

FM Low Noise Amplifier

FEATURES

- Without any earphone or telescopic antenna, receive FM radio signal through re-using other antenna
- Ultra-low noise figure: 0.9dB
- Standard CMOS process technology
- High power gain of 21dB under 2.8V supply
- High linearity P1dB: -14.3dBm
- Supply voltage: 1.6V~3.6V
- Shutdown current: <math><0.1\mu\text{A}</math>
- Compact DFN 1.5mmX1.0mmX0.55mm-6L package
- Operation frequency: 64MHz-110MHz

APPLICATIONS

- Feature or smart phone
- Portable audio device

TYPICAL APPLICATION CIRCUIT

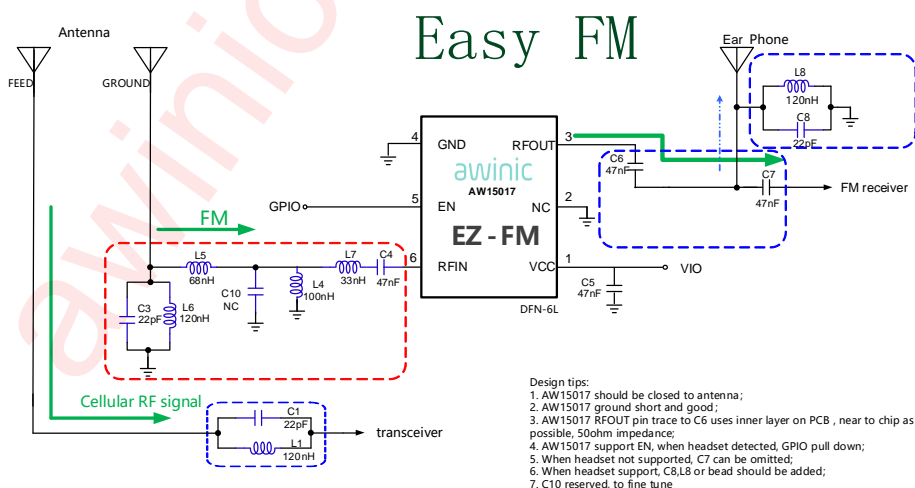


Figure 1 Typical Application Circuit of AW15017

PIN CONFIGURATION AND TOP MARK

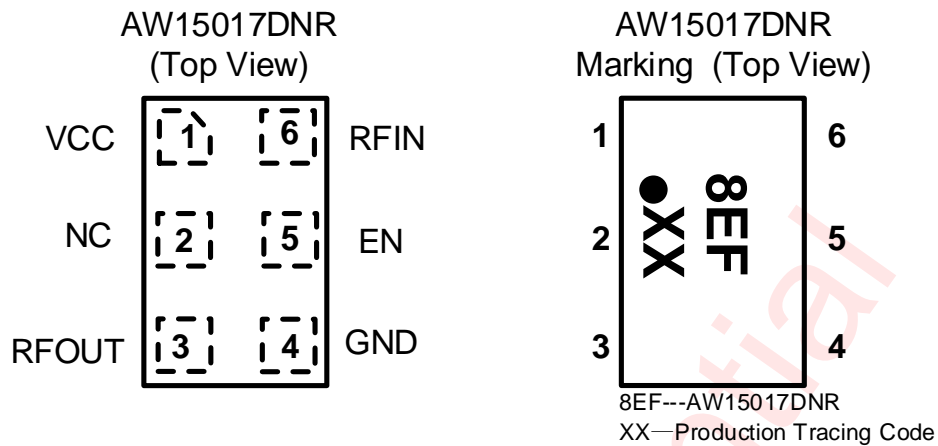


Figure 2 Pin Configuration and Top Mark

PIN DEFINITION

No.	NAME	DESCRIPTION
1	VCC	Supply connection.
2	NC	Not connected. Prefer ground.
3	RFOUT	RF output.
4	GND	Ground.
5	EN	EN (high level) supports 1.8V/2.8V IO with pull-down function.
6	RFIN	RF input.

