As one of the industry’s leading distributors, Avnet has years of strategic and tactical experience in the automotive sector. We work closely with our customers on world-class and high-profile projects that will define the future of automotive. At Avnet, we help you reach further with the widest range of products combined with our proven technical and world-class support, logistics and programming services.

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WHAT’S INVOLVED AND WHAT WE SUPPORT

SHIFTING INTO HIGH GEAR
For years, the automotive and transportation industries were driven by how much power you could get out of a vehicle, and then it was how much fuel efficiency you could achieve. Today, consumers are demanding a new definition of their transportation experience – one which includes: keeping the price down, the size efficient, with state-of-the-art connectivity and optimization, all built on non-traditional power sources at a higher degree of integration.

REACH FURTHER
That’s a pretty tall order for any single company to fill – unless you’re supported by a partner like Avnet with an ecosystem that helps navigate the competing and emerging standards within the marketplace.

RELIABILITY & HIGH AVAILABILITY AT ANY SPEED
Built on years of experience as a leader in safety and security, today, Avnet is helping to define and support connectivity with Tier I through Tier III suppliers.

GROWTH, AUTONOMY, FUSION AND FUTURE DIRECTION
As the car becomes another node on the network and autonomous transportation becomes more of a reality than science fiction, Avnet is leading the way in supporting interaction between the driver, the vehicle and the environment.

SCALABLE AND FLEXIBLE
Automotive and transportation electronics designers are faced with many technical challenges during the design process. Customer journeys are not linear – Their real lifecycle has no clear start/end points. We serve customers on their terms.
AUTOMOTIVE SOLUTIONS

SPECIALIZED DESIGN AND SUPPORT
We have assembled a team of Avnet, Supplier and Partner resources to deliver a true Automotive Segment Supply and Design Chain Support Ecosystem.

AVNET SALES PROFESSIONALS, FAES, SUPPLY CHAIN MANAGERS AND QUALITY ENGINEERS
Providing customers with day to day specialized supply and design chain support for automotive segment requirements.

SUPPLIER NETWORK
Avnet’s line up of supplier partners provide a full portfolio of automotive grade devices and solutions.

ENGINEERING TO “TOTAL SOLUTION” DESIGN PARTNERS
The Avnet Technical Network connects customers to design resources with the objective of accelerating new project development. These in house/partner resources offer engineering design services, software expertise, and manufacturing capabilities tied to the automotive segment and key applications.

AVAIL™ BLOCK DIAGRAM APP
Avnet’s FAE team is armed with our internal AVAIL Block Diagram Application, an interactive engineering tool built on the Microsoft Visio platform. The systems allows Avnet to take advantage of an elite knowledge base of engineering talent and manufacturer information. We have developed specific subsystem block diagrams for popular applications like Automated Car ADAS, Car Efficiency, In-Vehicle Networking and Infotainment to help customers develop system level Automotive Segment solutions quickly and efficiently.

AUTOMOTIVE CHALLENGES ACCEPTED!
Avnet puts you in the driver’s seat by providing technical assistance every step of the way, supply chain services that accelerate you up the on-ramp together with a complete ecosystem of technologies, to get you over the finish line.
DESIGN EXPERTISE
The addition of new capabilities into cars and other vehicles is making them virtually unrecognizable. Whether it’s the car as a node on the network or an autonomous vehicle, we’re covering new ground. Fortunately, Avnet provides vast experience along with proven development tools and reference designs to speed up the product-development journey.

For example, our team created Advanced Driver Assistance System (ADAS) reference designs, leveraging multifunction sensor technology to monitor lane drift and for collision avoidance. Avnet also has versatile embedded vision development platforms for rear-camera or smart-mirror applications. Our experience with developing options for adoption in car models will keep you clear of hazards along the way.

Avnet also understands you want to work with people who know the industry, speak the language and aren’t distracted with other priorities. Across the globe, we have teams specifically dedicated to automotive and transportation, located in the markets where design and development is happening. Our specialists come from the transportation industry. Around the globe our team shares best practices to stay finely tuned.

APPLICATIONS SERVED

SUSTAINABILITY
The right balance of economic progress, environmental care and social responsibility

Recognition of environmental responsibility is not only good for business, but become an integral part of the way how vehicles are marketed, purchased and driven. Adding Economic and Social progress brings sustainability to our future one of the most important industrial impacts.

COMFORT
Interaction between the driver, the vehicle and the environment

Comfort related electronics and electrical drives offer drivers and passengers continuously improved indoor environment with focus on the segments DIS, Telematic, DAS (Camera), Ambient & Interior Light and Sensors in order to host many other functionalities in the future.

SAFETY
Sensors register the situation in and around the vehicle

Safety spectrum ranges from purely camera-based systems, through lidar systems to radar systems; as well as the sensors for surrounding area detection, which require a very fast evaluation of data.

CONNECTED CAR
In other words "Building a New Industry"

The next ten years will see connectivity become the norm in vehicles. Today, this market comprises primarily aftermarket devices. However, the next few years will see a significant market movement as the number of cars with built in connectivity platforms will increase dramatically.
FEATURED SUPPLIERS

Amphenol

Amphenol FCI is an international connector and cable assembly solutions manufacturer of Backplane Connectors, Power Solutions, Board/Wire to Board Connectors, Input/Output Connectors, Optical Interconnect, Cable Assemblies and Flex Connectors. Amphenol FCI as a global leader in interconnect technology offers a wide range of solutions that are manufactured to withstand the diverse needs of today’s automotive industry.

AVX

AVX is a leading worldwide manufacturer and supplier of a broad line of passive electronic components and Interconnects. AVX components can be found in many automotive applications where quality and dependable products are required. From ADAS to Infotainment to Safety and everything in between, AVX has what you need in advanced passive components and interconnect solutions.

Broadcom

Broadcom Limited is a diversified global semiconductor leader built on 50 years of innovation, collaboration and engineering excellence. For the automotive industry, Broadcom offers a wide range of digital, IPM interface, gate drive optocouplers and isolation amplifiers. The first supplier to introduce 125°C plastic optocouplers for automotive applications, Broadcom automotive R2Coupler™ products are AEC-Q100 qualified.

Infineon

For leading solutions in automotive electronics from the pioneer in the industry, turn to Infineon Technologies. Products for various vehicle applications include smart high side switches, multicore microcontrollers, and led drivers. Customers profit from products resulting from nearly 40 years of experience in automotive applications and standards. A commitment to innovation and high quality means customers can count on Infineon to successfully drive automotive applications into the tomorrow and beyond.

ISSI

Automotive systems continue to become more sophisticated and complex. This creates the need for solutions that ISSI can help address. Automotive products include DRAM, SRAM, and Flash memory, along with analog products to support automotive electronics. ISSI is committed to the automotive market and committed to work with customers to provide them with the most cost-effective and highest quality products possible.

Micron

For over 25 years Micron has been a leading supplier of memory to the automotive and associated industries. Micron memory products work to optimize car engines, entertain passengers and keep our roads safer. A dedicated automotive segment team has built an in-depth understanding of the industry, contributing to the development of automotive practices and recognized methodologies. Micron’s product portfolio is designed and manufactured so that customers can rely on them as a single source for volatile and nonvolatile memory needs. Micron meets automotive compliance through: ISO 26262 – ASIL, TS 16949 and AEC-Q100 qualification.

Molex

Molex will help bring your next generation of cars to life by driving innovative interconnect and technical solutions through collaborative design. With Molex’s capabilities and extensive experience in the automotive market, high-quality solutions for the future of cars has never been so close. From the connected vehicle, safety and driver assist to body electronics and power train solutions, together, Molex can make your designs a reality.

NXP

NXP Secure and Connected Vehicle, a clear vision of the road ahead. Experience the reliability and innovation from the leader in automotive semiconductors. Electronics make up 80% of the innovation in today’s cars. With higher levels of autonomy, automotive semiconductor content will continue to increase - far beyond the car - to enable safe, secure and seamless mobility. With more than 60 years of automotive experience, NXP is set to drive this change.

Pulse

Pulse Electronics is worldwide leader in electronic component design and manufacturing. With an extensive line of state-of-the-art catalog products as well as custom capabilities, Pulse is a global supplier of electronic components to OEMs, contract manufacturers and CEMs. Pulse’s engineering design centers and manufacturing facilities (in North America, Europe and Asia) supply products to a broad international customer base. Pulse has multiple factories that are TS certified and upon request can provide PPAP documentation for automotive grade products.
Vishay's broad portfolio of automotive grade products include diodes and rectifiers, MOSFETs, optoelectronic products, resistors, inductors, and capacitors. Automotive systems include a wide range of functions and products. Vishay products are used in many automotive applications including powertrain, chassis control, body electronics, passive safety systems, exterior lighting, 48 VDC boardnet, start/stop, micro hybrid vehicles, full hybrid vehicles (HEVs), and full electric vehicles (FEVs).

