GaN on SiC Transistor, 8 W, 28 V
DC - 6 GHz

MACOM PURE CARBIDE™

MAPC-A3005-AD
Rev. V2

Features

- Saturated Power: 8 W
- Drain Efficiency: 69%
- Small Signal Gain: 19 dB
- DFN 3 x 4, 12 L Plastic Package
- RoHS* Compliant

Applications

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

Description

The MAPC-A3005-AD is a 8 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-A3005-AD provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

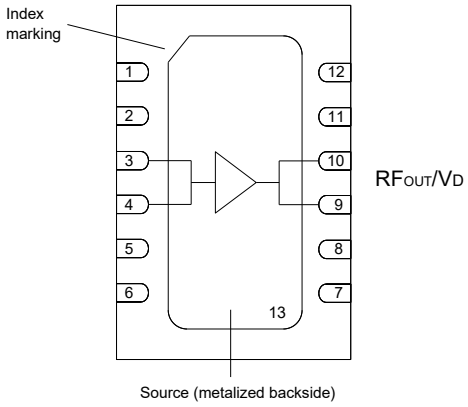
Typical RF Performance:

- Measured at CW @ P_{SAT} defined at P_{IN} = 30 dBm. V_{DS} = 28 V, I_{DQ} = 100 mA, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
2	40.0	10.0	65.7
4	39.4	9.4	48.3
6	39.9	9.9	45.3

3x4mm PDFN-12LD

Functional Schematic



Pin Configuration

Pin #	Pin Function	Function
3,4	RF_{IN} / V_G	RF Input / Gate
9,10	RF_{OUT} / V_D	RF Output / Drain
1,2,5,6,7, 8,11,12,13	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-A3005-AD000	Bulk
MAPC-A3005-ADTR1	Tape and Reel
MAPC-A3005-ADSB1	Sample Board

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

RF Electrical Specifications[2]: Freq. = 2 GHz, T_A = +25°C, V_{DS} = 28 V, I_{DQ} = 100 mA

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Units
Saturated Power	P_{IN} = 25 dBm, CW	P_{SAT}	7.0	8.4	12.5	W
Drain Efficiency	P_{IN} = 25 dBm, CW	η_{SAT}	64.0	68.4	90.0	%
Low Power Gain	P_{IN} = 10 dBm, CW	G_{SS}	12.0	18.9	23.0	dB

2. Final testing and screening for all transistor sales is performed using the MAPC-A3005-AD-AMP at 2 GHz.

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Drain-Source Voltage	84 V
Gate Voltage	-10, +2 V
Drain Current	1.4 A
Gate Current	2.1 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) = 10.1 °C/W for CW.
   a) For T_C = +25°C,
   T_J = 89 °C @ P_{DISS} = 6.29 W
   b) For T_C = +85°C,
   T_J = 148 °C @ P_{DISS} = 6.28 W

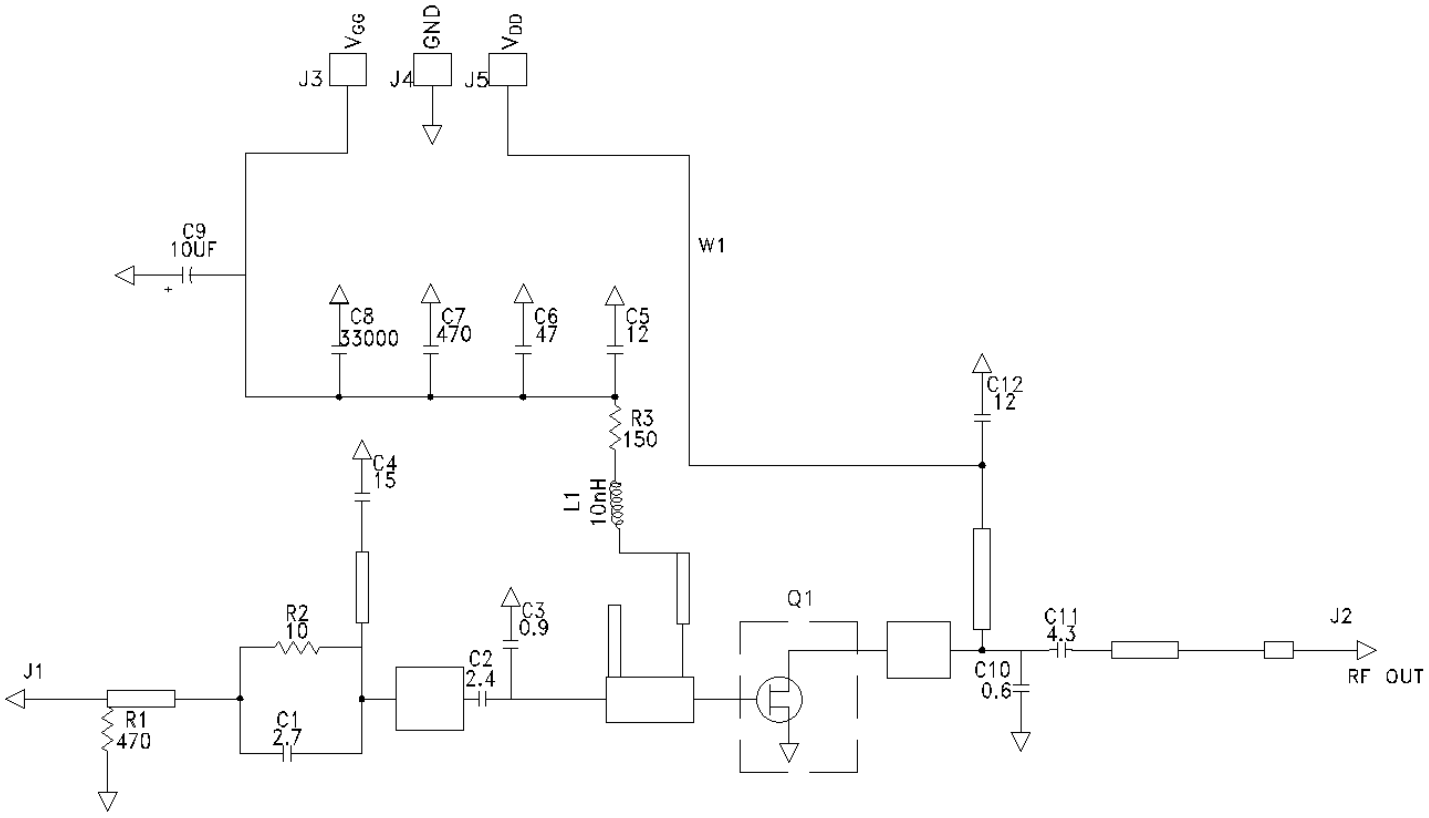
Handling Procedures

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 C2A devices.

