Data Sheet

RTC7672

5 GHz Front End Module for Wi-Fi 802.11a/n/ac

RichWave

RoHS Compliant | Pb Lead-Free | HF Halogen FREE

SEP 2017 - Ver. 0.3

Description

The RTC7672 is an integrated front end module (FEM) designed for 802.11a/n/ac WLAN applications. The device consists of a power amplifier (PA) with power detector, single pole double throw (SPDT) transmit/receive (T/R) switch, a high-gain low-noise amplifier (LNA) with bypass function, and that can be easily implemented into WLAN applications in compact dimensions.
The device is packaged in a compact 3.0mm x 5.0mm x 1.0mm (max) industry-standard 24-pin QFN package.

Functional Block Diagram
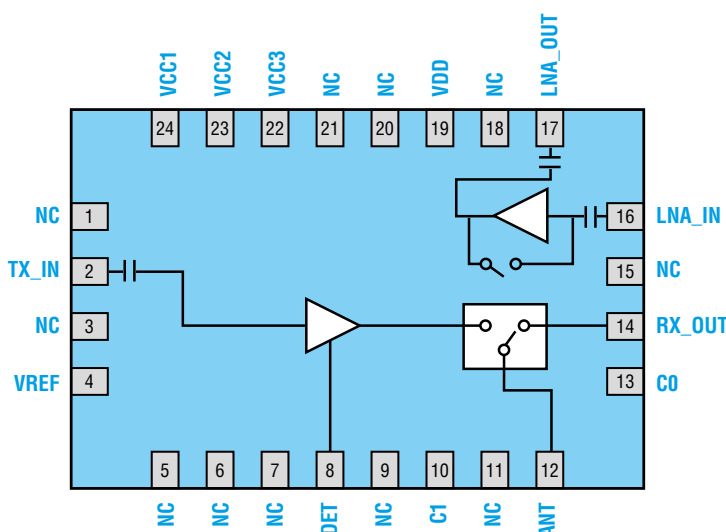
Features

- Frequency range : 5.15 − 5.85 GHz
- Output power:
  - +19 dBm @ −40 dB DEVM, VHT80, MCS11
  - +21 dBm @ −35 dB DEVM, VHT80, MCS9
  - +22.5 dBm @ −30 dB DEVM, VHT20/40, MCS7
- Transmit gain: 32 dB
- Receive gain: 18 dB
- Input and output fully 50 ohm matching
- 24L QFN-3.0mm x 5.0mm x 1.0mm (max) Package
- RoHS Compliant, Pb-free, Halogen Free
- Moisture Sensitivity Level : MSL 3

Applications

- IEEE 802.11a/n/ac Wireless LAN Systems
- 5GHz ISM Band Applications
- Cardbus, miniPCI, PCIe, AP Applications

Pin Assignments
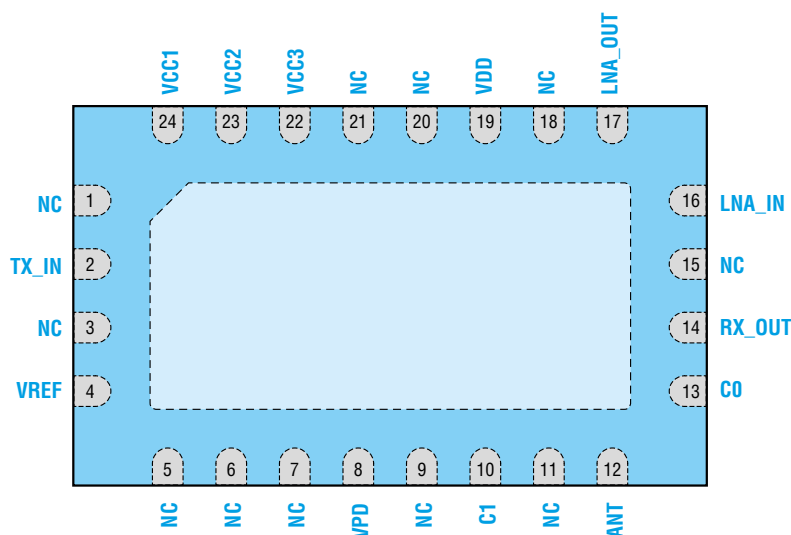
Top View Through Package

