

Features

- 2.4 - 2.5GHz Frequency Range
- High Efficiency Optimized for Battery Operation
- Up to +23dBm Output Power at 3.3V
- 108mA at 20dBm, 3.3V
- 2.7 - 3.6V Operation
- 3dB LNA Noise Figure
- Single-Ended Transceiver Interface
- -40°C to 125°C Temperature Range
- 3mm x 3mm x 0.45mm 16-Pin QFN Package
- Die in Wafer Form available

Applications

- IoT (Internet of Things) / M2M Connectivity
- Proprietary ISM Wireless Systems
- 802.15.4 Zigbee / Thread, RF4CE
- Bluetooth® Low Energy (BLE) Mesh Networks
- Smart Home Hubs and Gateways
- Consumer Electronics, Smart Appliances
- Smart Lighting, Smart Metering
- Drone, Toy, Media Remote Controller
- Industrial Wireless Sensor Networks
- Home, Industrial, Factory Automation

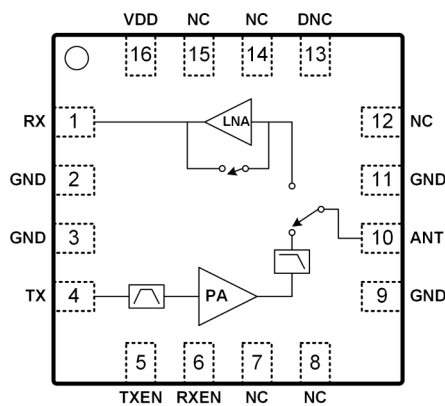


Figure 1: Functional Block Diagram

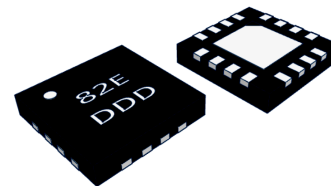
Description

The 8TR8202 is a Single-Chip CMOS RF Front-End IC . It is intended for Bluetooth®, Zigbee, Thread, ANT/ ANT+, and Proprietary ISM Wireless Systems in the 2.4GHz Band. Wide operating Supply Voltage (2.7V to 3.6V) and wide Temperature Range (-40°C to 125°C) support battery-powered wireless systems.

The 8TR8202 combines a power amplifier (PA), bypass, low noise amplifier (LNA) in a 3mm x 3mm x 0.45mm 16-pin QFN package. It also comes integrated with harmonic filters, and input/output matching circuitry.

The device delivers up to 23dBm output power at a supply voltage of 3.3V.

The 8TR8202 is RoHS compliant, halogen-free, and REACH Compliant. It is rated for Moisture Sensitivity Level 1 (MSL1), reflow at 260°C per JEDEC J-STD-020. Refer to IPC/JEDEC J-STD-020 for detailed solder reflow temperature and profile.

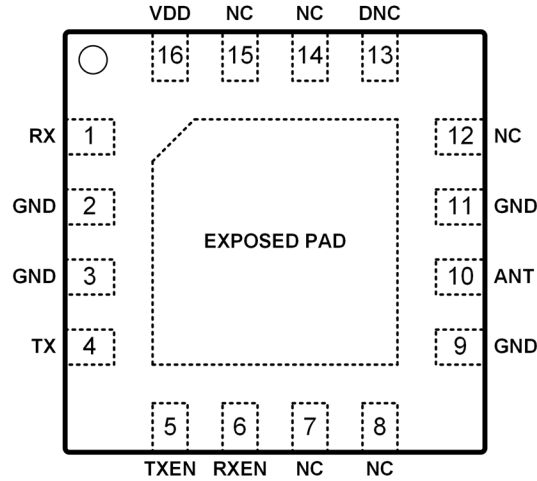


16-Lead 3mm x 3mm x 0.45mm, QFN Package

Figure 2: Package Type

Ordering Information

Part Number	Description
8TR8202	2.4GHz Front-End RFIC 2500 Pieces Per Tape and Reel
8TR8202-EVB	Fully Tested and Characterized Evaluation board
8TR8202-DWF	2.4GHz Front-End RFIC Die in Wafer Form

Pin Descriptions

Figure 3 :Pin Description (Top View)
Table 1: 8TR8202 Pin Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	RX	Receive Port (DC shorted to GND)	9	GND	Ground
2	GND	Ground	10	ANT	Antenna Port (DC shorted to GND)
3	GND	Ground	11	GND	Ground
4	TX	Transmit Port (DC shorted to GND)	12	NC	Not connected internally
5	TXEN	Control Logic Pin	13	DNC	Do Not Connect
6	RXEN	Control Logic Pin	14	NC	Not connected internally
7	NC	Not connected internally	15	NC	Not connected internally
8	NC	Not connected internally	16	VDD	DC Voltage Supply
EXPOSED PAD		Exposed pad should be connected to GND.			

