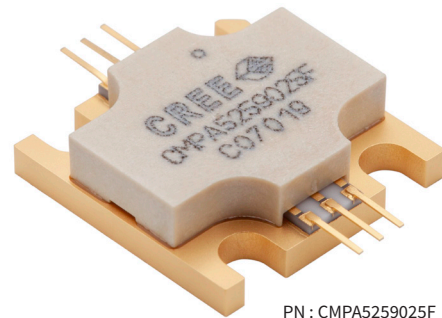


CMPA5259025F

25 W, 5.2 – 5.9 GHz, 28 V, GaN MMIC for Radar Power Amplifiers

Description

Wolfspeed'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

Features

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

Applications

- Radar

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 ¹	38.5	39.6	34.8	W
Efficiency ¹	53.5	51.3	47.2	%
Input Return Loss	-13.5	-15.5	-4.8	dB

Note:

¹100 μsec Pulse Width, 10% Duty Cycle, $P_{IN} = 22\text{ dBm}$



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

Parameter	Symbol	Rating	Units	Conditions
Drain-source Voltage	V_{DS}	84	V_{DC}	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	τ	40	in-oz	
Forward Gate Current	I_G	9.6	mA	25 °C
Thermal Resistance, Junction to Case ¹	$R_{\theta JC}$	1.66	°C/W	100 μ s, 10%, 85 °C
Case Operating Temperature	T_C	-40, +105	°C	

Notes: ¹ Measured for the CMPA5259025F at $P_{DISS} = 35$ W.

Electrical Characteristics ($T_C = 25$ °C)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹						
Gate Threshold Voltage	$V_{GS(th)}$	-3.6	-2.8	-2.4	V_{DC}	$V_{DS} = 10$ V, $I_D = 16.5$ mA
Gate Quiescent Voltage	$V_{GS(Q)}$	-	-2.7	-	V_{DC}	$V_{DD} = 28$ V, $I_D = 1.2$ A
Saturated Drain Current	I_{DS}	6.9	9.6	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	V_{BD}	84	-	-	V_{DC}	$V_{GS} = -8$ V, $I_D = 16.5$ mA
RF Characteristics²						
Small Signal Gain	S21	24	32	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 - 5.9 GHz, $P_{IN} = -20$ dBm
Input Return Loss	S11	-	-10	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 - 5.9 GHz, $P_{IN} = -20$ dBm
Output Return Loss	S22	-	-15	-4	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 - 5.9 GHz, $P_{IN} = -20$ dBm
Output Power	P_{OUT}	25	38.5	-	W	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 GHz, $P_{IN} = 22$ dBm
Output Power	P_{OUT}	25	39.6	-	W	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.5 GHz, $P_{IN} = 22$ dBm
Output Power	P_{OUT}	25	34.8	-	W	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.9 GHz, $P_{IN} = 22$ dBm
Power Added Efficiency	PAE	40	54	-	%	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 GHz, $P_{IN} = 22$ dBm
Power Added Efficiency	PAE	40	51	-	%	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.5 GHz, $P_{IN} = 22$ dBm
Power Added Efficiency	PAE	35	47	-	%	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.9 GHz, $P_{IN} = 22$ dBm
Power Gain	G_p	-	24	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.2 GHz, $P_{IN} = 22$ dBm
Power Gain	G_p	-	24	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.5 GHz, $P_{IN} = 22$ dBm
Power Gain	G_p	-	23.4	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 500$ mA, Freq = 5.9 GHz, $P_{IN} = 22$ dBm
Output Mismatch Stress	VSWR	-	3:1	-	Ψ	No damage at all phase angles, $V_{DD} = 28$ V, $I_{DQ} = 500$ mA, $P_{IN} = 22$ dBm

Notes:

¹ Measured on wafer prior to packaging.

