Fast Switching - MMIC

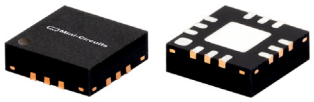
SPDT RF Switch

MSWA2-50+

50Ω DC to 5000 MHz

The Big Deal

- Very fast switching, 5ns rise/fall time typ.
- High isolation, 53 dB typ. at 1 GHz
- High IP3, +54 dBm typ. at 1 GHz



CASE STYLE: DQ1225

Product Overview

Mini-Circuits' MSWA2-50+ is an absorptive GaAs MESFET SPDT MMIC Switch supporting a wide range of switching applications from DC to 5000 MHz. This model provides high isolation and ultra-fast switching 5ns Rise/Fall time. It is produced using GaAs MESFET process and comes in a tiny 3x3mm QFN package rated MSL1.

Key Features

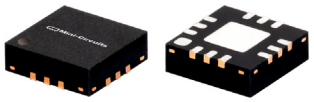
Feature	Advantages
Wideband, DC to 5000 MHz	One model can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrumentation.
High Isolation, 53 dB at 1000 MHz	High isolation significantly reduces leakage of power to the OFF port.
High linearity, +54 dBm IP3 at 1000 MHz	High linearity minimizes unwanted intermodulation products which are difficult or impossible to filter out in multi-carrier environments or in the presence of strong interfering signals from adjacent circuitry or received by an antenna.
Very fast switching, 5ns typ. rise/fall time	Fast switching makes this model suitable for applications where extremely fast transition between ports is required such as automated switching networks.
Small size, 3x3mm QFN package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

Fast Switching - MMIC

SPDT RF Switch

50Ω DC - 5000 MHz

Absorptive



Generic photo used for illustration purposes only

MSWA2-50+

CASE STYLE: DQ1225

+RoHS Compliant

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

Product Features

- High Isolation, 53 dB typ. at 1 GHz
- Low insertion loss, 0.7 dB typ. at 1 GHz
- High IP3, 54 dBm typ. at 1 GHz
- Fast switching, Rise/fall time, 5ns typ.
- Low current consumption, 6µA typ.

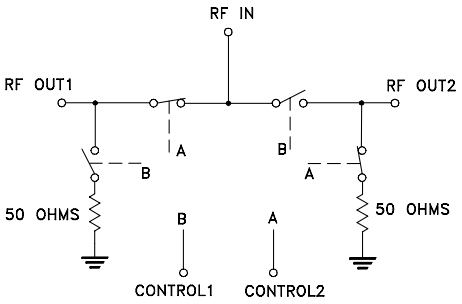
Typical Applications

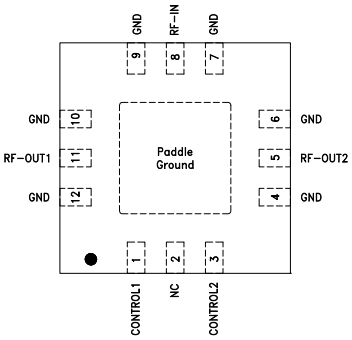
- Automated switching networks
- Cellular/ PCS infrasctructure
- Test instruments
- Military

General Description

Mini-Circuits' MSWA2-50+ is an absorptive GaAs MESFET SPDT MMIC Switch supporting a wide range of switching applications from DC to 5000 MHz. This model provides high isolation and ultra-fast switching 5ns Rise/Fall time. It is produced using GaAs MESFET process and comes in a tiny 3x3mm QFN package rated MSL1.

Simplified Schematic and Pad Description





Pad Number	Function
8	RF-IN
11	RF-OUT1
5	RF-OUT2
1	Control #1
3	Control #2
2	NO CONNECTION (NC)
4,6,7,9,10,12 & paddle	GROUND (GND)

RF Electrical Specifications[1], DC - 5000 MHz, T_{AMB}=25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency range[4]		DC		5000	MHz
Insertion loss[2]	0.3 - 100	—	0.5	0.8	dB
	100 - 1000	—	0.6	1.1	
	1000 - 2000	—	0.8	1.3	
	2000 - 4500	—	1.0	1.7	
	4500 - 5000	—	1.5	2.4	
Isolation between Common port and RF1/RF2 Ports	0.3 - 100	52	86	—	dB
	100 - 1000	46	59	—	
	1000 - 2000	43	51	—	
	2000 - 4500	29	47	—	
	4500 - 5000	25	32	—	
Isolation between RF1 and RF2 ports	0.3 - 100	56	88	—	dB
	100 - 1000	58	71	—	
	1000 - 2000	47	57	—	
	2000 - 4500	26	39	—	
	4500 - 5000	23	28	—	
Return loss (ON STATE)	0.3 - 100		27		dB
	100 - 1000		23		
	1000 - 2000		17		
	2000 - 4500		17		
	4500 - 5000		14		
Input Compression 0.1 dB[3] V_{DD}=-5V	10		15		dBm
	100		21		
	1000		24		
	5000		23		
Input Compression 0.1 dB[3] V_{DD}=-8V	10		16		
	100		28		
	1000		30		
	5000		29		
Input IP3 V_{DD}=-5V	10		34		dBm
	100		58		
	1000		53		
	5000		45		
Input IP3 V_{DD}=-8V	10		34		
	100		57		
	1000		58		
	5000		51		

Notes:
1. Tested on Mini-Circuit's test board TB-971A+, using Agilent's N5230A network analyzer (see Characterization Test Circuit, Fig.1).
2. Insertion loss values are deembedded from test board loss.
3. Do not exceed RF input power as shown in Absolute Maximum Rating table.
4. All RF connections must be DC blocked or held at 0V DC.

