BEREX

BSW6622

Ultra High Isolation SPDT RF Switch

5 MHz–8 GHz

Product Description

The BSW6622 is an absorptive SPDT 50Ω matched RF switch supporting bandwidth up to 8GHz. It's high linearity performance across the temperature range makes it ideally suitable for use in 3G/4G/5G wireless infrastructure and 802.11 a/n/ac/ax applications where high isolation and excellent performance is required.
The BSW6622 is designed with robust ESD protection circuits at all pins and packaged in an industry standard, fully RoHS2-compliant, 20Lead, 4mm x 4mm x 0.9mm QFN package.
The BSW6622 does not require blocking capacitors. If DC is presented at the RF port, add a blocking capacitor.
A functional block diagram is shown in Figure 1.

Block Diagram

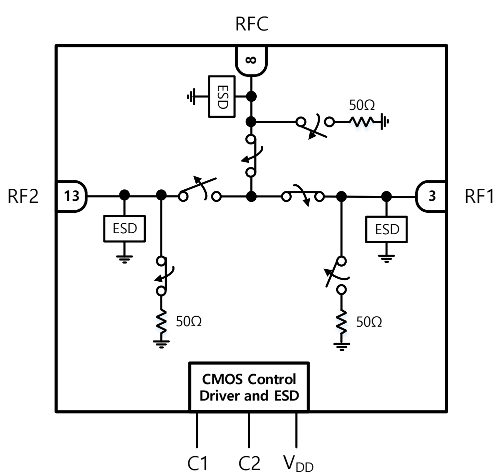


Figure 1. Functional Block Diagram

Applications

- Wireless 3G/4G/5G Infrastructure
- Base station & Repeater
- WLAN 802.11 a/b/ac/ax

Package Type

4mm x 4mm x 0.9mm, 20-Lead QFN Package

Figure 2. Package type

Device Features

- Output frequency range : 5MHz to 8.0GHz
- Supply Voltage : 2.7V to 5.5V
- ESD, HBM : ±1.5kV @All pins
- Operating temperature range : -40°C to +105°C
- Low Insertion Loss
  - : 0.73dB @ 2GHz
  - : 0.87dB @ 4GHz
  - : 1.10dB @ 6GHz
- Ultra High Isolation
  - RFC to RFx
    - : 62dB @ 2GHz
    - : 57dB @ 4GHz
    - : 48dB @ 6GHz
  - RFx to RFx
    - : 72dB @ 2GHz
    - : 58dB @ 4GHz
    - : 48dB @ 6GHz
- Switching time : 120 to 220ns
- 20-Lead QFN package : 4.0mm x 4.0mm x 0.9mm
- Lead-free/RoHS2 compliant QFN package

Preliminary Datasheet

Electrical Specifications

Typical conditions are at VDD = 5V, T_A = +25°C, C1/C2 Low = 0V, C1/C2 High = 3.3V, Z_L = 50Ω, excluding SMA Connector and PCB losses(1), unless otherwise noted.

Table 1. Electrical Specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating Frequency			5		8000	MHz
Insertion Loss	RFC - RFx	1GHz 2GHz 3GHz 4GHz 6GHz 8GHz		0.68 0.73 0.83 0.87 1.10 1.98		dB
Isolation (C to X)	RFC - RFx	1GHz 2GHz 3GHz 4GHz 6GHz 8GHz		67 62 60 57 48 46		dB
Isolation (X to X)	RFx - RFx	1GHz 2GHz 3GHz 4GHz 6GHz 8GHz		81 72 64 58 48 42		dB
Return Loss (Active Port)	RFC / RF1 / RF2	5MHz—6GHz 6GHz—8GHz		20 / 23/ 23 14 / 13/ 13		dB
Return Loss (Terminated Port)	RFC / RF1 / RF2	5MHz—6GHz 6GHz—8GHz		24 / 25/ 25 14 / 15/ 15		dB
Input P1dB	RFC - RFx	2.35GHz 3.5GHz 4.9GHz		36 36 34		dBm
Input IP2(2)	RFC - RFx	2.35GHz 3.5GHz 4.9GHz		108 105 100		dBm
Input IP3(2)	RFC - RFx	2.35GHz 3.5GHz 4.9GHz		64 64 65		dBm
2nd Harmonics(3)	RFC - RFx	2.35GHz 3.5GHz 4.9GHz		95 90 80		dBc
3rd Harmonics(3)	RFC - RFx	2.35GHz 3.5GHz 4.9GHz		100 101 95		dBc
Switching time	RFC - RFx	50% CTRL to 90% RF 50% CTRL to 10% RF		220 120		ns

The typical spurious performance of the BSW6622 is under –140dBm / 10Hz @ Over 10MHz

(1)Excluding SMA Connector and PCB loss.

1GHz (0.17dB), 2GHz (0.26dB), 3GHz (0.35dB), 4GHz (0.41dB), 5GHz (0.45dB), 6GHz (0.56dB), 7GHz (0.61dB), 8GHz (0.60dB)

(2)The each-tone Power is 20dBm and Tone spacing is 1MHz.

(3)Tone Power is 20dBm.

