



IP&E News

1st Quarter 2024



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ARROW

One charger
for all mobile
applications:

USB-C
(3rd Part)

Choosing the right
connector, implement the
interface and protect it.

USB-C: The interface of the future and its role in the industrial environment

This issue of IP&E News covers the interface for USB-C connectors.

Authors: Janus Piwek, Staff Technology Field Application Engineer, Arrow

USB-C Service Interface

- Secure Updates
- Configuration management of the system
- Communication and telemetry interface
- Data exchange: log data etc.

USB-C: One charger for (almost) all purposes

All mobile devices sold in the EU from December 2024 must have a USB-C port for charging. This will make USB-C the universal charging standard for small electronic devices. This includes smartphones, tablets, digital cameras, headphones, keyboards, computer mice and navigation devices. This is an important step towards greater uniformity and efficiency in the connector landscape. This consumer and environment-friendly directive was adopted by the European Union in 2022. It has even further-reaching implications for companies and consumers than previously assumed. Initially, it looked as if the directive would “only” affect mobile devices such as smartphones or tablets. This regulatory change marks a turning point. It affects both consumers and the manufacturers of mobile devices.

In the last two issues of IP&E News (online: <https://www.arrow.com/en/ipe/download-area/pemco-news>), we have already reported in detail on USB-C connectors and their safeguarding. Today we turn our attention to USB-C interfaces.

Opportunities and challenges in the industrial environment

The expansion of USB-C in mobile devices opens up new possibilities in the industrial environment. One major advantage is the standardization of charging and data transfer interfaces, which leads to a simplification of the infrastructure. Companies benefit from a reduction of different cables and adapters, which lowers costs and increases efficiency.

At the same time, the transition brings challenges. Companies must adapt or replace their existing hardware to ensure compatibility with USB-C. This requires investment and strategic planning to ensure business disruption is kept to a minimum.

The role of the USB-C interface

Interfaces play a key role in this development. USB-C interfaces not only support device charging, but also enable efficient data transfer and the connection of various peripheral devices. This extends the functionality of mobile devices in industrial applications, ranging from data acquisition to machine control. The graphic on the next page shows an overview of USB specifications with their speeds and power delivery capabilities.

The core components of USB-C

USB-C represents a significant improvement over previous USB standards. The core components that make this interface so unique include:

- **Anti-rotation plugs:** No matter how the plug is inserted. It always fits.
- **24-pin configuration:** The user-friendly 24-pin connector enables the simultaneous transmission of power, data, video and audio signals in high quality and is the best choice in many cases, even for applications where only power supply or charging of devices is required.

Faster data transfer and higher performance

The USB-C interface not only offers the advantages of a higher data transfer rate and simpler connectivity, but also the option of providing up to 240 watts of power via USB Power Delivery (USB-PD). This means that the USB-C interface with USB-PD offers a more convenient and flexible way of supplying devices with power. Using USB-C as a universal interface for powering different devices reduces the number of separate adapters and chargers. This in turn can reduce the consumption of resources such as materials and energy and thus have a positive impact on the environment.

Focusing on sustainability

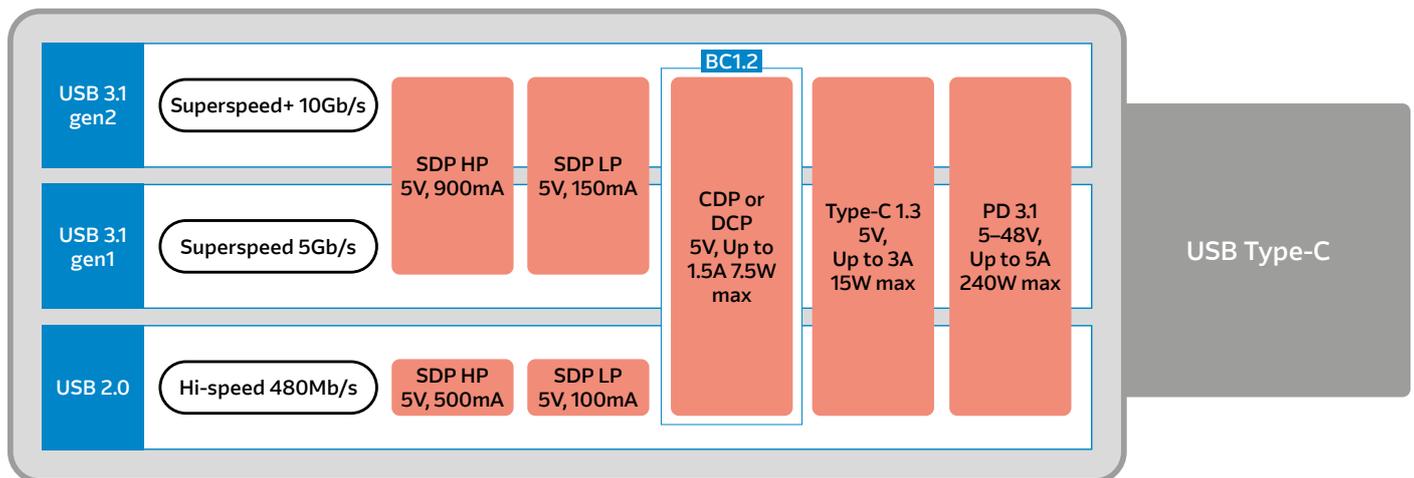
Every consumer, whether professional or private, is familiar with the following situation: over time, many different devices accumulate, such as cell phones, household appliances or laptops etc., all of which have their own power supply. This not only leads to a huge mess of cables - which charger is the right one - with the associated space requirements, but also to an increased