Xilinx provides fully automotive qualified devices and comprehensive solutions that include operating systems, IP, and platforms to enable next generation automotive systems including Infotainment, Driver Information, and Advanced Driver Assistance Systems. Applications span from collision avoidance - encompassing image and video processing, object recognition, and analytics - to the heart of the secure connected car with semi-autonomous operations and vehicle to vehicle communications.
Featured Applications
CHALLENGES & TRENDS

Things have changed a lot in the automotive industry over the last few years, especially due to the progress of digital transformation. This has affected vehicle development in the following ways:

- The tremendous speed of IT integration into the car (autonomous car, connected car, security)
- The increasing speed of innovation that aligns car usage with consumer mobility (eMobility, on demand features and services, shared mobility)
- New business models and new players that significantly increase the competition landscape and diversify the revenue stream

These are just some of the reasons that the automotive industry is becoming more and more complex. As an actor in this space, you can master the challenges and increase your competitive edge with Avnet by your side. You benefit from a broad and unique linecard offering the optimal mix of products from the world’s leading automotive suppliers and from innovative providers of best-in-class solutions.

Connectivity to Security
- Car2Car security
- Car2Cloud security
- Function on demand

Automated to Autonomous Driving
- Safety
- Connectivity
- Sensor fusion
- Reality index (robust, real-time status)
- Vision zero

Individuality to Flexibility / Freedom
- eMobility
- Urbanization
- Shared cars
- End-2-user-experience

Featured Applications
- Automated Car ADAS
- Car Efficiency
- In-Vehicle Networking
- Infotainment

We couldn’t possibly cover all of the applications we support so we have highlighted the above in this guide. We also have expertise in a number of other applications including Crypto, ECU & Gateway, Intelligent Lighting, System Basis Chip etc...
### Applications

<table>
<thead>
<tr>
<th>Amphenol</th>
<th>AVX</th>
<th>Broadcom</th>
<th>Infineon</th>
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<th>Pulse</th>
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<tr>
<td>Wireless Charging</td>
<td>USB</td>
<td>Wi-Fi®</td>
<td>Bluetooth®</td>
<td>Touch + Gesture</td>
<td>Car Audio</td>
<td>FlexRay</td>
<td>Ethernet</td>
<td>CAN</td>
<td>LIN</td>
<td>BLDC Motor Control</td>
<td>Battery Management</td>
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AUTOMATED CAR ADAS

FROM ADAS TO AUTONOMOUS SYSTEMS – SEMICONDUCTORS AVOID ACCIDENTS AND ALLOW ROBOTIC VEHICLES

Robotic vehicles coming in reach! The today’s semiconductor solutions enable the whole industry to go more and more into robotic or driverless system development. For sure, this will be a journey – the ADAS (advanced driver assistance systems) will take over in the next steps tasks from the Driver. i.e. Emergency Braking – by the way only with the Emergency Braking Assistant it will be possible in future to achieve the maximum number stars within the framework of the Euro NCAP rating. Targeting 0 fatalities in the traffic, all automobile manufacturers are currently working on the integration of this safety-relevant system. The spectrum ranges thereby from purely camera-based systems, through lidar systems to radar systems; as well as the sensors for surrounding area detection, which require a very fast evaluation of data. In addition, appropriate actuators must be operated so that for instance the brakes are applied if a relevant event occurs (for example: a pedestrian walks in front of the vehicle), so that an accident is avoided or at least made less serious. The surround-view types of driver assistance systems represent a mix of safety and comfort functions, by which the images from usually four cameras are merged and optically corrected in such a way that a bird’s eye view of the vehicle is shown on the central display.

For robotic functions one trend is to bring all data from all sensors to a sensor fusion system. By having all environmental data available in real-time, this will allow get control of the vehicle very close to the ‘human brain’. Nowadays multi-core-systems and the FPGA technology are the enabler from the semiconductor side for the sensor fusion.

Sensors – Sensors make driver assistance systems possible

Evaluation of sensor signals is necessary to actuate various safety-relevant functionalities. For instance, for ABS a rotational speed sensor is necessary for each individual wheel, while ESP/ESC requires a yaw-rate sensor as well. In a tire pressure monitoring system (TPMS), a pressure sensor can in turn offer valuable services. The ultrasonic sensors in the simple parking distance warning devices, the radar sensors and the front camera belong in this category. To put it briefly: a driver assistance system would not be possible without sensors.

CAR EFFICIENCY

HEV/EV – NEW MARKET FOR CLEVER ELECTRONIC SOLUTIONS

Hybrid electric vehicles (HEV) and fully electrically driven vehicles (EV) each require sophisticated electronics. As well as for control of the traction motor, the battery above all requires a separate control unit. The system known as BMS (Battery Management System) constantly detects the present state of charge of each individual cell and uses cell balancing to equalize the charge between the cells as required, monitoring the whole battery and ensuring the safety of this energy storage device. Because a constantly running internal combustion engine is no longer available in (H)EVs, all the auxiliary equipment such as the air conditioning or power steering must be driven electrically.

Stop/Start – Less pollution with the Stop/Start system

Stop/start systems switch off the engine during waiting times at traffic lights, etc., — but only if certain general conditions are met. To do this, the control unit of the stop/start system must evaluate information from various sensors and then control the engine and starter motor accordingly.

Battery Management – The centerpiece of every traction battery

The battery management system (BMS) is the centerpiece of every traction battery because it is responsible for both the safety and also the availability and longevity of the battery. In addition it controls the air conditioning of the battery so that it is always kept in an optimum and safe operating state. The BMS must be highly available and must never fail, so that a thermal runaway (burning) of the battery and the associated dangerous situation are prevented under all circumstances.

Motor Control – High reduction of energy consumption

The energy consumption in vehicles with internal combustion engines can be reduced by the electrification of accessories. Dedicated motor control units are required to control each of the electric motors in these accessories, as well for the control of other actuators. The spectrum here ranges from microcontrollers with integrated PWM controllers to complex motor control ICs with integrated drivers.

EPS/EPHS Power steering – Highly safety relevant system

In electric power steering (EPS) and electro-hydraulic power steering (EHPS), sensors and especially-safe microcontrollers are also necessary in addition to motor controls, because power steering counts as one of the highly safety-relevant systems in the vehicle and must meet the requirements of the ISO 26262 standard.
IN-VEHICLE NETWORKING

WORKING WITHOUT A DRIVER – THE NEW HARVESTERS

Networks such as CAN, LIN, FlexRay, MOST and also now Ethernet form the backbone of the vehicle. Besides solutions for passenger vehicles, EBV for example also offers intensive support for Ethernet solutions which are used in agriculture. In various applications in this area, CAN is often too slow so that the data bandwidth is simply not adequate. Construction machinery also often requires the high bandwidth, which only Ethernet offers at present. Ethernet has a clear advantage when for example it is necessary to capture the cutting result of a combined harvester together with the GPS data and to process this data immediately. This data is then used again as input for the application of fertilizer and seed in the following year. For instance if a meandering surface stream makes the seed too wet at certain places time and again, then the system can also decide to apply no seed at all at these places. Both in North America and in South America, many combined harvesters operate now without a driver; this is much easier there than in Europe because of the very large fields.

Telematics - Communication in vehicles

Telematic units are also used, above all in commercial vehicles. This concerns communication units that create a connection to a center. Because the communication unit is located in a vehicle however, it is also exposed to the demanding vehicle environment. Developing into vehicle to vehicle and vehicle to environment connection.

INFOTAINMENT/COMFORT

DIS INFOTAINMENT – GREAT COMFORT COMBINED IN ONE SYSTEM

Infotainment and Driver Information Systems (DIS) have now gained a great deal of importance, even in smaller cars. This means that the display functionality of the vehicle, together with navigation, Internet access, radio and other music playback units are integrated into one system.

Diagnostics – WLAN interface directly in the vehicle

More and more often, access to the OBD2 socket is achieved via a WLAN adapter plugged in at that point. All the communication with the workshop tester is done here via the WLAN interface. The next step is then a matter of bringing the WLAN interface directly into the vehicle and installing it permanently. If for instance a vehicle is equipped with a WLAN hotspot, then the manufacturer must decide whether the workshop is allowed to carry out an identification of the vehicle by WLAN or not.

RF-Systems – Keyless entry with RF-systems

Locking systems belong in the area of RF systems for applications such as remote keyless entry (radio frequency operation instead of a mechanical key), as well as tire pressure control systems or the wireless connection of non-critical system sensors to the other systems of the vehicle.

Sound Generators – Reduce the sound inside a vehicle for more comfort

There are primarily two different technologies in the area of sound generators. Firstly there is the creation of sound, for example to allow a very quiet electric vehicle to also be heard by blind people. Thus there is the directive in Germany that electric vehicles must be clearly heard, with up to 60 dBa at speeds of up to 30 km/h. The second area of producing sounds is the generation of counter-sound, which is better known as noise-cancellation. The area of noise-cancellation blends seamlessly into the area of comfort, because quietness in the passenger compartment is of great value.
Featured Products
Automotive campaign featured supplier technologies

| Technology          | Vehicle Networking | Sensors | RF & Wireless | Relays & Switches | Programmable | Power | Passives | Memory | MCU/MPU | Logic & Timing | LED/Opto | Interconnect | Disretes | Analog |
|---------------------|--------------------|---------|---------------|-------------------|--------------|-------|----------|--------|---------|----------------|----------|--------------|----------|
| Amphenol            | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| AVX                 | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Broadcom            | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Infineon            | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| ISSI                | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Micron              | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Molex               | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| NXP                 | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Pulse               | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| SanDisk             | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Vishay              | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
| Xilinx              | •                  | •       | •             | •                 | •            | •     | •        | •      | •       | •              | •        | •            | •        | •      |
Amphenol FCI is a global leader in interconnect technology offering a wide range of solutions that are manufactured to withstand the diverse needs of today's automotive industry.

