Product Specification

RS1441A Low Power Consumption SP4T

General Description

The RS1441A is a silicon-based, high power, low insertion loss, 30 MHz to 4 GHz, SP4T reflective switch in a 14 leads 2x2mm QFN package. 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.

Features

- Reflective, 50 Ω design
- High input 0.1 dB compression point of 37dBm
- Low insertion loss:
  - 0.35 dB typical to 1.0 GHz
  - 0.45 dB typical to 2.0 GHz
- Isolation of 55dB at 1.0GHz
- Single positive supply: 1.6 – 5.0 V

Applications

- IoT
- WiFi
- General application

Functional Block Diagram

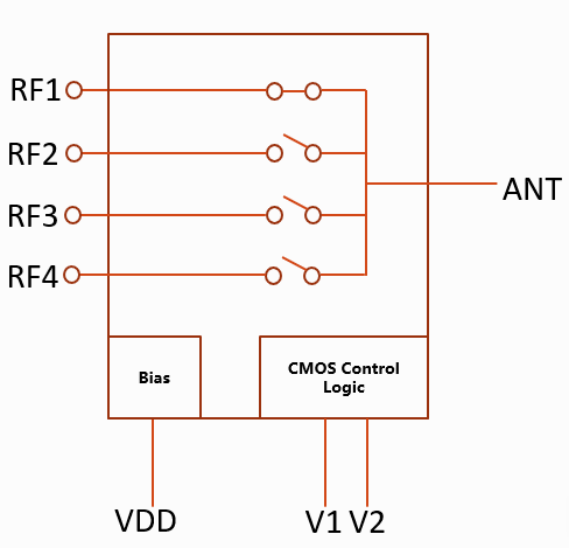


Figure 1

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Absolute Maximum Ratings

Table 1

Parameter	Min	Max	Units
VDD to GND	1.6	5	V
V1 V2 to GND	-0.3	3.6	V
Input Power, CW signal		36	dBm
Storage Temperature Range	-65	150	°C
ESD Voltage– HBM (Per JESD22-A114)		TBD	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 (VDD)		1.6	3.3	4.5	V
Logic High (V1, V2)				3.3	
Operating Temp Range	Case Temperature	-40		85	°C
RF Frequency Range		30		4000	MHz

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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		0.27		dB
	1 - 2GHz		0.38		
	2 - 4GHz		0.55		
RFC - RFX Isolation	0.1 - 1GHz		60		dB
	1 - 2GHz		55		
	2 - 4GHz		45		
RFX - RFX Isolation	0.1 - 1GHz		60		dB
	1 - 2GHz		52		
	2 - 4GHz		40		
Return Loss (RFC)	0.1 - 1GHz		-30		dB
	1 - 2GHz		-25		
	2 - 4GHz		-15		
Return Loss (RFX)	0.1 - 1GHz		-28		dB
	1 - 2GHz		-22		
	2 - 4GHz		-15		
Input 0.1dB Compression	0.8 - 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		350		ns
	50% CTRL to 10% RF		650		
Logic Input High Threshold		1.2		3.3	V
Logic Input Low Threshold		-0.3		0.4	V
Logic Current	For each control pin@3.3V		3		µA
DC Current (VDD)	control = 0V		42		µA

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Pin Diagram

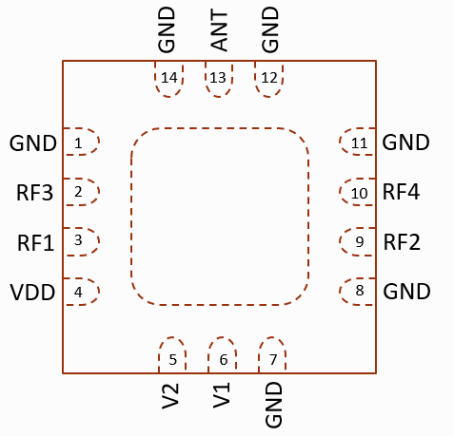


Figure 2

Pin Description

Table 4

Pin No.	Label	Description
1,7,8,11,12,14	GND	Ground
2	RF3	RF Port 3
3	RF1	RF Port 1
4	VDD	DC Supply Voltage Input
5	V2	Control Input 2
6	V1	Control Input 1
9	RF2	RF Port 2
10	RF4	RF Port 4
13	ANT	RF Common Port

