

**The IP&E
Specialist**

Electric & Fuel Cell Vehicle Powertrain Application Guide

TTI, Inc., – A Berkshire Hathaway Company



The IP&E Specialist

The Specialist in Electronics Component Distribution

Founded in 1971, TTI has steadily grown to become a world leading specialist distributor of electronic components. The company was founded on the premise that passive component purchasing could be made more efficient by offering product specialization, customer-driven service and proprietary supply chain solutions.

Why TTI?

• **Technical Experts** TTI's European team of field-based Sales Engineers and local Product and Technical Specialists are here to support you; from understanding component trends, sustainable sourceability and new product roadmaps, to in depth technical support for your design from our technical engineering experts.

• **Value Added Services** Connector assembly is one of the most important value-added services at TTI, Inc. – Europe. We are specialized in distributing manufacturer controlled and certified connectors and interconnect solutions from globally leading suppliers. Thanks to a large inventory level of connector components, TTI, Inc. – Europe can serve any market requirements.

• **Global Distribution Centers** Our European headquarters is located just outside of Munich, Germany in Maisach-Gernlinden. In total, we have 45.000m² of dedicated warehouse space and local sales and technical support in over 40 locations across Europe. TTI has more than 195.000m² of automated warehousing in North America, Europe and Asia. All are linked into a global warehouse management system that provides superior customer service and overall business efficiencies. Wherever you are in the world, TTI can support you. Year after year, customers rate our inventory availability, on-time delivery and accuracy among the very best in the industry – contact us today to find out what a true specialist has to offer.

• **Quality and Reliability** TTI's global warehouses are all ISO-registered and have received certification to the ISO 9001 and ISO 14001 Standards. TTI Europe is also certified to EN9120/EN9100, IECQ-CECC and ISO/IEC 27001 Standards. Additionally, our European sales branches are ISO 9001 certified. TTI has one global documentation system that ensures that every TTI branch and warehouse in the world follows the same processes.





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Applications

Auxiliary Systems

- Electric cooling pumps
- Electric water pumps
- HV air compressors
- HV air conditioning
- HV brake resistors
- HV heaters
- HV junction boxes
- Power steering pumps
- System control units

Electric Vehicle Systems

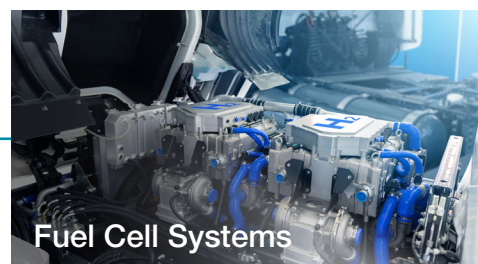
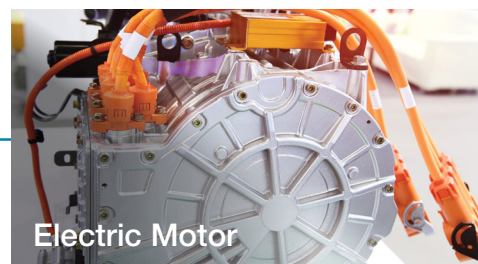
- AC/DC converters
- Battery packs
- Battery management systems
- DC/DC converters
- Drive inverters
- Electric motors
- Energy storage systems
- On-Board chargers
- Power distribution units
- Traction motor inverters

Fuel Cell Systems

- Coolant pumps
- Compressors
- Electrolysers
- Fuel cell engines
- Fuel cell stacks
- Hydrogen gas sensors
- Hydrogen storage units
- System control modules

Vehicle Types

- Agricultural equipment
- Automated guided vehicles
- Boats & watercraft
- Buses & mini-buses
- Cars & sportscars
- Construction equipment
- E-bikes
- Forklifts
- Lift platforms
- Material handling equipment
- Mining equipment
- Motorcycles & scooters
- Ships & ferries
- Trucks (Delivery & Long Haul)





Technology Trends

Antennas

- IOT antennas in Battery Management Systems

Capacitors

- Wider temperature range
- Custom HV Film Capacitors
- Hybrid and polymer

Circuit Protection

- Overvoltage and Overcurrent protection in BMS modules
- HV Fuses that can withstand high vibration

Connectors

- 1500V Connector Systems
- Ultrasonically welded cable assemblies
- CCS Inlets up to 500A
- NACS Inlets in USA
- MCS Inlets for heavy vehicles

Discrete Semiconductors

- 600V & 1200V Mosfet solutions
- Low voltage Mosfets and TVS protection diodes

Electromagnetic

- Expanded portfolios of high power inductors
- EMI suppression and filtering

Power Supplies

- Wider input range DC/DCs supporting battery systems

Relays

- Voltage levels above 1000V
- Pressurised and Non-pressurised options
- Move to DC Contactor solutions

Resistors

- Thin film precision in inverter designs
- Low ohmic shunts and current sense resistors

Sensors

- Current sensors for cables & busbars
- Thermal runaway sensors for battery packs
- 3-D position sensing in motors and compressors

Switches



- Enhanced sealing performance
- Need for emergency stops
- Anti-vandal proof switches



High Voltage Connectors

Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP
Radlok	Surlok Plus	HVSL 2xx-6xx Series	E-Power Lite
<ul style="list-style-type: none"> • 1000V DC, up to 500A • Unshielded and wire to device • 10mm² to 150mm² cable sizes 	<ul style="list-style-type: none"> • 1500V DC, up to 500A, IP67/ IP69K • Unshielded and wire to device • 6mm² to 95mm² cable sizes 	<ul style="list-style-type: none"> • Up to 1000V DC • Shielded, inline and wire to device • 2, 3, 4, 5 and 6 circuit versions 	<ul style="list-style-type: none"> • 1000V DC, up to 120A • Shielded and wire to device • 2.4, 3.6 and 5.7mm contact versions
			
Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol COMMUNICATIONS SOLUTIONS	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP
HVSL 800 – 1400 Series	DuraEV & DuraSwap	CHD Series	HVPT-M Series
<ul style="list-style-type: none"> • 1000V DC, up to 430A • Shielded and wire to device • 8.0, 10.0, 12.0 & 14.0mm contact versions 	<ul style="list-style-type: none"> • 10,000 mating cycles • 70A continuous current • IP67 rated in both mated and unmated • Finger protection 	<ul style="list-style-type: none"> • Voltage rating 1.500V DC • Up to 500A • EMI shielding • From 95 to 150 mm² cable 	<ul style="list-style-type: none"> • Voltage Rating 1000VDC • 2 and 3 circuit versions • 70 to 150mm² shielded wire • IP67 IP6K9K
			
Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP
Powerlok	Powerlok Gen 2	Manual Service Disconnects	Powerlink Cables
<ul style="list-style-type: none"> • 1000V DC, up to 500A, IP67 • Metal, shielded and wire to device • From 16 to 150mm² cables 	<ul style="list-style-type: none"> • 1000V DC, up to 500A, IP67/ IP6K9K • Metal, shielded and wire to device • Improved keying, latching and sealing compared to Gen 1 	<ul style="list-style-type: none"> • Micro-MSD 1500V DC, up to 350A • Mini-MSD: 690V DC, up to 400A • MSD: 690V DC, up to 630A • MSD-XL: 1000V DC, up to 630A 	<ul style="list-style-type: none"> • Shielded & unshielded versions • From 2.5 to 150mm² cables • Standard: ISO 6722 Class C 125
			



