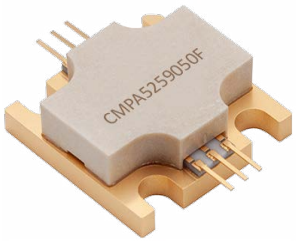
CMPA5259050F

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

Description

The CMPA5259050F is a gallium nitride (GaN) high electron mobility transistor (HEMT) based monolithic microwave integrated circuit (MMIC). It is 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.



Package Types: 440219
PN's: CMPA5259050F

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
- Defence radar
- Fire control radar
- Naval, marine, ground protection radar
- Weather radar

Typical Performance Over 4.9 - 5.9 GHz (T_C = 25 °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 dBm.

RoHS compliant

Absolute Maximum Ratings (Not Simultaneous) at 25 °C Case Temperature

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	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 W, T_{CASE} = 85 °C, 500 µs, 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	1 A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	2 (125 < 250 V)	JEDEC JESD22 C101-C

Electrical Characteristics (T_C = 25 °C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics[1]						
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 = 5.2 - 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	4	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] Pulse width = 100 µsec, 10% duty cycle.

Typical Pulsed Performance

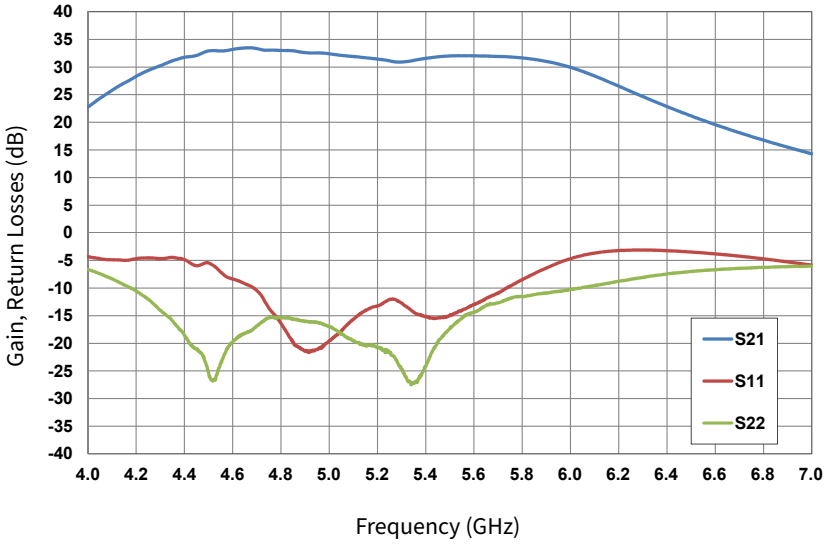


Figure 1. Gain and Input Return Loss vs Frequency of the CMPA5259050F Measured in CMPA5259050F-AMP Amplifier Circuit V_{DD} = 28 V, I_{DQ} = 1.0 A, T_C = 25 °C

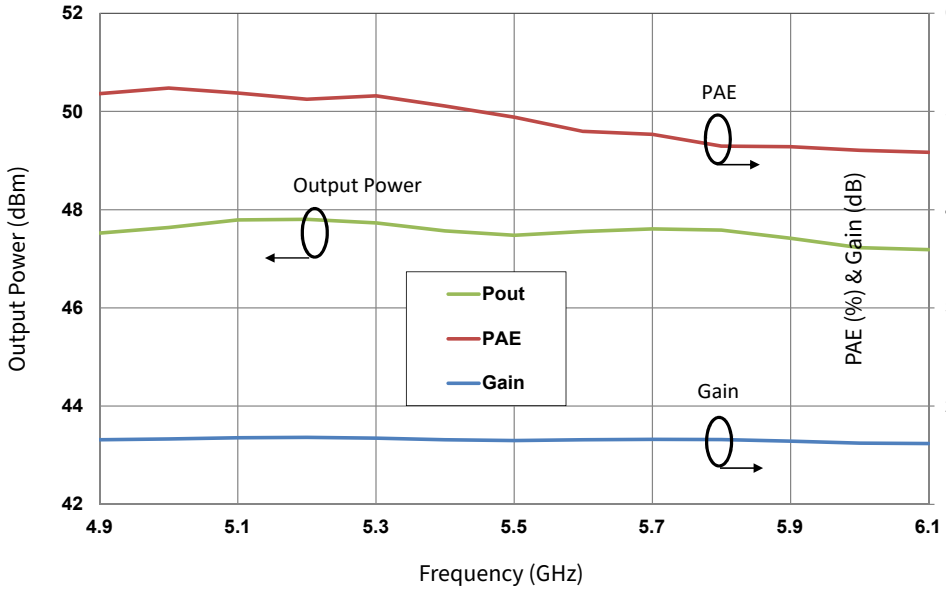


Figure 2. Output Power, Gain, and Power Added Efficiency vs Frequency of the CMPA5259050F Measured in CMPA525050F-AMP Amplifier Circuit
V_{DD} = 28 V, I_{DQ} = 1.0 A, P_{IN} = 26 dBm, Pulse Width = 100 µs, Duty Cycle = 10%, T_C = 25 °C

