SP6T RF Switch JSW6-23DR-75+

75Ω High Power 3W 5 to 2000 MHz

The Big Deal

- High Port count in super small size
- High Power P0.1dB, 3W
- Low Insertion Loss, 0.7 dB at 1 GHz

CASE STYLE: MT1817

Product Overview

JSW6-23DR-75+ is a high power reflective SP6T 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.

SP6T RF Switch

75Ω 5-2000 MHz

Reflective RF Switch with internal driver.
Single Supply Voltage, +2.5V to +4.8V, High Power 3W

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.
- High Power, P0.1dB 3W

JSW6-23DR-75+

CASE STYLE: MT1817

+RoHS Compliant

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

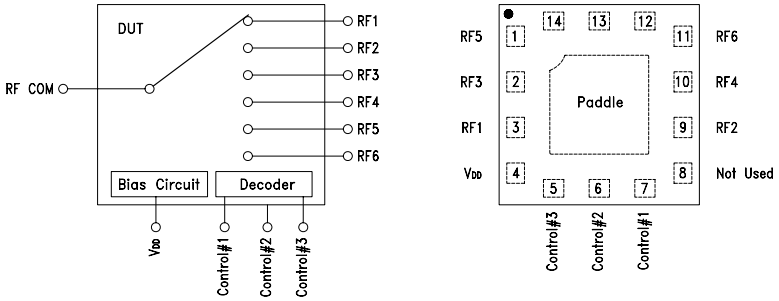
Typical Applications

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

General Description

JSW6-23DR-75+ is a high power 3W 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.

Simplified Schematic and Pad Description



Function	Pad Number	Description
RF COM	13	RF Common/ SUM Port
RF1	3	RF Out #1/In Port #1
RF2	9	RF Out #2/In Port #2
RF3	2	RF Out #3/In Port #3
RF4	10	RF Out #4/In Port #4
RF5	1	RF Out #5/In Port #5
RF6	11	RF Out #6/In Port #6

Function	Pad Number	Description
Control #1	7	Control IN #1
Control #2	6	Control IN #2
Control #3	5	Control IN #3
VDD	4	Supply Voltage
GND	Paddle	Ground
Not Used	8,12,14	No Connection

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 RF6 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 RF6 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	1.35	1.8	2.7/V_{DD}	V
Control Current		0.5	1.0	µA
Shutdown Current at V_{DD} = 3V		5		µA

Notes:
1. As measured in Mini-Circuit's test board TB-722-N+ (see Characterization Test Circuit, Fig.1).
2. Insertion loss values are de-embedded from test board loss.
3. Isolations for other port combinations, see Tables 1 & 2
4. Do not exceed RF input power as shown in Absolute Maximum Rating table.

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 RF6 Ports)

	Frequency (GHz)	Isolation Typ. (dB) "ON" Port					
RF Com to Port		RF1	RF2	RF3	RF4	RF5	RF6
RF1	0.01-1.0	---	49	41	48	47	48
RF1	1.0-1.5	---	45	36	44	42	44
RF1	1.5-2.0	---	42	34	41	39	41
RF2	0.01-1.0	49	---	48	41	48	47
RF2	1.0-1.5	45	---	44	37	43	41
RF2	1.5-2.0	42	---	40	35	40	38
RF3	0.01-1.0	43	45	---	45	40	45
RF3	1.0-1.5	37	41	---	41	37	41
RF3	1.5-2.0	34	38	---	38	35	39
RF4	0.01-1.0	45	43	45	---	46	42
RF4	1.0-1.5	41	37	41	---	41	36
RF4	1.5-2.0	38	34	38	---	38	33
RF5	0.01-1.0	41	41	38	41	---	42
RF5	1.0-1.5	35	37	32	38	---	38
RF5	1.5-2.0	33	35	25	35	---	35
RF6	0.01-1.0	41	41	40	46	42	---
RF6	1.0-1.5	37	36	37	38	38	---
RF6	1.5-2.0	35	33	35	33	35	---

Table 2. Isolation Matrix (Between Output Ports)

