

# High-Performance Defense and Aerospace Solutions

Industry's largest portfolio of MMICs, Discrete Products, Modules  
GaN | GaAs | SAW | BAW



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all around you

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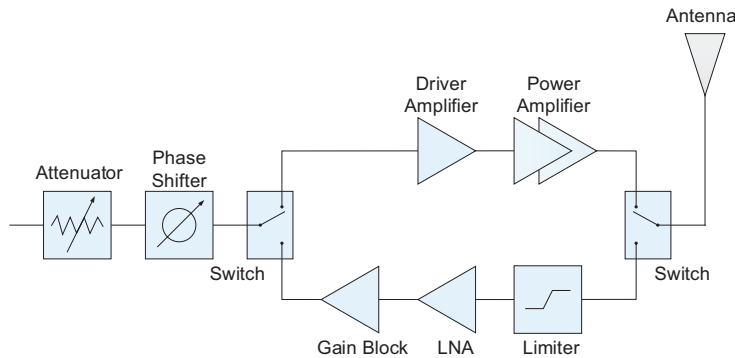


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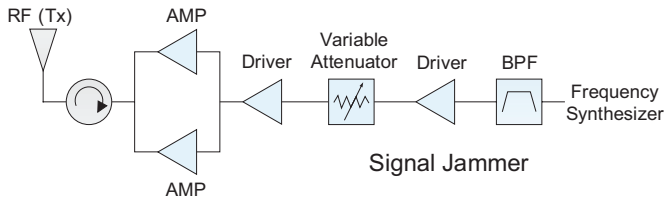
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# Mission Critical Defense Applications (Signal Chains)



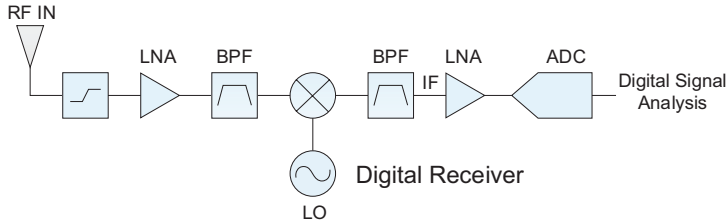
## Radar (L, S, C, X, Ku - Band)

Today's advanced radar systems need to be more powerful and have greater functionality to detect a variety of growing global threats. Qorvo® has the largest portfolio of high-performance MMICs and discrete components designed for these applications. We can deliver the products and signal chain expertise you need to maintain the leading edge no matter what frequency band you want to operate in.

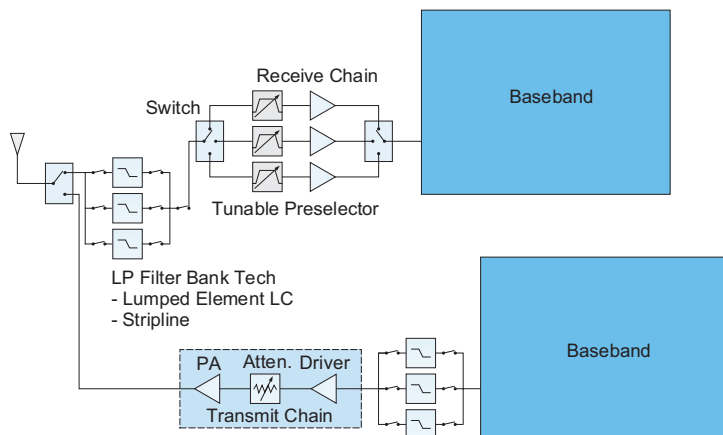


## Electronic Warfare (EW)

Over the past decade there has been a greater emphasis given to EW technologies by other countries. EW supremacy is vital to maintaining the battlefield advantage.



Qorvo offers a full array of best-in-class RF solutions that are designed for broadband applications like EW that offer the industry's lowest noise figures. We can offer designers a single function block or the entire signal chain depending on your needs. Our products are designed to operate at peak performance with each other making your job easier.



## Communications

Secure and reliable communications are priority one in any potential conflict. Qorvo is a leader in wireless communications both on and off the battlefield. We understand what it takes to maintain a reliable and secure wireless connection all the way from the antenna to the receiver. You can trust Qorvo products to keep the lines of communications open and working at maximum efficiency under any circumstances.

# Gallium Nitride (GaN) Innovation

With high-performance GaN technology, Qorvo continues to build on a strong gallium arsenide (GaAs) legacy by offering new products and strategic foundry services that strive to meet our partners' demanding requirements. With Qorvo, 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 10.

## The GaN Advantage

Qorvo GaN powers improvements in SWaP-C analyses. With superior power, efficiency and gain, system designers now have the flexibility to make design trades that were previously not possible. Higher power densities lead to higher power capability in a smaller area. Reduced combining leads to improved efficiencies. Higher voltage operation results in lower system losses. Improved power handling supports high power switches and highly robust LNAs. Qorvo's leading GaN reliability at higher junction temperatures gives the user the confidence in long-term operation. Whether the motivation is to increase power, reduce board area or improve efficiency, Qorvo GaN makes this possible while reducing overall system costs.

### Key Qorvo GaN attributes:

- >65 million device hours on 16,900 devices in the field, with less than 0.013% failures per million hours
- 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)
- Production technologies supporting DC through Ka-band
- Excellent noise figure – comparable to pHEMT
- Highly robust to ESD and RF input signals
- SiC substrates for superior thermal management
- High power density (Improved SWaP)
- High power-added efficiency (Improved SWaP)

## GaN Foundry Processes

As a DoD-accredited 'Microelectronics Trusted Source', Qorvo offers a variety of GaN technologies for optimized 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.