Product Description

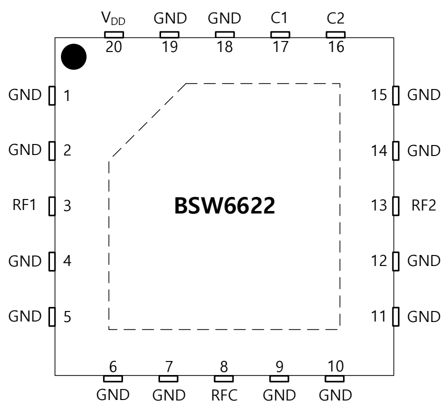


Figure 3. Pin Description

Table 2. Pin Description

Pin No.	Pin Name	Description
1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15, 18, 19	GND	Ground
3	RF1	RF1 Port
8	RFC	RFC Port
13	RF2	RF2 Port
16	C2	Switch Control Input (Definition for the C2 pin, See Table 3)
17	C1	Switch Control Input (Definition for the C1 pin, See Table 3)
20	VDD	Supply Voltage
Pad	Exposed Pad	Ground

Table 3. Control Truth Table

C1	C2	RFC-RF1	RFC-RF2
0	0	OFF	OFF
0	1	OFF	ON
1	0	ON	OFF
1	1	N/A	N/A

Table 4. Operating Ranges

Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	VDD	2.7	5	5.5	V
Supply Current	IDD	-	210	-	µA
Digital Input Control (C1/C2)	C_{High}	1.0	-	3.3	V
	C_{Low}	0	-	0.7	V
Operating Temperature Range	T_O	-40	+25	+105	°C
RF Input Power, CW	P_{CWOP}	-	-	30	dBm

Table 5. Absolute Maximum Ratings

Parameter			Symbol	Min	Max	Unit
Supply Voltage			VDD	-0.3	5.5	V
Digital Input Voltage			C1 / C2	-0.3	3.6	V
Maximum Input Power, CW (+25°C)			RF_{CWMAX}	-	Input P1dB	dBm
Storage Temperature Range			T_{ST}	-65	+150	°C
ESD	HBM	ALL pins	V_{ESDHBM}		±1500	V
	CDM	ALL pins	V_{ESDCDM}		±1000	V

Typical Performances

Typical conditions are at VDD = 5V, T_A = 25°C, C1/C2 Low = 0V, C1/C2 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB losses, unless otherwise noted.

Figure 4. Insertion Loss vs VDD [RFC to RF1]

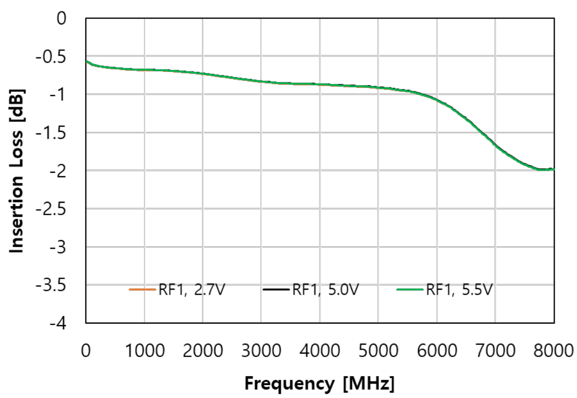


Figure 5 Insertion Loss vs VDD [RFC to RF2]

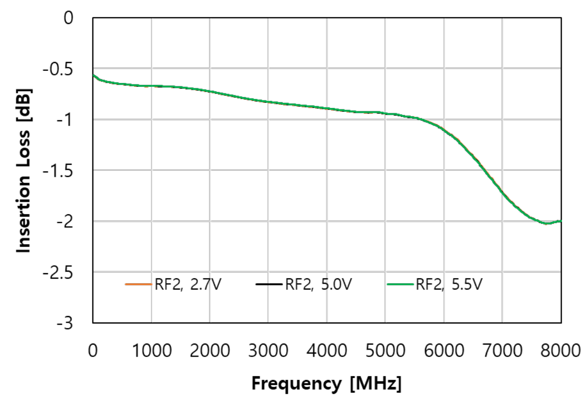


Figure 6. Insertion Loss vs Temp [RFC to RF1]

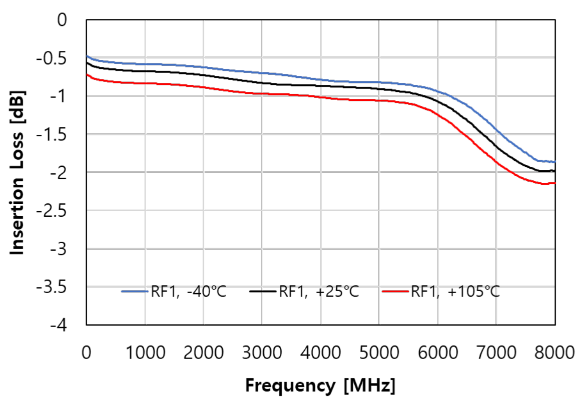


Figure 7. Insertion Loss vs Temp [RFC to RF2]

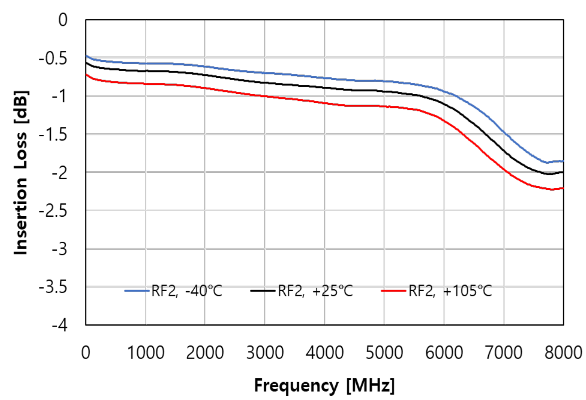


Figure 8. RFC Port Return Loss vs Temp [RF1 On state]

