GaN on SiC Amplifier, 120 W, 28 V
DC - 3 GHz

MACOM PURE CARBIDE™

MAPC-A1107-AB
Rev. V1

Features

- Output Power: 120 W @ 3 GHz
- Drain Efficiency: 66% @ 3 GHz
- Small Signal Gain: 20 dB @ 3 GHz
- Lead-Free Air Cavity Ceramic Package
- RoHS* Compliant

Applications

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

Description

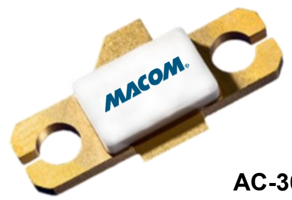
The MAPC-A1107 is a 120 W packaged, input matched amplifier utilizing a high performance, GaN on SiC production process. This amplifier supports both defense and commercial related applications.

Offered in a thermally-enhanced flange package, the MAPC-A1107 provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

Typical RF Performance:

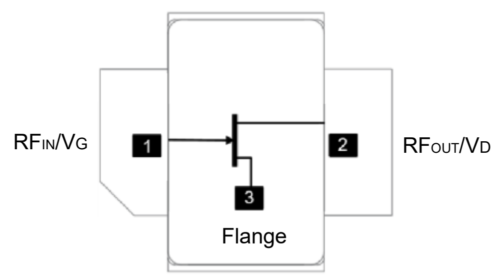
- Wide-band evaluation board performance
- Measured at CW, V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
0.5	48.8	12.9	69.9
1.0	48.2	12.2	52.1
1.5	48.6	12.5	62.6
2.0	48.4	12.5	63.0
2.5	49.8	13.8	58.7
3.0	50.0	14.0	61.0



AC-360B-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-A1107-AB000	Bulk
MAPC-A1107-ABSB1	Sample Board

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

RF Electrical Specifications[2]:
Freq. = 3 GHz, P_{IN} = 35 dBm, T_A = +25°C, V_{DS} = 28 V, I_{DQ} = 1 A, CW

Parameter	Symbol	Min.	Typ.	Max.	Units
Saturated Power	P_{OUT}	82	114	—	W
Drain Efficiency	η	63.5	67.0	—	%
Low Power Gain	G_{SS}	18.5	20	—	dB

2. Final testing and screening for all transistor sales is performed using the MAPC-A1107 production fixture at 3 GHz.

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Drain-Source Voltage	84 V
Gate Voltage	-10, +2 V
Drain Current	12 A
Gate Current	28 mA
Storage Temperature	-55°C to +150°C
Mounting Temperature	+245°C
Junction Temperature[5,6]	+225°C
Operating Temperature	-40°C to +85°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation near these survivability limits.
5. Operating at nominal conditions with $T_J \leq +225$ C will ensure MTTF > 1 x 10^6 hours.
6. Junction Temperature (T_J) = T_C + ϴjc * (V * I)
   Typical thermal resistance (ϴjc) = 1.5°C/W for CW.
   a) For T_C = +25°C,
      T_J = 107°C @ P_{DISS} = 54.3 W
   b) For T_C = +85°C,
      T_J = 172°C @ P_{DISS} = 57.4 W

