Features

- Saturated Power: 300 W
- Drain Efficiency: 75%
- Small Signal Gain: 23 dB
- Lead-Free Air Cavity Ceramic Package
- RoHS* Compliant

Applications

- Avionics - TACAN, DME, IFF
- Military Radio
- L-Band Radar
- Electronic Warfare
- ISM
- General Amplification

Description

The MAPC-A3001 is a 300 W packaged, unmatched transistor utilizing a high performance, GaN on SiC production process. This transistor supports both defense and commercial related applications.

Offered in a thermally-enhanced flange package, the MAPC-A3001 provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

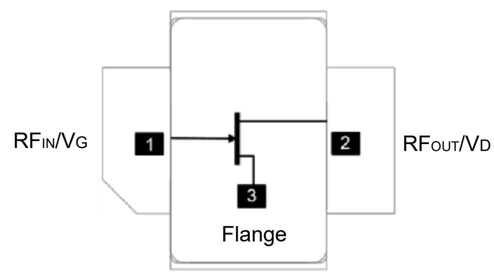
Typical RF Performance:

- Pulse width of 100 μsec and 10% duty, P_{IN} = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
1.2	55.1	20.1	68.8
1.3	54.9	19.9	71.2
1.4	54.6	19.6	67.1

AC-230B-2

Functional Schematic



Pin Configuration

Pin #	Pin Name	Function
1	RF_{IN} / V_G	RF Input / Gate
2	RF_{OUT} / V_D	RF Output / Drain
3	Flange[1]	Ground / Source

1. The flange on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information

Part Number	MOQ Increment
MAPC-A3001-AB000	Bulk
MAPC-A3001-ABSB1	Sample Board

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

RF Electrical Characteristics: in Evaluation Fixture

Freq. = 1.2 - 1.4 GHz, T_C = 25°C, V_{DS} = 50 V, I_{DQ} = 400 mA, Pulse Width = 100 µs, Duty Cycle = 10%
Performance in MACOM Evaluation Test Fixture, 50 Ω system

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output Power	Pulsed, P_{IN} = 35 dBm	P_{OUT}	-	300	-	dBm
Drain Efficiency	Pulsed, P_{IN} = 35 dBm	DE	-	73	-	%
Large Signal Gain	Pulsed, P_{IN} = 35 dBm	G_P	-	20	-	dB
Small Signal Gain	CW, P_{IN} = -20 dBm	S21	-	23.6	-	dB
Input Return Loss	CW, P_{IN} = -20 dBm	S11	-	-13.6	-	dB
Output Return Loss	CW, P_{IN} = -20 dBm	S22	-	-6	-	dB
Output Mismatch Stress	All Phase Angles	ψ	VSWR = 10:1, No Device Damage			

RF Electrical Specifications: in Production Test Fixture

Freq. = 1.3 GHz, P_{IN} = 35 dBm, T_A = 25°C, V_{DS} = 50 V, I_{DQ} = 400 mA,
Pulse Width = 100 µs, Duty Cycle = 10%
Note: Final testing and screening for all transistor sales is performed using the MAPC-A3001-AB production test fixture at 1.3 GHz.

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Units
Output Power	Pulsed, P_{IN} = 35 dBm	P_{OUT}	250	300	-	W
Drain Efficiency	Pulsed, P_{IN} = 35 dBm	η	68	72.0	-	%
Power Gain	Pulsed, P_{IN} = 35 dBm	G_P	18	20.0	-	dB

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	-	-	3.6	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-3.6	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 25.6 mA	V_T	-3.5	-2.7	-1.9	V
Gate Quiescent Voltage	V_{DS} = 50 V, I_D = 400 mA	V_{GSQ}	-	-2.3	-	V

Thermal Characteristics

Parameter	Symbol	Test Conditions	Units	Rating
Operating Junction Temperature	T_J	CW, P_{DISS} = 100 W, T_C = 85.0°C	°C	223
Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W	1.38

Absolute Maximum Ratings[1,2]

Parameter	Absolute Maximum
Drain-Source Voltage	150 V
Gate Voltage	-8 +2 V
Drain Current	24.5 A
Gate Current	25.6 mA
Input Power	39 dBm
Storage Temperature	-65C to +150°C
Mounting Temperature	+245°C
Junction Temperature[3,4,5]	+275°C
Operating Temperature	-40°C to +85°C

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. MACOM does not recommend sustained operation near these survivability limits.
3. Mounting temperature for 30 seconds.
4. Operating at nominal conditions with $T_J \leq$ +225 C will ensure MTTF > 1 x 10^6 hours.

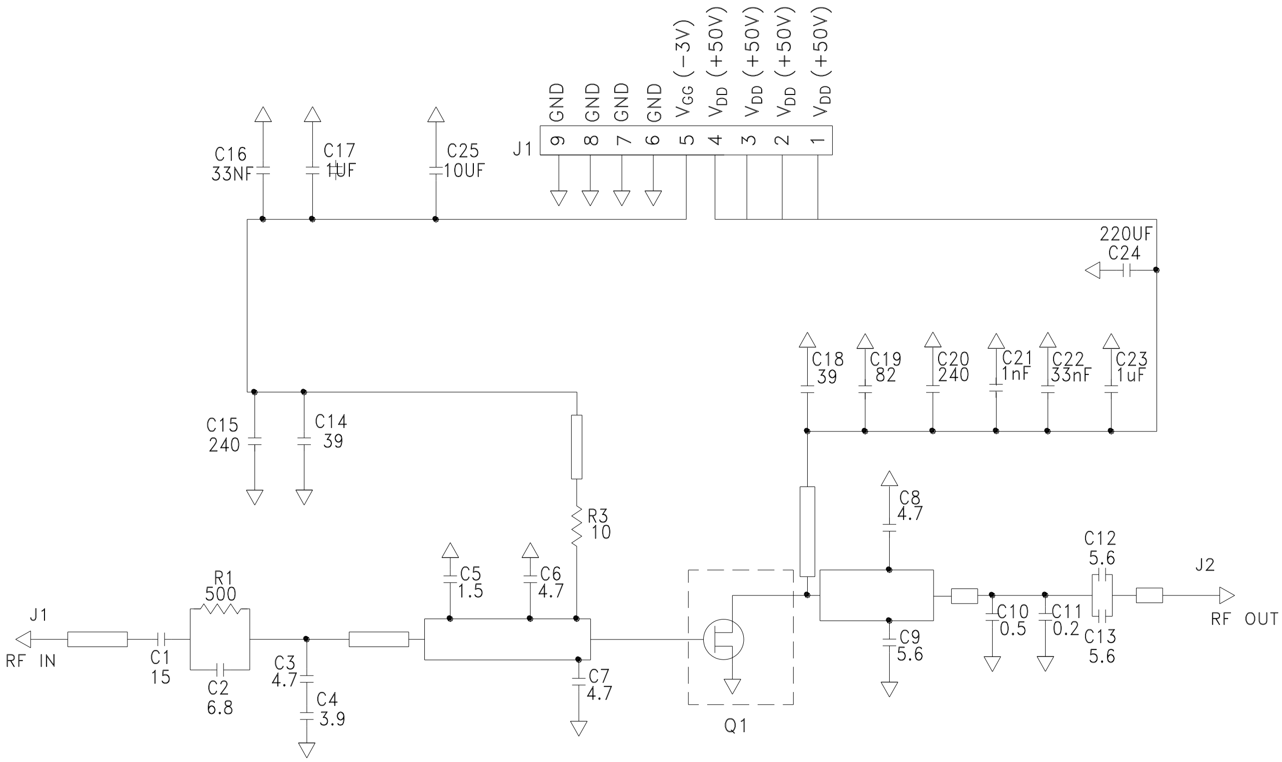
Handling Procedures

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.

Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



NOTE: UNITS ARE pF, OHM AND nH UNLESS OTHERWISE SPECIFIED

Description

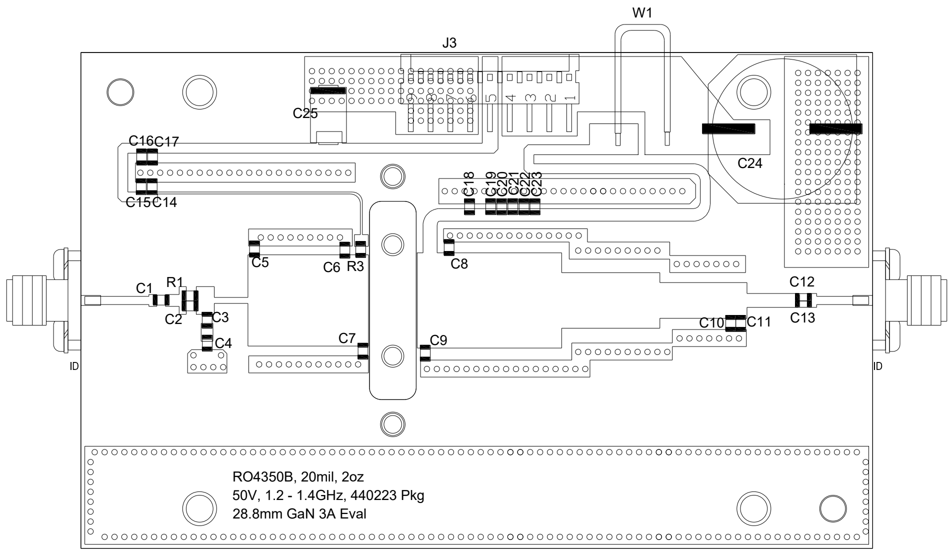
Parts measured on evaluation board (20-mil thick RO4350B). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

Biasing Sequence

Bias ON
1. Ensure RF is turned off
2. Apply pinch-off voltage of -5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF
1. Turn RF off
2. Apply pinch-off voltage of -5 V to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



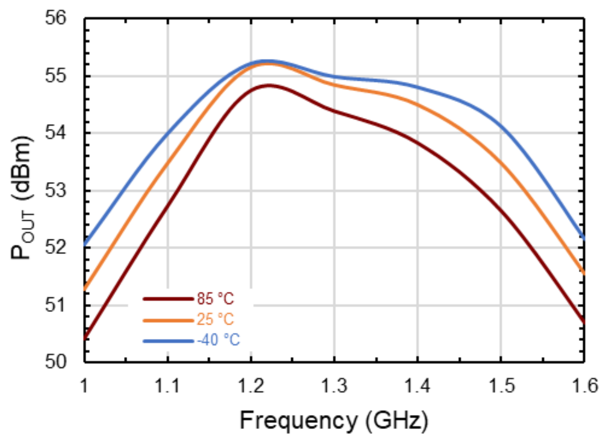
Assembly Parts List

Ref Des	Description	Manufacturer	Manufacturer PN	Qty
C1	15 pF 0805in T5% 125C 250V	Kyocera AVX	600F150JT250XT	1
C2	6.8 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F6R8BT250XT	1
C3, C6, C7, C8	4.7 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F4R7BT250XT	4
C4	3.9 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F3R9BT250XT	1
C5	1.5 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F1R5BT250XT	1
C9	5.6 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F5R6BT250XT	1
C12, C13	5.6 pF 0805in T0.1p 125C 250V (Mount Vertically)	Kyocera AVX	600F5R6BT250XT	2
C10	0.5 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F0R5BT250XT	1
C11	0.2 pF 0805in T0.1p 125C 250V	Kyocera AVX	600F0R2BT250XT	1
C14, C18	39 pF 0805in T2% 125C 250V	Kyocera AVX	600F390GT250XT	2
C15, C20	240 pF 0805in T1% 125C 250V	Kyocera AVX	600F241JT250XT	2
C16, C22	0.033 µF 0805in T10% 125C	Murata	GRM21BR72A333KA01	2
C17, C23	1 µF 0805in T10% 125C 100V	Murata	GCM21BC72A105KE36	2
C19	82 pF 0805in T5% 125C 250V	Kyocera AVX	600F820JT250XT	1
C21	1 nF 0603in T10% 125C 100V	Murata	GRM188R72A102KA01	1
C24	220 µF, +/-20%, 100V, ELECTROLYTIC, CASE SIZE K21	Panasonic	ECA-2AHG221	1
C25	10 µF TC2312in T10% 16V 125C	Kyocera AVX	TAJC106M016RNJ	1
R1	499 Ω 0805in T1% 155C 1/8W	Yageo	RC0805FR-07499RL	1
R3	10 Ω 0805in T5% 155C 1/8W	Yageo	RC0805FR-0710RL	1
W1	12 AWG 3.0" Wire			1
J1, J2	SMA, PANEL MOUNT , FLANGE, 4-HOLE, BLUNT POST	AMPHENOL CONNEX	132150	2
J3	HEADER RT>PLZ .1CEN LK 9POS	TE Connectivity	640457-9	1
Q1	MAPC-A3001-AB GaN Amplifier			1

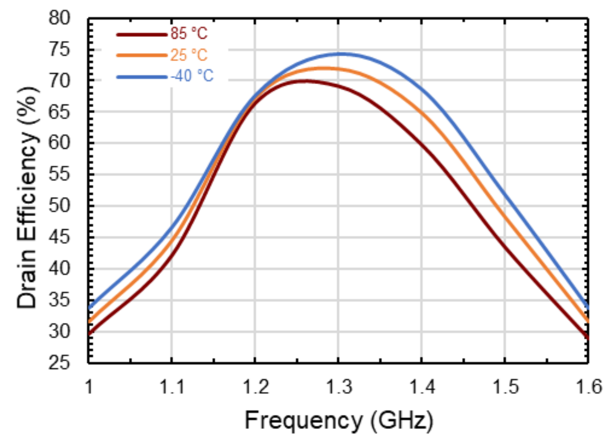
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

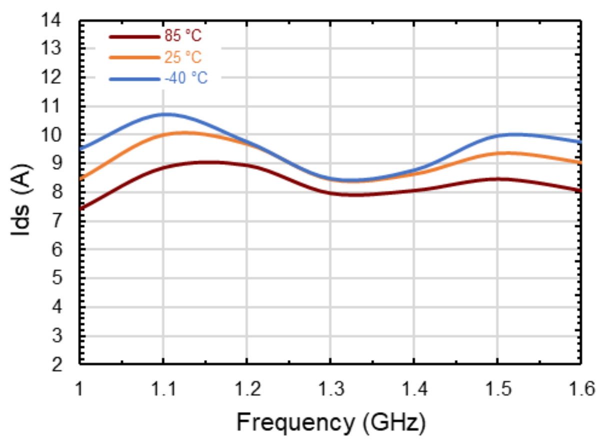
Output Power vs. Temperature and Frequency