Pin No.	Pin Name	Description	Pin No.	Pin Name	Description
2	TX_IN	Transmit Input	19	VDD	LNA supply voltage
4	VREF	PA enable	22	VCC3	Third stage supply voltage
8	VPD	Detector output	23	VCC2	Second stage supply voltage
10	C1	Control pin 1	24	VCC1	First stage supply voltage
12	ANT	Antenna	1, 3, 5, 6, 7, 9, 11, 15, 18, 20, 21	NC	Not connected inside the package. For the best performance please connect these pins to ground on PCB
13	C0	Control pin 0			
14	RX_OUT	Switch RX output			
16	LNA_IN	LNA input			
17	LNA_OUT	LNA output			
Exposed Paddle		It must be connected to a ground through PCB via for best performance			

Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Supply Voltage	VCC, VDD	+6.0	V
DC Input on Control Pins (C0, C1, VREF)	V_{IN}	3.6	V
RF Input Power in TX mode (50Ω load)	P_{IN}	+10	dBm
RF Input Power in RX LNA mode (50Ω load)	P_{IN}	+15	dBm
Operating Temperature	T_A	-40 to +85	°C
Storage Temperature	T_{STG}	-40 to +150	°C

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		5.15		5.85	GHz
Supply Voltage	VCC, VDD	4.75	5	5.25	V
Reference Voltage, High	VREF(H)	2.9	3.0	3.2	V
Reference Voltage, Low	VREF(L)	0		0.4	
C0, High	C0(H)	1.6		VCC	V
C0, Low	C0(L)	0		0.4	
C1, High	C1(H)	1.6		VCC	V
C1, Low	C1(L)	0		0.4	

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

Truth Table

| VREF	C0	C1	Mode
High	Low	High	TX
Low	High	Low	RX LNA
Low	High	High	RX Bypass
Low	Low	Low	All Off

NOTE: Any modes other than those listed above are not supported.

Electrical Specification

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Transmit Mode (TX_IN – ANT) T_A = +25 °C, VCC = VDD = 5 V, VREF = C1 = 3.0 V, C0 = 0 V. All unused RF ports terminated in a 50 Ω load, unless otherwise noted						
Operating Frequency	f		5.15		5.85	GHz
Output Power	Pout	DEVM = -35 dB, MCS9 VHT80		+21		dBm
		DEVM = -30 dB, MCS7 HT20/40		+22.5		
		80MHz, MCS0 Spectral Mask		+23.5		
		20MHz, MCS0 Spectral Mask		+24.5		
Small Signal Gain	G		30	32		dB
Gain Flatness	ΔG	Gain Variation Over the Full Band			2	dB
1 dB Output Compression Point	P1dB	1dB Power Compression		+29		dBm
Input Return Loss	|S11|	at TX_IN port		9		dB
Output Return Loss	|S22|	at ANT port		4		dB
2nd Harmonic	2fo	MCS0, Pout = 24.5 dBm (no external harmonic filter)		-30		dBm/MHz
3rd Harmonic	3fo			-38		dBm/MHz
Isolation	ISO	TX mode, ANT to LNA_OUT		27		dB
		TX mode, TX_IN to LNA_OUT		15		dB
Power Detector Output	Vpd	No RF		0.12		V
		Pout = 22 dBm		0.58		V
		Pout = 25 dBm		0.83		V
PA Switching Time	t_{SW}	From 10% to 90% power change of rising or falling edge		200		ns
PA Enable Current	Ien	Quiescent (no RF)		4.5		mA
Leakage Current	I_{leak}	VREF = 0 V		0.9		mA
Supply Current	Icc	Quiescent (no RF)		325		mA
		Pout = 22 dBm,		405		
		Pout = 25 dBm,		480		
Ruggedness	Ru	CW, P_{IN} = +10 dBm, load VSWR = 10:1	No Permanent Damage			
Stability	S	Pout = +24dBm, CW, VSWR = 10:1, all phase,	All non-harmonically related outputs from 0.1 GHz to 26.5 GHz < -44 dBm/MHz			

| Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Receive LNA Mode (ANT – LNA_OUT)						
T_A = +25 °C, VCC = VDD = 5 V, VREF = C1 = 0 V, C0 = 3 V. All unused RF ports terminated in a 50 Ω load, unless otherwise noted						
Operating Frequency	f		5.15		5.85	GHz
RX Gain	G	High Gain Mode		18		dB
Input Return Loss	|S11|	at ANT port		10		dB
Output Return Loss	|S22|	at LNA_OUT port		10		dB
Noise Figure	NF	High Gain Mode		2.8		dB
Isolation	ISO	LNA_OUT mode, ANT to TX_IN		37		dB
1 dB Input Compression Point	IP1dB	1dB Gain Compression		-7		dBm
Supply Current	Idd	LNA_OUT mode		26		mA
Switching Time	t_{SW}	From 10% to 90% power change of rising or falling edge, LNA_OUT to TX_IN mode		440		ns
Receive Bypass Mode (ANT – LNA_OUT)						
T_A = +25 °C, VCC = VDD = 5 V, VREF = 0 V, C0 = C1 = 3 V. All unused RF ports terminated in a 50 Ω load, unless otherwise noted						
Operating Frequency	f		5.15		5.85	GHz
RX Gain	G	Bypass Mode		-9		dB
1 dB Input Compression Point	IP1dB	1dB Gain Compression		23		dBm
Isolation	ISO	ANT - TX_IN		55		dB
Input Return Loss	|S11|	at ANT port		7		dB
Output Return Loss	|S22|	at LNA_OUT port		15		dB

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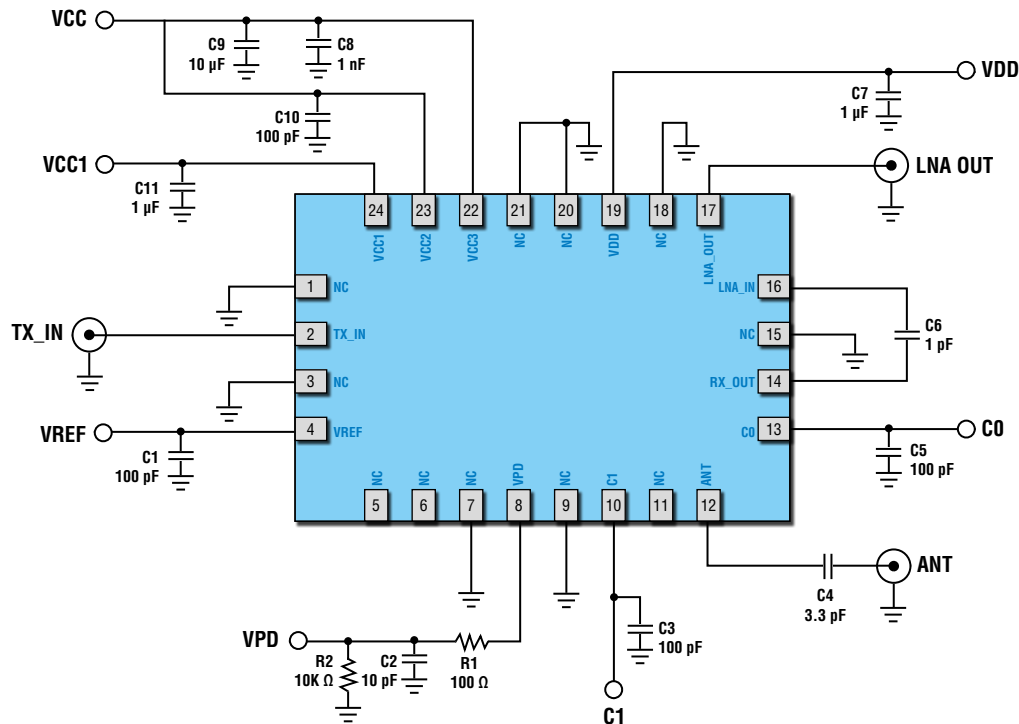
NOTE: Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