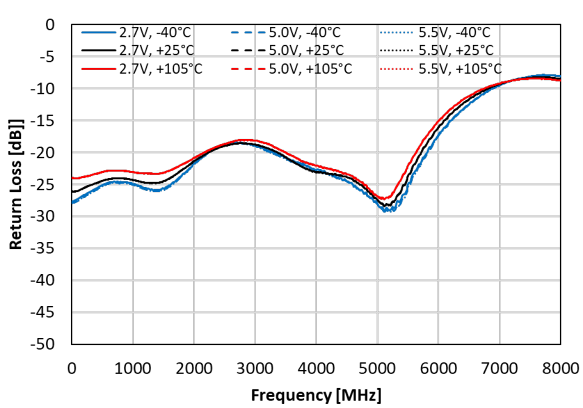
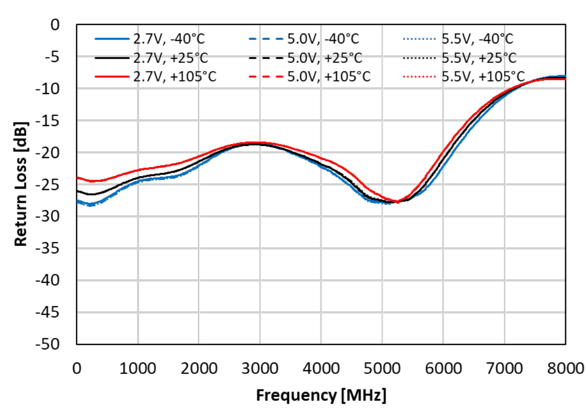


Figure 9. RFC Port Return Loss vs Temp [RF2 On state]



Typical Performances

Typical conditions are at VDD = 5V, T_A = 25°C, C1/C2 Low = 0V, C1/C2 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB losses, unless otherwise noted.

Figure 10. RF1 Port Return Loss vs Temp [On state]

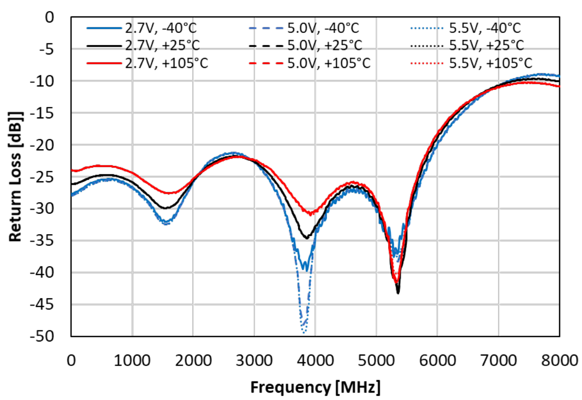


Figure 11. RF2 Port Return Loss vs Temp [On state]

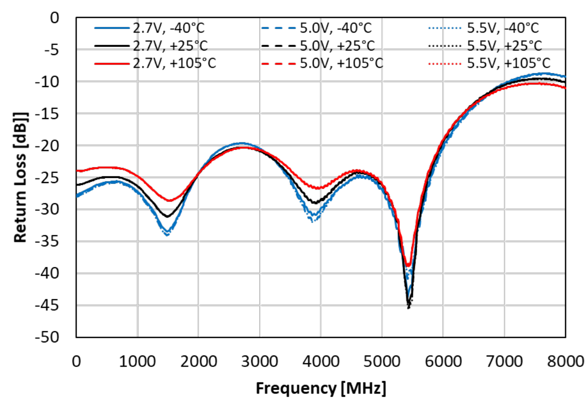


Figure 12. RF1 Port Return Loss vs Temp [Off state]

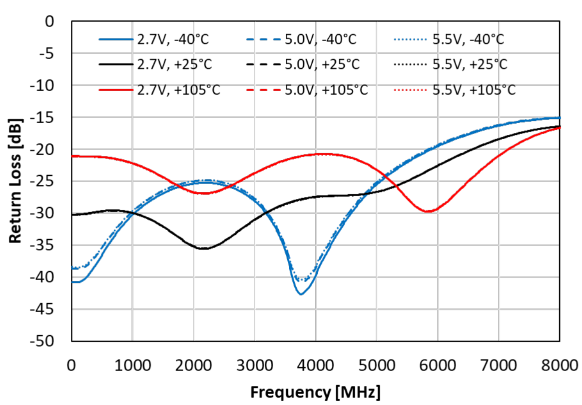


Figure 13. RF2 Port Return Loss vs Temp [Off state]

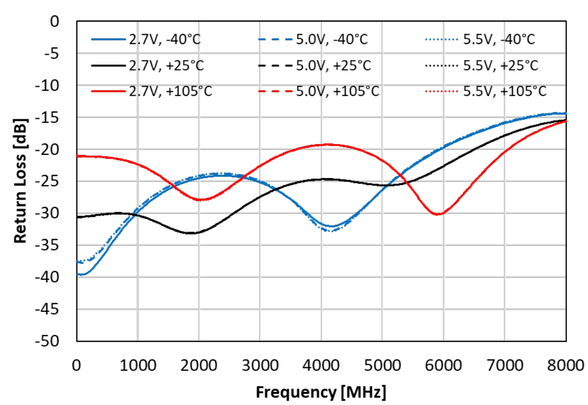


Figure 14. Isolation vs VDD [RFC to RFx]

