Product Specification

RS1481A Low Insertion SP8T

General Description

The RS1481A is a general-purpose, single-pole, eight-throw (SP8T), nonreflective switch manufactured using a silicon process. The RS1481A is available in a 2 mm × 2 mm, 14-lead QFN and provides high isolation and low insertion loss from 30 MHz to 4 GHz.

This reflective switch integrates on-board CMOS control logic with a low voltage CMOS-compatible control interface. Using a nominal +3.3 volt power supply voltage, a typical input 0.1dB compression point of +37 dBm can be achieved.

Applications

- LTE-based handsets
- Data cards
- Test equipment

Features

❖ **Excellent RF Performance**

- Nonreflective 50 Ω design
- Low insertion loss: 0.65 dB at 2.7GHz
- High isolation: ＞28 dB at 2.7 GHz

❖ **High input linearity**

- P0.1dB: 37 dBm typical
- Third Harmonics: -78 dBm typical

❖ **High power handling**

- 36 dBm through path

Functional Block Diagram

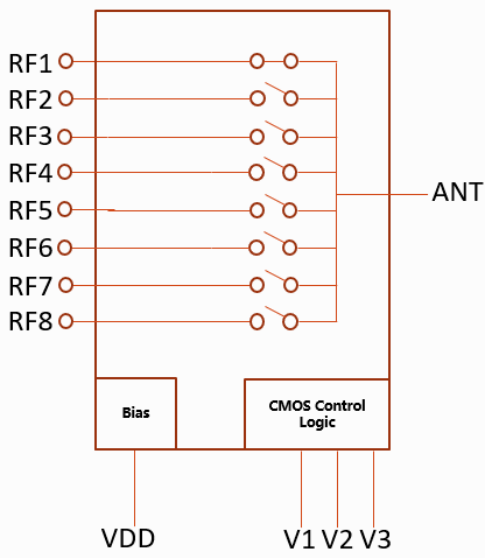


Figure 1

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Absolute Maximum Ratings

Table 1

Parameter	Min	Max	Units
VDD to GND	1.6	5.0	V
VCTRL to GND	-0.3	3.6	V
Input Power for any one selected RF through port , CW signal		36	dBm
Storage Temperature Range	-65	+150	°C
ESD Voltage– HBM (Per JESD22-A114)		1000	V

Stresses above those listed above may cause permanent damage to the device. Functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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Recommended Operating Conditions

Table 2

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		1.6	3.3	5	V
Logic High (V1, V2, V3)				3.3	
Operating Temp Range	Case Temperature	-40	25	+85	°C
RF Frequency Range		30		4000	MHz

Operation should be restricted to the limits in the Recommended Operating Conditions table. Operation between operating range maximum and absolute maximum for extended periods may reduce reliability.

Specification

Typical Application Circuit, Normal mode (VDD=3.3V), T_C = +25°C, F_{RF} = 2000MHz, Input power = 0dBm per tone unless otherwise stated. PCB board trace and connector losses are de-embedded unless otherwise noted.
Table 3

Parameter	Conditions	Min	Typ	Max	Units
Insertion Loss	0.1 - 1GHz		0.35		dB
	1 - 2GHz		0.4		
	2 - 3GHz		0.55		
	3 - 4GHz		0.6		
Isolation (RFC to RF2)	0.1 - 1GHz		60		dB
	1 - 2GHz		55		
	2 - 3GHz		48		
	3 - 4GHz		40		
Isolation (RFC to RF3 - 8)	0.1 - 1GHz		38		dB
	1 - 2GHz		28		
	2 - 3GHz		23		
	3 - 4GHz		20		
Isolation (RFX to RFX)	0.1 - 1GHz		40		dB
	1 - 2GHz		28		
	2 - 3GHz		22		
	3 - 4GHz		22		
Return Loss (RFC)	0.1 – 4GHz		25		dB
Return Loss (RFX)	0.1 – 4GHz		25		dB
Input 0.1dB Compression	0.1 – 4GHz		37		dBm
Input IP3	730MHz&780MHz, 20dBm input power		56		dBm
Second Harmonics	PIN = +26dBm@2.5GHz		-85		dBm
Third Harmonics	PIN = +26dBm@2.5GHz		-78		dBm
Switching Time	50% CTRL to 90% RF		660		ns
	50% CTRL to 10% RF		400		
Logic Input High Threshold		1.35	1.8	3.0	V
Logic Input Low Threshold		0	0	0.4	V
Logic Current	For each control pin@3.3V		3		μA
DC Current (VDD)	control =0V		37		μA