AMPHENOL FCI AUTOMOTIVE SOLUTIONS

USB TYPE C

Amphenol FCI’s USB 3.1 Type C is the future of the USB technology providing multifunction single cable solution for data, power, audio and video. The small form factor supports the evolving design trends. The reversible design enables quick and easy connections no matter which way it is inserted. It supports scalable power delivery up to 100 W and performance speed up to 10 Gbps.

<table>
<thead>
<tr>
<th>Features and benefits</th>
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<tbody>
<tr>
<td>Robust and small design</td>
</tr>
<tr>
<td>Reversible</td>
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<tr>
<td>SuperSpeed 10 Gbps (up to 10 Gbps in each direction with future speeds anticipated at 20 Gbps)</td>
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<tr>
<td>RoHS compliant, lead-free, halogen-free</td>
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<tr>
<td>Supports 5A mx. Power supply (compatible with USB Power Delivery)</td>
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</table>

CONAN® 1.0MM

Amphenol FCI’s Conan® 1.00 mm is a mezzanine connector designed for industrial applications and harsh environments. Its unique design with an audible “click” sound enhances the security and ease of use. RoHS compliant and lead free

<table>
<thead>
<tr>
<th>Features and benefits</th>
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<tbody>
<tr>
<td>Vertical configuration</td>
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<tr>
<td>Right angle configuration</td>
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<tr>
<td>Vertical housing and terminal profile guarantees support of up to 5 Gb/s</td>
</tr>
<tr>
<td>Vertical versus vertical mating configuration</td>
</tr>
<tr>
<td>Vertical receptacle versus RA header mating configuration</td>
</tr>
<tr>
<td>Audible “click” mating and polarization</td>
</tr>
<tr>
<td>Multiple packaging options available</td>
</tr>
<tr>
<td>Locating pegs and metal hold down options</td>
</tr>
</tbody>
</table>
BERGSTIK® 2.54MM
Amphenol FCI's BergStik® 2.54mm unshrouded headers are available in surface-mount (SMT), through-hole (THT), press-fit, stacking and pin-in-paste (PIP) versions. Designed in single and double row, they are available in straight or right angle options, from 2 to 72 positions. Featuring a “breakaway” design, each connector can be cut or broken to length to suit the application profile with a maximum current rating of 3A per contact.

Features and benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
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<tbody>
<tr>
<td>High temperature performing plastic</td>
<td>Reflow compatible</td>
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<tr>
<td>Variable spacing height for stacking headers</td>
<td>Meets your specific needs</td>
</tr>
<tr>
<td>Suitable for dual entry connectors</td>
<td>Meets your specific needs and is useful for mezzanine application</td>
</tr>
<tr>
<td>Drawn (not tamped) 0.64 mm square wire presenting 4 equal quality surfaces</td>
<td>Can be used for wire wrapping</td>
</tr>
<tr>
<td>Stand offs design</td>
<td>Allowing cleaning to eliminate soldering contaminations</td>
</tr>
<tr>
<td>Duplex Plating and Tin-Lead plating in press-fit area</td>
<td>Cost efficient and Easy pin insertion on the PCB</td>
</tr>
<tr>
<td>Retention legs optional</td>
<td>Higher retention on your PCB</td>
</tr>
<tr>
<td>According to DIN 41651 specification, HE13 and BT D2632</td>
<td>Qualified product</td>
</tr>
</tbody>
</table>

RIB-CAGE® BOARD-TO-BOARD
Amphenol FCI's Rib-Cage® connectors meet high performance standards for use in applications with shock and vibration. The versatile connector system includes dual-row, pin and socket connectors for right-angle and mezzanine connections between printed circuit boards (PCB) or flexible printed circuits (FPC).

Features and benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
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</thead>
<tbody>
<tr>
<td>10 to 100 position sizes in 10 position increments</td>
<td>Comprehensive range of sizes for all needs</td>
</tr>
<tr>
<td>Vertical V5 vertical mating configuration</td>
<td>Suitable for parallel board stacking applications</td>
</tr>
<tr>
<td>Exclusive Rib-Cage™ multi-point, gold plated receptacle contacts</td>
<td>Optimal reliability in high vibration and harsh shock applications</td>
</tr>
<tr>
<td>Multiple packaging options available</td>
<td>Suitable for a variety of feeding processing</td>
</tr>
</tbody>
</table>

USB 2.0 & 3.0
Amphenol FCI offers both USB 2.0 and 3.0 connector solutions. These connectors are ideal for use in removable storage devices into automotive multimedia systems. These connectors meet typical automotive application requirements in terms of temperature range; robustness and mating cycles.

Features and benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
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<tbody>
<tr>
<td>Meet USB 3.0 specifications</td>
<td>Mating interface follows USB 3.0 specification</td>
</tr>
<tr>
<td>Similar interface as USB 2.0 standard A&amp;B connectors, with added pins for SuperSpeed USB</td>
<td>Complete footprint compatibility with USB 2.0</td>
</tr>
<tr>
<td>Supports On-The-Go (OTG)</td>
<td>Accessible and convenient for users</td>
</tr>
<tr>
<td>Available in vertical through hole, right-angle through hotel and upright styles for USB 3.0 Available in cable solution, plug and right-angle SMT receptacle version for Micro USB 3.0</td>
<td>Meets environments, health and safety requirements</td>
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</tbody>
</table>
AVX is a worldwide leading supplier to the automotive industry. We offer a wide range of passive components and interconnect solutions manufactured to the highest quality and reliability standards required by demanding automotive applications. Transportation trends and new technological advancements in the fields of safety, comfort, convenience, power train, and fuel efficiency drive the need for more advanced, reliable, and effective electronics systems. With our expanding portfolio of automotive products, and our focus on quality, reliability, research, and development, AVX is committed to supporting the automotive industry’s needs today and into the future.

**AUTOMOTIVE POLYMER**

AVX’s TCO low ESR conductive polymer capacitors series with AEC-Q200 qualified components developed to deliver high endurance & performance stability to address the reliability requirements of automotive applications. AEC-Q200 qualified, the TCO Series meets the AEC’s challenging 125° C lifetime stability test and humidity bias testing at 85° C / 85% relative humidity, loaded, for up to 1,000 hours.

TCO Part Number Formula:

<table>
<thead>
<tr>
<th>TCQ</th>
<th>B</th>
<th>476</th>
<th>M</th>
<th>006</th>
<th>#</th>
<th>0070</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Case Size</td>
<td>Capacitance Code</td>
<td>Tolerance</td>
<td>Rated DC Voltage</td>
<td>Packaging</td>
<td>ESR in mΩ</td>
</tr>
<tr>
<td>See table above</td>
<td>μF code: 1st two digits represent significant figures, 3rd digit represents multiplier (number of zeros to follow)</td>
<td>M = ±20%</td>
<td>R = Pure Tin 77%</td>
<td>S = Pure Tin 13%</td>
<td>Reel</td>
<td></td>
</tr>
</tbody>
</table>

**FLEXISAFE MLC CHIPS**

AVX has developed a range of components specifically for safety critical applications. Utilizing the award-winning FLEXITERM™ layer in conjunction with the cascade design previously used for high voltage MLCCs, a range of ceramic capacitors is now available for customers who require components designed with an industry leading set of safety features. The FLEXITERM™ layer protects the component from any damage to the ceramic resulting from mechanical stress during PCB assembly or use with end customers. Board flexure type mechanical damage accounts for the majority of MLCC failures. The addition of the cascade structure protects the component from low insulation resistance failure resulting from other common causes for failure, such as thermal stress damage, repetitive strike ESD damage, and placement damage. With the inclusion of the cascade design structure to complement the FLEXITERM™ layer, the FLEXISAFE range of capacitors has unbeatable safety features.

FLEXISAFE Part Number Formula:

<table>
<thead>
<tr>
<th>FS03</th>
<th>5</th>
<th>C</th>
<th>104</th>
<th>K</th>
<th>O</th>
<th>Z</th>
<th>2</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Voltage</td>
<td>Dielectric</td>
<td>Capacitance Code in pF</td>
<td>Capacitance Tolerance</td>
<td>Failure Rate</td>
<td>Terminations</td>
<td>Packaging</td>
<td>Special Code</td>
</tr>
<tr>
<td>FS03 = 0003</td>
<td>250V = 3</td>
<td>27/12 C</td>
<td>2.5</td>
<td>±5%</td>
<td>4</td>
<td>Z = FLEXITERM™ with 3% min Lead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS05 = 0005</td>
<td>250V = 5</td>
<td>100V = 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS10 = 1200</td>
<td>250V = 10</td>
<td>100V = 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Not RoHS Complaint.*
**W2F/W3F SERIES SMT FEED-THROUGH CAPACITORS**

AVX W2F/W3F series feed through capacitors are designed to provide a standalone broadband EMI filtering solution in a small EIA standard sizes 0805 and 1206. W2F/W3F series feed through capacitors can replace a discrete Tee filter solution that uses two series ferrite beads and one parallel capacitor, effectively reducing board space usage by replace three components with one. This approach also offers the added advantage of eliminating hysteresis from current surges, typically experienced by ferrite beads. W2F/W3F series capacitors are also useful for decoupling high speed traces and low voltage power rails due their low parasitic inductance.

