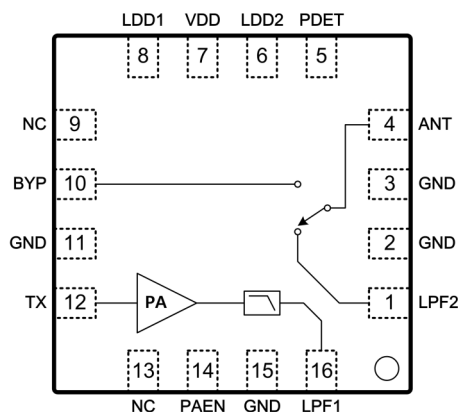


### Features

- For 863 - 870MHz, and 902 - 928MHz ISM Bands
- Integrated High Power PA
- Up to +25dBm  $P_{SAT}$
- 260mA at 3.3V, +24dBm  $P_{ANT}$
- 35dB Small Signal Tx Gain
- 70mA Tx Quiescent Current
- 2.7V to 3.6V Operation
- 1 Bit PAEN Logic Control
- 1.7dB Bypass Insertion Loss
- 1.0uA Bypass Current
- 3mm x 3mm x 0.45mm 16-pin QFN package
- -40°C to 125°C Temperature Range
- Die in Wafer Form Available

### Applications

- Sigfox, LoRaWAN™, WPAN, LPWAN, ZigBee
- IoT (Internet of Things) Nodes, Gateways
- Wireless M2M (Machine to Machine)
- Z-wave®, Weightless™
- Smart: Home, City, Lighting, and Energy
- Industrial and Building Automation
- Range Extenders



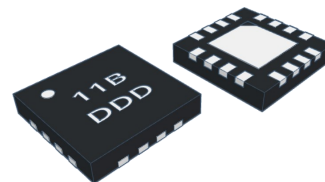
**Figure 1: Functional Block Diagram**

### Description

The 8TR1111 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 range of applications including battery powered wireless systems.

The 8TR1111 combines a power amplifier (PA), bypass, and a directional TX power Detector, as shown in Figure 1, in a 3mm x 3mm x 0.45mm, 16-pin QFN package. The device also comes integrated with filter networks, and input matching circuitry. Output matching is external. This device is ideal for Sigfox operation at 24dBm.

The 8TR1111 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
8TR1111	Sub GHz Front-End RFIC 2500pieces per Tape and Reel
8TR1111-EVB	Fully Tested and Characterize Evaluation Board
8TR1111-DWF	Sub GHz Front-End RFIC Die in Wafer Form

## Pin Description

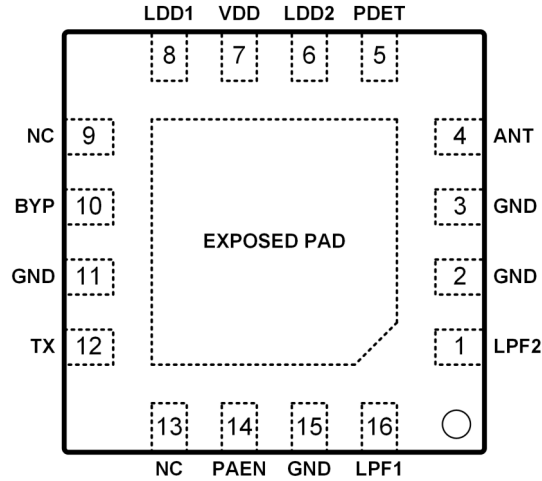


Figure 3 :Pin Description (Top View)

Table 1: 8TR1111 Pin Signal Descriptions

Pin	Name	Description	Pin	Name	Description
1	LPF2	Matching Network, node 2*	9	NC	Not connected internally
2	GND	Ground	10	BYP	Bypass Port
3	GND	Ground	11	GND	Ground
4	ANT	Antenna port	12	TX	TX PA Input
5	PDET	Detector Voltage Output	13	NC	Not connected internally
6	LDD2	Resistor 2 to VDD*	14	PAEN	Control Logic pin
7	VDD	VDD	15	GND	Ground
8	LDD1	Inductor 1 to VDD*	16	LPF1	Matching Network, node 1*
EXPOSED PAD		Exposed pad should be connected to GND.			