Pin Diagram

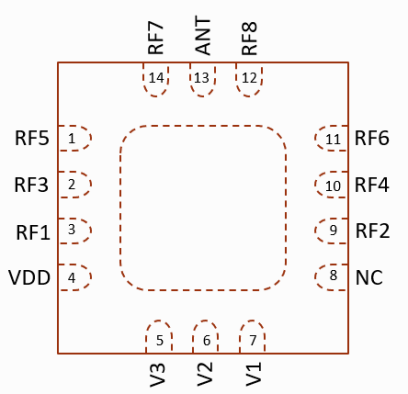


Figure 2

Pin Description

Table 4

Pin No.	Label	Description
1	RF5	RF Port 5
2	RF3	RF Port 3
3	RF1	RF Port 1
4	VDD	DC Supper Voltage Input
5	V3	Control Input 3
6	V2	Control Input 2
7	V1	Control Input 1
8	NC	Not connected
9	RF2	RF Port 2
10	RF4	RF Port 4
11	RF6	RF Port 6
12	RF8	RF Port 8
13	ANT	Antenna Port
14	RF7	RF Port 7

Control Logic

Table 5

Mode	V1	V2	V3
RF1 on	0	0	0
RF2 on	0	0	1
RF3 on	0	1	0
RF4 on	0	1	1
RF5 on	1	0	0
RF6 on	1	0	1
RF7 on	1	1	0
RF8 on	1	1	1

Application Information

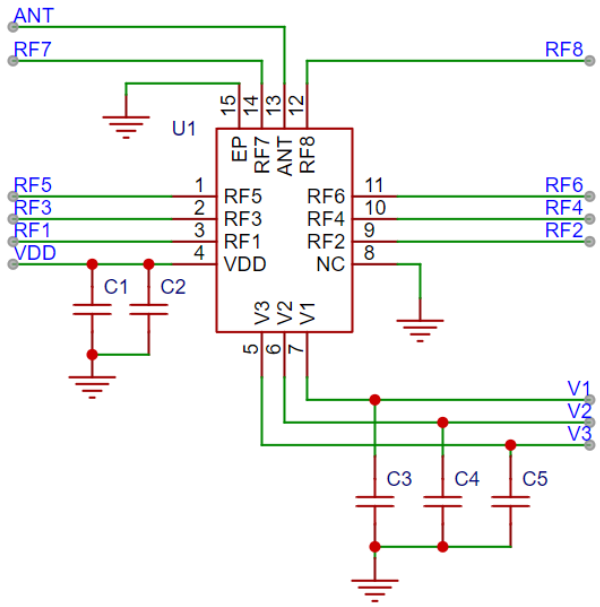


Figure 3

Table 6

Reference Designator	Value	Description
C1	0.1uF	C0402
C2~C5	100pF	C0402
U1	\	RS1481A