FUNCTIONAL BLOCK DIAGRAM

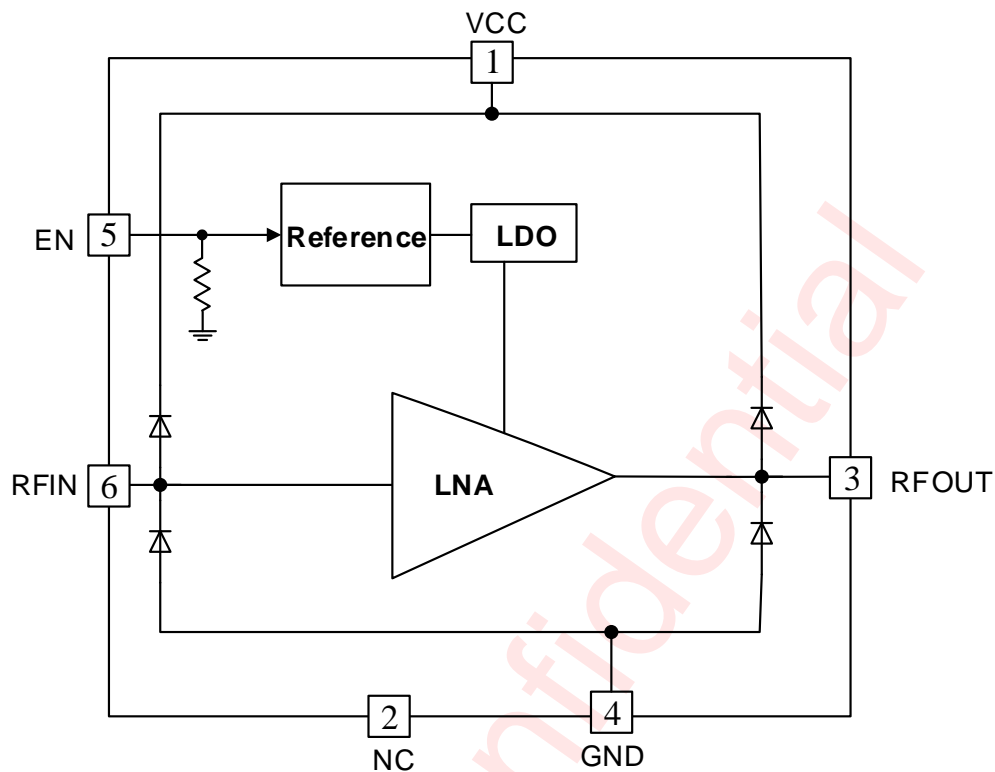


Figure 3 Function Block Diagram

ORDERING INFORMATION

Part Number	Temperature	Package	Marking	Moisture Sensitivity Level	Environmental Information	Delivery Form
AW15017DNR	-40°C ~ 85°C	DFN 1.5mmx1.0mm -6L	8EF	MSL1	ROHS+HF	3000 units/Tape & Reel

ABSOLUTE MAXIMUM RATINGS (NOTE1)

PARAMETERS	RANGE
Supply voltage VCC	-0.3V to 4.2V
EN pin voltage	-0.3V to 4.2V
Supply maximum current ICC	30mA
RF input power Pin	20dBm
Maximum Junction temperature T _{JMAX}	125°C
Storage temperature T _{STG}	-65°C to 150°C
Operating free-air temperature range	-40°C to 85°C
Lead temperature (Soldering 10 Seconds)	260°C
θ_{JA}	178°C/W
θ_{JB}	63.2°C/W
θ_{JC}	29.5°C/W
ESD(NOTE 2)	
HBM	±5kV
CDM	±2kV
Latch-up	
JEDEC STANDARD NO.78E SEPTEMBER 2016	+IT: +200mA -IT: -200mA

ELECTRICAL CHARACTERISTICS

TA=25°C, VCC=2.8V, EN=2.8V, Rs=Ro=50ohm, typical values (unless otherwise noted).

	Parameter	Test Condition	Min	Typ	Max	Units
EN_H	EN High Voltage		1	1.8	VCC	V
EN_L	EN Low Voltage		0	0	0.5	V
Freq	Frequency	-	64	90	110	MHz
ISD	Shut-down Current	EN=0V	0	0.1	1.0	μA
IQ	Static Current	EN=2.8V	8.5	10	13	mA
IEN	EN pin current	EN=2.8V	0	1	2	uA
NF	Noise Figure	Input/Output 50ohm		0.9	1.2	dB
S11	Input Return Loss	Input/Output 50ohm	-7	-3	-2	dB
S12	Reverse Isolation	Input/Output 50ohm	-38	-32	-29	dB
S21	Power Gain	Input/Output 50ohm	17	21	23	dB
S22	Output Return Loss	Input/Output 50ohm	-16	-10	-8	dB
Kf	Stability Factor		1			
IB P-1dB	In-Band 1dB-compression point	Input/Output 50ohm	-16	-14.3		dBm