Evaluation Test Fixture and Recommended Tuning Solution, 2 - 6 GHz



Description

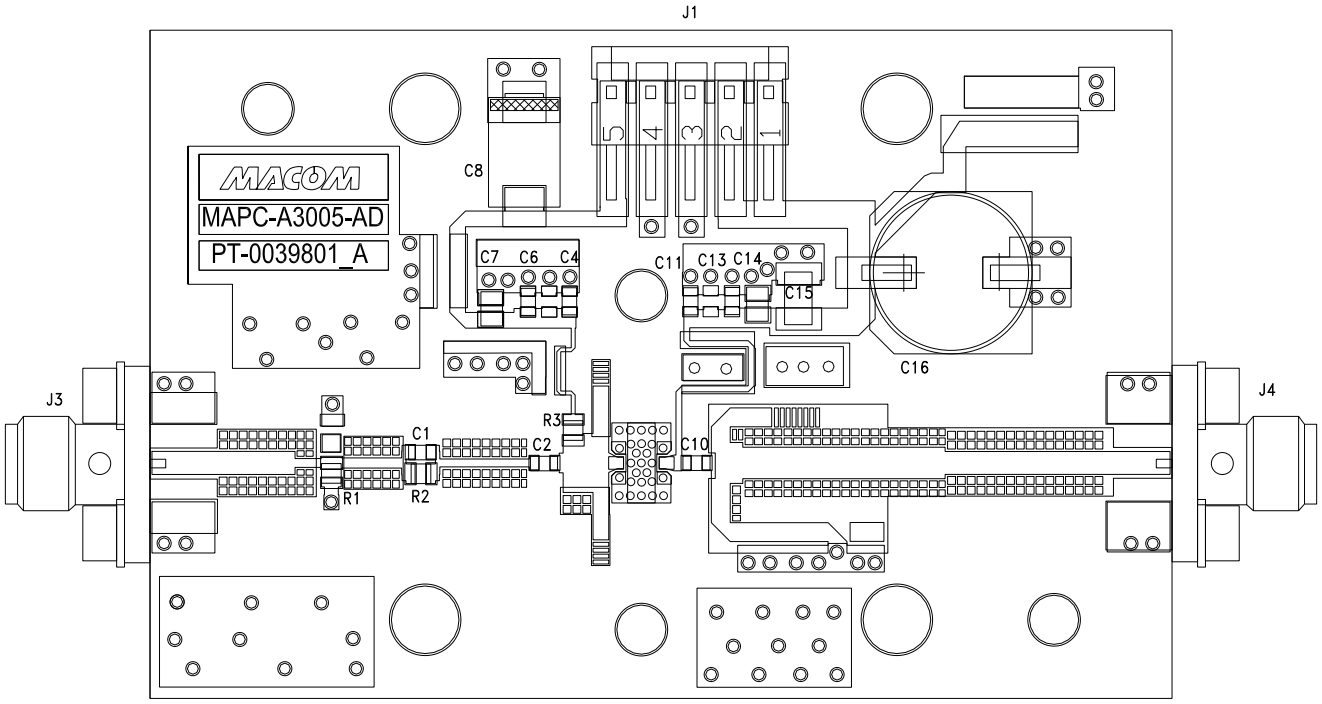
Parts measured on evaluation board (20-mil thick RT/duroid 5880). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

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, 2 - 6 GHz



Assembly Parts List

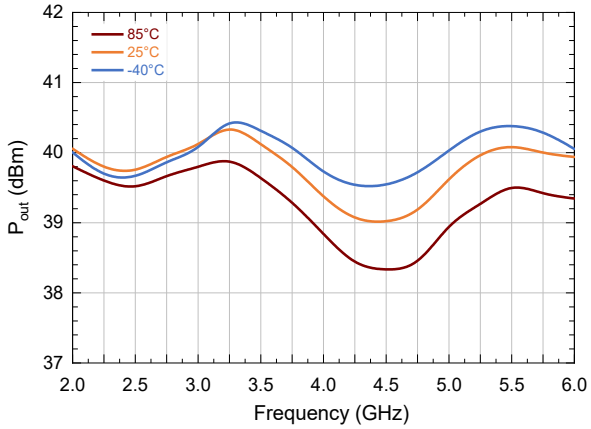
Reference Designator	Description	Qty.
C1	CAP 1.3pF 0603in T0.1p 125C 250V, ATC600S	1
C2	CAP 2.7pF 0603in T0.1p 125C 250V ATC600S	1
C4,C11	CAP 8.2pF 0603in T0.1p 125C 250V ATC600S	2
C10	CAP 3.6pF 0603in T0.1p 125C 250V ATC600S	1
C6,C13	CAP 470pF 0603in T5% X7R 100V AVX	2
C7,C14	CAP 33000pF 0805 X7R 100V	2
C8	CAP 10UF 2312 16V TANTALUM	1
C16	CAP CAP, 33 UF, 20%, G CASE	1
C15	CAP 1.0UF 1210 T10% X7R 100V	1
R1	RES, AIN, 470 OHM, +/- 5%, 0505, PtAg TERMINATION	1
R2	RES, AIN, 50.0 OHM, +/- 5%, 0505, PtAg TERMINATION	1
R3	RES, AIN, 360 OHM, +/- 5%, 0505, PtAg TERMINATION	1
J3,J4	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL	2
J1	HEADER RT>PLZ .1CEN LK 5POS	1
-	PCB, RO5880, 0.020" THK	1
Q1	MAPC-A3005-AD	1

Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

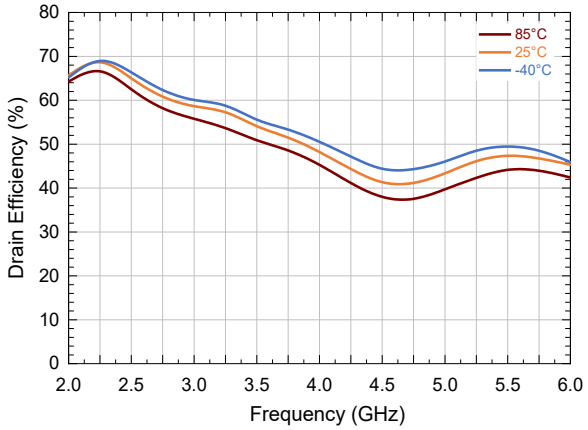
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