WF Part Number Formula:

```
W 3 1 C 223 A T 3 A

Style
W = Plated Ni & Sn
L = Plated SnPb

Size
2 = 0805
3 = 1206

Feedthru
F = 1

Number of Elements
1 = 100V
5 = 50V

Dielectric
A = NPO
C = X/R

Capacitance Code

Failure Rate
4 = AUTOMOTIVE

Termination
T = Plated Ni & Sn

Packaging Code
1 & 2 = 7" Reel
3 & 4 = 10" Reel
Embossed Tape

Quantity
Code
(Per Reel)
F = 1,000
A = 2,000
4,000 or
10,000

*Note: NPO available in 100V only and X7R available in 50V only.
```
ISOLATION PRODUCTS FOR AUTOMOTIVE APPLICATIONS

ISOLATION AMPLIFIER

ACPL-C87AT (±1% gain tolerance) and ACPL-C87BT (±0.5% gain tolerance) are designed for high precision DC voltage sensing in electronic motor drivers, DC/DC and AC/DC converters and battery monitoring systems. The ACPL-C87AT/C87BT features high input impedance and operate with full span of analog input voltage up to 2.46V. The shutdown feature provides power saving and can be controlled from an external source such as a microprocessor.

The ACPL-C87AT/C87BT automotive isolation amplifiers utilize superior optical coupling technology, with sigma-delta (∑−Δ) analog-to-digital converter, chopper stabilized amplifiers, and a fully differential circuit topology to provide unequaled isolation-mode noise rejection, low offset, high gain accuracy and stability.

Features
- Unity Gain
- ±0.5% (ACPL-C87BT) and ±1% (ACPL-C87AT) Gain Tolerance @25° C
- -0.3 mV Input Offset Voltage, 0.05% Nonlinearity
- 0 to 2 V Nominal Input Range
- 100kHz Bandwidth and Qualified to AEC-Q100 Grade 1 Test Guidelines
- Automotive Operating Temperature -40 to +125° C
- Compact, Surface-Mount Stretched SO-8 Package
- Worldwide Safety Approval: UL 1577 (5000 VRMS/1 min.) and CSA. IEC/EN/DIN EN 60747-5-5 (pending)

Applications
- Automotive Motor Inverter DC Bus Voltage Sensing
- Automotive DC/DC Converter Voltage Sensing
- Automotive AC/DC (Charger) DC Output Voltage Sensing
- Automotive Battery Pack Voltage Sensing
- Isolation Interface for Temperature Sensing
- General Purpose Voltage Sensing and Monitoring

DUAL-CHANNEL OPTOCOUPLE

The Broadcom ACFL-6212T is an automotive-grade, dual-channel optocoupler device designed for bi-directional digital communications. The device has two optocoupler channels internally aligned 180 degrees of each other, providing optimum chip pin-out configuration for bi-directional Tx/Rx data communication design and board layout. The two channels are electrically independent and galvanically isolated, providing an ideal isolated bi-directional power system communication interface.

The device is optimized for high speed systems supporting data rates up to 10 MBd and packaged in a compact SSO-12 package comparable to the SSO-8 footprint.

Features
- Automotive Qualified per AEC-Q100 Grade 1 Test Guidelines
- Operating Temperature from -40° C to +125° C
- 5 V CMOS Output
- 8 mm Creepage and Clearance
- Data Rates up to 10 MBd
- LED Current Drive (IF): 4 to 15 mA
- Low Propagation Delay: 100 ns (max)
- Compact, Auto-Insertable Stretched SO12 Package
- Worldwide Safety Approval: UL 1577 approval, Viso = 5,000 Vrms for 1 min, CSA Component acceptance Notice 5, IEC 60747-5-5 and EN/DIN EN 60747-5-2, Viorm = 1,140 Vpeak.
Applications
- Automotive CANBus and SPI Communications Interface
- Automotive Power Transistor Isolation
- High Temperature Digital Signal Isolation
- Automotive IPM Driver for DC/DC Converters and Motor Inverters
- Digital Isolation for A/D and D/A Conversion

R2COUPLER SMART GATE DRIVE OPTOCOUPLE

ACPL-32JT is a 2.5 A Automotive R2Coupler Smart Gate Drive Optocoupler, which features integrated flyback controller for isolated DC-DC converter, IGBT Desaturation sensing with fault feedback, Under-Voltage LockOut (UVLO) with soft-shutdown and fault feedback and active Miller current clamping. The fast propagation delay and tight timing skew performance enables excellent timing control and efficiency. This full feature optocoupler comes in a compact, surface-mountable SO-16 package for space-savings, and is suitable for traction power train inverter, power converter, battery charger, air-conditioner and oil pump motor drives in HEV and EV applications.

Features
- Qualified to AEC-Q100 Grade 1 Test Guidelines
- Operating temperature range: -40° C to +125° C
- Integrated flyback controller for isolated DC-DC converter
- Regulated Output Voltage: 20 V
- Wide Input Voltage Range: 8 V to 18 V
- Propagation delay: 250 ns (max.)
- Dead time distortion range: -160 ns to +60 ns
- Integrated fail-safe IGBT protection
- High Noise Immunity
- Compact SO-16 package with 8mm clearance and creepage

Applications
- Automotive Isolated IGBT/MOSFET Gate Drive
- Hybrid and Plug-in Powertrain Inverter
- Automotive DC-DC Converter
- AC and Brushless DC Motor Drives
- Uninterruptible Power Supplies (UPS)
LEADING SOLUTIONS IN AUTOMOTIVE ELECTRONICS

LINEAR VOLTAGE REGULATORS

Infineon’s vast portfolio of Automotive Linear Voltage Regulators offer wide input voltage range, with options for fixed or adjustable output voltages. With extremely low quiescent currents, these regulators are well-suited to automotive systems permanently connected to a battery. Featuring very low dropout voltages, the regulators are able to support extended input ranges down to 3 V, supporting advanced cranking conditions. Including built-in features like reset, watchdog, early warnings, as well as internal preventive features like over-current and over-temperature protection, these devices help solve many design challenges for automotive applications. All of this is possible with a single, small ceramic output capacitor of 1µF.

Part Families
- TLS805B1LDV50XUMA1
- TLF80511EJV33XUMA1
- TLF80511EJV50XUMA1

SMART HIGH SIDE SWITCH: PROFET™

The BTF6070-2EKV is a 60 mΩ dual channel Smart High-Side Power Switch, embedded in a PG-DSO-14-40 EP, Exposed Pad package, providing protective functions and diagnosis. The power transistor is built by an N-channel vertical power MOSFET with charge pump. The device is integrated in Smart6 HV technology. It is specially designed to drive Valve Applications in the harsh automotive environment. For lighting applications the nominal bulb load of P10W+P5W 24 V or P10W 12 V is considered. The BTF6070-2EKV is the first PROFET™ which is qualified according to ISO26262 Functional Safety Standard.

Part Family
- BTF60702EKVXUMA1
3D MAGNETIC SENSOR
The new automotive-qualified 3D magnetic sensor TLE493D-A1B6 offers accurate three-dimensional sensing with extremely low power consumption in a small TSOP-6-pin package. This small sensor offers an I2C interface for superior control along with a 12-bit data resolution for each measurement direction including chip temperature. With the ability to detect magnetic fields in the x, y, and z-direction, the sensor is ideally suited for the measurement of linear, rotary and 3D position sensing in automotive applications.

Part Family
- TLE493DA1B6HTSA1

32-BIT AUTOMOTIVE MCU: AURIX™
AURIX is Infineon’s specialized selection of microcontrollers serving the automotive industry by emphasizing performance and safety features. AURIX incorporates a multicore architecture based on three independent 32-bit TriCore CPUs, meeting the highest safety standards in the automotive space. The single MCU platform enables exceptional control over many automotive applications such as powertrain, body, safety, and ADAS. Leading-edge performance, combined with extreme efficiency, positions AURIX as the most powerful MCU solution for modern automotive requirements.

Part Family
- TC297TP128F300NBCKXUMA1

LITIX™ AUTOMOTIVE LED DRIVERS
The LITIX Power and LITIX Power Flex Automotive LED Driver IC families, based on a synchronous half bridge topology, are the ideal solution for driving high-power LEDs with maximum system efficiency. Offering many features such as over-voltage and over-temperature protection, as well as advanced diagnostics, LITIX drivers are built for harsh automotive conditions. Requiring few external components, LITIX are both innovative and cost-effective. The new LITIX Power Flex TLD5541-1QV, controllable using SPI, features a new fast dynamic load jump behavior to protect LEDs under current spikes.

