

## 0.1-3GHz SP2T Switch for 3G/4G TRX

### FEATURES

- Broadband frequency range: 0.1 to 3.0 GHz
- Low insertion loss: 0.35dB typical @ 2.7 GHz
- High isolation: >23dB @ 2.7 GHz
- Integrated logic
- Small DFN (6-pin, 1.1mm x 0.7 mm) package (MSL1, 260 °C per JEDEC J-STD-020)

### APPLICATIONS

- Cellular 3G/4G TRX
- Cellular modems , tablets and USB Devices
- Other RF front-end modules

### GENERAL DESCRIPTION

The AW13412 is a SP2T switch with low insertion loss and high Isolation. It can be used to support band switching and mode switching for cellular 3G/4G, data cards and tablets.

The symmetrical design of internal ports makes it convenient for PCB routing and adjustment of receiving and transmitting signals. The band/mode switching is realized by the GPIO pins as referenced in the chip block diagram and the control logic.

The AW13412 is provided in a compact 1.1mm x 0.7mm, 6-pin DFN package.

### TYPICAL APPLICATION CIRCUIT

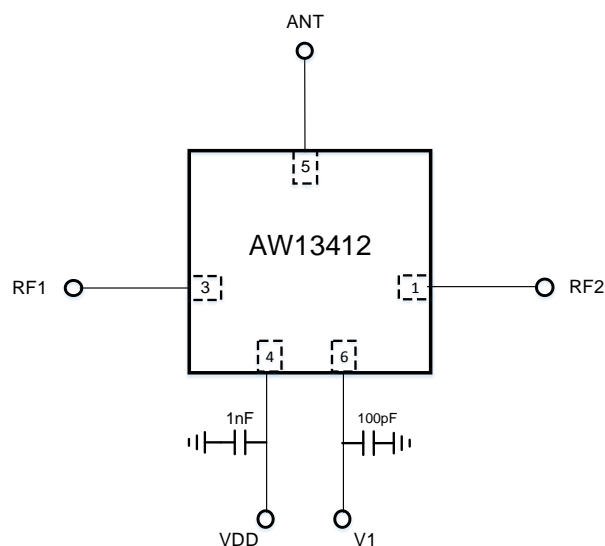
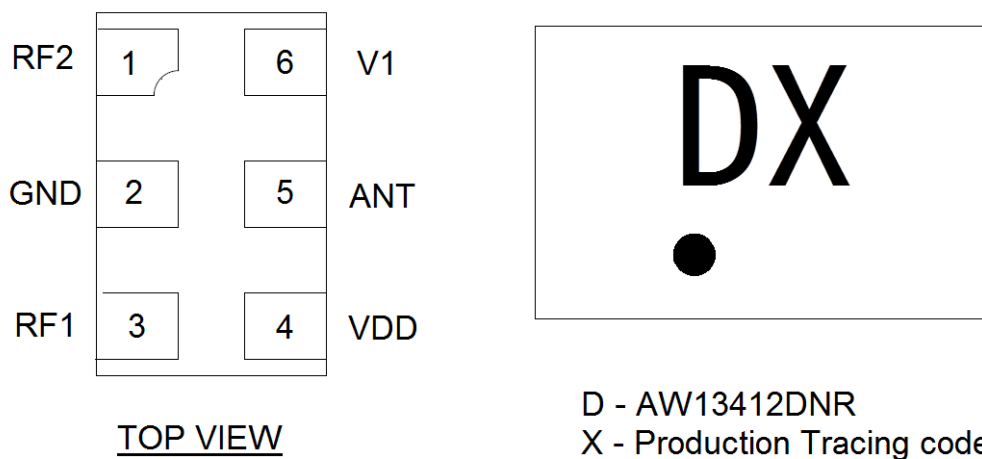


Figure 1 Typical Application Circuit of AW13412

All trademarks are the property of their respective owners.

