RTC7627 : 2.4 – 2.5 GHz Receive Path Front End Module (RX-FEM) for 802.11b/g/n/ac

Description

The RTC7627 is a CMOS single chip SP3T switch + LNA front end module (FEM) with integrated on-chip bypass switch function. The RTC7627 normally operates at 3.3 V supply with 12 mA current consumption at receive mode. The CMOS control logic function was also designed to be easily operated by three control voltages among Antenna and TX / RX / BT RF ports.

The features of low noise, low power consumption and compact package size make RTC7627 ideal to be applied in many wireless applications such as WLAN, Bluetooth® systems operated in the frequency of 2.4 – 2.5 GHz.

Feature

- Frequency Range: 2.4 – 2.5 GHz
- Single Supply Voltage : 3.3 V
- High Receive Gain : 16 dB
- Receive Mode Current : 12 mA
- Low Noise Figure : 1.5 dB
- Bypass Mode Function
- Small 16L QFN 2.5x2.5x1.15 mm^3 package
- RoHS / Halogen Free Compliant
- Moisture Sensitivity Level : MSL 3

Application

- 802.11b/g/n/ac WLAN applications
- Mobile and portable battery powered WLAN and Bluetooth® system.

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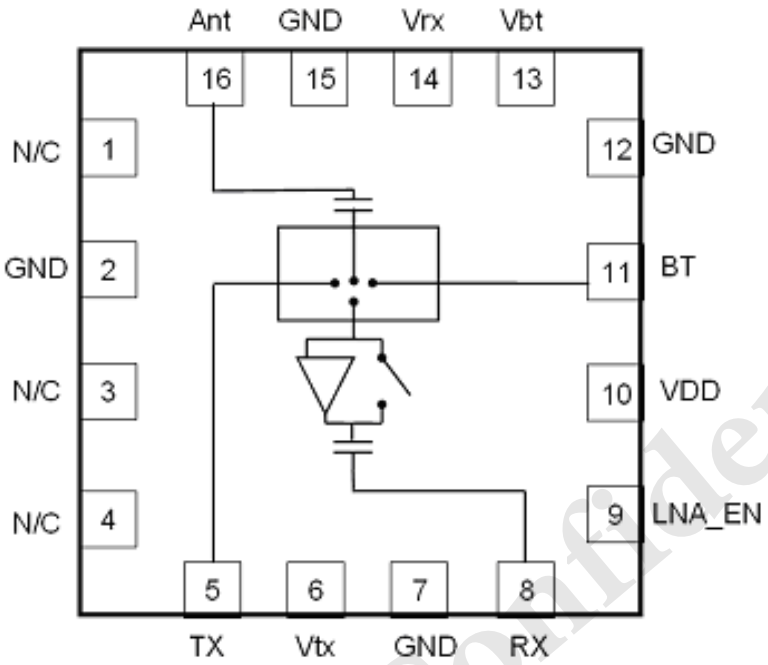
Function Block & Pin Out (top view)



Pin Function Description

Pin	Function	Description
1	N/C	No Connect
2	GND	Ground
3	N/C	No Connect
4	N/C	No Connect
5	TX	WLAN Transmit. Internally matched to 50Ω for RF
6	Vtx	Switch control. Connect the ANT to WLAN TX when high
7	GND	Ground
8	RX	LNA output. Internally matched to 50Ω for RF
9	LNA_EN	Control pin to put LNA in regular (on) or disable/bypass (off) mode

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10	VDD	DC supply to LNA. 3.3V nominal
11	BT	BT transmit. Internally matched to 50Ω for RF
12	GND	Ground
13	Vbt	Switch control. Connect the ANT to BT when high
14	Vrx	Switch control. Connect the ANT to WLAN RX when high
15	GND	Ground
16	Ant	Antenna port. Internally matched to 50Ω for RF
Exposed Pad		Exposed pad must be connected to GND through PCB via

Absolute Maximum Rating

Parameter	Symbol	Rating	Units
Supply Voltage	VDD	5	V
Control Voltage	Vtx, Vbt, Vrx	3.6	V
Antenna Input Power	P_{IN}	-4	dBm
TX or BT Input Power	P_{TX}, P_{BT}	+33	dBm
Operating Temperature	T_A	-40 to +85	℃
Storage Temperature	T_{ST}	-40 to +85	℃
ESD (HBM, JESD22-A114, All pin)	ESD_{HBM}	TBD	V

Note : Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only, functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation between operation range maximum and absolute maximum for extended periods may affect device reliability.

