Features
- Saturated Power: 40 W
- Drain Efficiency: 76%
- Small Signal Gain: 26 dB
- 3 x 4 mm 12 Lead DFN Plastic Package
- RoHS* Compliant

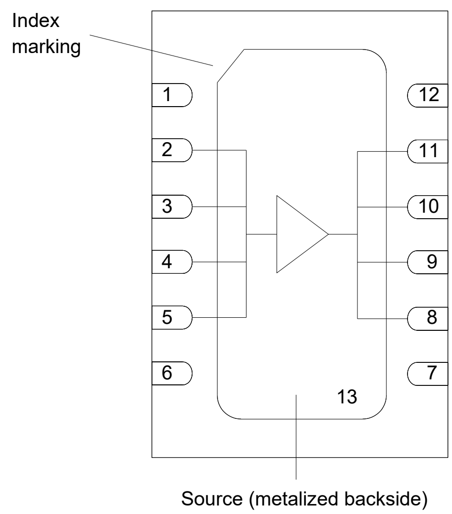
3 x 4 mm PDFN-12LD

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

Description
The MAPC-A3014 is a 40 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-A3014 provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

Functional Schematic



Typical RF Performance:
- Pulse Width 100 µs, 10% Duty Cycle, T_C = 25°C, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
1.2	46.5	21.6	76.0
1.3	46.2	21.1	76.0
1.4	46.1	21.1	73.7

Pin Configuration

Pin #	Pin Name	Function
2,3,4,5	RF_{IN} / V_G	RF Input / Gate
8,9,10,11	RF_{OUT} / V_D	RF Output / Drain
1,6,7,12,13	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-A3014-AD000	Bulk
MAPC-A3014-ADTR1	Tape and Reel
MAPC-A3014-ADSB1	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} = 100 mA, Pulse Width = 100 µs, Duty Cycle = 10%

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output Power	Pulsed, P_{IN} = 25 dBm	P_{OUT}	-	46.2	-	dBm
Drain Efficiency	Pulsed, P_{IN} = 25 dBm	DE	-	76	-	%
Large Signal Gain	Pulsed, P_{IN} = 25 dBm	G_P	-	21	-	dB
Small Signal Gain	CW, P_{IN} = -20 dBm	S21	-	28	-	dB
Input Return Loss	CW, P_{IN} = -20 dBm	S11	-	-14	-	dB
Output Return Loss	CW, P_{IN} = -20 dBm	S22	-	-10	-	dB
Output Mismatch Stress	All Phase Angles	ψ	VSWR = 10:1, No Device Damage			

RF Electrical Specifications in Production Test Fixture[2]

Freq = 1.3 GHz, P_{IN} = 23 dBm, T_A = +25C, V_{DS} = 50 V, I_{DQ} = 100 mA,
Pulse Width = 25 µs, Duty Cycle = 2%

Parameter	Symbol	Min.	Typ.	Max.	Units
Output Power	P_{OUT}	40.0	44.2	-	W
Drain Efficiency	η	67.0	73.4	-	%
Power Gain	G_P	23.0	23.5	-	dB

2. Final testing and screening for all transistor sales is performed using the MAPC-A3014 production socket test fixture.

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}	-	-	0.5	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-0.5	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 3.6 mA	V_T	-3.5	-	-1.9	V
Gate Quiescent Voltage	V_{DS} = 50 V, I_D = 100 mA	V_{GSQ}	-	-2.5	-	V

Thermal Characteristics

Parameter	Symbol	Test Conditions	Units	Rating
Operating Junction Temperature	T_J	CW, P_{DISS} = 15 W, T_C = 85.0°C	°C	191
Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W	7.07

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Drain-Source Voltage	150 V
Gate Voltage	-8 +2 V
Drain Current	3.4 A
Gate Current	3.6 mA
Input Power	29 dBm
Storage Temperature	-65C 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. The R_{th} for the applications test fixture, with 31 x 0.011 via holes designed on 20mil thick Rogers 4350 PCB is 3.9°C. The total R_{th} from the heat sink to the junction is 7.07°C + 3.9°C = 10.97°C/W.

