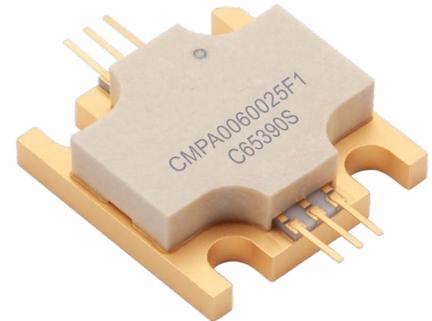


CMPA0060025F1

25 W, 20 MHz - 6.0 GHz, GaN MMIC, Power Amplifier

Description

The CMPA0060025F1 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 enables extremely wide bandwidths to be achieved in a small footprint screw-down package



PN: CMPA0060025F1
Package Type: 440219

Typical Performance Over 20 MHz - 6.0 GHz ($T_c = 25^\circ\text{C}$)

Parameter	20 MHz	0.5 GHz	1.0 GHz	2.0 GHz	3.0 GHz	4.0 GHz	5.0 GHz	6.0 GHz	Units
Gain	21.4	20.1	19.3	16.7	16.6	16.8	15.7	15.5	dB
Output Power @ $P_{IN} = 32$ dBm	26.9	30.2	26.3	23.4	24.5	24.0	20.9	18.6	W
Power Gain @ $P_{IN} = 32$ dBm	12.3	12.8	12.2	11.7	11.9	11.8	11.3	10.7	dB
Efficiency @ $P_{IN} = 32$ dBm	63	55	40	31	33	31	28	26	%

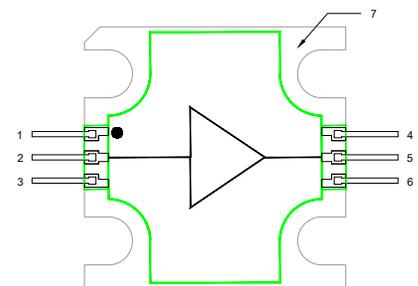
Note: $V_{DD} = 50$ V, $I_{DQ} = 500$ mA

Features

- 17 dB Small Signal Gain
- 25 W Typical P_{SAT}
- Operation up to 50 V
- High Breakdown Voltage
- High Temperature Operation
- 0.5" x 0.5" total product size

Applications

- Ultra Broadband Amplifiers
- Test Instrumentation
- EMC Amplifier Drivers



Absolute Maximum Ratings (not simultaneous) at 25°C

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	84	V_{DC}
Gate-Source Voltage	V_{GS}	-10, +2	
Storage Temperature	T_{STG}	-65, +150	°C
Operating Junction Temperature	T_J	225	
Maximum Forward Gate Current	I_{GMAX}	6.3	mA
Soldering Temperature ¹	T_S	245	°C
Screw Torque	τ	40	in-oz
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.3	°C/W
Case Operating Temperature ²	T_C	-40, +150	°C

Notes:

¹ Refer to the Application Note on soldering² Measured for the CMPA0060025F1 at $P_{IN} = 32$ dBm
Electrical Characteristics (Frequency = 20 MHz to 6.0 GHz unless otherwise stated; $T_C = 25^\circ\text{C}$)

