as a center tap.

**ADJUSTMENT SHAFT:** The mechanical input member of a trimming potentiometer which when actuated causes the wiper to traverse the resistance element resulting in a change in output voltage or resistance.

**SINGLE-TURN ADJUSTMENT:** Requires 360 ° or less mechanical input to cause the wiper to traverse the total resistance element.

**MULTITURN ADJUSTMENT:** Requires more than 360 ° mechanical adjustment to cause the wiper to traverse the total resistance element.

**TERMINAL:** An external member that provides electrical access to the resistance element and wiper.

**LEADWIRE TYPE TERMINAL:** Flexible insulated conductor.

**PRINTED CIRCUIT TERMINAL:** Rigid uninsulated electrical conductor, suitable for printed circuit board plug-in.

**SOLDER LUG TERMINAL:** Rigid uninsulated electrical conductor, suitable for external lead attachment.

**WIPER:** The wiper is the member in contact with the resistive element that allows the output to be varied when the adjustment shaft is rotated.

**STOP-CLUTCH:** A device which allows the wiper to idle at the ends of the resistive element without damage as the adjustment shaft continues to be actuated in the same direction.

**STOP – SOLID:** A positive limit to mechanical and/or electrical adjustment.

**STACKING:** The mounting of one trimming potentiometer adjacent to or on top of another utilizing the same mounting hardware.

**THEORETICAL RESOLUTION:** (Wirewound only) The theoretical measurement of sensitivity to which the output ratio may be adjusted; the reciprocal of the number of turns of wire in resistance winding expressed as a percentage.

\[ \frac{1}{N} \times 100 = \text{Theoretical resolution percent} \]

**Input and Output Terms**

**TOTAL APPLIED VOLTAGE:** The total voltage applied between the designated input terminals.

**OUTPUT VOLTAGE:** The voltage between the wiper terminal and the designated reference point. Unless otherwise specified, the designated reference point is the CCW terminal.

**OUTPUT RATIO:** The ratio of the output voltage to the designated input reference voltage. Unless otherwise specified, the reference voltage is the total applied voltage.

**LOAD RESISTANCE:** An external resistance as seen by the Output Voltage (connected between the wiper terminal and the designated reference point.)

**Adjustment Terms**

**DIRECTION OF TRAVEL:** Clockwise (CW) or counterclockwise (CCW) rotation when viewing the adjustment end of the potentiometer.

**MECHANICAL TRAVEL — SOLID STOPS:** The total travel of...
the adjustment shaft between integral stops. Continuity must be maintained throughout the travel.

MECHANICAL TRAVEL — CLUTCHING ACTION: The total travel of the adjustment shaft between the points where clutch actuation begins. Continuity must be maintained throughout the travel and during clutch actuation.

MECHANICAL TRAVEL — CONTINUOUS ROTATION: The total travel of the adjustment shaft when the wiper movement is unrestricted at either end of the resistive element as the adjustment shaft continues to be actuated.

ADJUSTMENT TRAVEL (ELECTRICAL): The total travel of the adjustment shaft between minimum and maximum output voltages.

CONTINUITY TRAVEL: The total travel of the shaft over which electrical continuity is maintained between the wiper and the resistance element.

Electrical and Operational Characteristics

TOTAL RESISTANCE: The DC resistance between the input terminals with the wiper positioned to either end stop, or in dead band for continuous rotation potentiometers.

TEST VOLTAGE

<table>
<thead>
<tr>
<th>Total Resistance, Nominal (ohms)</th>
<th>Maximum Test Voltage (Volts DC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-Wirewound</td>
</tr>
<tr>
<td>0.1 to 1.0</td>
<td>0.1</td>
</tr>
<tr>
<td>1.0 to 50</td>
<td>0.3</td>
</tr>
<tr>
<td>50 to 100</td>
<td>2.0</td>
</tr>
<tr>
<td>100 to 1000</td>
<td>3.0</td>
</tr>
<tr>
<td>1K to 100K</td>
<td>10</td>
</tr>
<tr>
<td>Over 0.1 megohm</td>
<td>50</td>
</tr>
</tbody>
</table>

NOTE: The test voltages should never exceed the equivalent of 10% rated power. The minimum voltage to be used is 10 MV.