	Frequency (GHz)	Isolation Typ. (dB) "ON" Port & to Port					
		RF1	RF2	RF3	RF4	RF5	RF6
From Port							
RF1	0.01-1.0	---	52	31	53	32	52
RF1	1.0-1.5	---	48	28	48	28	48
RF1	1.5-2.0	---	44	25	45	27	44
RF2	0.01-1.0	51	---	54	31	52	34
RF2	1.0-1.5	47	---	49	28	47	31
RF2	1.5-2.0	43	---	45	25	44	26
RF3	0.01-1.0	32	54	---	57	31	56
RF3	1.0-1.5	28	49	---	51	28	50
RF3	1.5-2.0	26	45	---	48	26	46
RF4	0.01-1.0	57	32	57	---	56	32
RF4	1.0-1.5	51	29	51	---	50	28
RF4	1.5-2.0	46	26	46	---	45	25
RF5	0.01-1.0	40	49	33	50	---	53
RF5	1.0-1.5	36	45	30	45	---	46
RF5	1.5-2.0	34	44	27	43	---	43
RF6	0.01-1.0	50	42	51	34	53	---
RF6	1.0-1.5	45	38	46	30	47	---
RF6	1.5-2.0	44	34	44	27	43	---

Absolute Maximum Ratings[5]

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[6]	5 Watt

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

Truth Table[7] (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	RF4	RF5	RF6
L	L	L	ON	—	—	—	—	—
L	L	H	—	ON	—	—	—	—
L	H	L	—	—	ON	—	—	—
L	H	H	—	—	—	ON	—	—
H	L	L	—	—	—	—	ON	—
H	L	H	—	—	—	—	—	ON
H	H	H	Shutdown					

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

Characterization Test Circuit

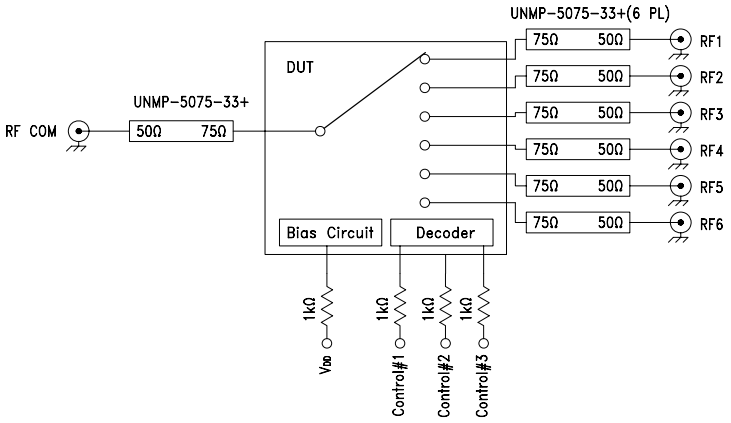


Figure 1: Block Diagram Of Test Circuit Used For Characterization.
(DUT soldered on Mini-Circuits' TB-722-N+)

Test Equipment:

For Insertion loss, Isolation, Return loss:
Agilent's N5230A Network Analyzer , E3631A power supply. Mini-Circuits matching pads UNMP-5075-33+

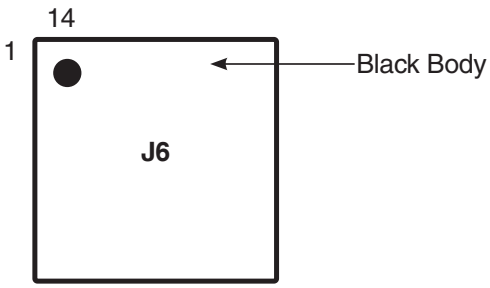
For Switching Time and Video Feed through
Agilent's HP81110A pulse generator, 54833A Oscilloscope, E3631A power supply.
Agilent's N9020A Spectrum Analyzer , E8257D Generator, E3631A power supply

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

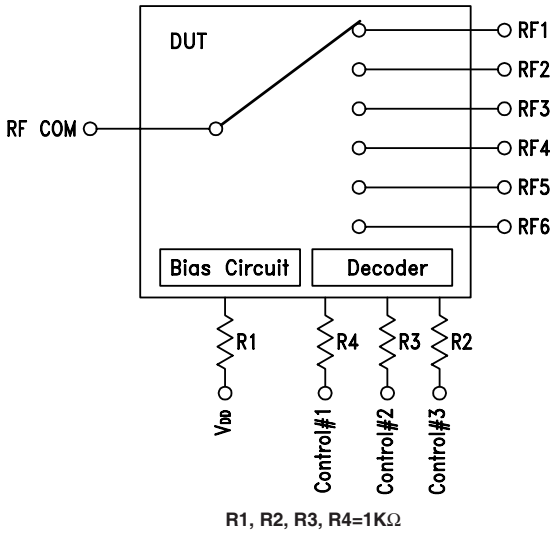


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.