GaN on SiC Transistor, 40 W, 65 V
DC - 6 GHz

MACOM PURE CARBIDE™

MAPC-A3029-AB
Rev. V1

Features

- Output Power: 40W
- Drain Efficiency: 72%
- Small Signal Gain: 21 dB
- Lead-Free Air Cavity Ceramic Package
- RoHS* Compliant

Applications

- Avionics - TACAN, DME, IFF
- UHF, S, C and L-band Radar
- General Amplification

Description

The MAPC-A3029-AB is a 40 W packaged, unmatched transistor. This transistor operates up to 1.4 GHz and supports both defense and commercial -related avionics, and radar applications. Under 65 V operation, the MAPC-A3029-AB typically achieves 40 W of output power with 18 dB of large signal gain and 72% drain efficiency via a 0.96 - 1.4 GHz reference design.

Packaged in a thermally-enhanced, flange package, the MAPC-A3029-AB provides superior performance under long pulse operation allowing customers to improve SWaP-C benchmarks in their next-generation systems.

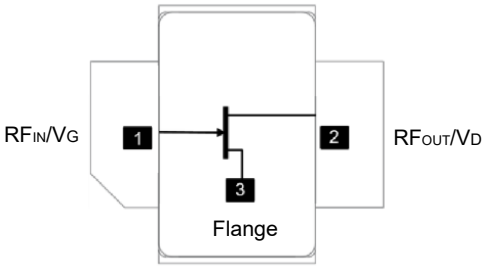
Typical RF Performance:

- Pulsed measurement, P_{IN} = 29 dBm, V_{DS} = 65 V, I_{DQ} = 150 mA, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
0.96	46.8	17.8	61.3
1.2	47.2	18.2	71.8
1.4	45.9	16.9	57.5

AC-200B-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-A3029-AB000	Bulk Quantity: Bolt-down
MAPC-A3029-ABSB1	Sample Board: Bolt-down

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

RF Electrical Specifications[2]:
Frequency = 1.2 GHz, CW, P_{IN} = 29 dBm, T_A = +25C, V_{DS} = 65 V, I_{DQ} = 150 mA

Parameter	Symbol	Min.	Typ.	Max.	Units
Output Power	P_{OUT}	52	53.5	—	W
Drain Efficiency	η	73	75	—	%
Power Gain	G_P	18.2	18.3	—	dB

2. Final testing and screening for all transistor sales is performed using the MAPC-A3029-ABSB1 production test fixture at 1.2 GHz.

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Drain-Source Voltage	150 V
Gate Voltage	-10 V to +2 V
Drain Current	4.2 A
Gate Current	5.2 mA
Input Power	31 dBm
Junction Temperature[5,6]	+225°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Mounting Temperature	+245°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) = 4.47 °C/W, pulse width = 300 µs, Duty Cycle = 20%.
   a) For T_C = +85°C,
   T_J = 190 °C @ P_{DISS} = 23.4 W

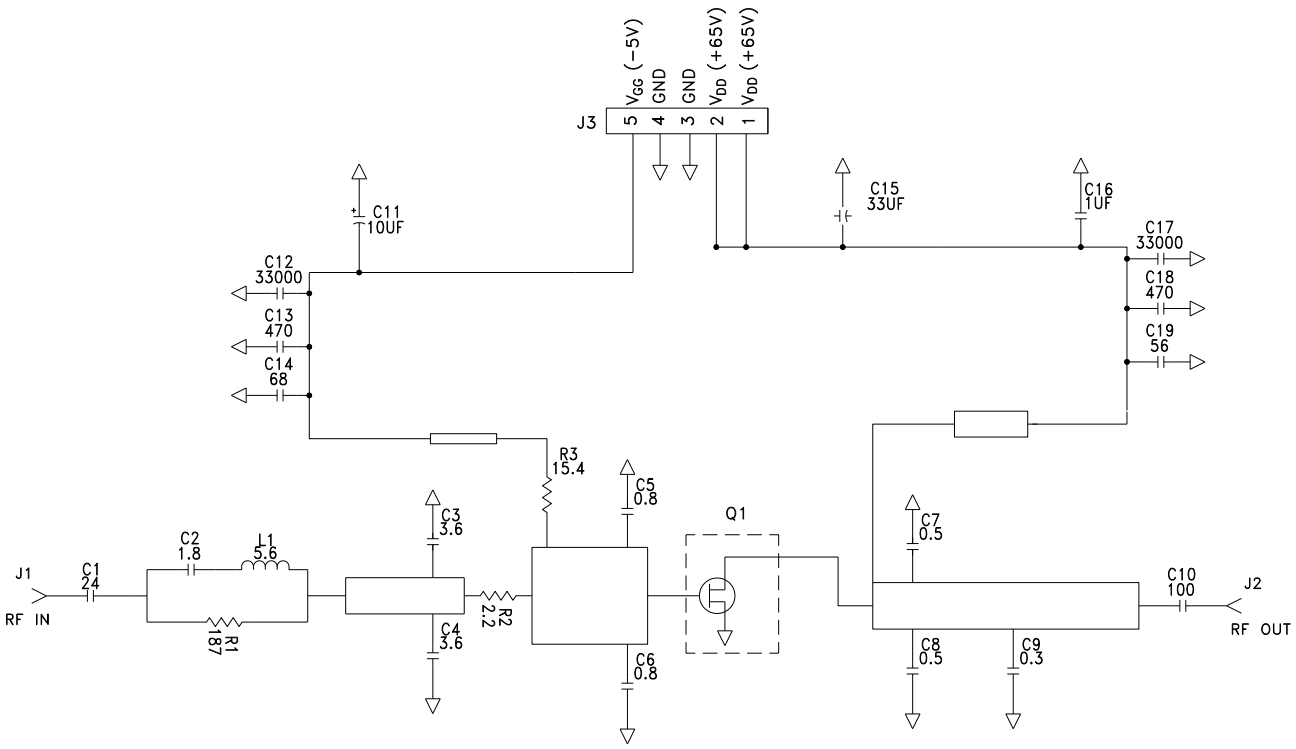
Handling Procedures

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 HBM Class 1A and CDM Class C0B devices.