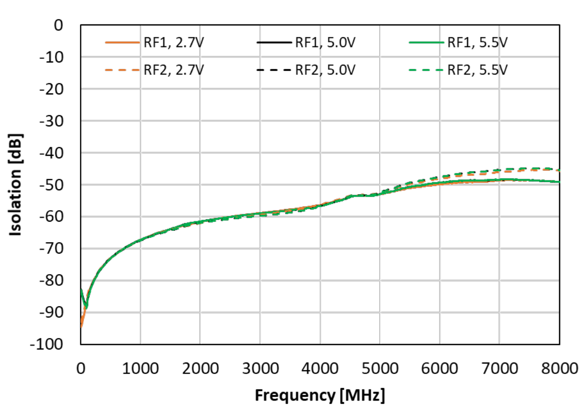
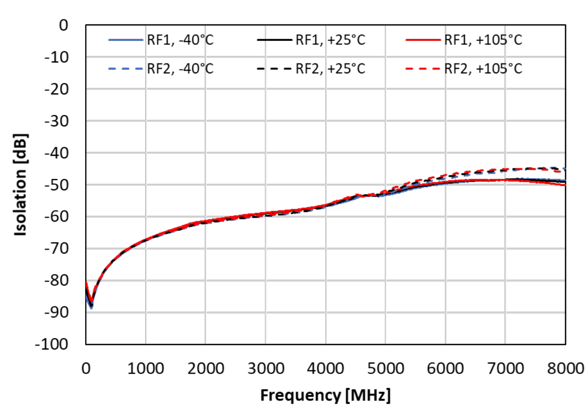


Figure 15. Isolation vs Temp [RFC to RFx]



Typical Performances

Typical conditions are at VDD = 5V, T_A = 25°C, C1/C2 Low = 0V, C1/C2 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB losses, unless otherwise noted.

Figure 16. Isolation vs VDD [RFx to RFx]

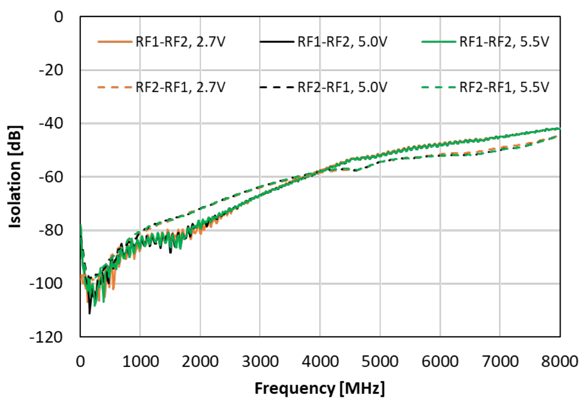


Figure 17. Isolation vs Temp [RFx to RFx]

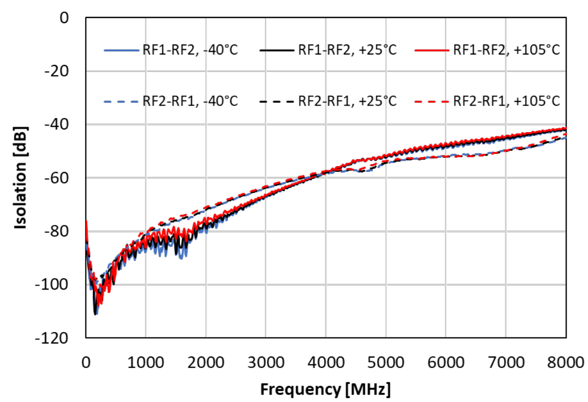


Figure 18. Input IP2 vs VDD [RFC to RFx]

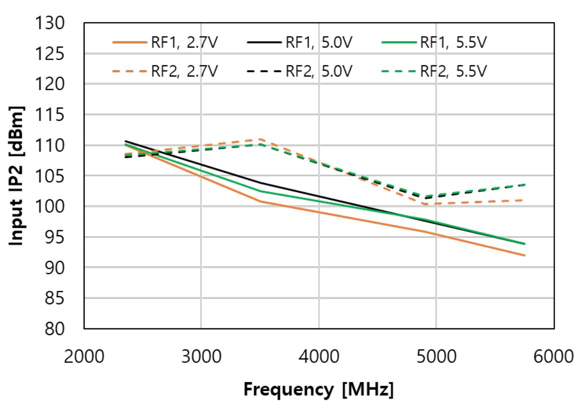


Figure 19. Input IP2 vs Temp [RFC to RFx]

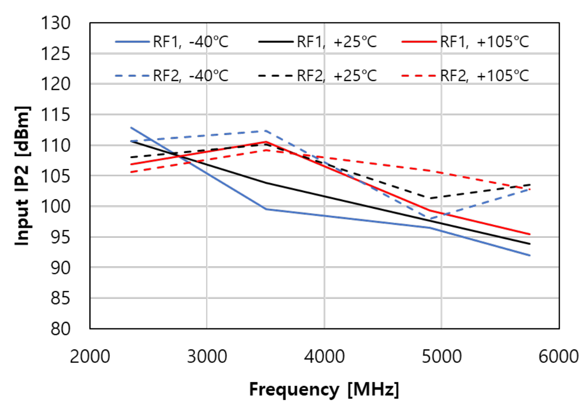


Figure 20 Input IP3 vs VDD [RFC to RFx]

