AWB7124: 728 to 768 MHz Small-Cell Power Amplifier Module

Applications

- LTE, WCDMA and HSDPA air interfaces
- Picocell, femtocell, home nodes
- Customer premises equipment
- Data cards and terminals

Features

- InGaP HBT technology
- -47 dBc ACPR @ ± 10 MHz, +24.5 dBm
- 30 dB gain
- High efficiency
- Low transistor junction temperature
- Internally matched for a 50 Ω system
- Low-profile miniature surface-mount package; halogen free and RoHS compliant
- Multi-carrier capability
- Surface-mount package (14-pin, 7 x 7 x 1.3 mm) (MSL3, 260 °C per JEDEC J-STD-020)

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

Description

The AWB7124 is a highly linear, fully matched, power amplifier module designed for picocell, femtocell, and customer premises equipment (CPE) applications. Its high-power efficiency and low adjacent channel power levels meet the extremely demanding needs of small cell infrastructure architectures. Designed for LTE, WCDMA and HSDPA air interfaces operating in the 728 to 768 MHz band, the AWB7124 delivers up to +24.5 dBm of LTE (E-TM1.1) power with an ACPR of -47 dBc. It operates from a convenient +4.2 V supply and provides 30 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 mm x 7 mm x 1.3 mm surface-mount package incorporates RF matching networks optimized for output power, efficiency, and linearity in a 50 Ω system.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.
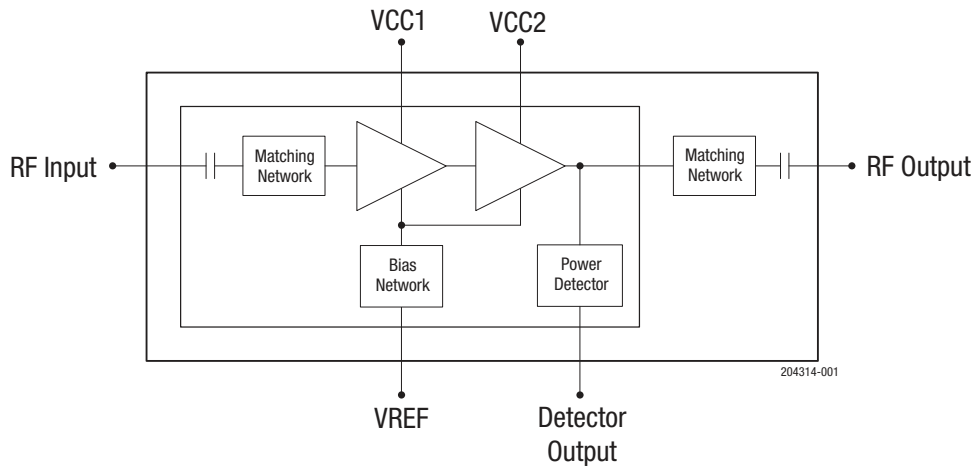
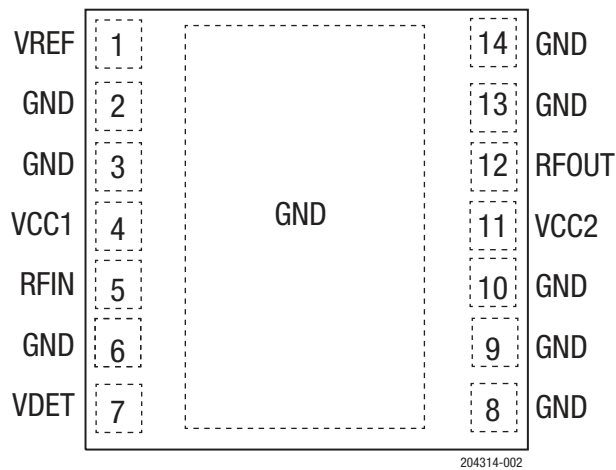Skyworks Solutions, Inc. • Phone [781] 376-3000 • Fax [781] 376-3100 • sales@skyworksinc.com • www.skyworksinc.com

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Figure 1. AWB7124 Block Diagram

**Figure 2. AWB7124 Pinout
(Top View)**

Table 1. AWB7124 Signal Pin Descriptions

Pin	Name	Description	Pin	Name	Description
1	VREF	Reference 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	GND	Ground	13	GND	Ground
7	VDET	Detector voltage	14	GND	Ground

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Electrical and Mechanical Specifications

The absolute maximum ratings of the AWB7124 are provided in Table 2. Recommended operating conditions are specified in Table 3, and DC characteristics are shown in Table 4. Electrical specifications are provided in Table 5.