Typical Performance Characteristics

Figure 4. Insertion Loss

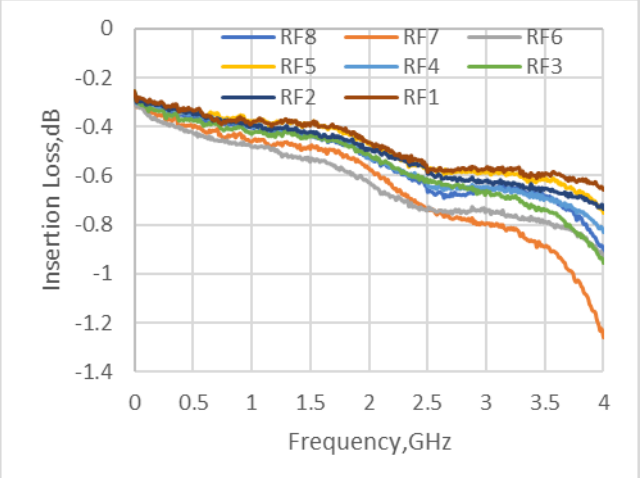


Figure 5. Output Return Loss

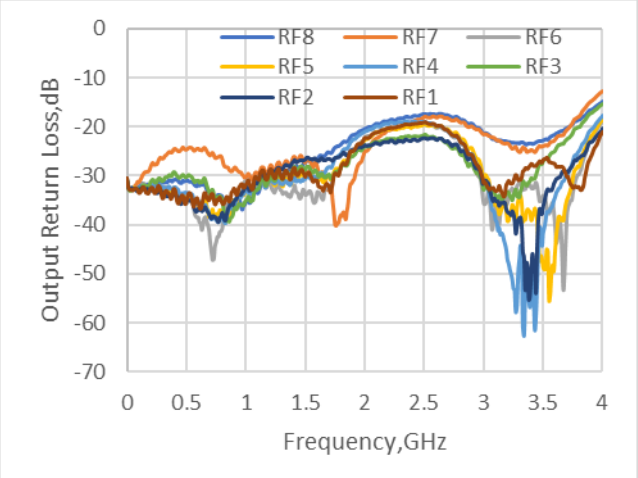


Figure 6. RFC-RFX Isolation

