WINSOURCE ELECTRONICS

THE DATASHEET OF

BSW7221

BSW7221

Low Loss / Fast Switching SPDT RF switch

5MHz-8500MHz

Product Description

The BSW7221 is a reflective SPDT RF switch that can be used in high power and good performance WLAN 802.11 a/b/g/n/ac/ax, Wireless Communication applications.

This device is packaged in RoHS2-compliant with 1.5mm x 1.5mm x 0.5mm, 6-Lead UDFN package. It must be used with back side ground soldering.

The BSW7221 has robust ESD protection circuits at all pins and temperature performance (operating temperature range : -40 to +105°C).

This switch does not require blocking capacitors. If DC is presented at the RF port, add a blocking capacitor. This device also has a high linearity performance over all temperature range such as IIP3, IIP2.

A functional block diagram is shown in Figure 1.

Block Diagram

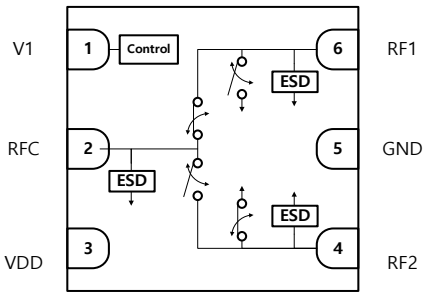


Figure 1 Functional Block Diagram

Applications

- WLAN 802.11 a/b/g/n/ac/ax
- Ultra-Wide-Band (UWB)
- Drone
- NFC
- Bluetooth
- Smart Card
- Wireless Infrastructure
- Remote keyless entry
- Telematics / Infotainment
- Two-way radios
- Wireless control systems
- GPS/Navigation

Package Type



1.5mm x 1.5mm x 0.5mm, 6-Lead UDFN Package

Figure 2 Package Type

Device Features

- Output frequency range : 5 MHz to 8.5 GHz
- Fast Switching Time : 90 to 135 ns
- Supply Voltage : 2.7V to 3.6V
- Low insertion loss
  : 0.37dB @ 2.45GHz
  : 0.59dB @ 5.75GHz
- High isolation
  : 44dB @ 2.45GHz
  : 29dB @ 5.75GHz
- Input 1 dB output compression
  : 37dBm @ 2.45GHz
  : 35dBm @ 5.75GHz
  : 34dBm @ 8.00GHz
- High IIP3
  : 65dBm @ 2.45GHz
  : 64dBm @ 5.75GHz
- ESD protection (HBM) : 2.0kV @ all pins
- 6-Lead UDFN package : 1.5mm x 1.5mm x 0.5mm
- Operating temperature range : -40°C to +105°C
- Lead-free/RoHS2-compliant UDFN package

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Electrical Specifications

VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB loss*, unless otherwise noted.

Table 1 Electrical Specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating Frequency			5		8500	MHz
Insertion Loss	RFC - RFx	13.56MHz 1GHz 2GHz 3GHz 4GHz 5GHz 6GHz 7GHz 8GHz 8.5GHz		0.29 0.32 0.36 0.38 0.42 0.47 0.61 0.53 0.57 0.81		dB
Isolation	RFC - RFx	13.56MHz 1GHz 2GHz 3GHz 4GHz 5GHz 6GHz 7GHz 8GHz 8.5GHz		83 52 47 39 34 31 30 27 24 23		dB
Isolation	RFx - RFx	13.56MHz 1GHz 2GHz 3GHz 4GHz 5GHz 6GHz 7GHz 8GHz 8.5GHz		79 45 36 33 30 28 25 23 21 20		dB
Return Loss	RFC, RF1, RF2	5MHz – 8.5GHz (Active port)		20		dB

* Excluding SMA Connector and PCB loss.
1GHz (0.15dB), 2GHz (0.23dB), 3GHz (0.31dB), 4GHz (0.39dB), 5GHz (0.45dB), 6GHz (0.53dB), 7GHz (0.67dB), 8GHz (0.73dB)

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Electrical Specifications

VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB loss*, unless otherwise noted.

