CGHV1A250F

8.8 - 9.6 GHz, 300 W GaN HPA

Description

Wolfspeed's CGHV1A250F is a 300W packaged transistor fully matched to 50 ohms at both input and output ports. Utilizing Wolfspeed's high performance, 50V, 0.25um GaN on SiC production process, the CGHV1A250F operates from 8.8-9.6 GHz and targets pulsed radar applications such a marine weather radar. The CGHV1A250F typically achieves 300 W of saturated output power with 12 dB of large signal gain and 40% drain efficiency under pulsed operation.

Available in an industry-standard flange package, the CGHV1A250F provides high-power, X-band performance allowing customers to design systems that meet next-generation requirements.

Figure 1. CGHV1A250F

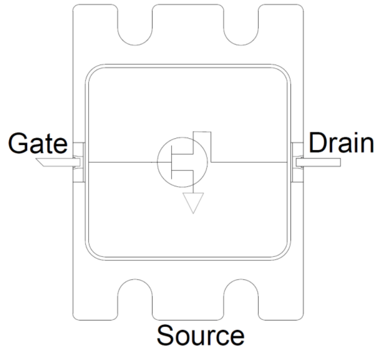


Figure 2. Functional Block Diagram

Features

- Psat: 300 W
- DE: 40 %
- LSG: 12 dB
- S21: 15 dB
- S11: -9 dB
- S22: -7 dB

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

Applications

- Marine Weather Radar

Absolute Maximum Ratings

Parameter	Symbol	Units	Value	Conditions
Pulse Width	PW	µs	100	
Duty Cycle	DC	%	10	
Drain to Source Voltage	V_{DSS}	V	150	
Gate Voltage	V_G	V	-8,+2	
Drain Current	I_D	A	30	
Gate Current	I_G	mA	42.24	
Input Power	P_{in}	dBm	46	
Dissipated Power[1]	P_{diss}	W	450	85°C
Storage Temperature	T_{stg}	°C	-65, +150	
Mounting Temperature	Tc	°C	260	30 seconds
Junction Temperature	Tc	°C	275	MTTF > 1E6
Output Mismatch Stress[1]	VSWR	Ψ	3:1	

1 Pulsed 100 uS, 10 %

Recommended Operating Conditions

Parameter	Symbol	Units	Typical Value	Conditions
Drain Voltage	Vds	V	45	
Gate Quiescent Voltage	VgsQ	V	-2.5	Vds=45V, Ids1060mA
Drain Current	Idq	mA	1060	
Input Power	Pin	dBm	43	
Case Temperature	Tcase	°C	-40 to 85	

RF Specifications (CGHV1A250F-AMP)

Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25 °C

Parameter	Units	Frequency	Min	Typical	Max	Conditions
Frequency	GHz		8.8		9.6	
Output Power	dBm	8.8		55.0		
		9.2		55.0		
		9.6		54.5		
Drain Efficiency	%	8.8		42		
		9.2		44		
		9.6		46		
LSG	dB	8.8		12.0		
		9.2		12.0		
		9.6		11.5		
Small-Signal Gain (S21)	dB	8.8		16.0		Pin = -20dBm
		9.2		15.5		
		9.6		15.0		
Input Return Loss	dB			-9		Pin = -20dBm
Output Return Loss	dB			-7		Pin = -20dBm

Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 3: Pout v. Frequency v. Temperature

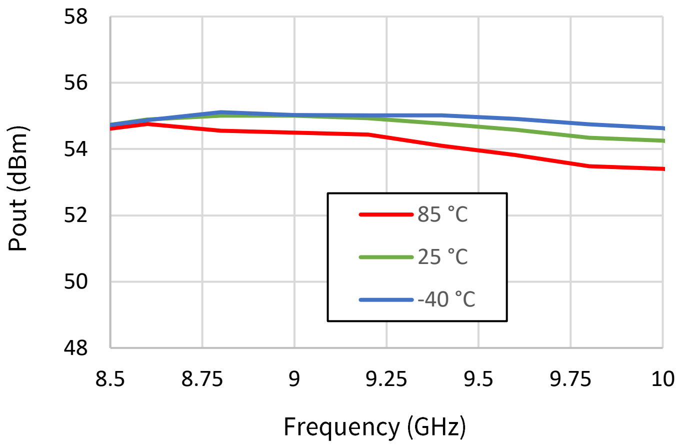


Figure 4: DE v. Frequency v. Temperature

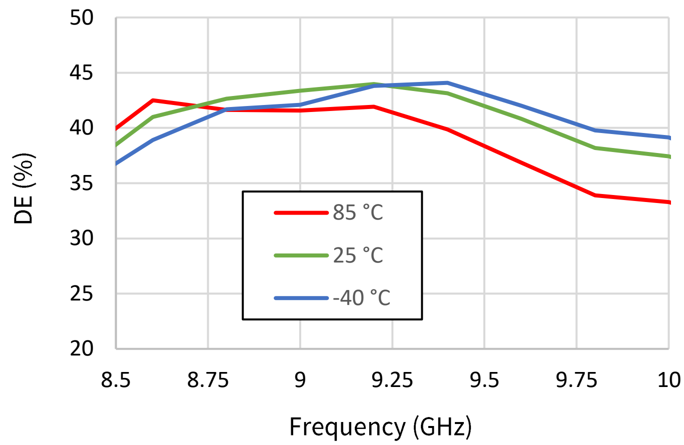


Figure 5: Id v. Frequency v. Temperature

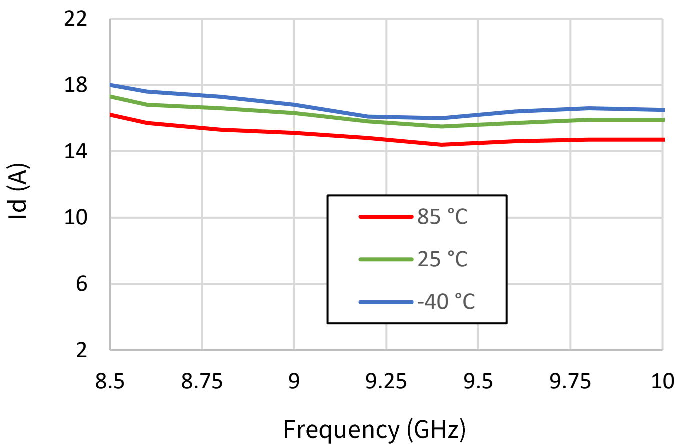


Figure 6: Ig v. Frequency v. Temperature

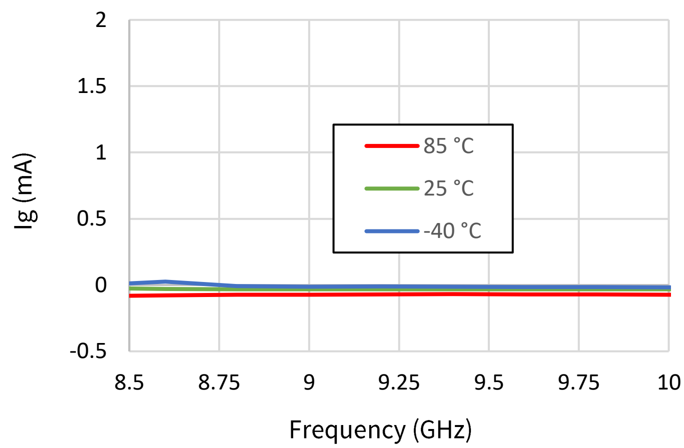
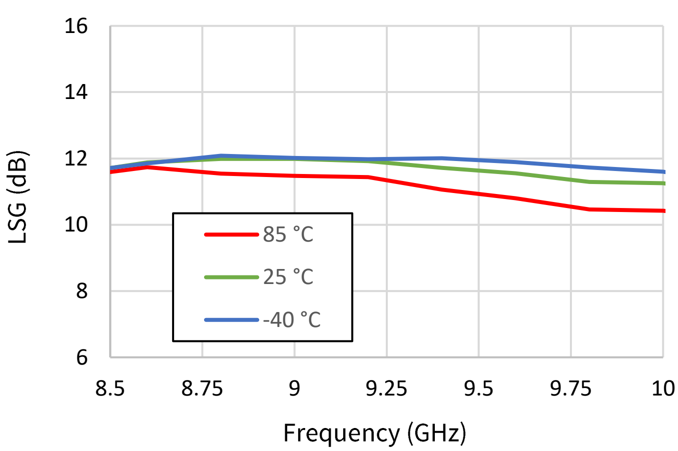