ABSOLUTE MINIMUM RESISTANCE: The resistance measured between the wiper terminal and each end terminal with the wiper positioned to give a minimum value.

END RESISTANCE: The resistance measured between the wiper terminal and an end terminal when the wiper is positioned at the corresponding end of mechanical travel. Absolute minimum resistance and end resistance are synonymous for continuous rotation trimmers.

TEMPERATURE COEFFICIENT OF RESISTANCE: The unit change in resistance per degree Celsius change from a reference temperature, expressed in parts per million per degree Celsius as follows:

\[
TC = \frac{R^2 - R^1}{R^1 (T^2 - T^1)} \times 10^6
\]

Where:

- \( R^1 \) = Resistance at reference temperature in ohms.
- \( R^2 \) = Resistance at test temperature in ohms.
- \( T^1 \) = Reference temperature in degrees Celsius.
- \( T^2 \) = Test temperature in degrees Celsius.

RESISTANCE-TEMPERATURE CHARACTERISTIC: The difference between the total resistance values measured at a reference temperature of 25 °C and the specified test temperature expressed as a percent of the Total Resistance.

\[
RTC = \frac{R^2 - R^1}{R^1} \times 100
\]

Where:

- \( R^1 \) = Resistance at reference temperature (25 °C) in ohms.
- \( R^2 \) = Resistance at the test temperature in ohms.

CONTACT RESISTANCE VARIATION: The apparent resistance seen between the wiper and the resistance element when the wiper is energized with a specified current and moved over the adjustment travel in either direction at a constant speed. The output variations are measured over a specified frequency bandwidth, exclusive of the effects due to roll-on or roll-off of the terminations and is expressed in ohms or % of total resistance.

NOTE: At the calibration of the decade, terminals 1 and 2 must be coincident. Calibration decade is to be set for the contact-resistance variation (CRV) level of the specified nominal resistance being tested.
<table>
<thead>
<tr>
<th>Test Current (±20 %)</th>
<th>Total Resistance Range</th>
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<tbody>
<tr>
<td>30 ma</td>
<td>2 = Rt = 200</td>
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<tr>
<td>5 ma</td>
<td>200 &lt; Rt = 3K</td>
</tr>
<tr>
<td>1 ma</td>
<td>3K &lt; Rt = 200K</td>
</tr>
<tr>
<td>200 ua</td>
<td>200K &lt; Rt = 1 megohm</td>
</tr>
<tr>
<td>50 ua</td>
<td>1 megohm &lt; Rt = 5 megohm</td>
</tr>
</tbody>
</table>

**EQUIVALENT NOISE RESISTANCE**: Wirewound only. Any spurious variation in the electrical output not present in the input, defined quantitatively in terms of an equivalent parasitic, transient resistance in ohms, appearing between the contact and the resistive element when the shaft is rotated. The equivalent Noise Resistance is defined independently of the resolution, functional characteristics and the total travel. The magnitude of the Equivalent Noise Resistance is the maximum departure from a specific reference line. The wiper of the potentiometer is required to be excited by a specific current and moved at a specific speed.

**CONTINUITY**: Continuity is the maintenance of continuous electrical contact between the wiper and both end terminals of the resistive element.

**SETTING STABILITY**: The amount of change in the output voltage, without readjustment, expressed as a percentage of the total applied voltage.

**DIELECTRIC STRENGTH**: The ability to withstand the application of a specified potential of a given characteristic, between the terminals and all other external conducting members such as shaft, housing and mounting hardware without exceeding a specified leakage current value.

**INSULATION RESISTANCE**: The resistance to a specified DC voltage impressed between the terminals and all other external conducting members such as shaft, housing and mounting hardware.

**POWER RATING**: The maximum power that a trimming potentiometer can dissipate across the total resistive element under specified conditions while meeting specified performance requirements.

**ROTATIONAL LIFE**: The number of cycles obtainable under specified operating conditions while remaining within specified allowable degradations. A cycle is defined as one complete traversal of the wiper over the resistive element in both directions.

**LOAD LIFE**: The number of hours at which a device may dissipate rated power under specified operating conditions while remaining within specified allowable degradations.

**ADJUSTABILITY (OUTPUT RESISTANCE)**: The precision with which the output resistance of a device can be set to the desired value.

**ADJUSTABILITY (OUTPUT VOLTAGE RATIO)**: The precision with which the output voltage ratio of a device can be set to the desired value.

