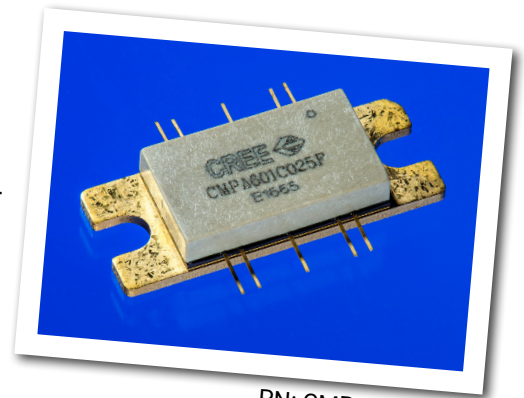


CMPA601C025F

25 W, 6.0 - 12.0 GHz, GaN MMIC, Power Amplifier

The CMPA601C025F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC) on a silicon carbide (SiC) substrate, using a 0.25 μm gate length fabrication process. The semiconductor offers 25 Watts of power from 6 to 12 GHz of instantaneous bandwidth. The GaN HEMT MMIC is housed in a thermally-enhanced, 10-lead 25 mm x 9.9 mm metal/ceramic flanged package. It offers high gain and superior efficiency in a small footprint package at 50 ohms.



PN: CMPA601C025F
Package Type: 440213

Typical Performance Over 6.0-12.0 GHz ($T_c = 25^\circ\text{C}$)

Parameter	6.0 GHz	7.5 GHz	9.0 GHz	10.5 GHz	12.0 GHz	Units
Small Signal Gain	35	34	34	37	31	dB
$P_{\text{OUT}} @ P_{\text{IN}} = 22 \text{ dBm}$	34	51	49	49.5	36.5	W
Power Gain @ $P_{\text{IN}} = 22 \text{ dBm}$	23	25	25	25	23.5	dB
PAE @ $P_{\text{IN}} = 22 \text{ dBm}$	21	36	35	33	27	%

Note: All data CW.

Features

- 34 dB Small Signal Gain
- 40 W Typical P_{SAT}
- Operation up to 28 V
- High Breakdown Voltage
- High Temperature Operation
- Size 0.172 x 0.239 x 0.004 inches

Applications

- Jamming Amplifiers
- Test Equipment Amplifiers
- Broadband Amplifiers

Absolute Maximum Ratings (not simultaneous) at 25°C

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}	-40, +150	°C	
Operating Junction Temperature	T_J	225	°C	
Maximum Forward Gate Current	I_{GMAX}	23	mA	25°C
Soldering Temperature ¹	T_{STG}	245	°C	
Screw Torque	T	40	in-oz	
Thermal Resistance, Junction to Case ²	$R_{\theta JC}$	0.85	°C/W	85°C @ $P_{DISS} = 116 W$
Case Operating Temperature ²	T_C	-40, +150	°C	

Note¹ Refer to the Application Note on soldering at <http://www.cree.com/rf/document-library>

Note² See also, the Power Dissipation De-rating Curve on page 4

Electrical Characteristics (Frequency = 6.0 GHz to 12.0 GHz unless otherwise stated; $T_C = 25^\circ C$)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics^{1,2}						
Gate Threshold	V_{TH}	-3.8	-2.8	-2.3	V	$V_{DS} = 10 V, I_D = 23 mA$
Saturated Drain Current	I_{DS}	10.6	13.0	-	A	$V_{DS} = 6V, V_{GS} = 2 V$
Drain-Source Breakdown Voltage	V_{BD}	84	100	-	V	$V_{GS} = -8 V, I_{DS} = 23 mA$
RF Characteristics³						
Small Signal Gain	S21	28	31	-	dB	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = -30 dBm$
Output Power ^{3,4}	P_{OUT1}	45.5	47.2	-	dBm	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 6 GHz$
Output Power ^{3,4}	P_{OUT2}	45.5	47.1	-	dBm	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 9.5 GHz$
Output Power ^{3,4}	P_{OUT3}	43.7	45.5	-	dBm	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 12 GHz$
Power Added Efficiency ^{3,4}	PAE_1	23	33.2	-	%	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 6 GHz$
Power Added Efficiency ^{3,4}	PAE_2	26	32.3	-	%	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 9.5 GHz$
Power Added Efficiency ^{3,4}	PAE_3	15.5	26.5	-	%	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm, Freq = 12 GHz$
Input Return Loss	S11	-	-5	-	dB	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = -30 dBm$
Output Return Loss	S22	-	-5	-	dB	$V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = -30 dBm$
Output Mismatch Stress	VSWR	-	5:1	VSWR	Ψ	No damage at all phase angles, $V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm$

