



# Core RF Solutions

for the world's leading companies

**qorvo**<sup>™</sup>  
all around you

**Qorvo helps shape solutions for the world's leading companies so that they can bring their products to market faster and better serve their customers. Qorvo provides the core RF product and technology leadership, semiconductor processing expertise and systems-level knowledge they need to solve the most difficult technical challenges, to connect and protect the world all around you.**



## Customers are at the heart of everything Qorvo does

The Connected Generation will depend on Qorvo's products and technologies, whether it's consumers who want to stay connected to high-speed data while traveling around the globe, or troops who need to maintain constant communication to safely accomplish their mission. Qorvo will do this for a very diverse base of customers serving mobile, infrastructure and aerospace/defense applications. It will accelerate the development of mobile devices, next-generation communications and network infrastructure, radar and avionics systems and will even provide the glue that connects the Internet of Things.

### **Qorvo will help customers in three key areas by:**

- 1 Offering the products and system-level expertise for communications/network infrastructure
- 2 Solving the complexity of wireless connectivity in next-generation handsets and terminals
- 3 Unlocking the potential of gallium nitride (GaN) for defense and commercial applications



## Delivering on the promise of wireless connectivity

**Qorvo can also add enhancements to RF Fusion, its very compact 4G solution that integrates all core transmit and receive RF functionality from the transceiver to the antenna in a single module. RF Fusion will incorporate the best performing power amplifiers, switches and filters tuned for optimal RF performance. It will also support the newest technologies including carrier aggregation, envelope tracking and average power tracking while providing full coverage of existing and future air interface standards from 2G to the newest versions of 4G.**

**RF**Fusion™

Robust growth of cellular radio components for both terminals and handsets is expected in the coming years, driven by more cellular bands, 4G/LTE, carrier aggregation, and multi-in multi-out (MIMO) technologies. According to industry analyst firm Strategy Analytics, technologies needed to support higher-speed LTE will put filters, power amplifiers, diversity receive modules and antenna tuners on a strong growth trajectory through 2018.



To address this growth, customers will turn to Qorvo to help solve technical challenges by offering all of the key pieces of the RF front-end puzzle. As the number of LTE bands grows, 43 bands and counting, the need for filters is growing exponentially. Qorvo offers the SAW, BAW and TC-SAW filters that today's handset designers need to solve the world's most difficult filtering challenges, as band guards continue to shrink within the crowded RF spectrum. And while RF complexity grows, the real estate allotted to RF within today's mobile devices remains the same.

To address this, Qorvo's advanced filtering solutions offer both performance and small size needed for integration with power amplifiers (PAs), switch-based products and antenna tuners to provide a complete RF front end. Advanced packaging technologies such as CuFlip™ copper flip interconnect and wafer level packaging (WLP) combine broadband PAs with premium filters in simplified, integrated solutions that span the entire RF chain from the baseband processor to the antenna.



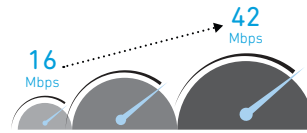
**4 Billion**

global Internet users by 2018, up from 2.5 billion in 2013.



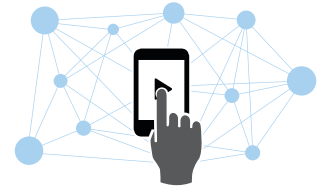
**21 Billion**

networked devices and connections globally by 2018, up from 12 billion in 2013.



**42 Mbps by 2018**

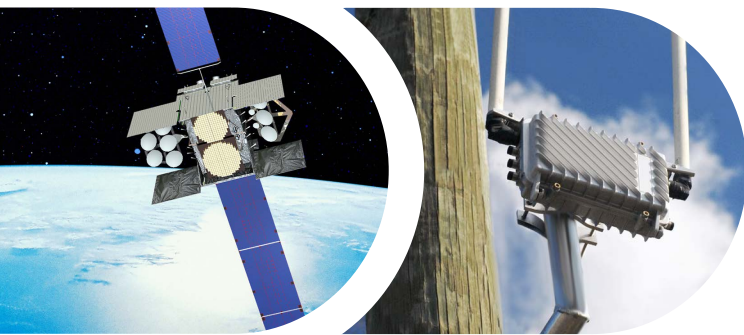
average fixed broadband connection speed will nearly triple, from 16 megabits per second (Mbps).



**Growth in Video on Demand**

and mobile data growth is putting unprecedented strain on networks that keep the Connected Generation connected.

Source: Cisco



## Delivering solutions for next-generation networks

While Qorvo is helping to solve the RF challenges within the mobile device, it also provides the products and systems-level expertise that infrastructure providers need to deploy next-generation networks. The Qorvo team is driving innovation at the heart of the mobile data ecosystem and enabling the global transition to broadband by delivering solutions to base station providers, backhaul providers, CATV network operators and MSOs, and optical fiber network companies. Qorvo is easing the strain on overstretched networks by helping carriers offload an increasing amount of data traffic onto Wi-Fi and small-cell networks (microcell, picocell and femtocell). Advanced filters and GaN and GaAs amplifiers from Qorvo enable these solutions to handle the interference, range, and capacity demands that will continue to grow as the utilization of high-bandwidth applications and crowded spectrum become more prevalent for consumers and businesses alike.