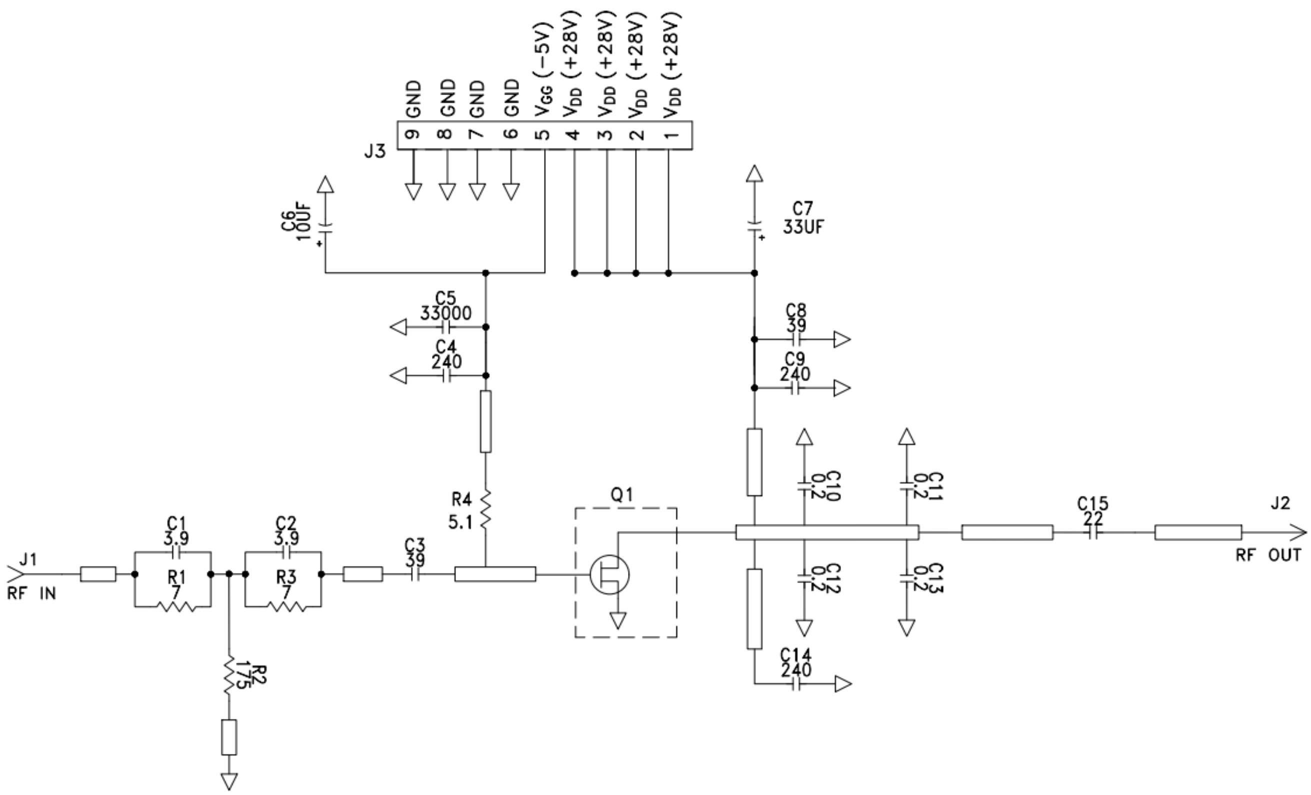
Handling Procedures

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, 0.5 - 3.0 GHz



Description

Parts measured on evaluation board (10-mil thick RO6035HTC). 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