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Truth Table

Vbt	Vrx	Vtx	LNA_EN	SP3T switch			LNA
				Ant–RX	Ant–TX	Ant–BT	
L	H	L	H/L	ON	OFF	OFF	ON/OFF
L	L	H	L	OFF	ON	OFF	OFF
H	L	L	L	OFF	OFF	ON	OFF
L	L	L	L	OFF	OFF	OFF	OFF

Recommended Operating Condition

State	Min	Typ	Max	Unit
Frequency Range	2.4	–	2.5	GHz
Supply Voltage(VDD)	3.0	3.3	3.6	V
Control Voltage(Vtx, Vbt, Vrx, LNA_EN) High	3.0	3.3	3.6	V
Control Voltage(Vtx, Vbt, Vrx, LNA_EN) Low	0	0	0.3	V

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Electrical Specification

Typical measurement data @T = 25℃, VDD = 3.3 V

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Frequency Range	f		2400		2500	MHz
Receive Gain Mode (Vtx = Vbt = 0 V , Vrx = LNA_EN = 3.3 V)						
Gain	G		14	16		dB
Gain Variation	|△G|	Full band			1	dB
Noise Figure	NF			1.5		dB
Input return loss	|S11|		11	14		dB
Output return loss	|S22|		12	15		dB
Reverse isolation	|S12|		22	25		dB
Port-to-port isolation ANT-TX	|ISO|		18	21		dB
Port-to-port isolation ANT-BT	|ISO|		14	17		dB
Input IP3	IIP3	f1 = 2440 MHz f2 = 2460 MHz input 2 signal (f1,f2)		4		dBm
Input P1dB	IP1dB			-5		dBm
LNA Bias Current (VDD)	IDD			12	17	mA
LNA Control Current (LNA_EN)	Ien			6	20	uA
LNA Control Current (Vrx)	Irx			2.5	20	uA
Receive Bypass Mode (Vtx = Vbt = LNA_EN = 0 V , Vrx = 3.3 V)						
Gain	G			-5.5		dB
Input return loss	|S11|		11	13		dB
Output return loss	|S22|		18	20		dB
Input IP3	IIP3	f1 = 2440 MHz f2 = 2460 MHz input 2 signal (f1,f2)		32		dBm

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Input P1dB	IP1dB			24		dBm
LNA Bias Current (VDD)	IDD			3	20	uA
LNA switching time (“on”<-->”off”)		10%<-->90% power change in raising or falling edge		330		ns
Transmit Mode (Vrx = Vbt = LNA_EN = 0 V , Vtx = 3.3 V)						
Insertion loss	IL			0.55	0.7	dB
Input return loss	|S11|		14	17		dB
Output return loss	|S22|		15	18		dB
Input P1dB	IP1dB			32		dBm
Port-to-port isolation ANT-RX	|ISO|		33	36		dB
Port-to-port isolation ANT-BT	|ISO|		34	37		dB
Supply Current (VDD)	IDD			3.3	20	uA
LNA Control Current (Vtx)	Itx			4.8	20	uA
Bluetooth Mode (Vrx = Vtx = LNA_EN = 0 V , Vbt = 3.3 V)						
Insertion loss	IL			0.6	0.75	dB
Input return loss	|S11|		15	18		dB
Output return loss	|S22|		15	19		dB
Input P1dB	IP1dB			32		dBm
Port-to-port isolation ANT-RX	|ISO|		34	37		dB
Port-to-port isolation ANT-TX	|ISO|		28	31		dB
Supply Current (VDD)	IDD			3.3	20	uA
LNA Control Current (Vbt)	Ibt			4.8	20	uA