### QGaN25:

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

### QGaN15:

- Technology: 0.15 $\mu$ m GaN on SiC
- Drain bias (Vd): up to 28V
- Operating frequencies: DC-40 GHz
- PAE: >50% at 30 GHz
- Power density: 4.2W/mm at 30 GHz
- Reliability: >10M hours at 200 degrees (C) and 28V (DC MTTF with failure defined as 10% degradation in Idmax)

### QGaN25HV:

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

### QGaN50:

- Technology: 0.50 $\mu$ m GaN on SiC
- Drain bias (Vd): up to 65V
- Operating frequencies: DC-8 GHz
- PAE: >78% at 3.5 GHz
- Power density: 9W/mm at 3.5 GHz
- Reliability: >10M hours at 200 degrees (C) and 65V (DC MTTF with failure defined as 10% degradation in Idmax)

## GaN Packaging Solutions

Qorvo packaging solutions focus on maximizing performance while managing thermal behavior and cost. Our high-performance GaN products can be found in a variety of Cu-based packages for superior heat transfer. Depending on the functionality and operating conditions, Qorvo offers bolt down packages down to small surface mount packages in either air cavity or overmold formats.

## GaN Standard Product Portfolio

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

Qorvo conducts extensive testing and analysis of both processes and products to provide exceptional performance, reliability and high-volume manufacturing capability. When 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 to provide accurate, lifetime reliability data.

## GaN Power Transistors and Pallets

Description	Frequency (GHz)	LS Compression Gain (dB)	PAE (%)	Psat (dBm)	Bias (V)	Package (mm)	Part Number
500W Discrete	DC-1.7	15	67	57.3	50	NI-780	QPD1016L
150W Discrete	DC-2.7	15	65	52.5	65	7.2x6.6 DFN	QPD1013
125W Discrete	DC-3.2	16	73	52.1	50	NI-360	QPD1008/L
200W Discrete	DC-3.4	12	60	51	50	NI-360	TGF2819-FL
55W Discrete	DC-3.5	13	50	47.2	28	NI-360	T2G4005528-FS
100W Discrete	DC-3.5	14	72	50	28	NI-360	TGF2929-FL
2x200W Discrete	DC-3.5	14	68	54	50	NI-650	T1G4020036-FL/-FS
75W Discrete	DC-3.6	20	80	48.7	48	7.2x6.6 DFN	QPD0050
90W Discrete	DC-3.6	16	73	49.5	48	7.2x6.6 DFN	QPD0060
75W Discrete	DC-3.7	15	80	48.5	48	NI-360	QPD1015/L
10W Discrete	DC-4	17	70	41	50	3x3 QFN	QPD1010
15W Discrete	DC-4	17	72	42	50	3x3 QFN	QPD1009
45W Discrete	DC-4	17	72	46.9	48	4x3 QFN	QPD0030
10W Discrete	DC-6	14	56	40	28	NI-200	T2G6000528-Q3
15W Discrete	DC-6	13	65	42.3	28	NI-200	T2G6001528-Q3
30W Discrete	DC-6	11	54	43.5	28	NI-200	T2G6003028-FL
35W Discrete	DC-6	17	78	45.4	48	4x3 QFN	QPD0020
5W Discrete	DC-12	8	50	37	32	3x3 QFN	TGF2977-SM
10W Discrete	DC-12	14	55	40.4	32	3x3 QFN	QPD1022
20W Discrete	DC-12	15	65	43	32	4x3 QFN	TGF2978-SM
27W Die	DC-12	14	54	44.3	32	Die	TGF2954
12W Die	DC-18	18	73	40.1	28	Die	TGF2023-2-02
25W Die	DC-18	15	78	43	28	Die	TGF2023-2-05
50W Die	DC-18	17	70	47.3	28	Die	TGF2023-2-10
90W Die	DC-18	16	71	50.5	28	Die	TGF2023-2-20
7W Discrete	0.03-1.2	16	60	39.4	50	6x5 DFN	QPD1011
15W Discrete	0.03-1.2	18	70	41	50	6x5 DFN	QPD1014
25W Discrete	0.03-1.2	18	73	46	50	6x5 DFN	QPD1004
15W Discrete	0.03-1.215	17	78	42	28	6x5 DFN	QPD1000
5W Discrete	0.03-3	14	63	37	32	3x3 QFN	TGF2965-SM
10W Discrete	0.03-3	14	63	39.7	32	3x3 QFN	TGF3015-SM
30W Discrete	0.03-4	17	73	44	32	4x3 QFN	TGF3021-SM
1300W Discrete	0.42-0.45	21	81	61.2	65	NI-1230	QPD1026L
1800W Discrete	0.96-1.215	18	77	62.7	65	NI-1230	QPD1025/L
1700W Pallet	0.96-1.215	17	65	62.3	65	108x57 Pallet	QPD1034
100W PAM	1.2-1.4	32	60	50	50	25x12.5 SMD	QPA2511
375W Discrete	1.2-1.4	17	75	56.3	65	NI-400	QPD1425/L
450W IMFET	1.2-1.4	15	62	54.9	45	NI50-CW	QPD1006
500W IMFET	1.2-1.4	17	67	57.3	50	17x24	QPD1003
750W Discrete	1.2-1.4	17	65	58.8	65	NI-780	QPD1028/L
1500W Discrete	1.2-1.4	17	70	61.8	65	NI-1230	QPD1029L
500W IMFET	2.7-3.1	14	68	57.6	50	RF-565	QPD1018
30W Discrete	2.7-3.5	15	64	45	50	6x5 DFN	QPD1020
500W IMFET	2.9-3.3	13	67	57.7	50	RF-565	QPD1019
125W PAM	3.1-3.5	30	62	51	50	25x12.5 SMD	QPA2513
500W IMFET	3.1-3.5	13	60	56.6	50	17x24	QPD1017
30W Discrete	9.2-9.7	9	49	34.3	28	7x7	QPD9300

## RF Filters, Dual Filters and Diplexers

Description	Frequency (MHz)	Bands	Technology	IL (dB)	Package (mm)	Part Number
978 MHz Bandpass Filter	977.2-978.8	ADS-B	BAW	3.5	6.43x4.64	QPQ0978
1030 MHz Bandpass Filter	1023-1037	SSR/IFF	BAW	3	3.71x2.57	880367
1090 MHz Bandpass Filter	1082-1098	SSR/IFF	BAW	3	3.71x2.57	880374
L5 GPS Bandpass Filter	1,160.95-1,191.95	L5	TC-SAW	1.2	1.4x1.2	QPQ1062
L2 GPS Bandpass Filter	1,212.1-1,243.1	L2	TC-SAW	1.2	1.4x1.2	QPQ1061
L1 GPS Bandpass Filter	1,559.92-1,590.92	L1	TC-SAW	1.3	1.4x1.2	QPQ1060
L1/L2 GPS Diplexer	1,559.92-1,590.92, 1,212.1-1,243.1	L1, L2	TC-SAW	1.6, 1.3	5x5	QPQ1063
L1/L2 GPS Dual Filter	1,563.42-1,587.42, 1,215.6-1,239.6	L1, L2	TC-SAW	2.6, 3.0	5x5	QPQ1028
Iridium/AltNav Bandpass Filter	1,616.0-1,626.5	Iridium	TC-SAW	1.7	1.4x1.2	QPQ1065

