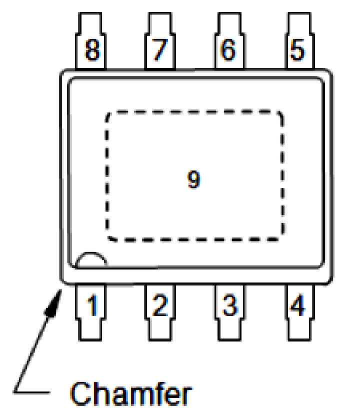
Features
- Optimized for CW, pulsed, WiMAX, and other applications from DC - 3000 MHz
- 27.5 W P3dB Peak Envelope Power (PEP)
- Drain Efficiency: 65%
- Small Signal Gain: 16.5 dB
- 100% RF tested
- Thermally - Enhanced SOIC-8 Plastic Package
- RoHS* Compliant

Applications
- Defense Communications,
- Land Mobile Radio,
- Avionics,
- Wireless Infrastructure,
- ISM
- VHF/UHF/L/S-Band Radar.

Description
The MAPC-A3002-AP GaN HEMT is a power transistor optimized for DC - 3 GHz operation. This device supports CW, pulsed, and linear operation with output power levels to 25 W. This transistor is assembled in an industry standard surface mount plastic package.

Functional Schematic



Ordering Information

Part Number	MOQ Increment
MAPC-A3002-AP000	Bulk
MAPC-A3002-APTR1	Tape and Reel
MAPC-A3002-APSB1	Sample Board

Pin Configuration

Pin #	Function
1 - 4	RF Input / Gate
5 - 8	RF Output / Drain
9	Paddle[1]

1. The exposed pad centered on the package bottom must be connected to RF and DC ground. This path must also provide a low thermal resistance heat path.

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

Typical 2-Tone Performance: (measured in test fixture)
Freq. = 2.5 GHz, T_c = +25°C, V_{DS} = 28 V, I_{DQ} = 200 mA, Tone Spacing = 1 MHz

Parameter	Symbol	Min.	Typ.	Max.	Units
Peak Envelope Power 3 dB Compression 1 dB Compression	$P_{3dB, PEP}$ $P_{1dB, PEP}$	24 —	27.5 15.0	—	W
Small Signal Gain	G_{ss}	15	16.3	18	dB
Drain Efficiency @ 3 dB Compression	η	55	65	—	%

DC Electrical Characteristics: T_C = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Off Characteristics						
Drain-Source Leakage Current	V_{GS} = -8V, I_D = 8 mA	V_{BDS}	100	—	—	V
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 60 V	I_{DLK}	—	—	4	mA
On Characteristics						
Gate Threshold Voltage	V_{DS} = 28 V, I_D = 8 mA	V_T	-2.4	-2.1	-2.0	V
Gate Quiescent Voltage	V_{DS} = 28 V, I_D = 8 mA	V_{GSQ}	-3.0	-2.0	-1.0	V
Maximum Drain Current	V_{DS} = 7 V pulsed, pulse width 300 ms 0.2% Duty Cycle	$I_{D, MAX}$	—	7.8	—	A

Absolute Maximum Ratings[2,3,4]

Parameter	Absolute Maximum
Drain-Source Voltage, V_{DS}	100 V
Gate Source Voltage, V_{GS}	-10, +3 V
Total Device Power Dissipation (derated above 25°C)	28 W
Junction Temperature, T_J	+200°C
Operating Temperature	-40°C to +85°C
Operating Temperature	-65°C to +150°C

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation near these survivability limits.
4. Operating at nominal conditions with $T_J \leq +200$ °C will ensure MTTF > 1 x 10^6 hours.

Thermal Characteristics[5]

Parameter	Test Conditions	Symbol	Typical	Units
Thermal Resistance	V_{DS} = 28 V, T_J = 200°C	$R_{\Theta JC}$	6.25	W

5. Junction temperature (T_J) measured using IR Microscopy. Case temperature measured using thermocouple embedded in heat-sink.

