Driver Amplifier
0.5 W, 3.3 - 3.8 GHz

MAAM-011324
Rev. V2

Features

- Driver Amplifiers with Simple Bias Control Circuit
- 3.3 - 3.8 GHz Operation Frequency
- No External Matching Components Required
- Gain: 17 dB
- Output P1dB: 26 dBm
- Output P3dB: 27 dBm
- Output IP3: 40 dBm
- Single supply voltage: 5 V
- Supply current: 116 mA
- Logic voltage: 1.8 V
- Lead-Free 3 mm 16 Lead SMT Package
- RoHS* Compliant

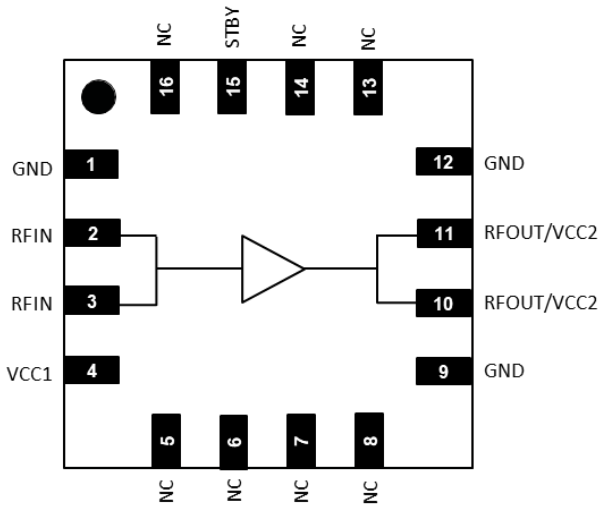
Applications

- 5G Massive MIMO
- Small Cell BTS
- Wireless Infrastructure
- Multi Market

Description

The MAAM-011324 is a wideband high linearity driver amplifier packaged in a compact 3 mm 16-Lead QFN package. This driver amplifier provides 17 dB gain and 26 dBm OP1dB with 116 mA quiescent current and device ON/OFF function to support TDD system application. RF input and output ports are internally matched at the entire operating frequency range of 3.3 - 3.8 GHz.

Functional Schematic



Pin Names[2]

Pin #	Function
1,9,12	GND
2,3	RFIN
4	VCC1
5 - 8, 13, 14, 16	No Connection[2]
10,11	RFOUT/VCC2
15	STBY
17	Paddle[3]

2. MACOM recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information[1]

Part Number	Package
MAAM-011324-TR1000	1k reel
MAAM-011324-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

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

Pin Description

Pin #	Name	description
1	GND	This pin is grounded internally
2	RFIN	This pin is dc grounded with shunt matching inductor. A dc-blocking capacitor is required on this pin.
3	RFIN	This pin is dc grounded with shunt matching inductor. A dc-blocking capacitor is required on this pin.
4	VCC1	Supply Voltage. Place bypass capacitor as close to pin as possible.
5	NC	Not connected internally
6	NC	Not connected internally
7	NC	Not connected internally
8	NC	Not connected internally
9	GND	This pin is grounded internally
10	RFOUT/ VCC2	Supply Voltage through a choke coil. DC-blocking capacitor is required following the choke coil.
11	RFOUT/ VCC2	Supply Voltage through a choke coil. DC-blocking capacitor is required following the choke coil.
12	GND	This pin is grounded internally
13	NC	Not connected internally
14	NC	Not connected internally
15	STBY	Supply ON/OFF logic control voltage
16	NC	Not connected internally