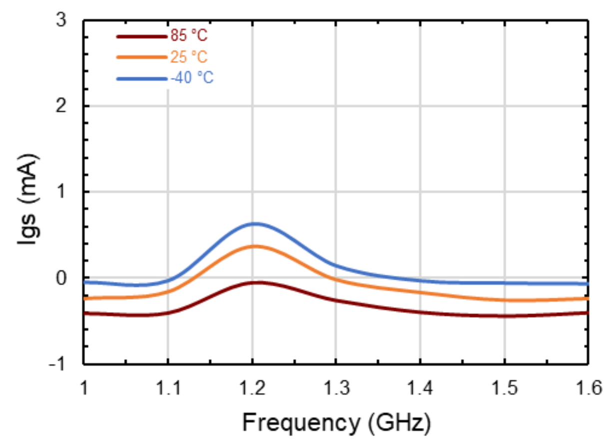
Drain Efficiency vs. Temperature and Frequency



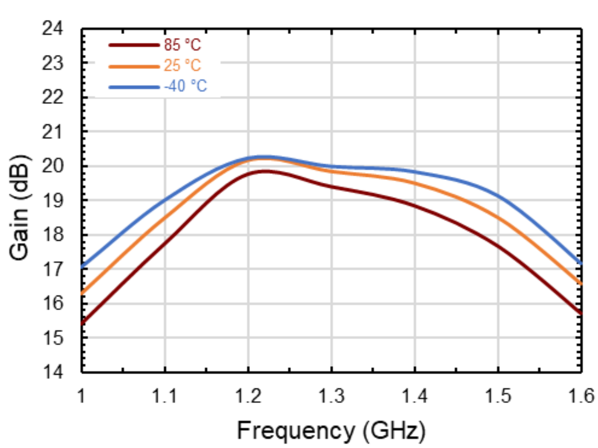
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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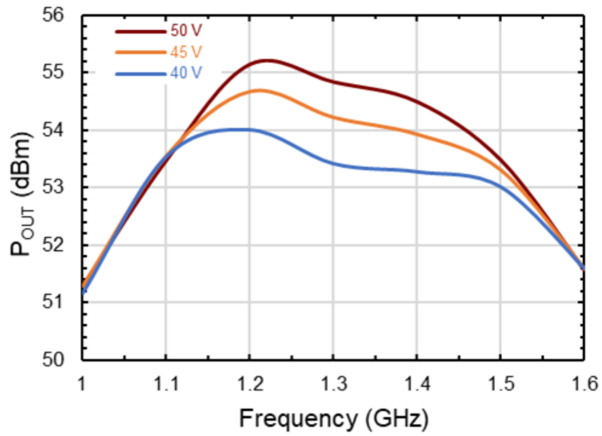
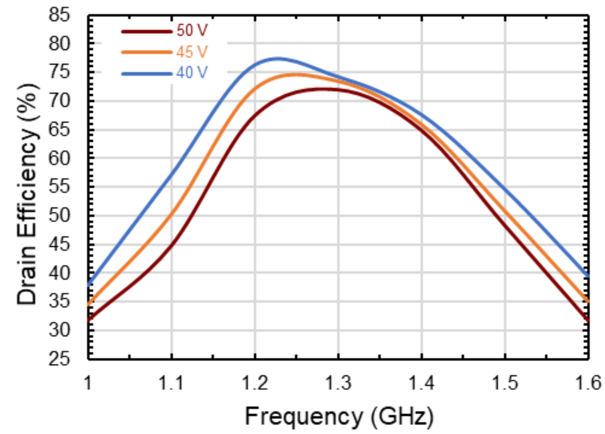
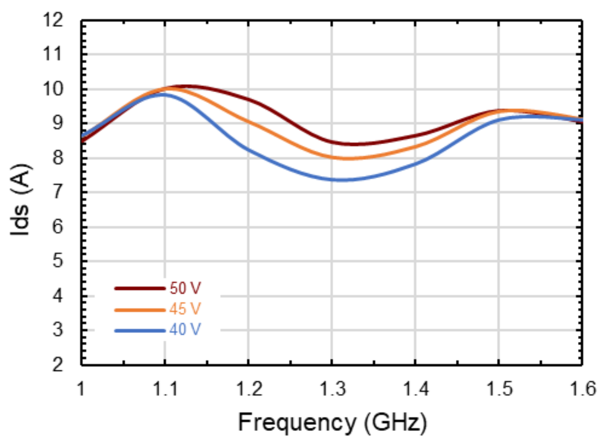
Output Power vs. V_{DS} and Frequency



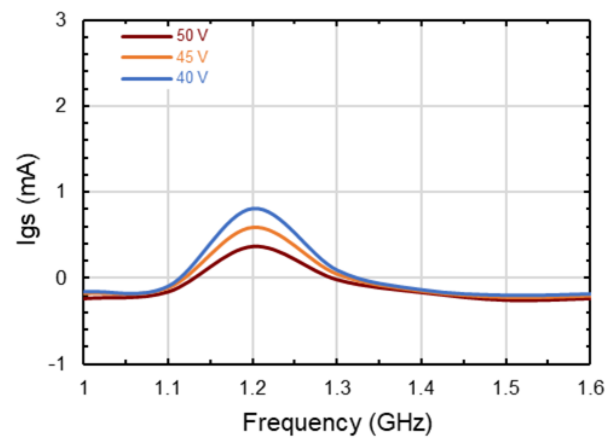
Drain Efficiency vs. V_{DS} and Frequency



