GaN Power Amplifiers

Description	Frequency (GHz)	Psat (dBm)	LS Gain (dB)	PAE (%)	Bias (V/mA)	Package (mm)	ECCN	Part Number
10W Wideband PA	0.03-2.5	40	>13	55	32/360	4x4 PQFN	EAR99	QPA2237
10W Wideband PA	0.03-2.5	40	>13	55	32/360	5x5 QFN	EAR99	TGA2237-SM
10W Wideband PA	0.1-3	41	>13	>40	40/360	4x4 QFN	EAR99	TGA2976-SM
10W Wideband PA	0.1-3	41	>13	>40	40/360	5x5 QFN	EAR99	TGA2216-SM
2W Wideband Driver	2-6	32.5	14.5	>30	25/40	4x4 QFN	EAR99	TGA2597-SM
30W Wideband PA	2-6	45	22	>30	28/400	15x15 Cu Bolt Down	3A001.b.2.a	TGA2578-CP
4W Wideband PA	2-18	36	14	>15	22/600	15x15 Cu Bolt Down	3A001.b.2.c	TGA2214-CP
10W Wideband PA	2-18	40	5	25	30/500	Die	ITAR	TGA2573-2
45W Wideband PA	2.5-6	46.5	20	>36	30/1550	Flange	3A001.b.2.a	TGA2576-2-FL
12W S-Band PA	2.7-3.5	41	25	52	28/175	5x5 PQFN	EAR99	TGA2975-SM
18W S-Band PA	2.7-3.5	42.5	25	54	28/225	5x5 PQFN	EAR99	TGA2830-SM
10W S-Band PA	2.7-3.7	40.5	25	>50	25/175	5x5 QFN	EAR99	TGA2583-SM
18W S-Band PA	2.7-3.7	42.5	24.5	>50	28/225	5x5 QFN	EAR99	TGA2585-SM
30W S-Band PA	2.8-3.7	45.5	18.5	>47	28/200	6x6 PQFN	EAR99	TGA2818-SM
50W S-Band PA	2.8-3.2	47	22	58	25/200	7x7 PQFN	EAR99	QPA1000
60W S-Band PA	2.9-3.5	>48	>24	>54	28/200	7x7 PQFN	EAR99	TGA2817-SM
100W S-Band PA	3-3.6	50	23	>50	30/300	15x15 Cu Bolt Down	3A001.b.2.a	TGA2813-CP
80W S-Band PA	3.1-3.5	49.5	24.5	55	30/200	7x7 PQFN	3A001.b.2.a	TGA2814-SM
80W S-Band PA	3.1-3.6	49	22	50	30/200	15x15 Cu Bolt Down	3A001.b.2.a	TGA2814-CP
100W S-Band PA	3.1-3.6	50	24	56	30/300	7x9 PQFN	3A001.b.2.a	TGA2813-SM
50W C-Band PA	5-6	47	20	45	28/500	6x6 PQFN	3A001.b.2.b	TGA2307-SM
2W C-Band Driver	5-8	>33	>15	>34	25/50	4x4 PQFN	EAR99	TGA2599-SM
2W C/X-Band Driver	6-12	>32	20	>15	25/200	5x5 QFN	EAR99	TGA2627-SM
2W C/X-Band Driver	6-12	33	14	>25	25/100	4x4 QFN	EAR99	TGA2598-SM
30W C/X-Band PA	6-12	>45	>22	>30	20/2000	15x15 Cu Bolt Down	3A001.b.2.b	TGA2590-CP
50W X-Band PA	7.9-8.4	47	10	36	24/2240	Flange	EAR99	TGA2586-FL
50W X-Band PA	7.9-11	47	24	34	28/650	15x15 Cu Bolt Down	3A001.b.2.b	TGA2238-CP
100W X-Band PA	7.9-11	50	22	35	28/1300	15x15 Cu Bolt Down	3A001.b.2.b	TGM2635-CP
20W X-Band PA	9-10	43	25	40	28/365	7x7 QFN	3A001.b.2.b	TGA2624-SM
16W X-Band PA	9-10	>42	>27	>37	28/365	15x15 Cu Bolt Down	3A001.b.2.b	TGA2624-CP
35W X-Band PA	9-10	45.5	27.5	>42	28/290	7x7 QFN	3A001.b.2.b	TGA2622-SM
35W X-Band PA	9-10	45.5	27.5	>43	28/290	15x15 Cu Bolt Down	3A001.b.2.b	TGA2622-CP
60W X-Band HPA	9-1	48	10	38	24/2400	Flange	3A001.b.3.b	TGA2312-FL
17W X-Band PA	10-11	42.5	28	>40	28/365	15x15 Cu Bolt Down	3A001.b.2.b	TGA2625-CP
32W X-Band PA	10-11	45	27	>41	28/290	15x15 Cu Bolt Down	3A001.b.2.b	TGA2623-CP
2W Ku-Band Driver	13-18	33	20	>25	20/70	4x4 QFN	EAR99	TGA2958-SM
12W Ku-Band PA	13.4-16.5	41	23	30	28/225	5.5x4.5 QFN	3A001.b.2.c	TGA2218-SM
25W Ku-Band PA	13.4-16.5	44	28	31	28/450	15x15 Cu Bolt Down	3A001.b.2.c	TGA2219-CP
35W Ku-Band PA	13.4-15.5	45.5	25.5	>34	22/900	15x15 Cu Bolt Down	3A001.b.2.b	TGA2239-CP
20W Ku-Band HPA	14-15.35	43	19	27	25/1000	Flange	3A001.b.2.b	TGA2579-2-FL
16W Ku-Band HPA	14-16	42	18	>24	25/2000	Flange	ITAR	TGA2572-2-FL
4W Ka-Band PA	27-31	36.5	22.5	25	20/140	7x7 QFN	3A001.b.2.c	TGA2594-HM
8W Ka-Band PA	27.5-31	39	21	>22	20/560	15x15 Cu Bolt Down	3A001.b.2.c	TGA2595-CP