The state of the AWB7124 is determined by the logic provided in Table 6.

Table 2. AWB7124 Absolute Maximum Ratings[1]

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	V_{CC}	0	+5	V
Logic control voltage	V_{CTL}	0	+3.5	V
RF output power	P_{OUT}		+28	dBm (modulated)
RF input power	P_{IN}		+10	dBm, CW
Juncture temperature	T_J		+150	°C
Storage temperature	T_{STG}	-40	+150	°C

Electrostatic discharge:
 	
    Human Body Model, Class 1C
    Charged Device Model, Class 4
	ESD		
			
			2000
			1000
				
				V
				V

[1] 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.

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. AWB7124 Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Units
Operating frequency	f	728		768	MHz
Supply voltage	V_{CC}	+3.2	+4.2	+4.5	V

Reference voltage:
 	
    PA on
    PA off
	V_{REF}	
		
		+2.80
		0
			
			+2.85
				
				+2.90
				+0.5
					
					V
					V

RF output power[1]	P_{OUT}		+24.5		dBm
Case temperature[2]	T_C	-40		+85	°C

[1] Typ RF output power is used during production test.

[2] Case temperature references the board temperature at the ground paddle on the backside of the package.

Table 4. AWB7124 Electrical Specifications[1]
(T$_C$ = +25 °C, V$_{CC}$ = +4.2 V, V$_{REF}$ = +2.85 V, 50 Ω system)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Gain[2]	G		28	30		dB
ACPR:[1,2,3] @ 10 MHz @ 20 MHz				 -47 -57		 dBc dBc
Power-added efficiency[1,2,3]				14.5		%
Thermal resistance	R$_{JC}$	Junction to case		22.3		°C/W
Quiescent current	Icq			140		mA
Reference current		Through VREF pin		5	10	mA
Leakage current		VCC = +4.5 V, VREF = 0 V		1.5	5	µA
Harmonics:[1,2] 2fo 3fo, 4fo				 -30 -50		 dBc dBc
Input return loss				10		dB
Spurious output level (all spurious outputs)		P$_{OUT}$ ≤ +24.5 dBm, in-band load VSWR < 4:1, 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		VCC = +4.2 V, P$_{IN}$ = 0 dBm Applies over full operating temperature range	8:1			VSWR

[1] ACPR and efficiency measured at 748 MHz.

[2] P$_{OUT}$ = +24.5 dBm.

[3] LTE E-TM1.1 (10 MHz)

Evaluation Board Description

The AWB7124 Evaluation Board is used to test the performance of the AWB7124 linear power amplifier. A schematic of a typical application circuit is shown in Figure 3.

Shutdown Mode

The power amplifier can be placed in a shutdown mode by applying logic low levels (see Operating Ranges table) to the V_{REF} voltage.
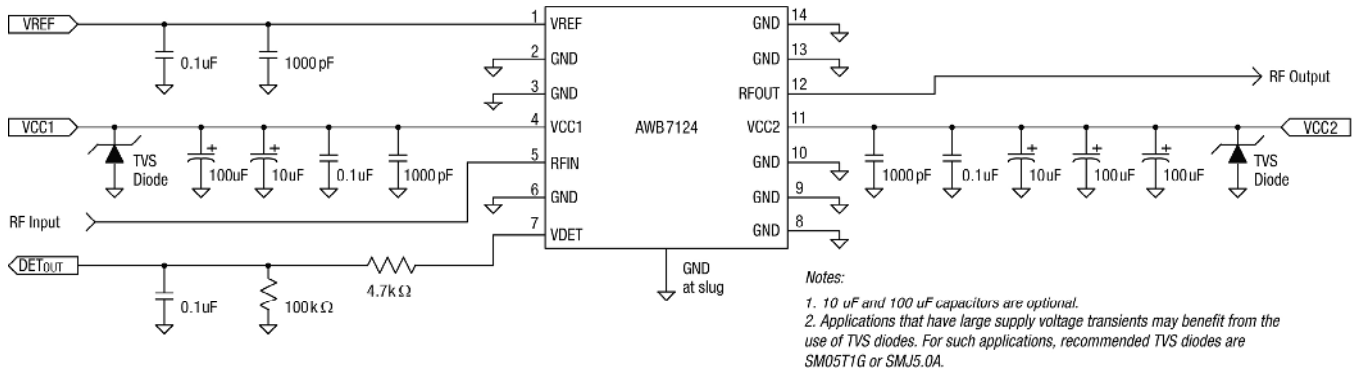
Figure 3. AWB7124 Application Circuit Schematic