## GaN Switches

Description	Frequency (GHz)	IL (dB)	ISO (dB)	P1dB (dBm)	Voltage (V)	Package (mm)	Part Number
50W SPDT	0.15-2.8	<0.7	>30	47	0/-40	4x4 QFN	QPC1005
50W SP3T	0.15-2.8	<1	>30	47	0/-40	4x4 QFN	QPC1006
100W SPDT	0.5-6	<1.1	>40	50	0/-40	5x5 QFN	TGS2355-SM
20W SPDT	0.5-12	<1	>30	43	0/-40	4x4 QFN	TGS2352-2-SM
10W SPDT	0.5-18	<1.5	>25	40	0/-40	4x4 QFN	TGS2353-2-SM
30W SP3T	2-11	1.5	20	-	0/-30	4x4 Laminate	QPC2511
10W SPDT	8-12	<1.2	30	41.7	0/-28	4x4 QFN	QPC2040

## GaN Power Amplifiers

Description	Frequency (GHz)	Psat (dBm)	LS Gain (dB)	PAE (%)	Bias (Vdc)	Package (mm)	Part Number
10W Wideband PA	0.03-2.5	40	13	55	32	4x4 QFN	QPA2237
10W Wideband PA	0.1-3	41	13	40	40	4x4 AC-QFN	TGA2976-SM
18W Wideband PA	1-6	42.7	24	40	22	5x6 AC-QFN	QPA0106
10W Wideband PA	1-8	40	15	30	28	5x6 AC-QFN	QPA1003P
30W Wideband PA	2-6	45	22	30	28	15x15 Flange	TGA2578-CP
2.5W Wideband PA	2-20	34	16	23	18	4.5x4.5 AC-QFN	QPA2213
10W Wideband PA	2-20	40	13	22	22	5x5 AC-QFN	QPA2962
20W Wideband PA	2-20	44	16	23	22	15x15 Flange	QPA2966
45W Wideband PA	2.5-6	46.5	20	36	30	Flange	TGA2576-2-FL
2W S-Band PA	2.7-3.5	33	17	52	25	4x4 QFN	QPA2935
12W S-Band PA	2.7-3.5	41	25	52	28	5x5 QFN	TGA2975-SM
100W S-Band PA	2.7-3.5	50	25	53	30	7x7 QFN	QPA3069
40W S-Band PA	2.7-3.7	46	24	48	28	6x6 QFN	QPA1014
50W S-Band PA	2.8-3.2	47	22	58	25	7x7 QFN	QPA1000
60W/50V S-Band PA	2.8-3.5	48	22	55	50	6x6 QFN	QPA1027
150W/50V S-Band PA	2.9-3.5	52	28	58	50	7x7 QFN	QPA3070
10W C-Band PA	4.5-7	40	19	40	22	5x5 QFN	QPA1019
4W S-Band PA	5-6	36.5	18	53	25	4x4 QFN	QPA0506
50W/50V C-Band PA	5-6	48	23	49	50	7x7 QFN	QPA2310
100W/50V C-Band PA	5-6	50	22	47	50	7x7 QFN	QPA2309
100W C-Band PA	5.7-7	50	20	38	26	19x19 Flange	QPM1017
2.5W Wideband PA	6-12	34	16	30	22	4x4 QFN	QPA2598
30W C/X-Band PA	6-12	45	22	30	20	15x15 Flange	TGA2590-CP
10W Wideband PA	6-18	40	20	20	20	Die	QPA1013D
20W Wideband PA	6-18	43	18	20	20	15x15 Flange	TGA2963-CP
15W X-Band PA	7.9-11	42	18	38	24	4.5x5.0 AC-QFN	QPA1010
25W X-Band PA	7.9-11	44.5	19.5	37.5	24	4.5x5.0 AC-QFN	QPA1011
50W X-Band PA	7.9-11	47	24	34	28	15x15 Flange	TGA2238-CP
100W X-Band PA	7.9-11	50	22	35	28	19x19 Flange	TGM2635-CP
5W X-Band PA	8-12	38	26	42	24	5x5 QFN	QPA2611
12W X-Band PA	8-12	41	23	40	24	5x5 QFN	QPA2612
2W X-Band PA	8.5-10.5	33	23	47	20	5x5 QFN	QPA2610
2W X-Band PA	8.5-10.5	33	27	50	16	4x3 QFN	QPA0001
4W X-Band PA	8.5-11	36.5	24	45	22	4x4 QFN	QPA1022
100W X-Band PA	10-12	50	22	26	28	19x19 Flange	QPM1021
16W X-Band PA	10.7-12.7	43	16	33	20	6x5 AC-QFN	QPA1009
35W X-Band PA	10.7-12.7	46	17	40	20	Die	QPA1006D
55W Ku-Band PA	12.75-15.35	47.5	22.5	37	24	Die	QPA1314D
80W Ku-Band PA	13-15.5	49	24	25	28	19x19 Flange	QPM2239
35W Ku-Band PA	13.4-15.5	45.5	25.5	34	28	15x15 Flange	TGA2239-CP
35W Ku-Band PA	15.4-17.7	45.5	21	20	26	15x15 Flange	QPA1315
20W K-Band PA	17.3-21.2	43	16	27	20	7.5x6 AC-QFN	QPA1724
2W Ka-Band	20-40	33	13	14	18	Die	QPA2040D
8W Ka-Band	20-40	39	12	12	18	Die	QPA2640D
10W Ka-Band PA	27.5-31	41	24	26	22	15x15 Flange	QPA2211
20W Ka-Band PA	27.5-31	43	22	22	22	15x15 Flange	QPA2212
0.4W Ka-Band PA	28-38	26	12	14	20	4x3 AC-QFN	QPA2225
3W Ka-Band PA	32-38	35	12	16	6	7x8 AC-QFN	QPA2575
10W Ka-Band PA	32-38	40	16	22	24	Die	TGA2222
4W Q-Band PA	37.5-42.5	36	14	25	24	Die	QPA4446D
6W Q-Band PA	37.5-42.5	38	12	20	24	Die	QPA4346D
10W Q-Band PA	37.5-42.5	40	11	17	24	Die	QPA4246D