² Measured in CMPA5259025F-TB test fixture at Pulse Width = 100 μ s, Duty Cycle = 10%



Typical Pulsed Performance

Figure 1. - Gain and Return Loss vs. Frequency of the CPM5259025F Measured in CPM5259025F-AMP Amplifier Circuit

$V_{DD} = 28\text{ V}$, $I_{DQ} = 0.5\text{ A}$, $T_C = 25^\circ\text{C}$

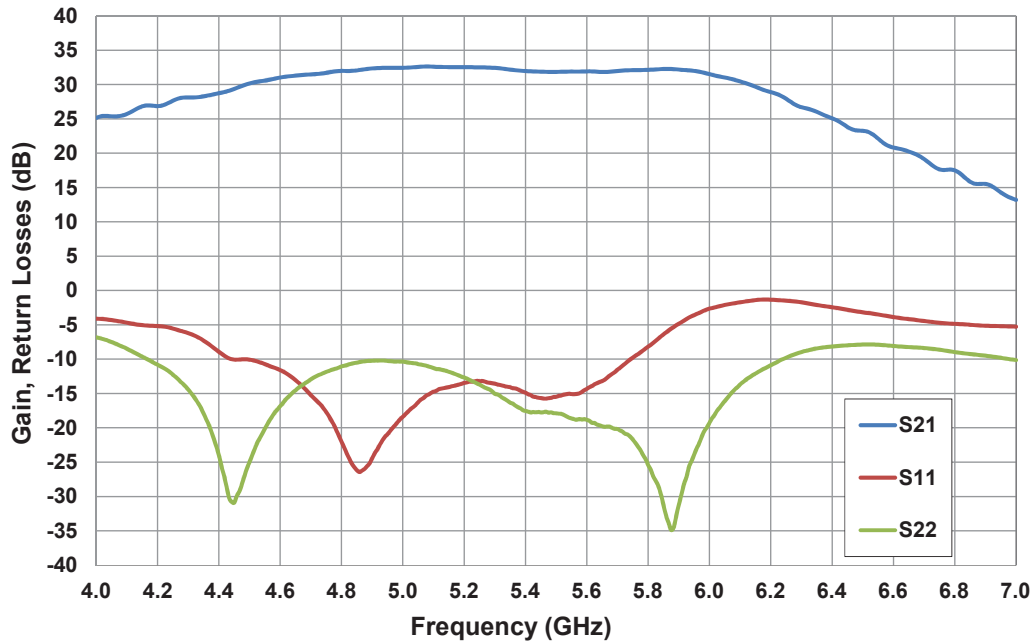
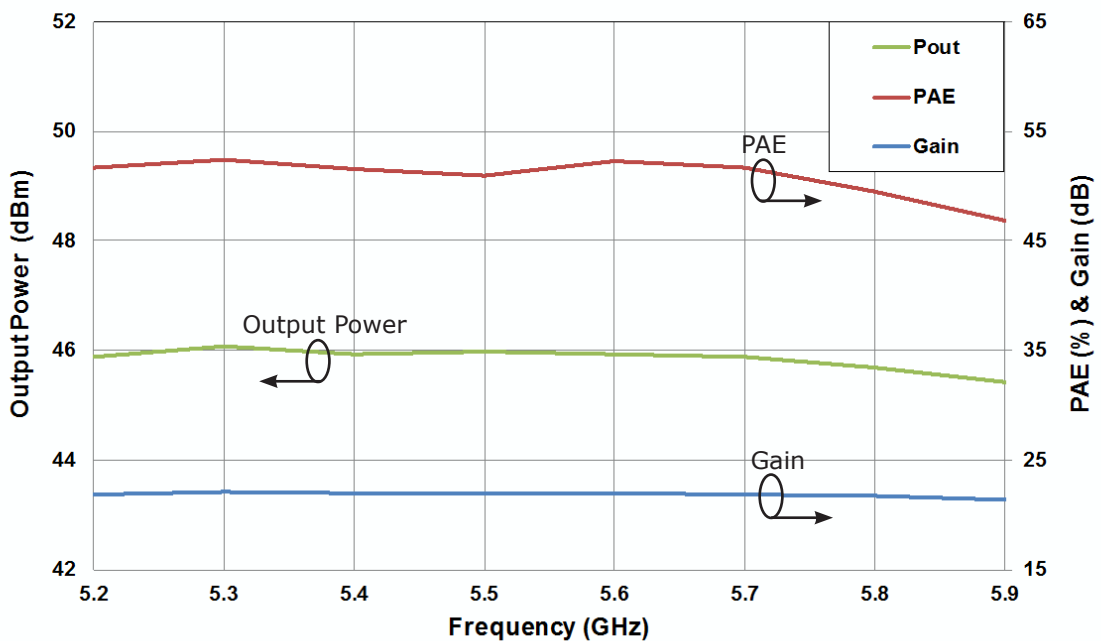