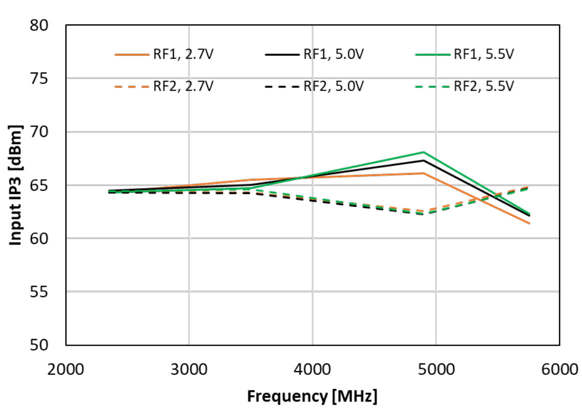
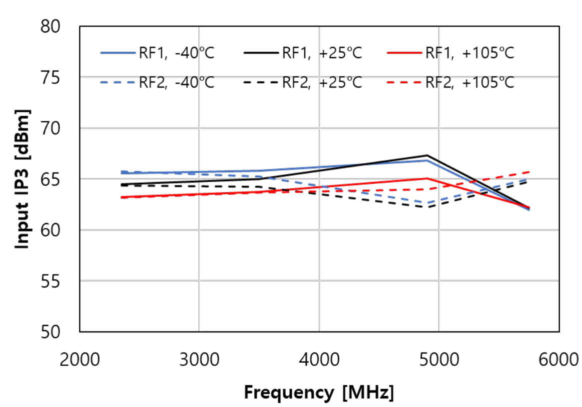


Figure 21 Input IP3 vs Temp [RFC to RFx]



Typical Performances

Typical conditions are at VDD = 5V, T_A = 25°C, C1/C2 Low = 0V, C1/C2 High = 3.3V, Z_L = 50Ω, Excluding SMA Connector and PCB losses, unless otherwise noted.

Figure 22. 2nd Harmonic vs VDD [RFC to RFx]

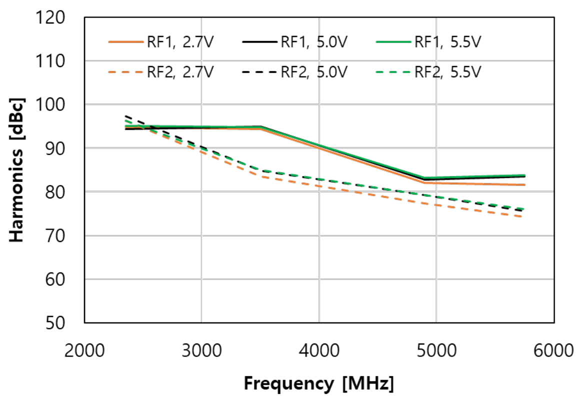


Figure 23. 2nd Harmonic vs Temp [RFC to RFx]

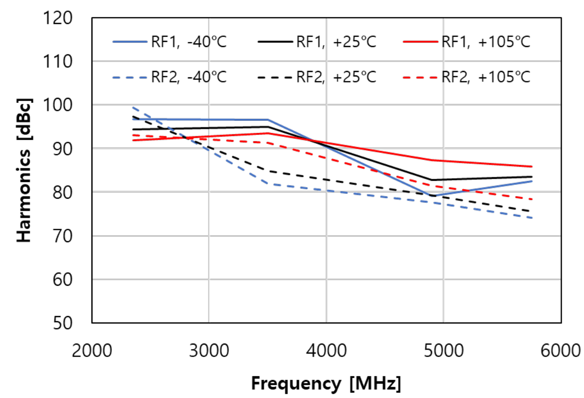


Figure 24. 3rd Harmonic vs VDD [RFC to RFx]

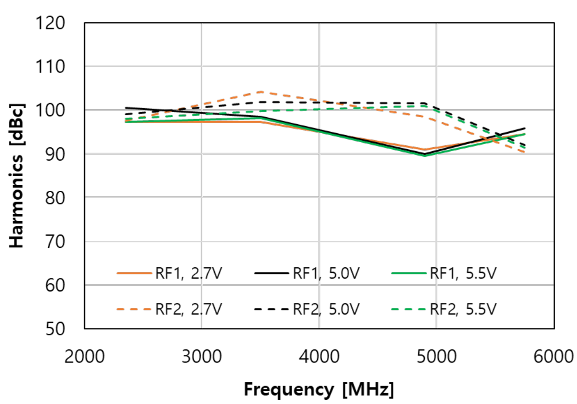


Figure 25. 3rd Harmonic vs Temp [RFC to RFx]

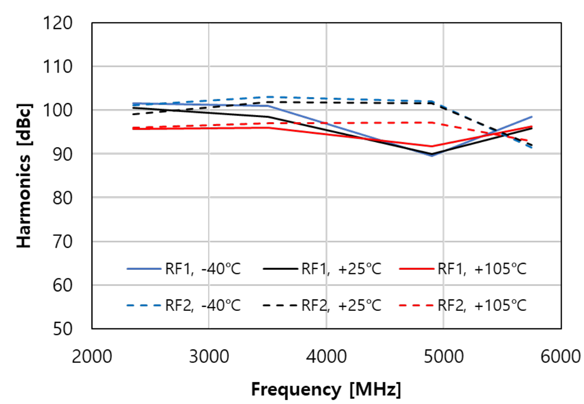


Figure 26. Input P1dB vs VDD [RFC to RFx]