Characteristics	Symbol	Typ.	Max.	Units	Conditions				
DC Characteristics									
Gate Threshold Voltage ²	$V_{GS(th)}$	-3.0	—	V	$V_{DS} = 20$ V, $\Delta I_D = 20$ mA				
Gate Quiescent Voltage	$V_{GS(Q)}$	-2.7	—	V_{DC}	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 32$ dBm				
Saturated Drain Current	I_{DS}	12	—	A	$V_{DS} = 12$ V, $V_{GS} = 2.0$ V				
RF Characteristics¹									
Power Output at P_{OUT} @ 4.5 GHz	P_{OUT}	42.8	—	dBm	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 32$ dBm				
Power Output at P_{OUT} @ 5.0 GHz		43.3	—						
Power Output at P_{OUT} @ 6.0 GHz		42.9	—						
Drain Efficiency at P_{OUT} @ 4.5 GHz	η	24.1	—	%					
Drain Efficiency at P_{OUT} @ 5.0 GHz		28.0	—						
Drain Efficiency at P_{OUT} @ 6.0 GHz		27.2	—						
Output Mismatch Stress	VSWR	—	5 : 1	Ψ	No damage at all phase angles, $V_{DD} = 50$ V, $I_{DQ} = 500$ mA, $P_{IN} = 32$ dBm				
Small Signal RF Characteristics									
Frequency	Min.	Typ. S21 (dB)	Max.	Min.	Typ. S11 (dB)	Max.	Min.	Typ. S22 (dB)	Conditions
0.02 GHz - 0.25 GHz	18	19.3	23.7	—	-4.1	-2.5	—	-8.5	$V_{DD} = 50$ V, $I_{DQ} = 500$ mA
0.25 GHz - 0.5 GHz		19.8	—	—	-6.8	-3.5	—	-8.9	
0.5 GHz - 1.0 GHz	15.5	18.6	22	—	-15.3	-6.5	—	-6.7	
1.0 GHz - 2.0 GHz			—	—		-12.5	—		
2.0 GHz - 3.0 GHz	13	16.3	20	—	-14.2	-6.5	—	-6.0	
3.0 GHz - 6.0 GHz			—	—		-6.5	—		

Notes:

¹ P_{OUT} is defined as $P_{IN} = 32$ dBm² The device will draw approximately 55-70 mA at pinch off due to the internal circuit structure

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Rev. 0.1, 2022-12-12

Typical Performance

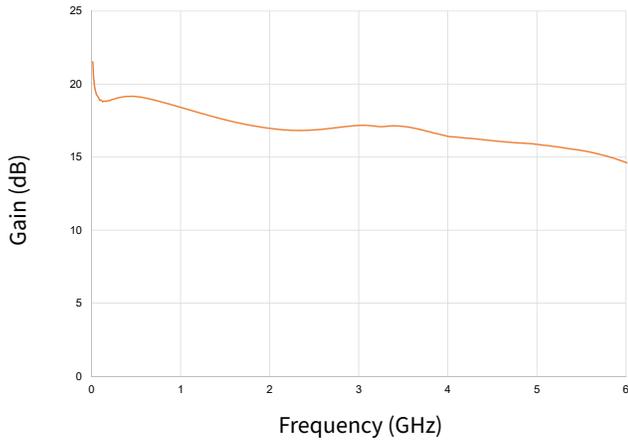


Figure 1. Small Signal Gain vs Frequency
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 500\text{ mA}$

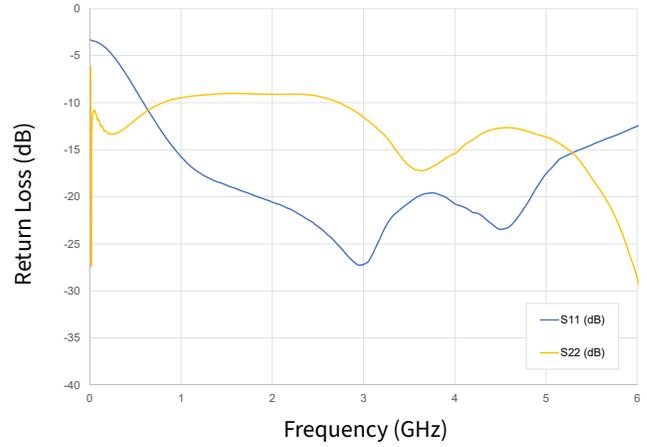


Figure 2. Input & Output Return Losses vs Frequency
 $V_{DD} = 50\text{ V}$, $I_{DQ} = 500\text{ mA}$

