

Features

- Saturated Power: 32 W
- Drain Efficiency: 66%
- Small Signal Gain: 17 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-A3007-AD is a 32 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-A3007-AD provides superior performance under CW operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

Typical RF Performance:

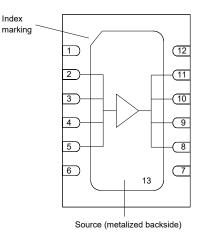
• Measured at CW = P_{sat} defined at P_{IN} = 32 dBm. V_{DS} = 28 V, I_{DQ} = 250 mA, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η₀ (%)
3.5	45.6	13.4	63.2
3.6	45.4	13.0	66.1
3.7	45.0	13.0	65.9



3 x 4 mm PDFN-12LD

Functional Schematic



Pin Configuration

Pin #	Pin Function	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-A3007-AD000	Bulk
MAPC-A3007-ADTR1	Tape and Reel
MAPC-A3007-ADSB1	Sample Board

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

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MAPC-A3007-AD

Rev. V1



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RF Electrical Specifications: Freq. = 3.7 GHz, $T_A = +25C$, $V_{DS} = 28$ V, $I_{DQ} = 250$ mA

Parameter	Conditions	Symbol	Min.	Тур.	Max.	Units
Saturated Power	P _{IN} = 33 dBm, 1% 25 µs PW	P _{SAT}	28.1	33.1	50.1	W
Drain Efficiency	P _{IN} = 33 dBm, 1% 25 µs PW	η _{sat}	58	64.5	90	%
Low Power Gain	P _{IN} = 10 dBm, 1% 25 µs PW	G _{SS}	10	15.5	22	dB

Note: Final testing and screening for all transistor sales is performed using the MAPC-A3007-ADSB1 at 3.7 GHz.

Absolute Maximum Ratings^{2,3}

Parameter	Absolute Maximum
Drain-Source Voltage	84 V
Gate Voltage	-10, +2 V
Drain Current	3.0 A
Gate Current	7.2 mA
Storage Temperature	-55°C to +150°C
Mounting Temperature	+245°C
Junction Temperature ^{4,5}	+225°C
Operating Temperature	-40°C to +85°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.
- Operating at nominal conditions with T_J ≤ +225 °C will ensure MTTF > 1 x 10⁶ hours.
- 5. Junction Temperature $(T_J) = T_C + \Theta jc^* (V^* I)$ Typical thermal resistance $(\Theta jc) = 3.65 \text{ °C/W}$ for CW. a) For $T_C = +25^\circ\text{C}$, $T_J = 93 \text{ °C} @ P_{\text{DISS}} = 18.5 \text{ W}$ b) For $T_C = +85^\circ\text{C}$,

T_J = 153 °C @ P_{DISS} = 18.7 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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(+28V) (+28V) (-2V) GND J2 GND GND /00 ۷_{DD} ر ۵ . ഹ м N 4 +C16 33UF C8 10UF C15 C5 8.2 C7 33000 C6 C14 240 _ C13 _ C12 470 _ 82 R2 47 ∆ | C3 | 0.3 C10 1.0 Q1 Δ C1 3.6 C17 「 C2 0.4 0.4 J3 RF OUT C9 1.0 RF IN R1 100 ⊥C18 ⊤0.6

Evaluation Test Fixture and Recommended Tuning Solution, 3.5 - 3.7 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 -5V to the gate
- 3. Turn-off drain voltage
- 4. Turn-off gate voltage

3

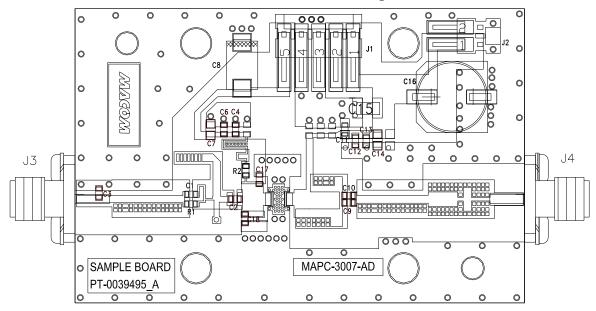
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Evaluation Test Fixture and Recommended Tuning Solution, 3.5 - 3.7 GHz