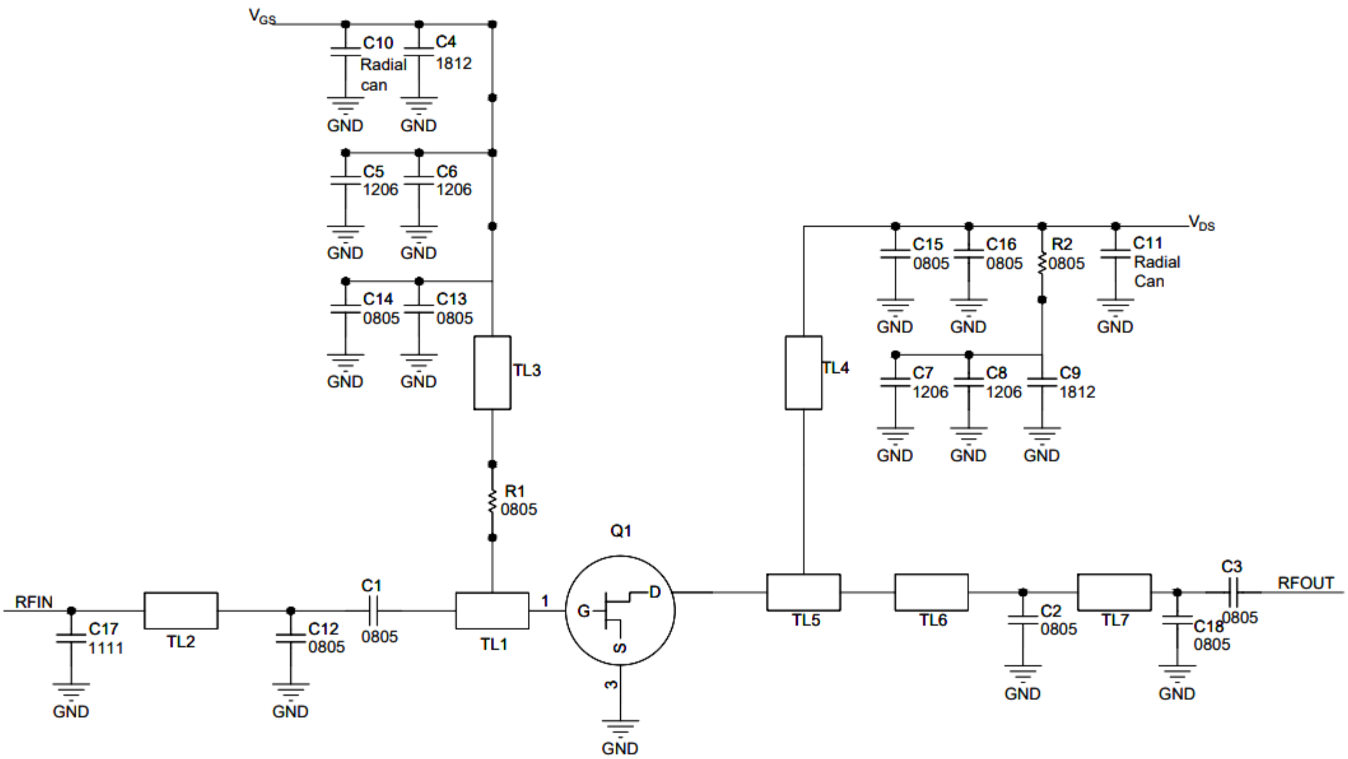
Handling Procedures

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 C3 devices.

Evaluation Test Fixture and Recommended Tuning Solution, 2.5 - 2.7 GHz



Description

Parts measured on evaluation board (30-mil thick RO4350). 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

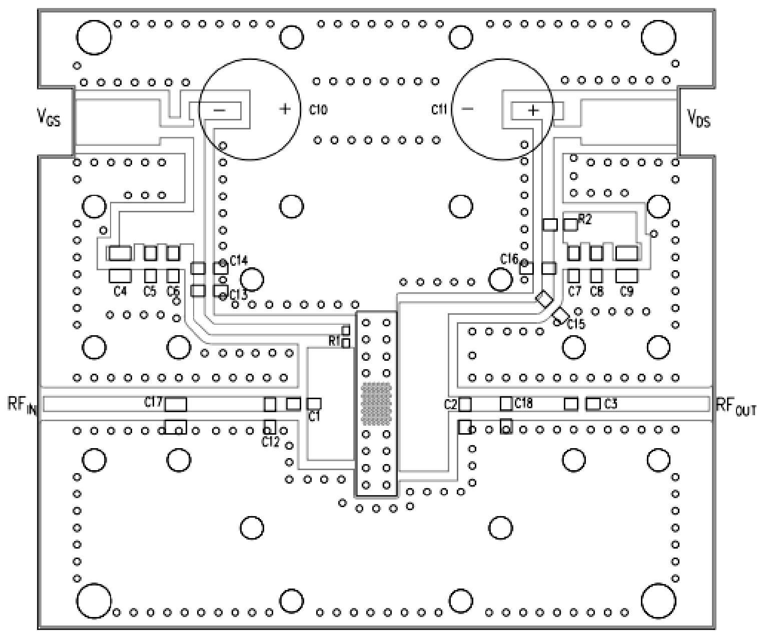
Bias ON

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, 2.5 - 2.7 GHz



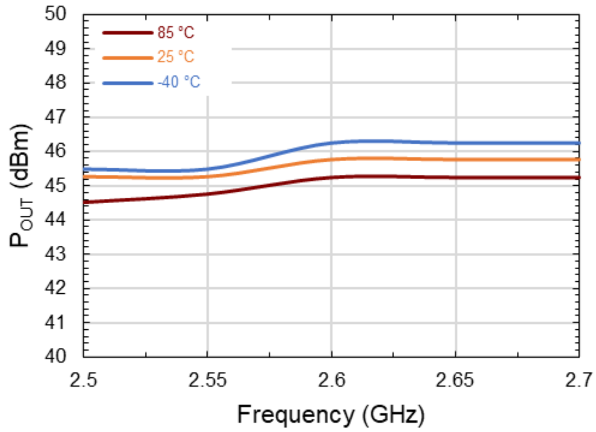
Assembly Parts List

Reference Designator	Description	Qty.
C1, C3	5.6 pF 0805in T0.1p 125C 250V AVX600F	2
C2, C18	1.1 pF 0805in T0.1p 125C 250V AVX600F	2
C4, C9	1 µF 1812in T20% 125C 100V TDK445	2
C5, C8	0.1 µF 1208in T10% 125C 250V Kemet X7R	2
C6, C7	10000 pF 1206in T10% 125C 250V AVXKGMX7R	2
C10	100 µF Radial Can T20% 80V EEE-FK	1
C11	220 µF Radial Can X7R 100V	1
C12	1.5 pF T0.1p 0805in 250V AVX600F1R5	1
C13, C15	33 pF 0805in T5% 125C 250V AVX600F330	2
C14, C16	1000 pF 0805in T10% 125C 50V C0805C102K	2
C17	1.2 pF 1111in T0.1p 125C 500V AVX100B1R2	1
R1	10 Ω 0805in T5% 155C 1/8W RC0805FR-0710RL	1
R2	330 Ω 0805 T1% 155C 1/8W ERJ-6RQFR33V	1
Q1	MAPC-A3002-AP GaN Transistor	1

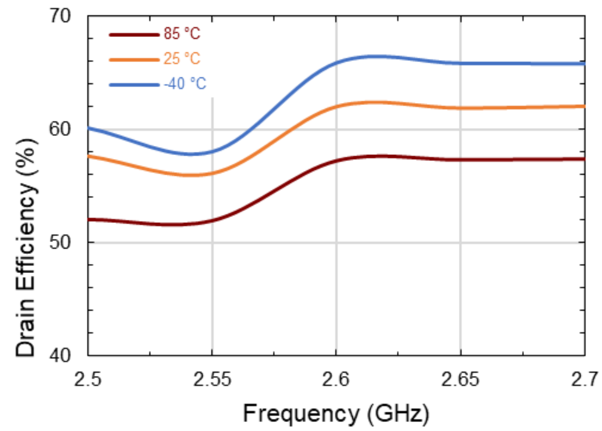
Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture

CW, P_{IN} = 32 dBm, V_{DS} = 28 V, I_{DQ} = 200 mA, Frequency = 2.5 GHz (Unless Otherwise Noted)
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

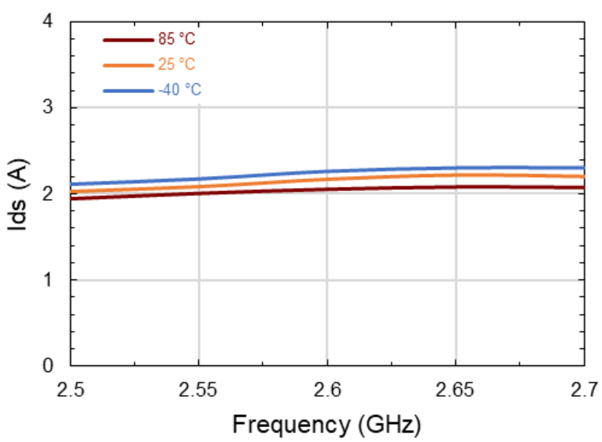
Output Power vs. Temperature and Frequency



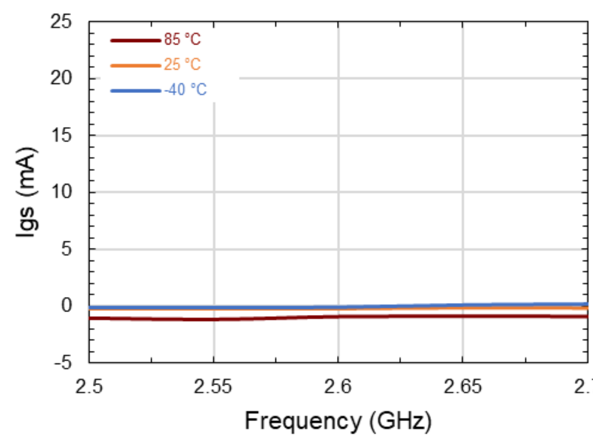
Drain Efficiency vs. Temperature and Frequency



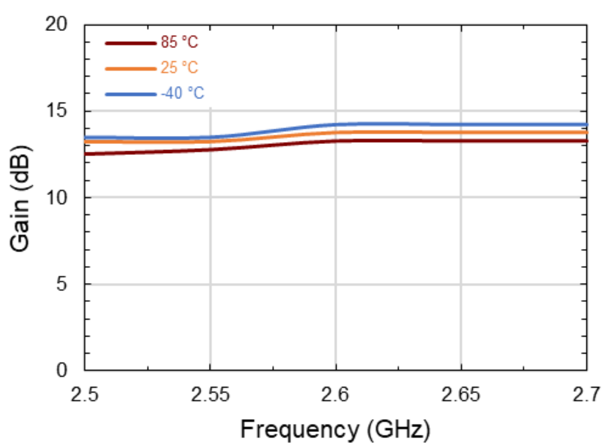
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency



Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture

CW, P_{IN} = 32 dBm, V_{DS} = 28 V, I_{DQ} = 200 mA, Frequency = 2.5 GHz (Unless Otherwise Noted)
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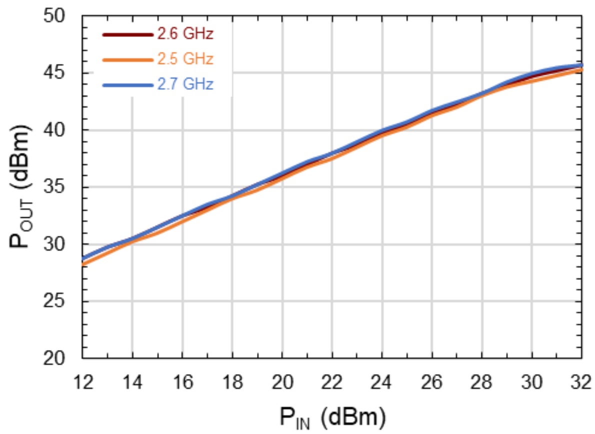
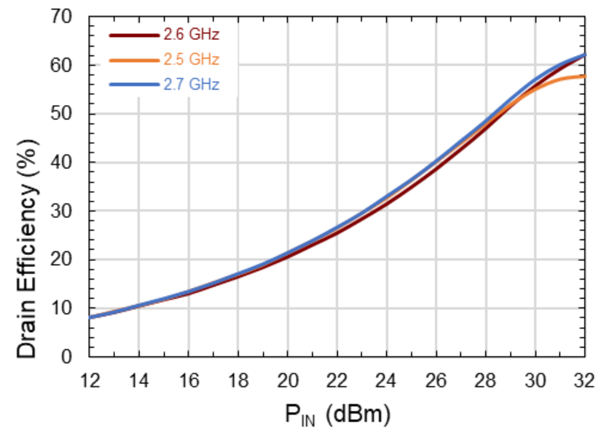
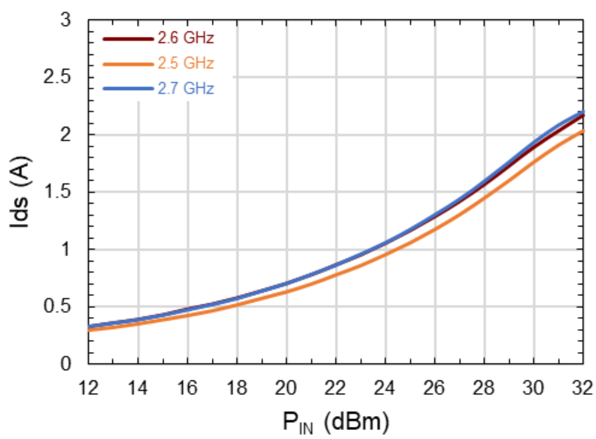
Output Power vs. Frequency and P_{IN}



