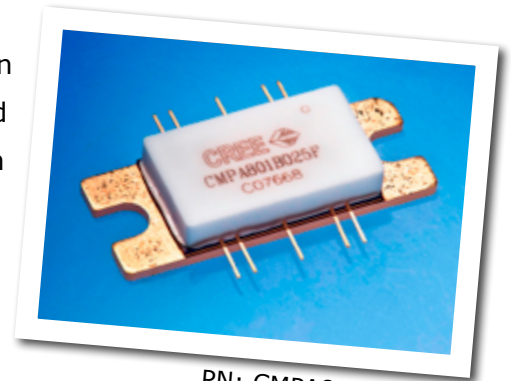


CMPA801B025F

25 W, 8.0 - 11.0 GHz, GaN MMIC, Power Amplifier

Cree's CMPA801B025F is a gallium nitride (GaN) High Electron Mobility Transistor (HEMT) based monolithic microwave integrated circuit (MMIC). GaN has superior properties compared to silicon or gallium arsenide, including higher breakdown voltage, higher saturated electron drift velocity and higher thermal conductivity. GaN HEMTs also offer greater power density and wider bandwidths compared to Si and GaAs transistors. This MMIC is available in a 10 lead metal/ceramic flanged package for optimal electrical and thermal performance.



PN: CMPA801B025F
Package Type: 440208

Typical Performance Over 8.5-11.0 GHz ($T_c = 25^\circ\text{C}$)

Parameter	8.5 GHz	10.0 GHz	11.0 GHz	Units
Output Power ¹	38.0	37.0	35.5	W
Output Power ¹	45.8	45.7	45.5	dBm
Power Added Efficiency ¹	37.0	36.0	35.0	%

Note¹: Measured in CMPA801B025F-TB under 100 uS pulse width, 10% duty.

Features

- 8.0 - 11.0 GHz Operation
- 37 W P_{OUT} typical
- 16 dB Power Gain
- 36 % Typical PAE
- 50 Ohm internally matched
- <0.1 dB Power droop

Applications

- Marine Radar
- Communications
- Satellite Communication Uplink



Absolute Maximum Ratings (not simultaneous)

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
Power Dissipation	P_{DISS}	77	W	
Storage Temperature	T_{STG}	-65, +150	°C	
Operating Junction Temperature	T_J	225	°C	
Maximum Forward Gate Current	I_{GMAX}	13	mA	25°C
Soldering Temperature ¹	T_S	245	°C	
Screw Torque	τ	40	in-oz	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.1	°C/W	Pulse Width = 100 μ s, Duty Cycle = 10%, $P_{DISS} = 77$ W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.0	°C/W	CW, 85°C, $P_{DISS} = 77$ W
Case Operating Temperature	T_C	-40, +95	°C	$P_{DISS} = 77$ W

Note:

¹ Refer to the Application Note on soldering at www.cree.com/products/wireless_appnotes.asp

Electrical Characteristics (Frequency = 8.0 GHz to 11.0 GHz unless otherwise stated; $T_C = 25^\circ\text{C}$)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
DC Characteristics¹						
Gate Threshold	V_{TH}	-3.8	-3.3	-2.3	V	$V_{DS} = 10$ V, $I_D = 57.6$ mA
Gate Quiescent Voltage	V_Q	-	-3.0	-	V	$V_{DS} = 28$ V, $I_D = 1.2$ A
Saturated Drain Current ²	I_{DS}	10.5	13.0	-	A	$V_{DS} = 6.0$ V, $V_{GS} = 2.0$ V
Drain-Source Breakdown Voltage	V_{BD}	84	100	-	V	$V_{GS} = -8$ V, $I_D = 57.6$ mA
RF Characteristics³						
Small Signal Gain	S21	17.5	24	-	dB	$V_{DD} = 28$ V, $I_{DQ} = 1.2$ A, $P_{IN} = -20$ dBm
Input Return Loss	S11	-	-6.0	-3.5	dB	$V_{DD} = 28$ V, $I_{DQ} = 1.2$ A
Output Return Loss	S22	-	-6.0	-2.9	dB	$V_{DD} = 28$ V, $I_{DQ} = 1.2$ A
Output Mismatch Stress	VSWR	-	-	5:1	Ψ	No damage at all phase angles, $V_{DD} = 28$ V, $I_{DQ} = 1.2$ A, Pulse Width = 100 μ s, Duty Cycle = 10%, $P_{IN} = 30$ dBm

Notes:

¹ Measured on-wafer prior to packaging.