Typical Pulsed Performance

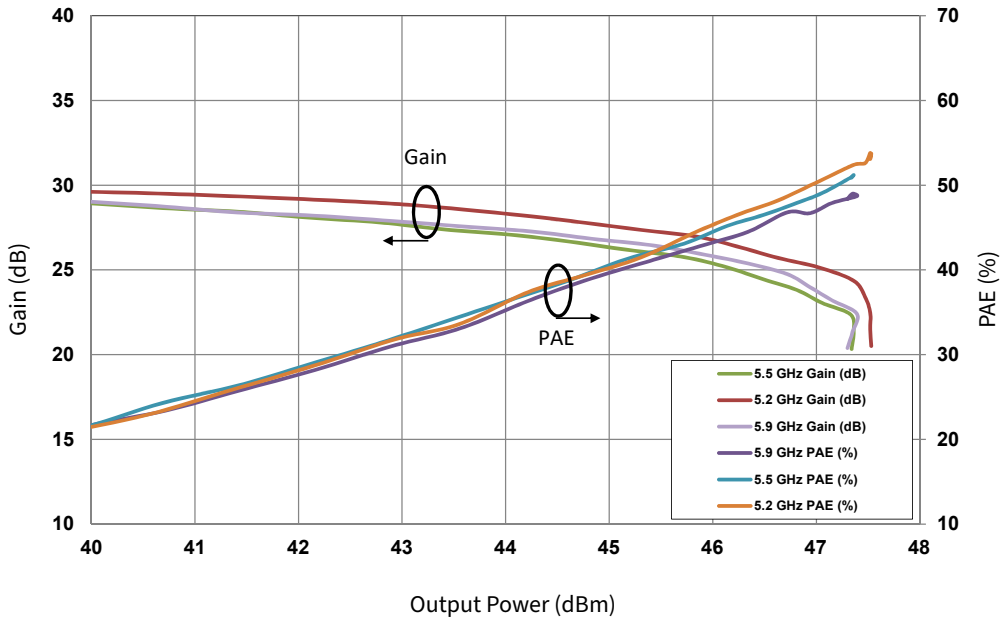
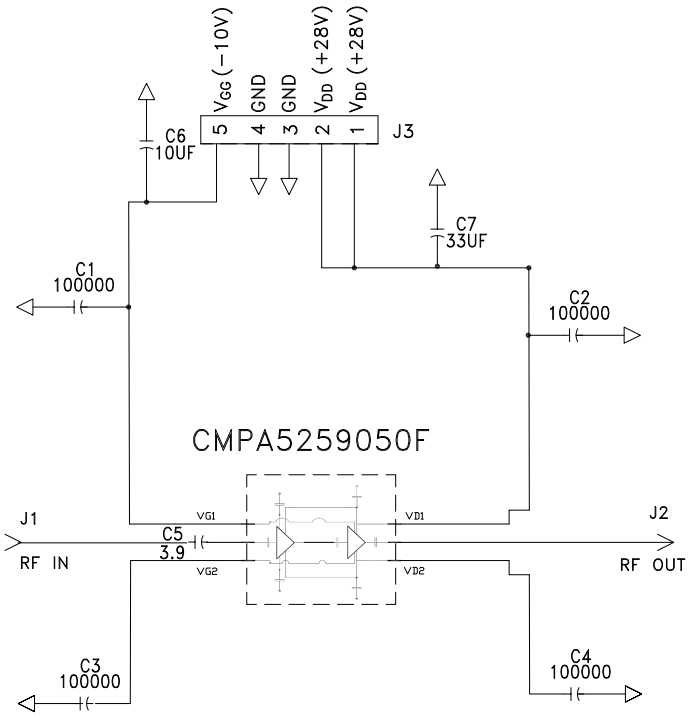
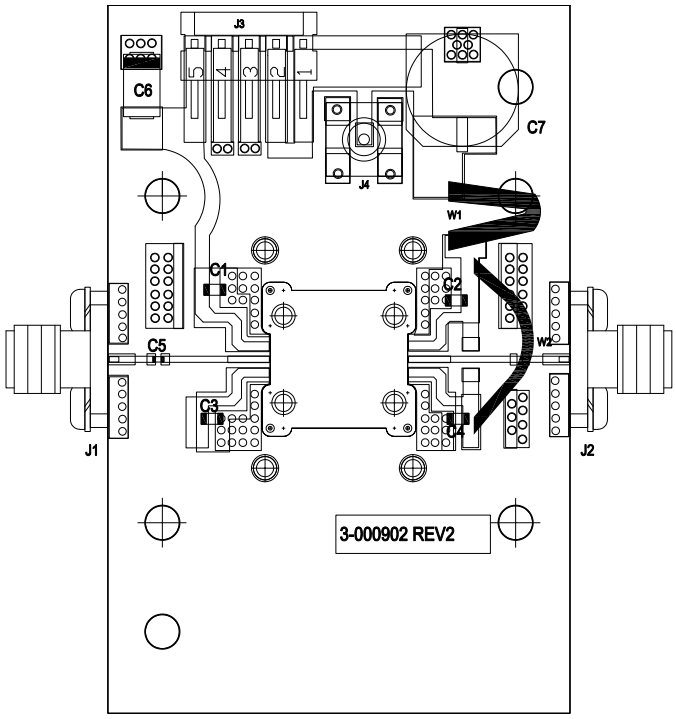