Component	Value	Description	Supplier	Part Number
IC		RTC7672	RichWave	
C1, C3, C5, C10	100 pF	Decoupling capacitor	WALSIN	0402N101J500LT
C2	10 pF	Decoupling capacitor	WALSIN	0402N100J500LT
C4	3.3 pF	DC blocking capacitor	WALSIN	0402N3R3C500LT
C6	1 pF	DC blocking capacitor	WALSIN	0402N1R0C500LT
C7, C11	1 μF	Decoupling capacitor	WALSIN	0402X105K6R3CT
C8	1 nF	Decoupling capacitor	WALSIN	0402B102K500CT
C9	10 μF	Decoupling capacitor	WALSIN	0805X106K6R3CT
R1	100 Ω		WALSIN	WR04X1000FTL
R2	10K Ω		WALSIN	WR04X1002FTL

Recommended Footprint Patterns
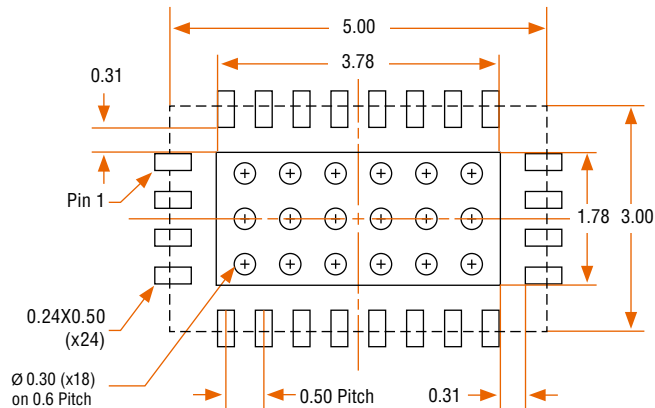
PCB Board Metal & Via Pattern
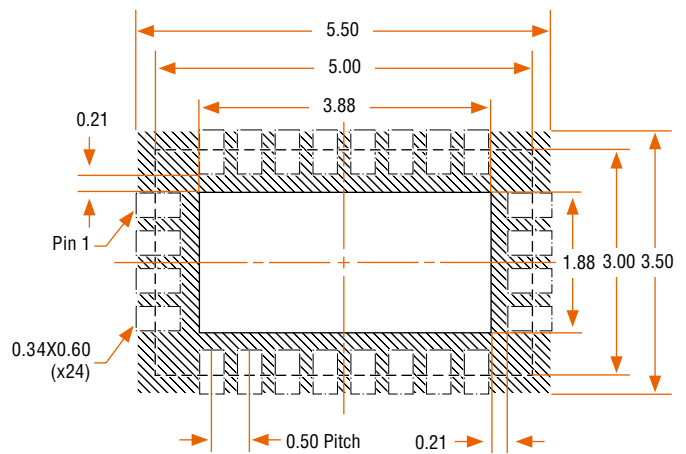
Top View