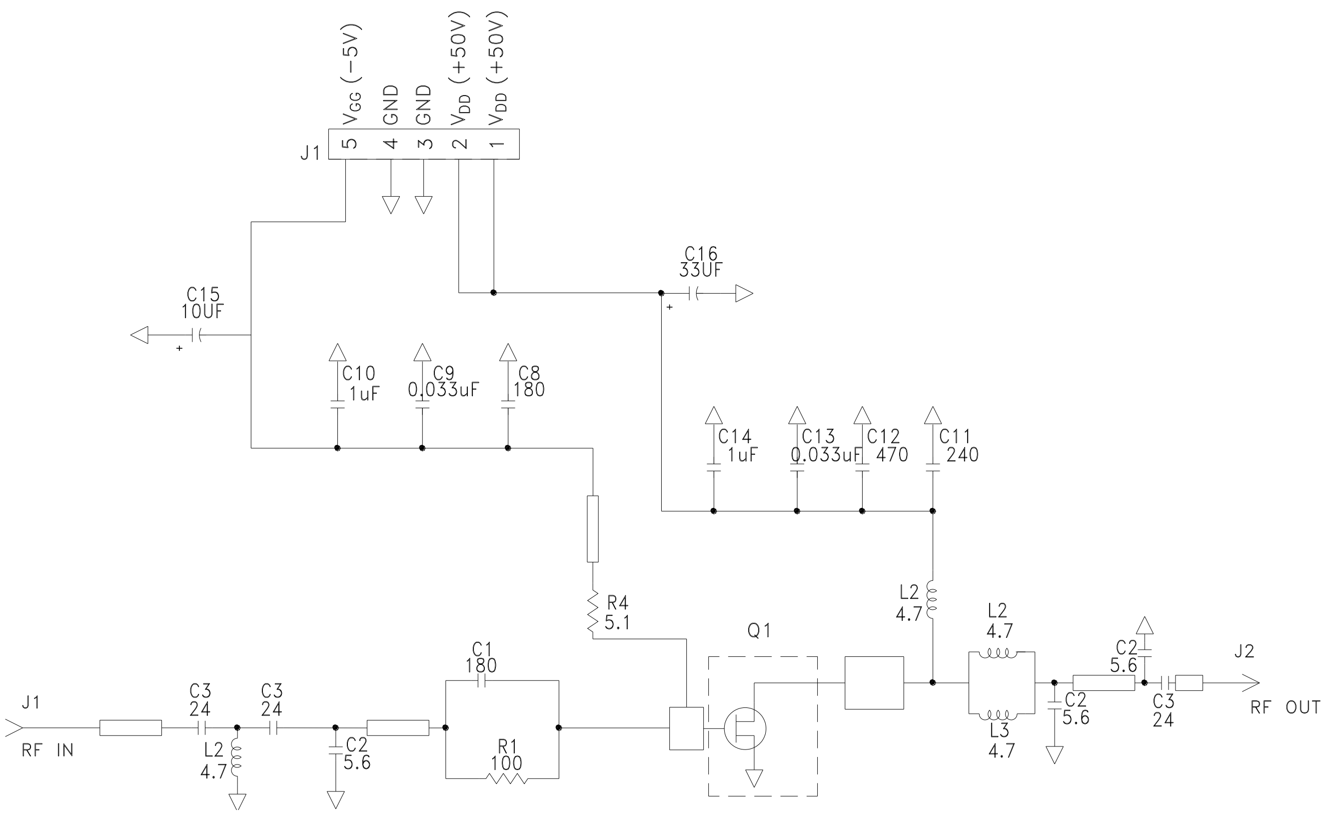
Handling Procedures

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, 1.2 - 1.4 GHz



Description

Parts are 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

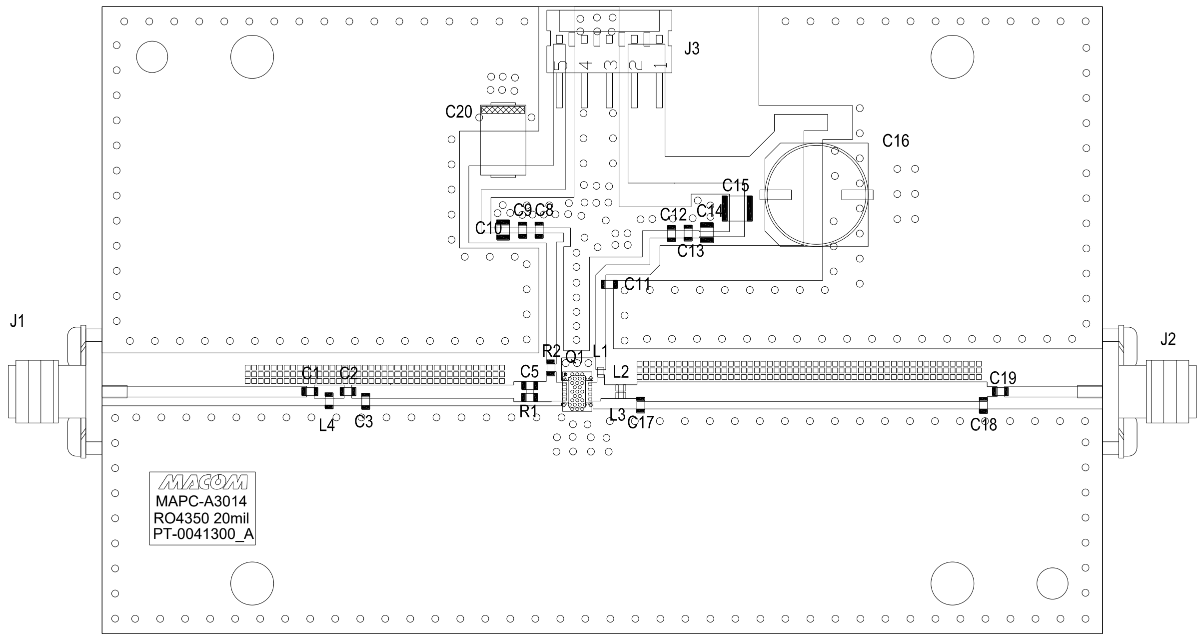
Bias ON

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

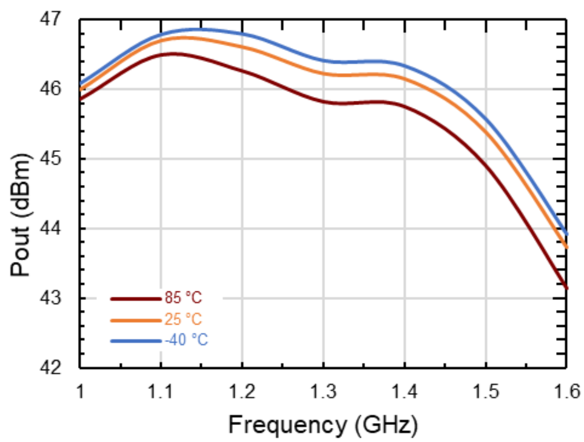


Assembly Parts List

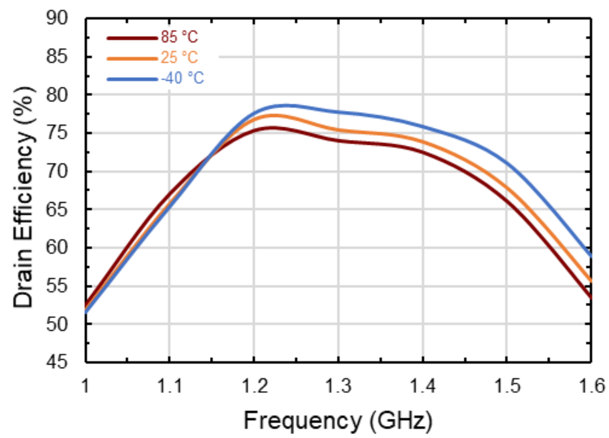
Ref Des	Description	Qty	Manufacturer	Manufacturer PN
C1, C11, C19	CAP, 82 pF, +/-1%, 0603, ATC600S	3	Kyocera AVX	600S820FT250XT
C2	CAP, 12 pF, +/-0.1pF, 0603, ATC600S	1	Kyocera AVX	600S120JT250XT
C17	CAP, 3 pF, +/-0.1pF, 0603, ATC600S	1	Kyocera AVX	600S3R0AT250XT
C3	CAP, 5.6 pF, +/-0.1pF, 0603, ATC600S	1	Kyocera AVX	600S5R6BT250XT
C5	CAP, 15 pF, +/-5%, 0603, ATC600S	1	Kyocera AVX	600S150JT250XT
C8	CAP, 240 pF, +/-1%, 0805, ATC600F	1	Kyocera AVX	600F241JT250XT
C12	CAP, 100pF, +/-5%, 0603, ATC	1	Kyocera AVX	600S101JT250XT
C9, C13	CAP, 470PF, 5%, 100V, 0603, X7R, ROHS COMPLIANT	2	Kyocera AVX	06031C471JAT2A
C10, C14	CAP,33000PF, 0805,100V, X7R	2	Digi-Key	P/N:490-3323-2-ND
C15	CAP, 1.0UF, 100V, +/-10%, X7R, 1210	1	MURATA	GCM21BC72A105KE36
C16	CAP, 33 UF, 20%, G CASE	1	PANASONIC	ECE-V2AA330P
C18	CAP, 0.9 pF, +/-0.05pF, 0603, ATC600S	1	Kyocera AVX	600S0R9AT250XT
C20	CAP 10UF 16V TANTALUM, 2312	1	Kemet	T496C106K016ATE2K0
R1	RES, 5.1 Ohm, 0603	1	Vishay	CRCW06035R10FKEA
R2	RES, 6.8 Ohm, 0603	1	TFT	TF0603HE6R80B
L1	IND, CHIP, 27 nH, 0906SQ	1	Coilcraft	0402HP-30NXJRW
L2, L3	IND, CHIP, 5.6 nH, 0402	2	Murata	LQW15AN5N6C80D
L4	IND, CHIP, 3.9 nH, 0603	1	Coilcraft	0603CS-3N9XGE
J1, J2	SMA, PANEL MOUNT, FLANGE, 4-HOLE, BLUNT POST	2	AMPHENOL CONNEX	132150
J3	HEADER RT>PLZ .1CEN LK 5POS	1	AMP, INC	92196A077
W1	Cable, 20 AWG, 4.0"	1	Remington	MIL-W-16878
Q1	MAPC-A3014-AD GaN Transistor	1	MACOM	MAPC-A3014-AD

Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture
Pulse Width = 100 µs, Duty Cycle = 10%, $_{PIN}$ = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

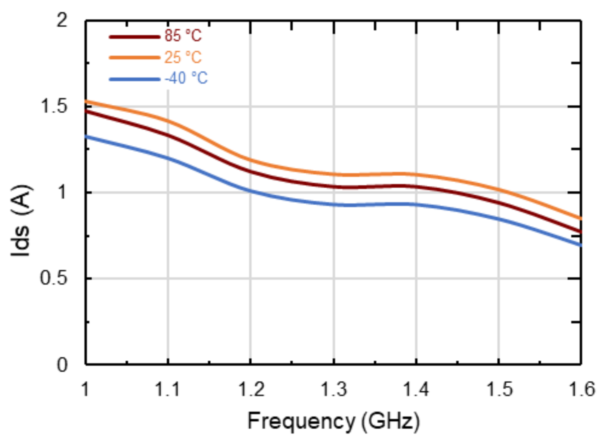
Output Power vs. Temperature and Frequency



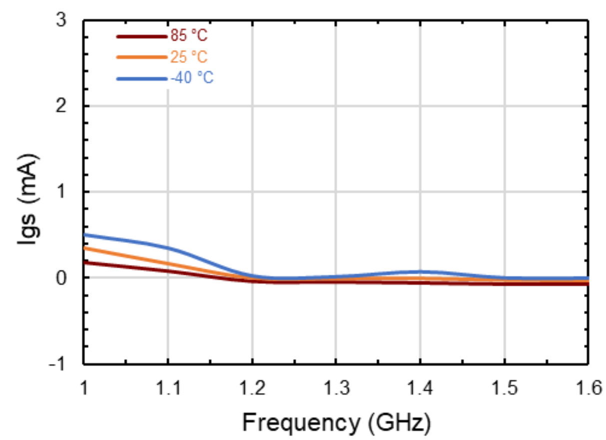
Drain Efficiency vs. Temperature and Frequency



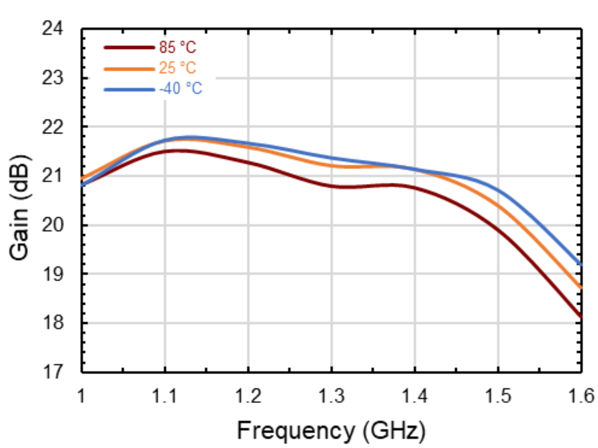
Drain Current vs. Temperature and Frequency



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
Pulse Width = 100 µs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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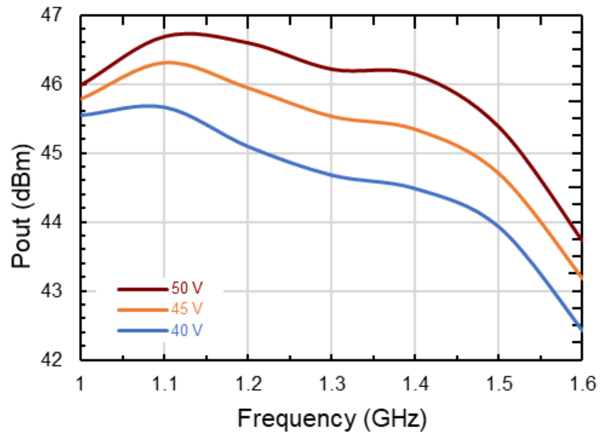
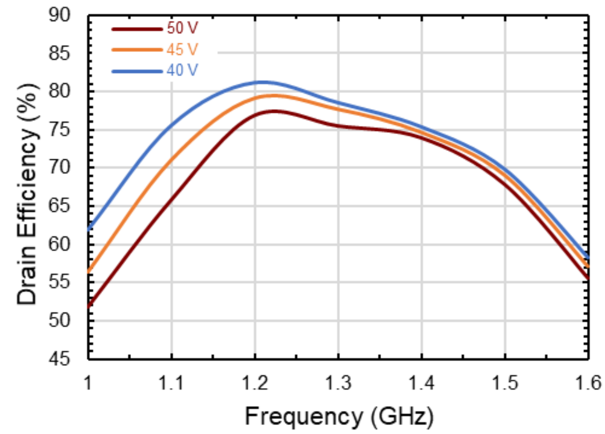
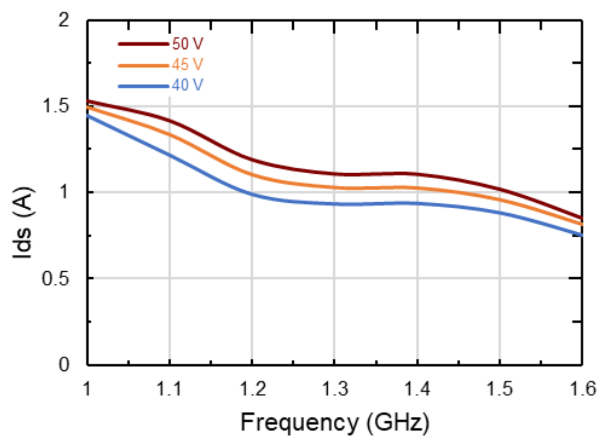
Output Power vs. V_{DS} and Frequency



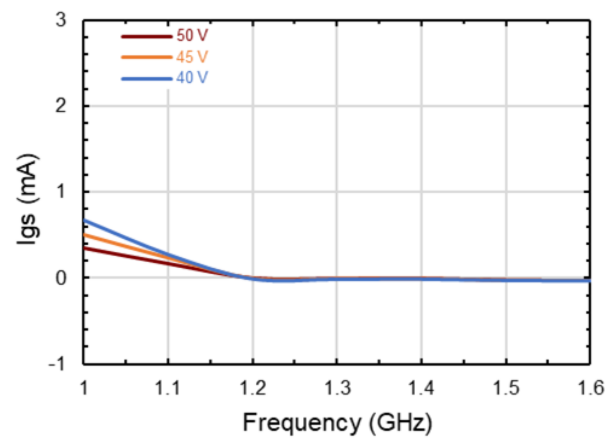
Drain Efficiency vs. V_{DS} and Frequency