Control Logic

Table 5

Mode	V1	V2
RF1 on	0	0
RF2 on	0	1
RF3 on	1	0
RF4 on	1	1

Application Information

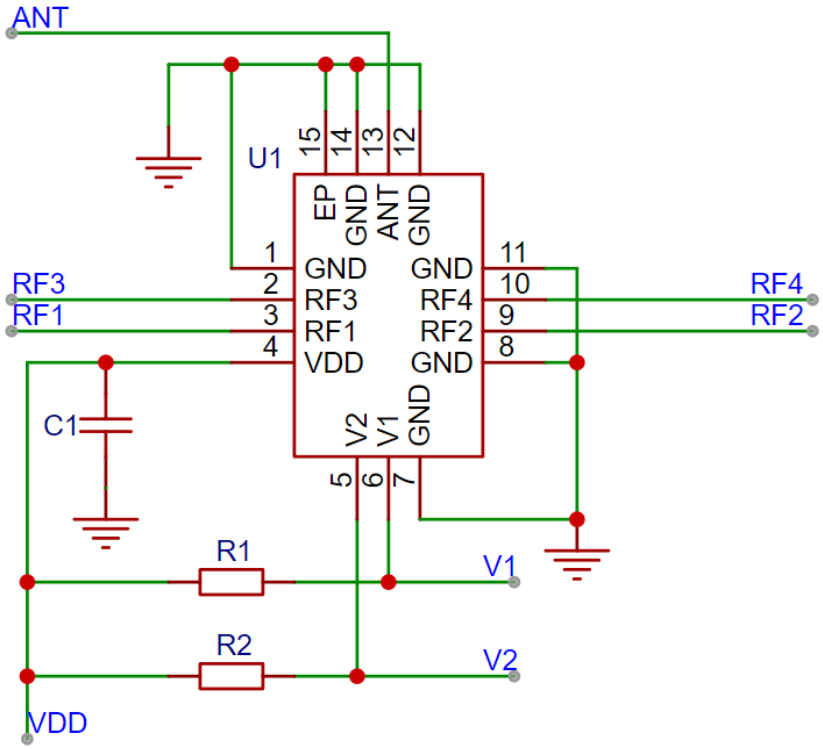


Figure 3

Table 6

Reference Designator	Value	Description
R1,R2	10Kohm	0402
C1	0.1uF	0402
U1		RS1441A