Assembly Parts List

Reference Designator	Description	Qty.
C1	3.6pF 0603in T0.1p 125C 250V ATC600S	1
C2, C17	0.4pF 0603in T0.05p 125C 250V ATC600S	2
C18	0.6pF 0603in T0.1p 125C 250V ATC600S	1
C3	0.3pF 0603in T0.1p 125C 250V ATC600S	1
C5	8.2pF 0603in T0.25p 125C 250V ATC600S	2
C6, C13	470pF 0603in T5% X7R 100V ACX	2
C7	33000pF 0805 X7R 100V	1
C8	10UF 2312 16V TANTALUM	1
C9, C10	1.0pF 0603in T0.05p 125C 250V ATC600S	2
C11	12pF 0603in T5% 125C 250V ATC600S	1
C12	82pF 0603in T5% 125C 250V ATC600S	1
C14	240pF 0805in T5% 125C 250V ATC600F	1
C15	1.0UF 1210 T10% X7R 100V MUR GRM23ER	1
C16	33UF T20% G CASE PANASONIC ELECROLYTIC	1
R1	100 OHMS 0603 T1% 1/16W	1
R2	47 OHMS 0603 T1% 1/16W	1
J1	HEADER RT>PLZ .1CEN LK 5POS	1
J2	HEADER RT>PLZ.1CEN LK 2 POS	1
J3, J4	CONN SMA PANEL MOUNT JACK FLANGE 4-HOLE BLUNT POST	2
-	PCB RO4350B 0.020" THK	1
Q1	MAPC-A3007-AD GaN Transistor	1

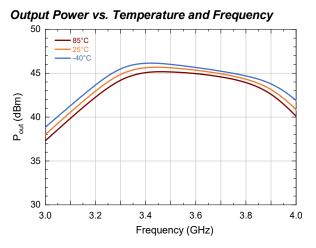


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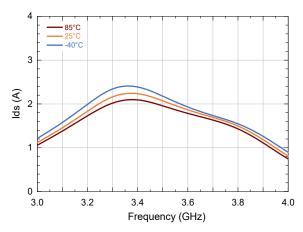
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Typical Performance Curves as Measured in the 3.5–3.7 GHz Evaluation Test Fixture

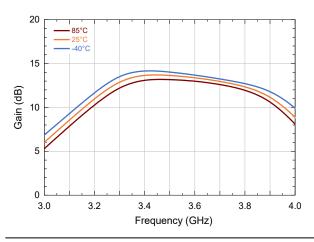
CW, P_{IN} =32dBm, V_{DS} = 28 V, I_{DQ} = 250 mA, Frequency = 3.7 GHz (Unless Otherwise Noted) For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.



Drain Current vs. Temperature and Frequency



Large Signal Gain vs. Temperature and Frequency

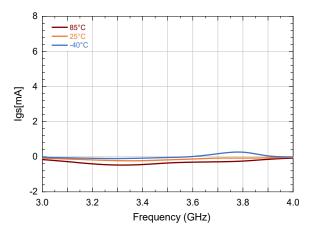


5

80 85°C 70 -40°C 60 Drain Efficiency (%) 50 40 30 20 10 0 3.0 3.2 3.4 3.6 3.8 4.0 Frequency (GHz)

Drain Efficiency vs. Temperature and Frequency

Gate Current vs. Temperature and Frequency



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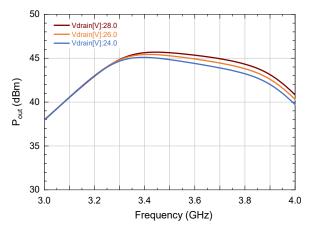
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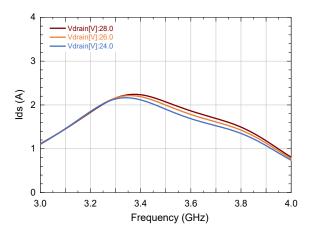
Typical Performance Curves as Measured in the 3.5–3.7 GHz Evaluation Test Fixture