Notes:

¹ Measured on-wafer prior to packaging.

² Scaled from PCM data.

³ Measured in CMPA601C025F-AMP with 12.4 GHz low pass filter.

⁴ Fixture loss de-embedded using the following offsets. The offset is subtracted from the input offset value and added to the output offset value.

- a) 6.0 GHz - 0.13 dB
- b) 9.50 GHz - 0.26 dB
- c) 12.0 GHz - 0.35 dB

CMPA601C025F Typical Performance

Figure 1. - Small Signal S-Parameters vs. Frequency

$V_{DD} = 28 \text{ V}$, $I_{DQ} = 2.0 \text{ A}$, $P_{IN} = -30 \text{ dBm}$

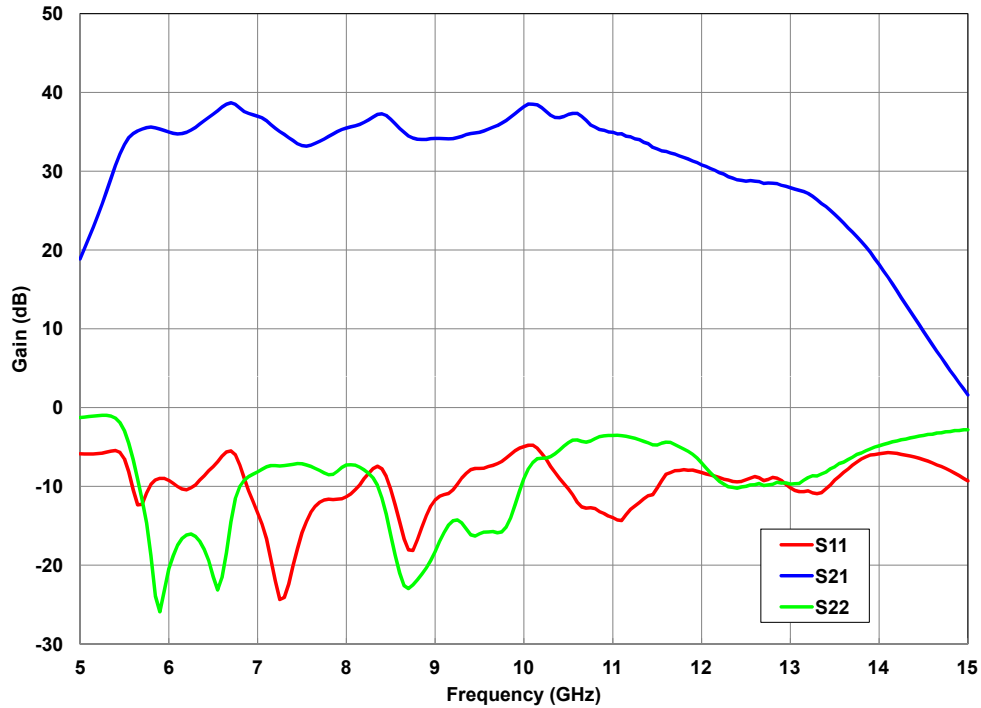
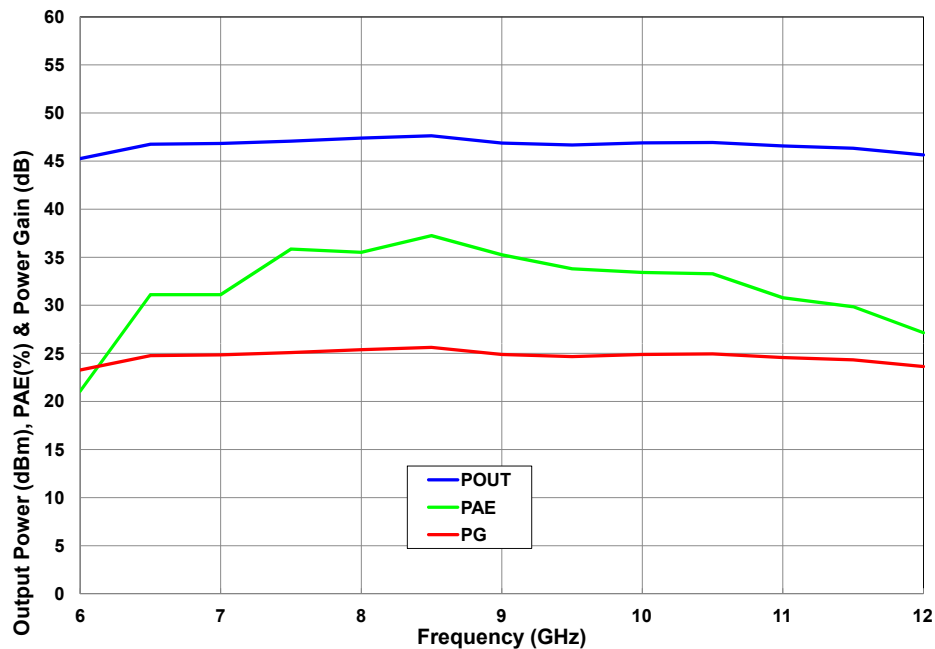