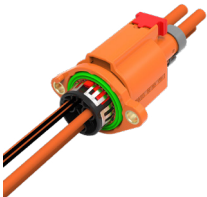
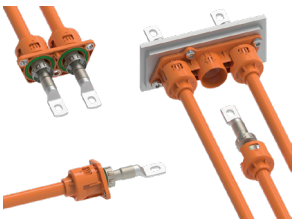
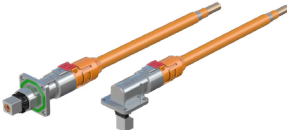
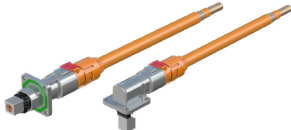
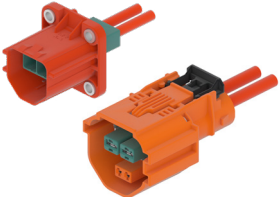
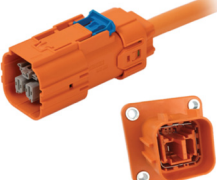





High Voltage Connectors

<p>• A P T I V •</p> <p>PowerPack Sealed Ring Connector</p> <ul style="list-style-type: none"> • 48V DC, 250A at 85°C • Unshielded and wire to device • High robustness against vibrations 	<p>• A P T I V •</p> <p>PowerPack HV Apex 280 OBC</p> <ul style="list-style-type: none"> • Powerpack HV APEX 280 OBC 3 & 5 ways is optimized for 32A on-board charging solutions using 6mm² cable range and based on field proven Apex 2.8 terminal 	<p>• A P T I V •</p> <p>ShieldPack HV APEX280 SB</p> <ul style="list-style-type: none"> • 1000V DC, 38A at 85°C • Bundle shielding and wire to device • 2-stage disconnect for safe unmating 	<p>• A P T I V •</p> <p>ShieldPack HV AK CLASS 1 SMU</p> <ul style="list-style-type: none"> • 850V DC, 30A at 85°C • Shielded and wire to device • Standard AK interface 
<p>• A P T I V •</p> <p>ShieldPack HV280 SI</p> <ul style="list-style-type: none"> • 1000V DC, 40A at 85°C • Shielded and wire to device • Inner connector with TPA 	<p>• A P T I V •</p> <p>ShieldPack HV CTS 630 SI</p> <ul style="list-style-type: none"> • 1000V DC, 50A at 85°C • Shielded, inliner and wire to device • Most compact 630 2-way system 	<p>• A P T I V •</p> <p>ShieldPack HV AK PASS-THROUGH SI</p> <ul style="list-style-type: none"> • 1000V DC, 1,2 3 ways • Shielded and wire to device • High robustness against vibrations 	<p>• A P T I V •</p> <p>ShieldPack HV AK CLASS 4 SI</p> <ul style="list-style-type: none"> • 1000V DC, 245A at 85°C • Shielded and wire to device • Inline and right angle versions 
<p>• A P T I V •</p> <p>ShieldPack HV RCS800 / 890 SB</p> <ul style="list-style-type: none"> • 1000V DC, 230A at 85°C • Bundle shielding and wire to device • Inline and right angle versions 	<p>• A P T I V •</p> <p>ShieldPack HV RCS890 SI</p> <ul style="list-style-type: none"> • 600V DC, 210A at 85°C • Shielded and wire to device • Slider solution for limited space designs 	<p>• A P T I V •</p> <p>ShieldPack HV RCS800/890 SI DM</p> <ul style="list-style-type: none"> • 850V DC, 220A at 85°C • Direct mate shielding to device • Innovative screw position assurance 	<p>• A P T I V •</p> <p>ShieldPack HV RCS1100/1190 SI</p> <ul style="list-style-type: none"> • 1000V DC, 370A at 85°C • Shielded and wire to device • Innovative screw position assurance 

High Voltage Connectors

 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
HVA280	HVA 400-2	HVA630	HVA1200
<ul style="list-style-type: none"> • 850V DC, 40A at 85°C, 2&3 way • Shielded and wire to device • Multicore and individually shielded versions 	<ul style="list-style-type: none"> • 1000V, 60 A at 85 °C (6 mm²) • Suitable for Class 1 & 2 applications • High Vibration Performance (SG3), terminal 	<ul style="list-style-type: none"> • 850V DC, up to 56A at 85°C, 2&5 way • Shielded and wire to device • Straight tab and 90° headers 	<ul style="list-style-type: none"> • 1000V DC, up to 100A at 85°C • Shielded and wire to device • Inline and right angle cable plugs
			
 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
HVP800	HVP1100	IPT	Manual Service Disconnects
<ul style="list-style-type: none"> • 850V DC, up to 200A at 85°C, 2&3 way • Shielded and wire to device • Inline and right-angle cable plugs 	<ul style="list-style-type: none"> • 750V, up to 300A at 85°C • Shielded and wire to device • Multiple coding options available 	<ul style="list-style-type: none"> • 850V DC, 1, 2 & 3-way versions • Shielded and wire to device • 16, 25, 35 and 50mm² versions available 	<ul style="list-style-type: none"> • Automotive – 450V DC, up to 360A fuses • ICT – 750V DC, up to 630A fuses
			
 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
HC Stak 25	PCON Terminal	CSJ 1800 Series	HV 2100 Series
<ul style="list-style-type: none"> • 1000V DC, up to 257A at 85°C • Shielded and wire to device • Released for copper and aluminium wire 	<ul style="list-style-type: none"> • 11, 18 and 21mm contacts available • Supports cables from 5 to 95mm² • Using silver plated contacts 	<ul style="list-style-type: none"> • 1000V, up to 257 A at 85°C • UL Finger + 2 mm / 30N protection • PCON 18 high- power terminal 	<ul style="list-style-type: none"> • 1000V DC, Up to 372A at 85C • Compact design • UL+2mm finger protection • Proven PCON 21 terminal design
			






















High Voltage Connectors

 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
HVA HD400	HVA IPT-HD Series	HVP-HD1000 Series	HVP-HD1400 Series
<ul style="list-style-type: none"> Up to 1000 VDC, and 60 A (at 80°C) Can withstand transmission-level vibrations Connector Position Assurance (CPA) 	<ul style="list-style-type: none"> 50/70/95 mm² conductors Low-contact resistance shielding Handles excessive vibrations IP67, IP68 and IP6K9K sealing rated 	<ul style="list-style-type: none"> 1000V and up to 300A 35 mm², 50 mm², 70 mm² cables Up to 3 pins in one header connector Both 180° and 90° headers 	<ul style="list-style-type: none"> 1000v and up to 500A 70 mm², 95 mm², 120 mm², 150 mm² Up to 3 pins in one header connector Both 180° and 90° headers
			