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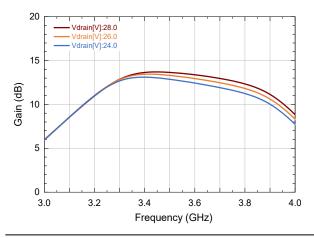
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Drain Current vs. V_{DS} and Frequency



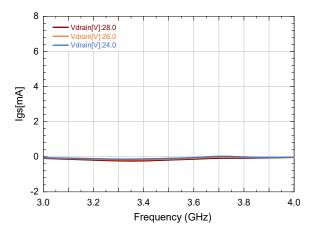
Large Signal Gain vs. V_{DS} and Frequency



6

Vdrain[V]:28.0 70 Vdrain[V]:24.0 60 Drain Efficiency (%) 50 40 30 20 10 0 3.0 3.2 3.4 3.6 3.8 4.0 Frequency (GHz)

Gate Current vs. V_{DS} and Frequency



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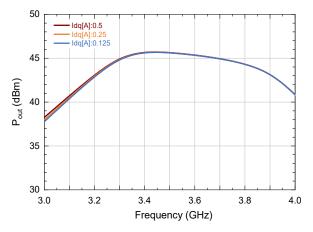
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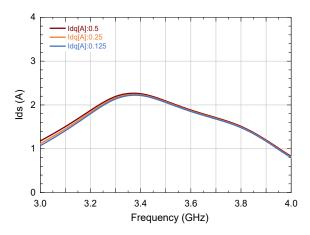
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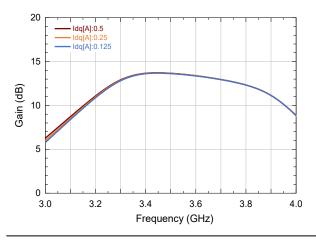
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Drain Current vs. *I*_{DQ} and Frequency



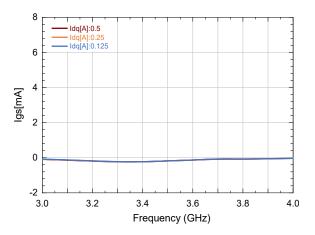
Large Signal Gain vs. I_{DQ} and Frequency



7

80 Idq[A]:0.5 70 Idq[A]:0.25 Idq[A]:0.125 60 Drain Efficiency (%) 50 40 30 20 10 0 3.0 3.2 3.4 3.6 3.8 4.0 Frequency (GHz)

Gate Current vs. I_{DQ} and Frequency





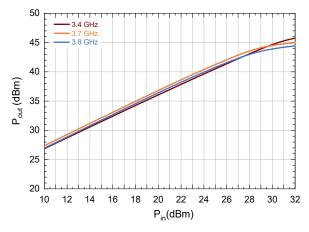
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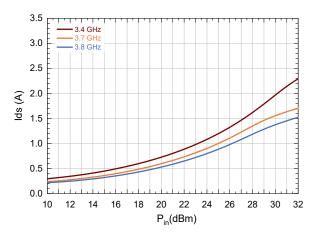
Rev. V1

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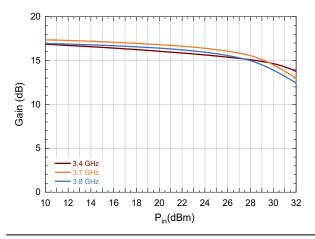
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Drain Current vs. Frequency and PIN



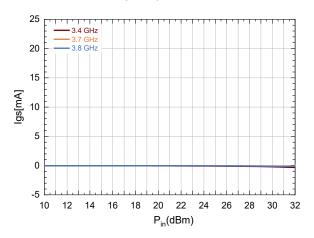
Large Signal Gain vs. Frequency and P_{IN}



8

80 3.4 GHz 70 3.8 GHz 60 Drain Efficiency (%) 50 40 30 20 10 0 10 12 14 16 18 20 22 24 26 28 30 32 P_{in}(dBm)

Gate Current vs. Frequency and PIN



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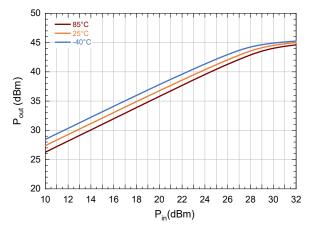


