Data Sheet

RTC7672

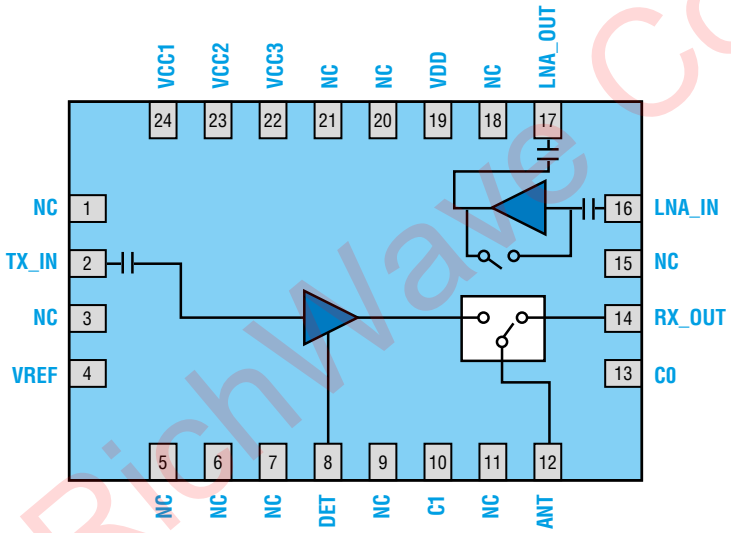
5 GHz Front End Module for Wi-Fi 802.11a/n/ac

SEP 2020 - Ver. 0.8

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



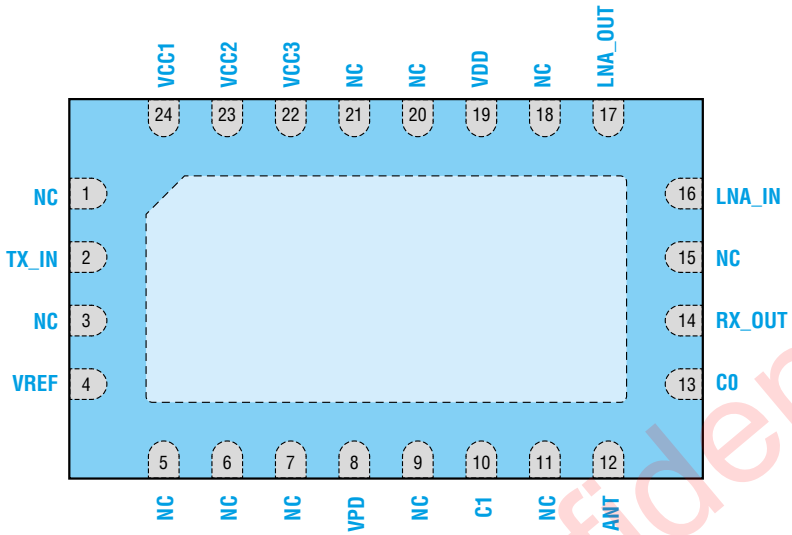
Features

- Frequency range : 5.15 – 5.85 GHz
- Output power:
  - +22 dBm @ –35 dB DEVM, VHT80, MCS9
  - +23.5 dBm @ –30 dB DEVM, HT20/40, MCS7
- Transmit gain: 31.5 dB
- Receive gain: 16 dB
- Noise figure: 2.7 dB
- 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
- 5 GHz 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	4.5	5	5.5	V
Reference Voltage, High Reference Voltage, Low	VREF(H) VREF(L)	2.8 0	3.0 –	3.2 0.4	V
C0, High C0, Low	C0(H) C0(L)	1.6 0	3.0 –	VCC 0.4	V
C1, High C1, Low	C1(H) C1(L)	1.6 0	3.0 –	VCC 0.4	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

