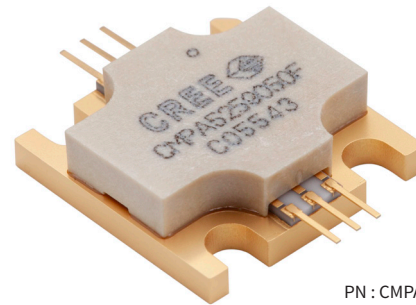


CMPA5259050F

50 W, 4.9 – 5.9 GHz, 28 V, GaN MMIC for Radar Power Amplifiers

Description

Wolfspeed'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 4.9 - 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

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

Typical Performance Over 4.9 - 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
Power Added Efficiency	51.5	52	52	%

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



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

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DS}	84	V_{DC}	
Gate-source Voltage	V_{GS}	-10, +2	V_{DC}	
Storage Temperature	T_{STG}	-55, +150	°C	
Operating Junction Temperature	T_J	225	°C	
Soldering Temperature	T_S	245	°C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case ¹	$R_{\theta JC}$	1.60	°C/W	$P_{DISS} = 61 \text{ W}, T_{CASE} = 85 \text{ °C}, 500 \mu\text{s}, 20\%$
Case Operating Temperature	T_C	-40, +105	°C	
Forward Gate Current	I_{GS}	16.8	mA	

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 < 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)}	-3.6	-2.5	-2.4	V _{DC}	V _{DS} = 10 V, I _{DS} = 16.8 mA
Gate Quiescent Voltage	V _{GS(Q)}	-	-2.7	-	V _{DC}	V _{DS} = 10 V, I _D = 16.8 mA
Saturated Drain Current	I _{DS}	12.6	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} = 16.8 mA
RF Characteristics^{2,3}						
Small Signal Gain	G _{SS}	28	31	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 4.9-5.9 GHz, P _{IN} = -20 dBm
Power Output	P _{OUT}	46	59.6	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = 24 dBm
Power Output	P _{OUT}	46	56.0	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = 24 dBm
Power Output	P _{OUT}	46	55.2	-	W	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = 24 dBm
Power Added Efficiency	PAE	40.5	51	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.2 GHz, P _{IN} = 24 dBm
Power Added Efficiency	PAE	42	52	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.5 GHz, P _{IN} = 24 dBm
Power Added Efficiency	PAE	42	52	-	%	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 5.9 GHz, P _{IN} = 24 dBm
Power Gain	G _P	-	21.8	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 4.9 - 5.9 GHz, P _{IN} = 26 dBm
Input Return Loss	S11	-	-12	-	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 4.9 - 5.9 GHz, P _{IN} = -20 dBm
Output Return Loss	S22	-	-17	4	dB	V _{DD} = 28 V, I _{DQ} = 1.0 A, Freq = 4.9 - 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 Pulse width = 100 μsec, 10% duty cycle



Typical Pulsed Performance

Figure 1. - Gain and Input Return Loss vs. Frequency of the CMPA5259050F Measured in CMPA5259050F-AMP Amplifier Circuit

