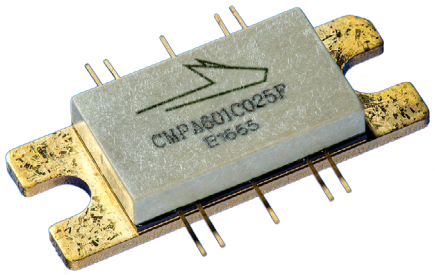
CMPA601C025F

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



PN: CMPA601C025F
Package Type: 440213

Description

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 0.25µm 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.

Typical Performance Over 6.0 - 12 GHz (T_C = 25°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_{OUT} @ P_{IN} = 22 dBm	34	51	49	45.9	36.5	W
Power Gain @ P_{IN} = 22 dBm	23	25	25	25	23.5	dB
PAE @ P_{IN} = 22 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

RoHS compliant

4600 Silicon Drive | Durham, NC 27703 | Tel: +1.919.313.5300

Absolute Maximum Ratings (not simultaneous) at 25°C

Parameter	Symbol	Rating	Units	Conditions
Drain-Source Voltage	V_{DSS}	84	V_{DC}	25°C
Gate-Source Voltage	V_{GS}	-10, +2		
Storage Temperature	T_{STG}	-40, +150	°C	
Operating Junction Temperature	T_J	225		
Maximum Forward Gate Current	I_{GMAX}	23	mA	25°C
Soldering Temperature[1]	T_{STG}	245	°C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case[2]	$R_{\theta JC}$	0.85	°C/W	85°C @ P_{DISS} = 116W
Case Operating Temperature[2]	T_C	-40, +150	°C	

Notes:
[1] Refer to the Application Note on soldering at wolfspeed.com/rf/document-library
[2] See also, the Power Dissipation De-rating Curve on page 5

Electrical Characteristics (Frequency = 6.0 GHz to 12.0 GHz unless otherwise stated; T_C = 25°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} = 6 V, I_{GS} = 2 V
Drain-Source Breakdown Voltage	V_{BD}	84	100	—	V	V_{GS} = -8 V, I_{DS} = 23 mA
RF Characteristics[3]						
Small Signal Gain at 6.0 - 10.5 GHz	S21	28	31	—	dB	V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = -30 dBm
Small Signal Gain at 10.5 - 12 GHz		25	28	—		
Output Power at 6 GHz[3,4]	P_{OUT1}	45.5	47.2	—	dBm	V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = 22 dBm
Output Power at 9.5 GHz[3,4]	P_{OUT2}	45.5	47.1	—		
Output Power at 12 GHz[3,4]	P_{OUT3}	43.0	44.8	—		
Power Added Efficiency at 6 GHz[3,4]	PAE_1	23	33.2	—	%	
Power Added Efficiency at 9.5 GHz[3,4]	PAE_2	26	32.3	—		
Power Added Efficiency at 12 GHz[3,4]	PAE_3	15.5	26.5	—		
Input Return Loss	S11	—	-5	—	dB	V_{DD} = 28 V, I_{DQ} = 2 A, P_{IN} = -30 dBm
Output Return Loss	S22	—		—		
Output Mismatch Stress	VSWR	—	—	5:1	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

