



### Product Features

- Excellent Insertion Loss and Isolation performance
- High Linearity
- RFFE 2.1 Control Interface
- Broadband frequency range: 0.4 to 5 GHz
- Small package: QFN-12 1.5mm x 1.5mm x 0.5mm
- No DC blocking capacitors required
- 1kV HBM ESD Protection on all pins

### Product Applications

- 3G/4G multimode cellular tablets and Multi-Mode GSM, EDGE, WCDMA, LTE
- Diversity antenna switching

### Product Description

The LX3144 is a Silicon On Insulator (SOI) Single Pole, Four Throw (4XSPST) antenna tuner with a Mobile Industry Processor Interface (MIPI) which require very low insertion loss, high isolation and high linearity performance.

The high linearity performance and low insertion loss for UMTS, CDMA2000, and LTE applications.

The LX3144 is manufactured in a compact 1.5mm x 1.5mm x 0.5mm, 12-pin surface mount Quad Flat No-Lead (QFN) package.

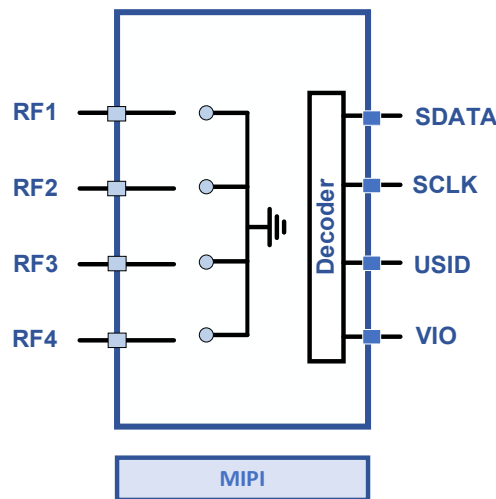


Figure 1 Functional Block Diagram

## Absolute Maximum Conditions

Parameters		Symbol	Minimum	Maximum	Units
Digital control signal		V <sub>IO</sub>	-0.3	2.5	V
RFFE Bus Voltage (SDATA, SCLK)		V <sub>I</sub>	-0.3	2.5	V
RFFE USID Voltage		V <sub>USID</sub>	-0.3	2.5	V
RFx Port Off V <sub>peak</sub>	GSM850/900 Tx Band	V <sub>RF</sub>		80	V
	GSM1800/1900 Tx Band				
RF input power		P <sub>in</sub>		+47	dBm
Max RF Voltage between RFC port and Ground (V <sub>RF</sub> ) V <sub>IO</sub> =1.8V.Temp=25°C		V <sub>p</sub>		80	V
Storage temperature		T <sub>STG</sub>	-55	+150	°C
Operating temperature		T <sub>OP</sub>	-40	+90	°C
Human Body Model, Class 1C		ESD	1000		V

1: Test condition 50% duty cycle, VSWR=1:1, +25 °C

**Note:** 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.

## General Electrical Specifications

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Units
Interface supply	V <sub>IO</sub>		1.65	1.80	1.95	V
SDATA, SCLK High	V <sub>IH</sub>		0.8*V <sub>IO</sub>	V <sub>IO</sub>	V <sub>IO</sub>	V
SDATA, SCLK Low	V <sub>IL</sub>		0	0	0.2*V <sub>IO</sub>	V
Control current: High Low	I <sub>CTL</sub>				10	μA
Turn-on time (PIN = +27 dBm)	T <sub>ON</sub>	Measured from 50% of final VDD supply voltage to 90% of RF power				μs
Switching time (PIN = +27 dBm)	T <sub>SW</sub>	Measured from 50% of final VDD supply voltage to 90% of RF power			20	μs

(V<sub>IO</sub> = 1.8 V, V<sub>IH</sub>=1.8V, V<sub>IL</sub>=0V, T<sub>OP</sub> = +25 °C, Characteristic Impedance [Z<sub>O</sub>] = 50 Ω, Unless Otherwise Noted)