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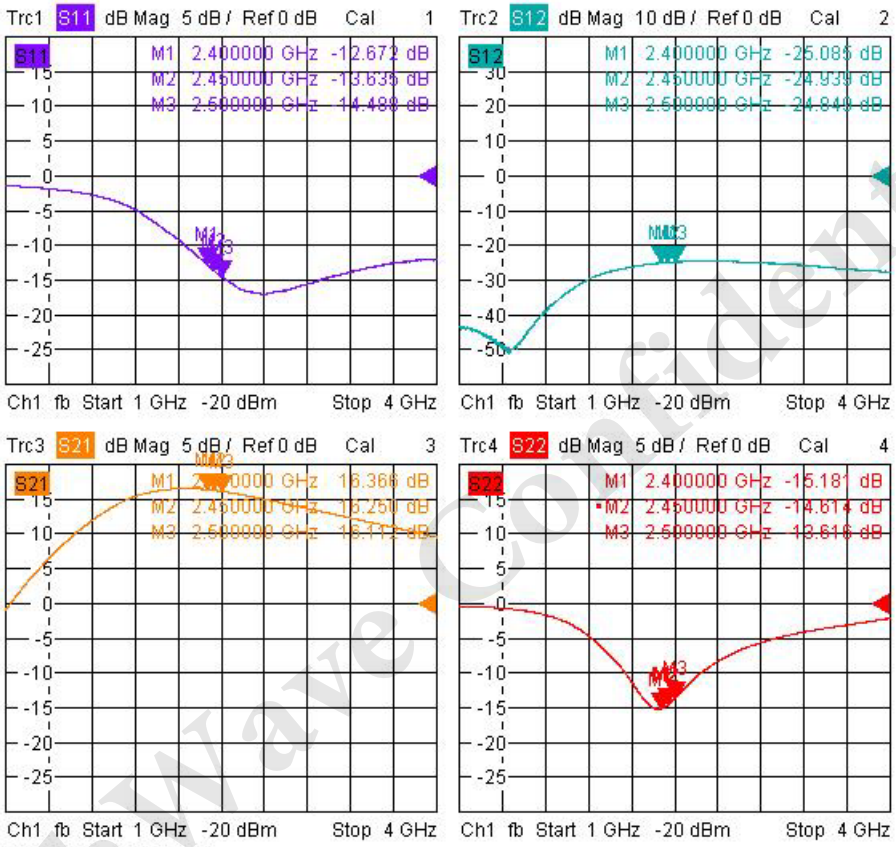
Typical Performance Characteristics

Receive Gain Mode

T = 25℃, VDD = Vrx = LNA_EN = 3.3 V, Vtx = Vbt = 0 V



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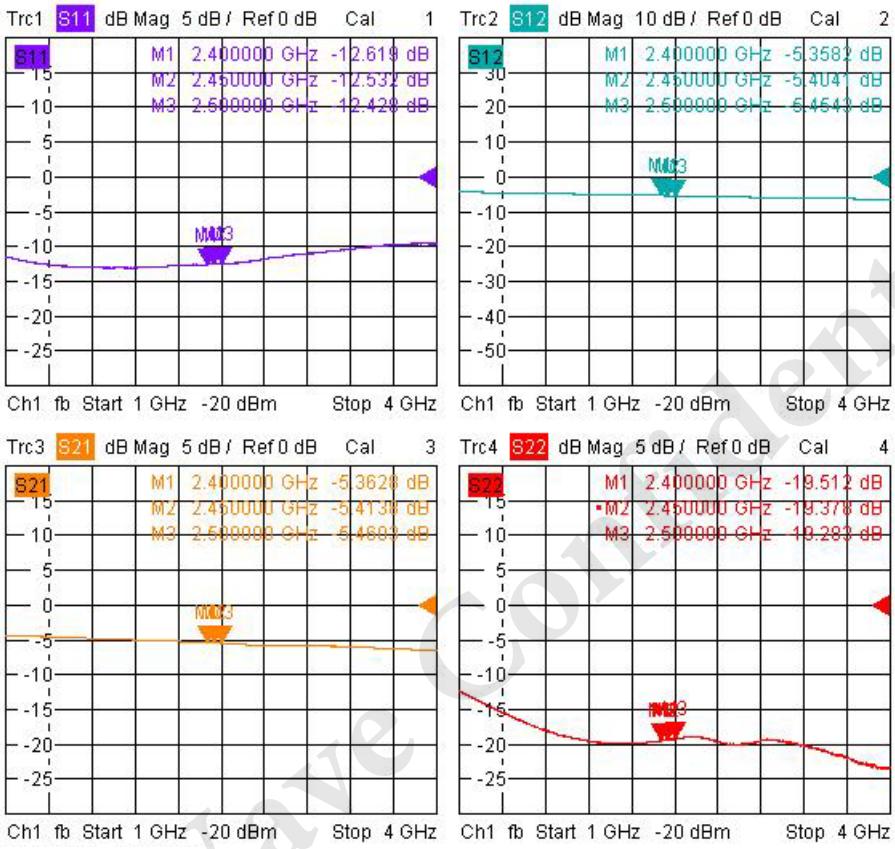
Receive Bypass Mode

