CMPA0560008S

0.5 – 6 GHz, 10 W GaN HPA

Description

The CMPA0560008S is a 10W packaged MMIC HPA utilizing the high performance, 0.15um GaN on SiC production process. The CMPA0560008S operates from 0.5-6 GHz and supports a variety of RF applications such as electronic warfare, test and measurement, radar among others. The CMPA0560008S achieves 10 W of saturated output power with 12 dB of large signal gain and typically 40% power-added efficiency under CW operation.

Packaged in a 5x5 mm plastic overmold QFN, the CMPA0560008S provides superior performance and environmental robustness in a small form factor allowing customers to improve SWaP-C benchmarks in their next-generation systems.

Figure 1. CMPA0560008S

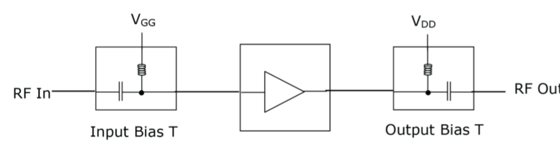


Figure 2. Functional Block Diagram

Features

- Psat: 10 W
- PAE: 40 %
- LSG: 12 dB
- S21: 19 dB
- S11: -11 dB
- S22: -8 dB
- CW operation
- Small 5 x 5 mm footprint

Note: Features are typical performance across frequency under 25C operation. Please reference performance charts for additional information.

Applications

- Electronic Warfare
- Test and Measurement
- Radar
- General Amplification

RoHS compliant

Absolute Maximum Ratings

Parameter	Symbol	Units	Value	Conditions
Drain Voltage	V_d	V	28	
Gate Voltage	V_g	V	-10, +2	
Drain Current	I_d	A	1.3	
Gate Current	I_g	mA	3.8	
Input Power	P_{in}	dBm	29	
Dissipated Power	P_{diss}	W	25	85 °C
Storage Temperature	T_{stg}	°C	-55, +150	
Mounting Temperature	T_J	°C	260	30 seconds
Junction Temperature	T_J	°C	225	
Output Mismatch Stress	VSWR	Ψ	5:1	

Recommended Operating Conditions

Parameter	Symbol	Units	Typical Value	Conditions
Drain Voltage	Vd	V	28	
Gate Voltage	Vg	V	-2.0	
Drain Current	Idq	mA	220	
Input Power	Pin	dBm	28	
Case Temperature	Tcase	°C	-40 to 85	

RF Specifications

Test conditions unless otherwise noted: Vd=28V, Idq= 220mA, CW, T_{base}=25 °C

Parameter	Units	Frequency	Min	Typical	Max	Conditions
Frequency	GHz		0.5		6	
Output Power	dBm	0.5		40		Pin = 28 dBm
		3		40		
		6		40		
Power-added Efficiency	%	0.5		60		Pin = 28 dBm
		3		44		
		6		36		
LSG	dB	0.5		12		Pin = 28 dBm
		3		12		
		6		12		
Small-Signal Gain (S21)	dB	0.5		21		Pin = -20 dBm
		3		19		
		6		19		
Input Return Loss	dB			-11		Pin = -20 dBm
Output Return Loss	dB			-8		Pin = -20 dBm

Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 3: Pout v. Frequency v. Temperature

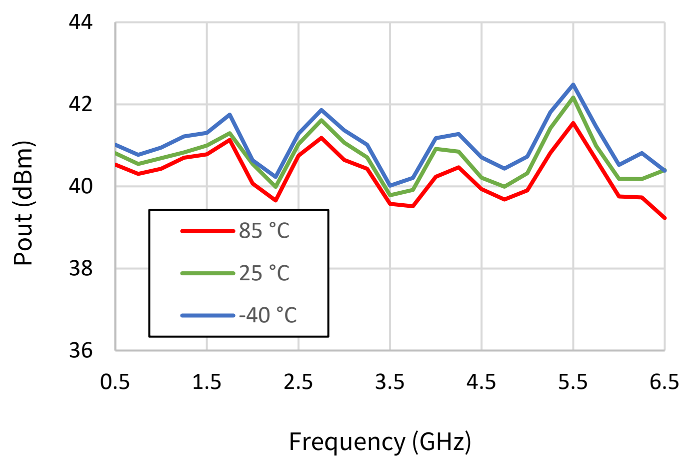


Figure 4: PAE v. Frequency v. Temperature

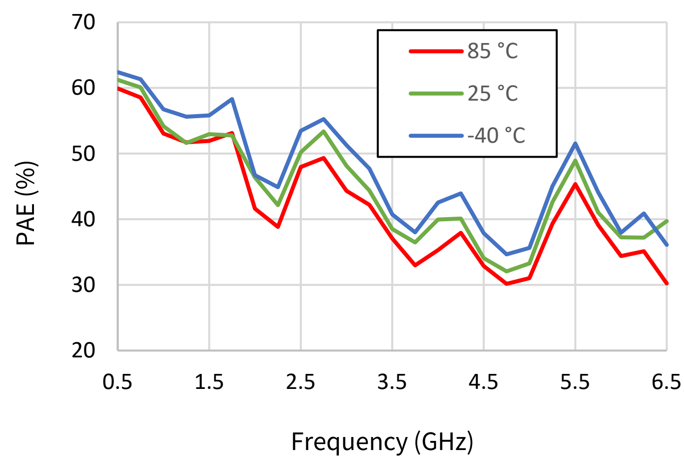


Figure 5: Id v. Frequency v. Temperature

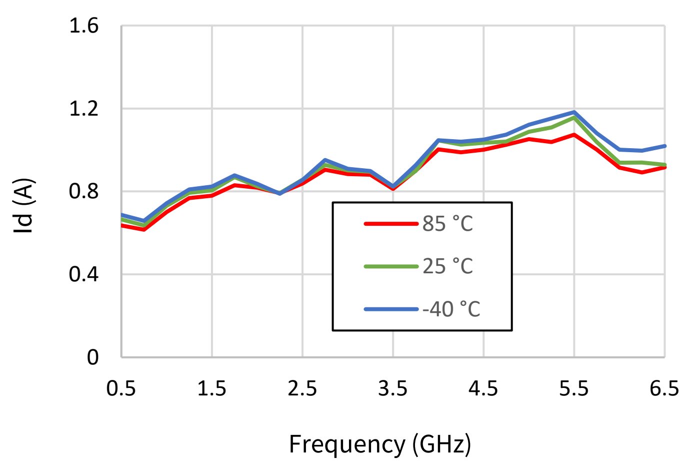


Figure 6: Ig v. Frequency v. Temperature

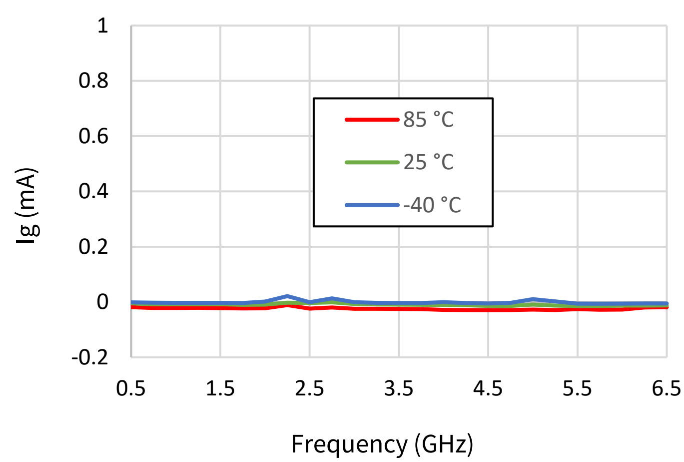
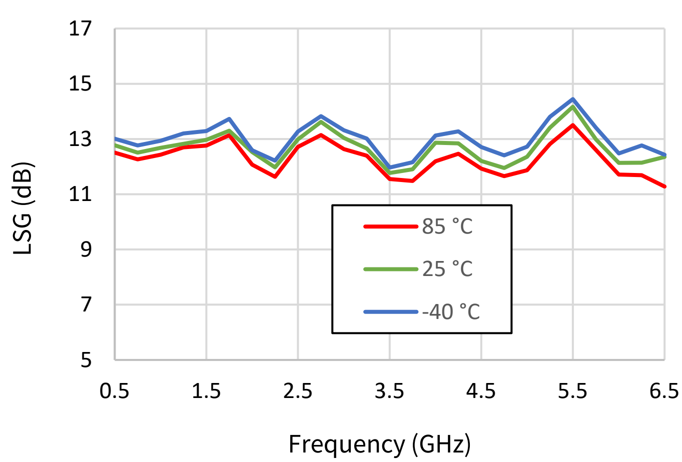


