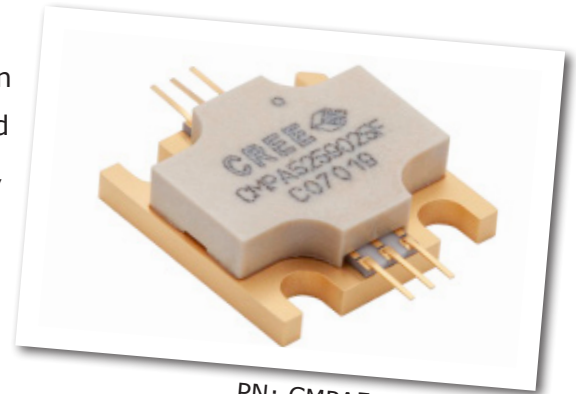


# CMPA5259025F

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

Cree's CMPA5259025F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC) designed specifically for high efficiency, high gain, and wide bandwidth capabilities, which makes CMPA5259025F ideal for 5.2 - 5.9 GHz Radar amplifier applications. The transistor is supplied in a ceramic/metal flange package.



PN: CMPA5259025F  
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	33.6	31.9	32.2	dB
Output Power	38.5	39.6	34.8	W
Efficiency	53.5	51.3	47.2	%
Input Return Loss	-13.5	-15.5	-4.8	dB

Note:  
100  $\mu\text{sec}$  Pulse Width, 10% Duty Cycle,  $P_{in} = 22\text{ dBm}$

### Features

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

### Applications

- Radar



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

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	$V_{DSS}$	84	$V_{DC}$	25°C
Gate-source Voltage	$V_{GS}$	-10, +2	$V_{DC}$	25°C
Storage Temperature	$T_{STG}$	-55, +150	°C	
Operating Junction Temperature	$T_J$	225	°C	
Soldering Temperature	$T_S$	245	°C	
Screw Torque	$\tau$	60	in-oz	
Forward Gate Current	$I_G$	8	mA	25°C
Thermal Resistance, Junction to Case <sup>1</sup>	$R_{\theta JC}$	1.66	°C/W	100 usec, 10%, 85°C
Case Operating Temperature	$T_C$	-40, +105	°C	

Notes:

<sup>1</sup> Measured for the CMPA5259025F at  $P_{DSS} = 35$  W.

## 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<sub>c</sub> = 25 °C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
<b>DC Characteristics<sup>1</sup></b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	-3.0	-2.5	-	V <sub>DC</sub>	V <sub>DS</sub> = 10 V, I <sub>DS</sub> = 500 mA
Gate Quiescent Voltage	V <sub>GS(Q)</sub>	-	-2.7	-	V <sub>DC</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 500 mA
Saturated Drain Current	I <sub>DS</sub>	16.4	18.6	-	A	V <sub>DS</sub> = 6 V, V <sub>GS</sub> = 2 V
Drain-Source Breakdown Voltage	V <sub>BD</sub>	84	100	-	V <sub>DC</sub>	V <sub>GS</sub> = -8 V, I <sub>DS</sub> = 500 mA
<b>RF Characteristics<sup>2</sup></b>						
Small Signal Gain <sub>1</sub>	G <sub>SS</sub>	-	32	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 GHz, P <sub>IN</sub> = -20 dBm
Small Signal Gain <sub>2</sub>	G <sub>SS</sub>	-	32	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.5 GHz, P <sub>IN</sub> = -20 dBm
Small Signal Gain <sub>3</sub>	G <sub>SS</sub>	-	32	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.9 GHz, P <sub>IN</sub> = -20 dBm
Power Output <sub>1</sub>	P <sub>OUT</sub>	-	38.5	-	W	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 GHz, P <sub>IN</sub> = 22 dBm
Power Output <sub>2</sub>	P <sub>OUT</sub>	-	39.6	-	W	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.5 GHz, P <sub>IN</sub> = 22 dBm
Power Output <sub>3</sub>	P <sub>OUT</sub>	-	34.8	-	W	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.9 GHz, P <sub>IN</sub> = 22 dBm
Power Added Efficiency <sub>1</sub>	PAE	-	54	-	%	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 GHz, P <sub>IN</sub> = 22 dBm
Power Added Efficiency <sub>2</sub>	PAE	-	51	-	%	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.5 GHz, P <sub>IN</sub> = 22 dBm
Power Added Efficiency <sub>3</sub>	PAE	-	47	-	%	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.9 GHz, P <sub>IN</sub> = 22 dBm
Power Gain <sub>1</sub>	G <sub>p</sub>	-	24	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 GHz, P <sub>IN</sub> = 22 dBm
Power Gain <sub>2</sub>	G <sub>p</sub>	-	24	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.5 GHz, P <sub>IN</sub> = 22 dBm
Power Gain <sub>3</sub>	G <sub>p</sub>	-	23.4	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.9 GHz, P <sub>IN</sub> = 22 dBm
Input Return Loss	S11	-	-10	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 - 5.9 GHz, P <sub>IN</sub> = -20 dBm
Output Return Loss	S22	-	-15	-	dB	V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, Freq = 5.2 - 5.9 GHz, P <sub>IN</sub> = -20 dBm
Output Mismatch Stress	VSWR	-	3:1	-	Ψ	No damage at all phase angles, V <sub>DD</sub> = 28 V, I <sub>DQ</sub> = 500 mA, P <sub>IN</sub> = 22 dBm

