

Features

- 2.4 - 2.5GHz Frequency Range
- Integrated PA, Bypass, Tx/Rx Switch
- Low TX Current for direct battery connection
- 17mA at +10dBm Output Power
- Up to 5dBm EDR Output Power
- Ultra-Low Bypass Current
- Bi-Directional Bypass with Low Insertion Loss
- 1-Bit Control between Bypass and PA Modes
- 2mm x 2mm x 0.45mm 8-Pin DFN Package
- -40°C to 105°C Temperature Range
- 1.8V Nominal Operating Voltage

Applications

- Bluetooth® Low Energy (BLE) Devices
- 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

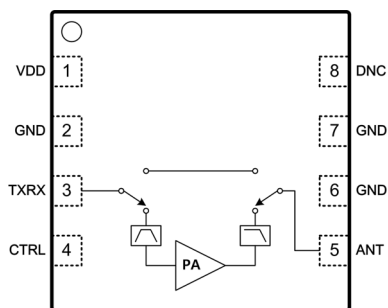


Figure 1: Functional Block Diagram

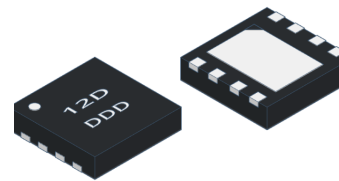
Description

The 8TR1215 is a compact, highly integrated front-end RFIC (Radio Frequency Integrated Circuit) intended for range extension of Bluetooth® Smart, 802.15.4 ZigBee™/ Thread, ANT+, and proprietary ISM wireless systems in the 2.4GHz band.

This application-friendly RFIC provides PA plus Bypass with Tx/Rx switches in an ultra-compact package. It requires only a dual-cell battery supply voltage and a single logic control signal.

The 8TR1215 combines a power amplifier (PA), bypass, and a transmit / receive (T/R) switch in a 2mm x 2mm x 0.45mm 8-pin DFN package. The device also comes integrated with filter networks, and input / output matching circuitry. This device is ideal for extended range BLE applications for Class 1 operation.

The 8TR1215 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.

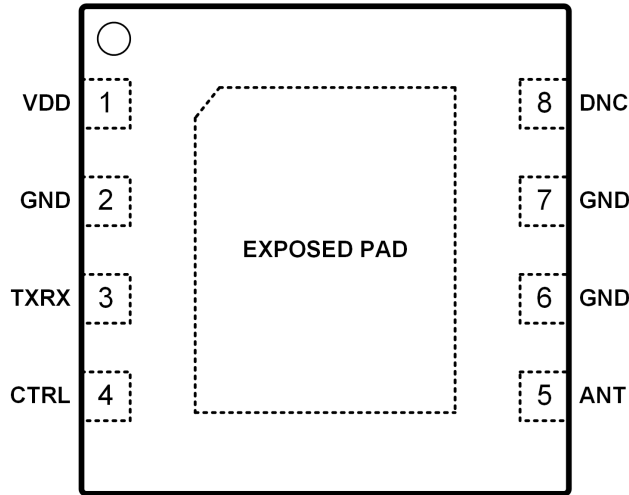


8-Lead 2mm x 2mm x 0.45mm, DFN Package

Figure 2: Package Type

Ordering Information

Part Number	Description
8TR1215	2.4GHz Front-End RFIC in 2mm x 2mm x 0.45mm 8-Pin DFN
8TR1215-EVB	Fully Tested and Characterized Evaluation Board
8TR1215-DWF	2.4GHz Front-End RFIC Die in Wafer Form

Pin Descriptions

Figure 3 :Pin Description (Top View)
Table 1: 8TR1215 Pin Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	VDD	DC Voltage Supply	5	ANT	Antenna port (DC shorted to GND)
2	GND	Ground	6	GND	Ground
3	TXRX	Transmit/Receive Port (DC shorted to GND)	7	GND	Ground
4	CTRL	Control Logic pin	8	DNC	Do Not Connect
EXPOSED PAD		Exposed pad should be connected to GND.			