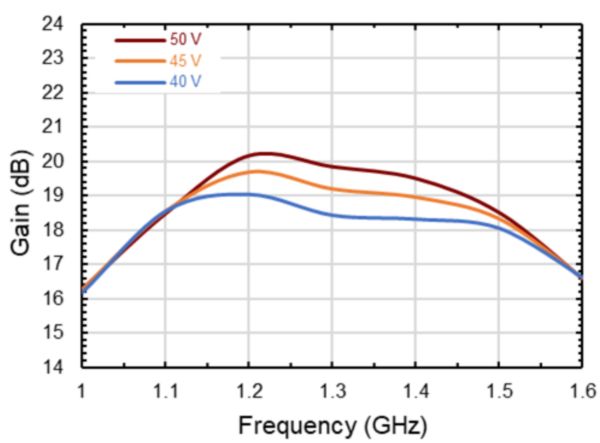
Drain Current vs. V_{DS} and Frequency



Gate Current vs. V_{DS} and Frequency



Large Signal Gain vs. V_{DS} and Frequency



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 μsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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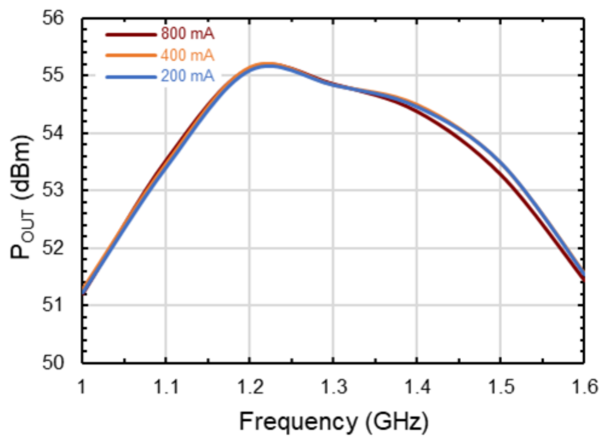
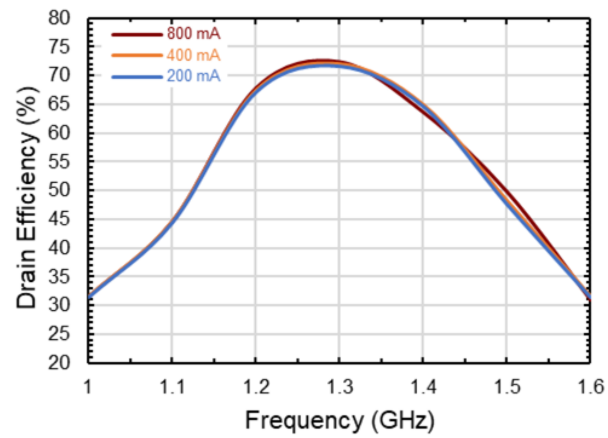
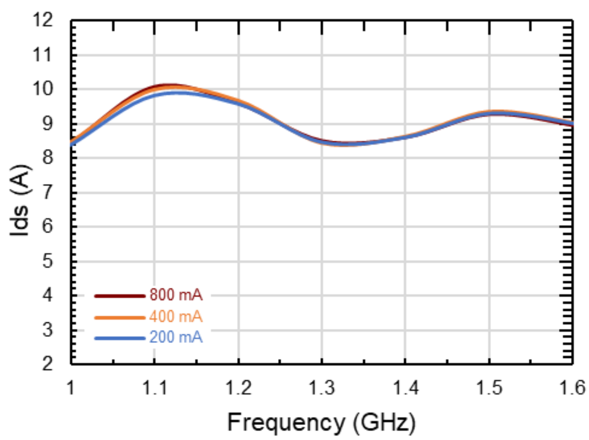
Output Power vs. I_{DQ} and Frequency



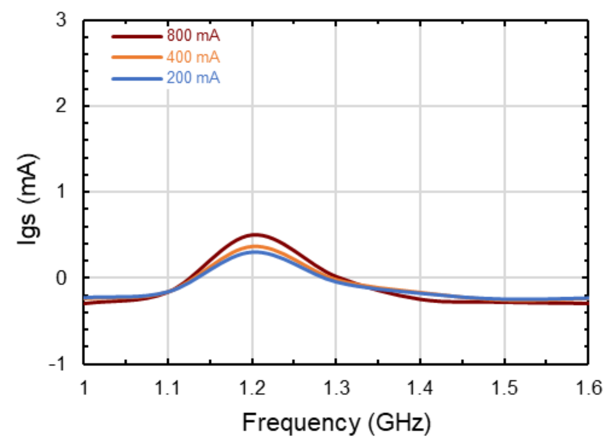
Drain Efficiency vs. I_{DQ} and Frequency



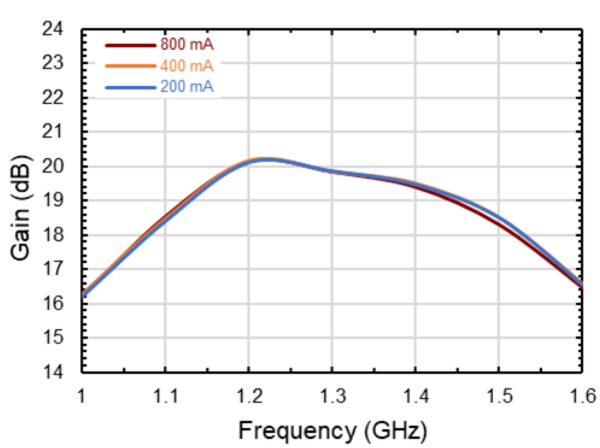
Drain Current vs. I_{DQ} and Frequency



Gate Current vs. I_{DQ} and Frequency



Large Signal Gain vs. I_{DQ} and Frequency



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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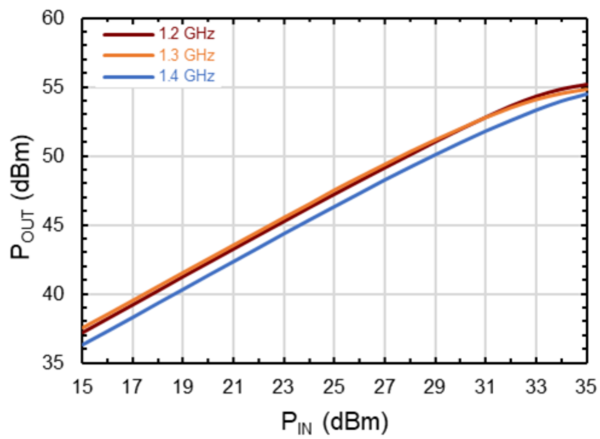
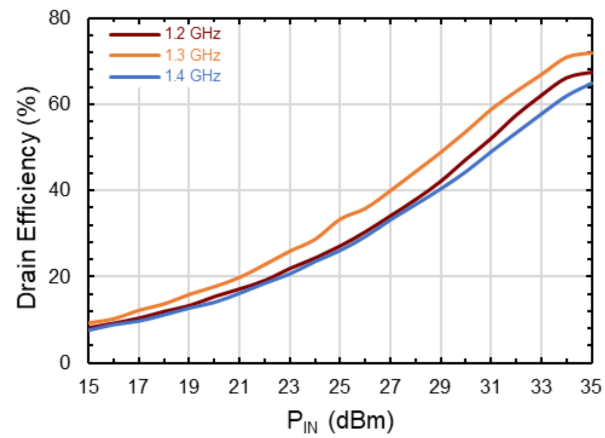
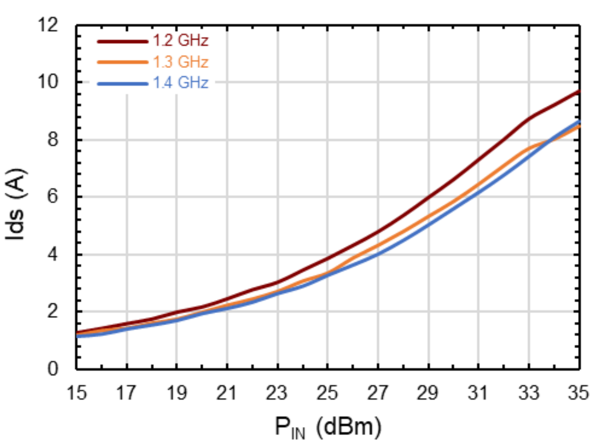
Output Power vs. Frequency and P_{IN}