² Scaled from PCM data.

³ Measured in the CMPA801B025F-TB.



Electrical Characteristics Continued... ($T_c = 25^\circ\text{C}$)

Characteristics	Symbol	Min.	Typ.	Max.	Units	Conditions
RF Characteristics^{1,2}						
Power Added Efficiency	PAE1	27.0	36.4	-	%	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, Frequency = 8.5 GHz, $P_{IN} = 30\text{ dBm}$
Power Added Efficiency	PAE2	26.2	35.8	-	%	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, Frequency = 10.0 GHz, $P_{IN} = 30\text{ dBm}$
Power Added Efficiency	PAE3	28.6	37.3	-	%	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, Frequency = 11.0 GHz, $P_{IN} = 30\text{ dBm}$
Power Gain	G	14.5	15.7	-	dB	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{IN} = 30\text{ dBm}$
Pulse Amplitude Droop	D	-	0.1	-	dB	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, Frequency = 8.5-11.0 GHz
Output Power	P_{OUT}	28.2	37.0	-	W	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{IN} = 1\text{ W}$
Output Power	P_{OUT}	44.5	45.7	-	dBm	$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, $P_{IN} = 30\text{ dBm}$

Notes:

¹ Pulse Width = 100 μs , Duty Cycle = 10 %.

² Measured in CMPA801B025F-TB.

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Test Methodology
Human Body Model	HBM	1A (> 250 V)	JEDEC JESD22 A114-D
Charge Device Model	CDM	II (200 < 500 V)	JEDEC JESD22 C101-C

CMPA801B025F Typical Performance

Figure 1. - Output Power, Gain and Power Added Efficiency vs. Frequency

$V_{DD} = 28\text{ V}$, $P_{IN} = 30\text{ dBm}$, $I_{DQ} = 1.2\text{ A}$
 Pulse Width = $100\ \mu\text{s}$, Duty Cycle = 10 %