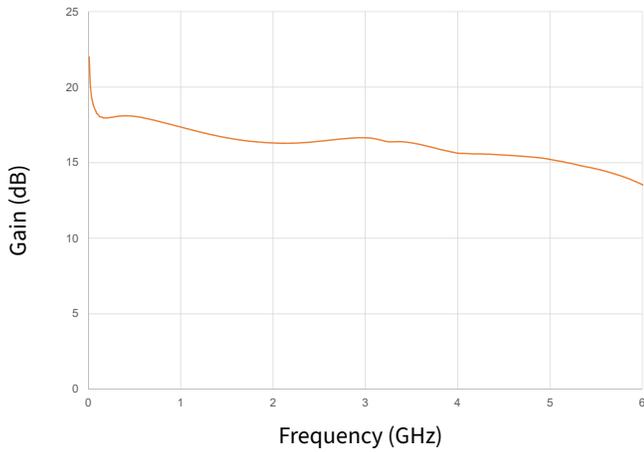


Figure 3. Small Signal Gain vs Frequency
 $V_{DD} = 40\text{ V}$, $I_{DQ} = 500\text{ mA}$

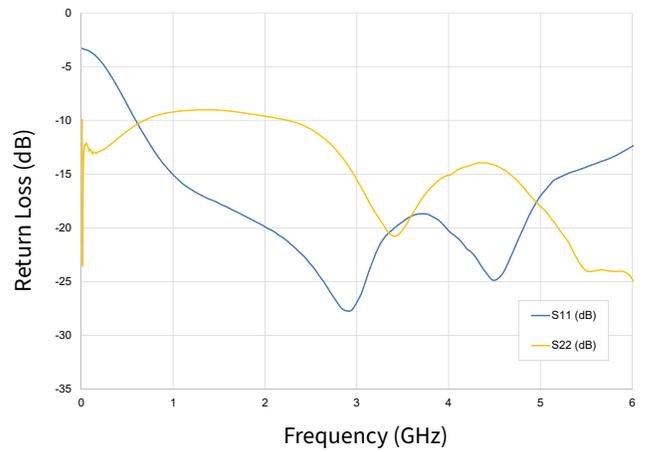


Figure 4. Small Signal Gain vs Frequency
 $V_{DD} = 40\text{ V}$, $I_{DQ} = 500\text{ mA}$

Typical Performance

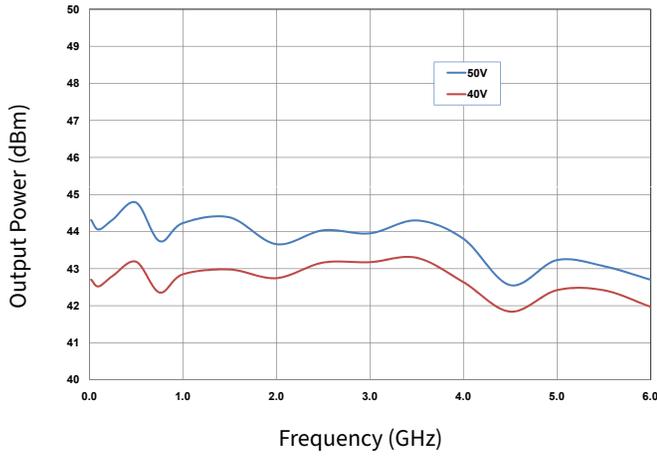


Figure 5. Output Power at $P_{IN} = 32$ dBm vs Frequency as a Function of Drain Voltage, $I_{DQ} = 500$ mA