CW, P_{IN} = 30 dBm, V_{DS} = 28 V, I_{DQ} = 100 mA

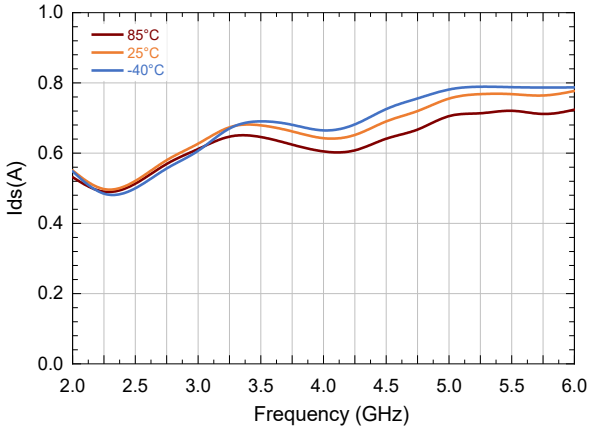
Output Power over Temperature



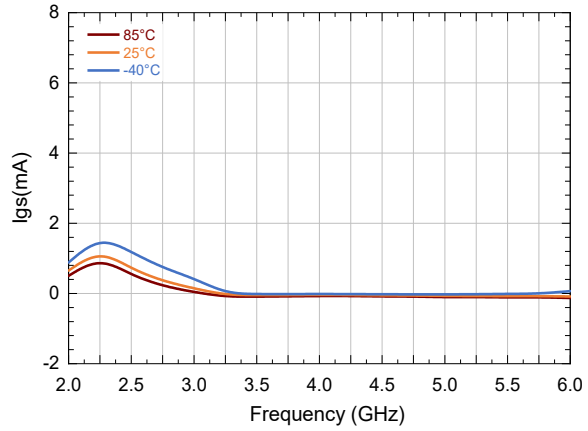
Drain Efficiency over Temperature



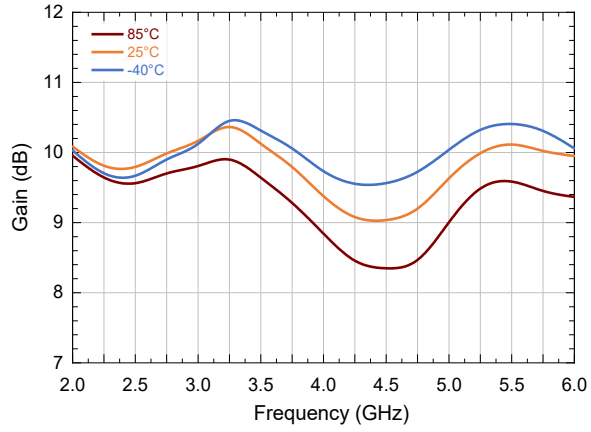
Drain Current over Temperature



Gate Current over Temperature



Large Signal Gain over Temperature



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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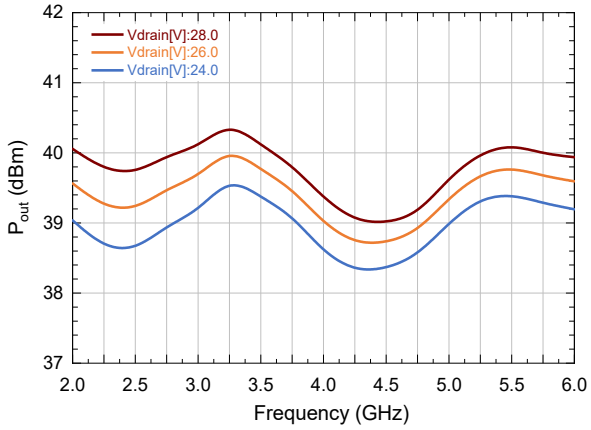
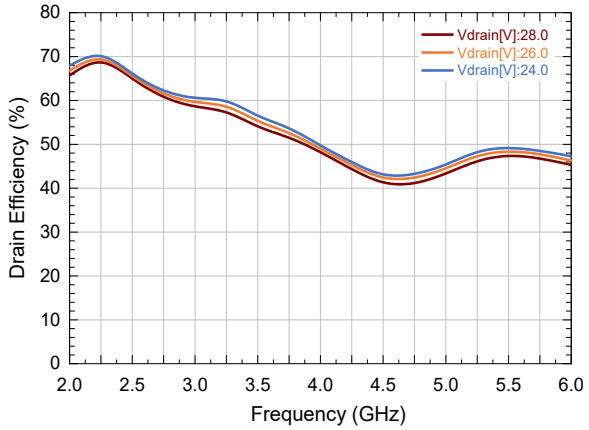
CW, P_{IN} = 30 dBm, I_{DQ} = 100 mA, T_C = 25°C