### Notes:

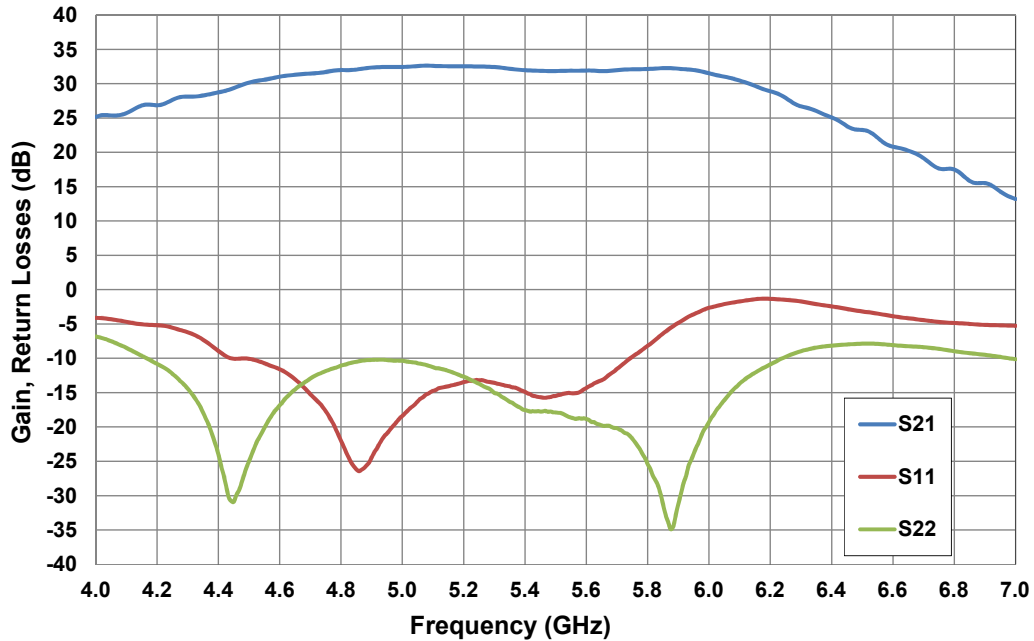
<sup>1</sup> Measured on wafer prior to packaging.

<sup>2</sup> Measured in CMPA5259025F-TB test fixture.