Evaluation Test Fixture and Recommended Tuning Solution, 0.96 - 1.4 GHz



Description

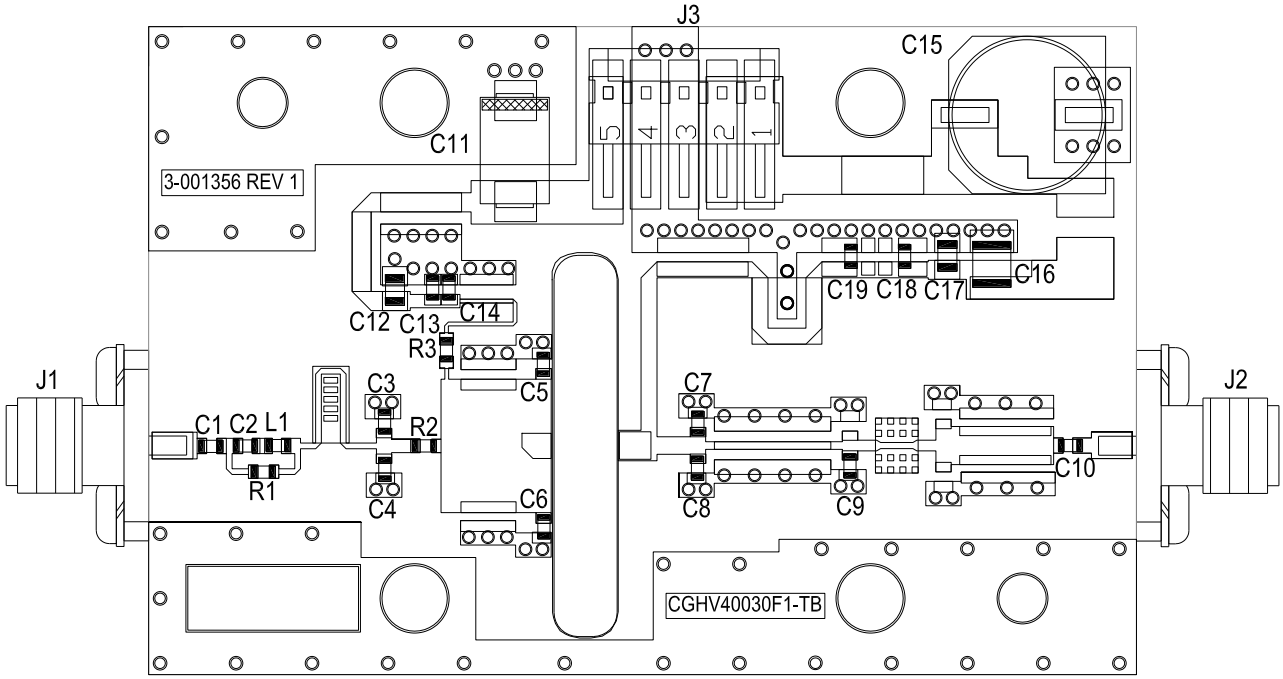
Parts measured on evaluation board (20-mil thick RO4350B). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

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, 0.96 - 1.4 GHz



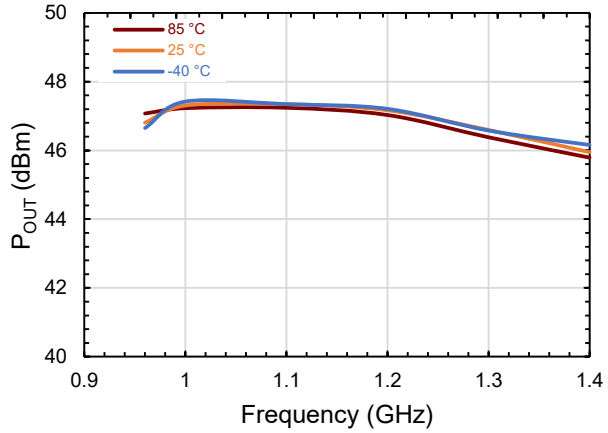
Assembly Parts List

Reference Designator	Description	Manufacturer	Part Number
R2	RES,1/16W,0603,1%,2.2 OHMS	Yageo	RC0603JR-072R2L
R3	RES,1/16W,0603,1%,15.4 OHMS	Vishay	CRCW060315R4FKEA
R1	RES,1/16W,0603,1%,187 OHMS	Vishay	CRCW0603187RFKEA
C1	CAP, 24pF, +/-5%, 0603, ATC	AVX	600S240JT250XT
C2	CAP, 1.8pF,+/-0.1pF, 0603, ATC	AVX	600S1R8BT250XT
C3,C4	CAP, 3.6pF,+/-0.1pF, 0603, ATC	AVX	600S3R6BT250XT
C5, C6	CAP, 0.8pF, +/-0.1 pF, 0603, ATC	ATC	600S0R8AT250XT
C7,C8	CAP, 0.5pF, +/- 0.05pF, 0603, ATC	AVX	600S0R5AT250XT
C9	CAP, 0.3pF,+/- 0.05pF, 0603, ATC	AVX	600S0R3AT250XT
C10	CAP, 100pF, +/-5%, 0603, ATC	AVX	600S101FT250XT
C11	CAP 10UF 16V TANTALUM, 2312	AVX	TAJC106M016RNJ
C12,C17	CAP,33000PF, 0805,100V, X7R	MURATA	GRM21BR72A333KA01
C13,C18	CAP, 470PF, 5%, 100V, 0603, X7R	Murata	GCM1885C2A471JA16
C14	CAP, 68pF,+/-5%pF, 0603, ATC	AVX	600S680JT250XT
C15	CAP, 33 UF, 20%, G CASE	Kemet	EDH336M100A9PAA
C16	CAP, 1.0UF, 100V, +/-10%, X7R, 1210	MURATA	GCJ31CR72A105KA01
C19	CAP, 56PF +/- 5%, 0603 , ATC600S	AVX	600S560FT250XT
L1	INDUCTOR, SMT, 0603, 5.6nH, 5%, RoHS COMPLIANT	JOHANSON DIELECTRIC	L-14C5N6SV4S
J1,J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST	AMPHENOL CONNEX	132150
J3	HEADER RT>PLZ .1CEN LK 5POS	AMP, INC.	640457-5
PCB	PCB, RO4350B, 20mil, 0.96GHZ-1.4GHZ		
Q1	Macom GaN Transistor		MAPC-A3029-AB

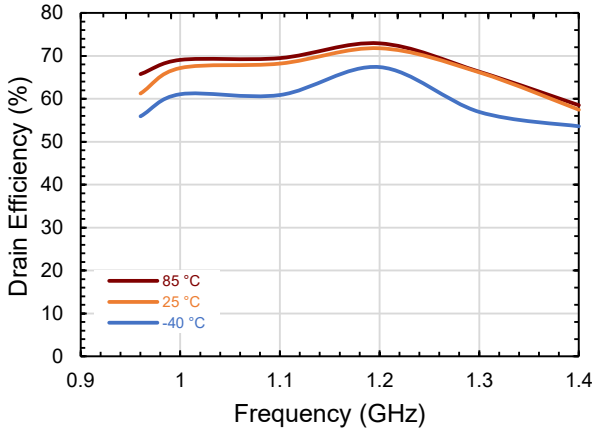
Typical Performance Curves as Measured in the 0.96 - 1.4 GHz Evaluation Test Fixture

Pulsed 300 µs, 20%, P_{IN} = 29 dBm, V_{DS} = 65 V, I_{DQ} = 150 mA, Frequency = 1.2 GHz (Unless otherwise noted)
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

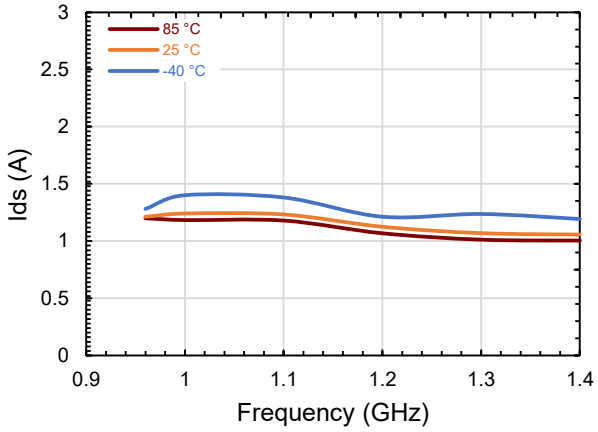
Output Power vs. Temperature and Frequency



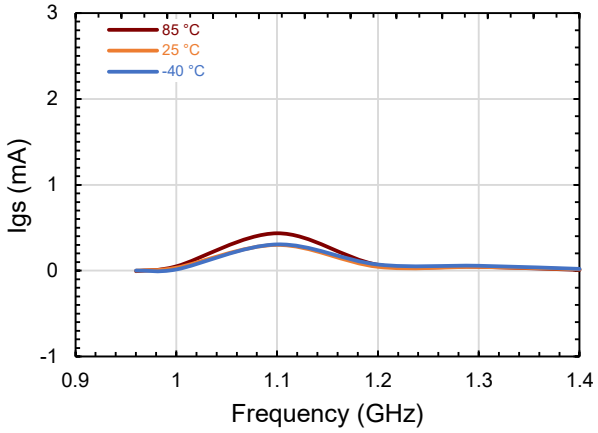
Drain Efficiency vs. Temperature and Frequency