Package Dimensions

The PCB layout footprint for the AWB7124 is shown in Figure 4. Typical part markings are noted in Figure 5. Package dimensions are shown in Figure 6, and 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 AWB7124 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.

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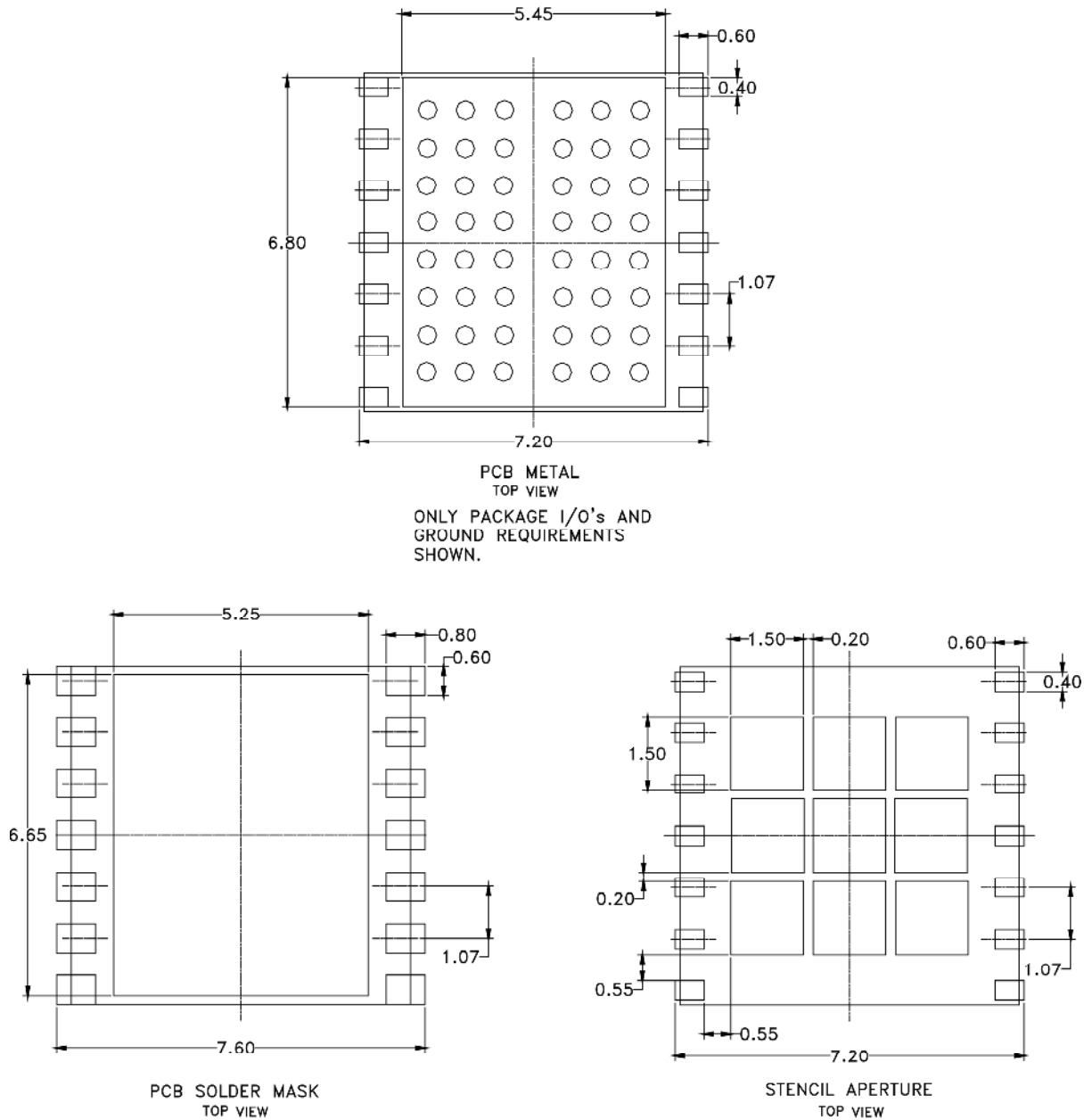
PCB METAL
TOP VIEW
ONLY PACKAGE I/O's AND
GROUND REQUIREMENTS
SHOWN.