Part Families
- TLD55411QVXUMA1
- TLD5190QVXUMA1
For the automotive industry, Broadcom offers a wide range of digital, IPM interface, gate drive optocouplers and isolation amplifiers. The first supplier to introduce 125°C plastic optocouplers for automotive applications, Broadcom automotive R2Coupler™ products are AEC-Q100 qualified.

AUTOMOTIVE MEMORY SOLUTIONS

ADAS

The Growth and Increasing Sophistication of ADAS in the World

As electronics in our cars continue to become more sophisticated, ADAS (Advanced Driver Assistance Systems) are taking center stage. These systems make many of the aspects of driving easier, and—most importantly—safer. Systems that prevent accidents clearly have the capability to save lives, and prevent injuries.

Examples of ADAS include:

- Lane Departure Warning System
- Surround View Park Assist
- Adaptive Cruise Control
- Blind spot Detection/Monitoring
- Night Vision
- Driver Monitoring

<table>
<thead>
<tr>
<th>ISSI Memory Products for ADAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS46LD32160A</td>
</tr>
<tr>
<td>IS46LD32200C</td>
</tr>
<tr>
<td>IS46LD32400B</td>
</tr>
<tr>
<td>IS46LR32160C</td>
</tr>
<tr>
<td>IS32AP2120</td>
</tr>
<tr>
<td>IS32BL3556</td>
</tr>
<tr>
<td>IS25LWP032D:</td>
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<tr>
<td>IS25LWP064A:</td>
</tr>
<tr>
<td>IS25LWP128:</td>
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<tr>
<td>IS25LWP256D:</td>
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<tr>
<td>S64WV25616EDBLL:</td>
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<td>S64WV51216EDBLL:</td>
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<tr>
<td>S64WV102416EDBLL:</td>
</tr>
<tr>
<td>IS25LWP032D:</td>
</tr>
<tr>
<td>IS25LWP064A:</td>
</tr>
<tr>
<td>IS25LWP128:</td>
</tr>
<tr>
<td>IS25LWP256D:</td>
</tr>
</tbody>
</table>

AUTOMOTIVE LIGHTING

Full Function Linear LED Driver IC for Automotive Interior Lighting

The IS32LT3175 is a feature-rich AEC-Q100 (Automotive Electronics Council) certified linear LED driver enabling reduced BOM count for low-cost and compact designs. The IS32LT3175 integrates a single channel LED driver with a programmable 150 mA current source, push–button control, courtesy signal input and integrated programmable fade-in/fade-out lighting control, Fig1A. The device is designed for use in LED-based map lights, dome lights, door lights and other automotive lighting applications, Fig1B.

Key Features and Benefits of the IS32LT3175:

- Reduced BOM: LED driver with theatrical dimming in one small 8 pin SOP package resulting in 65% less components requiring less printed circuit board area.
- Linear LED Driver: Low-noise, low-EMI, linear current source adjustable from 10–150 mA into one or more LEDs.
- Switch Input: Integrates switch debounce and latching logic to enable use of low cost momentary contact switch. The switch On/Off state is held during start-stop operation when voltage drops below 6V for a short period of time.
- Local or Remote: Can be controlled remotely by the automobile’s Body Control Module (BCM) or locally with a momentary contact switch. The local switch has priority over the remote BCM providing the user with direct control of the LED lamp.
- No Microcontroller: Advanced LED performance can be adjusted with simple resistors, eliminating the need for a microcontroller.
- AEC-Q100: Meets stress testing specifications making it suitable for use in the harsh automotive environment with guaranteed operation from –40° C to +125° C.

<table>
<thead>
<tr>
<th>ISSI Memory Products for Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS32LT3175P Channel: 1; 5<del>42 V, 20</del>150(mA), Source, BCM Positive, eSOP-8; Map Light</td>
</tr>
<tr>
<td>IS32LT3175N Channel: 1; 5<del>42 V, 20</del>150(mA), Source, BCM Negative, eSOP-8; Map Light</td>
</tr>
<tr>
<td>IS32LT3170 Channel: 1; 5<del>42 V, 10</del>150(mA), Sink, BCM Positive, SOT23-6; Button Backlight</td>
</tr>
<tr>
<td>IS32LT3172 Channel: 1; 5<del>42 V, 10</del>200(mA), Sink, BCM Positive, eSOP08-EP, Button Backlight</td>
</tr>
</tbody>
</table>

INFOTAINMENT

Drivers are increasingly expecting more performance and features in their center infotainment console. What was once simply an FM/AM radio with CD/MP3 has evolved into a system that has vehicle data, navigation, music from many sources including satellite radio, internet streaming, Bluetooth connectivity, safety camera display, phone calling, a gateway to OTA vehicle updates, and apps. Ease-of-use, compatibility, and customization are all potential benefits that the driver may appreciate. A mid to high-end microprocessor is likely needed in order to support all the peripheral interfaces and provide the performance for the multiple algorithms running simultaneously. In the block diagram, the MPU plays the music from any source, but needs to be ready to show the camera view, or updated data from the vehicle at a moment’s notice. Often, the DRAM chosen are multiple (2x or 4x) DDR3L devices. The Flash memory needed is usually both eMMC for media storage, and serial NOR for algorithm data.

<table>
<thead>
<tr>
<th>ISSI Memory Products for Infotainment</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS46TR16256AL  4 Gbit (256M x16) DDR3 DRAM, BGA(96), 1.35 V, 1.5 V, (666 MHz/1333 MT/s, (800 MHz/1600 MT/s</td>
</tr>
<tr>
<td>IS46TR16128CL  2 Gbit (128M x16) DDR3 DRAM, BGA(96), 1.35 V, 1.5 V, (666 MHz/1333 MT/s, (800 MHz/1600 MT/s</td>
</tr>
<tr>
<td>IS45S16400J  64 Mbit (4M x16) SDRAM, BGA(54), TSOP2(54), 3.3 V, 166 MHz, 143 MHz, 133 MHz</td>
</tr>
<tr>
<td>IS45S1660J  256 Mbit (64M x16) SDRAM, BGA(54), TSOP2(54), 3.3V, 166 MHz, 143 MHz, 133 MHz</td>
</tr>
<tr>
<td>IS22ES04G-JC(Q)LA1 4 GB eMMC 5.0, BGA(153), BGA100, 3.3 V, 200 MHz (HS400)</td>
</tr>
<tr>
<td>IS22ES08G-JC(Q)LA1 8 GB eMMC 5.0, BGA(153), BGA100, 3.3 V, 200 MHz (HS400)</td>
</tr>
<tr>
<td>IS22ES16G-JC(Q)LA1 16 GB eMMC 5.0, BGA(153), BGA100, 3.3 V, 200 MHz (HS400)</td>
</tr>
<tr>
<td>IS22ES32G-JC(Q)LA1 32 GB eMMC 5.0, BGA(153), BGA100, 3.3 V, 200 MHz (HS400)</td>
</tr>
<tr>
<td>IS32BL3555 2 CH @ 240 MA BOOST LED BACKLIGHT DRIVER, eTSSOP-16, 4.75 V to 40 V</td>
</tr>
<tr>
<td>IS32BL3556 4 CH @ 120 MA BOOST LED BACKLIGHT DRIVER, eTSSOP-20, 4.75 V to 40 V</td>
</tr>
<tr>
<td>IS32FL3740 3×4 DOTS MATRIX LED DRIVER, eTSSOP-20, 2.7 V to 5.5 V</td>
</tr>
<tr>
<td>IS25LP016D 16 Mb Serial NOR Flash, SOIC, USON, WSON, BGA, 3 V, 50 M/133 MHz</td>
</tr>
<tr>
<td>IS25LP032D 32 Mb Serial NOR Flash, SOIC, USON, WSON, BGA, 3 V, 50 M/133 MHz</td>
</tr>
<tr>
<td>IS25LP064A 64 Mb Serial NOR Flash, SOIC, WSON, BGA, 3 V, 50 M/133 MHz</td>
</tr>
<tr>
<td>IS25LP128 128 Mb Serial NOR Flash, SOIC, WSON, BGA, 3 V, 50 M/133 MHz</td>
</tr>
<tr>
<td>IS25LP256D 256 Mb Serial NOR Flash, SOIC, WSON, BGA, 3 V, 80 M/166 MHz</td>
</tr>
</tbody>
</table>
For over 25 years Micron has been a leading supplier of memory to the automotive and associated industries. Our memory products work to optimize car engines, entertain passengers and keep our roads safer.

**INNOVATION DRIVEN – AUTOMOTIVE MEMORY SOLUTIONS**

Micron’s dedicated automotive segment team has built an in-depth understanding of the industry, contributing to the development of automotive practices and recognized methodologies. Micron’s product portfolio is designed and manufactured so that customers can rely on us as a single source for volatile and nonvolatile memory needs. Micron meets automotive compliance through:

- ISO 26262 – ASIL
- TS 16949
- AEC-Q100 qualification

**THE MICRON ADVANTAGE**

A proven memory partner with 25+ years of experience, Micron provides advanced automotive memory solutions that meet stringent quality, reliability and compliance requirements.

- **BROAD PORTFOLIO**
  - of memory solutions that are rigorously tested for demanding automotive environments.

- **APPLICATION EXPERTISE**
  - Expertise in design implementation from engineers and system architects who understand automotive applications and market requirements.