Table 2 Electrical Specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating Frequency			5		8500	MHz
Input P1dB	RFC - RFx	13.56MHz 2.45GHz 5.75GHz 8.00GHz		33 37 35 34		dBm
Input IP3**	RFC - RFx	2.45GHz 5.75GHz		65 64		dBm
Input IP2**	RFC - RFx	2.45GHz 5.75GHz		105 90		dBm
2nd Harmonic***	RFC - RFx	2.45GHz 5.75GHz		95 80		dBc
3rd Harmonic***	RFC - RFx	2.45GHz 5.75GHz		100 100		dBc
Switching Time	RFC - RFx	50% control to 90% RF 50% control to 10% RF		135 90		ns
Settling Time	RFC - RFx	50% CTRL to 0.05dB final value Rising Edge 50% CTRL to 0.05dB final value Falling Edge		145 110		ns

The typical spurious performance of the BSW7221 is –115dBm / 10Hz @ Over 10MHz

* Excluding SMA Connector and PCB loss.
  1GHz (0.15dB), 2GHz (0.23dB), 3GHz (0.31dB), 4GHz (0.39dB), 5GHz (0.45dB), 6GHz (0.53dB), 7GHz (0.67dB), 8GHz (0.73dB)

** The two-tone Power is 18dBm each and Tone spacing is 20KHz.

*** Tone Power is 18dBm.

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Product Description

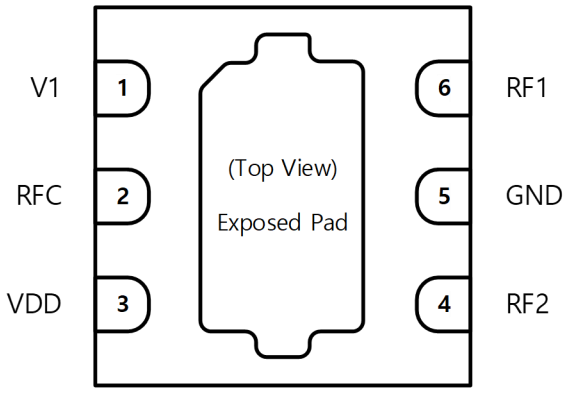


Figure 3 Pin Description (Top View)

Table 3 Pin Descriptions

No.	Pin Name	Descriptions
1	V1	Digital Control Logic Input
2	RFC	RF Common port
3	VDD	Supply Voltage
4	RF2	RF2 port
5	GND	Ground
6	RF1	RF1 port
Pad	Exposed Pad	Ground

Table 4 V1 Control Truth Table

V1	RFC-RF1	RFC-RF2
0	OFF	ON
1	ON	OFF

Table 5 Recommended Operation Coditions*

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	2.7	3.3	3.6	V
Supply Current	IDD	-	170	-	μA
Digital Input Control (V1)	V1 High	1.0	-	3.3	V
	V1 Low	0	-	0.7	V
Operating Temperature Range	To	-40	+25	+105	°C
RF Input Power, CW Freq.=2.45GHz, 5.75GHz any port, Z_L=50Ω	-	-	-	30	dBm

*Specifications are not guaranteed over all recommended operating conditions.

Table 6 Absolute Maximum Ratings

Parameter			Symbol	Min	Max	Unit
Supply Voltage			VDD	-0.3	3.6	V
Digital Input Voltage (V1)			V1	-0.3	3.6	V
Maximum Input Power, CW (+25°C)			-	-	Input P1dB	dBm
Storage Temperature range			-	-65	+150	°C
Maximum Junction Temperature			-	-	+150	°C
ESD	HBM	All pins	-	-	2000	V
	CDM	All pins	-	-	1000	V

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Typical Performances

VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB loss, unless otherwise noted.