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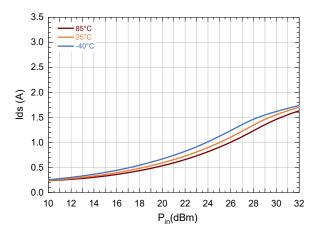
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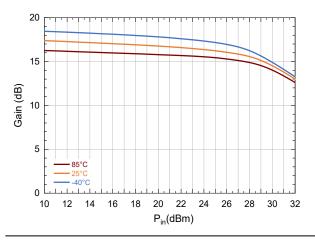
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Drain Current vs. Temperature and PIN



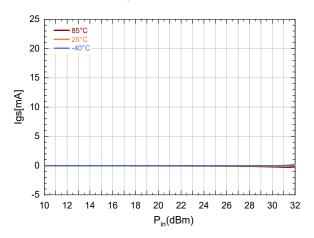
Large Signal Gain vs. Temperature and PIN





80 85°C 70 40 60 Drain Efficiency (%) 50 40 30 20 10 0 10 12 14 16 18 20 22 24 26 28 30 32 P_{in}(dBm)

Gate Current vs. Temperature and PIN





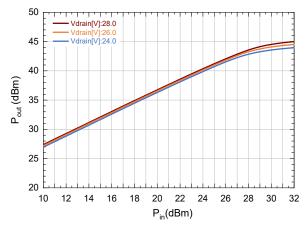
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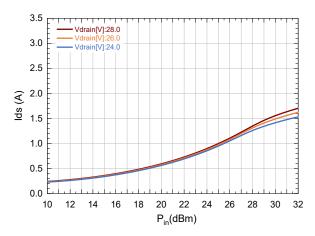
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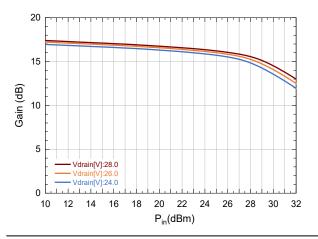
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Drain Current vs. V_{DS} and P_{IN}



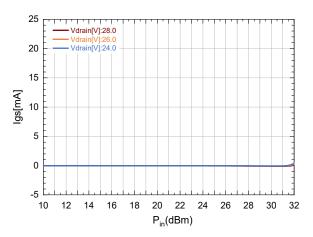
Large Signal Gain vs. V_{DS} and P_{IN}



10

80 Vdrain[V]:28.0 70 /drain[V]:24.0 60 Drain Efficiency (%) 50 40 30 20 10 0 10 12 14 16 18 20 22 24 26 28 30 32 P_{in}(dBm)

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





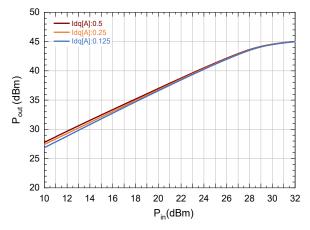
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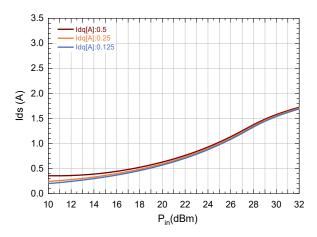
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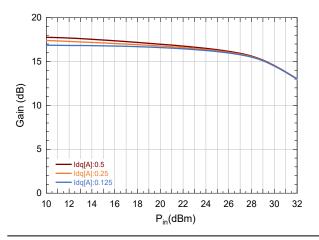
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Drain Current vs. IDQ and PIN



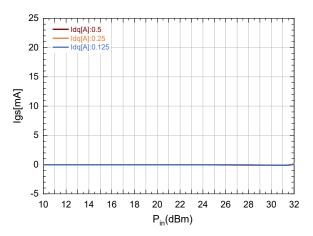
Large Signal Gain vs. IDQ and PIN



11

80 Idq[A]:0.5 70 Idq[A]:0.125 60 Drain Efficiency (%) 50 40 30 20 10 0 10 12 14 16 18 20 22 24 26 28 30 32 P_{in}(dBm)

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





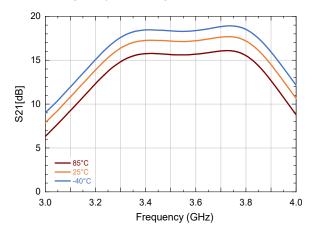
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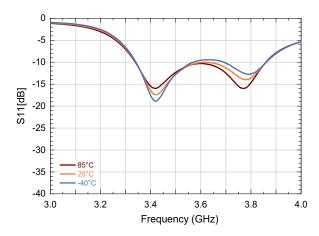
Typical Performance Curves as Measured in the 3.5– 3.7 GHz Evaluation Test Fixture:

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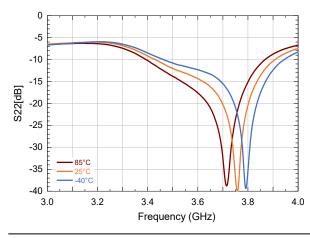
S21 vs Frequency and Temperature



S11 vs Frequency and Temperature

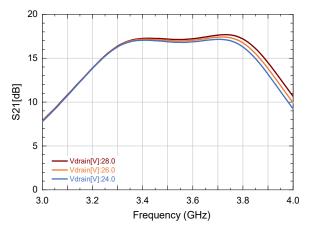


S22 vs Frequency and Temperature

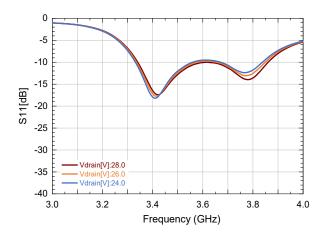


12

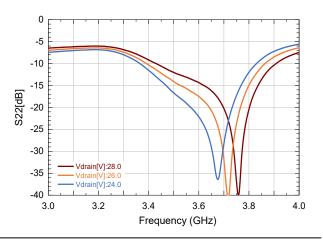
S21 vs Frequency and V_{DS}



S11 vs Frequency and V_{DS}



S22 vs Frequency and V_{DS}





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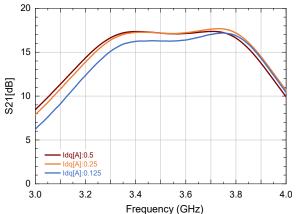
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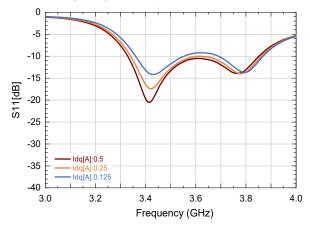
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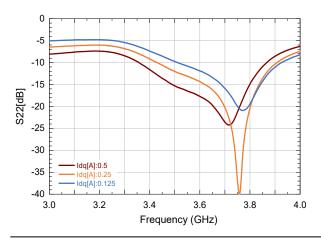
S21 vs Frequency and IDQ



S11 vs Frequency and IDQ



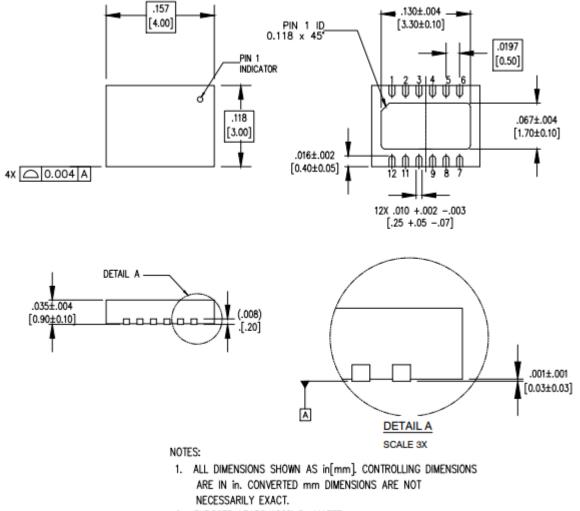
S22 vs Frequency and IDQ





MAPC-A3007-AD Rev. V1

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



2. EXPOSED LEADS 100% Sn MATTE.

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¹⁵

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