## RF Specifications

Parameters	Symbol	Test Condition	Min.	Typ.	Max.	Units
Operating frequency	f		0.4		5	GHz
On Resistance	Ron	Switch On path		2.2	2.6	$\Omega$
Off Capacitance	Coff	Switch Off path	200			fF
Adjacent Port Isolation (One Port On, Another Port Off)	ISO	Up to 0.9 GHz	45	46	48	dB
		Up to 2.1 GHz	36	37	39	
		Up to 2.7 GHz	33	34	36	
		Up to 3.8 GHz	30	31	33	
		Up to 4.2 GHz	26	27	28	
		Up to 5.0 GHz				
Adjacent Port Isolation (All Ports Off)	Iso	Up to 0.9 GHz		30		dB
		Up to 2.1 GHz		25		
		Up to 2.7 GHz		20		
		Up to 3.8 GHz		18		
		Up to 4.2 GHz		15		
		Up to 5.0 GHz		13		
Non-Adjacent Port Isolation (One Port On, Another Port Off)		Up to 0.9 GHz		45		dB
		Up to 2.1 GHz		40		
		Up to 2.7 GHz		33		
		Up to 3.8 GHz		30		
		Up to 4.2 GHz		25		
		Up to 5.0 GHz		20		
Non-Adjacent Port Isolation (All Ports Off)	RL	Up to 0.9 GHz		45		dB
		Up to 2.1 GHz		40		
		Up to 2.7 GHz		38		
		Up to 3.8 GHz		33		
		Up to 4.2 GHz		30		
		Up to 5.0 GHz		28		
2nd Order harmonics	2fo	Pin = +35 dBm,900MHz			-80	dBm
3rd Order harmonics	3fo	Pin = +35 dBm,900MHz			-80	dBm

**Truth Table**

Reg_1C	Reg_00								RF Channel Operating Mode
	D7	D6	D5	D4	D3	D2	D1	D0	
38	x	x	x	x	0	0	0	0	All ISO
38	x	x	x	x	0	0	0	1	RF1 to GND
38	x	x	x	x	0	0	1	0	RF2 to GND
38	x	x	x	x	0	0	1	1	RF2 & RF1 to GND
38	x	x	x	x	0	1	0	0	RF3 to GND
38	x	x	x	x	0	1	0	1	RF3 & RF1 to GND
38	x	x	x	x	0	1	1	0	RF3 & RF2 to GND
38	x	x	x	x	0	1	1	1	RF3, RF2 & RF1 to GND
38	x	x	x	x	1	0	0	0	RF4 to GND
38	x	x	x	x	1	0	0	1	RF4 & RF1 to GND
38	x	x	x	x	1	0	1	0	RF4 & RF2 to GND
38	x	x	x	x	1	0	1	1	RF4, RF2 & RF1 to GND
38	x	x	x	x	1	1	0	0	RF4 & RF3 to GND
38	x	x	x	x	1	1	0	1	RF4, RF3 & RF1 to GND
38	x	x	x	x	1	1	1	0	RF4, RF3 & RF2 to GND
38	x	x	x	x	1	1	1	1	All to GND

## Register definition

Register 0, Address: 0x00 (MODE_CTRL)				
Register 0	Description	Default	Notes	Trig
[7:0]	MODE_CTRL	0x0	Switch control. See Truth Table	0
Register 1B, Address: 0x1B				
Register 1B	Description	Default	Notes	Trig
[7:4]	Reserved	0000	Reserved	No
[3:0]	GSID	0000	Group slave ID	No
Register 1C Address: 0x1C (PM_TRIG)				
Register 1C	Description	Default	Notes	Trig
[7:6]	PWR_MODE	10	00 = Normal Operation (ACTIVE) 01 = Default Settings (STARTUP) 10 = Low Power (LOW POWER) 11 = Reserved	No
[5]	Trigger Mask 2	0	Trigger Enable: 0 Trigger Disable: 1	No
[4]	Trigger Mask 1	0	Trigger Enable: 0 Trigger Disable: 1	No
[3]	Trigger Mask 0	0	Trigger Enable: 0 Trigger Disable: 1	No
[2]	Trigger Register 2	0	1 = Latch Register 2 contents	No
[1]	Trigger Register 1	0	1 = Latch Register 1 contents	No
[0]	Trigger Register 0	0	1 = Latch Register 0 contents	No
Register 1D, Address: 0x01D (PM_ID)				
Register 1D	Description	Default	Notes	Trig
[7:0]	Product ID	0X52	Product ID = 0X52	No
Register 1E, Address: 0x01E (MAN_ID)				
Register 1E	Description	Default	Notes	Trig
[7:0]	Manufacturer ID	0x78	Manufacturer ID [7:0] = 0x78	No
Register 1F Address: 0x01F (USID)				
Register 1F	Description	Default	Notes	Trig
[7:4]	Manufacturer ID	0X4	Manufacturer ID [11:8]	No
[3:0]	User ID	0x6	The default value at reset is selected via pin USID.	No