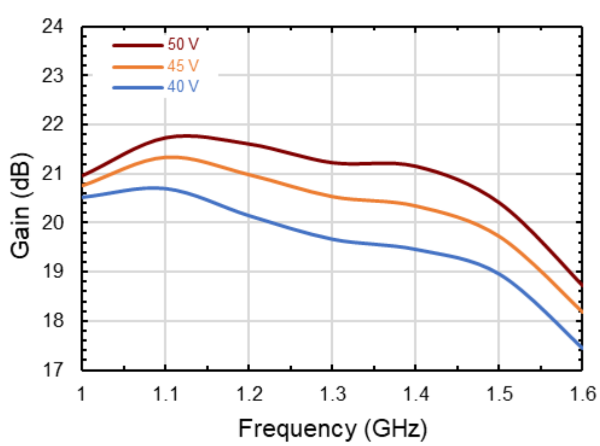
Drain Current vs. V_{DS} and Frequency



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
Pulse Width = 100 μs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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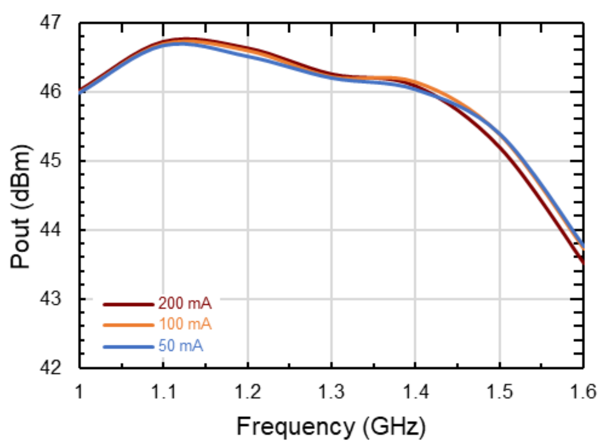
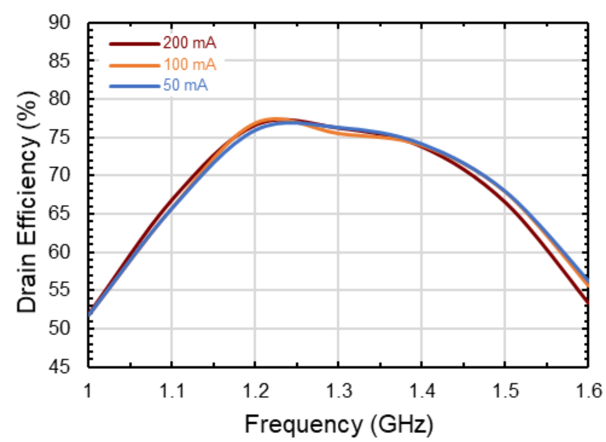
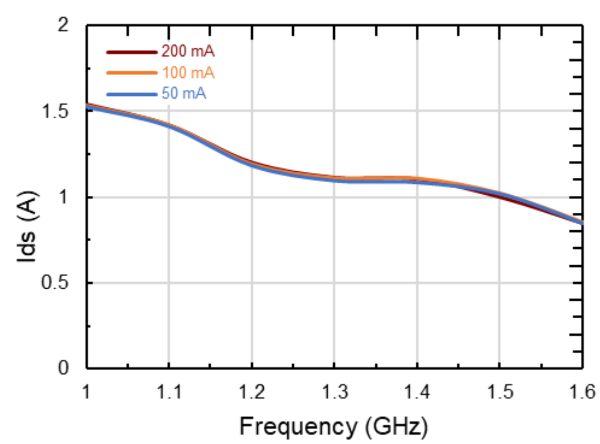
Output Power vs. I_{DQ} and Frequency



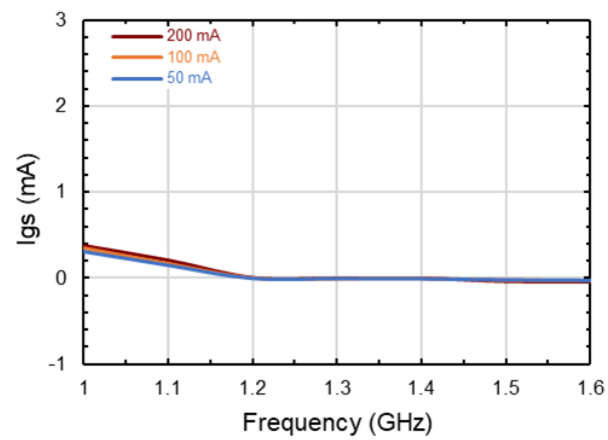
Drain Efficiency vs. I_{DQ} and Frequency



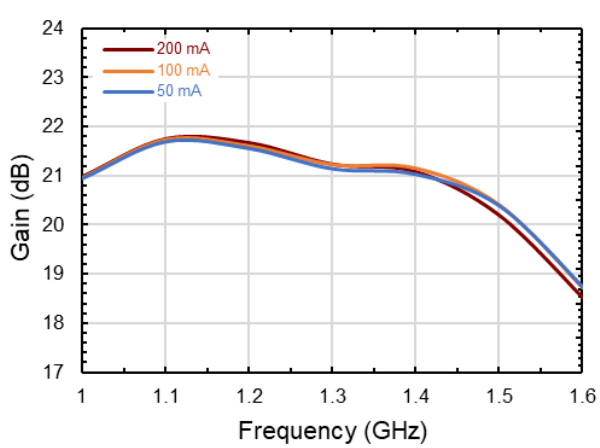
Drain Current vs. I_{DQ} and Frequency



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
Pulse Width = 100 µs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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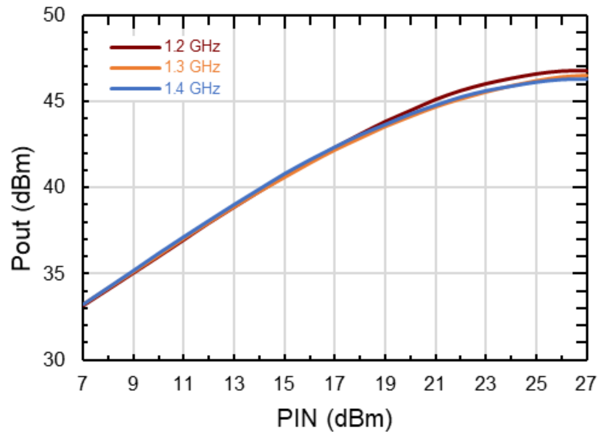
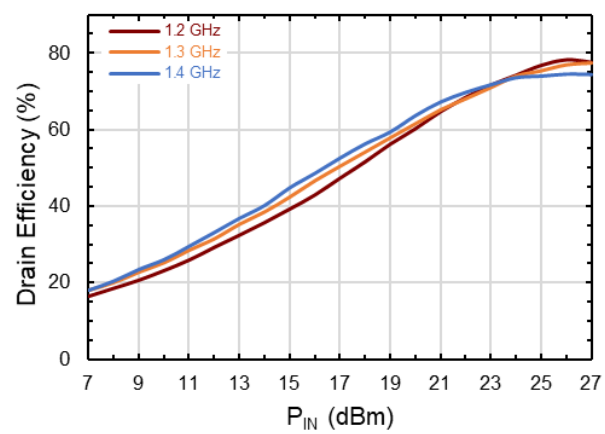
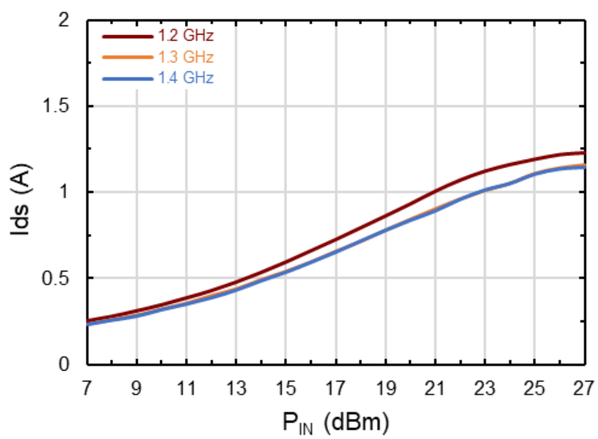
Output Power vs. Frequency and P_{IN}