General Specifications
Table 2: 8TR8202 Absolute Maximum Ratings

Parameter	Units	Minimum	Maximum
Supply Voltage (VDD)	V	0	3.6
Supply Current (I _{dd})	mA		250
Control Logic Pin (TXEN, RXEN)	V	0	3.6
Transmit Input Power at TX Port	dBm		10
Receive Input power at ANT Port	dBm		5
Storage Temperature	°C	-40	150

Note: Sustained operation at or above the Absolute Maximum Ratings for any single or combinations of the above parameters may result in permanent damage to the device and is not recommended. All Maximum RF Input Power Ratings assume 50Ω terminal impedance.

Table 3: 8TR8202 Recommended Operating Conditions

Parameter	Units	Minimum	Typical	Maximum
Supply Voltage (VDD, recommended)	V	2.7	3.3	3.6
Supply Voltage (VDD, extend supply voltage)**	V	1.8		3.6
Control Pin - Logic High State	V	1.2		VDD*
Control Pin - Logic Low State	V	0		0.4
Operating Frequency Range	GHz	2.4		2.5
Operating Temperature	°C	-40	25	125

*For Control Voltages > 3.0V, a 10kΩ series resistor should be used at the Control Logic Pins.

**Functional working with degraded performance for the supply voltage range 1.8V to 2.7V.

Table 4: 8TR8202 Transmit Electrical Specifications

(VDD = 3.3V, T_{Ambient} = 25°C, With External Harmonic Filter, Excluding PCB and Connector Loss, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
Frequency Range	GHz	2.4		2.5	
Saturated Output Power	dBm		15		VDD: 1.8V
			23		
Large-Signal Gain	dB		28		VDD:1.8V, 13dBm Pout
			32		20dBm Pout
Current Consumption	mA		60		VDD:1.8V, 15dBm Pout
			108		20dBm Pout
			136		22dBm Pout
Tx Quiescent Current	mA		22		No RF Applied
Second Harmonic	dBm/MHz		-50		Up to +23dBm with external harmonic filter as specified
Third Harmonic	dBm/MHz		-50		
Input Return Loss	dB		-12		
Output Return Loss	dB		-6		
Load VSWR for Stability			6:1		All Non-harmonic Spurs Less than -50dBm/MHz, 23dBm Pout
Load VSWR for Ruggedness			10:1		No Damage at +10dBm input power

Table 5: 8TR8202 Receive Electrical Specifications

(VDD = 3.3V, T_{Ambient} = 25°C, With External Harmonic Filter, Excluding PCB and Connector Loss, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
Frequency Range	GHz	2.4		2.5	
Small-Signal Gain	dB		12		
Current Consumption	mA		8.5		
Noise Figure	dB		3		
Input P1dB	dBm		0		
Input IP3	dBm		0		
Input Return Loss	dB		-12		
Output Return Loss	dB		-6		

Table 6: 8TR8202 Bypass Electrical Specifications

(VDD = 3.3V, T_{Ambient} = 25°C, With External Harmonic Filter, Excluding PCB and Connector Loss, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
Operating Frequency Band	GHz	2.4		2.5	
Bypass Insertion Loss	dB		3.5		TXEN = RXEN = 0V
Bypass Current	uA		1.2		TXEN = RXEN = 0V

Table 7: 8TR8202 Switching Time Specifications

(VDD = 3.3V, T_{Ambient} = 25°C, With External Harmonic Filter, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
TX to RX	usec		1.2		From 50% of RXEN to 90% of RX power
Off to RX	usec		0.2		From 50% of RXEN to 90% RX Power
RX to TX	usec		0.3		From 50% of TXEN to 90% RF
Off to TX	usec		0.3		From 50% of TXEN to 90% RF

Table 8: 8TR8202 Control Logic

"1" = Logic High, "0" = Logic Low

TXEN	RXEN	Operational Mode
0	0	Bypass Mode
0	1	RX Mode
1	0	TX Mode
1	1	TX Mode

Application Notes

The 8TR8202 Application note provides detailed descriptions and test data over various operating conditions. Visit www.berex.com or contact BeRex at sales@berex.com to request additional documentation.