Qorvo's portfolio is designed for every standard and generation of base stations, repeaters and small cells. The portfolio of products includes gain block amplifiers, linear amplifiers, power amplifiers, low noise amplifiers, digital step attenuators, variable gain amplifiers, frequency converters, switches and duplexers, as well as a wide selection of RF and IF SAW and BAW filters.

Qorvo is also helping cable operators and multi-system operators easily upgrade existing CATV infrastructure to meet the new DOCSIS 3.1 standard, which increases downstream data rates from 160 Megabits per second (Mb/s) to 10 Gigabits per second (Gbit/s), and upstream data rates from 120 Mb/s to 1 Gbit/s when compared to DOCSIS 3.0. Qorvo's DOCSIS 3.1 family includes the industry's broadest selection of 1.2GHz power amplifiers in both hybrid and multi-chip module form factors. These use state-of-the-art GaN HEMT process technology and offer optimal linearity and output power while providing robust reliability. Due to the high output and gain benefits, Qorvo's GaN amplifiers enable cable operators to upgrade their existing equipment within current locations, saving on both installation time and cost.

**Current and next-generation optical networks span speeds from 10 Gigabits per second (Gb/s) to 400 Gb/s.**

**Qorvo offers:**

- Packaged modules
- MMIC optical modulator drivers
- Limiting transimpedance amplifiers
- Linear transimpedance amplifiers
- Bessel filters and clock drivers

**Qorvo solutions help network providers cost-effectively increase bandwidth and speed across all optical networks:**

- Very-short-reach (VSR)
- Metro
- Long-haul

Qorvo's optical modulator drivers lead the industry by offering the lowest power dissipation, higher performance and convenience of surface-mount assembly.



\$10 million → \$600 million

**Expected growth in six years of the GaN market**  
(according to industry watcher Yole Development)

## GaN: the way forward for RF and high-density power

**Qorvo's development of GaN-based devices is leading to smaller, more efficient power amplifiers used for military radar and electronic warfare programs. Qorvo has built strong partnerships across the industry including the U.S. Department of Defense, and U.S. and international customers. Qorvo provides strategic foundry services and products to support DoD programs including airborne radar on the F-15, F-18, F-22 and F-35.**

**Products to support these mission critical programs include:**

- **Switches**
- **Discrete transistors**
- **Gain block amplifiers**
- **BAW filters**
- **Power amplifiers**
- **Attenuators**
- **Low-noise amplifiers**
- **SAW filters**

**MORE THAN  
170K**

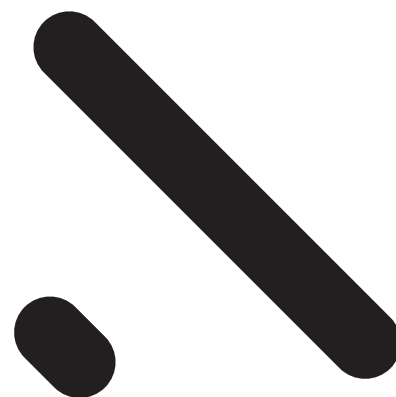
The number of 0.25µm GaN power amplifier devices shipped in support of an ongoing international radar production program.

GaN is needed to advance the state of the art in defense and commercial markets. Qorvo is well positioned for opportunities in both. Our proven GaN manufacturing readiness shows yields at the same levels as established GaAs production. Qorvo is leading the evolution of GaN into commercial power markets with innovative GaN technology utilizing 6-inch wafers.



Qorvo's GaN maturity enables products that offer the size, reliability, and high efficiency needed for more robust performance, lower maintenance and longer operational lifetimes. Qorvo is accredited by the Department of Defense as a Microelectronics Trusted Source (Category 1A) for its foundry, post-processing, packaging and assembly, and RF test services.

Qorvo continues to leverage GaN for commercial opportunities in CATV networking, power supplies and the next-generation power grid. Qorvo is accelerating the development of key wide-bandgap (WBG) semiconductor products based on its GaN technology to jumpstart the next generation of smaller, faster, cheaper and more efficient devices to be used in consumer electronics, electric vehicles, renewable power interconnection, industrial-scale variable speed drive motors and a smarter, more flexible energy grid.



Qorvo is leading the transition from GaN on-silicon carbide technology to 6-inch GaN-on-silicon wafers to develop commercial WBG devices that deliver superior power density, improved power efficiency and higher switching frequencies.

Beyond GaN, Qorvo is able to leverage its expertise in compound semiconductors and silicon (GaAs, SiGe, CMOS, SOI) as well as filters (BAW, SAW, TC-SAW) that help ensure customers have access to the best technology mix available today.

Complementing our processing and sourcing expertise are the industry's best and most cost-effective assembly and packaging technologies. Qorvo's strong applications teams serving the communications and defense markets will help drive future designs by shaping new products and solutions that address customers' toughest challenges.

**Simply put,  
Qorvo has  
what the  
industry  
needs.**

We have the right products, technologies, integration experience, intellectual property, systems-level knowledge, suppliers/partners and manufacturing scale to help customers deliver the solutions that are the heart of devices and networks that will connect and protect the world all around you.





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e-mail us at [info@qorvo.com](mailto:info@qorvo.com)