- **QUALITY**
  - High-quality memory solutions engineered and optimized from component design to finished packaging to meet challenging ISO/TS certification requirements.

- **COLLABORATION**
  - Collaboration with, and access to, an extensive ecosystem of Micron memory partners who can help advance and accelerate your design innovation and implementation.

- **LONGEVITY**
  - for many memory solutions that meet or exceed the industry’s expected life cycle and, at the same time, support legacy products.
DRAM
Automotive applications require memory to push the envelope in power consumption, signaling speeds, and bandwidth. Our SDRAM, DDR, DDR2, DDR3, and DDR4 deliver that and more.

Part Family
- 4 Gb DDR3L SDRAM - MT41K256M16TW-107 AAT

E.MMC MEMORY
Speeding integration, development and ease of design gets you to market faster. Our fully managed e.MMC memory with built-in controller and interface helps you do that.

Part Family
- 16 GB e.MMC- MTFC16GAKAECN-AIT

SERIAL NOR FLASH
Automotive memory must function in extreme environments. Our NOR Flash memory offers a high quality, small footprint package with execute in place capabilities for engine control units.

Part Family
- 256 Mb SPI NOR Flash - MT25QU256ABA8ESF-0AAT

LPDRAM
Built to consume less power without sacrificing performance, our LPDR, LPDDR2, LPDDR3, and LPDDR4 memory solutions are perfect for instrument cluster, infotainment, and ADAS solutions.

Part Family
- 1 Gb LPDDR2 SDRAM - EDB1832BDBH-1DAAT-F-R
Molex helps bring your next generation of cars to life by driving innovative interconnect and technical solutions through collaborative design. With Molex’s extensive experience in the automotive market, high-quality solutions for the future of cars has never been so close. From the connected vehicle, safety and driver assist to body electronics and power train solutions, together, we can make your designs a reality.

**BRING YOUR NEXT GENERATION OF CARS TO LIFE**

**STAC64™**

Available in single- or ganged multiple-bay configurations, the PAP and Mylar-version Stac64™ connectors support unsealed transportation applications.

**Part Families**

- 346910201: Stac64™ Right Angle Header Assembly, 20 Circuits, Polarization B, Gray, Tray. MLQ: 560
- 34691-0081: Stac64™ Right Angle Header Assembly, 8 Circuits, Polarization B, Gray, Tray. MLQ: 1008
- 34729-0081: Stac64™ Receptacle Assembly, 8 Circuits, Polarization B, Gray, Tray. MLQ: 2500

**Features & Benefits**

| Stackable connection system of readily available PCB headers | Reduced time-to-market: engineering and validation times reduced significantly |
| The header and receptacle housings are molded in standard USCAR color schemes for additional polarizations | No tooling necessary to produce custom multi-bay headers |
| Pre-assembled, linear Mylar PC tail alignment strip for right angle headers | Matches harness connector color coding scheme for visual aid in assembly |

**MX64™ SEALED CONNECTORS**

Designed to USCAR approved footprints and meets USCAR testing requirements. Small and compact, the MX64™ single-row female housings set the standard for 2.54 mm pitch sealed connectors. These connectors offer design flexibility by accommodating three different female terminal systems.

**Part Families**

- 33467-0006: 2.54 mm Pitch MX64™ Terminal, Gold (Au) Plating, 18-20 AWG, Left Reel Payoff. Also used with MX123™ Female Receptacle Housing. MLQ: 27,000.
- 31404-3110: 2.54 mm MX64™ Sealed Crimp Housing, Single Row, Kaizen Terminal, Black, 3 Circuits, Polarization A, with CPA Lock. MLQ: 800.

**Features & Benefits**

| Meets all USCAR footprints and testing requirements for 0.64mm square-pin connector systems | Compliance with OEM directives |
| Available with or without CPA | Adds locking protection when CPA is used |
| Four polarization options available in four different colors | Prevents mis-mating |

**DURACLICK™ SMT WIRE-TO-BOARD CONNECTORS**

DuraClik™ connectors provide superior electrical contact reliability, mating retention and space savings compared to competitive versions for high-vibration and high-temperature applications.

**Part Families**

- 502352-0400: DuraClik™ Wire-to-Board Header, Single Row, Right
Angle, 4 Circuits, Tin (Sn) Plating, Natural. MLQ: 4200.
- **502351-0400**: DuraClik™ Wire-to-Board Receptacle Housing, Single Row, 4 Circuits, Natural. MLQ: 24000.
- **560085-0101**: DuraClik™ Crimp Terminal, Female, 22–26 AWG, Reel. MLQ: 48,000

### Features & Benefits

| Positive inner-lock design | Provides space savings and prevents latch breakage from wire tangling |
| "Click" sound when mated | Audible mating confirmation |
| Secure PCB retention using a shock-proof SMT design with wide solder tabs (nails) | Can withstand upward pull force of 100 N (10 kgf) to meet automotive vibration requirements |

### MINI50™ UNSEALED CONNECTOR SYSTEM

Delivers 50% space savings over traditional USCAR 0.64 mm connectors with smaller terminals to fit more signals into vehicle interiors. Approved as the industry’s only USCAR 050 interface.

#### Part Families

- **34791-0020**: Mini50™ Unsealed Receptacle, Single Row, Non-Bridged, without CPA, 2 Circuits, Polarization Option A, Black. MLQ: 27,000
- **34912-8020**: Mini50™ Unsealed Receptacle, Single Row, Non-Bridged, without CPA, 2 Circuits, Polarization Option A, Black. MLQ: 750
- **560023-0421**: CTX50 Receptacle Terminal, Unsealed, M-Grip, D-Wind, Left Payoff. MLQ: 64,000

#### Features & Benefits

| Designed and tested to USCAR 050 specifications | Approved as the industry’s only USCAR 050 approved interface. From 4 to 24 circuits. Larger circuit versions also comply with USCAR specifications |
| 50% smaller than USCAR 0.64 mm unsealed interfaces | Minimizes PCB footprint for design flexibility and space saving |
| Addition of 2 circuit-size SMT headers and receptacles | Only two-circuit connector with a 0.50 mm terminal interface in the industry. Tested to full USCAR specifications. |

### STAK50H™ INFOTAINMENT CONNECTOR SYSTEM

Leveraging industry-approved terminal design, the stAK50H™ Infotainment Connector System incorporates unsealed hybrid connectors to deliver both signal and Ethernet connectivity through one low-footprint connector.

#### Part Families

- **160013-3041**: AK50 HYB HDR ASSY 56 CKT KEY4&1/56. MLQ: 351
- **160014-0001**: AK50 HYBRID RCPT 28 CKT DKGRY KEY 1. MLQ: 500
- **160014-0004**: AK50 HYBRID RCPT 28 CKT BLACK KEY 4. MLQ: 500

#### Features & Benefits

| Standard USCAR color-coded housings | Support visual polarization and expedite assembly of connector systems |
| Compliant to USCAR-2 and global automotive OEM standards | Enables faster time-to-market |
| 0.50mm and 1.20mm terminals developed around NanoMQS and AK (Arbeitskreis) Specifications | Supports a wide range of low-current signal (4.0A) and Ethernet applications |
SECURE AND CONNECTED VEHICLE – A CLEAR VISION OF THE ROAD AHEAD

WE MAKE DRIVING SAFER, CLEANER AND MORE ENJOYABLE

Safe and enjoyable driving, energy efficiency and secure communication to protect the privacy of passengers is our top priority. NXP’s unique competence in these areas forms the foundation of future cars. Being able to trust our cars is critical, even more so when they are driving autonomously.

VISION

The S32V230 family is designed to support computation-intensive applications for image processing. The S32V234, as part of the S32V230 family, is a high-performance automotive processor designed to support safe computation-intensive applications in the area of vision and sensor fusion. This is the first automotive vision system-on-chip (SoC) with the requisite reliability, safety and security measures to automate and ‘co-pilot’ a self-aware car. Our S32V230 microprocessors, as part of the SafeAssure program, are structurally designed to comply with stringent ISO 26262 functional safety requirements, and engineered for automotive-grade quality metrics measured in parts per billion.

S32V BLOCK DIAGRAM

Part Family
- PS32V234CMN1VUB (EVB: S32V234-EVB-D) – COMING SOON

RADAR

The S32R27 is a 32-bit Power Architecture based microcontroller for automotive and industrial radar applications. It offers >4x leap in performance per power vs the previous MPC577X products, and increases the level of integration available to designers of next generation automotive radar modules. The S32R27 is designed to address advanced RADAR signal processing capabilities and merge it with microcontroller capabilities for generic software tasks and car bus interfacing. It meets the high-performance computation demands required by modern beam-forming fast chirp modulation RADAR systems by offering unique signal processing acceleration together with powerful multi-core architecture.

Part Family
- PS32R274KAK2MMM (EVB: S32R274RRUEVB) – COMING SOON

Complimentary Product
- MC33FS652x – Fail Silent System Basis Chip (SBC) optimizes energy consumption through DC/DC switching regulators up to 2.2 A on Vcore, linear regulators and ultra-low-power saving modes.
GATEWAY

The MPC574xB/C/G family of MCUs provides a highly integrated, safe and secure single-chip solution for next-generation central body control, gateway and industrial applications. Enhanced low-power capabilities provide increased functionality with more efficient operation. Hardware security module protects ECUs against various attack scenarios. Functional safety support simplifies compliance for automotive safety systems targeting ISO 26262 and higher-end ASIL levels.

