

MAPC-A3010-AB

Rev. V1

MACOM PURE CARBIDE..

Features

Saturated Power: 120 W Drain Efficiency: 70% Small Signal Gain: 17 dB

Lead-Free Air Cavity Ceramic Package

RoHS* Compliant

Applications

Avionics - TACAN, DME, IFF

Military Radio

L. S-band Radar

Electronic Warfare

General Amplification

Description

The MAPC-A3010-AB is a 120 W packaged, unmatched transistor utilizing a high performance, 0.15 µm GaN on SiC production process. This transistor supports both defense and commercial related applications.

Offered in a thermally-enhanced flange package, the MAPC-A3010-AB provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

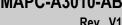
Typical RF Performance:

Measured at CW = P_{sat} , defined at I_{gs} = 2.88 mA. $V_{DS} = 28 \text{ V}, I_{DO} = 1000 \text{ mA}, T_{C} = 25^{\circ}\text{C}$

Frequency (GHz)	Output Power Gain (dBm) (dB)		η _□ (%)
1.2	51.6	16.6	66.4
1.3	51.8	17.2	69.4
1.4	50.9	18.0	71.7

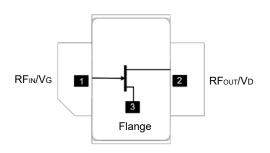
Ordering Information

Part Number	MOQ Increment
MAPC-A3010-AB	Bulk
MAPC-A3010-ABSB1	Sample Board





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.

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



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RF Electrical Specifications: Frequency = 1.3 GHz, P_{SAT} @ I_{GS} = 2.88 mA, T_A = +25°C, V_{DS} = 28 V, I_{DO} = 1000 mA, Low Power Gain tested at P_{IN} of 10 dBm.

Parameter	Symbol	Min.	Тур.	Max.	Units
Saturated Power	P _{SAT}	123	143	_	W
Drain Efficiency	η _{SAT}	62	67	_	%
Low Power Gain	G _{SS}	19.4	20.3	_	dB

Note: Final testing and screening for all transistor sales is performed using the MAPC-A3010-ABSB1 at 1.3 GHz.

Absolute Maximum Ratings^{2,3}

Parameter	Absolute Maximum	
Drain-Source Voltage	84 V	
Gate Voltage	-10 V, +2 V	
Drain Current	12 A	
Gate Current	29 mA	
Junction Temperature ^{4,5}	+225°C	
Operating Temperature	-40°C to +65°C	
Storage Temperature	-55°C to +150°C	
Mounting Temperature	+245°C	

- 2. Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- 4. Operating at nominal conditions with $T_J \le +225$ C will ensure MTTF > 1x 10^6 hours.
- Junction Temperature (T_J) = T_C + Θjc * (V * I)
 Typical thermal resistance (Θjc) = 1.39 °C/W for CW.
 a) For T_C = +25°C,
 T_J = 185°C @ P_{DISS} = 115 W

b) For $T_C = +65^{\circ}C$,

T_J = 225°C @ P_{DISS} = 115 W

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

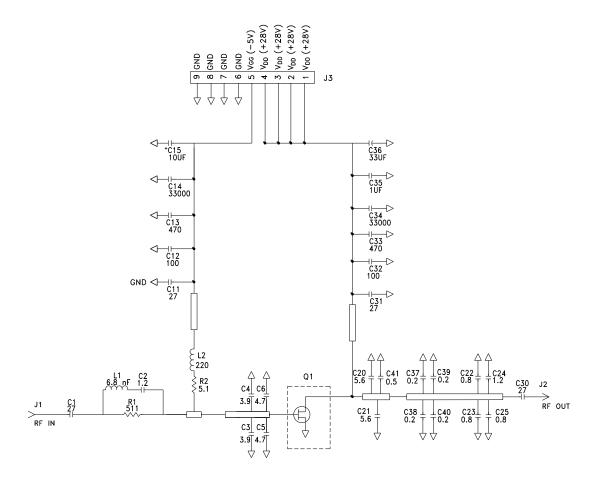
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.