Typical Performance Characteristics

Figure 4. Insertion Loss

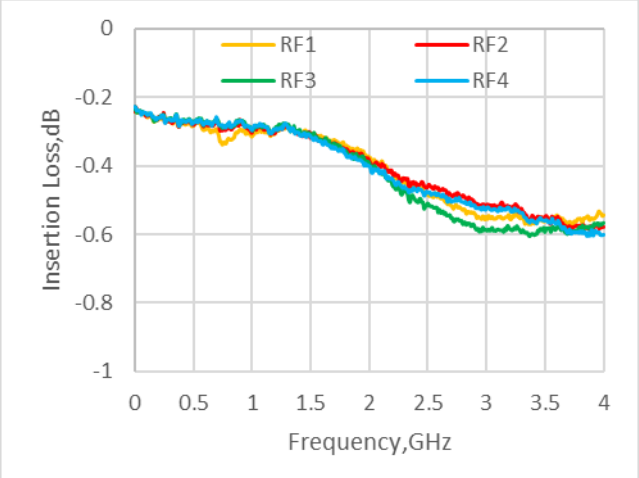


Figure 5. Input Return Loss

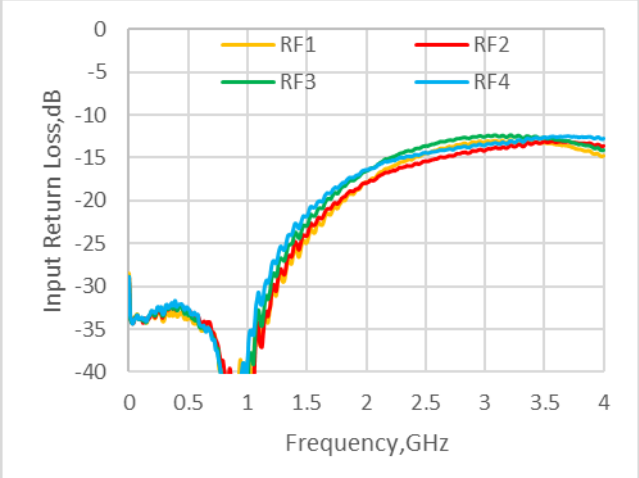


Figure 6. Output Return Loss

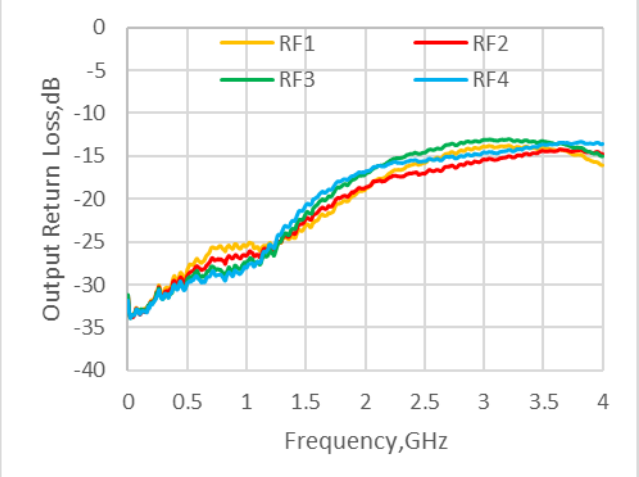


Figure 7. RFC-RFX Isolation

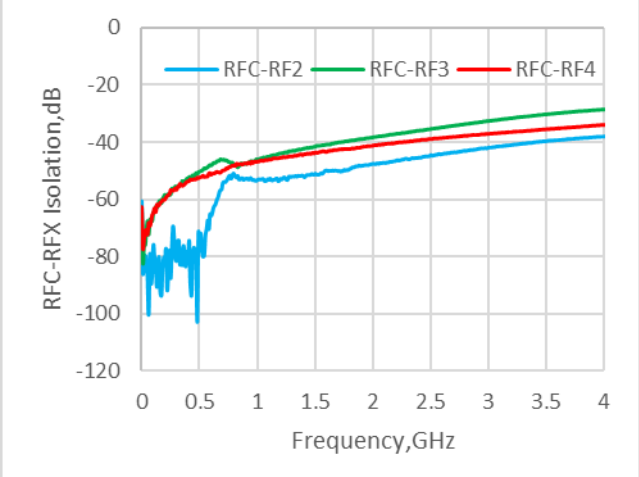


Figure 8. RFX-RFX Isolation

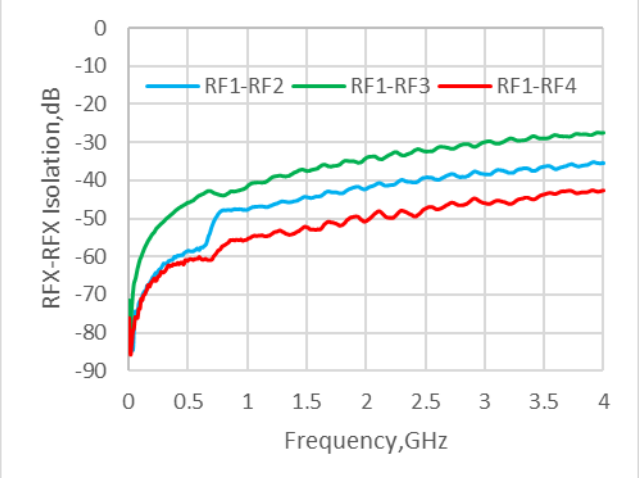
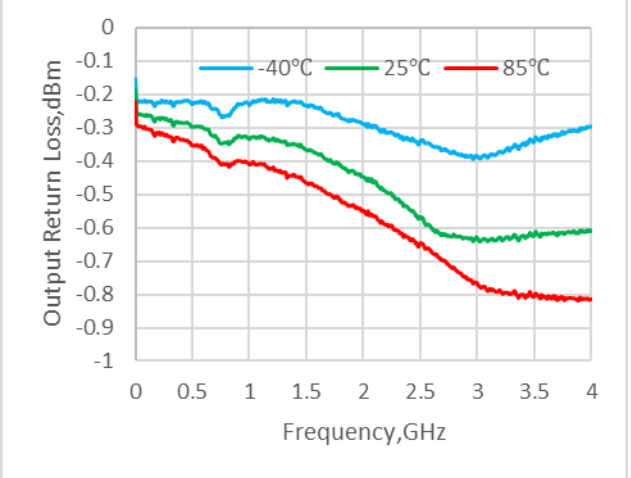


