

MAPC-A3005-AS

Rev. V1

MACOM PURE CARBIDE

Features

Saturated Power: 10 WDrain Efficiency: 55 %Small Signal Gain: 14 dB

Lead-Free Air Cavity Ceramic Package

RoHS* Compliant

Applications

Avionics - TACAN, DME, IFF

Military Radio

· L, S-band Radar

Electronic Warfare

ISM

General Amplification

Description

The MAPC-A3005-AS is a 10 W packaged, unmatched transistor utilizing a high performance, 0.15 μ m GaN on SiC production process. This transistor supports both defense and commercial related applications.

Offered in a thermally-enhanced flange package, the MAPC-A3005-AS provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

Typical RF Performance:

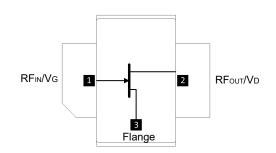
• Measured at CW , P_{IN} = 30 dBm, V_{DS} = 28 V, I_{DQ} = 100 mA, T_{C} = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η _□ (%)
2	40	10	68.6
4	40.4	10.4	58.2
6	39.2	9.2	52.3



440206

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

The flange on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information

Part Number	MOQ Increment
MAPC-A3005-AS	bulk
MAPC-A3005-ASSB1	Sample Board

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



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Electrical Specifications²:

Frequency = 2 GHz, P_{IN} = 30 dBm, T_A = +25°C, V_{DD} = 28 V, I_{DQ} = 100 mA Low Power Gain tested at Input Power of 10 dBm.

Parameter	Conditions	Units	Min.	Тур.	Max.
Saturated Power (P _{SAT})	_	W	8.7	9.5	_
Drain Efficiency (η _{SAT})	_	%	59.7	65.5	_
Low Power Gain (G _{SS})	P _{IN} = 10 dBm, CW	dB	12	14.5	_

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

Absolute Maximum Ratings^{3,4}

Parameter	Absolute Maximum
Drain-Source Voltage	84 V
Gate Voltage	-10, +2 V
Drain Current	0.75 A
Gate Current	2.1 mA
Input Power	31 dBm
Storage Temperature	-55C 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.
- MACOM does not recommend sustained operation near these survivability limits.
- 5. Operating at nominal conditions with $T_J \le +225$ C will ensure MTTF > 1 x 10^6 hours.
- Junction Temperature (T_J) = T_C + Θjc * (V * I)
 Typical thermal resistance (Θjc) = 9.5 °C/W for CW.

a) For $T_C = +25^{\circ}C$,

T_J = 78 °C @ P_{DISS} = 5.6 W

b) For $T_C = +85^{\circ}C$,

 T_J = 137 °C @ P_{DISS} = 5.4 W

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

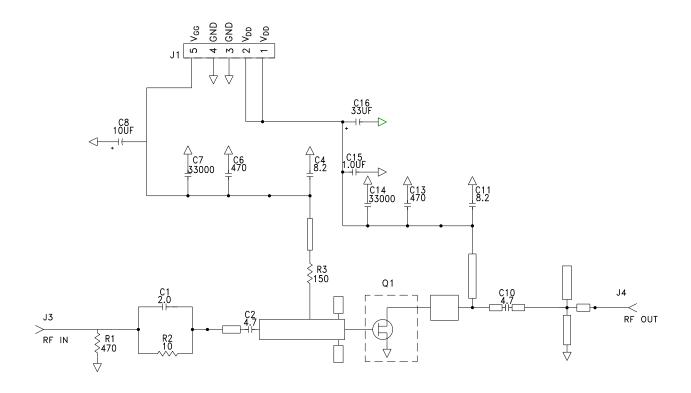
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.



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Evaluation Test Fixture and Recommended Tuning Solution, 2 GHz



Description

Parts measured on evaluation board (20-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

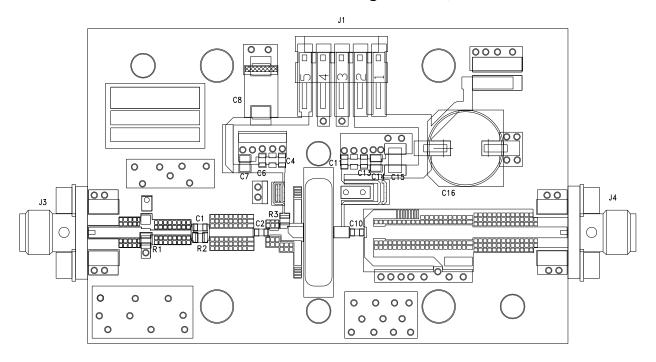
Bias OFF

- 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



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Evaluation Test Fixture and Recommended Tuning Solution, 2 GHz