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Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



Description

Parts measured on evaluation board (32-mil thick RO4003). 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

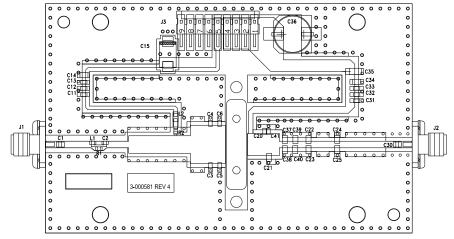
Bias OFF

- 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



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Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



Assembly Parts List

Reference Designator	Description	Qty.
C1, C30	CAP, 27 pF +/- 5%,, 250V, 0805, ATC 600F	2
C2	CAP, 1.2 pF, +/-0.1pF, 0603, ATC	1
C3, C4	CAP, 3.9 pF,+/-0.1pF, 0603, ATC	2
C5, C6	CAP, 4.7 pF,+/-0.1pF, 0603, ATC600S	2
C11, C31	CAP, 27 pF,+/-5%, 0603, ATC	2
C12, C32	CAP, 100 pF, +/-5%, 0603, ATC	2
C13, C33	CAP, 470 pF, 5%, 100V, 0603, X7R, ROHS COMPLIANT	2
C14, C34	CAP, 33000 pF, 0805,100V, X7R	2
C15	CAP, 10 µF 16V TANTALUM, 2312	1
C20	CAP, 5.6 pF +/- 0.1 pF, 0505, ATC 800A (Vertical)	1
C21	CAP, 5.6 pF +/- 0.1 pF, ATC 800B (Vertical)	1
C22, C23, C25	CAP, 0.8 pF +/- 0.05 pF, 0805, ATC 600F	3
C24	CAP, 1.2 pF +/- 0.1 pF, 0805, ATC 600F	1
C35	CAP, 1 μF, 100V, +/-10%, X7R, 1210	1
C36	CAP, 33 μF, 20%, G CASE	1
C37, C38, C39, C40	CAP, 0.2 pF +/- 0.05 pF, 0805, ATC 600F	4
C41	CAP, 0.5 pF +/- 0.1 pF, 0805, ATC 600F (Vertical)	1
L1	INDUCTOR,CHIP,6.8 nH,0603 SMT	1
L2	IND, FERRITE, 220 Ω, 0603	1
R1	RES,1/16W,0603,1%,511 Ω	1
R2	RES, 1/16W, 0603, 1%, 5.1 Ω	1
J1, J2	CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST	2
J3	HEADER RT>PLZ .1CEN LK 9POS	1
-	PCB, RO4003, Er = 3.38, h = 32 mil	1
Q1	MAPC-A3010-AB	1

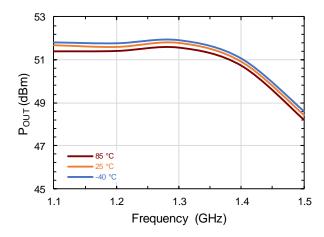


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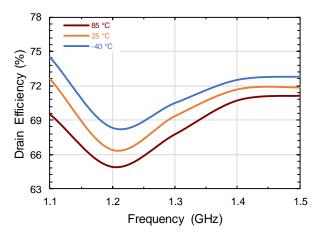
Rev. V1

Typical Performance Curves as Measured in the 1.2–1.4 GHz Evaluation Test Fixture CW, P_{SAT} measurements @ I_{gs} = 2.88 mA, V_{DS} = 28 V, I_{DQ} = 1A, Freq = 1.3 GHz (Unless Otherwise Noted) For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

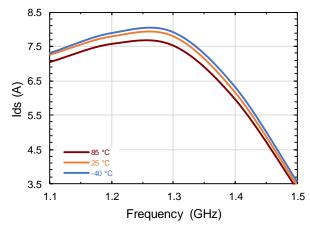
Output Power vs. Temperature and Frequency



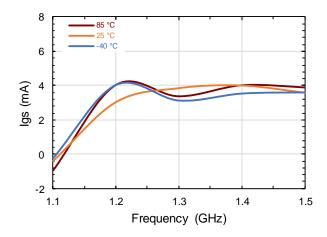
Drain Efficiency vs. Temperature and Frequency



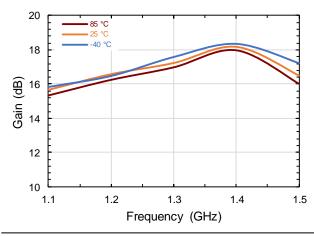
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency



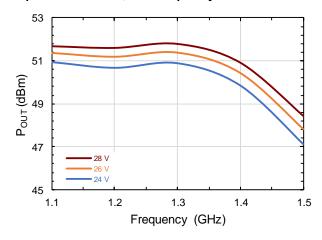


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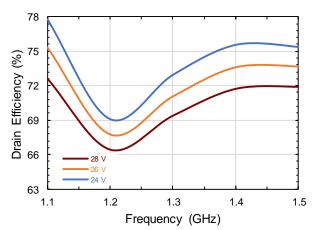
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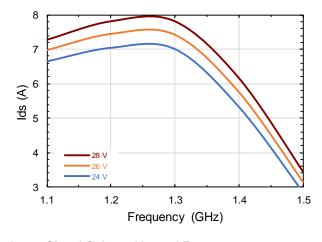
Output Power vs. VDS and Frequency



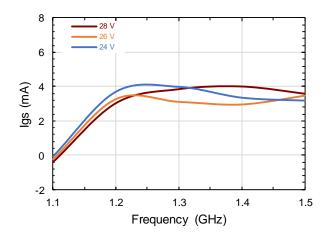
Drain Efficiency vs. V_{DS} and Frequency



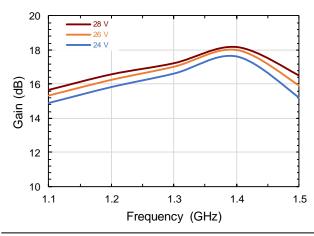
Drain Current vs. V_{DS} and Frequency



Gate Current vs. V_{DS} and Frequency



Large Signal Gain vs. VDS and Frequency



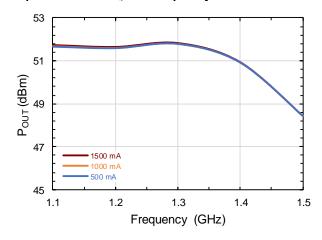


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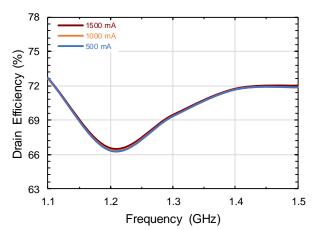
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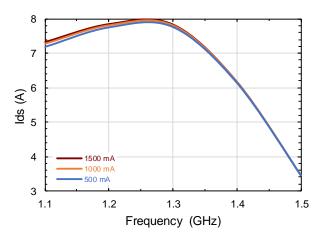
Output Power vs. IDQ and Frequency



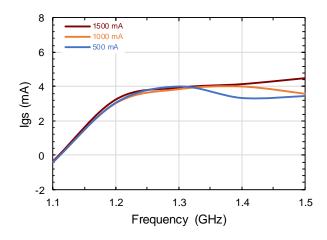
Drain Efficiency vs. IDQ and Frequency



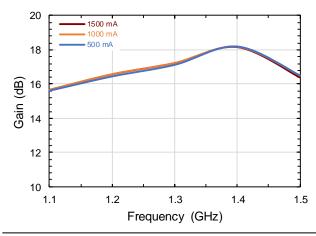
Drain Current vs. IDQ and Frequency



Gate Current vs. IDQ and Frequency



Large Signal Gain vs. IDQ and Frequency



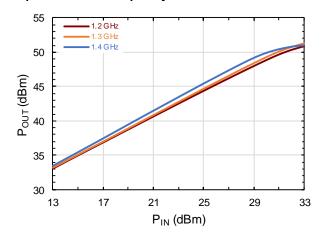


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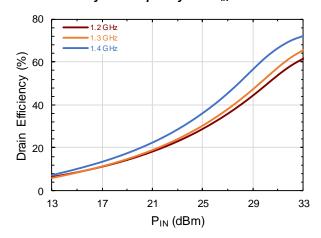
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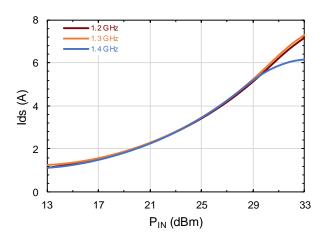
Output Power vs. Frequency and PIN