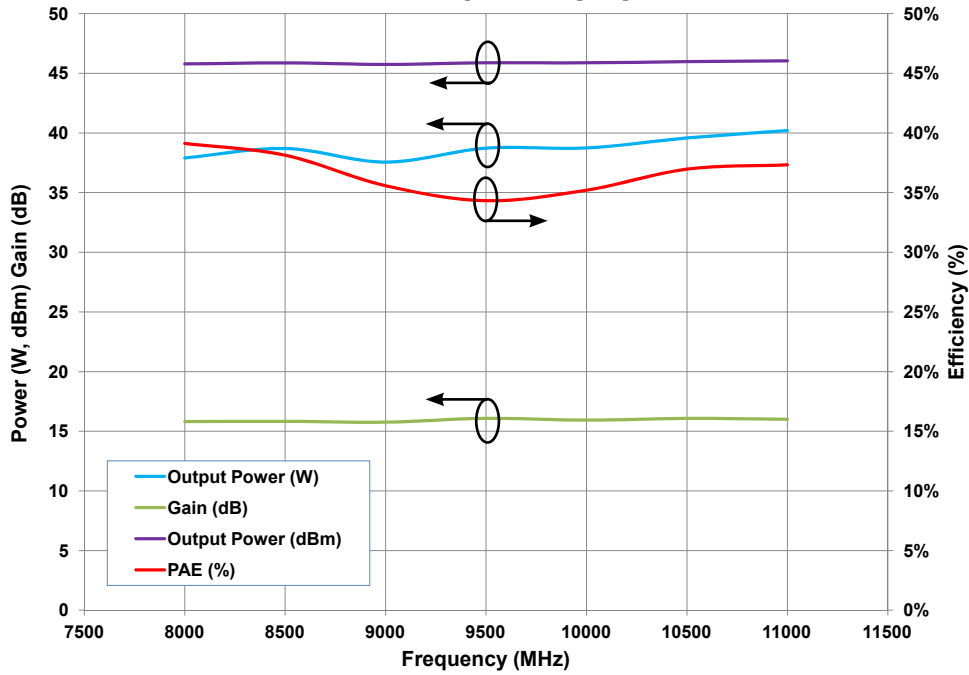
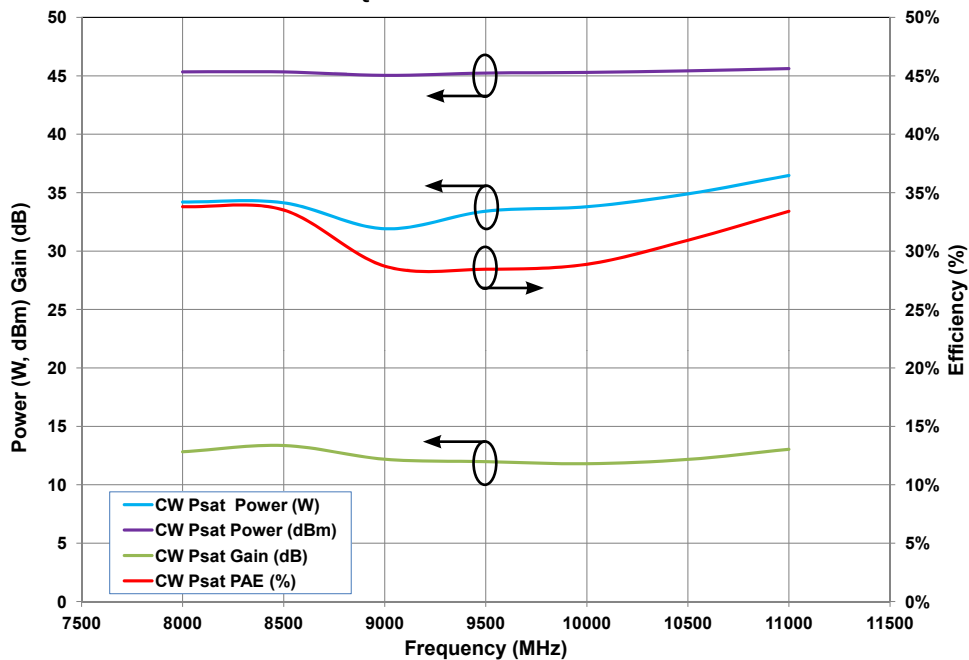


Figure 2. - Output Power, Gain and Power Added Efficiency vs. Frequency

$V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, CW P_{SAT} ($I_G \approx 1.5\text{ mA}$)



CMPA801B025F Typical Performance

Figure 3. - Output Power, Gain and Power Added Efficiency vs. Input Power
 $V_{DD} = 28\text{ V}$, $I_{DQ} = 1.2\text{ A}$, Frequency = 10 GHz