## PIN CONFIGURATION AND TOP MARK



**Figure 2** Pin Configuration and Top Mark

## PIN DEFINITION

| No. | NAME | DESCRIPTION          |
|-----|------|----------------------|
| 1   | RF2  | RF I/O path 2        |
| 2   | GND  | Ground               |
| 3   | RF1  | RF I/O path 1        |
| 4   | VDD  | DC power supply      |
| 5   | ANT  | Antenna port         |
| 6   | V1   | DC control voltage 1 |

## FUNCTIONAL BLOCK DIAGRAM

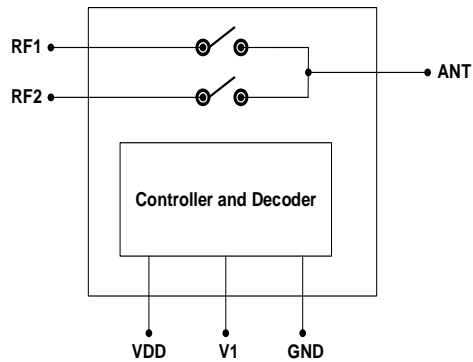
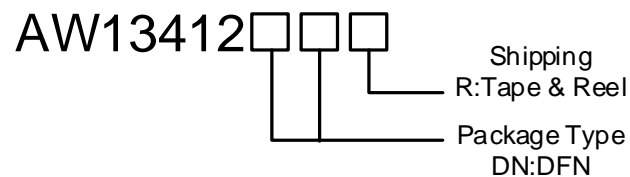


Figure 3 FUNCTIONAL BLOCK DIAGRAM

## ORDERING INFORMATION

| Part Number    | Temperature | Package                   | Marking | Moisture Sensitivity Level | Environmental Information | Delivery Form                   |
|----------------|-------------|---------------------------|---------|----------------------------|---------------------------|---------------------------------|
| AW13412DN<br>R | -40°C~85°C  | DFN<br>1.1mm*0.7<br>mm-6L | DX      | MSL1                       | ROHS+HF                   | 3000 units/<br>Tape and<br>Reel |



**ABSOLUTE MAXIMUM RATINGS**(NOTE1)

| PARAMETERS                              |    | RANGE          |
|---|----|----------------|
| Supply Voltage Range VDD                |    | 2.4V to 3.3V   |
| Control Voltage Range                   | V1 | 0V to 3V       |
| RF input power(RF1/RF2)                 |    | 34dBm          |
| Operating Free-air Temperature Range    |    | -40°C to 85°C  |
| Storage Temperature T <sub>STG</sub>    |    | -55°C to 150°C |
| Lead Temperature (Soldering 10 Seconds) |    | 260°C          |
| ESD (NOTE 2)                            |    |                |
| HBM                                     |    | ±1000V         |
| CDM                                     |    | ±500V          |

NOTE1: Conditions out of those ranges listed in "absolute maximum ratings" may cause permanent damages to the device. In spite of the limits above, functional operation conditions of the device should within the ranges listed in "recommended operating conditions". Exposure to absolute-maximum-rated conditions for prolonged periods may affect device reliability.

NOTE2: The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. Test method: MIL-STD-883J Method 3015.9

**ELECTRICAL CHARACTERISTICS**

VDD=2.8V, V1=0/1.8V, PIN=0dBm, TOP=+25°C, Z<sub>0</sub>=50Ω. (unless otherwise noted)

| PARAMETER                |                                    | TEST CONDITION   | MIN       | TYP  | MAX       | UNIT |
|--------------------------|------------------------------------|--|-----------|------|-----------|------|
| <b>DC Specifications</b> |                                    |  |           |      |           |      |
| VDD                      | Supply Voltage                     |  | 2.4       | 2.8  | 3         | V    |
| IDD                      | Supply Current                     |  |           | 45   |           | μA   |
| VCTL_H<br>VCTL_L         | Control Voltage<br>High<br>Low     |  | 1.35<br>0 | 1.8  | 3<br>0.45 | V    |
| ICTL                     | Control Current                    | VCTL = 1.8V  |           | 0.1  | 1         | μA   |
| tON                      | Turn-on Switching Time             | 50% of final control voltage to 90% of final RF power, switching between RF1/2 |           | 0.5  | 1         | μS   |
| <b>RF Specifications</b> |                                    |  |           |      |           |      |
| IL                       | Insertion loss(ANT pin to RF1/RF2) | 0.1-1.0G   |           | 0.30 | 0.40      | dB   |
|                          |                                    | 1.0-2.0G   |           | 0.45 | 0.55      | dB   |
|                          |                                    | 2.0-2.7G   |           | 0.35 | 0.45      | dB   |
| ISO                      | Isolation (ANT pin to RF1/RF2)     | 0.1-1.0G   | 33        | 35   |           | dB   |
|                          |                                    | 1.0-2.0G   | 27        | 30   |           | dB   |
|                          |                                    | 2.0-2.7G   | 23        | 25   |           | dB   |