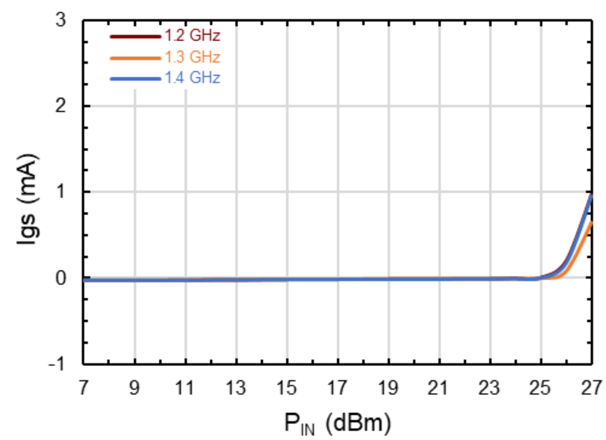
Drain Efficiency vs. Frequency and P_{IN}



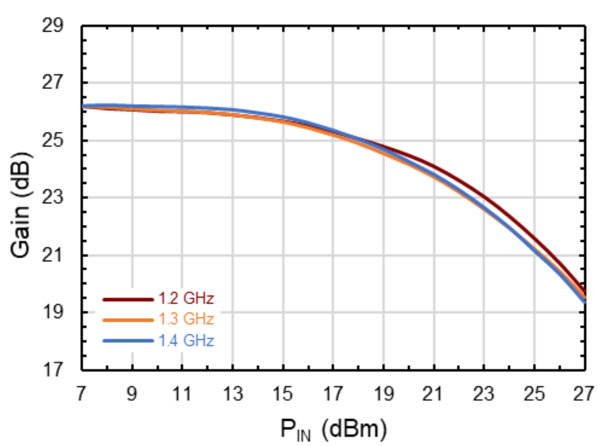
Drain Current vs. Frequency and P_{IN}



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
Pulse Width = 100 µs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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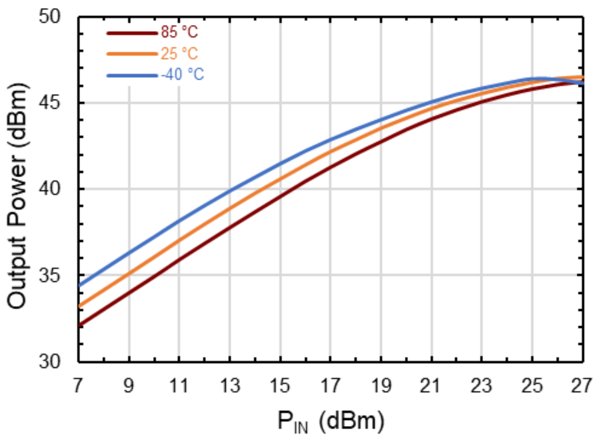
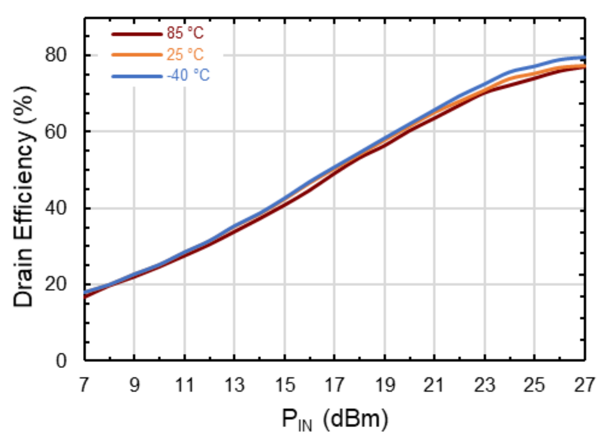
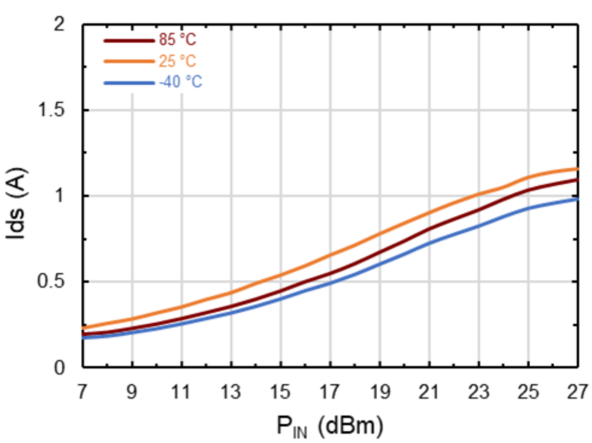
Output Power vs. Temperature and P_{IN}



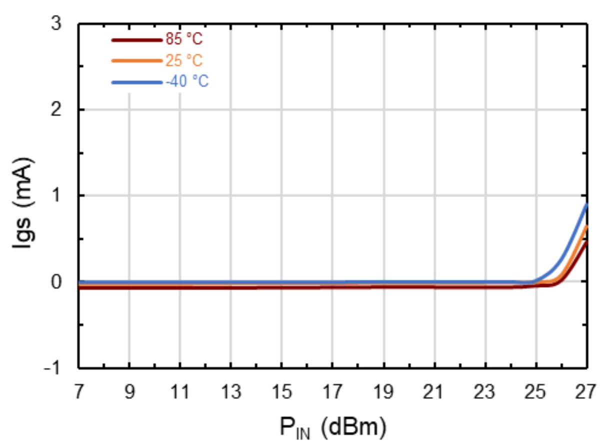
Drain Efficiency vs. Temperature and P_{IN}



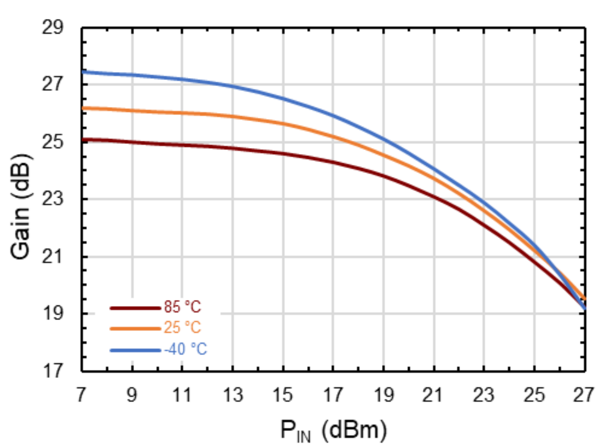
Drain Current vs. Temperature and P_{IN}