Figure 7: LSG v. Frequency v. Temperature



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 8: Pout v. Frequency v. Vd

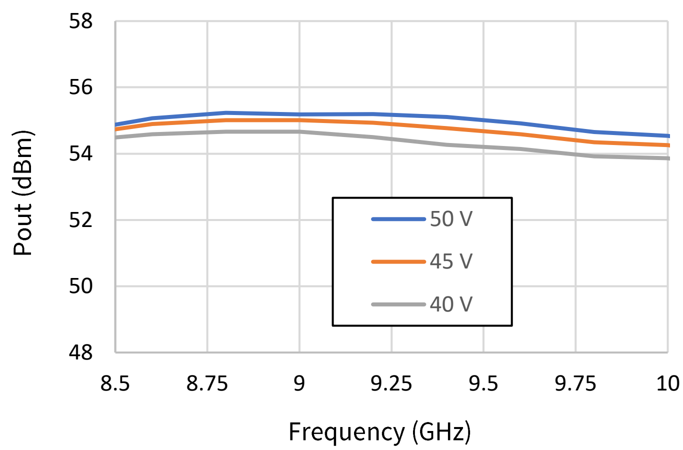


Figure 9: DE v. Frequency v. Vd

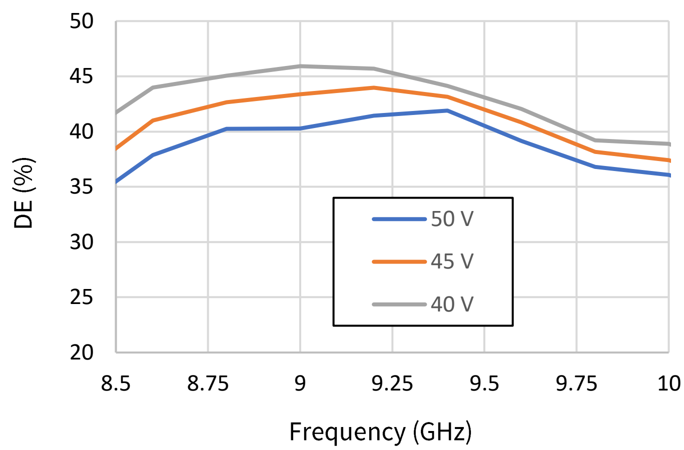


Figure 10: Id v. Frequency v. Vd

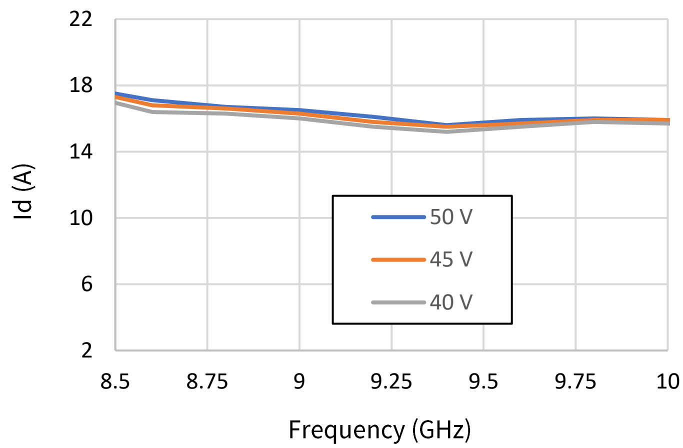


Figure 11: Ig v. Frequency v. Vd

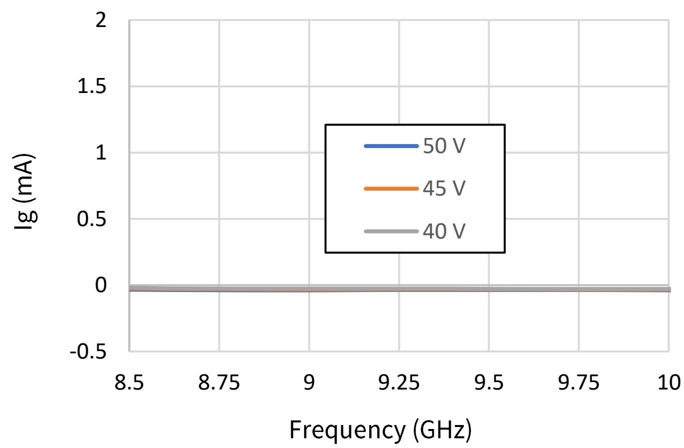
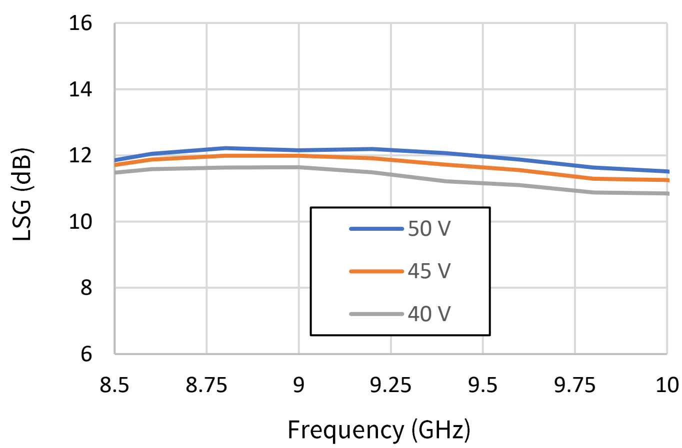


Figure 12: LSG v. Frequency v. Vd



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 13: Pout v. Frequency v. Idq