## GaN Low Noise Amplifiers

Description	Frequency (GHz)	Max Pin (dBm)	P1dB/OIP3 (dBm)	Gain (dB)	NF (dB)	Voltage/Current (V/mA)	Package (mm)	Part Number
Low Noise Amplifier	0.03-3	37	23/-	17	1.2	12/50	3x3 QFN	QPL1002
Wideband LNA	2-22	40	23	15	2	8/125	4x4 QFN	TGA2227-SM
Low Noise Amplifier	8-11	36	9/-	27	1.7	10/20	4x4 QFN	QPL1000

# GaAs Performance

Qorvo has always been recognized as the industry leader in GaAs design and manufacturing. With the acquisition of Custom MMIC, we have bolstered our existing GaAs product portfolio to include virtually every RF function block in a complete signal chain making Qorvo the leader in GaN and GaAs MMIC solutions.

Explore our GaAs product selection tables to find the perfect product(s) for your next RF design or go to [www.qorvo.com](http://www.qorvo.com) and use our easy-to-use parametric search tool to help speed your search and selection.

## Integrated Front-End Modules (GaN and GaAs Combined)

Description	Freq. Min (MHz)	Freq. Max (GHz)	Tx Gain (dB)	Tx Voltage (V)	Rx Gain (dB)	Rx NF (dB)	Rx Voltage (V)	Package (mm)	Part Number
2-18 GHz 10W	2	18	13	22	14	4	5	8x8	QPF0219
8-12 GHz 10W	8	12	22	24	25	2.2	1.8	7x5	QPF5010
8-12 GHz 5W	8	12	24	24	25	2.2	1.8	7x5	QPF5005
8.5-10.5 GHz 2W	8.5	10.5	20.5	20	24	2.1	1.8	7x5	QPF5002
8.5-10.5 GHz 3.2W GaN	8.5	10.5	33	25	25	2.2	10	5x5	QPM1002
2.5-4 GHz GaAs	2.5	4	-1.2	-	30	1.2	3.3	7x7	QPM2100
9-10.5 GHz 4W GaN	9	10.5	23	28	21	2.7	10	6x5	QPM2637
8-14 GHz LNA with Limiter	8	14	-	-	23	1.6	2	8.5x6	QPM6000
2-20 GHz LNA with Limiter	2	20	-	-	17	1.7-4	5	6.5x5	QPM1000
8-12 GHz 0.5W	8.5	10.5	30	6	26	2	6	6x6	QPM5811
2-4 GHz Rx Core	2.5	4	-1.2	3.3	30	1.2	3.3	7x7	QPM2100

## GaAs Switches

Freq. Min (MHz)	Freq. Max (GHz)	Switch Type	Abs/ Refl	IL (dB)	ISO (dB)	Speed (ns)	IP1dB (dBm)	Voltage (V)	Package (mm)	Part Number
DC	20	SPST	Non-R	1.3/1	48/50	1.8	25	0/-5	3x3/Die	CMD204C3/CMD204
DC	20	SPDT	Non-R	2	37/41	1.8	25	0/-5	3x3/Die	CMD195C3/CMD195
DC	18	SPDT	Non-R	1.75/1.5	46	1.8	23	0/-5	3x3/Die	CMD196C3/CMD196
DC	40	SPDT	R	2.3	36	4	19	0/-5	Die	CMD215
DC	20	SP4T	Non-R	2.4	39	66	21	0/-5	4x4/Die	CMD203C4/CMD203
DC	10	DPDT	Non-R	1.5	35	4	24	0/+5	3x3	CMD272P3
DC	12	DPDT	Non-R	1.7	42	12	25	0/+5	3x3	CMD273P3
DC	26	SPDT	R	1.4	40	3.4	21	0/-5	Die	CMD230
DC	15	SP3T	Non-R	2	42	66	21	0/-5	4x4	CMD234C4
DC	18	SP5T	Non-R	2.5	44	66	21	0/-5	4x4	CMD235C4/CMD235
DC	18	SP6T	Non-R	2.5	42	60	18	0/-5	4x4	CMD236C4/CMD236
0.100	6	SP3T	R	0.6	34	110	34	3.3	3x3	TQP4M0011

## GaAs Limiters

Description	Frequency (GHz)	Insertion Loss (dB)	Flat Leakage (dBm)	Package (mm)	Part Number
0.05-6 GHz, 100W VPIN Limiter	0.05-6	<0.7	<17	4x4	TGL2210-SM
0.1-20 GHz, 10W VPIN Limiter	0.1-20	<0.7	<18.5	1.5x1 Die	TGL2217
0.1-20 GHz, 10W VPIN Limiter	0.1-20	<0.9	<18.5	3.5x3.5	TGL2217-SM
1-6 GHz, 100W S-Band & C-Band VPIN Limiter	1-6	<0.5	<16	2x2 Die	TGL2205
2-4 GHz, 200W VPIN Limiter	2-4	<0.6	<18	4x4	TGL2927-SM
2-4.5 GHz, 100W S-Band VPIN Limiter	2-4.5	<0.5	15	2.5x2.5 Die	TGL2206
2-5.5 GHz, 100W VPIN Limiter	2-5.5	<1.0	<15.5	5x5	TGL2206-SM
2-6 GHz, 100W VPIN Limiter	2-6	<0.6	<16.5	4x4	TGL2205-SM
2-12 GHz Wideband Dual Stage	2-12	<0.5	<18	3x3 Die	TGL2201-SM
2-20 GHz, 5W VPIN Limiter	2-20	<1.0	<18	3x3	TGL2208-SM
2-25 GHz Wideband Dual Stage VPIN Limiter	2-25	<1	<18	1.1x1.1 Die	TGL2201
8-12 GHz, 50W VPIN Limiter	8-12	<0.5	<18	2x2 Die	TGL2209
8-12 GHz, 50W VPIN Limiter	8-12	<0.5	<18.5	4x4	TGL2209-SM
X-Band 40W Limiter in Plastic OVM QFN	8-12	<0.5	<19	4x4	QPP2209