T = 25℃, VDD = Vrx = 3.3 V, Vtx = Vbt = LNA_EN = 0 V



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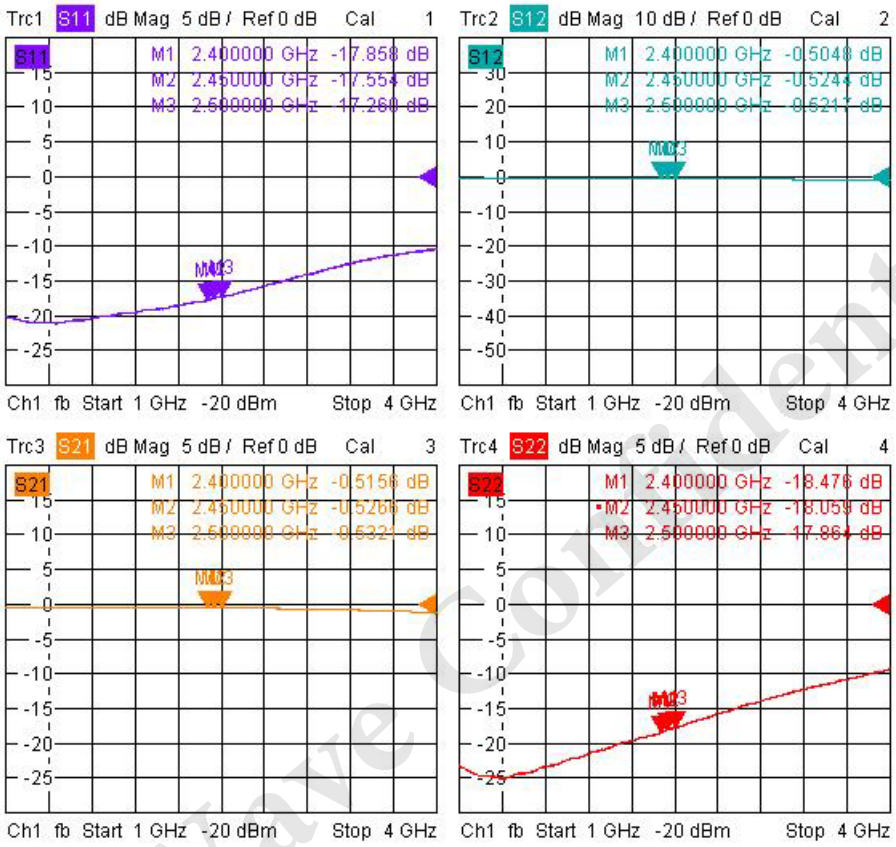
Transmit Mode