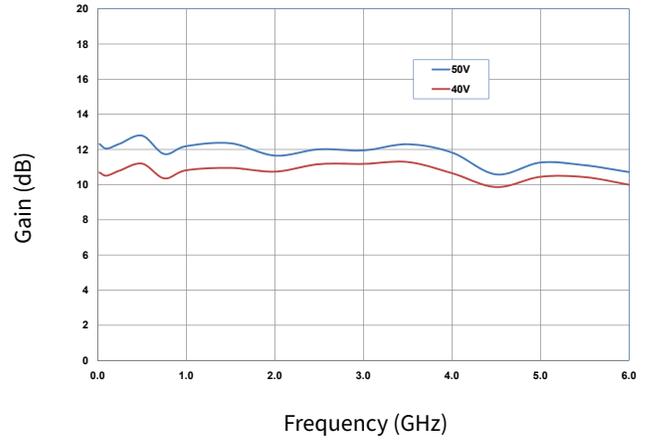


Figure 6. Power Gain at $P_{IN} = 32$ dBm vs Frequency as a Function of Drain Voltage, $I_{DQ} = 500$ mA

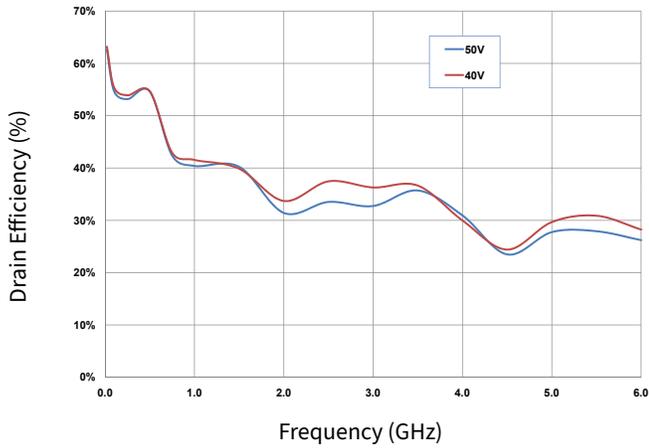


Figure 7. Drain Efficiency at $P_{IN} = 32$ dBm vs Frequency as a Function of Drain Voltage, $I_{DQ} = 500$ mA

Typical Performance

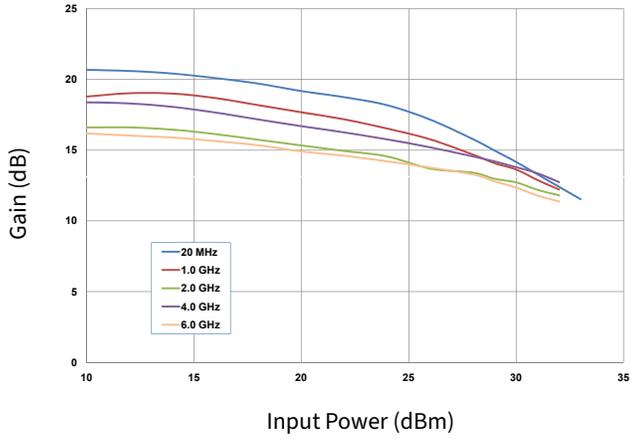


Figure 8. Gain vs Input Power at 50 V as a Function of Frequency, $I_{DQ} = 500 \text{ mA}$

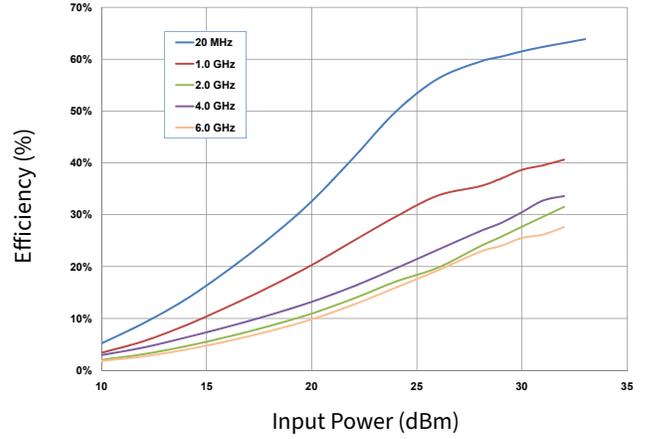


Figure 9. Efficiency vs Input Power at 50 V as a Function of Frequency, $I_{DQ} = 500 \text{ mA}$

