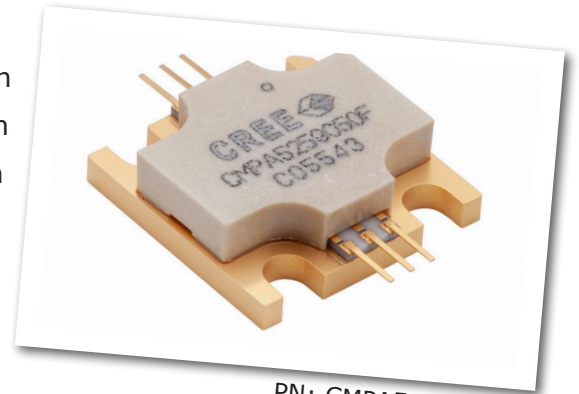


CMPA5259050F

50 W, 5200 - 5900 MHz, 28 V, GaN MMIC for Radar Power Amplifiers

Cree's CMPA5259050F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) designed specifically for high efficiency, high gain, and wide bandwidth capabilities, which makes CMPA5259050F ideal for 5.2 - 5.9 GHz Radar amplifier applications. The transistor is supplied in a 0.5 inch square ceramic/metal flange package.



PN: CMPA5259050F
Package Type: 440219

Typical Performance Over 5.2-5.9 GHz ($T_c = 25^\circ\text{C}$) of Demonstration Amplifier

Parameter	5.2 GHz	5.5 GHz	5.9 GHz	Units
Small Signal Gain	31.4	30.8	31.0	dB
Output Power	59.6	56.0	55.2	W
Efficiency	51.5	50.1	51.4	%
Input Return Loss	-12.5	-12.0	-7.0	dB

Note:
100 μsec Pulse Width, 10% Duty Cycle, $P_{IN} = 26\text{ dBm}$

Features

- 30 dB Small Signal Gain
- 50% Efficiency at P_{SAT}
- Operation up to 28 V
- High Breakdown Voltage
- 0.5 inch-square package

Applications

- AESA Radar
- Defense Radar
- Fire Control Radar
- Naval, Marine, Ground Protection Radar
- Weather Radar



Absolute Maximum Ratings (not simultaneous) at 25°C Case Temperature

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DSS}	84	V_{DC}	V_{DC}
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}	V_{DC}
Storage Temperature	T_{STG}	-55, +150	°C	°C
Operating Junction Temperature	T_J	225	°C	°C
Soldering Temperature	T_S	245	°C	°C
Screw Torque	τ	60	in-oz	in-oz
Thermal Resistance, Junction to Case ¹	$R_{\theta JC}$	1.60	°C/W	$P_{DISS} = 61 \text{ W}, T_{CASE} = 85^\circ\text{C}, 500 \mu\text{s}, 20\%$
Case Operating Temperature	T_C	-40, +105	°C	

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	2 (125 V to 250 V)	JEDEC JESD22 C101-C

Electrical Characteristics (T_c = 25 °C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹						
Gate Threshold Voltage	V _{GS(th)}	-3.0	-2.5	-	V _{DC}	V _{DS} = 10 V, I _{DS} = 1.0 A
Gate Quiescent Voltage	V _{GS(Q)}	-	-2.7	-	V _{DC}	V _{DS} = 10 V, I _D = 1.0 A
Saturated Drain Current	I _{DS}	16.4	18.6	-	A	V _{DS} = 6 V, V _{GS} = 2 V
Drain-Source Breakdown Voltage	V _{BD}	84	100	-	V _{DC}	V _{GS} = -8 V, I _{DS} = 1.0 A
RF Characteristics²						
Small Signal Gain ₁	G _{SS}	-	31	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = -20 dBm
Small Signal Gain ₂	G _{SS}	-	31	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = -20 dBm
Small Signal Gain ₃	G _{SS}	-	31	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = -20 dBm
Power Output ₁	P _{OUT}	-	59.5	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = 26 dBm
Power Output ₂	P _{OUT}	-	56	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = 26 dBm
Power Output ₃	P _{OUT}	-	55	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = 26 dBm
Power Added Efficiency ₁	PAE	-	51	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = 26 dBm
Power Added Efficiency ₂	PAE	-	50	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = 26 dBm
Power Added Efficiency ₃	PAE	-	51	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = 26 dBm
Power Gain ₁	G _p	-	21.8	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = 26 dBm
Power Gain ₂	G _p	-	21.5	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = 26 dBm
Power Gain ₃	G _p	-	21.4	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = 26 dBm
Input Return Loss	S11	-	-12	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 - 5.9 GHz, P _{IN} = -20 dBm
Output Return Loss	S22	-	-17	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 - 5.9 GHz, P _{IN} = -20 dBm
Output Mismatch Stress	VSWR	-	3:1	-	Ψ	No damage at all phase angles, V _{DD} = 28 V, I _{DQ} = 1.0 A, P _{IN} = 26 dBm