• APTIV •	• APTIV •	• APTIV •	• APTIV •
SHIELDPACK™ HV630 HVIL SI	SHIELDPACK™ HV AK CLASS 2 SMU 2 WAY	SHIELDPACK™ HV METAL PASS-THROUGH SI 70-95mm² 1 WAY	SHIELDPACK™ HV PLASTIC PASS-THROUGH SI 95-120mm² 1 AND 2 WAY
<ul style="list-style-type: none"> 1000V DC, 60A at 85°C Inner connector with TPA Industry leading vibration performance 	<ul style="list-style-type: none"> For applications with needs up to 55A Compliant to LV214 / LV215 Tool-less mating & un-mating system 	<ul style="list-style-type: none"> For applications with needs up to 400A Compliant to USCAR-2 / USCAR-37 High voltage panel mount system 	<ul style="list-style-type: none"> High operating temperature High robustness against vibrations Solution for demands on 120 mm²
			
Rosenberger	Rosenberger	YAZAKI	YAZAKI
HVR 200 Series	HPK Series	YPT-E Series	2P R8.0MM HV CONNECTOR
<ul style="list-style-type: none"> 1000V DC, Up to 270A at 85C Test voltage 2700 V DC Creepage 5 mm Clearance 2.19 mm 	<ul style="list-style-type: none"> 1000 V DC, 280 A at 85 °C Cable connectors (1, 2, or 3-pole) Test voltage 3200 V DC Temperature range -40 °C to +140 °C 	<ul style="list-style-type: none"> Temperature Class - LV215 Profile 4 Vibration Class - LV215 Class 3 Sealing Class - IP6K9K Max. Current 275A 85 C w/ 50 sqmm cable Max. Voltage 800V 	<ul style="list-style-type: none"> Temperature Class -USCAR-2T3 (-40.125C) Vibration Class - USCAR--2V Sealing Class - USCAR-2S3 Max Current - 260A@85Cw/50sqmm cable
			

Vehicle Inlets & Custom Assemblies

Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP
AC Charge Inlets – Type 2	AC / DC Combo Inlets – Type 2	CCS2 - 500A Inlet	CCS1 - 300A Inlet
<ul style="list-style-type: none"> • 500V DC, 16A, 32A 1 & 3 Phase • IP55 (mated), 2.5 to 6mm² cables • TUV Certification 	<ul style="list-style-type: none"> • 480V AC & 1000V DC, • 32A AC and up to 500A DC • Up to 100mm² cables • TUV Certification 	<ul style="list-style-type: none"> • 1000V (DC+ / DC-), 480V (L1,L2,L3 & N) • 500A (DC+ & DC- :150MM² Cable) • 63A (L1,L2,L3 & N: 16MM² Cable) • Mating Cycles >10,000 Cycles 	<ul style="list-style-type: none"> • Rated Current 48A AC, 300A DC • Rated Voltage 240V AC, 1000VDC
			
Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP
North American Charging System Inlet	Megawatt Charging System Inlet	Custom Busbar Assemblies	Custom HV Cable Assemblies
<ul style="list-style-type: none"> • 250A, 400A and 600A versions available • Please contact TTI product management for more information. 	<ul style="list-style-type: none"> • Level 1 - Up to 350A • Level 2 - Up to 1500A • Level 3 - Up to 3000A • Please contact TTI product management for more information 	<ul style="list-style-type: none"> • Amphenol Industrial have the capability to develop custom HV Cable Assemblies. • Please contact TTI for more information. 	<ul style="list-style-type: none"> • Amphenol Industrial have the capability to develop custom busbar assemblies in aluminium or copper. • Please contact TTI for more information.
			
Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol INDUSTRIAL PRODUCTS GROUP	Amphenol GLOBAL INTERCONNECT SYSTEMS	Amphenol GLOBAL INTERCONNECT SYSTEMS
Custom Cell Connection Systems	Custom Power Distribution Units	Cable Harnesses	High Speed Cables
<ul style="list-style-type: none"> • Temperature and voltage sensing of cells • Cable, FPC and busbar construction • Full assembly design 	<ul style="list-style-type: none"> • Power distribution unit (PDU) • Battery disconnect unit (BDU) • Build to print and custom design 	<ul style="list-style-type: none"> • Amphenol GIS specializes in manufacturing of wire and cable harnesses for various industries such as transportation and heavy equipment. 	<ul style="list-style-type: none"> • We offer products including: MCIO (PCIe Gen6), Extremerport swift, Ultraport SlimSAS™, OCuLink, HD MiniSAS, MiniSAS, SATA, DisplayPort, HDMI, DVI, USB and Ethernet.
			

Vehicle Inlets & Custom Assemblies

<p>• APTIV •</p> <p>AC / DC Combo Inlets – Type 2</p> <ul style="list-style-type: none"> • AC: slow charge (3-phase, 20A) • DC: fast charge (600V, 125A) • Interface complies with IEC62196 	<p>• APTIV •</p> <p>Mode 2 Charge Boxes</p> <ul style="list-style-type: none"> • EVSE restarts in the event of grid fault • Meets IEC62752 standard • IP67 water sealing protection 	<p>• APTIV •</p> <p>Mode 3 Jumpers Cables</p> <ul style="list-style-type: none"> • Superior durability that is proven in automotive mass production • Wiring crimps sealed from environment • CE & CQC marking/ certification 	<p> ITT <small>cannon</small></p> <p>AC Charging Inlets – Type 2</p> <ul style="list-style-type: none"> • IEC 62196 Type 2 vehicle inlet • 20A, 32A, 63A current rating • Optional dust cap or locking devices 
<p> ITT <small>cannon</small></p> <p>Mode 3 – AC Jumper Cables</p> <ul style="list-style-type: none"> • IEC 62196 Type 2 Mode 3 jumper cables • 20, 32 or 63A, single or three phase • Custom lengths possible 	<p> PHOENIX CONTACT</p> <p>Charx - AC Type 1</p> <ul style="list-style-type: none"> • Vehicle Inlet AC type 1, • IEC 62196-2, SAE J1772, • Up to 80 A / 250 V (AC), 	<p> PHOENIX CONTACT</p> <p>Charx - AC Type 2</p> <ul style="list-style-type: none"> • Vehicle Inlet AC type 2 • IEC 62196-2, • Up to 32 A / 480 V (AC) 	<p> PHOENIX CONTACT</p> <p>Charx - CCS Type 1 Inlet</p> <ul style="list-style-type: none"> • Vehicle Inlet CCS type 1, • IEC 62196-2, IEC 62196-3, • Up to 375 A / 1000 V (DC), 48 A / 250 V (AC) 
<p> PHOENIX CONTACT</p> <p>Charx - CCSType 2 Inlet</p> <ul style="list-style-type: none"> • Vehicle charging inlet, CCS type 2, • IEC 62196-2, IEC 62196-3, • Up to 375 A / 1000 V (DC), 32 A / 480 V (AC) 	<p> TE <small>connectivity</small> <small>AUTHORIZED DISTRIBUTOR</small></p> <p>AC Charge Inlets CI32ED – Type 2</p> <ul style="list-style-type: none"> • 480V DC, 16A or 32A 1or 3 phase • IP55 front IP67 back • Vibration: SG 2 (LV 215-1) 	<p> TE <small>connectivity</small> <small>AUTHORIZED DISTRIBUTOR</small></p> <p>AC / DC Combo Inlets CI200 – Type 2</p> <ul style="list-style-type: none"> • 480V AC & 1000V DC, • 32A AC and up to 200A DC • 50mm2 cables, 90 and 180° cable outlet 	<p> TE <small>connectivity</small> <small>AUTHORIZED DISTRIBUTOR</small></p> <p>AC / DC Combo Inlets CI500 – Type 2</p> <ul style="list-style-type: none"> • 80V AC & 1000V DC, • 32A AC and up to 500A DC • 95mm2 cables, 90 and 180° cable outlet 