General Specifications
Table 2: 8TR1215 Absolute Maximum Ratings

Parameter	Units	Minimum	Maximum
Supply Voltage (VDD)	V	0	2.4
Control Logic Pin (CTRL)	V	0	VDD
Transmit Output Power at ANT Port	dBm		16
Transmit Input Power at TXRX Port	dBm		10
Bypass Mode Power at ANT or TXRX 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: 8TR1215 Recommended Operating Conditions

Parameter	Units	Minimum	Typical	Maximum
Operating Frequency Range	GHz	2.4		2.5
Supply Voltage (VDD, recommended)	V	1.5	1.8	2.3
Control Pin - Logic High State	V	1.2		VDD*
Control Pin - Logic Low State	V	0		0.3
Control Pin Current (Logic High, 1.8V)	µA		0.2	
Operating Temperature	°C	-40	25	105

* For Control Voltages > 1.5V, a 10kΩ series resistor should be used at the Control Logic Pins.

Table 4: 8TR1215 Transmit Electrical Specifications

(VDD = 1.8V, 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		11		
EDR Spectral Mask	dBm		5		Spectral Mask compliant, 3Mbps EDR Signal
Small-Signal Gain	dB		15		
Large-Signal Gain	dB		12		+10dBm Pout
Current Consumption	mA		17		+10dBm Pout
			9		No RF applied
Second Harmonic	dBm/MHz		-47		Up to +13dBm with external harmonic filter as specified
Third Harmonic	dBm/MHz		-47		
Input Return Loss	dB		-10		
Load VSWR for Stability			6:1		All Non-harmonic Spurs Less than -43dBm/MHz Up to +14dBm
Load VSWR for Ruggedness			10:1		No Damage

Table 5: 8TR1215 Bi-Directional Bypass Electrical Specifications

(VDD = 1.8V, 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 Current	uA		0.4		
Bypass Insertion Loss	dB		2.4		Between TXRX and ANT Ports

Table 6: 8TR1215 Switching Time Specifications

(VDD = 1.8V, T_{Ambient} = 25°C, With External Harmonic Filter, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
TX to Bypass	usec		0.8		From 50% of CTRL to 10% RF
Bypass to TX	usec		0.8		From 50% of CTRL to 90% RF