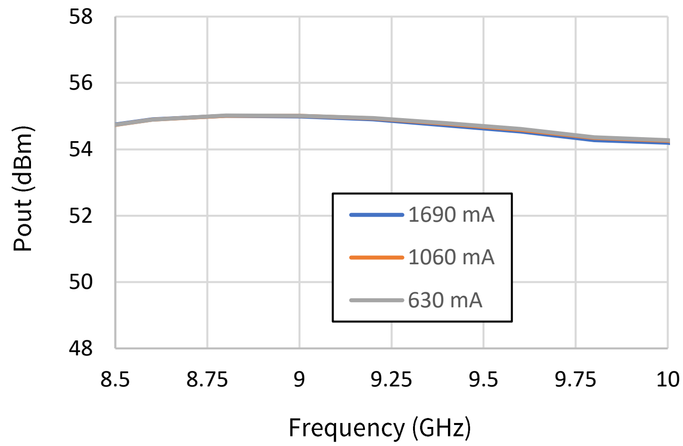


Figure 14: DE v. Frequency v. Idq

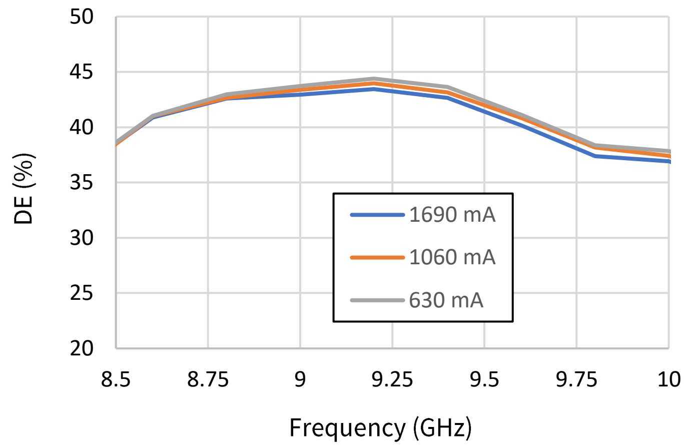


Figure 15: Id v. Frequency v. Idq

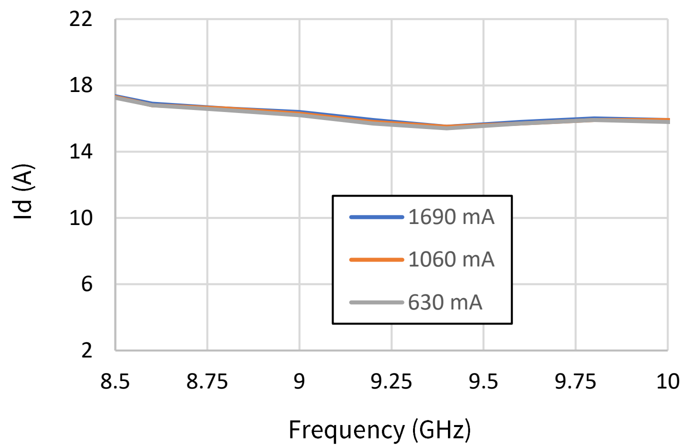


Figure 16: Ig v. Frequency v. Idq

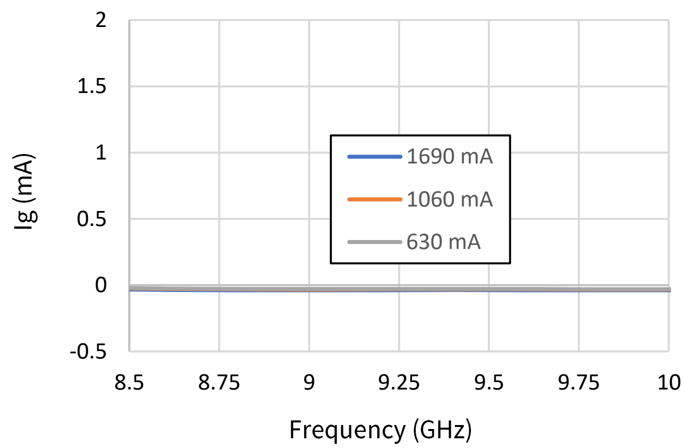
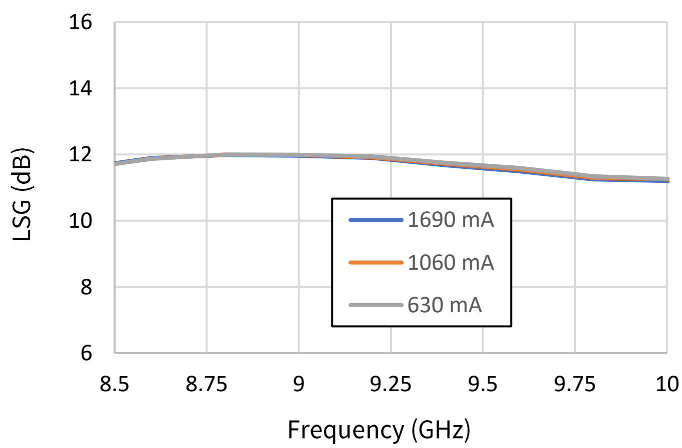


Figure 17: LSG v. Frequency v. Idq



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 18: Pout v. Pin v. Frequency

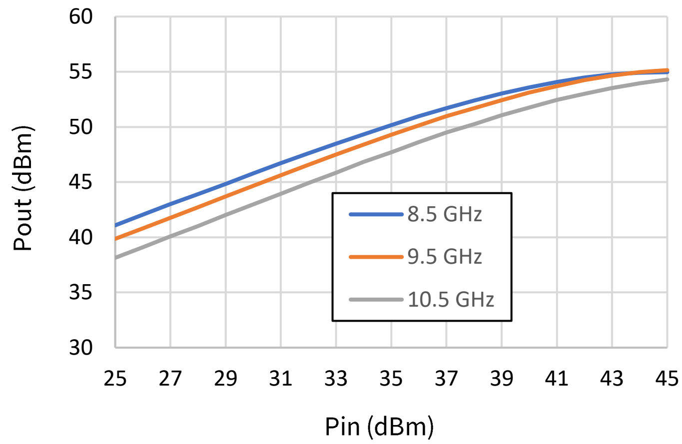


Figure 19: DE v. Pin v. Frequency

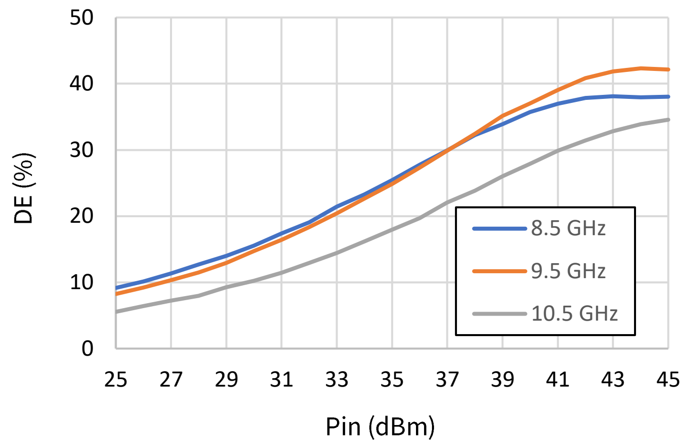


Figure 20: Id v. Pin v. Frequency

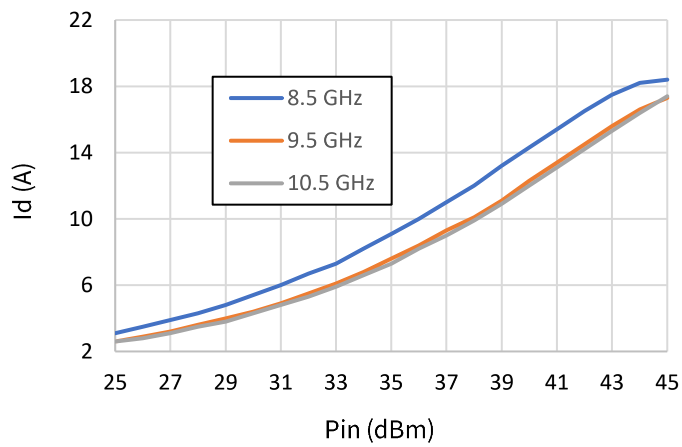


Figure 21: Ig v. Pin v. Frequency

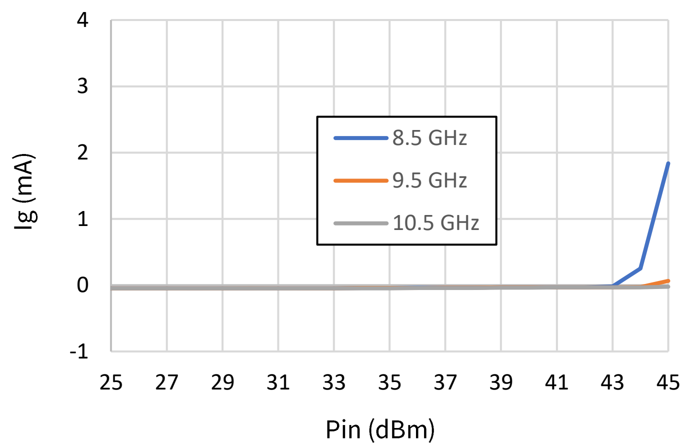
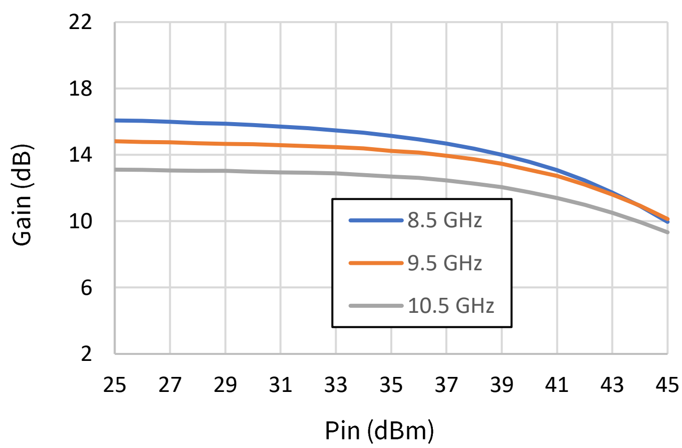


Figure 22: Gain v. Pin v. Frequency



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 23: Pout v. Pin v. Temperature

