DATA SHEET

AWB7138: 791 to 821 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
- -48 dBc ACPR @ ±10 MHz, +24.5 dBm
- 31 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
- Surface-mount (14-pin, 7 × 7 × 1.3 mm) package (MSL3, 260 °C per JEDEC J-STD-020)

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Description

The AWB7138 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, HSDPA air interfaces operating in the 791 MHz to 821 MHz band, the AWB7138 delivers up to +24.5 dBm of LTE (E-TM1.1) power with an ACPR of -48 dBc. The device operates from a convenient +4.2 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 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 block diagram of the AWB7138 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.

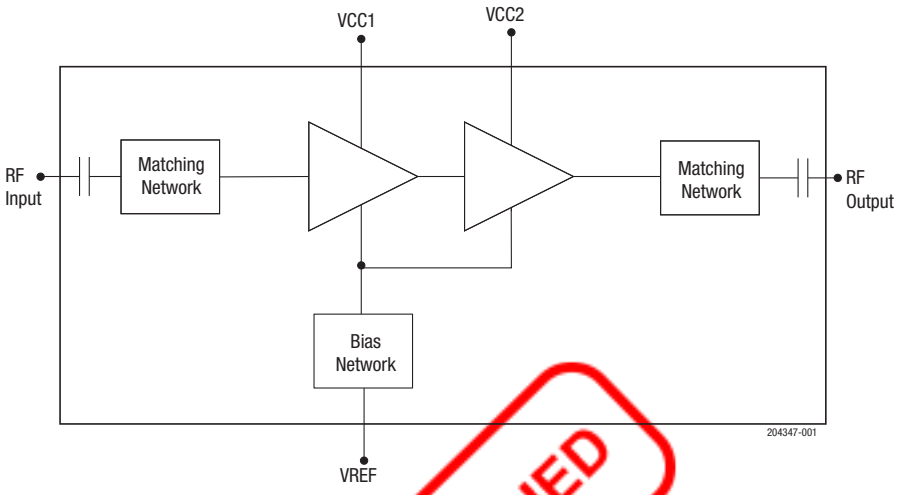

Figure 1. AWB7138 Block Diagram

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Figure 2. AWB7138 Pinout
(Top View)

Table 1. AWB7138 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	N/C	No connection	14	GND	Ground

Electrical and Mechanical Specifications

The absolute maximum ratings of the AWB7138 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. AWB7138 Absolute Maximum Ratings[1]

Parameter	Minimum	Maximum	Units
Supply voltage (V_{CC})	0	+5	V
Reference voltage (V_{REF})	0	+3.5	V
RF output power (P_{OUT})		+28	dBm, modulated
RF input power (P_{IN})		+10	dBm, CW
Junction temperature (T_J)		+150	°C
Storage temperature (T_{STG})	-40	+150	°C
Electrostatic discharge:			
Human Body Model, Class 1C[2]		2000	V
Charged Device Model, Class 4[3]		1000	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.

[2] JEDEC JS-001-2010.

[3] JEDEC JESD22-C101D.

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***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. AWB7138 Recommended Operating Conditions[1]

Parameter	Symbol	Min	Typ	Max	Units
Operating frequency	f	791		821	MHz
Supply voltage	V_{CC}	+3.2	+4.2	+4.5	V
Reference voltage:					
PA on	V_{REF}	+2.80	+2.85	+2.90	V
PA off		0		+0.5	V
RF output power[2]	P_{OUT}		+24.5		dBm
Case temperature[3]	T_C	-40		+85	°C

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

2 Typ RF output power is used during production test.

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

Table 4. AWB7138 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		28.5	31	36	dB
ACPR:[1,2,3] @ 10 MHz offset @ 20 MHz offset		10 MHz LTE BW		 -48 -57	 -45 -54	 dBc dBc
Power-added efficiency[1,2,3]			12	16.5		%
Thermal resistance	R_{JC}	Junction to case		23		°C/W
Supply current[1,2,3]	VCC	Total through VCC pins		405	545	mA
Quiescent current	Icq			140	190	mA
Reference current		Through VREF pin		5	10	mA
Leakage current		VCC = +5 V, VREF = 0 V		1.5	5	µA
Harmonics: 2fo 3fo, 4fo				 -50 -62	 -37 -40	 dBc dBc
Input return loss			9	18		dB
Spurious output level (all spurious outputs)		P_{OUT} ≤ +24.5 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		VCC = +4.2 V, PIN = +0 dBm Applies over full operating temperature range	8:1			VSWR

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1 Measured at 806 MHz.
2 P_{OUT} = +24.5 dBm.
3 E-TM1.1 10 MHz.

Evaluation Board Description

The AWB7138 Evaluation Board is used to test the performance of the AWB7138 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 V_{REF} voltage.