\*Refer to the Figure 4 : 8TR1111 Reference Design Schematic.

## General Specifications

**Table 2: 8TR1111 Absolute Maximum Ratings**

Parameter	Units	Minimum	Maximum
Supply Voltage (VDD)	V	0	3.7
Control Logic Pin (PAEN)	V	0	VDD
Transmit Output Power at ANT Port	dBm		26
Transmit Input Power at TX Port	dBm		10
Bypass Mode Power at ANT or BYP 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: 8TR1111 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
Control Pin Current (Logic High, 1.8V)	uA		0.2	
Operating Frequency Range	GHz	0.85		0.93
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: 8TR1111 Transmit Electrical Specifications**

(VDD = 3.3V, T<sub>Ambient</sub> = 25°C, With External Harmonic Filter, Including PCB and Connector Loss, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
Frequency Range	GHz	0.85		0.93	
Saturated Output Power	dBm		24		VDD: 3.3V
			23		VDD: 3.0V
Large-Signal Gain	dB		34		+24dBm Pout
Current Consumption	mA		260		+24dBm Pout
			100		+13dBm Pout
2 <sup>nd</sup> Harmonic	dBm/MHz		-35		Up to +24.5dBm with external harmonic filter as Specified
3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> Harmonic	dBm/MHz		-58		
Input Return Loss	dB		-10		
Load VSWR for Stability			6:1		All Non-harmonic Spurs Less than -43dBm/MHz
Load VSWR for Ruggedness			10:1		No Damage

**Table 5: 8TR1111 Bi-Directional Bypass Electrical Specifications**

(VDD = 3.3V, T<sub>Ambient</sub> = 25°C, With External Harmonic Filter, Including PCB and Connector Loss, Unless Otherwise Noted)

Parameter	Units	Min	Typ	Max	Test Conditions
Frequency Range	GHz	0.85		0.93	
Bypass Insertion Loss	dB		1.7		Between BYP and ANT Ports including harmonic filter
Bypass Current	uA		1.0		

**Table 6: 8TR1111 Switching Time Specifications**

(VDD = 3.3V, T<sub>Ambient</sub> = 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% of RF
Bypass to TX	usec		0.8		From 50% of CTRL to 90% of RF

**Table 7: 8TR1111 Control Logic**

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

PAEN	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 8TR1111 Application note provides detailed descriptions and test data over various operating conditions. Visit [www.berex.com](http://www.berex.com) or contact BeRex at [sales@berex.com](mailto:sales@berex.com) to request additional documentation.