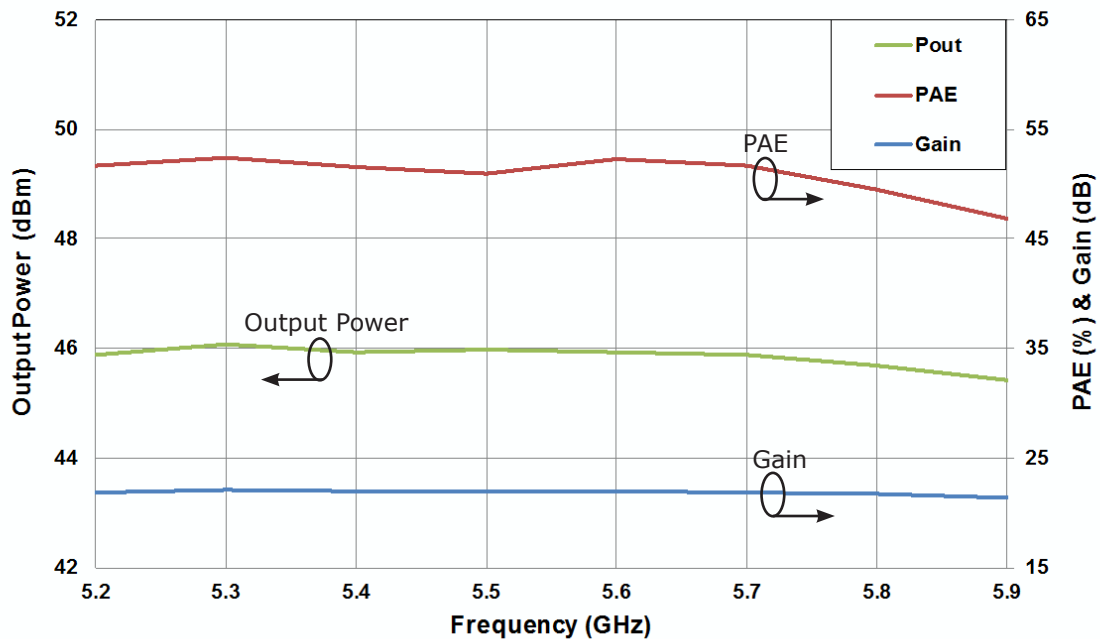
<sup>3</sup> Drain Efficiency = P<sub>OUT</sub>/P<sub>DC</sub>

## Typical Pulsed Performance of the CMPA5259025F

**Figure 1. - Gain and Input Return Loss vs. Frequency of the CMPA5259025F Measured in CMPA5259025F-AMP Amplifier Circuit**  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.5\text{ A}$ ,  $T_c = 25^\circ\text{C}$

