

Bourns Magnetics Capabilities

2021

BOURNS®

Agenda

- Bourns Magnetics Division overview
- Bourns magnetic components
- Bourns custom magnetics
- Bourns Kaschke components
- Bourns Magnetics capabilities summary

Bourns Magnetics Division at a Glance

- Three entities to support all customer needs
- Global design, testing, manufacturing & engineering support in all three geospheres
- In excess of 50 years Magnetics components experience
- Broad and expanding line of power and signal magnetic components
- Design and production of ferrite cores
- Extensive fully custom magnetics design capabilities
- Miniaturized, automotive grade, high quality & high reliability components
- Strong commitment to R&D and product innovation
- Platinum Level Supplier excellence award
- Global reference designs with major IC suppliers
- Dedication to flawless execution for our customers



Bourns Magnetics Division

Three Bourns entities to support all needs:

- **Power and Signal Magnetic Components**

- *Over 7000 inductor and transformer part numbers*
- *Standard product families: Power Inductors, Chip Inductors, Signal Transformers, Chokes & Ferrite Beads*

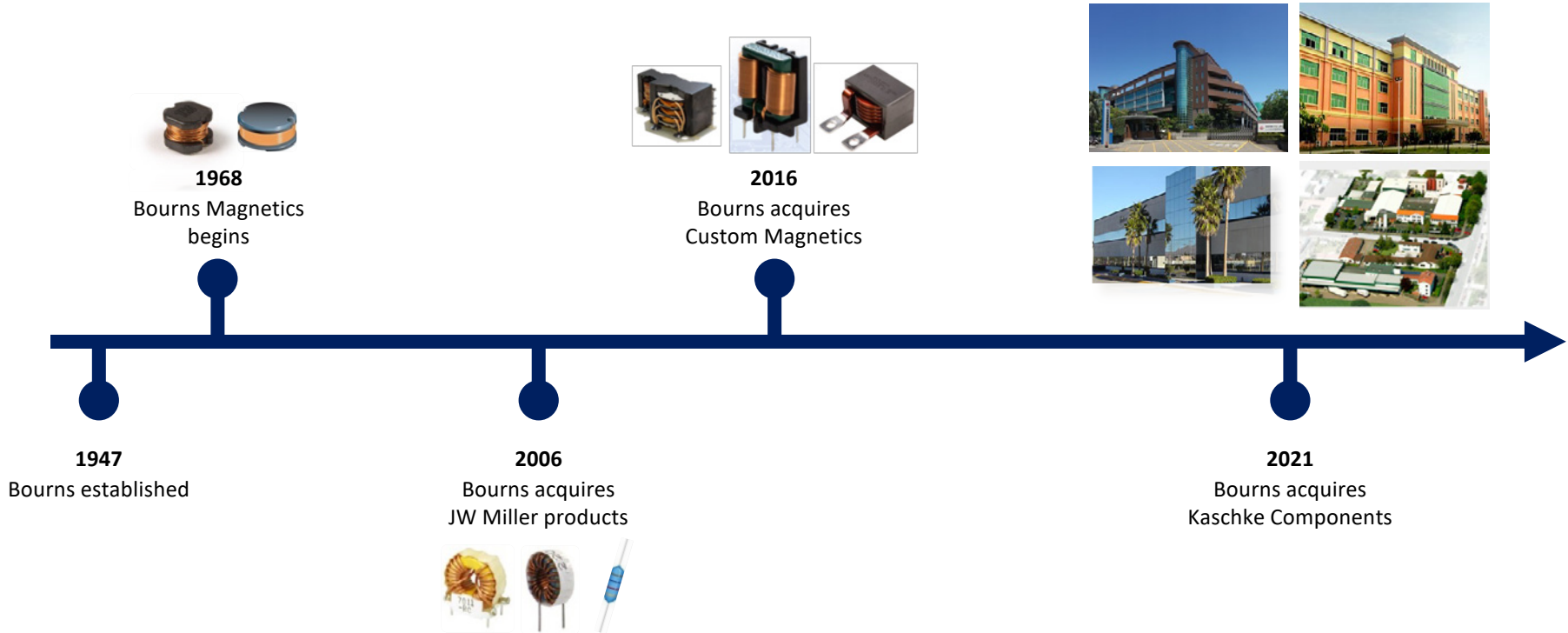
- **Custom Magnetics**

- *Direct support for customer specific application-driven requirements*