Electrical Specifications:
Freq. = 3.5 GHz, P_{IN} = -20 dBm, T_C = +25°C, V_{CC1} = V_{CC2} = +5 V, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	3.3 GHz 3.5 GHz 3.8 GHz	dB	— 15 —	17.6 17.3 16.3	—
Gain Flatness	3.3 - 3.8 GHz	dB	—	1.0	—
Dynamic Gain Variation	P_{IN} = -2 dBm, P_{IN} = -17 dBm	dB	—	0.3	—
Output P1dB	3.5 GHz	dBm	—	26	—
Output IP3	3.5 GHz, P_{IN}/tone = -5 dBm Δf = 10 MHz Δf = 200 MHz	dBm	—	40 37	—
Raw Linearity (ACPR)	P_{IN} = -2 dBm	dBc	—	57.7	—
Input Return Loss	—	dB	—	12	—
Output Return Loss	—	dB	—	12	—
Noise Figure	—	dB	—	4.5	—
Power Consumption	P_{IN}=-2 dBm Active State, VCC1, RFOUT/VCC2 Standby State,VCC1, VCC2, RFOUT	W	—	0.58 0.01	—

DC Electrical Specifications: V_{CC1} = V_{CC2} = +5 V

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Standby to Active Mode Settling Time	RFIN to RFOUT gain settled within 0.1 dB of final value after STBY command	ns	—	300	—
Active to Standby Mode Settling Time	RFIN to RFOUT signal reduced at least 30 dB after STBY command	ns	—	300	—
Supply Voltage	VCC1, VCC2	V	4.75	5	5.25
Supply Current	VCC1, RFOUT/VCC2	mA	—	116	—
Logic Control Voltage	Logic High, STBY Logic Low, STBY	V	1.17 0	—	3.3 0.63
Logic input Current	Logic High/Low, STBY	μA	-10	—	10

Truth Table

PIN	Device Control	
STBY	Logic High	Device Active Mode
	Logic Low	Device Standby Mode

Recommended Operating Conditions

Parameter	Operation Conditions
DC Supply VDD	4.75 V to 5.25 V
Operating Temperature[4]	-10°C to +110°C

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

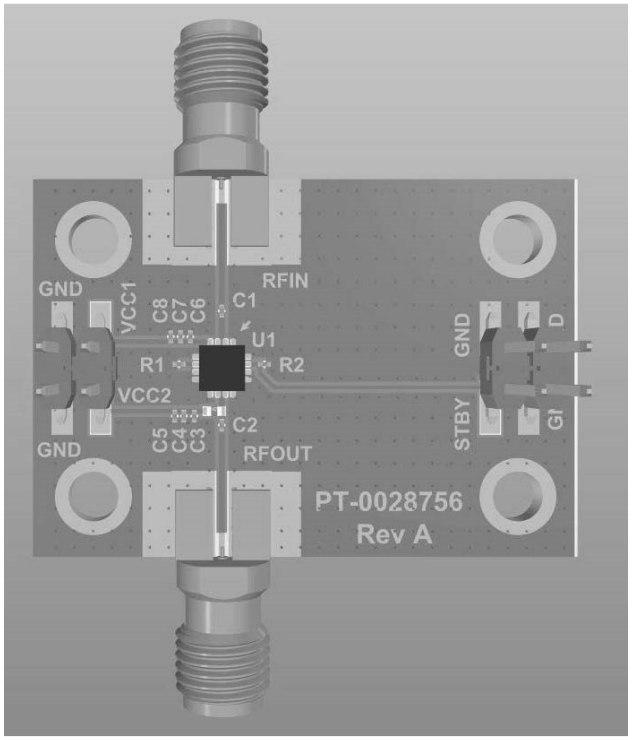
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HMB Class 1C and CDM Class C3 devices.

