Preliminary Datasheet

Product Description

The BSW7421 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, DOCSIS 3.0/3.1 and Wireless Communication applications.

This device is packaged in RoHS-compliant with 1.5x1.5mm, 6-lead UDFN package. It must be used with back side ground soldering.

The BSW7421 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

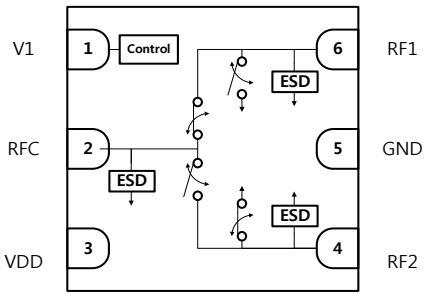

Figure 1 Functional Block Diagram

Applications

- WiMAX 802.16
- WLAN 802.11 a/b/g/n/ac/ax
- DOCSIS 3.0/3.1
- Drone
- Bluetooth
- Wireless Infrastructure
- Remote keyless entry
- Telematics / Infotainment
- Two-way radios
- Wireless control systems
- GPS/Navigation

Package Type

6-Lead 1.5x1.5mm, UDFN Package

Figure 2 Package Type

Device Features - Common

- Output frequency range : 5 MHz to 6.0 GHz
- Fast Switching Time : 125 to 140 ns
- Supply Voltage : 2.7V to 3.6V
- ESD protection : 2.0kV @ all pins
- 6-lead UDFN package : 1.5mm x 1.5mm x 0.5mm
- Operating temperature range : -40°C - +105°C

Device Features - 50Ω

- Low insertion loss
  : 0.74dB @ 2.45GHz
  : 0.89dB @ 5.75GHz
- High isolation
  : 52dB @ 2.45GHz
  : 37dB @ 5.75GHz
- Input 1 dB output compression
  : 39dBm @ 2.45GHz
  : 38dBm @ 5.75GHz
- High IIP3
  : 65dBm @ 2.45GHz
  : 65dBm @ 5.75GHz

Device Features - 75Ω

- Low insertion loss
  : 0.59dB @ 204MHz
- High isolation
  : 60dB @ 204MHz
- 2^{nd} Harmonic
  : 80dB @ 204MHz
- 3^{rd} Harmonic
  : 107dB @ 204MHz

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Preliminary Datasheet

Electrical Specifications - 50Ω

Typical conditions are at VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB loss(1), unless otherwise noted.

Table 1 Electrical Specifications - 50Ω

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating Frequency			5		6000	MHz
Insertion Loss	RFc - RFx	1GHz 2GHz 2.45GHz 3GHz 4GHz 5GHz 5.75GHz 6GHz		0.73 0.73 0.74 0.76 0.83 0.92 0.89 0.93		dB
Isolation	RFc - RFx	1GHz 2GHz 2.45GHz 3GHz 4GHz 5GHz 5.75GHz 6GHz		55 52 52 54 50 47 37 36		dB
Isolation	RFx - RFx	1GHz 2GHz 2.45GHz 3GHz 4GHz 5GHz 5.75GHz 6GHz		55 49 46 43 39 33 31 30		dB
Return Loss	RFc, RF1, RF2	5MHz – 6GHz (Active port)		20		dB
Input P1dB	RFc - RFx	2.45GHz 5.75GHz		39 38		dBm
Input IP3(2)	RFc - RFx	2.45GHz 5.75GHz		65 65		dBm
Input IP2(2)	RFc - RFx	2.45GHz 5.75GHz		105 90		dBm
2nd Harmonic(3)	RFc - RFx	2.45GHz 5.75GHz		95 80		dBc
3rd Harmonic(3)	RFc - RFx	2.45GHz 5.75GHz		100 100		dBc
Switching Time	RFc - RFx	50% control to 90% RF 50% control to 10% RF		140 125		ns
Settling Time	RFc - RFx	50% CTRL to 0.05dB final value Rising Edge 50% CTRL to 0.05dB final value Falling Edge		235 210		ns

(1) Excluding SMA Connector and PCB loss. 1GHz (0.12dB), 2GHz (0.20dB), 3GHz (0.27dB), 4GHz (0.35dB), 5GHz (0.51dB), 6GHz (0.52dB)
(2) Tone Power is 18dBm and Tone spacing is 20KHz.
(3) Tone Power is 18dBm.