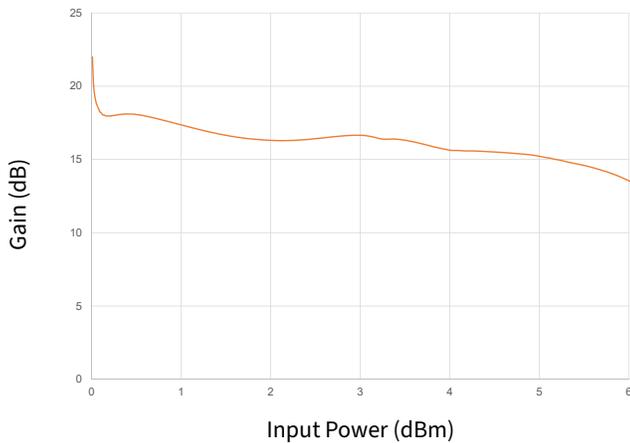


Figure 10. Gain vs Input Power at 40 V as a Function of Frequency, $I_{DQ} = 500 \text{ mA}$

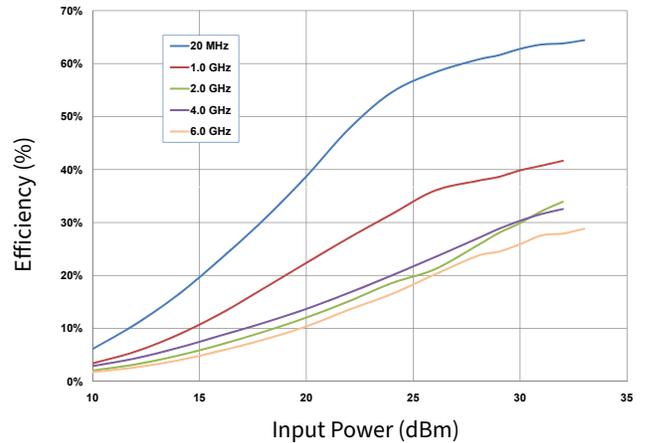


Figure 11. Efficiency vs Input Power at 40 V as a Function of Frequency, $I_{DQ} = 500 \text{ mA}$

General Device Information

The CMPA0060025F1 is a GaN HEMT MMIC Power Amplifier, which operates between 20 MHz - 6.0 GHz. The amplifier typically provides 17 dB of small signal gain and 25 W saturated output power with an associated power added efficiency of better than 20%. The wideband amplifier's input and output are internally matched to 50 Ohm. The amplifier requires bias from appropriate Bias-T's, through the RF input and output ports.

The CMPA0060025F1-AMP1 and the device were then measured using external Bias-T's, (TECDIA: AMP1T-H06M20 or similar), as shown in Figure 2. The Bias-T's were included in the calibration of the test system. All other losses associated with the test fixture are included in the measurements.