**Mechanical Terms**

**STARTING TORQUE**: The maximum moment in the clockwise and counterclockwise directions required to initiate shaft adjustment anywhere in the mechanical travel.

**STOP TORQUE**: The maximum static moment that can be applied to adjustment shaft at each mechanical stop for a specified period of time without loss of continuity or mechanical damage affecting operational characteristics.

**SOLDERABILITY**: The ability of the terminals to accept a uniform coating of solder under specified conditions.

**WELDABILITY**: The ability of materials to be welded together under specified conditions.

**TERMINAL STRENGTH**: The ability of the terminals to withstand specified mechanical stresses without sustaining damage that would affect utility of the terminals or operation of the trimming potentiometer.

**IMMERSION SEALED**: The ability of the unit to withstand submersion in acceptable cleaning solutions used in normal soldering processes without performance degradation under specified environmental conditions.

**Trimmer “Abilities”**

When you are selecting components for a new design, you typically take into account the environmental conditions that the components will need to endure during the lifetime of the instrument or device. Designers in the past have often overlooked the environmental extremes of their own production lines, where the conditions may be much more severe than anything encountered in actual end use.
Processability
“Processability” refers to the ability of the unit to withstand the production-line processes associated with the finishing steps on the PC boards. Typically, both SMT and through-hole products are subjected to similar PC board processing operations after preparation for assembly. These operations can generally be summarized as follows:

- **FLUX**
- **PRE-HEAT**
- **SOLDER**
- **WASH**
- **RINSE**
- **DRY**

Soldering (SMT)
Four types of equipment are usually associated with SMT soldering:

- **IR System** — Uses a multi-zone infrared furnace with IR elements heated to a temperature substantially above chamber or product temperature. Energy is supplied to the product primarily by IR radiation to reflow solder.

- **Forced Hot Air Convection System** — Uses a multizone forced air convection system with heat source panels using IR or other type heating elements. Approximately 85% of the heating is provided by free convection to reflow solder on exposed PC boards.

- **Dual Wave System** — Utilizes two parallel solder waves. The first is a turbulent wave followed by a laminar wave. The turbulent wave is for small, constricted areas, while the laminar wave removes solder projections.

- **Vapor Phase System** — Provides a single-zone condensation heat source achieved with liquid fluorinated hydrocarbons that have been brought to the boiling point to create a saturated vapor zone. Heat is then released by the fluid’s heat of vaporization as the vapor condenses on the product.

Soldering (Through-hole)
Two types of equipment are usually associated with through-hole soldering:

- **Single Wave System** — Provides an inclined portion of the solder wave for the PC board to pass over. The PC board is positioned to bring many potential solder joints in contact with the wave simultaneously for a short time for soldering.

- **Drag System** — Provides for PC boards to be dragged across the surface of the solder pot. Soldered connections are made during this operation.

PC Board Washing
Two types of equipment are usually associated with both SMT and through-hole products.

- **Pressure System** — Accomplishes cleaning by directing sprays of water under high pressure from multiple nozzles.

- **Flooding System** — Utilizes a combination of flooding (at normal water pressure) and surfactant action for cleaning.

Soldering and Wash Processes
Figure 1 shows typical profiles any component may see during a soldering and board washing operation. For details of material and process variables recommendations, see "Soldering and Cleaning Processes", page 152.
General Guidelines for Guarding Against Component Damage

To minimize temperature shock
• Pre-heat boards to maximum acceptable level
• Reduce time in solder

To avoid heating components above their maximum rated temperature
• Use lowest acceptable solder temperature
• Use maximum allowable conveyor speed
• Limit pre-heat temperature to maximum necessary

To limit time of exposure above rated temperature
• Limit time in solder
• After solder operation, cool board to wash temperature before it enters wash

To minimize temperature difference between top and bottom of board
• Apply pre-heat to both top and bottom

To reduce temperature shock on entering the moist environment of the wash
• Use wash/rinse temperature as near component temperature as possible
• Extend time between solder process and wash
• Cool board after solder operation, prior to entering wash

To minimize temperature variations as component travels through moisture
• Minimize number of wash/rinse and rinse/dry cycles
• Use heated air for air knives (to counter evaporative cooling effect)
• Minimize difference between wash and rinse temperature

To minimize exposure to high-pressure water during board wash
• Select trimmer models with pin styles that orient the rotor seal area away from exposure to the high-pressure water stream

**Settability**
Settability refers to the ease with which a trimmer can be set accurately to the position that produces the desired circuit condition.