Absolute Maximum Ratings[5,6]

Parameter	Unit
Input Average Power	26 dBm
DC Supply VCC	-0.5 V to 6.0 V
Logic Control Voltage	-0.5 V to 3.6 V
Junction Temperature[7,8]	+150°C
Functional Temperature	-40°C to +125°C
Storage Temperature	-65°C to +150°C

4. Tc is defined by exposed paddle temperature.
5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J \leq +150$ °C will ensure MTTF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + Θjc * (V * I)
   Typical thermal resistance (Θjc) = 59.0 °C/W.
   a) For T_C = +25°C,
   T_J = 57.4 °C @ 5 V, 110 mA
   b) For T_C = +110°C,
   T_J = 148.3 °C @ 5 V, 130 mA

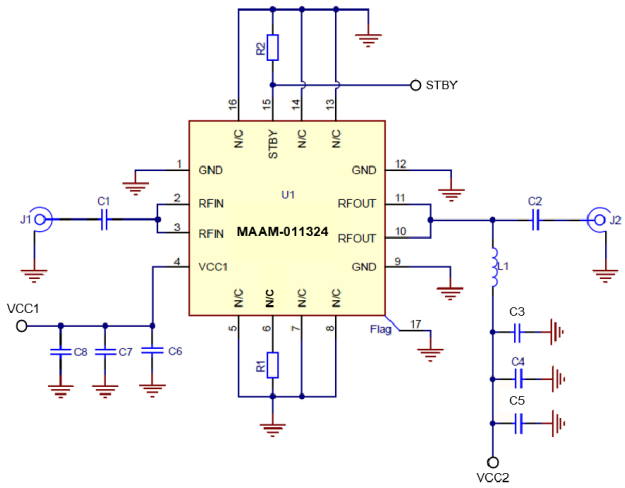
PCB Layout



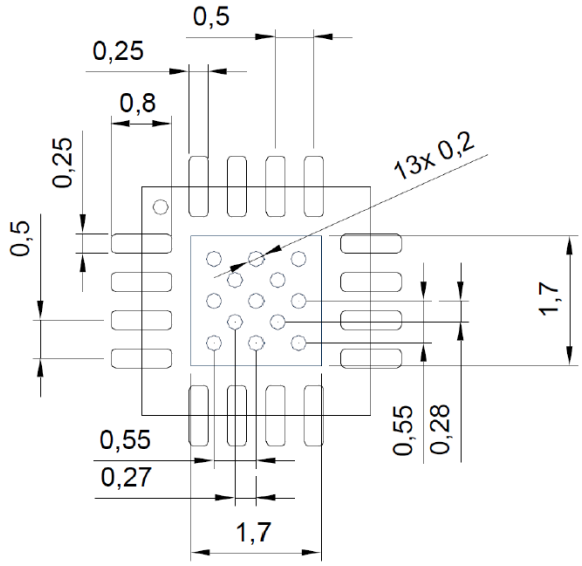
Parts List

Part	Value	Case Style
C1	1 pF	0201
C2	24 pF	0201
C3	100 pF	0201
C4	100 nF	0201
C5	DNP	0201
C6	100 pF	0201
C7	100 nF	0201
C8	DNP	0201
L1	6.8 nH	0402
R1	DNP	0201
R2	1 kΩ	0201
J1 - J2	142-0761-841	SMA, End Launch