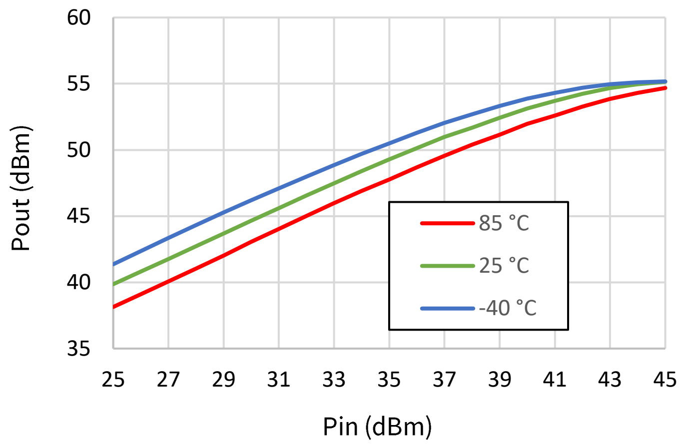


Figure 24: DE v. Pin v. Temperature

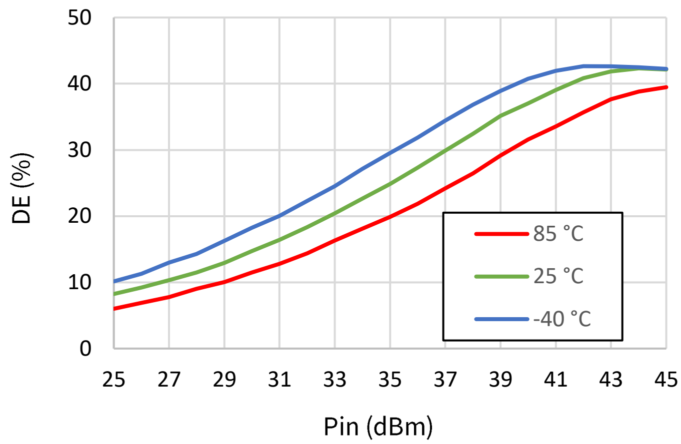


Figure 25: Id v. Pin v. Temperature

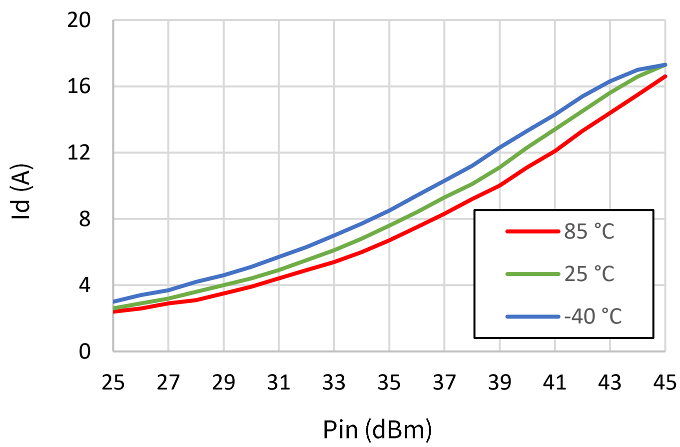


Figure 26: Ig v. Pin v. Temperature

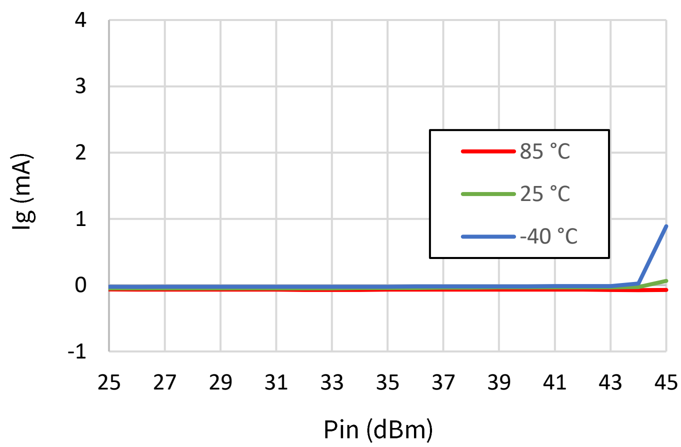
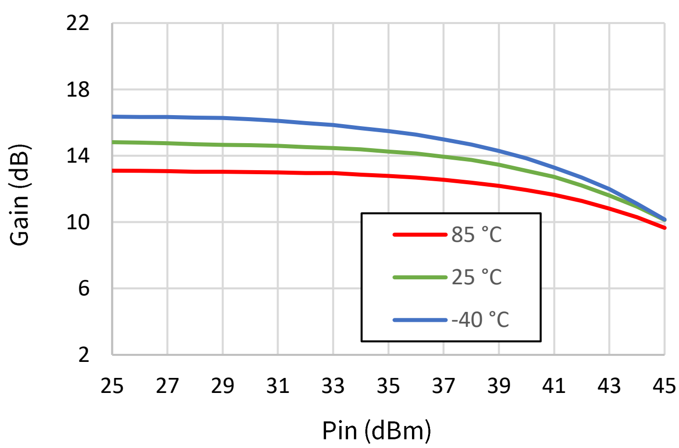


Figure 27: Gain v. Pin v. Temperature



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 28: Pout v. Pin v. Vd

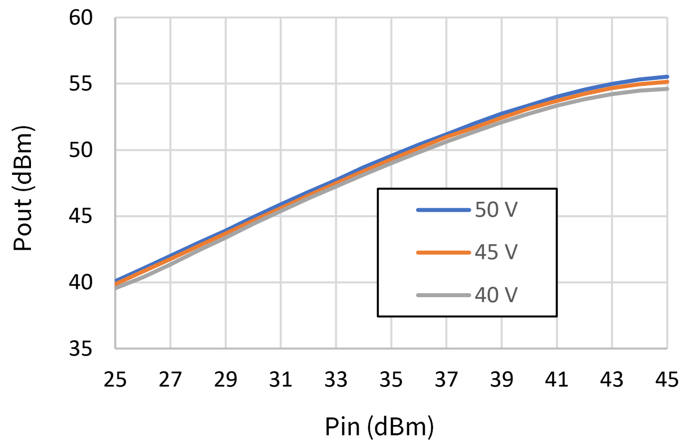


Figure 29: DE v. Pin v. Vd

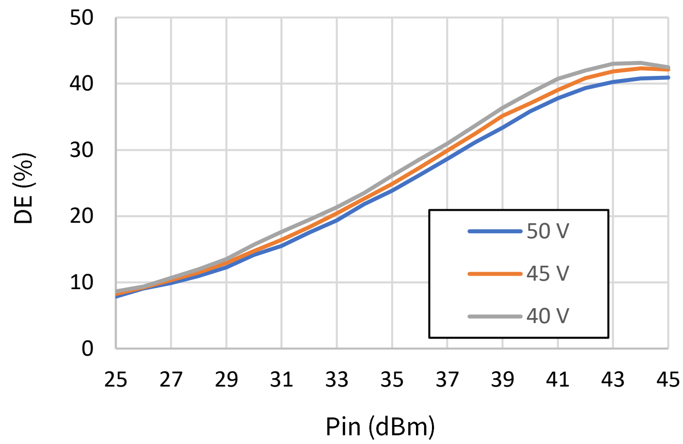


Figure 30: Id v. Pin v. Vd

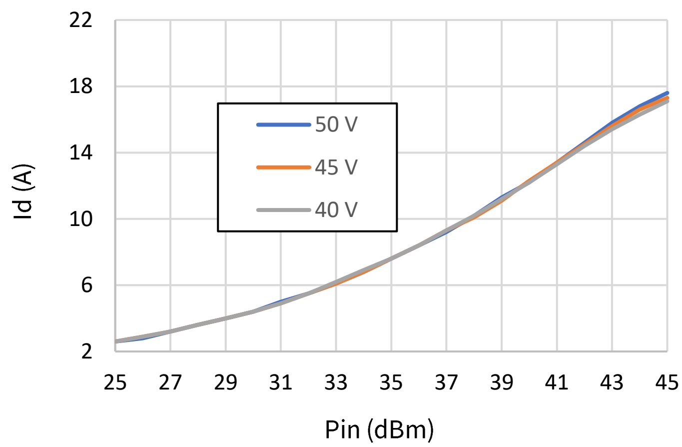


Figure 31: Ig v. Pin v. Vd

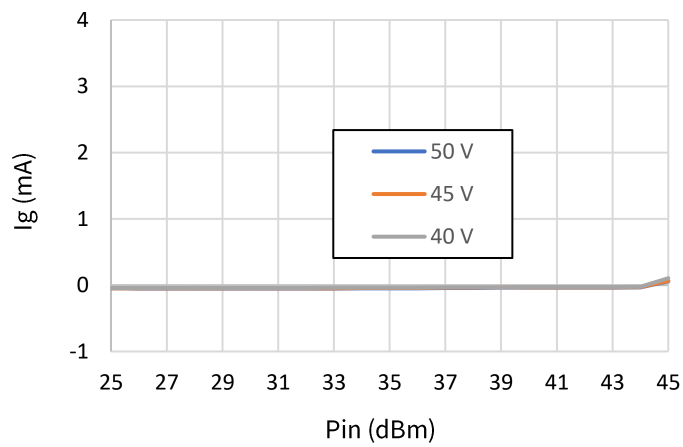
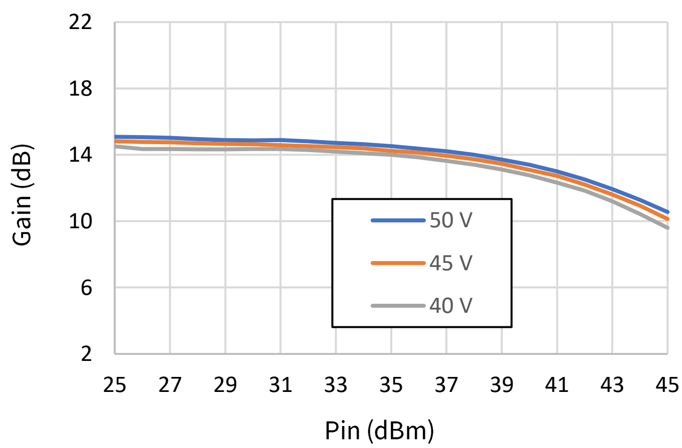