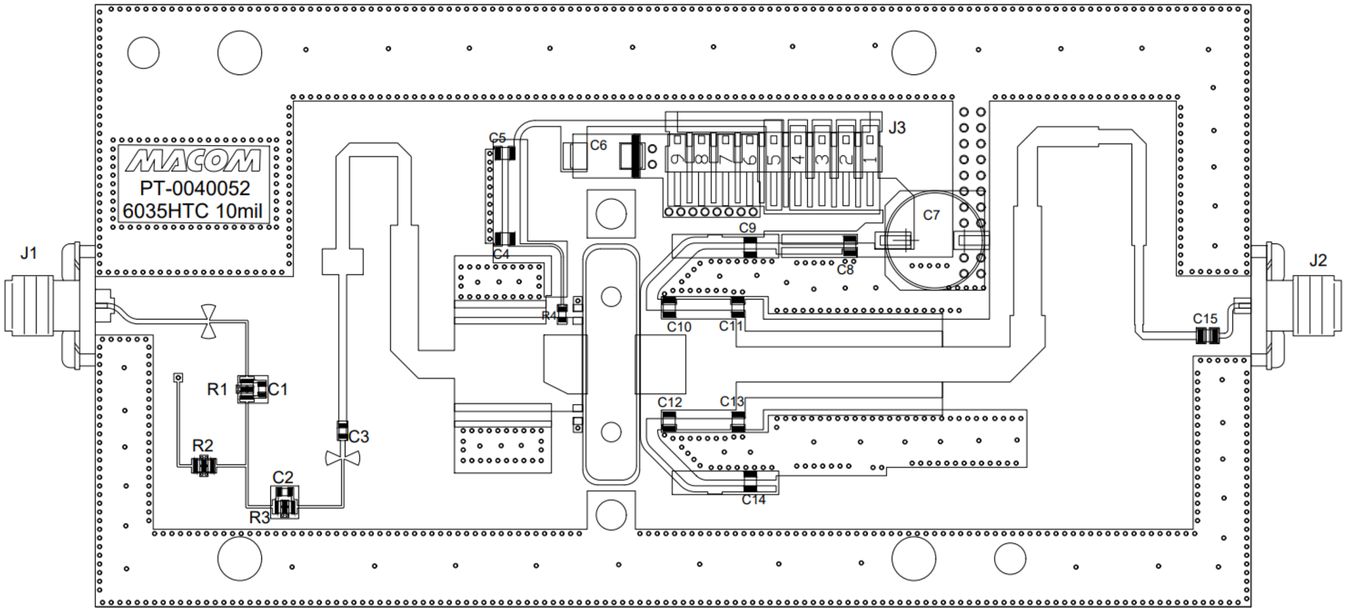
Bias ON

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, 0.5 - 3.0 GHz



Assembly Parts List

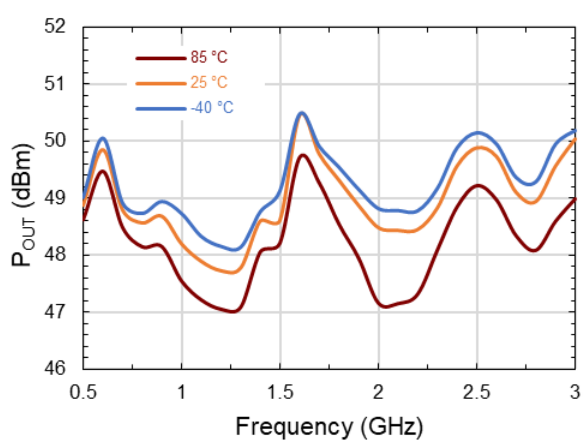
Reference Designator	Description	Part Number	Qty.
C1, C2	CAP, 3.9 pF, ±0.1pF, 250V, +125°C, 600S, AVX	600S3R9BT250XT	2
C3	CAP, 39 pF, ±5%, 250V, +125°C, 600S, AVX	600S390JT250XT	1
C4, C9, C14	CAP, 240 pF, ±5%, 250V, +125°C, 600F, AVX	600F241JT250XT	3
C5	CAP, 33 nF, ±10%, 100V, +125°C, 0805, AVX	GRM21BR72A333KA01	1
C6	CAP, 10 µF, ±10%, 16V, +125°C, 2312, AVX	TRJC106M016RRJ	1
C7	CAP, 33 µF, ±20%, 100V, +105°C, 0.406", PANASONIC/KEMET	EEE-FK2A330P | EDH336M100A9PAA	1
C8	CAP, 39 pF, ±5%, 250V, +125°C, 600F, AVX	600F390JT250XT	1
C10, C11, C12, C13	CAP, 0.2 pF, ±0.05pF, 250V, +125°C, 600F, AVX	600F0R2AT250XT	4
C15	CAP, 22 pF, ±5%, 250V, +125°C, 600F, AVX	600F220JT250XT	1
R1, R3	RES, 7 Ω, ±2%, 15mil substrate, 25W @100°C, 150°C, IMS	NDC-0805CS7R00G	2
R2	RES, 175 Ω, ±2%, 15mil substrate, 25W @100°C, 150°C, IMS	NDC-0805CS1750G	1
R4	RES, 5.1 Ω, ±1%, 0603, 1/16W, 155°C, Vishay	CRCW06035R10FKEA	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL, GIGALANE	PSF-S00-000	2
J3	HEADER RT>PLZ .1CEN LK 9POS, TEconnectivity	640457-9	1
-	PCB, 10mil, 1oz Cu + 1oz Clad, RO6035HTC	-	1
Q1	MAPC-A1107-AB, MACOM	MAPC-A1107-AB	1

Typical Performance Curves as Measured in the 0.5 - 3.0 GHz Evaluation Test Fixture

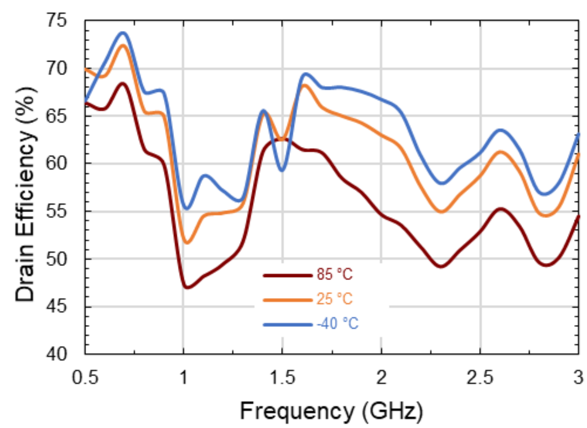
P_{IN} = 36 dBm CW, V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C. (Unless otherwise noted)

For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

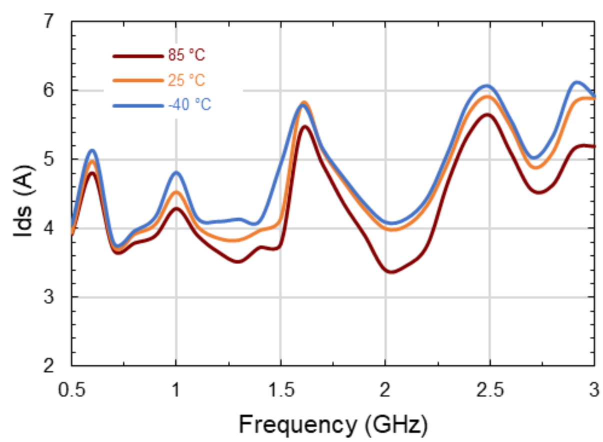
Output Power vs. Frequency vs. Temperature



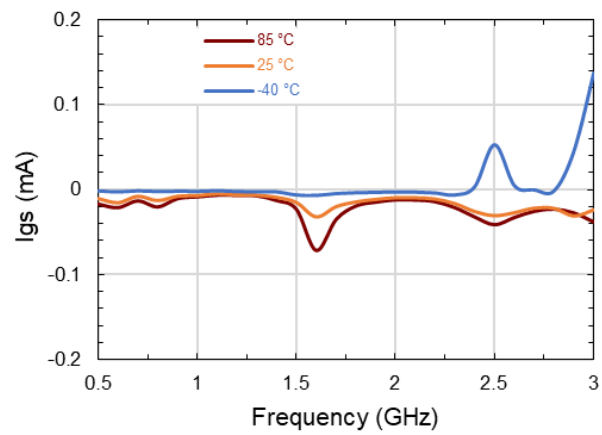
Drain Efficiency vs. Frequency vs. Temperature



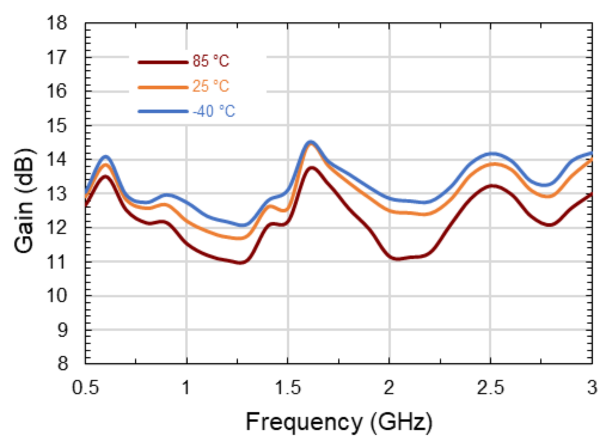
Drain Current vs. Frequency vs. Temperature



Gate Current vs. Frequency vs. Temperature



Large Signal Gain vs. Frequency vs. Temperature



Typical Performance Curves as Measured in the 0.5 - 3.0 GHz Evaluation Test Fixture

