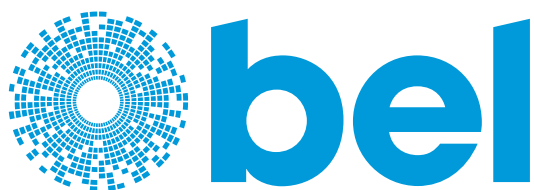


5G



5G Solutions



POWER | PROTECT | CONNECT

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5G & Bel

5G has finally arrived, with services already available in the USA and operators around the world gearing up for launches in 2019 and beyond. 5G's high speeds, low latencies and abundant bandwidth promise to open up countless new applications for a fully connected society, leading in turn to exponential growth rates of transported data.

5G roll-outs will drive a rapid growth in base stations and increased demand for backhaul connectivity. Processing and storing huge volumes of data will have a fundamental impact on data center capacity and topology and adopting 5G will require factory and office owners to adapt their networks.

End users, operators and suppliers in the 5G ecosystem will depend on companies such as Bel for the timely provision of high quality, reliable components to build the fabric of their 5G networks.



Power

5G network speeds and reduced latencies will enable many applications to offload computation-intensive tasks to data centers, driving a significant increase in demand for cloud computing and data traffic. At the same time telecom operators are modifying central offices to add compute racks able to sustain compute intensive tasks. To gear-up for 5G, data center owners and telecom companies will have to scale-up their operations by adding more power, cooling, servers, racks, etc. With current technology, 2kWh of energy is required to download one gigabyte of data. One major driver for data traffic is video streaming which is expected to grow even further. This growth will be reinforced by increasing availability of connectivity services and 5G. It is therefore clear that considerable advances in power supply efficiency are required to ensure the cost-effectiveness and sustainability of 5G. The new 5G networks will implement a dense, distributed network of base stations in a small cell infrastructure. This will allow more processing to happen on the edge, leading to lower latencies.

Small cells consume energy and need to be supplied by efficient power conversion units.



PFE3600-12-069RA, PFF3000-12-069RD & TET4000-48-069RA

Bel Power Solutions' PFE3600-12-069RA, PFF3000-12-069RD and TET4000-48-069RA are examples of power supply units designed specifically to meet the demanding requirements of the 5G data center and telecom central offices. Rated up to 4kW, and fully DSP controlled, these highly efficient front-end power supply units are ideally suited for server, switch and router applications. Converting either standard AC mains or 48Vdc telecom voltage into a 12Vdc or 53.5Vdc outputs, PFE3600-12-069RA, PFF3000-12-069RD and TET4000-48-069RA can be paralleled in specifically designed power shelves to provide up to 20kW power to an IT rack. They use state-of-the-art digital signal processing techniques to provide exceptional efficiency and high-power density.



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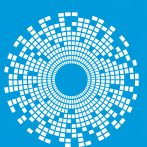
Connectivity

The 5G specification covers three broad use cases - Ultra-Reliable & Low Latency Communications, Massive Machine Type Communications and Enhanced Mobile Broadband. To deliver this functionality a number of technological innovations have been designed into 5G networks, including massive MIMO, beam-forming and network slicing. However, it is 5G's use of the mmWave spectrum at 30GHz and above which will unlock the bandwidth and data rates (up to 10 Gb/s compared to today's 1 Gb/s) demanded by many applications. Designing devices to operate at mmWave frequencies is challenging and high tolerance, precision components are required at all levels to ensure optimal transfer of electromagnetic energy.



RF, Microwave & mmWave

Connectors are omnipresent within electronic systems and, as 5G data speeds increase into mmWave frequencies, precision connections are essential to minimize signal losses. Cinch Connectivity Solutions' 5G connectivity solutions include a full range of components that are ready today for your 5G infrastructure. Cinch's Johnson product line offers connectors, adapters and cable assemblies that are designed to provide the highest quality data transmission for audio, video and data applications supporting frequencies up to 67GHz. For high flexibility, low loss and ultra-low loss RF/Microwave technology, Semflex cable and cable assemblies cover 5G frequencies up to 120 GHz. Midwest Microwave passive coaxial microwave components are known for their precision performance and high quality, which is necessary for 5G reliability and low latency requirements.