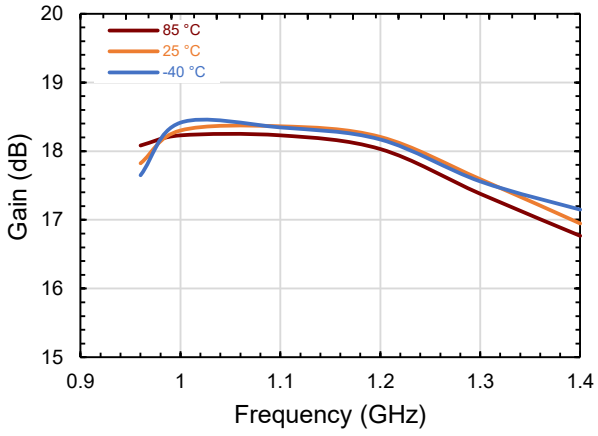
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency



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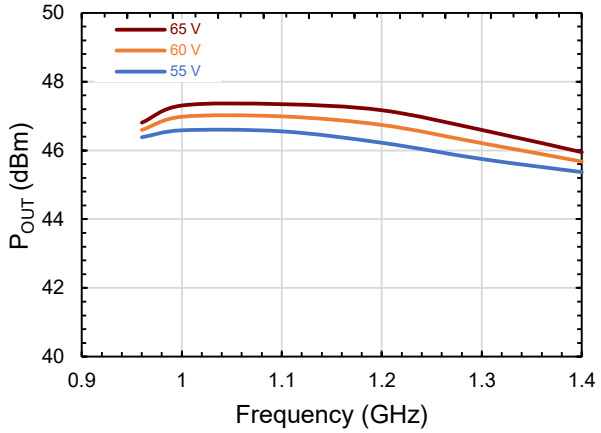
Output Power vs. V_{DS} and Frequency



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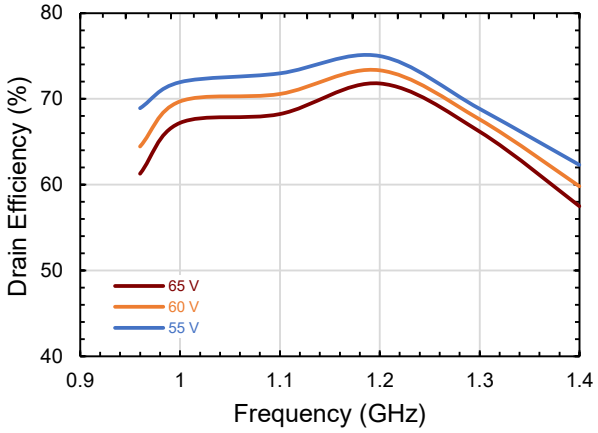

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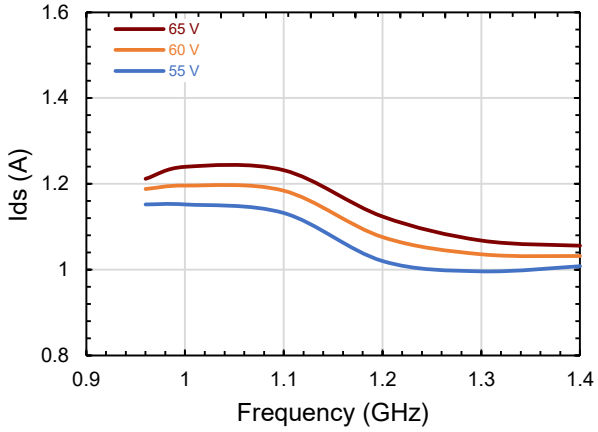
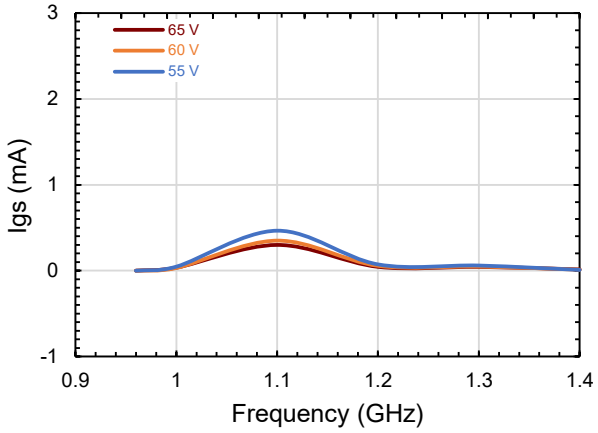


Gate Current vs. V_{DS} and Frequency



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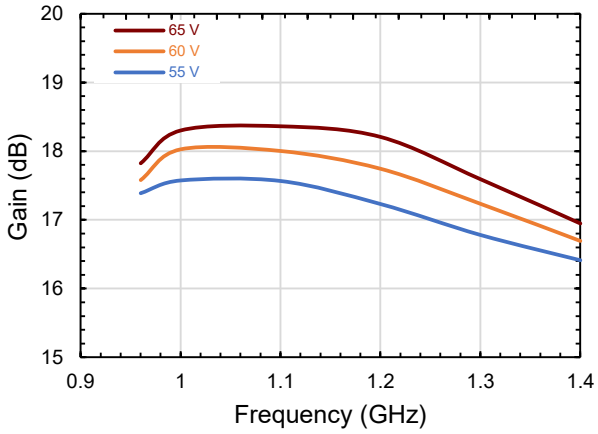

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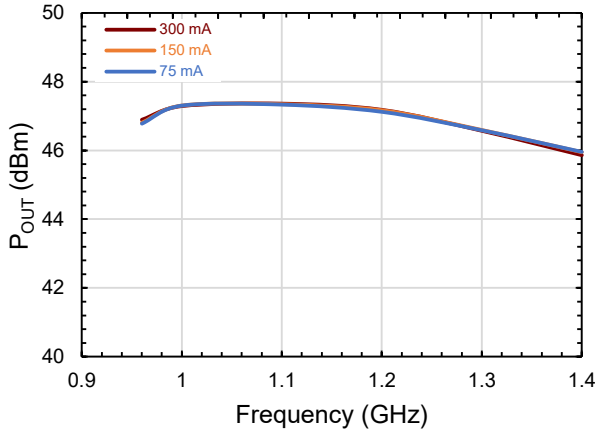

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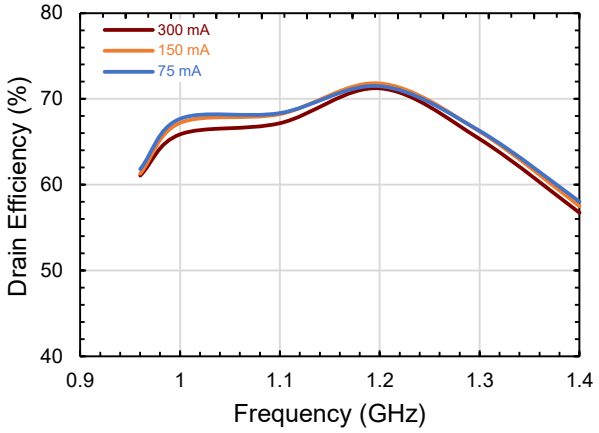