## GaAs Low Noise Amplifiers

Frequency (GHz)	Gain (dB)	NF (dB)	OP1dB (dBm)	OIP3 (dBm)	Voltage (V)	Current (mA)	Package (mm)	Part Number
2-6	31	1.6	12	23	3-5	45	4x4/Die	CMD308P4/CMD308
2-6	27	0.6	16	26	2-5/1.5	42	3x3/Die	CMD283C3/CMD283
2-18	17	2	17	29	5	75	Die	TGA2525
2-20	17	2	19	29	5	100	4x4	TGA2567-SM
4-8	15.5	1.8	17	30	3-5	60	3x3/Die	CMD270P3/CMD270
5-9	22	1.25	14	25.5	2.5-4.5	33	3x3	CMD318P3
5-11	27	1.5	13	23	3-5	45	4x4/Die	CMD309P4/CMD309
5-11	23	1.4	11	23	2-4.5	35	3x3/Die	CMD263P3/CMD263
6-11	20	1.8/2	16.5	27	3-5	66	3x3/Die	CMD271P3/CMD271
6-18	26	1.7/1.6	11	24/27	2-4.5	63	3x3/Die	CMD264P3/CMD264
6-18	27	1.4	12	24	3	52	3x3/Die	CMD328K3/CMD328
6-20	21	2.0	15	25	3-5.0	100	3x3/Die	CMD316C3/CMD316
7-14	26/27	1.1	18	-	3.5	120	4x4/Die	QPA2609/QPA2609D
8-12	20	0.92	16	22	3	30	3x3	CMD319C3
8-16	17	2.0	12	25	2-4	55	3x3/Die	CMD307P3/CMD307
10/10.5-13/12.7	16/17	1.2/1.1	-1.2/1	8	2	11	3x3/Die	QPL2210/QPL2210D
10.7-12.7	18	1.07	16	23	3	32	3x3	CMD320C3
13-20	26	1.1/1.2	18	-	3.5	105	4x4/Die	QPA2735/QPA2735D
17-22	25	1.3	20	28	3.5	90	4x4	QPA2626
17-25	27	1.4	8	17	3/1.5	27	4x4/Die	CMD298C4/CMD298
18-40	17	3.5	8	17	3/3	33	4x4/Die	CMD299K4/CMD299
22/25-32/31	23/22	1.6/1.7	19	27	3.5	90	4x4/Die	QPA2628/QPA2628D

## GaAs Driver Amplifiers

Frequency (GHz)	Gain (dB)	OP1dB (Psat)	OIP3 (dBm)	NF (dB)	Voltage (V)	Current (mA)	Package (mm)	Part Number
2-9	15	17	23	4.5	5-6	90	Die	CMD232
2-20	27	16	29	3	2-4	145	4x4	CMD295C4/CMD295
2.7-3.8	28	31	30	-	6	400	5x5	QPA1008
4-10	19.5	21	33	5.5	5	143	4x4	CMD315C4
5-7	19	28.4	37	6.5	7	375	4x4	CMD169P4
6-14	19	-	20	4	5	74	3x3	QPL3050
6-16	18.5	21	33	4-6	5	100	4x4	CMD305/C4/P3
8.5-10.5	34	30.8	-	-	6	156	4x3	QPA0812
20-45	20	26	31.5	6	5	480	Die	CMD293
26-35	15	19.5	24.5	3.5	5	72	Die	CMD199
26-35	15.5	21	24	4.4	5	90	Die	CMD243

## GaAs Distributed Amplifiers

Frequency (GHz)	Gain (dB)	OP1dB/Psat (dBm)	OP1dB (dBm)	NF (dB)	Voltage (V)	Current (mA)	Package (mm)	Part Number
DC-20	11/12	30/29	38	3.4	10/-0.55/5	400	5x5/Die	CMD201P5/CMD201
DC-20	12	11/13.5	22	2.5	3-8/3-8	40	3x4	CMD311P34
DC-20	13	31/30	38	3.4	10/-0.95	400	5x5/Die	CMD249P5/CMD249
DC-20	19.5	26/25	31	1.9	5-8/-1	200	5x5/Die	CMD192C5/CMD192
DC-20/24	17.5/18	25	31/32	2.5	5-8/-0.65	185	5x5/Die	CMD244K5/CMD244
DC-22	15	22/19	28	2.2	5-8/-0.65	80	4x4/Die	CMD240P4(C4)/CMD240
DC-22	17	20.5/19.5	28	2.5	5-8	108	4x4/Die	CMD284P4/CMD284
DC-30	13	27/28.5	33	3	10/3.5/-0.6	250	Die	CMD292
DC-40	11	21/18	27	4.4	5-8/-0/32	100	4x4/Die	CMD242K4/CMD242
DC-55	12.5	17.5	15	3	5/-0.5	110	Die	QPA0009D
DC-67	10	11/14	11	3.5	3/-0.4	40	Die	CMD304
1-24	16	24.5/24	33	3	5-8	225	4x4/Die	CMD317C4/CMD317
2-20	26.5	17/16	24	3	2-4/2	145	4x4/Die	CMD295C4/CMD295
2-20	9	22/20.5	24	4.5	3-6	120	4x4/Die	CMD233C4/CMD233
2-22	13.5	23/21	28	2.3	5-8/-0.65	74	4x4/Die	CMD241P4/CMD241
2-22	11	18	26	3	6	60	Die	QPA0012D