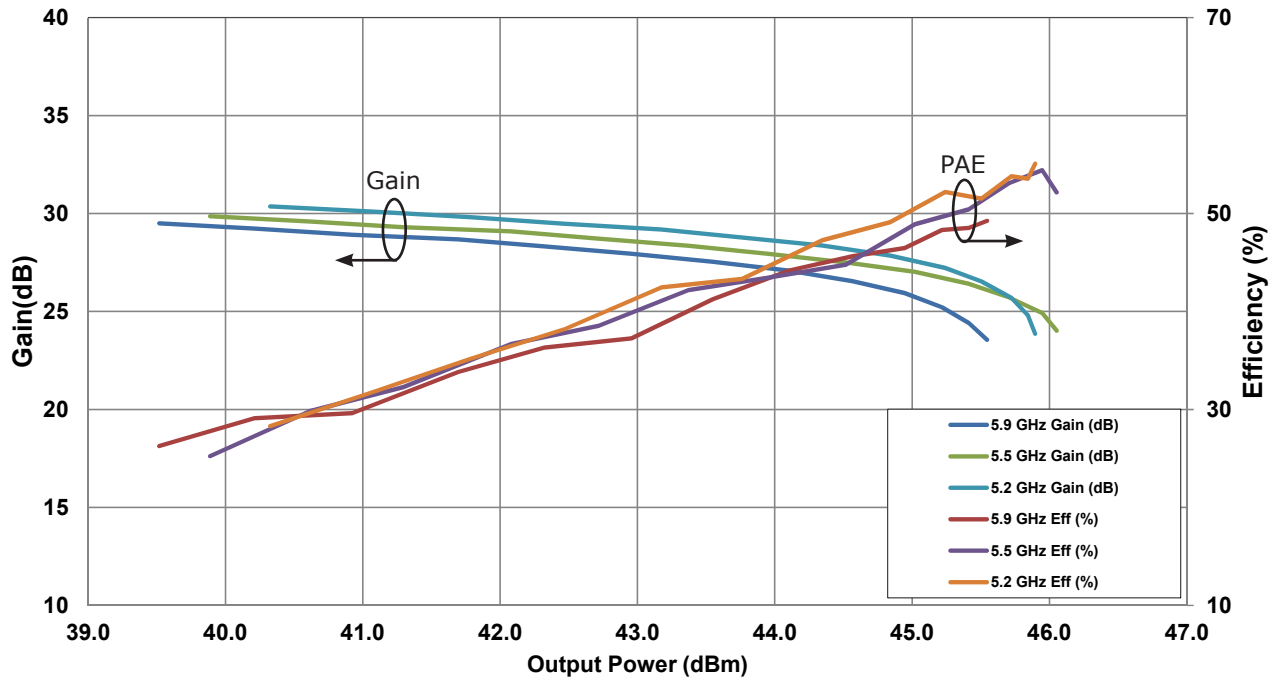


**Figure 2. - Output Power, Gain, and Power Added Efficiency vs. Frequency of the CMPA5259025F Measured in CMPA5259025F-AMP Amplifier Circuit**  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.5\text{ A}$ ,  $P_{IN} = 24\text{ dBm}$ , Pulse Width =  $100\ \mu\text{s}$ , Duty Cycle = 10%,  $T_c = 25^\circ\text{C}$

