MMIC

SP2T RF Switch

HSWA2-63DR+

Absorptive RF Switch with internal driver
Single Supply Voltage, +2.7V to +5.5V

THE BIG DEAL

- High Isolation, 69 dB at 1.0 GHz
- Low insertion loss, 0.95 dB typ. at 1 GHz
- High Input IP3, +65 dBm
- Fast switching, 300 ns typ.
- Tiny Size, 4x4mm
- Immune to latch-up

CASE STYLE: DG983-3

Generic photo used for illustration purposes only

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

APPLICATIONS

- Defense
- Test and Measurements
- Switch matrices

PRODUCT OVERVIEW

Mini-Circuits' HSWA2-63DR+ is a MMIC SPDT absorptive switch with an internal driver designed for wideband operation from 100 MHz to 6.0 GHz supporting many applications requiring high performance across a wide frequency range. This model provides excellent isolation, fast switching speed and high linearity in a tiny 4x4mm 20-Lead MCLP package. Produced using a unique CMOS process on silicon, it offers the performance of GaAs with the advantages of conventional CMOS devices. HSWA2-63DR+ provides a high level of ESD protection and excellent repeatability.

KEY FEATURES

Feature	Advantages
Wideband, 100 MHz to 6.0 GHz Usable over 1kHz to 6 GHz	One model can be used in many applications, saving component count. Also ideal for wideband applications such as military and instrumentation. With lower input power it can operate over 1kHz to 6 GHz covering even wider applications
Absorptive switch	In the off condition, RF output ports which are not switched ON are terminated into 50Ω. This enables proper impedance termination of the circuitry following the RF output ports, preventing any unintended action such as oscillation.
High Isolation: • 71 dB at 1000 MHz • 48 dB at 6000 MHz	High isolation significantly reduces leakage of power into OFF ports.
High linearity, +65 dBm IIP3	High linearity minimizes unwanted intermodulation products which are difficult or impossible to filter in multi-carrier environments such as CATV, or in the presence of strong interfering signal from adjacent circuitry or received by antenna.
Immune to Latch-up	Unlike conventional CMOS devices, HSWA is immune to latch-up
Tiny size, 4 x 4mm MCLP package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

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RF ELECTRICAL SPECIFICATIONS1, 100 MHZ - 6 GHZ, TAMB=25°C, VDD= +3.0V, 50 OHMS

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency range		**100**		**6000**	**MHz**
Insertion loss[2]	100 - 1000	—	0.95	1.15	dB
	1000 - 2000	—	0.95	1.15	
	2000 - 3000	—	1.0	1.2	
	3000 - 4000	—	1.15	1.35	
	4000 - 5000	—	1.25	1.55	
	5000 - 6000	—	1.60	1.90	
Isolation between Common port and RF1/RF2 Ports	100 - 1000	69	71	—	dB
	1000 - 2000	65	67	—	
	2000 - 3000	63	68	—	
	3000 - 4000	62	67	—	
	4000 - 5000	52	57	—	
	5000 - 6000	44	48		
Isolation between RF1 and RF2 Ports	100 - 1000	67	69	—	dB
	1000 - 2000	63	64	—	
	2000 - 3000	59	62	—	
	3000 - 4000	60	64	—	
	4000 - 5000	54	60	—	
	5000 - 6000	44	50		
Return loss (All Ports)	100 - 4000	—	20	—	dB
	4000 - 5000	—	15	—	
	5000 - 6000	—	13		
Input IP2	100 - 6000	—	110	—	dBm
Input IP3	100 - 6000	60	65	—	dBm
1.0 dB Input compression[3]	100 - 6000	33	35	—	dBm
Thermal Resistance, junction-to-ambient			78		°C/W

DC ELECTRICAL SPECIFICATIONS

Parameter	Min.	Typ.	Max.	Units
Supply voltage, V_{DD}	2.7		5.5	V
Supply current		120	200	µA
Control voltage Low	-0.3		0.6	V
Control voltage High	1.17		3.6	V
Control current		9	12	µA