Figure 7: LSG v. Frequency v. Temperature



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 8: Pout v. Frequency v. Vd

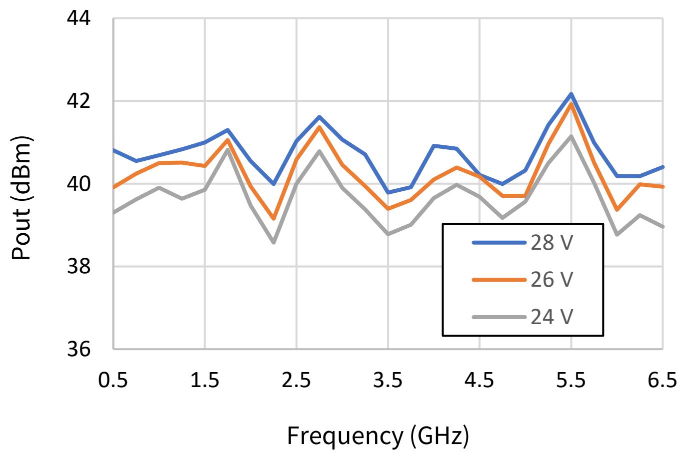


Figure 9: PAE v. Frequency v. Vd

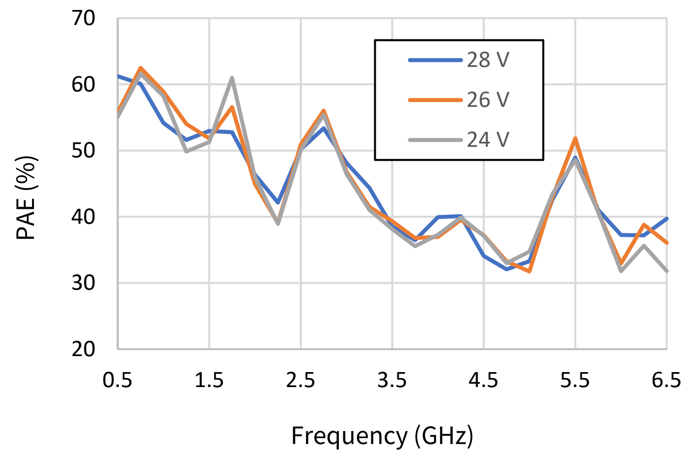


Figure 10: Id v. Frequency v. Vd

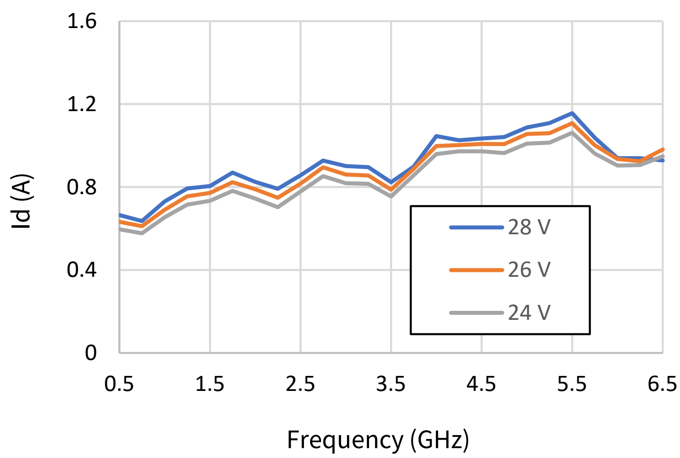


Figure 11: Ig v. Frequency v. Vd

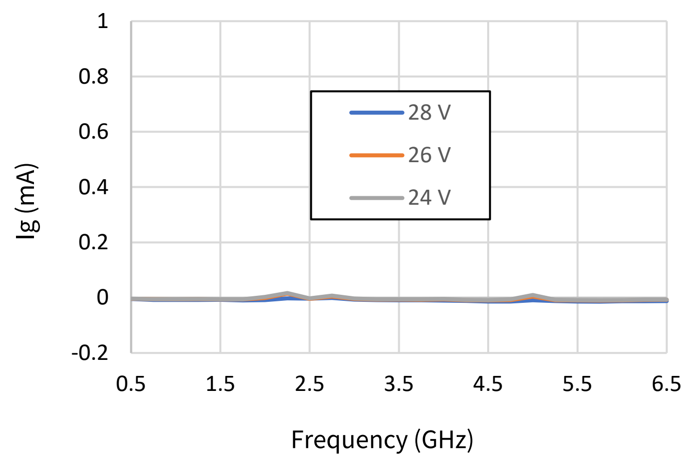
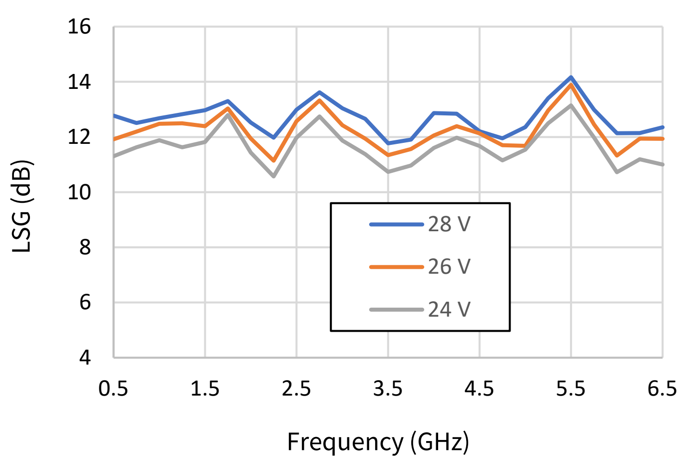


Figure 12: LSG v. Frequency v. Vd



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 13: Pout v. Frequency v. Idq