### Application Schematic and PCB Layout

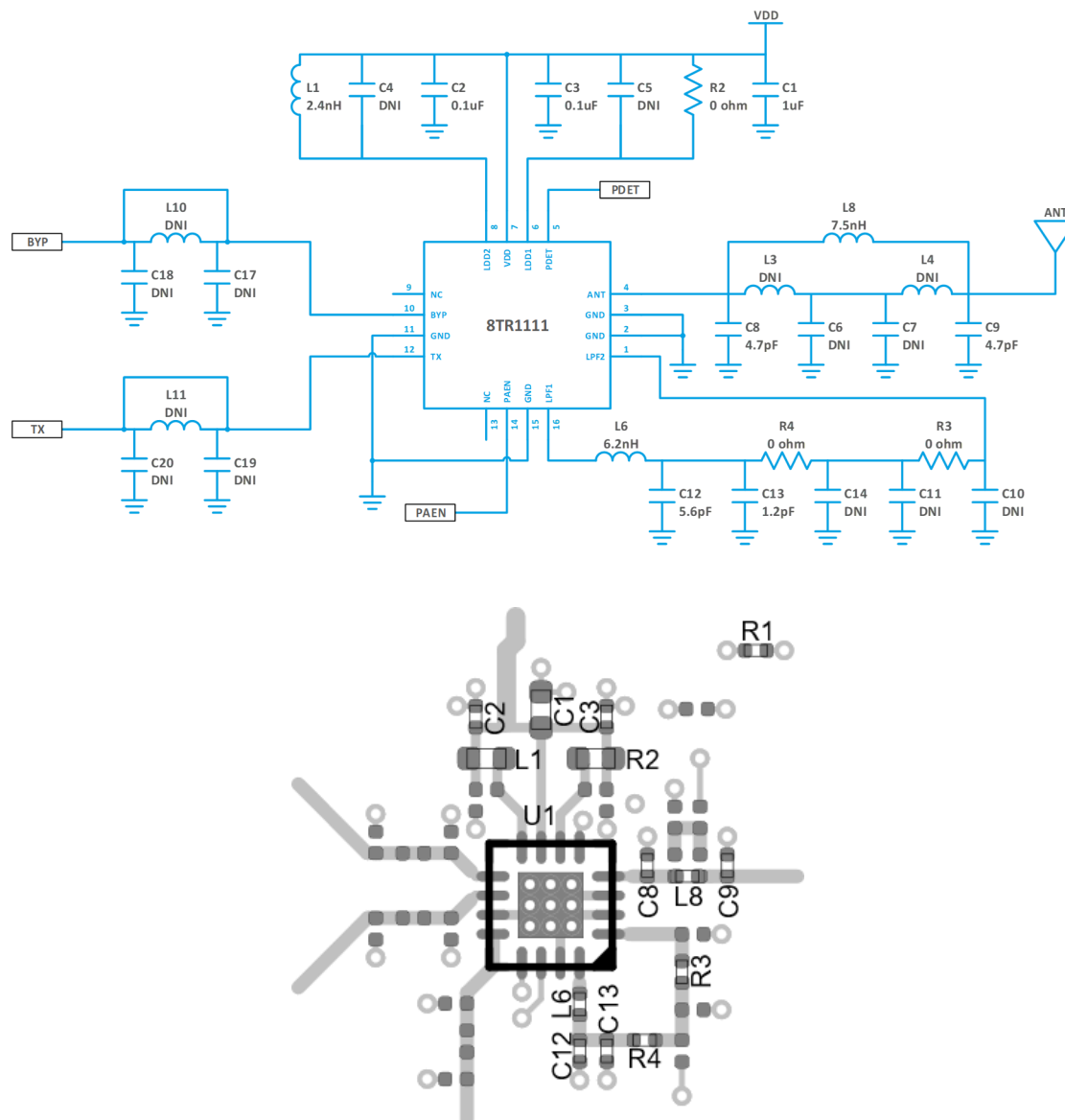


Figure 4: 8TR1111 Reference Design Schematic and PCB Layout

## Package Dimensions

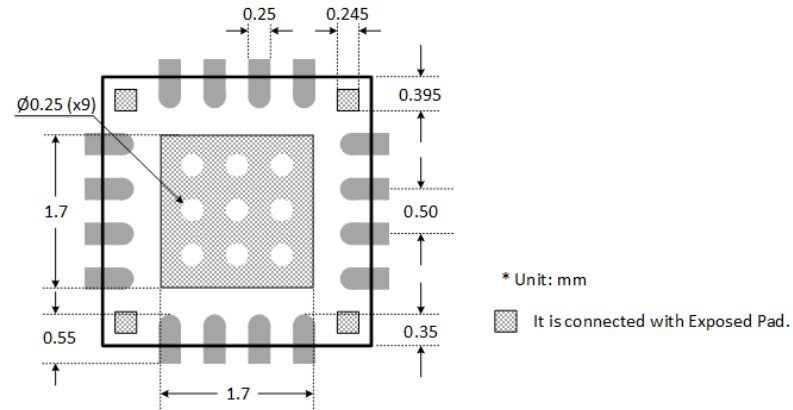
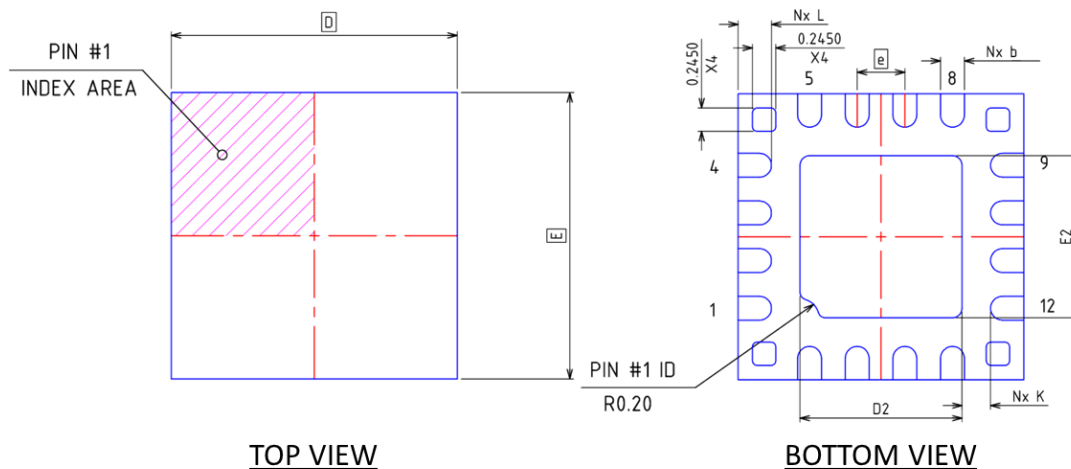
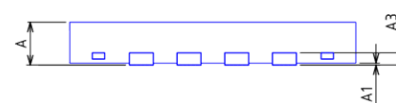


Figure 5: 8TR1111 Recommended PCB Layout Footprint



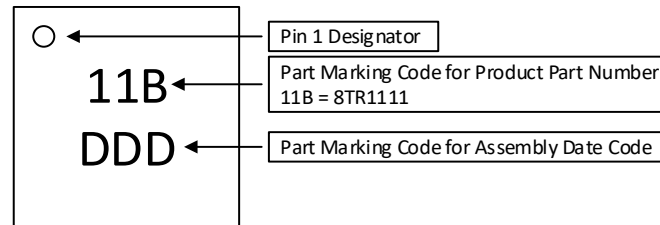
	MIN.	NOM.	MAX.
A	0.41	0.45	0.50
A1	0.00	0.02	0.05
A3	---	0.127 Ref	---
b	0.18	0.25	0.30
D	3.00 BSC		
E	3.00 BSC		
e	0.50 BSC		
D2	1.55	1.70	1.80
E2	1.55	1.70	1.80
K	0.20	---	---
L	0.25	0.35	0.45
N	16		



**SIDE VIEW**

Figure 6: 8TR1111 Package Dimension

### Package Marking



Note: The part marking: 11B represents the Product Part Number: 8TR1111.

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: 8TR1111 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.