## Pin-out Information

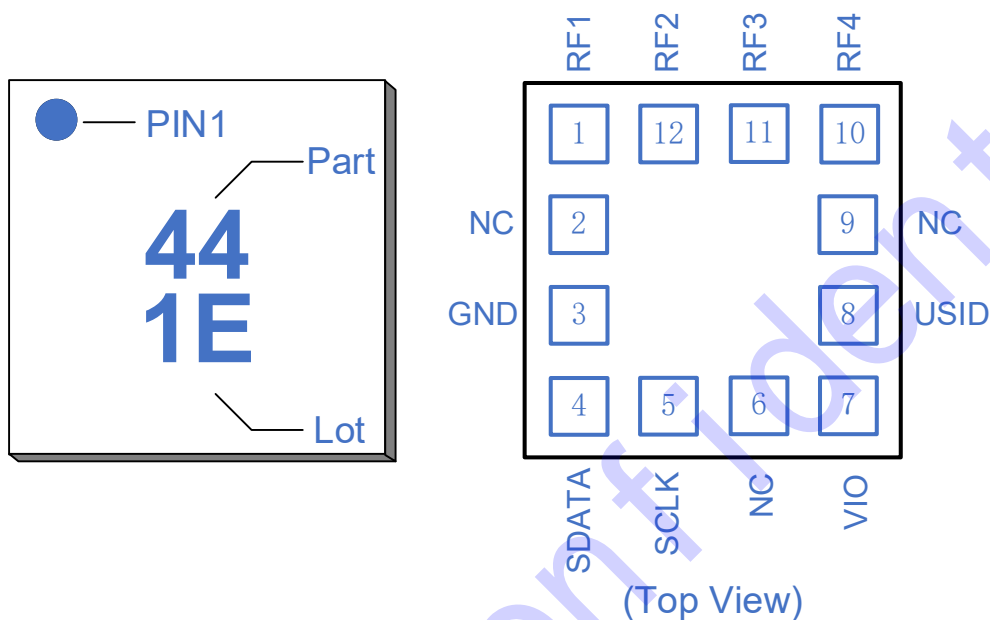


Figure 2 Pin-out Information

**Table 1. Pin Description**

Pin #	Name	Description	Pin #	Name	Description
1	RF1	RF Port 1	7	VIO	RFFE Reference Voltage
2	NC	Can be grounded or Not Connect	8	USID	RFFE USID Select Pin
3	GND	Ground	9	NC	Can be grounded or Not Connect
4	SDATA	RFFE Data Bus	10	RF4	RF Port 4
5	SCLK	RFFE Clock Bus	11	RF3	RF Port 3
6	NC	Can be grounded or Not Connect	12	RF2	RF Port 2

