RS1823 9kHz – 40GHz SPDT

General Description

The RS1823 is a general-purpose, broadband, nonreflective single-pole, double-throw (SPDT) switch in a LGA package. Covering the 9 kHz to 40.0 GHz range, the switch offers high isolation and low insertion loss. The switch features >60 dB isolation, 1.6 dB insertion loss up to 28.0 GHz, and a 2 µs switching time.The RS1823 can cover the same operating frequency range with positive supply voltage applied and the negative supply voltage (VSS). The RS1823 is packaged in a 3 mm × 3 mm, surface mount LGA 20 leads package.

Applications

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

Features

❖ **Excellent RF Performance**

- 9KHz – 40GHz broadband
- Nonreflective 50 Ω design
- Low insertion loss: 1.6 dB at 28 GHz
- High isolation: 60 dB at 28 GHz

❖ **High input linearity**

- P0.1dB: 29 dBm typical
- Third-order intercept (IP3): 50 dBm typical

Functional Block Diagram

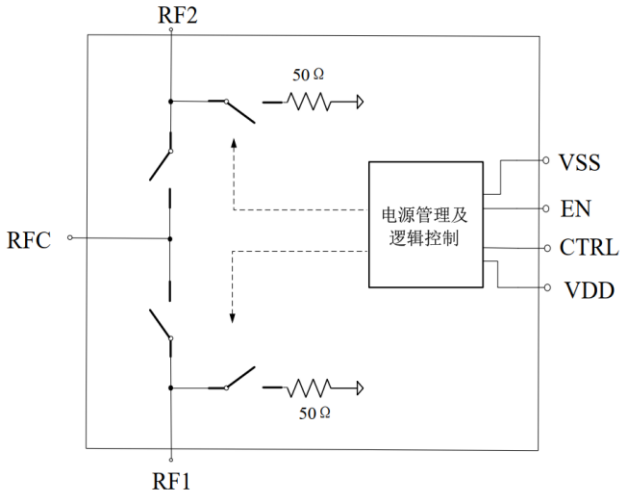


Figure 1

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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.		27	dBm
Input Power, internal 50ohm terminated		21	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)		500	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		-2.75	-2.5	-2.25	V
Operating Temp Range	Case Temperature	-40		105	^{O}C
Input Power			25		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.

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 - 10GHz		0.8		dB
	10- 20GHz		1.3		
	20 - 25GHz		1.6		
	25 - 35GHz		2.2		
	35 - 40GHz		2.6		
RFC - RFX Isolation	9kHz - 10GHz		58		dB
	10- 20GHz		56		
	20 - 25GHz		54		
	25 - 35GHz		50		
	35 - 40GHz		48		
RFX - RFX Isolation	9kHz - 10GHz		64		dB
	10- 20GHz		58		
	20 - 25GHz		56		
	25 - 35GHz		60		
	35 - 40GHz		53		
Return Loss (thru)	9kHz - 10GHz		-18		dB
	10- 20GHz		-16		
	20 - 25GHz		-13		
	25 - 35GHz		-11		
	35 - 40GHz		-8		
Return Loss (terminated)	9kHz - 10GHz		-20		dB
	10- 20GHz		-18		
	20 - 25GHz		-16		
	25 - 35GHz		-14		
	35 - 40GHz		-13		
Input 0.1dB Compression	0.4 GHz to 40 GHz		29		dBm
Input IP3			50		dBm
Switching Time	50% CTRL to 90%/10% RF		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		1		µA
DC Current (V_{DD})	3.3V Logic		50		µA

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Pin Diagram

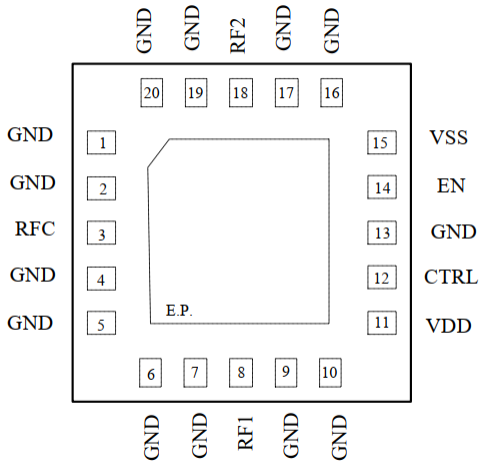


Figure 2

Pin Description

Table 4

Pin No.	Label	Description
1,2,4,5,6,7,9,10,13,16,17,19,20	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.
18	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.
15	V_{SS}	External negative Supply Voltage Pin.
12	CTRL	Control Input Pin.
14	EN	Enable input pin.
11	V_{DD}	Positive Supply Voltage Pin.
8	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	
EN	**CTRL**	**RF1 to RFC**	**RF2 to RFC**
High	Low	Isolation (off)	Isolation (off)
High	High	Isolation (off)	Isolation (off)
Low	Low	Isolation (off)	Insertion loss (on)
Low	High	Insertion loss (on)	Isolation (off)