Figure 32: Gain v. Pin v. Vd



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, PW=100uS, DC=10%, Pin = 43dBm, T_{base}=25°C, Frequency: 9.5GHz

Figure 33: Pout v. Pin v. Idq

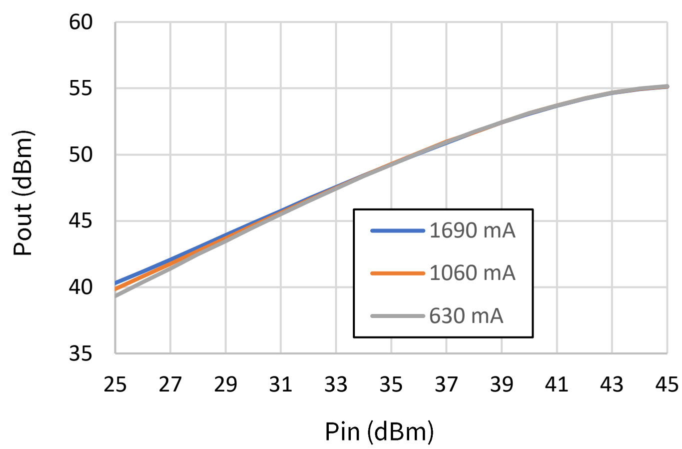


Figure 34: DE v. Pin v. Idq

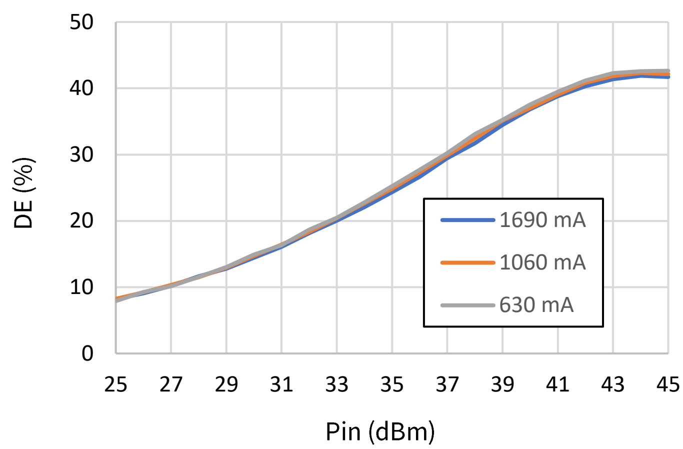


Figure 35: Id v. Pin v. Idq

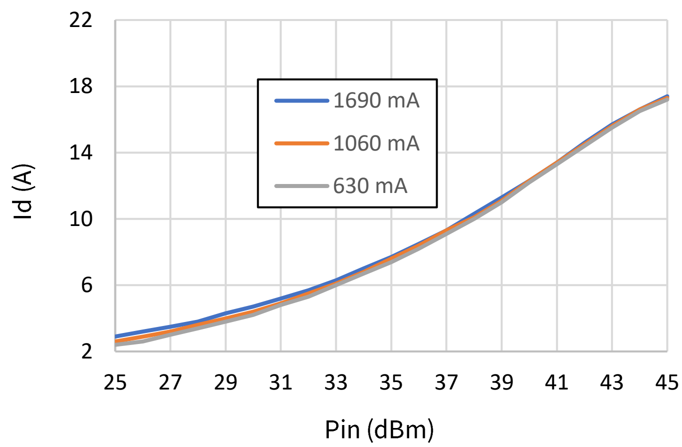


Figure 36: Ig v. Pin v. Idq

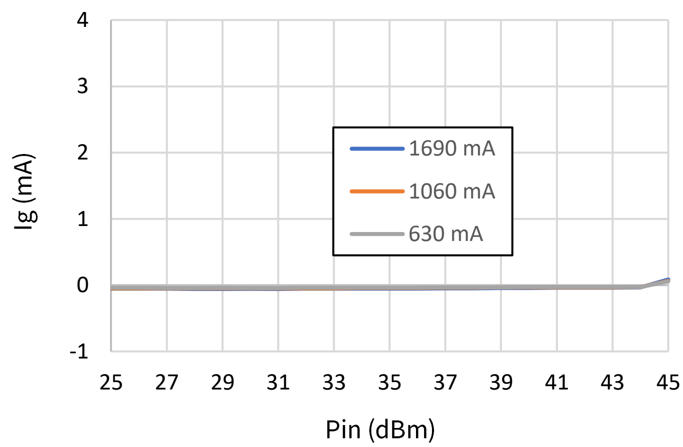
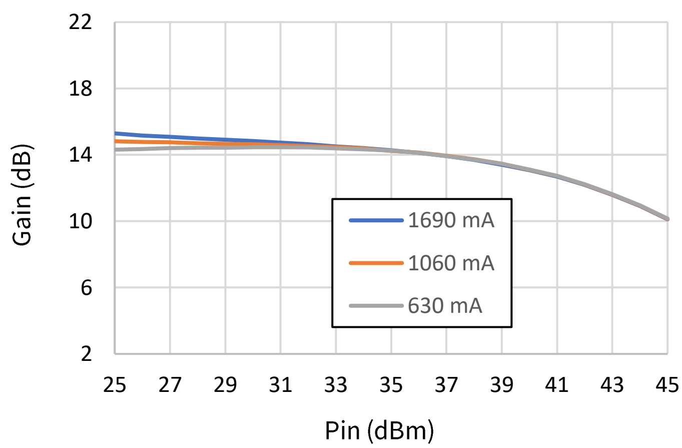


Figure 37: Gain v. Pin v. Idq



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, Signal = CW, Pin = -20dBm, T_{base}=25 °C