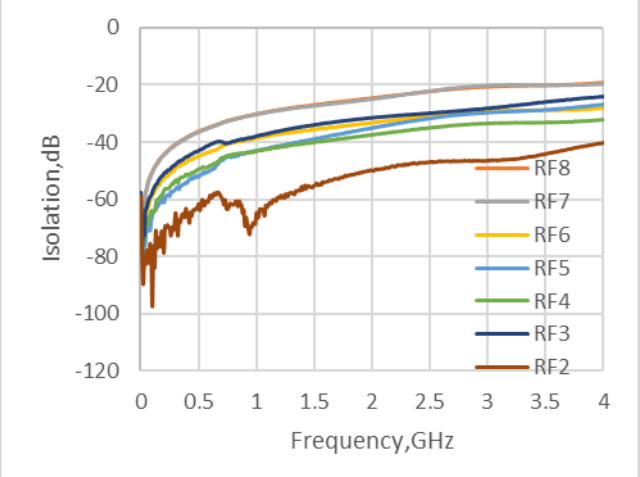


Figure 7. Insertion Loss

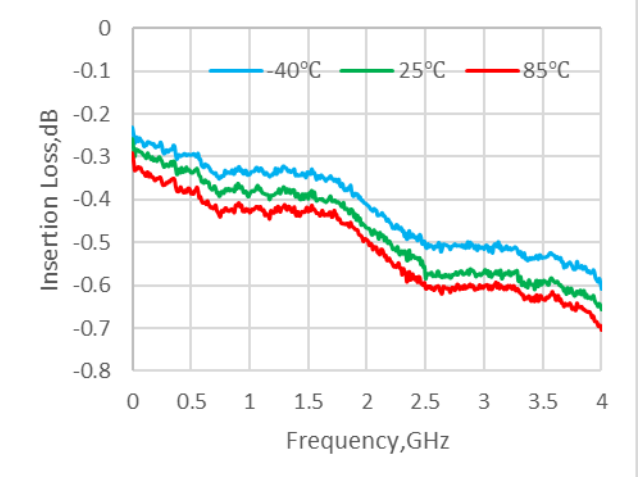


Figure 8. Input Return Loss

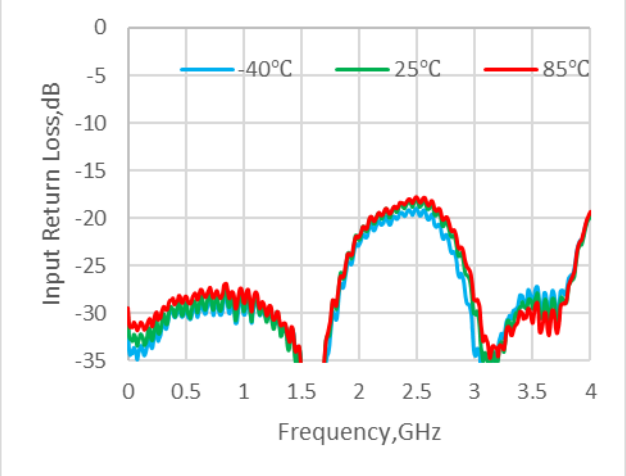
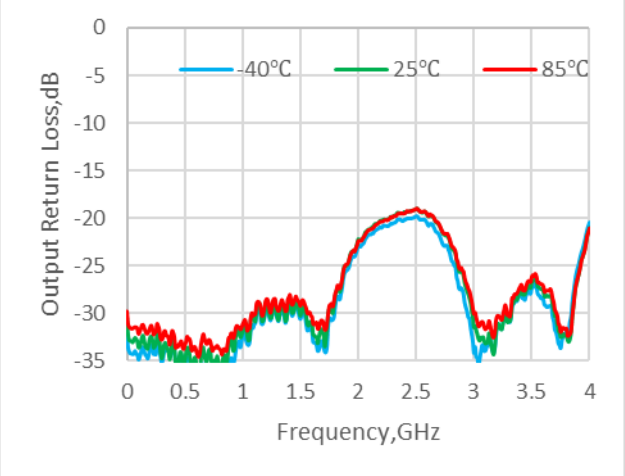