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
Pulse Width = 100 µs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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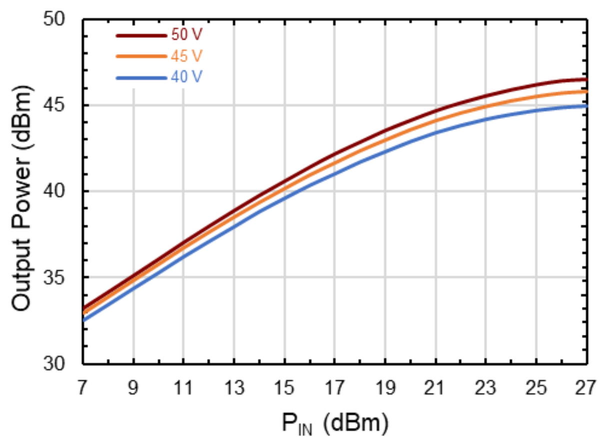
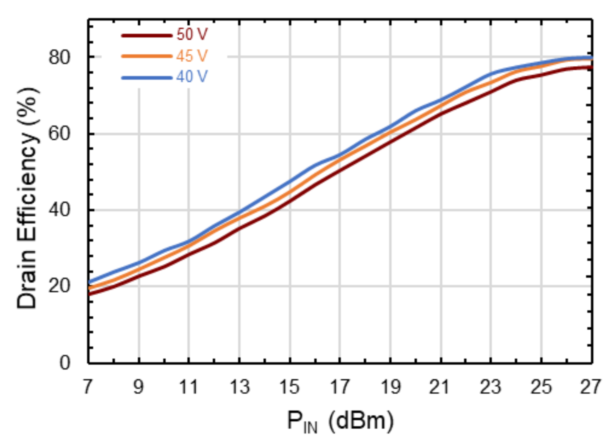
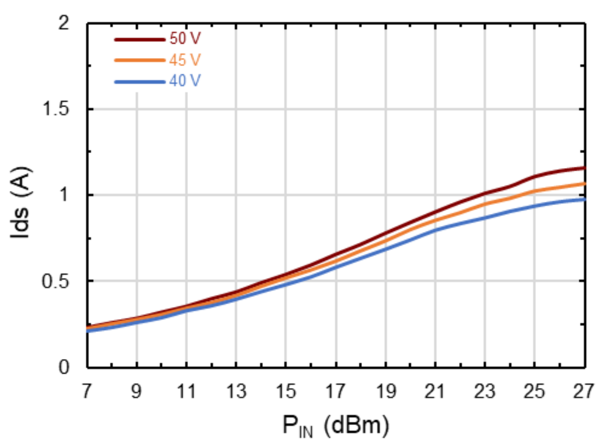
Output Power vs. V_{DS} and P_{IN}



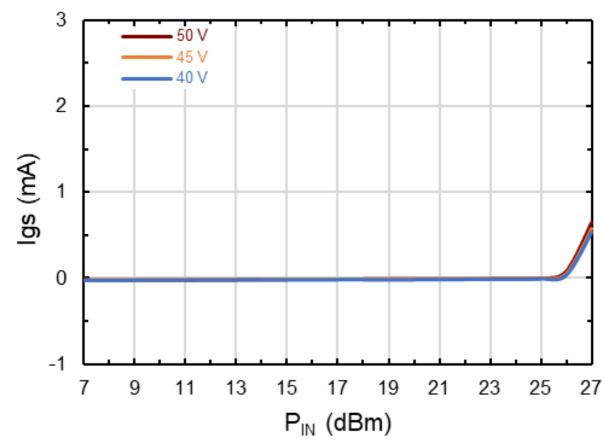
Drain Efficiency vs. V_{DS} and P_{IN}



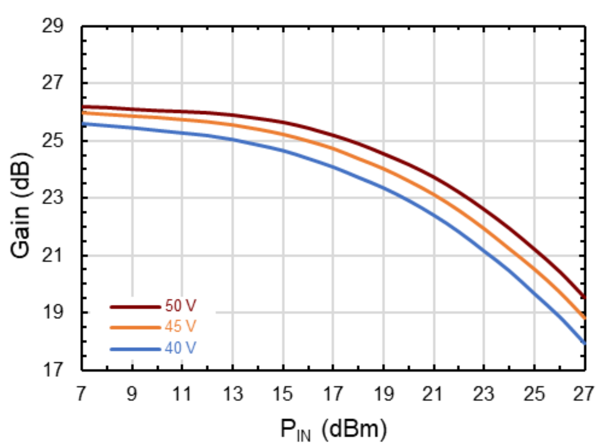
Drain Current vs. V_{DS} and P_{IN}



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
Pulse Width = 100 μs, Duty Cycle = 10%, P_{IN} = 25 dBm, V_{DS} = 50 V, I_{DQ} = 100 mA, Freq. = 1.3 GHz (Unless Otherwise Noted).
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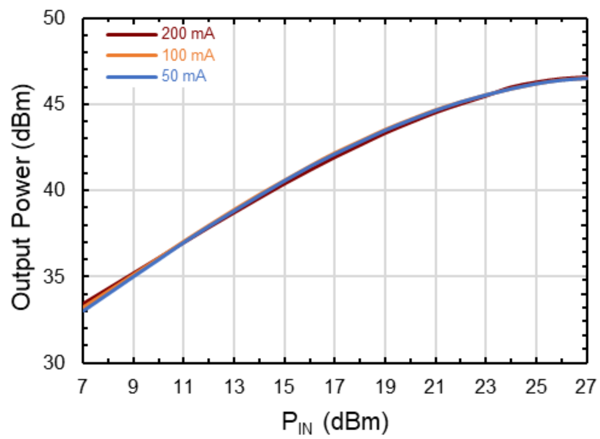
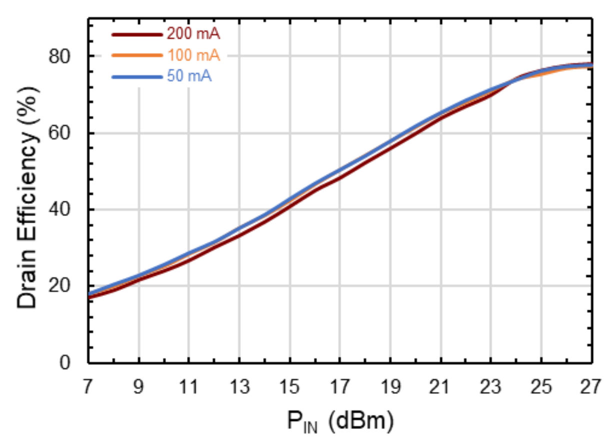
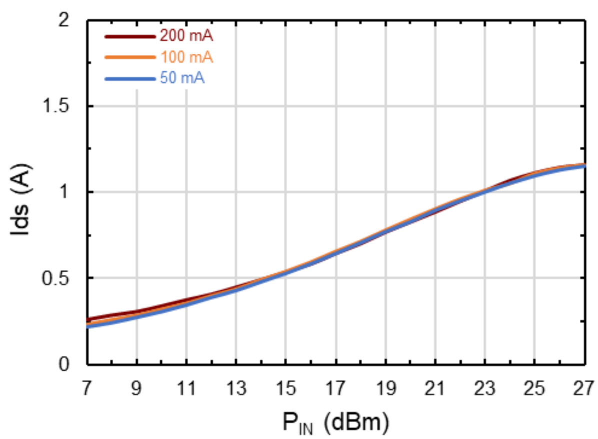
Output Power vs. I_{DQ} and P_{IN}