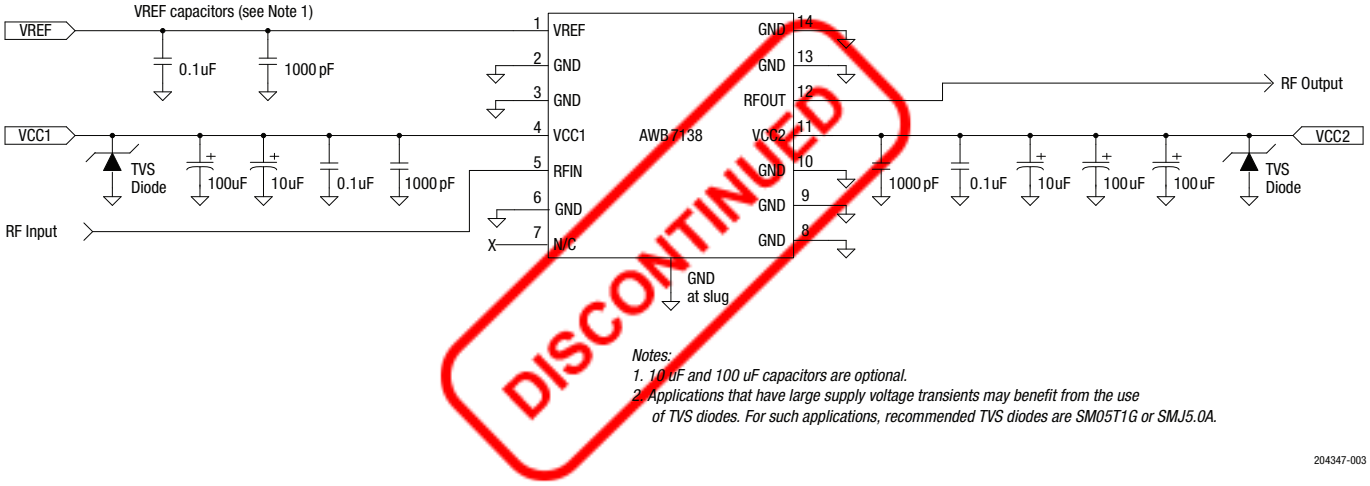


Figure 3. AWB7138 Evaluation Board Schematic

Package Dimensions

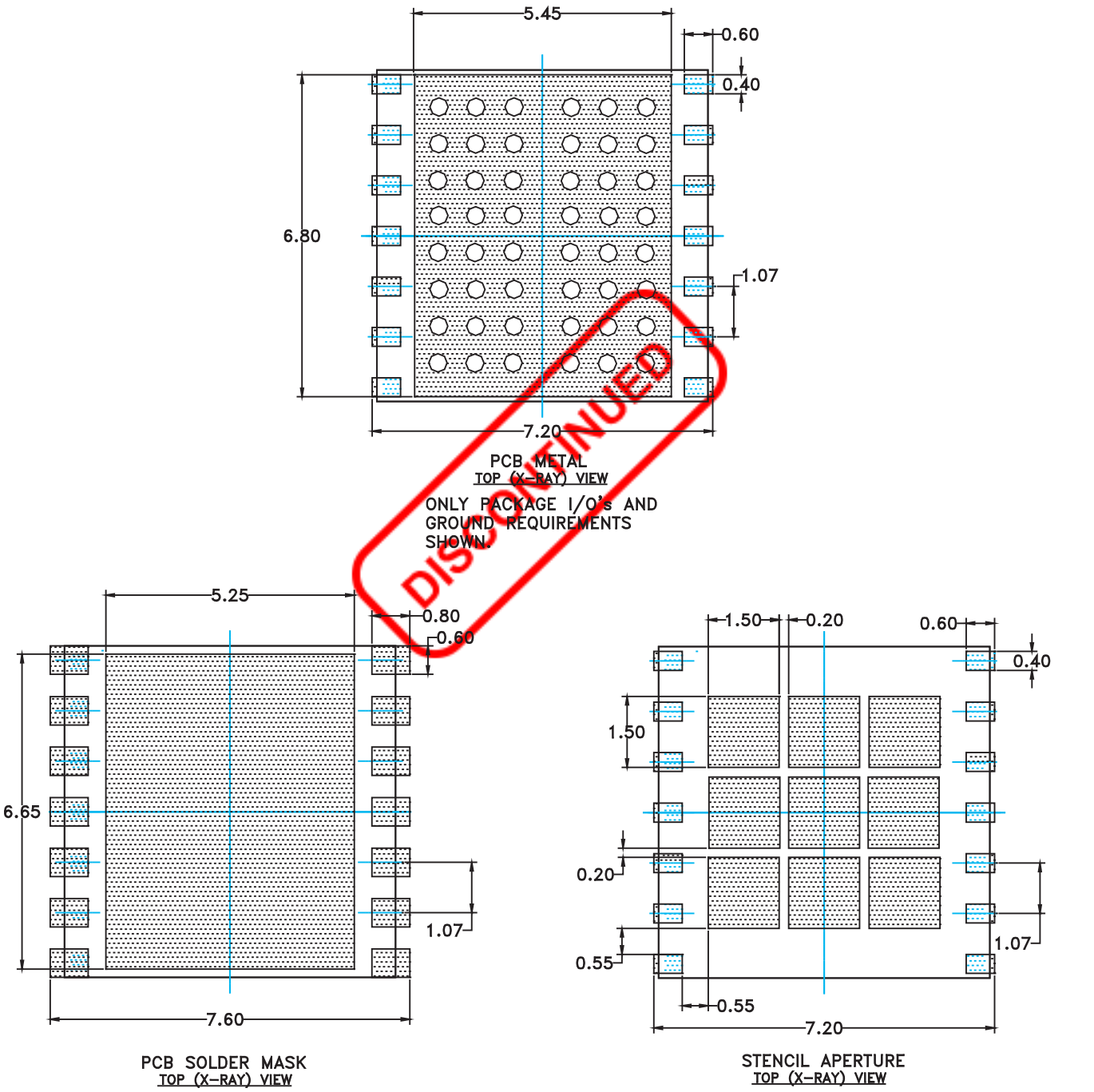
The PCB layout footprint drawing for the AWB7138 is shown in Figure 4. Typical part markings are shown in Figure 5. The package dimensions for the AWB7138 are shown in Figure 6. The tape and reel dimensions are provided in Figure 7.