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Ethernet

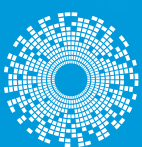
Although the arrival of 5G may raise questions over its future, most analysts agree that Ethernet will have a key role to play for many years to come. Ethernet's ability to combine power and data delivery underpins its flexibility and cost effectiveness for a broad range of home and enterprise applications such as access points, surveillance cameras, VoIP phone systems and LED lighting.

Ethernet standards continue to evolve with 400 Gbps now on the horizon, and the iCIRRUS consortium has recently demonstrated the feasibility of using the protocol in the front-haul segment of mobile access networks, where signals are received at antennas and sent to fixed base station terminals. Using Ethernet for so-called network "x-haul" makes sense due to its ubiquity and low cost.



SealJack™

Connectivity requirements – such as Base-station "any-haul" and many IoT applications – take Ethernet out of the office environment, where moisture and other factors threaten the operation of electronic systems. Stewart Connector's SealJack™ system, comprising RJ45 Modular plugs and jacks in a sealed IP67 design, provides reliable connectivity in the most demanding environments. The connectors support PoE+ connectivity and come in a range of configurations, including panel mount, dual or single plug terminations and shielded or unshielded. Cat5e and Cat6 applications are supported at 10/100 Base-T, 1G Base-T, 2.5G Base-T and 5G Base-T Ethernet speeds.



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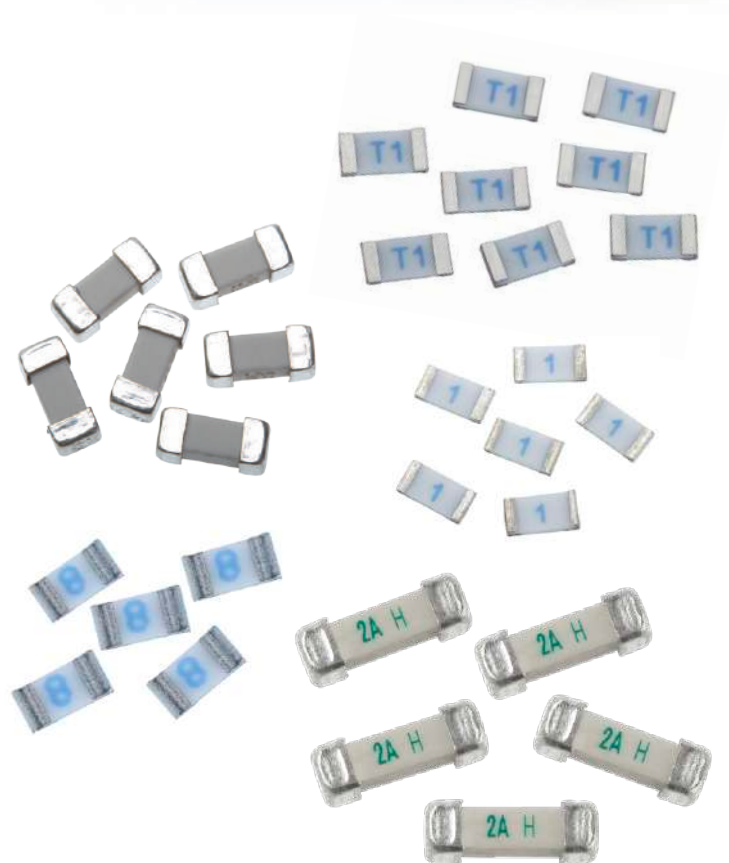
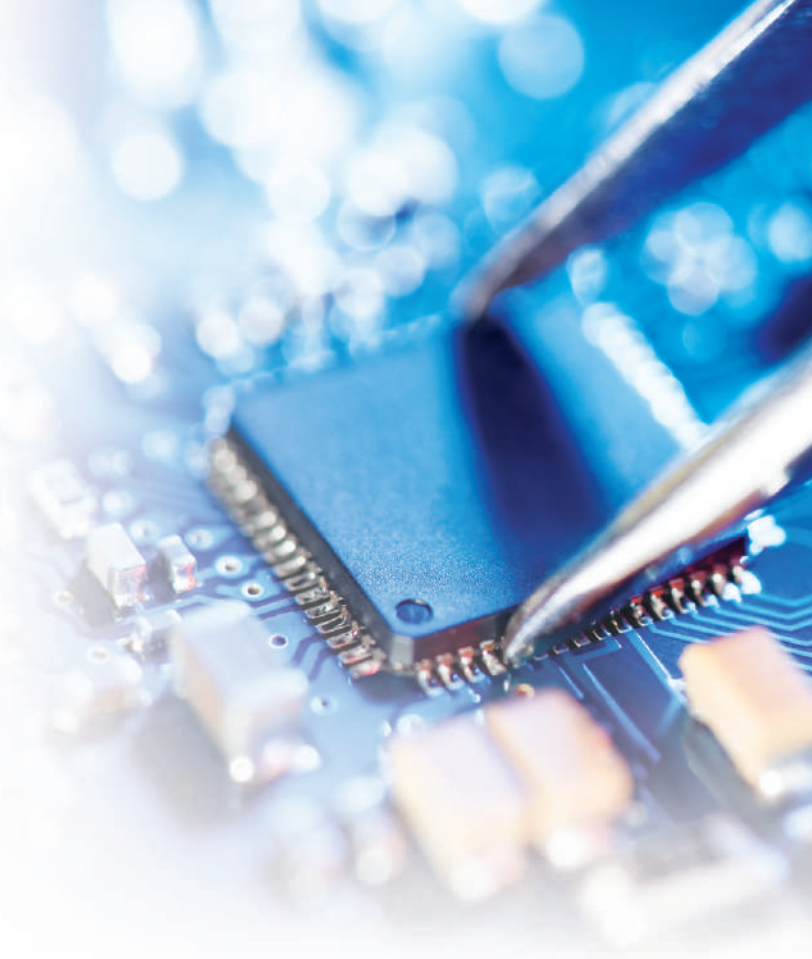
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Circuit Protection