Application Schematic



Recommended Thermal Land Pattern

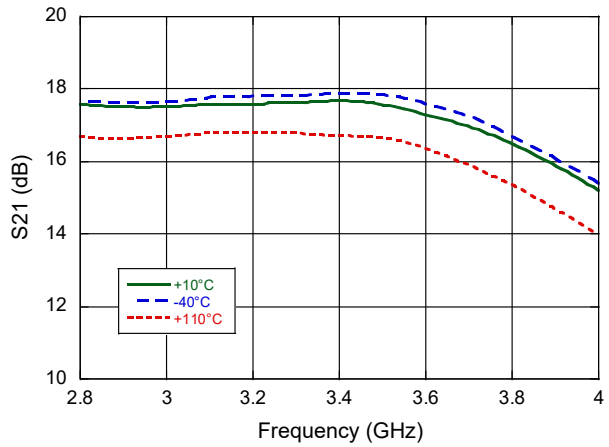


- 13 Ground Vias
- 0.2 mm Diameter, 1/2 oz. Copper

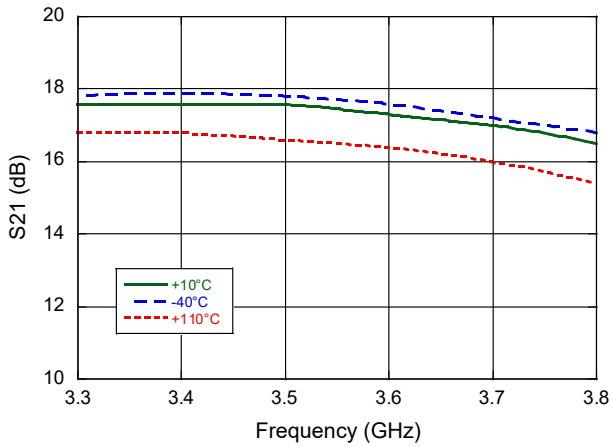
Typical Performance Curves:

P_{IN} = -20 dBm, V_{CC1} = V_{CC2} = +5 V, Z_0 = 50 Ω (unless otherwise stated)