## GaAs pHEMTs

Description	Frequency (GHz)	Gain (dB)	Psat (dBm)	NF (dB)	Bias (V)	Current (mA)	Dimensions (mm)	Part Number
0.16W Die	DC-20 (data at 12 GHz)	14	22	1	8	29	0.41x0.34x0.10	QPD2018D
0.25W Die	DC-20 (data at 12 GHz)	14	24	0.9	8	65	0.41x0.34x0.10	QPD2025D
0.40W Die	DC-20 (data at 12 GHz)	13	26	1.1	8	65	0.41x0.34x0.10	QPD2040D
0.63W Die	DC-20 (data at 12 GHz)	12	28	1.4	8	97	0.41x0.34x0.10	QPD2060D
0.89W Die	DC-20 (data at 12 GHz)	11.5	29.5	1	8	130	0.41x0.54x0.10	QPD2080D
1.26W Die	DC-20 (data at 12 GHz)	11	31	1	8	194	0.41x0.54x0.10	QPD2120D
1.78W Die	DC-20 (data at 12 GHz)	10.4	32.5	1	8	258	0.41x0.54x0.10	QPD2160D

## GaAs Low Phase Noise Amplifiers

Frequency (GHz)	Phase Noise	Gain (dB)	OP1dB/Psat (dBm)	OIP3 (dBm)	Bias Voltage (V)	Bias Current (mA)	Package (mm)	Part Number
DC-18	-165	14.4	0/24	34	5/3	180	Die	CMD326
DC-26.5	-165	16	18-20.5	29	+3-5/+3	74	4x4/Die	CMD275P4/CMD275
DC-40	-165	11.1	0/21.4	31	5/3	100	Die	CMD327
2-20	-165	15	19-22	30.5	+3-5/+3	82	4x4	CMD274P4
6-18	-165	18	18-22	29	+3-5/+3	76	4x4/Die	CMD245C4/CMD245
8-22	-165	17	18-18	25	+3-5/+3	48	4x4/Die	CMD246C4/CMD246
30-40	-160	13	13.5/15	21	+2-4/+3	28	Die	CMD247

## GaAs Mixers

Description	Frequency RF (GHz)	Frequency IF (GHz)	LO Drive (dBm)	Conver. Loss (dB)	LO-RF Isolation (dB)	LO-IF Isolation (dB)	IIP3 (dBm)	Package (mm)	Part Number
Fundamental Mixer	4-8.5	DC-2.2	+17	7	45	36	21	3x3	CMD251C3
Fundamental Mixer	4-28	DC-3	+17	8	43	50	20	Die	CMD312
Double Balanced	6-14	DC-5	+19	6	43	39	23	3x3	CMD253C3
Fundamental Mixer	6-45	DC-3	+17	9	41	42	20	Die	CMD313
Double Balanced	11-21	DC-6	+19	6	48	44	22	3x3	CMD254C3
Sub-harmonic x2	13-21	DC-4/3	+2	-10/-8.5	22/28	34/48	13/12	3x3/Die	CMD303C3/CMD303
Double Balanced	16-26	DC-9	+19	6.5	40	33	24	3x3	CMD255C3
Fundamental Mixer	20-32	DC-10	+13	7	36	36	18	3x3/Die	CMD180C3/CMD180
Sub-harmonic x2	20-32	DC-7	-2/-4	-8.5/-9.5	36	53	11/10	3x3/Die	CMD310C3/CMD310
Fund./Double Bal.	26-45	DC-12	+17	6.5	37	29	22	Die	CMD181/CMD181K3
Hi IF Mixer	30-46	5-20	+19	8	30	20	21	Die	CMD261

## GaAs I/Q Mixers

Frequency RF (GHz)	Frequency IF (GHz)	LO Drive (dBm)	Conver. Loss (dB)	LO-RF Isolation (dB)	LO-IF Isolation (dB)	IMR (dB)	IIP3 (dBm)	Package (mm)	Part Number
2.5-15	DC-1	17	-8	45	25	23	22	4x4	QPX0002
4-8	DC-2.4	+20	-6.5	52	27	30	25	4x4	CMD252C4
6-10	DC-3.5	+15	-6	46	20	30	18	4x4	CMD182C4
6-10	DC-3.5	+21	-5.5	40	18	31	25	4x4	CMD257C4
6-26	DC-3	17	-8	40	27	25	21	3.9x3.9	QPX0001
7.5-13	DC-4.5	+15	-5.5	43	23	26	18	4x4	CMD183C4
7.5-13	DC-3.5	+21	-5.5	38	20	29	25	4x4/Die	CMD258C4/CMD258
16-26	DC-9	+19	6.5	40	33	-	24	3x3	CMD255C3
20-32	DC-10	+13	-7	36	36	-	18	3x3	CMD180C3/CMD180
24-34	DC-7	15	-9	30	24	15	19	Die	QPX0004D
30-40	DC-5	15	-7	35	25	25	18	Die	QPX0003D

## GaAs Multipliers

Description	Frequency	LO Drive (dBm)	Conver. Loss (dB)	LO-RF Isolation (dB)	LO-IF Isolation (dB)	IMR (dB)	IIP3 (dBm)	Package (mm)	Part Number
Passive Multiplier	4-8	8-16	-12	15	48	-	-	3x3/Die	CMD225C3/CMD225
Passive Multiplier	7-11	14-22	-10.5	15	44	-	-	3x3/Die	CMD226C3/CMD226
Passive Multiplier	8-15	16-30	-11	15	32/40	-	-	3x3/Die	CMD227C3/CMD227



## GaAs Digital Step Attenuators

Frequency (GHz)	Insertion Loss (dB)	Attenuator Range (dB)	Bits	RMS Step Err. (dB)	Switching Speed	Voltage (V)	Package (mm)	Part Number
DC-20	5	32	5	1	-	-2.5/-5.5	3.9x3.9	QPC1008
DC-22/40	1.5/1.2	6	2	0.1	25	0/-5	3x3/Die	CMD281C3/CMD281
DC-22/40	1.9/1.5	12	2	0.2/0.1	25	0/-5	3x3/Die	CMD282C3/CMD282
DC-30	2.9	30	2	+/-2	28	0/-5	Die	CMD324
DC-30	4	31.5	6	+/-0.2	25	0/-5	Die	CMD325
0.1-15	<4.0	31.5	6	-	<30	-3.0 to -5.0	3x3	TGL2226-SM
1-31	<4.2	15.5	5	<0.5	<30	-3.3 to -5.0	3x3	TGL2223-SM