demand for resources in production and distribution. The European Commission estimates that the unnecessary purchase of chargers could save 250 million euros. In addition, these measures could reduce the amount of electronic waste by 1,000 tons per year. However, these figures only refer to the original targets of the directive for mobile devices. As already mentioned, the potential of the USB-C interface is far greater. This assessment is shared by numerous market research institutes.

Technical expertise and long-term partnerships to support market-leading partners

Arrow has maintained excellent partnerships with the industry's leading suppliers for many years. As a result, the technical know-how is now available to customers throughout the entire development process of the USB-C interface. This enables Arrow to provide its customers with competent and comprehensive advice at every stage of development.

The individual USB specifications with their speeds and power delivery capabilities

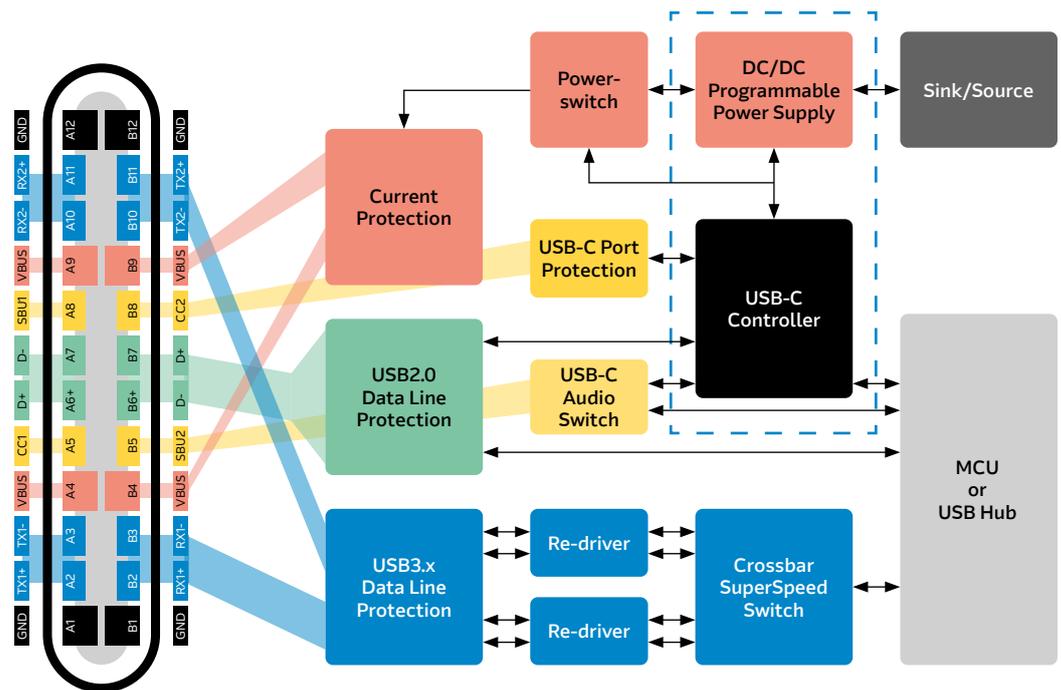


Legend
 SDP HP: Standard Downstream Port (High Power)
 SDP LP: Standard Downstream Port (Low Power)

CDP: Charging Downstream Port
 DCP: Dedicated Charging Port

BC1.2: Battery Charging Specification 1.2
 PD3.0: Power Delivery Specification 3.0

USB-C solution architecture



Proposed USB-C solution architecture

As you see in the USB-C solution architecture above, the depth of integration of the USB-C Power Delivery Controller has increased as more functions have been integrated into the chip. For example, the freely programmable microcontroller, the buck-boost DC/DC converter, the communication interfaces and other peripherals.