Assembly Parts List

Designator	Description	Qty.
C1	CAP, 2 pF, +/-0.1, 250V, 0603, 125C, ATC 600S	1
C2, C10	CAP, 4.7 pF, +/-0.1, 250V, 0603, 125C, ATC 600S	2
C4, C11	CAP, 8.2 pF, +/-0.1, 250V, 0603, 125C, ATC 600S	2
C6, C13	CAP, 470 pF, +/-T5%, 0603in, 100V, 125c Murata	2
C7, C14	CAP, 0.033 µF, +/-T10%, 100V, 0805in, 125C Murata	2
C8	CAP, 10 μF, +/-T20%, 16V, 2312in, 125C, AVX	1
C15	CAP, 1 μF, +/-T10%, 63V, 1210in, 125C, Murata	1
C16	CAP, 33 μF, +/-T20%, 100V, CAN-SMD, 105C, Panasonic	1
R1	RES, 47 Ω, 25W, 0505, 5%, 150C	1
R2	RES, 10 Ω, 25W, 0505, 5%, 150C	1
R3	RES, 150 Ω, 25W, 0505, 5%, 150C	1
J1	HEADER RT>PLZ .1CEN LK 5POS	1
J3,J4	CONNECTOR; SMB, Straight, JACK, SMD	2
-	PCB, RO5880, Er = 2.20, H = 20 mil	1
Q1	MAPC-A3005-AS	1



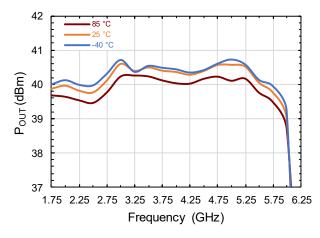
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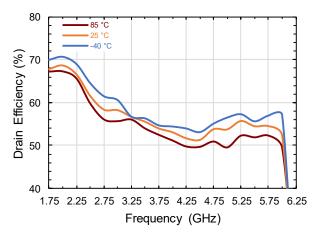
Typical Performance Curves as Measured in the 2-6 GHz Evaluation Test Fixture

CW, P_{IN} = 30 dBm, V_{DS} = 28 V, I_{DQ} = 100 mA. Frequency = 4 GHz (unless otherwise noted) For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

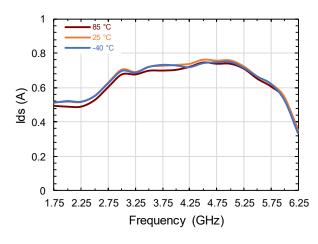
Output Power vs. Temperature and Frequency



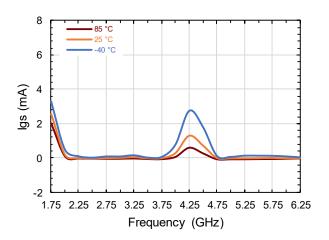
Drain Efficiency vs. Temperature and Frequency



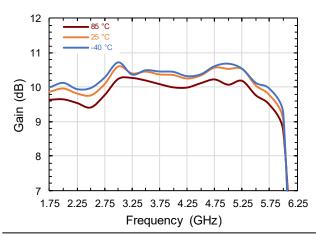
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency





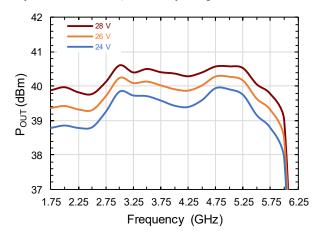
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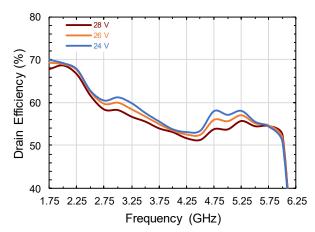
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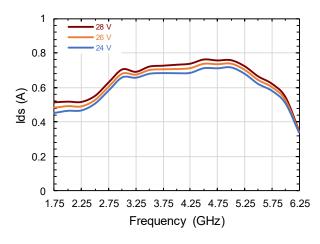
Output Power vs. VDS and Frequency