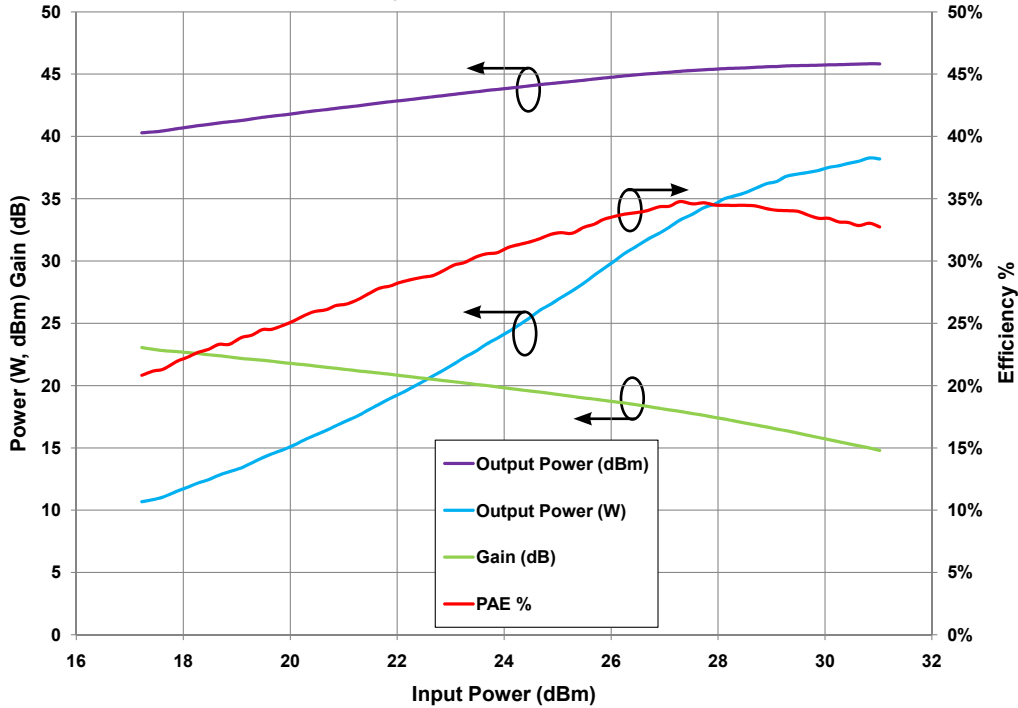
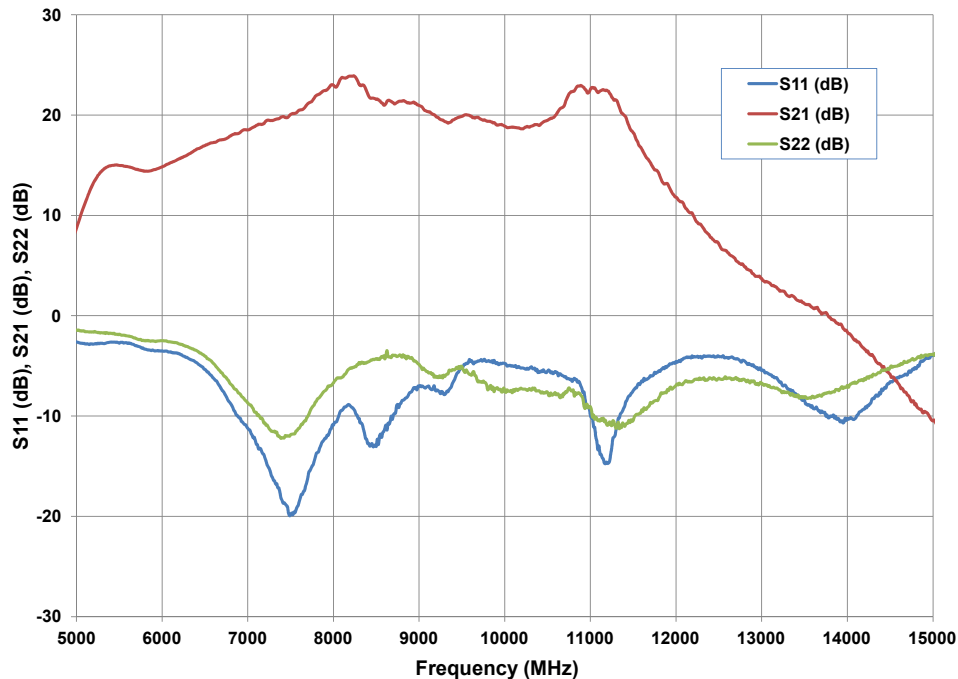