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $T_C = 25^\circ\text{C}$

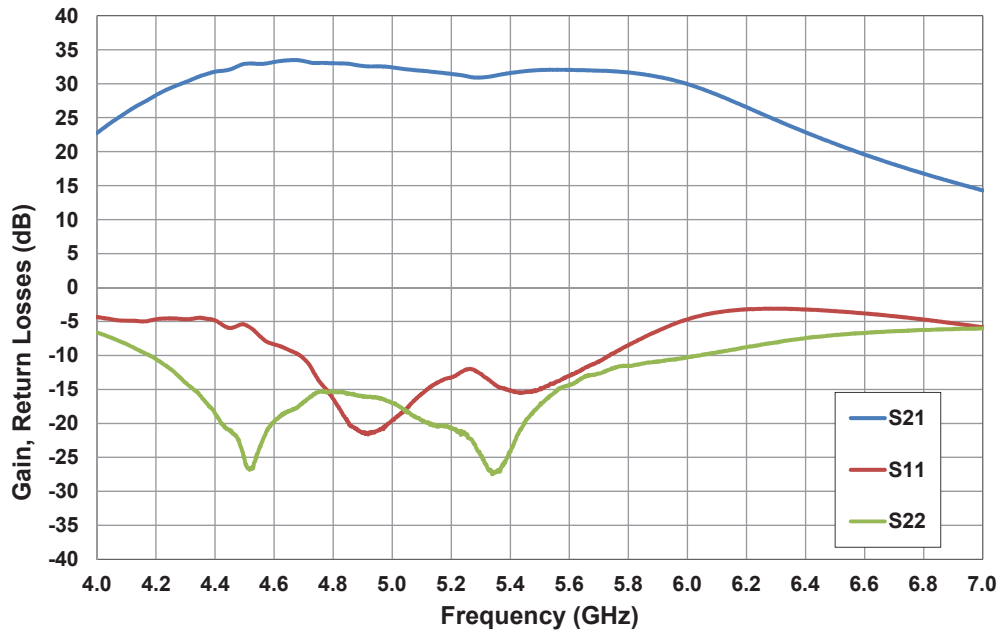
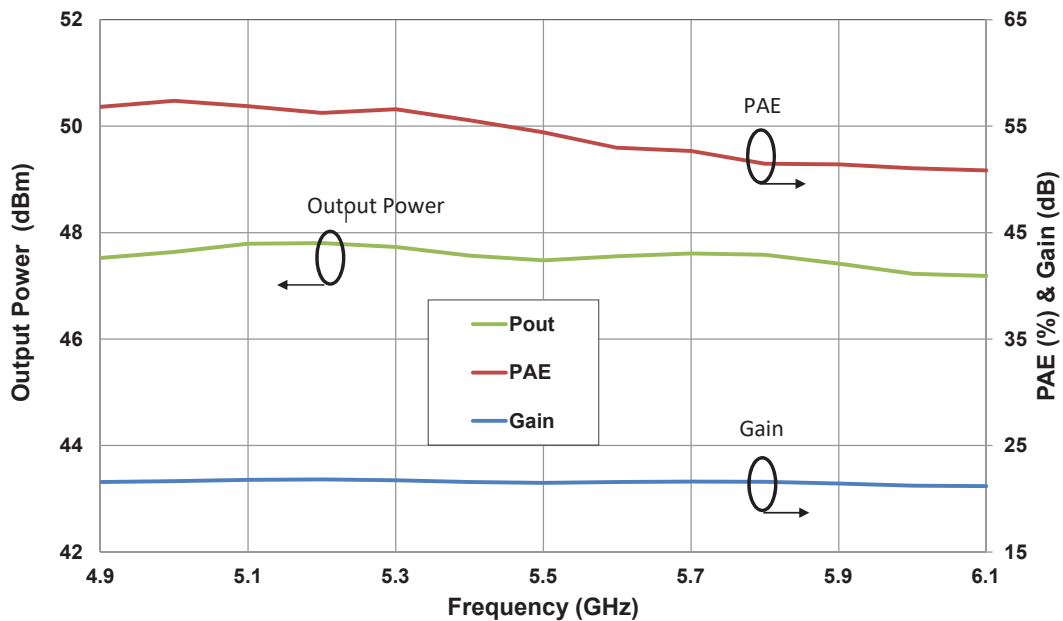


Figure 2. - Output Power, Gain, and Power Added Efficiency vs. Frequency of the CMPA5259050F Measured in CMPA5259050F-AMP Amplifier Circuit

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.0\text{ A}$, $P_{IN} = 26\text{ dBm}$, Pulse Width = $100\ \mu\text{s}$, Duty Cycle = 10%, $T_C = 25^\circ\text{C}$