Notes:

¹ Measured on wafer prior to packaging.

² Measured in CMPA5259050F-TB test fixture.

³ Drain Efficiency = P_{OUT}/P_{DC}

Typical Pulsed Performance of the CMPA5259050F

Figure 1. - Gain and Input Return Loss vs. Frequency of the CMPA5259050F Measured in CMPA5259050F-AMP Amplifier Circuit
 $V_{DD} = 28\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $T_c = 25^\circ\text{C}$

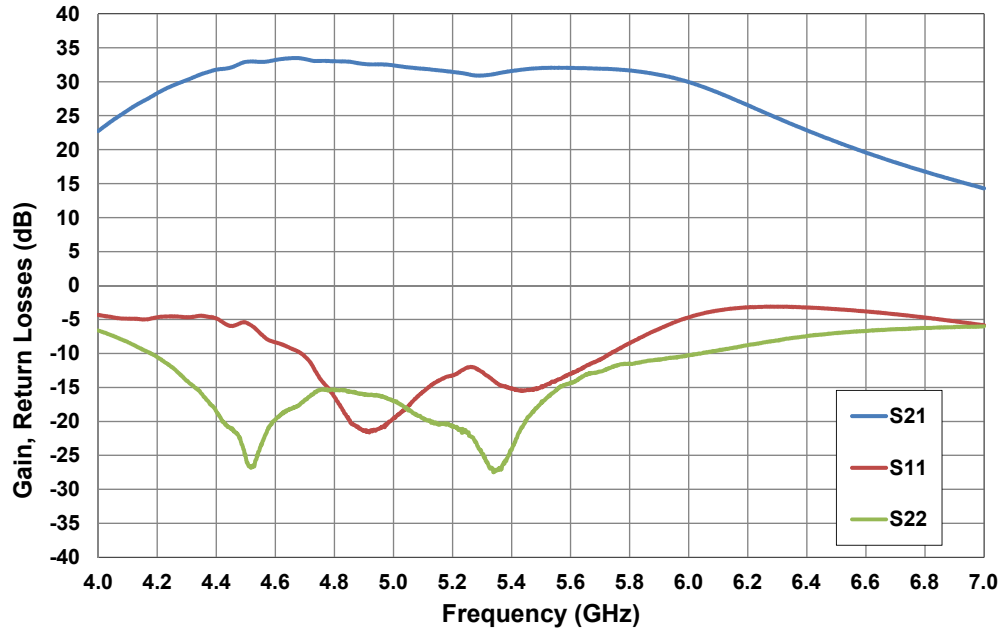
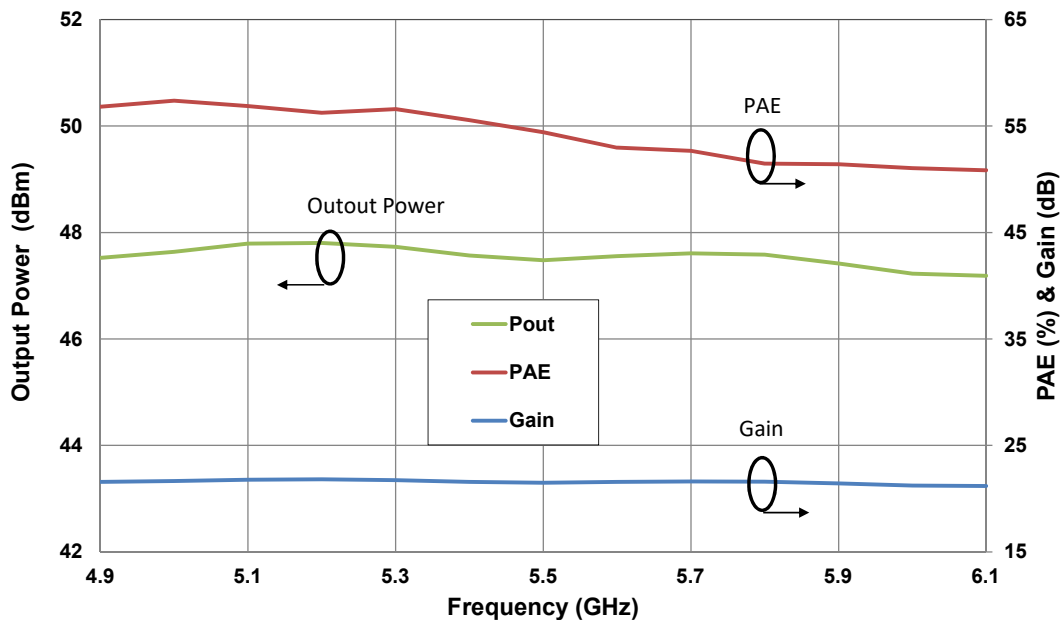