Figure 4 Insertion Loss vs. Vdd (RFC - RFx)

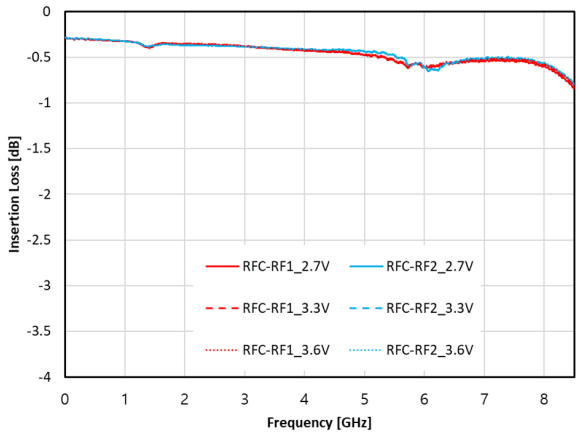


Figure 5 Insertion Loss vs. Temp (RFC - RFx)

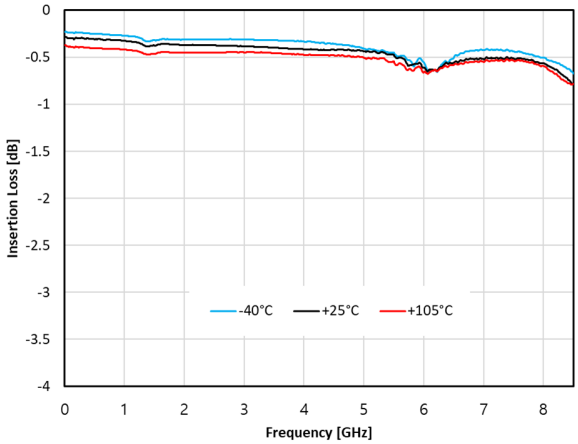


Figure 6 Return Loss (RFC, RFx)

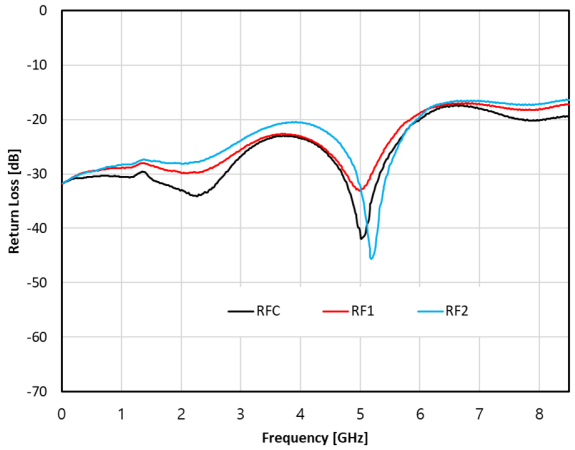
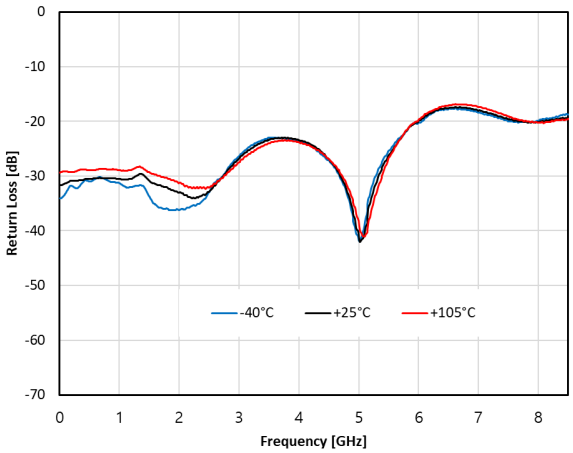


Figure 7 Return Loss vs. Temp (RFC)



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Typical Performances

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Figure 8 Isolation vs. Vdd (RFC - RFx)