Figure 3. Gain and Power Added Efficiency vs Output Power of the CMPA529050F Measured in CMPA525050F-AMP Amplifier Circuit V_{DD} = 28 V, I_{DQ} = 1.0 A, Pulse Width = 100 µs, Duty Cycle = 10%, T_C = 25 °C

CMPA5259050F-AMP Demonstration Amplifier Schematic



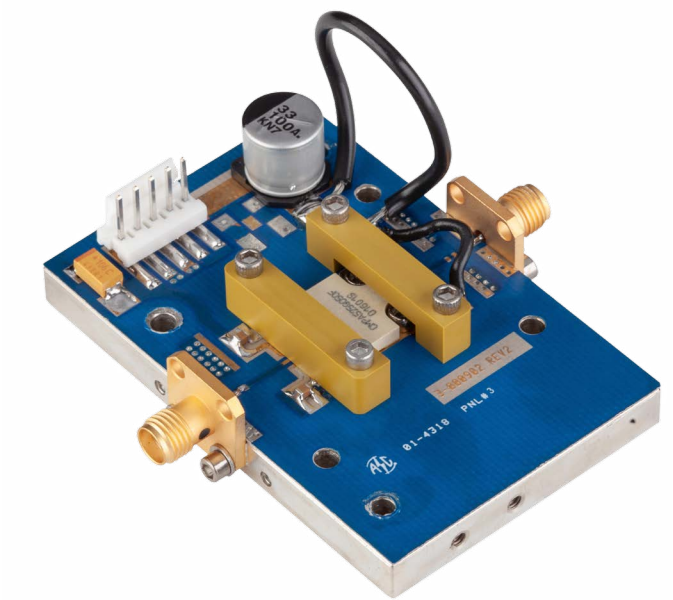
CMPA5259050F-TB Demonstration Amplifier Circuit Outline



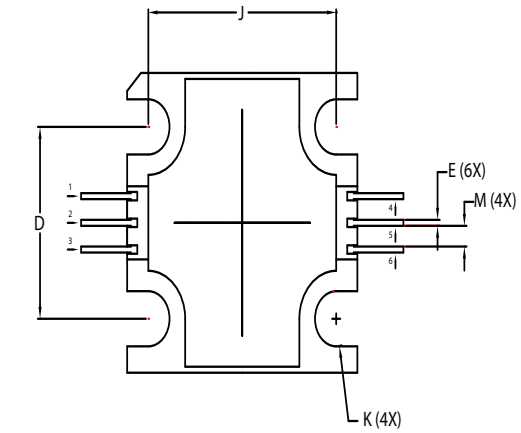
CMPA5259050F-AMP Demonstration Amplifier Circuit Bill of Materials