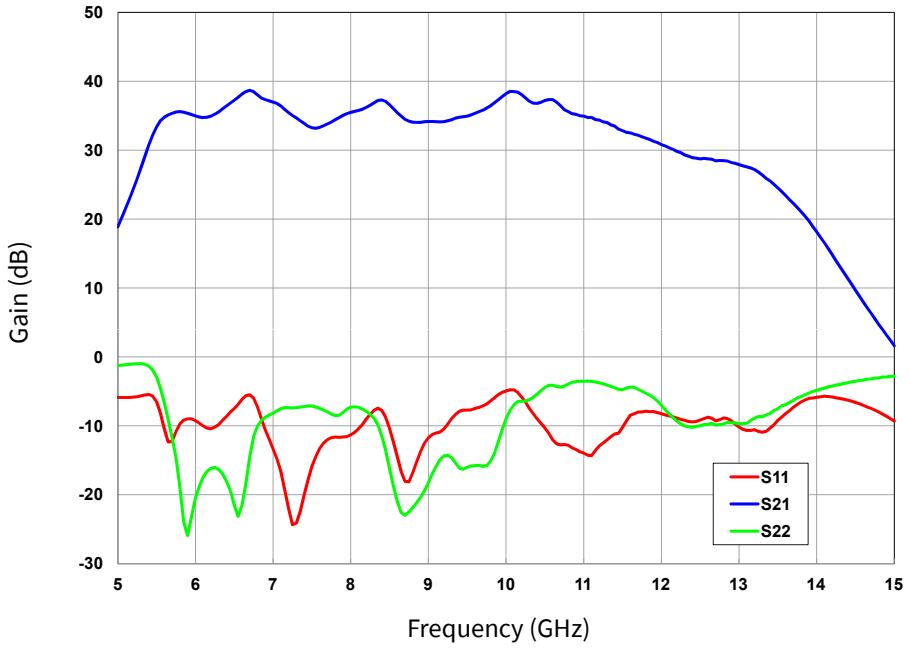


Figure 1. Small Signal S-Parameters vs. Frequency
V_{DD} = 28 V, I_{DQ} = 2.0 A, P_{IN} = -30 dBm

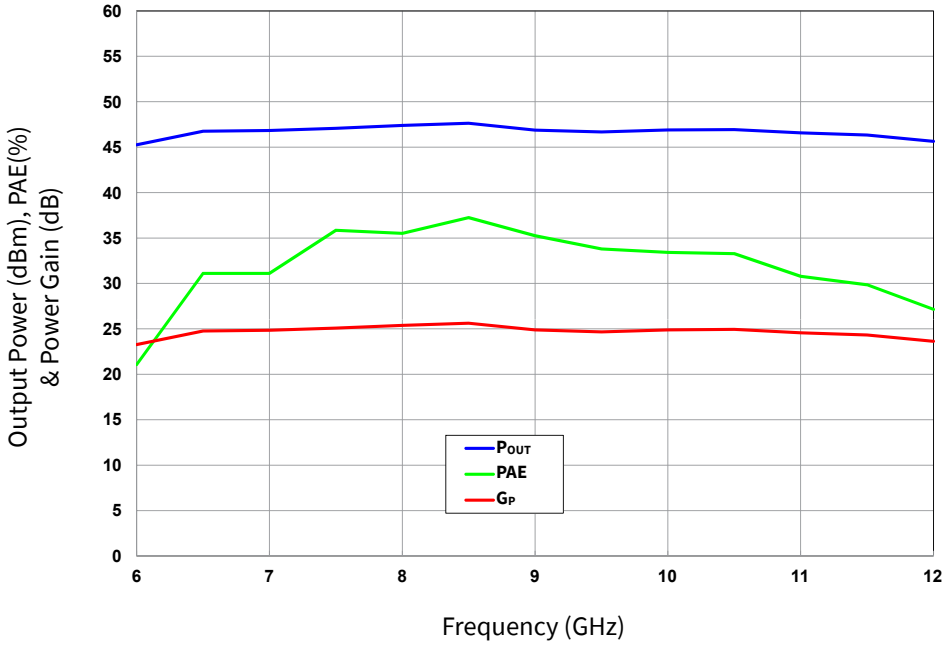


Figure 2. Output Power, Gain and Power Added Efficiency vs. Input Power
V_{DD} = 28 V, I_{DQ} = 2.0 A, P_{IN} = 22 dBm