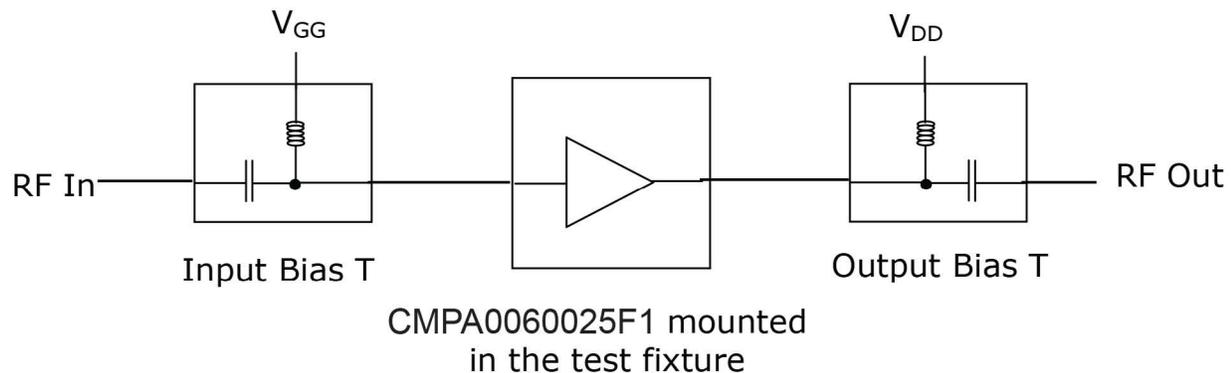
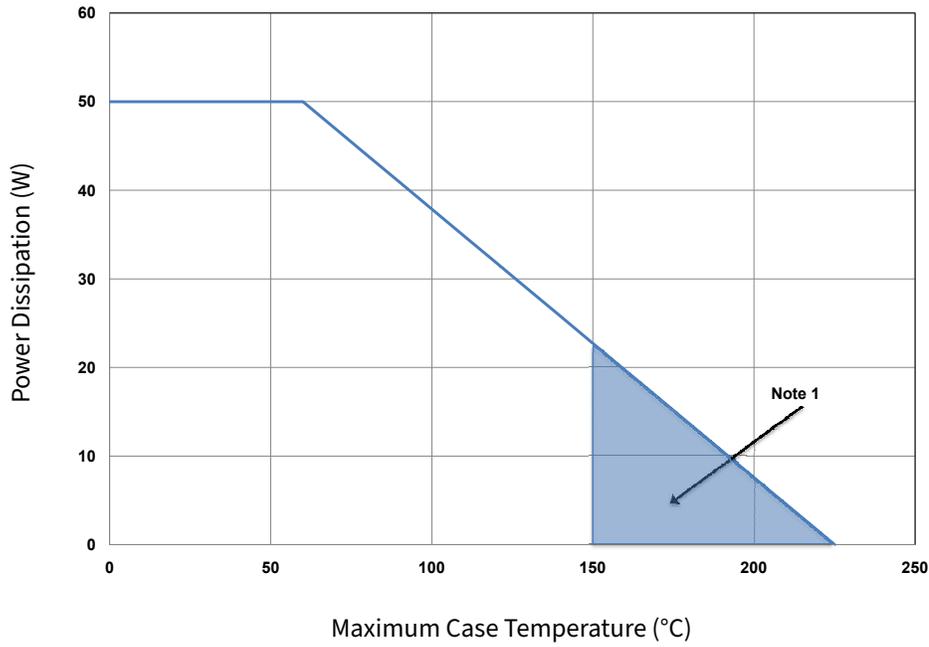