Where the requirement is for obtaining a highly accurate setting the preference is for cermet — because a small incremental adjustment in a wirewound unit does not always produce the expected change in output as the wiper moves off one turn of wire and onto another.

Setting accuracy is better with a multiturn unit than with a single-turn. This is especially true when the speed of setting is also a requirement as on a production line (Figure 2).

**Stability**
Stability refers to the ability of the trimmer to remain at the desired setting. Environmental factors play an important role here: stability may be affected by temperature exposure, thermal shock/cycling, humidity, and mechanical shock or vibration.

This is not a matter of concern in most applications, since Bourns’ trimmers exhibit excellent stability under all specified conditions. Stability is most often a concern when cermet trimmers are used in low current “dry” circuits (50 uA and below). Under these conditions the contact resistance may vary, making the wiper appear unstable. This is most noticeable in some rheostat applications. This can be avoided by using a wirewound unit, or choosing a cermet trimmer that has been designed for dry-circuit applications. Bourns applications engineers can assist you on this and other questions.

**Accessability**
When selecting a trimmer and determining its placement on the board, keep in mind the people who will have to use it. Bourns’ trimmers are available in a wide variety of sizes, shapes, configurations, and placement of adjustment screws. You will usually find a unit on which the access for adjustment will be convenient for the user.

Keep in mind the different requirements for accessibility depending on whether adjustment will be done on the assembly line or in the field; with the board uncovered, in a housing or cabinet, or on an extender. Also consider whether production-line adjustment will be done manually or by robotics. A Bourns applications engineer can advise you on special high-speed automatic adjustment features.
Usability
In selecting a trimmer for a specific application, it’s important to be aware that the catalog contains a myriad of facts about each model that can assist you in finding the most suitable choice. For example:

**Contact Resistance Variation (CRV)** — Under MIL-R 22097 and MIL-R-39035, the maximum CRV is 3 %. All Bourns® trimmers meet this standard (3 % or 3 ohms, whichever is greater). For applications that demand a more rigorous standard, some Bourns® trimmers are rated at 2 % or 2 ohms, and many others at 1 % or 1 ohm.

**Power Rating** — The ambient temperature at which the trimmer will operate has an important bearing on power rating. Power ratings are usually specified at 70 ° or 85 °C; at a temperature of 150 °C, the power rating of many trimmers is reduced to zero.

**Temperature Coefficient of Resistance (T.C.)** — This specification is a measure of how much the resistance changes with a change in temperature. In many applications a T.C. of ±250 PPM/°C is acceptable. Typical T.C. specifications for cermet models are ±100 PPM/°C and ±50 PPM/°C for wirewound models.
# Lead Free Solder Reflow Profile – SMD Trimmers

<table>
<thead>
<tr>
<th>Process Description</th>
<th>Materials</th>
<th>Temperature</th>
<th>Time Interval</th>
</tr>
</thead>
</table>
| 1. Apply solder paste to test board (8 - 10 mil thick) | • Sn Ag Cu Alloy water soluble or no clean solder paste1  
• Single sided epoxy glass (G10) (UL approved)  
• PC board approx. 4x4x.06 in. | Room temperature               |                                |
| 2. Place test units onto board        | 6 units/board                                                             | (see note 2)                     |                                |
| 3. Ramp up                            | Convection oven                                                           | 2.5 °C ±0.5 °/second             |                                |
| 4. Preheat                            | Convection oven                                                           | 150 °C to 190 °C                 | 90 ±30 seconds                 |
| 5. Time above liquidus                 | 220 °C                                                                   | 60-90 seconds                    |                                |
| 6. Peak temperature                   |                                                                           | 260 °C +0/-5 °C                  | 10-20 sec. within 5 °C of peak |
| 7. Ramp down                          | Room temperature²                                                          | 3 °C ±0.5 °C/second              |                                |
| 8. Cleaning water clean profile²      | High pressure deionized water 65 PSI maximum                              | 72 °F to 160 °F (22 °C to 71 °C) | As required                    |

Inspect solder joint to determine if solder joint is acceptable (i.e. exhibits wetting of joint’s surface). Use the following criteria (ref. acceptability of printed board assemblies, IPC-610A):

A) Acceptable (see Figure 1)
1. Feathered edges
2. Concave fillet
3. Fillet appears smooth

B) Unacceptable (see Figure 2)
1. Convex fillet
2. Solder balls (5 balls or more per square inch)

If unacceptable, determine cause and correct prior to next run.

