



Enabling Higher Data Rates and Increased Capacity

Qorvo® 5G Solutions Continue to Transform the World



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all around you

Qorvo is making 5G deployment a reality and supporting the growth of mobile data with a broad range of RF connectivity solutions. Our robust RF portfolio for both infrastructure and smartphone applications include PAs, phase shifters, amplifiers, switches, integrated modules and other high-performance RF solutions. Qorvo's early start in 5G comes from our legacy of millimeter wave (mmW) R&D and product development in the defense and aerospace markets, as well as a leading supplier of sub-6 GHz RF solutions to the world's leading 2G, 3G and 4G base station manufacturers.

Qorvo offers a family of high-performance discrete RF components to provide flexibility to system designers, as well as the highest level of integration of multifunction building blocks to reduce size, lower costs and accelerate time to market.

Our highly integrated front-end modules feature switch LNA modules in a single- or dual-channel configuration and are targeted for 5G massive MIMO or TDD macro base stations.

Switch LNA Modules for Sub-6 GHz 5G

| Frequency (GHz) | # of Channels | Insertion Loss (dB) | Noise Figure (dB) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) | Package (mm) | Part Number |
|-----------------|---------------|---------------------|-------------------|-----------|-------------|------------|--------------|-------------|
| 1.8-4.2 | 2 | 0.7 | 1.45 | 37 | 19 | 34 | 7x7 | QPB9319 |
| 1.85-2.02 | 1 | 0.5 | 1.1 | 32.5 | 21 | 31.5 | 8x8 | QPB9320 |
| 2.3-2.7 | 1 | 0.5 | 1.2 | 33 | 23 | 34 | 8x8 | QPC9314 |
| 2.3-3.8 | 2 | 0.8 | 1.3 | 35.5 | 19 | 31 | 6x6 | QPB9337 |
| 3.4-3.6 | 1 | 0.5 | 1.2 | 33.8 | 18.4 | 33 | 8x8 | QPB9324 |
| 3.6-3.8 | 1 | 0.5 | 1.2 | 34 | 19 | 32 | 8x8 | QPB9325 |
| 3.8-5.0 | 2 | 1.1 | 1.8 | 31.5 | 16.5 | 33 | 7x7 | QPB9329 |

Qorvo continues to lead the industry with lowest noise figure amplifiers across multiple process technologies. Qorvo's portfolio includes gain block amplifiers to be used in systems where additional gain is required.

Low Noise Amplifiers for Sub-6 GHz 5G

| Frequency (GHz) | Noise Figure (dB) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) | Vd (V) | Package (mm) | Part Number |
|-----------------|-------------------|-----------|-------------|------------|--------|--------------|-------------|
| 0.05-4 | 0.8 | 15.3 | 22.3 | 34 | 5 | 3x3 | TQP3M9005 |
| 0.05-6 | 0.65 | 16.5 | 22.5 | 37 | 5 | 2x2 | TQP3M9035 |
| 0.1-4 | 0.65 | 18.9 | 22.8 | 38 | 5 | 2x2 | SPF5122Z |
| 0.4-2 | 0.45 | 19 | 20 | 35 | 5 | 2x2 | TQP3M9036 |
| 0.6-4.2 | 0.53 | 22.6 | 19 | 37 | 5 | 2x2 | TQL9092 |
| 0.6-4.2 | 0.67 | 20 | 21.7 | 41.5 | 5 | 2x2 | TQL9093 |
| 0.6-4.2 | 0.55 | 22.8 | 17 | 32 | 5 | 2x2 | QPL9057 |
| 0.6-6 | 0.9 | 21.6 | 19 | 35 | 5 | 2x2 | QPL9503 |
| 0.7-6 | 0.4 | 20 | 20 | 35 | 5 | 2x2 | TQP3M9037 |