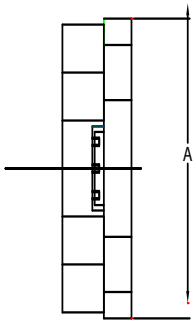
Designator	Description	Qty
C5	CAP, 3.9 pF, +/-0.1 pF, 0402, ATC	1
C7	CAP, 33 UF, 20%, G CASE	1
C1, C2, C3, C4	CAP CER 0.1 UF 100 V 10% X7R 0805	4
C6	CAP 10 UF 16 V TANTALUM, 2312	1
	PCB, RF35, 10 MIL THK	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FL	2
J3	HEADER RT > PLZ .1CEN LK 5POS	1
W1, W2	WIRE, BLACK, 22 AWG	2
J4	CONN, SMB, STRAIGHT JACK RECEPTACLE, SMT, 50 OHM, Au PLATED	1
Q1	MMIC, CMPA5259050F	1

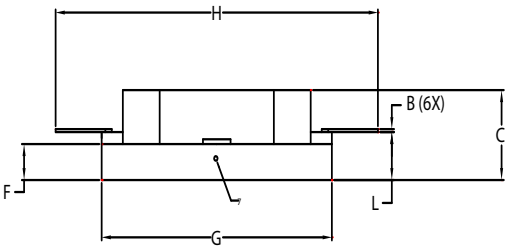
CMPA5259050F-AMP Demonstration Amplifier Circuit

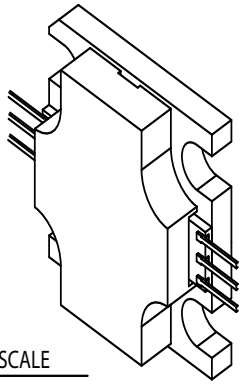


Product Dimensions CMPA5259050F (Package Type — 440219)









NOT TO SCALE

NOTES:

1. DIMENSIONING AND TOLERANICING PER ANSI Y14.5M, 1982.

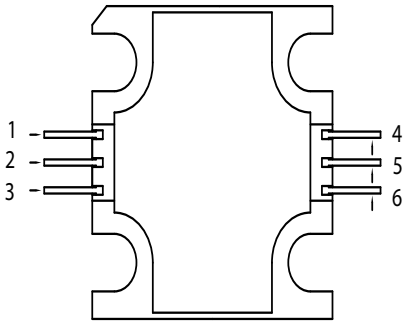
2. CONTROLLING DIMENSION: INCH.

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

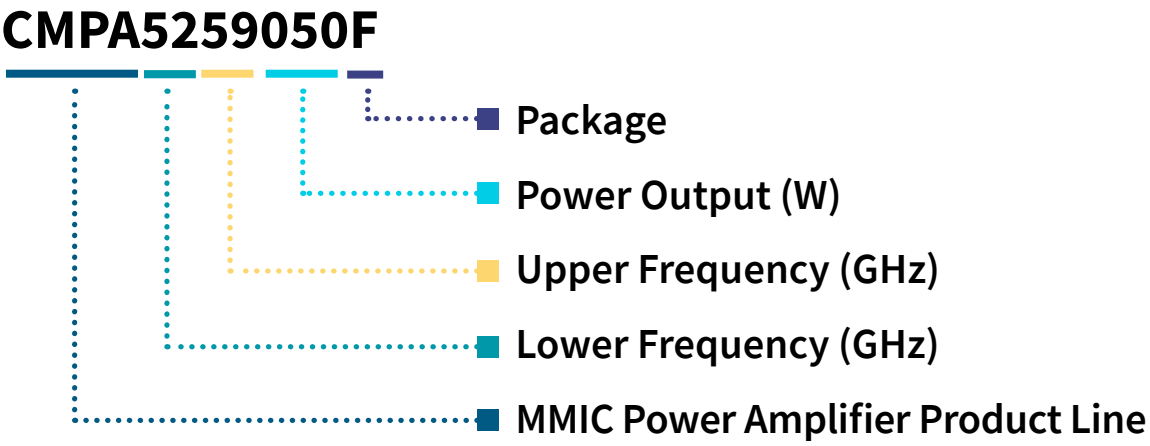


Table 1.

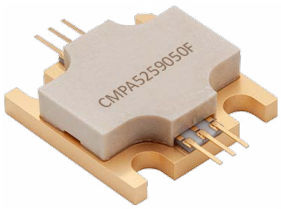
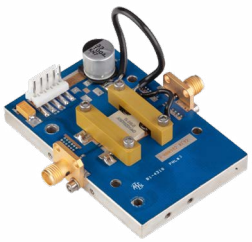
Parameter	Value	Units
Lower Frequency	4.9	GHz
Upper Frequency[1]	5.9	GHz
Power Output	50	W
Package	Flange	–

Note:
[1] Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

Table 2.

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:	1 A = 10.0 GHz 2 H = 27.0 GHz

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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