**Application circuit**

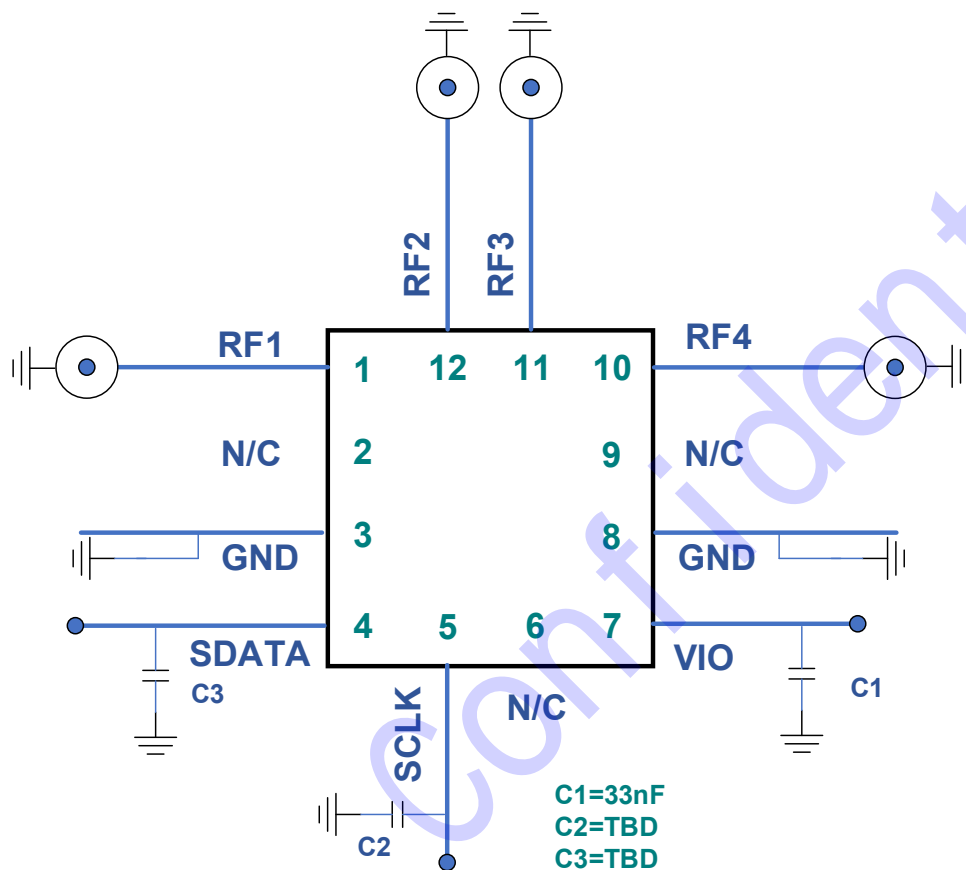


Figure 3 Application circuit

Evaluation Board

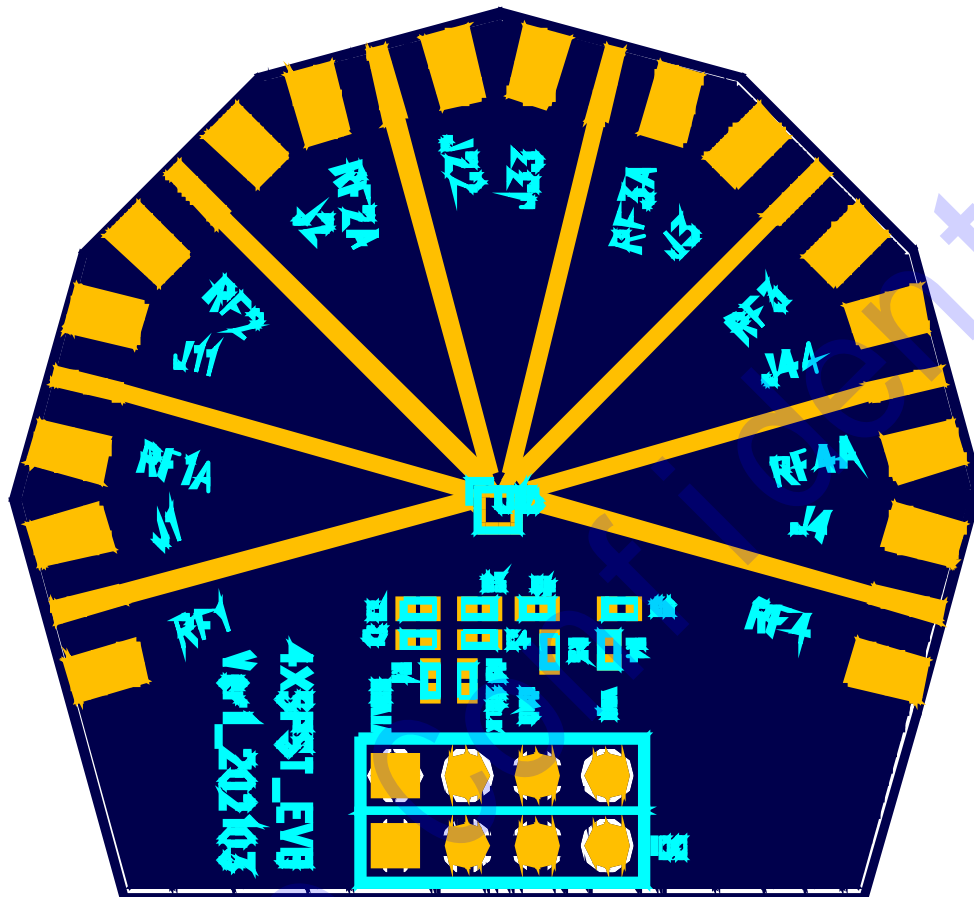