## GaAs Variable Attenuators

Frequency (GHz)	Insertion Loss (dB)	Attenuator Range (dB)	Voltage (V)	Package (mm)	Part Number
DC-20	3.2	33	+0.3 to -8	3x3	CMD285C3
0.050-18	3	32	5	3.2x3.2	RFS2113
18-40	1.6	37	0/-3	Die	CMD172

## GaAs Analog Attenuators

Frequency (GHz)	Insertion Loss (dB)	Attenuator Range (dB)	Voltage (V)	Package (mm)	Part Number
DC-30	1.5	16	-1 to 0	3x3	TGL4203-SM
DC-50	2	17	-1 to 0	Die	TGL4203
2-31	< 2	20	0 to 1.5	3x3/Die	TGL2767-SM/TGL2767

## GaAs Fixed Attenuators

Frequency (MHz)	Attenuation (dB)	Package (mm)	Part Number
DC->40,000	0	0.5x0.5/Die	TGL4201-00
DC->40,000	2	0.5x0.5/Die	TGL4201-02
DC->40,000	3	0.5x0.5/Die	TGL4201-03
DC->40,000	6	0.5x0.5/Die	TGL4201-06
DC->40,000	10	0.5x0.5/Die	TGL4201-10

## GaAs Digital Phase

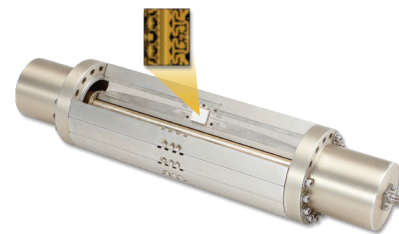
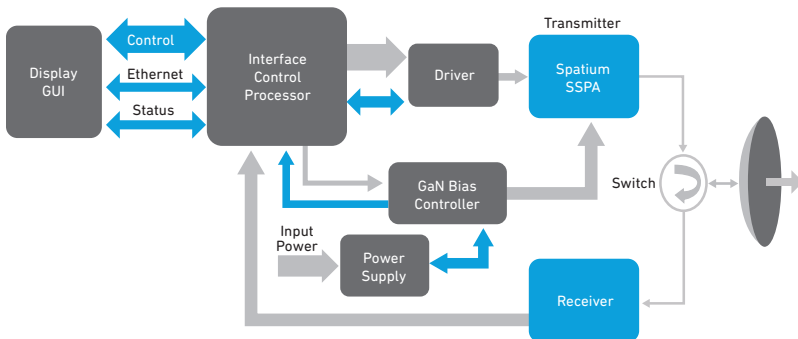
Frequency (MHz)	Number Bits (dB)	Insertion Loss (dB)	Amp. Err. (dB)	Phase Err. (deg)	Package (mm)	Part Number
2-4	5	7	-	5	4x4	CMD175P4
2.5-4	6	5	<0.4	<2.8	6x6	QPC2108
2.5-4	6	5	<0.4	<5	5x5	TGP2108-SM
5-18	Analog	3.2/3	-	200/400	4x4	CMD297P34/CMD297
6-18	6	<10	0.45	4	5x5/3.15x3.15 Die	TGP2105-SM/TGP2105
8-12	6	6	0.5	4	4x4/2.2x2.2 Die	TGP2109-SM/TGP2109
13-17	4	8	-	5	4x4	CMD176P4
15-19	6	7	0.85	4	4x4/2.11x1.41 Die	TGP2615-SM/TGP2615
28-32	5	6	0.5	5	1.88x0.75 Die	TGP2100
32-37	5	7	0.4	3.5	1.88x0.75 Die	TGP2102

## GaAs Upconverters/Downconverters

Description	RF Min (GHz)	RF Max (GHz)	IF Min (GHz)	IF Max (GHz)	LO Min (GHz)	LO Max (GHz)	Conversion Gain (dB)	Package (mm)	Part Number
17.7-26.5 GHz K-Band Upconverter	6	26.5	DC	4	6.85	15.25	13	5x5	TGC4510-SM
17-27 GHz K-Band Image Reject Downconverter	17	27	DC	4	6.5	15.5	15	5x5	TGC4610-SM

# High-Power, Ultra-Broadband Performance & Solid State Reliability Using Spatium® Technology

Patented Spatium RF power combining technology from Qorvo provides a low loss, broadband, highly reliable, efficient alternative to traveling wave tube amplifiers (TWTAs) for commercial and defense communications, radar, EW and many other RF applications. The Spatium SSPAs dramatically improve broadband RF power and efficiency through patented coaxial spatial combining techniques. These SSPA solutions are offered as standard products with several platforms available across the 2 to 40 GHz spectrum. For those applications that require customer specific SSPAs, Spatium solutions are readily customizable. Qorvo uses its world class GaN MMIC amplifiers to deliver longer service lifetimes than comparable TWTAs or conventional planar power combining products. Spatium SSPAs provide clear advantages in size, weight, power, and cost (SWaP-C). RF system designers can use Spatium technology to achieve unprecedented combining efficiency with output power from hundreds to thousands of watts. Spatium technology combined with GaN MMICs can allow solid state technology to reach power levels, bandwidths, and efficiencies never achieved before.



## Benefits of Spatium Technology

- Ultra-broadband operation: up to decade bandwidth
- Efficiently combines 16 GaN MMIC HPAs
- Up to 93% combining efficiency with high-operating frequencies
- Predictable performance, continuous operation
- SSPA provides graceful degradation vs TWTA single point of failure
- High reliability: 7+ years compared to TWTAs
- Technology readiness level (TRL 9)
- Much lower supply voltage: 5-50V
- Provides instantaneous bandwidth without warm-up time
- Compact design: smaller than TWTAs

## Applications

- EW
- Radar/SAR systems/jammers
- Satellite communications
- Terrestrial ground stations
- Test Instrumentation

