RS1821 9kHz – 13GHz SPDT

General Description

The RS1821 is a general-purpose, broadband, nonreflective single-pole, double-throw (SPDT) switch in a QFN surface mount package. Covering the 9 kHz to 13.0 GHz range, the switch offers high isolation and low insertion loss. The switch features >55 dB isolation, 0.7 dB insertion loss up to 8.0 GHz, and a 2.2 µs switching time.The RS1821 can cover the same operating frequency range with a single positive supply voltage applied and the negative supply voltage (VSS) tied to ground and still maintaining good power handling performance. The RS1821 is packaged in a 3 mm × 3 mm, surface mount QFN 16 leads package.

Applications

- Wireless infrastructure
- Military and high reliability applications
- Test equipment
- Pin diode replacement

Features

❖ **Excellent RF Performance**

- Nonreflective 50 Ω design
- Low insertion loss: 0.7 dB at 8 GHz
- High isolation: 55 dB at 8 GHz

❖ **High input linearity**

- P0.1dB: 36 dBm typical
- Third-order intercept (IP3): 55 dBm typical

❖ **ESD rating**

- 2 kV HBM, Class 2

Functional Block Diagram

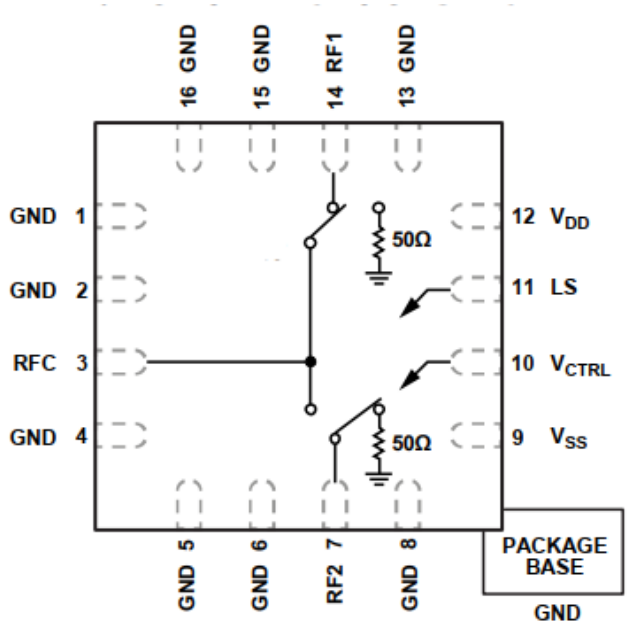


Figure 1

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Absolute Maximum Ratings

Table 1

Parameter	Min	Max	Units
V_{DD} to GND	-0.3	5.5	V
V_{SS} to GND	-3.4	0.3	V
Logic pinl to GND	-0.3	5.5	V
Input Power for any one selected RF through port.		35	dBm
Input Power, internal 50ohm terminated		24	dBm
Input Power, hot switching		TBD	dBm
Maximum Junction Temperature		140	°C
Storage Temperature Range	-65	150	°C
Lead Temperature (soldering, 10s)		260	°C
ESD Voltage– HBM (Per JESD22-A114)		2000	V
ESD Voltage – CDM (Per JESD22-C101)		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		3	3.3	5.25	V
Supply Voltage, VSS		-3.3	-3	-2.7	V
Operating Temp Range	Case Temperature	-40		105	^{O}C
Input Power			33		dBm
Input Power, internal 50ohm terminated			20		dBm
Input Power, hot switching			TBD		dBm

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.

