

GSR1415S: CMOS SOI DPDT Switch

0.1 – 7.2 GHz

Applications

- Dual-band wireless (802.11a/b/g/n/ac/ax/be)
- Diversity antenna switching
- Low power T/R systems
- Low insertion loss (0.5dB @ 2.5GHz)
- High isolation (35dB @ 2.5GHz)
- Low DC current: < 20uA
- Low delay, switch time: 100nS
- 1.5mm × 1.5mm QFN Package (MSL3, 260°C per JEDEC-J-STD-020)

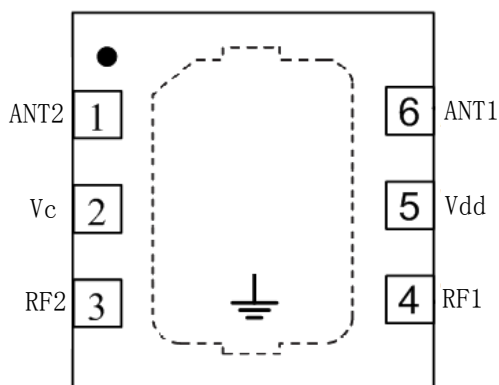
Features

- $P_{0.1dB}$ +32.5dBm typical @ +3.3V

Description

The GSR1415S is a CMOS SOI dual pole dual throw (DPDT) high power switch in a low cost miniature 1.5 mm × 1.5 mm package. The GSR1415S is ideally suited for applications where high power, low insertion loss, and small size are required. Typical applications are for dual-band wireless systems that connect separate transmit and receive functions to a common antenna, as well as other related handset and general purpose applications. This part can be used in all systems operating up to 7.2 GHz requiring high power at low control voltage.

Function and Pin Definition



GSR products are compliant with all applicable legislation and are halogen-free. For additional information, refer to GSR Microelectronics RoHS Compliance Declaration.

Figure 1. GSR1415S Pin-Def.
(Top View)

Table 1. GSR1415S Pin Definition

Pin #	Name	Description	Pin #	Name	Description
1	ANT2	Antenna 2	4	RF1	RF port 1
2	Vc	Logic control	5	Vdd	DC supply
3	RF2	RF port 2	6	ANT1	Antenna 1

Table 2. GSR1415S Absolute Maximum Ratings

Parameter	Absolute Maximum
Max Input Power (0.1 – 7.2 GHz, 3.3 V control)	+33 dBm
Operating Voltage	+4.2 V
Thermal resistance (Θ_{JC})	25 °C/W
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

Table 3. GSR1415S Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating frequency	f_0	0.1		7.2	GHz
Supply voltage	Vdd	1.2	1.6, 1.8, 3.3	3.6	V
Control voltage:					
Low	Vc_L	0	0	0.4	V
High	Vc_H	1.0	3.3	Vdd	V
Operating temperature	T _{oper.}		25		°C

Truth Table and Pin Out

Table 4. GSR1415S Truth Table 1

Vdd	Vc	ANT1—RF1	ANT2—RF2	ANT1—RF2	ANT2—RF1
Vdd	0	on	on	off	off
Vdd	1	off	off	on	on

Note: “1” = 1.2V to Vdd, Vdd = 1.2V to 3.6V, “0” = 0V to 0.4V.

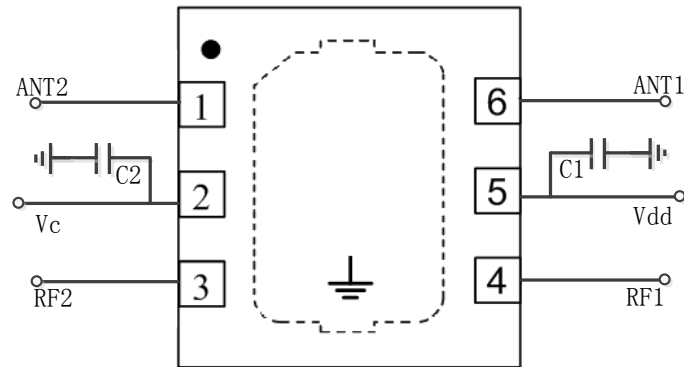


Figure 2. GSR1415S Pin Out

C1 and C2 are optional bypass capacitors (0.1pF or 0.2pF). The RF path should use DC block capacitor if it's with any dc voltage.

