

### FEATURES

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

### APPLICATIONS

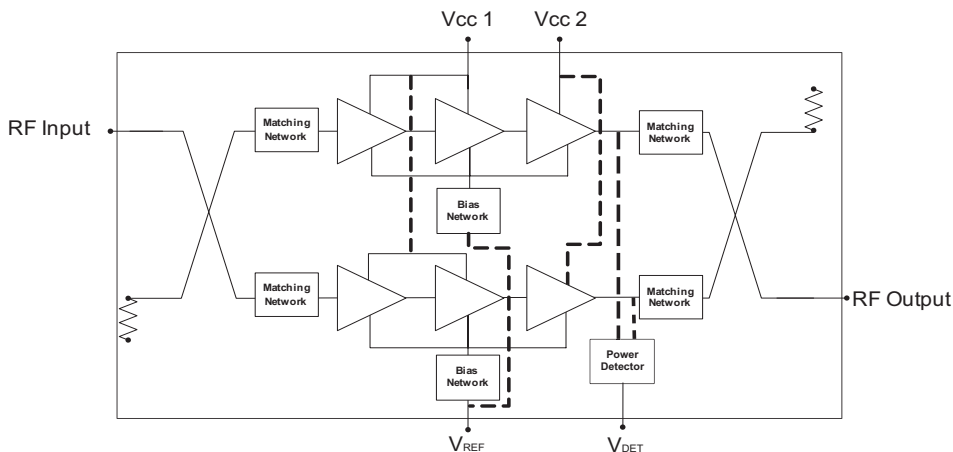
- WCDMA, HSDPA and LTE Air Interfaces
- Picocell, Femtocell, Home Nodes
- Customer Premises Equipment (CPE)
- Data Cards and Terminals



### 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  $\Omega$  system.



**Figure 1: Block Diagram**

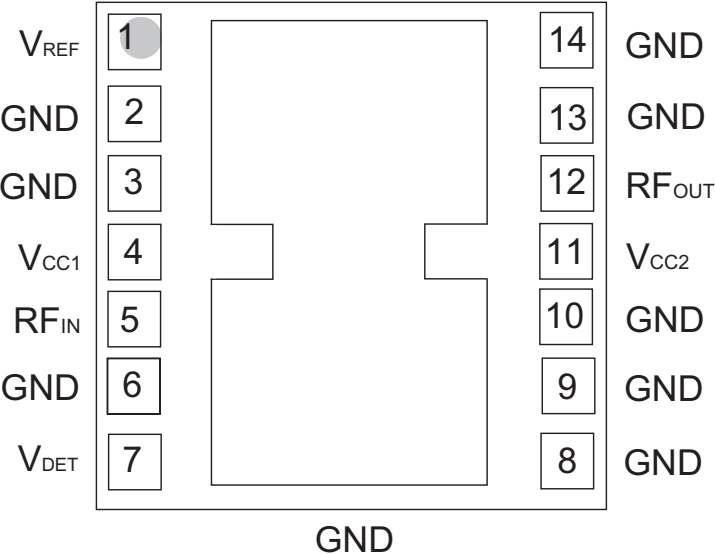


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

| PIN | NAME       | DESCRIPTION       |
|-----|------------|-------------------|
| 1   | $V_{REF}$  | Reference Voltage |
| 2   | GND        | Ground            |
| 3   | GND        | Ground            |
| 4   | $V_{CC1}$  | Supply Voltage    |
| 5   | $RF_{IN}$  | RF Input          |
| 6   | GND        | Ground            |
| 7   | $V_{DET}$  | Detector Output   |
| 8   | GND        | Ground            |
| 9   | GND        | Ground            |
| 10  | GND        | Ground            |
| 11  | $V_{CC2}$  | Supply Voltage    |
| 12  | $RF_{OUT}$ | 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<br>Human Body Model <sup>(1)</sup><br>Charged Device Model <sup>(2)</sup> | Class 1C<br>Class IV | -<br>- |                |
| 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<br>0 | +2.85<br>- | +2.90<br>+0.5 | V    | PA "on"<br>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><br>@ 5 MHz<br>@ 10 MHz              | -<br>- | -51<br>-63 | -47<br>-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<br>2f <sub>o</sub><br>3f <sub>o</sub> , 4f <sub>o</sub> | -<br>- | -50<br>-54 | -45<br>-50 | dBc  |                                                                                                                                                       |
| Input Return Loss                                                 | 15     | 20         | -          | dB   |                                                                                                                                                       |
| Output Return Loss                                                | 15     | 20         | -          | dB   |                                                                                                                                                       |
| P1dB                                                              | -      | +35        | -          | dBm  | CW tone                                                                                                                                               |
| Spurious Output Level<br>(all spurious outputs)                   | -      | -          | -60        | dBc  | P <sub>OUT</sub> ≤ +27 dBm<br>In-band load VSWR < 5:1<br>Out-of-band load VSWR < 10:1<br>Applies over all voltage and<br>temperature operating ranges |
| Load mismatch stress with no<br>permanent degradation or failure  | 8:1    | -          | -          | VSWR | V <sub>CC</sub> = +4.5 V, P <sub>OUT</sub> = +27 dBm<br>Applies over full operating<br>temperature range                                              |

Notes:

(1) ACPR and Efficiency measured at 1960 MHz.

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

(3) TM1 WCDMA 64 DPCH.

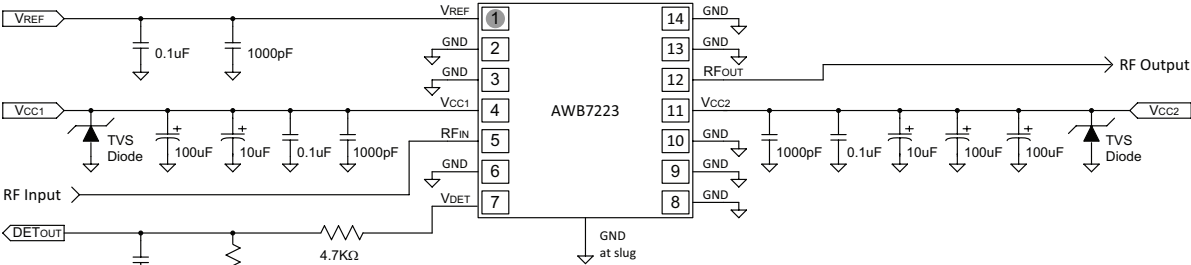
(4) Use only V<sub>CC2</sub> (pin 11) current when calculating device junction temperature.

# APPLICATION INFORMATION

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

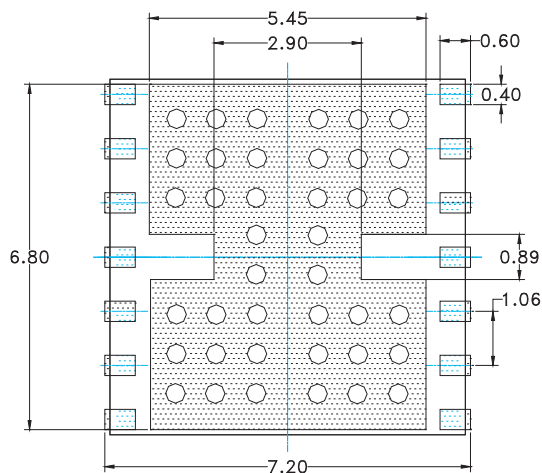
## Shutdown Mode

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

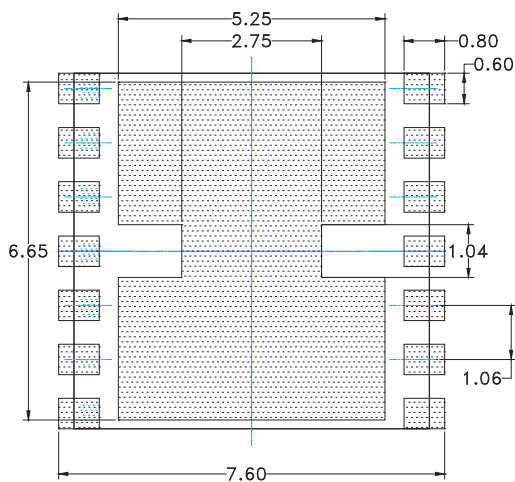


- Notes:
1. 10uF and 100uF capacitors are optional.
  2. Applications that have large supply voltage transients may benefit from the use of TVS diodes. For such applications, recommended TVS diodes are SM05T1G or SMJ5.0A.

Figure 3: Application Circuit Schematic

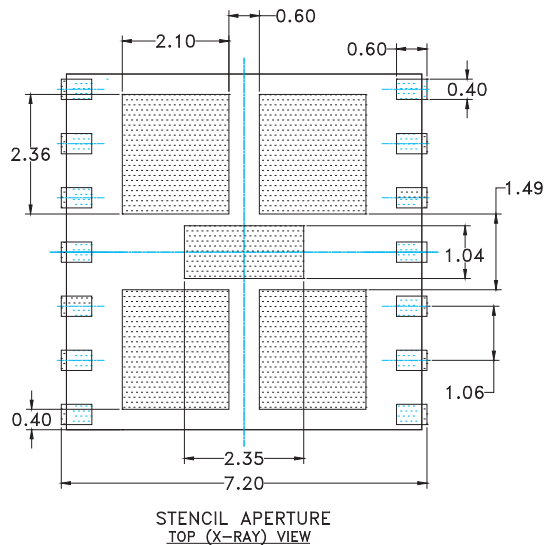


ONLY PACKAGE I/O's AND  
GROUND REQUIREMENTS  
SHOWN.



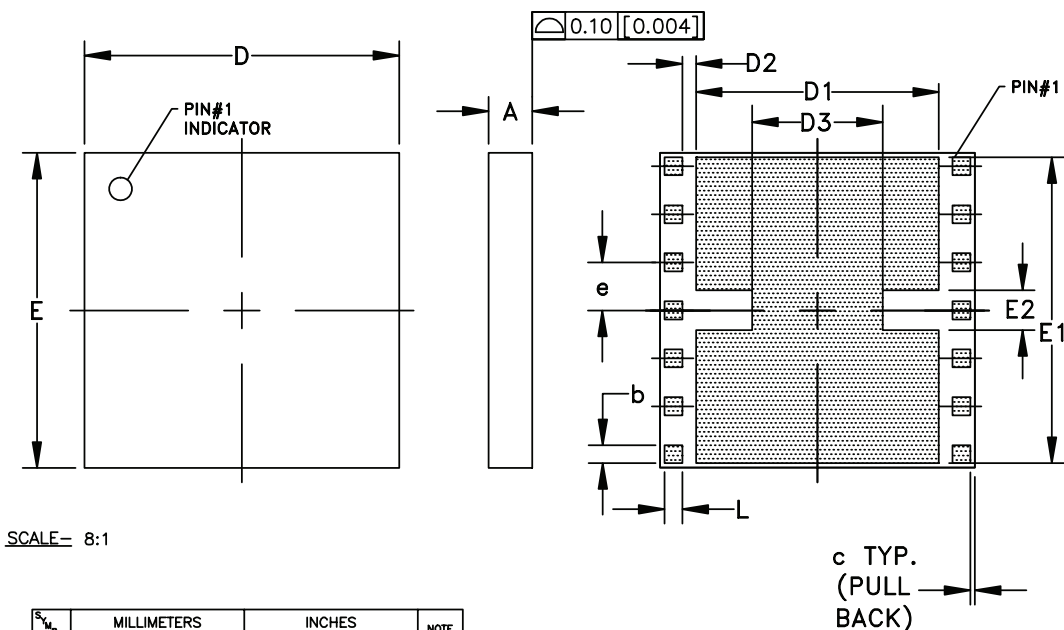
#### NOTES:

- (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.



**Figure 4: PCB Footprint**

## PACKAGE OUTLINE



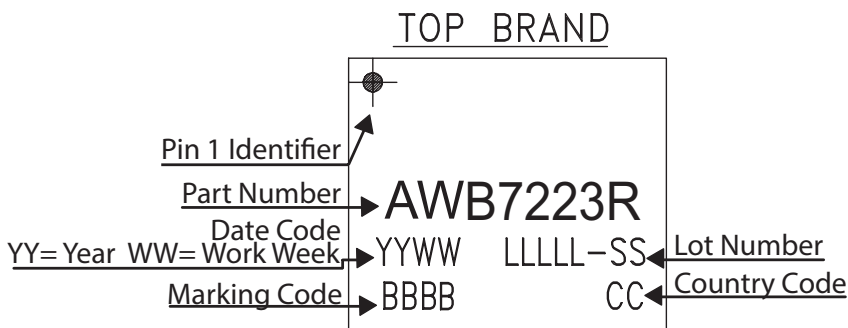
SCALE- 8:1

| Screw | 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= $\pm 0.076[0.003]$ .  
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



### Table 5: Tape & Reel Dimensions

| PACKAGE TYPE         | TAPE WIDTH | POCKET PITCH | REEL CAPACITY | MAX REEL DIA |
|----------------------|------------|--------------|---------------|--------------|
| 7 mm x 7 mm x 1.3 mm | 16 mm      | 12 mm        | 2500          | 13"          |



**ORDERING INFORMATION**

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

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