Potential for industrial applications

The potential of the USB-C interface for industrial applications is becoming increasingly apparent. The standardization of charging and data transfer interfaces leads to a simplification of the interface infrastructure. The use of USB-C as a universal interface for powering various devices reduces the number of individual adapters and chargers. This helps reduce the use of resources such as materials and energy, which in turn has a positive impact on the environment.

What is required to develop a USB-C Power Delivery solution?

- Clear definition of the use case
 - Static (USB-C only) / USB-C power delivery configuration
 - Number of connections (e.g. single/double/multiple)
 - Power supply function on each port: sink, source, dual role power (DRP)
 - Basic Type-C only / PD3.x / Extended Power Range (EPR)
 - Support for battery charging required?
 - Programmable power supply (PPS)
 - Power budget / balancing
- Is data also required?
 - Data role on the port (UFP, DFP)
 - USB2.x / USB3.x
- Additional functionality
 - Alternative mode for DisplayPort, HDMI, Thunderbolt, proprietary
- Compliance test for USB-C
- Automotive or industrial design
- Software frameworks stack / protocol analyzer tools

Technical Support for all USB-C Interfaces

In collaboration with customers and partners, Arrow is also driving the development of innovative solutions in the field of USB technology. These include, for example, highly integrated USB-C port controller families that use various hollow connectors for the power supply and can be implemented quickly and easily. Or a USB-C high-voltage microcontroller solution that offers a great deal of freedom to integrate complex USB-C power supplies into an existing system or product thanks to the integrated microcontroller and the USB-C PD firmware stack architecture.

With the help of a well-structured use case definition, Arrow supports customers in identifying a solution path for the development of a USB-C power supply solution that is optimally tailored to the application. This enables customers to work with Arrow's experts to determine all the requirements for their solution.

Highly professional tools such as protocol analyzers, sniffer tools and analysis boards from various manufacturers are also available for the testing phase and when errors occur. This shortens the time required for development and production can start more quickly.

Technical expertise

Technical expertise and long-term partnerships to support market-leading partners
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3M Machine Vision Cable Assemblies

3M brings years of expertise in signal transmission and electrical & mechanical cable design technology to factory automation

With what scholars are calling the Fourth Industrial Revolution upon us, manufacturing is steadily moving towards artificial intelligence (AI) to help make production lines more efficient.

In this shifting landscape with its expanding variety of applications, machine vision has emerged as a key force in driving productivity.

3M Industrial Camera Cable Assemblies solutions bring higher levels of performance and create new possibilities for factory automated machine vision systems.

3M delivers the latest industrial camera cable assemblies in a total of three common industry standards – USB3 Vision®, Camera Link and the emerging CoaXPress®, which is expected to become the mainstream interface for high-speed and high-resolution camera systems.

Greater lengths in USB3 Vision

Representing a new generation of machine vision standards, USB3 Vision allows for 5 Gbps high-speed communication and excellent compatibility. However, it has been limited by its relatively short transmission distance. 3M delivers cable assemblies that expand both functional cable length and sliding bendability within the standard.

A broad selection of Camera Link cable assemblies

As one of the originators of the Camera Link standard, 3M has for decades been at the forefront of developing total interconnect solutions for Camera Link, PoCL and PoCL Lite applications. These include 3M™ Camera Link Cable Assemblies, MDR/SDR connectors, boardmount connectors and cable variations to meet a broad range of electrical and mechanical requirements. System designers can configure to meet specific needs such as transmission speed, cable distance and inter- and intra-device connections. Flex cables feature U-shaped bending durability tested at 10 million cycles.

High-performance CoaXPress connectivity

3M provides CXP-12 and CXP-6 CoaXPress 2.0 compatible cable assemblies to help incorporate and maximize the latest in high-speed, high-resolution machine vision camera systems. Cable assemblies deliver high-speed data transfer of up to 12.5 Gbps per channel (CXP-12 with Micro-BNC, BNC connector specifications) and 6.25 Gbps per channel (CXP-6, DIN1.0/2.3).

We back up our interconnect products with local technical expertise for machine vision product selection, configuration and system support and we are dedicated to improving performance, robustness and reliability of machine vision systems.



Click here or scan QR-Code to find more information on arrow.com

Minitek® MicroSpeed 1.00 mm B-to-B Connector

Shielded design that are ideal for high-speed data applications with data rates up to 25 Gb/s.

Basics Minitek® MicroSpeed connector family with 1.00 mm pitch supports high-speed data applications with up to 25 Gb/s.

