ALM-32320

3.3GHz – 3.9GHz

2 Watt High Linearity Amplifier

Data Sheet

Description

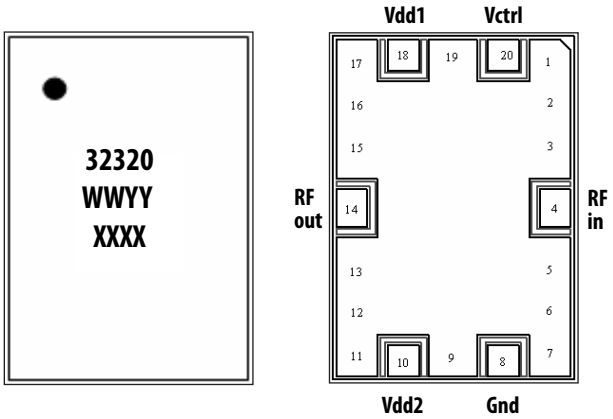
Avago Technologies' ALM-32320 is a high linearity 2 Watt PA with good OIP3 performance and exceptionally good PAE at 1dB gain compression point, achieved through the use of Avago Technologies' proprietary 0.25um GaAs Enhancement-mode pHEMT process.

All matching components are fully integrated within the module and the 50Ω RF input and output pins are already internally AC-coupled. This makes the ALM-32320 extremely easy to use as the only external parts are DC supply bypass capacitors.

The adjustable temperature-compensated internal bias circuit allows the device to be operated at either class A or class AB operation. The ALM-32320 is housed inside a miniature 7.0 x 10.0 x 1.1 mm3 20-lead multiple-chips-on-board (MCOB) module package.

Component Image

7.0 x 10.0 x 1.1mm^3 20-Lead MCOB Package



Top View Bottom View

Note:
Package marking provides orientation and identification
"32320" = Device Part Number
"WWYY" = Work week and year of manufacture
"XXXX" = Last 4 digit of lot number

Features

- Fully matched, input and output
- High linearity and P1dB
- Unconditionally stable across load condition
- Built-in adjustable temperature compensated internal bias circuitry
- GaAs E-pHEMT Technology[1]
- 5V supply
- Excellent uniformity in product specifications
- Tape-and-Reel packaging option available
- MSL-3 and Lead-free
- High MTTF for base station application

Specifications

3.5GHz; 5V, 810mA (typical)

- 12.6 dB Gain
- 51.0 dBm Output IP3
- 34.5 dBm Output Power at 1dB Gain Compression
- 46.6% PAE at P1dB
- 2.5dB Noise Figure

Applications

- Class A driver amplifier for WiMAX base stations.
- General purpose gain block.

Note:
1. Enhancement mode technology employs positive gate voltage, thereby eliminating the need of negative gate voltage associated with conventional depletion mode devices.

Attention: Observe precautions for handling electrostatic sensitive devices.
ESD Machine Model = 80 V
ESD Human Body Model = 800 V
Refer to Avago Application Note A004R: Electrostatic Discharge, Damage and Control.

Absolute Maximum Rating[2] T_A=25°C

Symbol	Parameter	Units	Absolute Max.
$V_{dd,max}$	Device Voltage, RF output to ground	V	5.5
$I_{ds,max}$	Device Drain Current	mA	1500
$V_{ctrl,max}$	Control Voltage	V	5.5
$P_{in,max}$	CW RF Input Power	dBm	28
P_{diss}	Total Power Dissipation [4]	W	8.25
$T_{j,max}$	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to 150

Thermal Resistance [3] θ_{jc} = 15°C/W
(Vdd = 5V, Ids = 810mA, Tc = 85°C)

Notes:
2. Operation of this device in excess of any of these limits may cause permanent damage.
3. Thermal resistance measured using Infra-Red measurement technique.
4. This is limited by maximum Vdd and Ids. Derate 66.7mW/ °C for Tc > 26.2°C.

Product Consistency Distribution Charts[5]

