Features
- Saturated Power: 10 W
- Power Added Efficiency: 24%
- Large Signal Gain: 18 dB
- Small Signal Gain: 22 dB
- Input Return Loss: <-10 dB
- Output Return Loss: <-10 dB
- CW operation
- Small Footprint

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

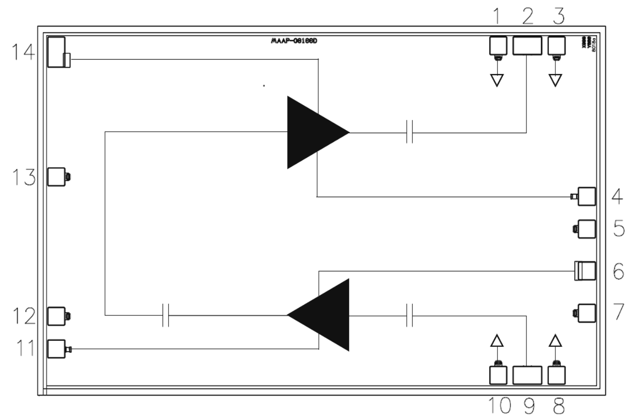
Description
The MAAP-G0100D is a 10 W, MMIC HPA utilizing MACOM's high performance, 0.15 µm GaN-on-SiC production process. This amplifier operates from 2 - 20 GHz and can support a variety of applications such as electronic warfare, radar, test and measurement, among others. Under saturation, the MAAP-G0100D achieves 10 W of typical output power with 18 dB of large signal gain and 24% power-added efficiency.

The bare die solution provides peak performance while minimizing required board space.

Ordering Information

Part Number	Package
MAAP-G0100D	Gel Pack (10/10)
MAAP-G0100D-AMP	Sample Board (1/1)

Functional Schematic



Pin Configuration[1]

Pin #	Name
1,3,5,7,8,10,12,13	GND
2	RF Output
4	VG2
6	VD1
9	RF Input
11	VG1
14	VD2

1. The backside of the MMIC must be connected to RF, DC and thermal ground.

RF Electrical Specifications: V_D = 28 V, I_{DQ} = 500 mA, CW, T_C = 25°C, Z_0 = 50 Ω

Parameter	Test Conditions	Frequency (GHz)	Units	Min.	Typ.	Max.
Output Power	P_{IN} = 22 dBm	2 10 20	dBm	39.5 40.5 39.2	40.5 41.5 40.8	—
Power Added Efficiency	P_{IN} = 22 dBm	2 10 20	%	18 22 22	22 28 29	—
Large Signal Gain	P_{IN} = 22 dBm	2 10 20	dB	17.5 18.5 17.2	18.5 19.5 19.5	—
Small Signal Gain	P_{IN} = -20 dBm	2 10 20	dB	—	25 25 20	—
Input Return Loss	P_{IN} = -20 dBm	2-20	dB	—	-10	—
Output Return Loss	P_{IN} = -20 dBm	2-20	dB	—	-10	—

DC Electrical Specifications:

Parameter	Units	Min.	Typ.	Max.
Drain Voltage	V	—	28	—
Gate Voltage	V	—	-1.8	—
Quiescent Drain Current	mA	—	500	—
Saturated Drain Current	mA	—	2000	—

Recommended Operating Conditions

Parameter	Symbol	Unit	Min.	Typ.	Max.
Input Power	P_{IN}	dBm	—	22	—
Drain Voltage	V_D	V	—	28	—
Gate Voltage	V_G	V	—	-1.8	—
Quiescent Drain Current	I_{DQ}	mA	—	500	—
Operating Temperature	T_C	°C	-40	—	+85

Absolute Maximum Ratings[2,3]

Parameter	Symbol	Unit	Min.	Max.
Input Power	P_{IN}	dBm	—	24
Drain to Source Breakdown Voltage	V_{DS}	V	—	84
Drain Voltage	V_D	V	20	28
Gate Voltage	V_G	V	-8	+2
Drain Current	I_D	A	—	2.5
Gate Current	I_G	mA	—	7
Dissipated Power @ +85°	P_{DISS}	W	—	49
VSWR	—	Ratio	—	3:1
Junction Temperature (MTTF > 1E6 Hrs)	T_J	°C	—	+225°C
Storage Temperature	T_{STG}	°C	-65	+150
Mounting Temperature (30 seconds)	T_M	°C	—	+320

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation near these survivability limits.

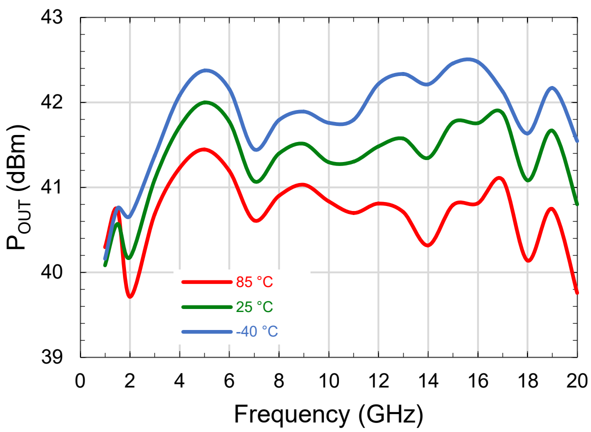
Handling Procedures
Please observe the following precautions to avoid damage:

Static Sensitivity
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

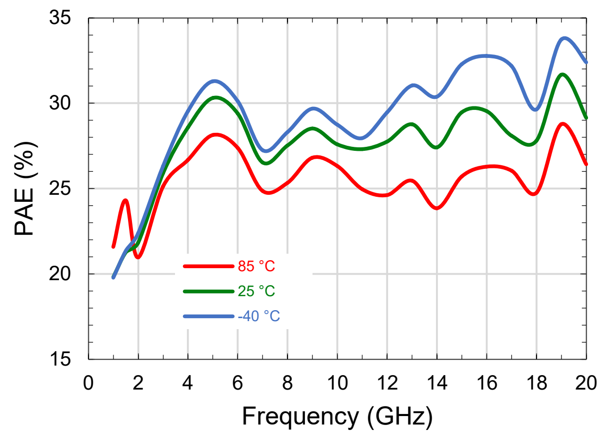
Typical Performance Curves - Large Signal over Temperature:

V_D = 28 V, I_{DQ} = 500 mA, CW, P_{IN} = 22 dBm

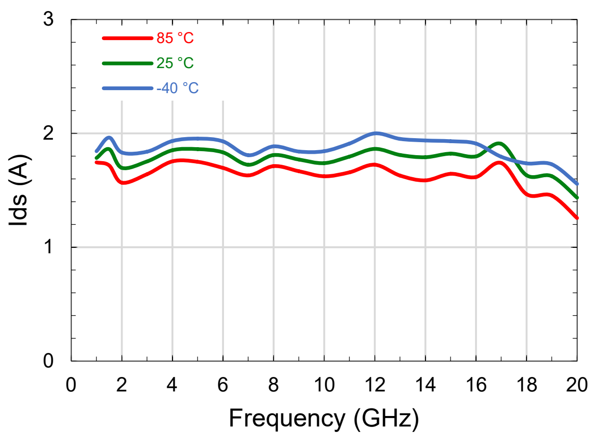
Output Power vs. Frequency



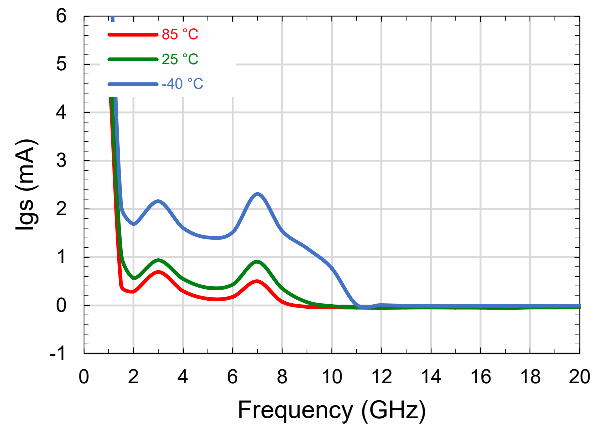
Power Added Efficiency vs. Frequency



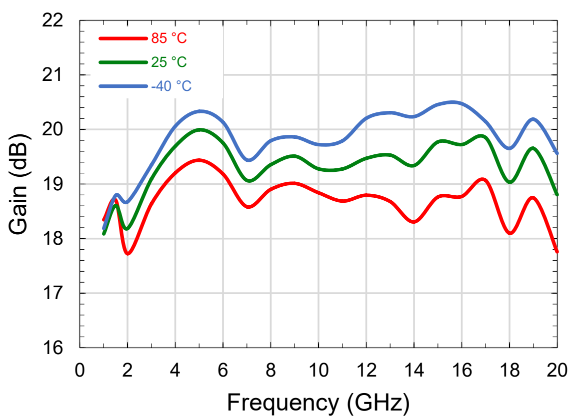
Drain Current vs. Frequency



Gate Current vs. Frequency



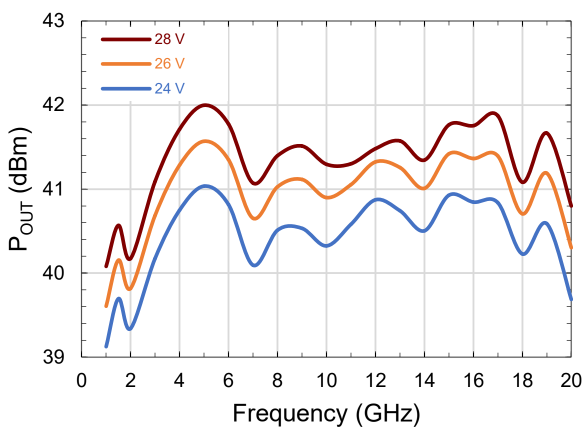
Large Signal Gain vs. Frequency



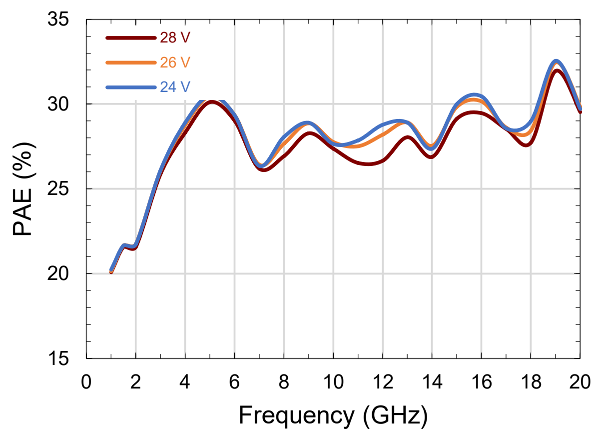
Typical Performance Curves - Large Signal over V_D:

I_{DQ} = 500 mA, CW, P_{IN} = 22 dBm, T_C = 25°C

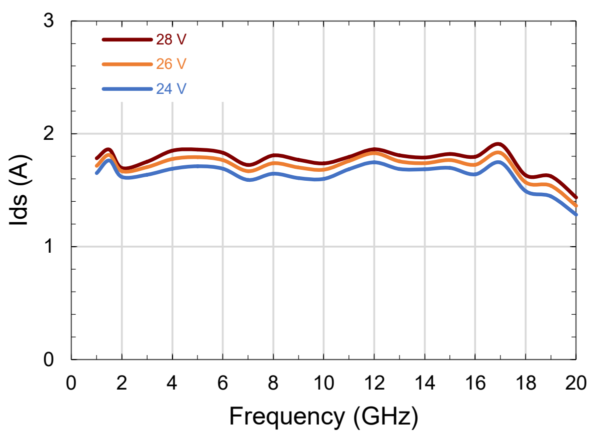
Output Power vs. Frequency



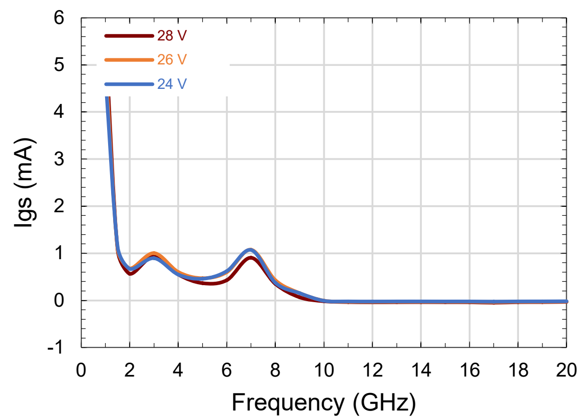
Power Added Efficiency vs. Frequency



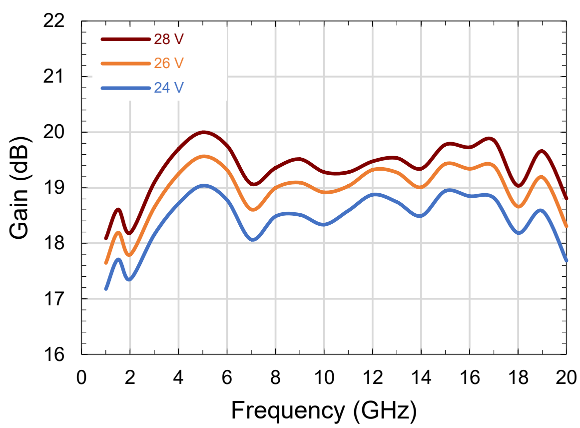
Drain Current vs. Frequency



Gate Current vs. Frequency



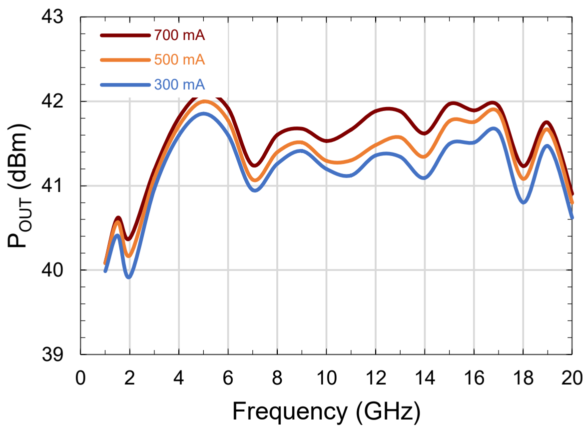
Large Signal Gain vs. Frequency



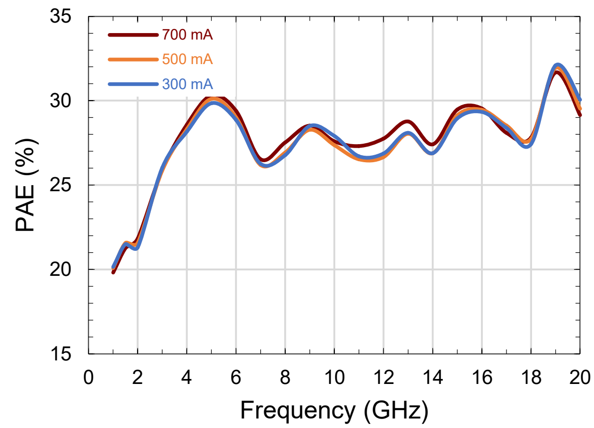
Typical Performance Curves - Large Signal over I_{DQ}:

V_D = 28 V, CW, P_{IN} = 22 dBm, T_C = 25°C

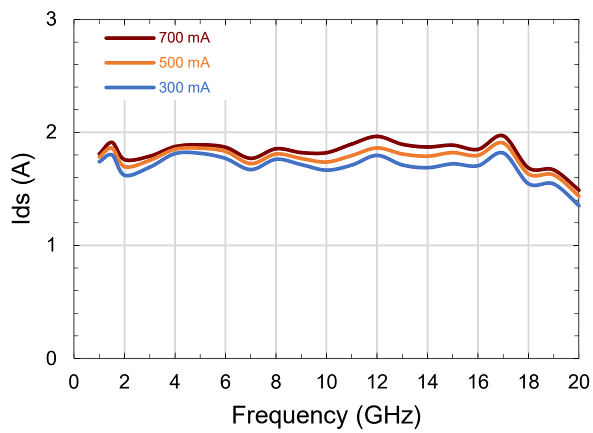
Output Power vs. Frequency



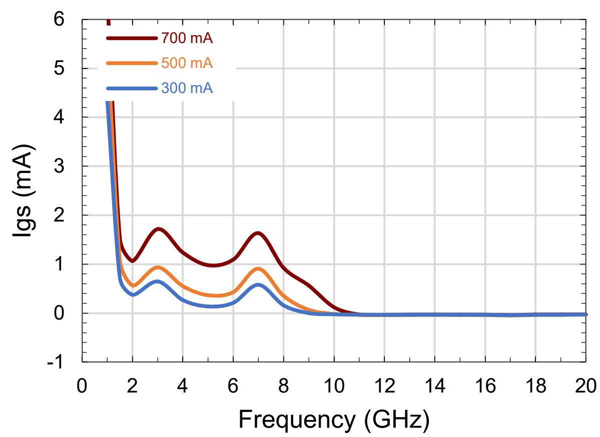
Power Added Efficiency vs. Frequency



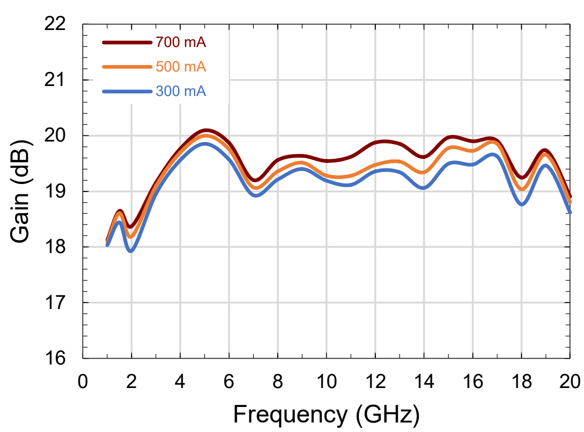
Drain Current vs. Frequency



Gate Current vs. Frequency



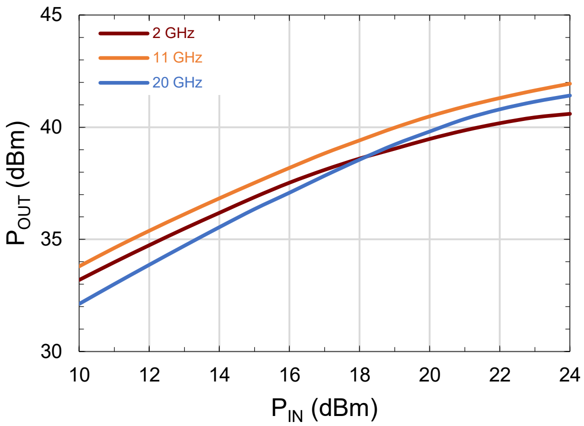
Large Signal Gain vs. Frequency



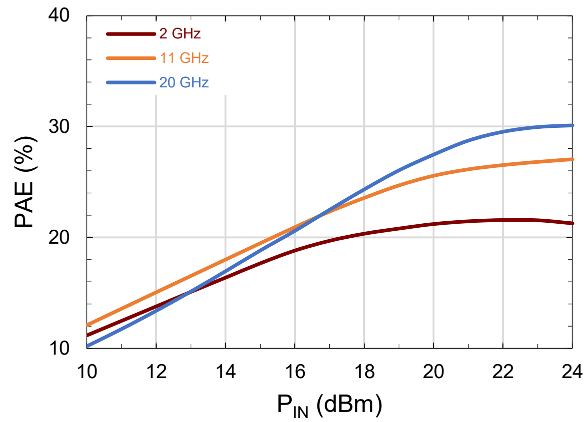
Typical Performance Curves - Drive-Up over Frequency:

V_D = 28 V, I_{DQ} = 500 mA, CW, T_C = 25°C

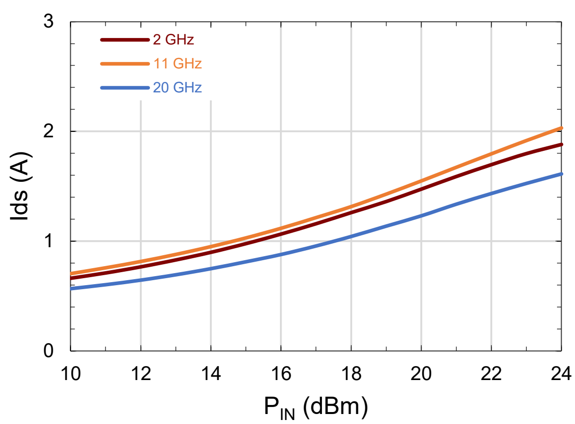
Output Power vs. Input Power



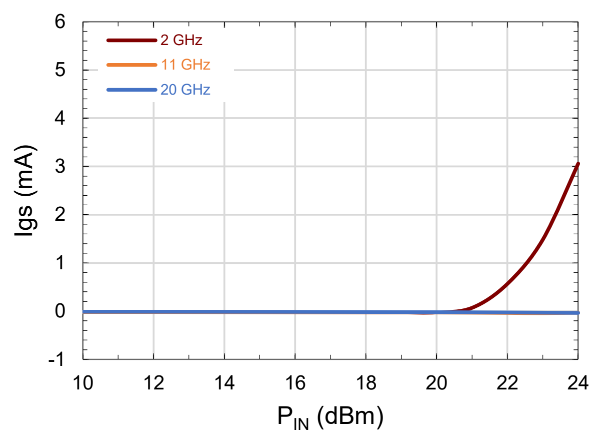
Power Added Efficiency vs. Input Power



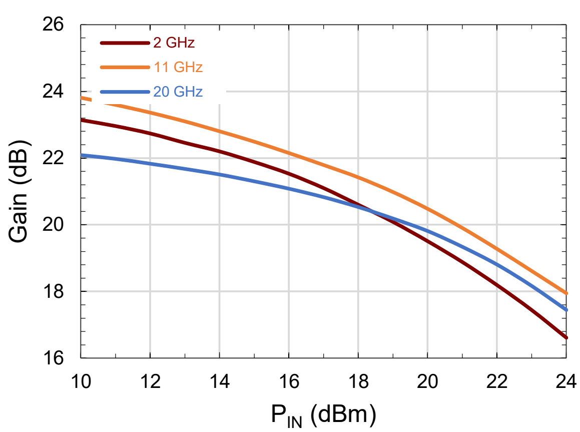
Drain Current vs. Input Power



Gate Current vs. Input Power



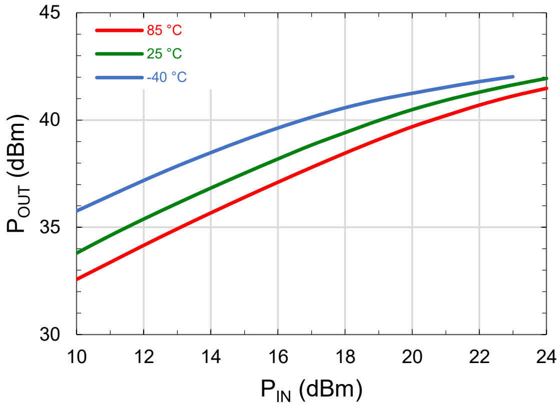
Gain vs. Input Power



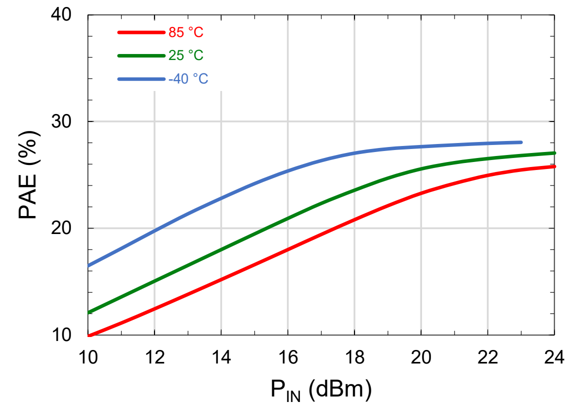
Typical Performance Curves - Drive-Up over Temperature:

V_D = 28 V, I_{DQ} = 500 mA, CW, Frequency = 11 GHz

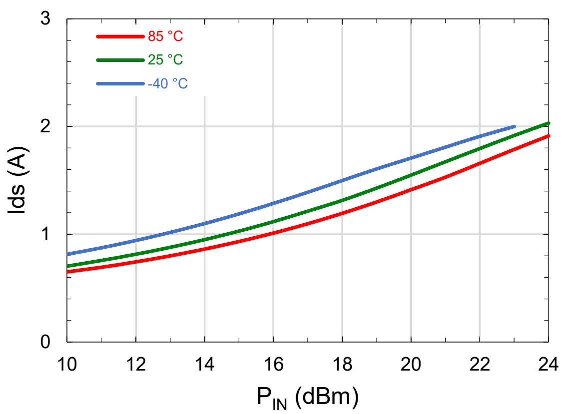
Output Power vs. Input Power



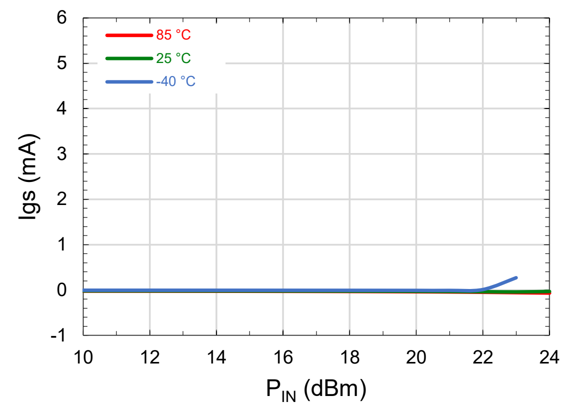
Power Added Efficiency vs. Input Power



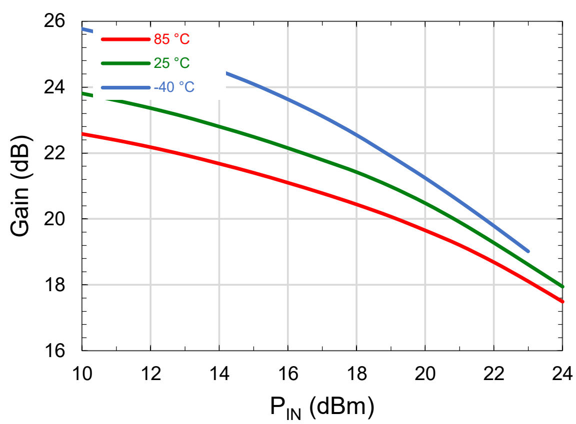
Drain Current vs. Input Power



Gate Current vs. Input Power



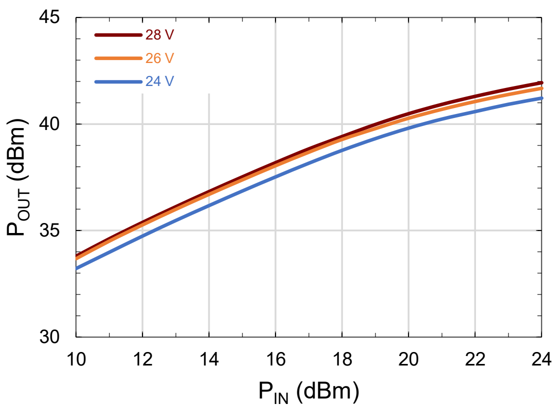
Gain vs. Input Power



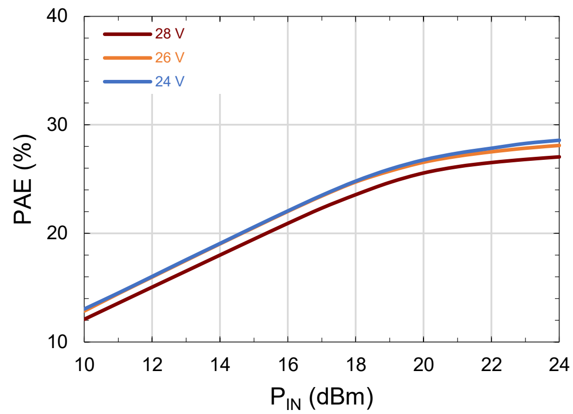
Typical Performance Curves - Drive-Up over V_D:

I_{DQ} = 500 mA, CW, Frequency = 11 GHz, T_C = 25°C

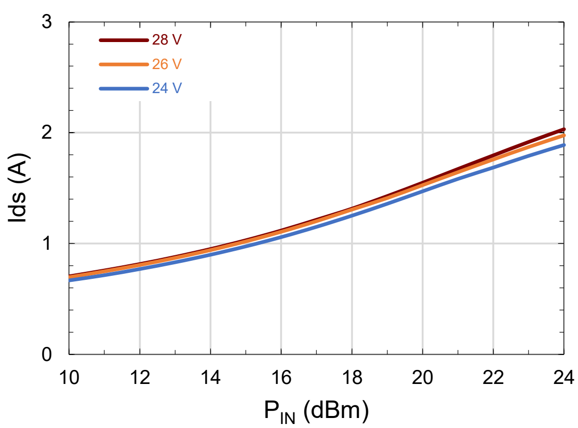
Output Power vs. Input Power



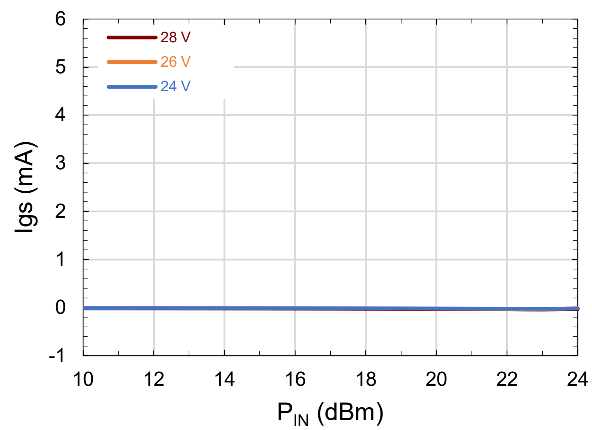
Power Added Efficiency vs. Input Power



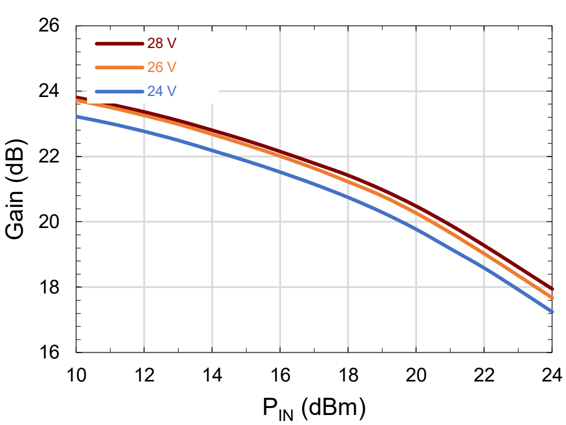
Drain Current vs. Input Power



Gate Current vs. Input Power



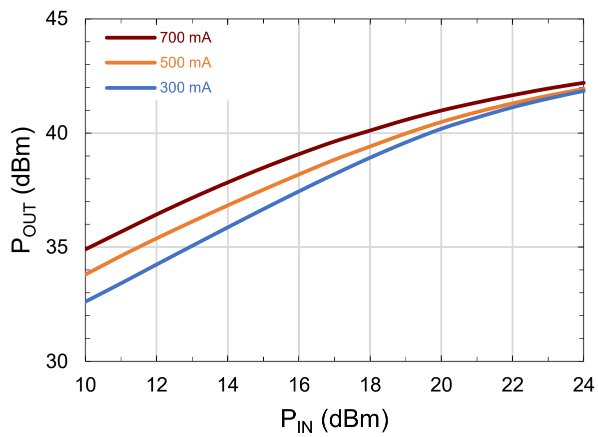
Gain vs. Input Power



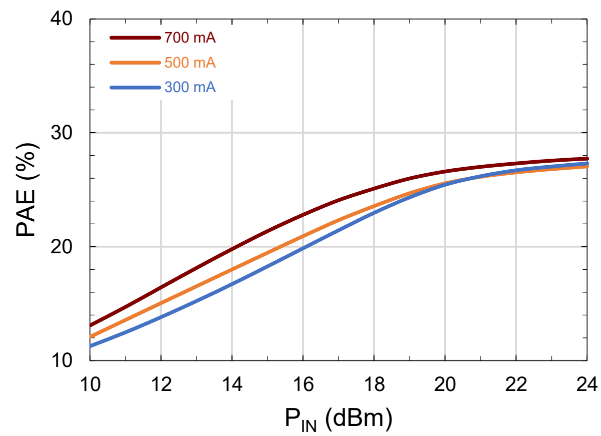
Typical Performance Curves - Drive-Up over I_{DQ}:

V_D = 28 V, CW, Frequency = 11 GHz, T_C = 25°C

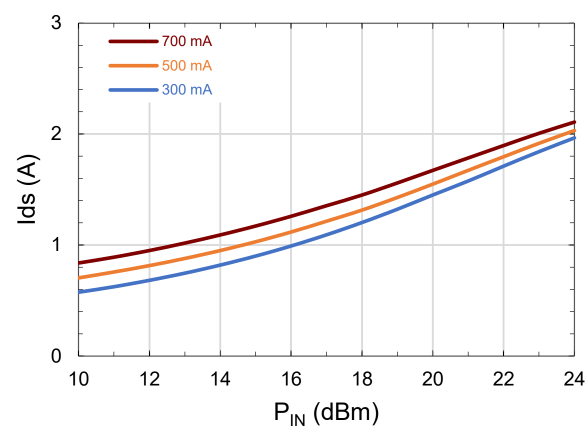
Output Power vs. Input Power



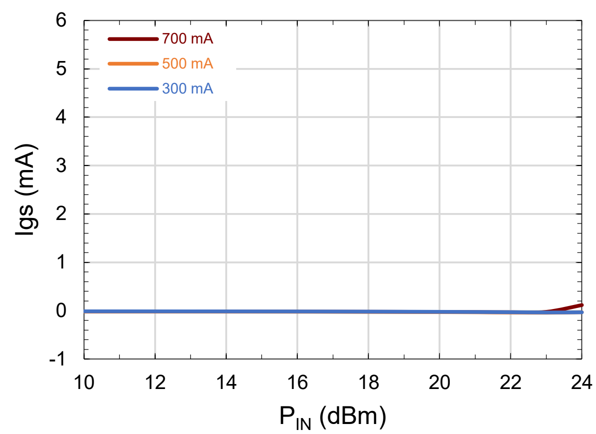
Power Added Efficiency vs. Input Power



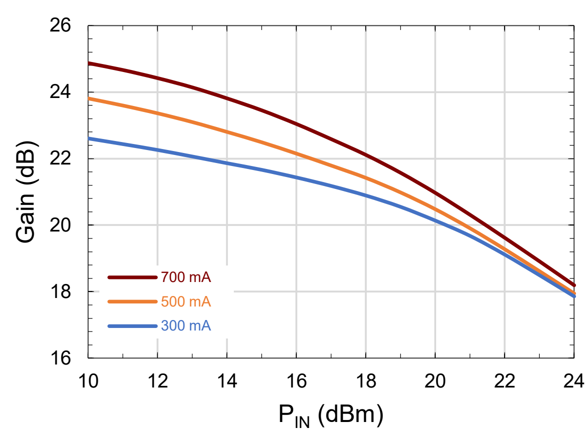
Drain Current vs. Input Power



Gate Current vs. Input Power



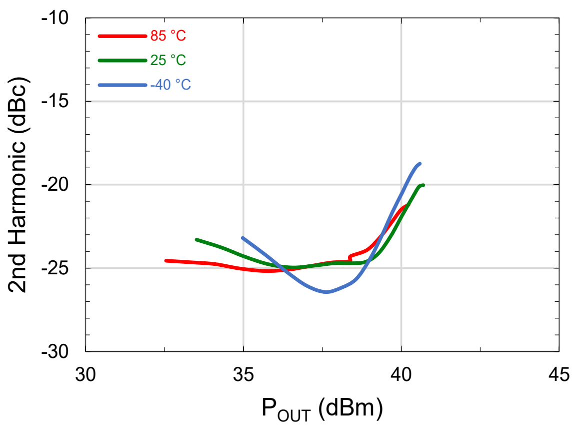
Gain vs. Input Power



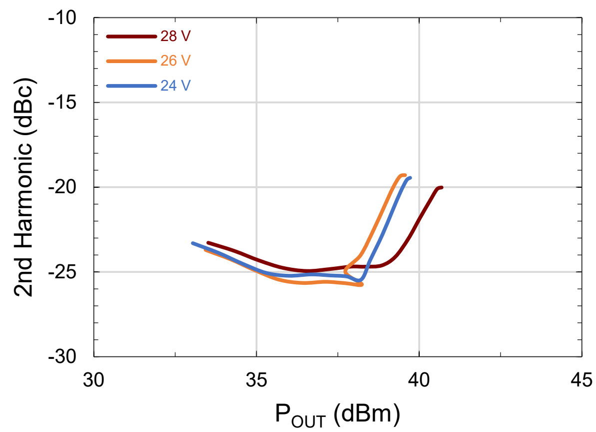
Typical Performance Curves - Harmonic Levels:

V_D = 28 V, CW, I_{DQ} = 500 mA

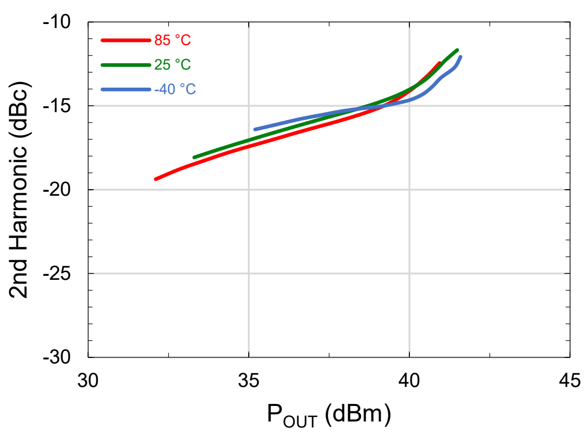
2nd Harmonic @ 2 GHz over Temperature



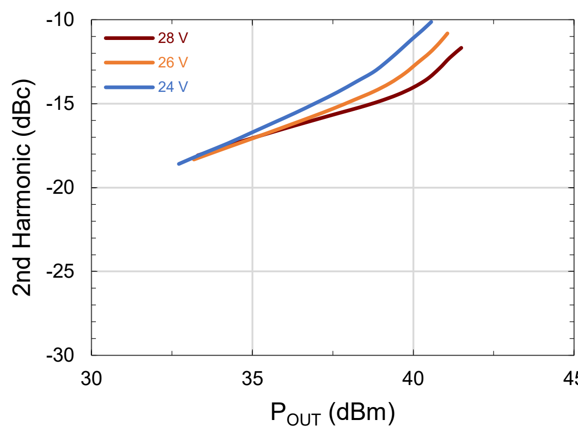
2nd Harmonic @ 2 GHz over Vd



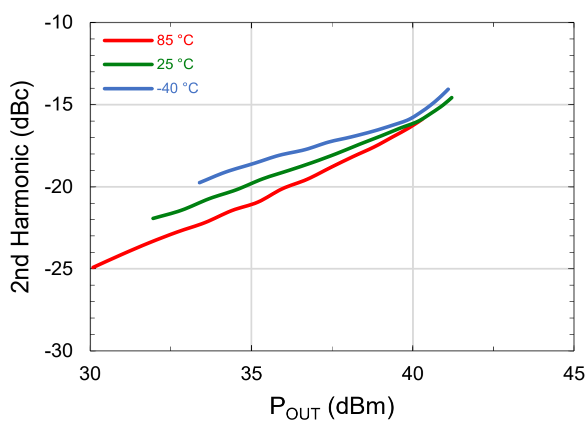
2nd Harmonic @ 11 GHz over Temperature



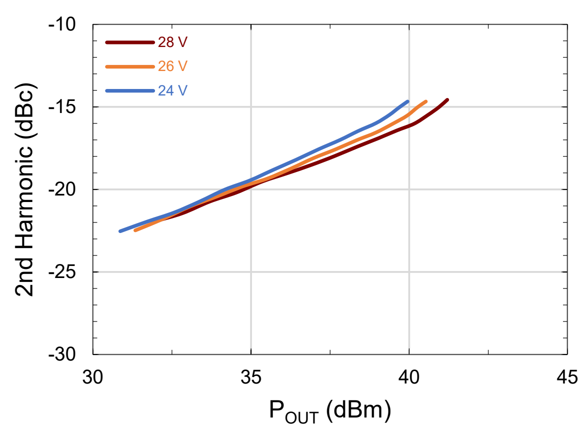
2nd Harmonic @ 11 GHz over Vd



2nd Harmonic @ 20 GHz over Temperature



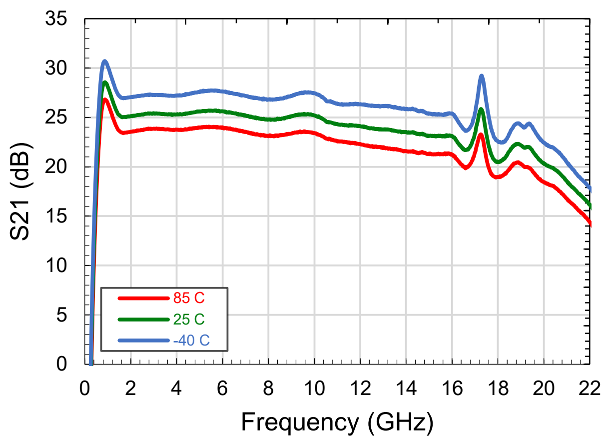
2nd Harmonic @ 20 GHz over Vd



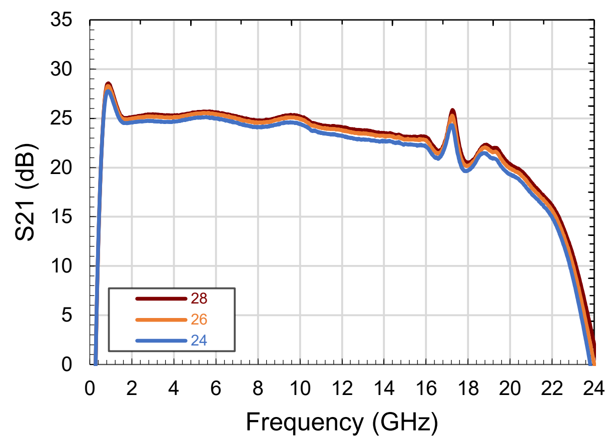
Typical Performance Curves - Small Signal over Temperature and V_D:

I_{DQ} = 500 mA, CW, P_{IN} = -30 dBm

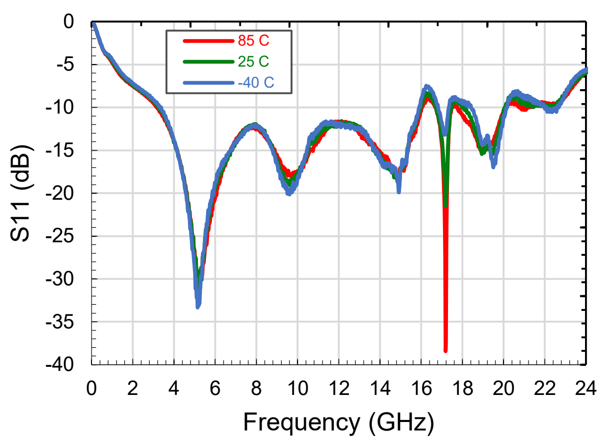
S21 vs. Frequency over Temperature @ V_D = 28 V



