

Features

- 2.4 - 2.5GHz Frequency Range
- Ultra-Compact Front-End RF Integrated Circuit
- Integrated LNA, Transmit/Receive Switch, Bypass, Input / Output Matching
- Low Noise Figure / Low Current Rx LNA Modes
- 11dB / 13dB Rx LNA Gain Options
- 2dB Noise Figure
- 4mA Low Current Rx LNA Mode
- 1.8dB Bi-Directional Bypass Insertion Loss
- 2.7 - 3.6V Operation
- 2mm x 2mm x 0.45mm QFN-16 Package
- -40°C to 105°C Temperature Range

Applications

- Bluetooth® Low Energy (BLE) Devices
- 802.15.4 ZigBee® / Thread Mesh Networks
- IoT (Internet of Things) / M2M Connectivity
- Bluetooth® Audio
- Bluetooth® Mesh Networks
- Sports and Medical Wearables
- Consumer Electronics, Toys
- Smart Home Appliances, Remote Controllers
- Wireless Sensor Nodes
- Beacons
- Proximity Sensors
- Range Extenders

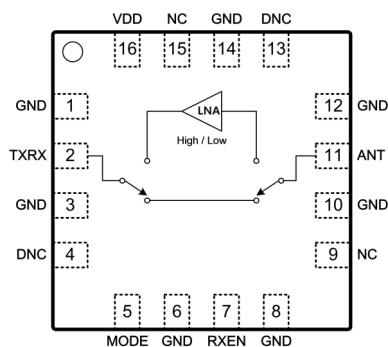


Figure 1: Functional Block Diagram

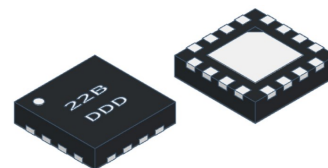
Description

The 8TR2211 is a compact, highly integrated front-end RFIC (Radio Frequency Integrated Circuit) intended for range extension of Bluetooth® Smart / Bluetooth® Low Energy (BLE) and proprietary ISM wireless systems in the 2.4GHz band.

The 8TR2211 is optimized for battery operation with enhanced efficiency, operating over a wide voltage supply range from 2.7V to 3.6V, suited for a wide array of applications including battery powered wireless systems.

The 8TR2211 combines an Receive (Rx) Low Noise Amplifier (LNA), Bi-Directional Bypass, a single-pole double throw (SPDT) Transmit / Receive Switch as shown in Figure 1, in a 2mm x 2mm x 0.45mm 16-pin QFN package. The device also comes integrated with input / output matching circuitry and Rx LNA Mode options for Low Noise Figure and Low Current.

The 8TR2211 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 2mm x 2mm x 0.45mm, QFN Package

Figure 2: Package Type

Ordering Information

Part Number	Description
8TR2211	2.4GHz Front-End RFIC 2500 Pieces Per Tape and Reel
8TR2211-EVB	Fully Tested and Characterize Evaluation Board
8TR2211-DWF	2.4GHz Front-End RFIC Die in Wafer Form

Pin Descriptions

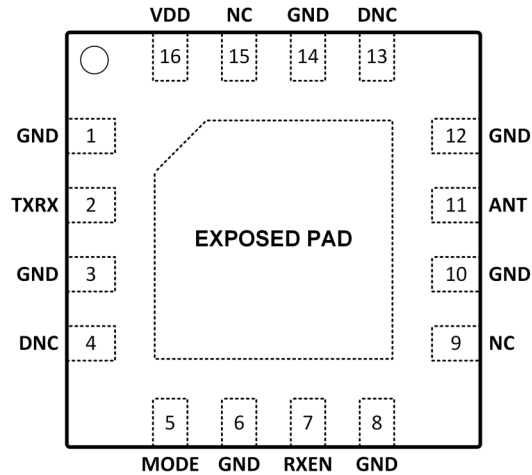


Figure 3 :Pin Description (Top View)