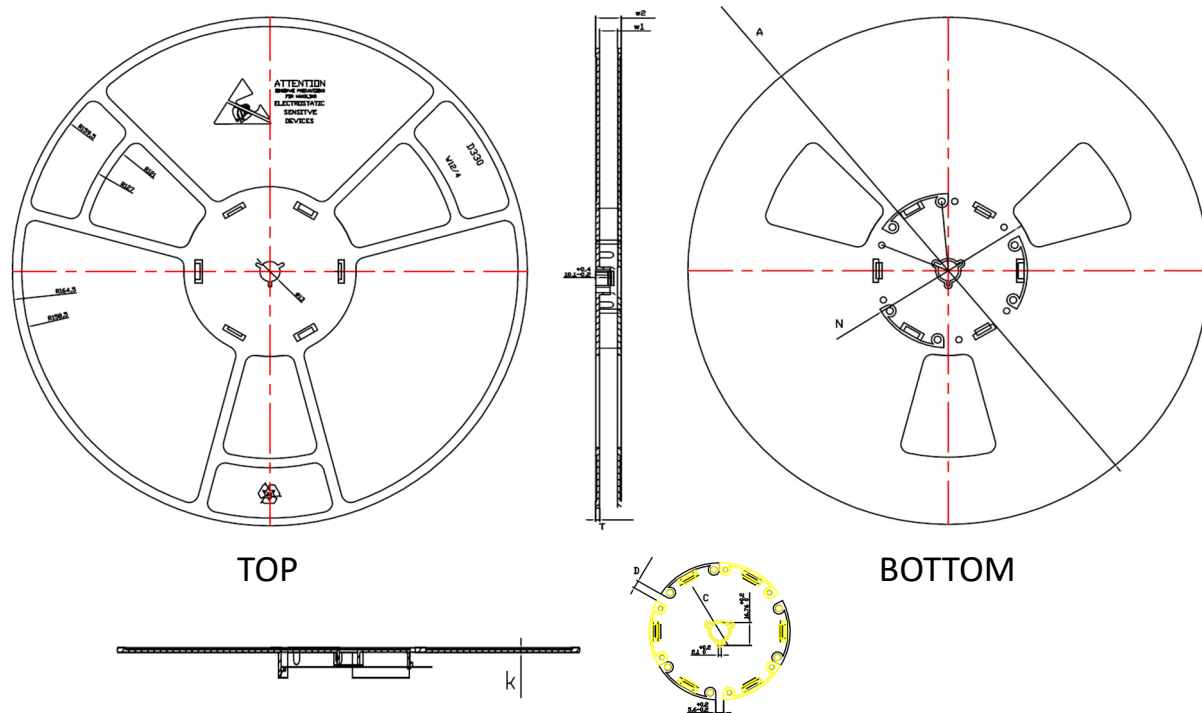
Electrostatic Discharge Rating - 1000V

### RoHS Compliance

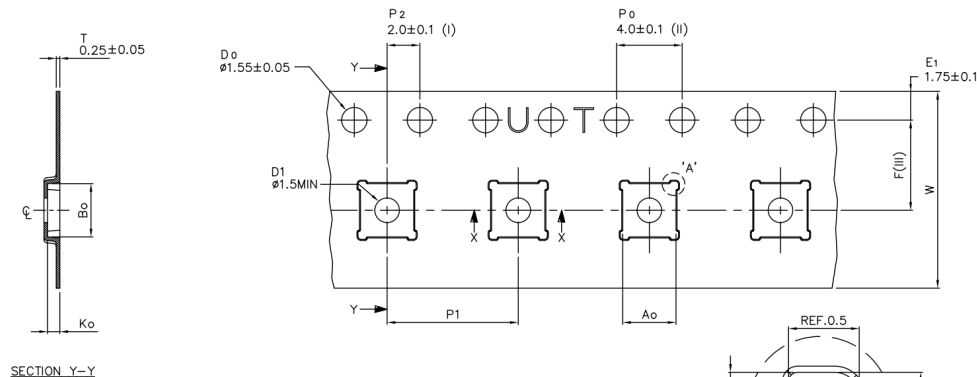
This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

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	$\phi 330^{+2}_{-2}$	$\phi 100^{+2}_{-2}$	$\phi 13.1^{+0.2}_{-0.2}$	$5.6^{+0.5}_{-0.5}$	$12.4^{+2}_{-0}$	$16.6^{+2}_{-0}$	$2.1 \pm 0.15$	$1.4^{+0.15}_{-0.1}$



Ao	3.25 +/ -0.1
Bo	3.25 +/ -0.1
Ko	0.75 +/ -0.1
F	5.50 +/ -0.1
P1	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  $\pm 0.20$ .
- (III) Measured from centreline of sprocket hole to centreline of pocket.
- (IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Figure 8: 8TR1111 Tape and Reel Dimension