PCB Connectors for BMS

Amphenol <small>COMMUNICATIONS SOLUTIONS</small>	Amphenol <small>COMMUNICATIONS SOLUTIONS</small>	Amphenol <small>COMMUNICATIONS SOLUTIONS</small>	Amphenol <small>COMMUNICATIONS SOLUTIONS</small>
0.5mm Power Pin Floating Board-to-Board Connectors	Minitek Microspace™ Crimp-to-Wire Connectors	FlexFast Flex to Board Solution	FlexLock
<ul style="list-style-type: none"> • High speed transmission 10Gb/s • Current rating up to 5A per power pin (5A/pin* 4) • Wide operating temperature from -40°C – 125°C 	<ul style="list-style-type: none"> • Suitable for automotive applications and harsh environments • LV214 Severity-2 compatible • Terminal positioning assurance (TPA) 	<ul style="list-style-type: none"> • Available in 40 positions single flex with right angle SMT configuration. • USCAR-T3V2, LV-214 S1 compliant • Gold plating reduces mating force 	<ul style="list-style-type: none"> • Compact design for automotive applications. • Meets USCAR- T2V2 and LV-214 S3 specifications. • Nominal current of 2A per contact
			
Amphenol <small>COMMUNICATIONS SOLUTIONS</small>	Amphenol <small>INDUSTRIAL PRODUCTS GROUP</small>	JAE	JAE
WireLock	Z-Connect	MX34	MX77
<ul style="list-style-type: none"> • Nominal current of 2A per contact • Supports cable wire gauges from 22AWG to 26AWG. • Available in 10 up to 40 positions 	<ul style="list-style-type: none"> • Anti-vibration • Cost and space saving • Low profile (mated 8.0mm maximum) 	<ul style="list-style-type: none"> • 0.64mm tab size, 3-40 ways • Pin side SMT type: UL94 V-0, others: UL94 HB • Meets automotive requirements • Tested according to USCAR2 	<ul style="list-style-type: none"> • Low profile, 0.4mm pin size, 4-40 ways • R/A SMT specification for automatic PCB mounting • Tested according to USCAR2 standards
			
JAE	molex	molex	molex
MX84B	DuraClik 2.0mm Connector Systems	Mini50 Connection Systems	Mini-Fit Max Connectors
<ul style="list-style-type: none"> • UL94 V-0 material • Tested according to LV214 standards • Structure and dimensions same as MX34 	<ul style="list-style-type: none"> • For high-vibration and high-temp applications • 2 to 15 circuits • Superior electrical contact reliability 	<ul style="list-style-type: none"> • 50% space savings over 0.64mm connectors • Sealed or unsealed receptacles • Designed for interior vehicle environments 	<ul style="list-style-type: none"> • 20.5A of current • 94/V-O Glow-wire resin • End-to-end stackable to deliver more power per mm2
			

PCB Connectors for BMS

			 <small>AUTHORIZED DISTRIBUTOR</small>
ConnTak50	Stak50H	CLIK-Mate	Nano MQS
<ul style="list-style-type: none"> • Single row: 2 to 6 circuits • Dual Row: 10 and 22 circuits • (8 and 20 when used with a CPA) • Right Angle, Vertical SMT 	<ul style="list-style-type: none"> • Terminals - 0.50mm, 1.20mm, 2.80mm • Circuit Sizes - 12 to 109 • 5.0A for 0.50mm • 12.0A for 1.20mm • 30.0A for 2.80mm 	<ul style="list-style-type: none"> • Pitch - 1.25, 1.50 and 2.00mm • Circuit Sizes - 2 - 34 • 1.25mm pitch: 2.5A • 1.50mm pitch: 3.0A • 2.00mm pitch: 4.0A 	<ul style="list-style-type: none"> • wire cross sections down to 0.13 mm² • nominal current of up to 3 amps • TL Version - up to 32 positions • SL version - up to 20 positions.
			
 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
Pico MQS	MQS High Voltage Sensing Detector	Generation 50 Connector System	MCON Connector System
<ul style="list-style-type: none"> • 1.27mm Pin-Pitch • 78% Reduced packaging weight • Smallest LV214 qualified crimped connection with Class 2 vibration stability 	<ul style="list-style-type: none"> • TE Connectivity's (TE) Micro Quadlok System, MQS, interconnection system offers high packing density, robust construction and highest functional requirements. 	<ul style="list-style-type: none"> • Qualified for USCAR 2 and 21 and compliant with USCAR 25 • 2-28 Circuits • 1.8mm header footprint 	<ul style="list-style-type: none"> • Up to 150°C for engine applications • 48V ready in the new generation of MCON connectors • IPx9k Weather-proof rating for exterior applications
			
 <small>AUTHORIZED DISTRIBUTOR</small>			
Erni MaxiBridge Connectors	YMT Series	YESC Series	Y-NEWT Series
<ul style="list-style-type: none"> • Crimp contact for versatile uses • Single and dual row versions • Shock and vibration resistant • Based on VW75174 and USCAR-2 specifications 	<ul style="list-style-type: none"> • male and female connectors, headers and applicable terminals are available. • Suitable for a wire cross-section range from 0.13 mm² up to 1.5 mm². • The larger 2.8 mm cavity can be used up to 4.0 mm² for 2.8 mm terminals. 	<ul style="list-style-type: none"> • Blade Sizes ; 0.64X0.64, 1.5X0.8, 2.8X0.8, 6.3X0.8, 9.5X1.2 • USCAR/ISO Blade Sizes Compatibility • Sealed/Unsealed Product Availability 	<ul style="list-style-type: none"> • Robust design with increased mating durability • PBT GF, Flammability class UL94-V0 • Sealing Class IPX9K
			

Relays

			
DCNEV Series	DCNEVT500	G9EJ Precharge Relay	G2RL-1A
<ul style="list-style-type: none"> • High current (250A) and voltage (900V) contactor • Coil enonomizer reduces power and heating • Sealed IP67, gas-filled relay 	<ul style="list-style-type: none"> • 1.800VDC and 500A • 360KW power switch capable, maximum short circuit 4,000A, 1 second 	<ul style="list-style-type: none"> • Capable of switching 400V 25A DC loads, a high capacity interruption through the function of extinction of magnetic arc by adopting high-efficiency magnetic circuit 	<ul style="list-style-type: none"> • Single pole, double pole, high-capacity (16 A) and high-sensitivity types (250 mW) • IEC/EN 60335-1 conformed. (-HA Model) • Up to 85°C and 105°C (-CV Model).
			