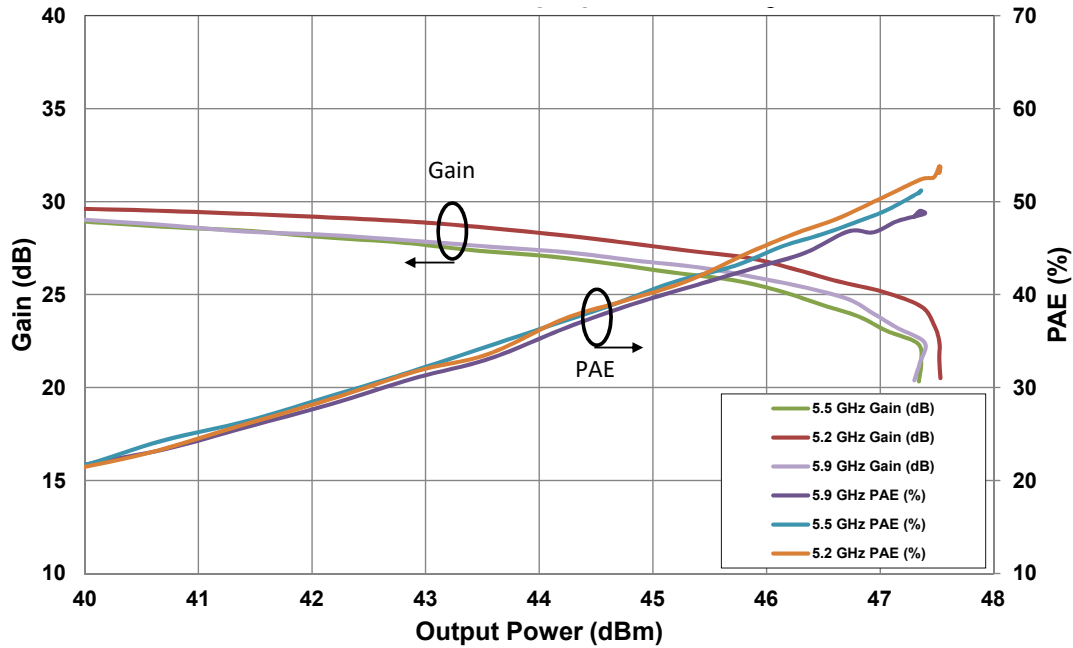
Figure 2. - Output Power, Gain, and Power Added Efficiency vs. Frequency of the CMPA5259050F Measured in CMPA5259050F-AMP Amplifier Circuit
 $V_{DD} = 28\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $P_{IN} = 26\text{ dBm}$, Pulse Width = $100\ \mu\text{s}$, Duty Cycle = 10%, $T_c = 25^\circ\text{C}$