Gain Block Amplifiers for Sub-6 GHz 5G

| Frequency (GHz) | Gain (dB) | OP1dB (dBm) | OIP3 (dBm) | Noise Figure (dB) | Vd (V) | Package (mm) | Part Number |
|-----------------|-----------|-------------|------------|-------------------|--------|--------------|-------------|
| 0.02-4 | 22 | 22 | 39.5 | 1.3 | 5 | 3x3 | TQP3M9019 |
| 0.02-4 | 20.5 | 21 | 37 | 1.3 | 5 | 3x3 | TQP3M9018 |
| 0.05-4 | 21.8 | 22 | 39.5 | 1.3 | 5 | SOT-89 | TQP3M9009 |
| 0.05-4 | 20.6 | 20 | 36 | 1.3 | 5 | SOT-89 | TQP3M9008 |
| 0.05-4 | 13.5 | 22.4 | 38.5 | 1 | 5 | 3x3 | TQP3M9006 |
| 0.05-4 | 14.9 | 21.6 | 39.5 | 2 | 5 | 3x3 | TQP3M9038 |
| 0.05-4 | 14.5 | 20.7 | 40 | 1.8 | 5 | SOT-89 | TQP3M9028 |
| 0.05-4 | 14.5 | 22 | 40.5 | 1.7 | 5 | 2x2 | TQL9048 |
| 0.05-4 | 14.5 | 20.8 | 35.5 | 1.6 | 5 | 2x2 | TQL9047 |
| 0.05-6 | 16 | 21.3 | 40.3 | 1.5 | 5 | 2x2 | TQL9062 |
| 0.1-4 | 13 | 23.6 | 41 | 1.3 | 5 | SOT-89 | TQP3M9007 |
| 1.8-5.0 | 29 | 22 | 35 | 1.5 | 5 | 3x3 | QPA9120 |

Qorvo continues to leverage its significant GaN experience for 5G applications. Below, Doherty® modules and transistors are shown.

Doherty® Amplifier Modules for Sub-6 GHz 5G

| Frequency (GHz) | Vd (V) | Gain (dB) | Pout Avg (W) | PAE @ Pout Avg (%) | Part Number |
|-----------------|--------|-----------|--------------|--------------------|-------------|
| 2.496-2.69 | 28 | 34 | 5 | 42 | QPA2705 |
| 3.4-3.6 | 28 | 32 | 3 | 33 | QPA3503 |
| 3.4-3.6 | 28 | 30 | 5 | 40 | QPA3506 |
| 4.4-5 | 28 | 34 | 1.25 | 27 | QPA4501 |

GaN Transistor Solutions for Sub-6 GHz 5G

| Frequency (GHz) | Vd (V) | Gain (dB) | Psat (W) | PAE @ Pout Avg (%) | Part Number |
|-----------------|--------|-----------|----------|--------------------|-------------|
| DC-2.7 | 65 | 22 | 150 | 64.8 | QPD1013 |
| DC-3.6 | 48 | 22 | 75 | 80 | QPD0050 |
| DC-3.6 | 48 | 25 | 90 | 73 | QPD0060 |
| DC-4.0 | 48 | 22 | 45 | 71.5 | QPD0030 |
| DC-4.0 | 50 | 24 | 15 | 72 | QPD1009 |
| DC-4.0 | 50 | 25 | 10 | 70 | QPD1010 |
| DC-4.0 | 32 | 19 | 5 | 64 | TQP0102 |
| DC-4.0 | 32 | 19 | 15 | 63 | TQP0103 |
| DC-4.0 | 32 | 17 | 30 | 60 | TQP0104 |
| DC-6.0 | 48 | 19 | 35 | 78 | QPD0020 |