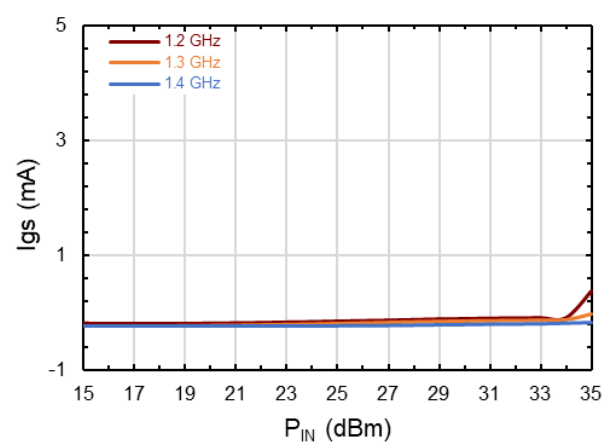
Drain Efficiency vs. Frequency and P_{IN}



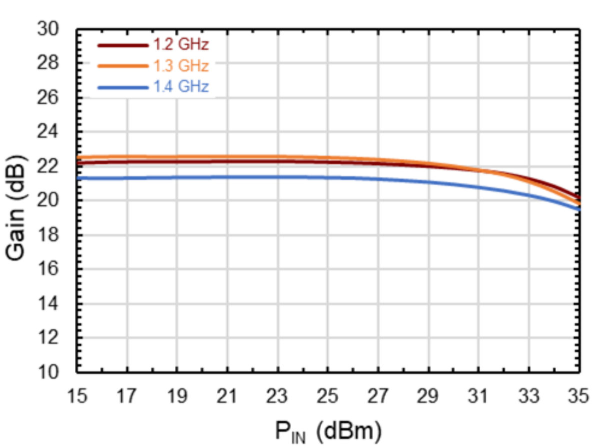
Drain Current vs. Frequency and P_{IN}



Gate Current vs. Frequency and P_{IN}



Large Signal Gain vs. Frequency and P_{IN}



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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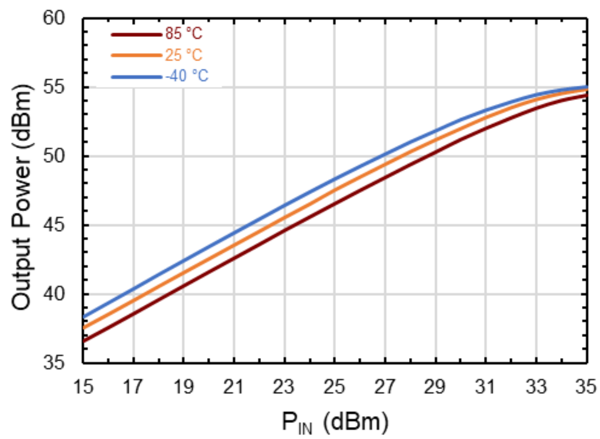
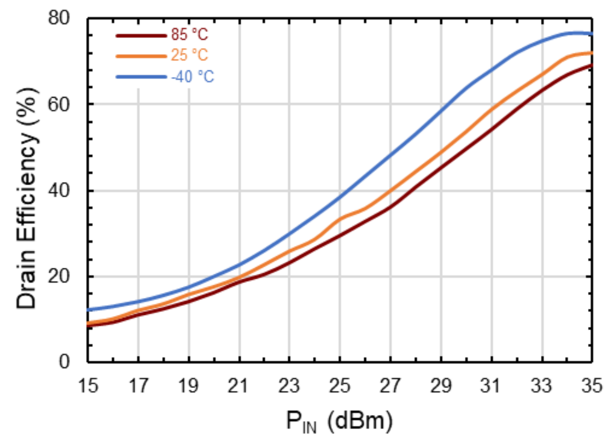
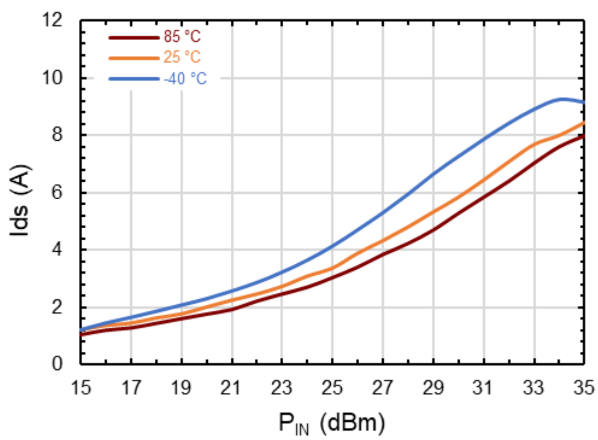
Output Power vs. Temperature and P_{IN}



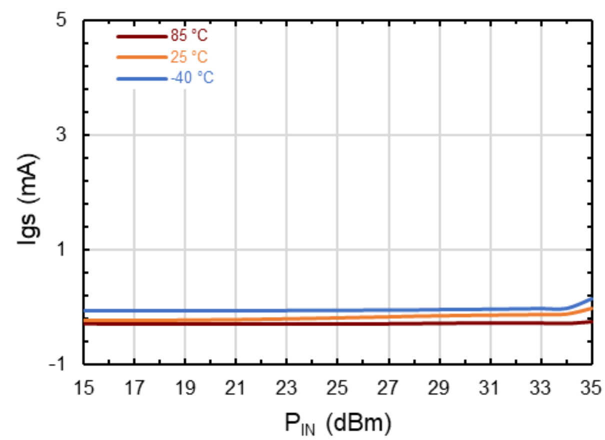
Drain Efficiency vs. Temperature and P_{IN}



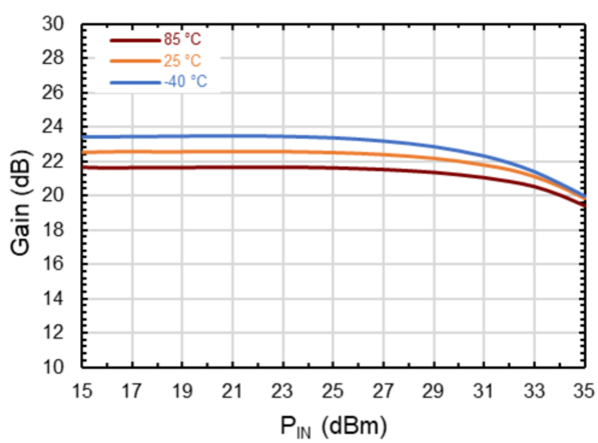
Drain Current vs. Temperature and P_{IN}



