Data Sheet

RTC7663

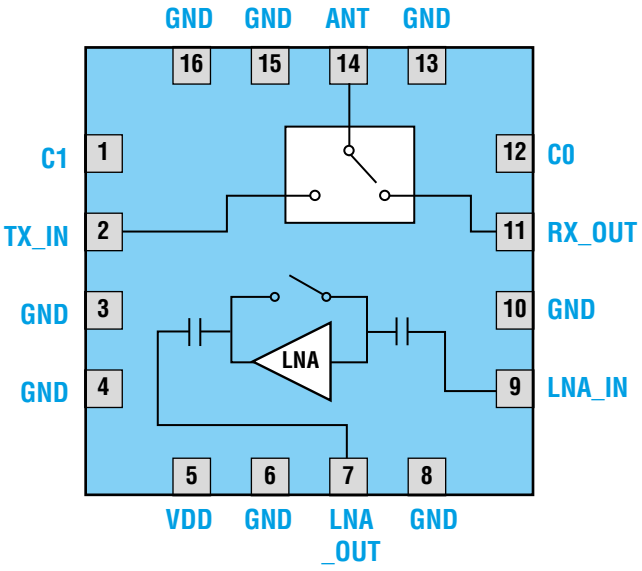
2.4 GHz Receive Path Front End Module (RX-FEM) for 802.11b/g/n/ac

JUN 2017 - Ver. 0.5

Description

The RTC7663 is a receive path front-end module (FEM) designed for 2.4 GHz to 2.5 GHz wireless applications. The device integrates a SPDT switch (SW) and low noise amplifier (LNA) in single chip, manufactured in 16L QFN 2.3mm x 2.3mm x 0.6mm (max) package. The RTC7663 features 1.7 dB low noise figure, 16 dB high gain while only consumes 12 mA current at receive mode. The features of low noise, low power consumption and compact package size make RTC7663 ideal to be applied in many wireless applications.

Functional Block Diagram



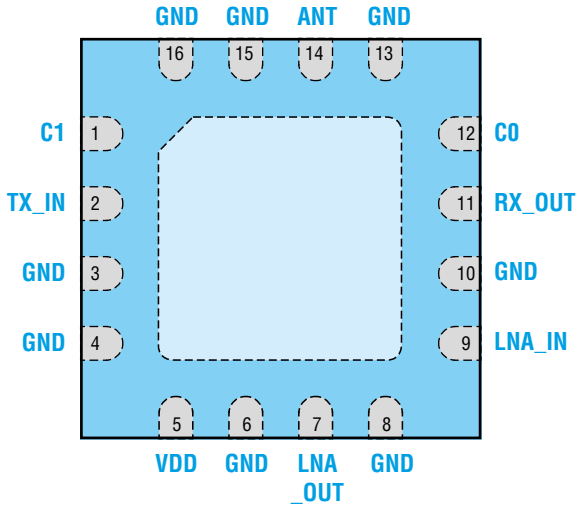
Features

- Frequency Range : 2.4 – 2.5 GHz
- Wide Supply Voltage : 3.0 ~ 5.0 V
- Low Control Voltage : 1.6 ~ 3.6 V
- High Receive Gain : 16 dB
- Receive Mode Current : 12 mA
- Low Noise Figure :1.7 dB
- Bypass Mode Function
- High TX to LNA_OUT isolation when TX mode : 53 dB
- Small 16L QFN 2.3mm x 2.3mm x 0.6mm (max) package
- RoHS Compliant, Pb-free, Halogen Free
- Moisture Sensitivity Level : MSL 3

Applications

- 802.11b/g/n/ac WLAN Applications
- Portable Battery-Powered Equipment
- Wi-Fi Access Points, Gateways, and Set Top Boxes

Pin Assignments



Top View Through Package

Pin No.	Pin Name	Description
1	C1	Control logic 1
2	TX_IN	TX input port
3	GND	Ground
4	GND	Ground
5	VDD	LNA supply voltage
6	GND	Ground
7	LNA_OUT	LNA output port. On-chip DC blocking capacitor is embedded
8	GND	Ground
9	LNA_IN	LNA input port. On-chip DC blocking capacitor is embedded
10	GND	Ground
11	RX_OUT	Switch RX output port
12	C0	Control logic 0
13	GND	Ground
14	ANT	Antenna port
15	GND	Ground
16	GND	Ground
Exposed Paddle		It must be connected to a ground through PCB via for best performance