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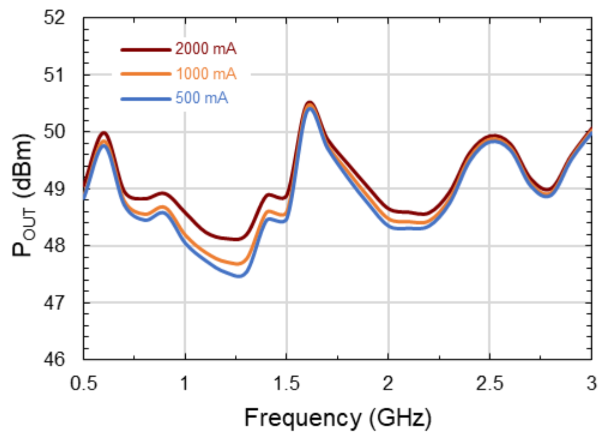
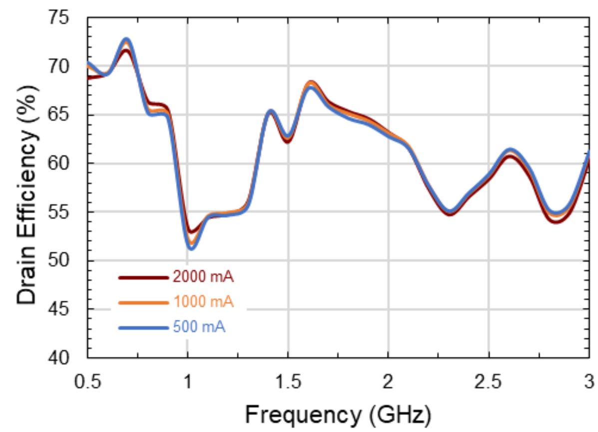
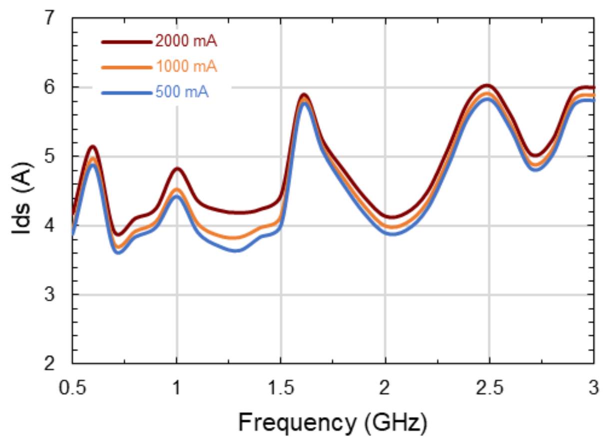
Output Power vs. Frequency vs. Quiescent Current



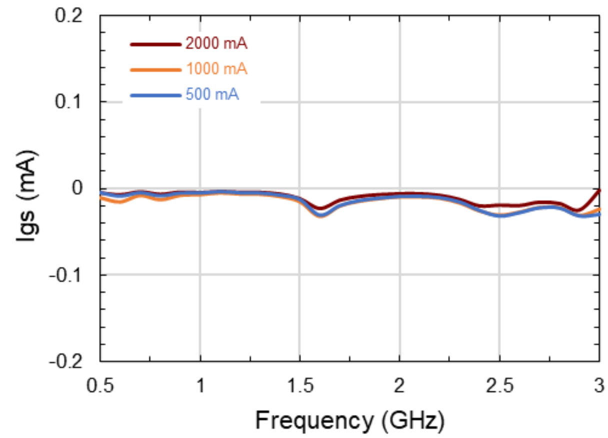
Drain Efficiency vs. Frequency vs. Quiescent Current



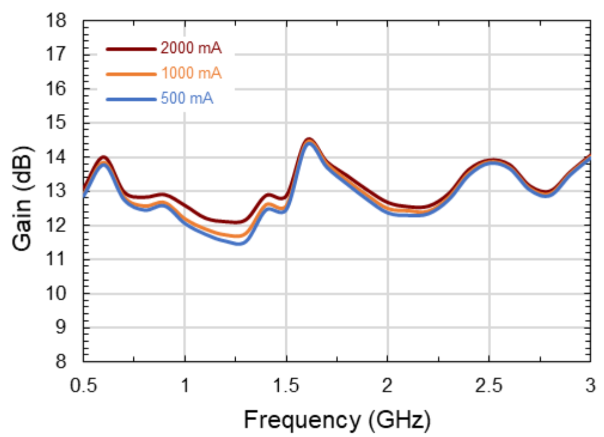
Drain Current vs. Frequency vs. Quiescent Current



Gate Current vs. Frequency vs. Quiescent Current



Large Signal Gain vs. Frequency vs. Quiescent Current



Typical Performance Curves as Measured in the 0.5 - 3.0 GHz Evaluation Test Fixture