Gate Current vs. Temperature and P_{IN}



Large Signal Gain vs. Temperature and P_{IN}



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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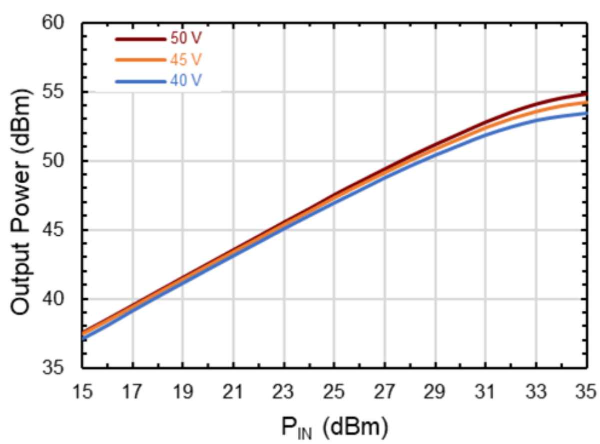
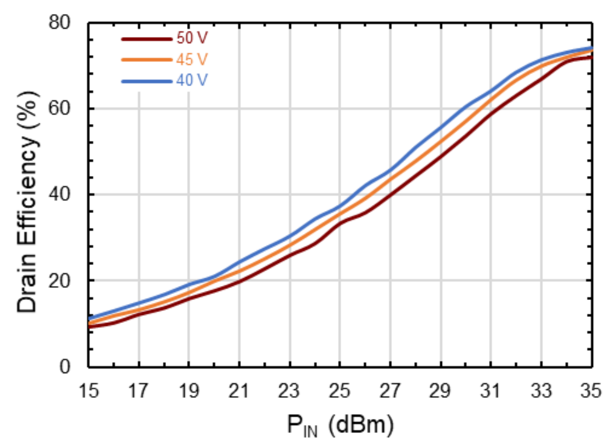
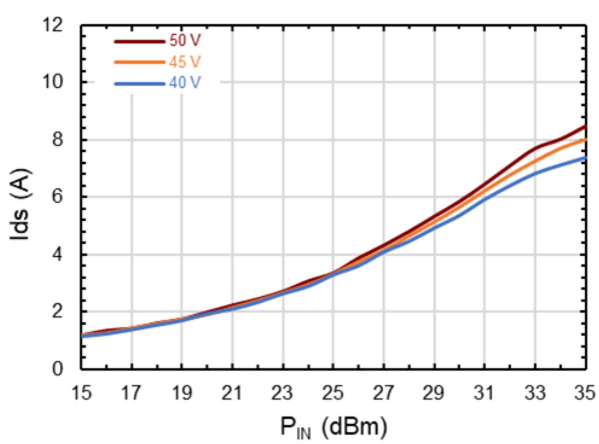
Output Power vs. V_{DS} and P_{IN}



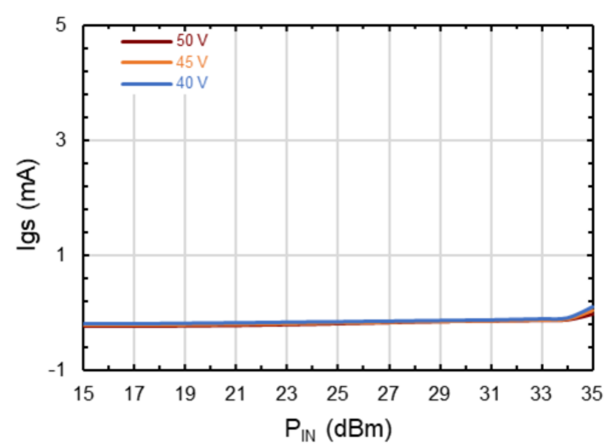
Drain Efficiency vs. V_{DS} and P_{IN}



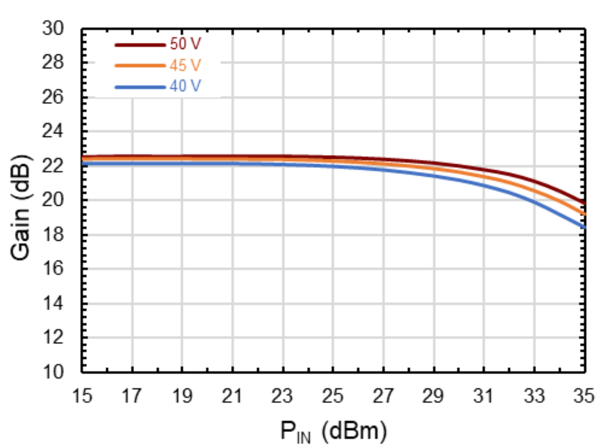
Drain Current vs. V_{DS} and P_{IN}



Gate Current vs. V_{DS} and P_{IN}



Large Signal Gain vs. V_{DS} and P_{IN}



Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulsed 100 µsec/10%,Pin = 35 dBm, V_{DS} = 50 V, I_{DQ} = 400 mA, Frequency = 1.3 GHz (Unless Otherwise Noted)
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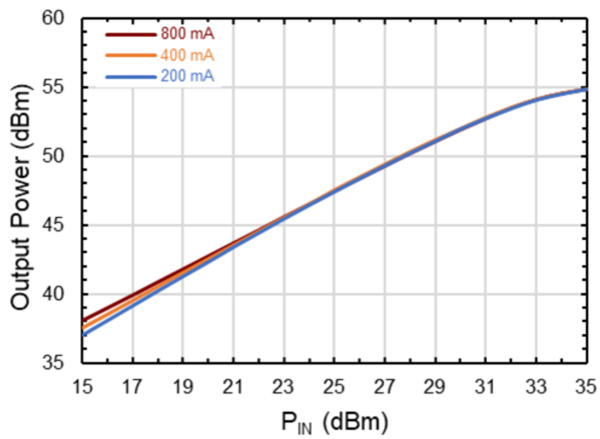
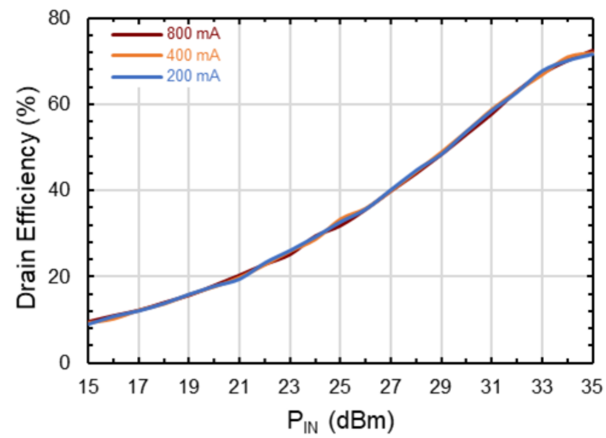
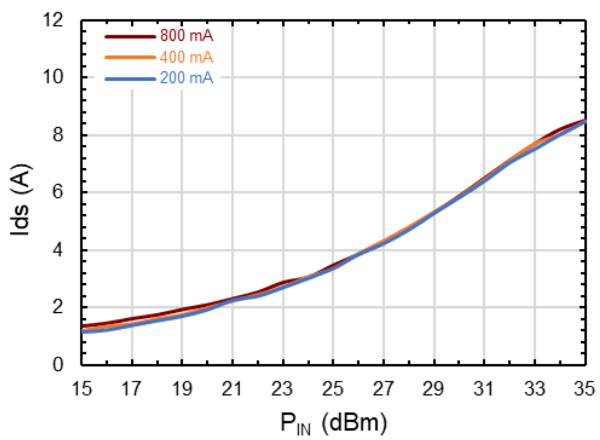
Output Power vs. I_{DQ} and P_{IN}