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Supply Voltage	VDD	5.5	V
Control Voltage	C0, C1	3.6	V
LNA Power (RX mode)	P_{RX}	+5	dBm
TX Input Power (CW tone)	P_{TXIN}	+36	dBm
Operating Temperature	T_A	-40 to +85	°C
Storage Temperature	T_{ST}	-40 to +150	°C
ESD (HBM, JESD22-A114, All pins)	ESD_{HBM}	1000	V

NOTE: Stresses above those conditions listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only. Functional operation of the device above those conditions indicated in the Absolute Maximum Ratings is not implied. The functional operation of the device at the conditions in between Recommended Operating Ranges and Absolute Maximum Ratings for extended periods may affect device reliability.

Recommended Operating Ranges

Parameter	Symbol	Min	Typ	Max	Unit
Operating Frequency	f	2.4		2.5	GHz
Supply Voltage	VDD	3.0	3.3	5.0	V
Control Voltage High	C0, C1	1.6	3.3	3.6	V
Control Voltage Low	C0, C1	0	0	0.3	V

NOTE: Recommended Operating Ranges indicate conditions for which the device is intended to be functional, but does not guarantee specific performance limits.

Truth Table

C0	C1	Mode
0	1	TX Mode (TX to ANT)
1	0	RX Mode (RX LNA to ANT)
1	1	Bypass Mode (RX Bypass to ANT)
0	0	No Connection

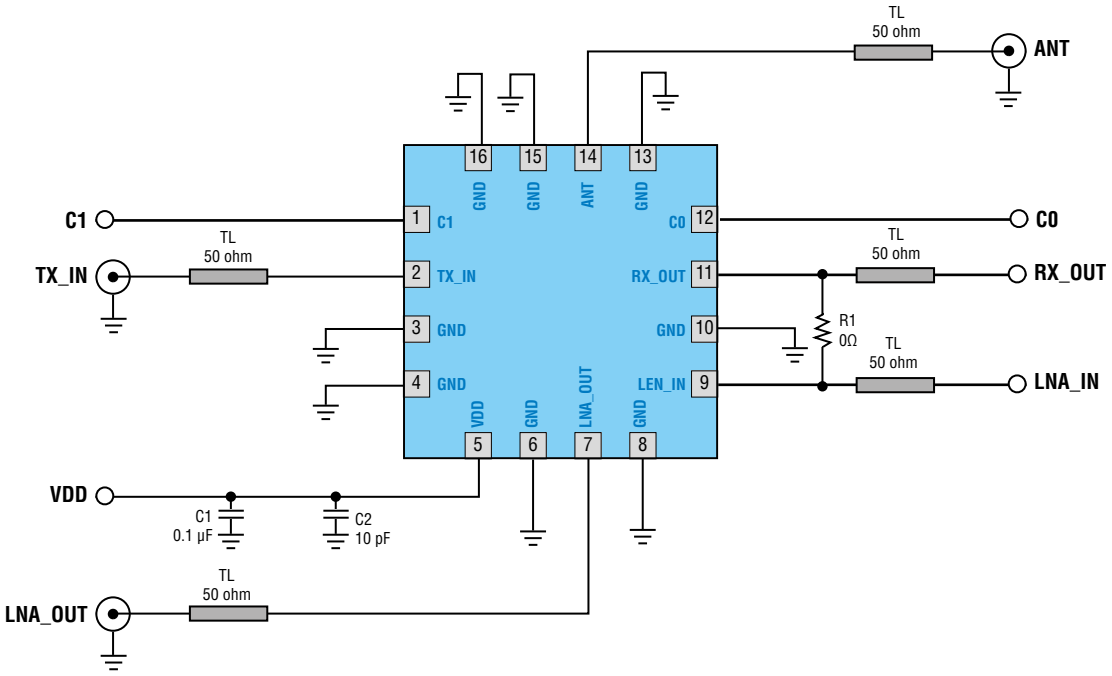
Electrical Specifications

T_A = +25°C, VDD = 3.3 V. All RF ports are connected to 50Ω unless otherwise noted