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. The CDM could refer to JEDEC EIA/JESD22-C101F*

AW15017 APPLICATION BOARD

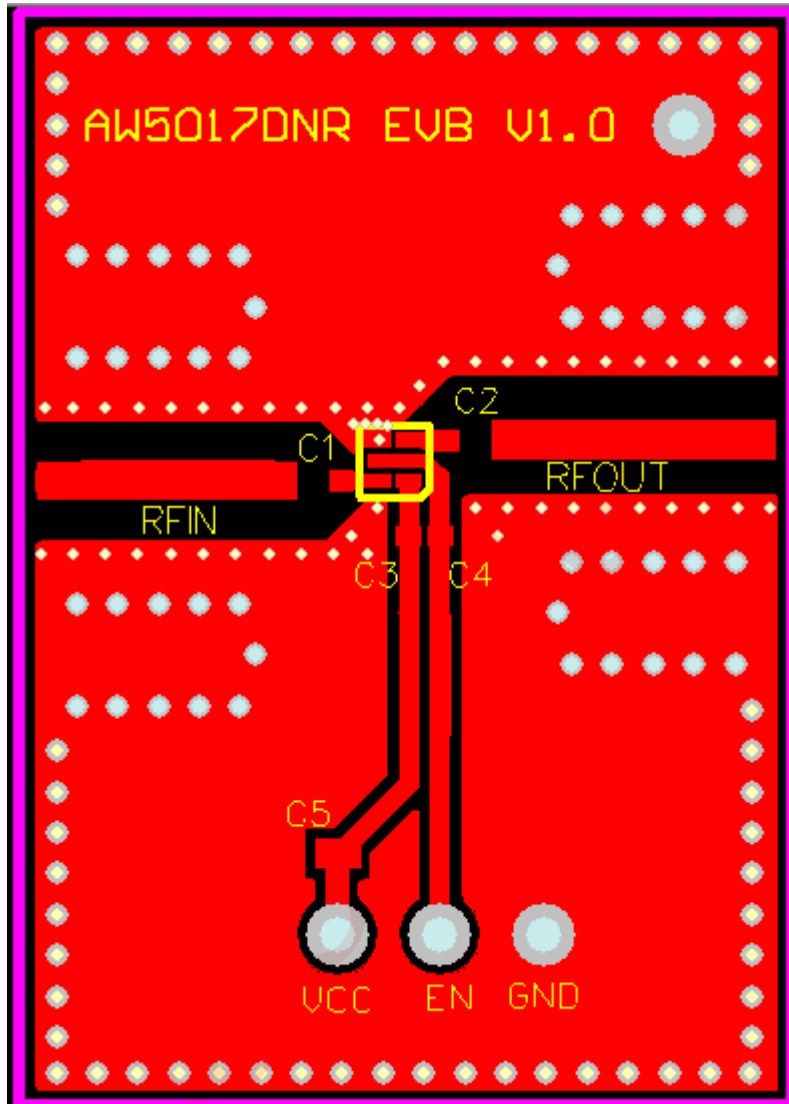


Figure 4 AW15017 EVB

MEASUREMENT DIAGRAM

Test DC Characteristics (Current & Power Consumption)