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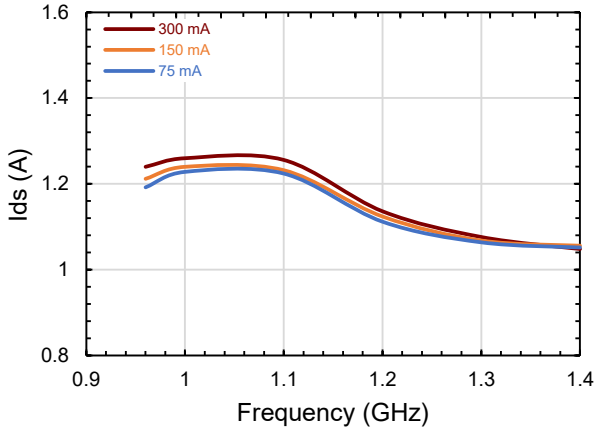

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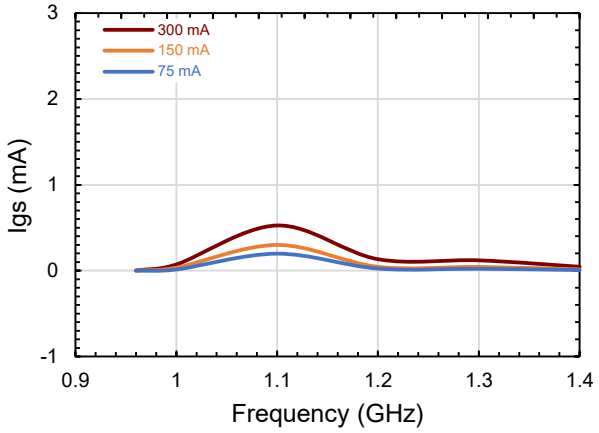

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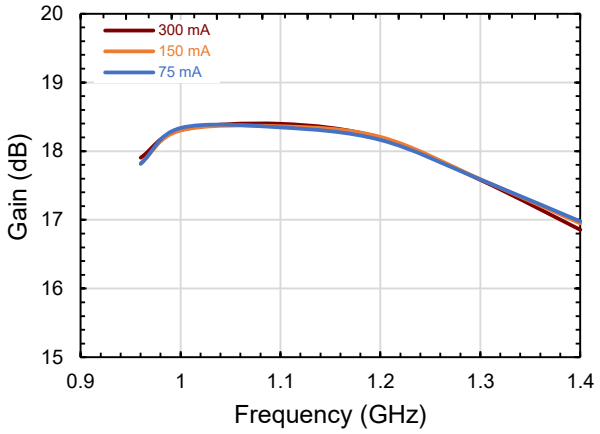

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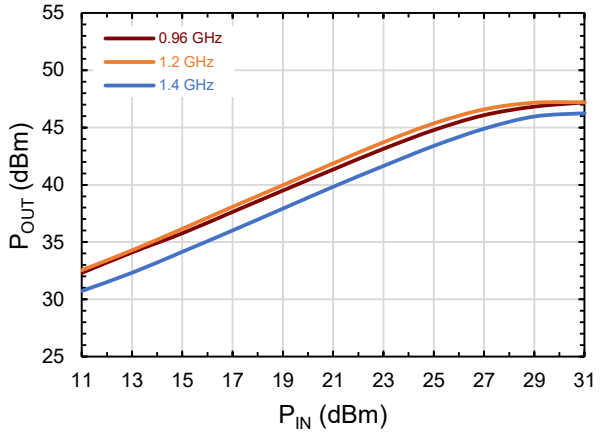

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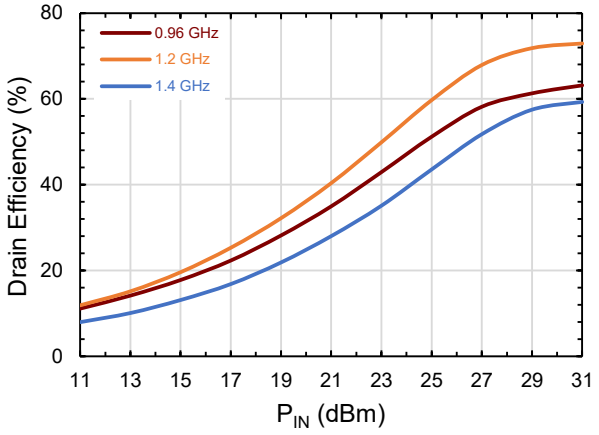

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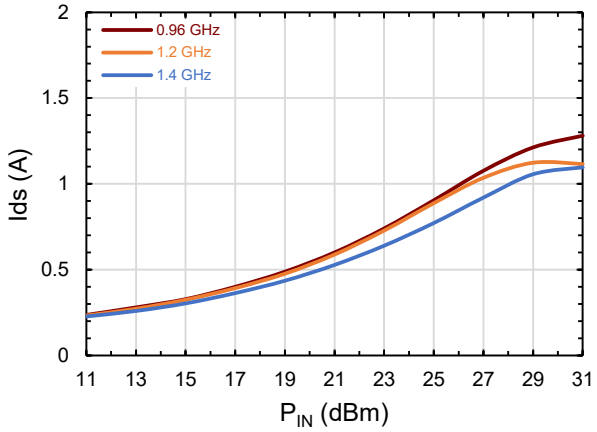

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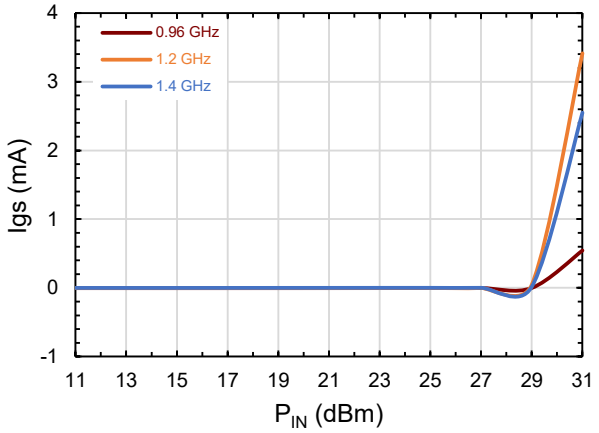

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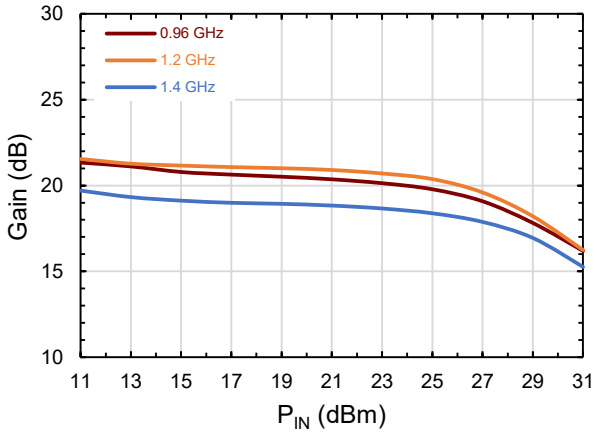

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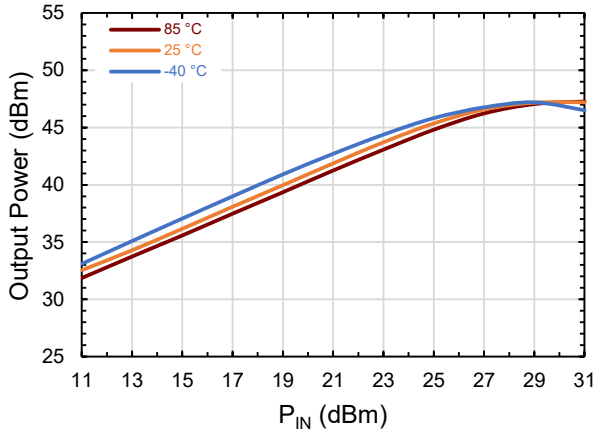