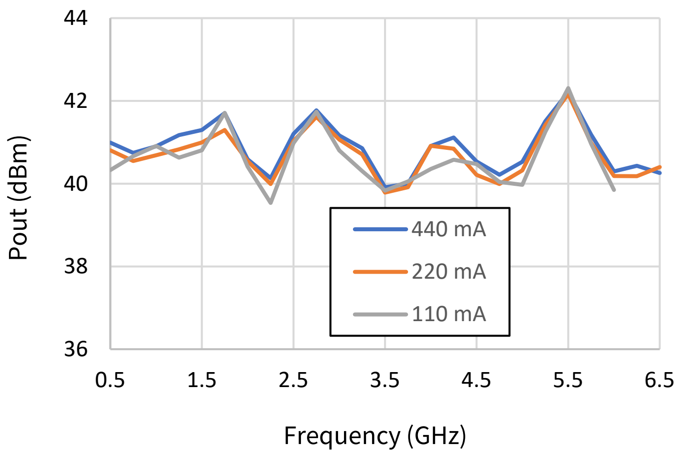


Figure 14: PAE v. Frequency v. Idq

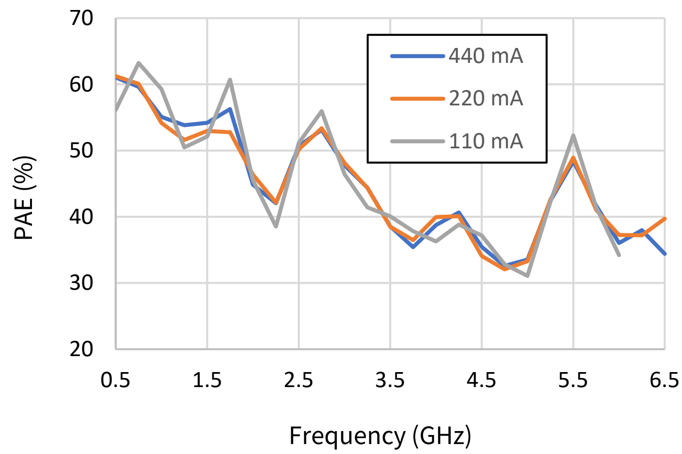


Figure 15: Id v. Frequency v. Idq

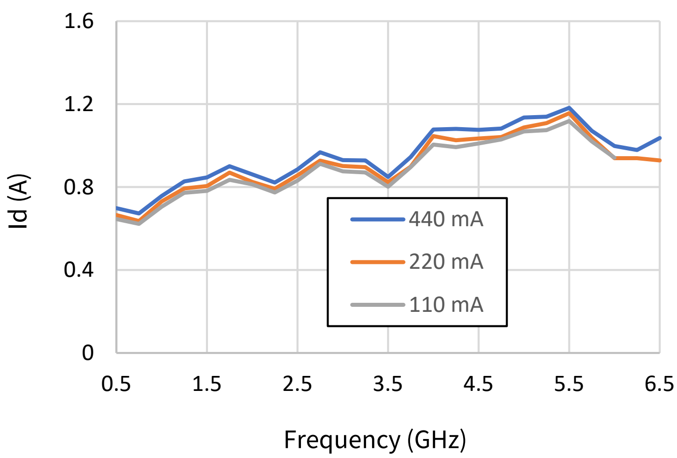


Figure 16: Ig v. Frequency v. Idq

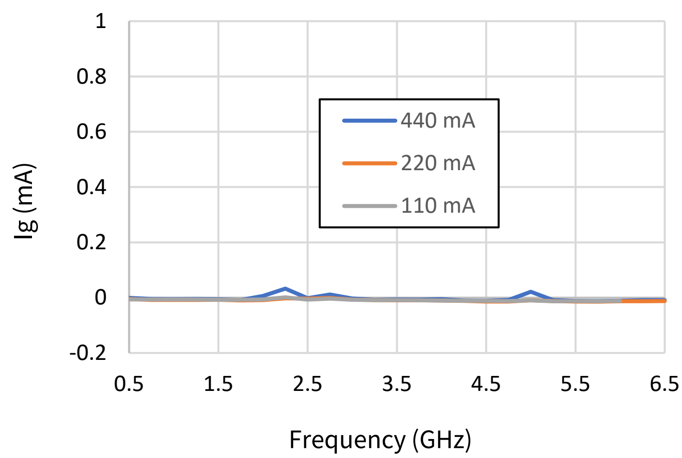
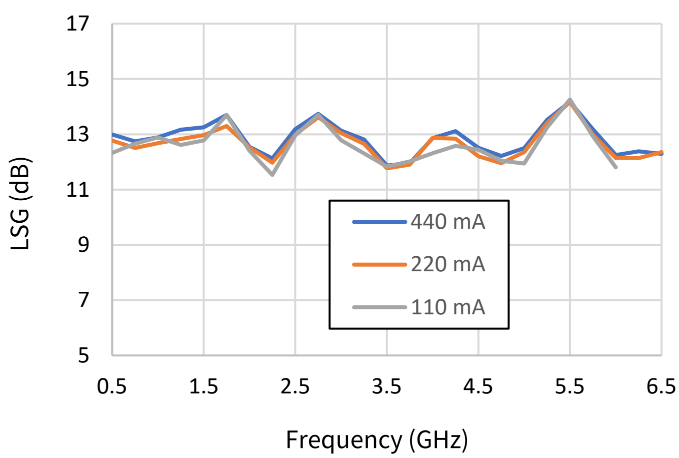


Figure 17: LSG v. Frequency v. Idq



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 18: Pout v. Pin v. Frequency

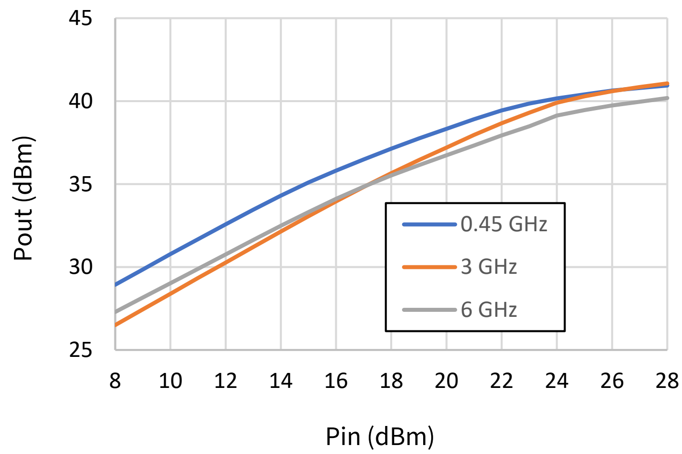


Figure 19: PAE v. Pin v. Frequency

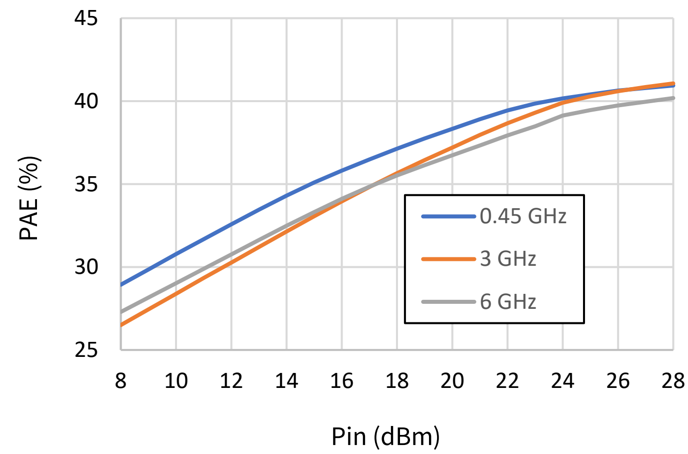


Figure 20: Id v. Pin v. Frequency

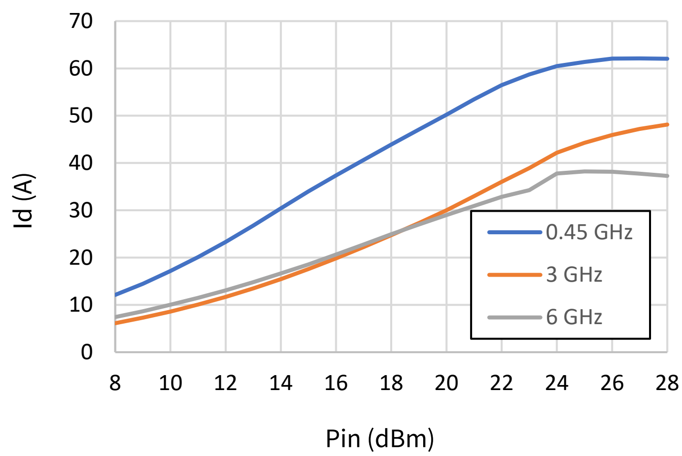


Figure 21: Ig v. Pin v. Frequency

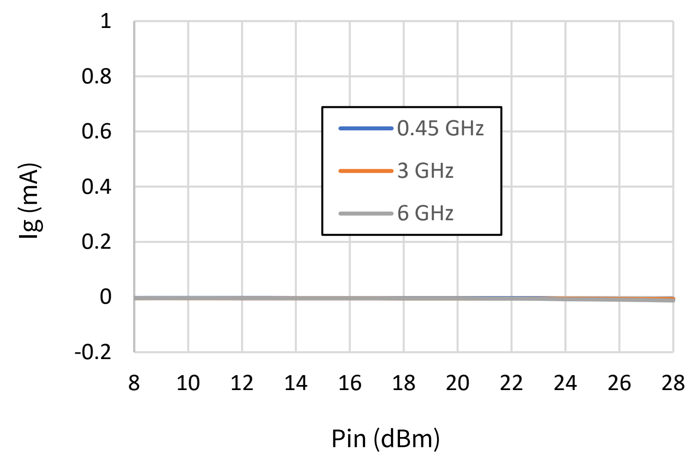
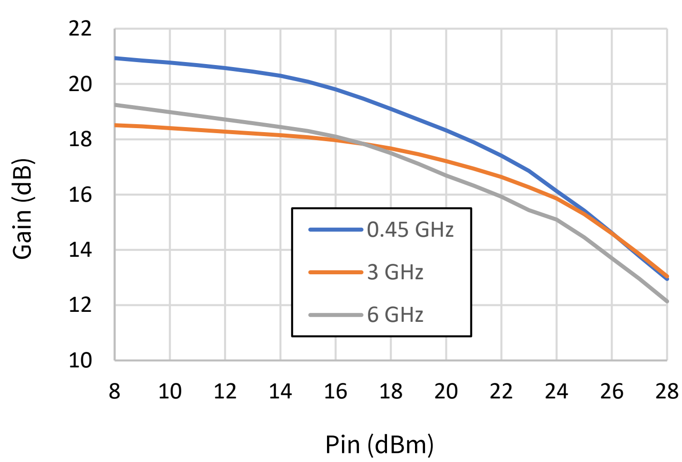