Figure 2. - Output Power, Gain and Power Added Efficiency vs. Input Power

$V_{DD} = 28 \text{ V}$, $I_{DQ} = 2.0 \text{ A}$, $P_{IN} = 22 \text{ dBm}$



CMPA601C025F Typical Performance

Figure 3. - Power Added Efficiency vs. Input Power

$V_{DD} = 28\text{ V}, I_{DQ} = 2.0\text{ A}$

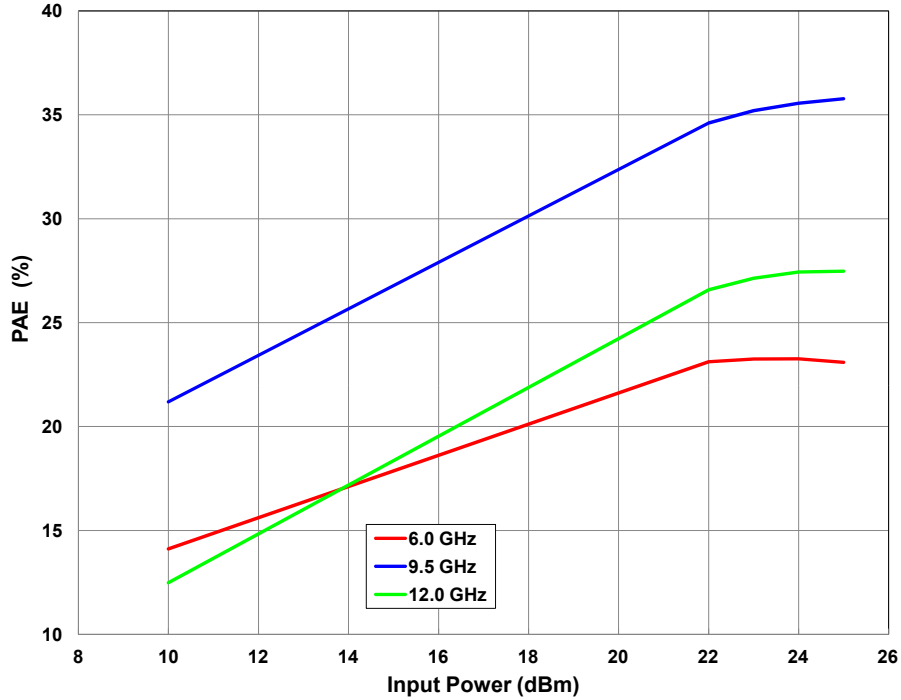
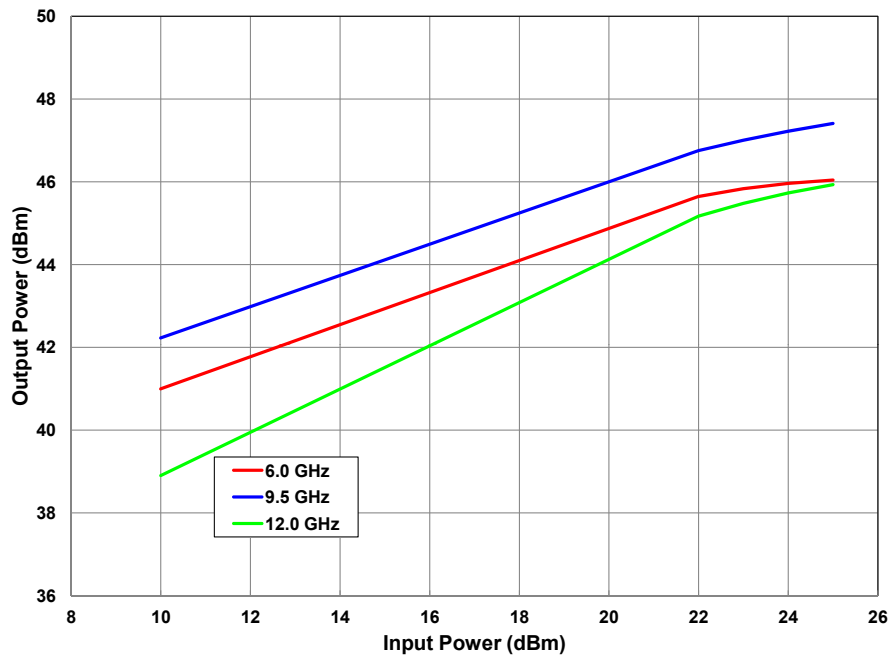