Part Families
- SPC5746CSK1MKU6
- SPC5748GGK1MMJ6 (EVB: DEVKIT-MPC5748G)

Complimentary Product
- UJA1131 – System Basis Chip (SBC) featuring integrated buck/boost with 5 V/3.3 V voltage regulator up to 500 mA.

CONNECTIVITY

S32K product series of 32-bit automotive microcontrollers provides a highly integrated, low-power, safe and secure single-chip solution. The combination of fast CPU with flexible low-power modes and the low-leakage technology process will not force any compromises on performance relative to low-power. Our combined Cortex® M0+ and M4-based automotive MCU offerings span a broad memory space and include package options from 8 K to 2 MByte with 16 to 176 pins initially. The ARM® Cortex M4 core architecture includes an IEEE-754 compliant single precision Floating Point Unit (FPU) with DSP functions unleashing the full potential of model-based design flows.

On the connectivity side, S32K supports CAN Flexible Data-rate (CAN-FD) as well as the new FlexIO configurable peripheral, allowing customers to implement future communication protocols that have not been invented yet as well as expand channels to existing on-chip hardware protocol controllers. The security modules protect ECUs against various attack scenarios and ensures system integrity. S32K microcontrollers are designed according to ISO26262 and bring the SafeAssure® functional safety program throughout the portfolio.

Part Family
- PS32K144UAT0VLLA, (EVB: S32K144EVB-Q100)

Complimentary Product
- MC33FS450x – Fail Silent System Basis Chip (SBC) optimizes energy consumption through DC/DC pre-regulator with LDO up to 500 mA on Vcore, linear regulators and ultra-low-power saving modes.

MOTOR CONTROL

The S12ZVM family gives the smallest, most efficient and scalable 3-phase motor control solution for industrial and automotive applications (BLDC, PMSM or SR-motor). It integrates a sophisticated S12Z 16–bit MCU together with a 12 V to 5 V voltage regulator, LIN physical layer or CAN physical layer and gate driver unit (GDU) in order to control six power MOSFETs for automotive and industrial applications such as blowers, fans or pumps for fuel, oil or water.

Part Families
- S912ZVMC25F1MKK
- S912ZVMC12F1MKH
- S912ZVML12F1MKH
- (EVB: S12ZVMC12EVBCAN, S12ZVML12EVBLIN; RD: MTRCKTSBNZVM128)

Complimentary Product
- MC33GD3000 – 3-Phase brushless motor pre-driver provides three half-bridge drivers, each capable of driving two N-channel MOSFETs, with gate drive capability of 1 A to 2.5 A.
A BROAD RANGE OF PRODUCTS FOR THE AUTOMOTIVE INDUSTRY

IN VEHICLE NETWORKING

Pulse Electronics has developed components for nearly every automotive communications application for today’s vehicles and the vehicles of the future. Networking products support multiple technology’s used in the automobile including MOST, CAN Bus, FlexRay, Ethernet Audio Video Bridging (AVB), 100BASE-T1, 1000BASE-T1, Power over Datalines (PoDL), and A2B. On top of these, Pulse has products that support technology’s used in battery management systems within the car.

Pulse’s network products support multiple applications including infotainment, battery management systems, advanced driver assistance systems, energy systems, and body control. With all components meeting AEC-Q200 requirements and capable of operating from -40° C up to 125° C temperature range with roadmap to 150° C for applications closer to the engine.

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<tr>
<th>Inductive coupling (NXP/LT)</th>
<th>Pulse part no.</th>
<th>Description</th>
<th># of channels</th>
<th>Working voltages</th>
<th>Hipot isolation</th>
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<td><strong>Operating temperature</strong></td>
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<td>1206 Size Chip Choke</td>
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<tr>
<td>PE-1812ACC series</td>
<td>1812 Size Chip Choke</td>
<td>CAN Bus, LVDS</td>
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<tr>
<td>AE2002</td>
<td>100Base-T1 Chip Choke</td>
<td>Single Twisted pair Ethernet</td>
<td>-40°C to +125°C</td>
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**ANTENNAS FOR AUTOMOTIVE APPLICATIONS**

As the demand for wireless connectivity within and around vehicles flourishes, Pulse/Larsen is here with the needed antenna solutions. We offer a unique far-reaching understanding of antenna and RF technology offering excellent value and outstanding quality covering 2G/3G/4G LTE, WLAN, (Wi-Fi), Zigbee, BLE, GNSS, ISM, VHF, UHF, NFC and other custom applications. Choose between high performing, robust board-mounted, flexible internal, or IP67 tough outdoor antenna designs for your automotive solutions needs. Perfect for key-fobs, GPS tracking, NFC, BLE and Zigbee communication, security cameras, data transmission, radio communications and Wi-Fi connections. All antennas can be customized and optimized for your automotive application.

**Embedded and internal antennas**

- **Smallest 2.4 GHz antenna**
  - W3092 – 2x1x0.5mm

- **GPS, Glonass Patch**
  - W3223 – 25x25x4mm, pin feed
  - W3224 – 18x18x4mm,
  - W3225 – 25x25x4mm, SM

- **ISM Coils**
  - W3126 – 315 MHz and W3127 – 433MHz

- **FPC Multi-bands**
  - W3915 (3G/GPS), W3917 & W3918 (Dual Wi-Fi)

- **Ceramic Chips**
  - W3006 and W3078 (Dual Wi-Fi), W3095 (Wi-Fi/GPS)

- **PCB antenna – Wi-Fi**
  - W3315B0100 and W3593B0100

- **NFC/BLE**
  - W5100, W5101

- **Mirror Antennas, 698-2700MHz**
  - W6100 & W6101 – Cable on side with Fakra conn.

- **Flex Antennas for LTE & Wi-Fi (MiMo), GNSS**
  - W6103 and W6102 (Wi-Fi Mimo), W6112 (LTE MiMo/GNSS)

Pulse manufactures IP67, ruggedized, built to-last antennas covering frequencies 136 MHz to 6 GHz, including GNSS and multi-bands. They have been a main supplier to large Automotive OEM’s and automotive aftermarket for decades.

**External and outdoor antennas**

- **GPS Multi-bands**
  - GPSMB501-LTE MiMo, Wi-Fi Mimo, GPS (direct and magnetic Mount)
  - GPSMB401 – LTE MiMo, Wi-Fi, GPS Low profile, for off-ground applications
  - GPSDM700/2500FFS (Shark Fin) – LTE and GPS
  - GPSCP400 and GPSCPM4 (GPS and Cellular, low profile)
  - GPSGM800/2170 – GPS/3G external antenna
  - GPSBB000/2170FS – GPS /3G 806-960, 1710-2170, GPS

- **Wi-Fi**
  - W1043, W1028B – external antenna – SPDA17RP2400/5900
  - Low Profile Vehicle – SLPT698/2170DMN (LTE) and SLPT2400/5900DMN (Dual Wi-Fi Customization)

You can rely on Pulse to be your trusted automotive antenna partner. We have been in the automotive antenna business over 50 years and have exceeded over 2 billion antennas shipped during that time.
Vishay’s broad portfolio of automotive grade products include diodes and rectifiers, MOSFETs, optoelectronic products, resistors, inductors, and capacitors. Automotive systems include a wide range of functions and products. Vishay products are used in many automotive applications including powertrain, chassis control, body electronics, passive safety systems, exterior lighting, 48 VDC boardnet, start/stop, micro hybrid vehicles, full hybrid vehicles (HEVs), and full electric vehicles (FEVs).

MOSFET SOLUTIONS FOR THE AUTOMOTIVE INDUSTRY
Vishay’s dedicated automotive processes instill quality and robustness from design to manufacturing.