Application Schematic and PCB Layout

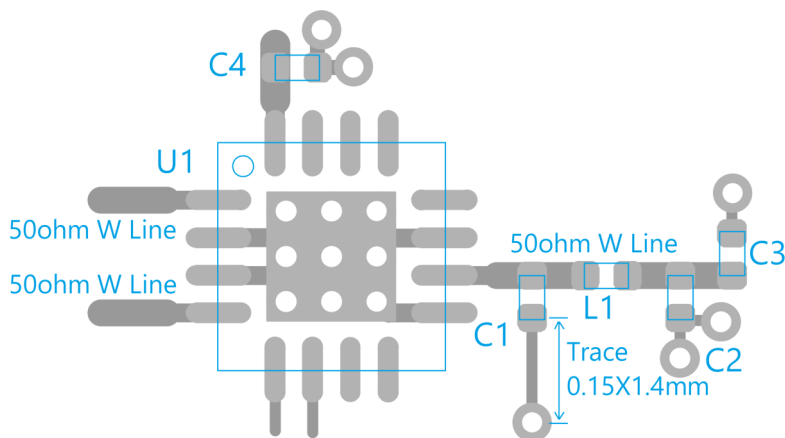
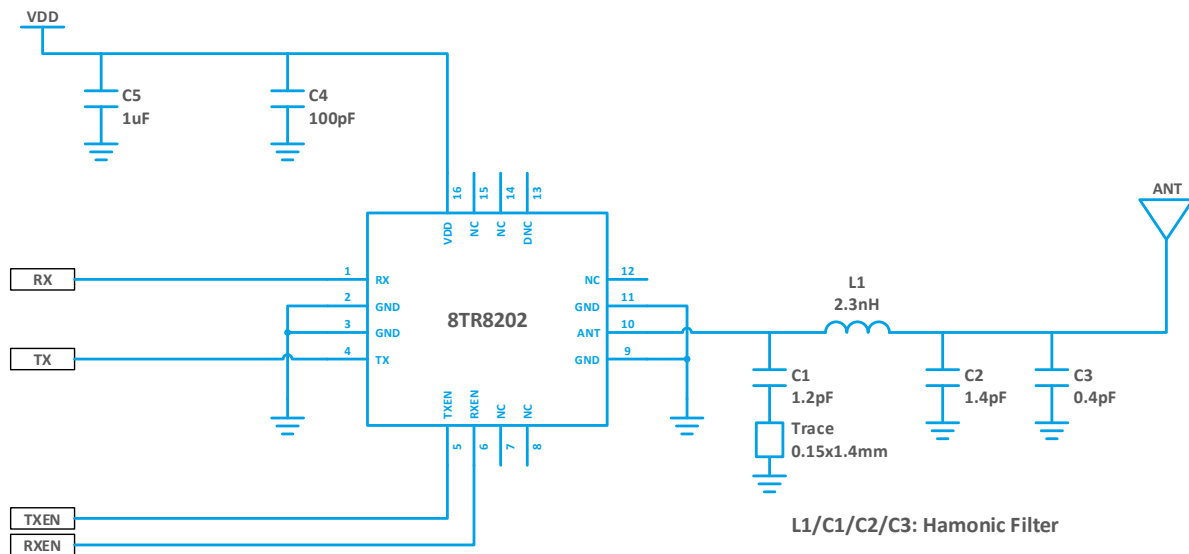