CMPA601C025F Typical Performance

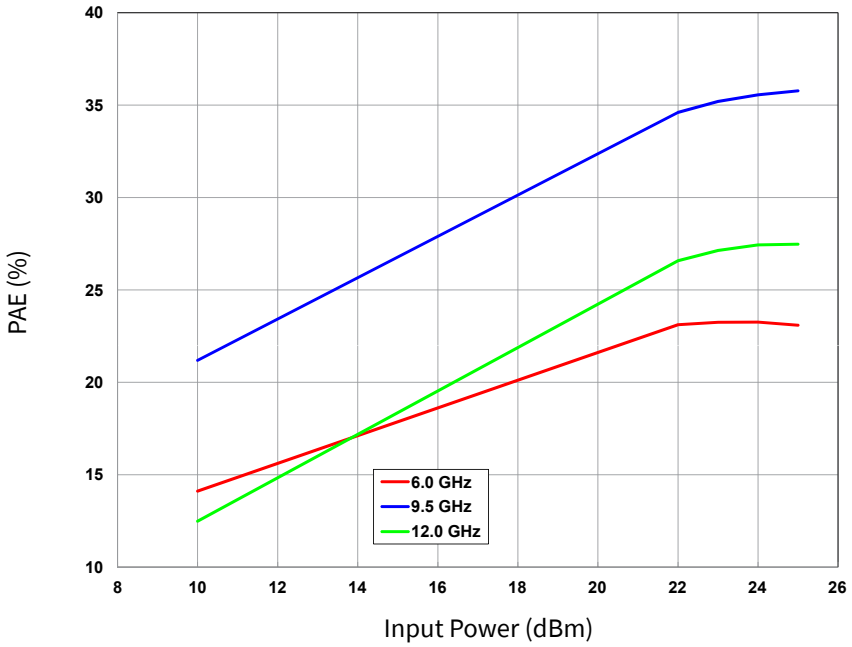


Figure 3. Power Added Efficiency vs. Input Power
V_{DD} = 28 V, I_{DQ} = 2.0 A

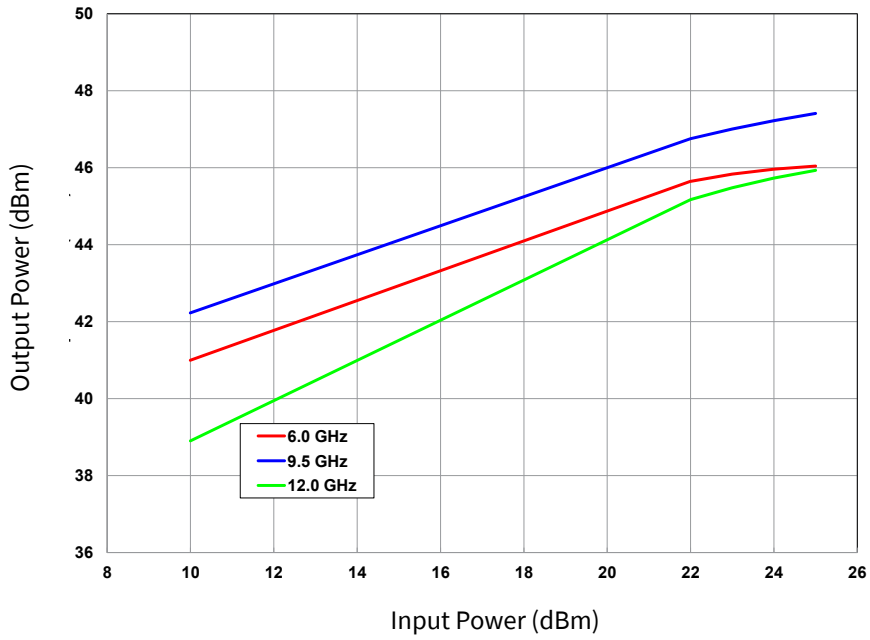


Figure 4. Output Power vs. Input Power
V_{DD} = 28 V, I_{DQ} = 2.0 A

CMPA601C025F Typical Performance

