

### Features

- 2.4 - 2.5GHz Frequency Range
- Integrated PA, Bypass, Tx/Rx Switch
- Low TX Current for direct battery connection
- 18mA at +10dBm Output Power
- Up to 6dBm 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

### Applications

- IoT (Internet of Things) / M2M Connectivity
- Sports and Medical Wearables
- Consumer Electronics, Toys
- Smart Home Appliances
- Remote Controllers Wireless Sensor Nodes
- Beacons
- Proximity Sensors
- Range Extenders

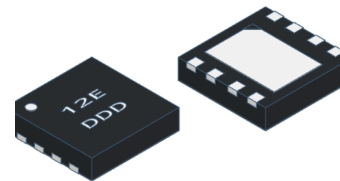
### Description

The 8TR1218 is a compact, highly integrated front-end RFIC (Radio Frequency Integrated Circuit) intended for range extension of 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.

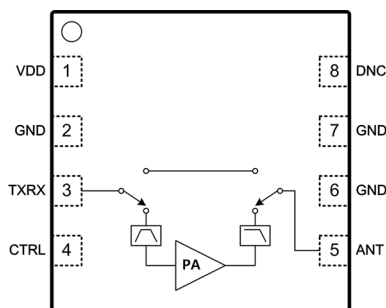
The 8TR1218 combines a power amplifier (PA), bypass, and a transmit / receive (T/R) switch in a 2mm x 2mm x 0.45mm 8-pin DFN package. The device also comes integrated with filter networks, and input / output matching circuitry. This device is ideal for extended range.

The 8TR1218 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

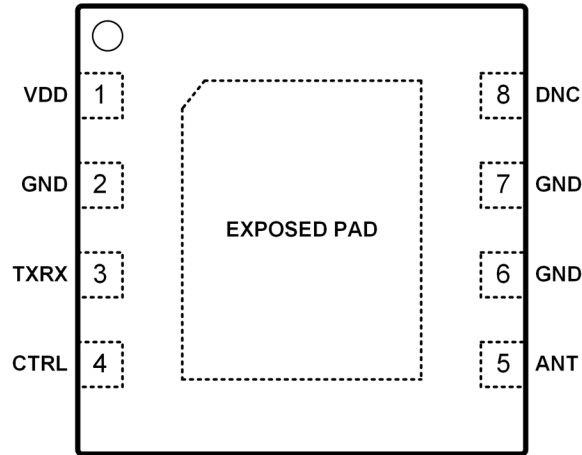
**Figure 2: Package Type**



**Figure 1: Functional Block Diagram**

### Ordering Information

Part Number	Description
8TR1218	2.4GHz Front-End RFIC 2500 Pieces Per Tape and Reel
8TR1218-EVB	Fully Tested and Characterized Evaluation Board
8TR1218-DWF	2.4GHz Front-End RFIC Die in Wafer Form

**Pin Descriptions**

**Figure 3 :Pin Description (Top View)**
**Table 1: 8TR1218 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: 8TR1218 Absolute Maximum Ratings**

Parameter	Units	Minimum	Maximum
Supply Voltage (VDD)	V	0	3.6
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		15
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: 8TR1218 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	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	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: 8TR1218 Transmit Electrical Specifications**

(VDD = 3.0V, T<sub>Ambient</sub> = 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	
Available Output Power	dBm		10		
EDR Spectral Mask	dBm		6		Spectral Mask compliant, 3Mbps EDR Signal
Small-Signal Gain	dB		9		-30dBm Pin
Large-Signal Gain	dB		9		+10dBm Pout
Current Consumption	mA		18		+10dBm Pout
			8		No RF applied
Second Harmonic	dBm/MHz		-50		Up to +10dBm with external harmonic filter as specified
Third Harmonic	dBm/MHz		-60		
Input Return Loss	dB		-20		
Load VSWR for Stability			6:1		All Non-harmonic Spurs Less than -43dBm/MHz
Load VSWR for Ruggedness			10:1		No Damage

**Table 5: 8TR1218 Bi-Directional Bypass Electrical Specifications**

(VDD = 3.0V, T<sub>Ambient</sub> = 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		0.6		
Bypass Insertion Loss with Filter	dB		2.5		Between TXRX and ANT Ports