ADVANTAGES OF SQ RUGGED SERIES
- AEC-Q101-qualified
- Junction temperature of 175° C
- Low on-resistance n- and p-channel TrenchFET® technologies
- Innovative space-saving package options

Applications
- EV, HEV and 48V Boardnet applications
- Powertrain control, electric power steering and safety
- Lighting, body electronics, and infotainment

Packages
- Available in innovative PowerPAK® packages ranging from 2 mm x 2 mm to 8 mm x 8 mm as well as industry standard TO packages
- Available as single and dual die options
- Also available as dual asymmetric package optimized for high efficiency buck regulators

<table>
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<tr>
<th>Featured Products</th>
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<tbody>
<tr>
<td>SQJQ100E 40 V N-Ch MOSFET with ultra-low RDS(ON) in thermally enhanced compact package replacing D2PAK saving &gt; 50 % board space Automotive Segment: 48 VDC Board-net, Chassis Control</td>
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<tr>
<td>SQ2398ES 100 V N-Ch MOSFET in small 3 mm x 3 mm package, ideal for switching low currents in small applications Automotive Segment: Exterior Lighting</td>
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<tr>
<td>SQJQ480E 40 V N-Ch MOSFET with ultra-low RDS(ON) in thermally enhanced compact package replacing D2PAK saving &gt; 50 % board space Automotive Segment: 48 VDC Board-net</td>
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<tr>
<td>SQJB60EP 60 V Dual N-Ch MOSFET in PowerPAK® SO-8L thermally enhanced compact package Automotive Segment: Exterior Lighting, Powertrain – Injection Control and Fuel Pump</td>
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<tr>
<td>SQJA46EP 40 V N-Ch MOSFET in thermally enhanced PowerPAK® SO-8L replaces DPAK in less than half of the area Automotive Segment: 48 VDC Board-net, Chassis Control</td>
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<tr>
<td>SQJ946EP 40 V Dual N-Ch MOSFET optimized for high-frequency DC/DC applications with lower switching losses in PowerPAK® SO-8L Automotive Segment: Exterior Lighting</td>
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<td>SQJ942EP 40 V Asymmetric N-Ch MOSFET optimized for high-frequency DC/DC applications with lower switching losses in PowerPAK® SO-8L Automotive Segment: Exterior Lighting, Body Electronics</td>
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<td>Product Code</td>
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<td>SQD10N30-330H</td>
<td>300 V N-Ch MOSFET in a DPAK (TO-252) Package</td>
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<tr>
<td>SQJ952EP</td>
<td>60 V Dual N-Ch MOSFET in enhanced compact package</td>
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<tr>
<td>SQJ956EP</td>
<td>60 V Dual N-Ch MOSFET in PowerPAK® SO-8L (Dual) thermally enhanced compact package</td>
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<td>SQJ958EP</td>
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### Automotive Qualified PowerPAK® Packages

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<th>Package Type</th>
<th>Details</th>
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<tr>
<td>PowerPAK® 8 x 8L</td>
<td>75% thinner and 55% smaller than D2PAK</td>
</tr>
<tr>
<td>PowerPAK® 8 x 8L DUAL</td>
<td>55% thinner, &gt; 50% smaller than two DPAKs</td>
</tr>
<tr>
<td>Optimized PowerPAK® SO-8L</td>
<td>Optimum high-and low-side combination for synchronous buck</td>
</tr>
<tr>
<td>PowerPAK® SO-8L</td>
<td>½ the size of DPAK, similar on-resistance</td>
</tr>
<tr>
<td>PowerPAK® 1212-8</td>
<td>½ the size of SO-8 with similar performance</td>
</tr>
<tr>
<td>PowerPAK® SC-70</td>
<td>2 mm x 2 mm ultra-compact, thermally enhanced</td>
</tr>
</tbody>
</table>
ALL PROGRAMMABLE AUTOMOTIVE SOLUTIONS

**XA ZYNQ® ULTRASCALE+ MPSOCs**

The XA Zynq® UltraScale+™ MPSoC family is based on the Xilinx® UltraScale™ MPSoC architecture. This family of products integrates a feature-rich 64-bit quad-core ARM® Cortex™-A53 and dual-core ARM Cortex-R5 based processing system (PS) and Xilinx programmable logic (PL) UltraScale architecture in a single device. Also included are on-chip memory, multiport external memory interfaces, and a rich set of peripheral connectivity interfaces.

**Part Numbers**
- XAZU2EG
- XAZU3EG

**XA ZYNQ®-7000 ALL PROGRAMMABLE SoCs**

Automotive grade XA Zynq-7000 All Programmable SoCs are ideally suited to the high computation requirements of advanced driver assistance systems (ADAS). The combined programmability of hardware and software allows development teams to integrate a complete ADAS imaging flow, from sensing through environmental characterization to feature implementation into a single device. Also, functions can be moved between hardware and software to eliminate data flow bottlenecks, maximize performance and minimize resources. The XA Zynq-7000 All Programmable SoC devices with their architecturally inherent flexibility are providing a cost-effective solution for building highly scalable platforms allowing system designers to dramatically reduce development times.

**Part Numbers**
- XA7Z010
- XA7Z020
- XA7Z030

**XA ARTIX®-7 ALL PROGRAMMABLE FPGAs**

Automotive grade XA Artix®-7 FPGAs are optimized for cost and power with small form-factor packaging for high-volume automotive applications. Designers benefit from 65% lower static and 50% lower power than 45 nm generation devices. The Artix 7 FPGA is used as a co-processor to offload work done in microcontrollers, digital signal processing, or other host processors. It provides flexible interfacing and is optimized to compliment host processors. Available IP and software enables rapid extension of system interfaces, peripherals, or processing with minimal development effort.

**Part Numbers**
- XA7A15T
- XA7A35T
- XA7A50T
- XA7A75T
- XA7A100T

Only Xilinx provides a flexible, standards based solution that combines software programmability, high performance image processing tightly coupled with analytics, and any-to-any connectivity with the security and safety needed for next generation automotive systems.
### AUTOMOTIVE GRADE PRODUCTS

#### ANALOG
- Amplifier
- Audio Driver
- Audio/Video
- Data Converters
- Interface
- LED Driver
- Multiplexers

#### DISCRETES
- Bipolar Transistor
- Diode
- IGBT Chip
- IGBT Module
- MOSFETs
- Small Signal
- Thyristor
- Transistor

#### DISPLAYS

#### INTERCONNECT
- Board Level
- Environment
- Hi-Speed
- I/O
- Power
- Wire and Cable

#### IN-VEHICLE NETWORKS
- CAN
- LIN
- Ethernet
- FlexRay

#### LED/OPTOELECTRONICS

#### LOGIC & TIMING
- Bus Switch
- Digital Synthesizer
- Logic ICs
- Oscillators
- Real Time Clock

#### MCU/MPU
- MCU 8-bit
- MCU 16/32-bit
- MPU RISC/ARM

#### MEMORY
- DRAM & Module
- EPROM/EEPROM/FRAM
- FIFO & Dual Port
- Flash
- NVRAM
- SRAM
- SSD

#### PASSIVES
- Capacitors
- Circuit Protection
- Filters
- Resistors
- RF Passives
- Thermal Management

#### POWER
- AC/DC/PFC
- DC/DC
- Gate Driver
- Inductors
- Linear + Voltage Regulators
- MOSFETs
- Power Module
- Power Monitor + Supervisor
- References
- Switching Regulator

#### RELAYS
- Electromechanical Relays
- Solid State Relays
- DIP Switch
- Pushbutton Switch
- Snap Switch
- Tactile Switch

#### PROGRAMMABLE LOGIC
- FPGAs
- All Programmable SoCs

#### RF & WIRELESS
- Connectors
- In-Vehicle
- RF & Wideband
- Wireless Comm

#### SENSORS
- Current
- Humidity
- Image/Optical
- Position
- Pressure
- Temperature
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<th>SUPPLIER</th>
<th>ANALOG</th>
<th>DISCRETES</th>
<th>DISPLAYS</th>
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<th>LOGIC &amp; TIMING</th>
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Avnet optimizes supply chains by providing end-to-end supply chain services to electronic original equipment manufacturers (EOEMs), Electronic Manufacturing Services (EMS) providers and electronic component manufacturers. By combining internal competencies of global warehousing and logistics, finance, information technology and asset management with objective, external industry-wide data, Avnet’s supply chain services allow customers to increase their overall business knowledge — enabling more informed decisions.

**Component Intelligence**
- Bill of material (BOM) analysis
- Inventory optimization services
- Green initiative programs

**Supply Chain Assessment**
- Discovery and logistical analysis
- Financial analysis
- Project implementation

**Inventory Management Solutions**
- MRP management
- Supplier Managed Inventory
  - Consignment
  - Proximity warehousing
  - KanBan
- Diversity Programs
- Kitting/Turnkey Programs
- New product introduction (NPI) program support
- End-of-Life product management

**Financial Benefits**
- Lower inventory on hand
- Free up cash flow
- Strengthen balance sheet
- Lower cost of ownership
- Increase investment options
- Compare projected benefit against current costs
- Detailed analysis and reporting

Avnet offers engineers a host of services from any point in the design cycle from concept to architectural design to new product introduction and on through next generation modification or end-of-life. Avnet has the technical products, services and tools to accelerate design cycles — including ASIC and programmable logic engineering services, IP cores and more. With offerings that run the gamut from Web seminars to connector assembly, Avnet offers it all.

**Assembly and Programming**
- Commercial and military interconnect assembly
- Custom cable assembly
- Device programming
- Power supply
- Thermal management

**Design Tools**
- Design Resource Center
- Development and evaluation kits
- Embedded OS solutions
- IP cores

**Engineering Services**
- ASIC design / FPGA design
- Systems design
- Design service partners

**Technical Education**
- SpeedWay Design Workshops™
- On-Ramp Technical Sessions™
- Seminars / Webinars

Main point of contact regarding Quality to support segment customers either remotely or at their location as needed.
- Coordinates the procurement of PPAPs, working directly with the manufacturers and the customers to assure the requirements are met.
- Address specific quality requirements from customers either internally or through our manufacturers. (RoHS, DoNUs, Customer Specific forms, etc.)
- Coordinate the Failure Analysis Requests and 8D procurement along with the manufacturers to ensure the corrective actions are addressing the actual root cause of the issue.
- Address the IMDS requests to the corresponding manufacturers and follow up to make sure the nodes are submitted correctly to our customers IMDS ID.