Table 1: 8TR2211 Pin Signal Descriptions

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

General Specifications
Table 2: 8TR2211 Absolute Maximum Ratings

Parameter	Units	Minimum	Maximum
Supply Voltage (VDD)	V	0	3.7
Control Logic Pin (MODE, RXEN)	V	0	VDD
Receive Input Power at ANT Port	dBm		5
Receive Mode Power at TXRX Port	dBm		10
Bypass Mode Power at TXRX or ANT Port	dBm		20
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: 8TR2211 Recommended Operating Conditions

Parameter	Units	Minimum	Typical	Maximum
Supply Voltage (VDD, recommended)	V	2.7	3.0	3.6
Supply Voltage (VDD, extend supply voltage)**	V	1.8		3.6
Control Pin - Logic High State (MODE, RXEN)	V	1.2		VDD*
Control Pin - Logic Low State (MODE, RXEN)	V	0		0.4
Control Pin Current (Logic High, 1.8V)	uA		0.2	
Operating Frequency Range	GHz	2.4		2.5
Operating Temperature	°C	-40	25	105

*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: 8TR2211 Receive Electrical Specifications

 (VDD = 3.0V, 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		13		High Current/Low NF Mode
			11		Low Current Mode
Current Consumption	mA		7		High Current/Low NF Mode
			4		Low Current Mode
Noise Figure	dB		2		High Current/Low NF Mode
			2.5		Low Current Mode
Input P1dB	dBm		-8		High Current/Low NF Mode
Input IP3	dBm		1		High Current/Low NF Mode
Input Return Loss	dB		-8		
Output Return Loss	dB		-8		

Table 5: 8TR2211 Bi-Directional Bypass Electrical Specifications

 (VDD = 3.0V, 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	
Bypass Insertion Loss	dB		1.8		
Bypass Current	uA		0.6		
			0.5		VDD: 2.7V
LNA to Bypass Switching Time	usec		0.9		From 50% of RXEN to 10% RF
Bypass to LNA Switching Time	usec		0.8		From 50% of RXEN to 90% RF

Table 6: 8TR2211 Control Logic

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

Mode	RXEN	Operational Mode
0	0	Bypass Mode*
0	1	LNA Low Current Mode
1	0	LNA High Current/Low NF Mode
1	1	LNA High Current/Low NF Mode

*The Bypass Mode feature provides an ultra-low current consumption, as in a conventional sleep Mode.