Figure 4: 8TR8202 Reference Design Schematic and PCB Layout

Package Dimensions

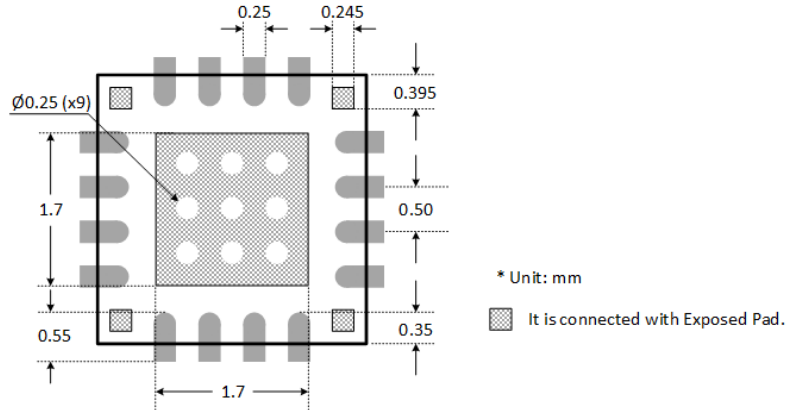
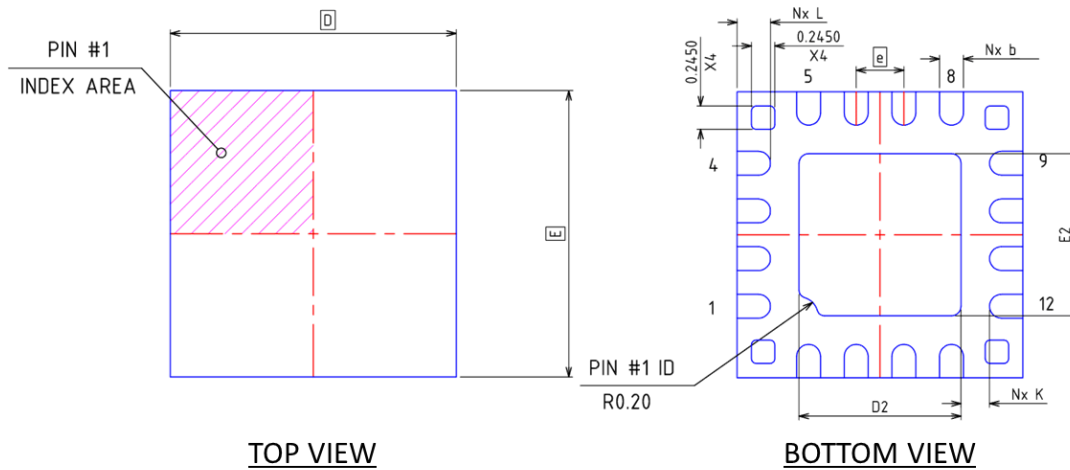


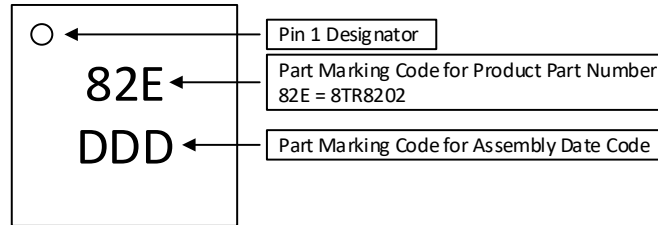
Figure 5: 8TR8202 Recommended PCB Layout Footprint



	MIN.	NOM.	MAX.
A	0.41	0.45	0.50
A1	0.00	0.02	0.05
A3	---	0.127 Ref	---
b	0.18	0.25	0.30
D	3.00 BSC		
E	3.00 BSC		
e	0.50 BSC		
D2	1.55	1.70	1.80
E2	1.55	1.70	1.80
K	0.20	---	---
L	0.25	0.35	0.45
N	16		

Figure 6: 8TR8202 Package Dimension

Package Marking



Note: The part marking: 82E represents the Product Part Number: 8TR8202.

Due to the size limitations of this package, only three (3) characters can be marked on each of two (2) rows. Therefore the Product Part Number is represented in the part marking by a 3-character code.

Figure 7: 8TR8202 Part Marking Code

ESD Handling Information

Electro Static Discharge (ESD) can cause immediate (or latent) failures in semiconductor Integrated Circuits (ICs). BeRex, Inc. RFIC products are designed with integral ESD protection structures, and all IC products are tested to meet industry standards for ESD event survival. Users must adhere to all precautions for handling ESD sensitive devices throughout the manufacturing, test, shipping, handling, or operational processes, and during field service operations in order to achieve optimum system performance and life expectancy. Production quantities of this product are shipped in a standard tape and reel format.