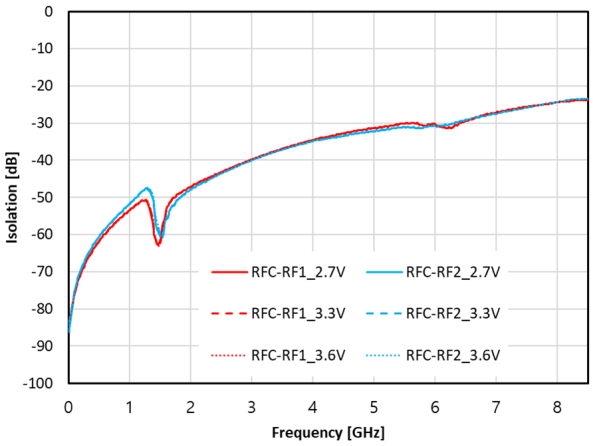


Figure 9 Isolation vs. Temp (RFC - RFx)

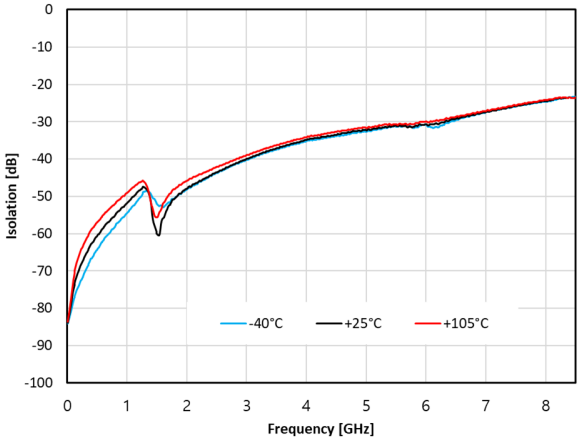


Figure 10 Isolation vs. Vdd (RFx - RFx)

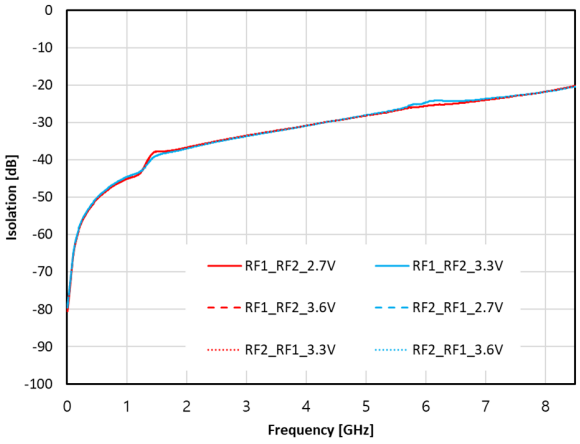
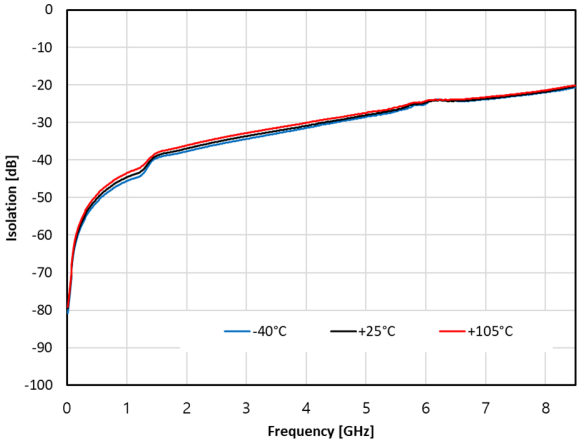


Figure 11 Isolation vs. Temp (RFx - RFx)