PCB Stencil Pattern
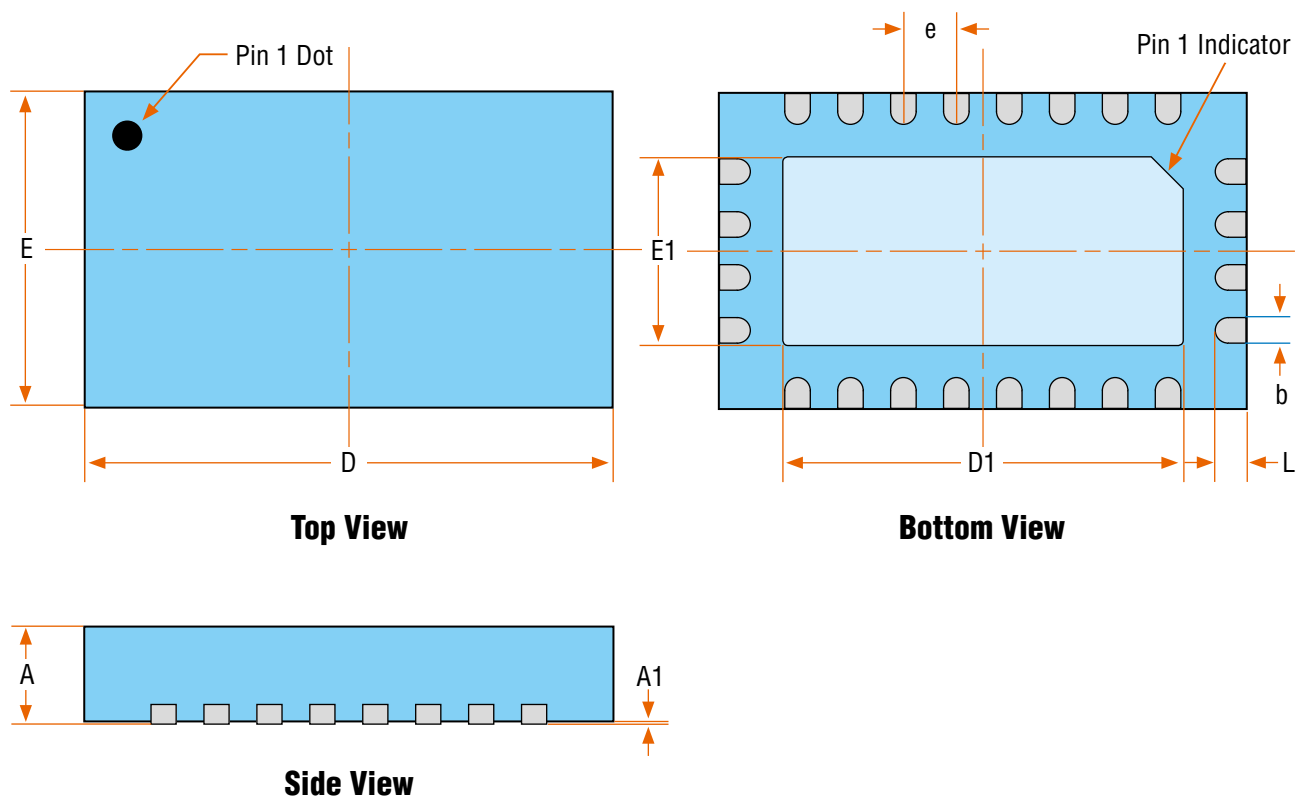
Top View

82% solder coverage on Pad
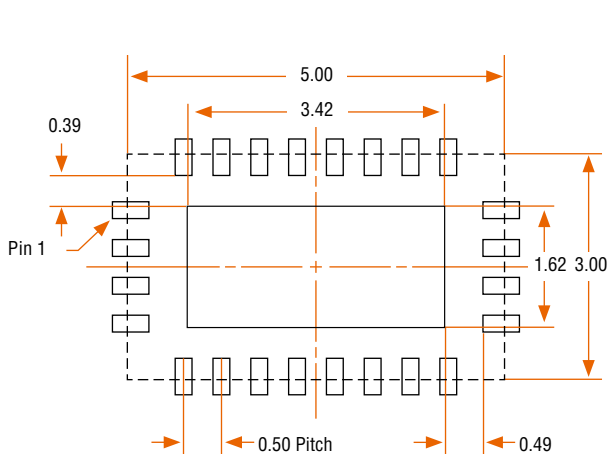
PCB Solder Mask Pattern

Top View

NOTE :

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

Package Dimensions

Top View

Bottom View

Side View

24L QFN 3 X 5 X 1.0 - A		
SYMBOL	**MIN**	**MAX**
A	0.800	1.000
A1	0.000	0.050
b	0.180	0.300
D	4.900	5.100
D1	3.650	3.900
e	0.500BSC	
E	2.900	3.100
E1	1.650	1.900
L	0.200	0.400

NOTE :

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

Customer Service

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