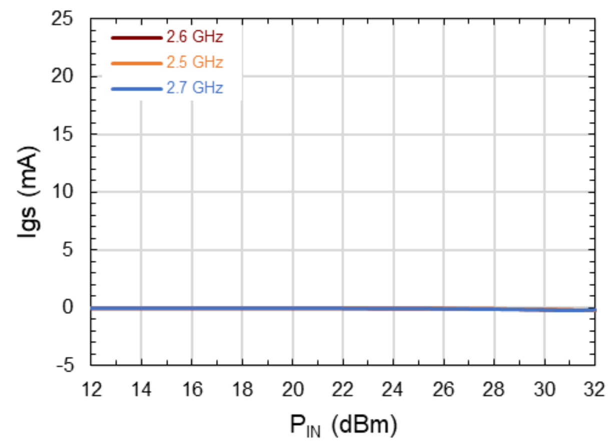
Drain Efficiency vs. Frequency and P_{IN}



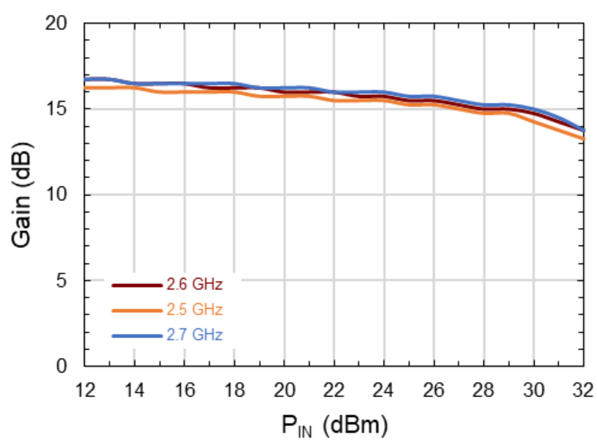
Drain Current vs. Frequency and P_{IN}



Gate Current vs. Frequency and P_{IN}



Large Signal Gain vs. Frequency and P_{IN}



Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture

CW, P_{IN} = 32 dBm, V_{DS} = 28 V, I_{DQ} = 200 mA, Frequency = 2.5 GHz (Unless Otherwise Noted)

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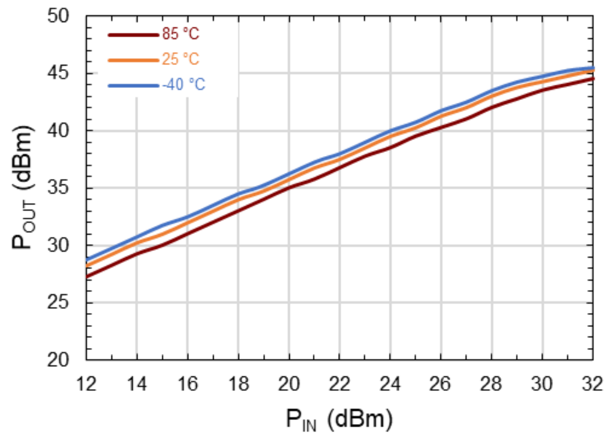
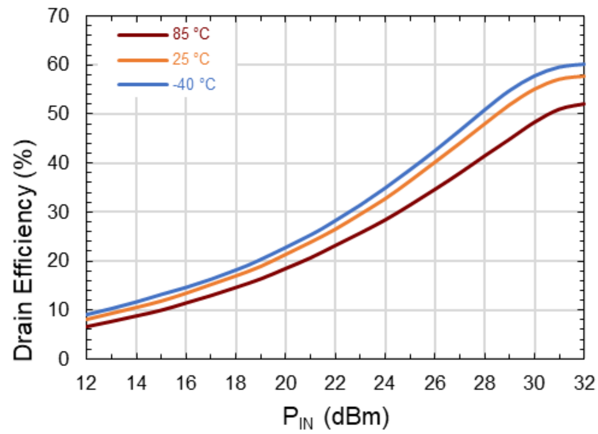
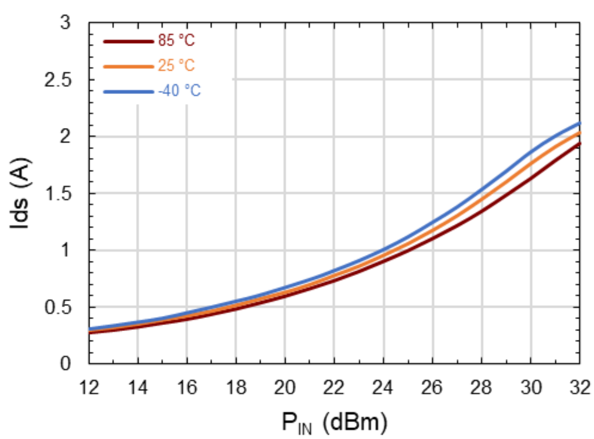
Output Power vs. Temperature and P_{IN}



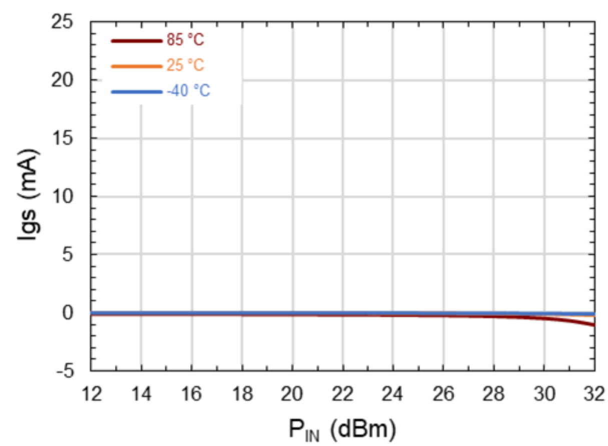
Drain Efficiency vs. Temperature and P_{IN}