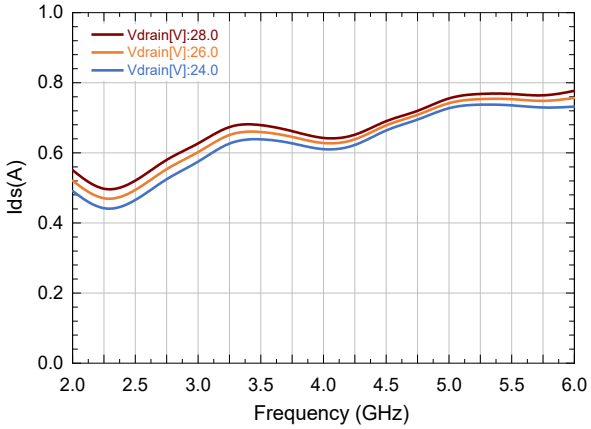
Output Power over Voltage



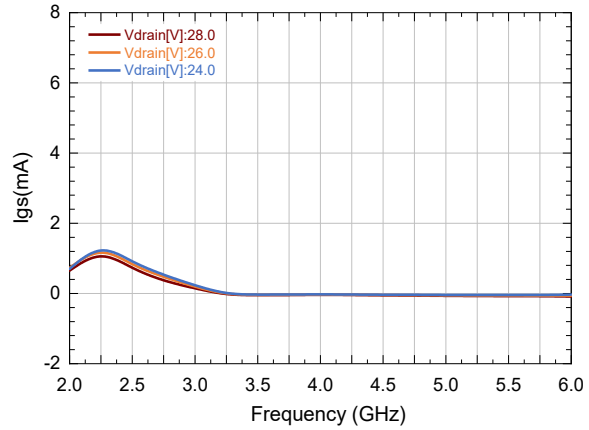
Drain Efficiency over Voltage



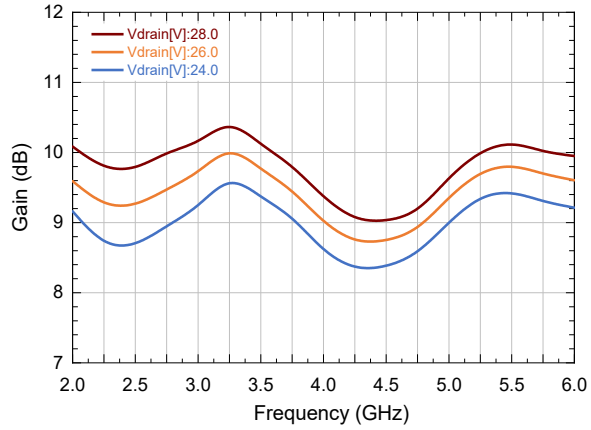
Drain Current over Voltage



Gate Current over Voltage



Large Signal Gain over Voltage



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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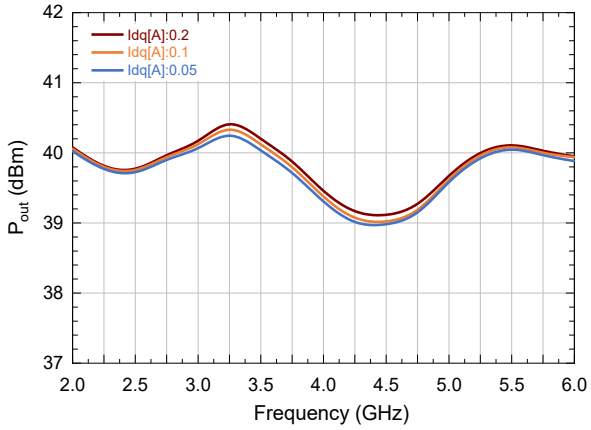
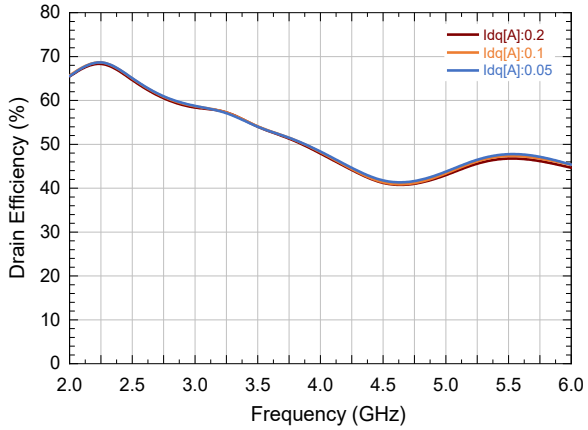
CW, P_{IN} = 30 dBm, V_{DS} = 28 V, T_C = 25°C

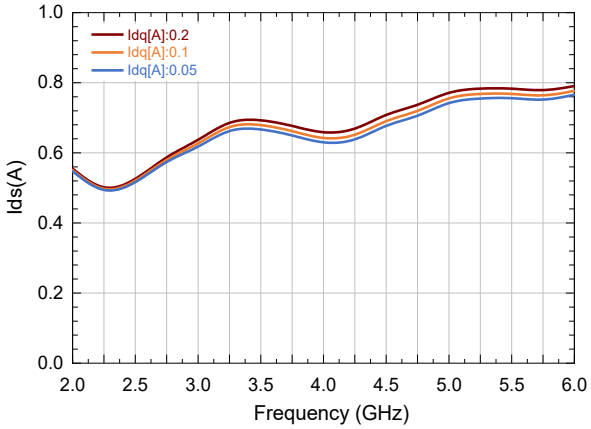
Output Power over Quiescent Drain Current



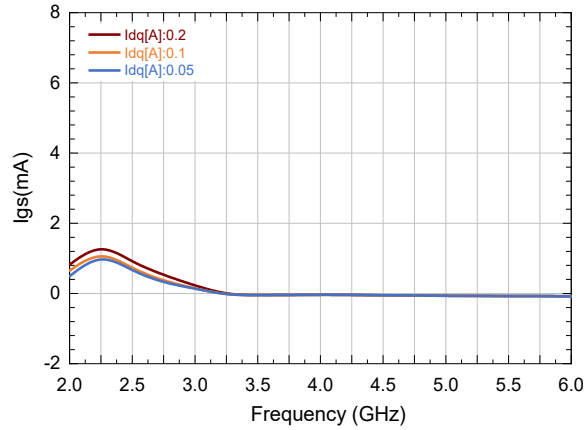
Drain Efficiency over Quiescent Drain Current



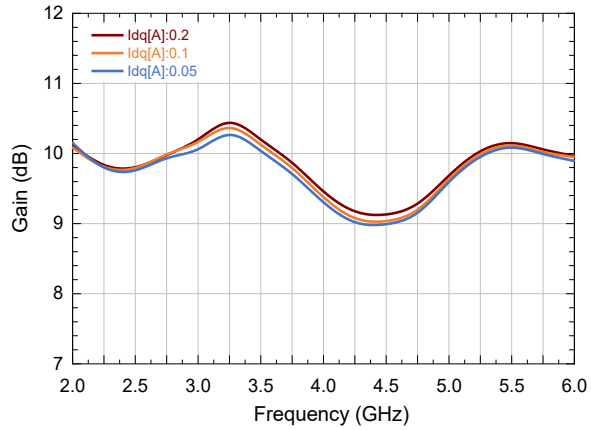
Drain Current over Quiescent Drain Current



Gate Current over Quiescent Drain Current



Large Signal Gain over Quiescent Drain Current



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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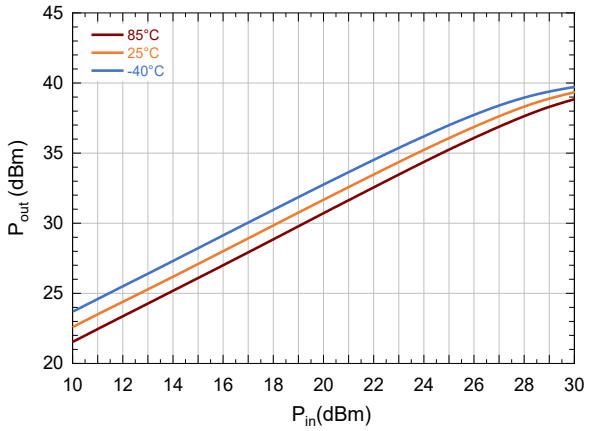
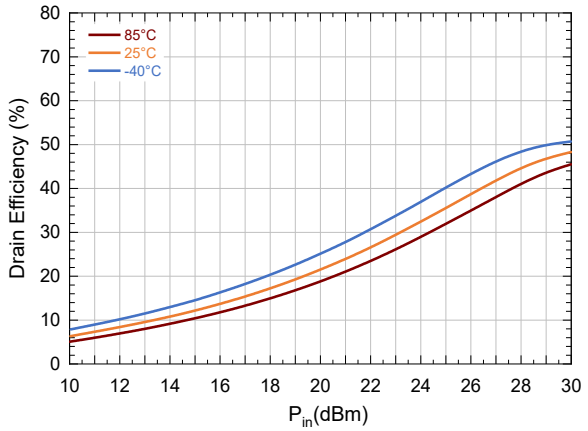
CW, V_{DS} = 28 V, I_{DQ} = 100 mA, Freq. = 2 GHz

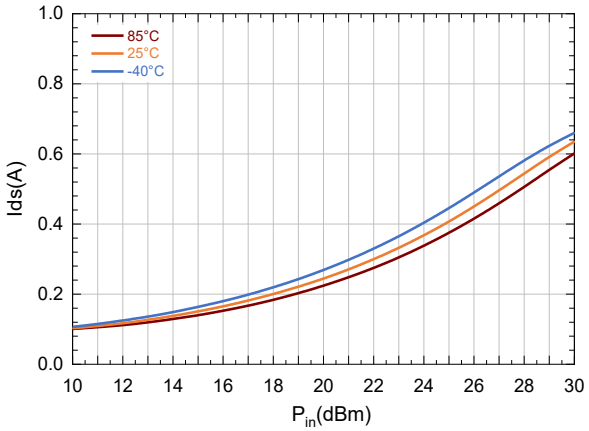
Output Power over Temperature vs. P_{IN}