Figure 2. - Output Power, Gain, and Power Added Efficiency vs. Frequency of the CPM5259025F Measured in CPM5259025F-AMP Amplifier Circuit

$V_{DD} = 28\text{ V}$, $I_{DQ} = 0.5\text{ A}$, $P_{IN} = 24\text{ dBm}$, Pulse Width = 100 μs , Duty Cycle = 10%, $T_C = 25^\circ\text{C}$

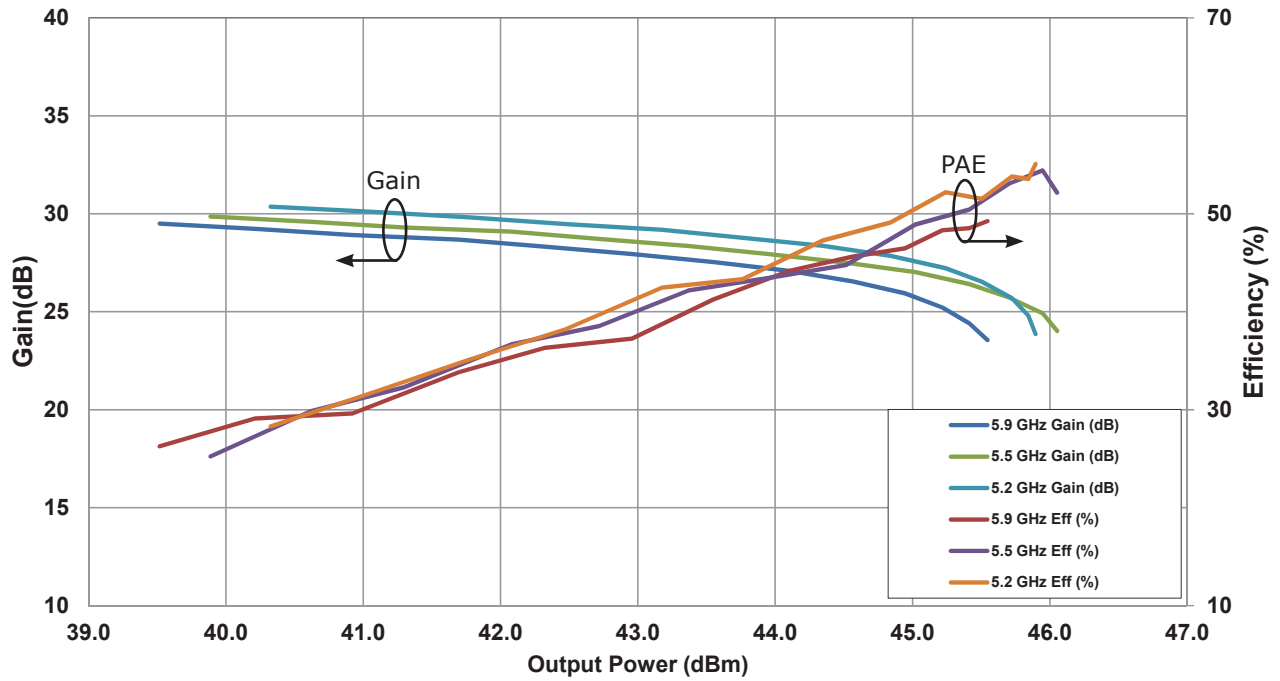




Typical Pulsed Performance

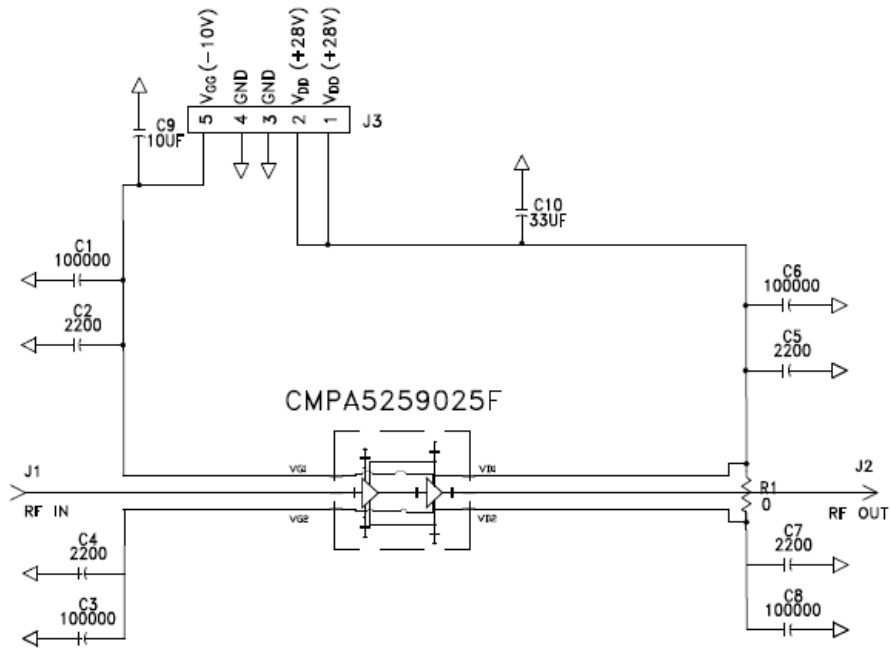
Figure 3. - Gain and Power Added Efficiency vs. Frequency of the CPMA529025F Measured in CPMA525025F-AMP Amplifier Circuit

$V_{DD} = 28\text{ V}$, $I_{DQ} = 0.5\text{ A}$, Pulse Width = 100 μs , Duty Cycle = 10%, $T_c = 25^\circ\text{C}$