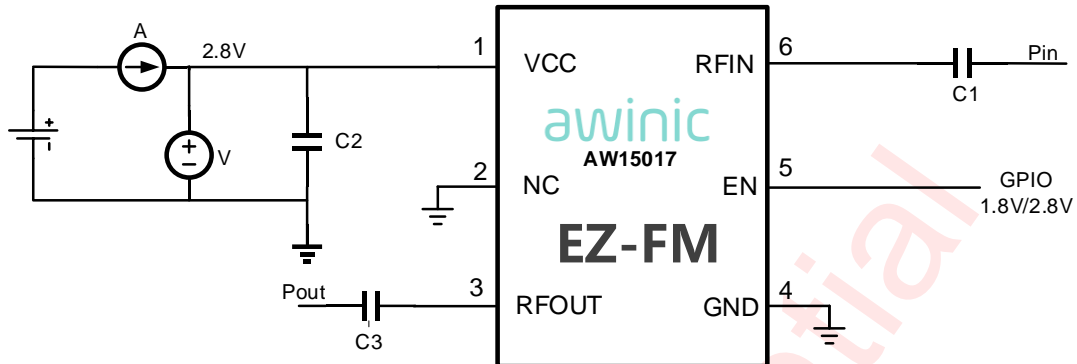


Figure 5 AW15017 DC Test Diagram

Test S-parameter

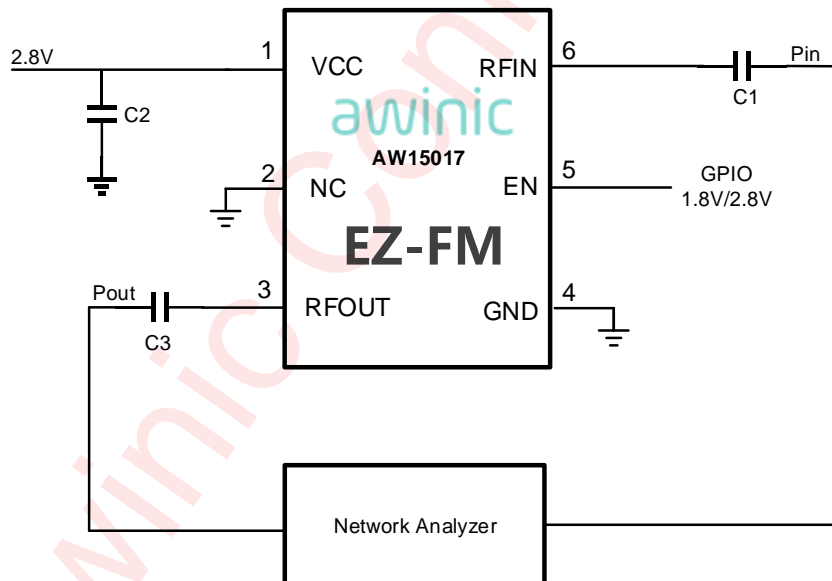


Figure 6 AW15017 S-parameter Measurement Diagram

Test Noise Figure

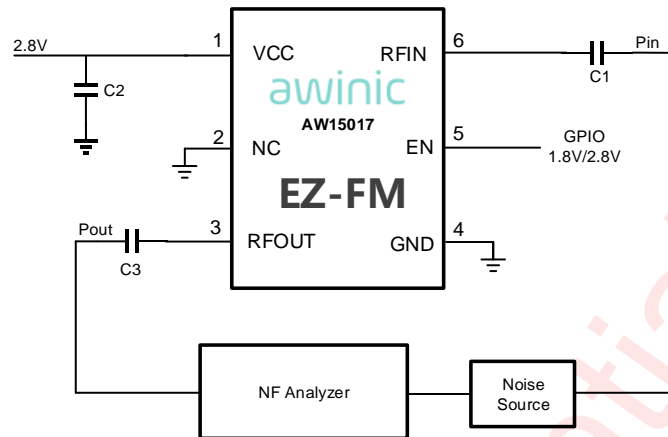


Figure 7 AW15017 Noise Figure Measurement Diagram

APPLICATION INFORMATION

Choice of Components

Taking Figure 1 as reference:

Filter block near PIFA antenna is composed of L6 and C3. These two components can be removed for Dipole antenna. Typical value of L6 is 120nH and C3 is 22pF.

Filter block of FM signal is composed of C1 and L1. Cellular RF signal goes through while FM signal is rejected. Typically C1 is 22pF and L1 is 120nH.

Matching circuit of FM signal path is composed of C4, L4, L5 and L7. FM signal goes through while cellular signal is rejected. Typically L4 is 100nH, L5 is 68nH and L7 is 33nH.

C5 is supply filtering capacitor. C6 is DC blocking capacitor. Both are 47nF typically.

C7 is added (value is 47nF), only if earphone is used as antenna.

Following tables show recommended inductor and capacitor values.