- *IATF 16949 and VDA6.3 fully approved design and factory to support critical application requirements for automotive grade applications*
- *Design, development and production in China with Mexico option available*

- **Kaschke Components**

- *Ferrite cores of power grade material*
- *Custom development for industrial grade magnetic products*
- *Design, development and production in Europe and North Africa (Germany and Tunisia)*

Bourns Magnetics Brief History



Global Infrastructure to Support Customers

**China
Dongguan**



Custom
Transformers

Integrated
Assembly

Solenoids

**China
Xiamen**



Signal
Transformers

Isolation
Transformers

Custom
Inductors

**Taiwan
Taipei**



Power
Inductors

Chip
Inductors

Chokes

**Mexico
Chihuahua**



Custom
Inductors

Integrated
Assembly

**Germany
Gottingen**



Ferrite
Cores

Common
Mode Chokes

Transponder
Coils

**Tunisia
Zaghouan**



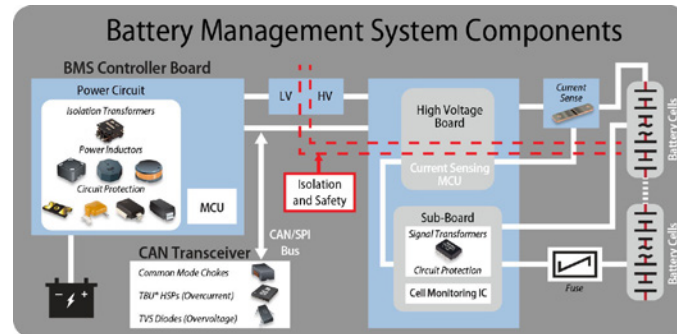
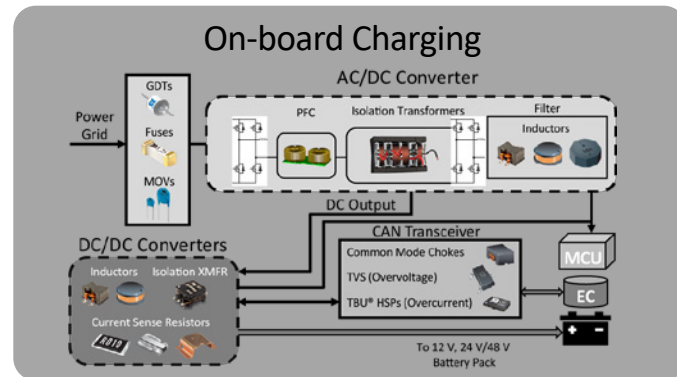
Std. Platform
Transformers

Common
Mode Chokes

Custom
Magnetic
Designs

Magnetics Solutions for Next-Gen Applications

- Automotive, industrial and renewable energy BMS
- On-board/off-board charging
- Advanced computer memory modules
- Advanced driving assistance systems (ADAS)
- Smart connected IoT devices
- Power conversion for most power levels