NOTES:
1. Water soluble solder paste only above 100K.
2. Refer to ref. temperature profile. Temperature at lead/pad junction with “K” type thermocouple.
3. Units that are board mounted for environmental testing must see a peak temperature in the reflow zone, as specified. This is to ensure that all test units will see “worst case conditions”.
4. Ramp down rate to be measured from 255 °C to 150 °C.
5. Process Description 8 does not apply to open frame trimmers.

---

![Figure 1](image1.png)

**Figure 1**

FEATHERED EDGES
CONCAVE

![Figure 2](image2.png)

**Figure 2**

NO FEATHERED EDGES
CONVEX

---

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

REV 04/04
Standard Soldering and Cleaning Processes

This application note is designed to provide step-by-step processing recommendations. It covers the popular Surface Mount Component (SMC) soldering processes currently in use and provides recommendations and cautions for each step. Since many variations of temperature, time, processes, cleaning agents and board types are found in the electronics industry, you’ll want to test and verify your own system.

The process steps, recommendations and cautions are based on Bourns’ Trimpot® surveys of SMC users, equipment manufacturers and materials suppliers. Also, comments reflect results of Bourns testing. Our findings suggest the following soldering and cleaning processes:

1. **SOLDERING** – Forced Hot Air, Convection, IR, Vapor Phase (In-Line), Wave (Single and Dual)
2. **CLEANING** – Solvent, Aqueous, Semi-Aqueous, No-Clean

On the facing page are the common methods, materials and maximum temperature/time parameters for soldering and cleaning processes.

---

1. **Solder Paste Printing**
   - **Flow**
   - **Reflow**

   **GENERAL**
   Use the optimum solder paste for the pattern, printing process, solder paste density and solder joint quality.

   **RECOMMENDED**
   Use Sn 63% Pb 37% solder paste. Use 8 to 10 mil thickness for solder paste print.

   **CAUTION**
   Since solder paste usually contains a high percentage of activators, you must ensure adequate cleaning to remove all residues, unless no-clean (low solids) paste is used.

2. **Adhesive Application**
   - **Flow**
   - **Wave**

   **GENERAL**
   The adhesive must hold the SMC in correct orientation upon placement and maintain correct trimmer position during physical handling before final solder processing.

   **RECOMMENDED**
   To assure positional stability, place a single dot of epoxy under the SMC.

   **CAUTION**
   Stability after placement is a direct function of the volume of adhesive used. Use enough epoxy to assure stability through the cure process.

   - Avoid overflow of epoxy to solder pad and terminal areas.

3. **SMC Placement**

   **GENERAL**
   Use pick-and-place equipment with vacuum nozzle ID size that allows adequate suction to pick the SMC out of the embossed cavity.

   **RECOMMENDED**
   The nozzle inside diameter (ID) should not exceed .100 in. (2.54 mm) to ensure adequate suction and part alignment.

   **CAUTION**
   Align terminals with solder belt direction of travel to avoid body shadowing effects during flow soldering.

4. **Adhesive Cure**
   - **Flow**
   - **Wave**

   **GENERAL**
   Use heat/time cure method with either convection oven or infrared radiation.

   **RECOMMENDED**
   Cure using the temperature and times recommended by the adhesive manufacturer.

   **CAUTION**
   Use enough cure time to assure complete adhesive transition from fluid to solid.

5. **Flux Application**
   - **Flow**
   - **Wave**

   **GENERAL**
   Use the correct flux to remove surface oxides, prevent reoxidation and promote wetting.

   **RECOMMENDED**
   - RMA
   - No-clean SRB (Synthetic Resin Based)
   - OA (Organic Acid) (See caution)

   **CAUTION**
   Avoid highly activated fluxes. Consult factory before using OA.
Standard Soldering and Cleaning Processes

6 Solder
Reflow: Hot Air, IR and Vapor Phase

GENERAL
Preheat sufficiently using both time and temperature to vaporize all solder paste solvents and moisture, leaving only solder and flux as component enters solder reflow phase.