Figure 2. Typical test system setup required for measuring CMPA0060025F1-AMP1

CMPA0060025F1 Power Dissipation De-rating Curve

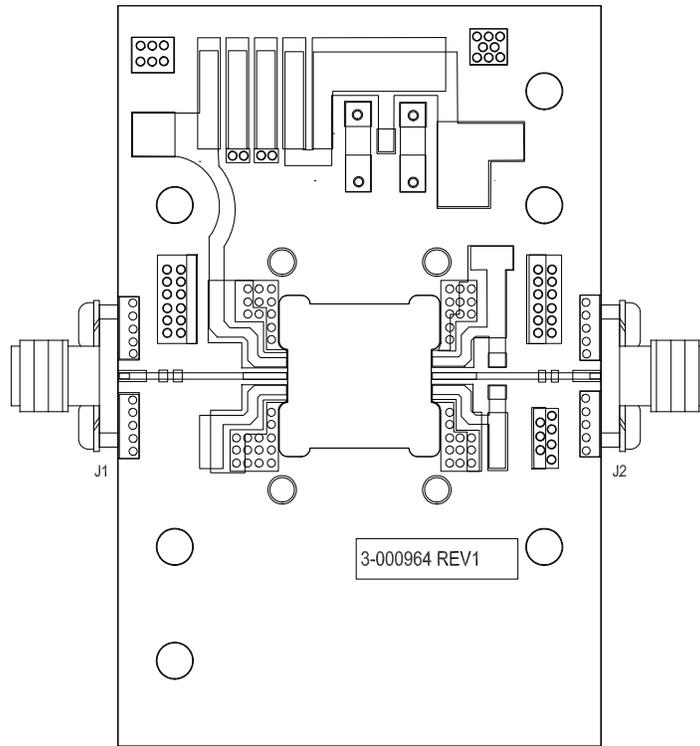


Note: Area exceeds Maximum Case Temperature (See Page 2)

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Class	Classification Level	Test Methodology
Human Body Model	HBM	2	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

CMPA0060025F1-AMP Demonstration Amplifier Circuit Outline

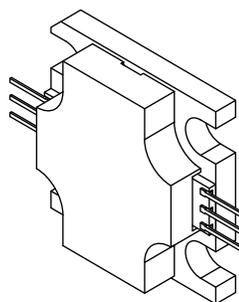
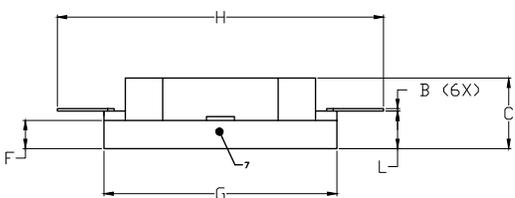
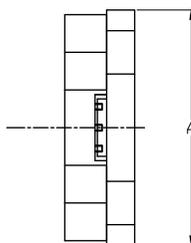
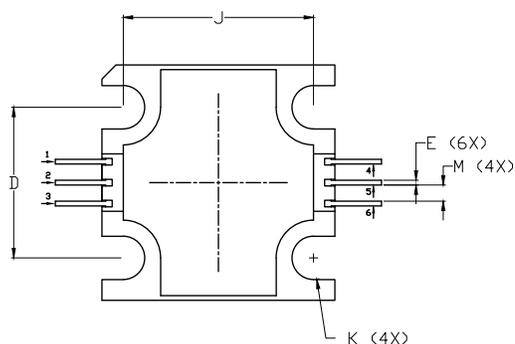


CMPA0060025F1-AMP Demonstration Amplifier Circuit Bill of Materials

Designator	Description	Qty
J1,J2	CONNECTOR, SMA, AMP11052901-1	2
-	PCB, TACONIC, RF-35-0100-CH/CH	1
Q1	CMPA0060025F1	1

Note: An external Bias-T is required

Product Dimensions CPM0060025F1 (Package Type — 440219)

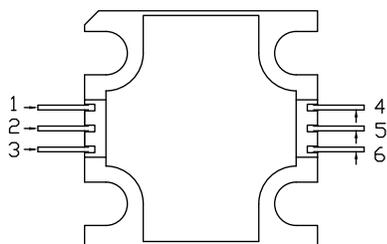


NOT TO SCALE

NOTES:

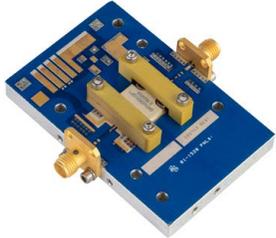
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020" BEYOND EDGE OF LID.
4. LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.
5. ALL PLATED SURFACES ARE NI/AU

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



PIN	Function
1	NC
2	Gate
3	NC
4	NC
5	Drain
6	NC
7	Source

Product Ordering Information

Order Number	Description	Unit of Measure	Image
CMPA0060025F1	GaN HEMT	Each	
CMPA0060025F1-AMP	Test board with GaN MMIC installed	Each	

Notes & Disclaimer

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