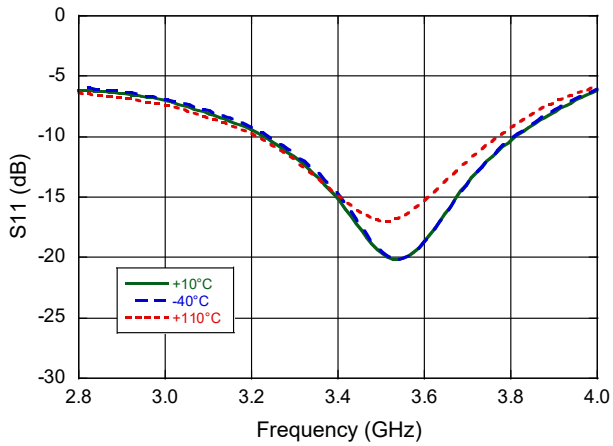
Gain, 2.8 - 4.0 GHz



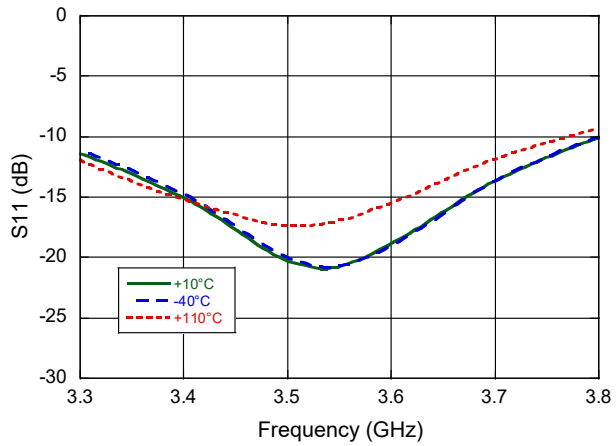
Gain, 3.3 - 3.8 GHz



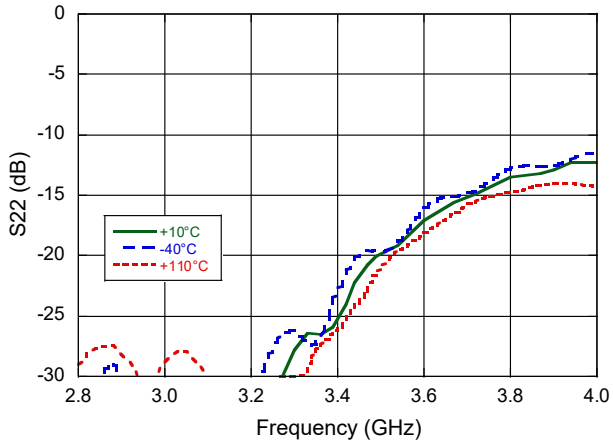
Input Return Loss, 2.8 - 4.0 GHz



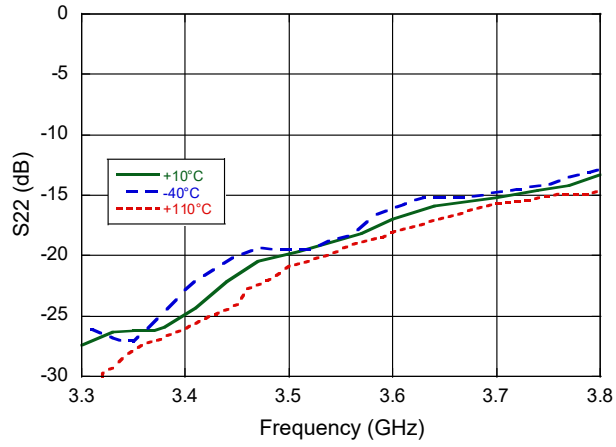
Input Return Loss, 3.3 - 3.8 GHz



Output Return Loss, 2.8 - 4.0 GHz



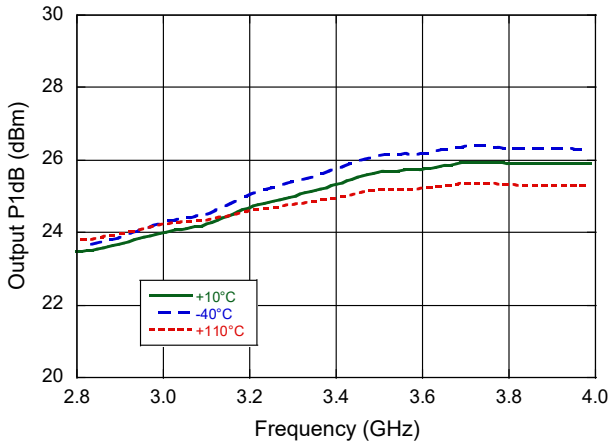
Output Return Loss, 3.3 - 3.8 GHz



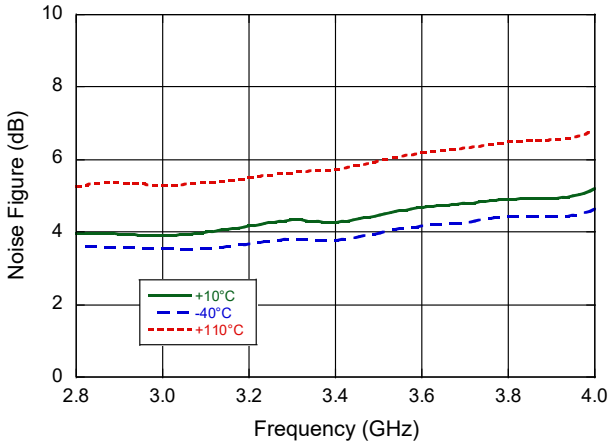
Typical Performance Curves

$V_{CC1} = V_{CC2} = +5$ V, $Z_0 = 50\ \Omega$ (unless otherwise stated)

