

SP6T RF Switch

JSW6-33DR+

50Ω 5 to 2700 MHz High Power 3W

The Big Deal

- High Port count in super small size
- Single Positive Supply Voltage, 2.5 – 4.8V
- High Power P0.1dB, 3W typ.
- Low Insertion Loss, 0.6 dB at 1 GHz



CASE STYLE: MT1817

Product Overview

JSW6-33DR+ 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 5-2700 MHz	Enables a single component to be used in a vast array of applications from VHF up to 2.7 GHz.
High IIP3: 55 dBm typ.	Results in little or negligible inter-modulation generation, meeting requirements for digital communication signals.
Low Loss, 0.6 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

50Ω 5-2700 MHz

Reflective RF Switch with internal driver.

Single Supply Voltage, +2.5V to +4.8V, High Power 3W

Product Features

- High Isolation, 37 dB typ. at 1 GHz
- Low insertion loss, 0.6 dB typ. at 1 GHz
- High IP3, 59 dBm typ. at 1 GHz
- Low current consumption, 40 μ A typ.
- High Power, P0.1dB 3W typ.

Typical Applications

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

General Description

JSW6-33DR+ is a high power 3W reflective SPDT switch with integral driver, operates with single positive supply voltage while consuming, 40 μ A typical. It has been designed for very wideband operation of 5-2700 MHz. It is packaged in a tiny 14-lead 2mm x 2mm x 0.55mm package and is rated MSL1 and class 1B ESD.



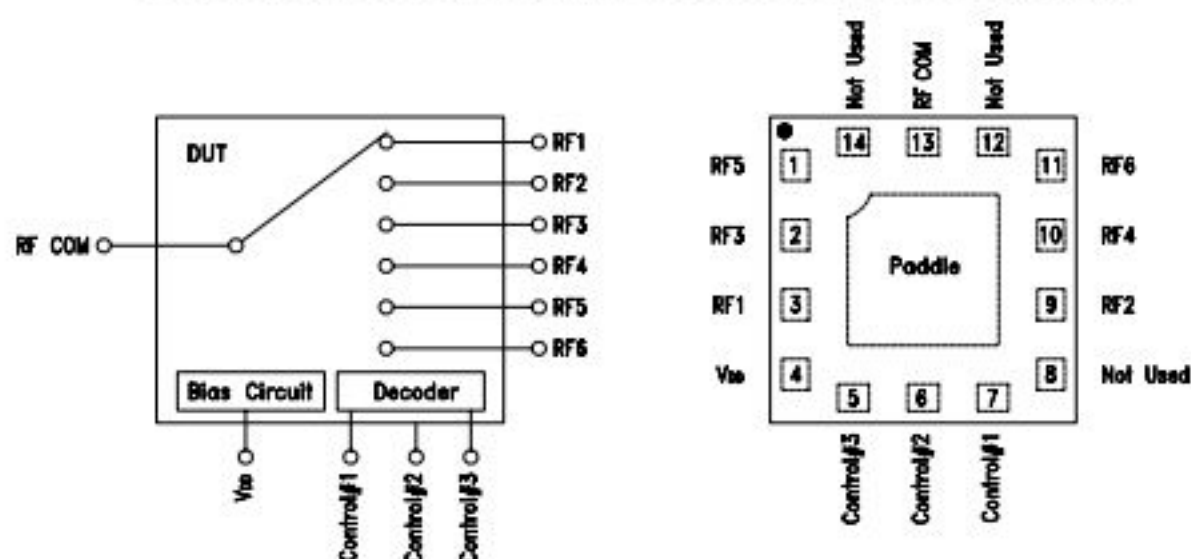
JSW6-33DR+

CASE STYLE: MT1817

+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
RF3	2	RF Out #3/In Port #3	VDD	4	Supply Voltage
RF4	10	RF Out #4/In Port #4	GND	Paddle	Ground
RF5	1	RF Out #5/In Port #5	Not Used	8,12,14	No Connection
RF6	11	RF Out #6/In Port #6			



RF Electrical Specifications⁽¹⁾, 5 - 2700 MHz, $T_{AMB}=25^{\circ}\text{C}$, $V_{DD}=+2.5$ to 4.8V