## Spatium SSPA Amplifiers

Frequency (GHz)	Psat (W)	Small Signal Gain (dB)	Power Gain (dB)	PAE (%)	Voltage (V)	Part Number
2-18	100-200	17-20	11-14	15-35	20	QPB0218
2-18	100-200	17-20	11-14	15-35	20	QPB0218N
2-18	130-316	17-20	8-12	13-28	18	QPB0220
2-18	220	17	12.8	22.6	18	QPB0220N
6-18	162-288	15-19	9.1-11.6	15-24	18	QPB0618N
8-11	590-740	27-30	19.7-20.7	31-39	28	QPB1024
13.4-15.5	590-645	23.7-24.1	19.7-20.7	25-28	28	QPB1316
18-40	80-126	13-17	10-12	8-14	18	QPB2040N
27.5-31	182-224	23-27	13.6-14.5	25-28	22	QPB2731
27.5-31	150-200	21-24	13-14	22-26	22	QPB2731N
32-38	126-155	17-26	7.7-8.5	15-18	24	QPB3238
32-38	117-141	18-25	8-9	16-20	24	QPB3238N
34-36	316-347	21-25	16-16.4	15-17	28	QPB1111

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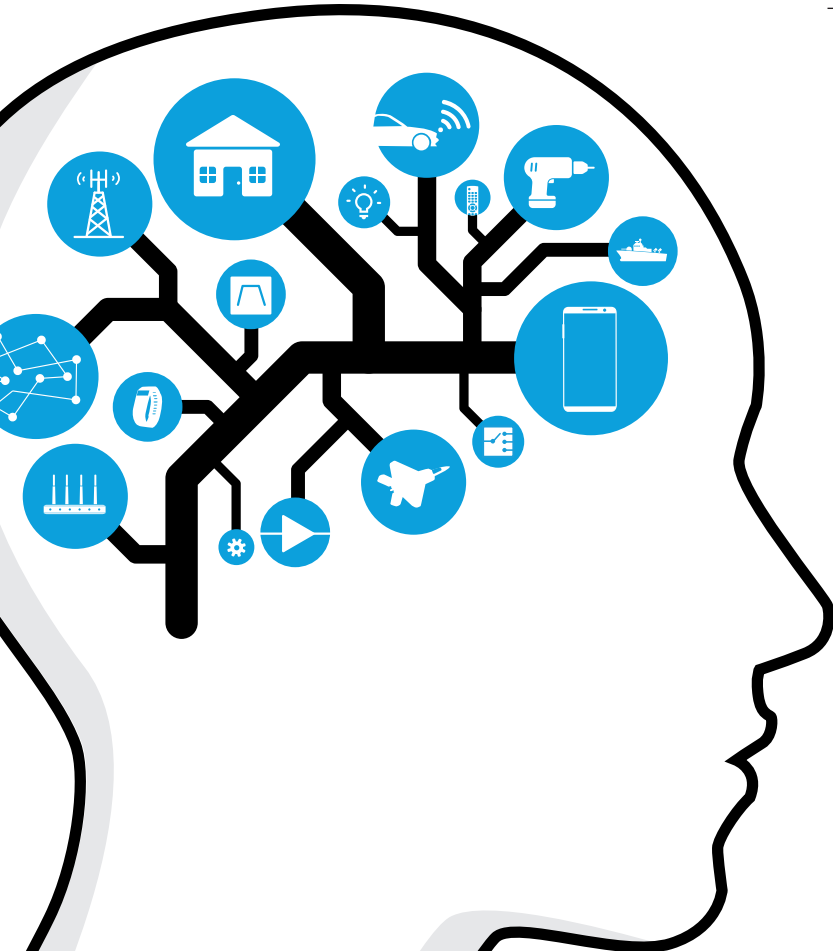
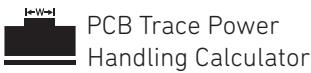
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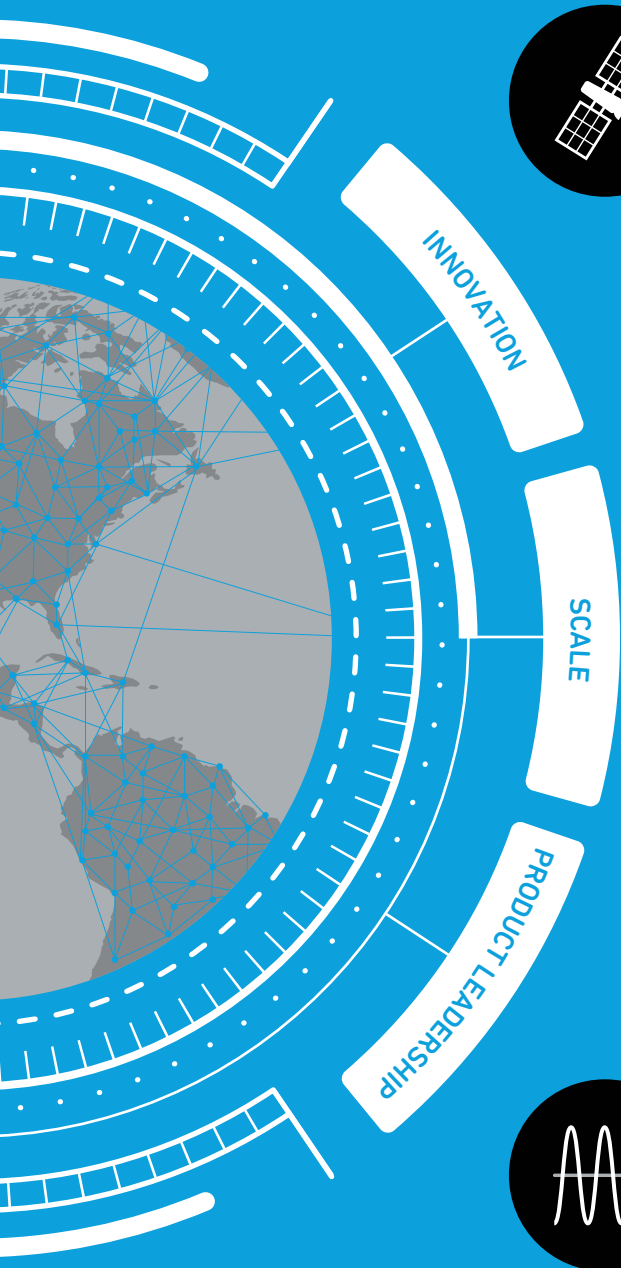
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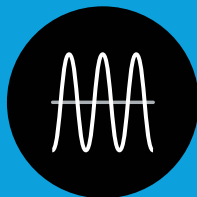
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