Figure 9. Output Return Loss



Typical Performance Characteristics

Figure 10. RFC-RF2 Isolation

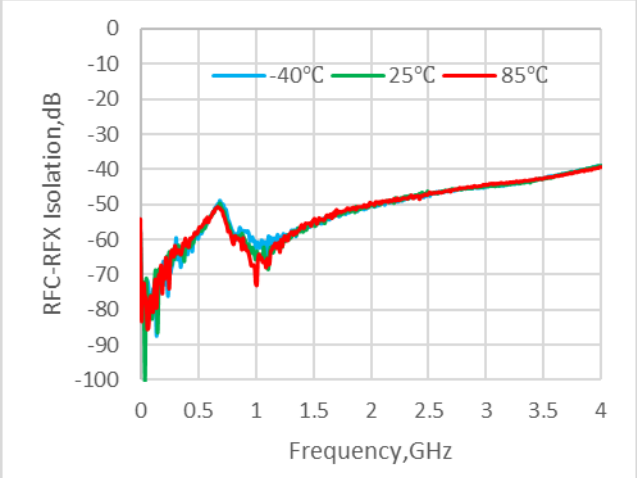


Figure 11. RFC-RF3~8 Isolation

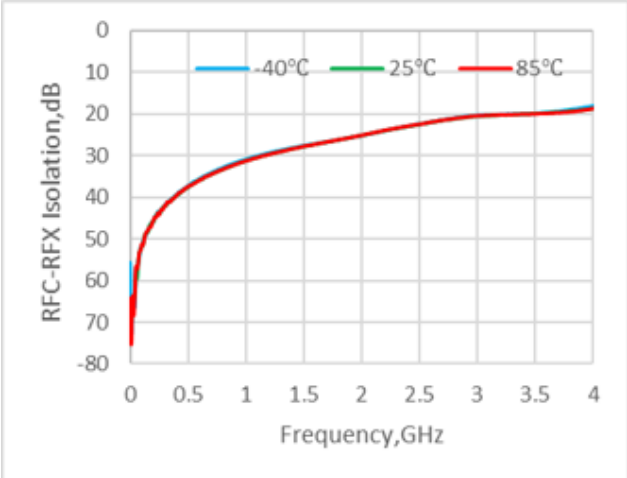


Figure 12. RFX-RFX Isolation

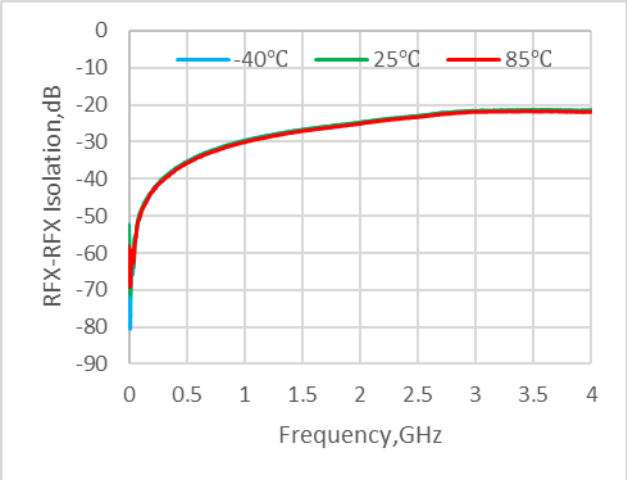


Figure 13. Noise Figure

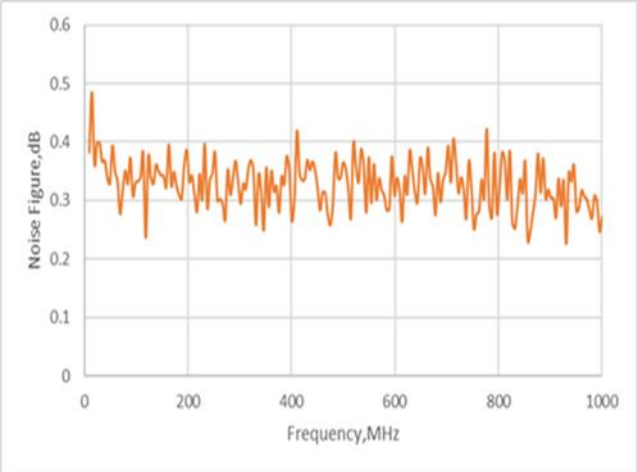
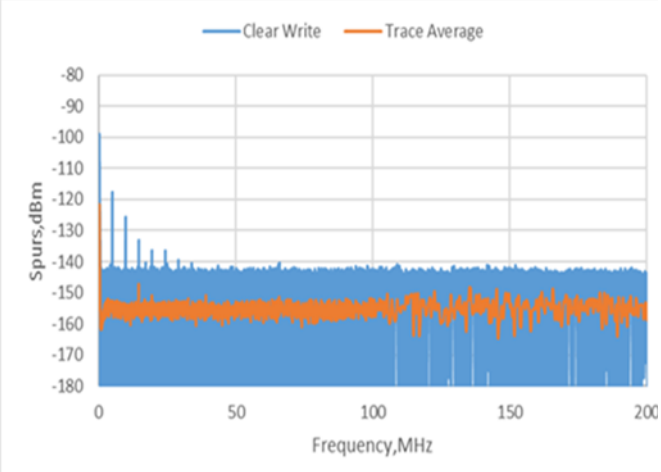