From consumer handsets to small, densely-packed base stations, 5G services are enabled by complex electronic systems; circuit boards packed with sensitive integrated devices, including RF signal transceivers, memory and high-speed processors. Protecting these systems requires solutions that meet all of the requirements of the application, covering size, weight, performance and cost. The 5G infrastructure will span large basestations, picocells and handsets, down to the smallest smart sensor, and will be installed in various environments subject to extremes in temperature and shock. This will require a portfolio of circuit protection solutions designed for the most demanding applications, covering voltage, current and power levels that are potentially wider than any other vertical sector.

Chip Fuses & PTCs

Bel Fuse's circuit protection portfolio offers one of the broadest ranges of circuit protection products on the market today, including board level and surface mount fuse designs, such as the C2Q Chip Fuses. The portfolio also includes PCB mount, radial fuses rated up to 350VAC, standard glass and ceramic cartridge fuses including axial leaded board mounted options and a complete range of PTC resettable fuses. In addition to the standard products, Bel Fuse offers a wide range of value-add options to facilitate more efficient production line assembly.



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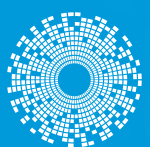
Integrated Connector Modules

Delivery of 5G data will depend heavily on Ethernet at various points in the technology chain. With PCB real estate at a premium, Integrated Connector Modules (ICMs) provide the perfect partner to 5G, by integrating the electrical interfacing circuitry, or magnetics, into the connector. Adding 5G levels of bandwidth to existing forms of connectivity, such as wireless access points and base stations, security cameras and industrial control, will see ICMs becoming even more important. It will also see an increase in the use of Power over Ethernet (PoE) solutions, to help build out networks in a minimally invasive way.

Access to ICMs offering up to four ports with PoE at 1GBase-T bandwidths will help 5G extend its reach as network operators look to monetize increased capacity quickly.

MagJack® ICMs: 100W to 10GBaseT

As the inventor and largest supplier of Integrated Connector Modules (ICM), Bel has the broadest portfolio of ICM products available, perfectly suited to meeting the needs of 5G. Bel and TRP ICMs support 10/100 Base-T to 10GBase-T, for up to 100W PoE (PSE and PD), and non-PoE applications. Bel multirate compatible 10G ICMs are designed to meet today's bandwidth requirements and those that will come with 5G deployment, including single-port, 4-port side-by-side and high density 2x8 stacked ICMs. All ICMs meet IEEE 802.3 standards and include protection from 6kV ESD strikes, to deliver reliability and long service in the harshest environments.



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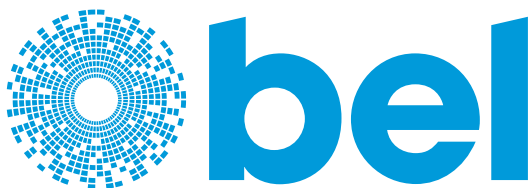
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