Figure 22: Gain v. Pin v. Frequency



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 23: Pout v. Pin v. Temperature

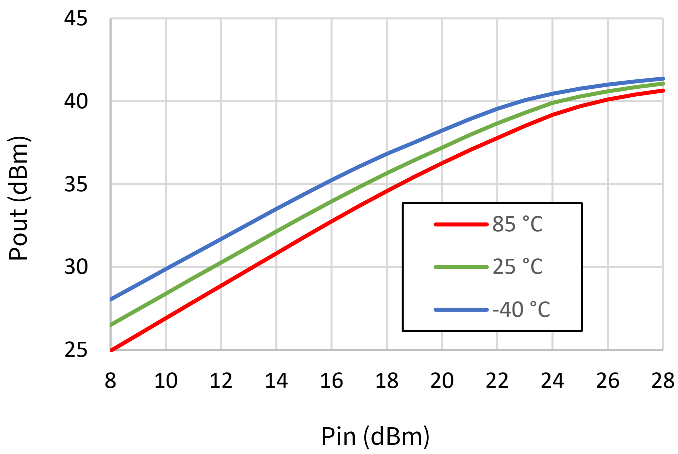


Figure 24: PAE v. Pin v. Temperature

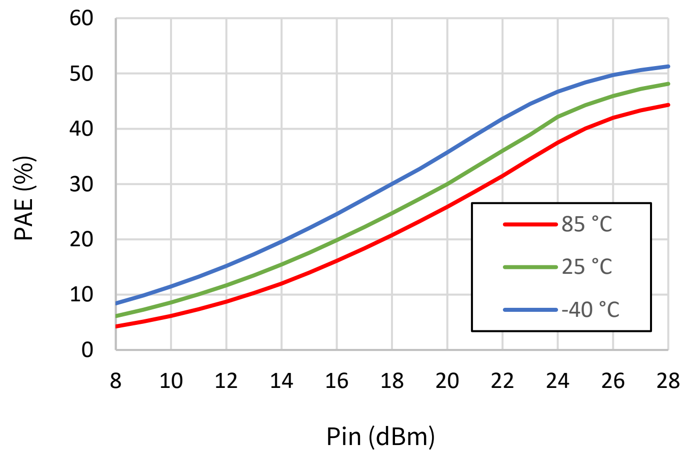


Figure 25: Id v. Pin v. Temperature

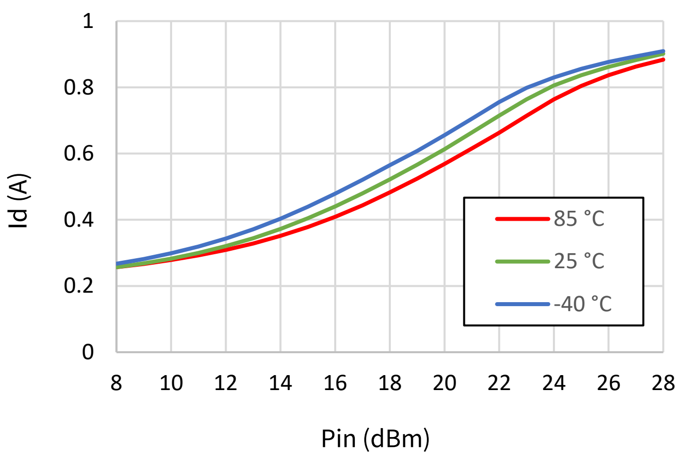


Figure 26: Ig v. Pin v. Temperature

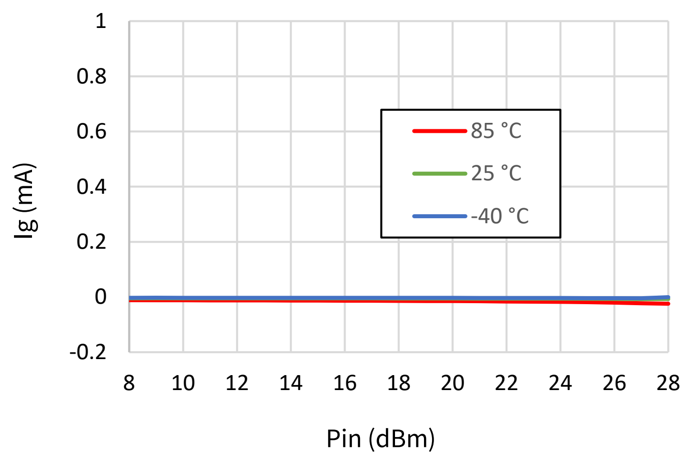
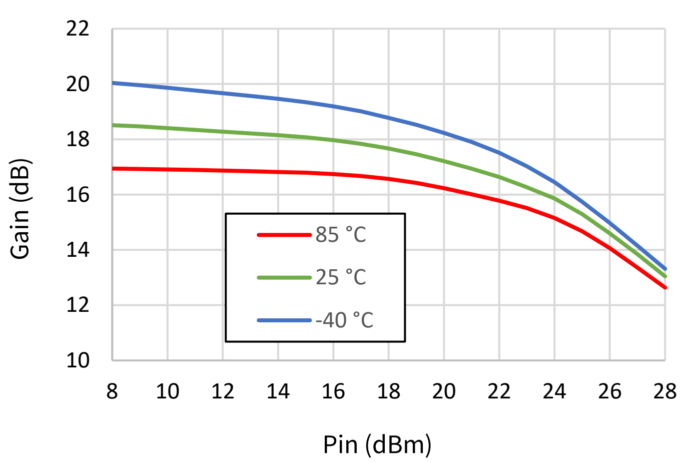