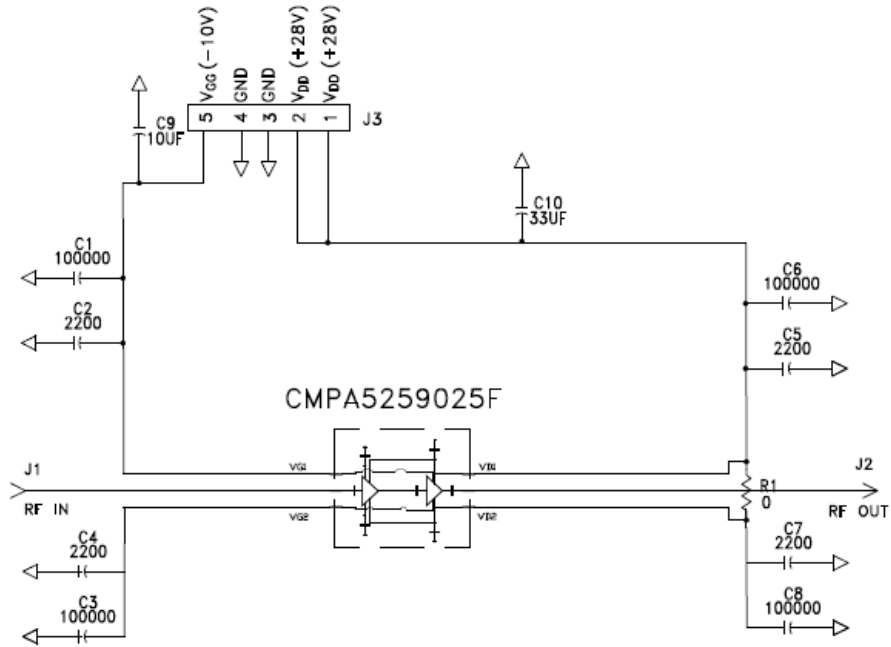


## Typical Pulsed Performance of the CMPA5259025F

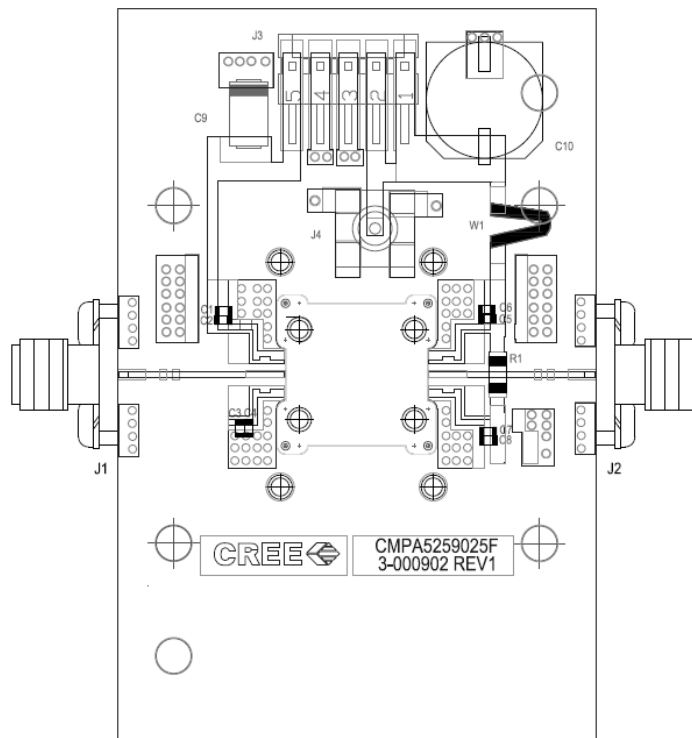
**Figure 3. - Gain and Power Added Efficiency vs. Frequency of the CMPA529025F**  
**Measured in CMPA525025F-AMP Amplifier Circuit**  
 $V_{DD} = 28\text{ V}$ ,  $I_{DQ} = 0.5\text{ A}$ , Pulse Width = 100  $\mu\text{s}$ , Duty Cycle = 10%,  $T_C = 25^\circ\text{C}$



## CMPA5259025F-TB Demonstration Amplifier Schematic



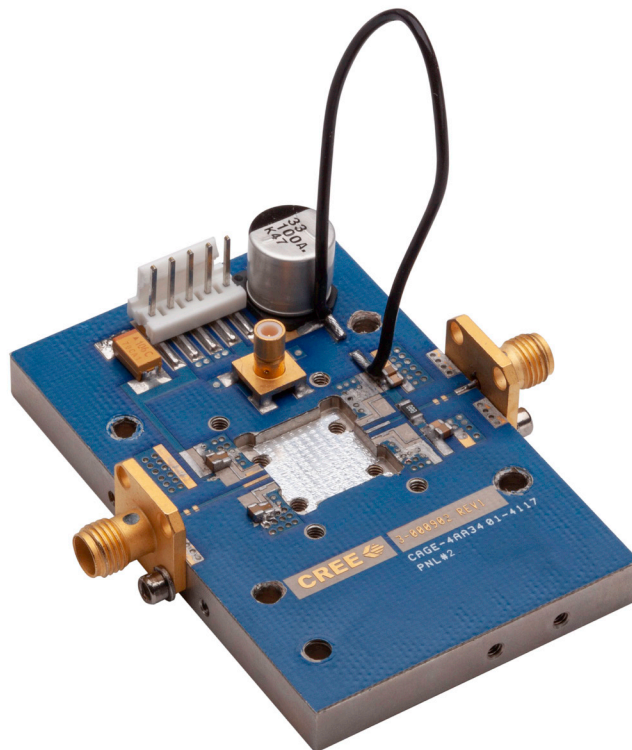
## CMPA5259025F-TB Demonstration Amplifier Circuit Outline



## CMPA5259025F-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, CMPA5259025F 0.010" THK	1
W1	Wire, Black, 22 AWG ~ 3"	

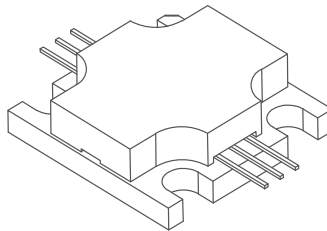
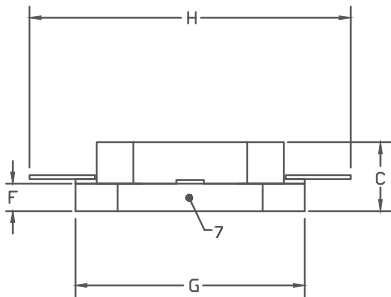
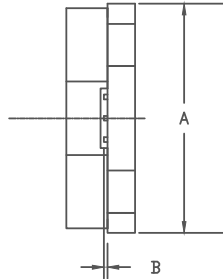
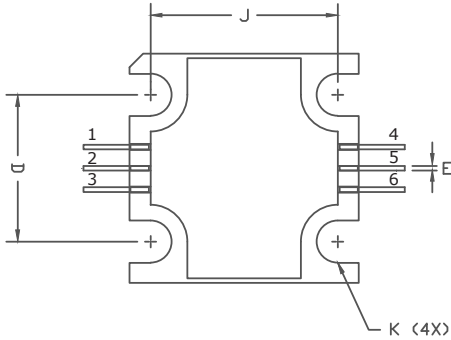
## CMPA5259025F-TB Demonstration Amplifier Circuit