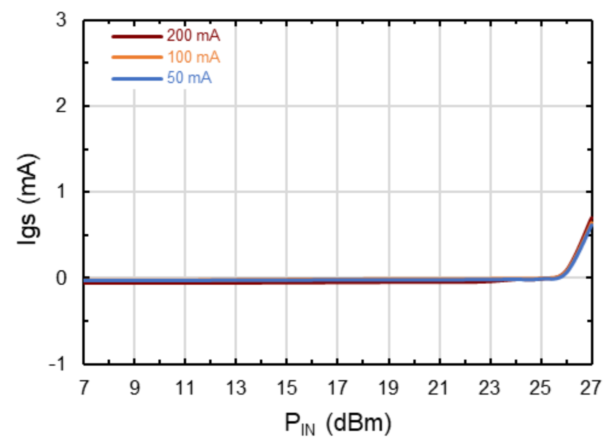
Drain Efficiency vs. I_{DQ} and P_{IN}



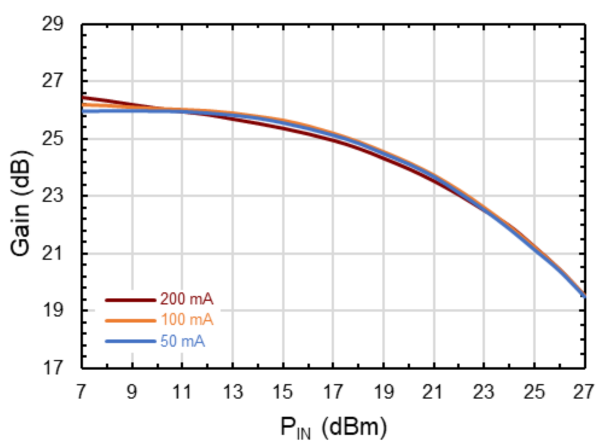
Drain Current vs. I_{DQ} and P_{IN}



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



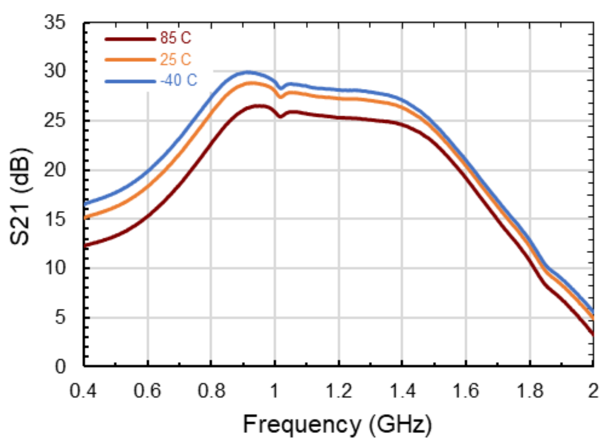
Large Signal Gain vs. I_{DQ} and P_{IN}



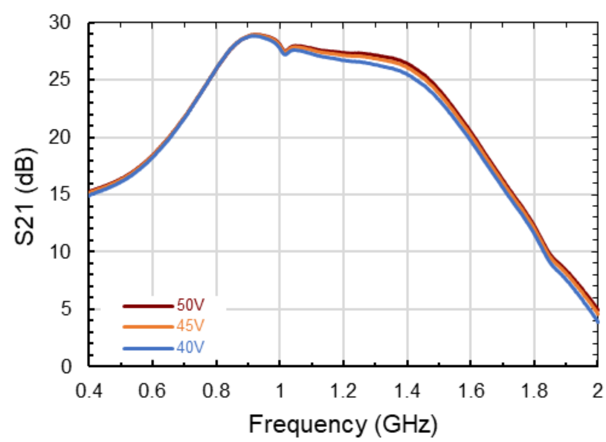
Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 50 V, I_{DQ} = 100 mA, P_{IN} = -20 dBm
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