Power and Signal Catalog Components

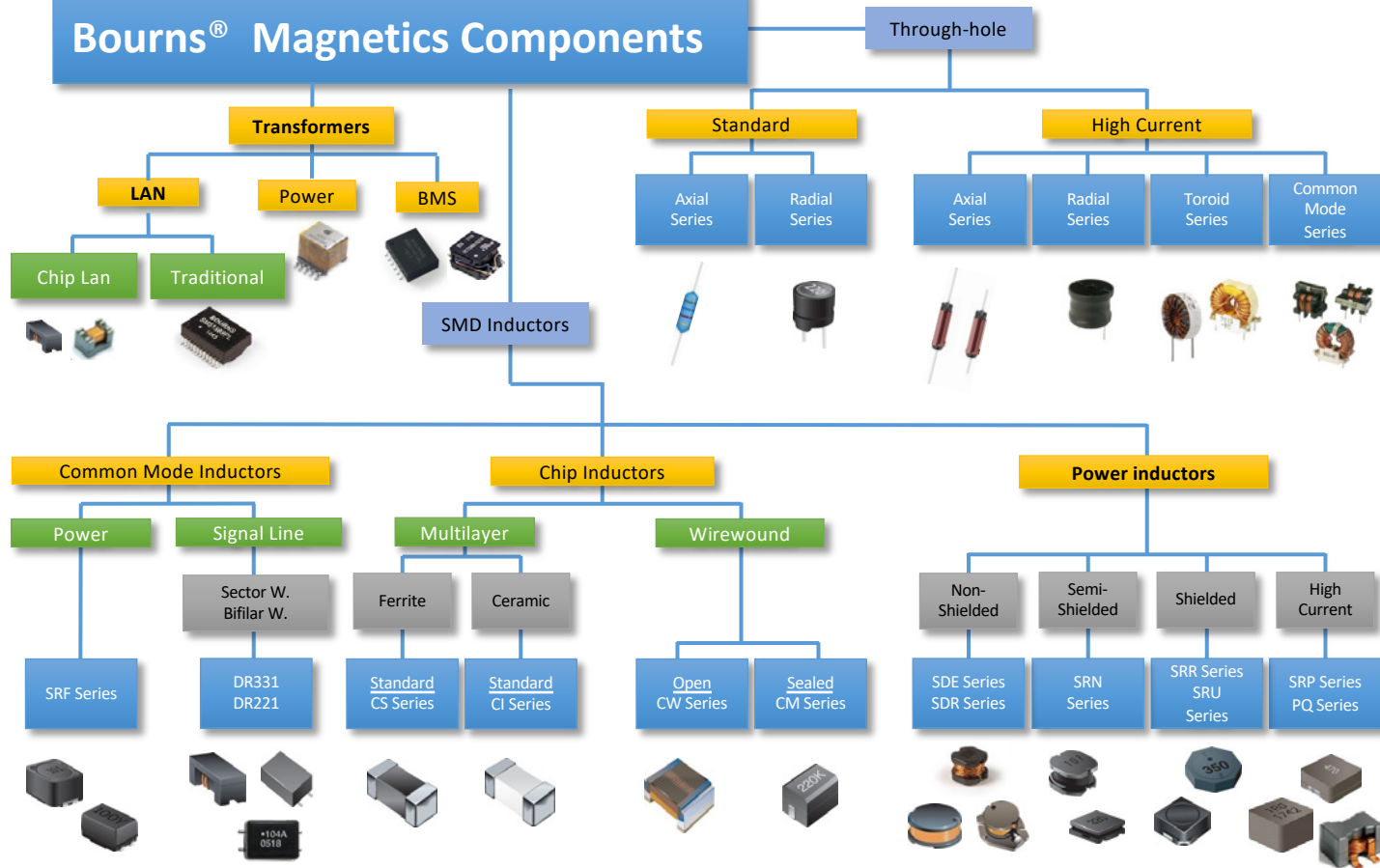


Power and Signal Magnetic Components

- Broad portfolio of catalog Power and Signal Magnetic Components
- Portfolio matches increasingly complex and demanding application needs
- Portfolio makes it easy to select the right components for any application
- Strong technology roadmap, continuous new product releases
 - *40 new series introduced in 2020*
 - *>20 new series introduced in 2021 YTD*
 - *AEC-Q200 compliant components*
 - *Designed to support high current, high frequency, high temperature, low DCR, low core loss, small size requirements*
- Multiple reference designs with global IC manufacturers
- Agency standards compliance
- Large and growing portfolio of automotive grade parts
- Platinum Level Supplier Excellence Award recipient