| PARAMETER          |  | TEST CONDITION                                     | MIN | TYP | MAX | UNIT |
|--------------------|--|--|-----|-----|-----|------|
| RL                 | Input return loss (ANT pin to RF1/RF2)       | 0.1-1.0G   | 23  | 27  |     | dB   |
|                    |  | 1.0-2.0G   | 20  | 22  |     | dB   |
|                    |  | 2.0-2.7G   | 18  | 20  |     | dB   |
| 2fo                | Second harmonics (ANT pin to RF1/RF2)        | PIN=+26dBm,<br>0.1-3GHz                            |     | 85  |     | dBc  |
| 3fo                | Third harmonics (ANT pin to RF1/RF2)         | PIN=+26dBm,<br>0.1-3GHz                            |     | 88  |     | dBc  |
| P <sub>0.1dB</sub> | 0.1dB Compression Point (ANT pin to RF1/RF2) | 0.1GHz-3GHz  |     | 34  |     | dBm  |
| IIP3               | 3 <sup>rd</sup> Order Input Intercept Point  | @ 2.0GHz,<br>PIN=+26dBm,<br>$\Delta f=1\text{MHz}$ |     | 57  |     | dBm  |

## TIMING DIAGRAM (POWER ON AND OFF SEQUENCE)

It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the device. The control signal V1 should be set to 0V unless VDD is set in the operating voltage range.

Power ON:

- 1) Apply voltage supply --- VDD
- 2) Set Controls---V1
- 3) Apply RF input

Change switch position from one RF port to another:

- 1) Remove RF input
- 2) Change control voltages V1 to set the switch to desired RF port
- 3) Apply RF input

Power OFF:

- 1) Remove RF input
- 2) Remove control voltages-V1
- 3) Remove VDD input

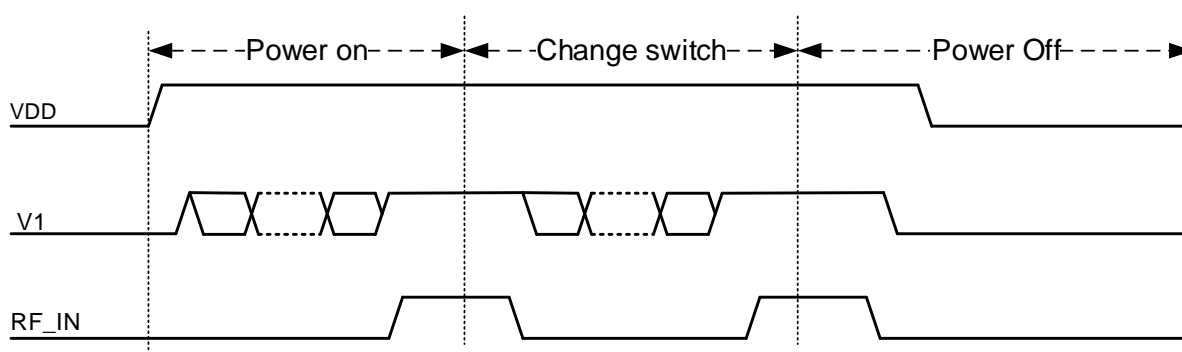


Figure 4 Power on/Change switch/Power off sequence

## AW13412 CONTROL LOGIC

| State | Active Path | V1 |
|-------|-------------|----|
| 0     | ANT to RF1  | 0  |
| 1     | ANT to RF2  | 1  |