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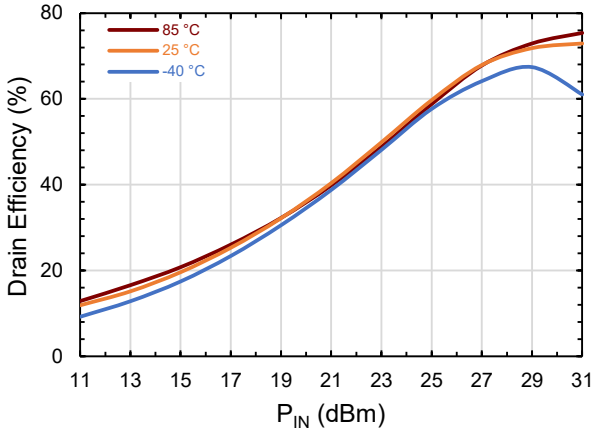

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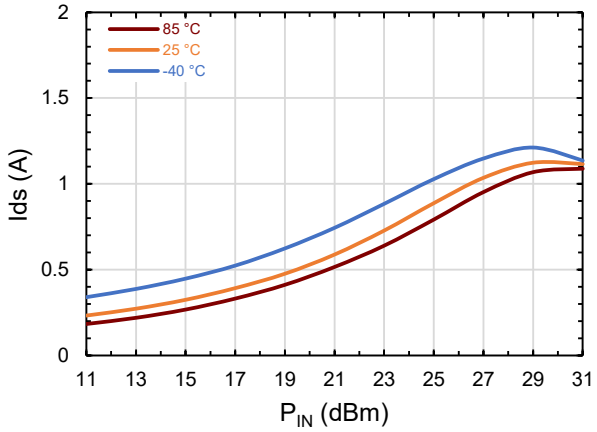

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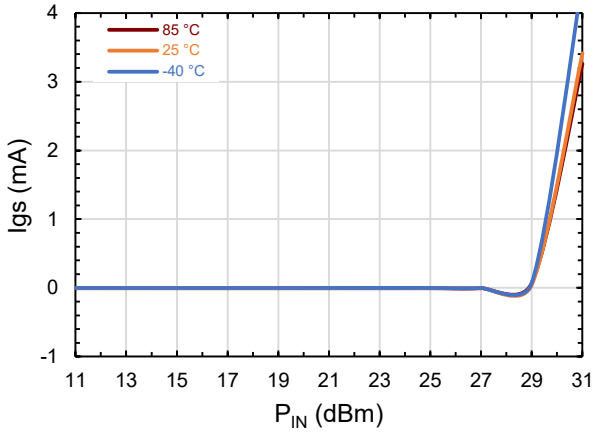

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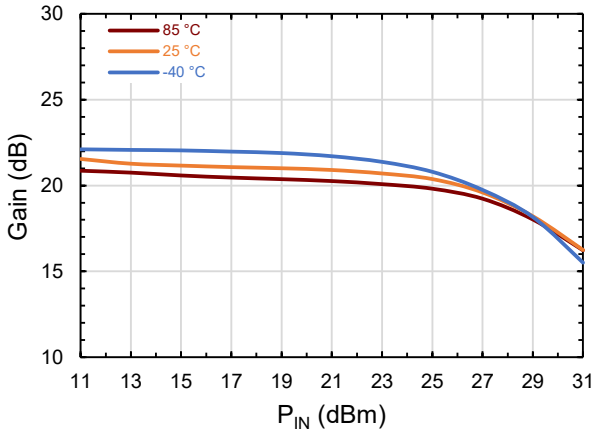

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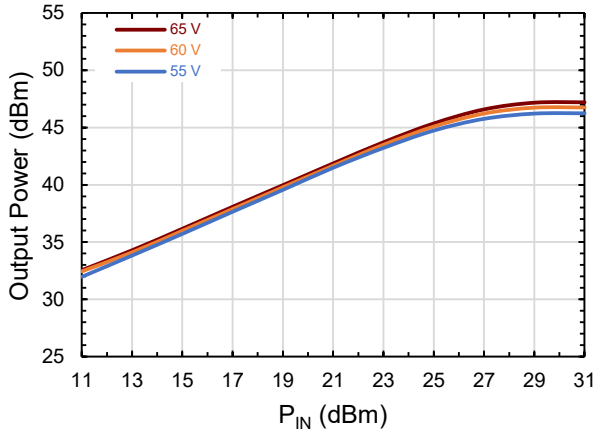

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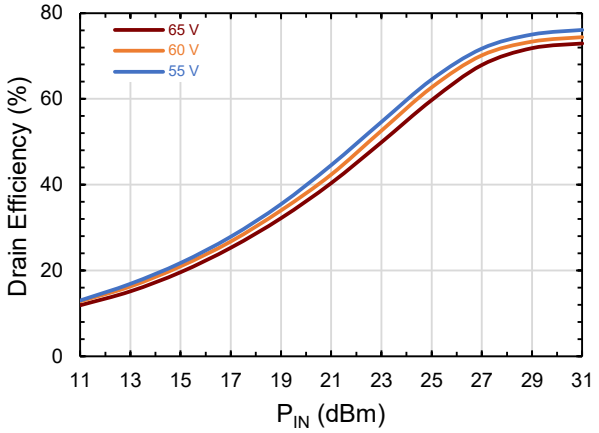

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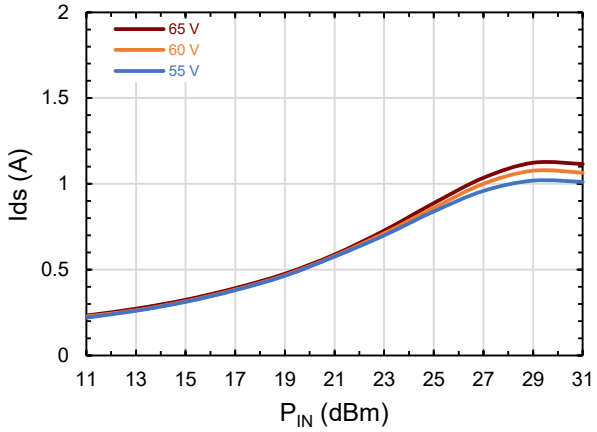

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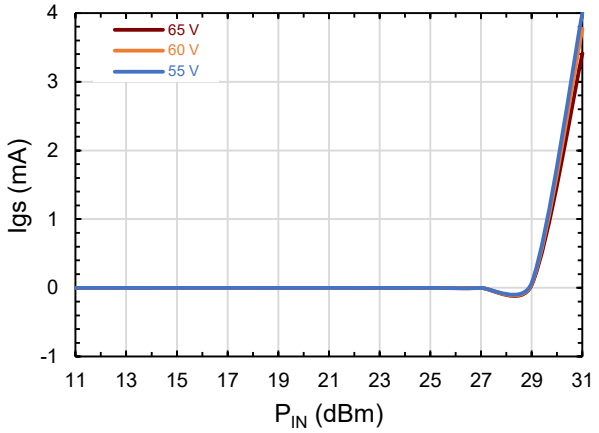