Bourns® Magnetics Components



Power Inductors: Non-shielded, Semi-shielded, Shielded and High Current Shielded

Inductor Model	SDE / SDR Non-shielded	SRN Semi-shielded	SRR / SRU Shielded	SRP High Current Shielded
Appearance				
Features	• Ferrite core • Low cost • High saturation current	• Ferrite core • Semi-Shielded with epoxy resin • Lower radiation than non-shielded • Lower cost than shielded	• Ferrite core • Shielded • Low radiation • Low DCR	• Alloy powder core • Shielded • Low radiation • Low DCR • High rated current
Models Available	24	28	64	83
Footprint	3 x 3 to 22 x 22 mm	2.6 x 1.6 to 10 x 10 mm	2.8 x 2.8 to 18 x 18 mm	2 x 1.6 to 23 x 23 mm
Height	2.5 to 7 mm	1 to 6 mm	0.9 to 6.5 mm	1 to 7 mm
Inductance	0.8 to 15,000 μ H	0.47 to 470 μ H	0.47 to 15,000 μ H	0.1 to 100 μ H
Rated Current	0.02 to 16 A	0.28 to 10 A	0.02 to 20 A	1.2 to 55 A

Transformers - Power / Signal / BMS / Chip LAN

Inductor Model	BS6 – HCT – SM Power	SM Signal	SM915xx BMS	SM Chip LAN (Discrete & Module)
Appearance				
Features	• Various input / output voltage • High isolation voltage • High clearance/ creepage distance • Design to meet IEC	• Toroid core • IEEE 802.3 Ethernet compatible • PoE / PoE+ • Built-in common mode chokes • +125 °C operating temp. available	• Toroid core • One or two-channel • High isolation voltage • High working voltage • Built-in common mode chokes • High temperature +125 °C	• Ferrite drum core / ferrite plate cap • Shielded construction • IEEE 802.3 Ethernet compatible • PoE / PoE+ Discrete: • Flexible PCB layout Module: • Pin-to-pin compatible to traditional LAN transformer • Built-in common mode chokes • Metal shield
Models Available	4	14	7	5 (Discrete) + 5 (Module)
Footprint	10.5 x 9.8 to 17.8 x 13.5 mm	12.8 x 9.3 to 24.2 x 18.2 mm	8.89 x 7.62 to 31.5 x 12.5 mm	3.5 x 3.2 to 4.7 x 3.22 mm (Discrete) 12.7 x 8.67 to 17.03 x 14.6 mm (Module)
Height	6.5 to 12.7 mm	5.65 to 12.8 mm	5 to 9.5 mm	2.9 mm (Discrete) 4 - 4.5 mm (Module)
Rated Power	1.8 – 13 W	N/A	N/A	N/A
Bit Rate	N/A	10/100/1000M	N/A	1 to 10G

Common Mode Chokes - Power / Signal

Inductor Model	DR – SRF Power	SRF Signal
Appearance		
Features	• Ferrite core • Shielded construction • Bifilar and sector wound available	• Ferrite drum core / ferrite plate cap • Shielded construction • Bifilar wound - high common mode impedance
Models Available	14	12
Footprint	5.2 x 5 to 12.5 x 12.6 mm	2 x 1.2 to 4.5 x 3.2 mm
Height	6.5 to 12.7 mm	1.2 to 3 mm
Impedance	140 – 10,000 Ω	30 – 10,000 Ω
Rated Current	0.1 – 8.9 A	100 – 400 mA

Bourns® Automotive Grade Magnetics



Advanced Product Quality Planning (APQP)

Products are developed using the APQP structured approach to product and process design to ensure products satisfy customer needs.