Figure 38: S21 v. Frequency v. Temperature

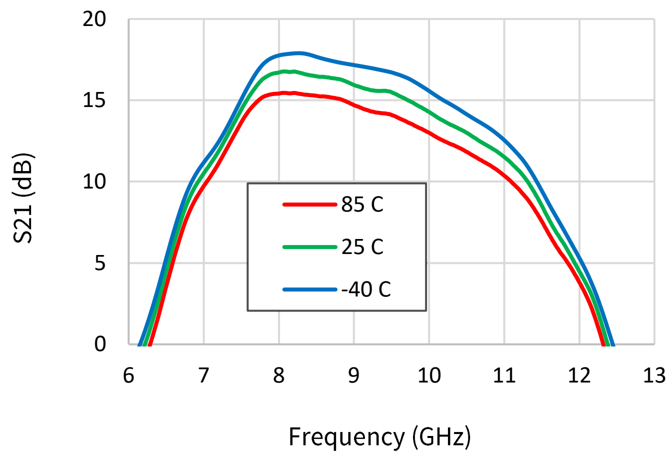


Figure 39: S21 v. Frequency v. Vd

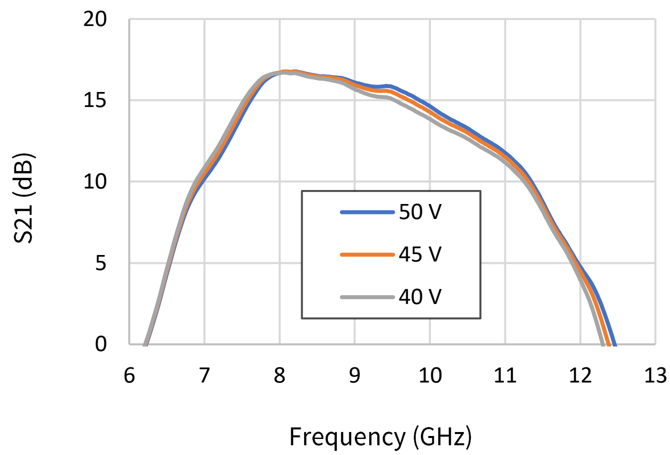


Figure 40: S11 v. Frequency v. Temperature

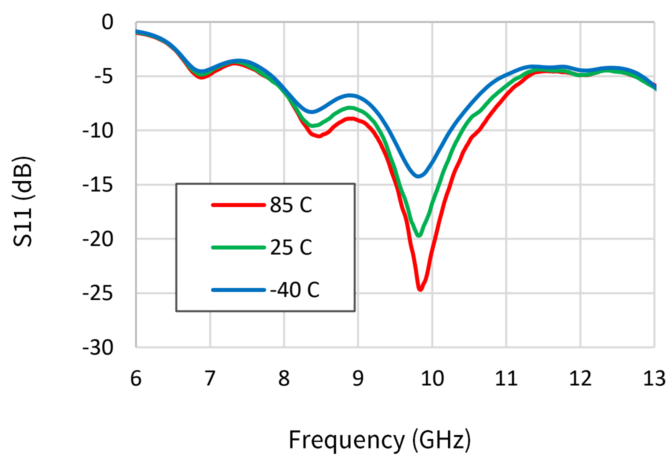


Figure 41: S11 v. Frequency v. Vd

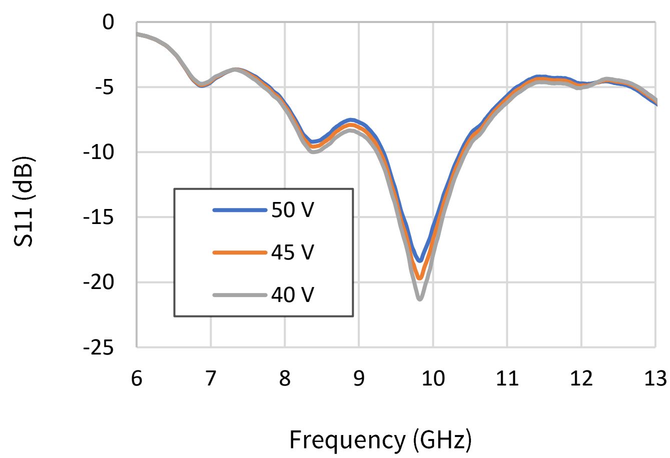


Figure 42: S22 v. Frequency v. Temperature

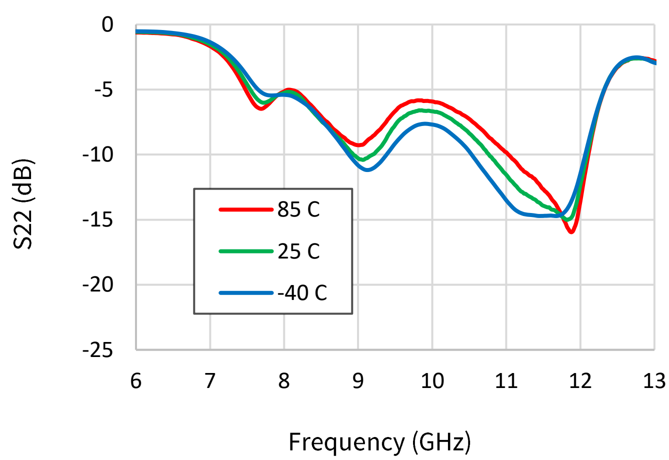
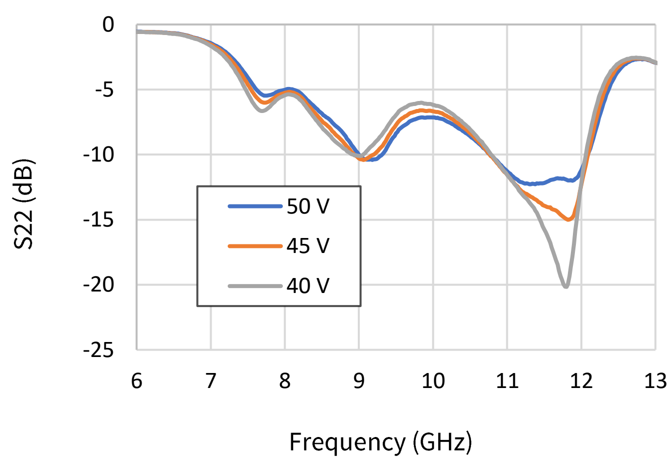


Figure 43: S22 v. Frequency v. Vd



Test conditions unless otherwise noted: Vd=45V, Idq= 1060mA, Signal = CW, Pin = -20dBm, T_{base}=25 °C

Figure 44: S21 v. Frequency v. Idq

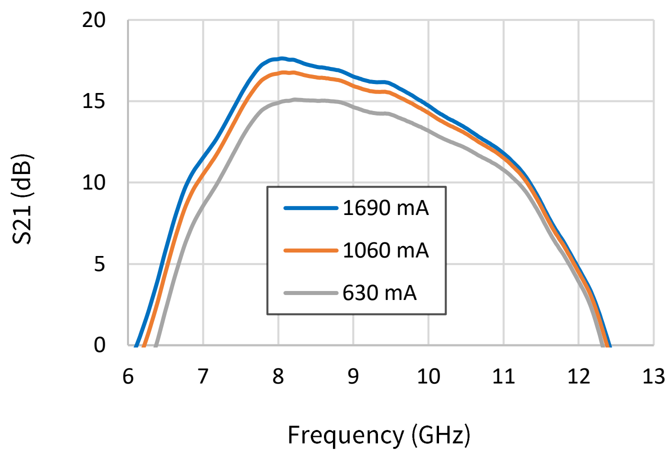


Figure 45: S11 v. Frequency v. Idq

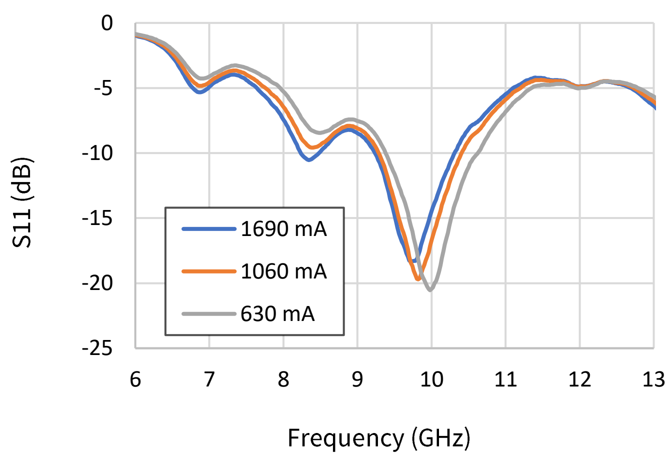
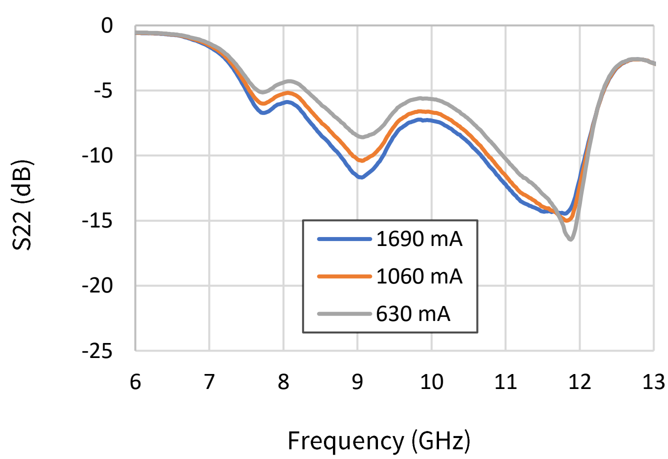