Table 7: 8TR1215 Control Logic

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

CTRL	Operational Mode
0	Bypass Mode*
1	TX PA Mode

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

Application Notes

The 8TR1215 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

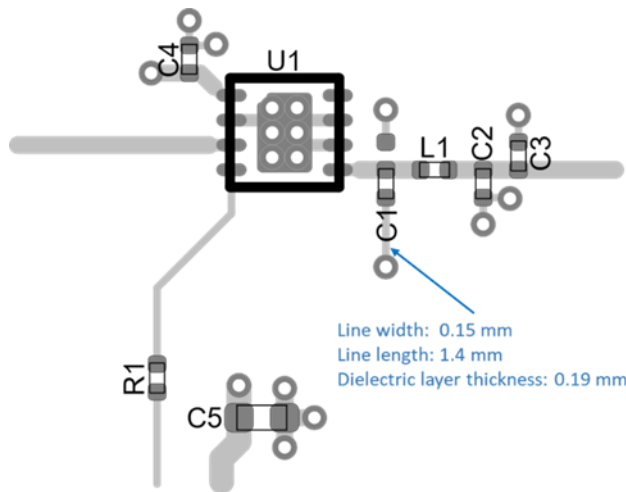
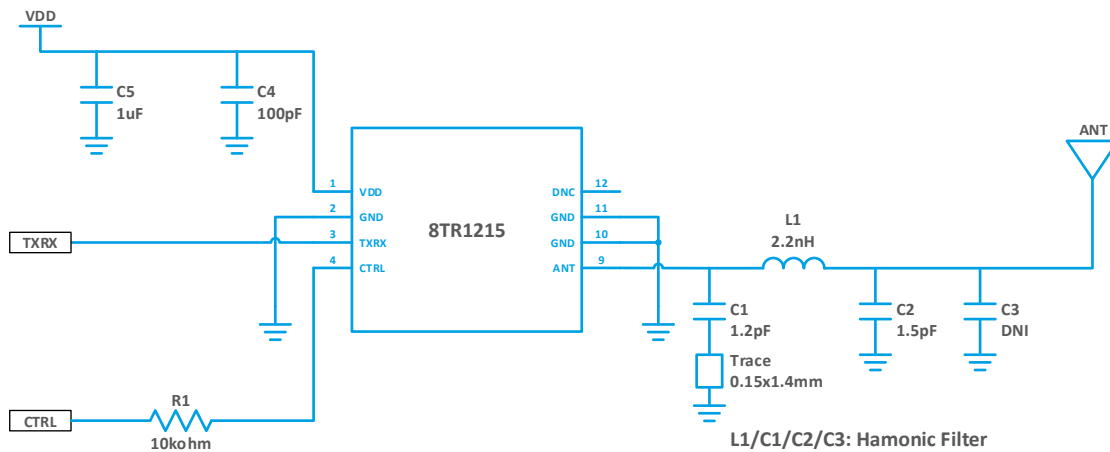
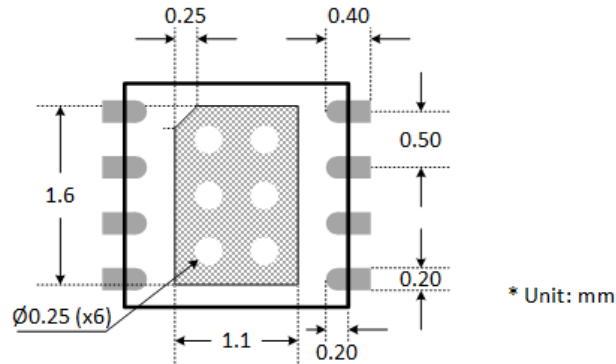
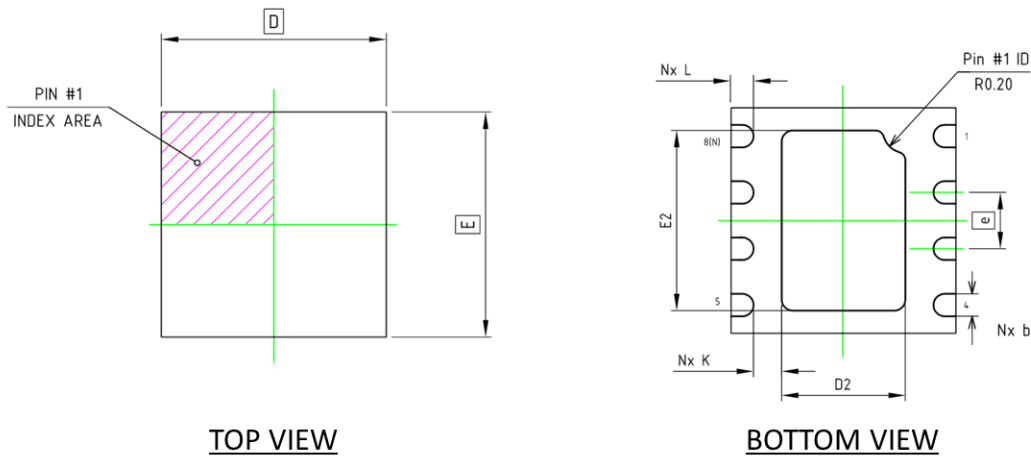
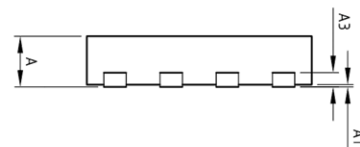


Figure 4: 8TR1215 Reference Design Schematic and PCB Layout

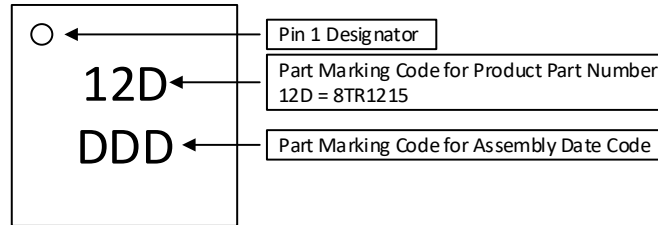
Preliminary Datasheet

Package Dimensions

Figure 5: 8TR1215 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	0.50 BSC		
D2	1.00	1.10	1.20
E2	1.50	1.60	1.70
K	0.20	---	---
L	0.10	0.20	0.30
N	8		


SIDE VIEW
Figure 6: 8TR1215 Package Dimension

Package Marking



Note: The part marking: 12D represents the Product Part Number: 8TR1215.

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: 8TR1215 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.