Minitek® MicroSpeed connectors provide superior EMC performance that reduces coupling inductance and offers significantly improved electromagnetic compatibility. The poka-yoke polarization prevents visual mismatching, which makes it ideal for use in industrial environments where visual and tactile tools are compromised during the mating process. These connectors are capable of supporting multiple PCB orientation applications and are suitable for customer applications as well. Its robust design with dual-beam contacts provides high electrical reliability and withstands a high level of vibration.

Markets and Applications



Industrial
Programmable Logic Controller (PLC)
Automation Machines



Automotive
Advanced Driver Assistance
Systems (ADAS)
Micro Controller Unit (MCU)



IT Datacom
Server/Storage



Medical
MRI machine
Computed Tomography



Orderable at arrow.com

- [10147073-2600RLF](https://arrow.com/10147073-2600RLF)

Features	Benefits
High speed performance up to 25Gb/s.	Can be used in high-computing and signal transfer applications in data communication, computing, medical, and industrial automation segments.
EMI Shielding.	Reduced coupling inductance leading to excellent electromagnetic compatibility.
Dual-beam receptacle contacts.	Provide high electrical reliability and withstands high level of vibration.
Blind-mating.	Suit for those tasks where visual and tactile tools are compromised during mating process.
Vertical, Right Angle, Combo solutions.	Support various applications.
Lead-free and RoHS compliant.	Meets environmental, health and safety requirements.
Licensed second source to Erni with an exact mating cross-reference.	Allows direct selection and usage of mating counterpart for Erni's product.



Bel High Reliability Medical Power Solutions

The Bel line of medically certified 60601 power supplies provide up to 500 W and feature highly efficient GaN.

By harnessing the superior reliability, high power density, and efficiency of Gallium Nitride (GaN) transistors, medical equipment manufacturers can develop smaller, lighter, and more reliable solutions that optimally address the demanding safety standards and requirements of modern healthcare and home health environments.

Bel Power Solutions has been at the forefront of implementing high power density switching power supplies using GaN transistors as power switching devices. These rugged transistors excel in challenging thermal environments, allowing for wider temperature range operation spanning a wide variety of applications, from compact portable devices to high-power medical systems.

The EOS product line offers highly reliable medical power supplies, some of which include GaN technology and boast up to 2.56 million hours MTBF. Rigorously tested for safe, reliable performance through thermal cycling, life testing, and design verification, these power supplies adhere to the latest medical safety standards, including IEC/EN 60601-1 3rd Edition, with 2 x MOPP isolation for Class I applications, and are RoHS compliant and CE marked.

Manufactured in India, the MEPG and MFLS series power supplies provide highly efficient power in a compact form for medical applications. They are available in 250, 300, 400 and 500 W models with output voltage options ranging from 12 to 58 V, efficiency of up to 90 % and a power density of up to 23.7 W/in³. They're designed for high reliability and can operate from -40 °C ~ 70 °C, with overvoltage, overcurrent, short circuit, and overtemperature protection features to prevent damage.



Orderable at arrow.com

- [MEPG Series – Bel Power Solutions](#)
- [MFLS Series – Bel Power Solutions](#)



Click or Scan the QR code to learn more about Bel's highly reliable medical power supply products.

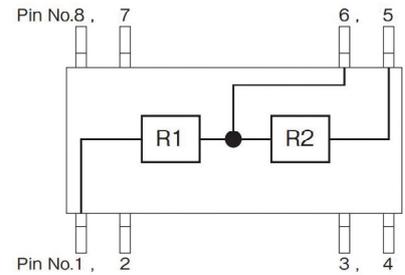


High Precision High Voltage Divider

HVD P08 – Thin Film High Voltage Divider Network

Applications

- High voltage divider for HEV/EV
- Battery module (voltage monitoring, battery management circuit)
- Inverter module (inverter circuit, DC-DC converter)
- Voltage detection circuit of quick charger
- Charging control circuits
- Power supplies
- Motor control units
- High magnification of operational amplifier circuits



KOA's HVD-series are designed as high precision high voltage divider network for working voltages up to 1000 V.

HVD's are always customized parts.

Constructed using 2 metal thin film resistors inside a molded IC package, the device provides 0.1% ratio tolerance and 10ppm ratio TCR.

The ratios of the inner R1 & R2 are selectable between 1:10 to 1:1000.

Customized resistor combinations of the inner R1 & R2 are available as needed.

With an initial TCR down to ± 25 ppm and a tolerance as low as $\pm 0.1\%$, the HVD-series from KOA is ideal for precision designs such as high-accuracy sensing or voltage detection circuits in automotive, industrial and measuring applications.