Figure 4 Evaluation Board Assembly Diagram



**Package Outline Dimension**

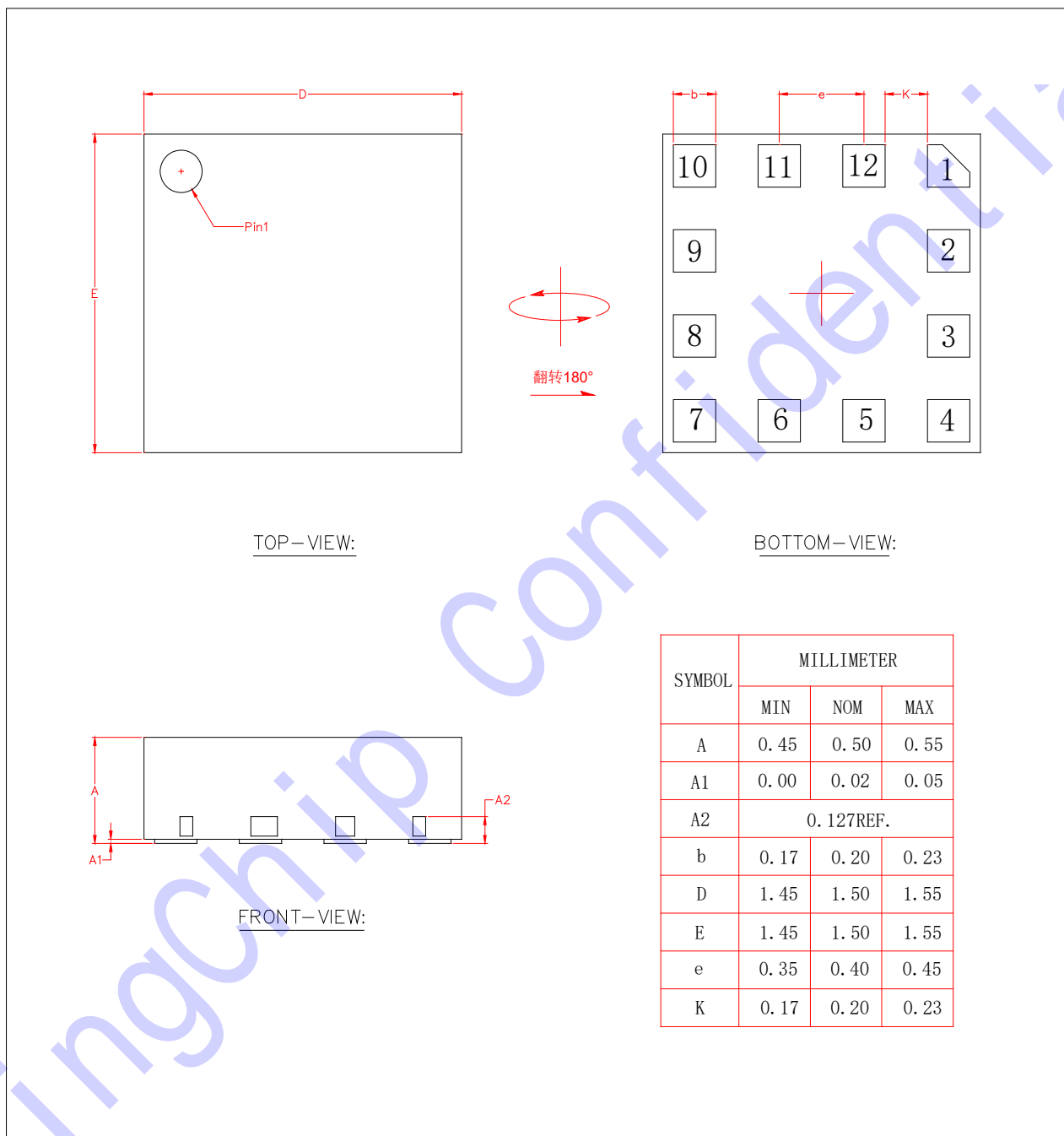
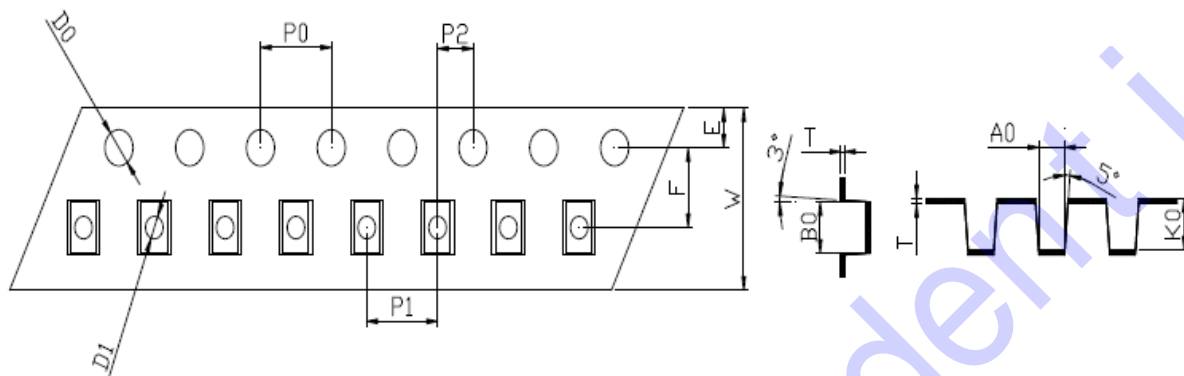