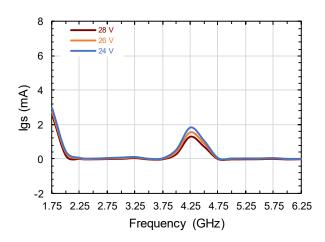
Drain Efficiency vs. V_{DS} and Frequency



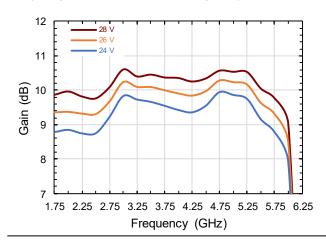
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Gate Current vs. V_{DS} and Frequency



Large Signal Gain vs. VDS and Frequency





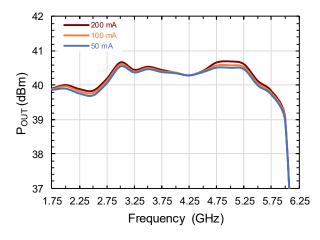
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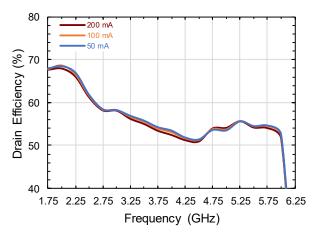
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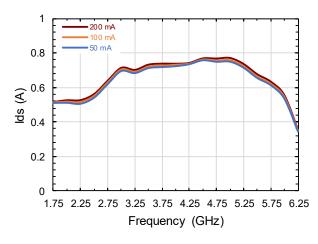
Output Power vs. IDQ and Frequency



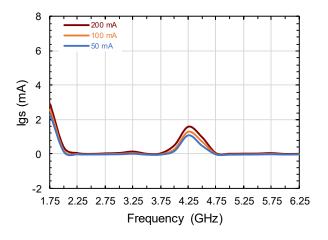
Drain Efficiency vs. I_{DQ} and Frequency



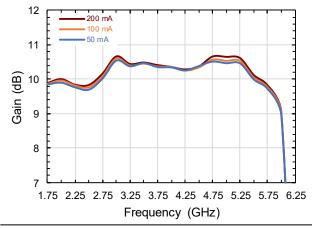
Drain Current vs. IDQ and Frequency



Gate Current vs. IDQ and Frequency



Large Signal Gain vs. IDQ and Frequency





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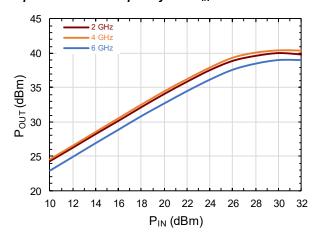
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Typical Performance Curves as Measured in the 2-6 GHz Evaluation Test Fixture

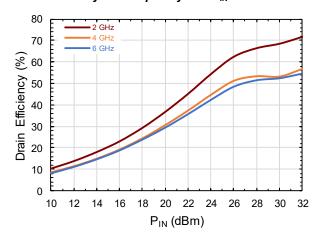
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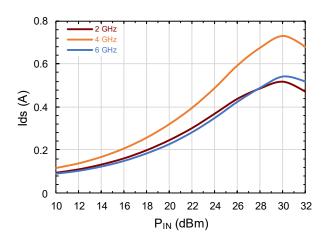
Output Power vs. Frequency and PIN



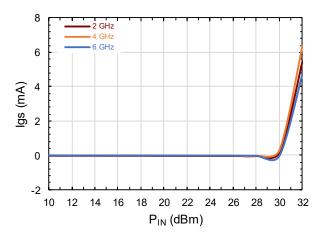
Drain Efficiency vs. Frequency and PIN



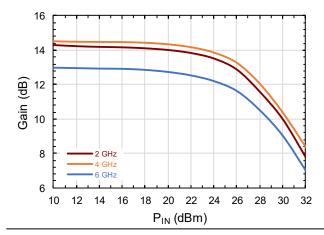
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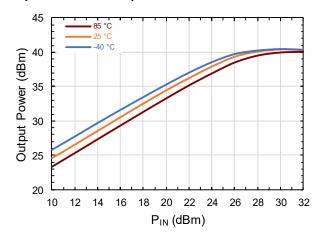
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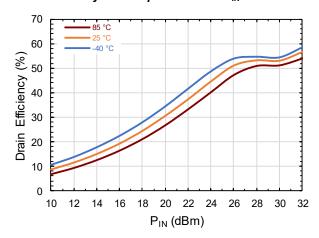
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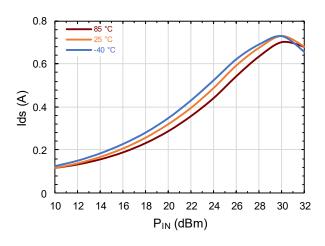
Output Power vs. Temperature and PIN