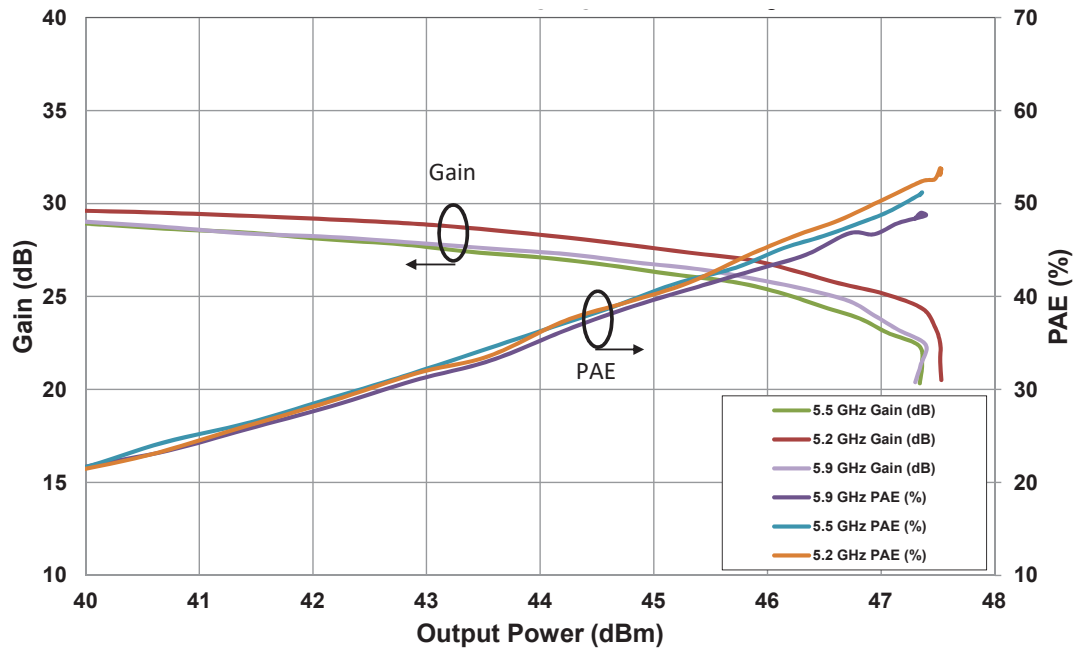




Typical Pulsed Performance

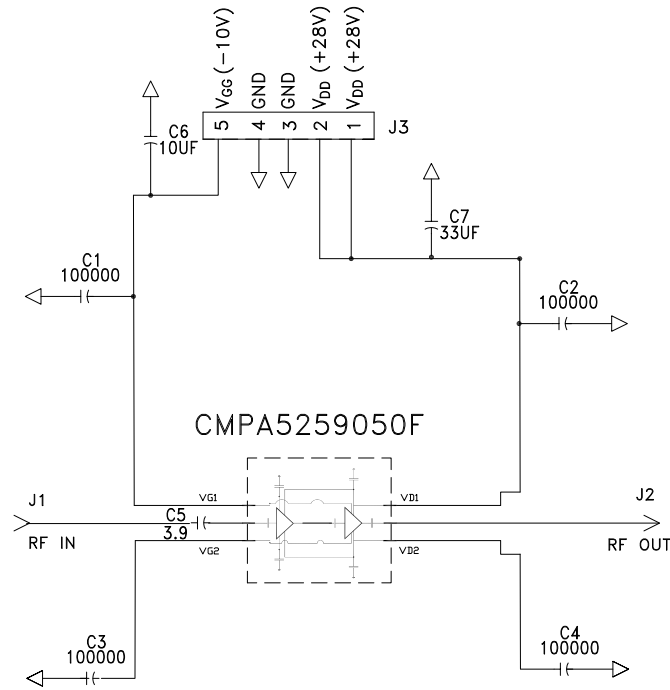
Figure 3. - Gain and Power Added Efficiency vs. Output Power of the CPMA529050F Measured in CPMA525050F-AMP Amplifier Circuit