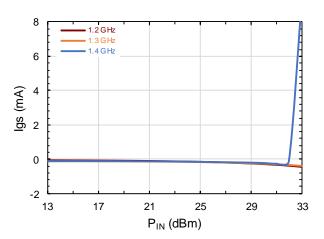
Drain Efficiency vs. Frequency and PIN



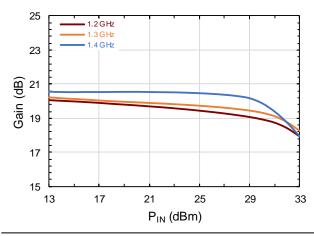
Drain Current vs. Frequency and PIN



Gate Current vs. Frequency and PIN



Large Signal Gain vs. Frequency and P_{IN}



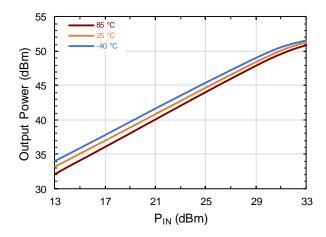


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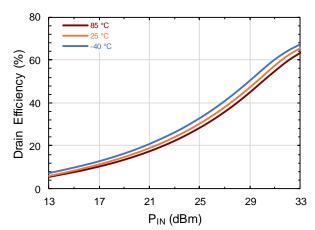
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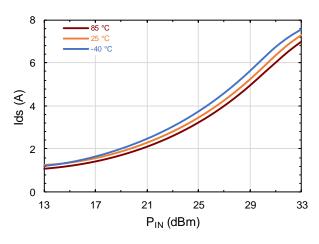
Output Power vs. Temperature and PIN



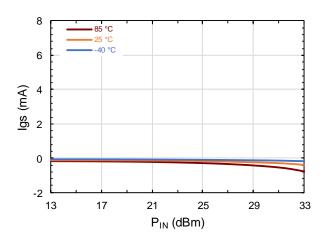
Drain Efficiency vs. Temperature and PIN



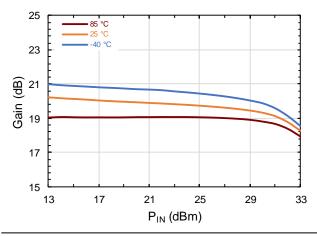
Drain Current vs. Temperature and PIN



Gate Current vs. Temperature and PIN



Large Signal Gain vs. Temperature and PIN



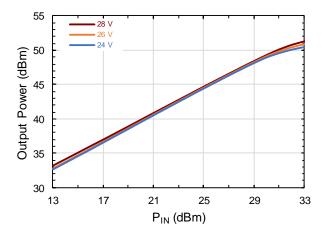


MAPC-A3010-AB

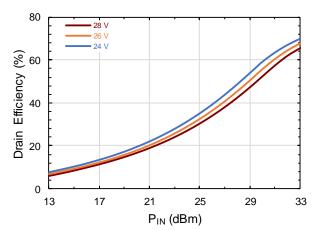
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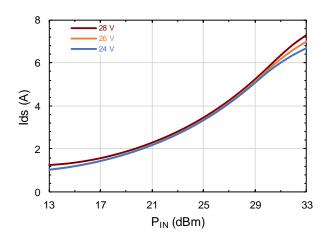
Output Power vs. V_{DS} and P_{IN}