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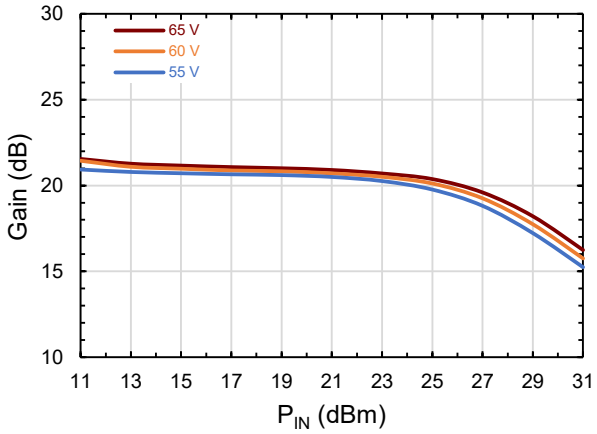

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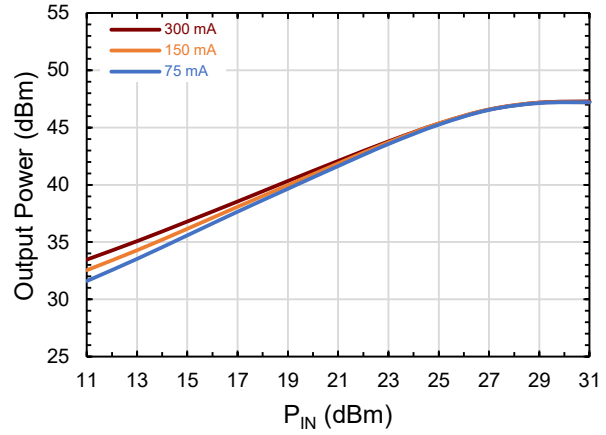
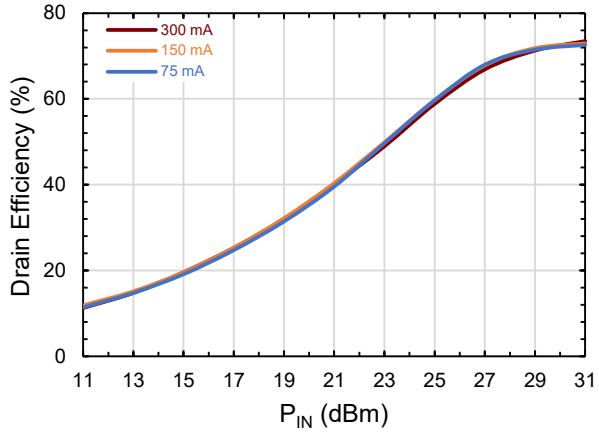


Drain Efficiency vs. I_{DQ} and P_{IN}



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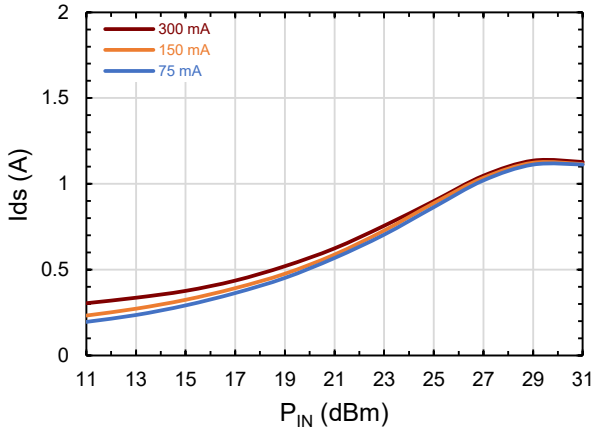

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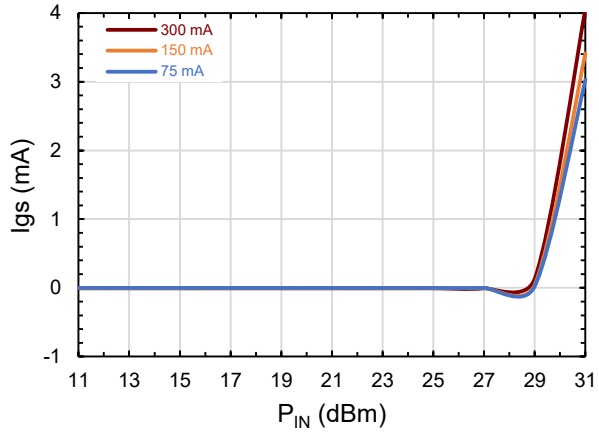

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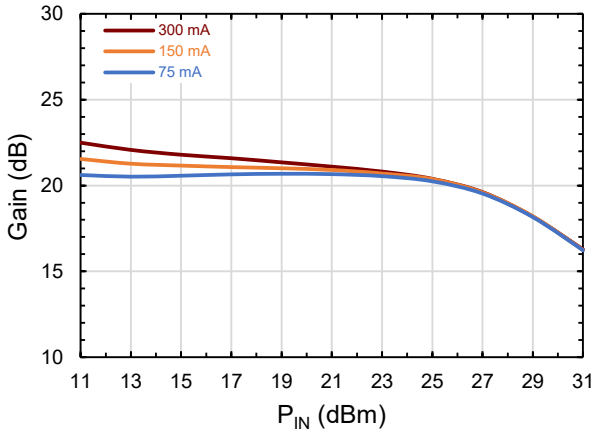
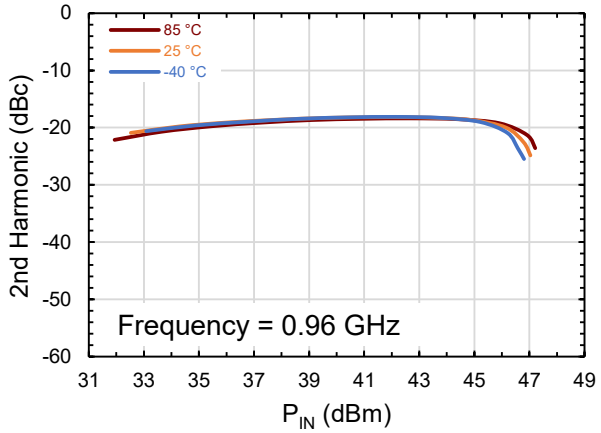


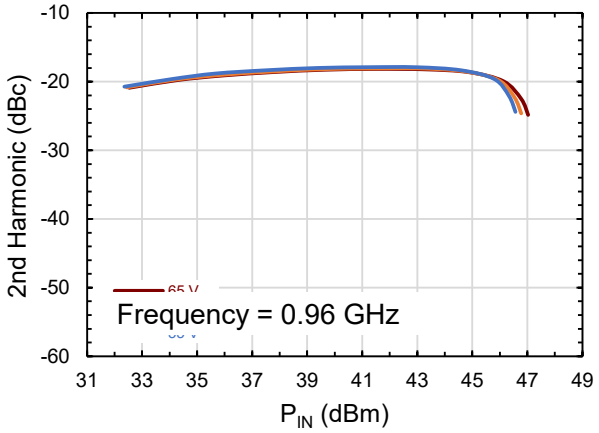
Typical Performance Curves as Measured in the 0.96 - 1.4 GHz Evaluation Test Fixture

Pulsed 300 µs, 20%, P_{IN} = 29 dBm, V_{DS} = 65 V, I_{DQ} = 150 mA, Frequency = 1.2 GHz (Unless otherwise noted)
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