**Table 6: 8TR1218 Switching Time Specifications**

(VDD = 3.0V, T<sub>Ambient</sub> = 25°C, With External Harmonic Filter, Unless Otherwise Noted)

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

**Table 7: 8TR1218 Control Logic**

“1” = Logic High, “0” = Logic Low

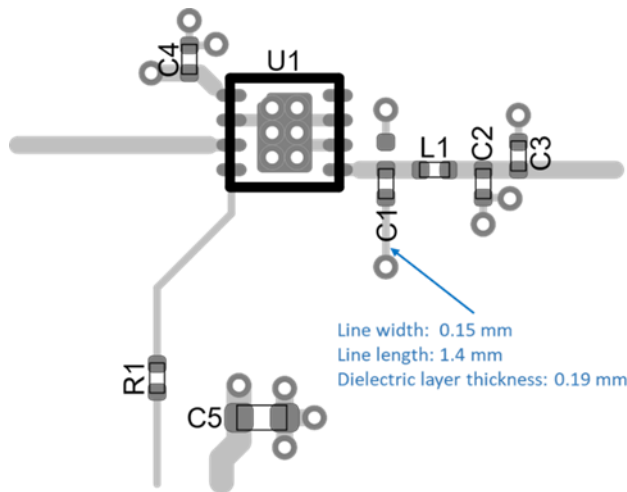
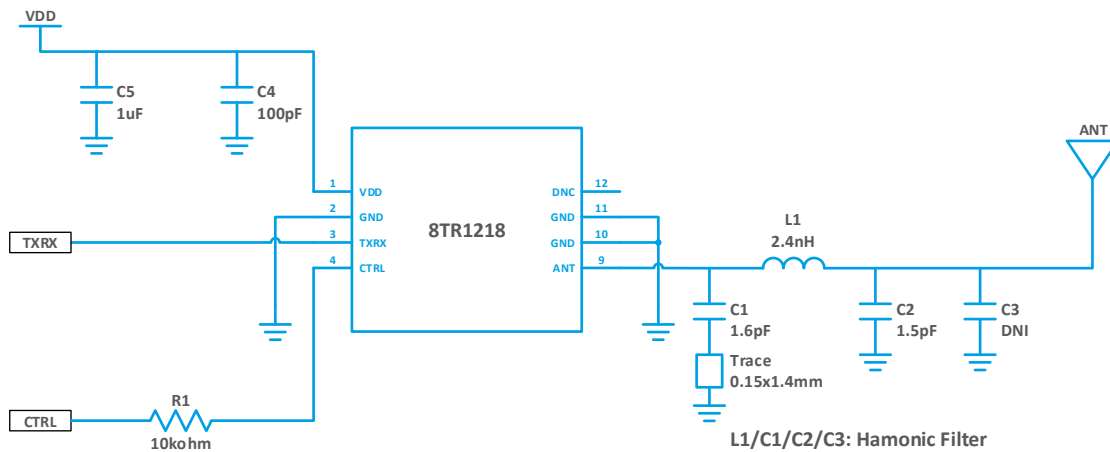
CTRL	Operational Mode
0	Bypass Mode*
1	TX PA Mode