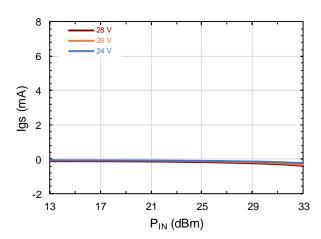
Drain Efficiency vs. V_{DS} and P_{IN}



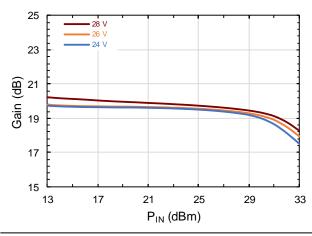
Drain Current vs. V_{DS} and P_{IN}



Gate Current vs. VDS and PIN



Large Signal Gain vs. VDS and PIN



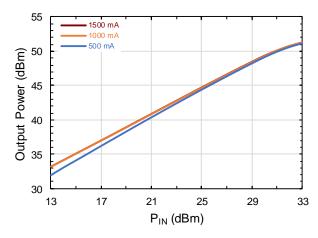


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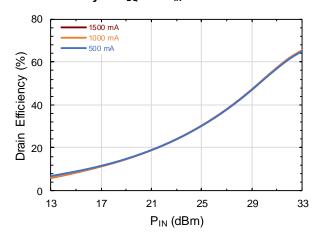
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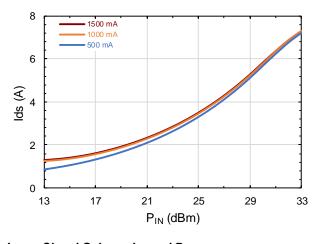
Output Power vs. IDQ and PIN



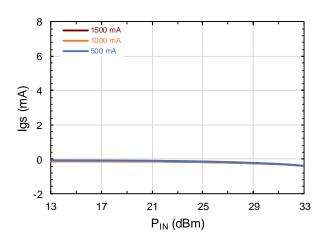
Drain Efficiency vs. IDQ and PIN



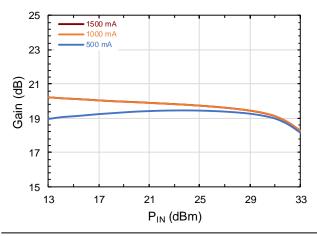
Drain Current vs. IDQ and PIN



Gate Current vs. IDQ and PIN



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



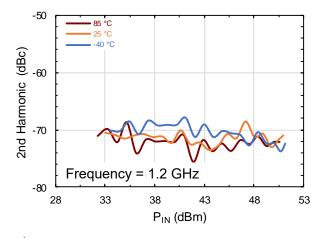


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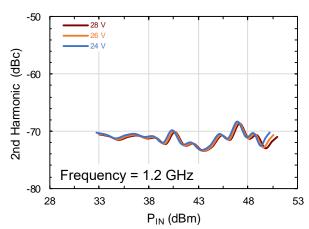
Rev. V1

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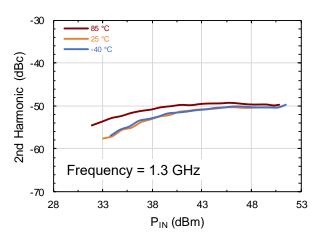
2nd Harmonic vs. Temperature and P_{IN}



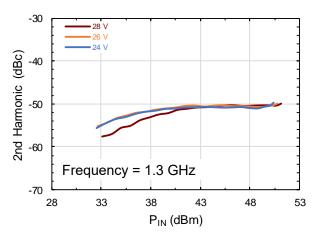
 2^{nd} Harmonic vs. V_{DS} and P_{IN}



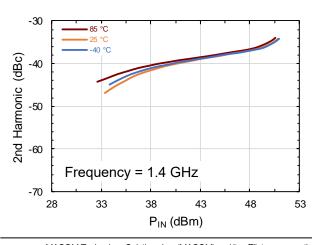
2nd Harmonic vs. Temperature and P_{IN}



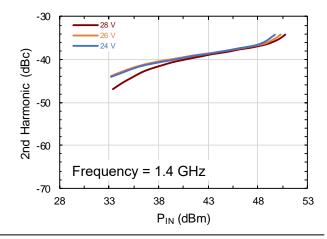
 2^{nd} Harmonic vs. V_{DS} and P_{IN}



2nd Harmonic vs. Temperature and P_{IN}



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





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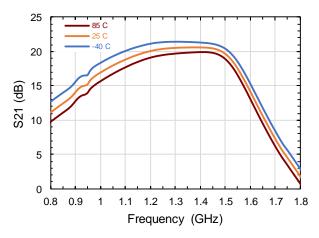
Rev. V1

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

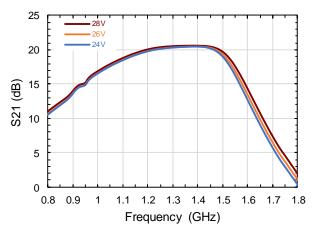
 \overrightarrow{CW} , $V_{DS} = 28 \text{ V}$, $I_{DQ} = 1000 \text{ mA}$, Pin=-20dBm (Unless Otherwise Noted)