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Electrical Specifications - 75Ω

Typical conditions are at VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 75Ω, Excluding SMA Connector and PCB loss(1), unless otherwise noted.

Table 2 Electrical Specifications - 75Ω

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating Frequency			5		6000	MHz
Insertion Loss	RFc - RFx	5MHz 204MHz 633MHz 1218MHz 1700MHz 1794MHz		0.50 0.59 0.66 0.74 0.71 0.68		dB
Isolation	RFc - RFx	5MHz 204MHz 633MHz 1218MHz 1700MHz 1794MHz		78 60 53 45 39 38		dB
Isolation	RFx - RFx	5MHz 204MHz 633MHz 1218MHz 1700MHz 1794MHz		78 60 52 47 42 41		dB
Return Loss	RFc, RF1, RF2	5MHz – 3GHz (Active port)	15	20		dB
2nd Harmonic(2)	RFc - RFx	204MHz 633MHz		80 110		dBc
3rd Harmonic(2)	RFc - RFx	204MHz 633MHz		107 120		dBc

(1) Excluding SMA Connector and PCB loss.
5MHz(0.02dB), 204MHz(0.04dB), 633MHz(0.09dB), 1218MHz(0.13dB), 1700MHz(0.17dB), 1794MHz(0.19dB)
(2) Tone Power is 18dBm.

Preliminary Datasheet

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Preliminary Datasheet

Product Description

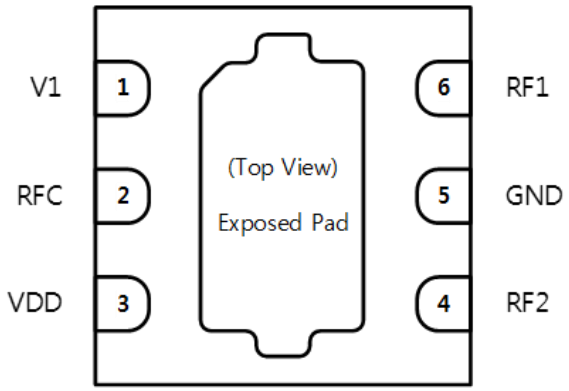

Figure 3 Functional Block Diagram

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 Operating Ranges

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

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
ESD	HBM	All pins	-	-	2000	V
	CDM	All pins	-	-	1000	V

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Preliminary Datasheet

Typical Performances - 50Ω

Typical conditions are at 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)

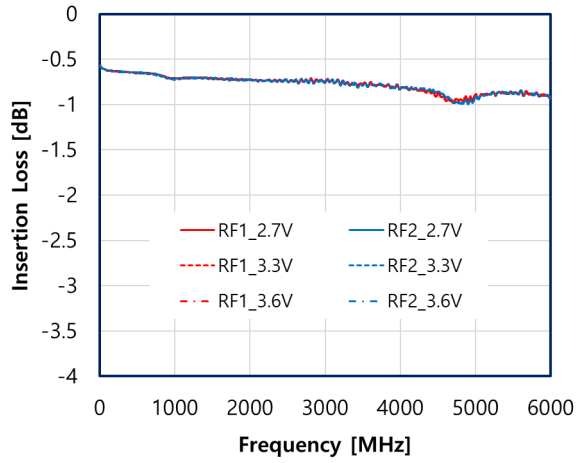


Figure 5 Insertion Loss vs. Temp (RFC - RFx)