## Product Dimensions CMPA5259025F (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



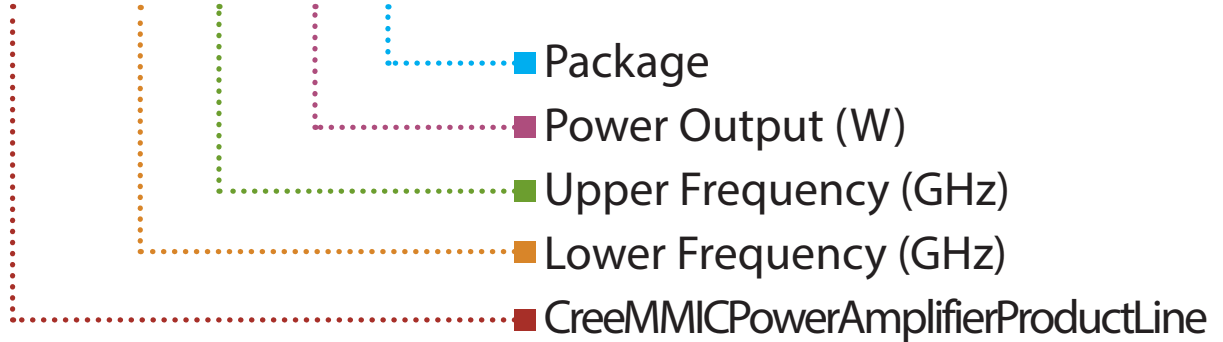
NOT TO SCALE

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	∅ .092		2.34	

PIN	
1	Gate bias
2	RF <sub>IN</sub>
3	Gate bias
4	Drain bias
5	RF <sub>OUT</sub>
6	Drain bias
7	Source



# CMPA5259025F



Parameter	Value	Units
Lower Frequency	5.2	GHz
Upper Frequency <sup>1</sup>	5.9	GHz
Power Output	25	W
Package	Flange	-

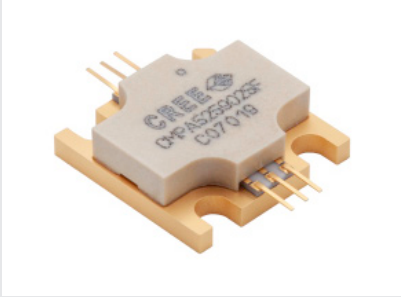
**Table 1.**

**Note<sup>1</sup>:** 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
CMPA5259025F	GaN MMIC	Each	
CMPA5259025F-AMP	Test board with GaN MMIC installed	Each	



## Disclaimer

Specifications are subject to change without notice. Cree, Inc. believes the information contained within this data sheet to be accurate and reliable. However, no responsibility is assumed by Cree for its use or for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Cree. Cree makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose. "Typical" parameters are the average values expected by Cree in large quantities and are provided for information purposes only. These values can and do vary in different applications, and actual performance can vary over time. All operating parameters should be validated by customer's technical experts for each application. Cree products are not designed, intended, or authorized for use as components in applications intended for surgical implant into the body or to support or sustain life, in applications in which the failure of the Cree product could result in personal injury or death, or in applications for the planning, construction, maintenance or direct operation of a nuclear facility. CREE and the CREE logo are registered trademarks of Cree, Inc.

For more information, please contact:

Cree, Inc.  
4600 Silicon Drive  
Durham, North Carolina, USA 27703  
[www.cree.com/RF](http://www.cree.com/RF)

Sarah Miller  
Marketing  
Cree, RF Components  
1.919.407.5302

Ryan Baker  
Marketing & Sales  
Cree, RF Components  
1.919.407.7816

Tom Dekker  
Sales Director  
Cree, RF Components  
1.919.407.5639