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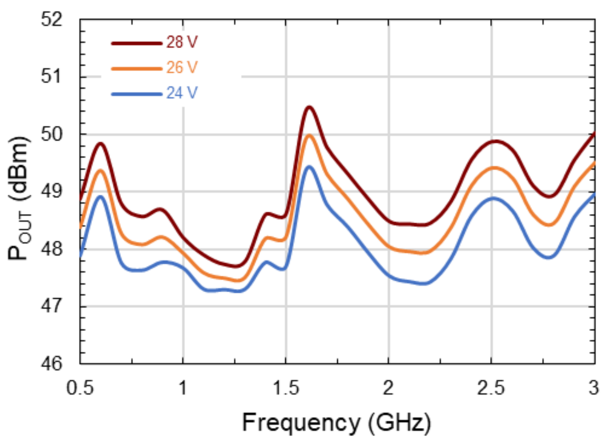
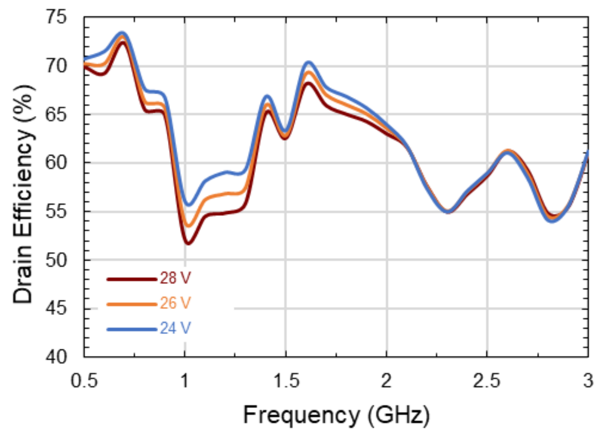
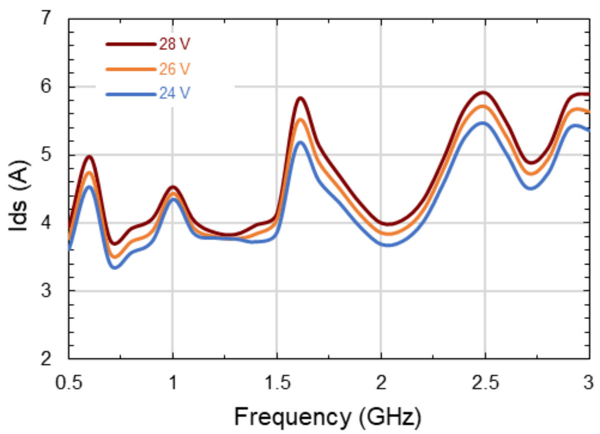
Output Power vs. Frequency vs. Drain Voltage



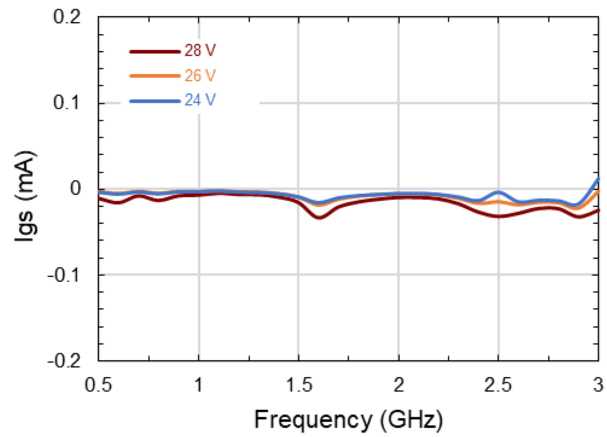
Drain Efficiency vs. Frequency vs. Drain Voltage



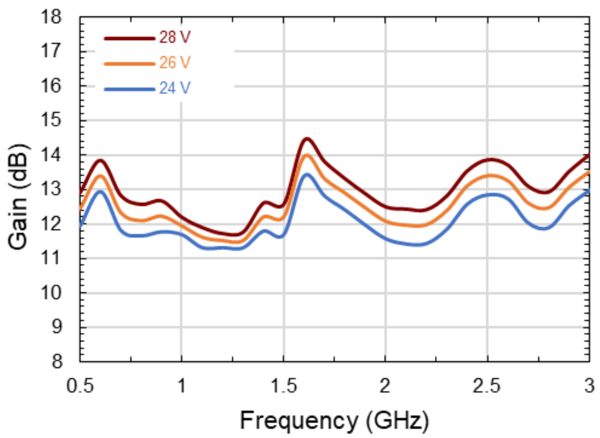
Drain Current vs. Frequency vs. Drain Voltage



Gate Current vs. Frequency vs. Drain Voltage



Large Signal Gain vs. Frequency vs. Drain Voltage



Typical Performance Curves as Measured in the 0.5 - 3.0 GHz Evaluation Test Fixture

P_{IN} = 36 dBm CW, V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C. (Unless otherwise noted)