Figure 27: Gain v. Pin v. Temperature



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 28: Pout v. Pin v. Vd

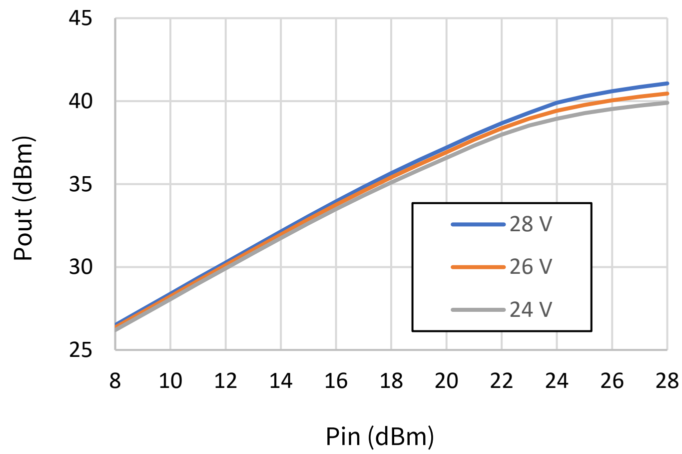


Figure 29: PAE v. Pin v. Vd

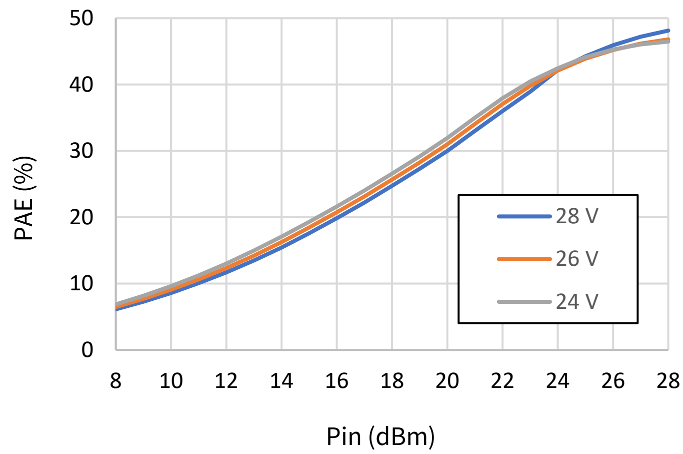


Figure 30: Id v. Pin v. Vd

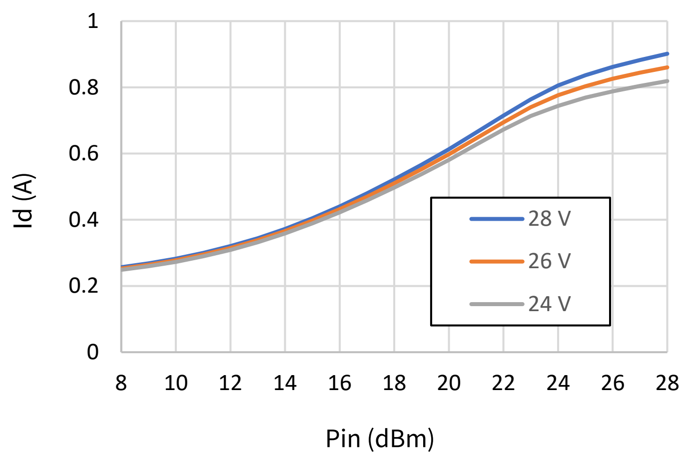


Figure 31: Ig v. Pin v. Vd

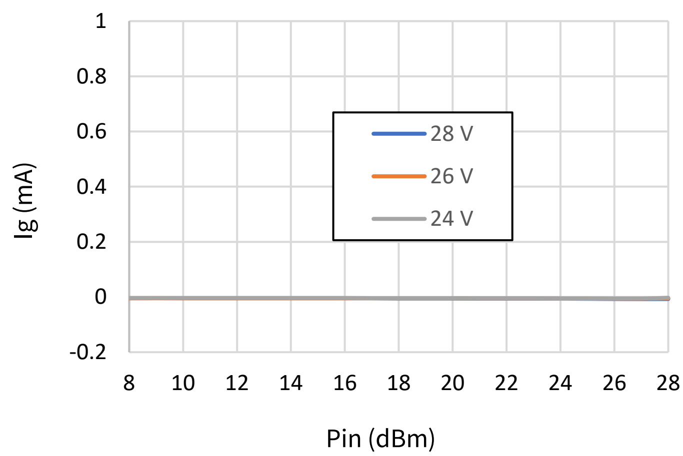
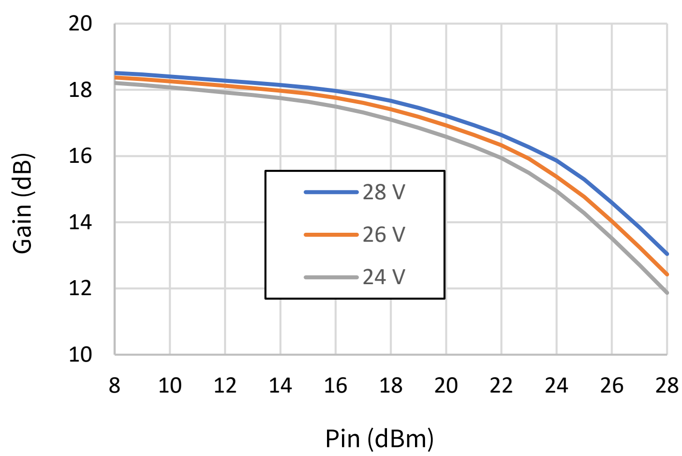


Figure 32: Gain v. Pin v. Vd



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = 28 dBm, T_{base}=25 °C, Frequency: 3GHz

Figure 33: Pout v. Pin v. Idq

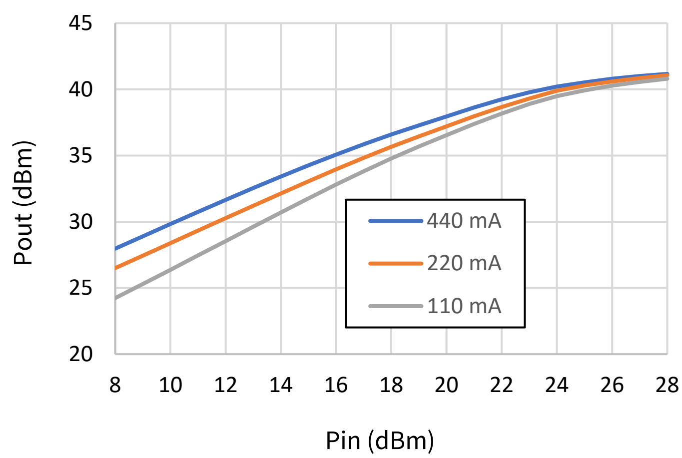


Figure 34: PAE v. Pin v. Idq

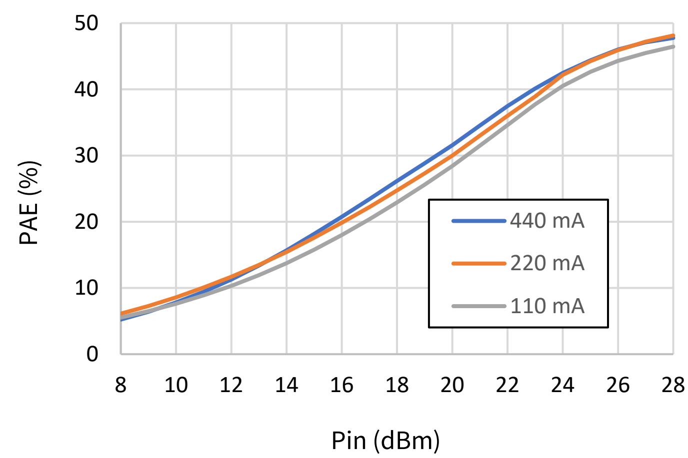


Figure 35: Id v. Pin v. Idq

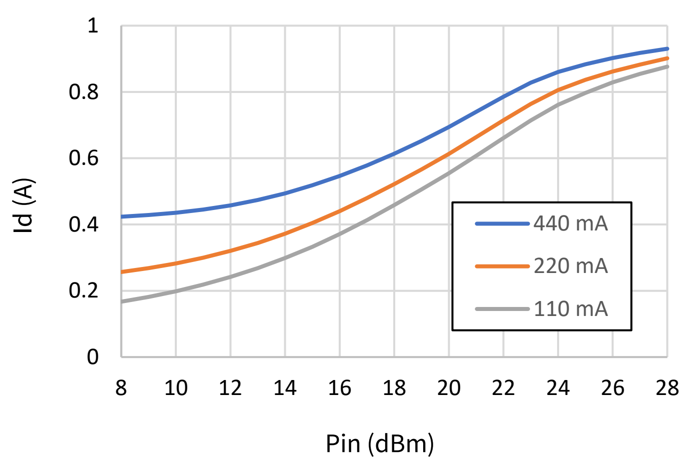


Figure 36: Ig v. Pin v. Idq

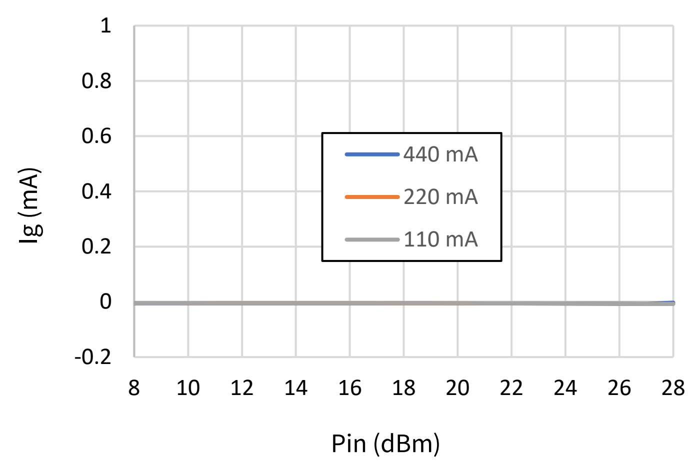
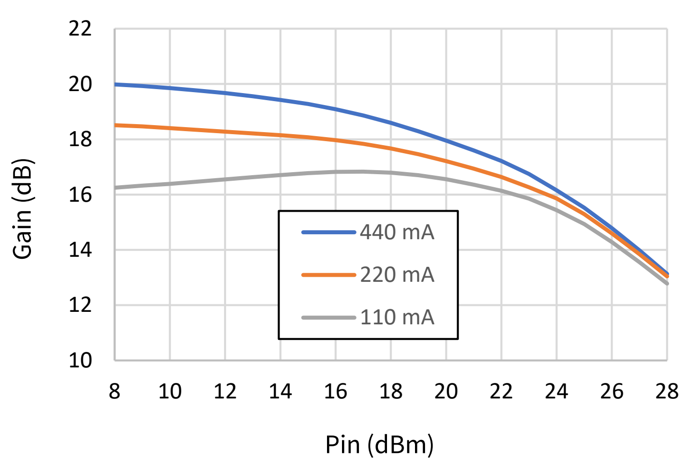