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

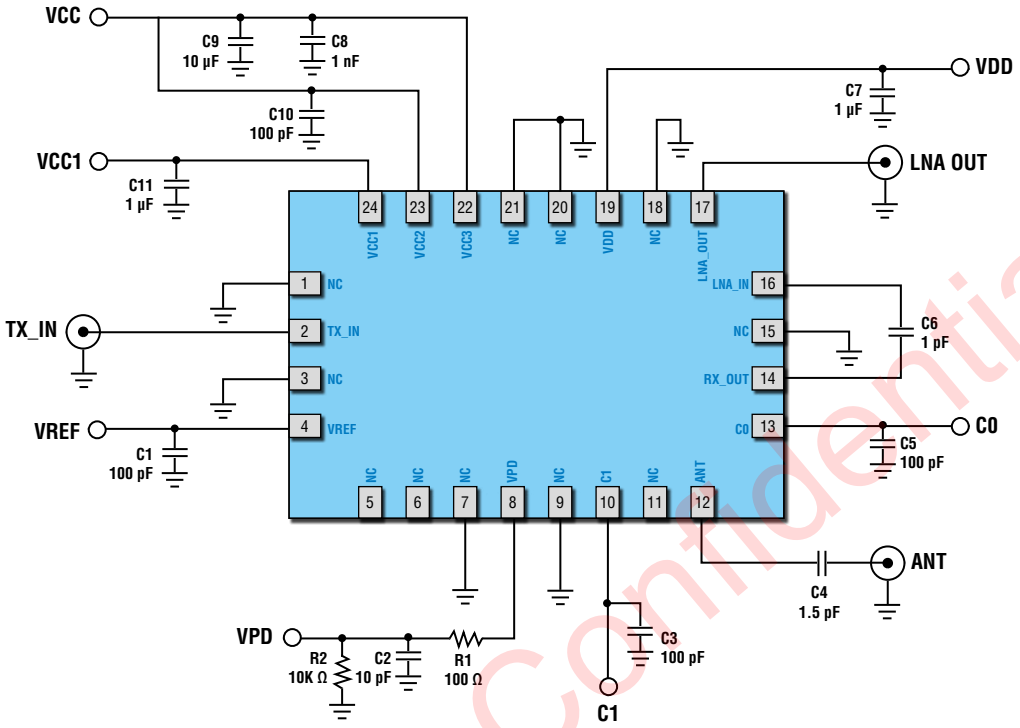
NOTE: Any modes other than those listed above are not supported.

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	20.5	22		dBm
		DEVM = -30 dB, MCS7 HT20/40	22	23.5		
		80MHz, MCS0 Spectral Mask	23.5	25.5		
		20MHz, MCS0 Spectral Mask	24.5	26.5		
Small Signal Gain	G		30	31.5	32.5	dB
Gain Flatness	ΔG	Over any 40MHz channel	-0.5		+0.5	dB
1 dB Output Compression Point	P1dB	1dB Power Compression	27.5	29		dBm
Input Return Loss	|S11|	at TX_IN port	4	6		dB
2nd Harmonic	2fo	MCS0, Pout = 26 dBm (no external harmonic filter)			-20	dBm/MHz
3rd Harmonic	3fo				-22	dBm/MHz
Isolation	ISO	ANT to LNA_OUT	38	45		dB
Power Detector Output	Vpd	Pout = 0 dBm	0.05	0.12	0.20	V
		Pout = 5 dBm	0.10	0.14	0.20	V
		Pout = 21 dBm	0.50	0.55	0.60	V
		Pout = 26 dBm	0.85	0.95	1.05	V
PA Enable Current	Ien	No RF	4	4.5	5	mA
Supply Current	Icc	Quiescent (no RF)	330	360	390	mA
		Pout = 22 dBm	420	450	480	
		Pout = 26 dBm	500	530	570	

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	14	16	18	dB
Gain Variation		Over any 40MHz channel	-0.25		+0.25	dB
Input Return Loss	|S11|	at ANT port	8	10		dB
Noise Figure	NF	High Gain Mode		2.7	3.2	dB
Isolation	ISO	ANT to TX_IN	33	40		dB
1 dB Input Compression Point	IP1dB	1dB Gain Compression	-5	-3		dBm
Supply Current	Idd	LNA_OUT mode	22	24	27	mA
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	-12	-10	-8	dB
1 dB Input Compression Point	IP1dB	1dB Gain Compression	21.5	23		dBm
Isolation	ISO	ANT - TX_IN	40	45		dB
Input Return Loss	|S11|	at ANT port	7	9		dB
Output Return Loss	|S22|	at LNA_OUT port	5	7		dB

Application Circuit

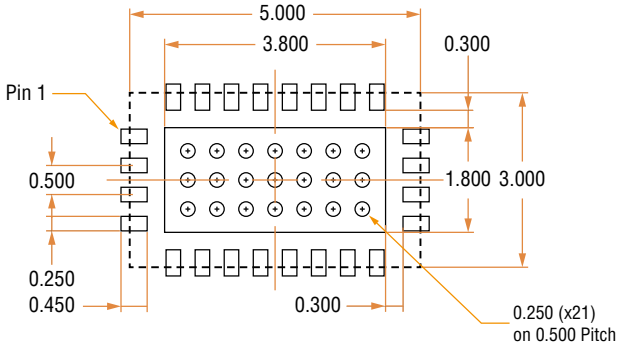


NOTE: Information in the above application is for reference only, and does not guarantee the mass production design of the device.