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

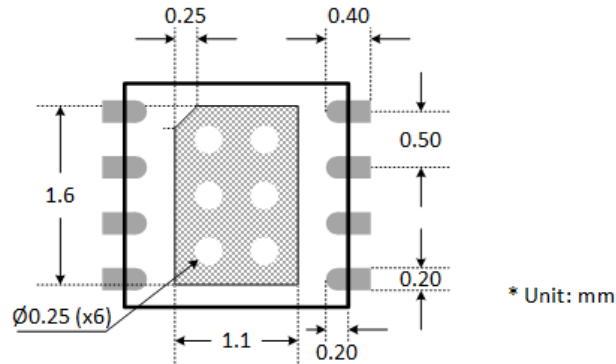
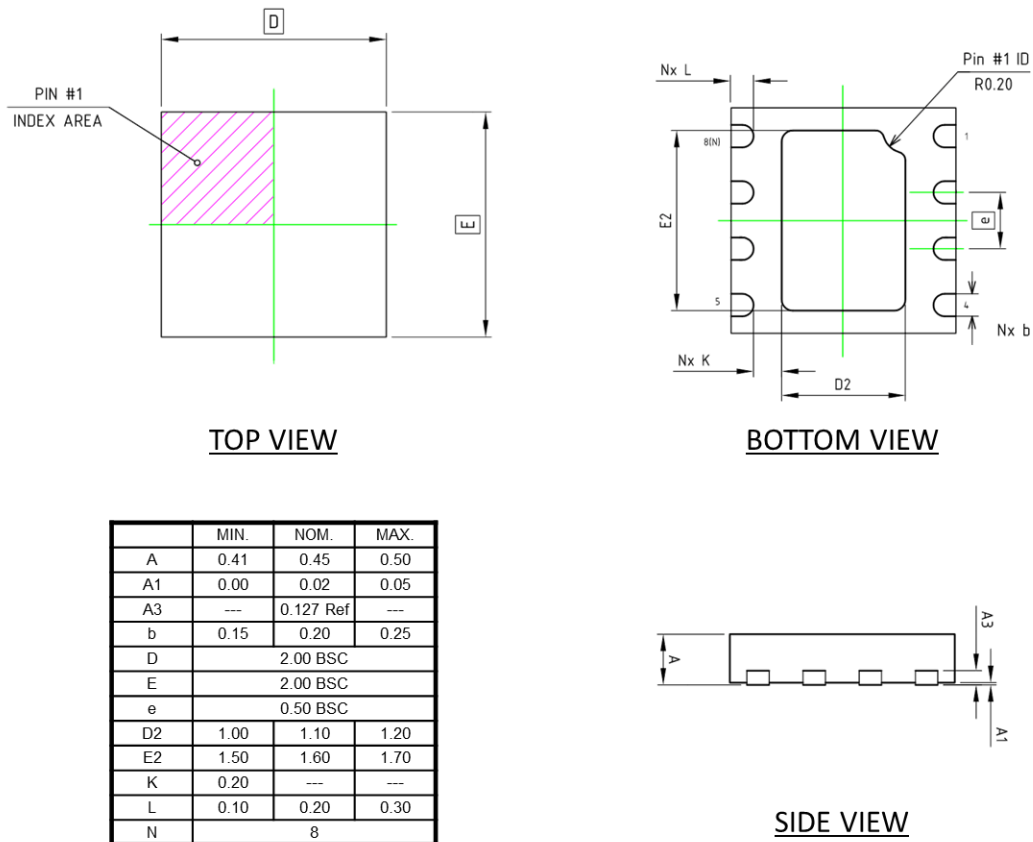
### Application Notes

The 8TR1218 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.

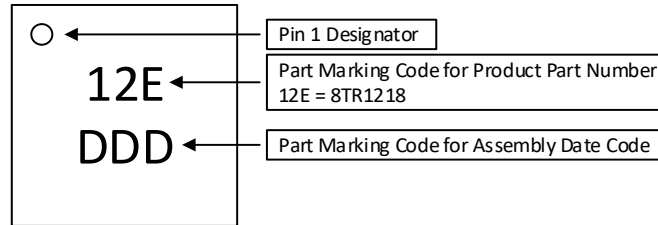
### Application Schematic and PCB Layout



**Figure 4: 8TR1218 Reference Design Schematic and PCB Layout**

**Package Dimensions**

**Figure 5: 8TR1218 Recommended PCB Layout Footprint**

**Figure 6: 8TR1218 Package Dimension**

### Package Marking



Note: The part marking: 12E represents the Product Part Number: 8TR1218.

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: 8TR1218 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.