Samples/evaluation fixtures are available; call for details.

GaN Low Noise Amplifiers

Description	Frequency (GHz)	Max Pin (dBm)	P1dB/IIP3 (dBm)	Gain (dB)	NF (dB)	Voltage / Current (V / mA)	Package (mm)	ECCN	Part Number
S/C-Band LNA	2-6	30	18/30	22	1	10/100	4x4 PQFN	EAR99	TGA2611-SM
Wideband LNA	2-20	40	23	15	2	8/125	4x4 QFN	EAR99	TGA2227-SM
C/X-Band LNA	6-12	33	19/28	22	2	10/100	4x4 PQFN	EAR99	TGA2612-SM

Samples/evaluation fixtures are available; call for details.

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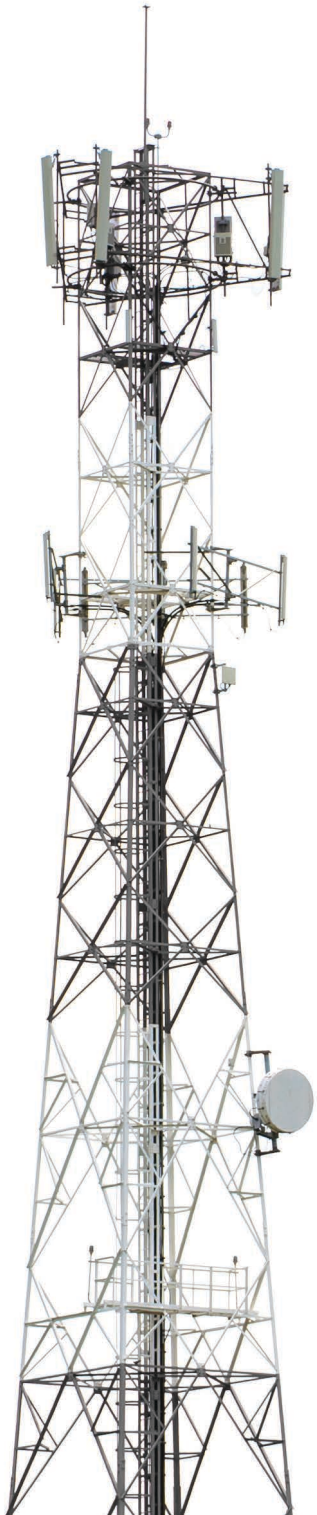