The HVD-series also features an excellent long-term stability, is AEC-Q200 tested and suitable for high reliability applications.

Features and Benefits

- High precision high voltage divider
- Ultra precise due to low ratio tolerance and T.C.R.
- High reliability and long-term stability
- Available custom combinations of R1 & R2 and tolerance as needed
- Max. resistance value 51 M Ω
- Max. working voltage 1000 V
- Resistance ratio selectable between 1:10 to 1:1000
- Operating temperatures up to +155 °C
- AEC-Q200 tested
- EU-RoHS compliant

Orderable at arrow.com

- [HVD Series](#)



Click or scan the QR-Code to get the newest datasheet from the KOA website



FloXY® (Floating B2B)

FloXY® – BASIC OVERVIEW

FloXY® is a product brand of Kyocera's Floating Board to Board Connector series. By moving in the X and Y directions to absorb misalignment (offset) during mounting and mating, the product group has achieved the high reliability required in the automotive and industrial markets.

"HS" is added value as high-speed transmission standards of 16 Gbps or more.

FloXY is a registered trademark of KYOCERA in Japan and other countries.

Features & Benefits

- Stacking Height: 4.0 mm ~ 30.0 mm
- Floating: +/- 1.0 mm Max.
- Two-Point Contact Structure (High Reliability)
- Right angle type is available

- Capable of high-speed transmission PCIe Gen4 (16 Gbps)
- High heat resistance (125 °C)
- Multiple connectors can be used on the same board
- Reduces stress on solder joints

These specifications may differ from product to product.

Applications

- Infotainment
- Sensors (Camera/Radar/LiDAR)
- Power Train (EPS/Inverter)
- ECU/DCU

"High Reliability"	"High-speed"
 <p>FloXY</p>	 <p>FloXY^{HS}</p>
<p>Series 8152/5655/5656/5689 Pitch: 0.4 ~ 0.635 mm Height: 3.5 ~ 30.0 mm</p>	<p>Series 5652 Pitch: 0.5 mm Height: 14.0 ~ 30.0 mm</p>

One Action Connectors

One Action Connectors – BASIC OVERVIEW

This type of connector enables the FPC/FFC to be locked in a single operation (one action) of inserting the FPC/FFC.

A typical ZIF-type FPC/FFC connector requires three operations (three actions): (1) opening the lock, (2) inserting the FPC/FFC, and (3) closing the lock. However, one-action lock type connectors reduce the number of labor hours required for assembly to 1/3.

Features & Benefits

- Good workability (One Action)
- Capable of high-speed transmission
- (V-by-One?HS* / MIPI D-PHY / USB 3.1 Gen2 etc...)
- Designed for AOI inspection to confirm mating condition High heat resistance (125 °C)

- Vertical type is available
- Foreign matter removal performance
- Compatible with automated mating by robots

These specifications may differ from product to product.

Orderable at arrow.com

"One-action"		
 <p>6810 (ST/RA) Pitch: 0.5 mm Height: 4.1/6.0 mm</p>	 <p>6817 (ST/RA) Pitch: 0.5 mm Height: 2.6/5.32 mm</p>	 <p>6893 (RA) Pitch: 0.5 mm Height: 2.8 mm MIPI D-PHY Support</p>

Samples available

*V-by-One is a registered trademark of THine Electronics, Inc

Applications

- Infotainment
- Sensors (Camera/Radar/LiDAR)
- Power Train (EPS/Inverter)
- AV / IT equipment (TV/PC/Game/XR...)
- OA / Industrial (Printer/Drone/Security...)



Current Sensing Resistors

These CSRs provide an optimal, low-cost solution for measuring current flow to provide control and over-current protection crucial for battery management and motor control.

Orderable at arrow.com

- WPB Series
- WSTC Series
- WSTM Series

Applications

- Battery management system
- Motor control and protection
- DC/DC converters

Features

- Power rating up to 3W
- High precision and stability
- Low-temperature coefficient of resistance
- SMD form factor



Click or scan QR-Code to read more

Benefits

- Cost-effective solution
- Small size – design flexibility, space-saving

Series	Size	Material	Resistance		Power (W)	TCR (ppm)
			Ro (mΩ)	Rt (%)		
 WPB	2512	Metal Plate	0.5-56	1	2	50/100/150
	0402	Epoxy, Foil	5-50	1	0.33	100
 WSTC	0603	Epoxy, Foil	3-20	0.5-1	0.33	75/100
	0805	Epoxy, Foil	1-20	1	0.5	50/75/100/150
	1206	Epoxy, Foil	1-20	1	1	50/75
 WSTM	0603	Ceramic, Foil	6-33	1	0.5	50/75
	0805	Ceramic, Foil	3-470	1	0.75	50/75
	1206	Ceramic, Foil	4-499	1	1	50
	2512	Ceramic, Foil	2-470	1	2	50/75
	4527	Ceramic, Foil	7-20	1	4	50/100