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
TX Mode (TX to ANT, C0 = 0 V, C1 = 3.3 V)						
Frequency	f		2.4		2.5	GHz
Insertion Loss	IL			0.39	0.6	dB
Input Power 1dB Compression	P1dB			36		dBm
Input Return Loss	|S11|		15	20		dB
Output Return Loss	|S22|		15	22		dB
Control Current	I_{CTL_TX}	SW control current		0.03		μA
Isolation TX – RX	Iso_4	TX to LNA_OUT		53		dB
Isolation TX – RX	Iso_5	TX to RX_OUT		32		dB
RX Mode (RX LNA_OUT to ANT, C0 = 3.3 V, C1 = 0 V)						
Frequency	f		2.4		2.5	GHz
Receive Gain	|S21|	high gain mode	14	16		dB
Noise Figure	NF	high gain mode		1.7	2.0	dB
Input Power 1dB Compression	P1dB	high gain mode	-10	-8		dBm
IIP3 +10MHz offset	IIP3	Input 2 signals f1 = fRX+10 MHz f2 = fRX+20 MHz	0	2		dBm
Reverse Isolation	|S12|		20	24		dB
Input Return Loss	|S11|		7	10		dB
Output Return Loss	|S22|		8	10		dB
Switching On Time	t_{ON}	50% C0, C1 to 90% RF		400		ns
Switching Off Time	t_{OFF}	50% C0, C1 to 10% RF		100		ns
Supply Current	I_{DD_RX}	VDD current at RX No input signal		12	16	mA
Supply Current (no connection mode)	I_{DD_OFF}	VDD current at no connection mode No input signal		3.8		μA
Control Current	I_{CTL_RX}	SW control current		0.03		μA

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
RX Bypass Mode (RX Bypass to ANT, C0 = 3.3 V, C1 = 3.3 V)						
Frequency	f		2.4		2.5	GHz
Insertion Loss	IL	bypass mode		6	9	dB
Input Power 1dB Compression	P1dB	bypass mode		18	15	dBm
Input Return Loss	|S11|		15	20		dB
Output Return Loss	|S22|		15	20		dB
Control Current	I_{CTL_BP}	SW control current		0.01		μA

Application Circuits

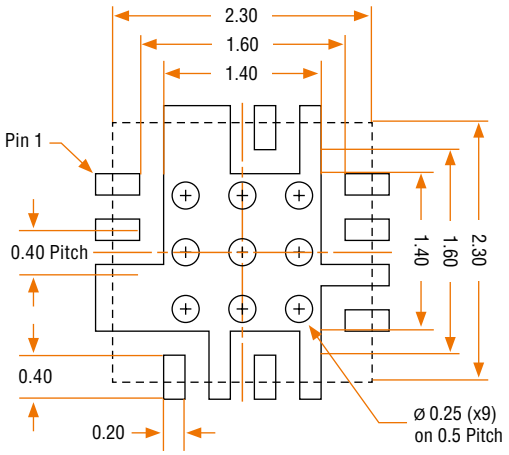


NOTE: Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

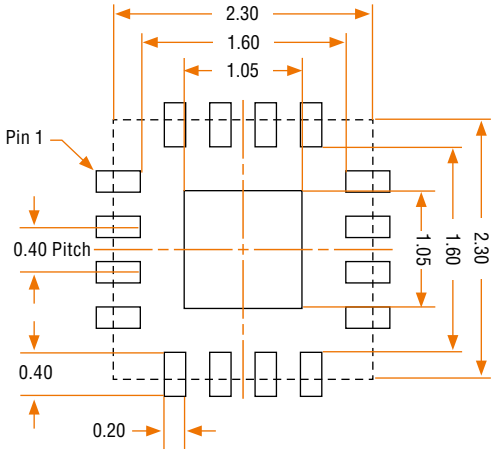
Component	Value	Description	Supplier	Part Number
IC		RTC7663	RichWave	
C1	0.1 µF	De-coupling capacitor	Walsin	0402B104K100CT
C2	10 pF	De-coupling capacitor	Walsin	0402N100J500LT
R1	0Ω		Walsin	WR04X00R0PTL