Figure 9. Insertion Loss



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Typical Performance Characteristics

Figure 10. Input Return Loss

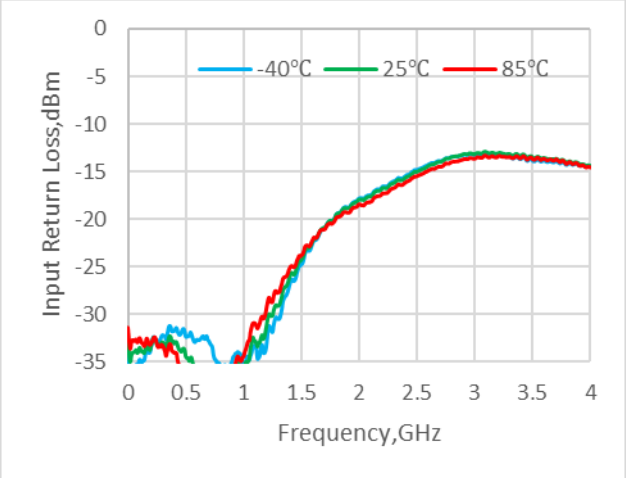


Figure 11. Output Return Loss

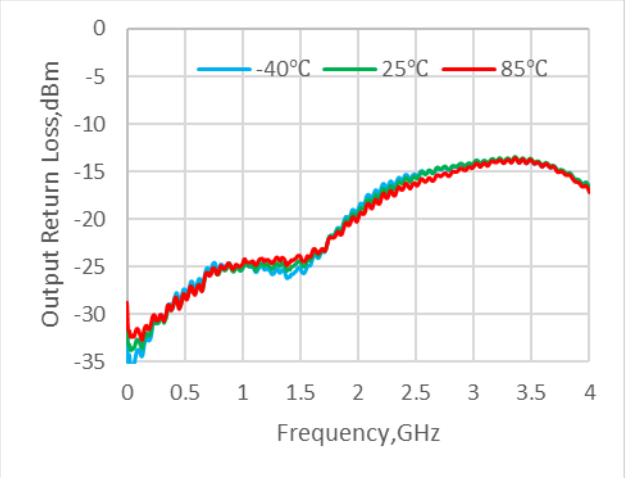


Figure 12. RFX-RFX Isolation

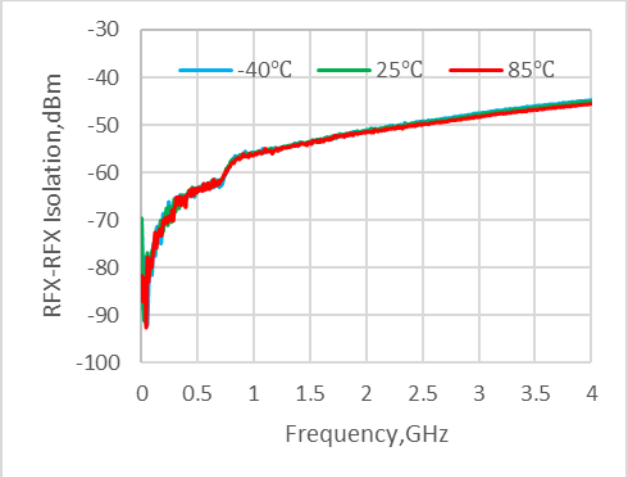


Figure 13. RFC-RFX Isolation

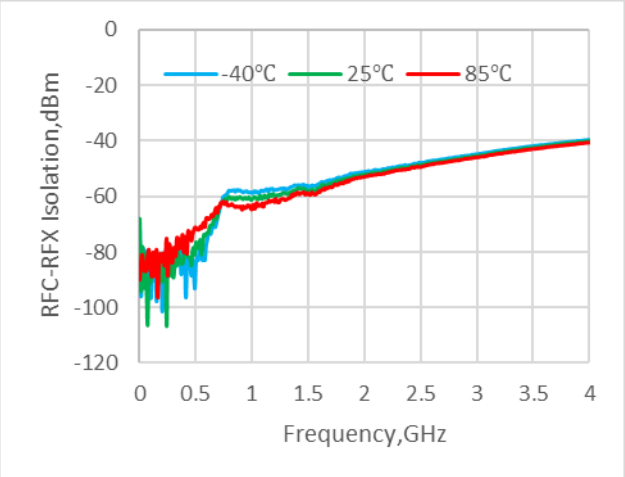


Figure 14. Noise Figure

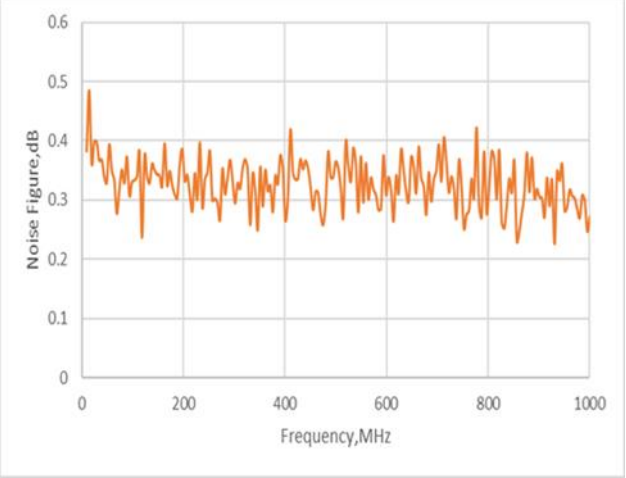