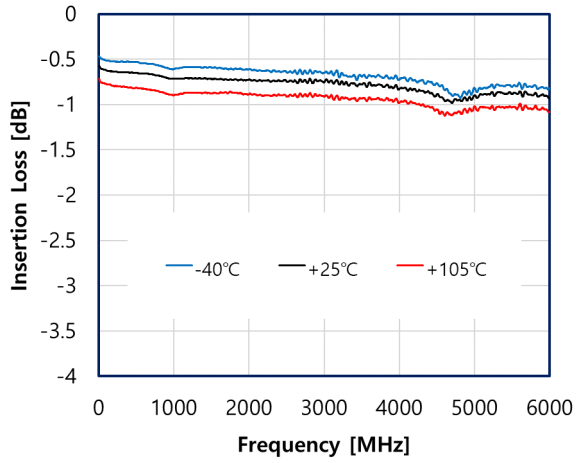


Figure 6 Return Loss (RFC, RFx)

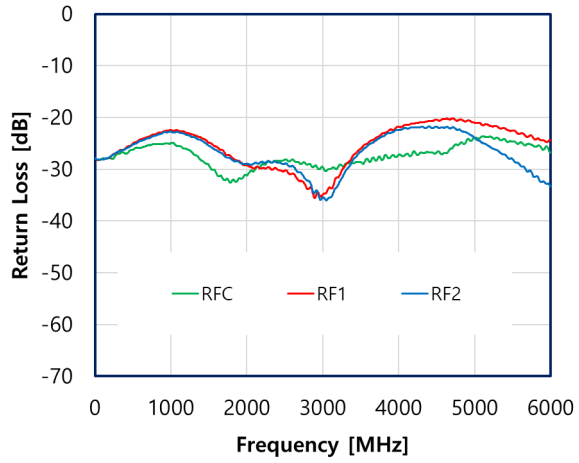
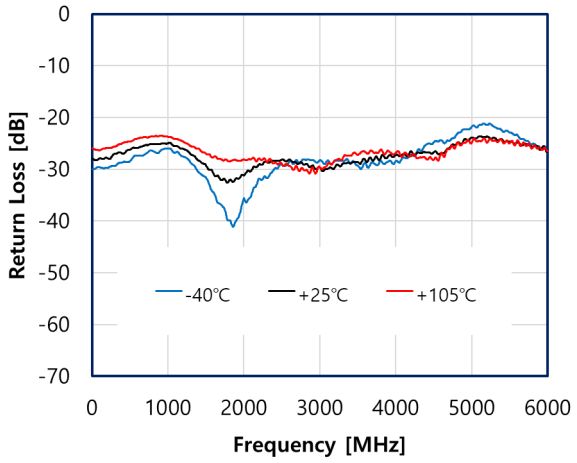


Figure 7 Return Loss vs. Temp (RFC)



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Preliminary Datasheet

Typical Performances - 50Ω

Typical conditions are at 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 8 Isolation vs. Vdd (RFC - RFx)

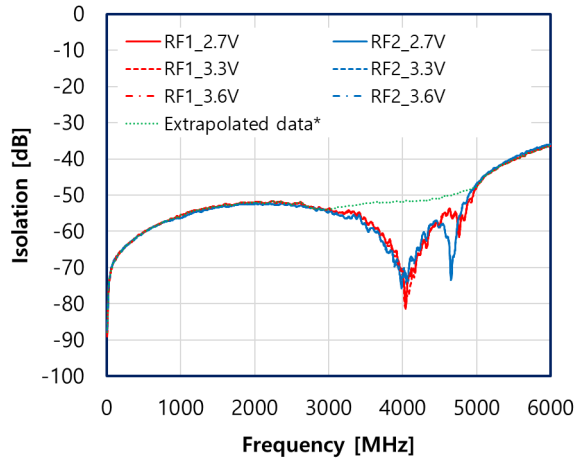
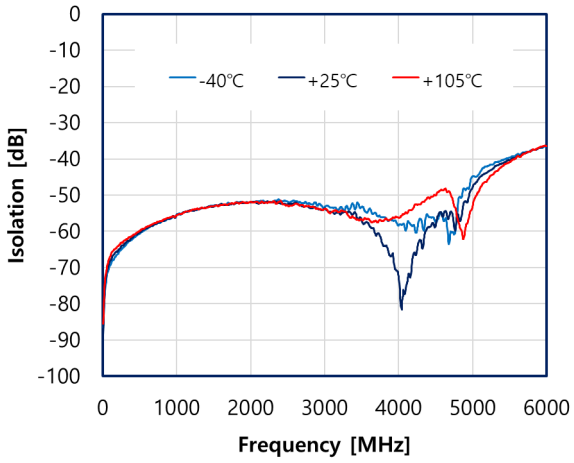