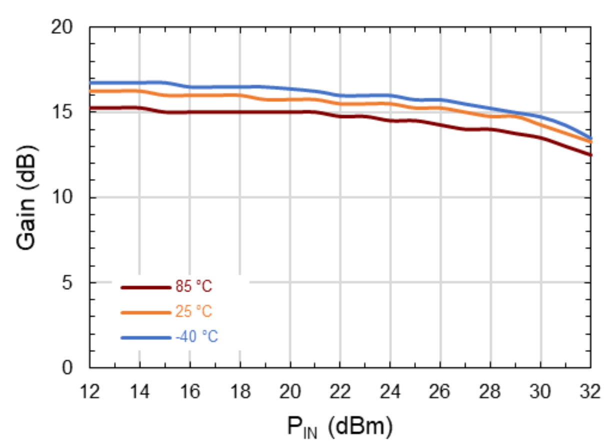
Drain Current vs. Temperature and P_{IN}



Gate Current vs. Temperature and P_{IN}



Large Signal Gain vs. Temperature and P_{IN}



Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture

CW, P_{IN} = 32 dBm, V_{DS} = 28 V, I_{DQ} = 200 mA, Frequency = 2.5 GHz (Unless Otherwise Noted)
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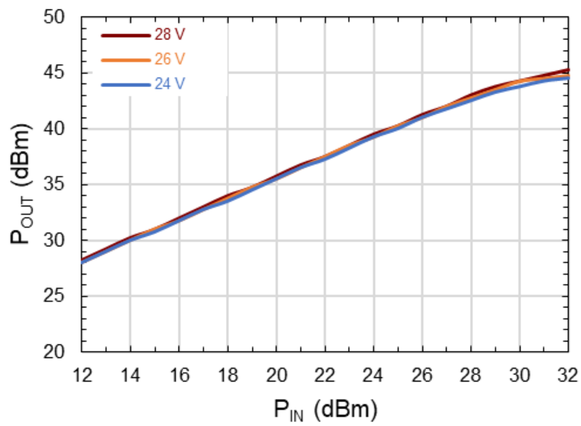
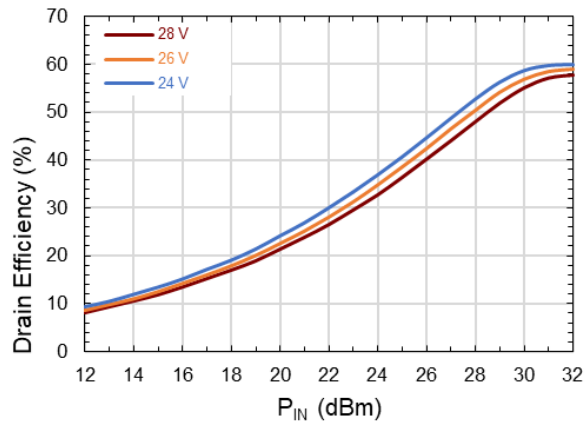
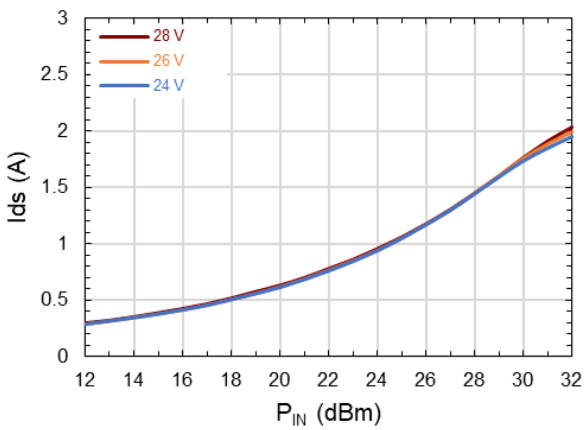
Output Power vs. V_{DS} and P_{IN}