DC Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
Control voltage Low (V_L)	-0.2		0	V
Control voltage High (V_H)	-8		-5	V
Control Current at V_L		9		µA
Control Current at V_H		75		µA

Switching Specifications

Parameter	Min.	Typ.	Max.	Units
Rise/Fall Time (10 to 90% or 90 to 10% RF)		4		nSec
Switching Time, 50% CTRL to 90/10% RF		7		nSec
Video Feedthrough, (control 0 to -5V, freq.=500 KHz		21		mV_{P-P}

Absolute Maximum Ratings[6]

Parameter	Ratings
Operating temperature	-40°C to + 85°C
Storage temperature	-65°C to +150°C
Control Voltage	-8.5V
RF Input Power	31dBm

6. Operation of this device above any of these conditions may cause permanent damage.

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

Control Voltage #1	Control Voltage #2	RF-IN	
		RF-Out 1	RF-Out 2
0	-5/-8	OFF	ON
-5/-8	0	ON	OFF

ON- low insertion loss state OFF- absorptive State

Characterization Test Circuit

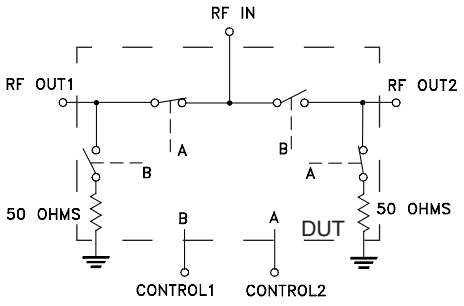
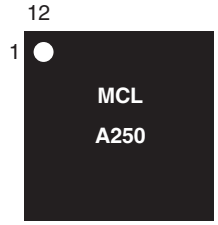


Figure 1. Block Diagram of test Circuit used for characterization
(DUT soldered on Mini-Circuit's TB-971A+)

Test Equipment:

For Insertion loss, Isolation, Return loss and DC current:
Agilent's N5230A Network Analyzer, E3631A power supply. Cblock: Internal to network Analyzer.
For Switching Time and DC Current:
Agilent's 54832B oscilloscope, 81110A pulse generator and E3631 A power supply. Cblock: Mini-Circuits BLK-18-S+
For Input IP3:
Mini-Circuits DC blocks: BLK-18-S+ on all ports, Agilent's E8257D signal generators, 437B power meter, N9020A Signal analyzer and E3631 A power supply.
For Compression:
Mini-Circuits DC blocks: BLK-18-S+ on all ports. ZVE-8G and ZHL-42W amplifier as driver amplifier at RF Common. Agi lent's N5230A Network Analyzer, E3631A power supply
Conditions:
Control Voltage = 0 and -5V/-8V
For Insertion loss, isolation and return loss: Pin=0 dBm
For Input IP3: Pin=-5dBm/tone.
For Switching time: RF frequency: 500 MHz at 0 dBm, Control Frequency: 500 KHz and 0 and -5V/-8V.

Product Marking



Marking may contain other features or characters for internal lot control

Recommended Application Circuit

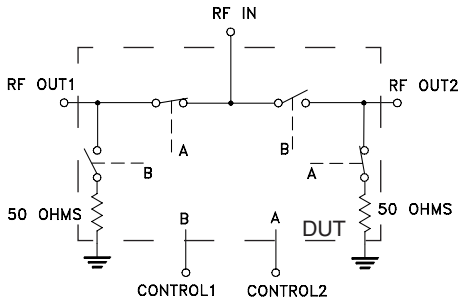


Fig. 2: Evaluation board includes case, connectors and components soldered to PCB.

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	DQ1225 *Plastic package; Lead finish: Matte tin*
Tape & Reel **Standard quantities available on reel**	F66 *7" reels with 20, 50, 100, 200, 500, 1K , 2K devices*
Suggested Layout for PCB Design	PL-545
Evaluation Board	TB-971A+
Environmental Ratings	ENV12

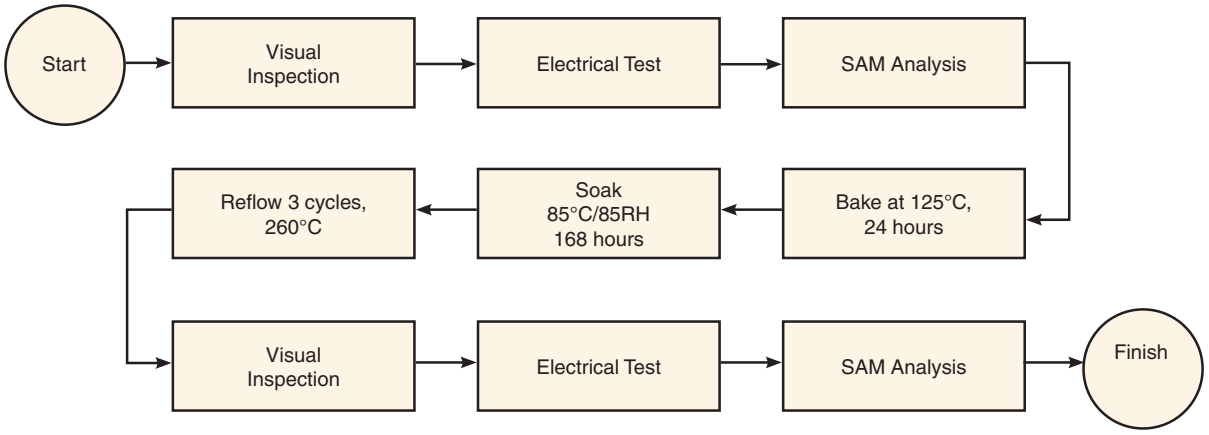
ESD Rating

Human Body Model (HBM): Class 1A (250V to <500V) in accordance with ANSI/ESD STM 5.1-2001

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Mini-Circuits:

MSWA2-50+