Figure 9 Isolation vs. Temp (RFC-RFx)



* Extrapolated data is the actual performance of part excluding the resonance of the evaluation board.

Figure 10 Isolation vs. Vdd (RFx - RFx)

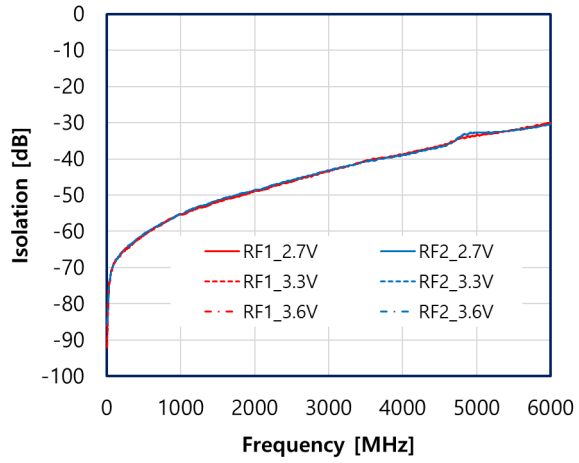
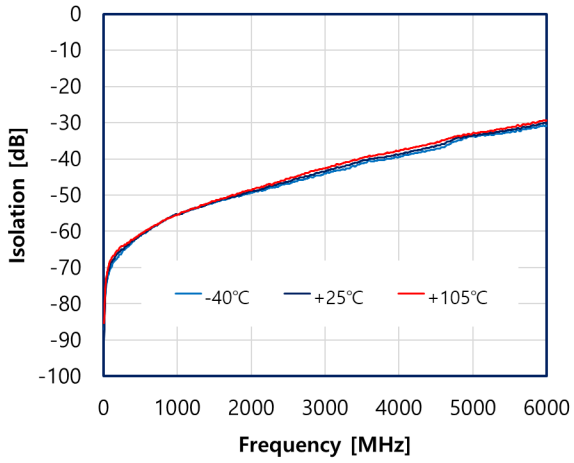


Figure 11 Isolation vs. Temp (RFx - RFx)



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Preliminary Datasheet

Typical Performances - 75Ω

Typical conditions are at VDD = 3.3V, T_A = 25°C, V1 Low = 0V, V1 High = 3.3V, Z_L = 75Ω, Excluding SMA Connector and PCB loss, unless otherwise noted.

Figure 12 Insertion Loss vs. Vdd (RFC - RFx)

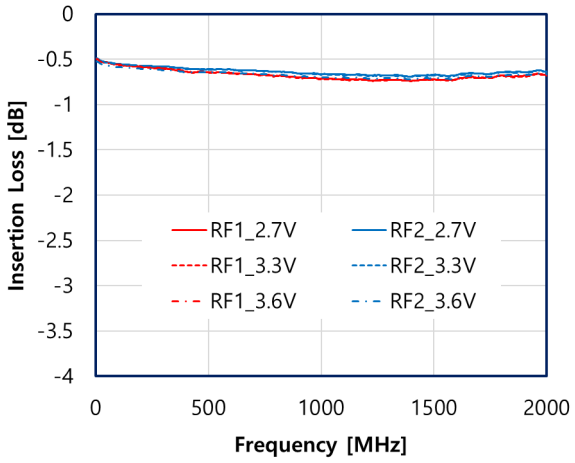


Figure 13 Return Loss (RFC, RFx)