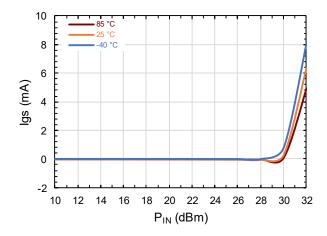
Drain Efficiency vs. Temperature and PIN



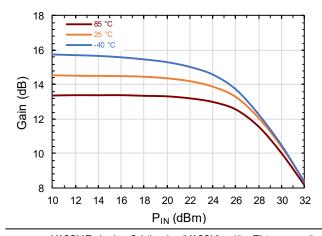
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Gate Current vs. Temperature and PIN



Large Signal Gain vs. Temperature and PIN





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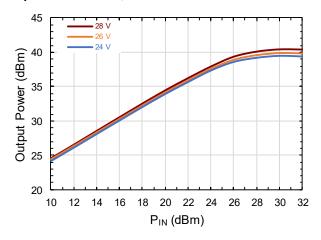
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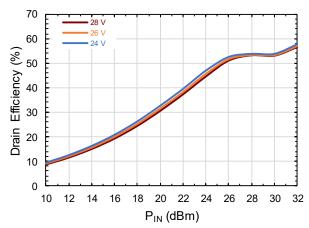
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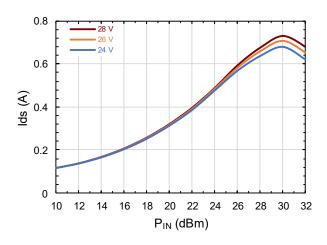
Output Power vs. V_{DS} and P_{IN}



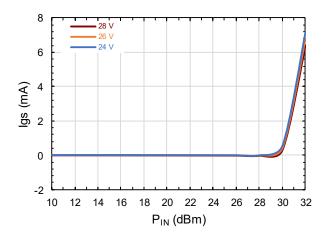
Drain Efficiency vs. V_{DS} and P_{IN}



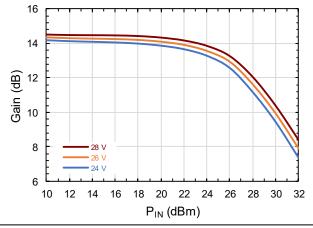
Drain Current vs. V_{DS} and P_{IN}



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



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





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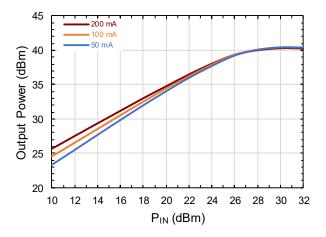
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Typical Performance Curves as Measured in the 2-6 GHz Evaluation Test Fixture

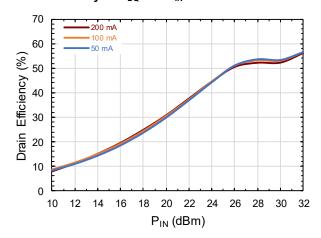
CW, P_{IN} = 30 dBm, V_{DS} = 28 V, I_{DQ} = 100 mA. Frequency = 4 GHz (Unless otherwise noted)

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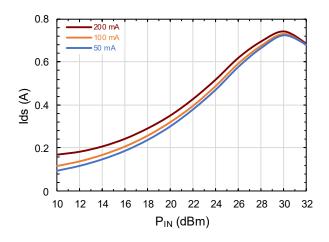
Output Power vs. IDQ and PIN