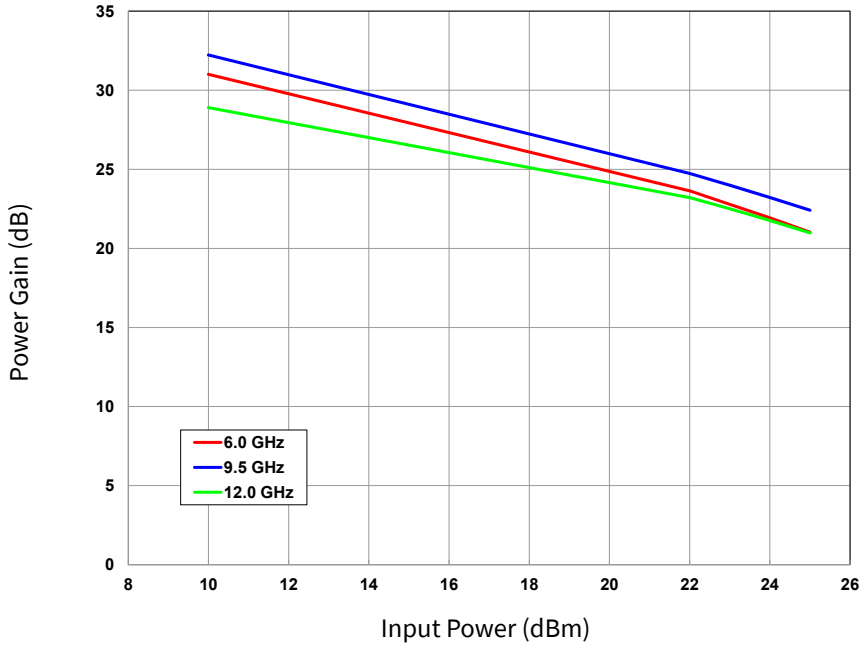


Figure 5. Gain vs Input Power
V_{DD} = 28 V, I_{DQ} = 2.0 A

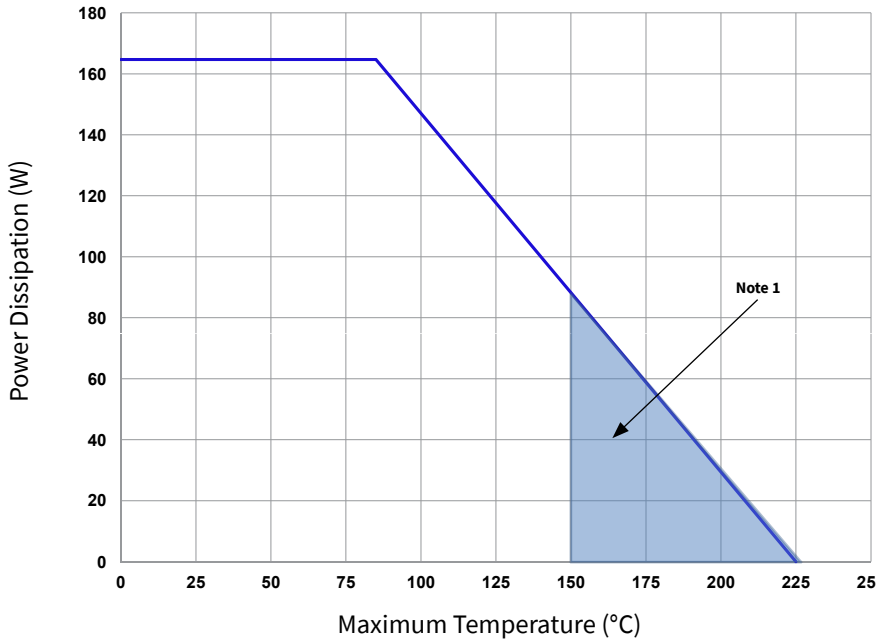


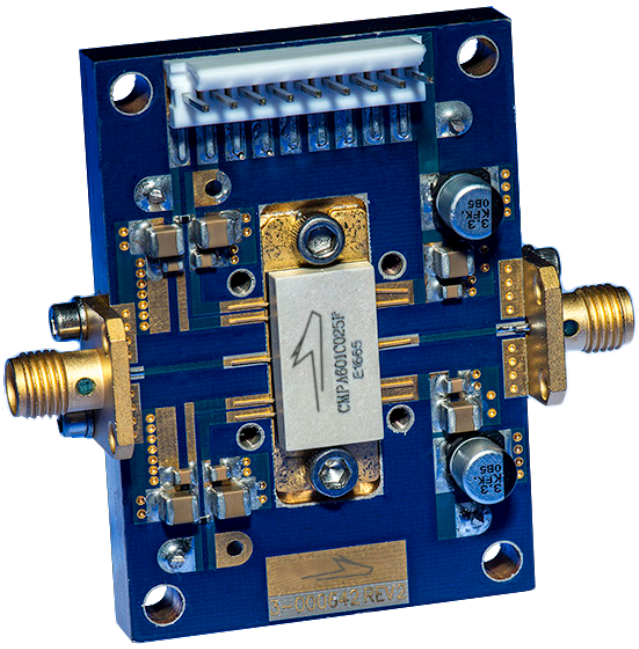
Figure 6. Power Dissipation Derating Curve

Notes:
[1] Area exceeds Maximum Case Operating Temperature (See Page 2)