Figure 4. - Small Signal S-Parameters vs. Frequency

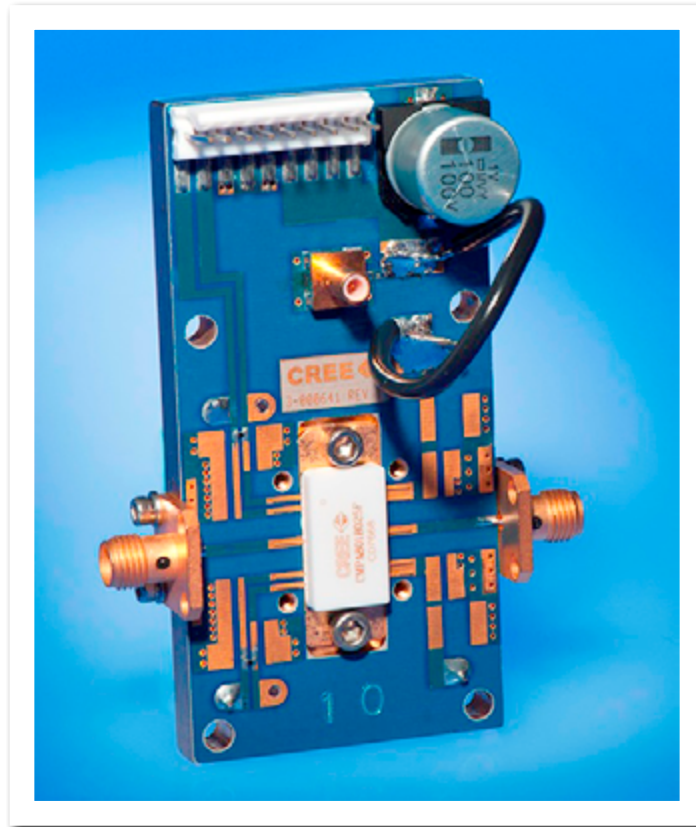




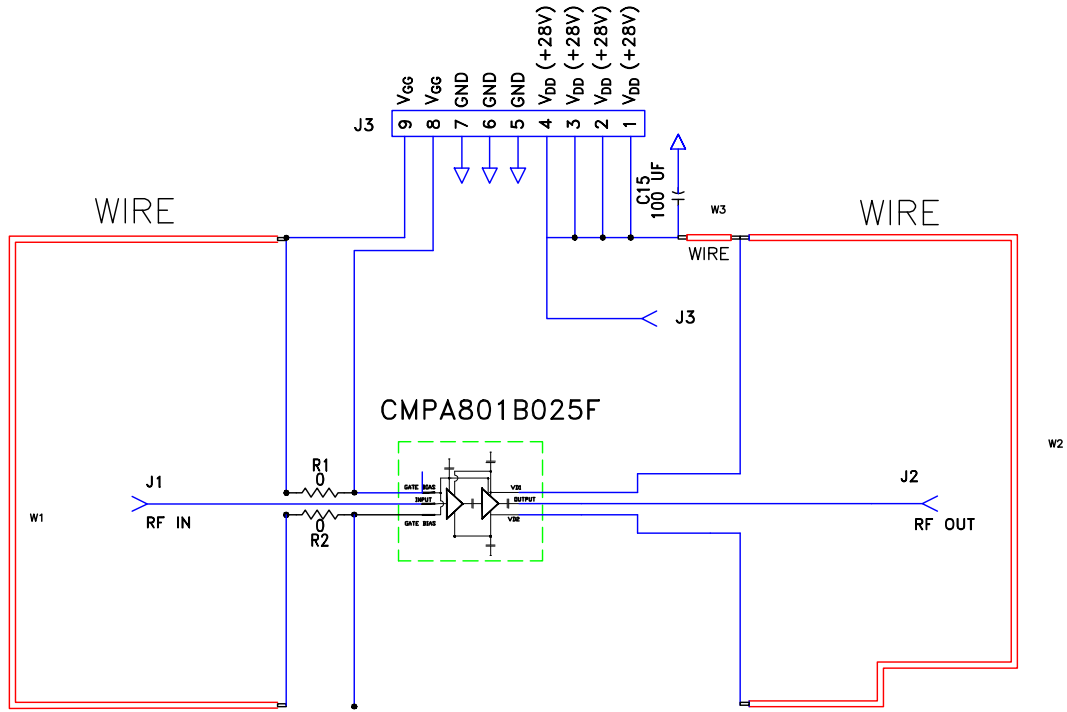
CMPA801B025F-TB Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
C15	CAP ELECT 100UF 80V AFK SMD	1
R1, R2	RES 0.0 OHM 1/16W 0402 SMD	2
C11, C14	CAP ELECT 3.3UF 80V FK SMD	2
W1	WIRE, BLACK, 22 AWG ~ 1.50"	1
W2	WIRE, BLACK, 22 AWG ~ 1.75"	1
J1,J2	CONNECTOR, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
J3	CONNECTOR, HEADER, RT>PLZ .1CEN LK 9POS	1
J4	CONNECTOR, SMB-U SURFACE MOUNT	1
-	PCB, TEST FIXTURE, TACONICS RF35P, 20 MILS, 440208 PKG	1
-	2-56 SOC HD SCREW 1/4 SS	4
-	#2 SPLIT LOCKWASHER SS	4
Q1	CMPA801B025F	1

