RAISING RELIABILITY OF DEVICES FOR THE 5G TELECOM INFRASTRUCTURE

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The coming era of 5G mobile communications has users excited about the possibilities and broadband systems designers and manufacturers a bit nervous about the realities. Deployment will come in phases – the first this year, with scaled rollout of broader deployment expected to begin in 2020. While handheld devices may have the required chipsets, infrastructures must be able to manage the huge amounts of data and speeds required to satisfy 5G demands. The move from 4G to 5G is more than a step change; it's a leap. Current projections are that 5G will be able to handle 1,000 times more traffic and will provide data download speeds at 10x the rate of 4G LTE. To put that in context, 4G+ download speeds, on average, are about 60Mbit/second. 5G is projected to deliver anywhere between 1,000 – 10,000 Mbit/second (1 -10 Gbit/sec). You'll be able to download an HD movie onto your phone in less than a second.

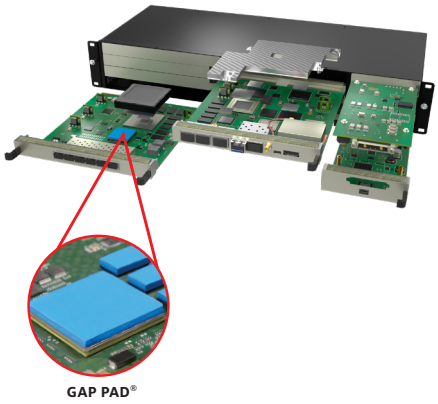
4G has almost tapped its limit, and with more users, devices and wireless applications being added on a daily basis, 5G technology is required to accommodate the increasing data loads. This means more of everything from an infrastructure standpoint: additional base stations, higher capacity routers and switches and more reliable high power components to handle the data volume and speeds 5G is promising. Currently, there is no one approach or solution that has emerged as the 5G single enabler. **Instead, the new capability will comprise a broad heterogeneous network and is likely to include some or all of the following:**

More base stations – Not only will more traditional base stations be in play, but a higher volume of smaller base stations, often called small cells, can help with the challenges posed by high-frequency millimeter waves and offer a relay solution for signal transmission.

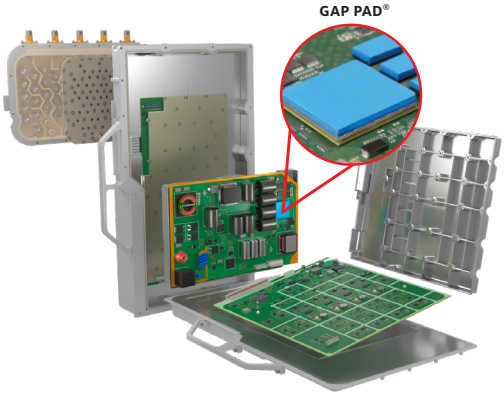
More antenna transmitters and receivers, and directed signal transmission – Massive MIMO (multiple-input, multiple-output) allows for substantive increases in signal transmission. However, with this comes increased interference, which requires beamforming to accurately send data packets to the required destination. Beamforming also offers solutions to mm wave transmission and interference challenges.

Higher power devices – Like nearly all electronic sectors, the more function you can pack into a smaller space the better. The same holds true for 5G telecom; base stations, routers and switches will have to churn and move data faster than ever. Greater capacity doesn't necessarily mean bigger boxes, just higher power devices in the same footprint. Expect a huge increase in the number of high powered processors/ASICs and hardware components.

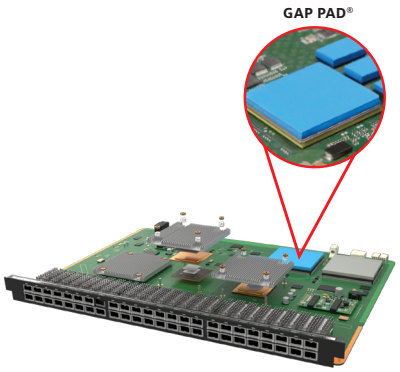
BERGQUIST® GAP PAD® GAP FILLING MATERIAL IN TELECOM APPLICATIONS



Base Station



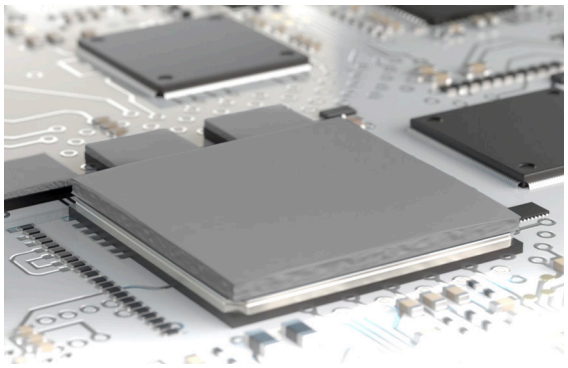
Remote Radio Unit



Router Line Card

Once in place, 5G will expand the efficient use of connected life and business – from our mobile phone experience to connected home devices, virtual and augmented reality applications, autonomous driving, the Internet of Things (IoT), the Industrial Internet of Things (IIoT) and a multitude of future technologies not even on the horizon. As customers, we expect it all to work on-demand, 24/7/365. Reliable function of 5G network infrastructures is critical; and, at the foundation of all 5G devices are the electrical connections, protection of electronic devices and thermal control needed to ensure dependable, on-call operation. Delivering the reliability required for systems that will be subjected to the demands of indoor and outdoor environments, temperature extremes, and high in-use temperatures is central to 5G transformation. One of the most critical elements of consistent performance is thermal control and, with the variety of components used and environments experienced, requires multiple approaches.

Henkel's BERGQUIST® GAP PAD®, an ultra-low modulus gap filling materials, offer extremely high thermal conductivity and low assembly stress which, traditionally, have been difficult properties to deliver in a single solution. With a variety of pad-based thermal interface material (TIM) systems that offer thermal conductivity levels from 3.0 W/m-K to 12 W/m-K products – ultra-low modulus BERGQUIST® GAP PAD® gap filling materials are ideal for high power devices such as core chip and system-on-a-chip (SOC) devices found within 5G-capable telecom base band units, routers and switches. Phase change TIMs and liquid gels that provide application versatility and customizable flow characteristics provide the adaptability needed for applications such as radio frequency ICs, power amplifiers, FBGAs/FLGAs and power supplies.



Reliable 5G networks will clearly require a host of solutions – at the printed circuit board level all the way up to the final system enclosure – to deliver on the huge expectations. Keeping all systems go also means keeping all systems cool, making thermal management one of the most critical pieces of the 5G solution.

Learn more about Henkel's complete 5G telecom infrastructure portfolio of electronic materials:

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https://www.henkel-adhesives.com/us/en/industries/data-and-telecom-infrastructure.html

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