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Specification

Typical Application Circuit, Normal mode (V_{DD}=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	9kHz - 3GHz		0.5		dB
	3GHz - 8GHz		0.7		
	8 - 10GHz		0.9		
	10 - 13GHz		1.2		
RFC - RFX Isolation	9kHz - 3GHz		55		dB
	3GHz - 8GHz		50		
	8 - 10GHz		47		
	10 - 13GHz		35		
RFX - RFX Isolation	9kHz - 3GHz		55		dB
	3GHz - 8GHz		48		
	8 - 10GHz		35		
	10 - 13GHz		28		
Return Loss (thru)	9kHz - 3GHz		-25		dB
	3GHz - 8GHz		-25		
	8 - 10GHz		-25		
	10 - 13GHz		-18		
Return Loss (terminated)	9kHz - 3GHz		-25		dB
	3GHz - 8GHz		-22		
	8 - 10GHz		-22		
	10 - 13GHz		-13		
Input 0.1dB Compression	1 MHz to 13.0 GHz		36		dBm
Input IP3	Two-tone input power = 14 dBm at each tone, 1 MHz to 13.0 GHz		55		dBm
Switching Time	50% CTRL to 90%/10% RF		2.2		µs
Settling Time	50% CTRL to 0.05dB margin of final RF		TBD		
Logic Input High Threshold		1.4		5	V
Logic Input Low Threshold		-0.3		0.6	V
Logic Current	For each control pin		25	TBD	µA
DC Current (V_{DD})	3.3V Logic		250	TBD	µA

Pin Diagram

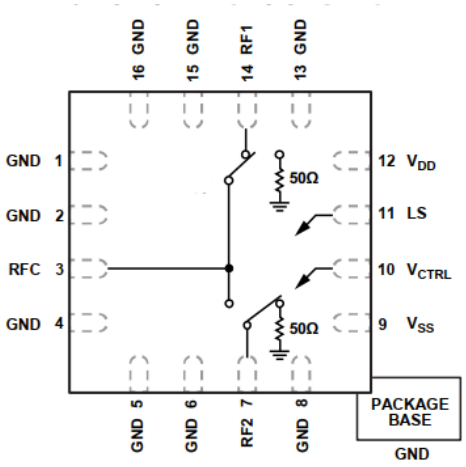


Figure 2

Pin Description

Table 4

Pin No.	Label	Description
1, 2, 4 to 6, 8, 13, 15, 16	GND	Ground. These pins must be connected to the RF and dc ground of the PCB.
3	RFC	RF Common Port. This pin is dc-coupled to 0 V and ac matched to 50 Ω. No dc blocking capacitor is required when the RF line potential is equal to 0 V dc.
7	RF2	RF Throw Port 2. This pin is dc-coupled to 0 V and ac matched to 50 Ω. No dc blocking capacitor is required when the RF line potential is equal to 0 V dc.
9	V_{SS_EXT}	External negative Supply Voltage Pin. If this pin is grounded, the IC could work under single posistive power supply. Internal charge pump will generate negative voltage.
10	V_{CTRL}	Control Input Pin.
11	LS	Logic Select Input Pin.
12	V_{DD}	Positive Supply Voltage Pin.
14	RF1	RF Throw Port 1. This pin is dc-coupled to 0 V and ac matched to 50 Ω. No dc blocking capacitor is required when the RF line potential is equal to 0 V dc.

Control Logic

Table 5

Digital Control Inputs		RF Paths	
LS	**V_{CTRL}**	**RF1 to RFC**	**RF2 to RFC**
High	Low	Insertion loss (on)	Isolation (off)
High	High	Isolation (off)	Insertion loss (on)
Low	Low	Isolation (off)	Insertion loss (on)
Low	High	Insertion loss (on)	Isolation (off)