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 AWB7138 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.

Figure 4. AWB7138 PCB Layout Footprint Dimensions

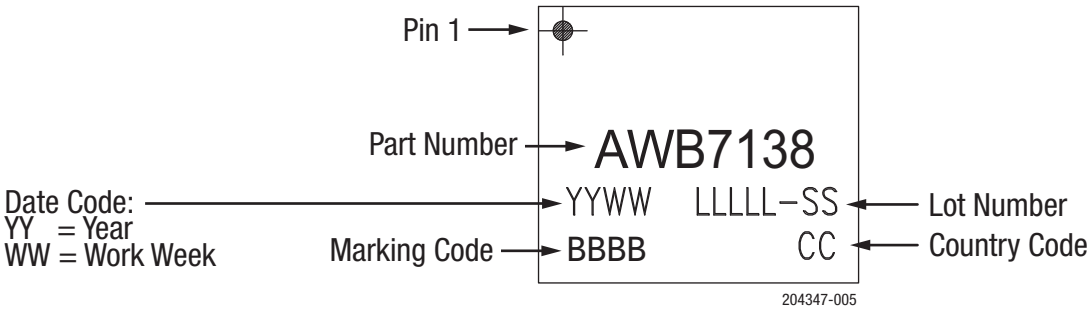
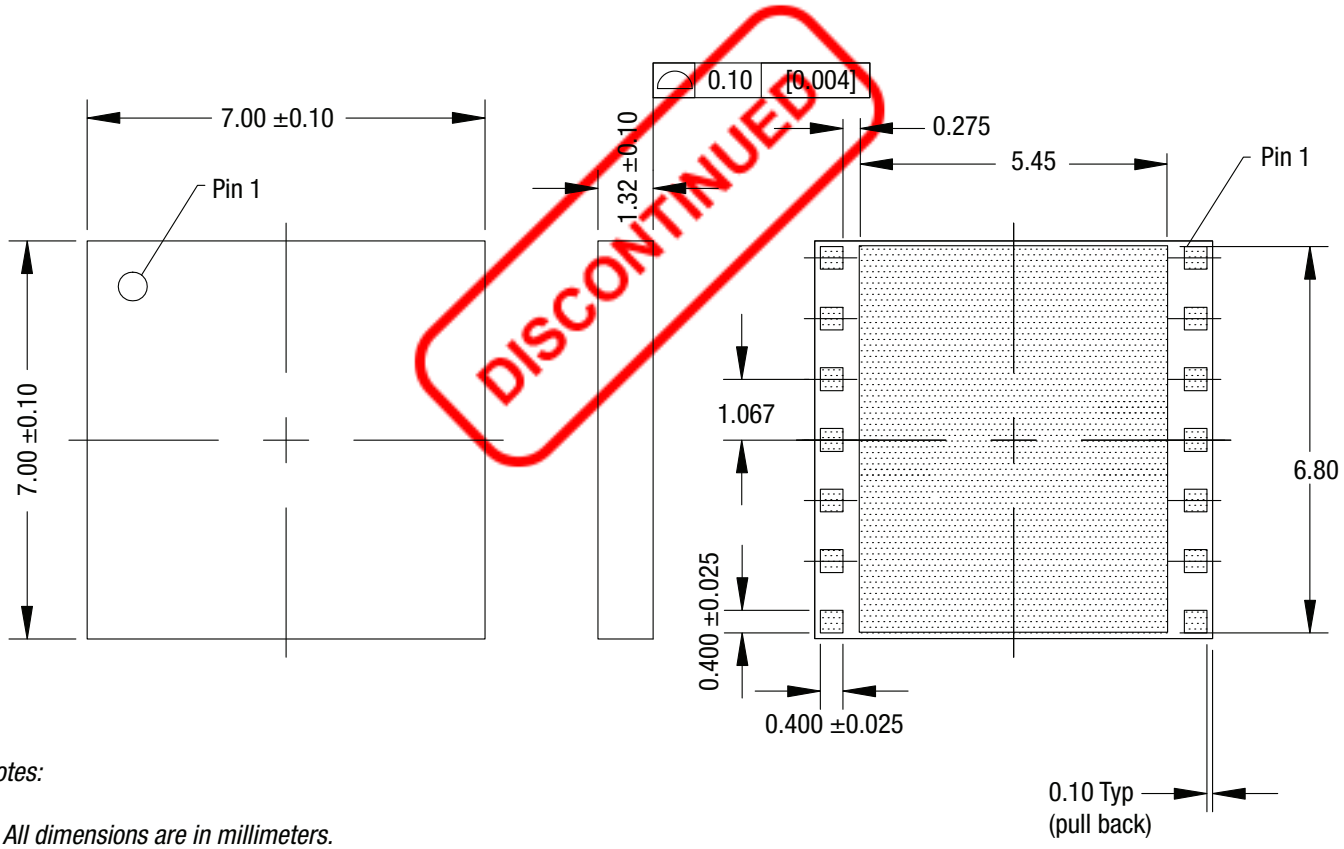