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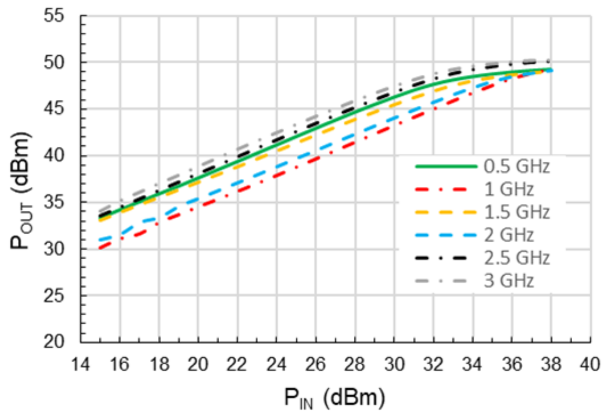
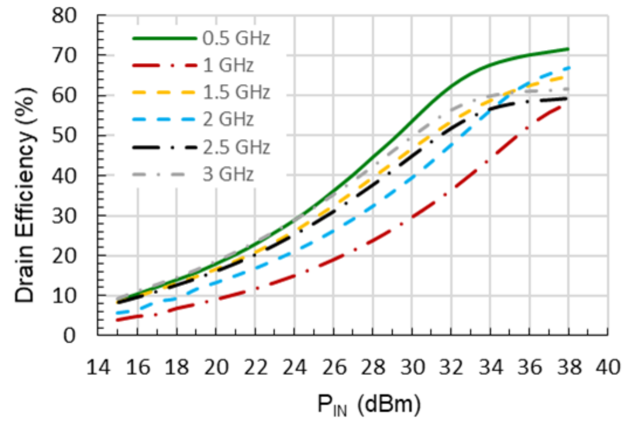
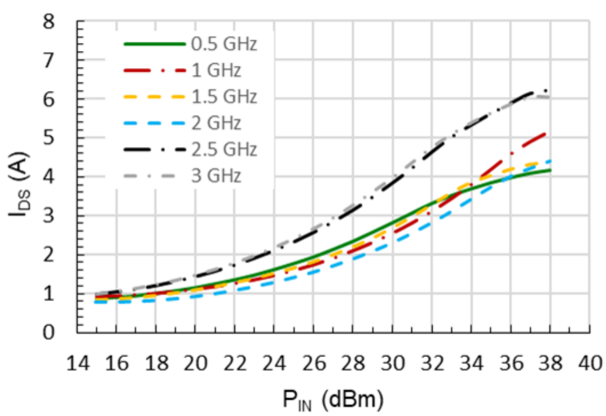
Output Power vs. Input Power



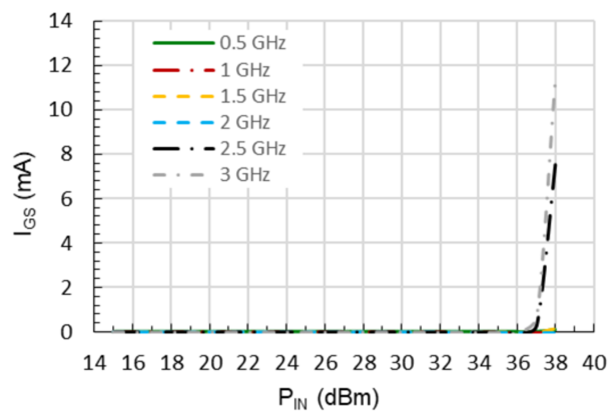
Drain Efficiency vs. Input Power



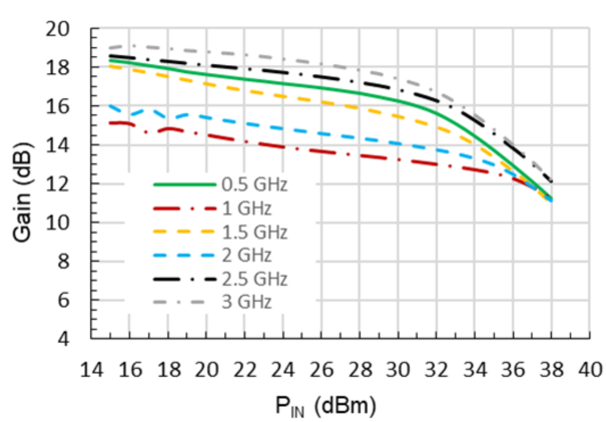
Drain Current vs. Input Power



Gate Current vs. Input Power



Large Signal Gain vs. Input Power



Typical Performance Curves as Measured in the 0.5 - 3.0 GHz Evaluation Test Fixture:

P_{IN} = -20 dBm, V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C. (Unless otherwise noted)

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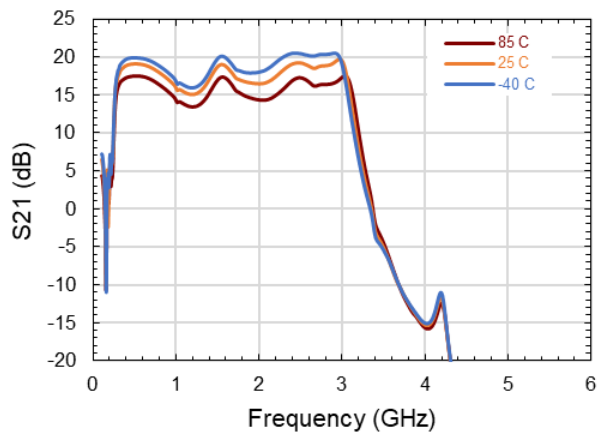
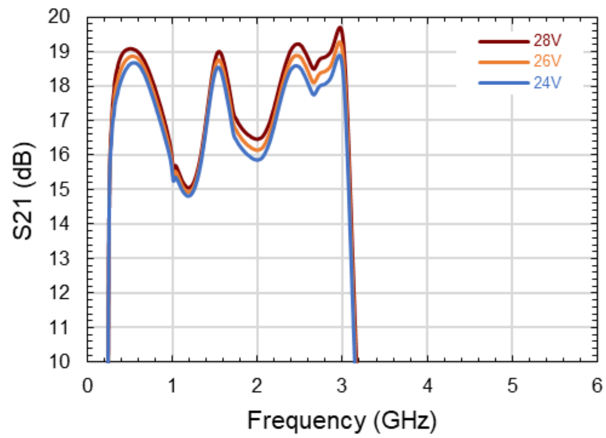
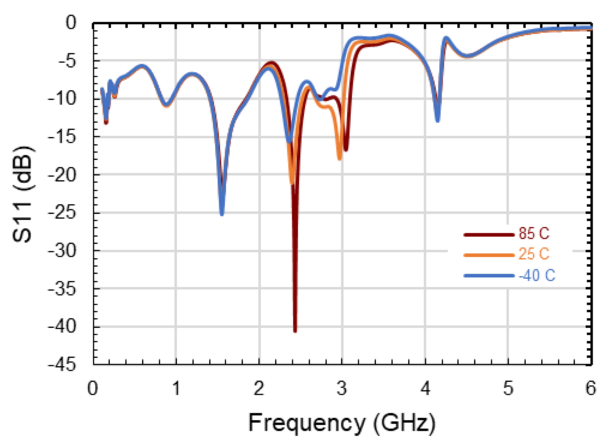
S21 vs. Frequency vs. Temperature