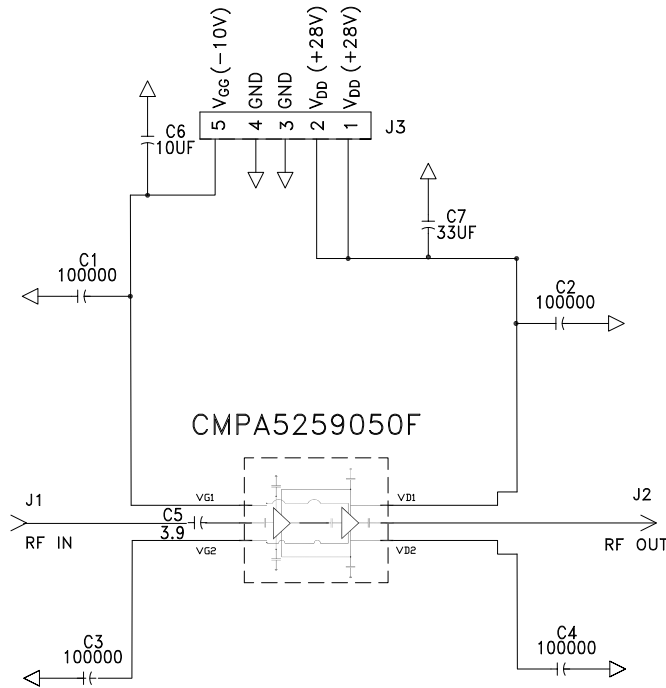
Typical Pulsed Performance of the CMPA5259050F

Figure 3. - Gain and Power Added Efficiency vs. Output Power of the CMPA529050F Measured in CMPA525050F-AMP Amplifier Circuit

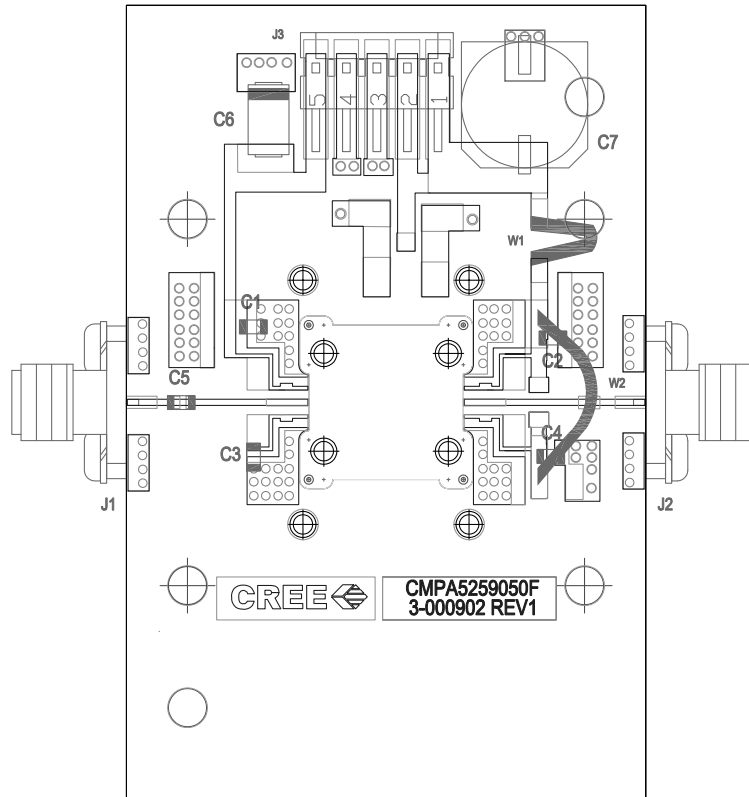
$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.0\text{ A}$, Pulse Width = 100 μs , Duty Cycle = 10%, $T_c = 25^\circ\text{C}$