T = 25℃, VDD = Vtx = 3.3 V, Vrx = Vbt = LNA_EN = 0 V



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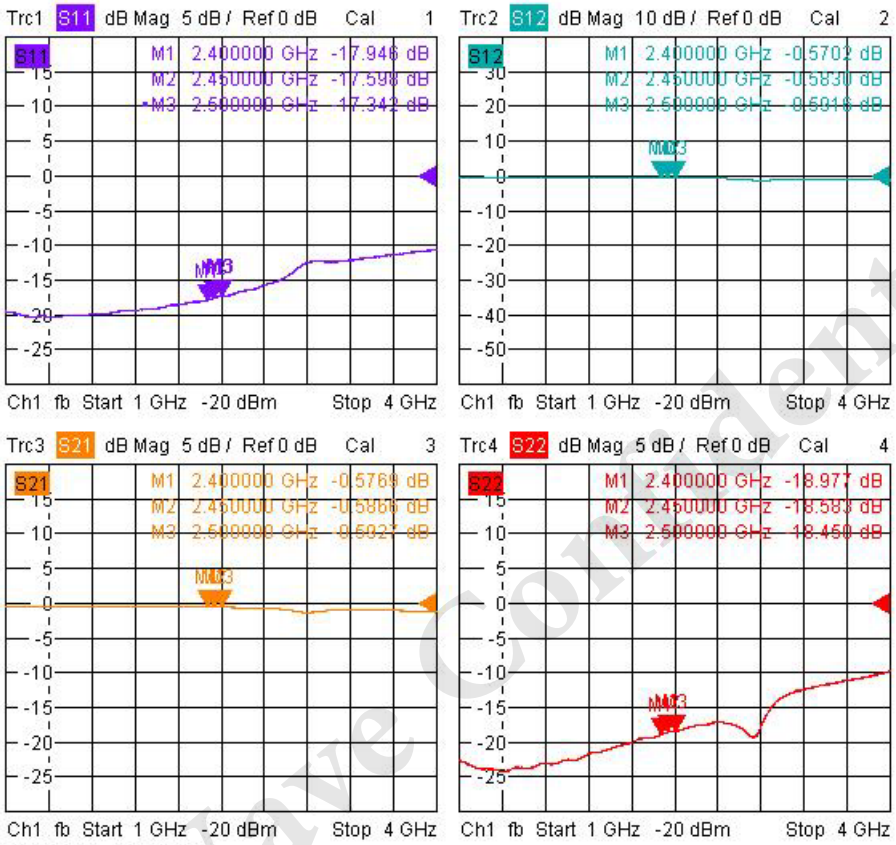
Bluetooth Mode

T = 25℃, VDD = Vbt = 3.3 V, Vrx = Vtx = LNA_EN = 0 V



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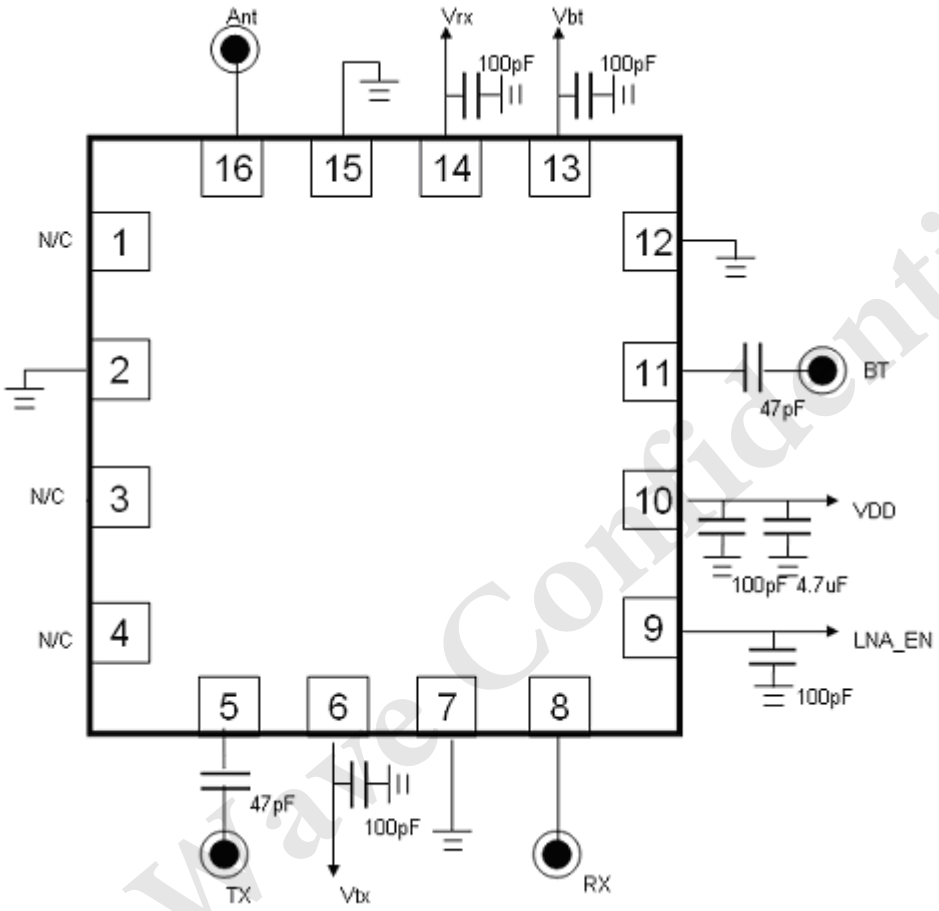
Application Circuit