qorvo®

all around you

Gallium Nitride Innovation

Qorvo® has driven innovation and development of gallium nitride (GaN) products and technologies that enable next-generation systems for over 15 years. With high-performance GaN technology supporting products from DC through Ka-band, Qorvo continues to build on a strong GaAs legacy by offering new products and strategic foundry services that strive to meet our partner's demanding system requirements. With Qorvo, not only are you getting world-class electrical performance, our partners also benefit from a 'trusted' supplier with industry-leading GaN reliability. Qorvo is also the only GaN supplier to reach manufacturing readiness level (MRL) 9. Looking for a supplier who can take your ideas from concept to production? Qorvo is expanding the possibilities.

The GaN Advantage

RF power densities, made possible with GaN technology, range between five and six-times higher than gallium arsenide-based RF amplifiers. GaN technology's proven ability makes it an ideal choice for infrastructure, defense and aerospace applications such as radar, electronic warfare, communications, navigation and similar applications. This increase in performance capability offers our partners the flexibility to reduce board space and system costs while improving system performance. Only Qorvo delivers performance, quality and reliability that sets the standard for the industry.

Key Qorvo GaN attributes:

- >65 million device hours on 16,900 devices in the field, with less than 0.013% failures per million hours
- Applications from DC through W-band
- High power density
- Proven reliability at high junction temperatures, mean time to failure (MTTF) of greater than 10^7 (10 million) to 10^9 (1 billion) hours at 200 degrees (C) and greater than 10^6 (1 million) to 10^8 (100 million) hours at 225 degrees (C)
- Highest power-added efficiency
- Excellent noise figure – comparable to pHEMT
- Highly robust to ESD and RF input signals
- High RF power handling (receiver applications)
- Very high thermal conductivity substrate

GaN Foundry Processes

As a DoD-accredited 'Microelectronics Trusted Source', Qorvo offers a variety of GaN custom ASIC solutions. Accreditation encompasses foundry, post-processing, packaging / assembly and test services. Support provided by our foundry services division complements Qorvo's high-frequency standard product portfolio. Qorvo services are centered upon satisfying custom requirements and can blend product and process solutions.

QGaN25:

- Technology: 0.25µm GaN on SiC
- Drain bias (Vd): up to 40V
- Operating frequencies: DC-18GHz
- PAE: >60% at 10GHz
- Power density: 6W/mm at 10GHz
- Reliability: >10M hours at 200C and 40V (3-temp DC MTTF w/failure defined as 10% degradation in Idmax)

QGaN25HV:

- Technology: 0.25µm GaN on SiC
- Drain bias (Vd): up to 48V
- Operating frequencies: DC-12GHz
- PAE: >78% at 3.5GHz
- Power density: 6.5W/mm at 3.5GHz
- Reliability: >10M hours at 200C and 48V (3-temp DC MTTF w/failure defined as 10% degradation in Idmax)

QGaN15:

- Technology: 0.15µm GaN on SiC
- Drain bias (Vd): up to 28V
- Operating frequencies: DC-40GHz
- PAE: >50% at 30GHz
- Power density: 4.5W/mm at 30GHz
- Reliability: >10M hours at 200C and 28V (DC MTTF w/failure defined as 10% degradation in Idmax)

QGaN50:

- Technology: 0.50µm GaN on SiC
- Drain bias (Vd): up to 65V
- Operating frequencies: DC-10GHz
- PAE: >70% at 3.5GHz
- Power density: 9W/mm at 3.5GHz
- Reliability: >100M hours at 200C and 65V (DC MTTF w/failure defined as 10% degradation in Idmax)

GaN Packaging Advancements

Qorvo's GaN MMICs in our unique, copper-based packages deliver superior heat transfer from the MMIC to the heat sink. These packages are much lower cost than other thermal spreaders. We also offer GaN in surface mount plastic over molded packages which provide environmental protection and ease of assembly for our customers.

GaN Standard Product Portfolio

Qorvo's proven technology leadership in high-performance Gallium Arsenide (GaAs) has been extended to Gallium Nitride (GaN). With GaN proving to be an evolutionary technology in support of next generation military and commercial applications, Qorvo is leading the way with an assortment of world class products across frequency and functionality. With a growing portfolio of GaN-based amplifiers and switches along with our expanding line of high-performance transistors, Qorvo is the premiere solution provider for your GaN needs.

Qorvo conducts extensive testing and analysis of both processes and products in order to provide the highest performance and reliability while delivering exceptional high volume manufacturing capability. Equally important is measuring and predicting thermal behaviors. Qorvo simulates FET channel temperature using finite element analysis then verifies those models against micro-Raman measurements of the FET in order to provide accurate long term lifetime reliability data.