Figure 3. Insertion Loss

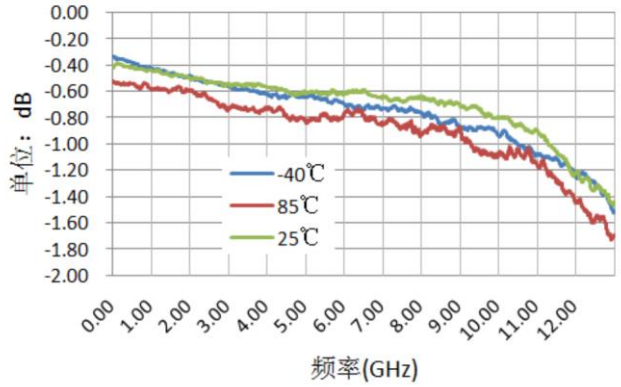


Figure 4. RFC On State Return Loss

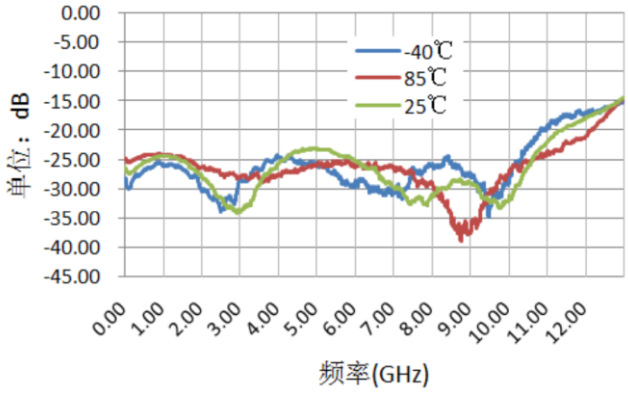


Figure 5. RFX On State Return Loss

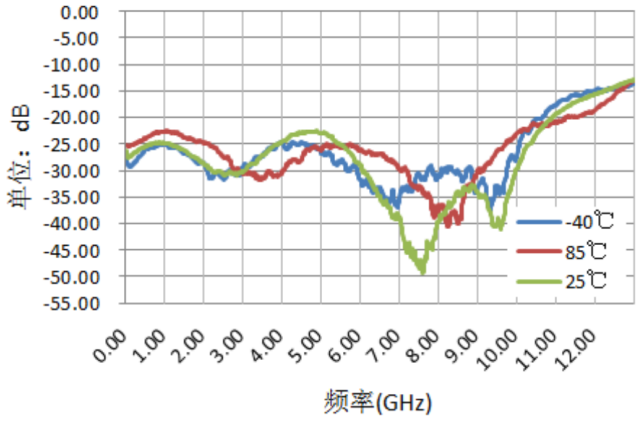


Figure 6. RFX Off State Return Loss

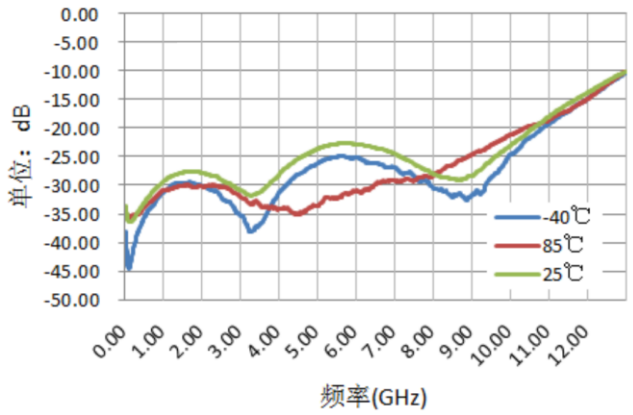


Figure 7. RFX – RFX Isolation

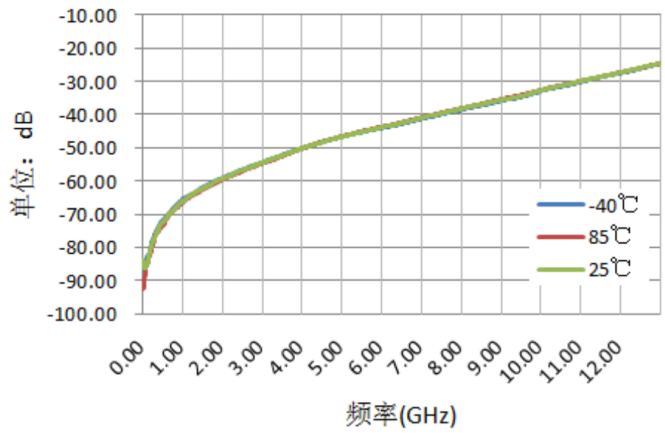
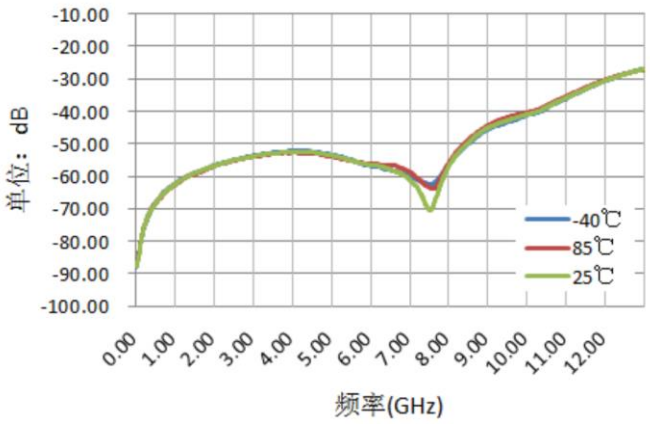