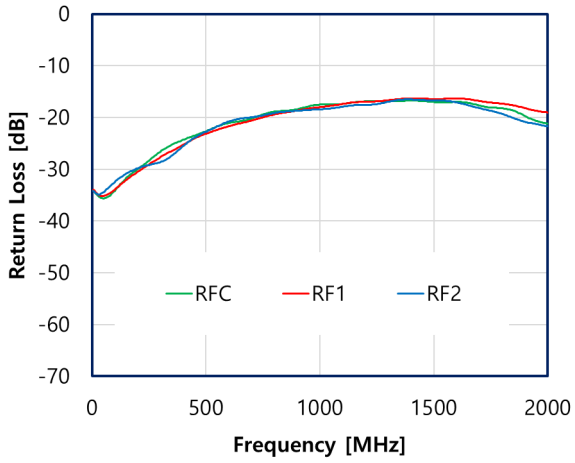


Figure 14 Isolation vs. Vdd (RFC - RFx)

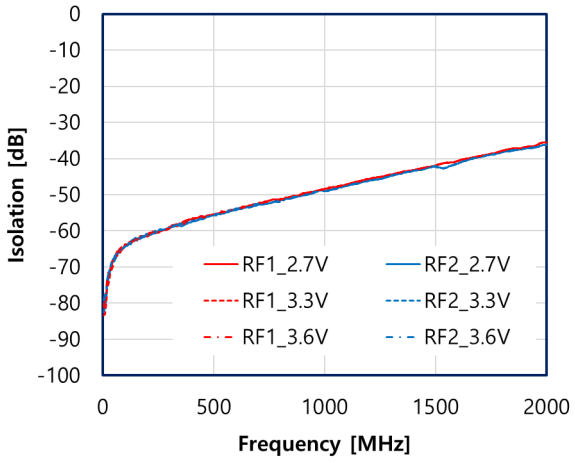
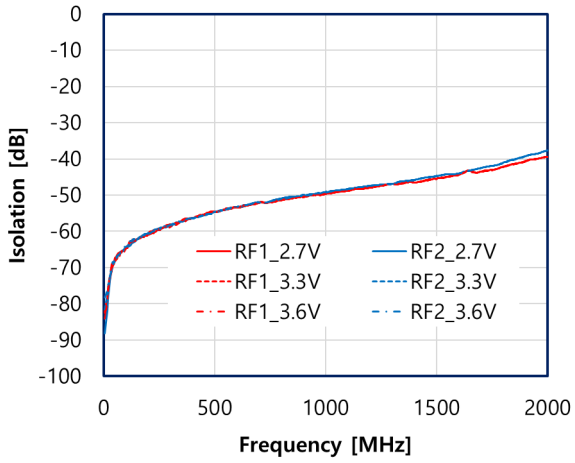


Figure 15 Isolation vs. Vdd (RFx - RFx)



