

SP3T RF Switch

JSW3-23DR-75+

75Ω 5 to 2000 MHz

The Big Deal

- High Port count in super small size
- Low Insertion Loss, 0.7 dB at 1 GHz



CASE STYLE: MT1817

Product Overview

JSW3-23DR-75+ is a reflective SP3T RF switch, with reflective short on output ports in the off condition. Made using Silicon-on-Insulator process, it has very high IP3, a built-in CMOS driver and negative voltage generator. Its tiny 2x2mm, 14-lead case enables wideband performance in tight spaces and dense PCB layouts.

Key Features

Feature	Advantages
Wideband operation 5-2000 MHz	Enables a single component to be used in a vast array of applications from VHF up to 2.0 GHz.
High IIP3: 55 dBm typ.	Results in little or negligible inter-modulation generation, meeting requirements for digital communication signals.
Low Loss, 0.7 dB at 1 GHz High input power, 3W	Low loss and high power capability enable a single switch to be used for a variety of applications, saving inventory.
Built in negative voltage generator	Operates with a single positive supply voltage; no need for DC blocking capacitors, unless external DC is present at the RF ports.
Built-in CMOS driver	No need for external driver, saving PCB space and cost.
Tiny MCLP package 2 x 2mm, 14-lead	Provides low inductance, repeatable transitions, and excellent thermal contact to PCB.



SP3T RF Switch

75Ω 5-2000 MHz

Reflective RF Switch with internal driver.
Single Supply Voltage, +2.5V to +4.8V

Product Features

- High Isolation, 38 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 μA typ.

Typical Applications

- CATV systems
- SATCOM system
- Automated Test Stations
- Telecom systems

General Description

JSW3-23DR-75+ is a reflective SPDT switch with integral driver, operates with single positive supply voltage while consuming, 40 μA typical. It has been designed for very wideband operation of 5-2000 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.

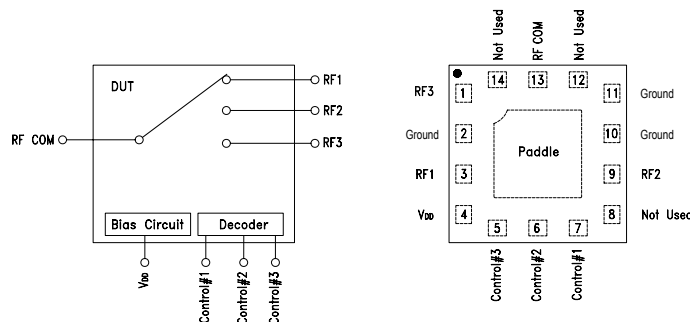


JSW3-23DR-75+

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+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Simplified Schematic and Pad Description



Function	Pad Number	Description	Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port	Control #1	7	Control IN #1
RF1	3	RF Out #1/In Port #1	Control #2	6	Control IN #2
RF2	9	RF Out #2/In Port #2	Control #3	5	Control IN #3
Ground	2	Ground Externally	VDD	4	Supply Voltage
Ground	10	Ground Externally	Ground	Paddle	Ground Externally
RF3	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
Ground	11	Ground Externally			

RF Electrical Specifications⁽¹⁾, 5 - 2000 MHz, T_{AMB}=25°C, V_{DD}= +2.5 to 4.8V

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		5		2000	MHz
Insertion Loss ⁽²⁾ (ON STATE)	5 to 1000	—	0.7	0.9	dB
	1000 to 1500	—	0.8	1.0	
	1500 to 2000	—	1.1	1.3	
Isolation between Common Port and RF1 to RF3 Ports ⁽³⁾	5 to 1000	35	38	—	dB
	1000 to 1500	29	32	—	
	1500 to 2000	22	25	—	
Return Loss (ON STATE) RF-COM, RF1 to RF3 Ports	5 to 1000	—	15	—	dB
	1000 to 1500	—	14	—	
	1500 to 2000	—	10	—	
Input IP3	V _{DD} =2.5 to 4.8V	5 to 500	—	55	dBm
	V _{DD} =3.0V	1000 to 2000	—	59	
0.1dB Input Compression ⁽⁴⁾	5 to 2000	—	35	—	dBm

DC Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
VDD, Supply Voltage	2.5	3.0	4.8	V
Supply Current (V _{DD} = 3V)		40		μA
Control Voltage Low	0		0.4	V
Control Voltage High ⁽⁵⁾	1.35	1.8	2.7	V
Control Current		0.5	1.0	μA
Shutdown Current at V _{DD} = 3V		5		μA

Notes:

- As measured in Mini-Circuit's test board TB-722-3-F+ (see Characterization Test Circuit, Fig.1).
- Insertion loss values are de-embedded from test board loss.
- Isolations for other port combinations, see Tables 1 & 2
- Do not exceed RF input power as shown in Absolute Maximum Rating table.
- If V_{DD} < 2.7V, then Max Control Voltage high=V_{DD}

Switching Specifications

Parameter	Min.	Typ.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)	—	0.42 (Rise Time) 0.84 (Fall Time)	—	μSec
Switching Time, 50% CTRL to 90/10% RF (ON/OFF)	—	1.9 (ON Time) 1.4 (OFF Time)	—	μSec
Video Feedthrough, (control 0 to 1.8V, freq.=10 KHz, V _{DD} =3V)	—	4.0	—	mV _{P-P}

Table 1. Isolation Matrix (RF-COM to RF1 to RF3 Ports)

RF Com to Port	Frequency (GHz)	Isolation Typ. (dB)		
		"ON" Port		
		RF1	RF2	RF3
RF1	0.01-1.0	---	49	47
RF1	1.0-1.5	---	45	42
RF1	1.5-2.0	---	42	39
RF2	0.01-1.0	49	---	48
RF2	1.0-1.5	45	---	43
RF2	1.5-2.0	42	---	40
RF3	0.01-1.0	41	41	---
RF3	1.0-1.5	35	37	---
RF3	1.5-2.0	33	35	---

Table 2. Isolation Matrix (Between Output Ports)

From Port	Frequency (GHz)	Isolation Typ. (dB)		
		"ON" Port & to Port		
		RF1	RF2	RF3
RF1	0.01-1.0	---	52	32
RF1	1.0-1.5	---	48	28
RF1	1.5-2.0	---	44	27
RF2	0.01-1.0	51	---	52
RF2	1.0-1.5	47	---	47
RF2	1.5-2.0	43	---	44
RF3	0.01-1.0	40	49	---
RF3	1.0-1.5	36	45	---
RF3	1.5-2.0	34	44	---

Absolute Maximum Ratings⁽⁶⁾

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to 150°C
V _{DD} , Supply Voltage	5.0V
Voltage Control	-0.5V Min. 3.0 Max.
RF input power ⁽⁷⁾	5 Watt

6. Operation of this device above any of these conditions may cause permanent damage.
 7. Derate linearly to 2.5W at 85°C.

Truth Table⁽⁸⁾ (State of control voltage selects the desired switch state)

State of Control Voltages			RF Common to		
Control #1	Control #2	Control #3	RF1	RF2	RF3
L	L	L	ON	—	—
L	L	H	—	ON	—
H	L	L	—	—	ON
H	H	H	Shutdown		

8. Any control state not defined above, places the switch in an undefined state, but will not damage the switch.

Characterization Test Circuit

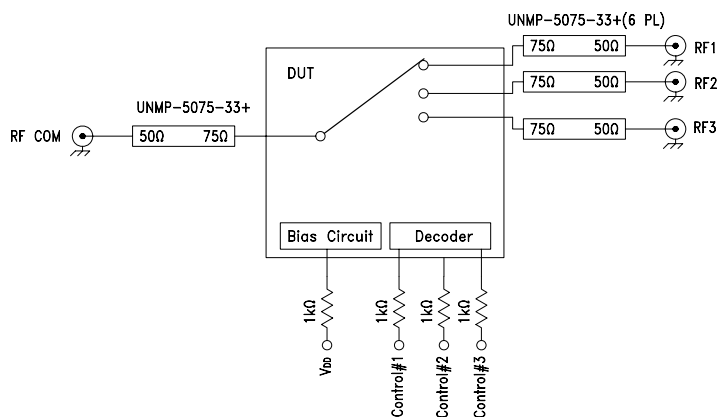


Figure 1: Block Diagram Of Test Circuit Used For Characterization.
 (DUT soldered on Mini-Circuits' TB-722-3-F+)

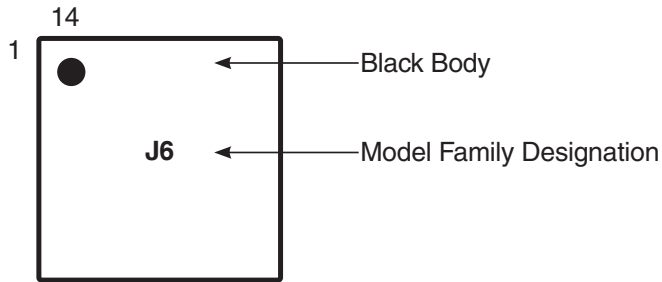
Test Equipment:

- For Insertion loss, Isolation, Return loss:**
 Agilent's N5230A Network Analyzer , E3631A power supply. Mini-Circuits matching pads UNMP-5075-33+
- For Switching Time and Video Feed through**
 Agilent's HP81110A pulse generator, 54833A Oscilloscope, E3631A power supply.
 Agilent's N9020A Spectrum Analyzer , E8257D Generator, E3631A power supply
- For Compression:**
 R&S Network Analyzer ZVA24, E3631A power supply.

