



# SKYWORKS®

## AWB7223

1.930 -1.995 GHz

### Small-Cell Power Amplifier Module

Data Sheet

#### FEATURES

- InGaP HBT Technology
- -51 dBc ACPR @ ± 5 MHz, +27 dBm
- 30.5 dB Gain
- High Efficiency
- Low Transistor Junction Temperature
- Matched for a 50 Ω System
- Low Profile Miniature Surface Mount Package; RoHS Compliant
- Multi-Carrier Capability

#### APPLICATIONS

- WCDMA, HSDPA and LTE Air Interfaces
- Picocell, Femtocell, Home Nodes
- Customer Premises Equipment (CPE)
- Data Cards and Terminals



#### PRODUCT DESCRIPTION

The AWB7223 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 WCDMA, HSDPA, and LTE air interfaces operating in the 1.930 GHz to 1.995 GHz band, the AWB7223 delivers up to +27 dBm of WCDMA (64 DPCH) power with an ACPR better than -50 dBc. It

operates from a convenient +4.5 V supply and provides 30.5 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.

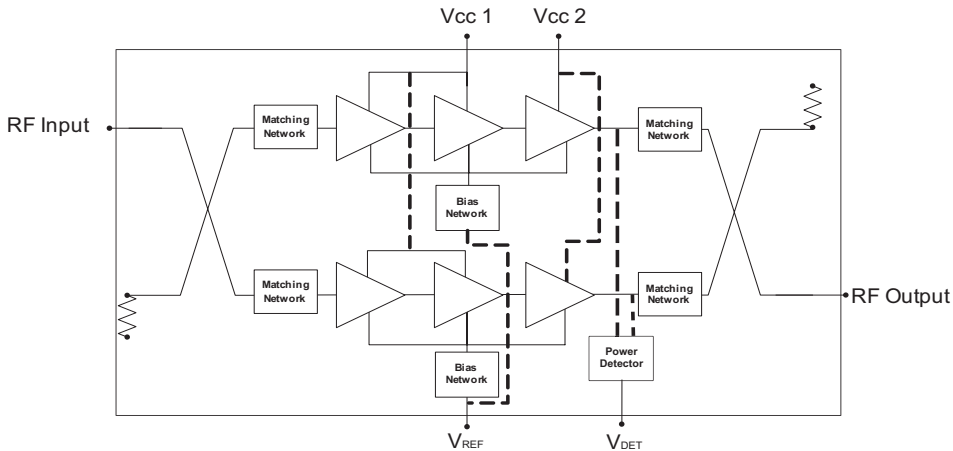


Figure 1: Block Diagram

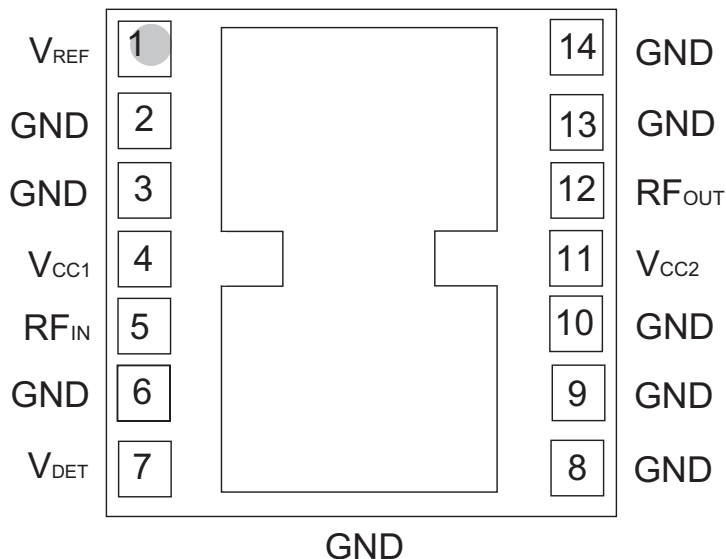


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	V <sub>REF</sub>	Reference Voltage
2	GND	Ground
3	GND	Ground
4	V <sub>CC1</sub>	Supply Voltage
5	RF <sub>IN</sub>	RF Input
6	GND	Ground
7	V <sub>DET</sub>	Detector Output
8	GND	Ground
9	GND	Ground
10	GND	Ground
11	V <sub>CC2</sub>	Supply Voltage
12	RF <sub>OUT</sub>	RF Output
13	GND	Ground
14	GND	Ground

## ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Supply Voltage ( $V_{CC}$ )	0	+5	V
Reference Voltage ( $V_{REF}$ )	0	+3.5	V
RF Output Power ( $P_{OUT}$ )	-	+30	dBm, modulated
RF Input Power ( $P_{IN}$ )	-	+10	dBm, CW
ESD Rating Human Body Model <sup>(1)</sup> Charged Device Model <sup>(2)</sup>	Class 1C Class IV	- -	
MSL Rating <sup>(3)</sup>	4	-	
Junction Temperature ( $T_J$ )	-	+150	°C
Storage Temperature ( $T_{STG}$ )	-40	+150	°C

Functional operation is not implied under these conditions. Exceeding any one or a combination of the Absolute Maximum Rating Conditions may cause permanent damage to the device. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Notes:

(1) JEDEC JS-001-2010.

(2) JEDEC JESD22-C101D.

(3) 260 °C peak reflow.

Table 3: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (f)	1930	-	1995	MHz	
Supply Voltage ( $V_{CC}$ )	+3.6	+4.5	+4.65	V	
Reference Voltage ( $V_{REF}$ )	+2.80 0	+2.85 -	+2.90 +0.5	V	PA "on" PA "shut down"
RF Output Power ( $P_{OUT}$ ) <sup>(1)</sup>	-	+27	-	dBm	
Case Temperature ( $T_C$ ) <sup>(2)</sup>	-40	-	+85	°C	

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

Notes:

(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: Electrical Specifications**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +4.5 V, V<sub>REF</sub> = +2.85 V, 50 Ω system)**

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain <sup>(2)</sup>	27	30.5	34	dB	1930 - 1995 MHz
ACPR <sup>(1), (2), (3)</sup> @ 5 MHz @ 10 MHz	- -	-51 -63	-47 -60	dBc	
Power-Added Efficiency <sup>(1), (2), (3)</sup>	12	15.5	-	%	
Thermal Resistance (R <sub>JC</sub> ) <sup>(4)</sup>	-	12	-	°C/W	Junction to Case
Supply Current <sup>(1), (2), (3)</sup>	-	720	930	mA	total through V <sub>CC</sub> pins
Quiescent Current (I <sub>q</sub> )	196	227	290	mA	
Reference Current	10	13	18	mA	through V <sub>REF</sub> pin
Leakage Current	-	3	10	μA	V <sub>CC</sub> = +5 V, V <sub>REF</sub> = 0 V
Harmonics 2f <sub>o</sub> 3f <sub>o</sub> , 4f <sub>o</sub>	- -	-50 -54	-45 -50	dBc	
Input Return Loss	15	20	-	dB	
Output Return Loss	15	20	-	dB	
P1dB	-	+35	-	dBm	CW tone
Spurious Output Level (all spurious outputs)	-	-	-60	dBc	P <sub>OUT</sub> ≤ +27 dBm In-band load VSWR < 5:1 Out-of-band load VSWR < 10:1 Applies over all voltage and temperature operating ranges
Load mismatch stress with no permanent degradation or failure	8:1	-	-	VSWR	V <sub>CC</sub> = +4.5 V, P <sub>OUT</sub> = +27 dBm Applies over full operating temperature range

**Notes:**

(1) ACPR and Efficiency measured at 1960 MHz.

(2) P<sub>OUT</sub> = +27 dBm.

(3) TM1 WCDMA 64 DPCH.

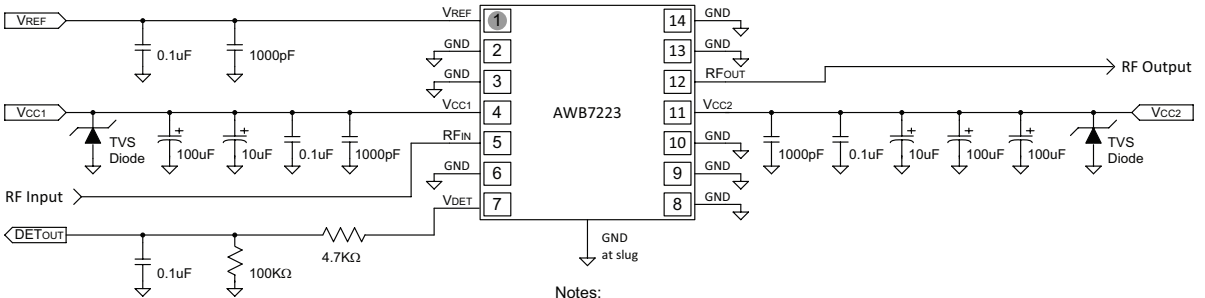
(4) Use only V<sub>CC2</sub> (pin 11) current when calculating device junction temperature.

**APPLICATION INFORMATION**

To ensure proper performance, refer to all related Application Notes.

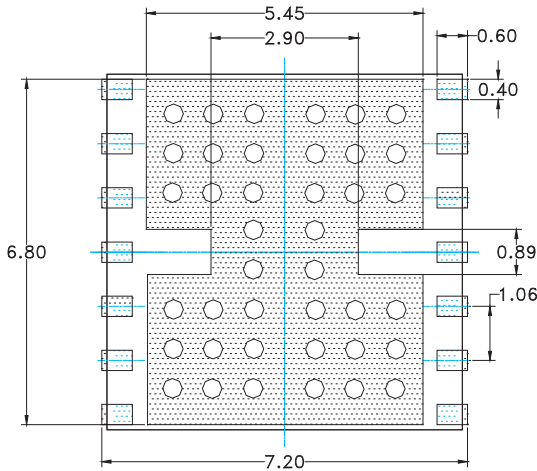
**Shutdown Mode**

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

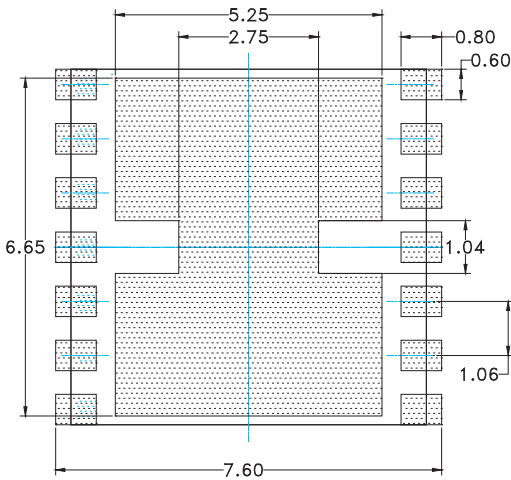


- Notes:
1. 10uF and 100uF capacitors are optional.
  2. Applications that have large supply voltage transients may benefit from the use of TVS diodes. For such applications, recommended TVS diodes are SM05T1G or SMJ5.0A.

**Figure 3: Application Circuit Schematic**



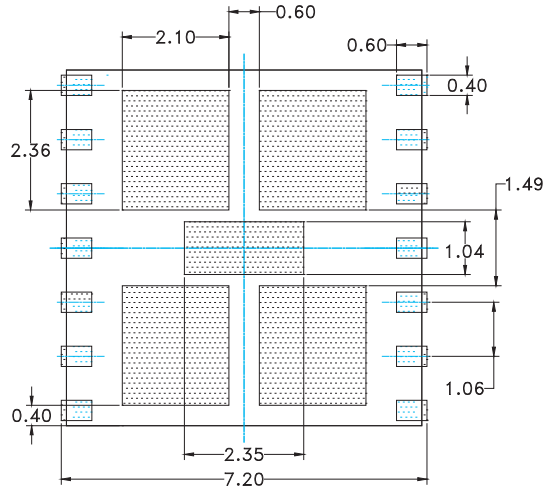
PCB METAL  
TOP (X-RAY) VIEW  
ONLY PACKAGE I/O's AND  
GROUND REQUIREMENTS  
SHOWN.



PCB SOLDER MASK  
TOP (X-RAY) VIEW

NOTES:

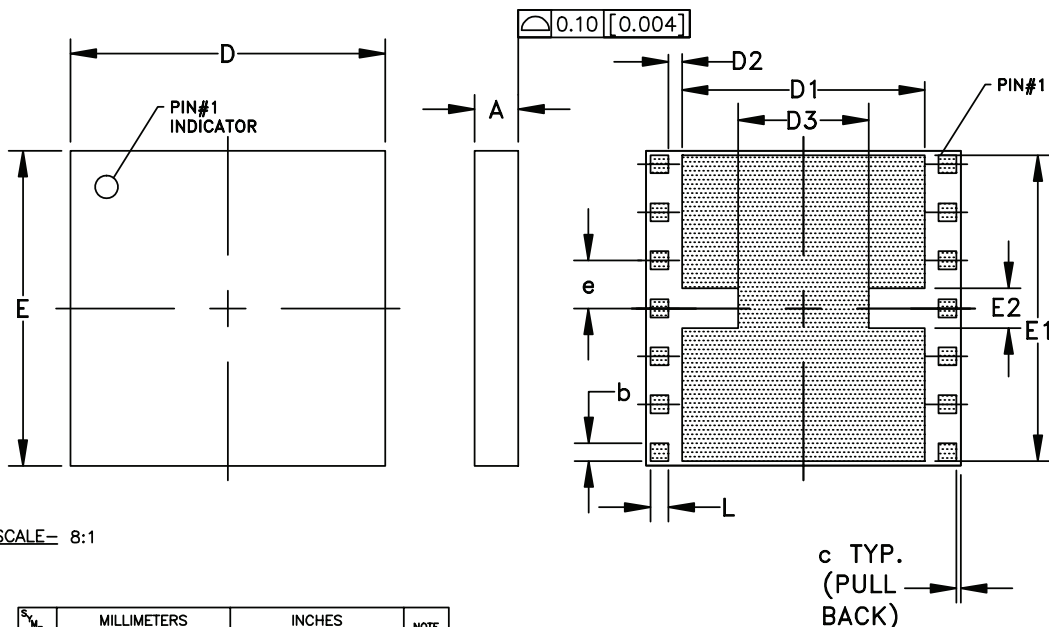
- (1) UNLESS SPECIFIED DIMENSIONS ARE SYMMETRICAL ABOUT CENTER LINES SHOWN.
- (2) DIMENSIONS IN MILLIMETERS.
- (3) VIAS SHOWN IN PCB METAL VIEW ARE FOR REFERENCE ONLY. NUMBER & SIZE OF THERMAL VIAS REQUIRED DEPENDENT ON HEAT DISSIPATION REQUIREMENT AND THE PCB PROCESS CAPABILITY.



STENCIL APERTURE  
TOP (X-RAY) VIEW

Figure 4: PCB Footprint

PACKAGE OUTLINE



SCALE= 8:1

DIM.	MILLIMETERS			INCHES			NOTE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	1.17	1.27	1.37	0.046	0.05	0.054	--
b	0.375	0.400	0.425	0.0148	0.0157	0.0167	14X
c	--	0.10	--	--	0.004	--	--
D	6.90	7.00	7.10	0.272	0.276	0.280	--
D1	--	5.40	--	--	0.213	--	--
D2	--	0.30	--	--	0.0118	--	--
D3	--	2.90	--	--	0.114	--	--
E	6.90	7.00	7.10	0.272	0.276	0.280	--
E1	--	6.80	--	--	0.268	--	--
E2	--	0.89	--	--	0.035	--	--
e	--	1.067	--	--	0.0420	--	6X
L	0.375	0.400	0.425	0.0148	0.0157	0.0167	14X

NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS
2. UNLESS SPECIFIED TOLERANCE=±0.076[0.003].
3. PADS (INCLUDING CENTER) SHOWN UNIFORM SIZE FOR REFERENCE ONLY. ACTUAL PAD SIZE AND LOCATION WILL VARY WITHIN MIN. AND MAX. DIMENSIONS ACCORDING TO SPECIFIC LAMINATE DESIGN.

Figure 5: M52 Package Outline - 14 Pin 7 mm x 7 mm x 1.3 mm Surface Mount Module

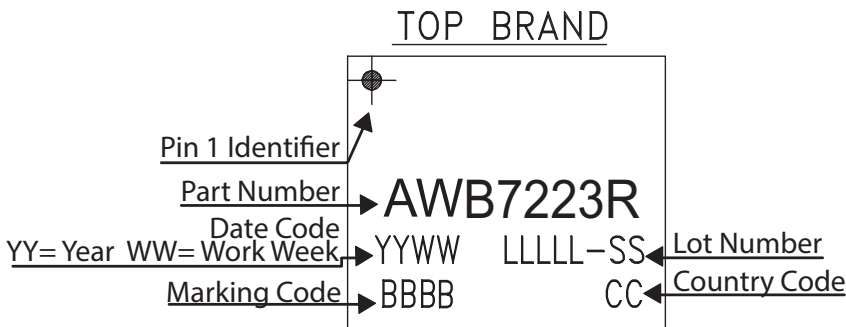


Figure 6: Branding Specification





## ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AWB7223RM52P7	-40 °C to +85 °C	RoHS-compliant 14 Pin 20 pin, 4 x 4 x 0.80 mm Surface Mount Module	Bags
AWB7223RM52P8	-40 °C to +85 °C	RoHS-compliant 14 Pin 20 pin, 4 x 4 x 0.80 mm Surface Mount Module	Tape and Reel, 2500 pieces per Reel
AWB7223RM52P9	-40 °C to +85 °C	RoHS-compliant 14 Pin 20 pin, 4 x 4 x 0.80 mm Surface Mount Module	Partial Reel

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