IATF 16949:2016 Automotive Quality Management System

All Bourns® automotive grade products are produced in facilities certified to IATF 16949.



VDA 6.3 German Automotive Industry

Process based audits to evaluate and improve controls in our manufacturing operation and new product introduction; audit score of >80% for manuf. Facility.

Automotive Electronics Council

Component Technical Committee

AEC-Q200 for Passive Components; AEC-Q101 for Semiconductors

Automotive grade products are qualified to the stress tests specified in the latest AEC qualification standards.

PPAP Production Part Approval Process

PPAP Level 3 to be provided for all Auto Grade Components

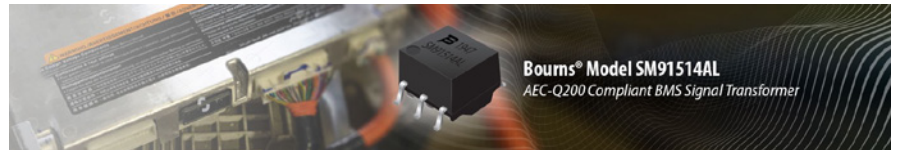
Bourns® standard components must be presented to a customer for approval using PPAP.



Magnetics New Product Releases 2021 YTD

2021 YTD Key New Product Releases

- 21 new series released
- 128 new part numbers added
- New Power Inductors, Common Mode Chokes, Chip LAN Modules and BMS Transformers



Magnetics New Product Releases 2021 YTD-Continued

Bourns® Model SRF3225TABM
and SRF3225TAFD Series
1210-Size Automotive Grade
Common Mode Chip Inductors



Bourns® Model CWF1610
and CWF2414 Series
New Chip Inductors



Bourns® Model SRN6045HA Series
New Automotive Grade Semi-shielded Power Inductors



Bourns® Model SRP6530A Series
New AEC-Q200 Compliant High Current Shielded Power Inductors



Bourns® Model SM91076L
MMA Suggested
Shielded LAN Transformer



Bourns® Model SM91501ALO
New AEC-Q200 Compliant BMS Signal Transformer



Bourns® Model SM91502ALA
New AEC-Q200 Compliant BMS Signal Transformer



Reference Designs with Global IC Manufacturers

- Reference designs help customers save time and minimize risk
- Bourns has multiple reference designs with major IC manufacturers

Year	Semiconductor Company	IC Part Number	Application	Bourns Part Number	Reference
2021	TI	TPA6304-Q1	Automotive Class D Amplifier	SRP5015T A-20Y	TPA6304-Q1 Evaluation Module
2021	TI	TPA6304-Q1	Automotive Class D Amplifier	SRP5015TA-R22Y	TPA6304-Q1 Evaluation Module
2021	TI	TPA6304-Q1	Automotive Class D Amplifier	SRP5015TA-R33M	TPA6304-Q1 Evaluation Module
2021	TI	SN6501-Q1	Isolated Power Supplies	HCTSM8	SN6501-Q1
2021	ADI	ADBMS6830M	Automotive BMS	SM91501ALE	LTC6812-1
2021	ADI	ADBMS682	Automotive BMS	SM91501ALE	LTC6812-1
2021	PI	INN3996CQ	High voltage input automotive isolated DC-DC Power Supply	SRP4020T A-1R5M	DER-889Q Design Example Report

Bourns Custom Magnetics

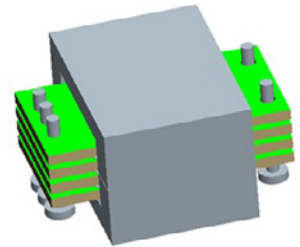
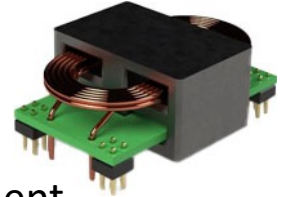
Dongguan, China