Figure 14. Low-Frequency Spur @RBW=100Hz



Typical Performance Characteristics

RFC-to-RFX Isolation

Table 7

"ON"Port	Frequency	Isolation(dB)							
		RF1	RF2	RF3	RF4	RF5	RF6	RF7	RF8
RF1	0.1-1G	-	70	55	57	58	52	43	43
	1-2G	-	58	36	41	40	37	28	28
	2-3G	-	50	33	36	34	33	24	24
	3-4G	-	45	28	35	31	31	23	23
RF2	0.1-1G	67	-	56	51	53	57	45	45
	1-2G	58	-	42	35	36	41	28	28
	2-3G	50	-	38	31	32	34	24	24
	3-4G	44	-	36	28	31	30	22	22
RF3	0.1-1G	51	65	-	57	50	54	45	45
	1-2G	35	51	-	43	34	37	29	29
	2-3G	32	45	-	37	30	33	24	24
	3-4G	28	43	-	35	26	31	22	22
RF4	0.1-1G	66	49	55	-	52	50	43	43
	1-2G	52	34	42	-	37	34	29	29
	2-3G	46	31	38	-	32	30	25	25
	3-4G	45	27	36	-	31	25	22	22
RF5	0.1-1G	59	64	45	58	-	52	46	44
	1-2G	44	50	30	43	-	38	31	30
	2-3G	40	44	28	38	-	34	25	25
	3-4G	34	42	24	36	-	31	21	21
RF6	0.1-1G	65	58	57	45	54	-	41	45
	1-2G	52	43	43	31	38	-	29	30
	2-3G	44	38	38	27	33	-	24	24
	3-4G	42	35	36	24	31	-	22	22
RF7	0.1-1G	73	67	61	58	51	57	-	46
	1-2G	51	50	45	44	36	40	-	31
	2-3G	43	44	40	39	32	34	-	26
	3-4G	38	41	34	36	27	32	-	22
RF8	0.1-1G	66	69	57	62	54	52	45	-
	1-2G	52	50	45	45	40	36	31	-
	2-3G	45	43	39	38	34	32	25	-
	3-4G	42	39	36	34	31	28	22	-

Typical Performance Characteristics

RFX-to-RFX Isolation

Table 8

"ON"Port	Frequency	Isolation(dB)							
		RF1	RF2	RF3	RF4	RF5	RF6	RF7	RF8
RF1	0.1-1G	-	65	47	61	63	53	44	45
	1-2G	-	48	32	47	43	39	30	30
	2-3G	-	41	27	42	37	37	27	27
	3-4G	-	37	24	38	32	33	23	23
RF2	0.1-1G	66	-	59	43	52	65	43	43
	1-2G	47	-	47	31	39	44	30	30
	2-3G	41	-	43	25	36	37	27	27
	3-4G	36	-	39	23	33	33	23	23
RF3	0.1-1G	46	69	-	60	45	54	44	44
	1-2G	31	49	-	47	30	40	31	31
	2-3G	27	43	-	43	25	38	28	28
	3-4G	24	38	-	38	22	33	23	23
RF4	0.1-1G	68	44	60	-	53	42	40	42
	1-2G	49	31	47	-	40	30	30	31
	2-3G	43	26	43	-	37	26	28	28
	3-4G	38	24	39	-	33	22	23	23
RF5	0.1-1G	54	67	38	61	-	54	49	44
	1-2G	41	50	28	48	-	41	33	31
	2-3G	36	43	23	43	-	38	27	27
	3-4G	33	39	21	38	-	34	23	23
RF6	0.1-1G	68	53	61	41	54	-	44	47
	1-2G	50	40	48	28	41	-	31	33
	2-3G	43	34	43	23	37	-	27	27
	3-4G	38	33	39	21	33	-	23	23
RF7	0.1-1G	62	67	54	68	45	59	-	46
	1-2G	48	50	41	49	32	43	-	33
	2-3G	43	44	35	42	27	39	-	29
	3-4G	38	39	32	37	24	33	-	23
RF8	0.1-1G	67	60	66	53	58	45	46	-
	1-2G	50	47	50	41	43	33	33	-
	2-3G	43	41	43	34	38	28	28	-
	3-4G	39	39	39	32	34	24	24	-

Timing Diagram (Power On and Off sequence)

It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the device. The control signal V1, V2, V3 should be set in the operating voltage range.

Power On:

- Apply voltage supply -----VDD
- Set Controls V1, V2, V3
- Apply RF input.

Change switch position from on RF port to another:

- Remove RF input.
- Change control voltage V1, V2, V3 to set the switch to desire RF port.
- Apply RF input.

Power Off:

- Remove RF input.
- Remove control voltage V1, V2, V3
- Remove VDD input.