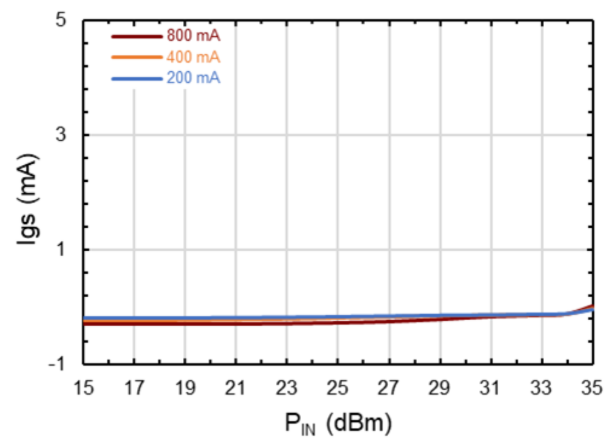
Drain Efficiency vs. I_{DQ} and P_{IN}



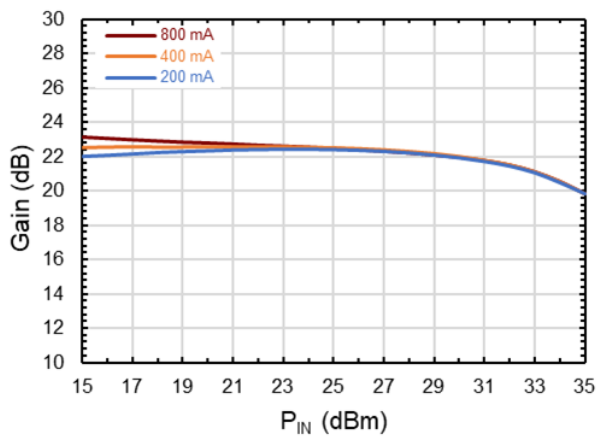
Drain Current vs. I_{DQ} and P_{IN}



Gate Current vs. I_{DQ} and P_{IN}



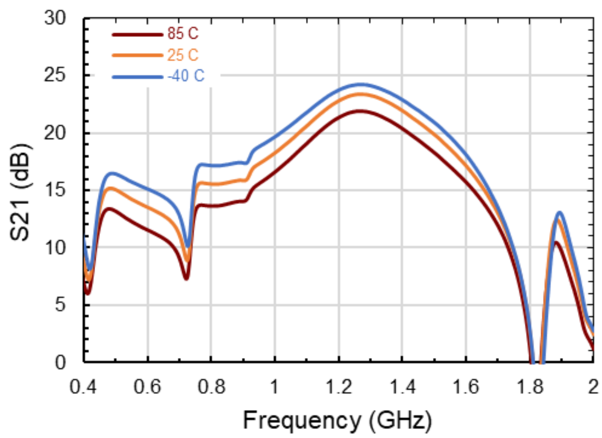
Large Signal Gain vs. I_{DQ} and P_{IN}



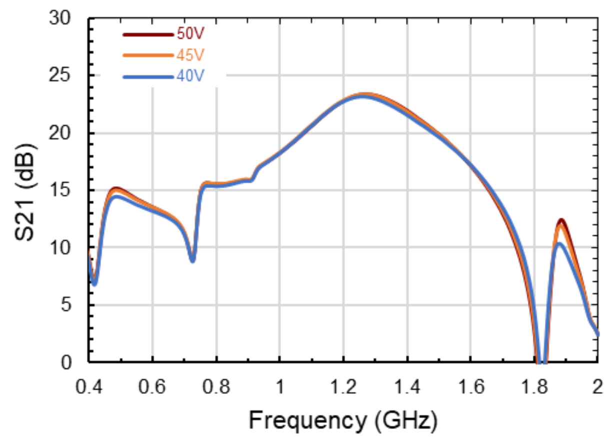
Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 50V, I_{DQ} = 400 mA, Pin=-20dBm
For Engineering Evaluation Only—This data does not Modify MACOM’s Datasheet Limits.