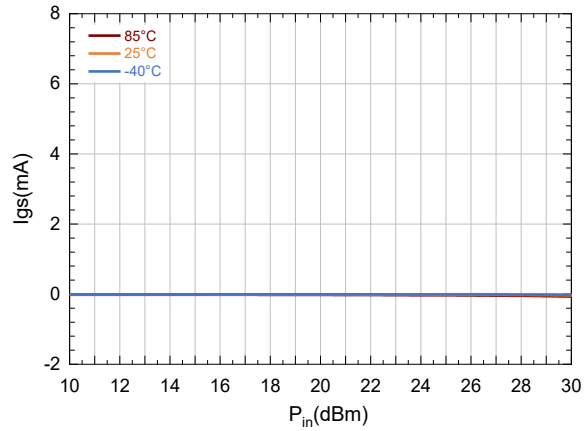
Drain Efficiency over Temperature vs. P_{IN}



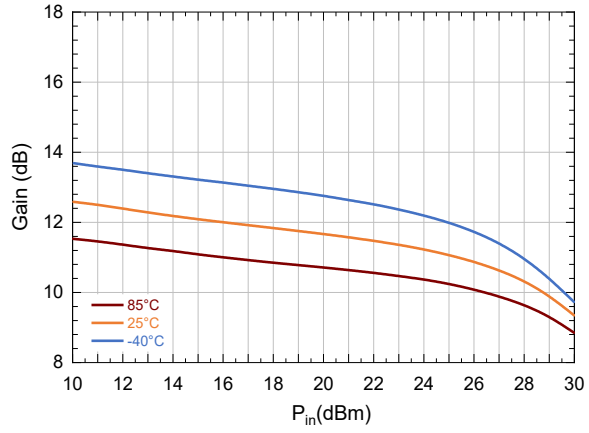
Drain Current over Temperature vs. P_{IN}



Gate Current over Temperature vs. P_{IN}



Large Signal Gain over Temperature vs. P_{IN}



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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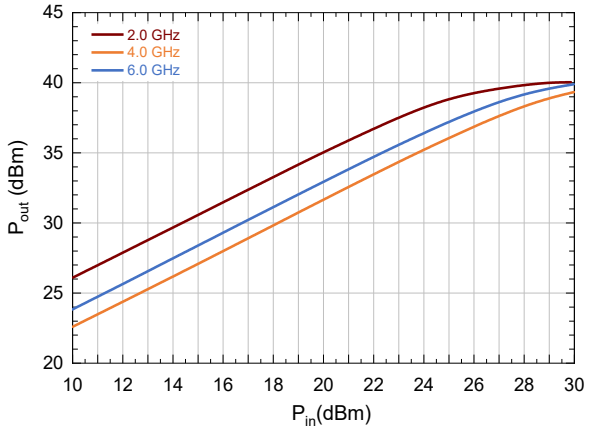
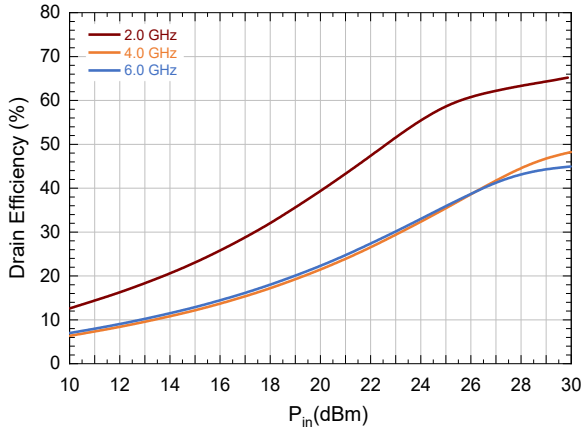
CW, V_{DS} = 28 V, I_{DQ} = 100 mA, T_C = 25°C

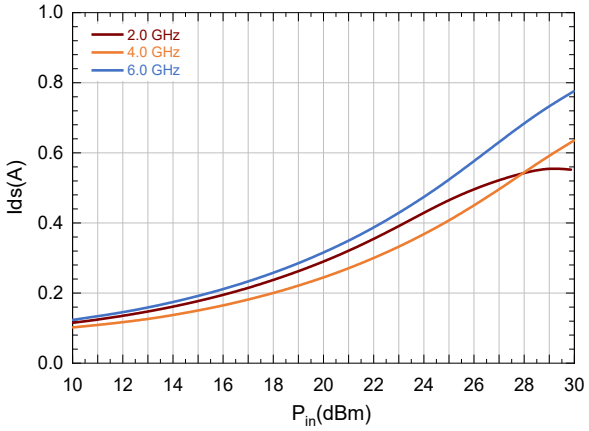
Output Power over Frequency vs. P_{IN}



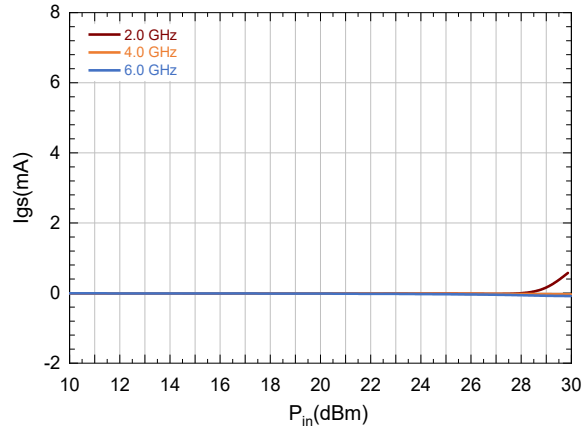
Drain Efficiency over Frequency vs. P_{IN}