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		5		2700	MHz
Insertion Loss ⁽²⁾	5 to 1000	—	0.6	0.8	dB
	1000 to 2000	—	0.6	0.8	
	2000 to 2700	—	0.6	0.8	
Isolation between Common Port and RF1 to RF6 Ports ⁽³⁾	5 to 1000	35	37	—	dB
	1000 to 2000	28	30	—	
	2000 to 2700	25	27	—	
Return Loss (ON STATE) RF-COM, RF1 to RF6 Ports	5 to 1000	—	15.5	—	dB
	1000 to 2000	—	14.2	—	
	2000 to 2700	—	14.3	—	
Input IP3	$V_{DD}=2.5$ to 4.8V 5 to 500	—	55	—	dBm
	$V_{DD}=3.0\text{V}$ 1000 to 2700	—	59	—	
0.1dB Input Compression ⁽⁴⁾	5 to 2700	—	35	—	dBm

DC Electrical Specifications

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

Notes:

- As measured in Mini-Circuit's test board TB-724+ (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.

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	—	1.9 (ON Time) 1.4 (OFF Time)	—	μSec
Video Feedthrough, (control 0 to 1.65V, freq.=10 KHz)	—	3.0	—	mV _{P-P}

Table 1. Isolation Matrix (RF-COM to RF1 to RF6 Ports)

	Frequency (GHz)	Isolation, Typ. (dB)					
		"On" Port					
		RF1	RF2	RF3	RF4	RF5	RF6
RF Com to Port							
RF1	0.01-1.0	-	49	37	48	53	49
RF1	1.0-2.0	-	43	30	42	38	43
RF1	2.0-2.7	-	40	28	38	34	39
RF2	0.01-1.0	48	-	48	38	48	50
RF2	1.0-2.0	43	-	42	30	42	38
RF2	2.0-2.7	39	-	38	28	39	33
RF3	0.01-1.0	39	44	-	44	38	45
RF3	1.0-2.0	32	38	-	38	30	39
RF3	2.0-2.7	29	35	-	35	28	36
RF4	0.01-1.0	44	39	44	-	44	37
RF4	1.0-2.0	38	31	38	-	39	30
RF4	2.0-2.7	35	28	35	-	36	27
RF5	0.01-1.0	44	39	44	40	-	40
RF5	1.0-2.0	33	34	31	34	-	34
RF5	2.0-2.7	28	31	27	31	-	31
RF6	0.01-1.0	39	41	39	43	40	-
RF6	1.0-2.0	33	32	34	31	34	-
RF6	2.0-2.7	31	28	31	27	31	-

Table 2. Isolation Matrix (Between Output Ports)

	Frequency (GHz)	Isolation, Typ. (dB)					
		"On" Port					
		RF1	RF2	RF3	RF4	RF5	RF6
From Port to Port							
RF1	0.01-1.0	-	54	29	57	37	55
RF1	1.0-2.0	-	45	24	47	32	46
RF1	2.0-2.7	-	41	22	42	28	42
RF2	0.01-1.0	54	-	57	29	55	37
RF2	1.0-2.0	44	-	46	24	45	32
RF2	2.0-2.7	40	-	41	22	41	29
RF3	0.01-1.0	30	58	-	59	29	62
RF3	1.0-2.0	25	46	-	46	24	46
RF3	2.0-2.7	22	43	-	43	22	43
RF4	0.01-1.0	58	30	58	-	62	30
RF4	1.0-2.0	45	25	46	-	46	24
RF4	2.0-2.7	42	22	42	-	42	22
RF5	0.01-1.0	44	58	32	45	-	48
RF5	1.0-2.0	37	45	26	38	-	40
RF5	2.0-2.7	32	42	23	37	-	37
RF6	0.01-1.0	45	44	46	32	48	-
RF6	1.0-2.0	38	37	38	26	39	-
RF6	2.0-2.7	36	32	36	23	37	-

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.