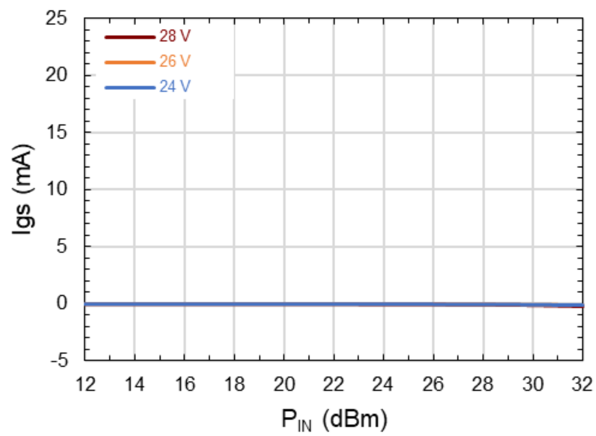
Drain Efficiency vs. V_{DS} and P_{IN}



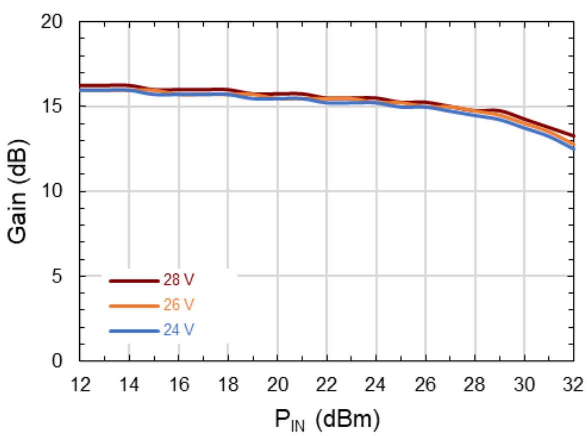
Drain Current vs. V_{DS} and P_{IN}



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



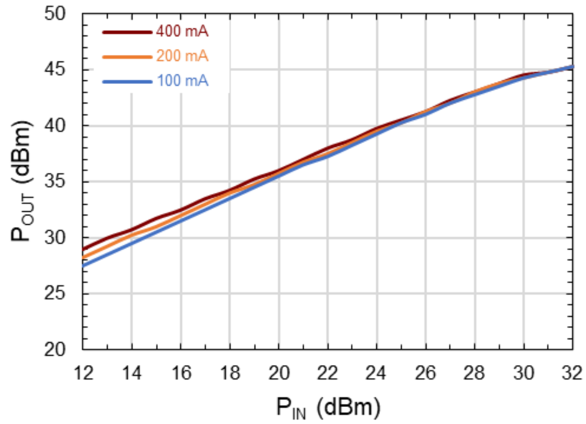
Large Signal Gain vs. V_{DS} and P_{IN}



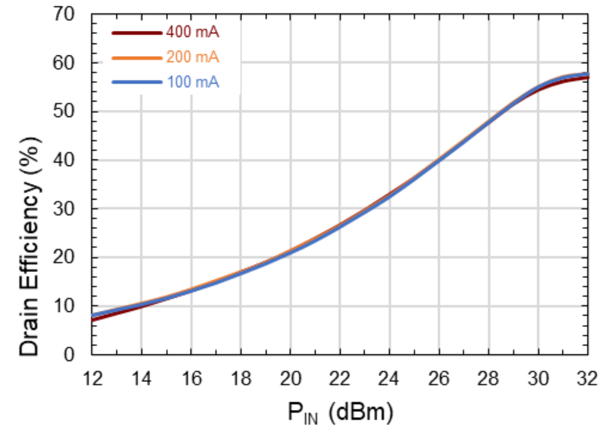
Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture

CW, P_{IN} = 32 dBm, V_{DS} = 28 V, I_{DQ} = 200 mA, Frequency = 2.5 GHz (Unless Otherwise Noted)
For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

