Features
- Lead free
- RoHS compliant*
- Resistor ladder in 1:2 ratio
- Stable thin-film-on-silicon technology
- Ultra-miniature packages to JEDEC standards

Applications
- Digital to analog converters
- Successive approximation ADCs
- Ideal for space-constrained applications

General Information

The R2R Ladder Network is used in Digital to Analog and Analog to Digital conversion. Binary weighted currents, flowing in the individual ladder segments, depend on the integrity of the R:2R relationship for an accurate conversion result. Fabricated with Tantalum Nitride on Silicon, these resistors feature excellent stability, TCR and tracking performance. R2R Ladder Networks are available in a range of miniature packages conforming to JEDEC standards.

Electrical & Environmental Characteristics

<table>
<thead>
<tr>
<th>Electrical Characteristics</th>
<th>Symbol</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance Range</td>
<td>R</td>
<td>10 K</td>
<td>50 K</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Tolerance:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute</td>
<td></td>
<td>±1 %</td>
<td>±5 %</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Ratio</td>
<td></td>
<td>±0.5 %</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>TCR:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Absolute</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Tracking</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>V</td>
</tr>
</tbody>
</table>

Environmental Characteristics

| ESD                        | 2 K    |         |         |         | V    |
|                           |        |         |         |         |      |
| Operating Temperature      |        |         |         |         | °C   |
| TJ                         | -55    | +125    |         |         | °C   |
| Storage temperature        |        |         |         |         | °C   |
| Tstg                       | -65    | +150    |         |         | °C   |

Power Rating per Resistor @ 70 °C

<table>
<thead>
<tr>
<th>QSOPOperating Temperature</th>
<th>0.1</th>
<th>Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 Pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20, 24 Pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28 Pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NBSOIC: Operating Temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14, 16 Pin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Power Rating per Package @ 70 °C:

<table>
<thead>
<tr>
<th>QSOPOperating Temperature</th>
<th>0.75</th>
<th>Watt</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Pin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

QSOP Package Dimensions

Narrow-Body SOIC Package Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>2QSP16</td>
<td>4.80 - 4.98 (1.89 - 1.96)</td>
</tr>
<tr>
<td>2QSP20</td>
<td>8.56 - 8.74 (3.37 - 3.44)</td>
</tr>
<tr>
<td>2QSP24</td>
<td>8.56 - 8.74 (3.37 - 3.44)</td>
</tr>
<tr>
<td>2QSP28</td>
<td>9.80 - 9.98 (3.86 - 3.93)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>2NBS08</td>
<td>4.80 - 4.98 (1.89 - 1.96)</td>
</tr>
<tr>
<td>2NBS14</td>
<td>8.56 - 8.74 (3.37 - 3.44)</td>
</tr>
<tr>
<td>2NBS16</td>
<td>9.80 - 9.98 (3.86 - 3.93)</td>
</tr>
</tbody>
</table>

Governing dimensions are in mm. Dimensions in parentheses are in inches and are approximate.

JEDEC Reference Number MO-137.
Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

QSOP Package Power Temperature Derating Curve

Narrow-Body SOIC Package Power Temperature Derating Curve

Schematic

Typical Part Marking

Standard Resistance Values

<table>
<thead>
<tr>
<th>R1 Value (ohms)</th>
<th>R2 Value (ohms)</th>
<th>Resistance Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 K</td>
<td>20 K</td>
<td>103</td>
</tr>
<tr>
<td>25 K</td>
<td>50 K</td>
<td>253</td>
</tr>
</tbody>
</table>

Represents total content. Layout may vary.
Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

Dispensing

For large quantities, the product will be dispensed in Tape and Reel (see diagram below).

<table>
<thead>
<tr>
<th>Package</th>
<th>A0</th>
<th>B0</th>
<th>K0</th>
<th>Width</th>
<th>Pitch</th>
<th>No. of Pieces per 13 reel</th>
<th>No. of Pieces per tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>QSOP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Pin</td>
<td>6.4</td>
<td>5.2</td>
<td>2.1</td>
<td>12</td>
<td>8</td>
<td>3,500</td>
<td>98</td>
</tr>
<tr>
<td>20, 24 Pin</td>
<td>6.5</td>
<td>9.0</td>
<td>2.1</td>
<td>16</td>
<td>8</td>
<td>3,500</td>
<td>56</td>
</tr>
<tr>
<td>28 Pin</td>
<td>6.5</td>
<td>10.3</td>
<td>2.1</td>
<td>16</td>
<td>8</td>
<td>3,500</td>
<td>49</td>
</tr>
<tr>
<td>NBSOIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Pin</td>
<td>6.4</td>
<td>9.0</td>
<td>2.1</td>
<td>12</td>
<td>8</td>
<td>3,500</td>
<td>98</td>
</tr>
<tr>
<td>14 Pin</td>
<td>6.5</td>
<td>9.0</td>
<td>2.1</td>
<td>16</td>
<td>8</td>
<td>3,500</td>
<td>56</td>
</tr>
<tr>
<td>16 Pin</td>
<td>6.5</td>
<td>9.0</td>
<td>2.1</td>
<td>16</td>
<td>8</td>
<td>3,500</td>
<td>49</td>
</tr>
</tbody>
</table>

How To Order

2 QSP 20 - T J 6 - 103 LF

Product Class
Thin-Film-on-Silicon

Standard Package Style
QSP = QSOP
NBS = Narrow-Body SOIC

Pin Count
QSP = 16, 20, 24, 28
NBS = 8, 14, 16

Dispensing
R = Reel
T = Tube

Standard Grade Tolerance
J = ±5 %
G = ±2 %
F = ±1 %

Circuit
6 = R/2R Ladder

Resistance Value Code
1st three digits specify R1 resistance code.

Terminations
* LF = 100 % Sn (lead free)