Figure 3. Insertion Loss

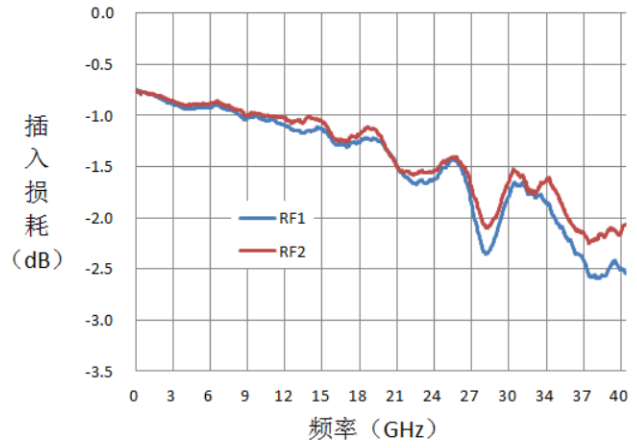


Figure 4. RFC On State Return Loss

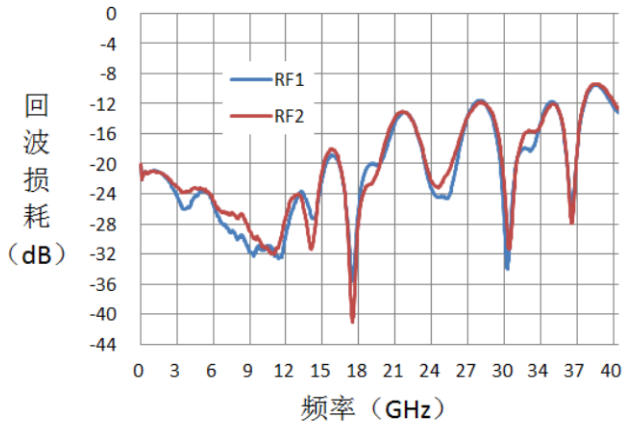


Figure 5. RFX On State Return Loss

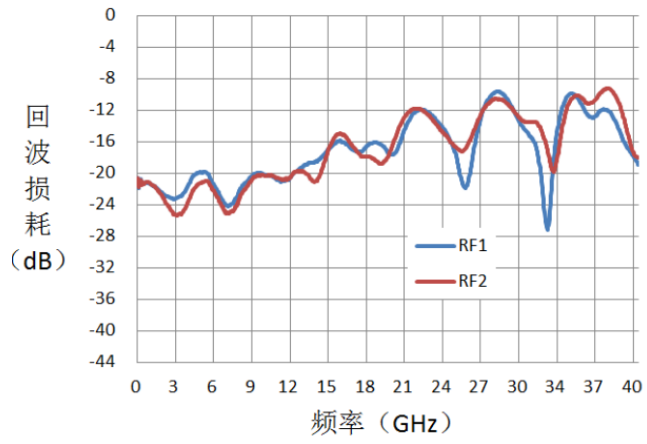


Figure 6. RFX Off State Return Loss

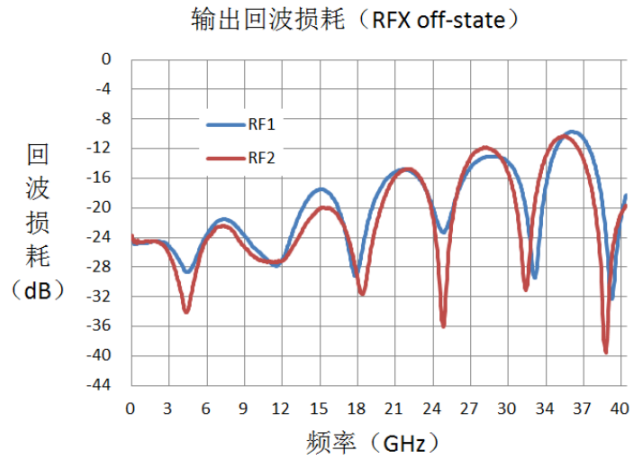


Figure 7. RFX – RFX Isolation

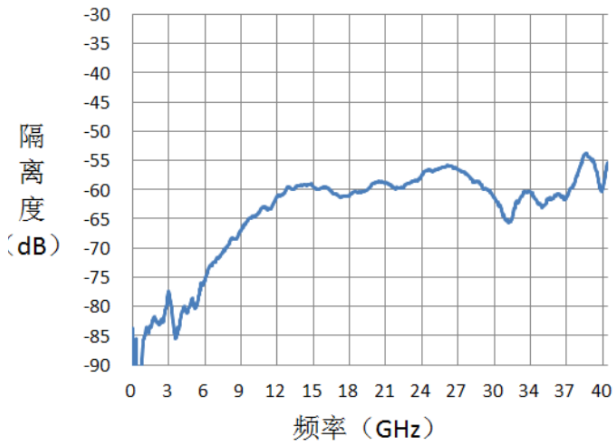
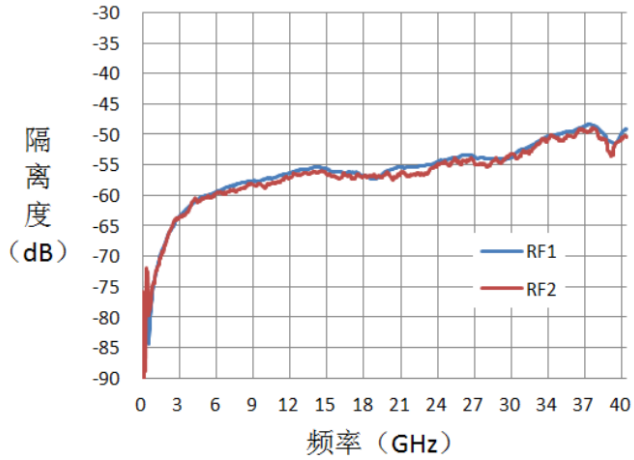
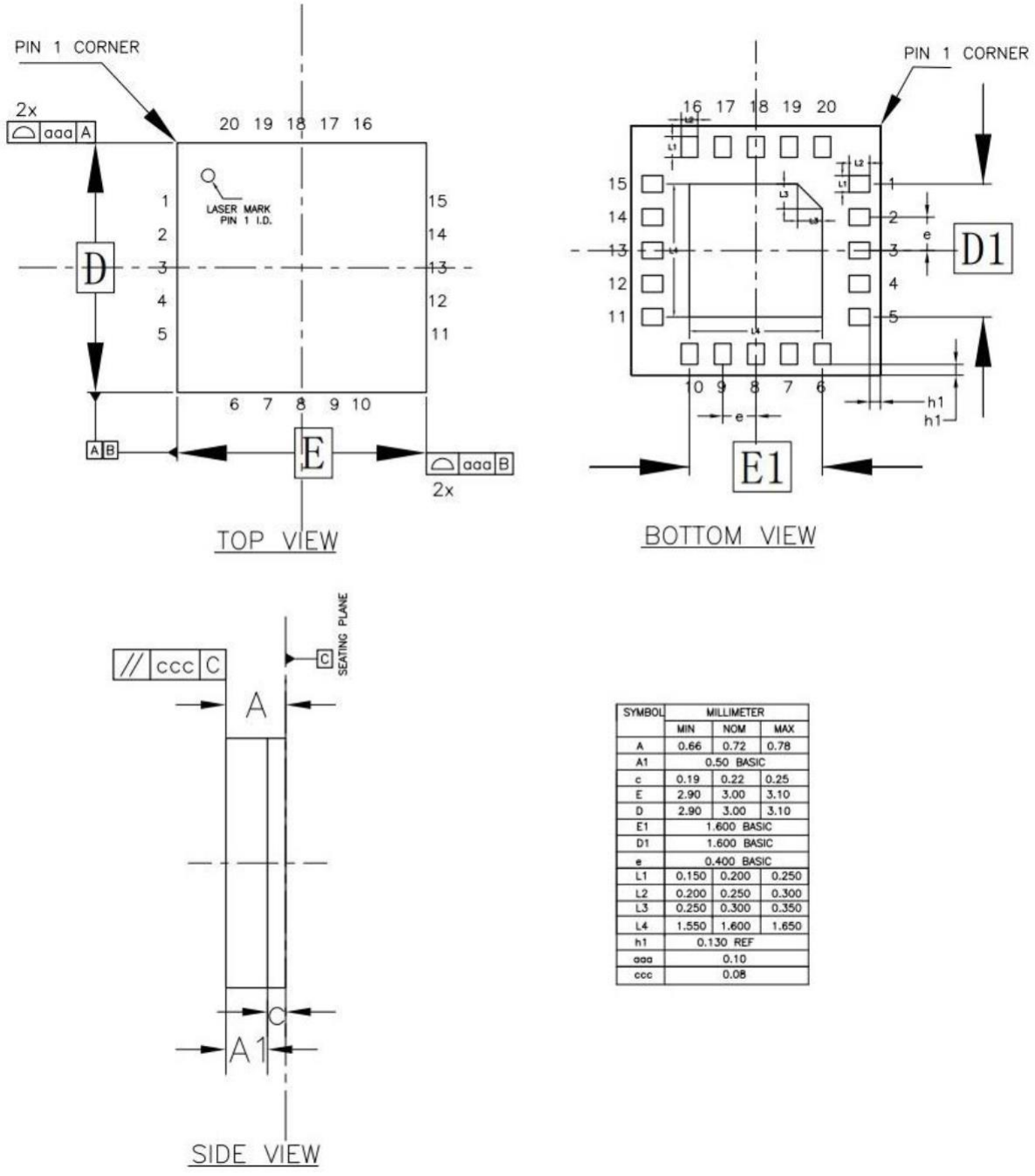


Figure 8. RFC – RFX Isolation



Package Drawing



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.66	0.72	0.78
A1		0.50 BASIC	
c	0.19	0.22	0.25
E	2.90	3.00	3.10
D	2.90	3.00	3.10
E1		1.600 BASIC	
D1		1.600 BASIC	
e		0.400 BASIC	
L1	0.150	0.200	0.250
L2	0.200	0.250	0.300
L3	0.250	0.300	0.350
L4	1.550	1.600	1.650
h1		0.130 REF	
aaa		0.10	
ccc		0.08	

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

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