- Founded as Transtek in 1998
- Acquired by Bourns in November, 2016
- Highly Automated Production
- IATF 16949 Qualified
- AEC-Q200 Testing In-house
- Focused on Customized Magnetic Components for automotive power applications (OBC, EV Charging Stations, BMS), energy storage and renewable energy industry



Bourns Custom Magnetics Capabilities

- Broad portfolio of custom magnetic components and modules
 - Transformers, inductors, common mode chokes
- Designed for high-efficiency, compact size and excellent thermal management
- Produced in IATF 16949 and ISO 14000 certified factories
- Compliance with typical customer-requested safety agency standards
 - UL 2231, UL 60601, UL 60950-1, UL 62368-1, IEC 60664-1, IEC 61558-2, IEC 62752, IEC 62955, CSA 22.2
- Compliance with industry standards
 - UL 508, EN 61558-1, EN 60950, EN 60368-1
- High Frequency Power Topologies
 - Buck, boost, SEPIC, CUK, half and full bridge LLC, push-pull, forward, flyback
- Production facilities are equipped with test and design verification tools
 - AEC-Q200 testing in-house
 - Finite element analysis



Full Custom Capabilities

- Bobbins, cores, wires
- Aluminum housings
- Thermally conductive potting
- Litz wire & flat wire windings
- Almost all power levels
- High current inductors for PFCs, filter applications and common mode chokes
- High power SMPS transformers for any topology
- Fast prototypes
- Flexible & automated production
- Optimized design solution that meets cost and volume production goals



Custom Magnetics Examples



<1 W Flyback transformers for
LV applications



Critical isolation/signal
transmission for BMS
(e.g., Li-ion cell)



Filter inductors and CMCs



PFCs



Reinforced SMPS transformers -
50 W Class F rated



Planar PCB transformers with
high isolation and ultra-low
variation between parts



6 kW Main LLC transformers for
EV and inverter applications -
UL Class F EIS



60 kW Multiple components,
potted and heat sink housed
units

Kaschke Components

Tunisia and Germany



- Founded as Kaschke >65 years ago
- Acquired by Bourns in February 2021
- Products are developed in Germany, manufactured at production sites in Tunisia
- End markets include industrial, automotive, medical, consumer, energy
- Design, development and production of ferrite cores
- Plants are ISO 9001:2015 certified
- Other certifications include



Kaschke Components Capabilities

- Broad range of custom components
 - *From miniature SMD chokes for medical devices to high-performance boost chokes for inverters used in wireless energy transfer systems of up to 240 kW*
 - *SMPS transformers for any topologies*
 - *CMC, DMC, PFC and storage chokes*
- Ultra-fine wire, Litz wire, edge wire and foil winding
- Modern soldering, joining, potting, testing technology for process control
- Flexible and automated production lines



Kaschke Ferrite Capabilities

- Internal material development
- Internal product design
- Internal powder production
- Material lines
 - NiZn ferrite
 - MnZn ferrite
- Internal tool and system manufacturing



- Big shapes, high flux density
- Low losses up to 100 kHz
- Ring cores up to R102 with very good insertion losses and high Q-factor
- Rod cores for antennas and transmitter/receiver coils in the 20 kHz–40 MHz range
- Pot cores for proximity switches and wireless power transfer
- Impeder cores for inductive welding
- Customized core shapes

Bourns Magnetics Capabilities Summary

- Broad magnetics product portfolio with extensive custom design capabilities
- Solutions that enable efficient, safe, high reliability and long-life operation
- Continued innovation in miniaturization, advanced construction materials, additional design parameters
- Experts in advanced magnetics designs that meet:
 - *Superior power conversion efficiency*
 - *Isolation*
 - *EMC compliance*
 - *Signal integrity*
 - *Increased power density*
 - *Excellent thermal management*
- Global design, testing, manufacturing & engineering support in all three geospheres
- More than 50 years magnetic components experience



Thank you!

BOURNS®