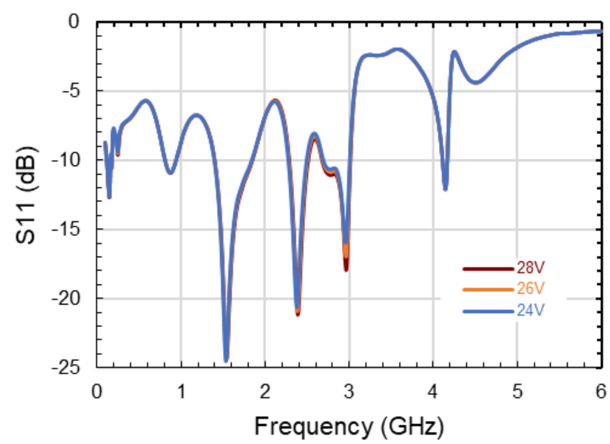
S21 vs. Frequency vs. Drain Voltage



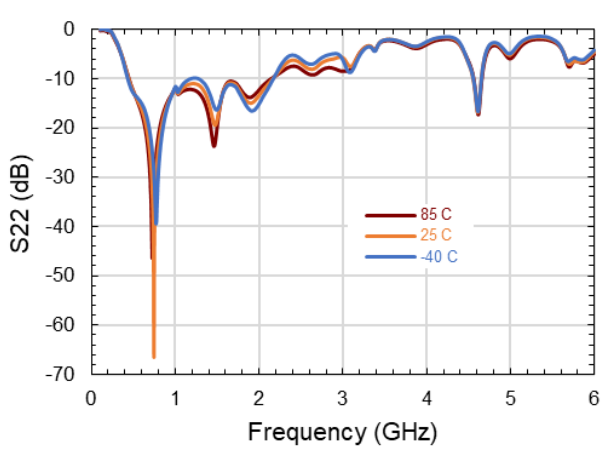
S11 vs. Frequency vs. Temperature



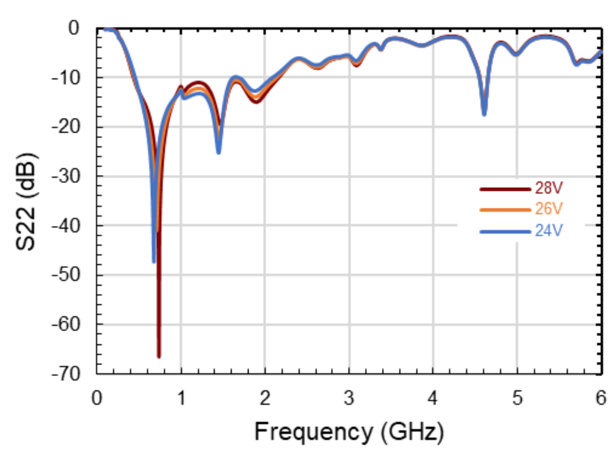
S11 vs. Frequency vs. Drain Voltage



S22 vs. Frequency vs. Temperature



S22 vs. Frequency vs. Drain Voltage



Typical Performance Curves as Measured in the 0.5– 3.0 GHz Evaluation Test Fixture:

P_{IN} = -20 dBm, V_{DS} = 28 V, I_{DQ} = 1 A, T_C = 25°C. (Unless otherwise noted)