Figure 8. RFC – RFX Isolation



Package Drawing

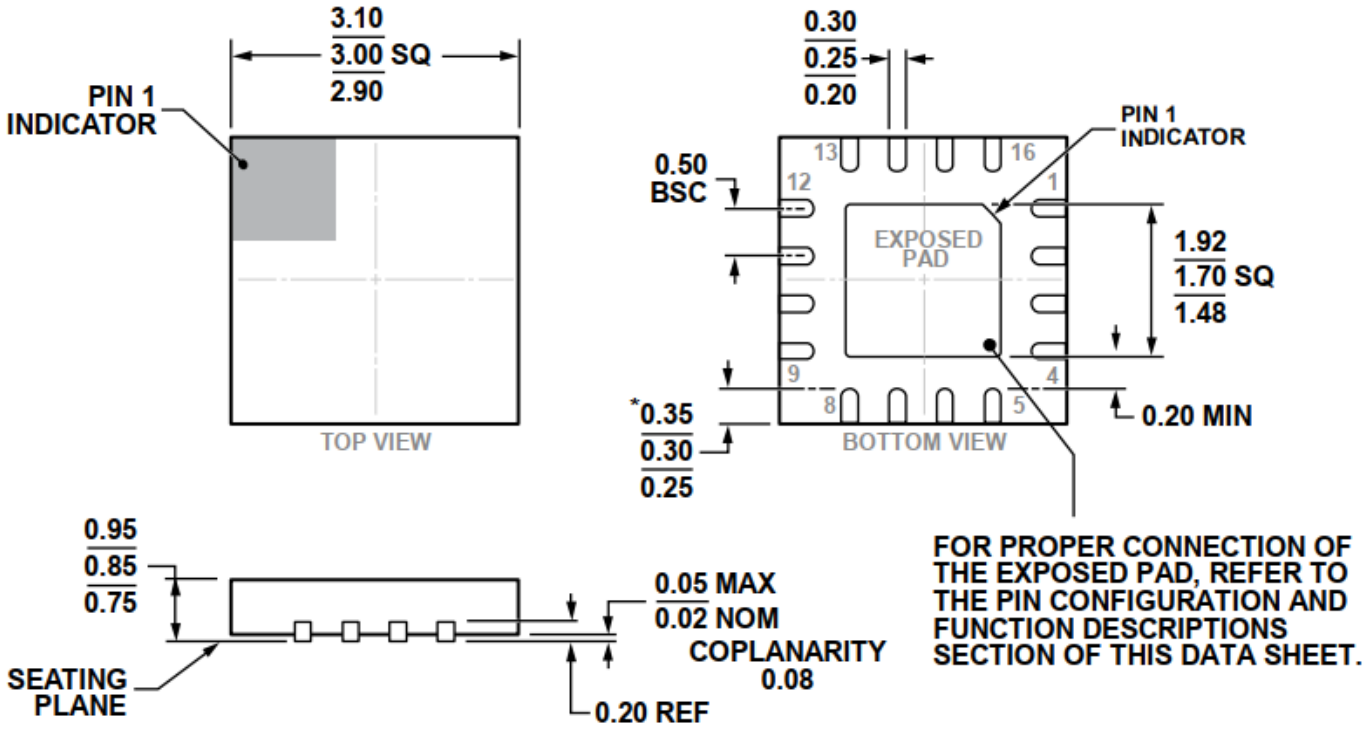


Figure 9

Revision History

Table 6

Revision Number	Revision Date	Description	Modifications
0.1	2022/9/7	Draft	—
0.2	2023/10/24		Add plots

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

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