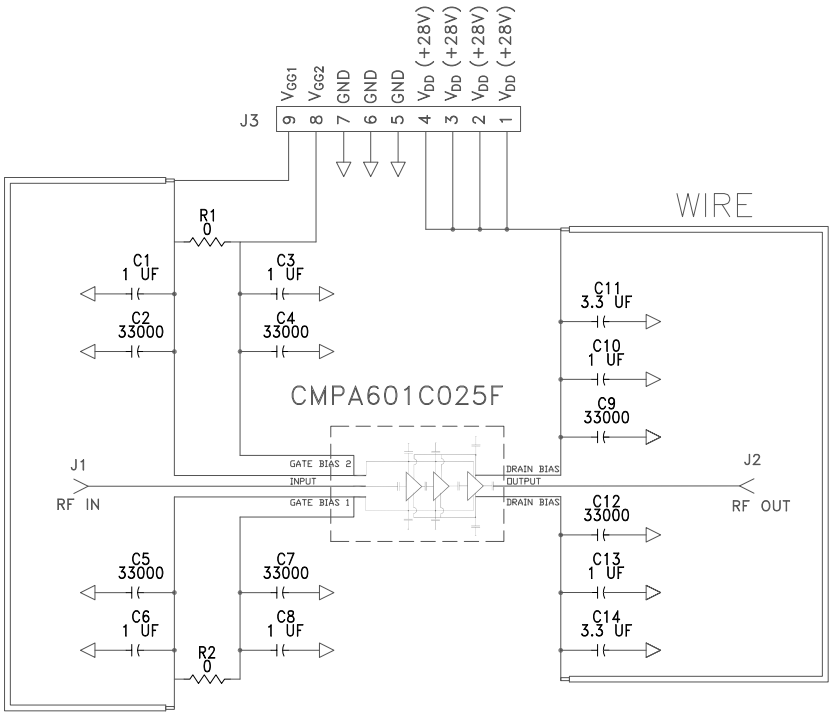
CMPA601C025F-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C2, C4, C5, C7, C9, C12	CAP, 33000pF, 0805, 100V, X7R	6
C1, C3, C6, C8, C10, C13	CAP, 1.0µF, 100V, 10%, X7R, 1210	6
C11 ,C14	CAP ELECT 3.3µF 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

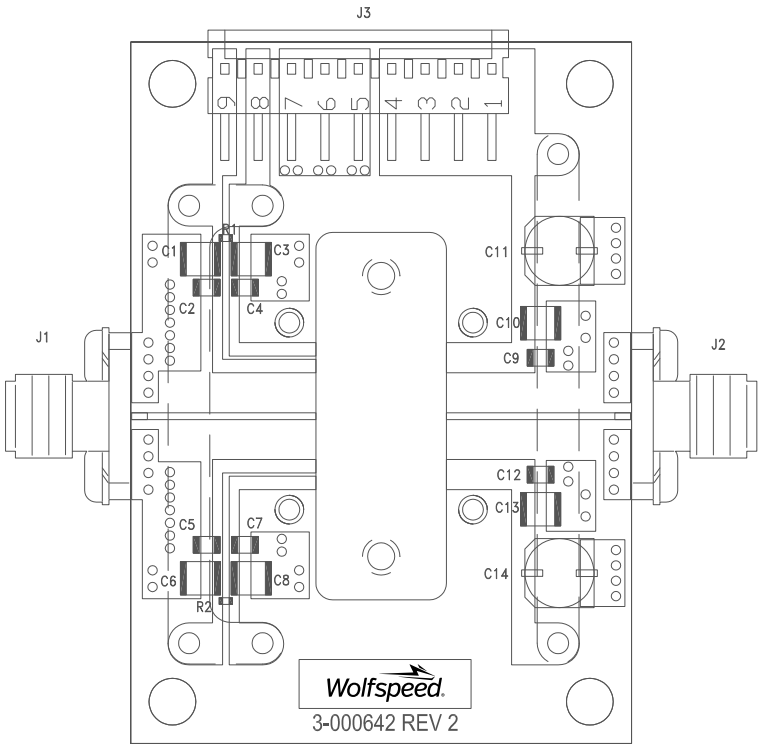
CMPA601C025F-AMP Demonstration Amplifier Circuit