			
G2RL-2A	G2RG-2A	EV Series (10A...300A)	PhotoMOS® AQV258HAX
<ul style="list-style-type: none"> • Single pole, double pole, high-capacity (16 A) and high-sensitivity types (250 mW) • IEC/EN 60335-1 conformed. (-HA Model) • Up to 85°C and 105°C (-CV Model). 	<ul style="list-style-type: none"> • Power Relay with 110 VDC 5 A • Switching Capacity (Use 2 poles in series with 3 mm contact gap) • 2.8-mm contact gap (EN50091-1) 	<ul style="list-style-type: none"> • High cut-off and short circuit capability up to 8,000A by inert gas for arc extinction 	<ul style="list-style-type: none"> • 1.500VDC, 20mA, for HV battery and insulation monitoring in automotive applications
			
			
HE-S Series	HE-R Series	HVC27 Series	HVC43 Series
<ul style="list-style-type: none"> • High-capacity • Max. switching current: 40 A • Compact size • Low operating power: 1,880 mW (holding power: 170 mW) 	<ul style="list-style-type: none"> • High-capacity • Mirror contact mechanisms (Compliant with IEC60947-4-1) • PCB Terminals • Low operating power: 4.0 W (Holding power 0.49 W) 	<ul style="list-style-type: none"> • 1200VDC relay, for 200A, 300A, 500A • Bi-directional, dual-coil & aux contact available 	<ul style="list-style-type: none"> • New 1000VDC relay for 150A, 200A, 250A • Single Coil • Mechanical Contact • Bidirectional design and very compact size
			

Relays

		 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
HVC45 Series	HVC50 Series	EVC50 and EVC80	EVC 135 Series
<ul style="list-style-type: none"> • 1000V DC, Up to 300A DC • Single Coil • Mechanical Contact • Bidirectional design 	<ul style="list-style-type: none"> • 1500V DC, Up to 600A DC • Dual Coil • Mechanical Contact • Bidirectional design 	<ul style="list-style-type: none"> • Limiting continuous current 50A or 80A at 85°C. • Suitable for 450VDC with limited capability to 600VDC 	<ul style="list-style-type: none"> • Limiting continuous current 135A at 85°C • Hermetically sealed • UL approved
			
 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
EVC 175 Series	EVC250	EVC 500 Series	KILOVAC EV200
<ul style="list-style-type: none"> • Compact high voltage main contactor • Voltage rating up to 450VDC • Current up to 175A at 85°C • Short circuit carry currents up to 5kA 	<ul style="list-style-type: none"> • Continuous current rating of 250A • Simplified design of the EVC 250 with optimized parts allows fully automatic production 	<ul style="list-style-type: none"> • 500 Amp continuous current rating • Voltage rating (max): 900 VDC • 12kV of isolation between open contacts • Hermetically sealed 	<ul style="list-style-type: none"> • 500A, 900VDC • economizer included • Meets IEC 60947- 4-1 annex f mirror contact
			
 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>	 <small>AUTHORIZED DISTRIBUTOR</small>
Kilovac K1K Series	Kilovac K250 Series	Kilovac LEV100H	Mini K HV Precharge Relay
<ul style="list-style-type: none"> • 1.000VDC, 1.000A unique relay in the market in one housing 	<ul style="list-style-type: none"> • Contact Voltage Rating: 1000 VDC Max • Contact Current Rating: 250 A • Contact Form: Form X (SPST-NO) • Hermetically sealed 	<ul style="list-style-type: none"> • 150A, 1000V DC • Auxiliary contacts 	<ul style="list-style-type: none"> • For pre-charge currents up to 20A • Available with PCB and plug-in terminals • IEC 60664 compliant
			



Amphenol Advanced Sensors	Amphenol Advanced Sensors	Amphenol Advanced Sensors	Amphenol Advanced Sensors
GE-209X Pressure and Temperature Combi Sensor	BAF147B002 Coolant leak detection sensor	Inline flow-through fluid temp sensor	JS8845 INTEGRATED PIPE CLIP TEMP SENSOR
<ul style="list-style-type: none"> Pressure and temperature measurements in one sensor assembly. Ideal for EV and industrial applications. 	<ul style="list-style-type: none"> Battery pack leak detection sensor for use with water-based liquid cooling systems. 	<ul style="list-style-type: none"> For heat exchange and EV battery pack coolant systems. 	<ul style="list-style-type: none"> Measuring the surface temp of metal tubing used in heating/cooling systems. AEC 200 qualified.
Amphenol Advanced Sensors	Amphenol Advanced Sensors	Amphenol Advanced Sensors	Amphenol Advanced Sensors
WTF083B001 Threaded coolant temp sensor	CTTS-203856-S02 Type FL low profile temp sensor	A-1737 MOTOR COIL TEMPERATURE SENSOR	ZTP-148SR Analogue output IR temp sensor
<ul style="list-style-type: none"> Sensor for threaded ports, optimised for battery pack liquid coolant systems. 	<ul style="list-style-type: none"> Type FL low profile and contour-conforming temperature sensor for EV battery pack temperature monitoring. AEC 200 qualified. 	<ul style="list-style-type: none"> For monitoring the temperature of windings in EV/HEV and industrial motors. 	<ul style="list-style-type: none"> Non-contact surface temperature sensor suitable for many monitoring applications such as electrical connections in EV chargers.
			PIHER <i>sensing systems</i> an Amphenol® company
H2-High Pressure Sensor HPS	VST Temperature Sensor	CCT pressure/temperature sensors	HCSP-1BS SINGLE-PHASE OPEN LOOP CURRENT SENSORS
<ul style="list-style-type: none"> High pressure tanks and reservoirs Filling and refueling stations Measure and testing technology 	<ul style="list-style-type: none"> H2 applications and special media Cooling-water systems Fuel cell systems 	<ul style="list-style-type: none"> Climate control system in vehicles with alternative drives Heat pump Thermal management (battery) Compact size and minimal weight 	<ul style="list-style-type: none"> Busbar mount Simple / dual analog ratiometric output ±200A to ±1500A Galvanic separation between power and control

PIHER <i>sensing systems</i> an Amphenol® company	PIHER <i>sensing systems</i> an Amphenol® company	PIHER <i>sensing systems</i> an Amphenol® company	PIHER <i>sensing systems</i> an Amphenol® company
HCSP-3BS THREE-PHASE CURRENT SENSORS FOR TRACTION INVERTER	HCSO-1W WIRE MOUNT AUTOMOTIVE OPEN LOOP HALL EFFECT CURRENT SENSOR	SSH-G01 SPEED AND DIRECTION SENSOR FOR TRANSMISSION GEAR SPEED	PSCI High Speed e-Motor Rotor Position Sensor
<ul style="list-style-type: none"> • Busbar mount • 3 simple analog ratiometric outputs • Current values: Up to 1200A • Compatibility with Infineon HybridPack • Press fit contact 	<ul style="list-style-type: none"> • Cable mount • Simple / dual analog ratiometric output • Current values: $\pm 25A$ to $\pm 1000A$ • Dual channel high/low current 	<ul style="list-style-type: none"> • Speed and direction • Fast and near zero speed sensing capable • Compact and rugged • Resistant to moist and high vibration environments 	<ul style="list-style-type: none"> • Up to 200k rpm • Demodulated sine-cosine output / no converter needed • Strayfield immunity • Lightweight and compact
			