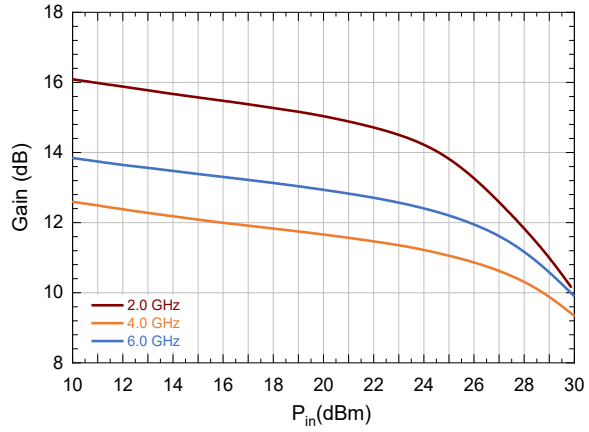
Drain Current over Frequency vs. P_{IN}



Gate Current over Frequency vs. P_{IN}



Large Signal Gain over Frequency vs. P_{IN}



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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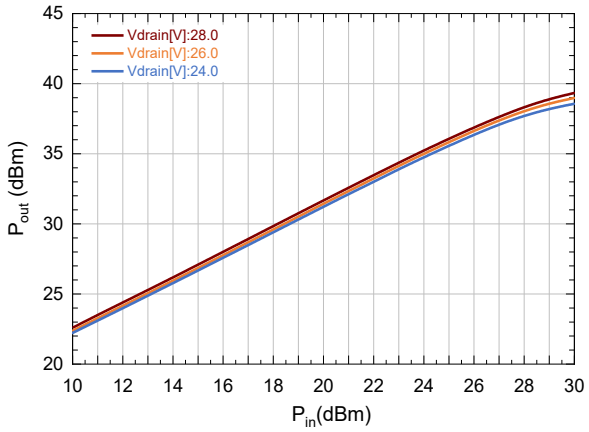
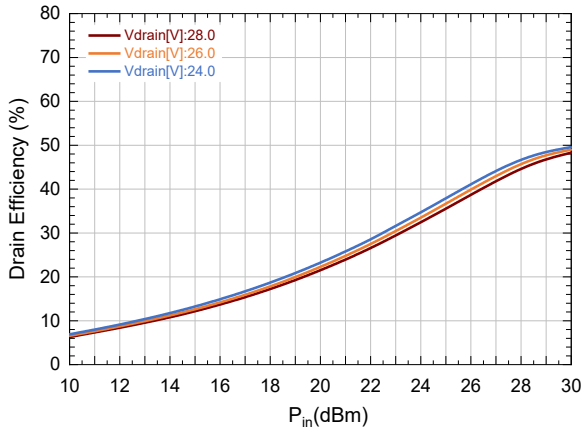
CW, I_{DQ} = 100 mA, Freq. = 2 GHz, T_C = 25°

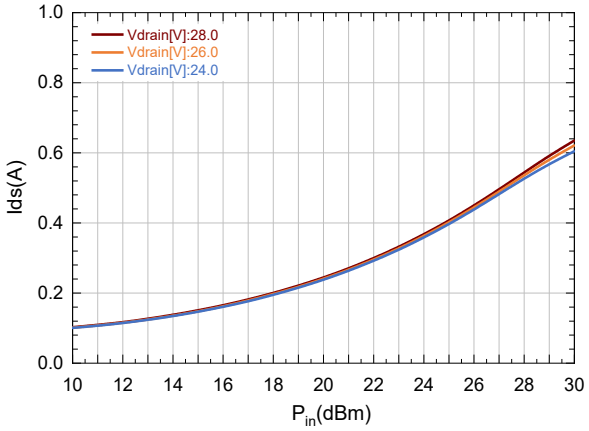
Output Power over Voltage vs. P_{IN}



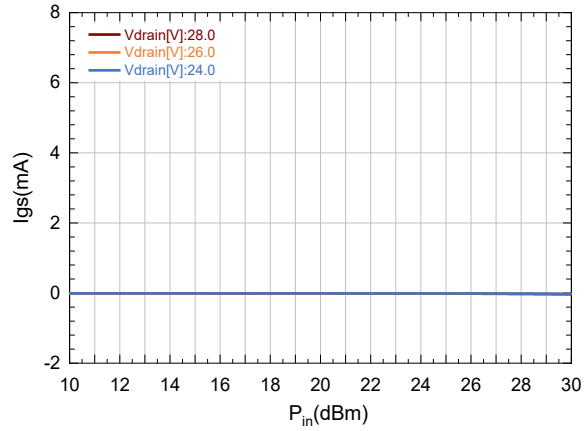
Drain Efficiency over Voltage vs. P_{IN}



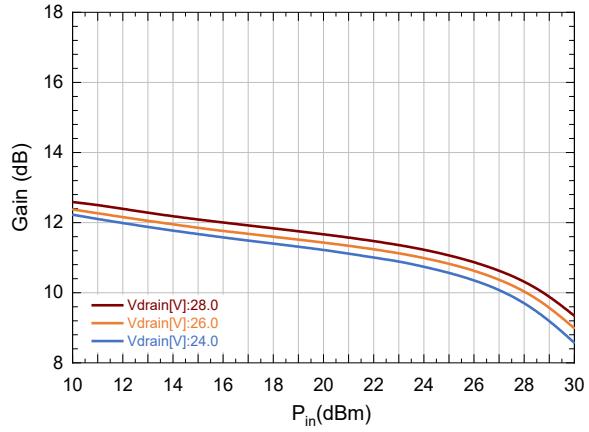
Drain Current over Voltage vs. P_{IN}



Gate Current over Voltage vs. P_{IN}



Large Signal Gain over Voltage vs. P_{IN}



Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture

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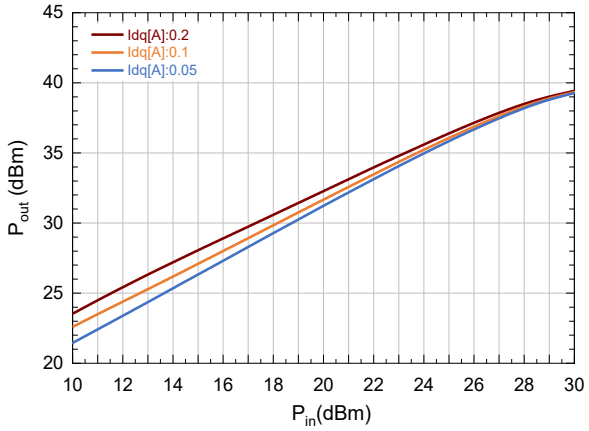
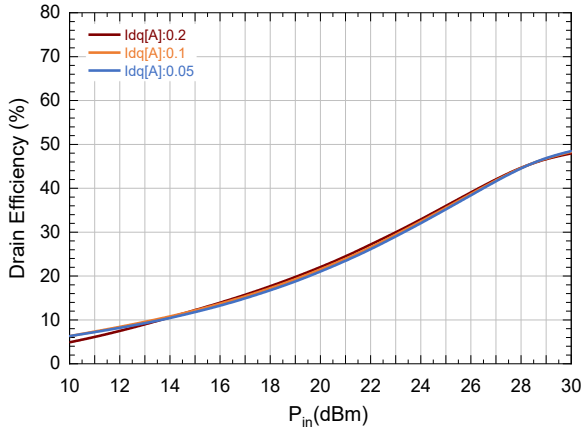
CW, V_{DS} = 28 V, Freq. = 2 GHz, T_C = 25°

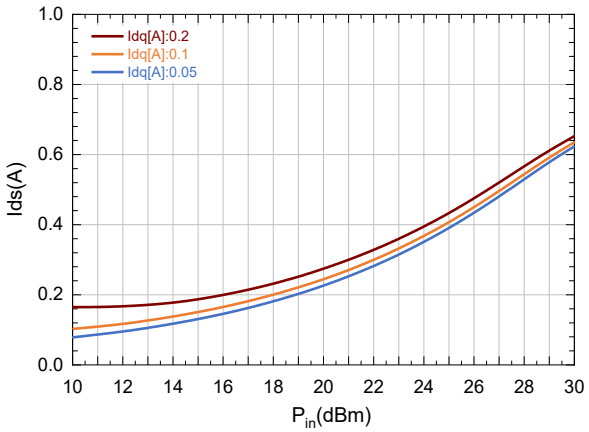
Output Power over Quiescent Drain Current vs. P_{IN}