Ultra Compact Switches for Medical

C&K switches meet the expectations for medical wearables: miniaturization, superior performance, quality & long life cycles

The medical industry is at the forefront of integrating advanced features into personal connected medical devices, connected drug delivery auto injectors, and minimally invasive medical devices and tools. As patients take greater control of their healthcare, there's a growing demand for tools with enhanced functionality. Moreover, significant advancements are occurring in the Diabetes Care market, notably in glucose monitors, insulin pens, and continuous monitoring equipment.

Amidst this dynamic landscape, Littelfuse's microminiature electromechanical switches emerge as the preferred solution for ensuring the consistent and superior performance of these medical devices. As a leading provider of switches, C&K (now part of Littelfuse) ensures that our products meet the stringent requirements

of the medical industry, delivering superior performance, high quality, and long life cycles. Engineered to be compact and durable, our switches are tailored to meet the unique demands of medical applications. Additionally, alongside our extensive Medical Switch Product Line, we offer purpose-built options to meet even the most exacting customer requirements. With a vast portfolio comprising over 55,000 products, we often have existing variants to address diverse needs.

Orderable at arrow.com

- [nanoT Series](#)
- [KSC Series](#)
- [KMT0 Series](#)
- [KXT3 Series](#)
- [HDT Series](#)
- [FDSE Series](#)



nanoT series



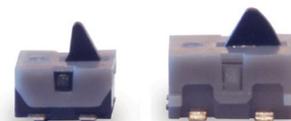
KSC series



KMT0 series



KXT3 series



HDT series



FDSE series



Connector Trends: 2030 and Beyond

Six years into the future is a brief timespan – what several game-changing innovations is the world is likely to witness?

Six years into the future doesn't seem very futuristic – yet in that brief timespan, the world is likely to witness several game-changing innovations in the datacom, transportation, energy and consumer connectivity industries. A recent Molex report, Predicting the Connectivity of Tomorrow, provides an in-depth look at the inspiring developments in electronics that are anticipated through the remainder of this decade.

The report showcases emerging applications like contactless connectivity and data transmission at twice the speeds we see today. It also highlights slim devices that forge new frontiers in miniaturization.

What will drive major trends in the development of interconnect solutions from now until 2030 — and how will engineers keep up with the rapidly evolving landscape of data, devices and infrastructure? Read on to learn about Molex's innovative approach to connector design and the latest connector developments poised to enable the future.

The Art of Interconnectivity

Making a connector that can accommodate more power or data might sound like a simple feat. But like any other design challenge, interconnect technology involves trade-offs between variables that are often at odds with each other. For any connector, main variables include:

- Signal integrity and power quality
- Rate of data transfer and/or power rating
- Thermal management
- Form factor, size and weight

Augmenting one variable often amplifies deficiencies in others. Higher power applications, for example, force engineers to consider the extra thermal energy generated. Faster speeds through a cable or wireless device can result in more noise and less signal. Molex's miniaturization focus offers a glimpse into the future of connector design — a future in which engineers balance heat, weight, power and data within ever-smaller form factors.

Trends Driving the Connector of the Future

How will connectors evolve over the remainder of this decade? Click to read the full article and discover several market drivers likely to impact connector design, along with examples of related Molex innovations:



Click or scan QR-Code to read more





New PhotoMOS[®] Relay – AQY206GV

Panasonic Industry releases new PhotoMOS[®] relay AQY206GV offering high voltage capability in a miniature SSOP package

Applications

- Industrial equipment
- I/O modules
- Controls
- Measuring equipment
- Testing equipment

In the realm of modern industrial equipment, precision and reliability are paramount. Panasonic Industry introduces the AQY206GV, a high-voltage, high-capacity MOSFET relay packaged in a compact SSOP, set to transform a range of industrial applications. Despite its compact SSOP package, this relay boasts extraordinary voltage capability, reaching up to 600 V.

Designed with practicality in mind, the AQY206GV relay is engineered for quiet, rapid, and bounce-free switching. Its adaptability finds relevance across multiple modern industrial domains, from sophisticated industrial machinery to testing and measuring equipment, inspection machines, and multi-point recorders.