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Preliminary Datasheet

Evaluation Board - 50Ω

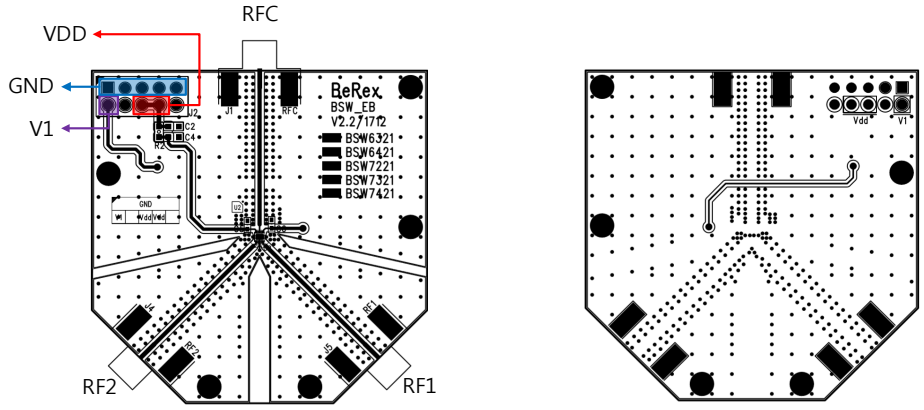

Figure 16 Evaluation Board Layout - 50Ω

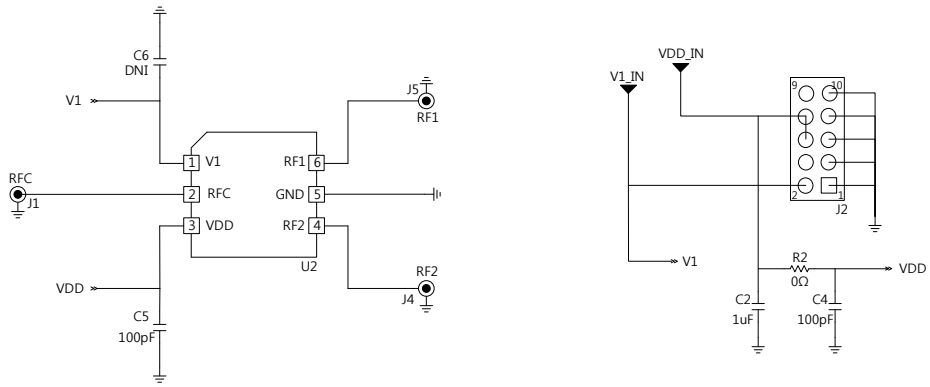

Figure 17 Evaluation Board Schematic - 50Ω

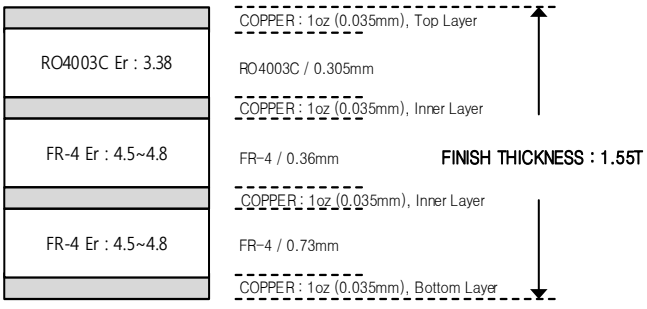

Figure 18 Evaluation Board PCB Layer Information 50Ω

Table 6 Bill of Material - Evaluation Board 50Ω

No.	Ref Des	Part Qty	Part Number	Remark
1	C2	1	CAP 1608 1uF J 50V	
2	C4	1	CAP 1608 100pF J 50V	
3	C5*	1	CAP 1005 100pF J 50V	
4	C6	1	CAP 1005 DNI	
5	R2	1	RES 1608 J 0ohm	
6	J2	1	10 Pin Header	
7	RFC, RF1, RF2	3	SMA_END_LAUNCH	
8	U2	1	BSW7421	

* C5 should be placed near the device.