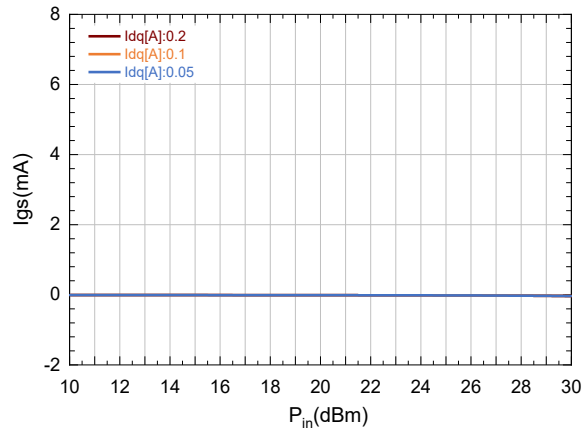
Drain Efficiency over Quiescent Drain Current vs. P_{IN}



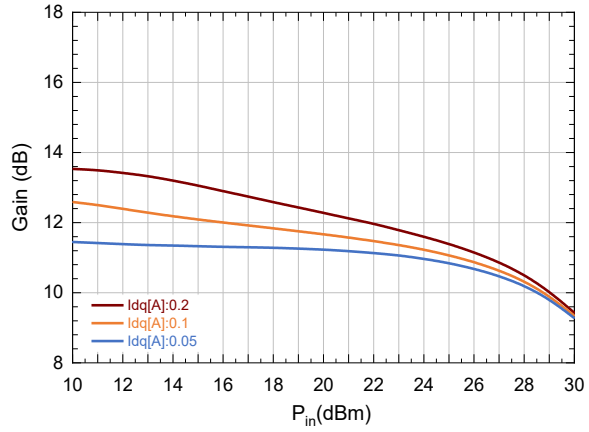
Drain Current over Quiescent Drain Current vs. P_{IN}



Gate Current over Quiescent Drain Current vs. P_{IN}



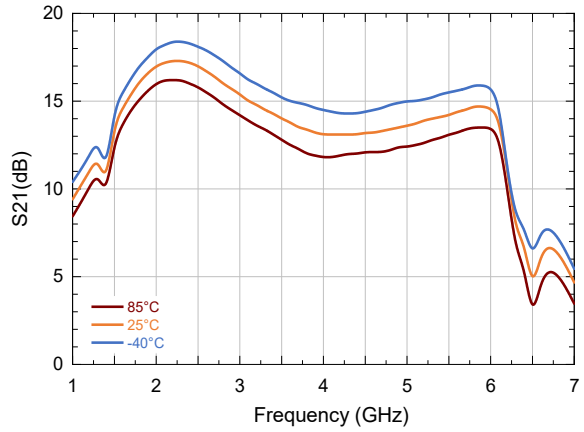
Large Signal Gain over Quiescent Drain Current vs. P_{IN}



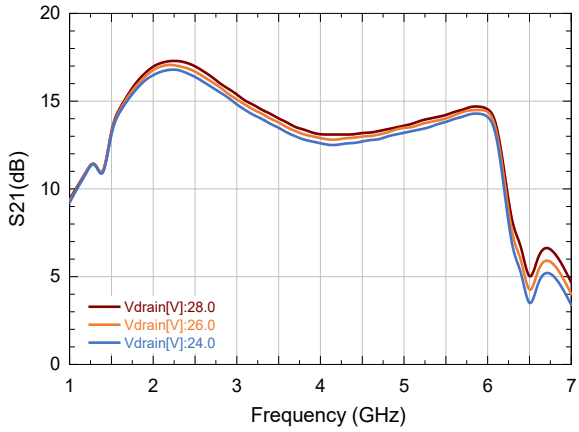
Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture:

For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.
CW, I_{DQ} = 100 mA, P_{IN} = -10 dBm

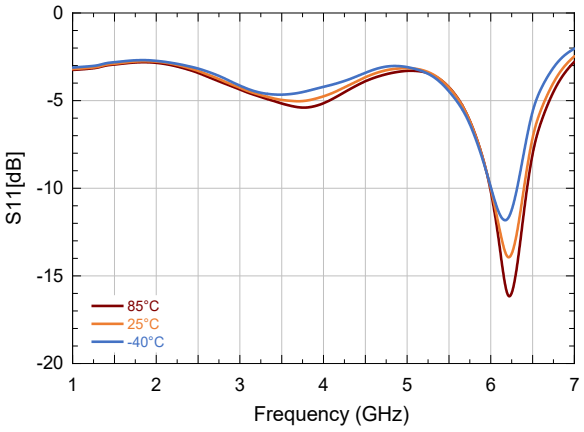
S21 over Temperature vs. Frequency @ 28 V



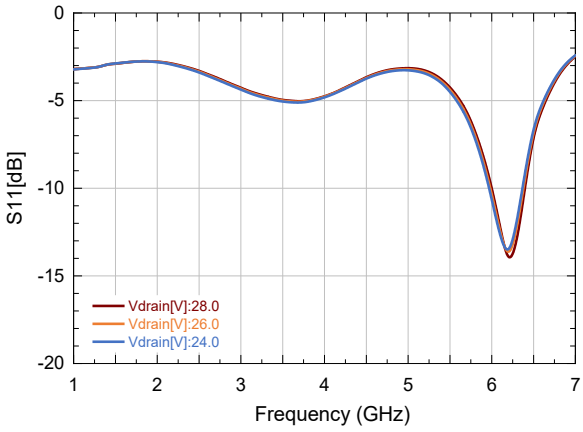
S21 over Voltage vs. Frequency @ 25°C



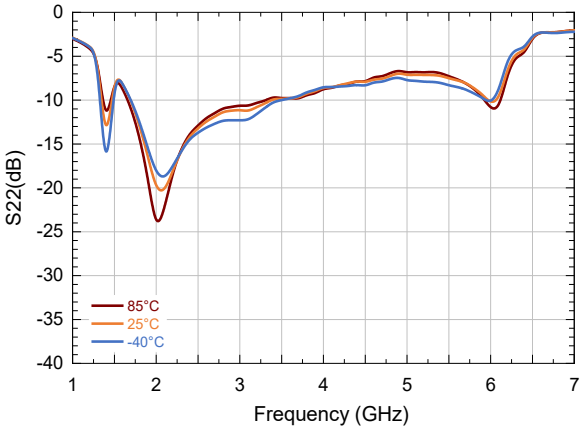
S11 over Temperature vs. Frequency @ 28 V