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

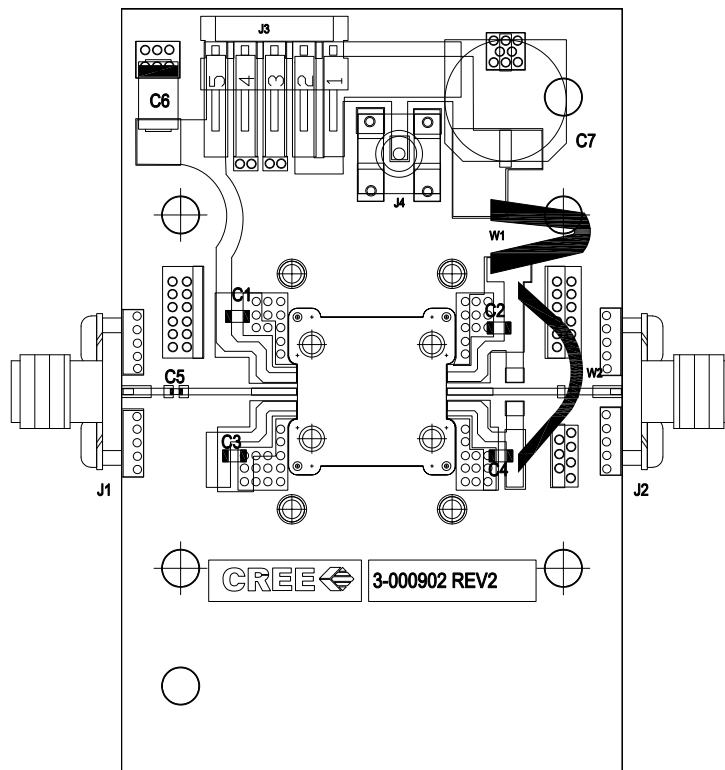




CMPA5259050F-TB Demonstration Amplifier Schematic



CMPA5259050F-TB Demonstration Amplifier Circuit Outline

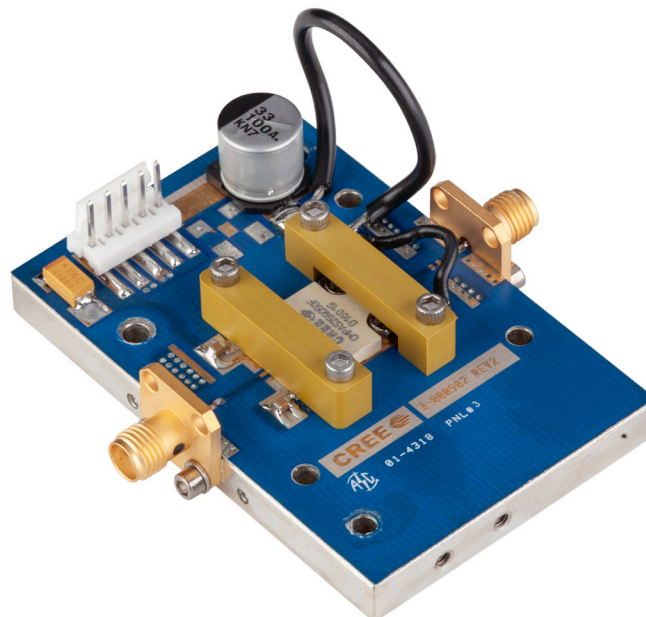




CMPA5259050F-TB Demonstration Amplifier Circuit Bill of Materials

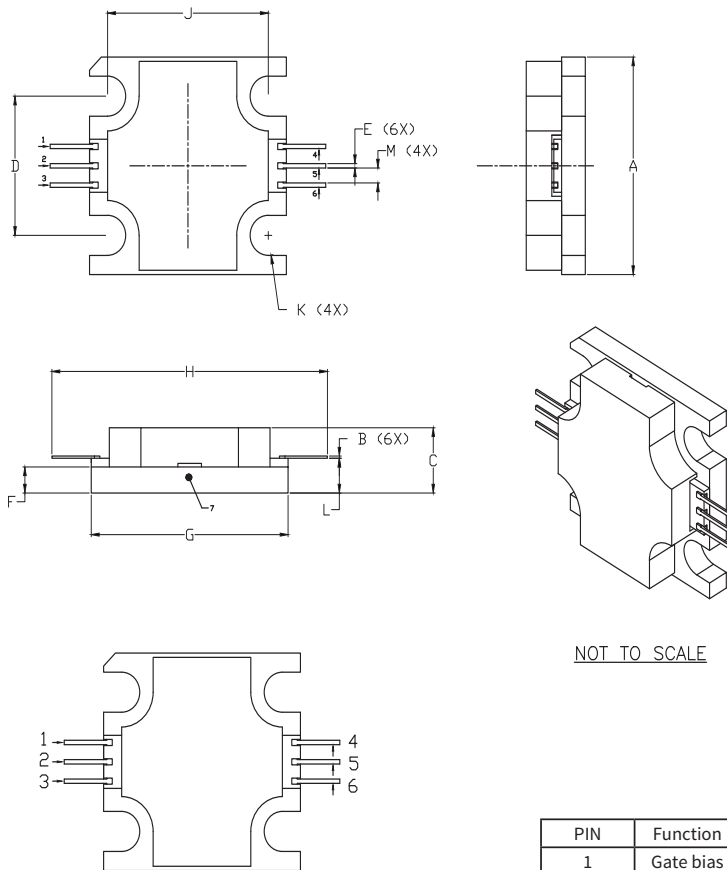
Designator	Description	Qty
C5	CAP, 3.9pF, +/-0.1pF, 0402, ATC	1
C7	CAP, 33 UF, 20%, G CASE	1
C1, C2, C3, C4	CAP CER 0.1UF 100V 10% X7R 0805	4
C6	CAP 10UF 16V TANTALUM, 2312	1
	PCB, RF35, 10 MIL THK	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FL	2
J3	HEADER RT>PLZ .1CEN LK 5POS	1
W1, W2	WIRE, BLACK, 22 AWG	2
J4	CONN, SMB, STRAIGHT JACK RECEPTACLE, SMT, 50 OHM, Au PLATED	1

CMPA5259050F-AMP Demonstration Amplifier Circuit