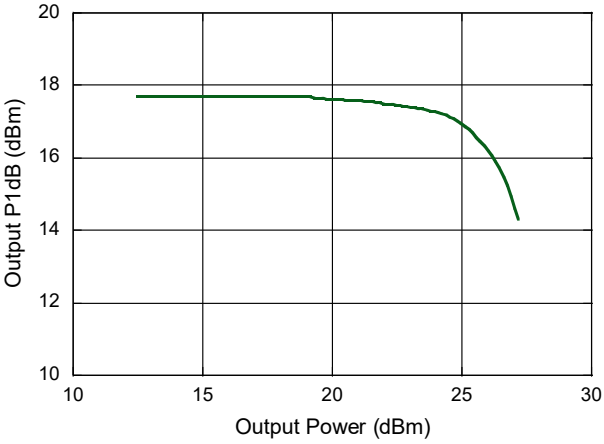
Output P_{1dB}



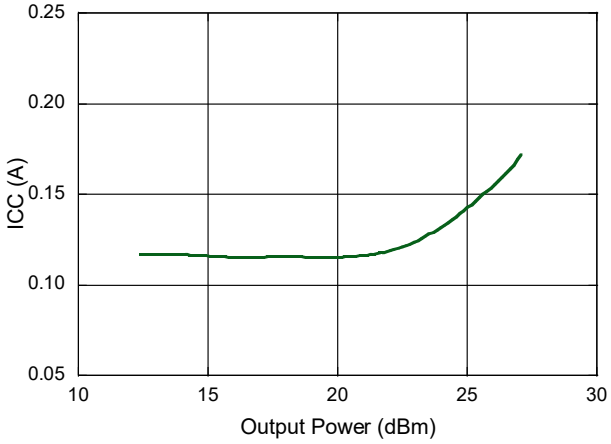
Noise Figure



Gain vs. Output Power: 3.5 GHz, +25°C

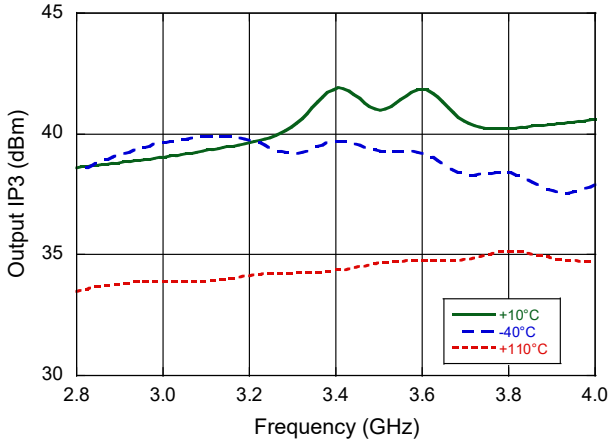


ICC vs. Output Power: 3.5 GHz, +25°C

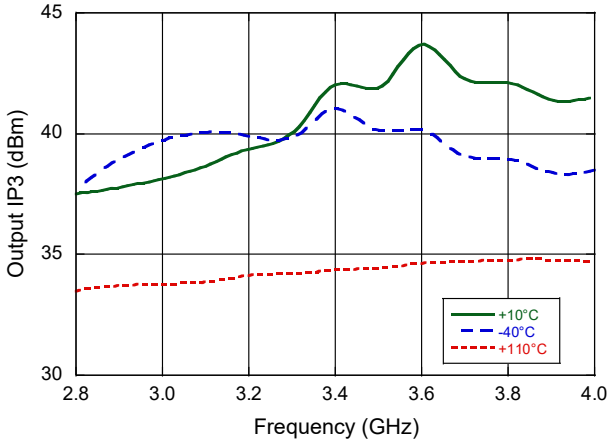


Typical Performance Curves: $V_{CC1} = V_{CC2} = +5$ V, $Z_0 = 50\ \Omega$ (unless otherwise stated)

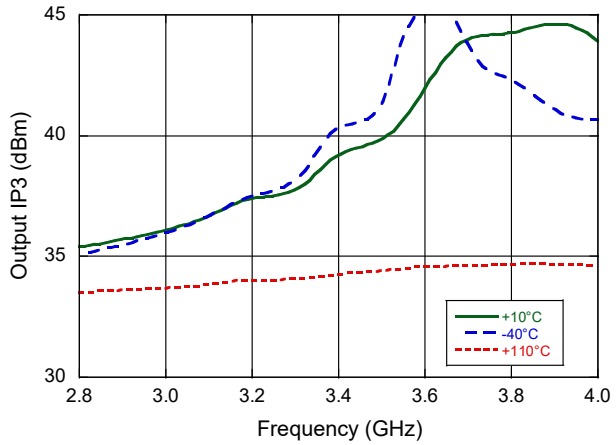
Output IP3
10 MHz Spacing, Input Power = -15 dBm/tone



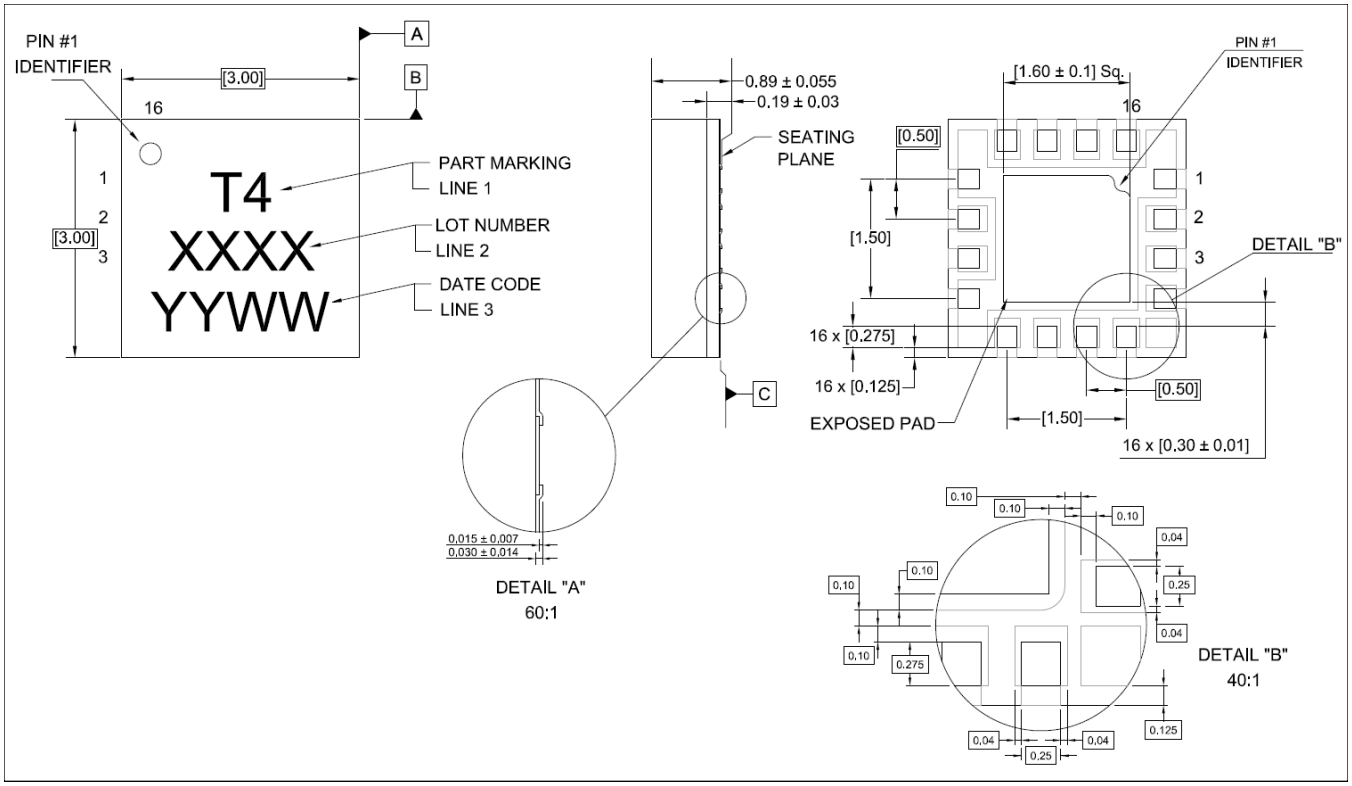
Output IP3
10 MHz Spacing, Input Power = -10 dBm/tone



Output IP3
10 MHz Spacing, Input Power = -5 dBm/tone



Lead-Free 3 mm 16-Lead SMT†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 3 requirements in accordance to JEDEC J-STD-020D.
Plating is NiPdAu over copper

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