Figure 4. - Output Power vs. Input Power

$V_{DD} = 28\text{ V}, I_{DQ} = 2.0\text{ A}$



CMPA601C025F Typical Performance

Figure 5. - Gain vs Input Power
 $V_{DD} = 28\text{ V}, I_{DQ} = 2.0\text{ A}$

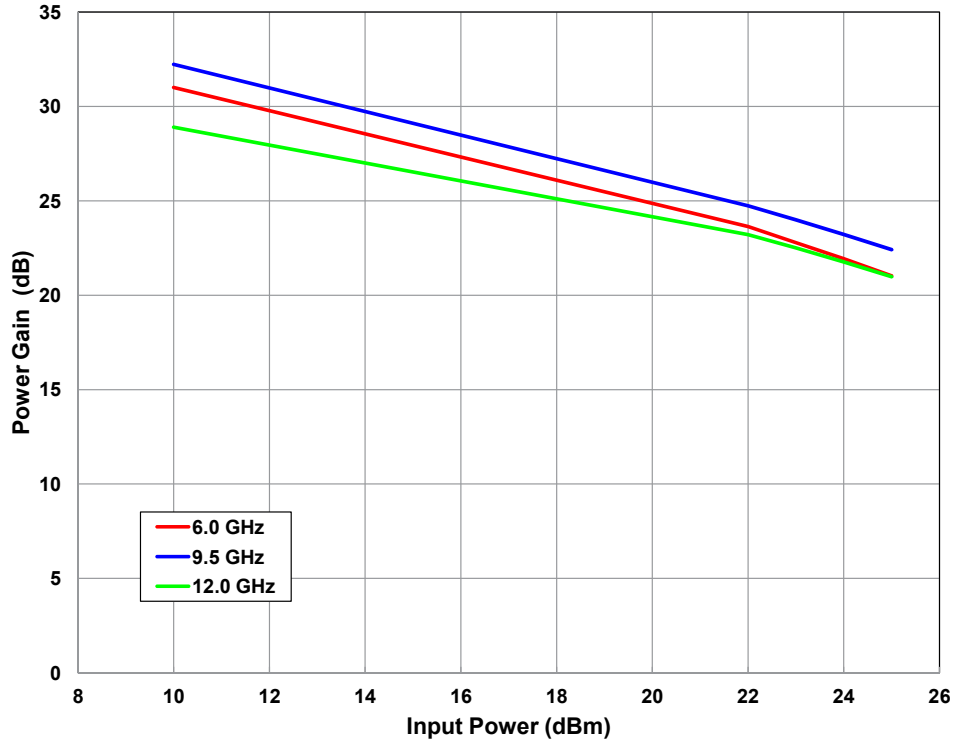
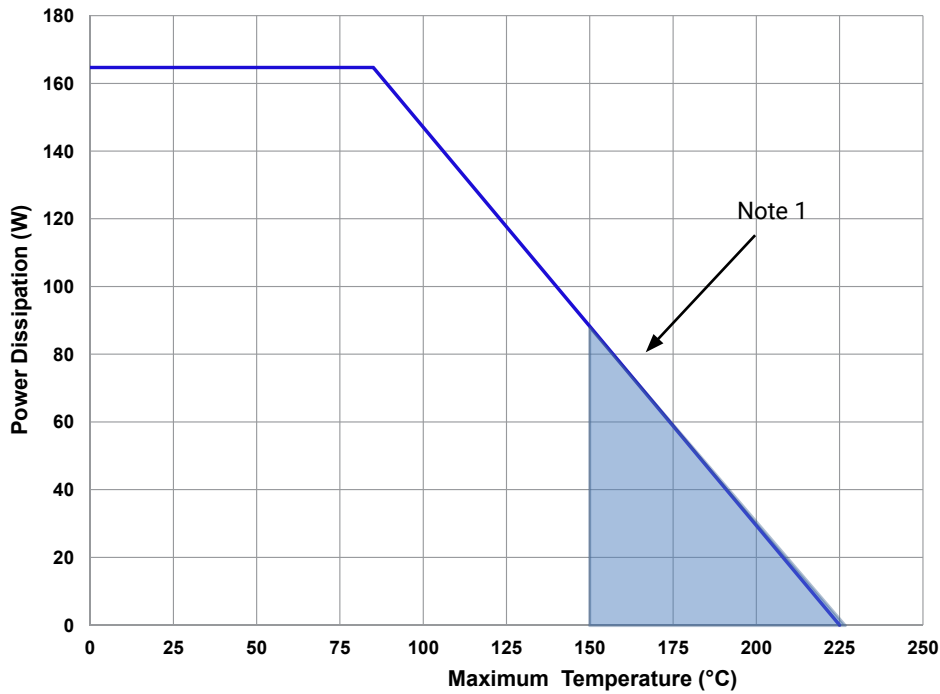


Figure 6. - Power Dissipation Derating Curve



Note 1. Area exceeds Maximum Case Operating Temperature (See Page 2).