Switch Solutions for Sub-6 GHz 5G

| Frequency (GHz) | Switch Type | *Insertion Loss (dB) | *Isolation (dB) | *Switching Speed (ns) | P _{IN} Max (dBm) | IIP3 (dBm) | Package (mm) | Part Number |
|-----------------|-------------|----------------------|-----------------|-----------------------|---------------------------|------------|--------------|-------------|
| 0.005-6 | SP2T | 0.3 | 37 | 2000 | 37 | 75 | 2x2 QFN | RFSW1012 |
| 0.005-6 | SP2T | 0.25 | 39 | 2000 | 37 | 76 | 1.1x1.5 LGA | QPC1022 |
| 0.005-6 | SP3T | 0.45 | 37 | 2000 | 35 | 70 | 1.8x1.8 QFN | RFSW6032 |
| 0.005-6 | SP4T | 0.45 | 34 | 2000 | 35 | 71 | 1.8x1.8 QFN | RFSW6042 |
| 0.005-6 | SP6T | 0.55 | 29 | 2000 | 32 | 71 | 2x2 QFN | RFSW6062 |
| 0.005-6 | SP8T | 0.55 | 28 | 2000 | 32 | 69 | 2x2 QFN | QPC6082 |
| 0.005-6 | DSP3T | 0.35 | 28 | 2000 | 35 | 70 | 2x2 QFN | RFSW6232 |
| 0.005-6 | DSP2T | 0.3 | 30 | 2000 | 35 | 70 | 2x2 QFN | RFSW6222 |
| 0.005-6 | SP1T | 0.85 | 53 | 165 | 37 | 58 | 2x2 DFN | QPC6014 |
| 0.005-6 | SP2T | 0.75 | 60 | 250 | 36 | 65 | 4x4 QFN | RFSW6024 |
| 0.005-6 | SPDT | 0.9 | 62 | 180 | 37 | 60 | 4x4 QFN | QPC6324 |
| 0.005-6 | SP3T | 0.95 | 60 | 150 | 36 | 59 | 4x4 QFN | QPC6034 |
| 0.005-6 | SP4T | 0.95 | 56 | 150 | 36 | 61 | 4x4 QFN | QPC6044 |
| 0.005-6 | SP5T | 1.1 | 56 | 150 | 36 | 59 | 4x4 QFN | QPC6054 |
| 0.005-6 | SP6T | 1.1 | 56 | 150 | 36 | 59 | 4x4 QFN | QPC6064 |
| 0.03-4.2 | SPDT | 0.35 | 40 | 8500 | 44.5 | 74 | 5x5 QFN | QPC3025 |

* Measured at 2 GHz

Higher frequency mmW bands are expected to expand both network capacity and wireless use cases, with theoretical 5G transfer speeds of up to 10 gigabits per second. These mmW bands operate over a significantly shorter range than lower frequency bands, driving a significant increase in residential and commercial placements of short-range, smaller cell sites.

Qorvo has over a decade of experience supporting mmW applications and solutions. Qorvo combines mmW systems expertise and the industry's most comprehensive high-power RF product and technology portfolio to help leading manufacturers quickly launch next-generation infrastructure products.

Solutions for mmW 5G

| Frequency (GHz) | Function | Channels | Rx IL (dB) | Rx Gain (dB) | Tx Psat (W) | Tx Gain (dB) | Tx PAE (%) | Package (mm) | Part Number |
|-----------------|------------------|----------|------------|--------------|-------------|--------------|------------|--------------|-------------|
| 26.5-29.5 | Front-End Module | 1 | 3.5 | 17 | 1 | 27 | 8** | 5x4 | QPF4001 |
| 37-40.5 | Front-End Module | 2 | 4.2 | 18 | 2 | 23 | 7** | 6x4.5 | QPF4006 |
| | | 1 | | | 2 | | | 4.5x4 | QPF4005 |

** PAE at backed off linear operating power

| Frequency (GHz) | Function | Tx Psat (W) | Tx Gain (dB) | Tx PAE (%) | Package (mm) | Part Number |
|-----------------|----------|-------------|--------------|------------|--------------|-------------|
| 17-37 | Driver | 0.2 | 20 | – | 3x3 | TGA4030-SM |
| 27-31 | PA | 4 | 25 | 25 | 7x7 | TGA2594-HM |

| Frequency (GHz) | Function | Noise Figure (dB) | Gain (dB) | P1dB (%) | OIP3 (dBm) | Bias (V) | Package (mm) | Part Number |
|-----------------|----------|-------------------|-----------|----------|------------|----------|--------------|-------------|
| 22-32 | LNA | 1.6 | 23 | 19 | 27 | 3.5 | 4x4 | QPA2628 |