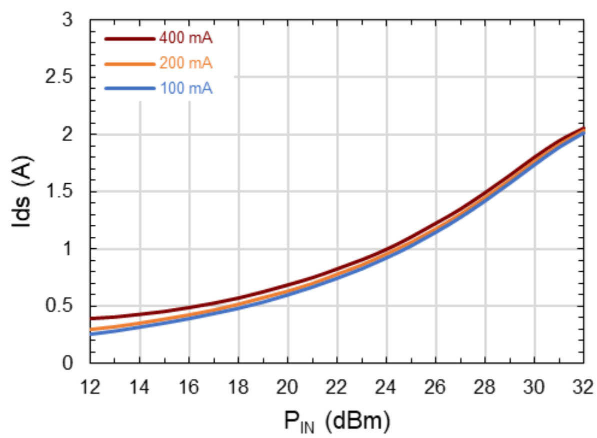
Output Power vs. I_{DQ} and P_{IN}



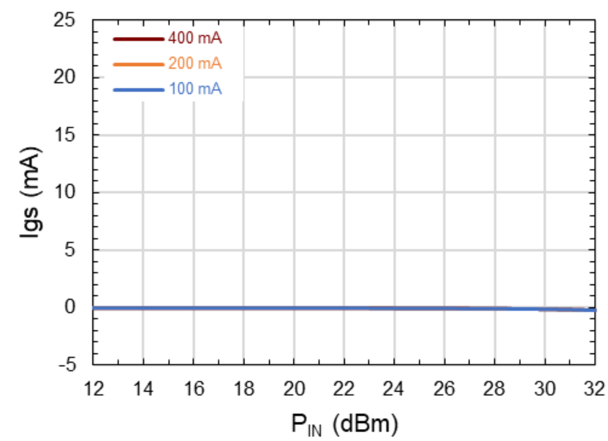
Drain Efficiency vs. I_{DQ} and P_{IN}



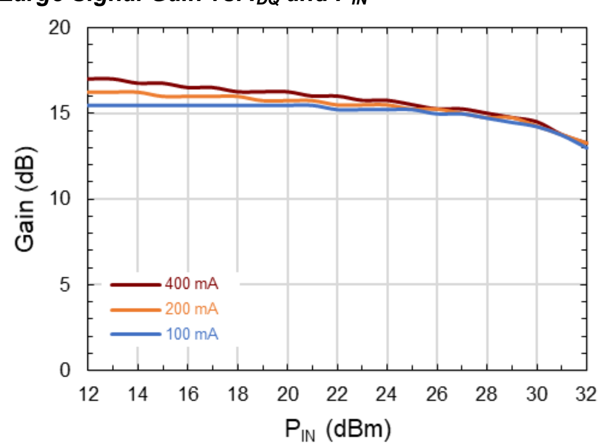
Drain Current vs. I_{DQ} and P_{IN}



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

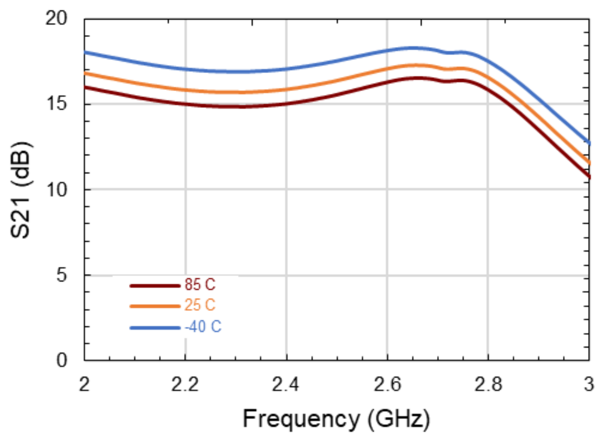


Large Signal Gain vs. I_{DQ} and P_{IN}

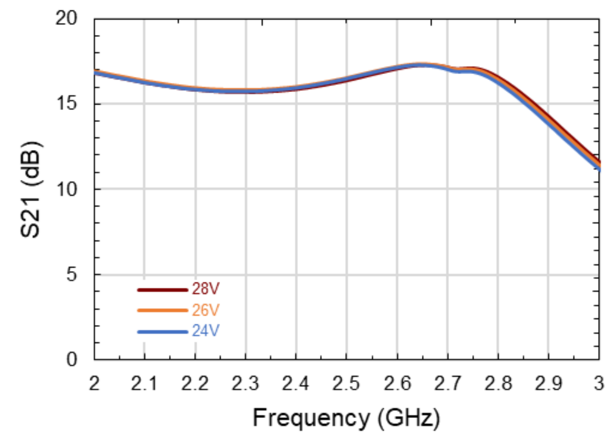


Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture:
CW, V_{DS} = 28 V, I_{DQ} = 200 mA, P_{IN} = -20 dBm (Unless Otherwise Noted)
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