RECOMMENDED
Solder zone profile of 230 °C for 20 seconds.

CAUTION
Do not exceed time and temperature reflow profile of 235 °C for 45 ±5 seconds for hot air/IR reflow and 215 °C for 3 minutes for vapor phase reflow. Use 215 °C as minimum reflow temperature.

Minimize thermal shock by limiting temperature rise rate to 3 °C/sec and by stabilizing board and components temperature during preheating.

7 Solder
Flow (Wave)

GENERAL
For maximum component reliability and performance, minimize the time of temperature exposure above 200 °C.

RECOMMENDED
Use SN 63 % Pb 37 % solder. Solder zone profile of 245 °C for 5 seconds.

CAUTION
Do not exceed 280 °C peak temperature for dual wave solder process with a flow zone totaling 5 seconds.

Minimize thermal shock by limiting temperature rise rate to 3 °C/sec and by stabilizing board and components temperature during preheating.

8 Wash
Solvent

GENERAL
Use solvent cleaning primarily for nonpolar contaminants such as rosin based flux residues.

RECOMMENDED
Use any suitable washing solvents that meet ODC requirements.

CAUTION
Limit excessive direct spray pressure to 60 psi or below for optimum reliability.

9 Wash
Semi-Aqueous

GENERAL
Use semi-aqueous for nonpolar contaminants such as rosin based flux residues.

RECOMMENDED
Use terpene or hydrocarbon based for prewash. Use water for final wash.

CAUTION
Limit excessive direct spray pressure to 60 psi or below for optimum reliability.

10 Wash
Aqueous

GENERAL
Use aqueous cleaning primarily for polar contaminants such as organic flux residues.

RECOMMENDED
Use any of these aqueous wash materials:
- Deionized water
- Surfactants
- Saponifiers

CAUTION
Limit excessive direct spray pressure to 60 psi or below for optimum reliability. Ultrasonics may cause component damage or failure.

11 No-Wash

GENERAL
No-wash is an option when no-clean (low solids) flux is used for solder operations.

GENERAL
Excessive and/or repeated high temperature heat exposure may affect component performance and reliability.

RECOMMENDED
Hot air reflow technique is preferred.

CAUTION
Avoid use of a soldering iron or wave soldering as a rework technique.

Board Rework Technique
## Standard Soldering/Cleaning Methods

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Reflow</th>
<th>Hot Air Infrared (Solvent)</th>
<th>Hot Air Infrared (Semi-Aq.)</th>
<th>Hot Air Infrared (Aqueous)</th>
<th>Hot Air Infrared (No Clean)</th>
<th>Vapor Phase (Solvent)</th>
<th>Vapor Phase (Semi-Aq.)</th>
<th>Vapor Phase (Aqueous)</th>
<th>Vapor Phase (No Clean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solder Paste Printing</td>
<td>°</td>
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<td>2. Adhesive Application</td>
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<td>3. Component Placement</td>
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<td>4. Adhesive Cure</td>
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<td>5. Flux Application</td>
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<td>6. Solder (Reflow)</td>
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<td>8. Wash (Solvent)</td>
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<td>8. Wash (Semi-Aqueous)</td>
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<td>8. Wash (Aqueous)</td>
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<tr>
<td>High Pressure Fluids</td>
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</table>
## Standard Soldering/Cleaning Methods

<table>
<thead>
<tr>
<th>Flow</th>
<th>Material</th>
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<tbody>
<tr>
<td>Wave (Solvent)</td>
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<tr>
<td>Wave (Semi-Aqueous)</td>
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<th>260/5</th>
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<td></td>
<td>215</td>
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<td>215</td>
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</table>
Factory Installed Panel Mount

Trimpot® Potentiometer Panel Mounting Options and Hardware

Many Trimpot® Potentiometers are available for panel mount application.

This product option provides for maximum design flexibility.

To order Trimpot® Potentiometers with panel mount hardware attached by the factory, simply add an “M” or “Z” suffix to the Bourns® part number per Table I.

Example:
3006P-1-100Z

To order military Trimpot® Potentiometers with panel mount hardware attached by the factory, order the military part number and add “with panel mount attached.”