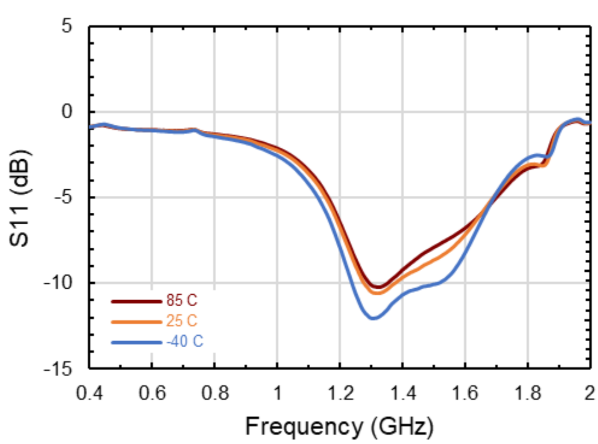
S21 vs Frequency and Temperature



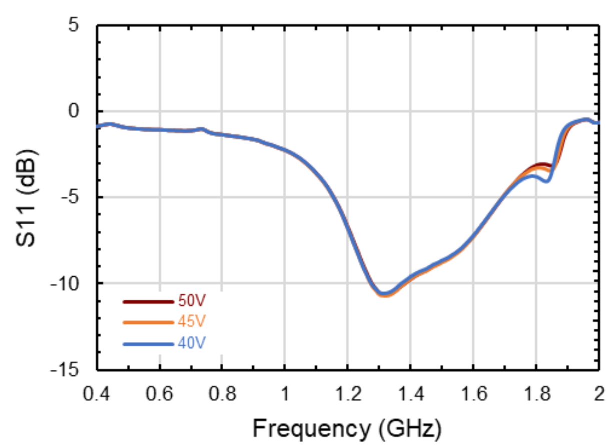
S21 vs Frequency and V_{DS}



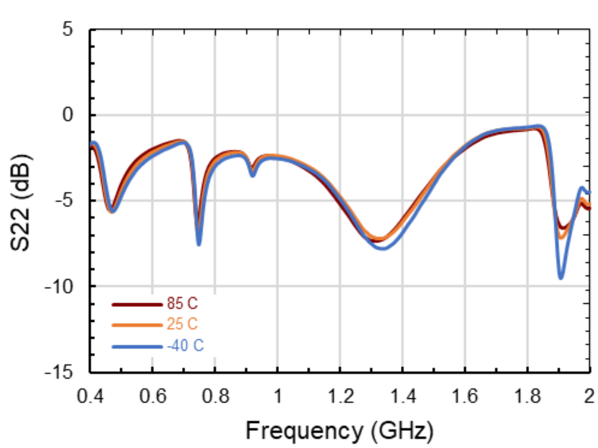
S11 vs Frequency and Temperature



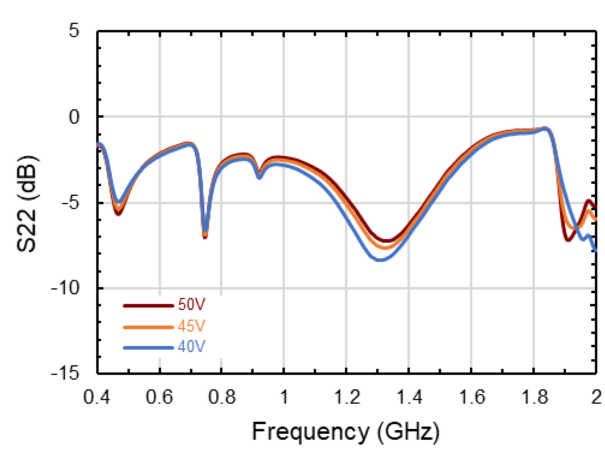
S11 vs Frequency and V_{DS}



S22 vs Frequency and Temperature

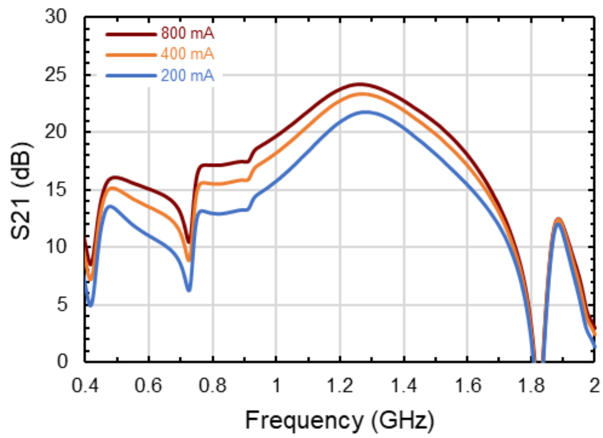


S22 vs Frequency and V_{DS}

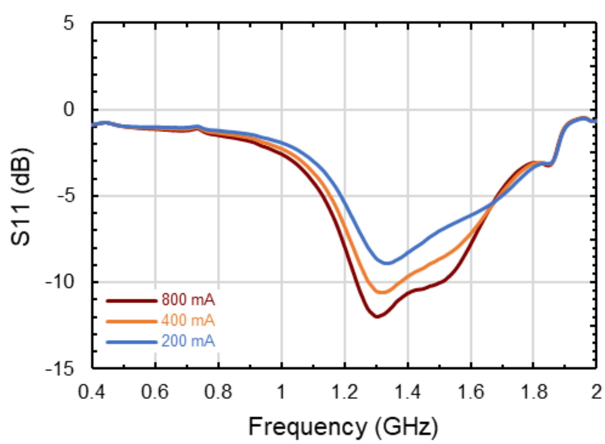


Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:
CW, V_{DS} = 50V, I_{DQ} = 400 mA, Pin=-20dBm
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

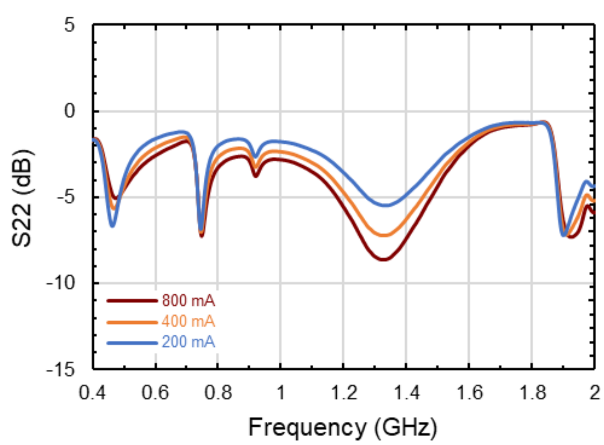
S21 vs Frequency and I_{DQ}



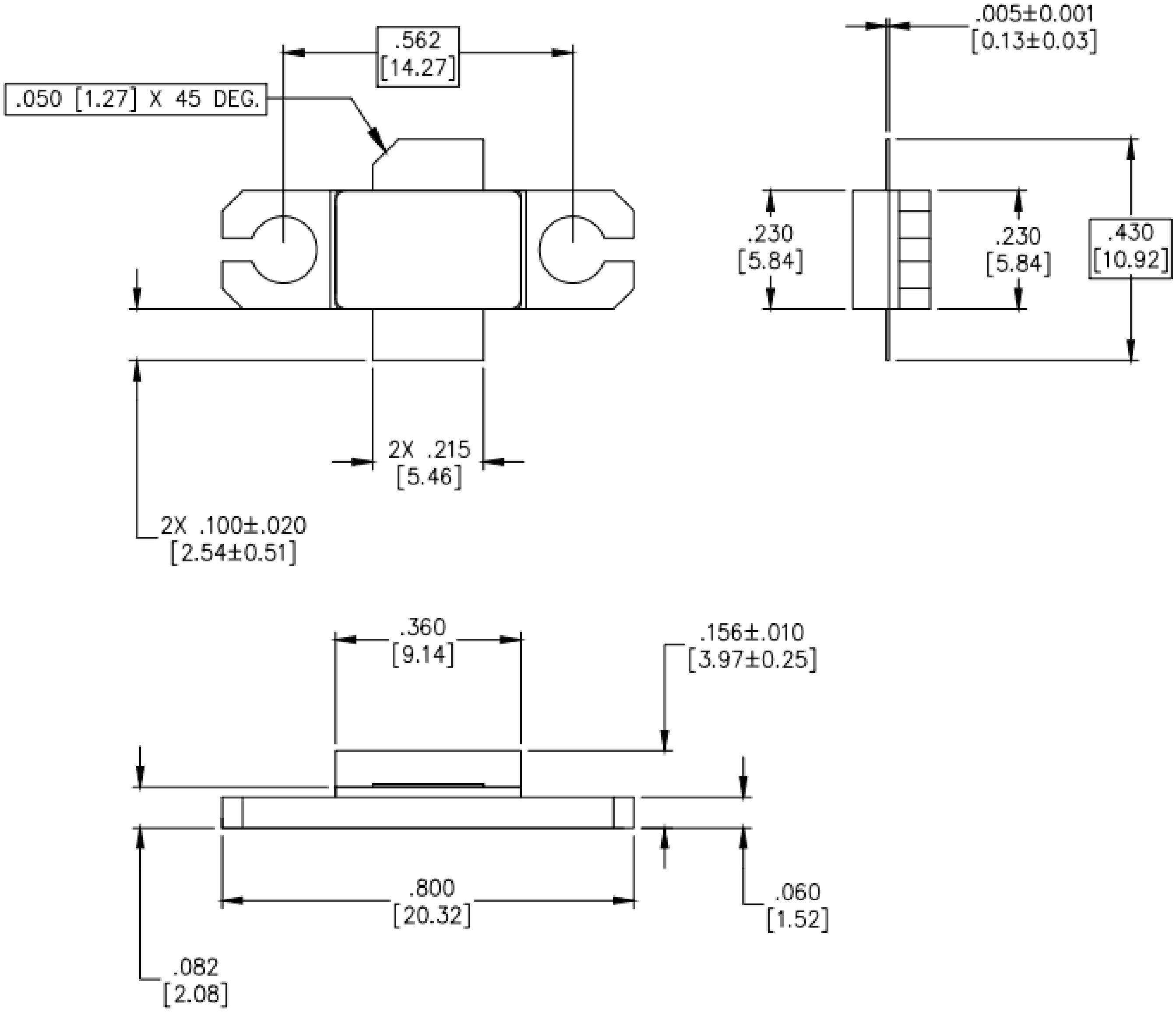
S11 vs Frequency and I_{DQ}



S22 vs Frequency and I_{DQ}



AC-360B-2 Package Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in AND CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
2. ALL TOLERANCES ARE ±.005 [0.13] UNLESS OTHERWISE NOTED
3. LEAD FINISH: AU
   FLANGE FINISH: AU
4. LID SEAL EPOXY MAY FLOW OUT A MAXIMUM OF .020 [0.51] FROM EDGE OF LID
5. LID MAY BE MIS-ALIGNED UP TO .010 [0.25] FROM PACKAGE IN ANY DIRECTION