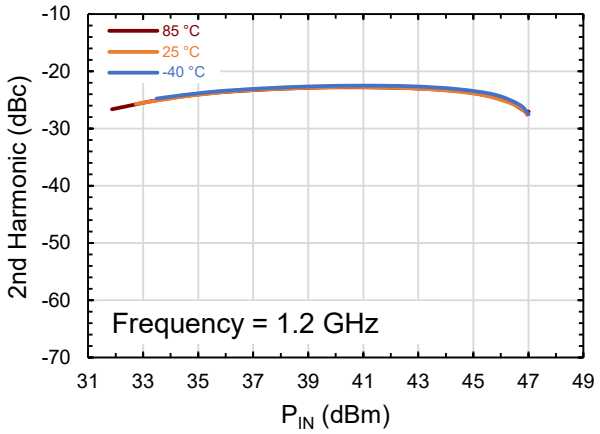
2nd Harmonic vs. Temperature and P_{IN}



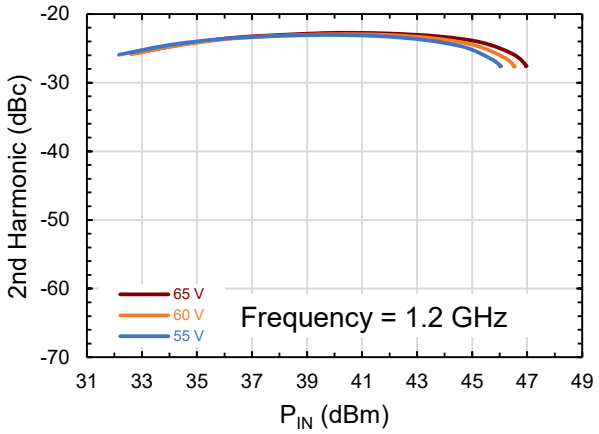
2nd Harmonic vs. V_{DS} and P_{IN}



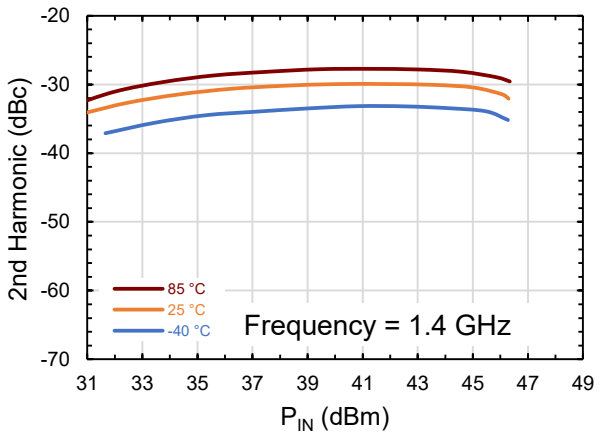
2nd Harmonic vs. Temperature and P_{IN}



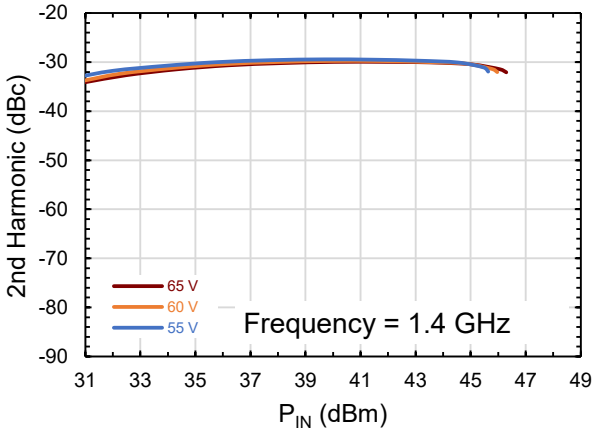
2nd Harmonic vs. V_{DS} and P_{IN}



2nd Harmonic vs. Temperature and P_{IN}



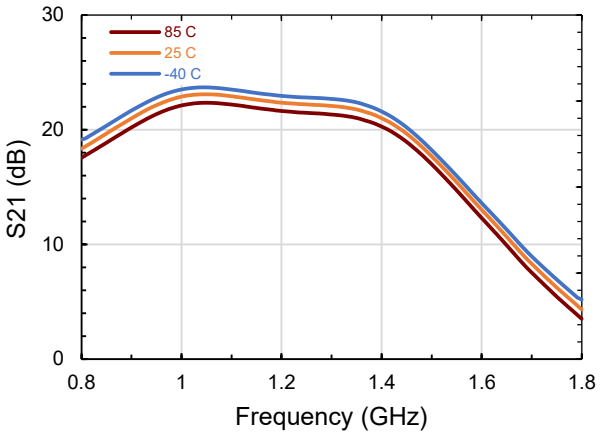
2nd Harmonic vs. V_{DS} and P_{IN}



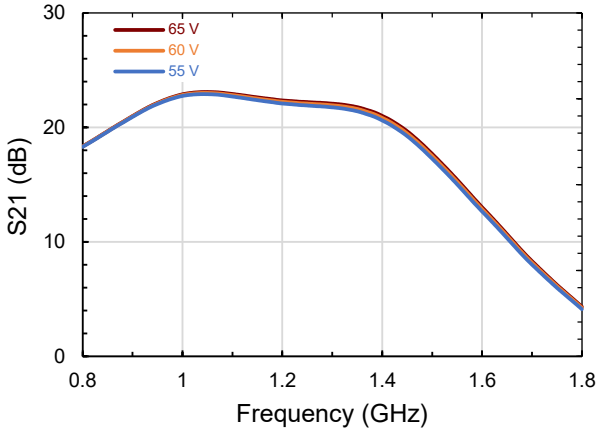
Typical Performance Curves as Measured in the 0.96 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 65 V, I_{DQ} = 150 mA, P_{IN} = -20 dBm (Unless Otherwise Noted)
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