## APPLICATION CIRCUITS

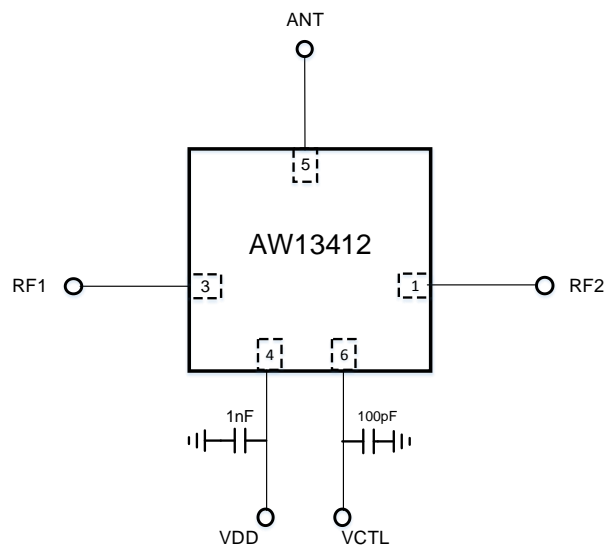


Figure 5 AW13412 EVB Schematic

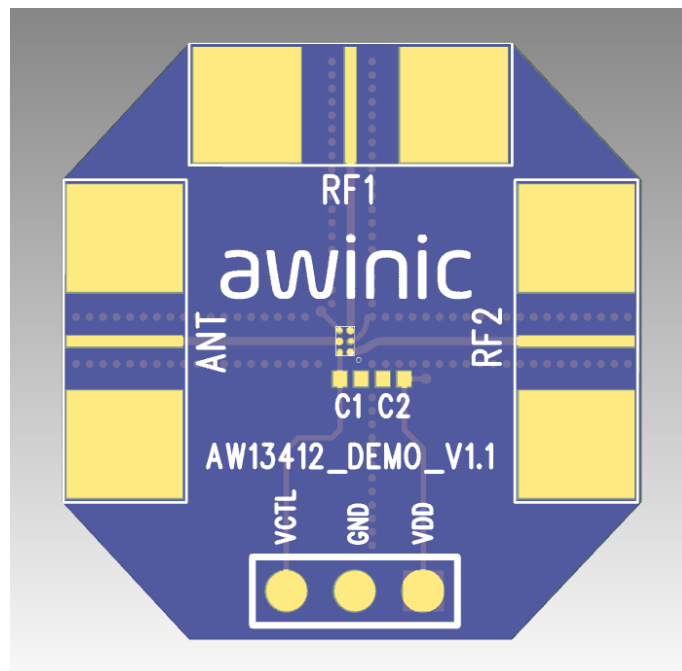


Figure 6 AW13412 EVB

## PACKAGE OUTLINE DIMENSIONS

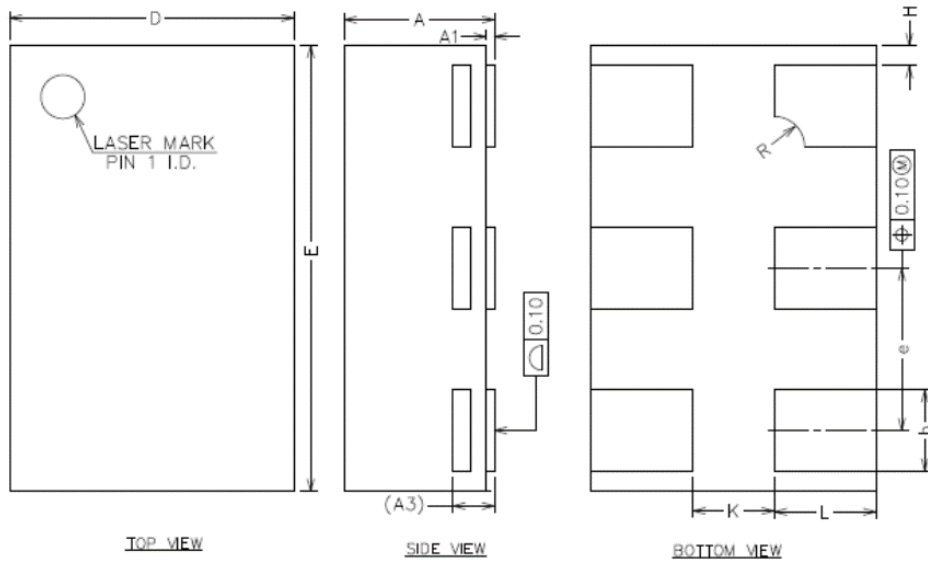


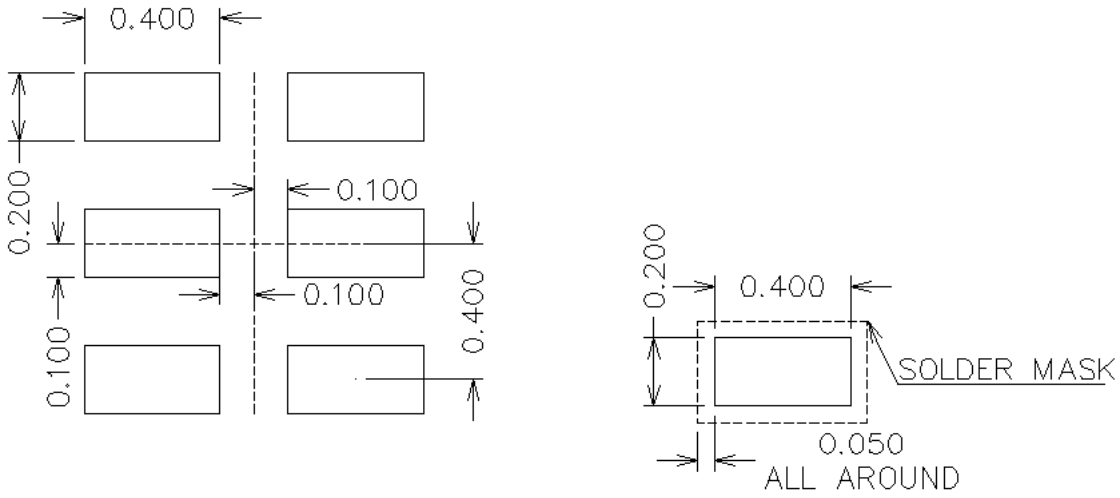
Figure 7 Package Outline

## AW13412 OUTLINE DIMENSIONS

COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN      | NOM  | MAX  |
|--------|----------|------|------|
| A      | 0.5      | 0.55 | 0.6  |
| A1     | 0.00     | 0.02 | 0.05 |
| A3     | 0.10REF  |      |      |
| b      | 0.15     | 0.20 | 0.25 |
| D      | 0.60     | 0.70 | 0.80 |
| E      | 1.00     | 1.10 | 1.20 |
| e      | 0.35     | 0.40 | 0.45 |
| H      | 0        | 0.05 | 0.1  |
| L      | 0.2      | 0.25 | 0.30 |
| K      | 0.15     | 0.20 | 0.30 |
| R      | 0.075REF |      |      |