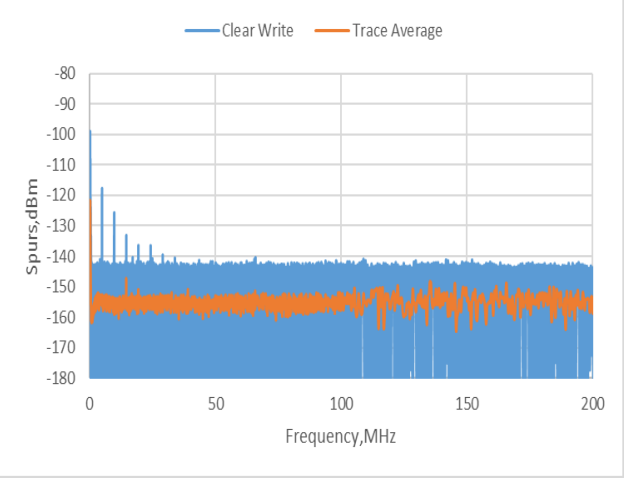


Figure 15. Low-Frequency Spur @RBW=100Hz



Typical Performance Characteristics

RFC-to-RFX Isolation

Table 7

"ON"Port	Frequency	Isolation(dB)			
		RF1	RF2	RF3	RF4
RF1	0.1-1G	-	74	58	57
	1-2G	-	52	43	45
	2-3G	-	47	38	42
	3-4G	-	43	34	37
RF2	0.1-1G	68	-	56	56
	1-2G	51	-	47	42
	2-3G	45	-	42	36
	3-4G	41	-	39	32
RF3	0.1-1G	59	72	-	58
	1-2G	44	59	-	46
	2-3G	39	50	-	42
	3-4G	35	45	-	38
RF4	0.1-1G	70	56	58	-
	1-2G	61	48	46	-
	2-3G	51	43	42	-
	3-4G	46	36	39	-