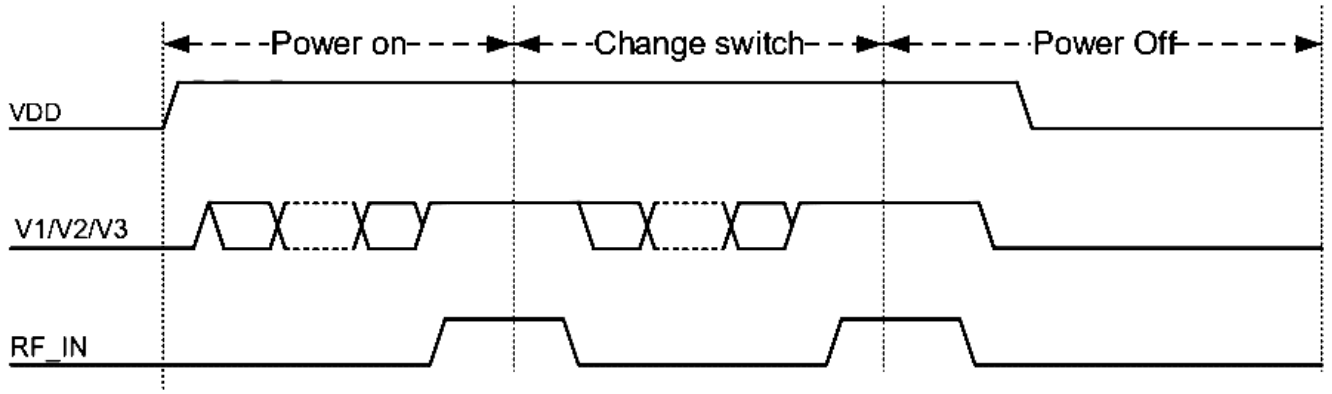
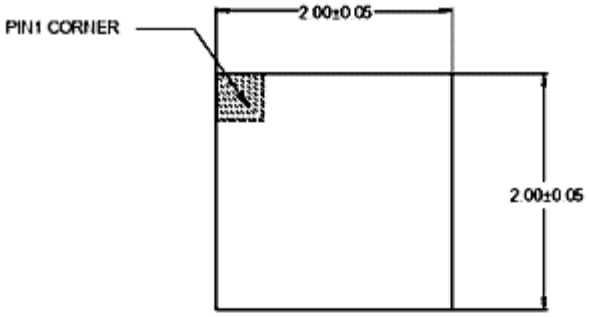
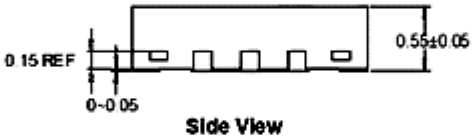


Figure 15

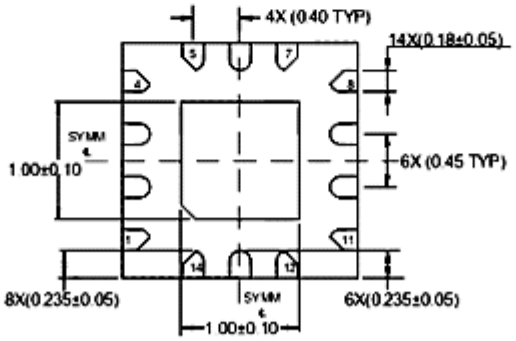
Package Drawing



Top View



Side View



Bottom View

Unit: mm

Figure 16

Revision History

Table 9

Revision Number	Revision Date	Description	Modifications
0.1	2022/4/1	Initial release	
0.2	2023/3/31	Advanced Information	
0.3	2023/8/15	Preliminary	
0.4	2023/10/12	Update	Add IIP3
1.0	2024/3/21	Release	
1.1	2024/10/25	Update	Figure3-6
1.2	2025/08/20	Update	General Description/Features/Functional Block Diagram/Absolute Maximum Ratings/Specification/Pin Diagram /Applications Information/ Typical Performance Characteristics /Package Drawing

Document Categories

Advance Information

The product is in a formative or design stage. The datasheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The datasheet contains preliminary data. Additional data may be added at a later date. RFone Technology reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

The datasheet contains final data. In the event RFone Technology decides to change the specifications, RFone Technology will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Sales Contact

For additional information, contact Sales at sales@rfonetech.com.

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