SGX <i>SENSORTECH</i>	SGX <i>SENSORTECH</i>	Honeywell	Honeywell
SGX-BLD1, BLD2 Hydrogen and EV battery gas leak detection sensor	SGX-TRDU5 Hydrogen and Battery Leakage Detection Sensor	SNG-S Series Speed Sensors	BAS Series Battery Safety Sensors
<ul style="list-style-type: none"> • Automotive product • Fast response time (<1 second) • Thermal conductivity gas sensor • High H2 range detection from 0 up to 10% • CO gas sensor (BLD2 only) 	<ul style="list-style-type: none"> • Temperature range: -40°C to 140°C • Insensitive to angular rotation during assembly • Moisture ingress protection rated to IP69K 	<ul style="list-style-type: none"> • Temperature range: -40°C to 140°C • Insensitive to angular rotation during assembly • Moisture ingress protection rated to IP69K 	<ul style="list-style-type: none"> • Detects particulate matter such as smoke, drops of liquid, dirt in Lithium-ion battery packs • Two operating modes allows battery monitoring in low power mode
			
Honeywell	Honeywell	Honeywell	Littelfuse
BPS series Battery Safety Sensors	CSHV Series open loop current sensors	CSNV700 Series Flux Gate Current Sensors	54100 and 54140 Series TMR Sensor
<ul style="list-style-type: none"> • Settable warning threshold for customization to fit end application operating conditions • Two operating modes allows battery monitoring in low power mode 	<ul style="list-style-type: none"> • Different sensing ranges: $\pm 100A$ to $\pm 1500A$ • precise battery state measurement • easy integration into different magnetic environments. 	<ul style="list-style-type: none"> • Different sensing ranges: $\pm 700A$ • precise battery state measurement • easy integration into different magnetic environments 	<ul style="list-style-type: none"> • Magnetically operated position sensor • Operation with north or south pole • Digital switching • High Sensitivity
			

Sensors, Power & Passives

			
TTape™ Distributed Temperature Monitoring	TAS Series High-Precision TMR Angle Sensors with Analog Output	TAD Series High-Precision TMR Angle Sensors with Digital Output	Pressure Sensor MiniCell™
<ul style="list-style-type: none"> Simple integration with existing BMS solutions complementing NTCs No calibration or temperature look-up tables needed AEC-Q200 qualified 	<ul style="list-style-type: none"> Specialized angle sensor for use under harsh environmental conditions. High reliability and low FIT rates allow operation in safety-critical applications 	<ul style="list-style-type: none"> TAD2141: TMR Sensor with integrated signal processor unit TAD 4140: Dual, independent TMR Sensors with integrated signal processor units 	<ul style="list-style-type: none"> Robust design High accuracy Suitable for aggressive liquids and gases Differential pressure measurement
			
			
Pressure Sensor AFA	300 Series Epoxy Glass RTD Sensors	MGJ1 and MGJ2 Series DC/DC Converters	PPH Snubber Capacitor
<ul style="list-style-type: none"> Pressure Range from 1bar to 11bar Rugged, screw-in design Suitable for non-freezing media Absolute pressure measurement 	<ul style="list-style-type: none"> Rectangular, flat, laminated stator stick Easily inserted between coils in stator of motor Maximum temperature 155°C 	<ul style="list-style-type: none"> 1W and 2W SMD gate drive DC-DC converters AECQ104 – pending Ideal for driving IGBT and SiC MOSFET 	<ul style="list-style-type: none"> 1µF capacitance rating 600VAC voltage rating 800A peak current 2400A surge current
			
			
AEC-Q200 compliant Inductors and Transformers	CSS Series High Power Current Sense Resistors	HCT Trasnformer	HCM1A-V2 High Current inductors
<ul style="list-style-type: none"> Excellent long term stability Low inductance Low thermal EMF AEC-Q200 compliant 	<ul style="list-style-type: none"> Excellent long term stability Low inductance Low thermal EMF AEC-Q200 compliant 	<ul style="list-style-type: none"> Toroid core for high coupling and low radiation Complies with IEC/UL 60664-1 and IEC/UL 62368-1 AEC-Q200 compliant 	<ul style="list-style-type: none"> Novel core material and automated process AEC-Q200 G1 (2100hrs at 155C, ESD HBM 8kV, up to 30g vibration) Low DCR and low core loss
			

 <p>EATON Powering Business Worldwide</p>	 <p>knowles PRECISION DEVICES</p>	 <p>knowles PRECISION DEVICES</p>	 <p>KOA</p>
UN ECE R10 and R100 qualified Supercap Modules	Hi Voltage MLCC	KC Link Cap	Anti Surge Resistors
<ul style="list-style-type: none"> • Highest power and energy density on the market • IP65 Ruggedized construction • UN ECE R10 and R100 qualified 	<ul style="list-style-type: none"> • Safety capacitors with 305Vac rating • Safety capacitors with 1kVdc rating • Includes 1812 Y2 safety capacitor 	<ul style="list-style-type: none"> • Standard and large size MLCCs, up to 3KV • StackiCap™ high CV high-voltage capacitors • Safety certified MLCCs, AC DC dual rated 	<ul style="list-style-type: none"> • Outstanding pulse performance (SG73, SG73P, SG73G) • Excellent in ESD characteristics (SG73, SG73S) • High component and equipment reliability
			
 <p>KOA</p>	 <p>KYOCERA AVX</p>	 <p>KYOCERA AVX</p>	 <p>KYOCERA AVX</p>
Metal Plate Shunt Resistors	TCO Polymer	TCQ Polymer	Automotive MLCC
<ul style="list-style-type: none"> • 0.5mΩ to 20mΩ • 1W (0805 inch) to 5W (2512 inch) • Current ratings up to 100A • T.C.R.: ±50 / ±75ppm/K • 0.6... 0.7mm low profile height 	<ul style="list-style-type: none"> • Conductive polymer electrode • Robust design for automotive applications • Meets requirements of AEC-Q200 • -55 to +150°C operation temp. 	<ul style="list-style-type: none"> • 175°C rated, with no derating • AEC-Q200 qualified • Bi-Directional transient voltage protection • EMI/RFI attenuation 	<ul style="list-style-type: none"> • AEC-Q200 qualified • Plated with nickel/tin finish • Made with high-purity ceramics • Highly reliable
			
 <p>Laird A DuPont Business</p>	 <p>Lelon</p>	 <p>OHMITE</p>	 <p>Littelfuse</p>
Thermal Interface Products	Aluminium Polymer	Current Sensing Module	AUMOV® Series Varistors Series
<ul style="list-style-type: none"> • Thermal Interface Materials (TIMs) conduct heat between two or more solid mating surfaces. • They improve heat transfer between them and enhance the efficiency of the thermal management system. 	<ul style="list-style-type: none"> • +105°C operating temperature ceiling, assured for 2000 hours • 4.4mm to 12.7mm lengths available • 3μA to 3200μA leakage currents available 	<ul style="list-style-type: none"> • 5KV galvanic isolation • IP40-compliant housing design • CAN2.0B interface isolated, 120Ω internal terminated 	<ul style="list-style-type: none"> • Complies with 1000 cycle, -55°C to 125°C, thermal shock cycling test • Wide operating voltage range • Three disc sizes available: 10mm, 14mm and 20mm
			