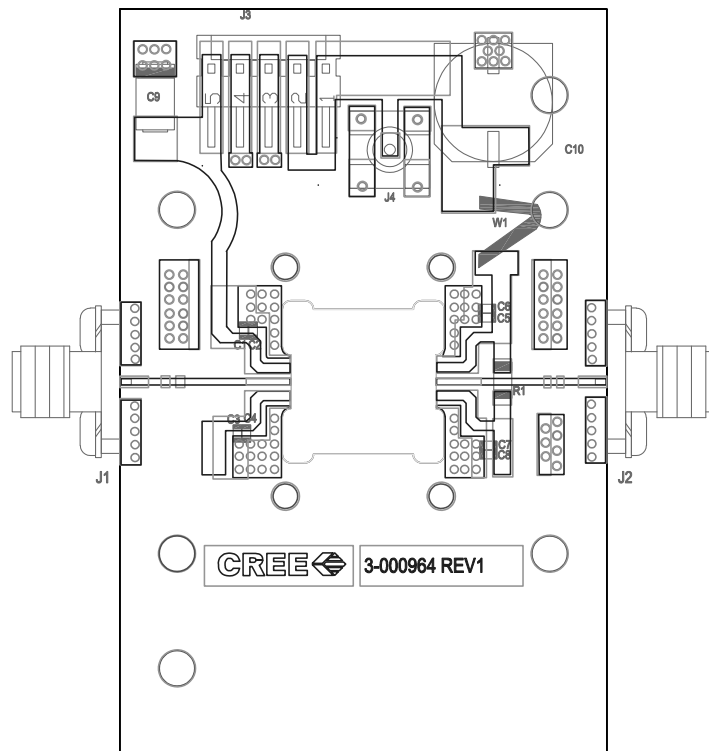




CMPA5259025F-AMP Demonstration Amplifier Schematic



CMPA5259025F-AMP Demonstration Amplifier Circuit Outline

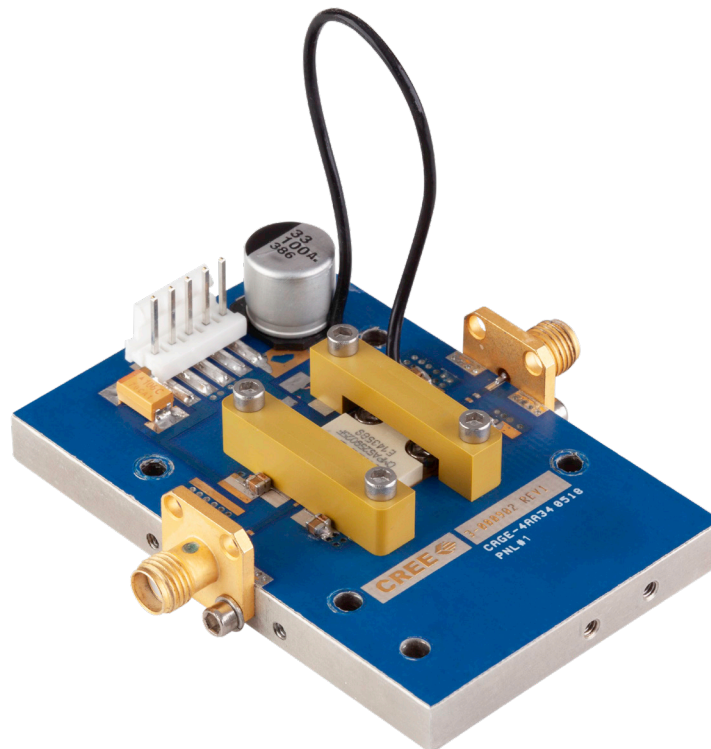




CMPA5259025F-TB Demonstration Amplifier Circuit Bill of Materials

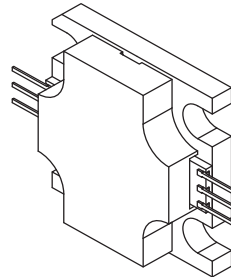
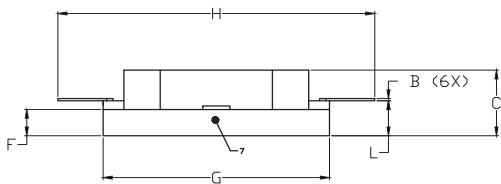
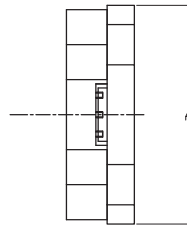
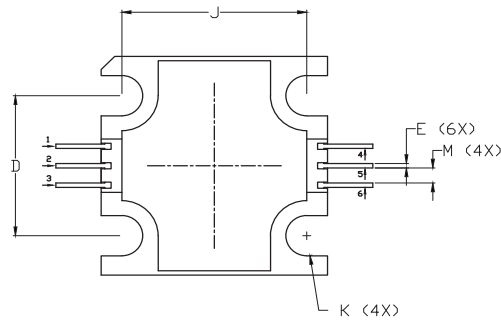
Designator	Description	Qty
R1	RES 0 OHM, SMT, 1206, 125 mW	1
C1, C3, C6, C8	CAP, 100000 pF, (0.1 UF) +/- 10%, 100 V, 0805	4
C2, C4, C5, C7	CAP, 0805, 2200 pF, 100 V, 0805	4
C9	CAP, 10 UF, 16 V, Tantalum	1
C10	CAP, 33 UF, 20%, G Case	1
J3	Header RT> PLZ .1 CEN LK 5POS	1
J1, J2	CONN, SMA, Female, 2-Hole, 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-AMP Demonstration Amplifier Circuit