Example:
RT12C2103M, with panel mount attached.

To order panel mounting accessories for customer installation, simply use the part number per Table II.

Example:
H83P

NOTE: For complete product specifications, see catalog page for the trimmer model.

Torque – Apply maximum 8 in. lbs. on mounting nut when mounted on panel.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

REV 05/04
Factory Installed Panel Mount

**Models 3292**
X, L and W Styles

**Models RT22/RTR22/RJ22 3250/3252**

**Models RT24/RTR24/3290**
H and W Styles – 3290
X & W Styles – RT24/RTR24

Notes:
1. Provided with lockwasher and mounting nut.
Customer Installed Panel Mount – Unsealed

See Table II for panel mount part number

<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1-1/4 Inch Rectangular Multiturn Modules</td>
<td>1/2 Inch Square Multiturn Models</td>
<td>Adapter for Models 3005 AND 3006</td>
</tr>
</tbody>
</table>

The H-83P Adapter is used with Models 3005 and 3006. Order separately and simply snap fit the trimmer in the plastic case. The H-83P with lock-washer and mounting nut is available in 50-piece lots.

Notes:
1. Provided with lockwasher and mounting nut.
2. Recommend panel holes. #10 drill .194/.008

*Specify H82 if panel Seal is required.

Notes:
1. Provided with lockwasher and mounting nut.
2. Drawings shown with Trimmer. Order part separately.

Notes:
1. Drawings shown with Trimmer. Order part separately.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

REV 05/04
Customer Installed Panel Mount

3/8 Inch Square Multiturn Models

H-114P/115P/116P Panel Mount

Table I – Factory Installed Panel Mounts

<table>
<thead>
<tr>
<th>Standard Part Number</th>
<th>Part Number with Panel Mount</th>
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<tr>
<td>3005P-1-(RC)</td>
<td>3005P-1-(RC) Z</td>
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<td>3006P,Y, or W-1-(RC)</td>
<td>3006P,Y, or W-1-(RC) Z</td>
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<tr>
<td>3009P or Y-1-(RC)</td>
<td>3009P or Y-1-(RC) Z</td>
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<tr>
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<td>3057L,J,P or Y-1-(RC) M</td>
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<td>3059L,J,P or Y-1-(RC)</td>
<td>3059L,J,P or Y-1-(RC) M</td>
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<td>3250L or W-1-(RC)</td>
<td>3250L or W-1-(RC) M</td>
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<td>3252L or W-1-(RC)</td>
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<tr>
<td>3290H or W-1-(RC)</td>
<td>3290H or W-1-(RC) M</td>
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<tr>
<td>3292L,W or X-1-(RC)</td>
<td>3292L,W or X-1-(RC) M</td>
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<tr>
<td>3296W or X-1-(RC)</td>
<td>3296W or X-1-(RC) M</td>
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Table II – Retro-Fit Panel Mounts

For installation by customer

<table>
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<tr>
<th>Standard Part Number</th>
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<td>3005P-1-(RC)</td>
<td>H-83P</td>
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<tr>
<td>3006P,Y, or W-1-(RC)</td>
<td>H-83P</td>
</tr>
<tr>
<td>3057L,J,P or Y-1-(RC)</td>
<td>H-65P Screw Assembly</td>
</tr>
<tr>
<td>3059L,J,P or Y-1-(RC)</td>
<td>H-65P Screw Assembly</td>
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<tr>
<td>3250L, W, X-(RC)</td>
<td>H-65P-1*</td>
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<tr>
<td>3252L, W-1-(RC)</td>
<td>H-65P-3*</td>
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<td>3252X-1-(RC)</td>
<td>H-65P-5*</td>
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<tr>
<td>3290H or W-1-(RC)</td>
<td>H-114P*</td>
</tr>
<tr>
<td>3292L-1-(RC)</td>
<td>H-115P*</td>
</tr>
<tr>
<td>3292W or X-1-(RC)</td>
<td>H-116P*</td>
</tr>
<tr>
<td>RT12P,YL</td>
<td>H-58P Screw Assembly</td>
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<tr>
<td>RJ12LY</td>
<td>H-58P Screw Assembly</td>
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<tr>
<td>RT22L,W,X / RTR22L,W,X</td>
<td>H-65P-1*</td>
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<tr>
<td>RJ22L,W</td>
<td>H-65P-3*</td>
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<td>RJ22X</td>
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<tr>
<td>RJR24W or X</td>
<td>H-117P*</td>
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*Specify H-82 if panel seal is required.