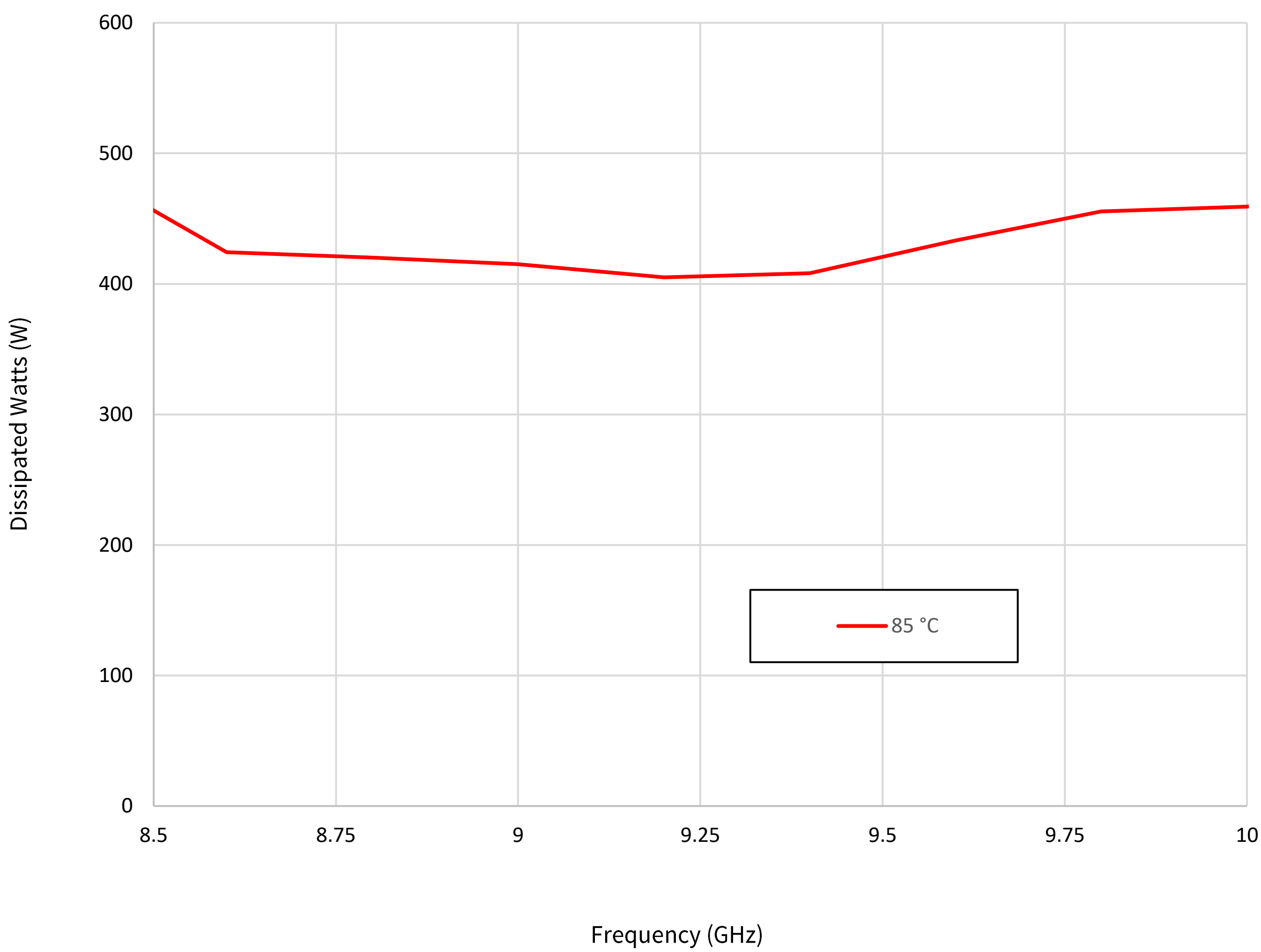
Figure 46: S22 v. Frequency v. Idq



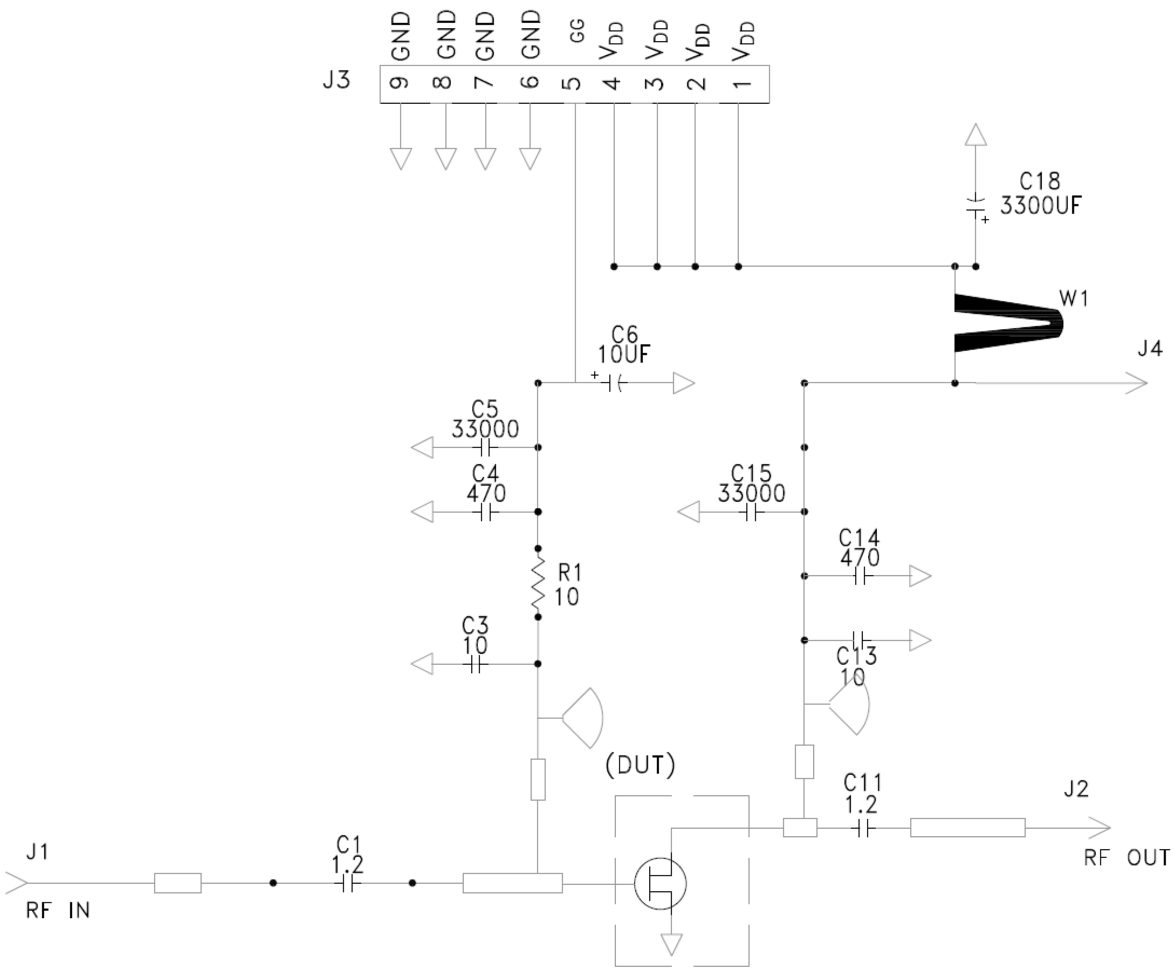
Thermal Characteristics

Parameter	Symbol	Value	Operating Conditions
Operating Junction Temperature	T_J	263°C	Freq = 9.5 GHz, V_d = 45 V, I_{dq} = 1060 mA, I_{drive} = 14.4 A, P_{in} = 43 dBm, P_{out} = 53.85 dBm, P_{diss} = 423 W, T_{case} = 85°C, PW=100uS, DC=10%
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.42°C/W	