Application Notes

The 8TR2211 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

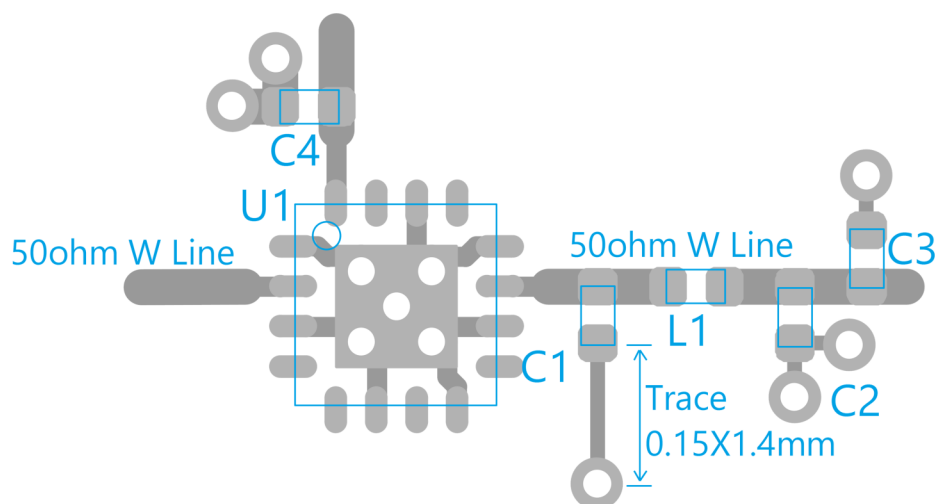
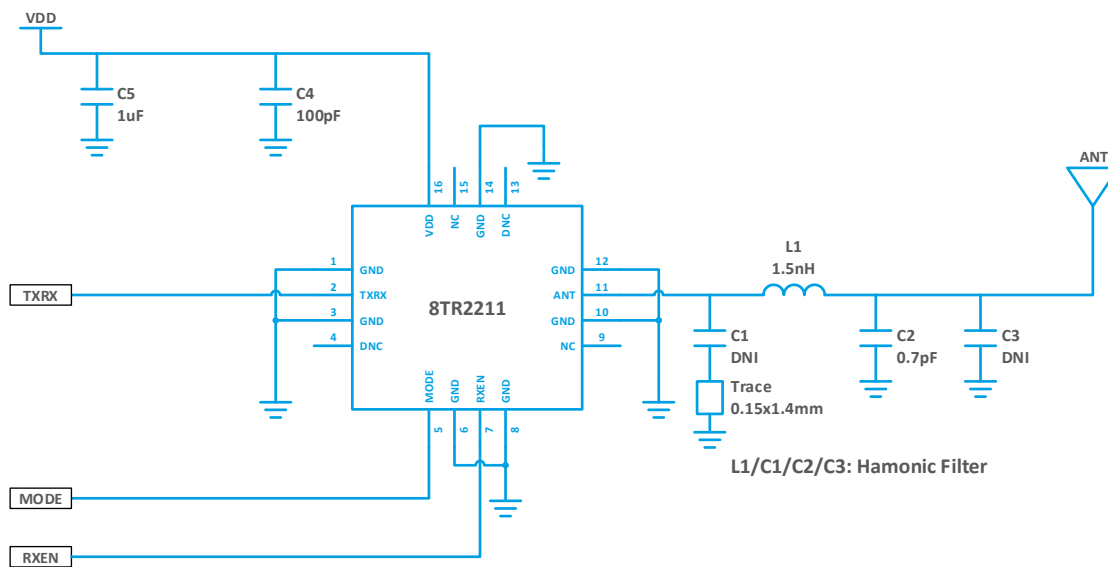


Figure 4: 8TR2211 Reference Design Schematic and PCB Layout

Package Dimensions

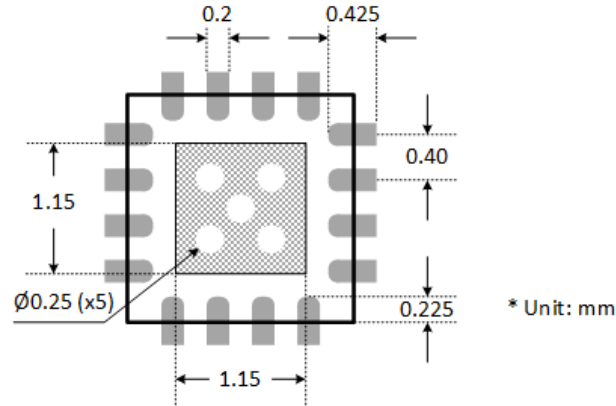
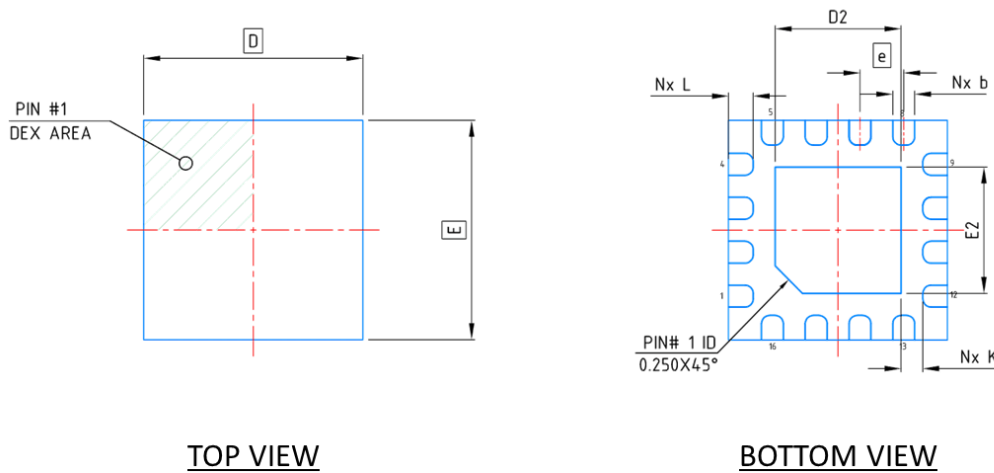