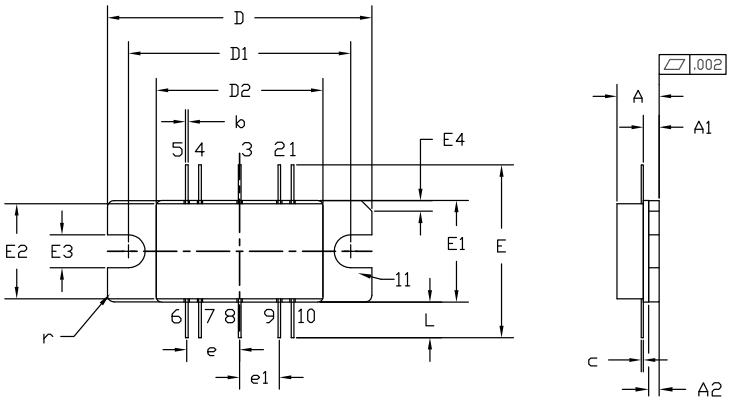
CMP601C025F-AMP Demonstration Amplifier Circuit Schematic



CMPA601C025F-AMP Demonstration Amplifier Circuit Outline



Product Dimensions CMPA601C025F



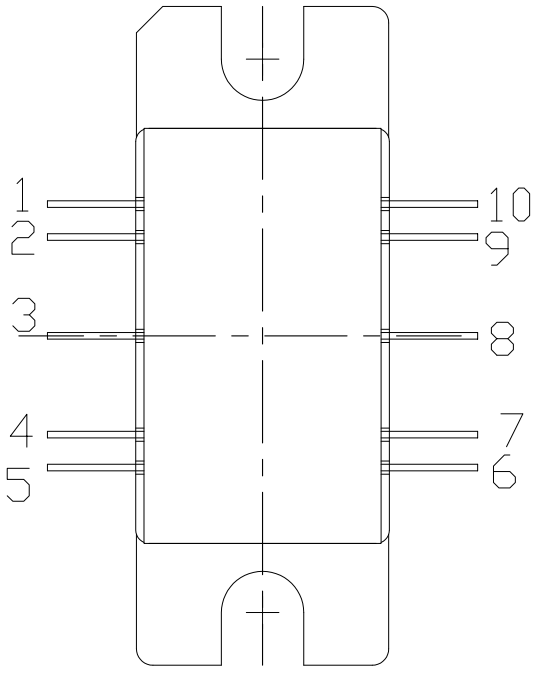
NOTES:

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.

	INCHES		MILLIMETERS		NOTES
DIM	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 1: GATE BIAS
2: GATE BIAS
3: RF IN
4: GATE BIAS
5: GATE BIAS
6: DRAIN BIAS
7: DRAIN BIAS
8: RF OUT
9: DRAIN BIAS
10: DRAIN BIAS
11: SOURCE

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



Part Number System

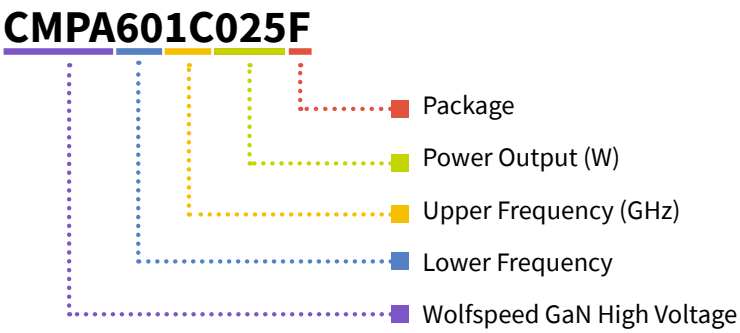


Table 1.

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

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

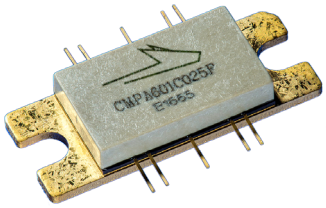
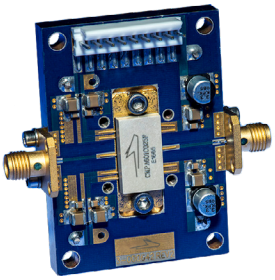
Table 2.

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:	1A = 10.0 GHz 2H = 27.0 GHz

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Classification Level	Test Methodology
Human Body Model	HBM	1A	ANSI/ESDA/JEDEC JS-001 Table 3	JEDEC JESD22 A114-D
Charge Device Model	CDM	C3	ANSI/ESDA/JEDEC JS-002 Table 3	JEDEC JESD22 C101-C

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA601C025F	GaN HEMT	Each	
CMPA601C025F-AMP	Test board with GaN HEMT installed	Each	

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