Figure 37: Gain v. Pin v. Idq



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = -10 dBm, T_{base}=25 °C

Figure 38: S21 v. Frequency v. Temperature

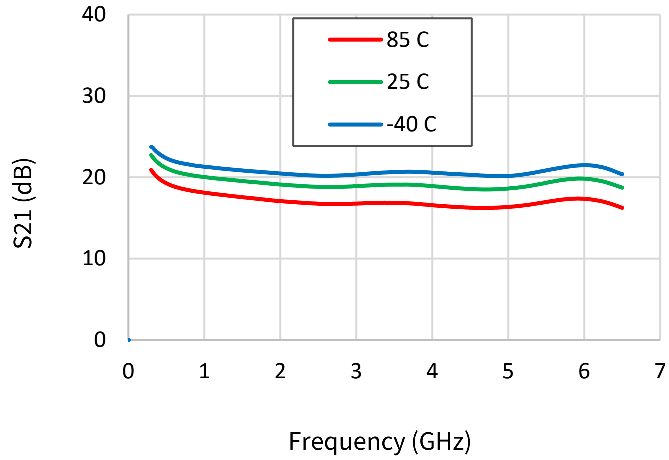


Figure 39: S21 v. Frequency v. Vd

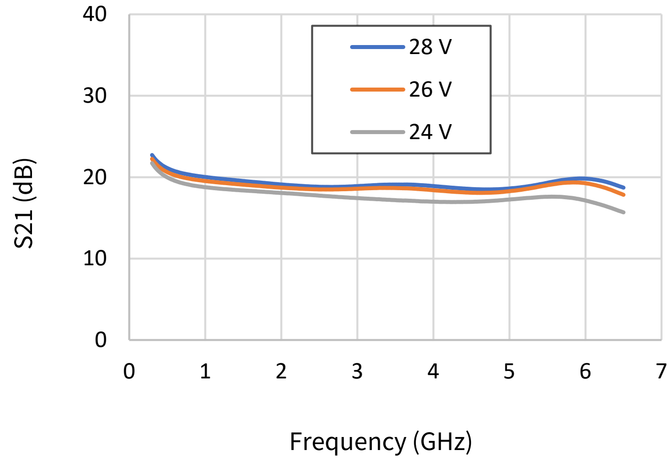


Figure 40: S11 v. Frequency v. Temperature

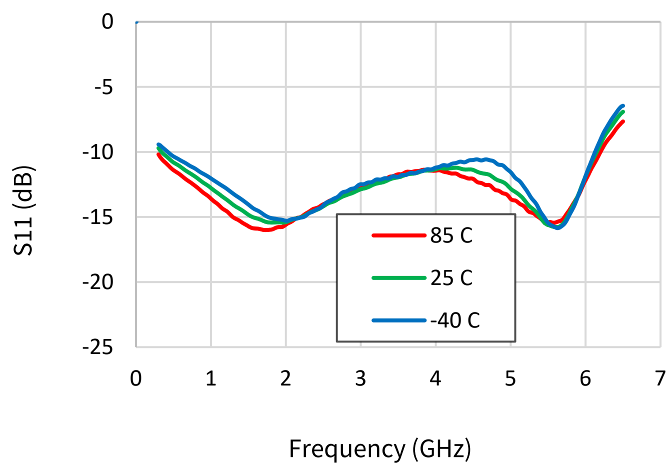


Figure 41: S11 v. Frequency v. Vd

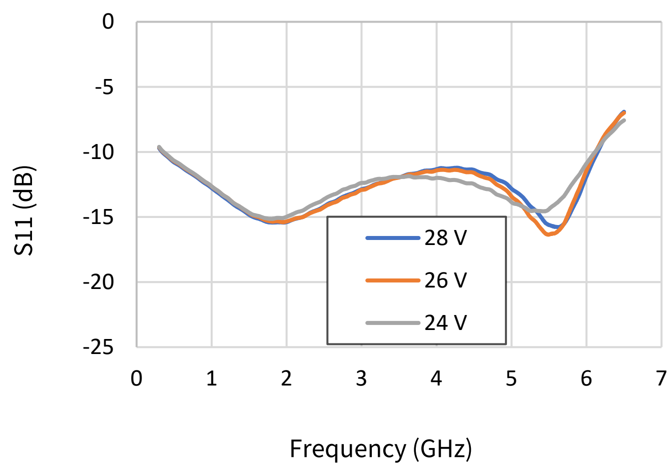


Figure 42: S22 v. Frequency v. Temperature

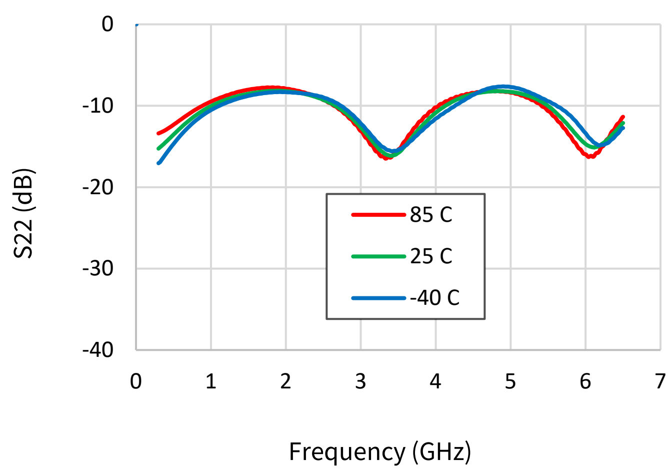
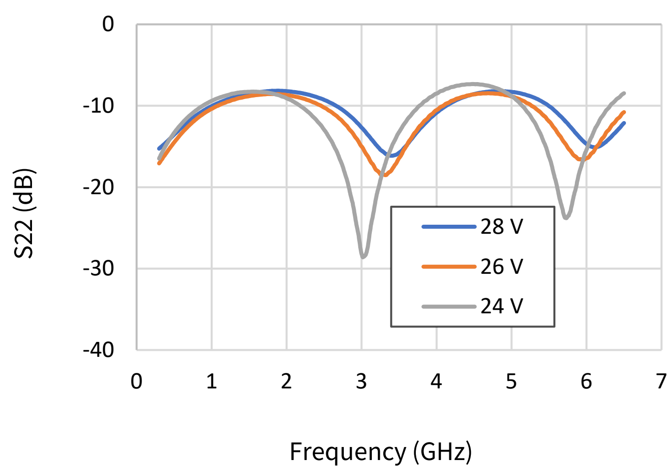


Figure 43: S22 v. Frequency v. Vd



Test conditions unless otherwise noted: Vd=28 V, Idq=0.220A, CW, Pin = -10 dBm, T_{base}=25 °C