Figure 5: 8TR2211 Recommended PCB Layout Footprint



	MIN.	NOM.	MAX.
A	0.41	0.45	0.50
A1	0.00	0.02	0.05
A3	---	0.127 Ref	---
b	0.15	0.20	0.25
D	2.00 BSC		
E	2.00 BSC		
e	0.40 BSC		
D2	1.00	1.15	1.25
E2	1.00	1.15	1.25
K	0.20	---	---
L	0.125	0.225	0.325
N	16		

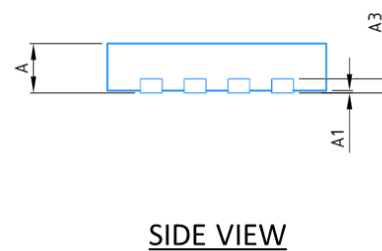
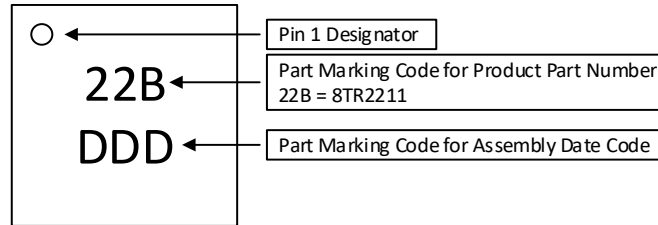


Figure 6: 8TR2211 Package Dimension

Package Marking



Note: The part marking: 22B represents the Product Part Number: 8TR2211.

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: 8TR2211 Typical Part Marking

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.