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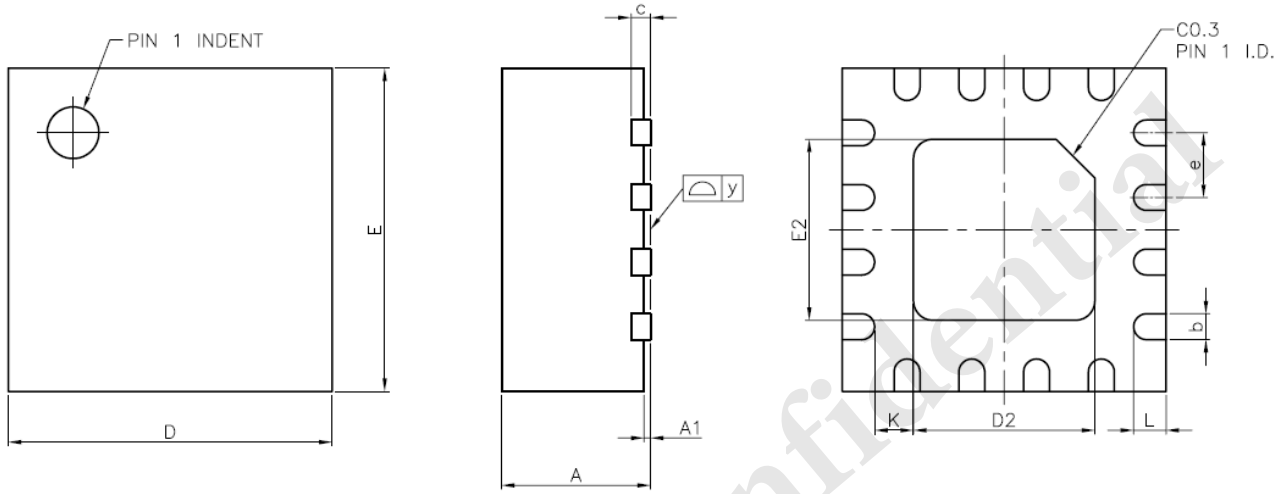
Package Outline Dimension



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN.	NOM.	MAX.
A	1.10	1.15	1.20
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
c	---	0.15 REF.	---
D	2.40	2.50	2.60
D2	1.35	1.40	1.45
E	2.40	2.50	2.60
E2	1.35	1.40	1.45
e	---	0.50	---
K	---	0.30 REF.	---
L	0.20	0.25	0.30
y	0.00	---	0.075