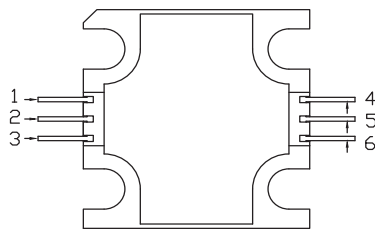




Product Dimensions CPM5259025F (Package Type – 440219)



NOT TO SCALE



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

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	∅ .092		2.34	
L	0.075	0.085	1.905	2.159
M	0.032	0.040	0.82	1.02

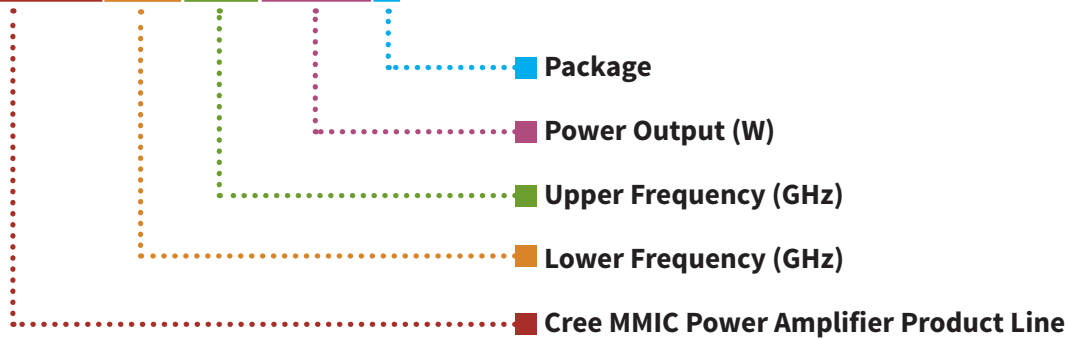
Electrostatic Discharge (ESD) Classifications

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



Part Number System

CMPA5259025F



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

Table 1.

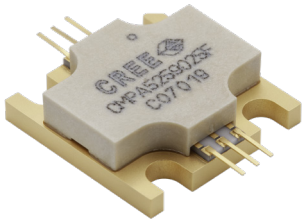
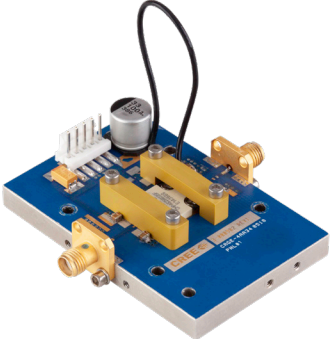
Note¹: Alpha characters used in frequency code indicate a value greater than 9.9 GHz. See Table 2 for value.

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
CMPA5259025F	GaN MMIC	Each	
CMPA5259025F-AMP	Test board with GaN MMIC installed	Each	



For more information, please contact:

4600 Silicon Drive
Durham, North Carolina, USA 27703
www.wolfspeed.com/rf

Sales Contact
rfsales@cree.com

Notes & Disclaimer

Specifications are subject to change without notice. “Typical” parameters are the average values expected by Cree in large quantities and are provided for information purposes only. Cree products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. No responsibility is assumed by Cree for any infringement of patents or other rights of third parties which may result from use of the information contained herein. No license is granted by implication or otherwise under any patent or patent rights of Cree.

© 2019-2020 Cree, Inc. All rights reserved. WolfSpeed® and the WolfSpeed logo are registered trademarks of Cree, Inc.