What sets the AQY206GV apart is its ability to operate at high speeds, facilitated by minimal T-on and T-off durations. The relay's low on-resistance, averaging at 8 Ohms, is instrumental in efficient power management, offering an optimal balance between performance and power consumption.

Engineered to withstand rigorous conditions, the AQY206GV excels in temperatures up to +105 degrees Celsius. This resilience underscores its reliability in demanding industrial environments where consistency is non-negotiable.

Crafted with a pragmatic focus, the AQY206GV relay meets the needs of application engineers seeking dependable, high-performance components. Its compact form factor and exceptional capabilities



establish a new standard for high-voltage, high-capacity switching, promising enhanced efficiency and reliability across diverse electronic applications.

As industries increasingly demand compact yet powerful electronic components, the AQY206GV emerges as a reliable solution, facilitating innovation without compromising performance. Its versatility and robustness position it as an indispensable component in the toolkit of application engineers, driving industrial efficiency forward.

Features

- 600 V load voltage
- 0.15 A load current
- AC / DC dual use
- 1FormA type
- Type 8 Ω ON resistance
- SSOP type, SMD or THT
- Noiseless switching
- Endless lifetime
- Galvanic isolation between input and output circuit

Orderable at arrow.com

- [AQY206GV](#)

Series	Package	Output configuration	Load voltage	AC/DC dual use	I/O isolation voltage
HF 1 Form A	DIP6	1a (1 Form A)	40, 60, 250, 400 V	Yes	1,500 V
HF 1 Form A high capacity	DIP6	1a (1 Form A)	1,200 V	Yes	1,500 V



World's first SMD PTC ICL



SMD PTC thermistor for self-regulated pre-charging and active discharge of DC-Link capacitors for industrial and automotive applications.

Uncharged DC-Link capacitors in electric vehicles, charging stations or solar inverters behave like a short circuit when switched on. This poses a risk of damaging fuses, semiconductors and other electronic components in the circuit. The SMD PTC ICL automatically increases its resistance in response to the growing temperatures caused by high inrush current or in case of high malfunction current. This behavior reduces the fault current to a non-critical

level and thus protects the PTC element itself and other electronic components in the circuit. This behavior can also be utilized for active discharging of the DC-Link capacitor and has the benefit of saving costs, because additional overtemperature protection is not needed anymore.

Main features and benefits

- Surface mountable (reflow solderable)
- Space and weight savings on PCBs
- Intrinsically safe in case of a failure and resettable
- Qualification according to AEC-Q200

Main applications

- Charging and discharging DC link capacitors
- Traction inverter for xEV
- Variable speed drives
- Switched-mode power supplies

Orderable at arrow.com

- [B59404J0170A020](#)
- [B59405J0170A020](#)



Click or scan QR-Code to read more

Dimensions w x th x h [mm]	V _{max} [V AC]	V _{link max.} [V DC]	R ₂₅ [Ohm]	T _{ref} [C]	C _{th} [J/K]	Ordering code
13 x 10 x 11	350	500	500	170	1.0	B59404J0170A020
13 x 10 x 11	700	1000	1000	170	1.0	B59405J0170A020*

*In development

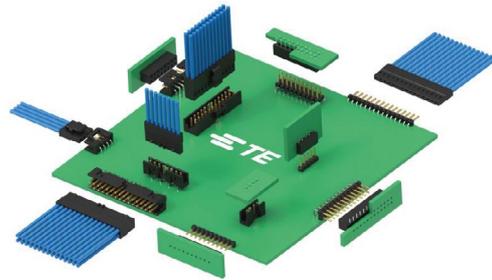


AMPMODU 2 mm Interconnection System

38 % less space on PCB board compared with 0.100" centerline.
Multiple options for Board-to-Board stacking. Ease of assembly.

Applications

- PLC
- I/O devices
- Servo drives
- Robotics & AGV
- Material handling equipment
- Industrial controls
- Instrumentation and test equipment
- Building automation devices
- Medical equipment
- Energy storage systems



TE Connectivity(TE)'s AMPMODU 2 mm interconnection system reliably and economically meets the requirements of today's miniature, sophisticated electronics. This system is ideal for space constrained environments and offers a wide portfolio with design features that enable reliable signal transfers in demanding applications. TE's compact 2 mm design enables space savings, providing designers with greater overall flexibility. The AMPMODU 2 mm system occupies 38 % less space on a printed circuit board as compared to traditional 2.54 mm centerline connectors. This connector system is available in both board-to-board and wire-to-board mating options and utilizes a dual-beam contact design to enable 2 points of contact for increased signal reliability.