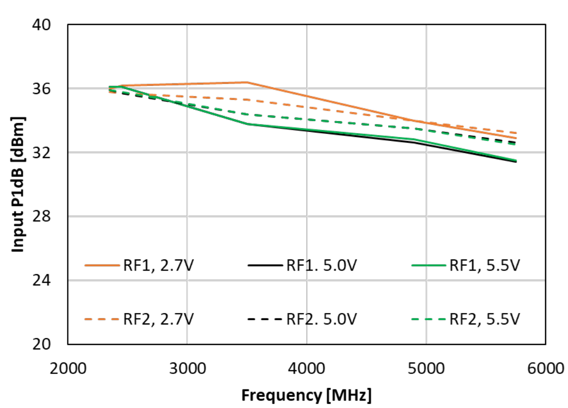
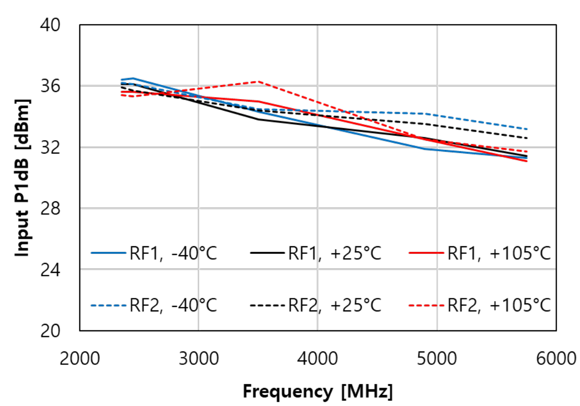
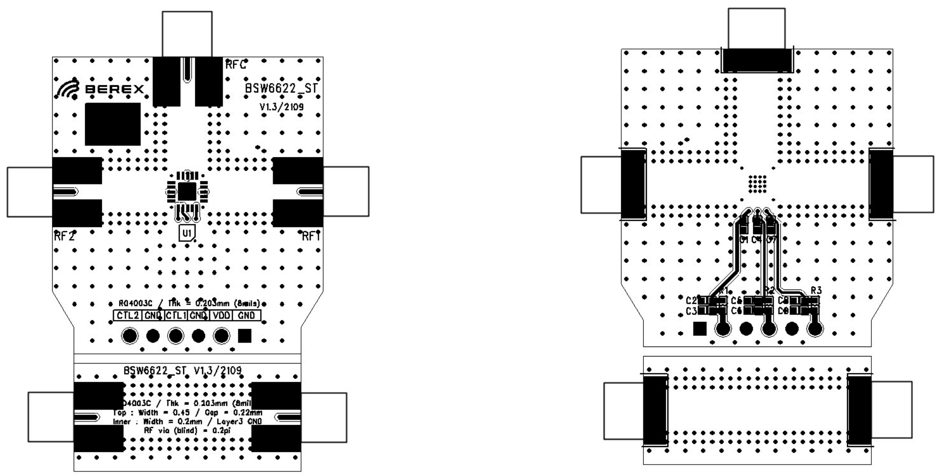


Figure 27. Input P1dB vs Temp [RFC to RFx]



Evaluation Board



[Top View] [Bottom View]

Figure 28. Evaluation Board Layout

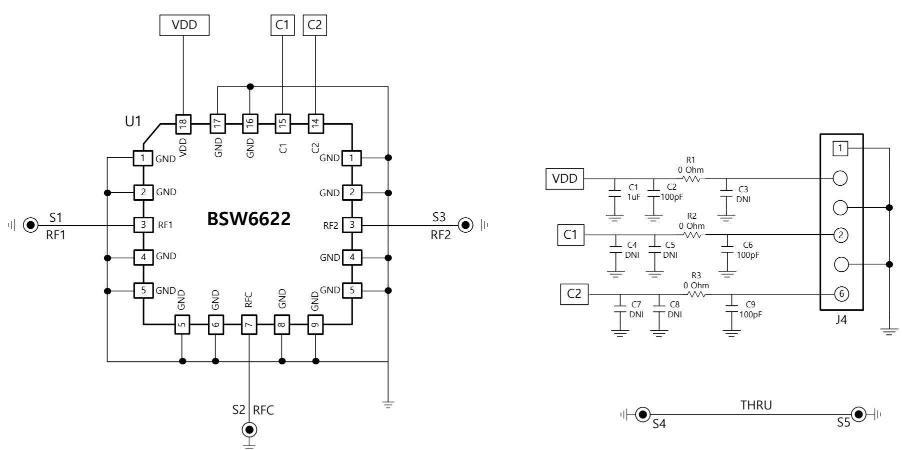


Figure 29. Evaluation Board Schematic

Table 6. Bill of Material - Evaluation Board

No.	Ref Des	Part Qty	Part Number	Remark
1	C1	1	CAP 1005 1uF J 50V	C1 should be placed near the BSW6622
2	C2,C6,C9	3	CAP 1005 100pF J 50V	
3	C3,C4,C5,C7,C8	4	CAP 1005 DNI	
4	R1,R2,R3	3	RES 1005 0 ohm	
5	J4	1	6 Pin Header 2.54mm	
5	S1,S2,S3,S4,S5	5	SMA_END_LAUNCH	
7	U1	1	BSW6622	