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Preliminary Datasheet

Evaluation Board - 75Ω

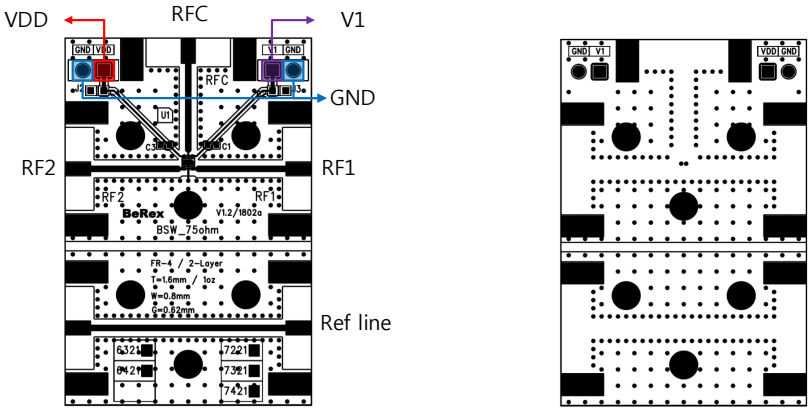

Figure 19 Evaluation Board Layout - 75Ω

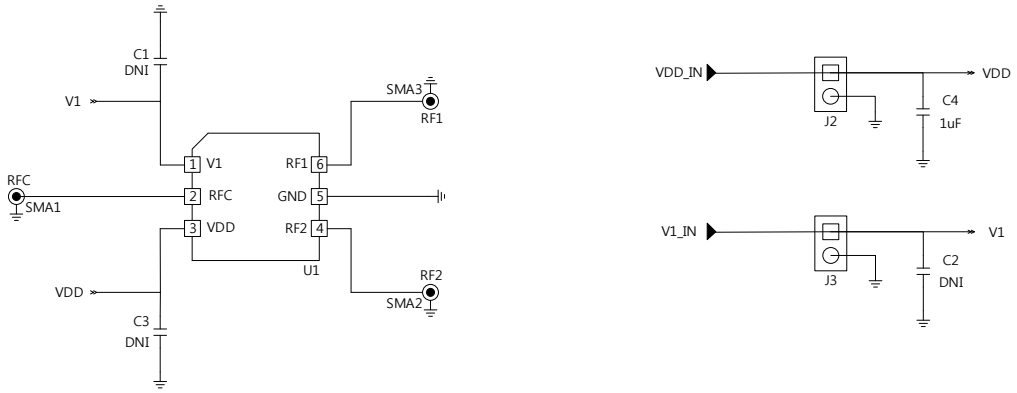

Figure 20 Evaluation Board Schematic - 75Ω

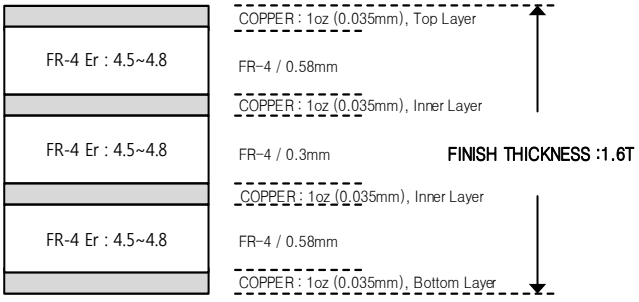

Figure 21 Evaluation Board PCB Layer Information 75Ω

Table 7 Bill of Material - Evaluation Board 75Ω

No.	Ref Des	Part Qty	Part Number	Remark
1	C4	1	CAP 1608 1uF J 50V	
2	C1, C2, C3	3	CAP 1005 DNI	
3	J2, J3	2	2 Pin Header	
4	RFC, RF1, RF2	3	F Type_END_LAUNCH	
5	U1	1	BSW7421	