The AMPMODU 2 mm connection system is available in 4 types of plating options: 30 μ " [0.76 μ m] gold, 15 μ " [0.38 μ m] gold, 4 μ " [0.1 μ m] gold flash, and tin. All 2 mm board-mount connectors are offered in single and double row versions and vertical and horizontal orientations for both headers and receptacles. Surface mount and through-hole mounting options are available with the capability to support reflow solder processes up to 260 °C.

Board-mount connectors can be packaged in tape and reel to support automated assembly processes, or in tubes, which may be ideal in manual assembly environments. AMPMODU 2 mm wire-to-board connectors are available without latches, and with detent or positive latches for high-vibrations applications that demand more secure electrical connections. Wire-mount receptacles are offered with two options for discrete wire termination – crimp snap-in contacts and insulation displacement contacts (IDC). Additionally, wire termination is easily accomplished with TE-designed application tooling.

The AMPMODU 2 mm interconnection system is the clear choice for demanding Industrial applications, offering a comprehensive, economical, and reliable connector portfolio.

Key Benefits

- Reliable connection in high vibration environments with detent and positive latching variants
- Ergonomic and easy mating/unmating process with positive latching variant
- Interchangeable IDC and Crimp Snap-In contacts



Click here or scan QR-Code to find more information and available products on arrow.com



TT Electronics Current Sense Range

TT Electronics offers a wide range of resistive solutions to designers in all fields needing to measure the flow of current.

Target Applications

- Battery charging circuits
- Battery management systems
- DC-DC converters
- High power compact applications
- Automotive power conversion
- Automotive small motor control
- Instrumentation
- Process monitoring
- Power supplies

The growth of battery-powered portable products, increasing concern to minimize energy usage and the spread of electrically actuated systems in cars result in growing demands for measuring current in electronic systems. Moreover, designers of power supplies, battery management systems and motor drives are commonly faced with the need to measure current accurately. Whether this serves the purpose of fault protection or functional control, the simplest method is often to use a current sense resistor. Using current sense resistors, the current is measured by converting it to a voltage which is then compared with a threshold, digitized or otherwise processed.

TT electronics offers a large range of standard resistive current sense products and also offers custom designs. To see TT Electronics' complete current sense portfolio see www.ttelectronics.com

Main Features

- Many products AEC-Q200 approved
- Applicable for high power usage
- 2- and 4-terminal current shunts
- Resistance values down to 50 $\mu\Omega$



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Orderable at arrow.com



- [LRMAP3920 / 5930 / 2726 / 2817 / 4026](#) – low resistance metal alloy power resistors



- [OAR](#) – open air metal element resistors



- [OARS](#) – surface mount metal element resistors



- [LRMA](#) – low resistance metal alloy resistors



- [ULR](#) – metal element resistors



- [MFC](#) – metal foil on ceramic chip resistors



- [LRCS](#) – low value current sense chip resistors



- [LR](#) – low value flat chip resistors



- [LRF3W](#) – low value 3 W inverse form chip resistor



- [EBW8518 / 5216](#) – electron-beam welded bus-bar shunts



Hall Effect Sensors from ZF

ZF's linear and angular position sensors based on "Hall effect"

Both sensors series LIN and AN are RoHS compliant and suitable for wide air gap applications.



Nothing works without sensor technology. Any modern and smart technology relies on precise sensor technology - whether optical sensors, pressure, position, speed, temperature, or acceleration sensors. Due to the vast number of sensor types and versions, it is a great challenge to choose the right sensor for a specific application. One sensor technology is "Hall effect" which are highly sensitive to magnetic fields. They can be used for linear and rotary measurements as well as for speed and direction sensing.

In its product range, ZF Friedrichshafen AG has different Hall effect sensors for diverse applications. The LIN series for linear position measurements and ANG series for angular position measurements are non-contact position sensors with one or two independent outputs. They are suitable for applications such as hydraulic valves, hydraulic controls, electric drives, pneumatic controls and others.

The LIN-series can measure a range of up to 45 mm, while the ANG series provide a programmable measuring range from 0° to 360° degrees. IP68 classification makes these sensors universal also for use in rough environmental conditions. They comply with industrial EMC/EMI directives and come with a 12 Bit resolution.

Besides the LIN and ANG series, the ZF sensor portfolio includes Hall effect sensors for speed and direction detection.

Orderable at arrow.com

- AN101101
- AN820001
- AN820002
- AN820031
- AN820032
- AN920031
- AN920032
- AN920036

- ANG-11HAW1
- ANG-21HAW1
- CU103601
- CU103602
- CU103603
- LIN-11HAW1
- LIN-21HAW1



Click or scan QR-Code to read more about Hall Sensors



Click or scan QR-Code to read more about Angle Sensors



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