			
Auto PPTC	HC 20EV Series High Current Fuse	Nano Fuse	Low ESL MLCC
<ul style="list-style-type: none"> AEC-Q200 qualified, RoHS compliant, and ISO/ TS16949 certified Surface-mount form factor High performance Small footprint – 1812 size 	<ul style="list-style-type: none"> Interrupting rating: 16kA at 500VDC Voltage rating: 500VDC Current ratings 60 – 125A M6 bolt-down terminals 	<ul style="list-style-type: none"> Meets AEC-Q200 automotive qualifications Operating temperature range from -40°C to 85°C Small size/surface mountable type 	<ul style="list-style-type: none"> Low ESL Allows a reduction in the number of components Contributes to noise suppression
			
			
Power Inductors	Automotive Resonator Crystal	Common Mode Chokes	High Power SMD Fuse
<ul style="list-style-type: none"> Wire wound metal alloy type for automotive power lines Wire wound ferrite type for automotive power lines 	<ul style="list-style-type: none"> AEC-Q200 SMD device 2.0mm x 1.6mm in dimension (LxW) 50.0000MHz frequency 	<ul style="list-style-type: none"> Low magnetic leakage flux Excellent winding insulation Broad range of inductance ratings Horizontal and vertical orientations 	<ul style="list-style-type: none"> High breaking capacity Safe tripping in 15s at twice the rated current High operating temperature range
			
			
Common Mode Chokes	PCM Solid Aluminium Capacitor	GYE Hybrid Capacitor	ERJB Series
<ul style="list-style-type: none"> Wide variety of package sizes available 2.8Arms to 20Arms current rating range 94μH to 1.8mH inductance range 	<ul style="list-style-type: none"> High reliability, low ESR, high ripple current 8000 hours life at +125°C SMD type, lead-free reflow soldering condition at +260°C peak 	<ul style="list-style-type: none"> High reliability, low ESR, and high ripple current Long life of 4000 hours at 125°C, high-capacitance AEC-Q200 compliant 	<ul style="list-style-type: none"> Separated resistive elements for surge distribution Achieves small size and high power and overload characteristics
			






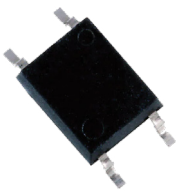
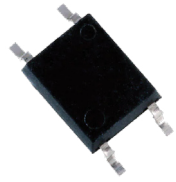





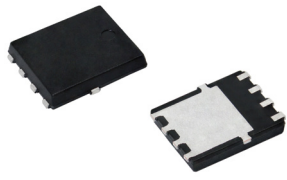
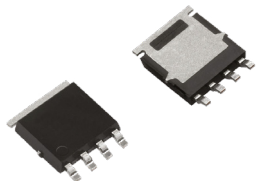
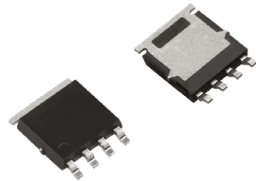
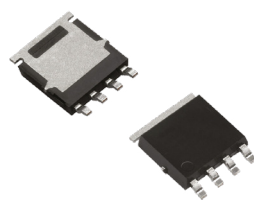






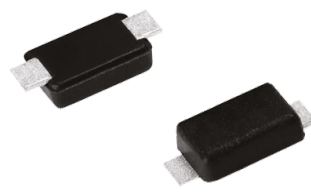
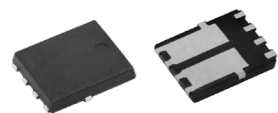
Panasonic INDUSTRY	Panasonic INDUSTRY	Panasonic INDUSTRY	 SAMSUNG ELECTRO-MECHANICS
ZE Hybrid Cap	ZKU Hybrid Cap	ZS Conductive Polymer	High Voltage MLCC
<ul style="list-style-type: none"> Low leakage current Operating temperature range: -55°C to +145°C High rated voltage range: 25 to 63 VDC RoHS / REACH compliant 	<ul style="list-style-type: none"> 39µF up to 560µF Endurance rating 4000 hours at 125°C Operating temperature -55°C to +125°C Rated voltage 25VDC / 35VDC 	<ul style="list-style-type: none"> Surface mount package 4000 hour life at 125°C High ripple current and large capacitance Vibration proof variants available on request 	<ul style="list-style-type: none"> Normal type (epoxy) 1206 case size Excellent DC bias characteristics AEC-Q200 qualified
			
 SAMSUNG ELECTRO-MECHANICS			
High Temperature Powertrain MLCC	Ceralink Cap	CGA and CKG MLCC	DC Link Cap
<ul style="list-style-type: none"> Powertrain high-temperature solution Normal type (epoxy) 0805, 1206, and 1210 sizes Excellent DC bias characteristics 	<ul style="list-style-type: none"> Rated voltages from 500V DC to 900V DC Capacitance range from 0.25µF to 20µF Ideal for high currents and in combination with SiC or GaN 	<ul style="list-style-type: none"> Low self-heating and high ripple resistance due to low ESR AEC-Q200 compliant 	<ul style="list-style-type: none"> High reliability for severe ambient conditions Long life – 50.000h (85°C, rated voltage) AEC-Q200 qualified capacitors available on request
			
			
ESD Protection	NTC Thermistor	SMD Varistor	Metal Shunt Resistors
<ul style="list-style-type: none"> European factory (fast and flexible) Short lead-times Wide product portfolio AEC-Q200 certified 	<ul style="list-style-type: none"> Type families qualified acc. to AEC Q200 Robust design for high-voltage applications NTC families with standard lead spacing design 	<ul style="list-style-type: none"> Transient protection acc. to ISO 7637-2 and 16750-2 ESD protection acc. to IEC 61000-4-2 AEC-Q200 certified 	<ul style="list-style-type: none"> Precision to 1% and 100ppm/K Inductance <5nH Thermal EMF <1µV/K Value range 50 to 250µΩ Power rating 36W
			

	 The DNA of tech.	 The DNA of tech.	 The DNA of tech.
Moulded Power Inductors	IHL D Inductors	IHLE Inductors	MC HP High Power Thin Film Resistors
<ul style="list-style-type: none"> HM72L up to +125°C/HA72L up to +155°C HA72L: AEC-Q200 certified Up to 80A maximum current 3Mhz frequency performance Low core loss 	<ul style="list-style-type: none"> Two IHLP® style inductors placed vertically in one board-space saving package AEC-Q200 qualified Two sizes available: 3232 and 4032 	<ul style="list-style-type: none"> Integrated e-shields reduce EMI High temp. operation to +155°C AEC-Q200 qualified Coplanarity of their four terminal $\leq 100\mu\text{m}$ 	<ul style="list-style-type: none"> Available in case sizes 0402, 0603, and 0805 Rated dissipation up to 0.4W for case size 0805 Operating temperature up to 175°C
			