Evaluation Board Bill of Material

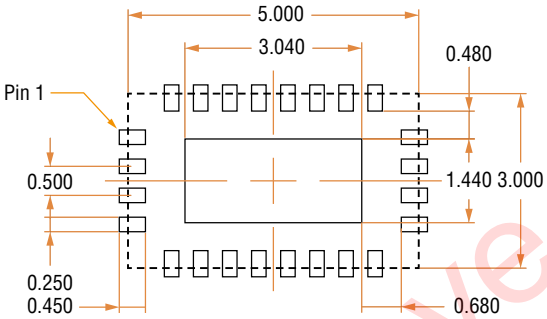
Component	Value	Description	Supplier	Part Number
IC		RTC7672	RichWave	
C1, C3, C5, C10	100 pF	Decoupling capacitor	WALSIN	0402N101J500LT
C2	10 pF	Decoupling capacitor	WALSIN	0402N100J500LT
C4	1.5 pF	DC blocking capacitor	WALSIN	0402N1R5C500LT
C6	1 pF	DC blocking capacitor	WALSIN	0402N1R0C500LT
C7, C11	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

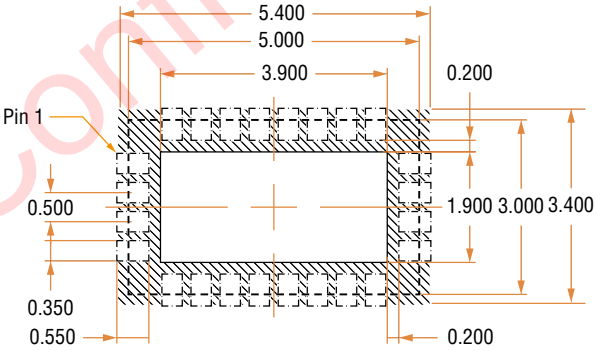
Top View



PCB Stencil Pattern

Top View

64% solder coverage on Pad



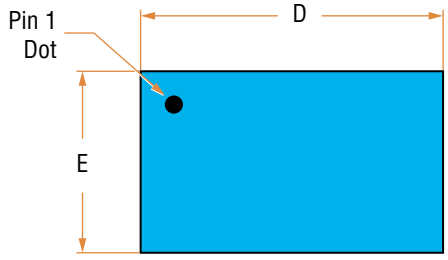
PCB Solder Mask Pattern

Top View

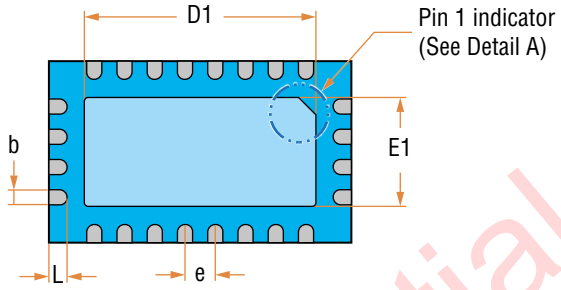
NOTE :

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

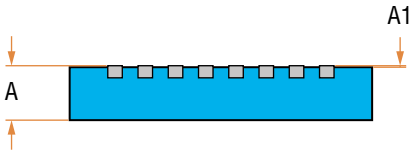
Package Dimensions



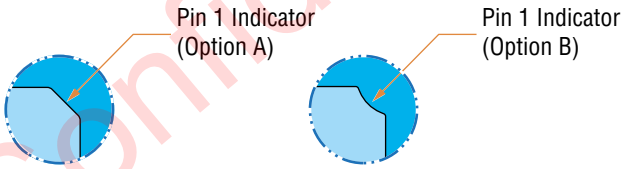
Top View



Bottom View



Side View



Detail A

24L QFN 3 X 5 X 1.0 - A			
SYMBOL	**MIN**	**TYP**	**MAX**
A	0.800	0.900	1.000
A1	0.000	0.020	0.050
b	0.180	0.250	0.320
D	4.900	5.000	5.100
D1	3.650	3.800	3.950
e		0.500 BSC	
E	2.900	3.000	3.100
E1	1.650	1.800	1.950
L	0.200	0.300	0.400

NOTE :

1. All dimensions are measured in millimeters
2. Drawing is not to scale
3. The shape of the Pin 1 Indicator can be either Option A or Option B, but it must be located within the zone indicated.

Customer Service

RichWave Technology Corp.
3F, No.1, Alley 20, Lane 407. Sec.2, Tiding Bvd., Neihu Dist., Taipei City 114, Taiwan, R.O.C.
TEL +886-2-87511358 FAX +886-2-66006887
www.richwave.com.tw

Disclaimers

RichWave reserves the right to make changes without further notice to specifications and product descriptions in this document to improve reliability, function or design. RichWave does not assume any liability arising out of the application or use of information or product described in this document. Neither does RichWave convey any license under its intellectual property rights nor licenses to any of circuits described in this document to any third party.
The information in this document is believed to be accurate and reliable and is provided on an “as is” basis, without any express or implied warranty. Any information given in this document does not constitute any warranty of merchantability or fitness for a particular use. The operation of this product is subject to the user’s implementation and design practices. It is the user’s responsibility to ensure that equipment using this product is compliant to all relevant standards.
RichWave’s products are not designed or intended for use in life support equipment, devices or systems, or other critical applications, and are not authorized or warranted for such use.