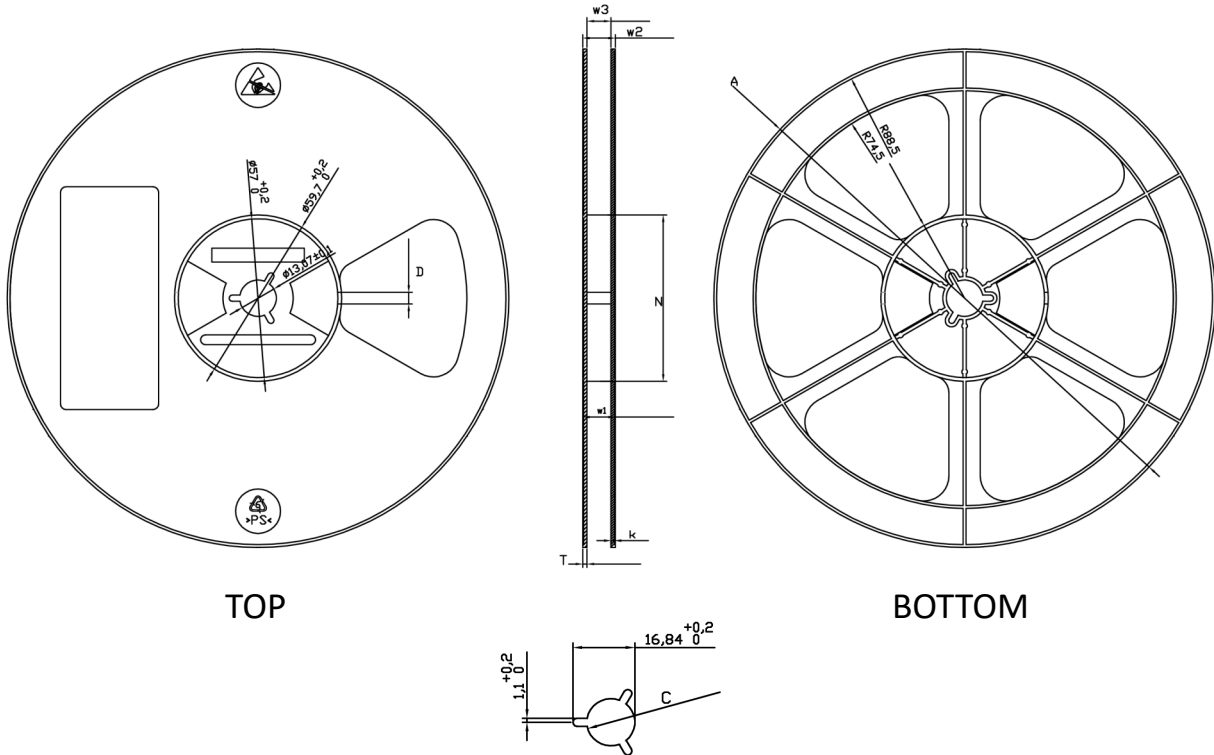
Electrostatic Discharge Rating - 3000V

RoHS Compliance

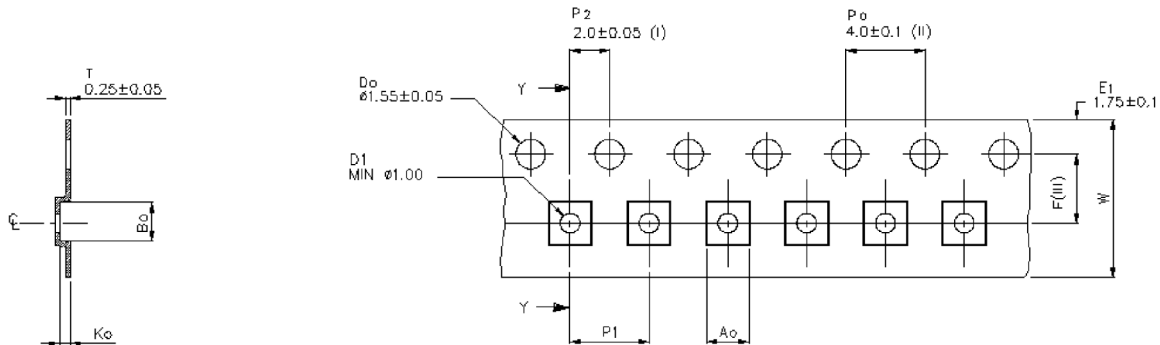
This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

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	w3	T	k
8MM	$\phi 180^{+2}_{-2}$	$\phi 60^{+1}_{-1}$	$\phi 13.1^{+0.2}_{-0.2}$	4.2 ± 0.5	8.4^{+1}_{-0}	11.6^{+1}_{-1}	8.75^{+1}_{-1}	1.5 ± 0.15	$1.25^{+0.1}_{-0.05}$



SECTION Y-Y

A ₀	2.20 +/- 0.05
B ₀	2.20 +/- 0.05
K ₀	0.55 +/- 0.05
F	3.50 +/- 0.05
P1	4.00 +/- 0.10
W	8.00 +0.3/-0.1

- (i) Measured from centreline of sprocket hole to centreline of pocket.
- (ii) Cumulative tolerance of 10 sprocket Hole is ± 0.20 .
- (iii) Measured from centreline of sprocket hole to centreline of pocket.

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

Figure 8: 8TR2211 Tape and Reel Dimension