RFX-to-RFX Isolation

Table 8

"ON"Port	Frequency	Isolation(dB)			
		RF1	RF2	RF3	RF4
RF1	0.1-1G	-	60	53	66
	1-2G	-	44	37	52
	2-3G	-	39	32	47
	3-4G	-	37	29	43
RF2	0.1-1G	59	-	65	51
	1-2G	44	-	53	36
	2-3G	39	-	48	30
	3-4G	35	-	44	27
RF3	0.1-1G	52	64	-	64
	1-2G	39	48	-	53
	2-3G	35	43	-	48
	3-4G	30	39	-	43
RF4	0.1-1G	65	53	64	-
	1-2G	49	38	53	-
	2-3G	44	33	48	-
	3-4G	39	30	44	-

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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 should be set in the operating voltage range.

Power On:

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

Change switch position from on RF port to another:

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

Power Off:

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

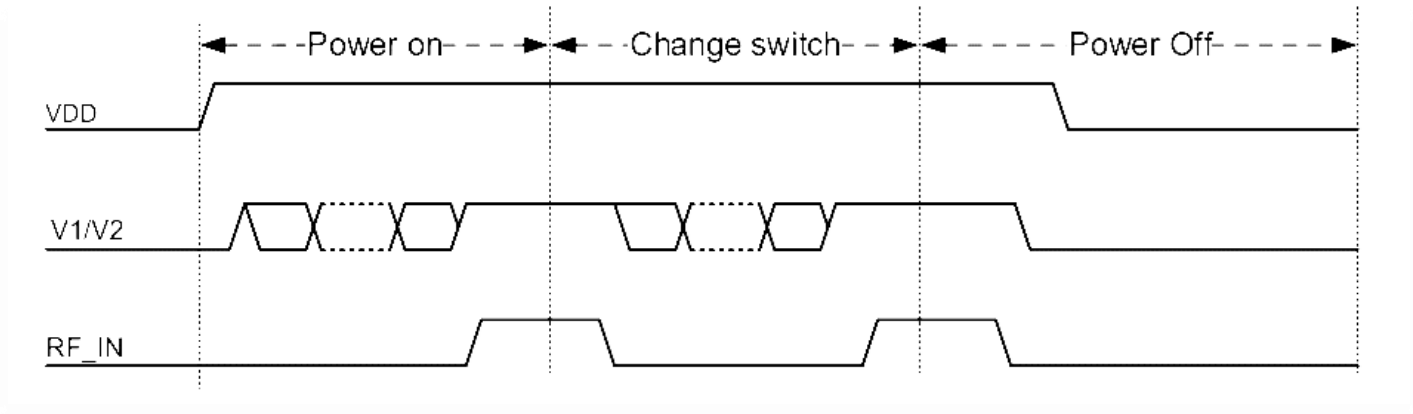
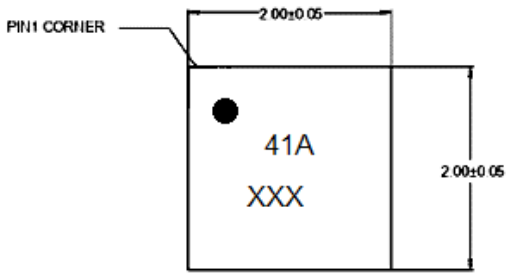
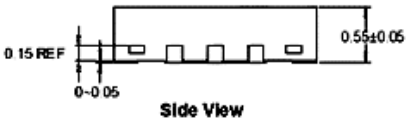


Figure 11

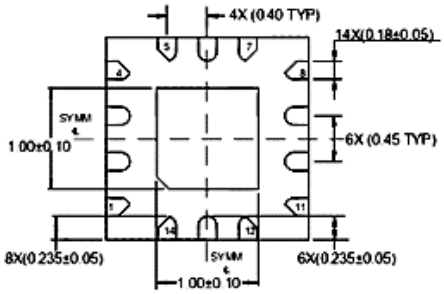
Package Drawing



Top View



Side View



Bottom View

Unit: mm

Figure 12

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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	2024/2/21	Update voltage range of logic pin	
1.1	2024/4/25	Update Package Drawing	
1.2	2025/7/11	Update DATA	

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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