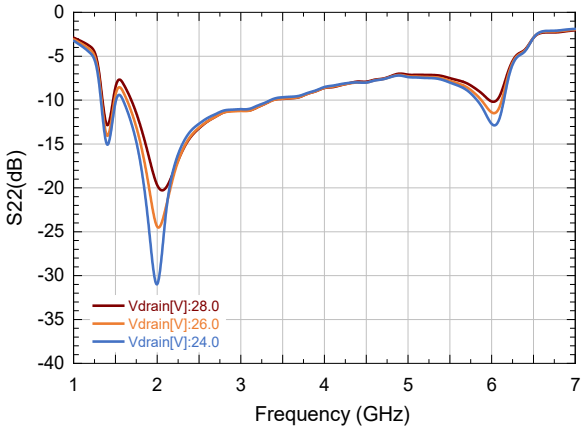
S11 Voltage vs. Frequency @ 25°C



S22 over Temperature vs. Frequency @ 28 V



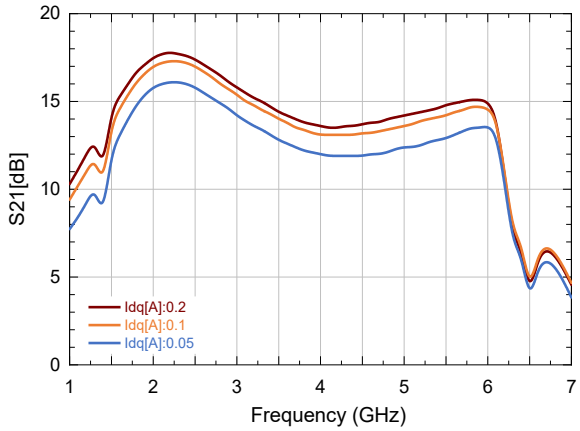
S22 Voltage vs. Frequency @ 25°C



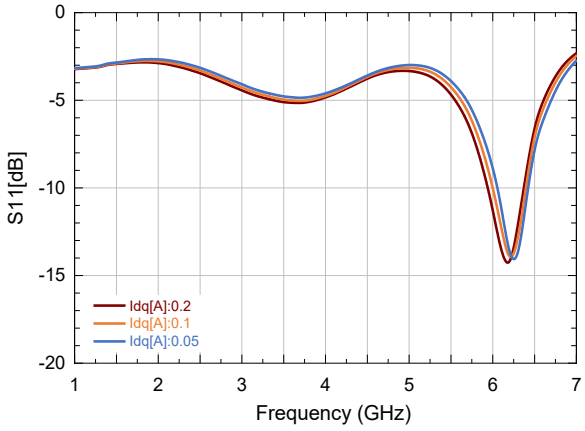
Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture:

For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.
CW, I_{DQ} = 100 mA, P_{IN} = -10 dBm

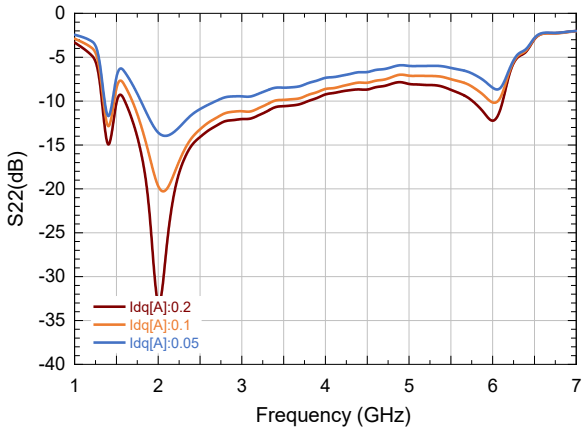
S21 over Quiescent Drain Current vs. Frequency



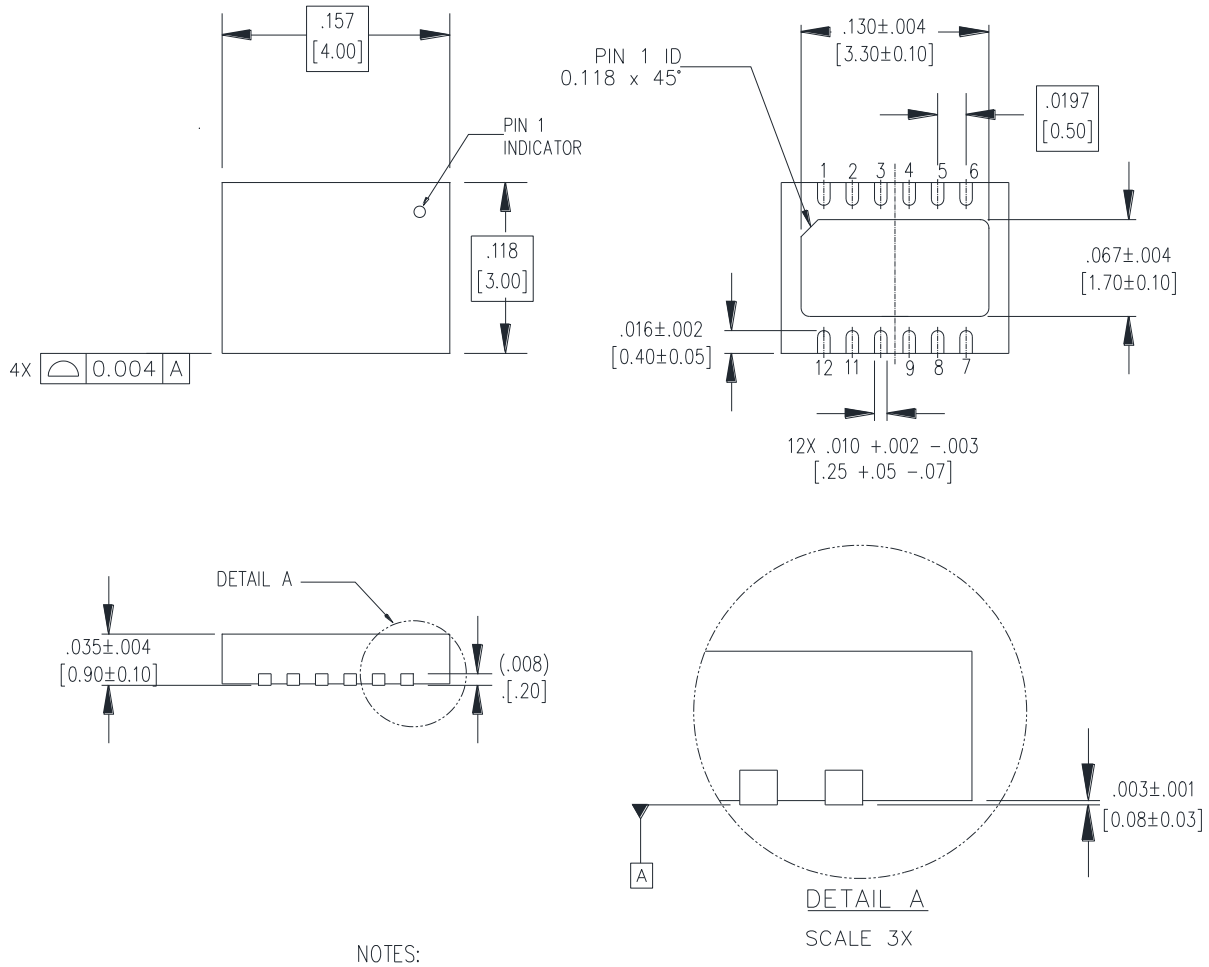
S11 over Quiescent Drain Current vs. Frequency



S22 over Quiescent Drain Current vs. Frequency



Lead-free 3 x 4 mm 12-Lead Package Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in. CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
2. EXPOSED LEADS 100% Sn MATTE.