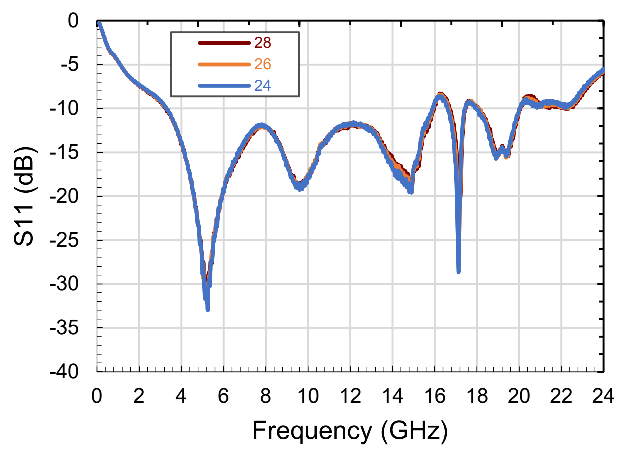
S21 vs. Frequency over V_D @ 25°C



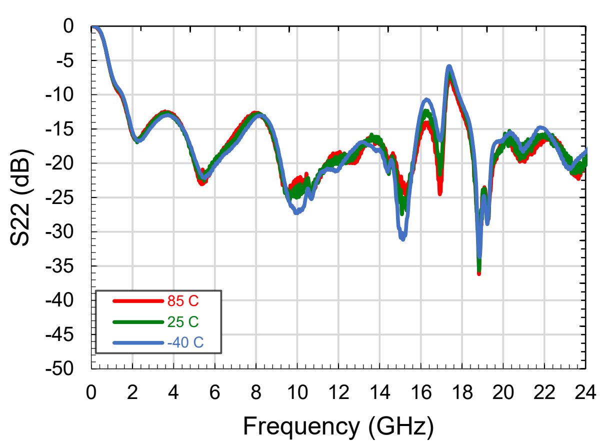
S11 vs. Frequency over Temperature @ V_D = 28 V



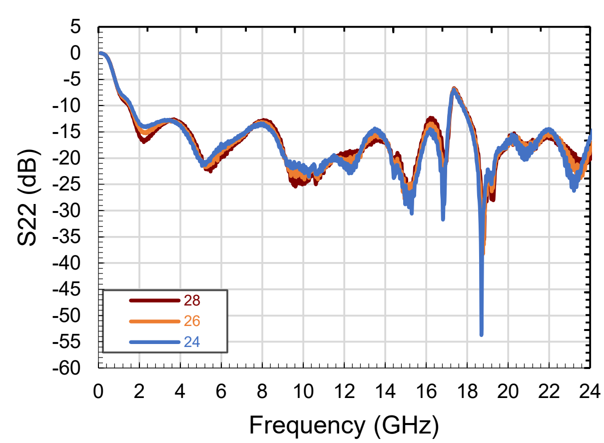
S11 vs. Frequency over V_D @ 25°C



S22 vs. Frequency over Temperature @ V_D = 28 V



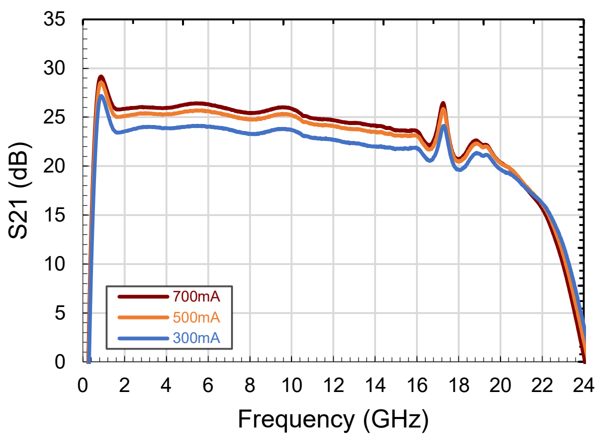
S22 vs. Frequency over V_D @ 25°C



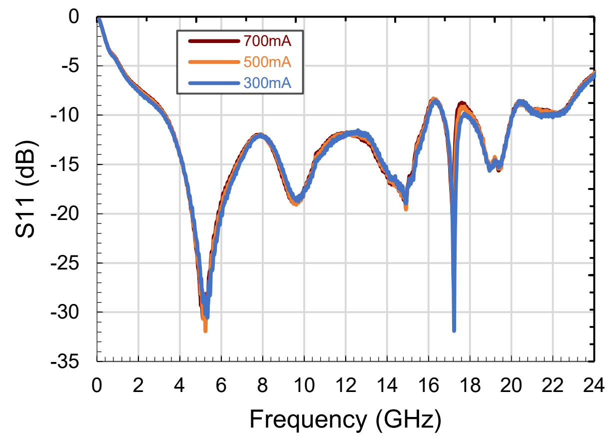
Typical Performance Curves - Small Signal over I_{DQ}:

V_D = 28 V, CW, P_{IN} = -20 dBm

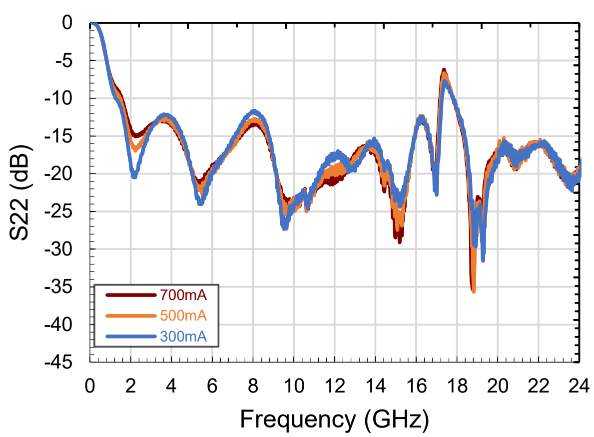
S21 vs. Frequency over I_{DQ}



S11 vs. Frequency over I_{DQ}



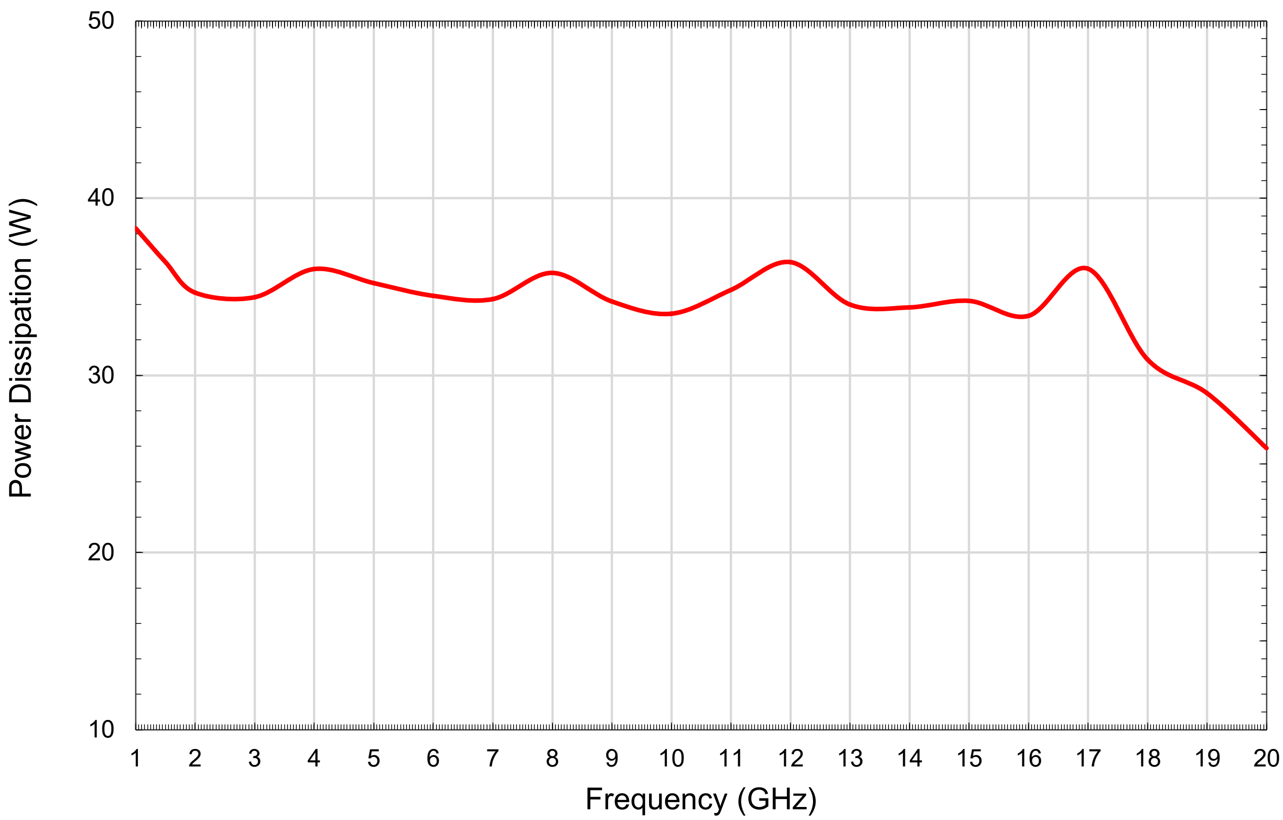
S22 vs. Frequency over I_{DQ}



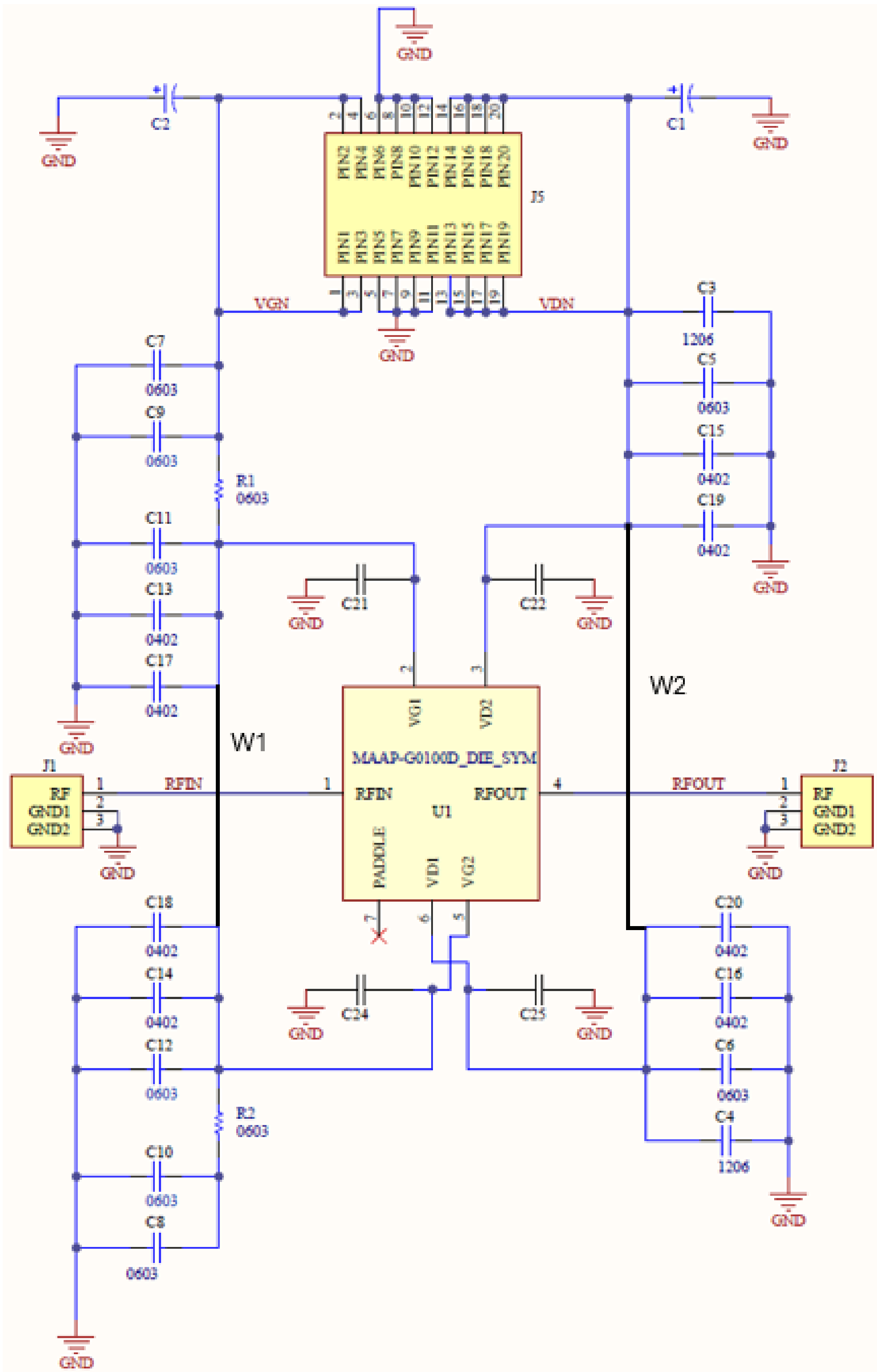
Thermal Characteristics

Parameter	Operating Conditions	Value
Operating Junction Temperature (T_J)	Freq = 11 GHz, V_D = 28 V, I_{DQ} = 500 mA, I_{DRIVE} = 1.65 A , P_{IN} = 22 dBm, P_{OUT} = 40.7 dBm, P_{DISS} = 35 W, T_C = 85°C, CW	185ºC
Thermal Resistance, Junction to Case ($R_{\theta JC}$)		2.85ºC/W

Power Dissipation vs. Frequency (T_C = 85°C)



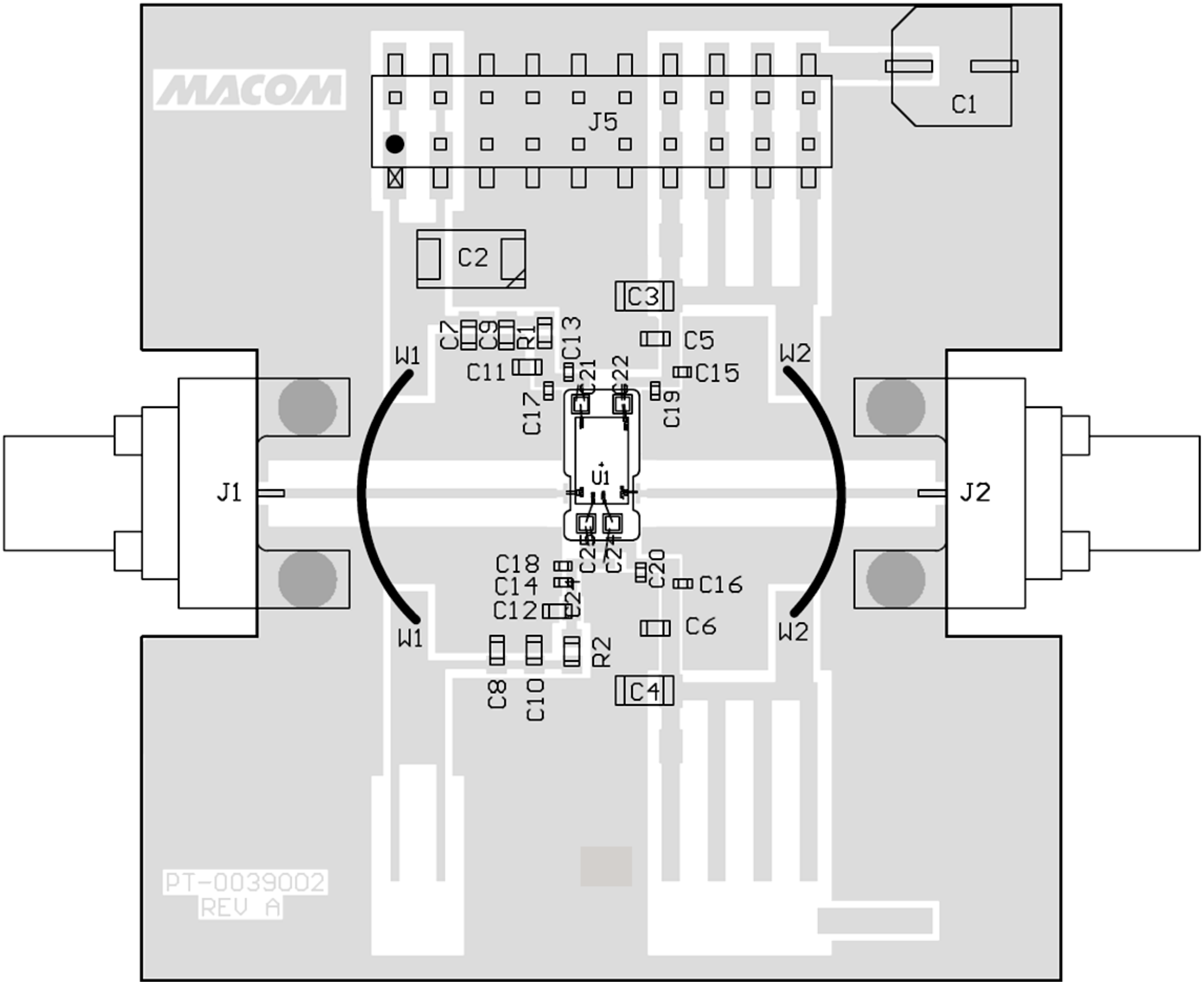
Evaluation Board Schematic (MAAP-G0100D-AMP)