Evaluation Board

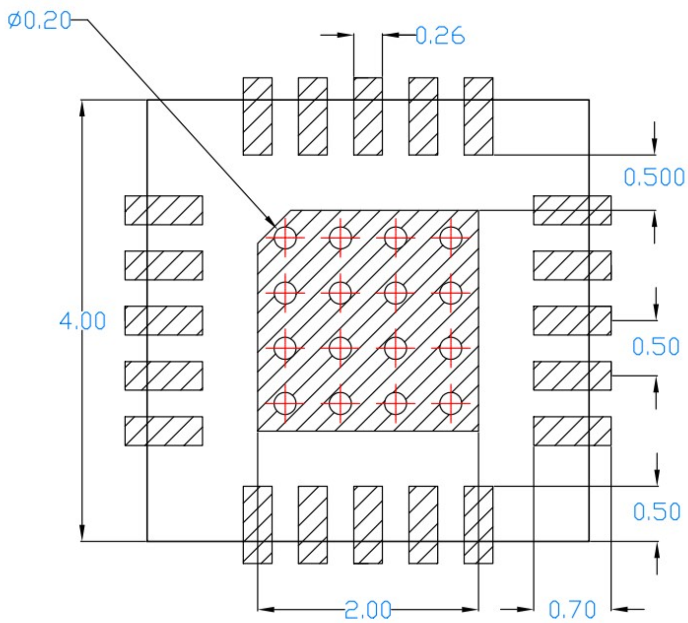


Figure 30. Suggested PCB Land Pattern

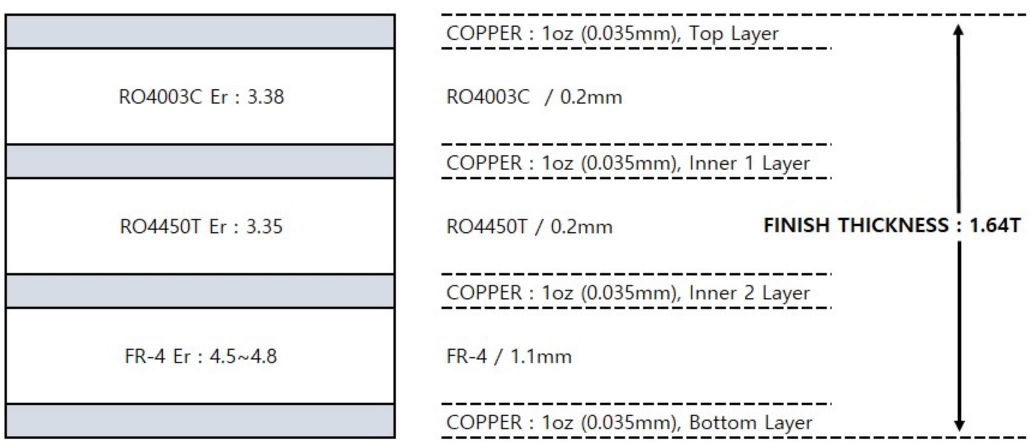
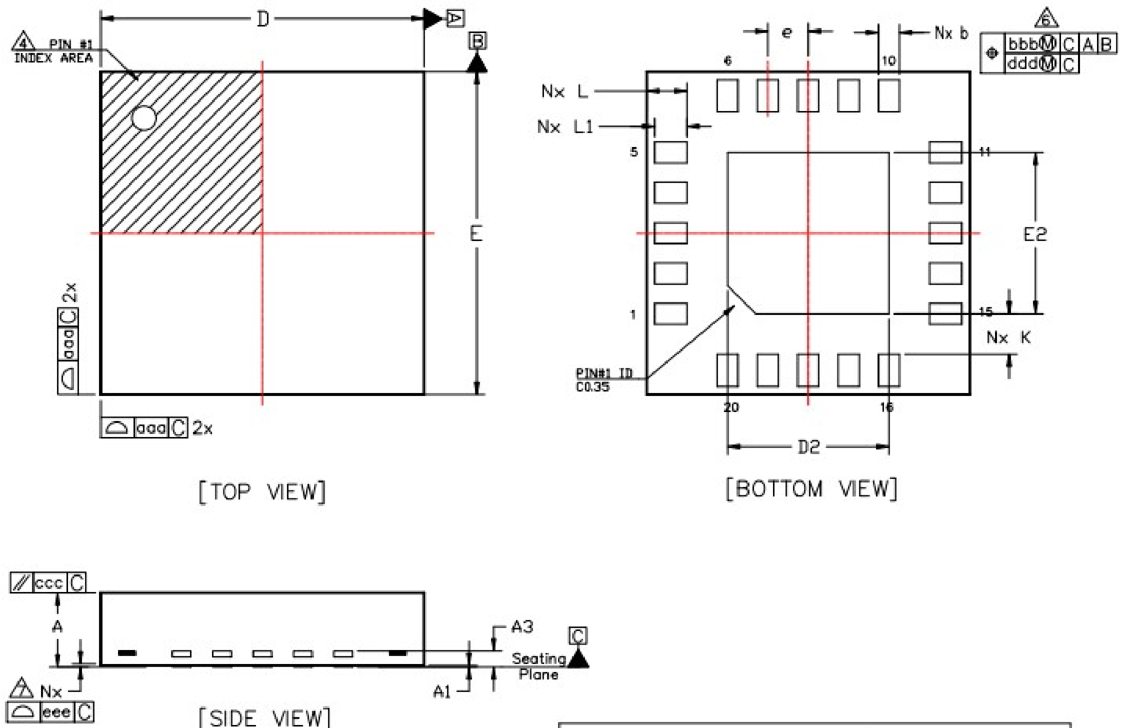