 The DNA of tech.			 a YAGEO company
Power Metal Plate™ Shunts	AS Series MLCC	Auto Grade Surge Resistors	Auto Grade Y2 Cap
<ul style="list-style-type: none"> Very low inductance 0.5nH to 5 Excellent frequency response to 50MHz Low thermal EMF ($< 3\mu\text{V}/^\circ\text{C}$) AEC-Q200 qualified 	<ul style="list-style-type: none"> AEC-Q200 qualified and PPAP ready IATF 16949 certified Board flex $\geq 5\text{ mm}$ 100% AOI & SPC monitor 	<ul style="list-style-type: none"> AEC-Q200 qualified and PPAP ready IATF 16949 certified Board flex $\geq 5\text{ mm}$ 100% AOI & SPC monitor 	<ul style="list-style-type: none"> Approvals: ENEC, uL, cUL, CQC Class Y2/X1 (IEC 60384-14) TURAC /1,500 V URDC acc. to IEC 60384-14 Self-healing properties
			
 a YAGEO company	 a YAGEO company	 a YAGEO company	 A YAGEO Company
COG MLCC	KC Link Cap	METCOM Inductors	PM2155 Series
<ul style="list-style-type: none"> Industry-leading CV values High volumetric capacitance with low leakage current High thermal stability High ripple current capability Automotive grade available 	<ul style="list-style-type: none"> EIA 1812, 2220, and 3640 case size AEC-Q200 automotive qualified Flexible termination option available 	<ul style="list-style-type: none"> AEC-Q200 qualified High efficiency inductor Metal composite powder Shielded construction Low magnetic flux leakage 	<ul style="list-style-type: none"> Push pull converter transformer IEC 62368 and 61558 basic Insulation compliant 12mm creepage 4KVRms isolation (600VRms continuous)
			

Discrete Semiconductors

BOURNS® 5.0SMDJ-Q TVS-Series 5kW in SMC Package <ul style="list-style-type: none"> • Surface mount SMC package • Standoff voltage: 5 to 170 volts • Peak Pulse Power: 5000 watts • AEC-Q101 compliant 	BOURNS® CDSOT23-T24CAN-Q CANbus Protectors <ul style="list-style-type: none"> • Single device for two I/O lines • Low capacitance for high-speed CANbus • AEC-Q101 compliant 	BOURNS® TBU-DB055-100-WH-Q High-Speed Protectors <ul style="list-style-type: none"> • Superior circuit protection • Blocks surges up to rated voltage limit • High-speed performance • Small SMT package 	 150V AECQ Ultra Junction Power MOSFETs <ul style="list-style-type: none"> • AEC-Q101 Qualified • Low on-resistance RDS(ON) and gate charge Qg • dv/dt ruggedness • Avalanche capability 
 IX4340 5A, Dual Low-Side MOSFET Driver <ul style="list-style-type: none"> • Two independent drivers, each capable of sourcing and sinking 5A • CMOS and TTL compatible inputs 	 IX4351NE SiC MOSFET and IGBT Driver <ul style="list-style-type: none"> • Separate 9A peak source and sink outputs • Internal charge pump regulator for selectable negative gate drive bias • Thermal shutdown 	 IXTY2P50PA P-Ch -500V, 2A MOSFET <ul style="list-style-type: none"> • AEC Q101 Qualified • Avalanche Rated • Rugged PolarPTM Process • Low Package Inductance • Easy to Mount 	 Pxxx0S3N-A - AECQ High Surge Current SiDActor <ul style="list-style-type: none"> • AEC-Q101 qualified • High surge rating 8/20 µs 3000 A protection • DO-214AB package • Low voltage overshoot & Low on-state voltage 
 SZ1SMB Series 600W in SMB Package <ul style="list-style-type: none"> • Zener transient overvoltage suppressors • Peak power – 600W at 1ms • ESD rating of class 3 (>1 kV) per human body model 	 SZSMF4L Series - AECQ TVS Diode in SOD-123FL <ul style="list-style-type: none"> • Working peak reverse voltage range 5V to 78V for uni-directional • range 10V to 78V for bi-directional • Peak power: 400 watts @ 1 ms 	 MER2DAL-AU SMD Super Fast Recovery Rectifier <ul style="list-style-type: none"> • Superfast recovery times-epitaxial construction • Low forward voltage, high current capability • Low leakage • AEC-Q101 qualified 	 PJEC2415VM1WS-AU ESD Protection Diode <ul style="list-style-type: none"> • Bidirectional ESD protection of one line • Low leakage current maximum of 0.05A at rated voltage • AEC-Q101 qualified 

Discrete Semiconductors

			 The DNA of tech.
PJQ5540V-AU - 40V N-CH Enhancement Mode MOSFET	TLX9175J Photo Coupler	TLX9906 Photo Coupler	AEC-Q101 Qualified DFN-Packaged Rectifiers
<ul style="list-style-type: none"> • RDS(ON), VGS@10V, ID@20A<2.1mΩ • Excellent FOM • Standard Level Drive • AEC-Q101 qualified 	<ul style="list-style-type: none"> • Normally open (1-Form-A) device • Peak off-state voltage: 600V (min) • Trigger LED current: 3mA (max) • AECQ101 qualified 	<ul style="list-style-type: none"> • MOSFET gate driver • Isolation voltage: 3750Vrms (min) • Operating temp. -40 to 125°C • AECQ101 qualified 	<ul style="list-style-type: none"> • Wettable flanks - DFN3820A package • 1A to 5A forward current range • 200V, 400, or 600V repetitive peak reverse voltage options
			
 The DNA of tech.	 The DNA of tech.	 The DNA of tech.	 The DNA of tech.
R3T2FPHM3/I - Hybrid Rectifier and TVS	SQJ444EP Automotive N-Channel 40V MOSFETs	SQJA80EP Automotive N-Channel 80V MOSFETs	SQJA81EP AECQ Grade P-Channel 80V MOSFET
<ul style="list-style-type: none"> • Automotive two-in-one solution for rectifier and TVS • Oxide planar chip junction • AEC-Q101 qualified available 	<ul style="list-style-type: none"> • TrenchFET® power MOSFET • AEC-Q101 qualified • 100% Rg and UIS tested 	<ul style="list-style-type: none"> • TrenchFET® power MOSFET • AEC-Q101 qualified • 100% Rg and UIS tested 	<ul style="list-style-type: none"> • Maximum on-resistance, 17.3mΩ at 10V • Gate charge down to 52nC at 10V • Compact 5.13mm by 6.15mm PowerPAK® SO-8L
			
 The DNA of tech.	 The DNA of tech.	 The DNA of tech.	 The DNA of tech.
TA6F6 Series SMD PAR® TVS	VOMDA1271-AECQ MOSFET Driver	VS-1EFH02HM3 Hyperfast Rectifier, 1A FRED Pt®	VS-8DKH02HM3 Hyperfast Rectifier, 2x4 A
<ul style="list-style-type: none"> • Very low profile - typical height of 0.95 mm • TJ = 185 °C capability • Excellent clamping capability • AEC-Q101 qualified 	<ul style="list-style-type: none"> • AEC-Q102 qualified • Isolation test voltage 3750 VRMS • Operating temperature from -40 °C to +125 °C 	<ul style="list-style-type: none"> • Specified for output and snubber operation • Low forward voltage drop • Low leakage current 	<ul style="list-style-type: none"> • Hyperfast recovery time, reduced Qrr, soft recovery • 175°C max operating junction temperature • Specific for output and snubber operation
			

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