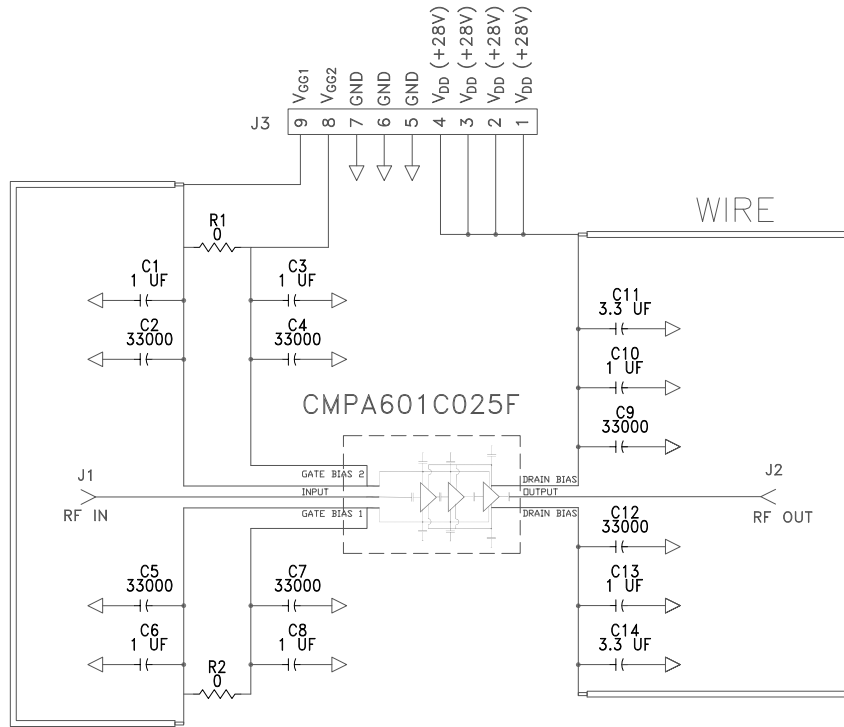
CMPA601C025F-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C2,C4,C5,C7,C9,C12	CAP,33000PF, 0805,100V, X7R	6
C1,C3,C6,C8,C10,C13	CAP, 1.0UF, 100V, 10%, X7R, 1210	6
C11,C14	CAP ELECT 3.3UF 80V FK SMD	2
R1,R2	RES 0.0 OHM 1/16W 0402 SMD	2
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
W1	WIRE, BLACK, 22 AWG ~ 1.50"	1
W2	WIRE, BLACK, 22 AWG ~ 1.75"	1
Q1	CMPA601C025F	1

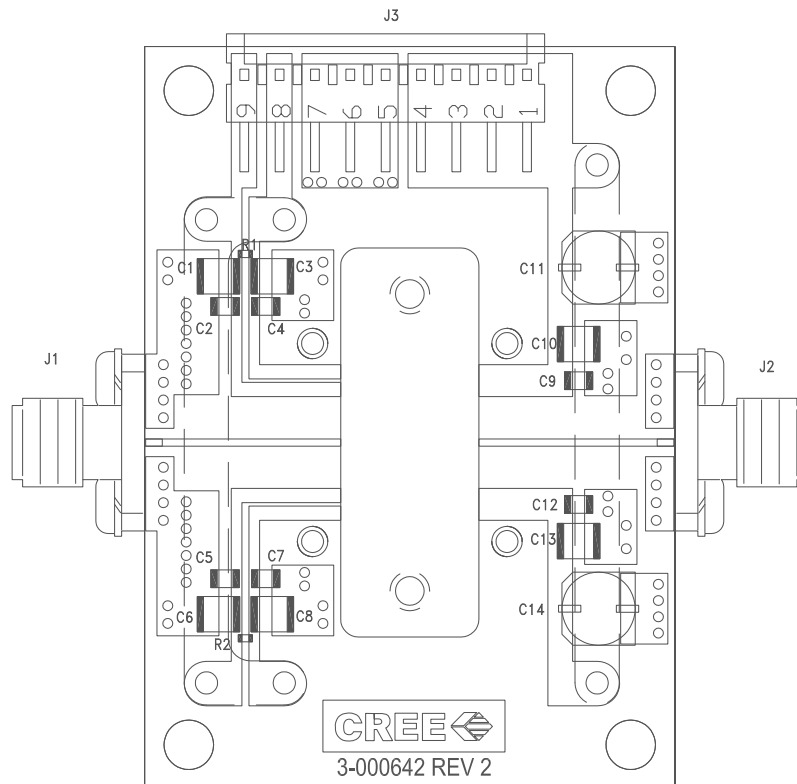
CMPA601C025F-AMP Demonstration Amplifier Circuit