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



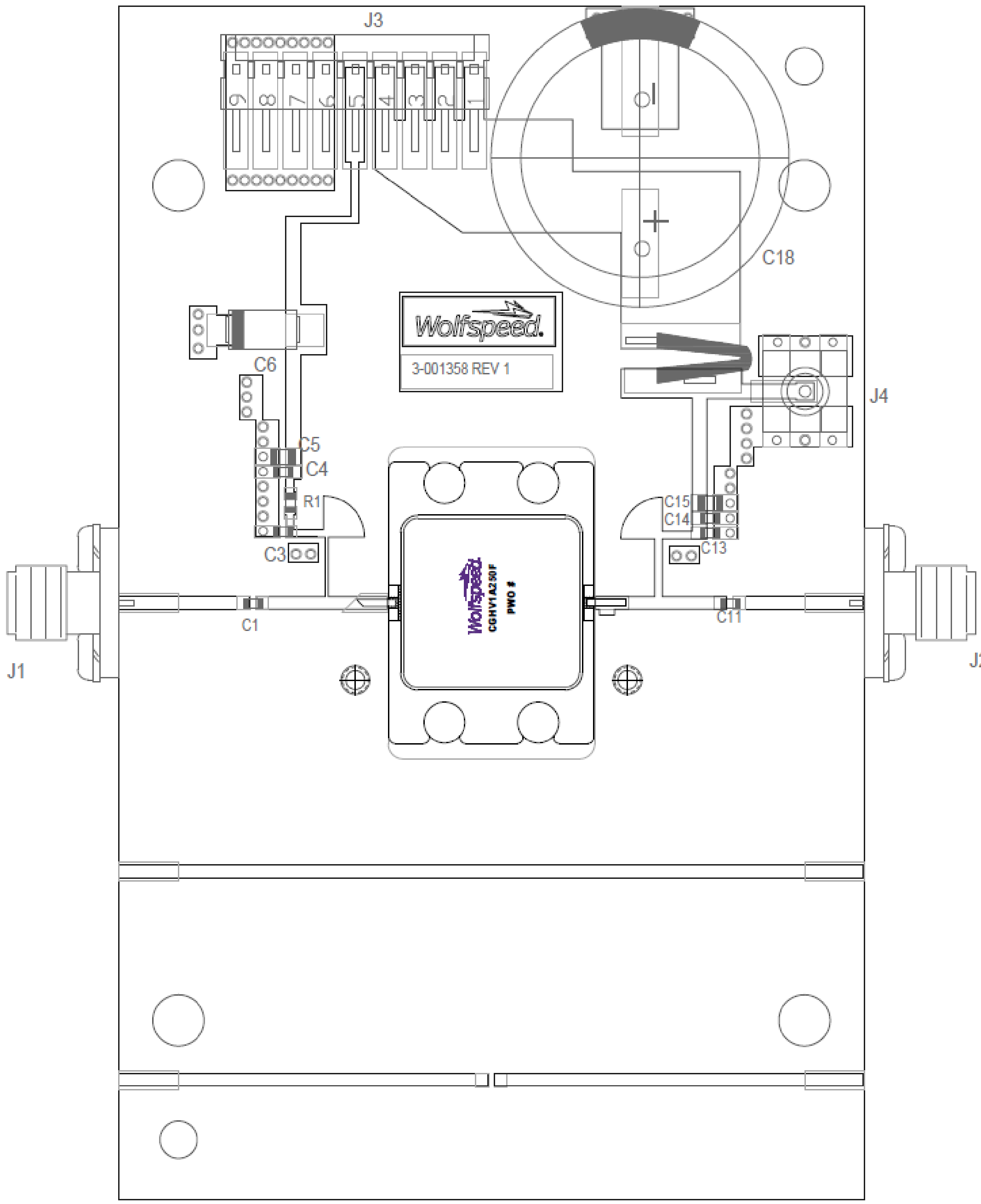
CGHV1A250F-AMP Evaluation Board Schematic Drawing



CGHV1A250F-AMP Evaluation Board Bill of Materials

Reference Designator	Description	Qty
C5,C15	CAP, 33000PF, 0805,100V, X7R	2
R1	RES,1/16W,0603,1%,10 OHMS	1
C10,C13	CAP, 10pF, +/- 1%, 250V, 0805, ATC600F	2
C18	CAP, 3300 UF, 100V, ELEC	1
W1	WIRE, 18 AWG ~ 1.75”	1
J1,J2	CONN,SMA,FEM,W/.500 FLNG	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
J4	CONN, SMB, STRAIGHT JACK RECEPTACLE	1
C1,C11	CAP, 1.2pF, +/-0.1pF, 0603, ATC600S	2
R3,R2	RES,1/16W,0603,1%,5.1 OHMS	2
C4,C14	CAP, 470PF, 5%,100V, 0603	2
C6	CAP 10UF 16V TANTALUM, 2312	1
Q1	CGHV1A250F, GaN Transistor	1
	PCB, CGHV1A250F, RO6035HTC, 20 mil	1
	BASEPLATE, CU, 2.5 X 4.0 X 0.5 IN	1

CGHV1A250F-AMP Evaluation Board Assembly Drawing



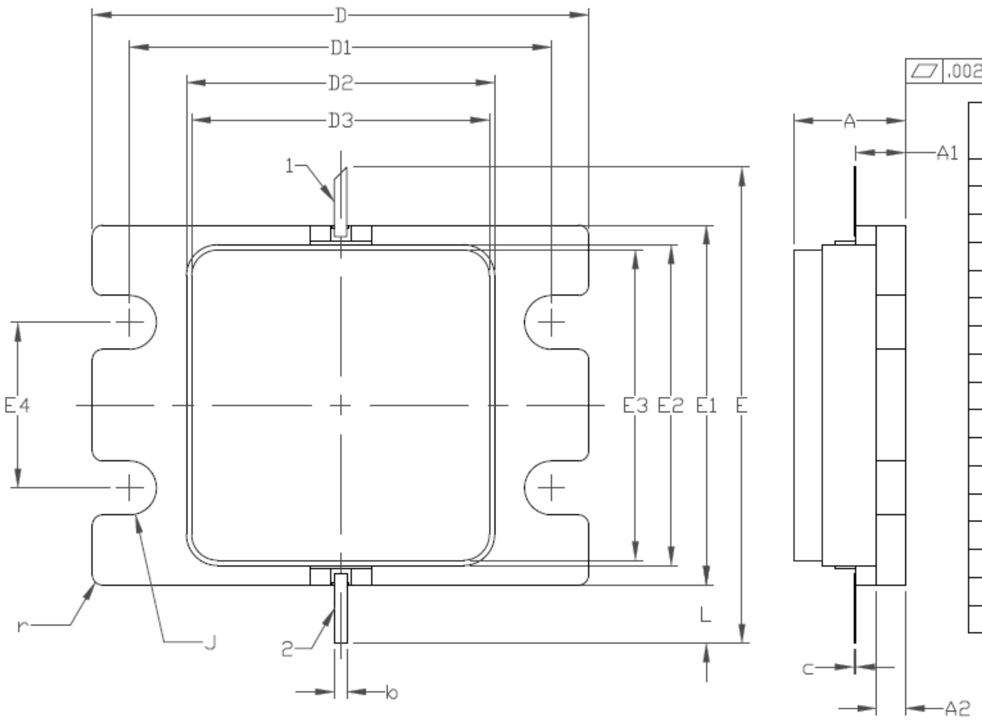
Bias On Sequence

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

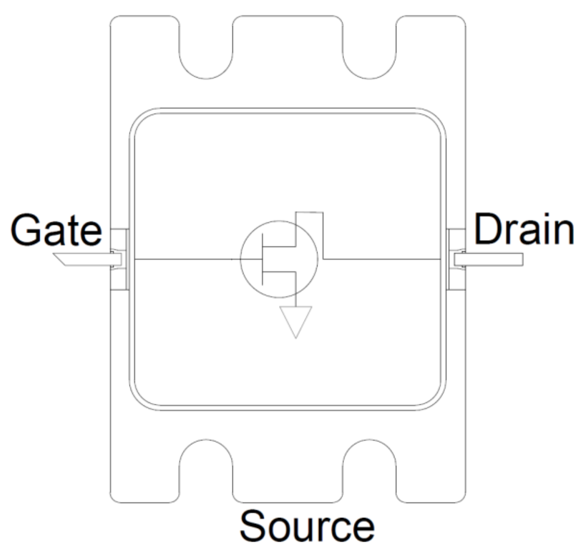
1. Turn RF off
2. Apply pinch-off to the gate (Vg=-5V)
3. Turn off drain voltage (Vd)
4. Turn off gate voltage (Vg)

Product Dimensions



1. GATE
2. DRAIN

DIM	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.205	0.221	5.21	5.61	
A1	0.088	0.100	2.24	2.54	2x
A2	0.049	0.061	1.24	1.55	
b	0.022	0.026	0.56	0.66	2x
c	0.003	0.006	0.08	0.15	
D	0.935	0.955	23.75	24.26	
D1	0.797	0.809	20.24	20.55	2x
D2	0.581	0.593	14.76	15.06	
D3	0.565	0.571	14.35	14.50	
E	0.906		23.01		REF
E1	0.679	0.691	17.25	17.55	
E2	0.604	0.616	15.34	15.65	
E3	0.588	0.594	14.93	15.09	
E4	0.309	0.321	7.85	8.15	2x
J	ø0.097	ø0.107	ø2.46	ø2.72	4x
L	0.090	0.130	2.29	3.30	2x
r	0.02 TYP		0.51 TYP		12x



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
CGHV1A250F	8.8 – 9.6 GHz, 300W GaN PA		
CGHV1A250F-AMP	Evaluation Board w/ PA	1 Each	

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