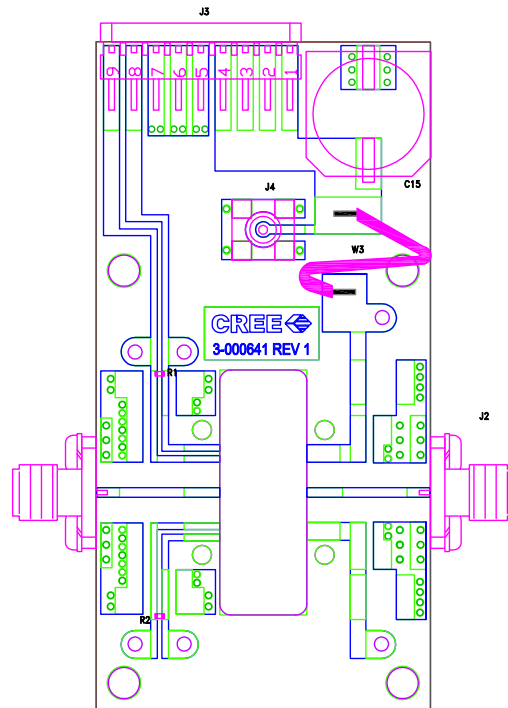
CMPA801B025F-TB Demonstration Amplifier Circuit



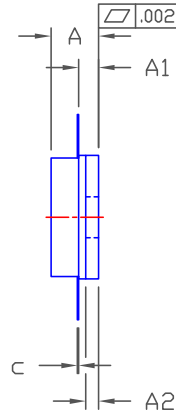
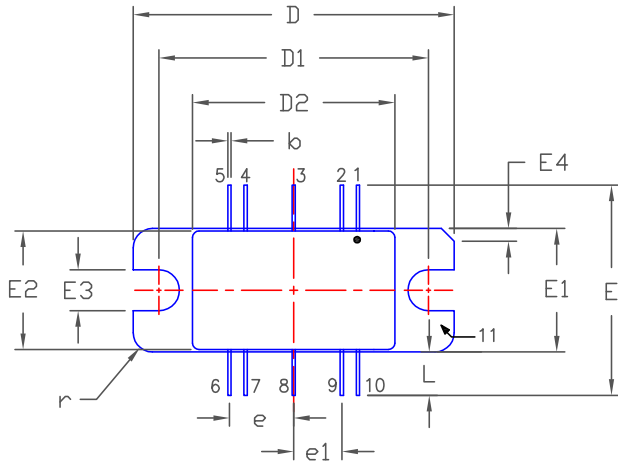
CMPA801B025F-TB Demonstration Amplifier Circuit Schematic



CMPA801B025F-TB Demonstration Amplifier Circuit Outline



Product Dimensions CMPA801B025F (Package Type — 440208)