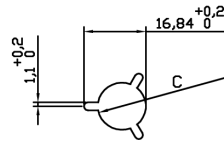
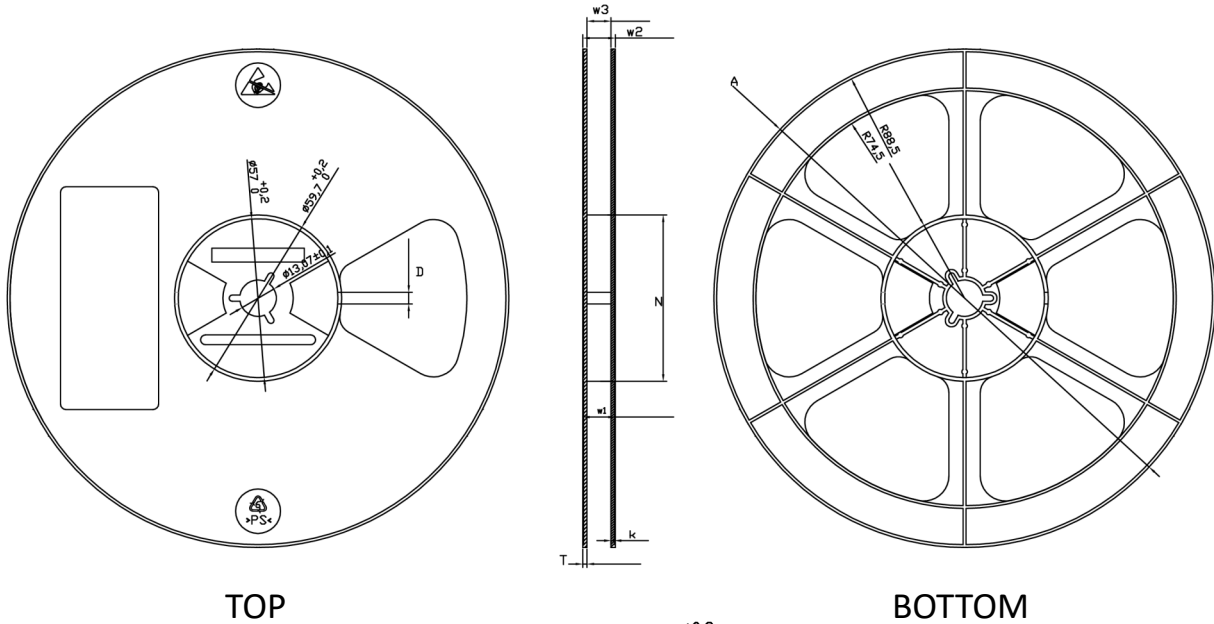
Electrostatic Discharge Rating - 3000V

RoHS Compliance

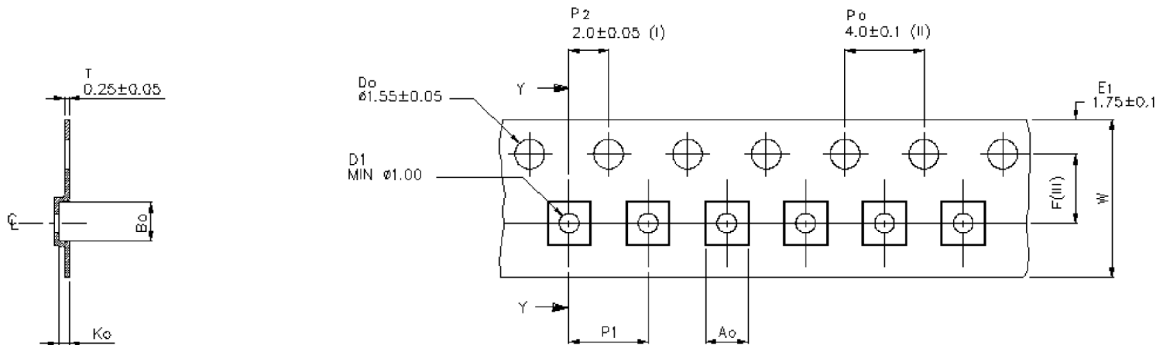
This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

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	ø180 ⁺² ₋₂	ø60 ⁺¹ ₋₁	ø13.1 ^{+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 MIDENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

Figure 8: 8TR1215 Tape and Reel Dimension