

## DATA SHEET

# AWB7230: 3.40 to 3.80 GHz Small-Cell Power Amplifier Module

## Applications

- WiMAX and LTE Uplink Air Interfaces
- Picocell, femtocell, home nodes
- Customer premises equipment
- Data cards and terminals

## Features

- InGaP HBT technology
- 2.5% EVM @ +29 dBm (OFDMA)
- 31 dB gain
- Integrated step attenuator
- Integrated output power detector
- High efficiency
- Low transistor junction temperature
- Matched for a 50  $\Omega$  system
- Low profile miniature surface-mount package; RoHS compliant
- Surface-mount (14-pin, 7 x 7 x 1.3 mm) package (MSL3, 260 °C per JEDEC J-STD-020)



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## Description

The AWB7230 is a fully matched, Multi-Chip-Module (MCM) designed for picocell, femtocell, and customer premises equipment (CPE) applications. Its high linearity and efficiency meet the extremely demanding needs of small-cell infrastructure architectures. Designed for WiMAX and LTE air interfaces operating in the 3.40 to 3.80 GHz band, the AWB7230 delivers up to +29 dBm of WiMAX power with an exceptionally low EVM. The device operates from a convenient +4.5 V supply and provides 31 dB of gain.

The device is manufactured using an advanced InGaP HBT MMIC technology offering state-of-the-art reliability, temperature stability, and ruggedness. The self-contained 7 x 7 x 1.3 mm surface-mount package incorporates RF matching networks optimized for output power, efficiency, and linearity in a 50  $\Omega$  system.

A block diagram of the AWB7230 is shown in Figure 1. The device package and pinout are shown in Figure 2. Signal pin assignments and functional pin descriptions are described in Table 1.

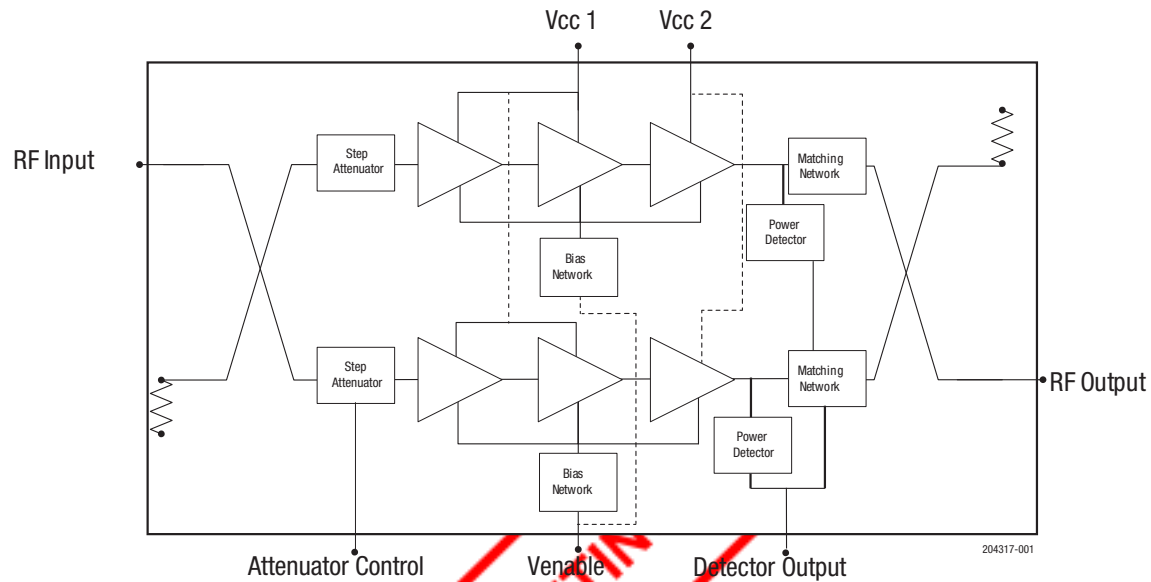


Figure 1. AWB7230 Block Diagram

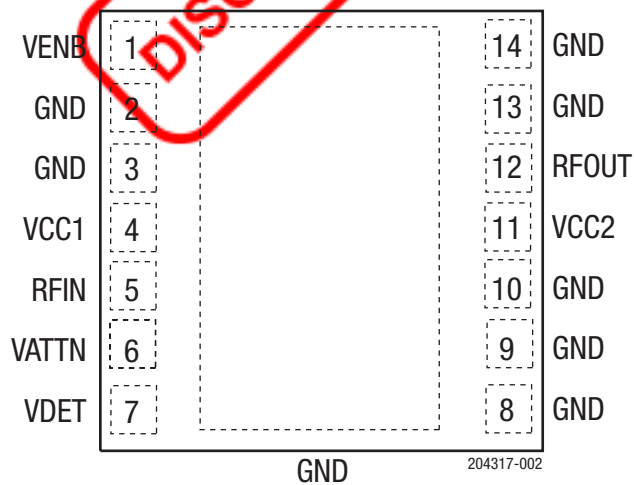


Figure 2. AWB7230 Pinout (Top View)

Table 1. AWB7230 Signal Pin Descriptions

Pin	Name	Description	Pin	Name	Description
1	VENB	PA enable voltage	8	GND	Ground
2	GND	Ground	9	GND	Ground
3	GND	Ground	10	GND	Ground
4	VCC1	Supply voltage	11	VCC2	Supply voltage
5	RFIN	RF input	12	RFOUT	RF output
6	VATTN	Attenuator control	13	GND	Ground
7	VDET	Detector output	14	GND	Ground

## Electrical and Mechanical Specifications

The absolute maximum ratings of the AWB7230 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

**Table 2. AWB7230 Absolute Maximum Ratings<sup>1</sup>**

Parameter	Minimum	Maximum	Units
Supply voltage (VCC)	0	+5	V
Enable voltage (VENB)	0	+3.2	V
Attenuator control voltage (VATTN)	0	+3.7	V
RF output power (POUT)		+32	dBm
RF input power (PIN)		+10	dBm, CW
Electrostatic discharge:			
Human Body Model, Class 1C <sup>2</sup>		2000	V
Charged Device Model, Class 4 <sup>3</sup>		>1000	V
Junction temperature (TJ)		+150	°C
Storage temperature (TSTG)	-40	+150	°C

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

<sup>2</sup> JEDEC JS-001-2010.

<sup>3</sup> JEDEC JESD22-C101D.

**ESD HANDLING:** Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.

**Table 3. AWB7230 Recommended Operating Conditions<sup>1</sup>**

Parameter	Symbol	Min	Typ	Max	Units
Operating frequency	f	3400		3800	MHz
Supply voltage	VCC	+3.3	+4.5	+4.65	V
Enable voltage:					
PA on	VENB	+2.7	+2.85	+3.1	V
PA shutdown		0		+0.5	V
Attenuator control voltage:					
Logic HIGH (enabled)	VATTN	+2.3		+3.7	V
Logic LOW (disable)		0		+0.7	V
RF output power	POUT		+29		dBm
Case temperature	Tc	-40		+85	°C

<sup>1</sup> The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

**Table 4. AWB7230 Electrical Specifications<sup>1</sup>****(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +4.5 V, V<sub>ENB</sub> = +2.85 V, 50 Ω system)**

Parameter	Test Conditions	Min	Typ	Max	Units
Gain <sup>2</sup>		27	31	37	dB
Attenuation	V <sub>ATTN</sub> = 2.5 V	17	20	24	dB
Spectrum Mask: <sup>1,2</sup> @ Offset A @ Offset B @ Offset C @ Offset D	10 MHz Channel Bandwidth WiMAX Forum Band Class 5C MMRT			-51.37 -40.5 -50.5 -50.5	dBc dBc dBc dBc
Power-added efficiency <sup>1,2</sup>		14	16		%
Thermal resistance (R <sub>JC</sub> ) <sup>3</sup>	Junction to case		13		°C/W
Collector current (I <sub>CC</sub> ) <sup>1,2</sup>	Total through V <sub>CC</sub> pins	900	1080	1260	mA
EVM <sup>2</sup>			2.5	3.5	%
Power detector output @ 29 dBm	R <sub>L</sub> (load resistor) = 100 kΩ	0.9	1.4	1.75	V
Quiescent current (I <sub>Q</sub> )		230	300	380	mA
V <sub>ENB</sub> current	Through V <sub>ENB</sub> pin		0.6	2	mA
Leakage current	V <sub>CC</sub> = +4.5 V, V <sub>REF</sub> = 0 V		600	1000	μA
Harmonics <sup>(2)</sup> 2f <sub>0</sub> , 4f <sub>0</sub> 3f <sub>0</sub>			-50 -55	-45 -45	dBc dBc
Input return loss			-15	-9	dB
Spurious output level <sup>2</sup> (all spurious outputs)	P <sub>OUT</sub> ≤ +29 dBm In-band load VSWR < 5:1 Out-of-band load VSWR < 10:1 Applies over all voltage and temperature operating ranges			-60	dBc
Load mismatch stress with no permanent degradation or failure	V <sub>CC</sub> = +4.5 V, P <sub>OUT</sub> = +29 dBm Applies over full operating temperature range	8:1			VSWR

<sup>1</sup> Spectrum mask and efficiency measured at 3600 MHz.<sup>2</sup> P<sub>OUT</sub> = +29 dBm.<sup>3</sup> Use only V<sub>CC2</sub> (pin 11) current when calculating device junction temperature.

## Evaluation Board Description

The AWB7230 Evaluation Board is used to test the performance of the AWB7230 device. A schematic of a typical application circuit is shown in Figure 3.

## Shutdown Mode

The power amplifier can be placed in shutdown mode by applying logic low levels (see Operating Ranges table) to the VENB voltage.

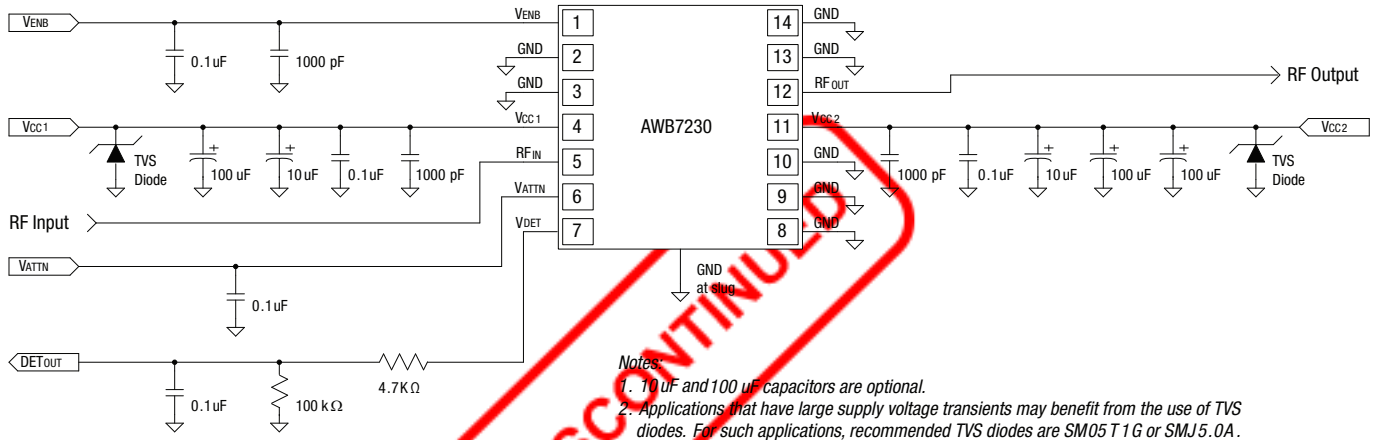


Figure 3. AWB7230 Evaluation Board Schematic

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## Package Dimensions

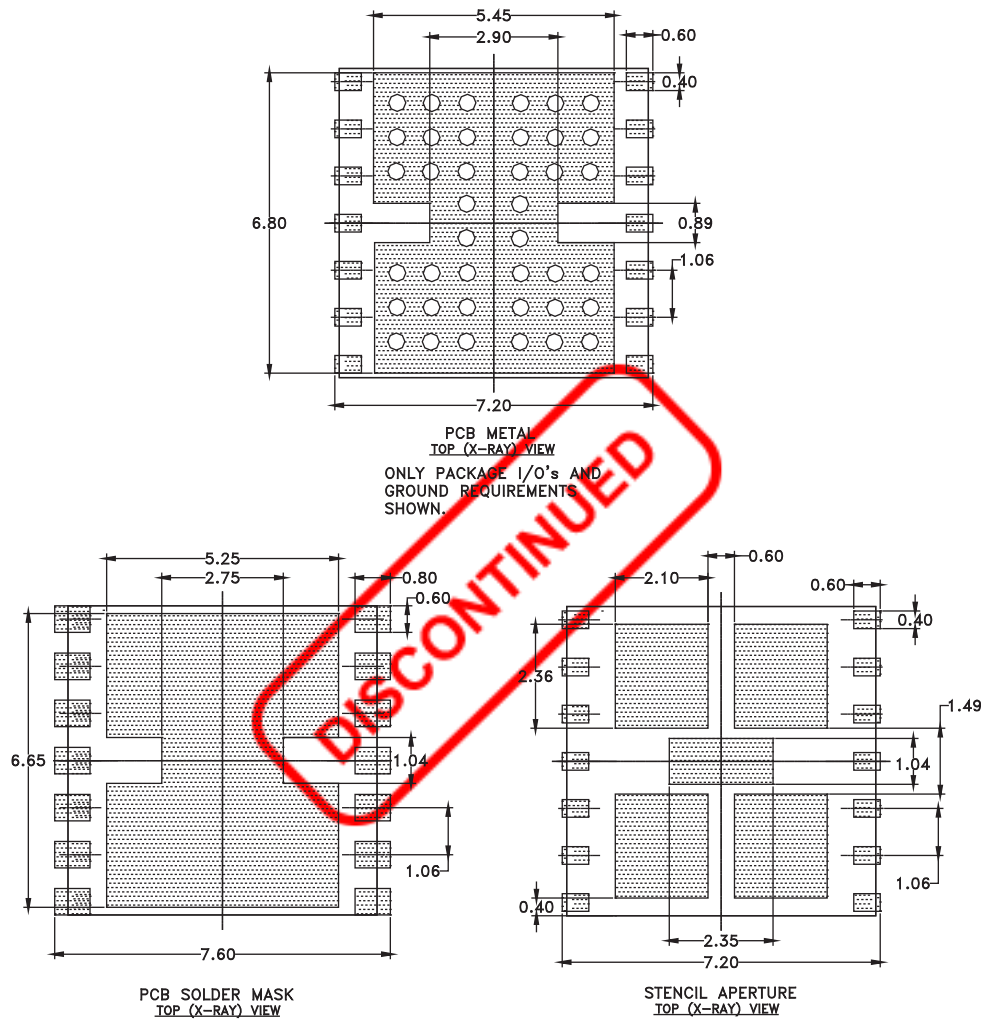
The PCB layout footprint drawing for the AWB7230 is shown in Figure 4. Typical part markings are shown in Figure 5. The package dimensions for the AWB7230 are shown in Figure 6. The tape and reel dimensions are provided in Figure 7.

## Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The AWB7230 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.



Notes:

1. Unless specified, dimensions are symmetrical about center lines shown.
2. Dimensions are in millimeters.
3. Vias shown in PCB Metal View are for reference only. Number and size of thermal vias required are dependent on heat dissipation requirements and the PCB process capability.

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**Figure 4. AWB7230 PCB Layout Footprint Dimensions**

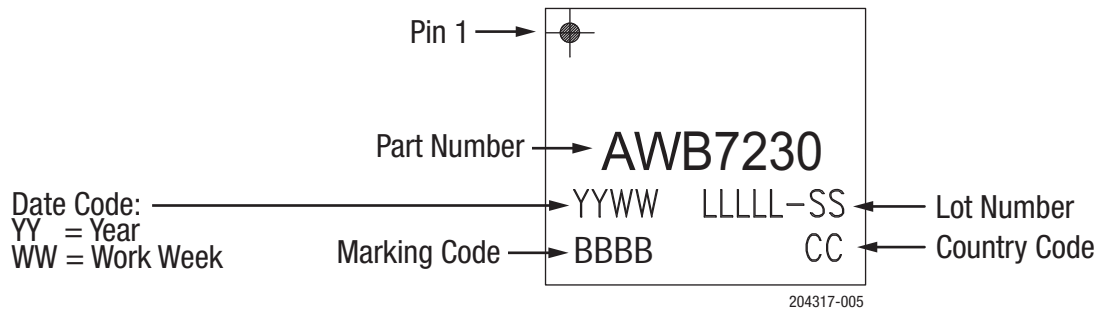
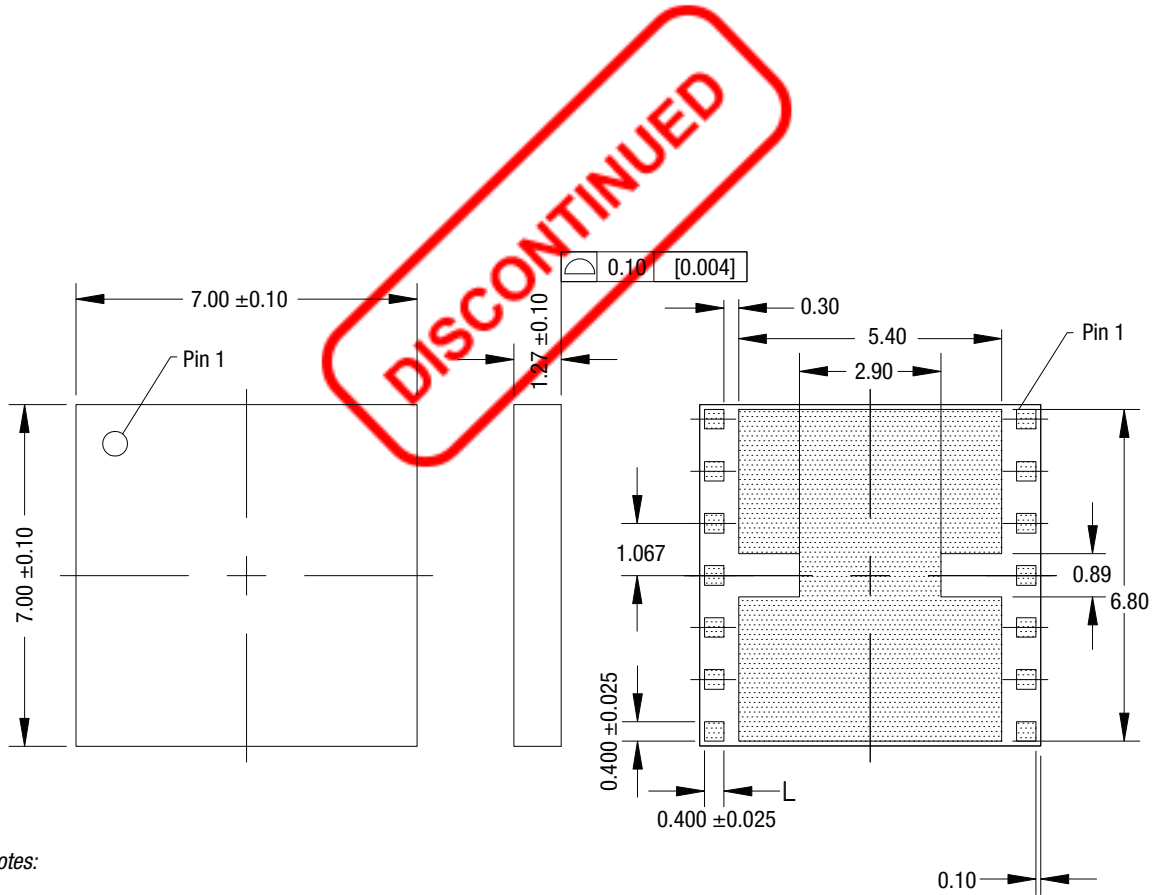


Figure 5. AWB7230 Typical Part Marking

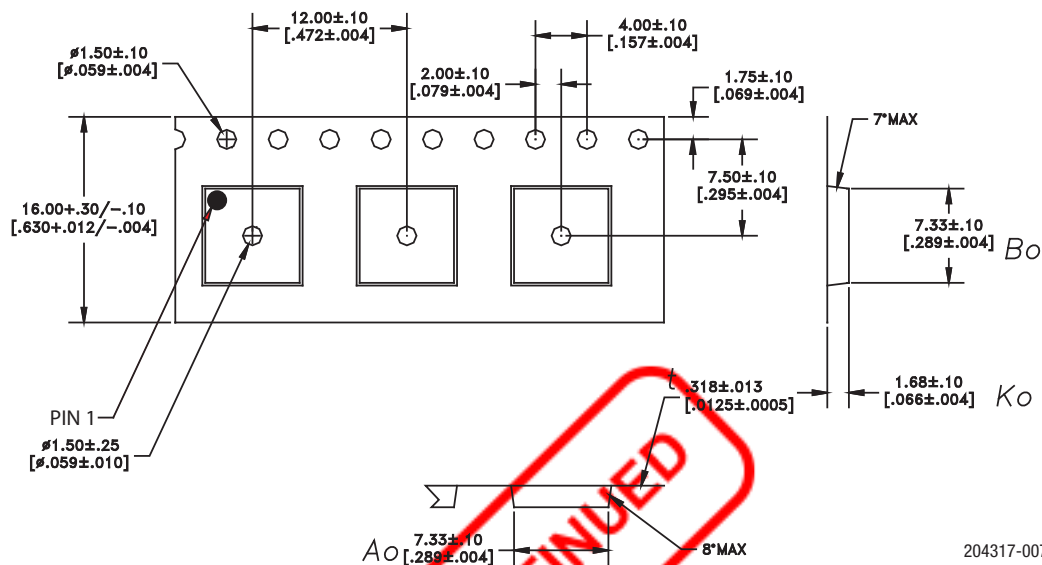


Notes:

1. All dimensions are in millimeters.
2. Unless specified otherwise, tolerance =  $\pm 0.076$  [0.003].
3. Pads (including center) are shown as uniform size for reference only.  
Actual pad size and location will vary within the minimum and maximum dimensions according to the specific laminate design.

204317-006

Figure 6. AWB7230 Package Dimensions



204317-007



## Ordering Information

Model Number	Package Description	Component Packaging
AWB7230P8	RoHS-compliant 14-pin 7 x 7 x 1.3 mm surface-mount module	2500-piece tape and reel
EVB7230		Evaluation Board part number



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