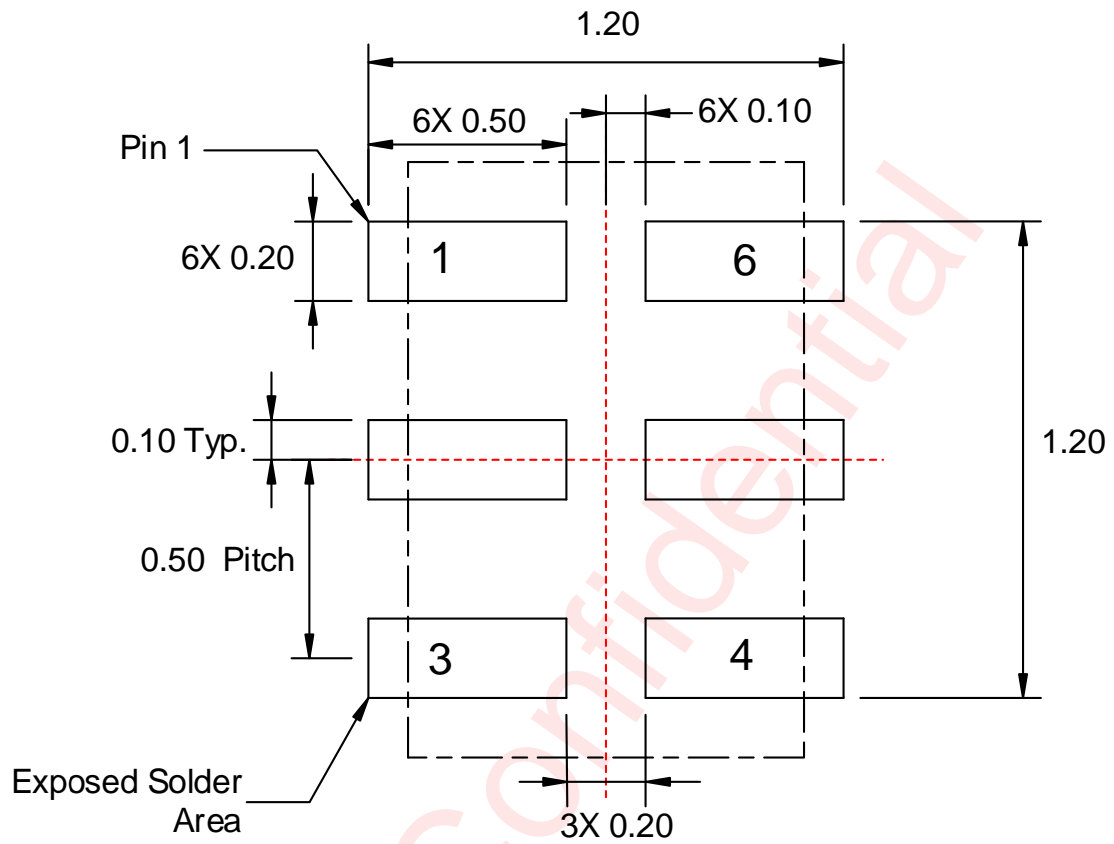
Inductor Selection Table

Part	Typical (nH)	Q (min)	Frequency (MHz)	MFR	Size
LQG15HS33NJ02	33	8	100	Murata	0402
LQG15HS68NJ02	68	8	100		0402
LQG15HSR12J02	120	8	100		0402
LQG15HSR10J02	100	8	100		0402
SDCL1005C33NJTDF	33	8	100	Sunlord	0402
SDCL1005C68NJTDF	68	8	100		0402
SDCL1005CR12JTDF	120	8	100		0402
SDCL1005CR10JTDF	100	8	100		0402

Capacitor Selection Table

Part	Typical	Voltage (V)	MFR	Size
GRM1555C1H220JA01	22pF	25	Murata	0402
GRM1555C1H390JA01	39pF	25		0402
GRM155R71C473KA01	47nF	16		0402