LAND PATTERN DATA



TAPE AND REEL INFORMATION

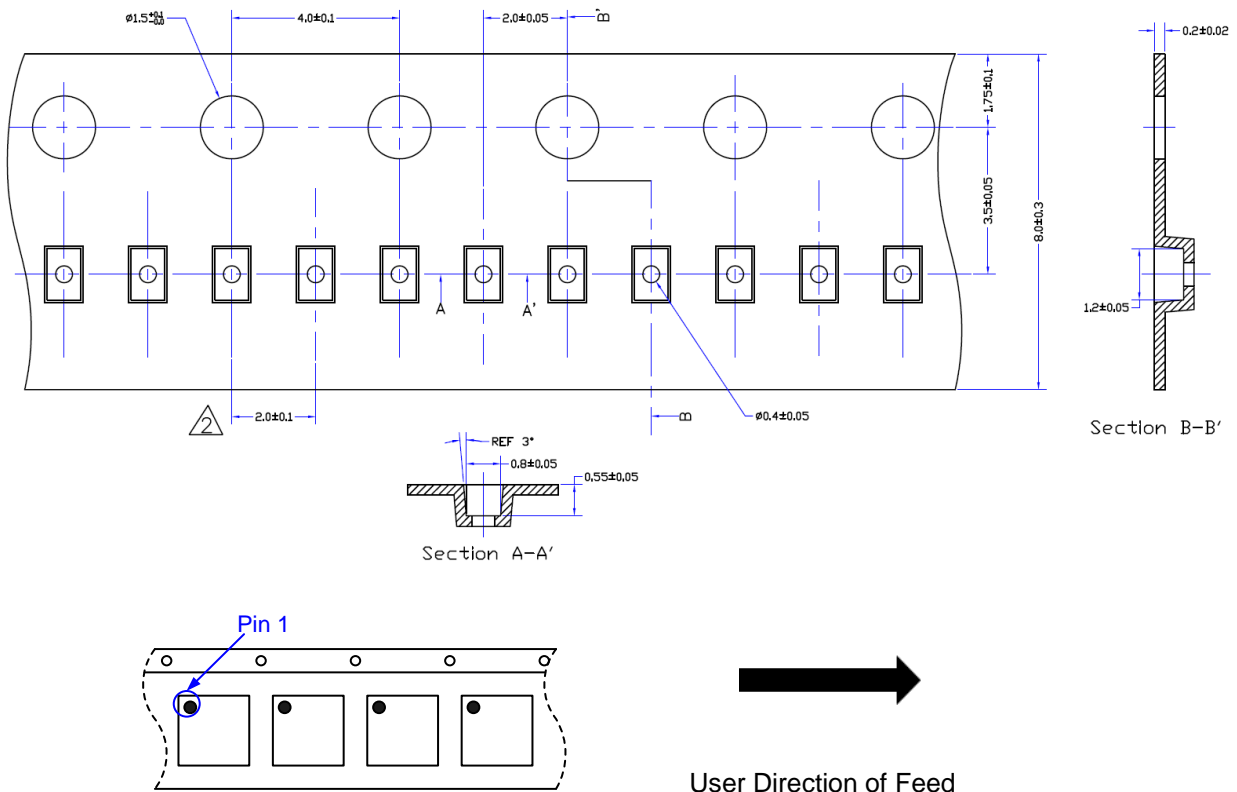
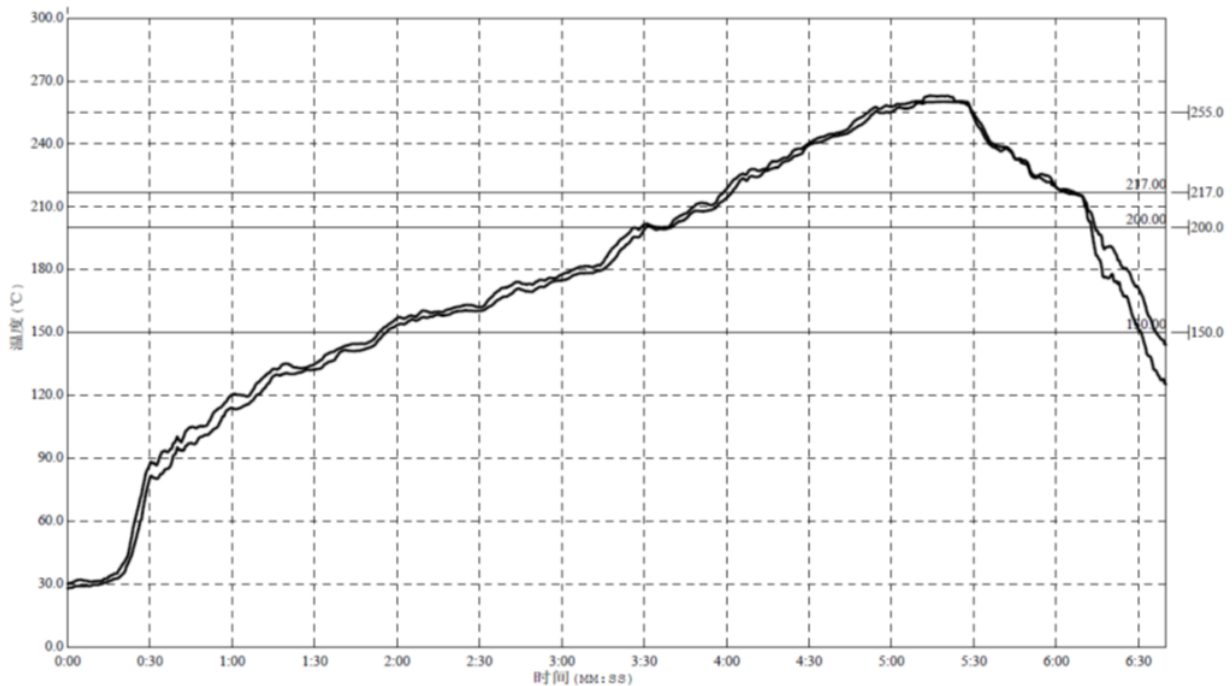