Figure 5. AWB7138 Typical Part Marking



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.

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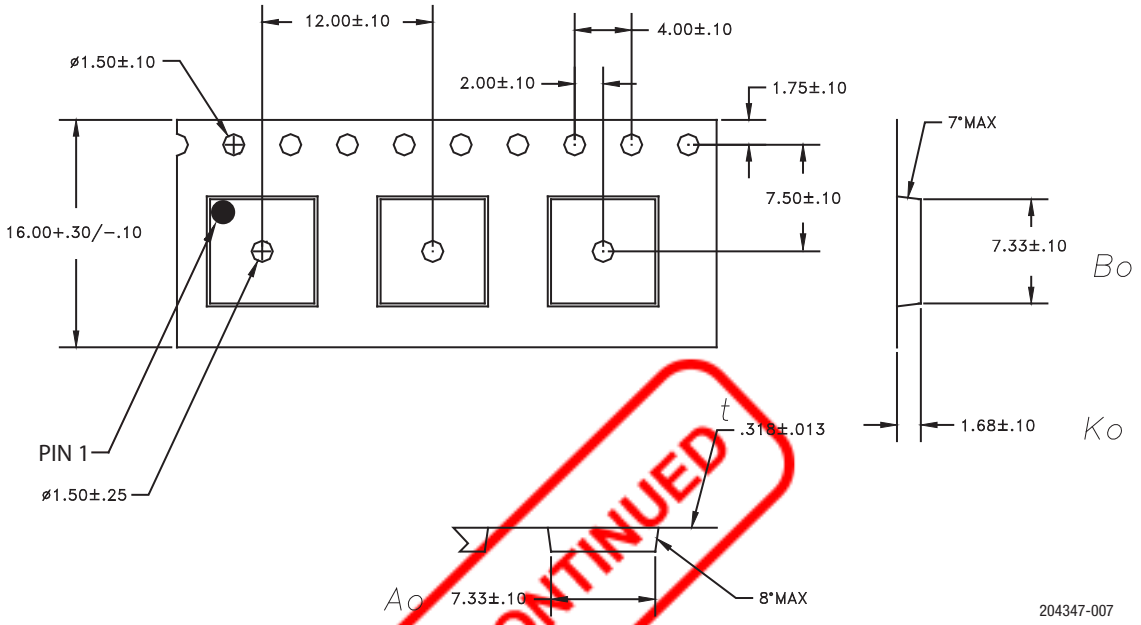
Figure 6. AWB7138 Package Dimensions



All dimensions are in millimeters.

Figure 7. AWB7138 Tape and Reel Dimensions

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Ordering Information

Part Number	Product Description	Component Packaging
AWB7138P8	RoHS-compliant 14-pin 7 x 7 x 1.3 mm surface-mount module	2500-piece tape and reel
EVB7138		Evaluation Board part number

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