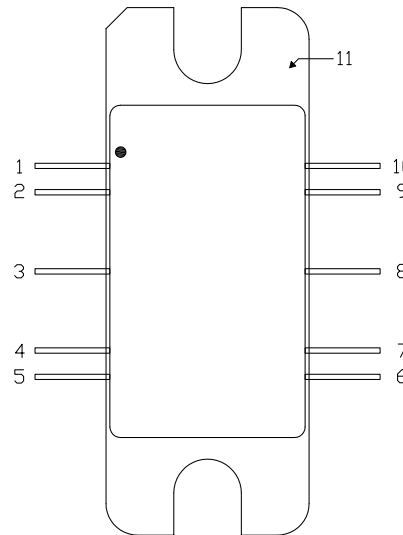
- PIN 1. GATE BIAS
- 2. GATE BIAS
- 3. RF INPUT
- 4. GATE BIAS
- 5. GATE BIAS
- 6. DRAIN BIAS
- 7. DRAIN BIAS
- 8. RF OUTPUT
- 9. DRAIN BIAS
- 10. DRAIN BIAS
- 11. SOURCE

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.

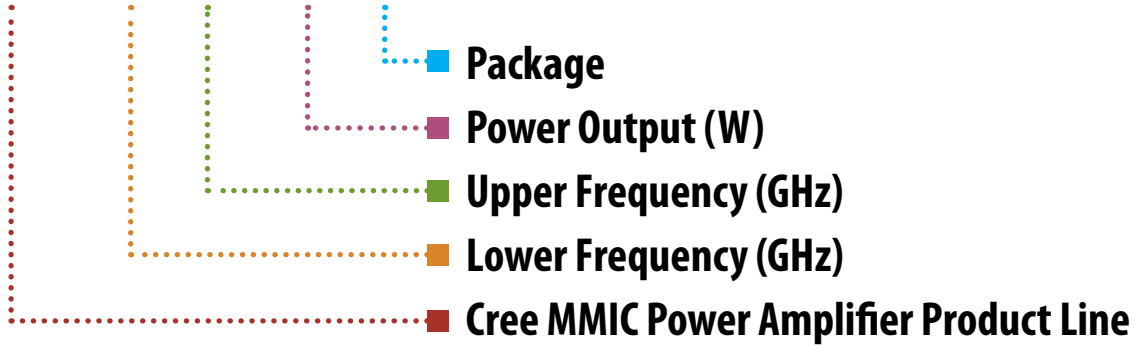
DIM	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.138	0.158	3.51	4.01	
A1	0.057	0.067	1.45	1.70	
A2	0.035	0.045	0.89	1.14	
b	0.01 TYP		0.254 TYP		10x
c	0.003	0.006	0.08	0.15	
D	0.995	1.005	25.27	25.53	
D1	0.835	0.845	21.21	21.46	
D2	0.623	0.637	15.82	16.18	
E	0.654 TYP		16.61 TYP		
E1	0.380	0.390	9.65	9.91	
E2	0.365	0.375	9.27	9.53	
E3	0.123	0.133	3.12	3.38	
E4	0.035	0.045	0.89	1.14	
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	0.06 TYP		1.52 TYP		4x

Pin Number	Qty
1	Gate Bias for Stage 2
2	Gate Bias for Stage 2
3	RF In
4	Gate Bias for Stage 1
5	Gate Bias for Stage 1
6	Drain Bias
7	Drain Bias
8	RF Out
9	Drain Bias
10	Drain Bias
11	Source



Part Number System

CMPA801B025F



Parameter	Value	Units
Lower Frequency	8.0	GHz
Upper Frequency ¹	11.0	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.



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For more information, please contact:

Cree, Inc.
4600 Silicon Drive
Durham, North Carolina, USA 27703
www.cree.com/wireless

Sarah Miller
Marketing
Cree, RF Components
1.919.407.5302

Ryan Baker
Marketing
Cree, RF Components
1.919.407.7816

Tom Dekker
Sales Director
Cree, RF Components
1.919.407.5639