Figure 44: S21 v. Frequency v. Idq

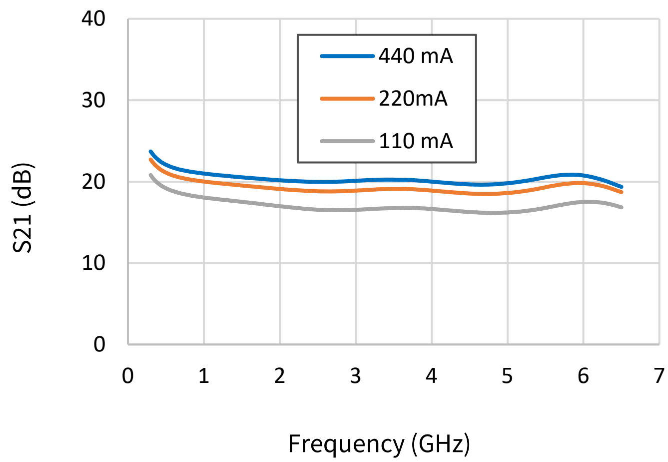


Figure 45: S11 v. Frequency v. Idq

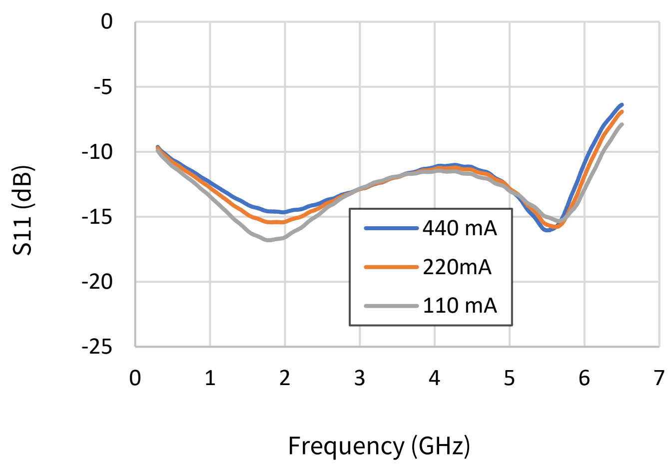
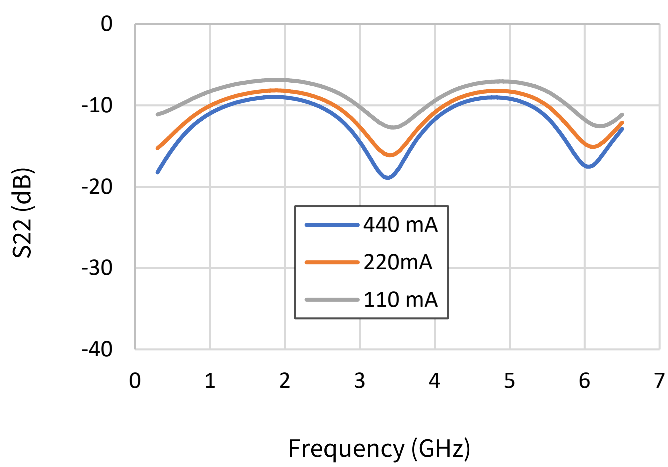


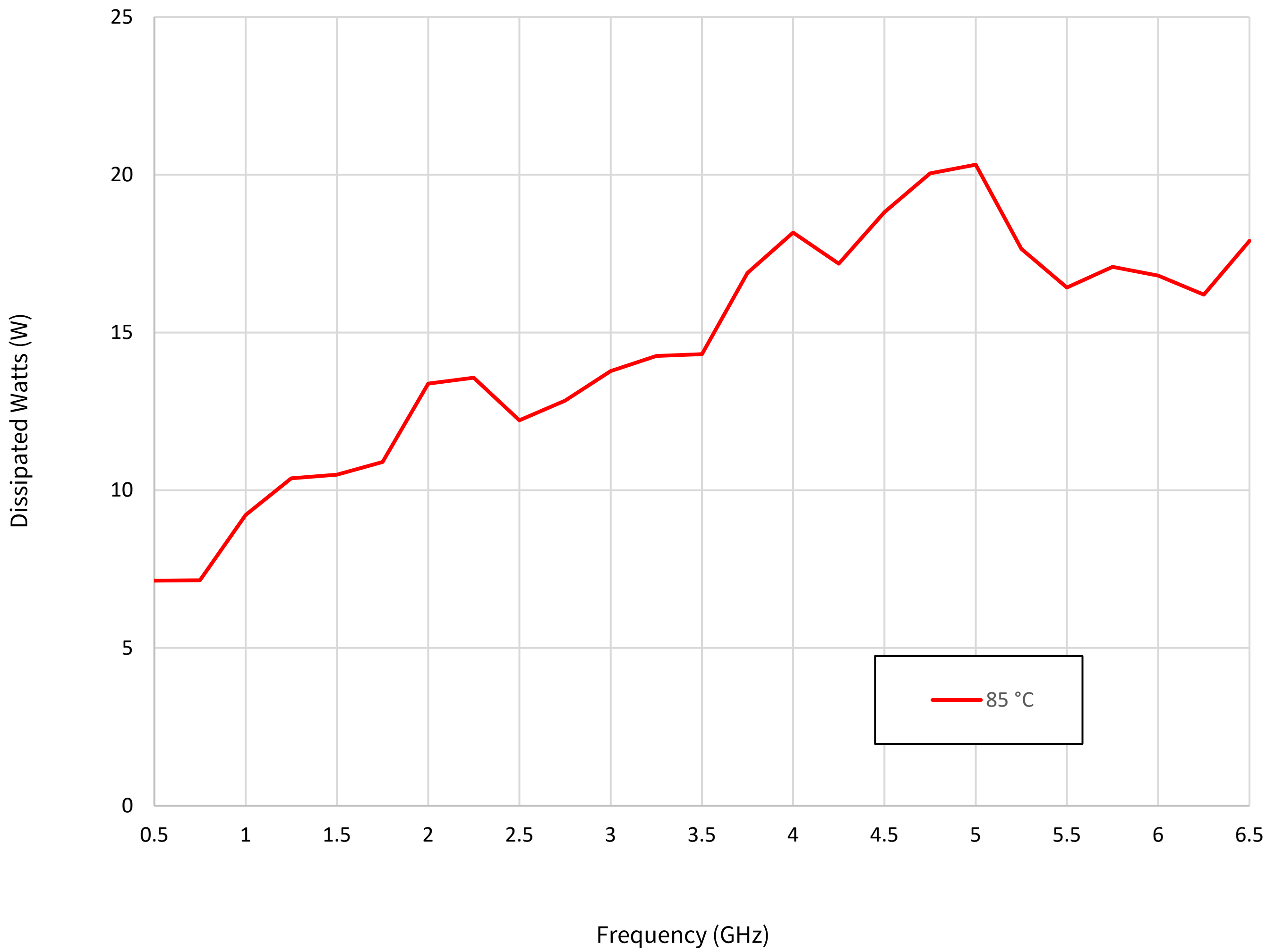
Figure 46: S22 v. Frequency v. Idq



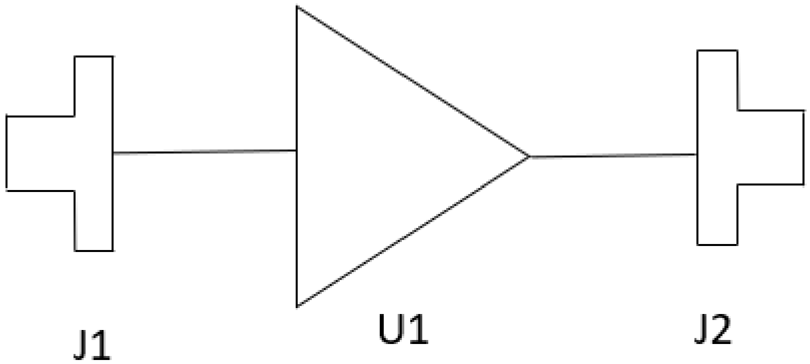
Thermal Characteristics

Parameter	Symbol	Value	Operating Conditions
Operating Junction Temperature	T_J	131°C	Freq = 3.0 GHz, V_d = 28 V, I_{dq} = 220 mA, I_{drive} = 0.88 A, P_{in} = 28 dBm, P_{out} = 40.6 dBm, P_{diss} = 13.8 W, T_{case} = 85°C, CW
Thermal Resistance, Junction to Case	$R_{θJC}$	3.3°C/W	

Power Dissipation v. Frequency (Tcase = 85°C)