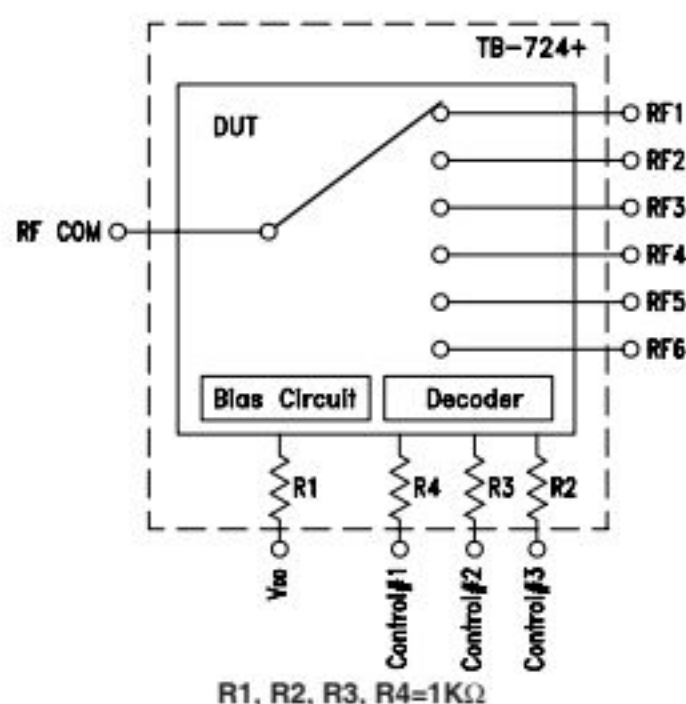
Characterization Test Circuit

Figure 1: Block Diagram Of Test Circuit Used For Characterization.
(DUT soldered on Mini-Circuits' TB-724+)

Test Equipment:**For Insertion loss, Isolation, Return loss:**

Agilent's N5230A Network Analyzer, E3631A power supply.

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:

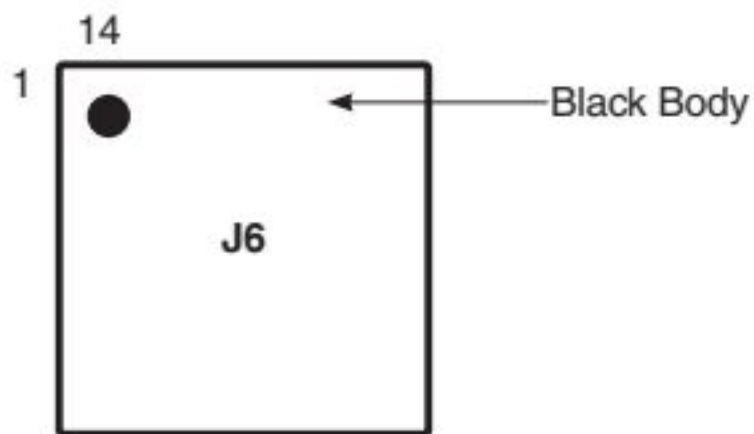
V_{DD}= +2.5, +3.0 and +4.8V, Control= 0 and 1.35V.

For Insertion loss, isolation and return loss: Pin=0 dBm

For Input IP3: Pin=+10dBm/100kHz 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