Notes:
1. Provided with lockwasher and mounting nut.
2. Drawings shown with Trimmer. Order part separately.
**H-82 Panel Seal**
For all panel mounts with size 10-32 bushings.

**H-25/H-28 Stacking Straps**
Models 3250, 3252 (H-25) and 3292 (H-28).

**H-26S Side Bracket**
Models 3250 and 3252. This hardware is available for special mounting applications.

To be used with the following to provide panel seal:
- H-58P
- H-65P-1
- H-65P-3
- H-65P-5
- H-114P
- H-115P
- H-116P
- H-117P

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<td>Thickness</td>
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Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

REV 05/04
H-90/H-91/H-92-1

Adjustment Tools

Features
- Meets UL 94V-0
- Pocket clip
- For use on most trimmer shafts/rotors
- Recessed end for use with extended shafts
- H-90 & H-91 available in blue; H-92-1 available in off-white

**H-90**

- Stainless Steel Blade
- Recessed
- .254 (.010)

**H-91**

- Stainless Steel Blade
- Recessed
- .254 (.010)

*H-91 RECOMMENDED FOR USE WITH TRIMMER MODELS 3224 AND 3214.

**H-92-1**

- Stainless Steel Blade
- Recessed
- .381 (.015)

*H-92-1 RECOMMENDED FOR USE WITH TRIMMER MODELS 3342, 3223 AND 3213.
Design Kits: Trimming Potentiometers

Trimming potentiometers perform a variety of circuit adjustments in all types of electronic equipment. The variety of physical configurations available and the ability to withstand today’s manufacturing environment offers the designer flexibility in selecting the best trimmer for the application. Around the world, trimmers are used in virtually every electronic market.

Part Numbers
Each kit contains samples of each of the part numbers. Part numbers could change based on latest offering. Refer to website – additional kits may be available.

<table>
<thead>
<tr>
<th>Kit Numbers</th>
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<td>H-841</td>
<td>H-91 Adjustment Tool</td>
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Design Kit: 
Linear Motion Potentiometers

A spin-off of the trimming potentiometer product line, the linear motion potentiometer was developed to meet the needs of designers wishing to detect movement of position. Applications for these compact components include: Solenoid positioning sensors for automated controllers, volume control on audio equipment, joystick controllers, satellite dish positioning, and robotics.

Part Numbers
Each kit contains samples of each of the part numbers. Part numbers could change based on latest offering. Refer to website – additional kits may be available.

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<tr>
<td>3048L-5-203</td>
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<td>3046L-3-203</td>
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Design Kits: 
Modular Contacts

Bourns Modular Contacts are off-the-shelf interconnect devices that can be used in cellular telephones, PDAs, laptop computers, portable medical and test equipment; anywhere a rechargeable battery pack is required. Because they can be used as either compression or sliding Modular Contacts, they can function as connectors for many other non-battery related applications.

Part Numbers
Each kit contains samples of each of the part numbers. Part numbers could change based on latest offering. Refer to website – additional kits may be available.

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<td>70AAJ-2-M0</td>
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<td>70AAJ-2-F0</td>
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</table>
Design Kits: Switches

Bourns switches are low voltage, low current, signal level devices designed for selection, operation or programming. Key and tactile switches are push/momentary devices. Rotary switches are single-pole, double-throw devices. DIP switches are dual in-line, double pole with 1 to 12 positions. Switch applications include instrumentation, industrial controls, communications equipment, computers, security systems, appliances, automotive, audio/visual and pagers.

Part Numbers
Each kit contains samples of each of the part numbers. Part numbers could change based on latest offering. Refer to website – additional kits may be available.

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<td>+31-70-3004345</td>
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<td>Brazil:</td>
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<td>Japan:</td>
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<td>+41 (0)41 768 5555</td>
<td>+41 (0)41 768 5510</td>
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## Technical Assistance

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<td>+41 (0)41 768 5555</td>
<td>+41 (0)41 768 5510</td>
</tr>
<tr>
<td>North America:</td>
<td>+1-951-781-5500</td>
<td>+1-951-781-5700</td>
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</table>

## www.bourns.com

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