Figure 8-1 Tape and Reel





## REFLOW



| Reflow Note                                 | Spec          |
|---|---------------|
| Average ramp-up rate (217°C to peak)        | Max. 3°C /sec |
| Time of Preheat temp. (from 150°C to 200°C) | 60-120sec     |
| Time to be maintained above 217°C           | 60-150sec     |
| Peak Temperature                            | >260°C        |
| Time within 5°C of actual peak temp         | 20-40sec      |
| Ramp-down rate                              | Max. 6°C /sec |
| Time from 25°C to peak temp                 | Max. 8min     |

Figure 9 Package Reflow Standard Profile

NOTE 1: All data are compared with the package-top temperature, measured on the package surface;

NOTE 2: AW13412 adopted the Pb-Free assembly.

## REVISION HISTORY

| <b>Vision</b> | <b>Date</b> | <b>Change Record</b>      |
|---------------|-------------|---------------------------|
| V1.0          | Aug 2017    | Officially Released       |
| V1.1          | Nov 2017    | Change datasheet template |

## DISCLAIMER

Information in this document is believed to be accurate and reliable. However, Shanghai AWINIC Technology Co., Ltd (AWINIC Technology) does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

AWINIC Technology reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. Customers shall obtain the latest relevant information before placing orders and shall verify that such information is current and complete. This document supersedes and replaces all information supplied prior to the publication hereof.

AWINIC Technology products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an AWINIC Technology product can reasonably be expected to result in personal injury, death or severe property or environmental damage. AWINIC Technology accepts no liability for inclusion and/or use of AWINIC Technology products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications that are described herein for any of these products are for illustrative purposes only. AWINIC Technology makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

All products are sold subject to the general terms and conditions of commercial sale supplied at the time of order acknowledgement.

Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Reproduction of AWINIC information in AWINIC data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. AWINIC is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of AWINIC components or services with statements different from or beyond the parameters stated by AWINIC for that component or service voids all express and any implied warranties for the associated AWINIC component or service and is an unfair and deceptive business practice. AWINIC is not responsible or liable for any such statements.

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [RF Receiver](#) category:*

*Click to view products by [Awinic](#) manufacturer:*

Other Similar products are found below :

[MICRF011YN](#) [STA8088EXG](#) [TDA5235](#) [HMC8100LP6JETR](#) [TDA5240](#) [STA8088CFG](#) [MAX14736EWLT](#) [TQM7M5022](#) [TDA5225](#)  
[PQJ7911AHN/COC,515](#) [MAX7036GTP/V+](#) [MAX14737EWL+T](#) [SI4705-D62-GM](#) [ATA8205P6C-TKQW](#) [SI4732-A10-GS](#) [B82450A1084C](#)  
[U3741BM-P3FLG3](#) [TDA5225XUMA1](#) [TDA7200XUMA1](#) [ATA8202C-PXQW-1](#) [AD6674-750EBZ](#) [AD6674-500EBZ](#) [MAX1473ETJ+](#)  
[MAX7033EUI+T](#) [Si4836-A10-GS](#) [SI4826-A10-CU](#) [SI4825-A10-CS](#) [SI4824-A10-CU](#) [SI4707-B20-GMR](#) [MAX2769BETI/V+](#)  
[MAX1471ATJ/V+](#) [SI4831-B30-GUR](#) [SI4844-B20-GUR](#) [SI4704-D60-GU](#) [AW13412DNR](#) [LT5504EMS8#PBF](#) [ADRV9008BBCZ-1](#)  
[MRF24J40MAT-I/RM](#) [SI4824-A10-CUR](#) [T5743P3-TGQ](#) [AS3932-BQFT](#) [AD6641BCPZ-500](#) [AD6642BBCZ](#) [AD6643BCPZ-200](#)  
[AD6643BCPZ-250](#) [AD6649BCPZ](#) [AD6649BCPZRL7](#) [AD6650ABC](#) [AD6652BBCZ](#) [AD6655ABCPZ-125](#)