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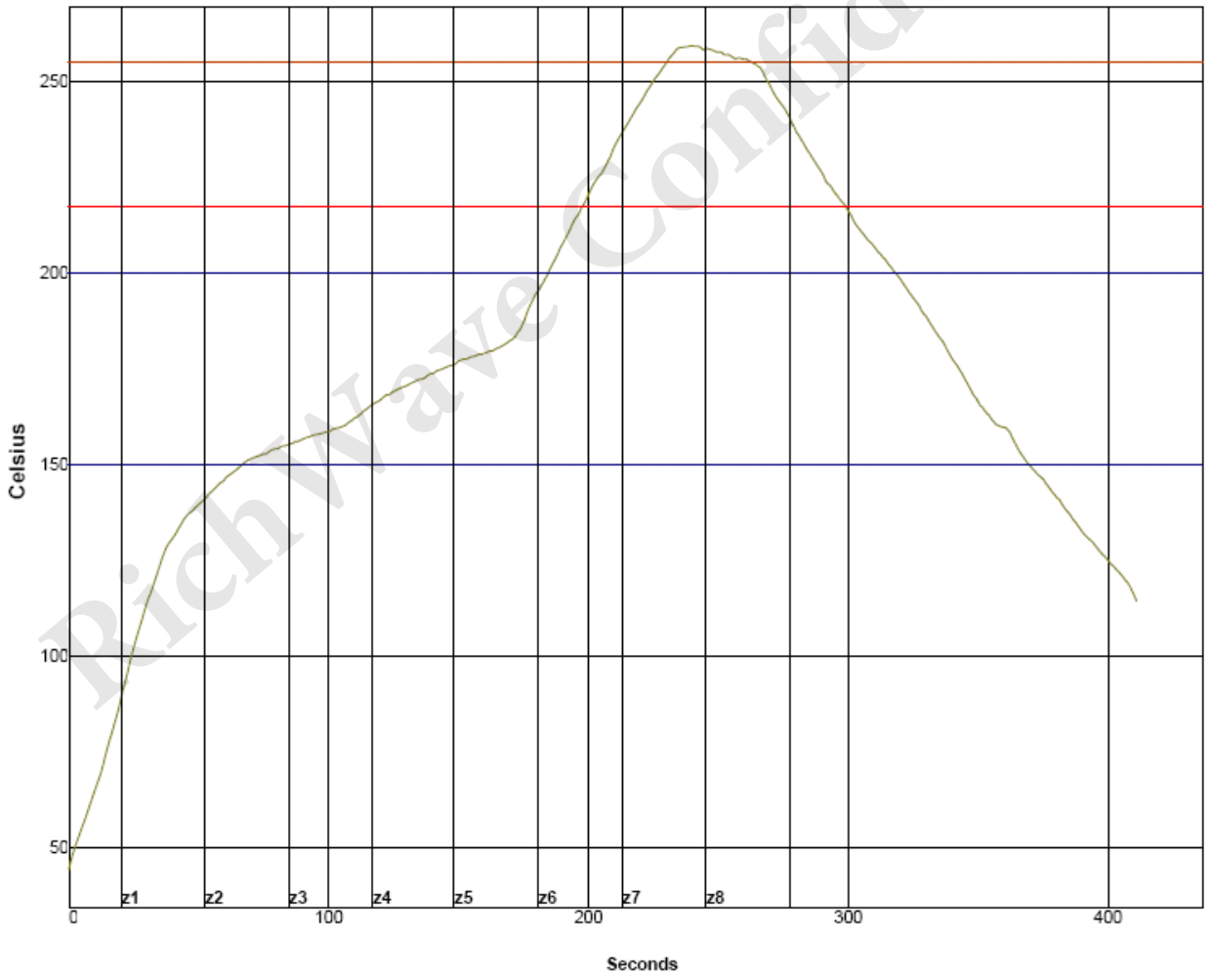
Recommended Solder Reflow Profiles

Average ramp-up rate (200˚C to peak)	3˚C/second max.
Preheat temperature 175 (+/-25) ˚C	60~120secs
Temperature maintained above 217˚C	60~150secs
Time within 5˚C of actual peak temperature	30 seconds min.
Peak temperature range	(260 +2/-2)˚C
Ramp down rate	6˚C/second max.
Time 25˚C to peak temperature	8 minutes max.

* Follow JEDEC spec J-STD-020D



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