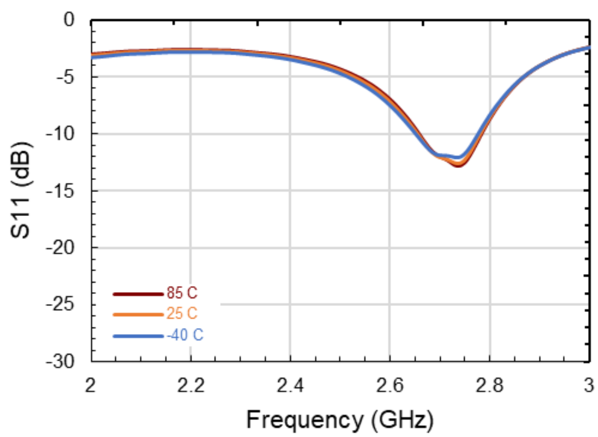
S21 vs Frequency and Temperature



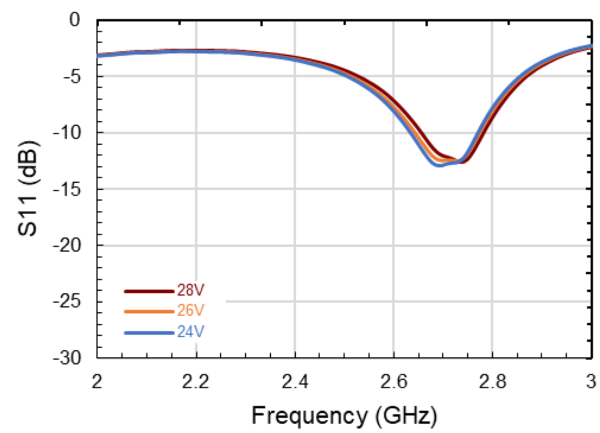
S21 vs Frequency and V_{DS}



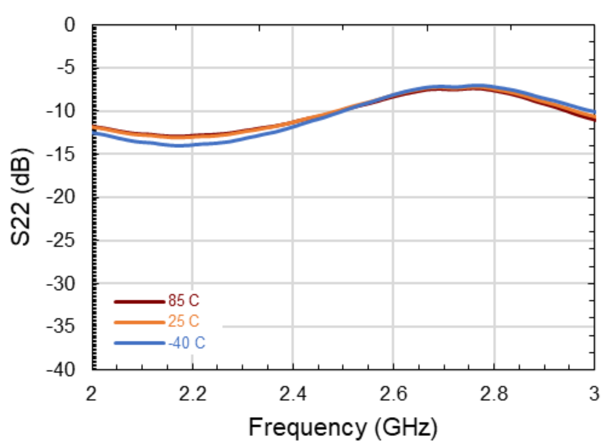
S11 vs Frequency and Temperature



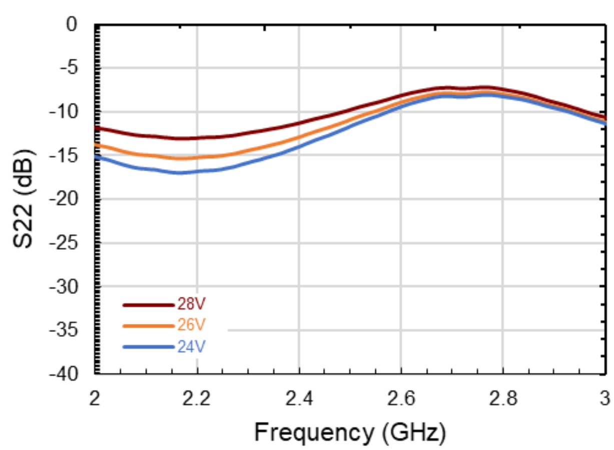
S11 vs Frequency and V_{DS}



S22 vs Frequency and Temperature



S22 vs Frequency and V_{DS}



Typical Performance Curves as Measured in the 2.5 - 2.7 GHz Evaluation Test Fixture:
CW, V_{DS} = 28 V, I_{DQ} = 200 mA, P_{IN} = -20 dBm (Unless Otherwise Noted)
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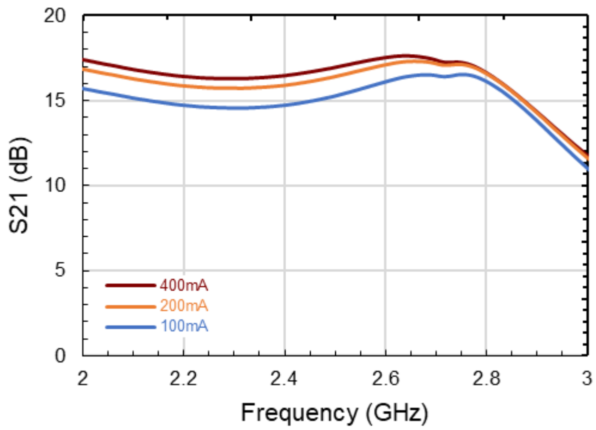
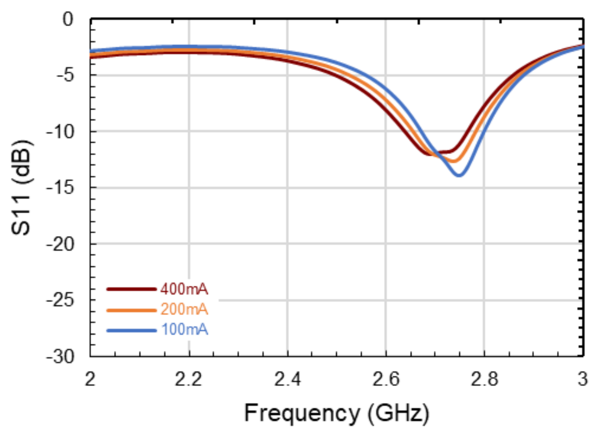
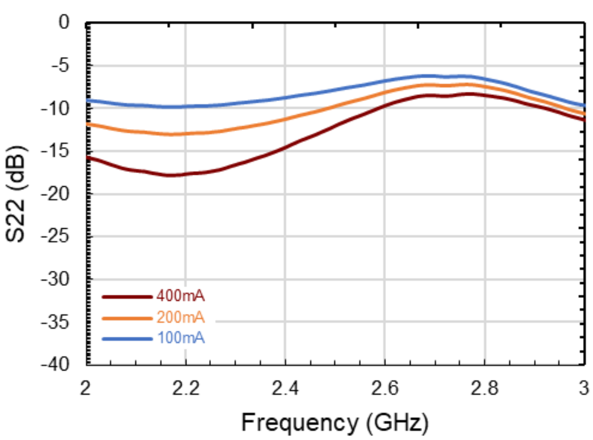
S21 vs Frequency and I_{DQ}



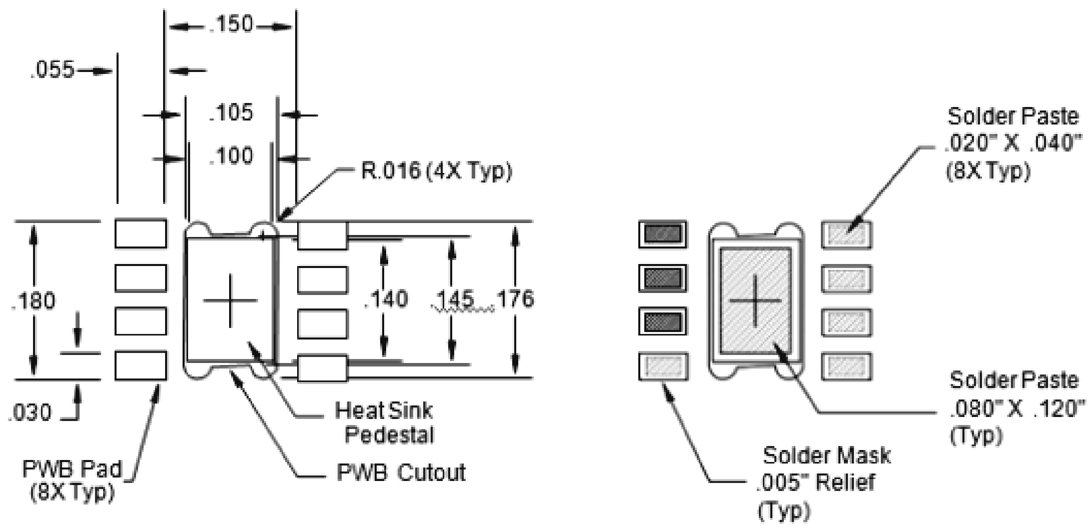
S11 vs Frequency and I_{DQ}



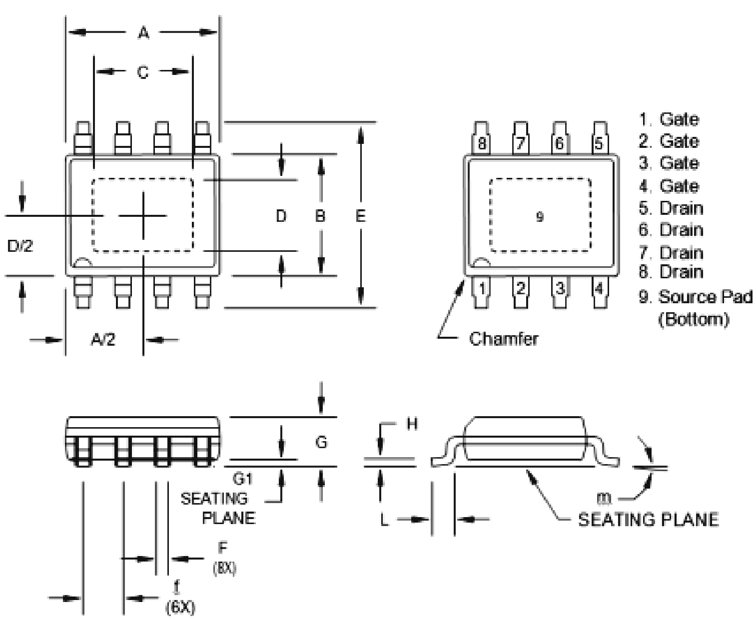
S22 vs Frequency and I_{DQ}



Mounting Footprint



Package Dimensions and Pin out



Dim.	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.189	0.196	4.80	4.98
B	0.150	0.157	3.81	3.99
C	0.107	0.123	2.72	3.12
D	0.071	0.870	1.870	2.21
E	0.230	0.244	5.85	6.19
f	0.050 BSC		1.270 BSC	
F	0.0138	0.0192	0.35	0.49
G	0.055	0.061	1.40	1.55
G1	0.000	0.004	0.00	0.10
H	0.075	0.098	1.91	2.50
L	0.016	0.035	0.41	0.89
m	0°	8°	0°	8°