GaN on SiC Power Transistors

Description	Frequency (GHz)	Linear Gain (dB)	Psat (dBm)	PAE (%)	Voltage (V)	Current (mA)	Package (mm)	ECCN	Part Number
285W, 36V, DC-2GHz	DC-2	19	54.2	54	36	576	NI-780	EAR99	T1G2028536-FL/-FS
100W, 32V, DC-3.5GHz	DC-3.5	15	51	50	32	250	NI-360	3A001b.3.b	TGF2819-FL/-FS
100W, 28V, DC-3.5GHz	DC-3.5	15	50	55	28	260	NI-360	EAR99	TGF2929-FL/-FS
120W, 36V, DC-3.5GHz	DC-3.5	16	50.8	52	36	360	NI-360	3A001b.3.b	T1G4012036-FL/-FS
2x120W, 36V, DC-3.5GHz	DC-3.5	16	54	52	36	520	NI-650	3A001b.3.b	T1G4020036-FL/-FS
45W, 32V, DC-3.5GHz	DC-3.5	19	46.4	52	32	220	NI-360	EAR99	T1G4004532-FL/-FS
30W, 32V, DC-3.5GHz	DC-3.5	16.5	44.5	49	32	150	NI-360	EAR99	T2G4003532-FL/-FS
55W, 28V, DC-3.5GHz	DC-3.5	15	47.2	50	28	200	NI-360	EAR99	T2G4005528-FS
5W, 32V, DC-4GHz	DC-4	19	37	68	32	25	3x3 PQFN	EAR99	TQP0102
15W, 32V, DC-4GHz	DC-4	19	43.5	64	32	70	3x4 PQFN	EAR99	TQP0103
30W, 32V, DC-4GHz	DC-4	17	44.6	64	32	60	3x4 PQFN	EAR99	TQP0104
10W, 32V, DC-6GHz	DC-6	19	40	54	32	50	5x5 QFN	EAR99	T1G6001032-SM
15W, 28V, DC-6GHz	DC-6	15.5	42.3	70	28	100	NI-200	EAR99	T2G6001528-SG
7W, 28V, DC-6GHz	DC-6	15.5	39.5	50	28	50	NI-200	EAR99	T2G6000528-Q3
18W, 28V, DC-6GHz	DC-6	15	42.5	>50	28	50	NI-200	EAR99	T2G6001528-Q3
30W, 28V, DC-6GHz	DC-6	14	45	50	28	200	NI-200	EAR99	T2G6003028-FL/-FS
6W Discrete Power	DC-18	18	38	71.6	28	25-125	Die	EAR99	TGF2023-2-01
12W Discrete Power	DC-18	21	40.1	73.3	28	50-250	Die	EAR99	TGF2023-2-02
25W Discrete Power	DC-18	18	43	78.3	28	100-500	Die	3A001b.3.b	TGF2023-2-05
50W Discrete Power	DC-18	19.8	47.3	69.5	28	200-1,000	Die	3A001b.3.b	TGF2023-2-10
90W Discrete Power	DC-18	19.2	50.5	70.5	28	400-2,000	Die	3A001b.3.b	TGF2023-2-20
7W Discrete Power	DC-14	14	37.6	54	32	25	Die	EAR99	TGF2952
12W Discrete Power	DC-12	14	41.2	54	32	50	Die	EAR99	TGF2953
27W Discrete Power	DC-12	14	44.3	54	32	100	Die	3A001b.3.b	TGF2954
40W Discrete Power	DC-12	14	46.3	54	32	150	Die	3A001b.3.b	TGF2955
55W Discrete Power	DC-12	14	47.7	54	32	200	Die	3A001b.3.b	TGF2956
70W Discrete Power	DC-12	14	48.5	52	32	250	Die	3A001b.3.b	TGF2957
10W, 32V, 0.03-3GHz	0.03-3	17	39.7	51	32	50	3x3 PQFN	EAR99	TGF3015-SM
5W, 32V, 0.03-3GHz	0.03-3	17	37	50	32	30	3x3 PQFN	EAR99	TGF2965-SM
5W, 32V, 0.03-4GHz	0.03-4	17	44	55	32	65	3x4 PQFN	EAR99	TGF3021-SM
5W, 32V, 4-6GHz	0.03-4	12	44	50	32	25	3x3 PQFN	EAR99	TGF3020-SM
5W, 32V, DC-12GHz	DC-12	13@10GHz	37	50	32	25	3x3 PQFN	EAR99	TGF2977-SM
20W, 32V, DC-12GHz	DC-12	11@10GHz	43	50	32	100	3x4 PQFN	3A001b.3.b	TGF2978-SM
25W, 32V, DC-12GHz	DC-12	11@10GHz	44	50	32	150	3x4 PQFN	3A001b.3.b	TGF2979-SM
16W, 50V, DC-4GHz	DC-4	24	42	72	50	26	3x3 PQFN	EAR99	QPD1009
8W, 50V, DC-4GHz	DC-4	25	39	70	50	18	3x3 PQFN	EAR99	QPD1010
100W, 28V, DC-3.5GHz	DC-3.5	15	50	55	28	260	NI-360 HM	EAR99	TGF2929-HM
120W, 50V, DC-3.2GHz	DC-3.2	tbd	51	tbd	50	tbd	NI-360	EAR99	QPD1008/L
tbdW, 50V, DC-4GHz	DC-4	tbd	tbd	tbd	50	tbd	NI-360	EAR99	QPD1015/L
15W, 28V, 0.03-1.215GHz	0.03-1.215	20	42	70	28	26	5x6 PQFN	EAR99	QPD1000

Samples/evaluation fixtures are available; call for details.

GaN Switches

Description	Frequency (GHz)	IL (dB)	ISO (dB)	P.1dB (dBm)	Voltage (V)	Package (mm)	ECCN	Part Number
40W SPDT	0.5-6	<1.1	>25	46	0 / -40	4x4 QFN	EAR99	TGS2354-SM
100W SPDT	0.5-6	<1.1	>40	50	0 / -40	5x5 QFN	EAR99	TGS2355-SM
5W SPDT	0.5-12	<1	>30	37	0 / -40	4x4 QFN	EAR99	TGS2352-2-SM
4W SPDT	0.5-18	<1.5	>25	36	0 / -40	4x4 QFN	EAR99	TGS2353-2-SM

Samples/evaluation fixtures are available; call for details.