Figure 31. Evaluation Board PCB Layer Information

Package Outline Drawing



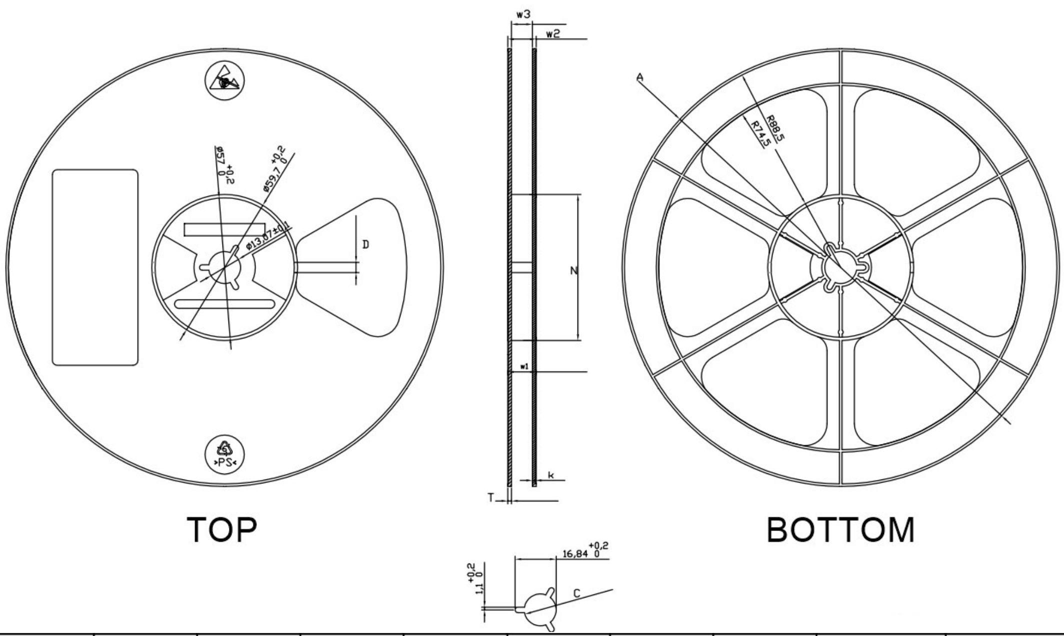
NOTES:

1. Dimensioning and tolerancing conform to ASME Y14.5-2009.
2. All dimensions are in millimeters.
3. N is the total number of terminals.
4. The location of the marked terminal #1 identifier is within the hatched area.
5. ND and NE refer to the number of terminals each D and E side respectively.
6. Dimension b applies to the metallized terminal and is measured between 0.15mm and 0.3mm from the terminal tip. If the terminal has a radius on the other end of it, dimension b should not be measured in that radius area.
7. Coplanarity applies to the terminals and all other bottom surface metallization.

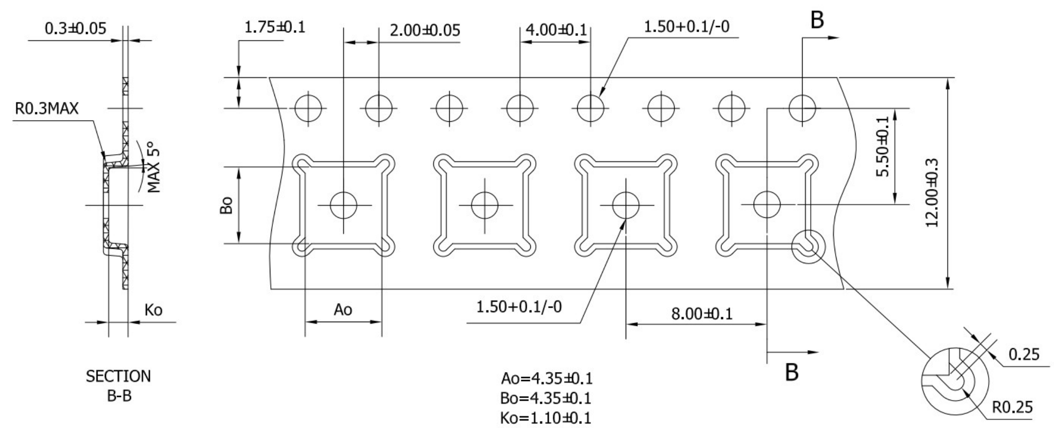
Dimension Table				
Symbol Thickness	Min	Nominal	Max	Note
A	0.80	0.90	1.00	
A1	0.00	0.02	0.05	
A3	---	0.203 Ref.	---	
b	0.21	0.26	0.31	6
D		4.00 BSC		
E		4.00 BSC		
e		0.50 BSC		
D2	1.95	2.00	2.05	
E2	1.95	2.00	2.05	
K	0.20	---	---	
L1	0.35	0.40	0.45	
L	0.40	0.50	0.60	
aaa		0.05		
bbb		0.10		
ccc		0.10		
ddd		0.05		
eee		0.08		
N		20		3
ND		5		5
NE		5		5
NOTES		1,2		

Figure 32. Package Outline Dimension

Tape & Reel



TYPE	A	N	C	D	w1	w2	w3	T	k
12MM	Ø180 +2/−2	Ø60 +1/−1	Ø13.1 +0.2/−0.2	4.2±0.5	12.5 +1/−0	15.7 +1/−1	12.7 +1/−1	1.5±0.15	1.2±0.1



NOTES:
1 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2 CAMBER IN COMPLANCE WITH EIA 481
3 POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED
AS TRUE POSITION OF POCKET,NOT POCKET HOLE

Packaging information:	
Tape Width	12mm
Reel Size	7inch
Device Cavity Pitch	8mm
Device Per Reel	1000EA

Figure 33. Tape & Reel Information

Package Marking

Marking information:	
BSW6622	Device Name
YY	Year
WW	Work Week
XX	Wafer Lot Number

Figure 34. Package Marking

Lead plating finish

100% Tin Matte finish

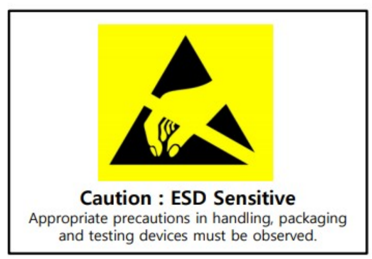
(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

ESD information1 :	
Rating	Class 1C (±1500V)
Test	Human Body Model (HBM)
Standard	JEDEC Standard JS-001-2017

ESD information2 :	
Rating	Class C3 (±1000V)
Test	Charged Device Model (CDM)
Standard	JEDEC Standard JS-002-2018

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