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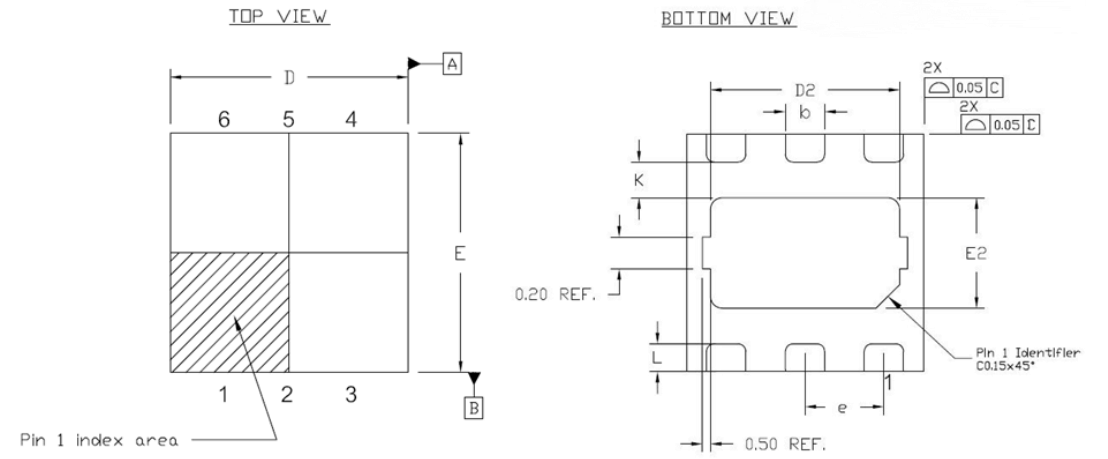
Preliminary Datasheet

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 22 Package Outline Drawing

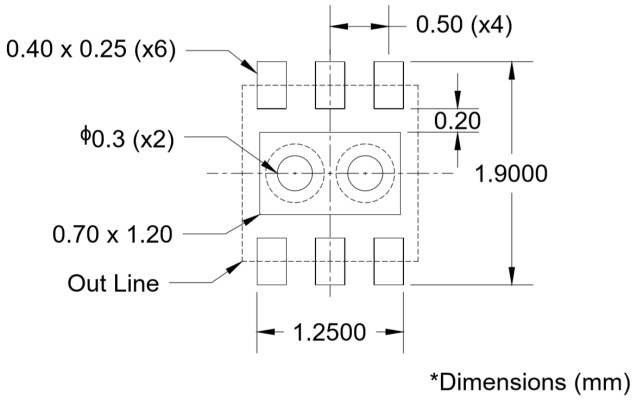


Figure 23 Recommended Land Pattern

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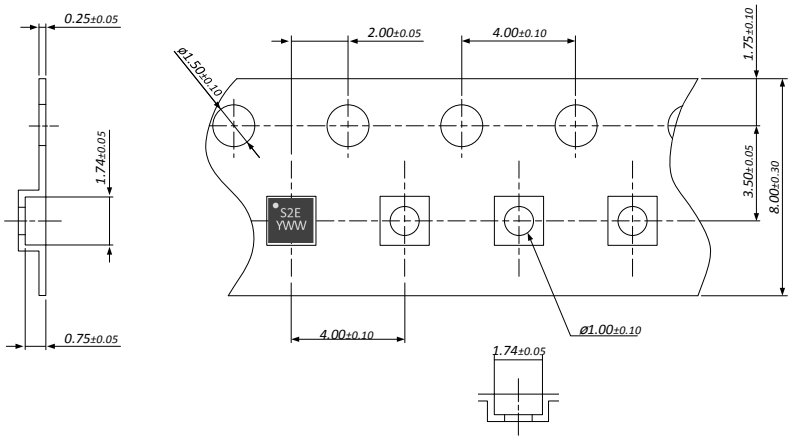
Tape & Reel



Packaging information :

Tape Width (mm) : 8

Reel Size (inches) : 7

Device Cavity Pitch (mm) : 4

Device Per Reel : 3000EA

Figure 24 Tape & Reel

Package Marking

S : Switch

2 : The number of switch throw

E : Sequential Number

Y : Year

WW : Work Week

Figure 25 Package Marking

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 Rating: Class 2
Value: Passes < 2000V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114B

MSL Rating: Level 1 at +265°C convection reflow
Standard: JEDEC Standard J-STD-020

Proper ESD procedures should be followed when handling this device.

NATO CAGE code:

2	N	9	6	F

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