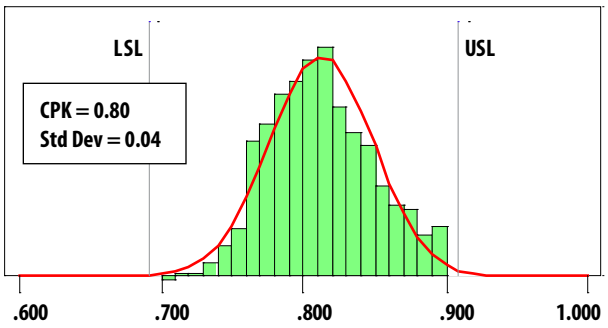


Figure 1. Ids; LSL = 690mA, nominal = 810mA, USL = 910mA

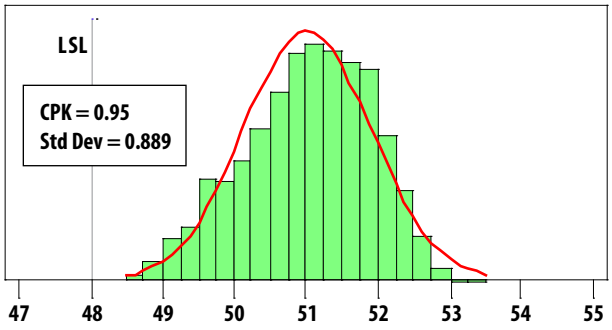


Figure 2. OIP3; LSL = 48dBm, nominal = 51dBm

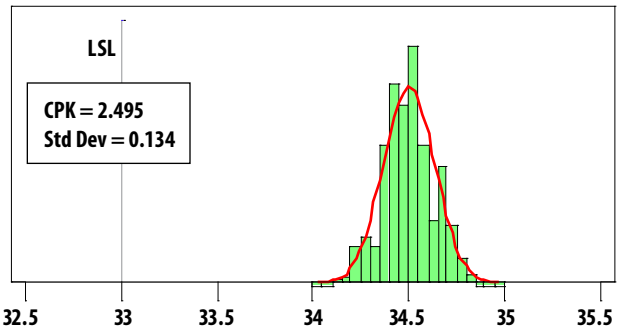


Figure 3. P1dB; LSL = 33dBm, nominal = 34.5dBm

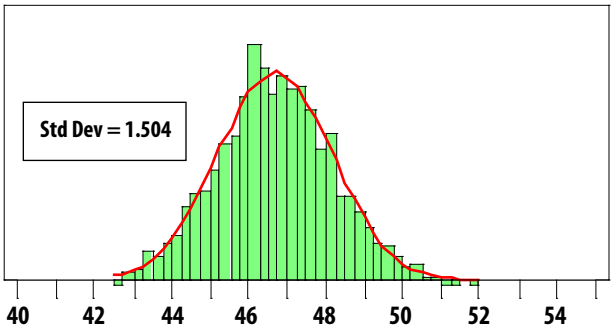


Figure 4. PAE at P1dB; nominal = 46.6%

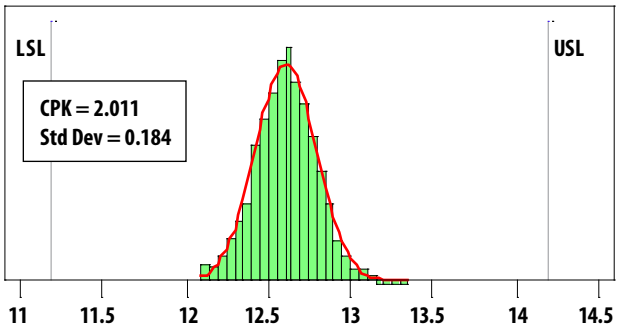


Figure 5. Gain; LSL=11.2dB, Nominal = 12.6dB, USL=14.2dB

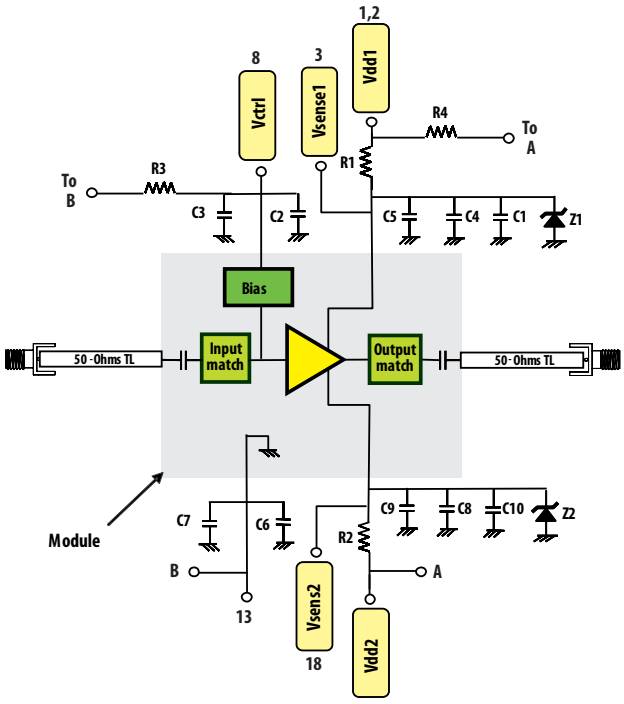
Note:
5. Distribution data sample size is 500 samples taken from 3 different wafer lots. T_A = 25°C, Vdd = 5V, Vctrl = 5V, RF performance at 3.5GHz unless otherwise specified. Future wafers allocated to this product may have nominal values anywhere between the upper and lower limits.
6. Measurements are made on a production test board. Input trace losses have not been de-embedded from actual measurements.

Electrical Specifications [7]

T_A = 25 °C, Vdd =5V, Vctrl =5V, RF performance at 3.5GHz, measured on demo board (see Figure 7) unless otherwise specified.

Symbol	Parameter and Test Condition	Units	Min.	Typ.	Max.
Ids	Quiescent current	mA		810	
Ictrl	Vctrl current	mA		28	
Gain	Gain	dB		12.5	
OIP3 [8]	Output Third Order Intercept Point	dBm		50.0	
OP1dB	Output Power at 1dB Gain Compression	dBm		34.3	
PAE	Power Added Efficiency	%		46.0	
NF	Noise Figure	dB		2.5	
S11	Input Return Loss, 50Ω source	dB		-9.0	
S22	Output Return Loss, 50Ω load	dB		-12.0	
S12	Reverse Isolation	dB		-26.5	

Notes:
7. Measurements at 3.5GHz obtained using demo board described in Figure 6 and 7.
8. OIP3 test condition: F_{RF1} - F_{RF2} = 10MHz with input power of -5dBm per tone measured at worst side band
9. Use proper biasing, heat sink and de-rating to ensure maximum channel temperature is not exceeded. See absolute maximum ratings and application note (if applicable) for more details.