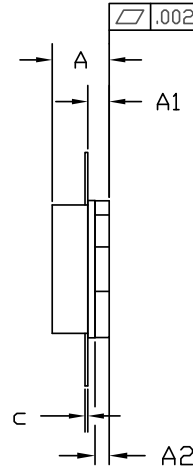
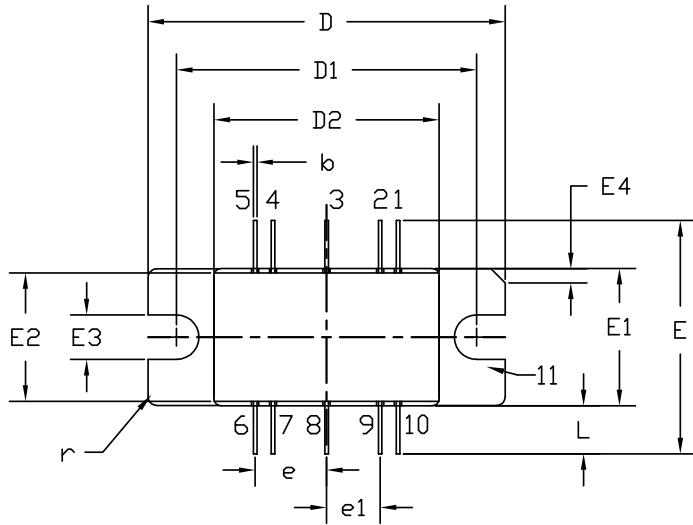
CMP601C025F-AMP Demonstration Amplifier Circuit Schematic



CMPA601C025F-AMP Demonstration Amplifier Circuit Outline



Product Dimensions CMPA601C025F

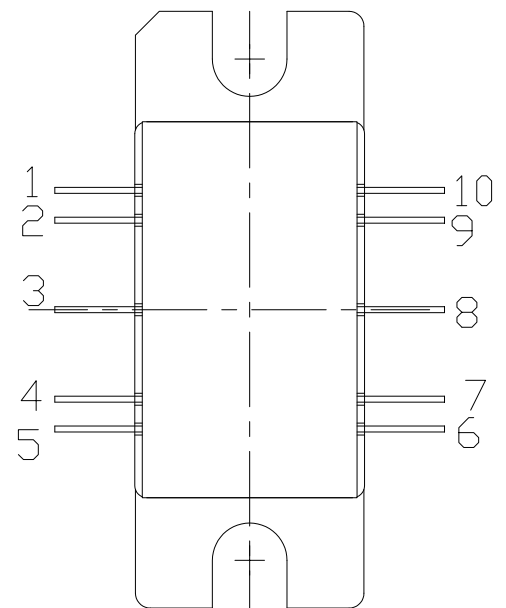


NOTES:

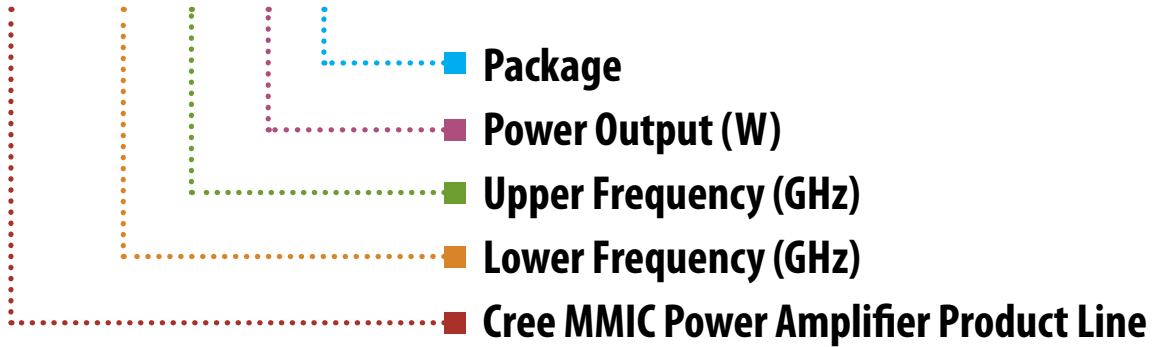
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1994.
2. CONTROLLING DIMENSION: INCH.
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
4. LID MAY BE MISALIGNED TO THE BODY OF PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

DIM	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.155	0.175	3.94	4.45	
A1	0.055	0.065	1.40	1.65	
A2	0.035	0.045	0.89	1.14	
b	0.01 TYP		0.254 TYP		10x
c	0.007	0.009	0.18	0.23	
D	0.995	1.005	25.27	25.53	
D1	0.835	0.845	21.21	21.46	
D2	0.623	0.637	15.82	16.18	
E	0.653 TYP		16.59 TYP		
E1	0.380	0.390	9.65	9.91	
E2	0.355	0.365	9.02	9.27	
E3	0.120	0.130	3.05	3.30	
E4	0.035	0.045	0.89	1.14	45° CHAMFER
e	0.200 TYP		5.08 TYP		4x
e1	0.150 TYP		3.81 TYP		4x
L	0.115	0.155	2.92	3.94	10x
r	0.025 TYP		.635 TYP		3x

Pin Number	Qty
1	Gate Bias for Stage 1, 2 & 3
2	Gate Bias for Stage 1, 2 & 3
3	RF IN
4	Gate Bias for Stage 1, 2 & 3
5	Gate Bias for Stage 1, 2 & 3
6	Drain Bias
7	Drain Bias
8	RF OUT
9	Drain Bias
10	Drain Bias



CMPA601C025F



Parameter	Value	Units
Lower Frequency	6.0	GHz
Upper Frequency ¹	12.0	GHz
Power Output	25	W
Package	Flanged	-

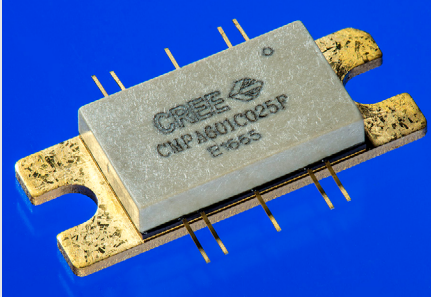
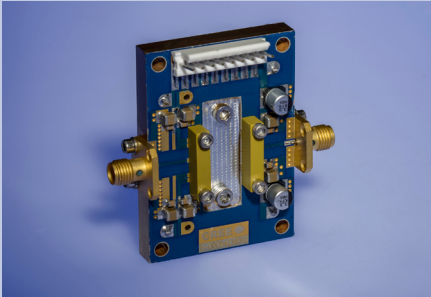
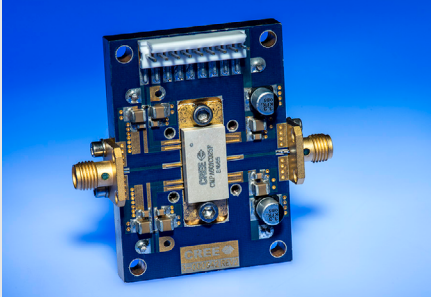
Table 1.

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
CMPA601C025F	GaN HEMT	Each	
CMPA601C025F-TB	Test board without GaN HEMT	Each	
CMPA601C025F-AMP	Test board with GaN HEMT 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

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