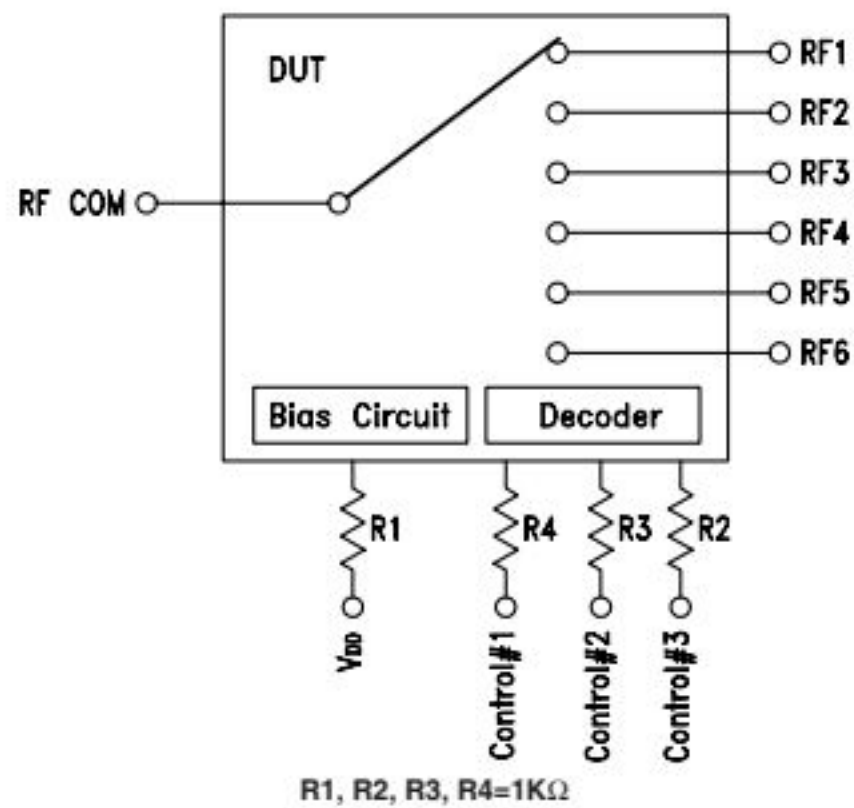


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

Additional Detailed Technical Information

additional information is available on our dash board. To access this information [click here](#)

Performance Data	Data Table
	Swept Graphs
Case Style	MT1817 Plastic package; Lead finish: Matte Tin
Tape & Reel Standard quantities available on reel	F108 7" reels with 20, 50, 100, 200, 500, 1K or 3K devices
Suggested Layout for PCB Design	PL-416
Evaluation Board	TB-724+
Environmental Ratings	ENV75

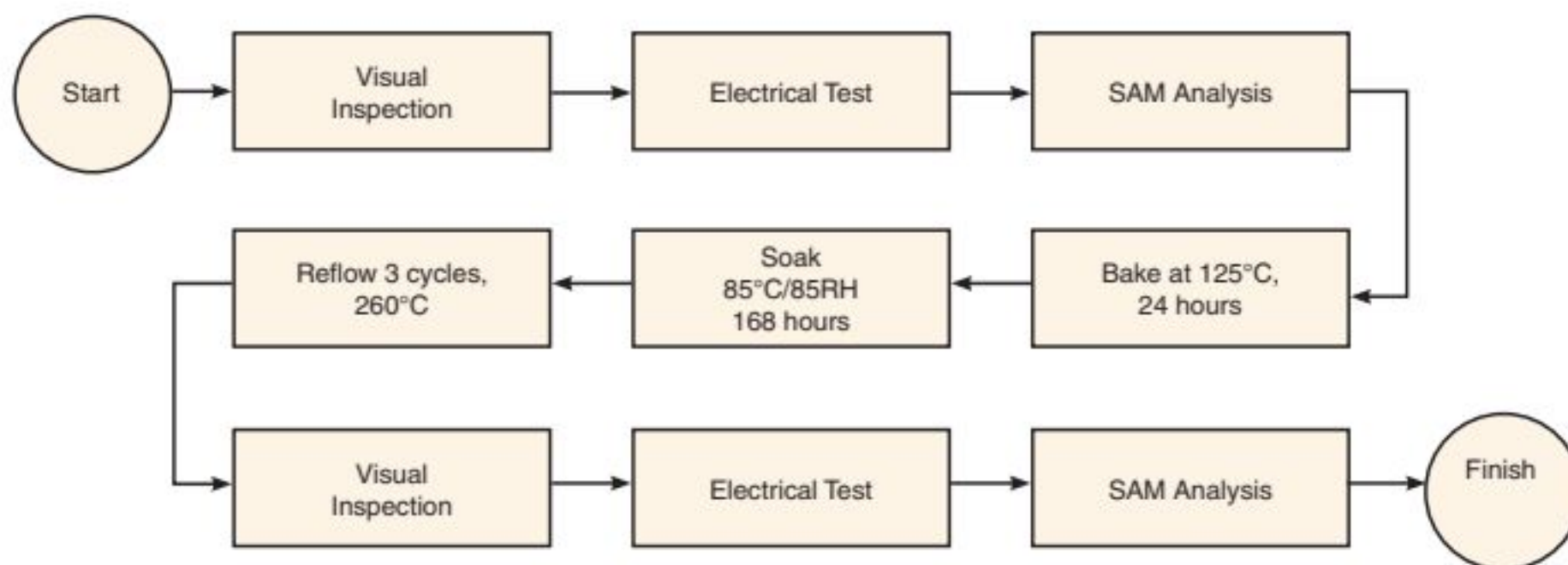
ESD Rating

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**

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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