CMPA5259050F-TB Demonstration Amplifier Schematic



CMPA5259050F-TB Demonstration Amplifier Circuit Outline

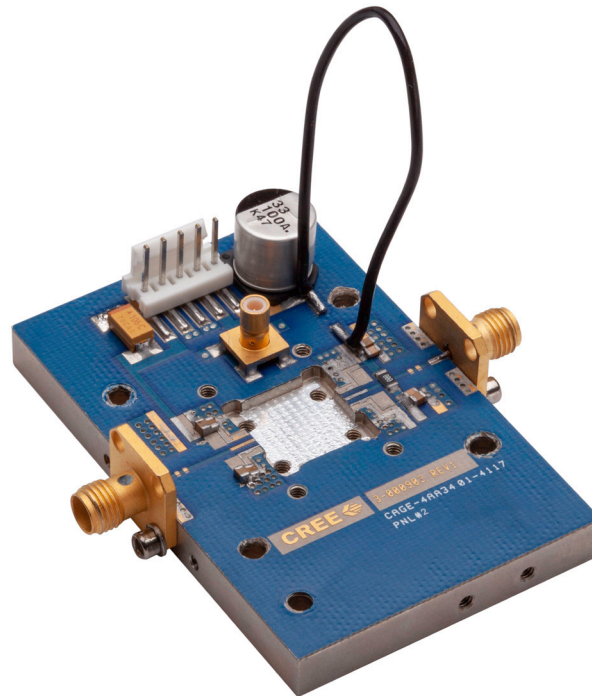


CMPA5259050F

CMPA5259050F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
R1	RES 0 OHM, SMT, 1206, 125 mW	1
C1, C3, C6, C8	CAP, 100000 pF, (0.1 UF) +/- 10%, 100 V, 0805	4
C2, C4, C5, C7	CAP, 0805, 2200 pF, 100 V, 0805	4
C9	CAP, 10 UF, 16 V, Tantalum	1
C10	CAP, 33 UF, 20%, G Case	1
J3	Header RT> PLZ .1 CEN LK 5POS	1
J1, J2	CONN, SMA, Female, 2-Hole, Flange	2
J4	CONN, SMB, Straight Jack Receptacle, SMT, 50 OHM, Au Plated	1
	Baseplate, AL, 2.60 X 1.7 X 0.25	1
	#4 Split Lockwasher SS	4
	2-56 SoC HD Screw 3/16 SS	4
	#2 Split Lockwasher SS	4
	4-40 SOC HD Screw 3/8" SS	4
	PCB, Taconics, RF 35, CMPA5259050F 0.010" THK	1
W1	Wire, Black, 22 AWG ~ 3"	