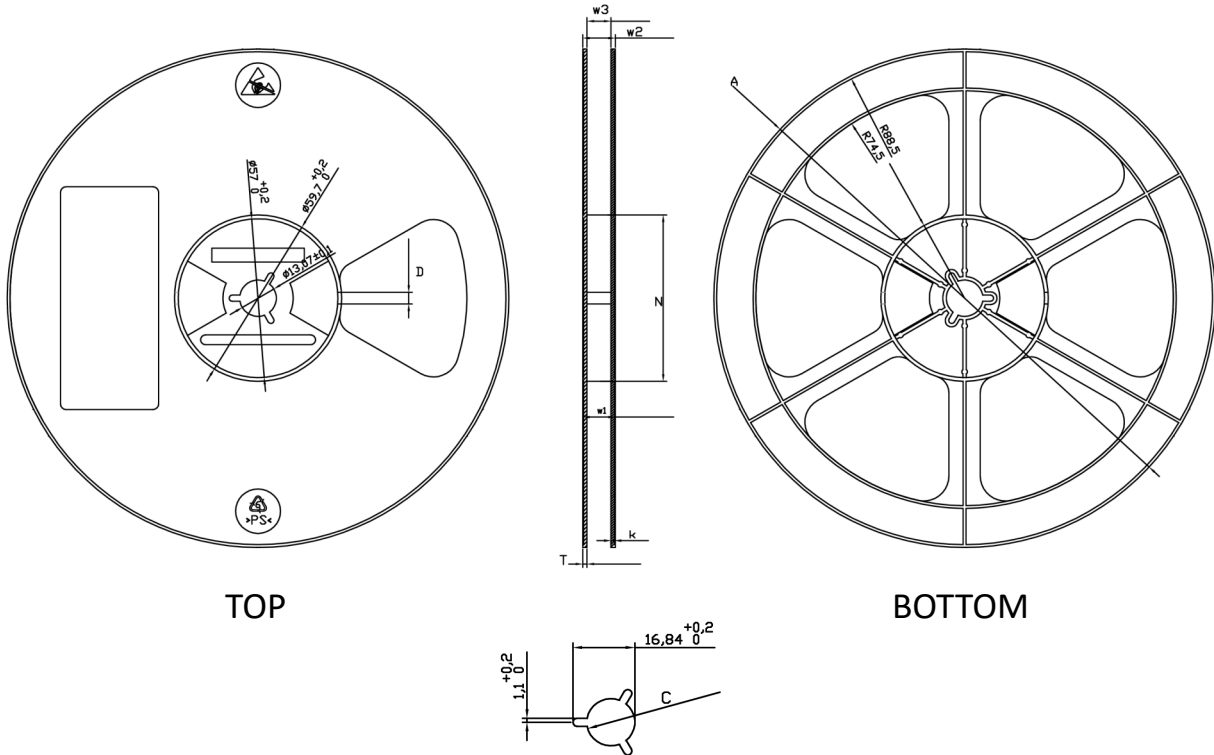
Electrostatic Discharge Rating - 3000V

### RoHS Compliance

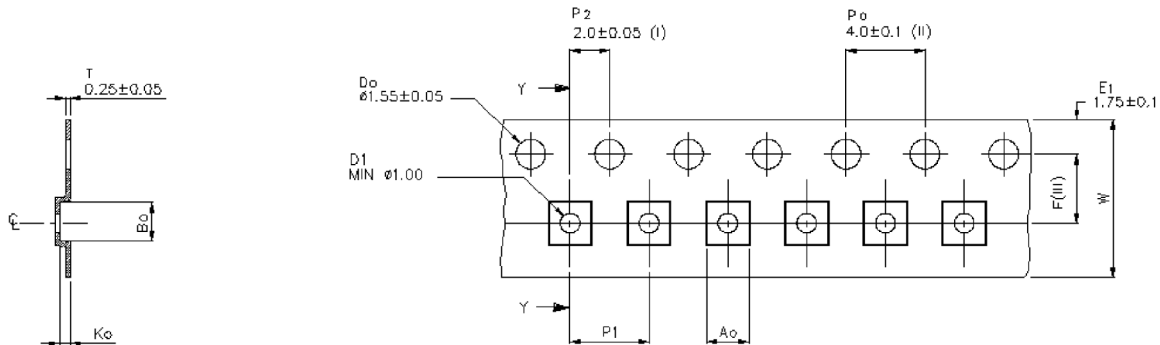
This part is compliant with Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2011/65/EU as amended by Directive 2015/863/EU.

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	$\phi 180^{+2}_{-2}$	$\phi 60^{+1}_{-1}$	$\phi 13.1^{+0.2}_{-0.2}$	$4.2 \pm 0.5$	$8.4^{+1}_{-0}$	$11.6^{+1}_{-1}$	$8.75^{+1}_{-1}$	$1.5 \pm 0.15$	$1.25^{+0.1}_{-0.05}$



SECTION Y-Y

Ao	2.20 +/- 0.05
Bo	2.20 +/- 0.05
Ko	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  $\pm 0.20$ .
- (iii) Measured from centreline of sprocket hole to centreline of pocket.

ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE STATED

**Figure 8: 8TR1218 Tape and Reel Dimension**