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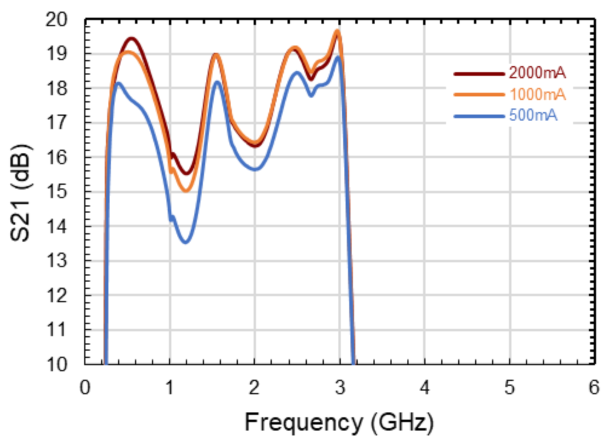
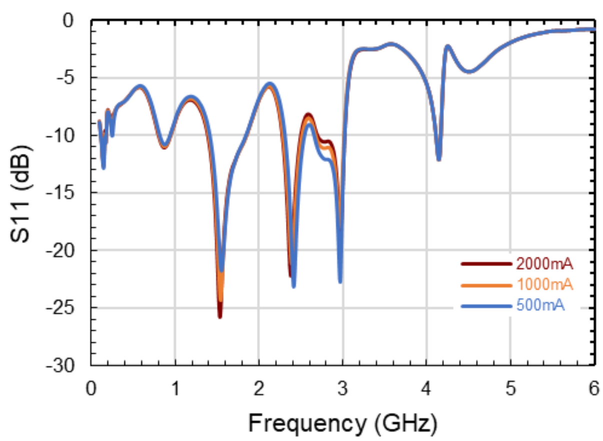
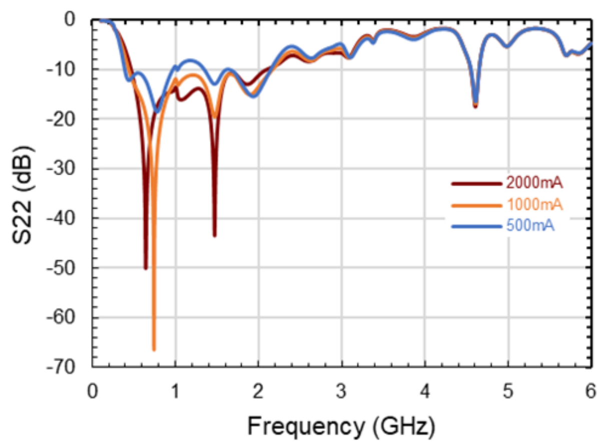
S21 vs. Frequency vs. Quiescent Current



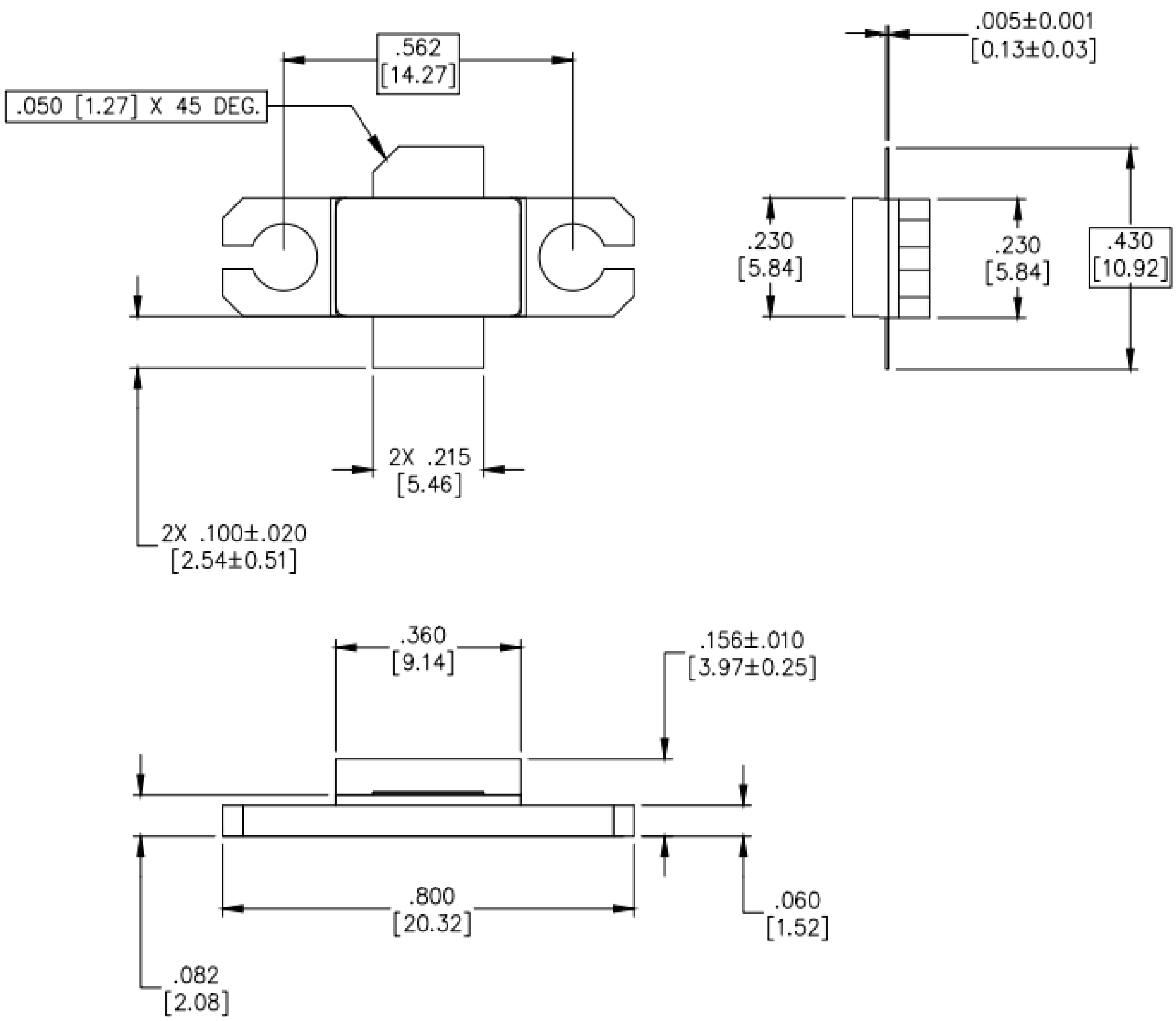
S11 vs. Frequency vs. Quiescent Current



S22 vs. Frequency vs. Quiescent Current



Lead-free 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