Electrical Specification

Table 5. GSR1415S electrical specifications at 25 °C (V_{dd} = 3.3 V, V_c = 0 V or 3.3 V)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Insertion Loss	IL	0.1GHz — 2.0GHz		0.45	0.60	dB
		2.4GHz — 2.5GHz		0.50	0.65	dB
		4.9GHz — 6.0GHz		0.65	0.80	dB
		6.0GHz — 7.2GHz		0.70	0.85	dB
Isolation (ANT1 to RF1, ANT2 to RF2) V _c =1	Iso	0.1GHz — 2.5GHz	30	33		dB
		4.9GHz — 6.0GHz	28	31		dB
		6.0GHz — 7.2GHz	28	31		dB
Isolation (ANT1 to RF2, ANT2 to RF1) V _c =0	Iso	0.1GHz — 2.5GHz	47	50		dB
		4.9GHz — 6.0GHz	32	35		dB
		6.0GHz — 7.2GHz	28	31		dB
Isolation (ANT1 to ANT2, RF1 to RF2) V _c =1	Iso	0.1GHz — 2.5GHz	37	40		dB
		4.9GHz — 6.0GHz	25	28		dB
		6.0GHz — 7.2GHz	20	23		dB
Isolation (ANT1 to ANT2, RF1 to RF2) V _c =0	Iso	0.1GHz — 2.5GHz	35	38		dB
		4.9GHz — 6.0GHz	34	37		dB
		6.0GHz — 7.2GHz	32	35		dB
Return Loss	RL	0.1GHz — 2.0GHz	20	30		dB
		2.4GHz — 2.5GHz	20	25		dB
		4.9GHz — 6.0GHz	16	20		dB
		6.0GHz — 7.2GHz	15	18		dB
2 nd Harmonic	2f ₀	2.45GHz, Pin=+24dBm. V _c = 0V/3.3V	-48	-55		dBm
3 rd Harmonic	3f ₀	2.45GHz, Pin=+24dBm. V _c = 0V/3.3V	-50	-57		dBm
0.1 dB Input Compression Point	IP _{0.1dB}	0.1-7.2GHz, V _c = 0V/3.3 V		32.5		dBm
1 dB Input Compression Point	IP _{1dB}	0.1-7.2GHz, V _c = 0V/3.3 V		33		dBm
3 rd Order Input Intercept Point	IIP3	P _{IN} = +20 dBm/tone, Δf = 1 MHz, 2450 MHz		55		dBm

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
3 rd Order Input Intercept Point	IIP3	$P_{IN} = +20$ dBm/tone, $\Delta f = 1$ MHz, 5850 MHz		53		dBm
Linear Power	P_{IN-2G}	802.11a, 54 Mbps, 2.45 GHz, P_{IN} for 2.5% EVM		26.5		dBm
	P_{IN-5G}	802.11ac, MCS9 HT80, 5.85 GHz, P_{IN} for 1.8% EVM		24.6		dBm
Switching Characteristics	T_{rise}, T_{fall}	10% to 90% RF, 90% to 10% RF		20		ns
	T_{on}, T_{off}	50% control to 90% RF, and 50% control to 10% RF		100		ns
Vdd Current	I_{vdd}	Vdd = 3.3 V		16		uA
Control Current	I_{vc}	Vc = 3.3 V			5	uA

Table 6. GSR1415S electrical specifications at 25 °C (Vdd = 1.8 V, Vc = 0 V or 1.8 V)