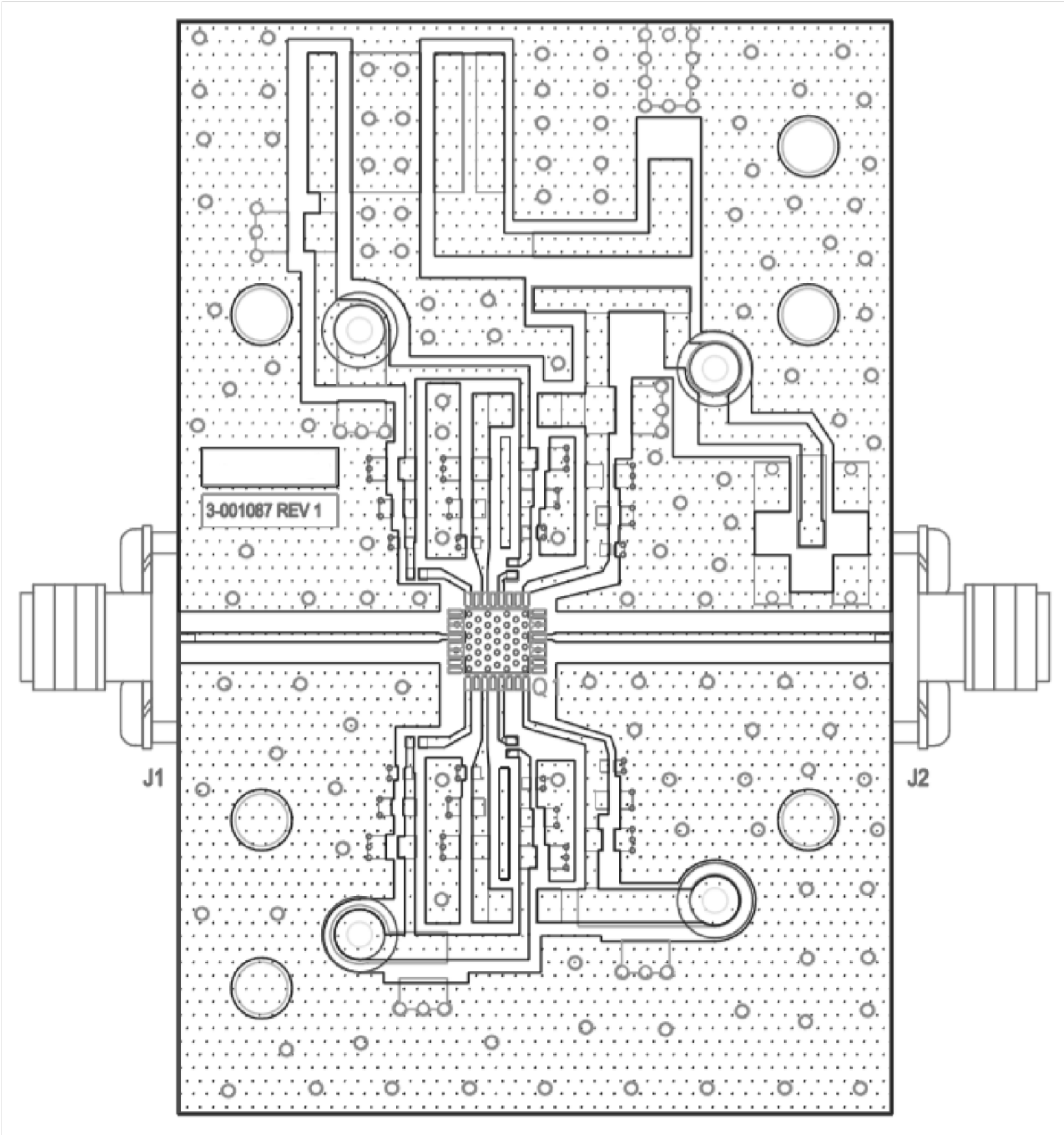
CMPA0560008S-AMP1 Evaluation Board Schematic Drawing



CMPA0560008S-AMP1 Evaluation Board Bill of Materials

Reference Designator	Description	Qty
J1, J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
U1	CMPA0560008S	1
-	PCB, TEST FIXTURE, RF35, 0.010", 5X5 2-STAGE, QFN	1
-	2-56 SOC HD SCREW 3/16 SS	4
-	#2 SPLIT LOCKWASHER SS	4

CMPA0560008S-AMP1 Evaluation Board Assembly Drawing



Bias On Sequence

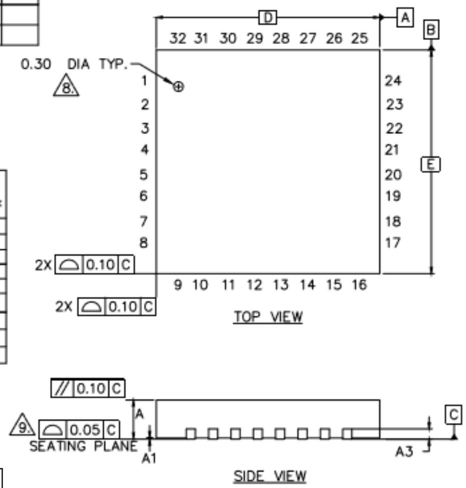
1. Ensure RF is turned-off
2. Apply pinch-off voltage of -5 V to the gate (Vg)
3. Apply nominal drain voltage (Vd)
4. Adjust Vg to obtain desired quiescent drain current (Idq)
5. Apply RF

Bias Off Sequence

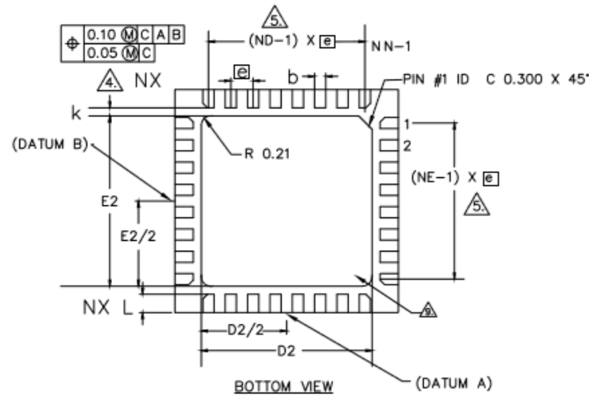
1. Turn RF off
2. Apply pinch-off to the gate (Vg=-5V)
3. Turn off drain voltage (Vd)
4. Turn off gate voltage (Vg)

Product Dimensions

SYMBOL	MIN.	NOM.	MAX.	NOTE
A	0.80	0.90	1.00	
A1	0.00	0.03	0.06	
A3		0.203 REF.		
θ	0	——	12	2
K		0.17 MIN.		
D		5.0 BSC		
E		5.0 BSC		



SYMBOL	0.50mm LEAD PITCH			NOTE
	MIN.	NOM.	MAX.	
e		0.50 BSC.		
N		32		3
ND		8		5
NE		8		5
L	0.35	0.41	0.46	
b	0.21	0.25	0.29	4
D2	3.76	3.82	3.88	
E2	3.76	3.82	3.88	



NOTES :
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M. – 1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS, θ IS IN DEGREES.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM TERMINAL TIP.
5. ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
6. MAX. PACKAGE WARPAGE IS 0.05 mm.
7. MAXIMUM ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.
8. PIN #1 ID ON TOP WILL BE LASER MARKED.
9. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
10. THIS DRAWING CONFORMS TO JEDEC REGISTERED OUTLINE MO-220
11. ALL PLATED SURFACES ARE 100% TIN MATTE 0.010 mm +/- 0.005 mm.

PIN	DESC.	PIN	DESC
1	NC	17	NC
2	NC	18	NC
3	RFGND	19	NC
4	RFIN / Vg	20	RFGND
5	RFGND	21	RFOUT / Vd
6	NC	22	RFGND
7	NC	23	NC
8	NC	24	NC
9	NC	25	NC
10	NC	26	NC
11	NC	27	NC
12	NC	28	NC
13	NC	29	NC
14	NC	30	NC
15	NC	31	NC
16	NC	32	NC

Electrostatic Discharge (ESD) Classification

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

Product Ordering Information

Part Number	Description	MOQ Increment	Image
CMPA0560008S	0.5 – 6 GHz, 10W GaN MMIC		
CMPA0560008S-AMP1	Evaluation Board w/ PA	1 Each	

Notes & Disclaimer

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