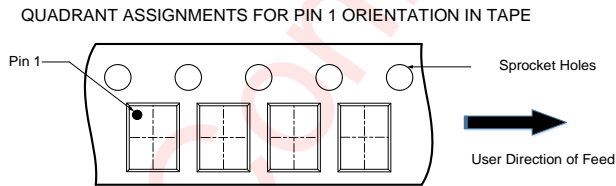
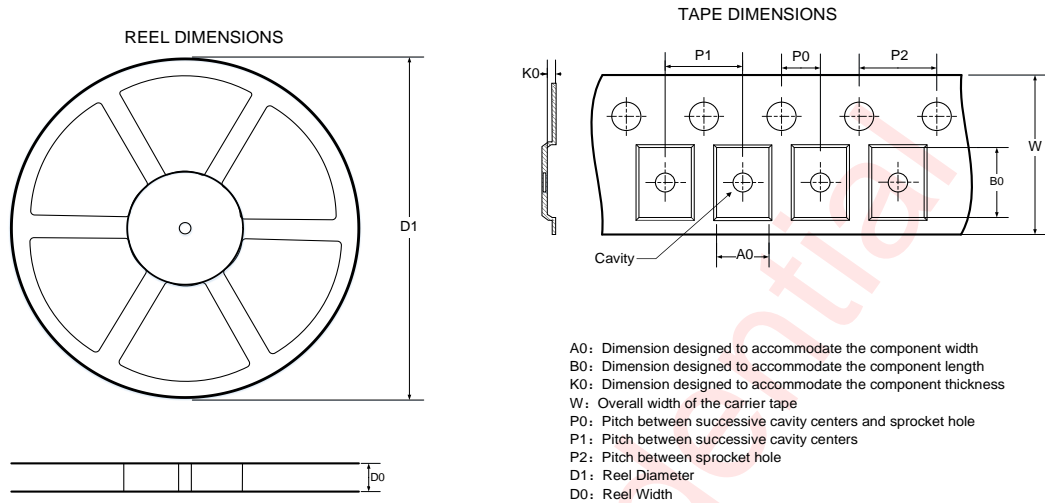
LAND PATTERN



All measurements are in millimeters

Figure 9 Land Pattern

TAPE & REEL DESCRIPTION



All Dimensions are nominal

D1 (mm)	D0 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)
178	8.4	1.12	1.72	0.7	2	4	4	8

Figure 10 Tape & Reel Description

REFLOW

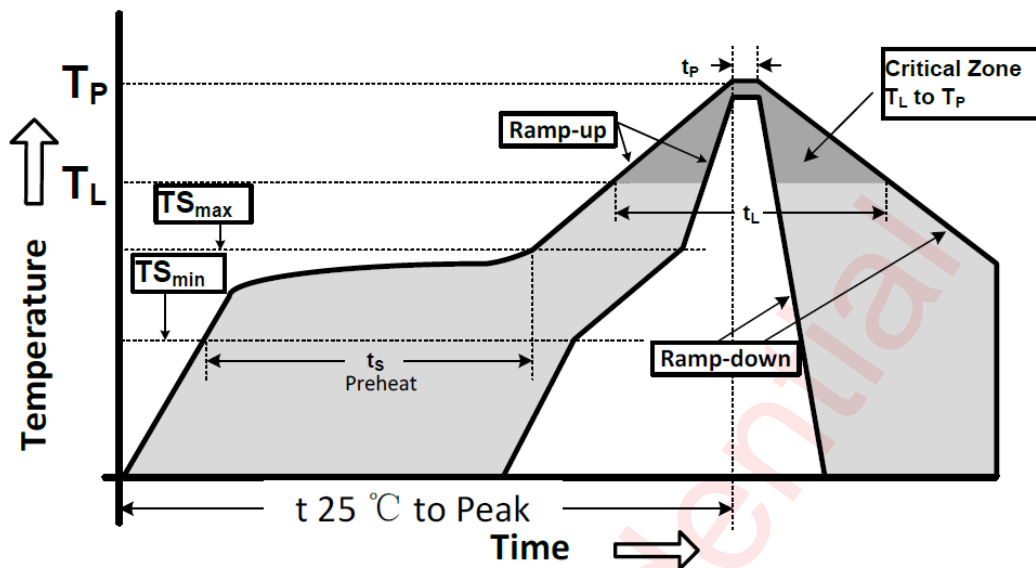


Figure 11 Package Reflow Oven Thermal Profile

Reflow Note	Spec
Ramp-up rate (TSmax to Tp)	3°C/second max.
Preheat temperature (TSmin to TSmax)	150°C to 200°C
Preheat time (ts)	60 - 180 seconds
Time above TL, 217°C (tL)	60 - 150 seconds
Peak temperature (Tp)	260°C
Time within 5°C of peak temperature(tp)	20 - 40 seconds
Ramp-down rate	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

NOTES:

1. All data are compared with the package-top temperature, measured on the package surface;
2. AW15017 adopted the Pb-Free assembly.

REVISION HISTORY

Document ID	Release date	Change notice	Supersedes
AW15017_V0.9X	2019-09-06	Officially Released	-
AW15017_V1.0	2021-01-25	Change datasheet template	

awinic Confidential

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.