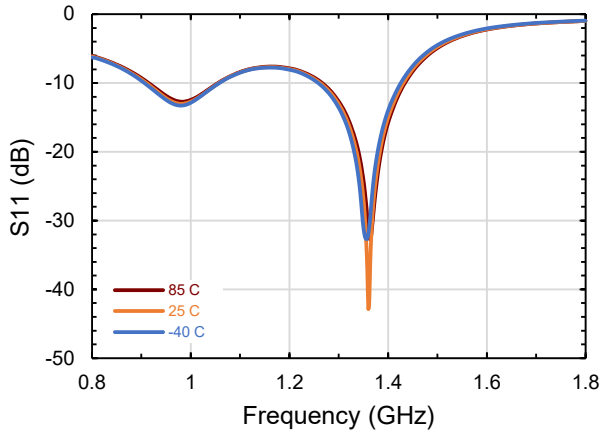
S21 vs Frequency and Temperature



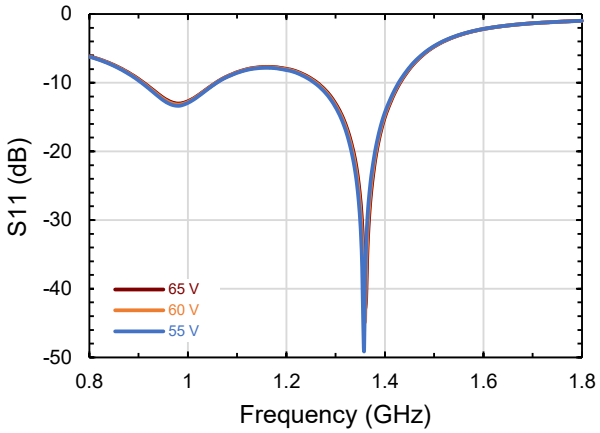
S21 vs Frequency and V_{DS}



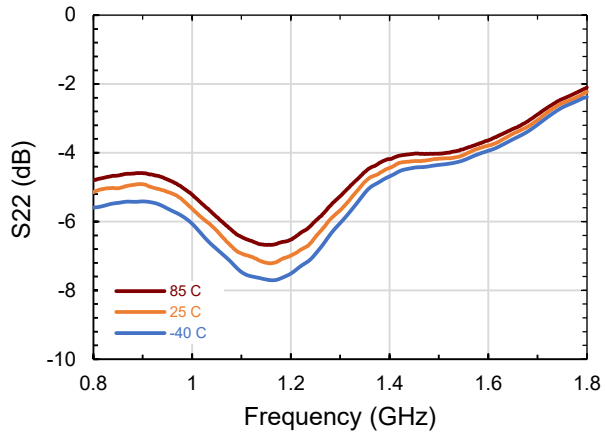
S11 vs Frequency and Temperature



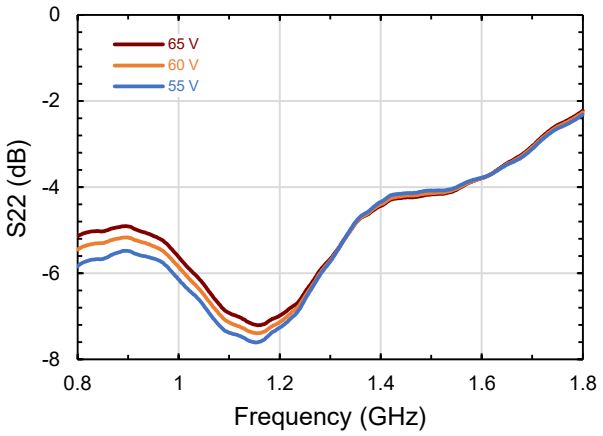
S11 vs Frequency and V_{DS}



S22 vs Frequency and Temperature



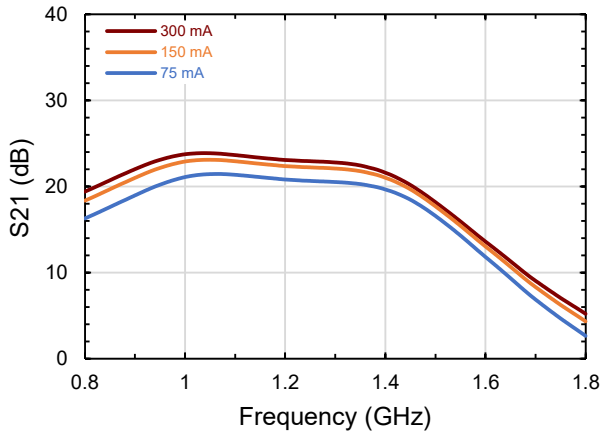
S22 vs Frequency and V_{DS}



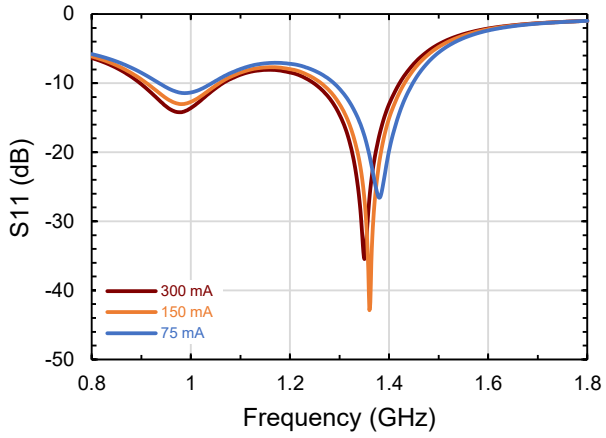
Typical Performance Curves as Measured in the 0.96 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 65 V, I_{DQ} = 150 mA, P_{IN} = -20 dBm (Unless Otherwise Noted)
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

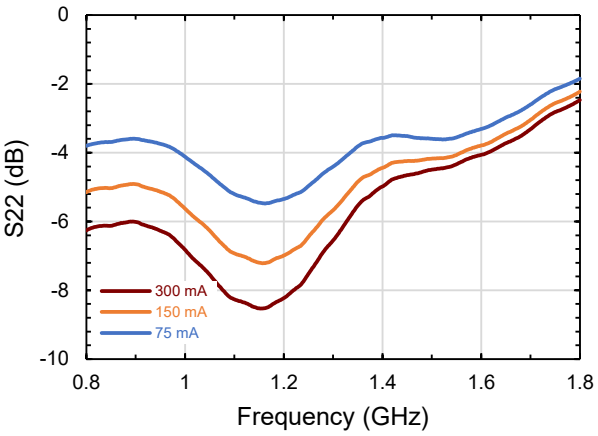
S21 vs Frequency and I_{DQ}



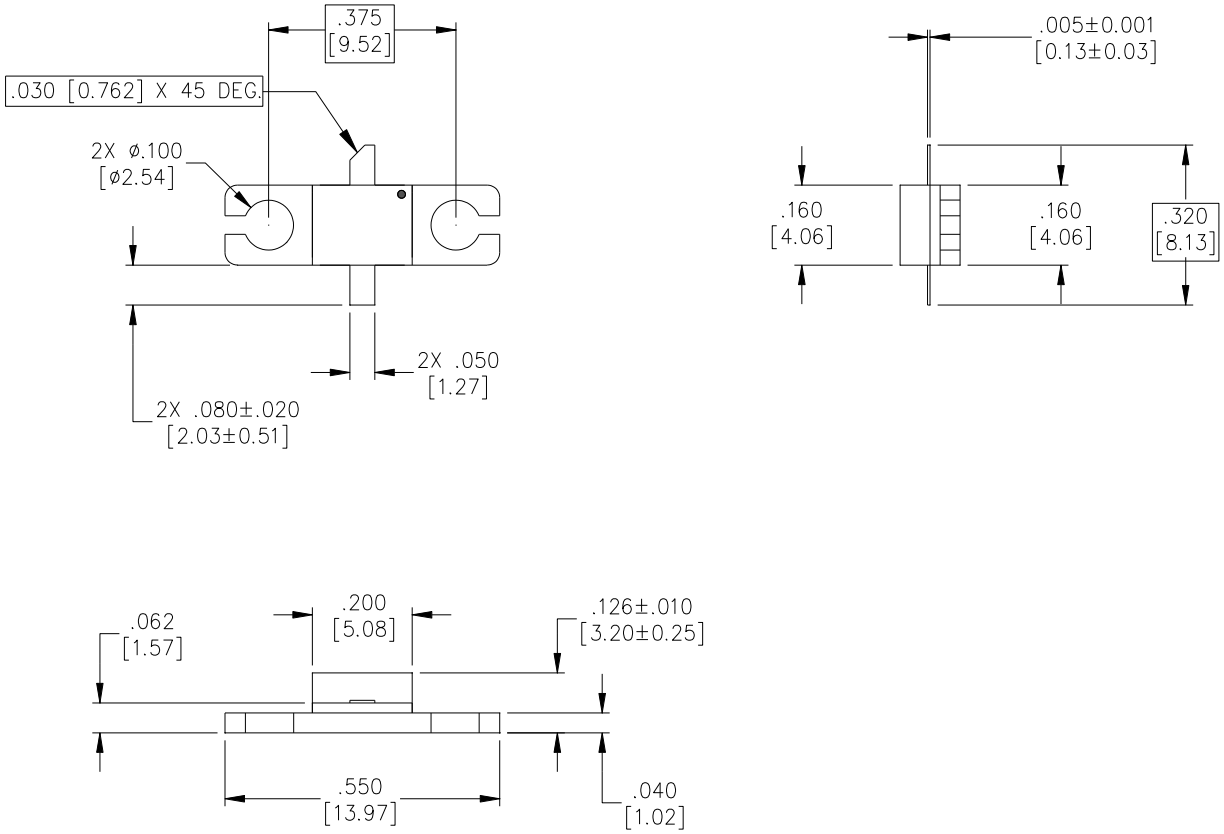
S11 vs Frequency and I_{DQ}



S22 vs Frequency and I_{DQ}



AC-200B-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