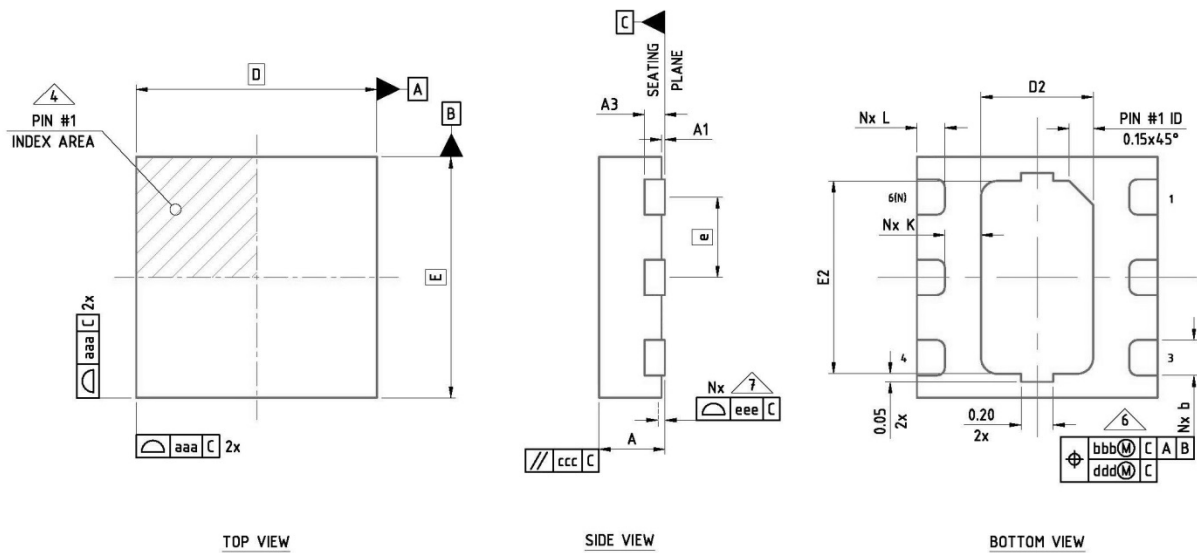
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Insertion Loss	IL	0.1GHz — 2.0GHz		0.45	0.60	dB
		2.4GHz — 2.5GHz		0.60	0.75	dB
		4.9GHz — 6.0GHz		0.75	0.90	dB
		6.0GHz — 7.2GHz		0.82	0.97	dB
Isolation (ANT1 to RF1, ANT2 to RF2) Vc=1	Iso	0.1GHz — 2.5GHz	30	33		dB
		4.9GHz — 6.0GHz	28	31		dB
		6.0GHz — 7.2GHz	28	31		dB
Isolation (ANT1 to RF2, ANT2 to RF1) Vc=0	Iso	0.1GHz — 2.5GHz	46	49		dB
		4.9GHz — 6.0GHz	32	35		dB
		6.0GHz — 7.2GHz	27	30		dB
Isolation (ANT1 to ANT2, RF1 to RF2) Vc=1	Iso	0.1GHz — 2.5GHz	37	40		dB
		4.9GHz — 6.0GHz	25	28		dB
		6.0GHz — 7.2GHz	20	23		dB
Isolation (ANT1 to ANT2, RF1 to RF2) Vc=0	Iso	0.1GHz — 2.5GHz	35	38		dB
		4.9GHz — 6.0GHz	34	37		dB
		6.0GHz — 7.2GHz	32	35		dB
Return Loss	RL	0.1GHz — 2.0GHz	20	30		dB
		2.4GHz — 2.5GHz	20	25		dB
		4.9GHz — 6.0GHz	16	20		dB
		6.0GHz — 7.2GHz	15	18		dB

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
2 nd Harmonic	2fo	2.45GHz, Pin=+24dBm. Vc = 0V/1.8V	-46	-52		dBm
3 rd Harmonic	3fo	2.45GHz, Pin=+24dBm. Vc = 0V/1.8V	-48	-54		dBm
0.1 dB Input Compression Point	IP _{0.1dB}	0.1-7.2GHz, Vc = 0V/1.8 V		30.7		dBm
1 dB Input Compression Point	IP _{1dB}	0.1-7.2GHz, Vc = 0V/1.8 V		31.2		dBm
3 rd Order Input Intercept Point	IIP3	P _{IN} = +20 dBm/tone, Δf = 1 MHz, 2450 MHz		52		dBm
3 rd Order Input Intercept Point	IIP3	P _{IN} = +20 dBm/tone, Δf = 1 MHz, 5850 MHz		50		dBm
Linear Power	P _{IN} -2G	802.11a, 54 Mbps, 2.45 GHz, P _{IN} for 2.5% EVM		24.5		dBm
	P _{IN} -5G	802.11ac, MCS9 HT80, 5.85 GHz, P _{IN} for 1.8% EVM		22.5		dBm
Switching Characteristics	T _{rise} , T _{fall}	10% to 90% RF, 90% to 10% RF		20		ns
	T _{on} , T _{off}	50% control to 90% RF, and 50% control to 10% RF		90		ns
Vdd Current	I _{vdd}	Vdd = 1.8 V		4		uA
Control Current	I _{vc}	Vc = 1.8 V			3	uA

Note 1: Performance is guaranteed only under the conditions listed in this table.