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Evaluation Board

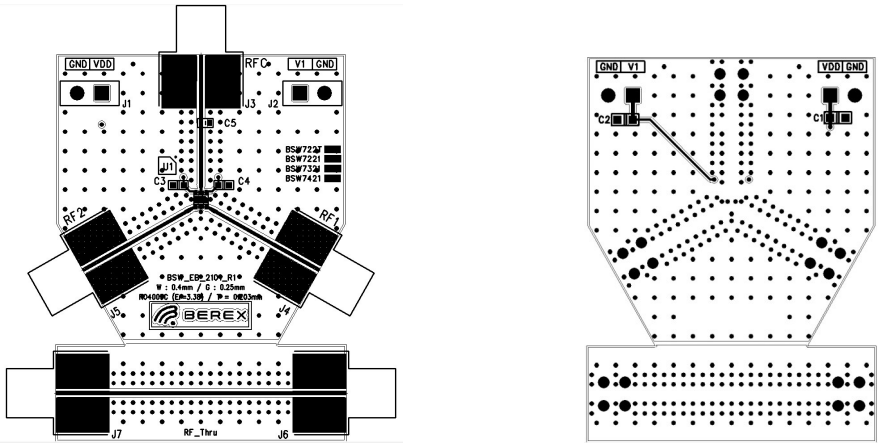


Figure 12 Evaluation Board Layout

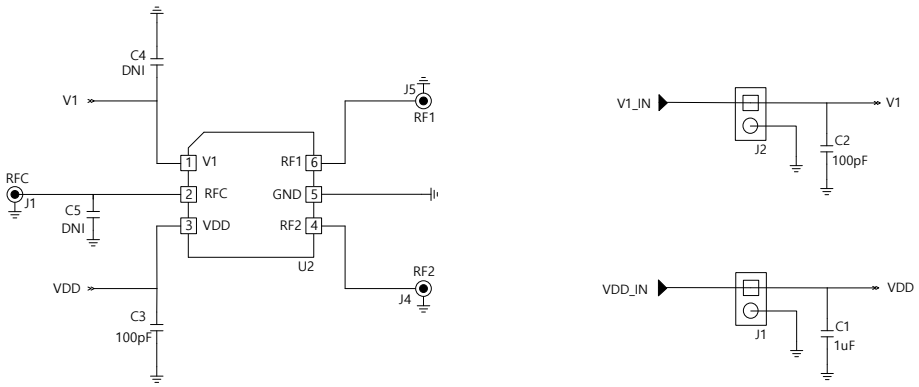


Figure 13 Evaluation Board Schematic

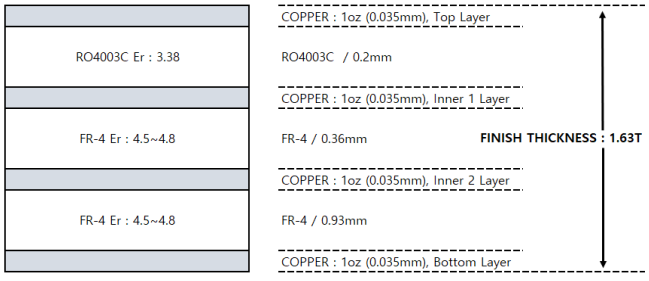


Figure 14 Evaluation Board PCB Layer Information

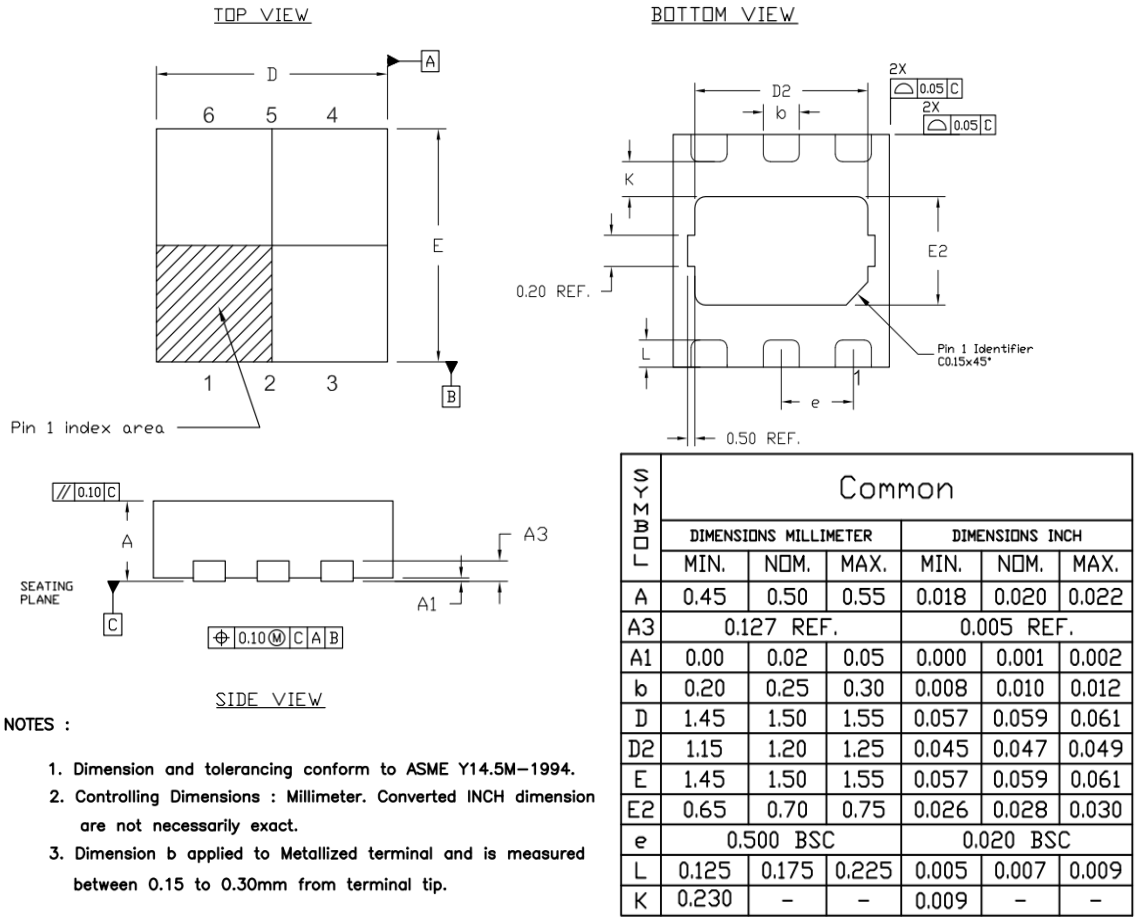
No.	Ref Des	Part Qty	Part Number	Remark
1	C1	1	CAP 1005 1uF J 50V	
2	C2,C3*	2	CAP 1005 100pF J 50V	
3	C4	2	CAP 1005 DNI	
4	C5	1	CAP 0603 DNI	
6	J1,J2	2	2 Pin Header	
7	RFC, RF1, RF2	3	SMA_END_LAUNCH	
8	U1	1	BSW7221	

* C3 should be placed near the device.

Table 7 Bill of Material - Evaluation Board

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Package Outline Drawing



SYMBOL	Common					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.45	0.50	0.55	0.018	0.020	0.022
A3	0.127 REF.			0.005 REF.		
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.20	0.25	0.30	0.008	0.010	0.012
D	1.45	1.50	1.55	0.057	0.059	0.061
D2	1.15	1.20	1.25	0.045	0.047	0.049
E	1.45	1.50	1.55	0.057	0.059	0.061
E2	0.65	0.70	0.75	0.026	0.028	0.030
e	0.500 BSC			0.020 BSC		
L	0.125	0.175	0.225	0.005	0.007	0.009
K	0.230	–	–	0.009	–	–

NOTES :

1. Dimension and tolerancing conform to ASME Y14.5M–1994.
2. Controlling Dimensions : Millimeter. Converted INCH dimension are not necessarily exact.
3. Dimension b applied to Metallized terminal and is measured between 0.15 to 0.30mm from terminal tip.