Figure 5 Package Outline Dimension

### Package Dimensions (5000pcs)



W	8.00±0.05	T	0.20±0.02	D1	1.10±0.10
E	1.75±0.10	F	3.50±0.10	D0	1.60±0.10
P0	4.00±0.10	P1	4.00±0.10	P2	2.00±0.10
A0	1.70±0.05	B0	1.70±0.05	K0	0.60±0.05

Figure 6 Tape and Reel Dimensions

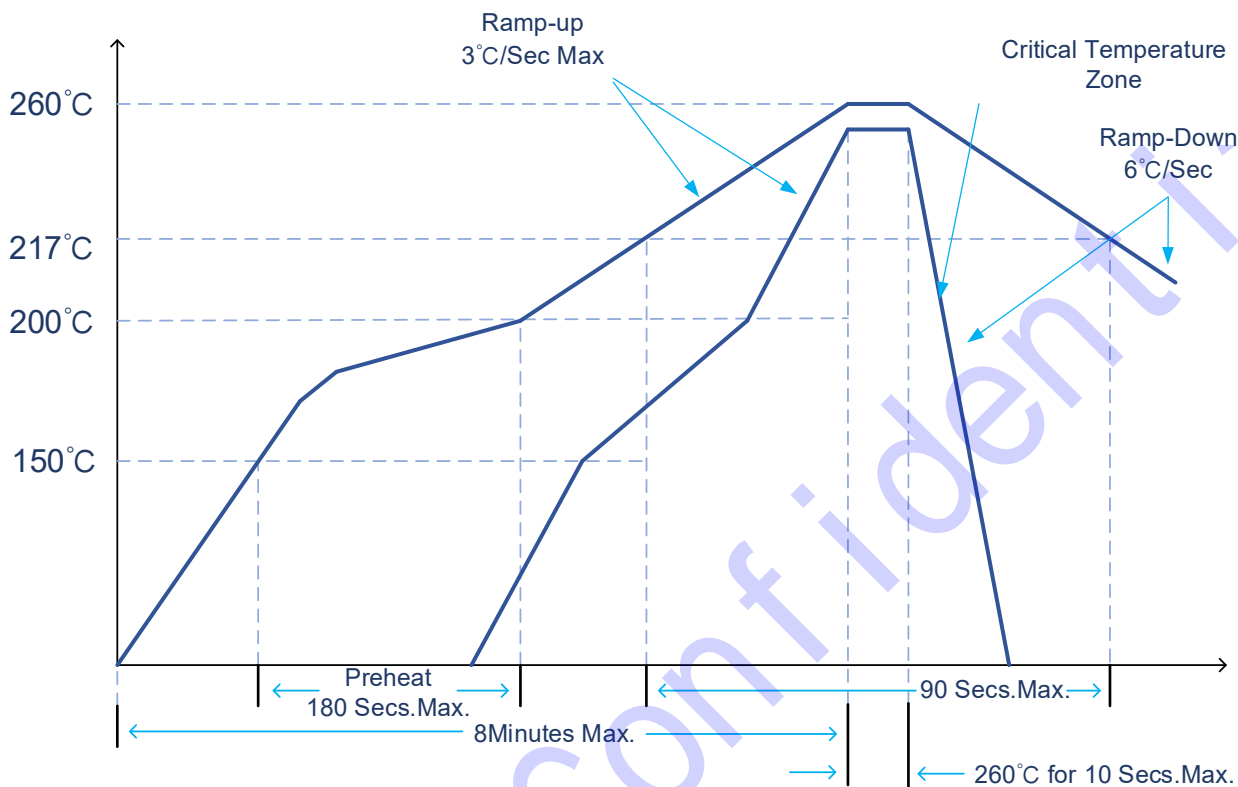
### Declaration of No Harmful Substances

This part is compliant with 2005/20/EC packaging directive, 1907/2006/EC REACH directive and the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- SVHC Free

**Reflow Chart**



NOTE: Reflow Profile with 240°C peak also acceptable.