Conditions:

- V_{DD}= +2.5, +3.0 and +4.8V, Control= 0 and 1.35V.
- For Insertion loss, isolation and return loss:** Pin=0 dBm
- For Input IP3:** Pin=+10dBm/tone at V_{DD}=3V
- For Switching time:** RF frequency: DC at 200mV, Control Frequency: 10 KHz and 0 and +8V.

Product Marking



Recommended Application Circuit

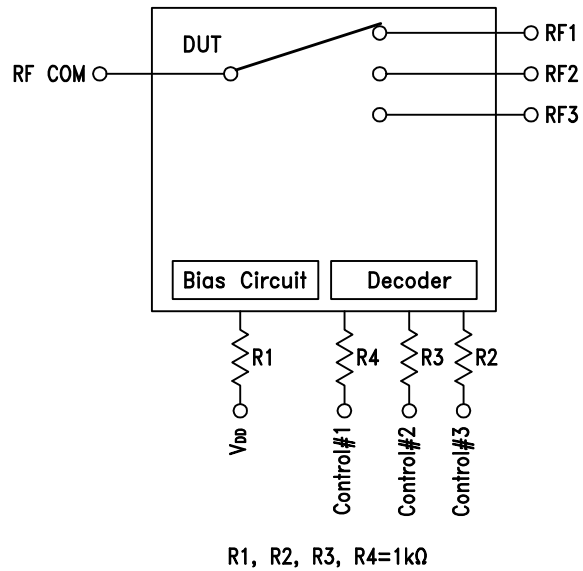


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

Additional Detailed Technical Information	
<i>additional information is available on our dash board. To access this information click here</i>	
Performance Data	Data Table
	Swept Graphs
Case Style	MT1817 <i>Plastic package; Lead finish: Matte Tin</i>
Tape & Reel	F108
Standard quantities available on reel	<i>7" reels with 20, 50, 100, 200, 500, 1K or 3K devices</i>
Suggested Layout for PCB Design	PL-458
Evaluation Board	TB-722-3-F+
Environmental Ratings	ENV75

ESD Rating

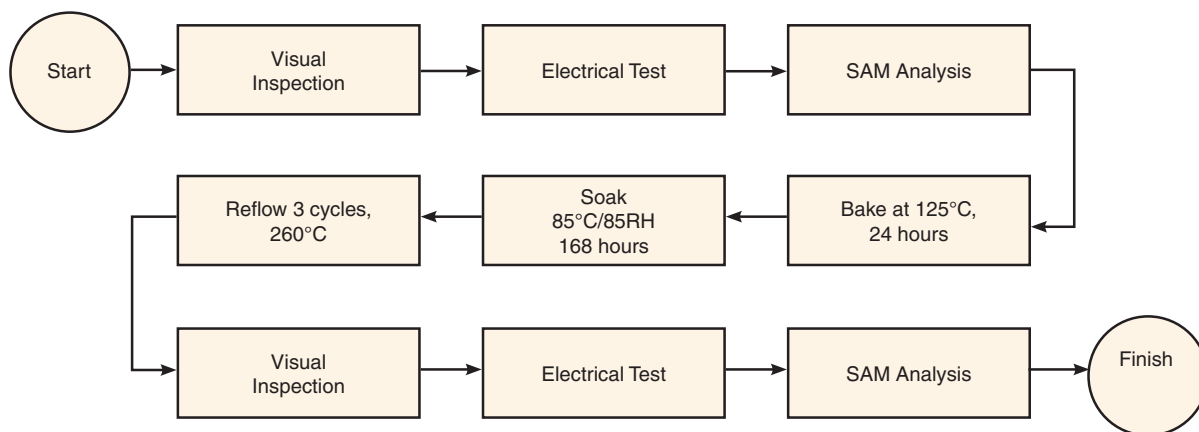
Human Body Model (HBM): Class 1B (500 to < 1000V) in accordance with JESD22-A114

Machine Model (MM): Class A (Pass 100V) in accordance with JESD22-A115

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart



Additional Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp