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# SKYWORKS®

## AWB7225

860 - 894 MHz

### Small-Cell Power Amplifier Module

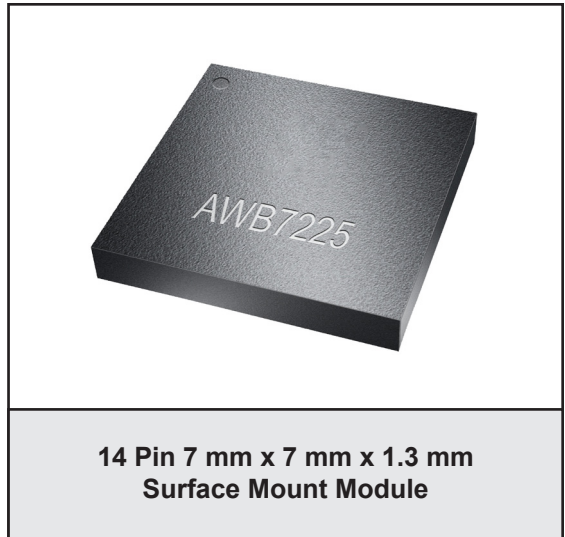
DATA SHEET

#### FEATURES

- InGaP HBT Technology
- -48 dBc ACPR @ ±10 MHz, +27 dBm
- 30 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

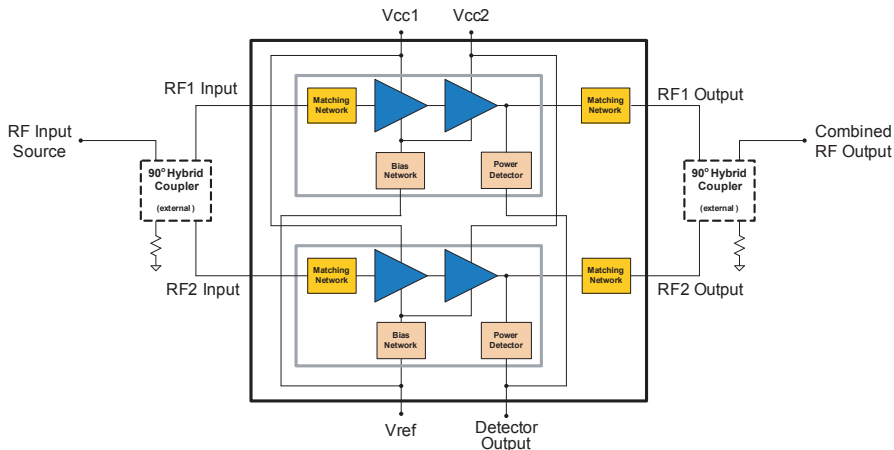
- LTE, WCDMA, and HSDPA Air Interfaces
- Picocell, Femtocell, Home Nodes
- Customer Premises Equipment (CPE)



#### PRODUCT DESCRIPTION

The AWB7225 is a fully matched, Multi-Chip-Module (MCM) designed for picocell, femtocell, and customer premises equipment (CPE) applications. Consisting of two parallel path high linearity, high efficiency power amplifiers, the device meets the extremely demanding needs of small cell infrastructure architectures. Designed for LTE, WCDMA and HSDPA air interfaces operating in the 860 MHz to 894 MHz bands, the AWB7225 delivers up to +27 dBm of LTE (E-TM1.1)

power through an external 90-degree hybrid coupler, with an ACPR of -48 dBc. The device operates from a convenient +4.5 V supply and provides 30 dB of RF gain. The AWB7225 is manufactured using an advanced InGaP HBT MMIC technology offering state-of-the-art reliability, temperature stability, and ruggedness. Its 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**

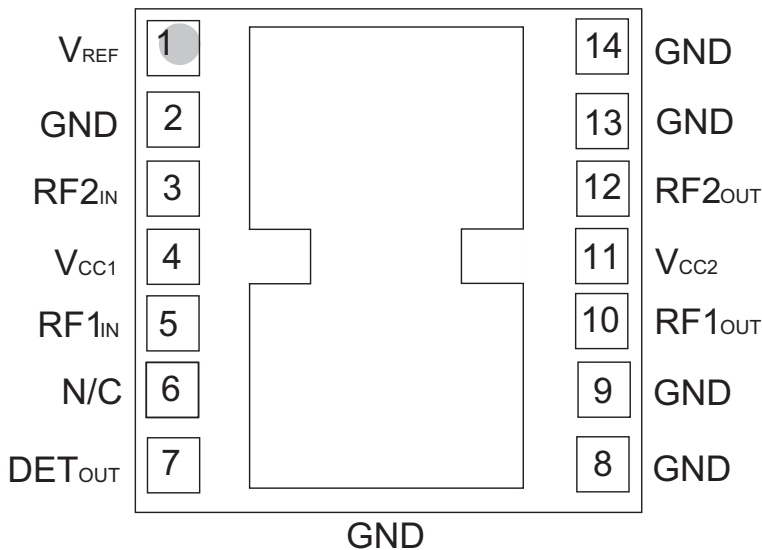


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

| PIN | NAME               | DESCRIPTION       |
|-----|--------------------|-------------------|
| 1   | V <sub>REF</sub>   | Reference Voltage |
| 2   | GND                | Ground            |
| 3   | RF2 <sub>IN</sub>  | RF2 Input         |
| 4   | V <sub>CC1</sub>   | Supply Voltage    |
| 5   | RF1 <sub>IN</sub>  | RF1 Input         |
| 6   | N/C                | No Connection     |
| 7   | DET <sub>OUT</sub> | Detector Output   |
| 8   | GND                | Ground            |
| 9   | GND                | Ground            |
| 10  | RF1 <sub>OUT</sub> | RF1 Output        |
| 11  | V <sub>CC2</sub>   | Supply Voltage    |
| 12  | RF2 <sub>OUT</sub> | RF2 Output        |
| 13  | GND                | Ground            |
| 14  | GND                | Ground            |

## ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

| PARAMETER  | MIN                  | MAX    | UNIT           |
|--|----------------------|--------|----------------|
| Supply Voltage (V <sub>CC</sub> )  | 0                    | +5     | V              |
| Reference Voltage (V <sub>REF</sub> )  | 0                    | +3.5   | V              |
| RF Output Power (P <sub>OUT</sub> ) <sup>(1)</sup>                                   | -                    | +30    | dBm, modulated |
| RF Input Power (P <sub>IN</sub> )  | -                    | +10    | dBm, CW        |
| ESD Rating<br>Human Body Model <sup>(2)</sup><br>Charged Device Model <sup>(3)</sup> | Class 1C<br>Class IV | -<br>- |                |
| MSL Rating <sup>(4)</sup>  | 4                    | -      |                |
| Junction Temperature (T <sub>J</sub> )   | -                    | +150   | °C             |
| Storage Temperature (T <sub>STG</sub> )  | -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) At output of external 90° hybrid coupler.

(2) JEDEC JS-001-2010.

(3) JEDEC JESD22-C101D.

(4) 260 °C peak reflow.

Table 3: Operating Ranges

| PARAMETER  | MIN        | TYP        | MAX           | UNIT | COMMENTS                  |
|--|------------|------------|---------------|------|---------------------------|
| Operating Frequency (f)                            | 860        | -          | 894           | MHz  |                           |
| Supply Voltage (V <sub>CC</sub> )                  | +3.6       | +4.5       | +4.65         | V    |                           |
| Reference Voltage (V <sub>REF</sub> )              | +2.80<br>0 | +2.85<br>- | +2.90<br>+0.5 | V    | PA "on"<br>PA "shut down" |
| RF Output Power (P <sub>OUT</sub> ) <sup>(1)</sup> | -          | +27        | -             | dBm  |                           |
| Case Temperature (T <sub>C</sub> ) <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         | 32         | dB   |  |
| ACPR <sup>(1), (2), (3)</sup><br>@ 10 MHz<br>@ 20 MHz                            | -<br>- | -48<br>-57 | -45<br>-54 | dBc  |  |
| Power-Added Efficiency <sup>(1), (2), (3)</sup>                                  | 12     | 14         | -          | %    |  |
| Thermal Resistance (R <sub>JC</sub> ) <sup>(4)</sup>                             | -      | 14.5       | -          | °C/W | Junction to Case   |
| Supply Current <sup>(1), (2), (3)</sup>  | -      | 796        | 928        | mA   | total through V <sub>CC</sub> pins   |
| Quiescent Current (I <sub>q</sub> )  | 200    | 270        | 350        | mA   |  |
| Reference Current  | 7.5    | 10         | 12.5       | 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 <sup>(2)</sup><br>2f <sub>o</sub><br>3f <sub>o</sub> , 4f <sub>o</sub> | -<br>- | -55<br>-63 | -45<br>-53 | dBc  |  |
| Input Return Loss <sup>(2)</sup>   | 15     | 20         | -          | dB   |  |
| Output Return Loss <sup>(2)</sup>  | 15     | 20         | -          | dB   |  |
| P1dB   | -      | +35.5      | -          | dBm  | CW tone  |
| Spurious Output Level <sup>(2)</sup><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 temperature operating ranges |
| Load mismatch stress with no permanent degradation or failure <sup>(2)</sup>     | 8:1    | -          | -          | VSWR | V <sub>CC</sub> = +4.5 V, P <sub>OUT</sub> = +27 dBm<br>Applies over full operating temperature range  |

**Notes:**

(1) ACPR and Efficiency measured at 877 MHz.

(2) P<sub>OUT</sub> = +27 dBm, using specified external 90° hybrid couplers.

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

(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.

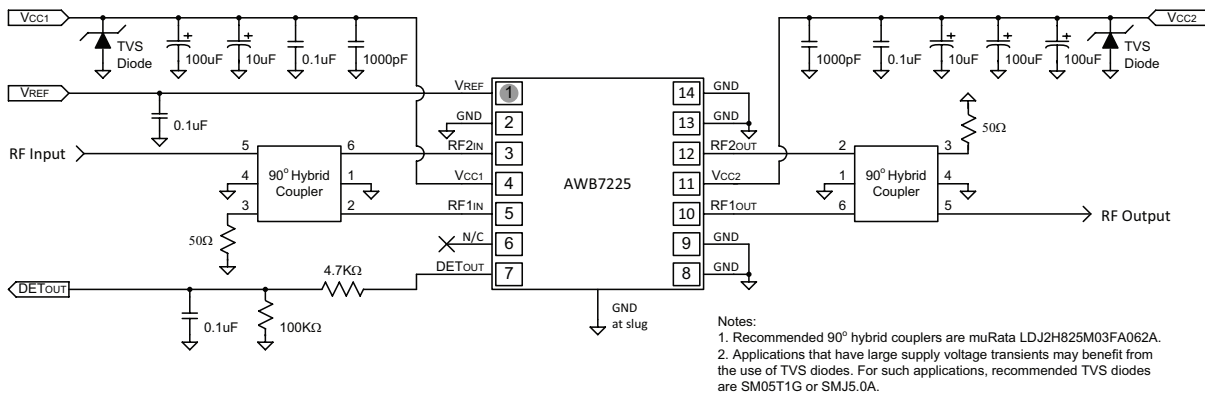
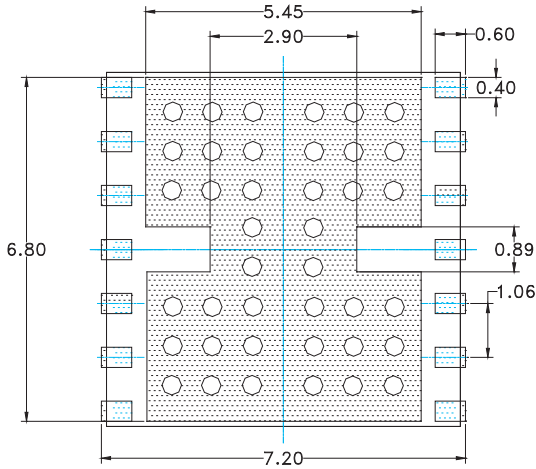


Figure 3: Application Circuit Schematic

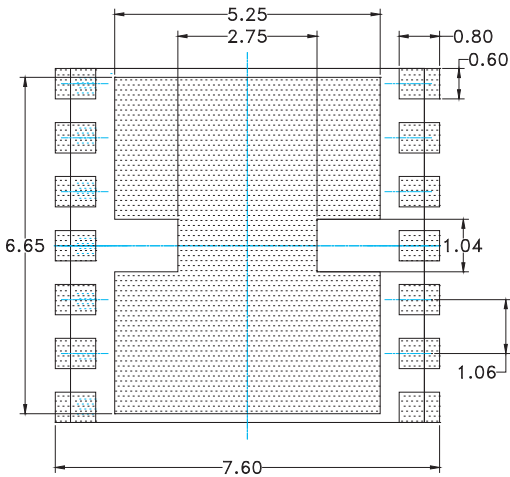


PCB METAL  
TOP (X-RAY) VIEW

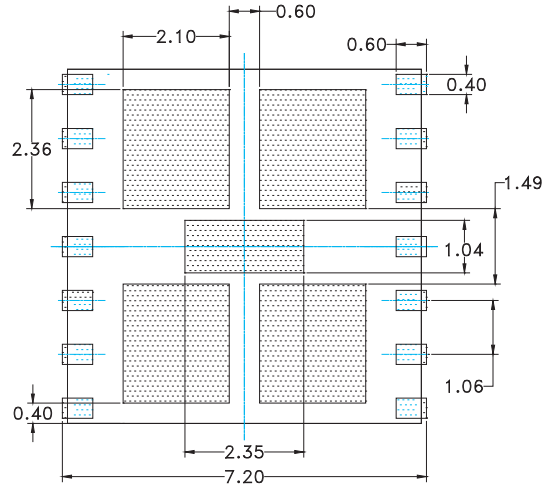
ONLY PACKAGE I/O's AND  
GROUND REQUIREMENTS  
SHOWN.

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.



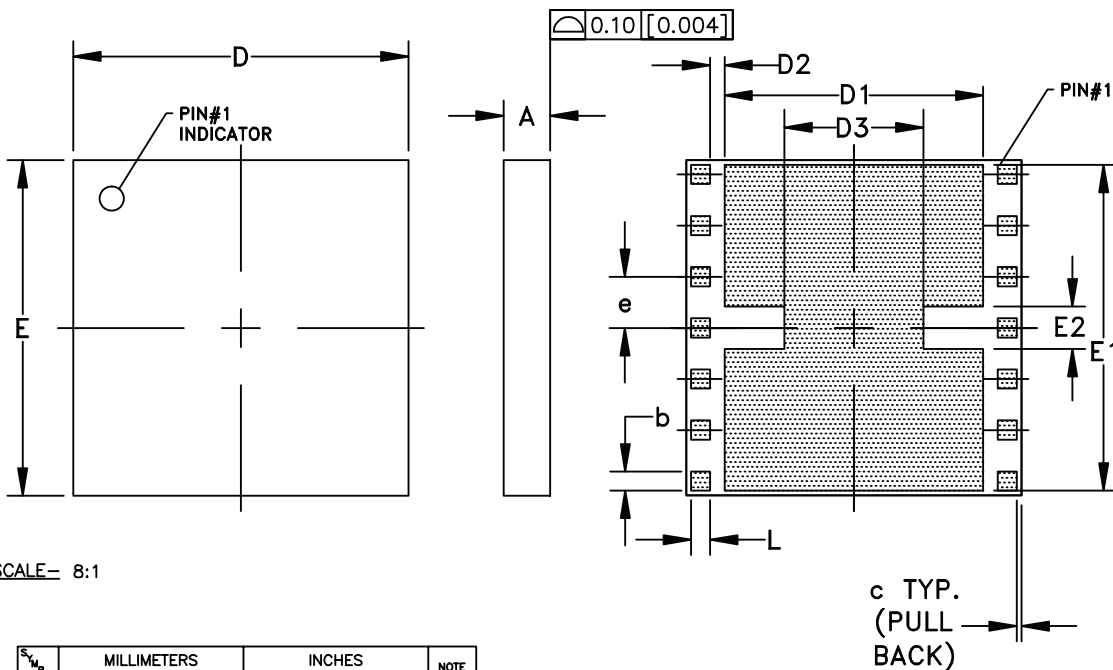
PCB SOLDER MASK  
TOP (X-RAY) VIEW



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

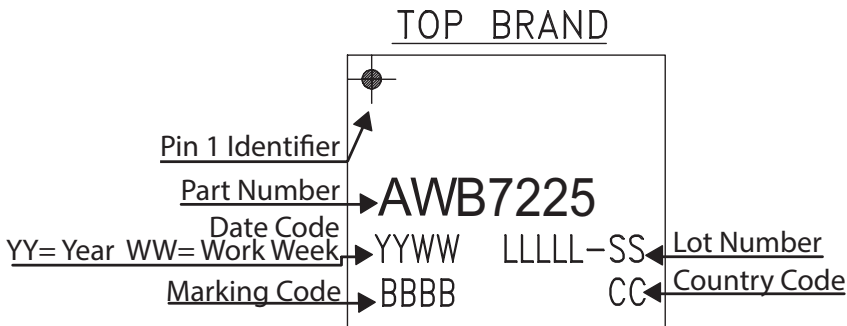


Figure 6: Branding Specification



COMPONENT PACKAGING

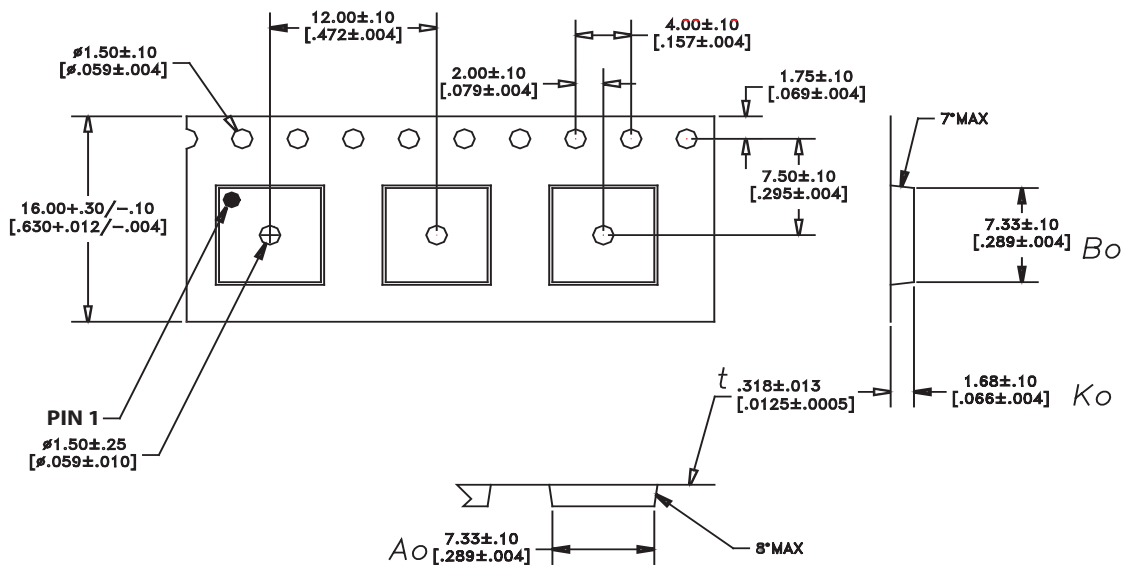


Figure 7: Tape & Reel Packaging

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                 |
|--------------|-------------------|---|-------------------------------------|
| AWB7225P7    | -40 °C to +85 °C  | RoHS-compliant 14 Pin<br>7 mm x 7 mm x 1.3 mm<br>Surface Mount Module | Loose in Bag                        |
| AWB7225P8    | -40 °C to +85 °C  | RoHS-compliant 14 Pin<br>7 mm x 7 mm x 1.3 mm<br>Surface Mount Module | Tape and Reel, 2500 pieces per Reel |
| AWB7225P9    | -40 °C to +85 °C  | RoHS-compliant 14 Pin<br>7 mm x 7 mm x 1.3 mm<br>Surface Mount Module | Partial Reel                        |

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