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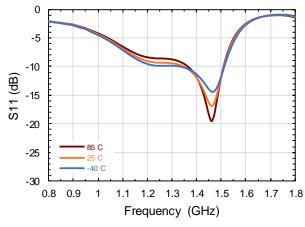
S21 vs Frequency and Temperature



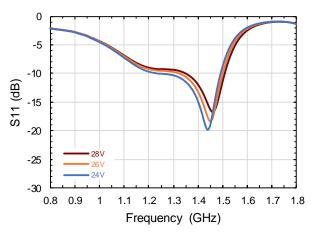
S21 vs Frequency and V_{DS}



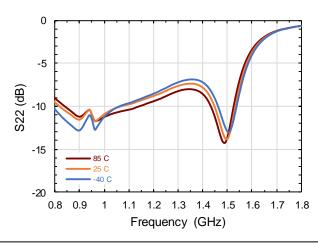
S11 vs Frequency and Temperature



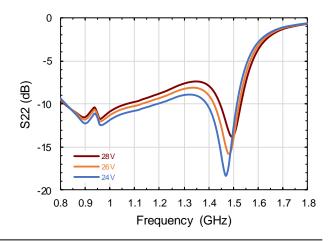
S11 vs Frequency and Vps



S22 vs Frequency and Temperature



S22 vs Frequency and V_{DS}



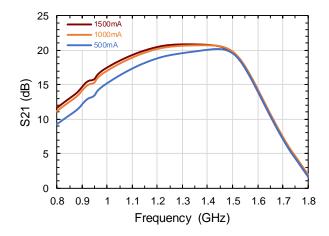


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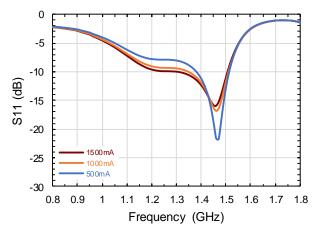
Rev. V1

Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture: CW, V_{DS} = 28 V, I_{DQ} = 1000 mA, Pin=-20dBm (Unless Otherwise Noted) For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

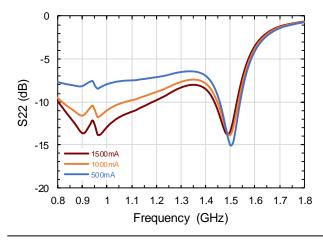
S21 vs Frequency and IDQ



S11 vs Frequency and IDQ



S22 vs Frequency and IDQ

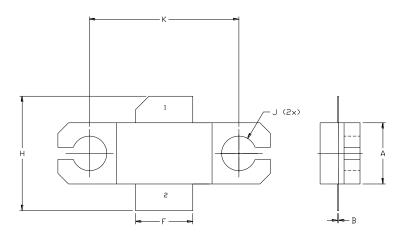


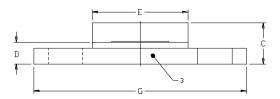


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Lead-free 440223 Package Dimensions





NOTES:

1. DIMENSIONING AND TOLERANICING PER ANSI Y14.5M, 1982.

2. CONTROLLING DIMENSION: INCH.

3. ADHESIVE FROM LID MAY EXTEND A MAXIMUM OF 0.020° BEYOND EDGE OF LID.

4. LID MAY BE MISALIGNED TO THE BODY OF THE PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

5. ALL PLATED SURFACES ARE NI/AU

	INCHES		MILLIM	IETERS
DIM	MIN	MAX	MIN	MAX
Α	0.225	0.235	5.72	5.97
В	0.004	0.006	0.10	0.15
С	0.145	0.165	3.68	4.19
D	0.077	0.087	1.96	2.21
E	0.355	0.365	9.02	9.27
F	0.210	0.220	5.33	5.59
G	0.795	0.805	20.19	20.45
Н	0.400	0.460	10.16	11.68
J	ø .130		3.3	30
k	0.562		14.	27

PIN 1. GATE PIN 2. DRAIN PIN 3. SOURCE

GaN on SiC Transistor, 120 W, 28 V DC - 4 GHz



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