Circuit Symbol	Size	Value	Description
C1, C10	0805	2.2uF	Ceramic Chip Capacitor
C2, C4, C9	0402	0.1uF	Ceramic Chip Capacitor
C3, C5, C8	0402	10nF	Ceramic Chip Capacitor
C6, C7	0402	Not Used	N/A
R1, R2	1206	0 Ohm	Chip Resistor
R3	0402	Not Used	N/A
R4	0805	0 Ohm	Chip Resistor
Z1, Z2	0805	Not Used	Zener Diode 5.6V (Optional)

Note:
To supply Vdd1 and Vdd2 individually, remove R4 and supply Vdd1 from pin 1,2 and Vdd2 from pin 19,20

Figure 6. Demo board application schematics and components table

Demo board layout

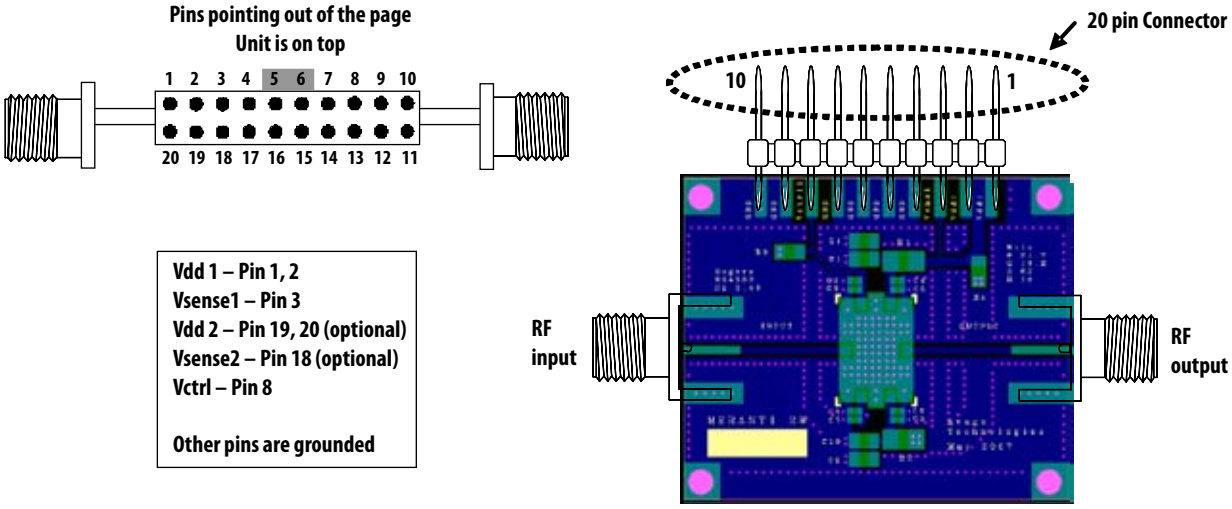


Figure 7. Demo board layout diagram

1. Recommended PCB material is 10 mils Rogers RO4350, with FR4 backing for mechanical strength.
2. Suggested component values may vary according to layout and PCB material.

ALM-32320 Typical Over-Temperature Performance

Vdd = 5V, Vctrl = 5V, Input Signal = CW unless stated otherwise.

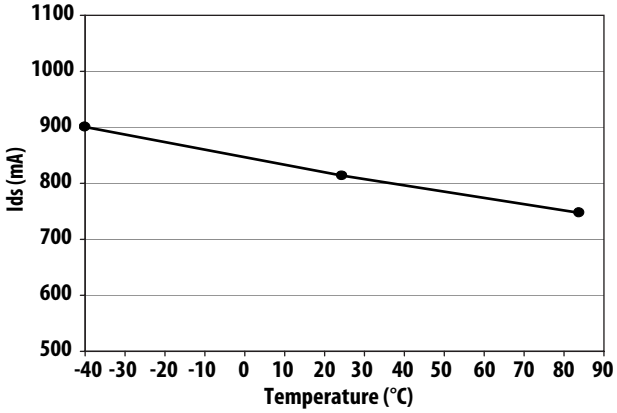


Figure 8. Over temperature Ids

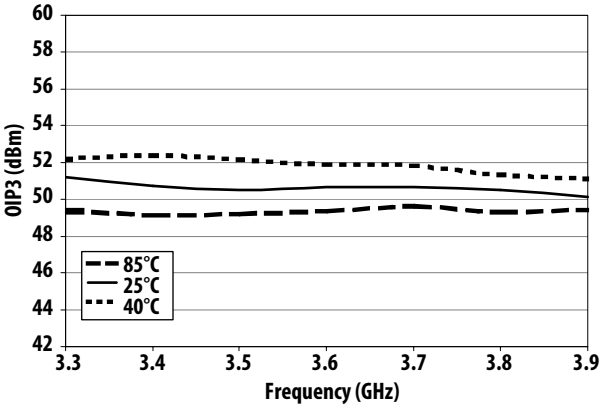


Figure 9. Over temperature OIP3 vs Frequency

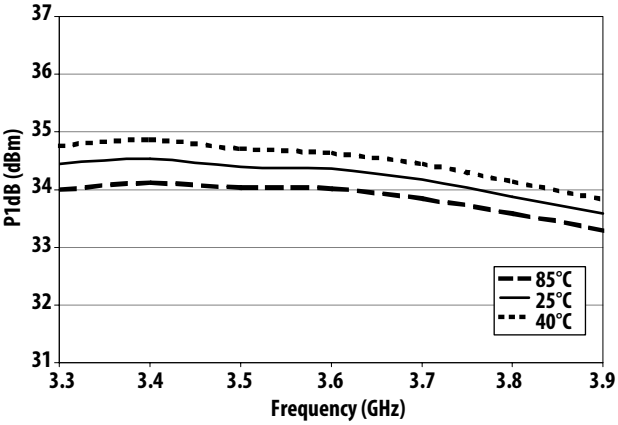


Figure 10. Over temperature P1dB vs Frequency

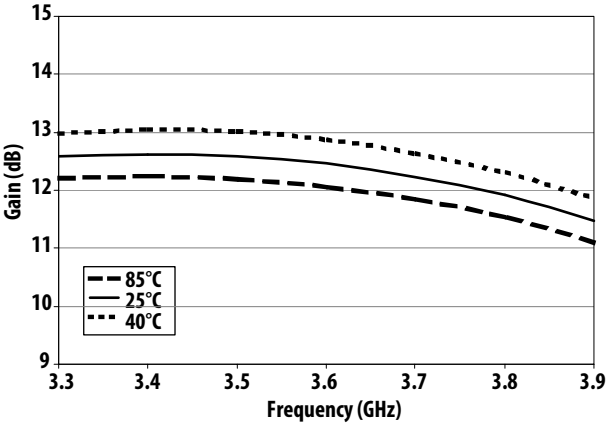


Figure 11. Over temperature Gain vs Frequency

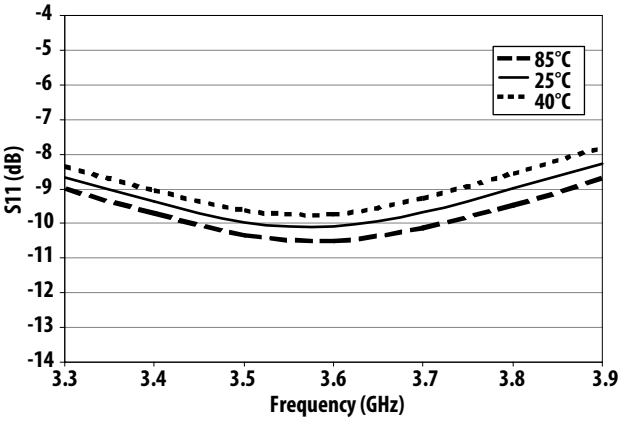


Figure 12. Over temperature S11 vs Frequency

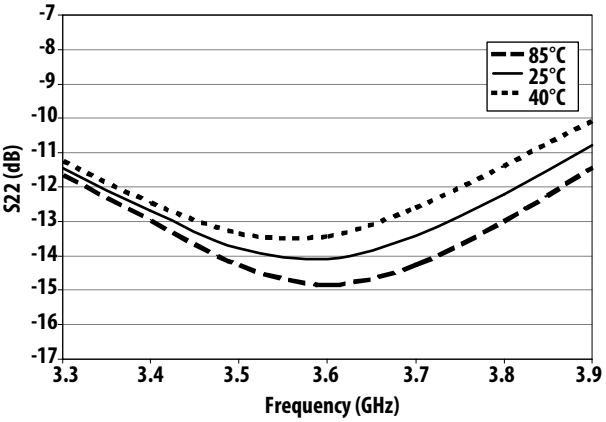


Figure 13. Over temperature S22 vs Frequency

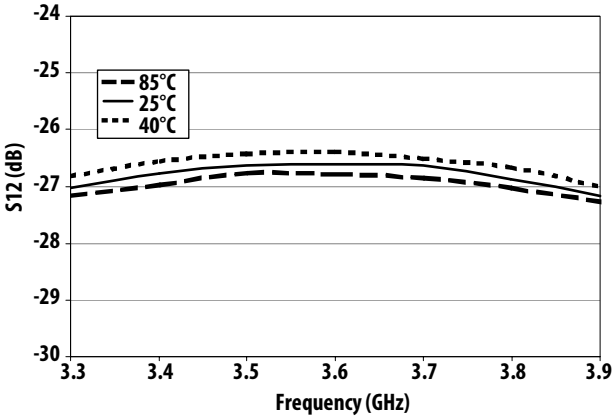


Figure 14. Over temperature S12 vs Frequency

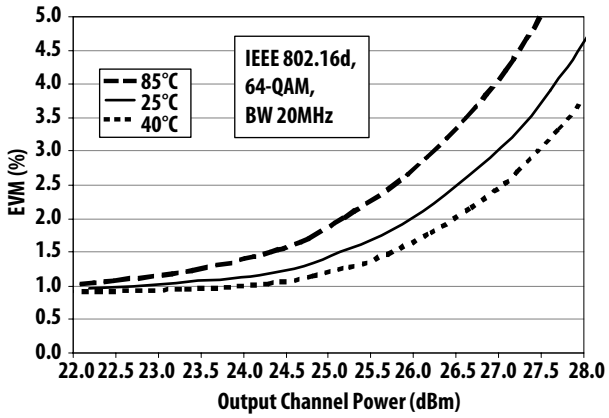


Figure 15. Over temperature WiMAX EVM vs Output Power @ 3.3GHz

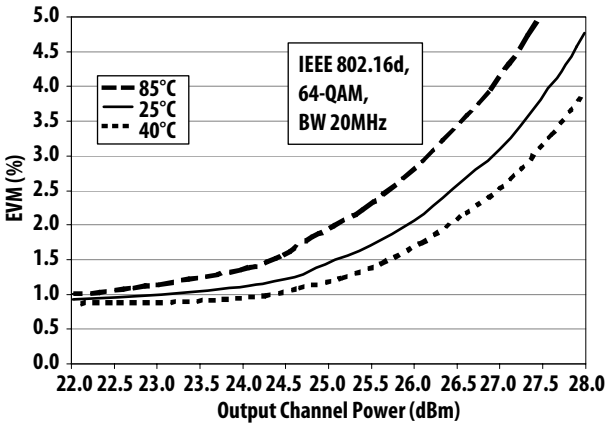


Figure 16. Over temperature WiMAX EVM vs Output Power @ 3.5GHz

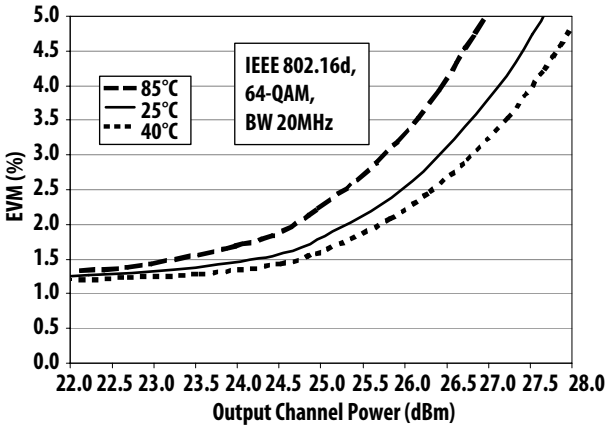
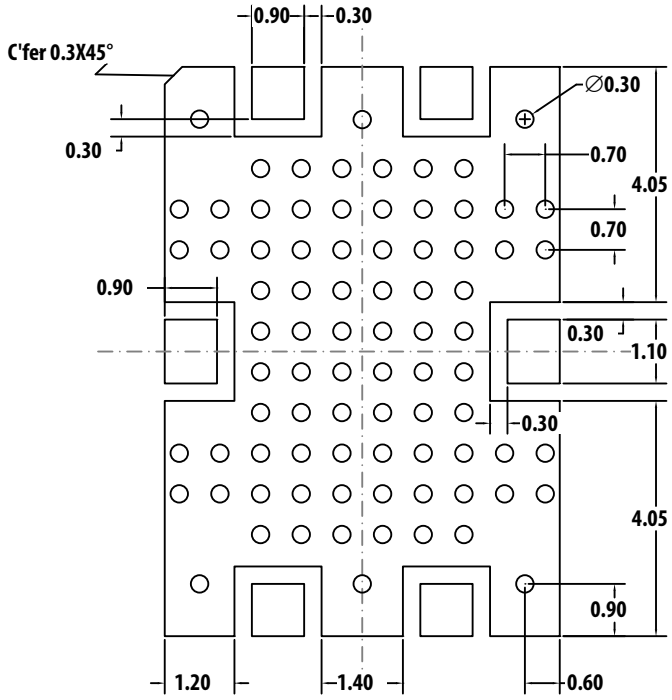
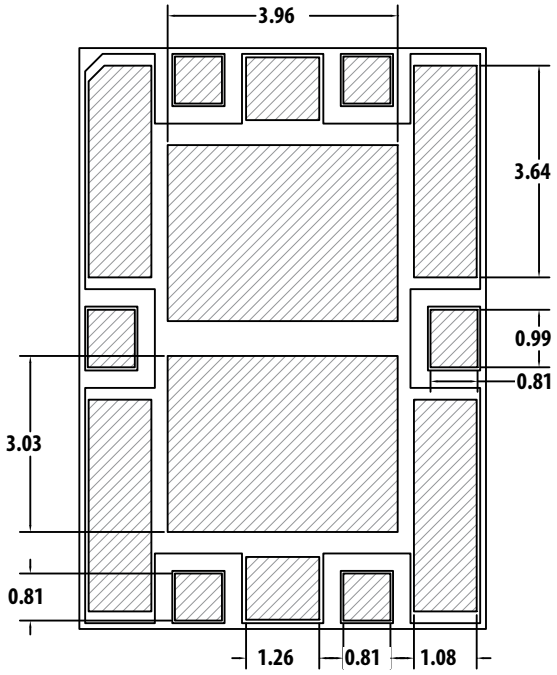


Figure 17. Over temperature WiMAX EVM vs Output Power @ 3.9GHz

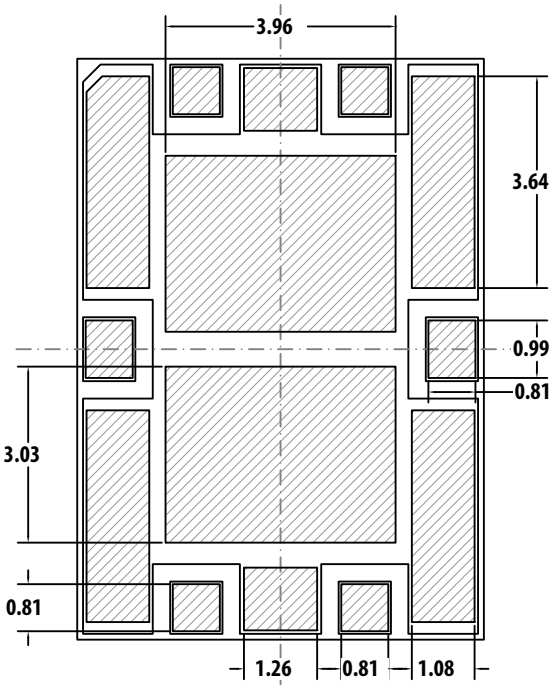
PCB Layout and Stencil Design



PCB Land Pattern (Top View)



Stencil Outline



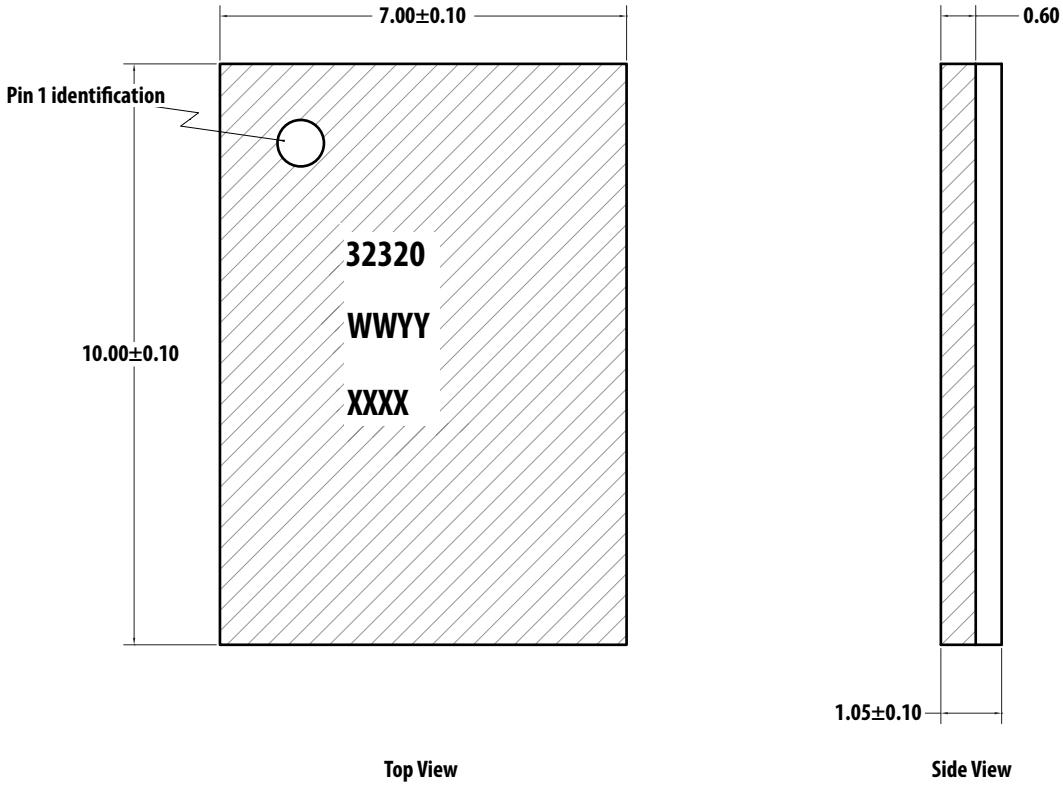
Combined PCB and stencil layout Land Pattern (Top View)

Note:
All dimensions are in millimeters.

Part Number Ordering Information

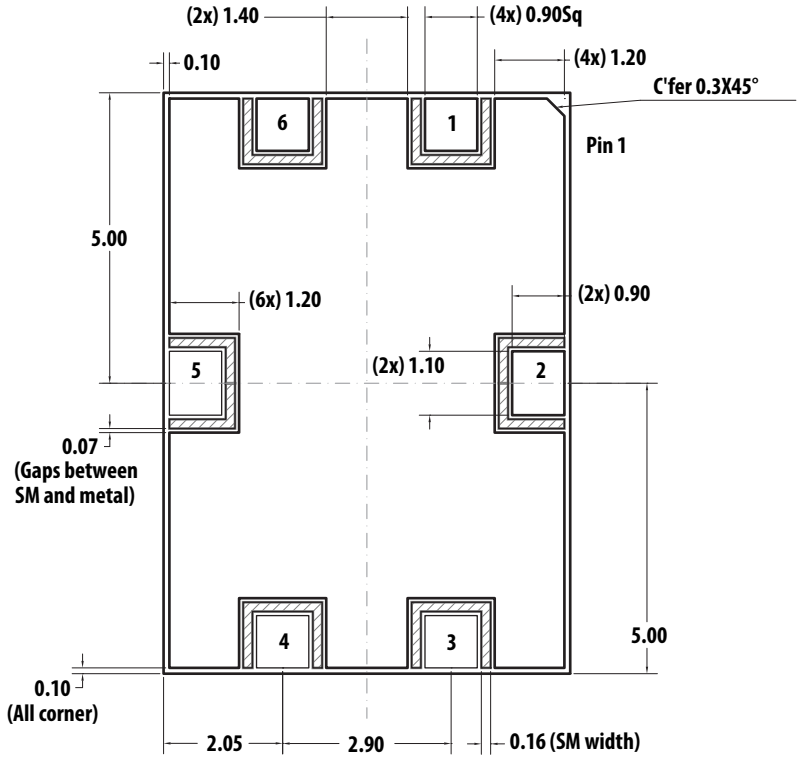
Part Number	No. of Devices	Container
ALM-32320-TR1G	1000	13″ Reel
ALM-32320-TR2G	3000	13″ Reel
ALM-32320-BLKG	100	antistatic bag

MCOB 7 x 10 Package Dimensions



Top View

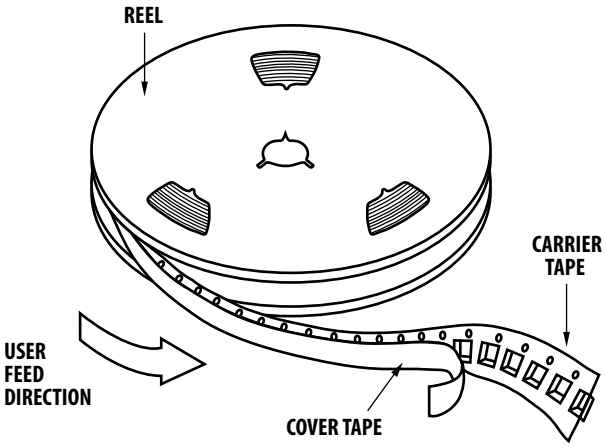
Side View

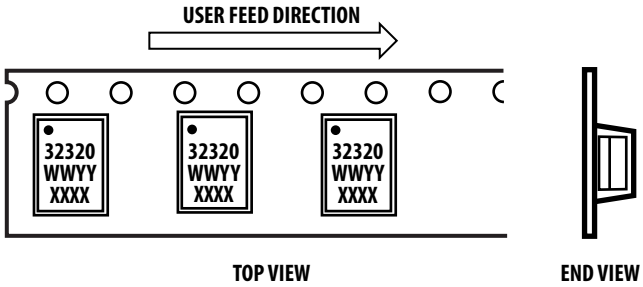


Bottom View

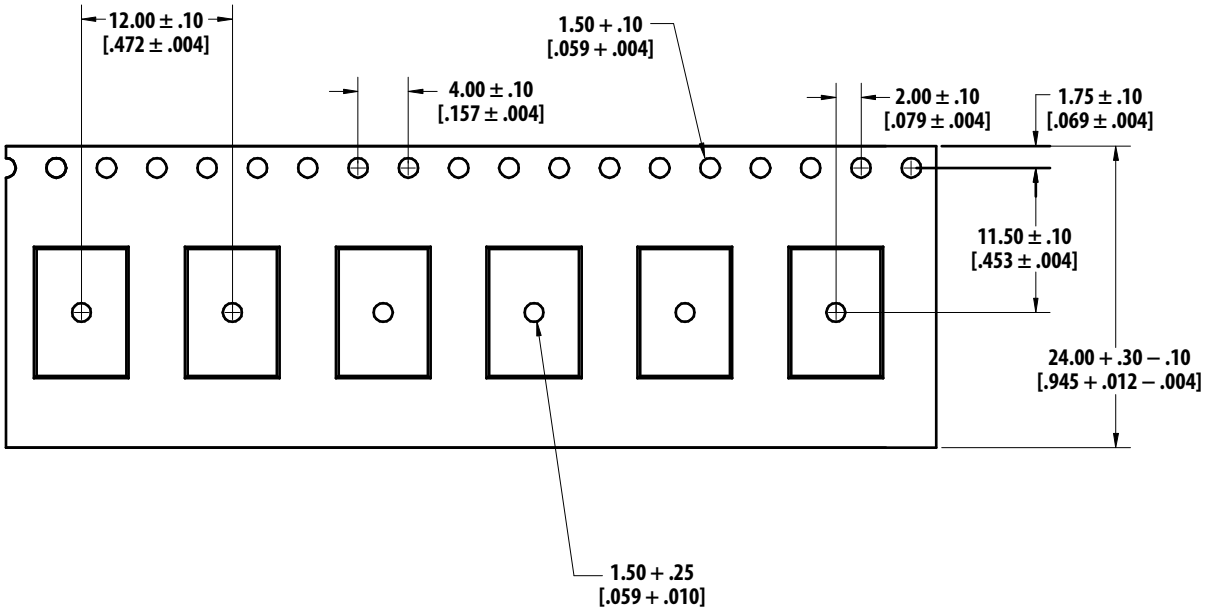
Notes:
1. All dimensions are in milimeters
2. Dimensions are inclusive of plating
3. Dimensions are exclusive of mold flash and metal burr

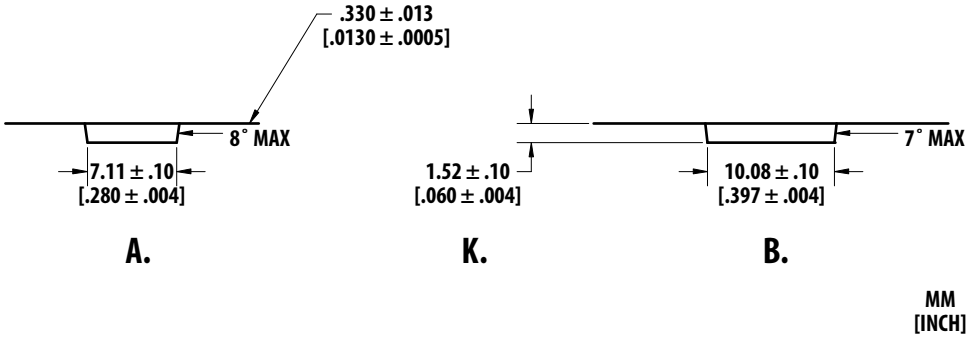
Device Orientation





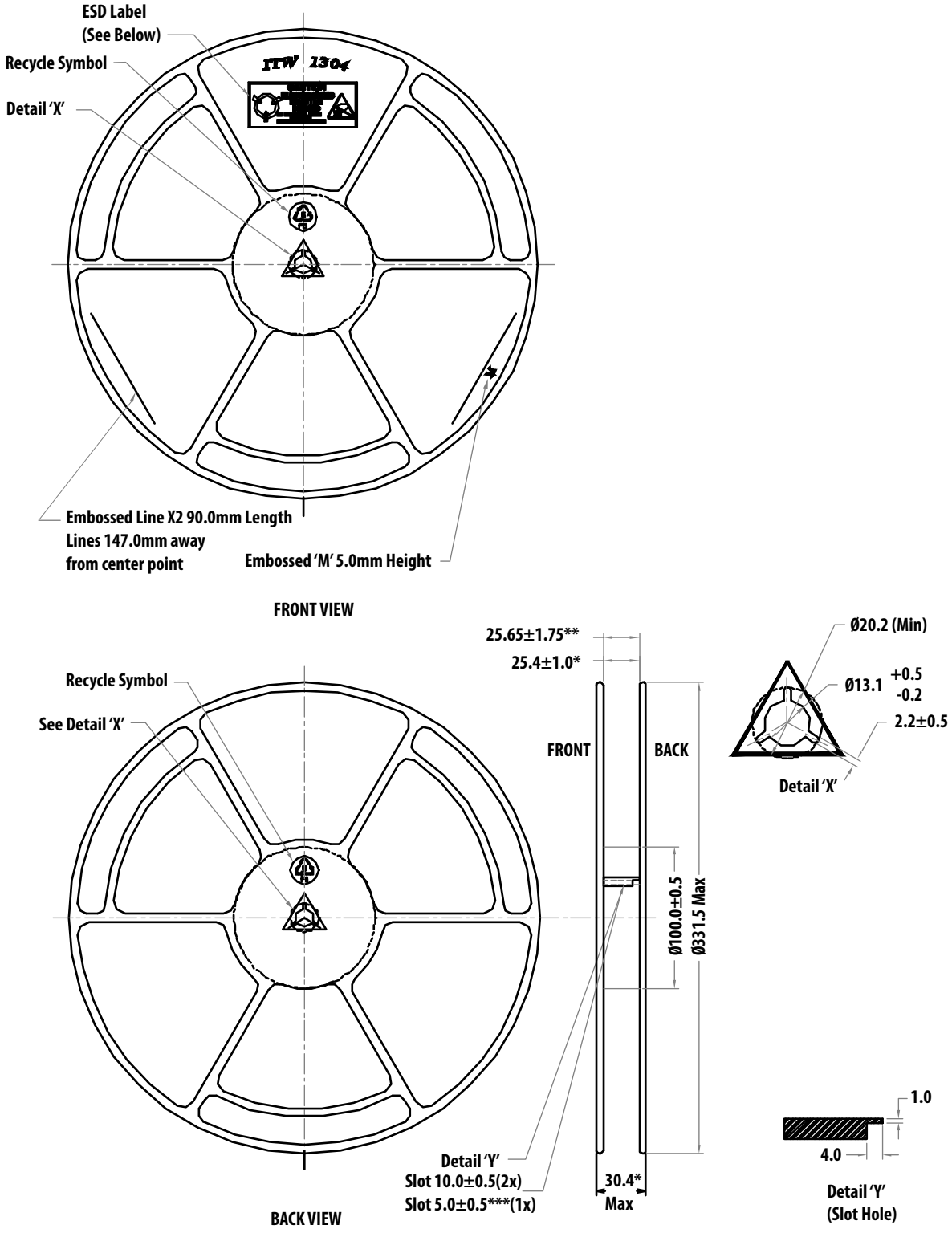
Tape Dimensions





MM
[INCH]

Reel Dimensions - 13" Reel



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