Figure 15 Package Outline Drawing

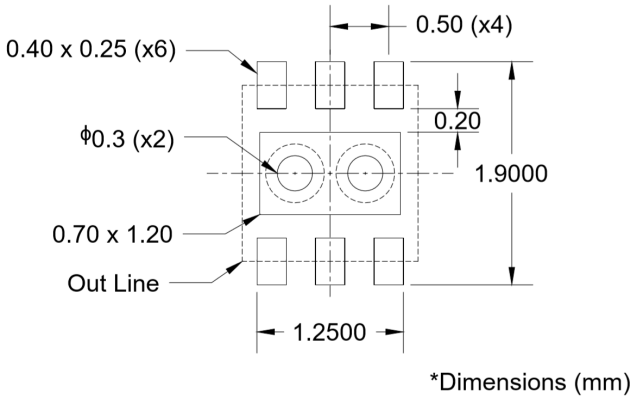
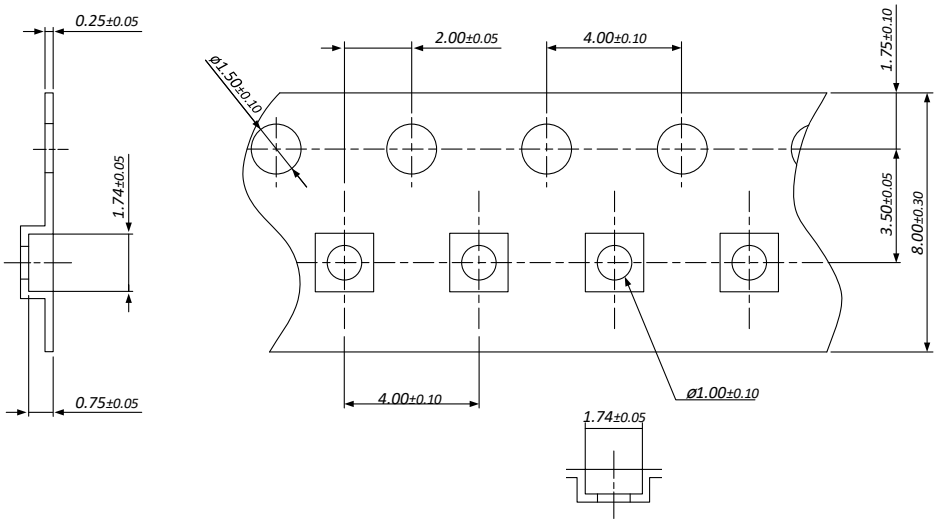


Figure 16 Recommended Land Pattern

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Tape & Reel



Packaging information:	
Tape Width	8mm
Reel Size	7inch
Device Cavity Pitch	4mm
Device Per Reel	3000EA

Figure 17 Tape & Reel

Package Marking





Marking information:			
Marking Code 1		Marking Code 2	
S	RF Switch	2	The number of switch throw
2	The number of switch throw	C	Sequential Number
C	Sequential Number	XX	Wafer Lot Number
Y	Work Year		
XX	Wafer Lot Number		

Figure 18 Package Marking

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Lead plating finish

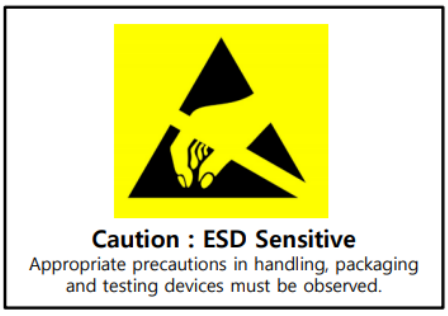
100% Tin Matte finish

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

ESD information:	
Rating	Class 2 (2000V)
Test	Human Body Model (HBM)
Standard	JS-001-2017

MSL information:	
Rating	Level 1 at +260°C convection reflow
Standard	JEDEC Standard J-STD-020



Proper ESD procedures should be followed when handling the device.

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 product also is 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 components of a product and/or its packaging placed on the European Community market by the BeRex and Suppliers.

NATO CAGE code:

2	**N**	**9**	**6**	**F**

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