2: Board loss de-embedded.

Package Dimensions



Dimension Table				
Thickness Symbol	X1			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	0.41	0.45	0.50	
A1	0.00	0.02	0.05	
A3	---	0.127 Ref	---	
b	0.17	0.22	0.27	6
D	1.50 BSC			
E	1.50 BSC			
e	0.50 BSC			
D2	0.55	0.70	0.80	
E2	1.05	1.20	1.30	
K	0.15	---	---	
L	0.125	0.175	0.225	
aaa	0.05			
bbb	0.10			
ccc	0.10			
ddd	0.05			
eee	0.08			
N	6			3
NE	3			5
NOTES	1, 2			

NOTE:

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. NE refers to the maximum number of terminals on E side.
6. Dimension b applies to the metalized terminal. If the terminal has a radius on the end of it, dimension b should not be measured in that radius area.
7. Coplanarity applies to the terminals and all other bottom surface metalization.

Figure 3. GSR1415S Package Dimensions

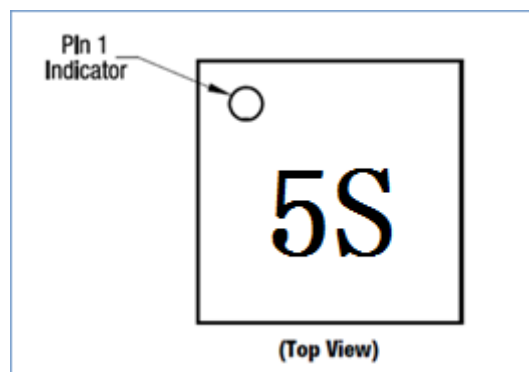
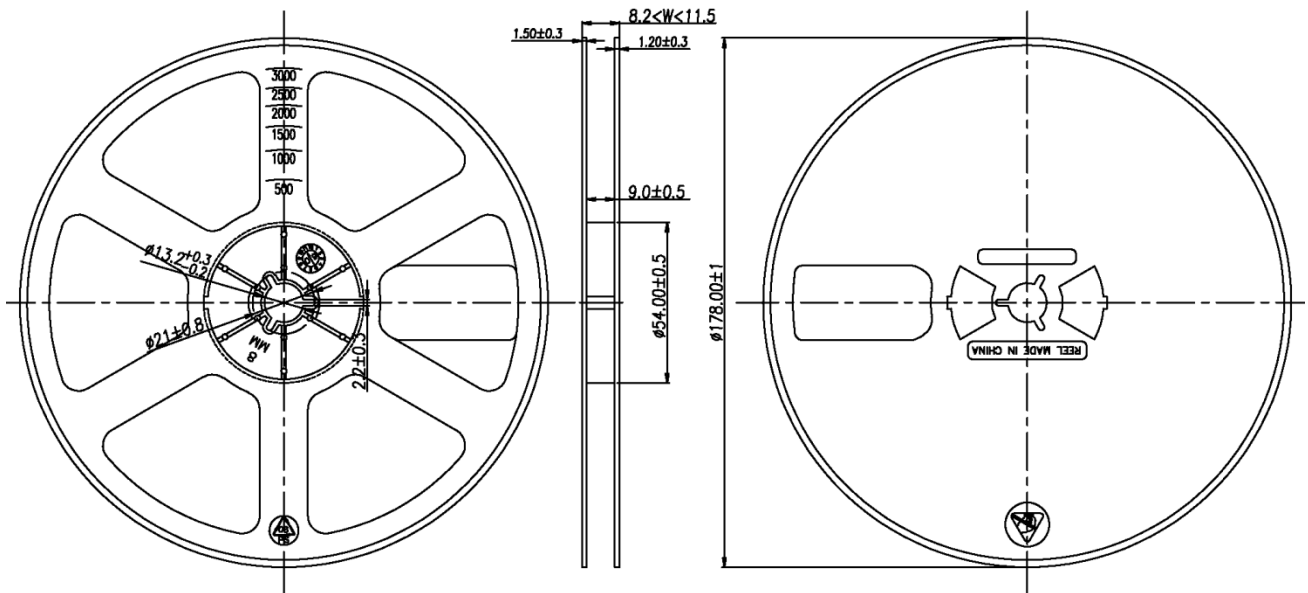
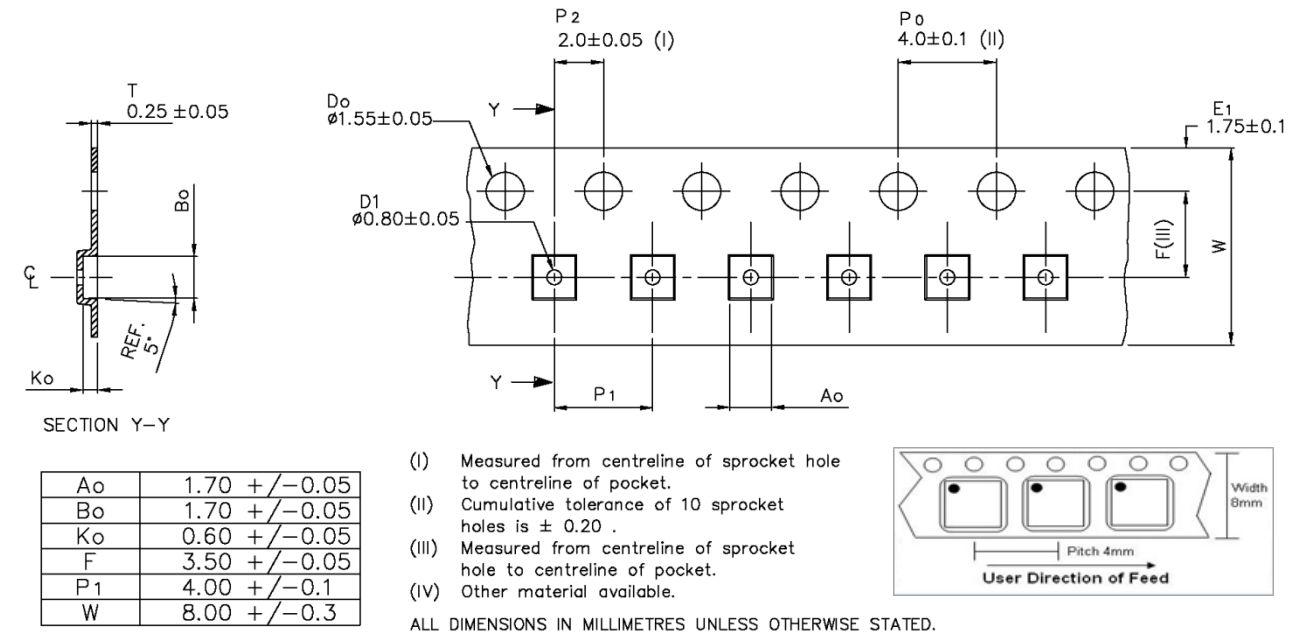


Figure 4. Typical Case Markings



5000 / reel

Figure 5. GSR1415S Tape and Reel Dimensions

ESD Precautions

The GSR1415S is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. ESD protection circuitry is contained in this device, but special handling precautions are required.

Electrostatic discharge	Symbol	Typ.
Human Body Model (HBM), Class-1C	ESD	1500 V
Charged Device Model (CDM), Class-C3	CDM	1000V

RoHS Compliant

The product does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), and are therefore considered RoHS compliant.

Revision History

Rev.	Date	Description
1.0	July. 24, 2022	Initial Release
1.1	Nov. 29, 2022	Modify Electrical Specification
1.2	Feb. 10, 2023	Modify Electrical Specification
1.3	Jun. 15, 2023	Add Electrical Specification
1.4	Jun. 26, 2024	Add Package Information
1.5	Aug. 22, 2024	Modify Electrical Specification
1.6	Jun. 18, 2025	Add Electrical Specification
1.7	Jul. 10, 2025	Add Electrical Specification