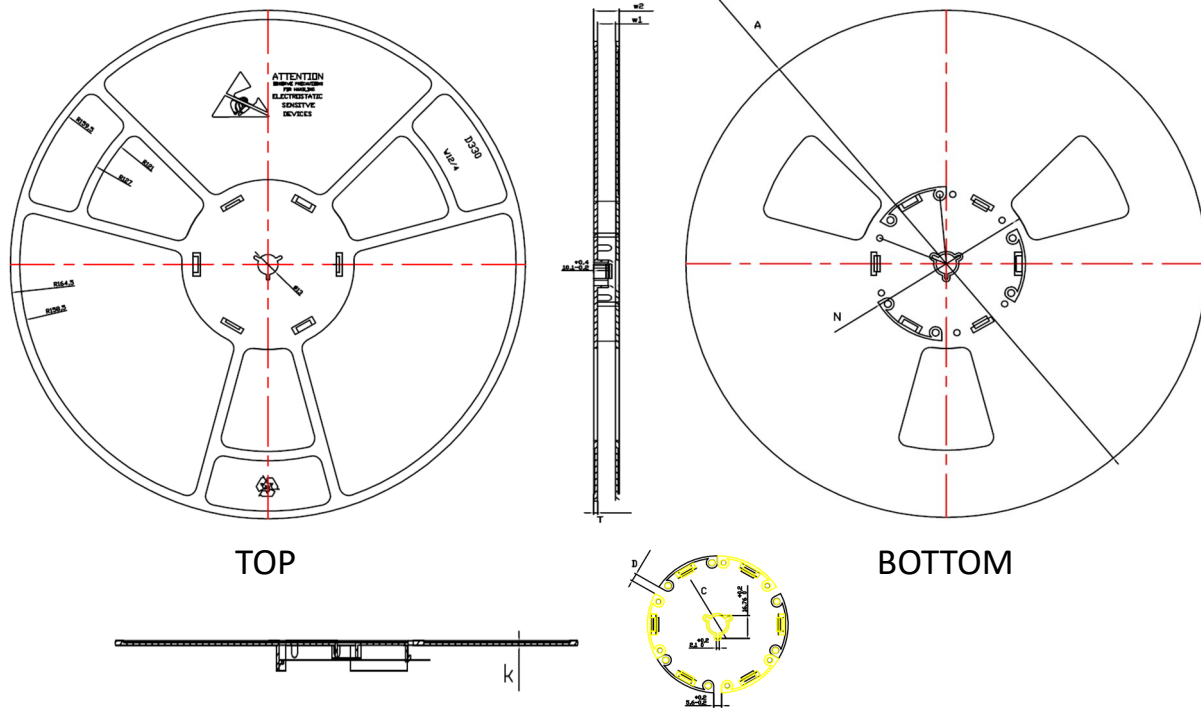
Electrostatic Discharge Rating - 1000V

RoHS Compliance

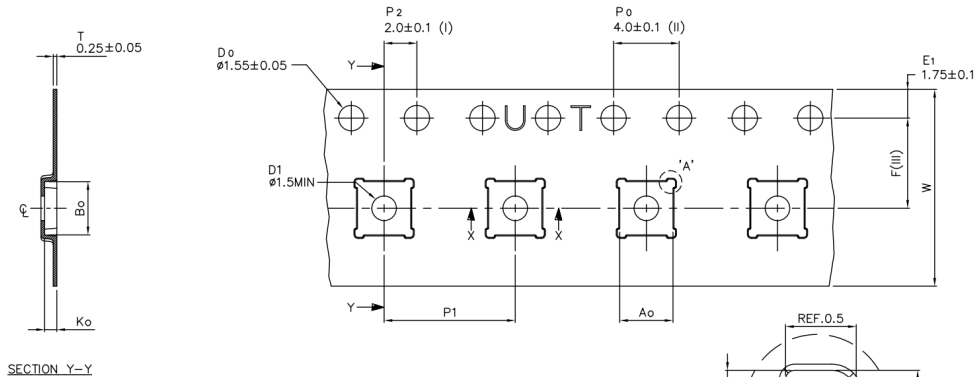
This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

This part is lead-free, halogen-free and compliant with a concentration of the Substances of Very High Concern (SVHC) candidate list which are contained in a quantity of less than 0.1%(w/w) in each component of a product and/or its packaging placed on the European Community market by the BeRex and Suppliers.

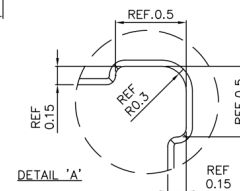
Tape & Reel



TYPE	A	N	C	D	w1	w2	T	k
12MM	$\phi 330^{+2}$	$\phi 100^{+2}$	$\phi 13,1^{+0,2}$	$5,6^{+0,5}$	$12,4^{+2}_{-0}$	$16,6^{+2}_{-0}$	$2,1 \pm 0,15$	$1,4^{+0,15}_{-0,1}$



A ₀	3.25 +/−0.1
B ₀	3.25 +/−0.1
K ₀	0.75 +/−0.1
F	5.50 +/−0.1
P ₁	8.00 +/−0.1
W	12.00 +/−0.3



- (I) Measured from centreline of sprocket hole to centreline of pocket.
- (II) Cumulative tolerance of 10 sprocket holes is ± 0.20.
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Figure 8: 8TR8202 Tape and Reel Dimension