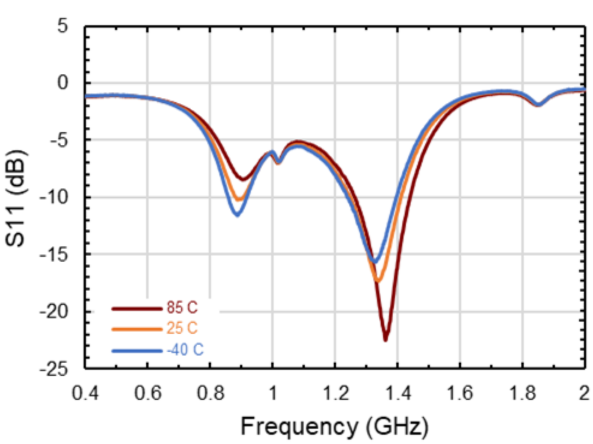
S21 vs Frequency and Temperature



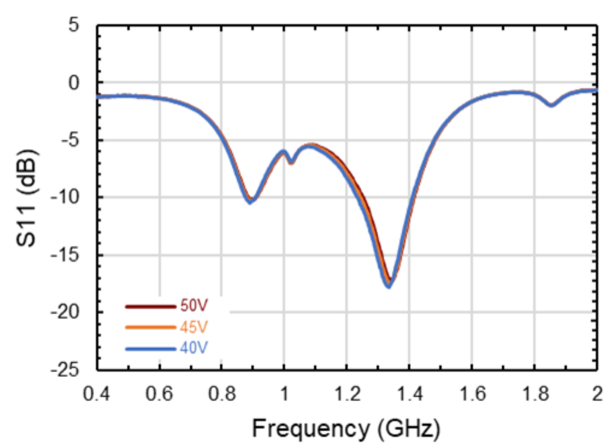
S21 vs Frequency and V_{DS}



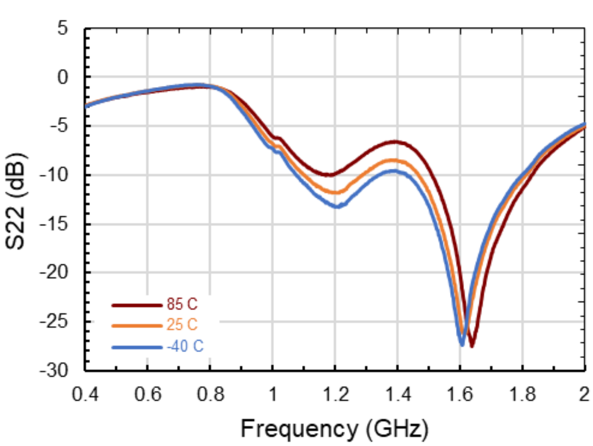
S11 vs Frequency and Temperature



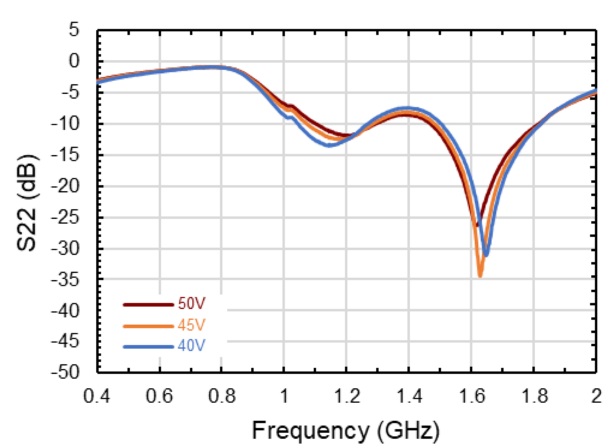
S11 vs Frequency and V_{DS}



S22 vs Frequency and Temperature



S22 vs Frequency and V_{DS}

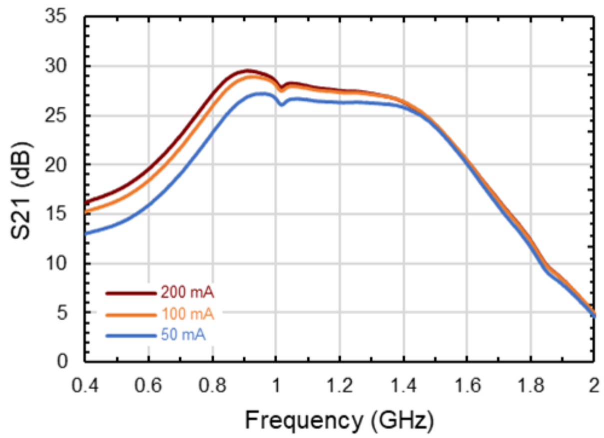


Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:

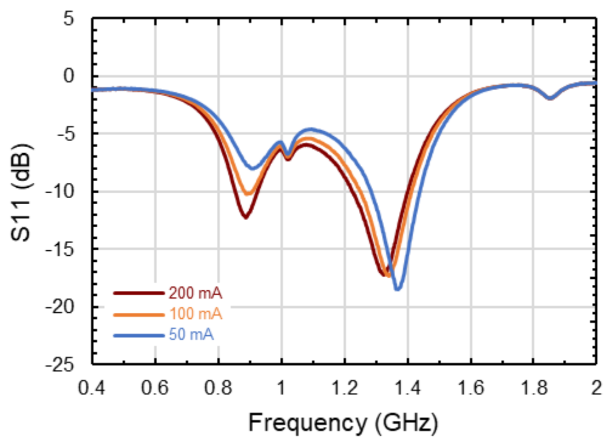
CW, V_{DS} = 50 V, I_{DQ} = 100 mA, P_{IN} = -20 dBm

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

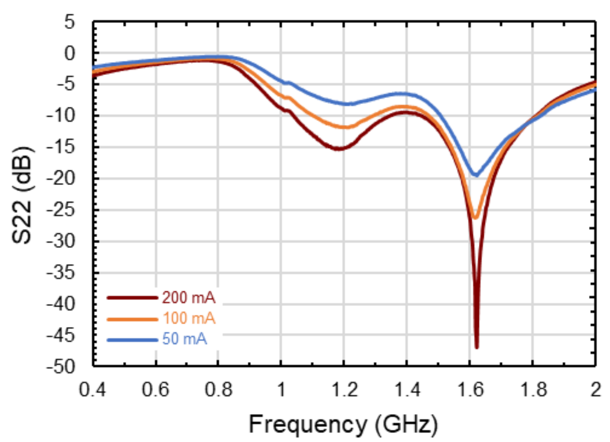
S21 vs Frequency and I_{DQ}



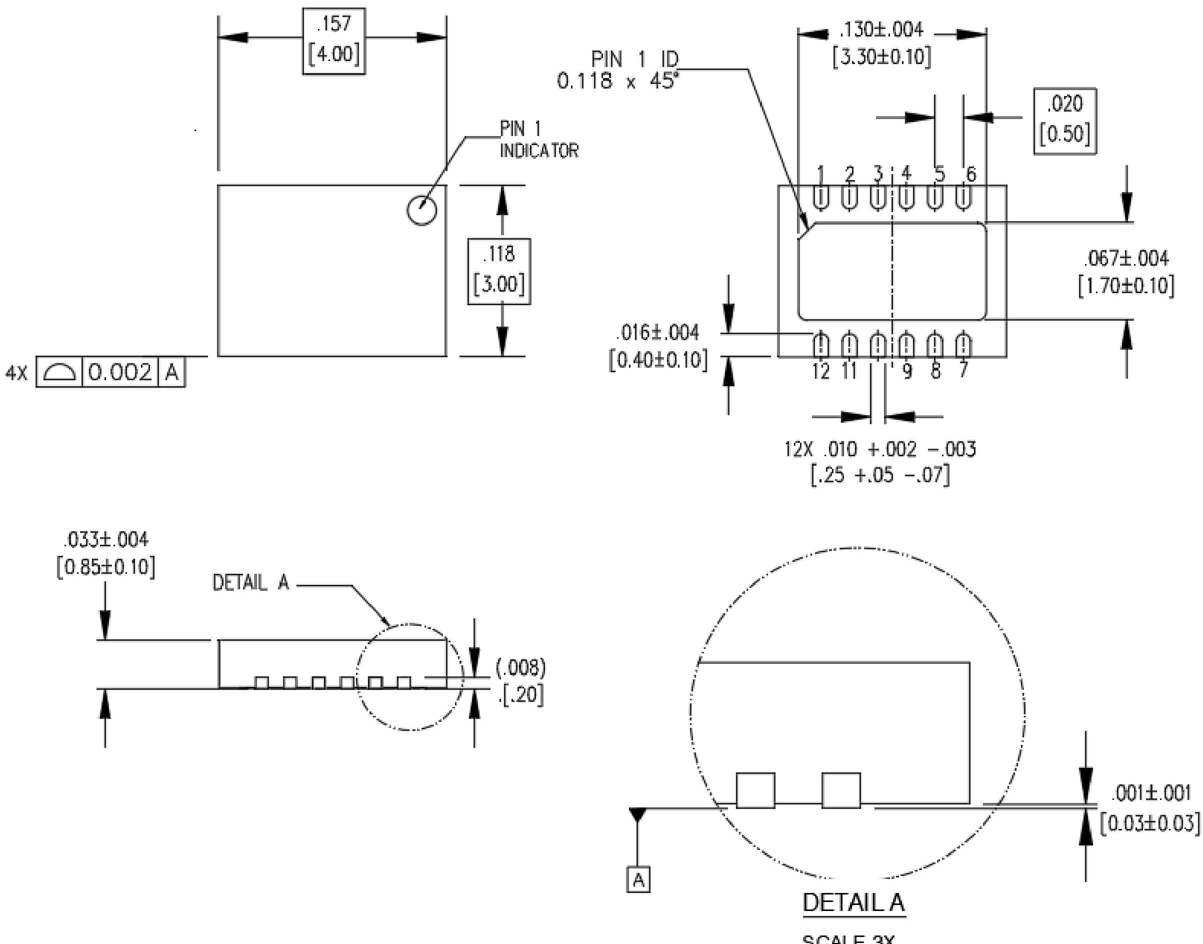
S11 vs Frequency and I_{DQ}



S22 vs Frequency and I_{DQ}



Package Dimensions: 3 x 4 mm PDFN-12L



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.