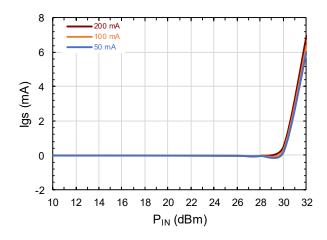
Drain Efficiency vs. IDQ and PIN



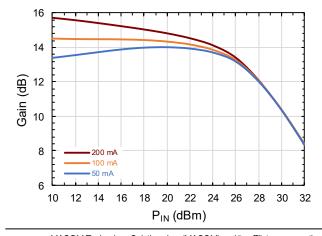
Drain Current vs. I_{DQ} and P_{IN}



Gate Current vs. IDQ and PIN



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





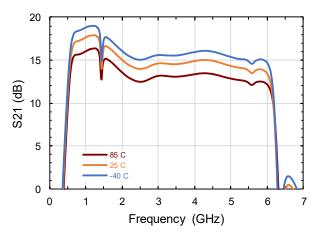
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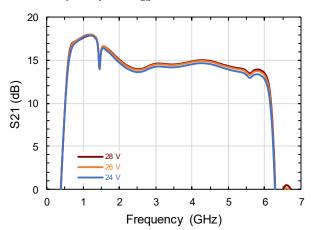
Typical Performance Curves as Measured in the 2 - 6 GHz Evaluation Test Fixture: CW, V_{DS} = 28 V, I_{DQ} = 100 mA, Pin=-20dBm (Unless Otherwise Noted)

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

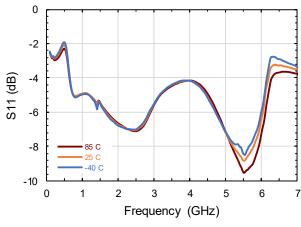
S21 vs Frequency and Temperature



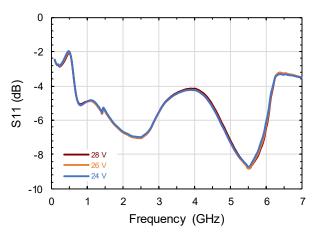
S21 vs Frequency and V_{DS}



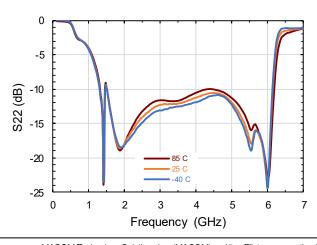
S11 vs Frequency and Temperature



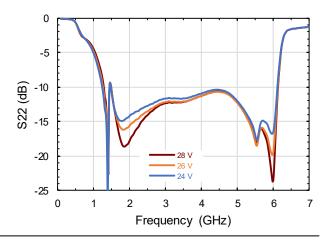
S11 vs Frequency and Vps



S22 vs Frequency and Temperature



S22 vs Frequency and V_{DS}



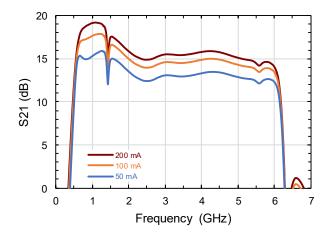


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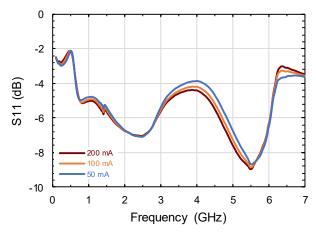
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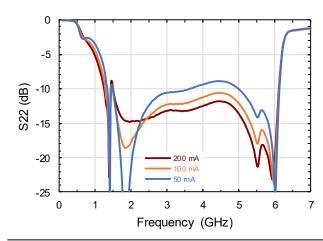
S21 vs Frequency and IDQ



S11 vs Frequency and IDQ



S22 vs Frequency and IDQ

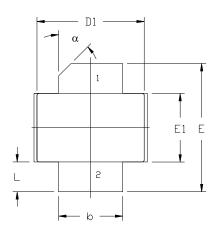


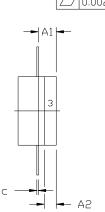


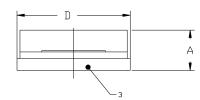
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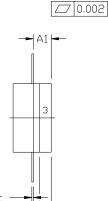
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Lead-free 440206 Package Dimensions









- 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M 1994.
- 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 PACKAGE BY A MAXIMUM OF 0.008" IN ANY DIRECTION.

	INCHES		MILLIMETERS		NOTES
DIM	MIN	MAX	MIN	MAX	
Α	0.125	0.145	3.18	3.68	
A1	0.057	0.067	1.45	1.70	
A2	0.035	0.045	0.89	1.14	
ь	0.210	0.220	5.33	5.59	2×
С	0.004	0.006	0.10	0.15	2×
D	0.375	0.385	9.53	9.78	
D1	0.355	0.365	9.02	9.27	
E	0.400	0.460	10.16	11.68	
E1	0.225	0.235	5.72	5.97	
L	0.085	0.115	2.16	2.92	2×
α	45° REF		45° REF		

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

GaN on SiC Transistor, 10 W, 28 V DC - 8 GHz



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