Recommended Footprint Patterns



PCB Board Metal & Via Pattern

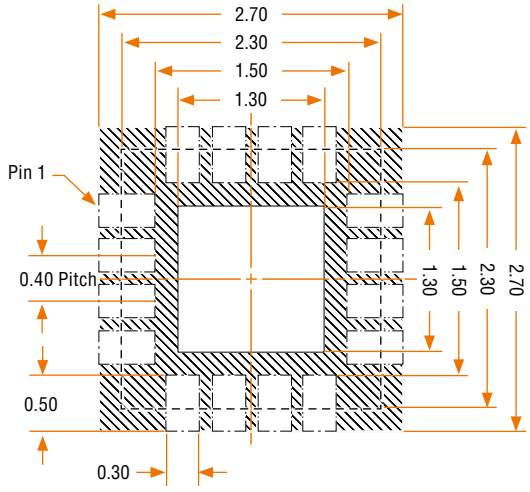
Top View



PCB Stencil Pattern

Top View

56% Solder Coverage on Pad



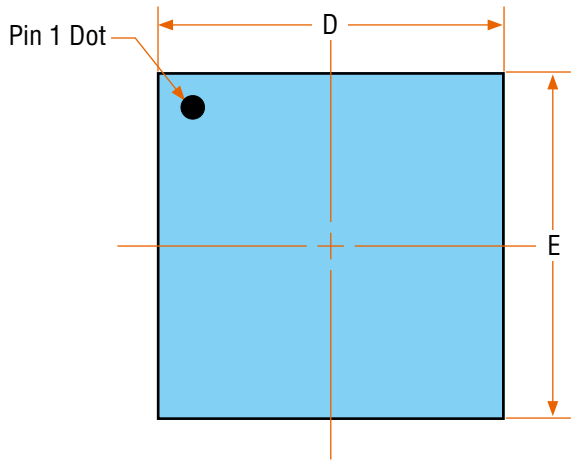
PCB Solder Mask Pattern

Top View

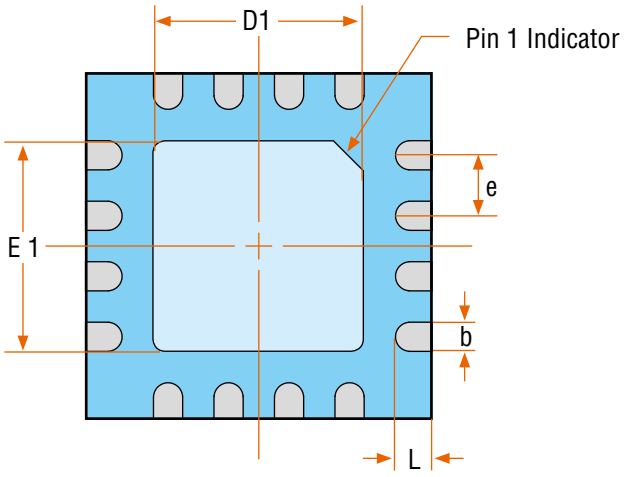
NOTE :

1. All dimensions are measured in millimeters.
2. Drawing is not to scale.

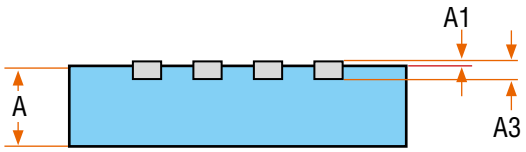
Package Dimensions



Top View



Bottom View



Side View

16L QFN 2.3 X 2.3 X 0.6 - A		
SYMBOL	**MIN**	**MAX**
A	0.500	0.600
A1	0.000	0.050
A3	0.110	0.150
b	0.150	0.250
D	2.200	2.400
D1	1.300	1.500
e	0.400 BSC	
E	2.200	2.400
E1	1.300	1.500
L	0.174	0.326

NOTE :

1. All dimensions are measured in millimeters.
2. Drawing is not to scale.

Customer Service

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