Evaluation Board Parts List (MAAP-G0100D-AMP)

Part	Value	Qty.
C1	33 µF, Electrolytic Capacitor	1
C2	10 µF, Tantalum Capacitor	
C3,C4	10 µF, Cap 50V, 1206	2
C5,C6,C7,C8	2.2 µF, Cap, 50V, 0603	4
C9,C10	470 pF, Cap, 100V, 0603	2
C11,C12	10 pF, Cap, 250V, 0603	2
C13,C14,C15,C16	0.1 µF, Cap, 50V, 0402	4
C18, C18, C19, C20	0.47 pF, Cap, 50V, 0402	4
C21,C22,C24,C25	10 nF, Cap, single layer vertical, 30mil square	4
J1, J2	SMA Female End Launch RF Connector, .005” Pin, .048” Coax	2
J5	20-Pin DC Header, Right Angle	1
R1,R2	0 Ω, Resistors, 0603	2
W1,W2	Jumper Wire	2
U1	MMIC Die, MAAP-G0100D	1

Evaluation Board Assembly Drawing (MAAP-G0100D-AMP)

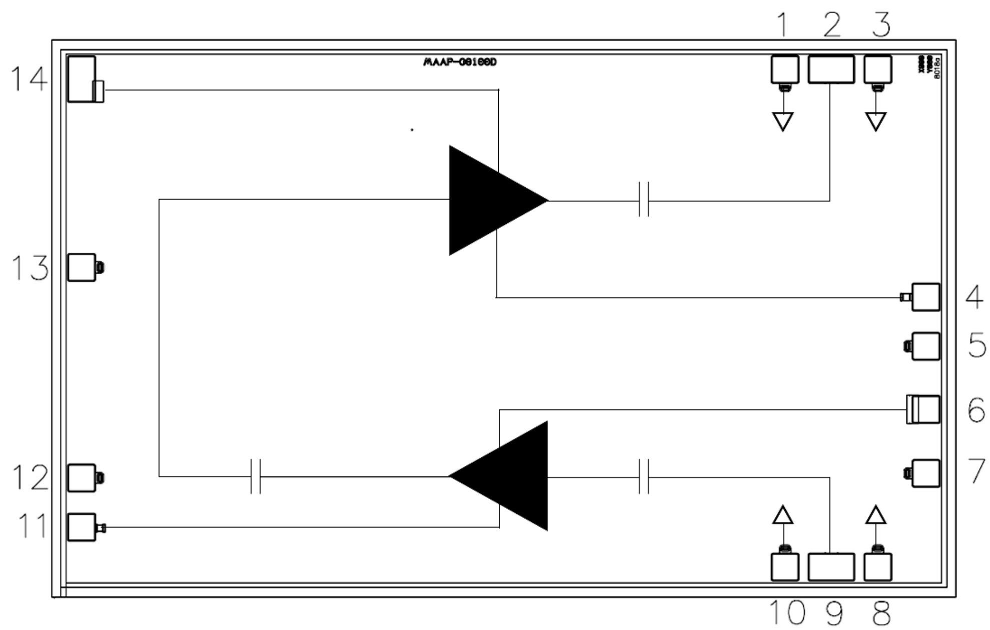


Bias On Sequence

1. Ensure RF is turned-off
2. Apply pinch-off voltage of -5 V to the gate (V_G)
3. Apply nominal drain voltage (V_D)
4. Adjust Vg to obtain desired quiescent drain current (I_{DQ})
5. Apply RF

Bias Off Sequence

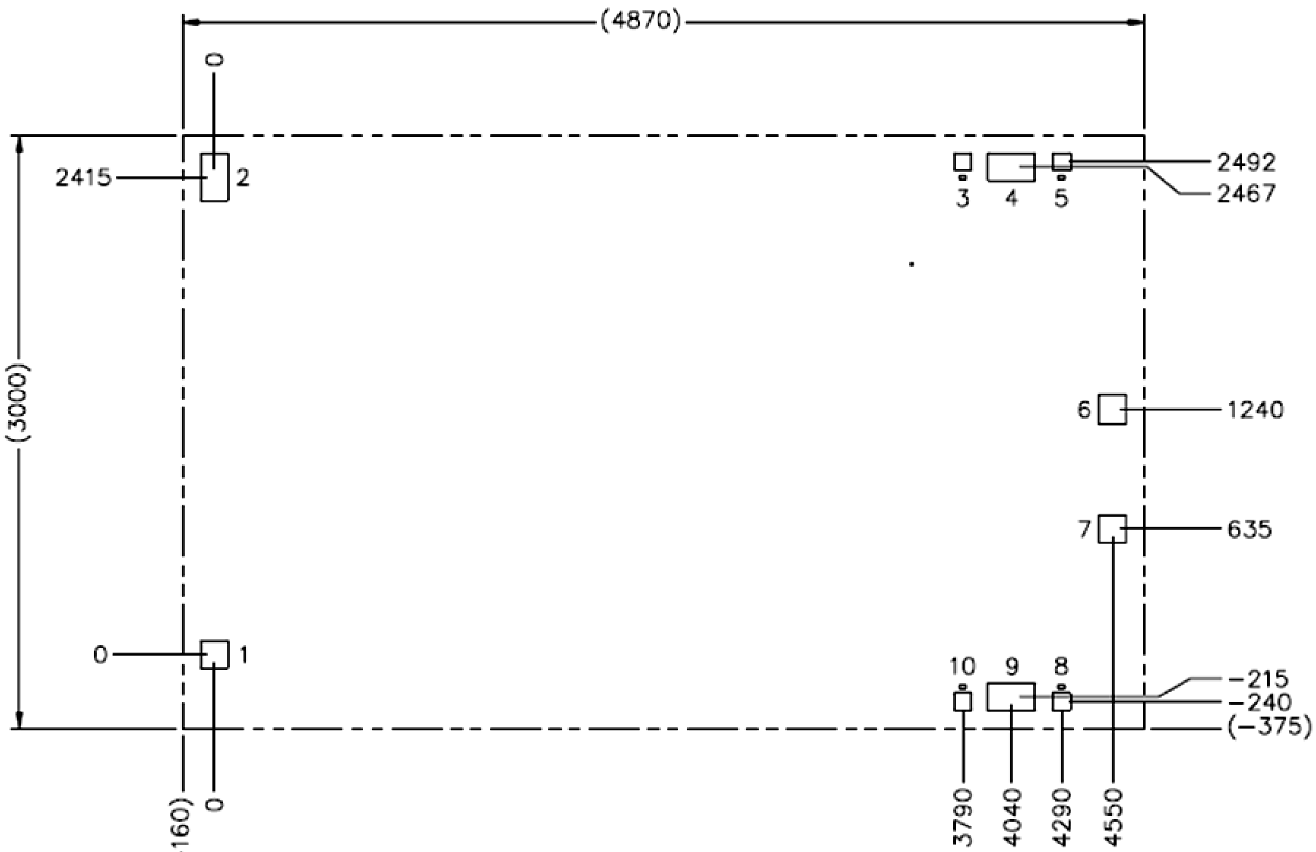
1. Turn RF off
2. Apply pinch-off to the gate (V_G = -5 V)
3. Turn off drain voltage (V_D)
4. Turn off gate voltage (V_G)



Pin Description

Pin #	Name	Description	Pad Size (µm)
1,3,5,7,8,10,12,13	GND	RF and DC ground.	140 x 140
11	VG1	Gate bias for stage 1.	140 x 140
4	VG2	Gate bias for stage 2	140 x 140
6	VD1	Drain bias for stage 1	140 x 140
14	VD2	Drain bias for stage 2	140 x 140
2	RF_{OUT}	RF Output. 50-ohm matched. Internally DC blocked.	140 x 250
9	RF_{IN}	RF Input. 50-ohm matched. Internally DC blocked.	140 x 250
MMIC backside	GND	RF and DC ground.	NA

Mechanical Information



Notes
1.) Die size: 1770 µm x 3580 µm (+0/-50 µm)
2.) Die thickness: 75 µm (+/- 10 µm)
3.) Unless otherwise specified, all dimensions shown are µm with a tolerance of +/- 5 µm.

Revision History

Rev	Date	Change Description
V1	09/22/2025	Production release