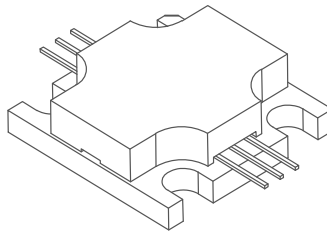
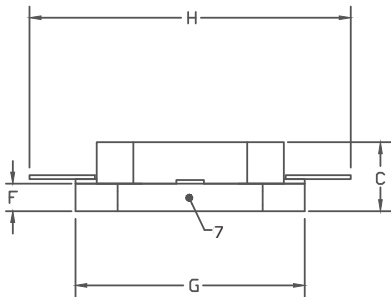
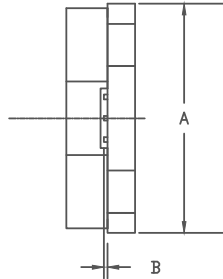
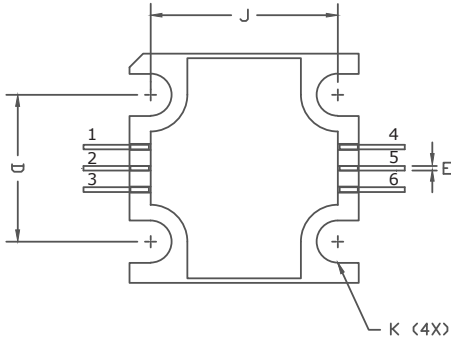
CMPA5259050F-TB Demonstration Amplifier Circuit



Product Dimensions CMPA5259050F (Package Type — 440219)

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
4. LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
5. ALL PLATED SURFACES ARE NI/AU



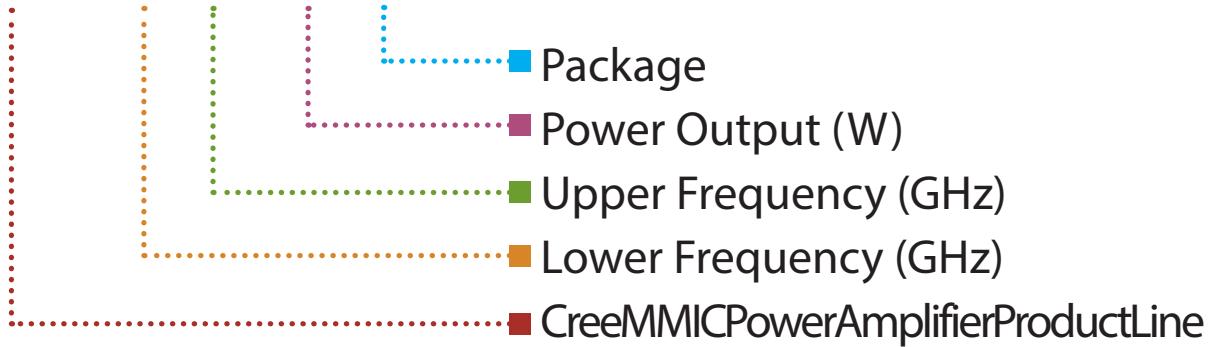
NOT TO SCALE

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.495	0.505	12.57	12.82
B	0.007	0.009	0.178	0.229
C	0.140	0.160	3.56	4.06
D	0.315	0.325	8.00	8.25
E	0.009	0.011	0.229	0.279
F	0.055	0.065	1.40	1.65
G	0.495	0.505	12.57	12.82
H	0.695	0.705	17.65	17.91
J	0.403	0.413	10.24	10.49
K	Ø .092		2.34	

PIN	
1	Gate bias
2	RF _{IN}
3	Gate bias
4	Drain bias
5	RF _{OUT}
6	Drain bias
7	Source

Part Number System

CMPA5259050F



Parameter	Value	Units
Lower Frequency	5.2	GHz
Upper Frequency ¹	5.9	GHz
Power Output	50	W
Package	Flange	-

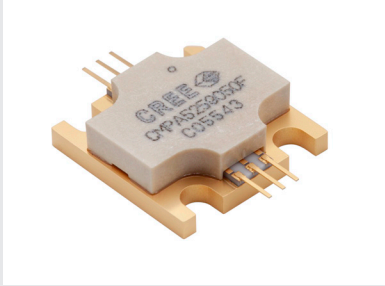
Table 1.

Note¹: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

Character Code	Code Value
A	0
B	1
C	2
D	3
E	4
F	5
G	6
H	7
J	8
K	9
Examples:	1A = 10.0 GHz 2H = 27.0 GHz

Table 2.

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA5259050F	GaN MMIC	Each	
CMPA5259050F-AMP	Test board with GaN MMIC installed	Each	



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