Product Dimensions CMPA5259050F (Package Type — 440219)



NOT TO SCALE

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

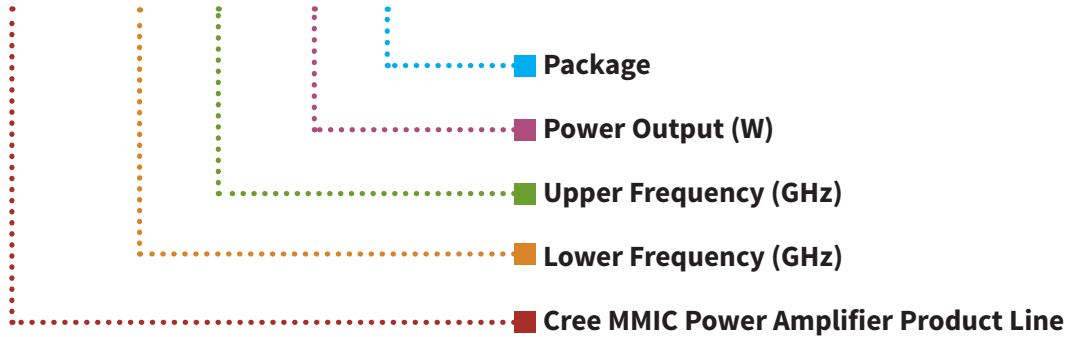
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.495	0.505	12.57	12.82
B	0.003	0.005	0.076	0.127
C	0.140	0.160	3.56	4.06
D	0.315	0.325	8.00	8.25
E	0.008	0.012	0.204	0.304
F	0.055	0.065	1.40	1.65
G	0.495	0.505	12.57	12.82
H	0.695	0.705	17.65	17.91
J	0.403	0.413	10.24	10.49
K	ø .092		2.34	
L	0.075	0.085	1.905	2.159
M	0.032	0.040	0.82	1.02

PIN	Function
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	4.9	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	



For more information, please contact:

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Notes & Disclaimer

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