PCB SOLDER MASK
TOP VIEW

STENCIL APERTURE
TOP VIEW

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. AWB7124 PCB Layout Footprint

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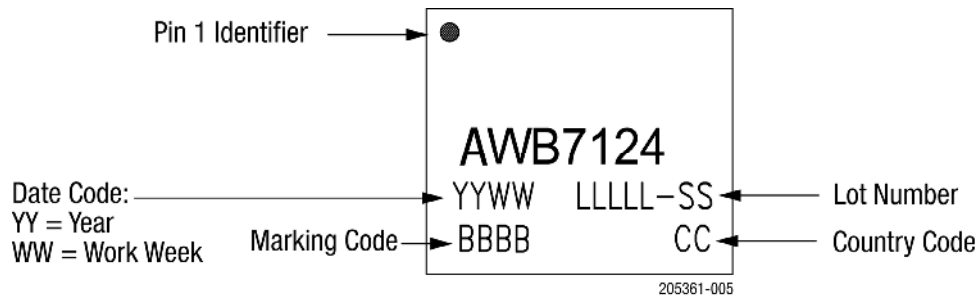
Figure 5. AWB7124 Typical Part Markings
(Top View)
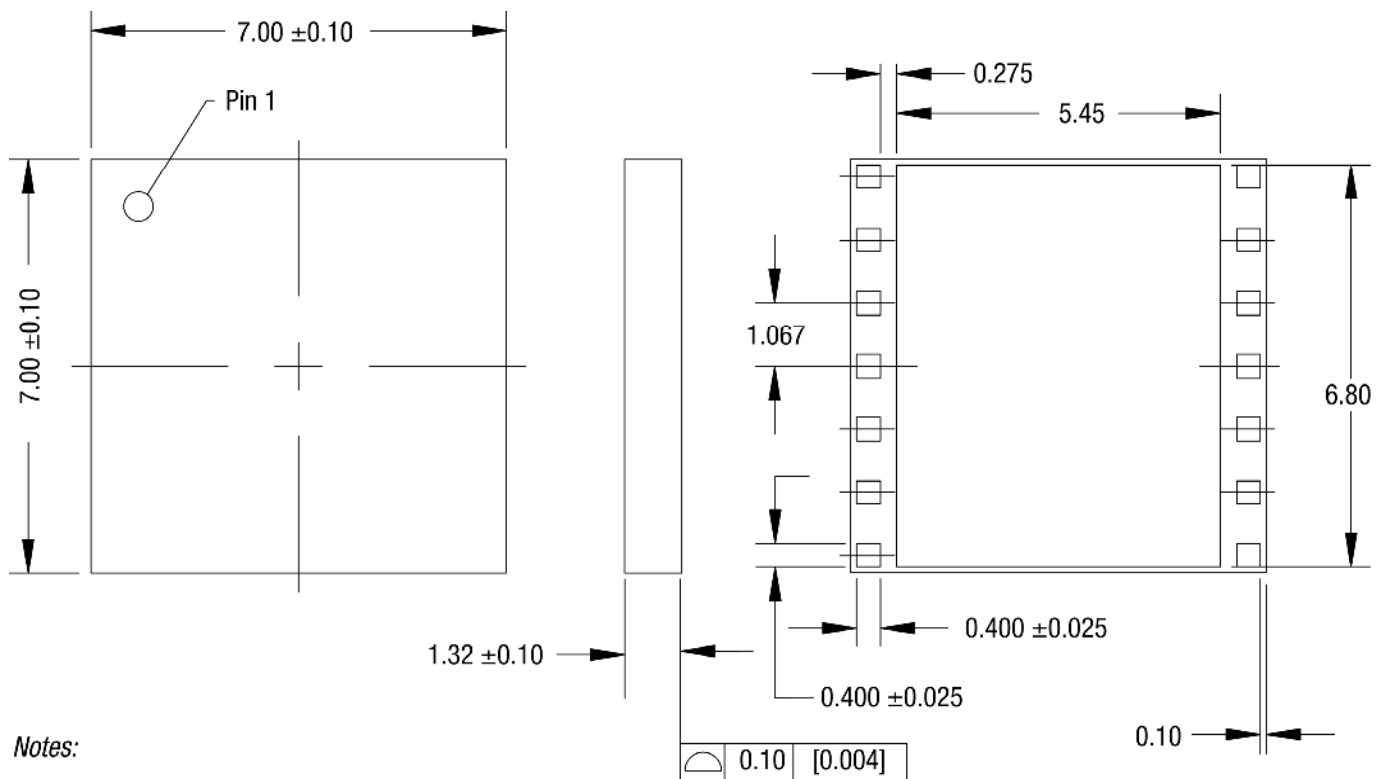
Notes:

1. All dimensions are in millimeters.
2. Unless specified otherwise, tolerance = ±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.

Figure 6. AWB7124 Package Dimensions
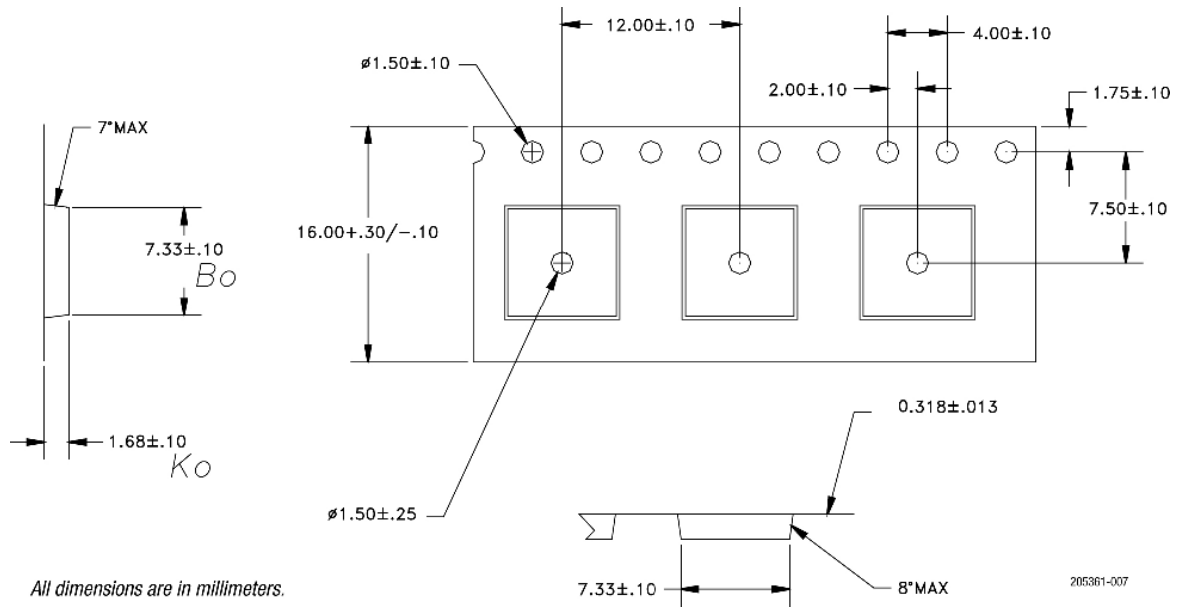
Figure 7. AWB7124 Tape and Reel Dimensions

Ordering Information

Product Description	Product Part Number	Packaging
AWB7124P8: 728 to 768 MHz Small-Cell PA Module	AWB7124P8	Tape and reel, 2500 pieces per reel

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