SWITCHING SPECIFICATIONS

Parameter	Condition	Min.	Typ.	Max.	Units
Switching time 50% control to 90/10%RF	fctrl=1KHz VDD=3V Vctrl High=1.8V Vctrl Low=0V		300	400	nS
Video feed-through			27		mV_{P-P}
Rise/Fall time 10 to 90% or 90 to 10%			67		nS

Notes:
1. Tested on Mini-Circuits' test board TB-919+, using Agilent's N5230A network analyzer (see Characterization test circuit, Fig.2).
2. Insertion loss values are de-embedded from test board loss.
3. Do not exceed RF input power as shown in Absolute Maximum Ratings table.

MAXIMUM RATINGS[4]

Parameter	Ratings
Operating temperature	-40°C to +105°C
Storage temperature	-65°C to 150°C
V_{DD}, Supply voltage	-0.3 to 5.5V
Voltage control	-0.3V Min. 3.6 Max.
RF Input power, CW[5]	+30 dBm
RF Power into output ports[5]	+20 dBm
Maximum Die Junction Temperature	150°C

4. Operation of this device above any of these conditions may cause permanent damage.
5. 100% Duty Cycle, all band, 50Ω

POWER RATING

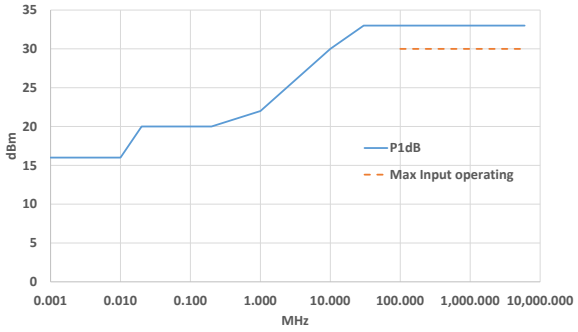

Figure 1. P1dB and Max Input Operating Power vs. Frequency

TRUTH TABLE

Mode	State of Control Voltage	
	Control 1	Control 2
RF COM-RF1 ON	HIGH	LOW
RF COM-RF2 ON	LOW	HIGH
ALL OFF	LOW	LOW
Unsupported	HIGH	HIGH

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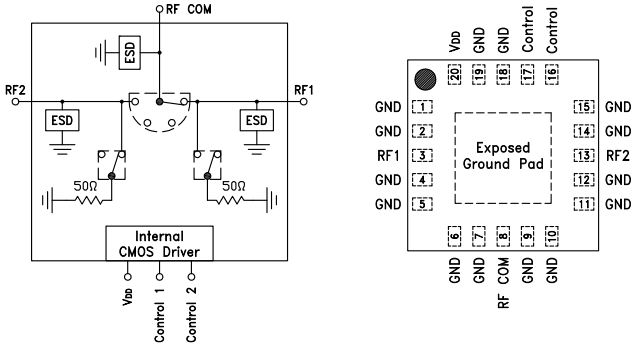
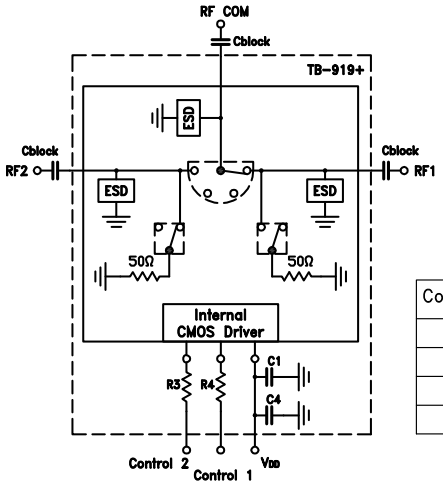
SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF COM	8	RF Common/ SUM port*
RF1	3	RF out #1/In port #1*
RF2	13	RF out #1/In port #2*
Control 1	17	CMOS Control IN #1
Control 2	16	CMOS Control IN #2
VDD	20	Supply voltage
GND	1,2,4,7,9,10-12, 14,15,18,19	Ground

* Must be held at 0VDC. If required add DC blocking capacitors on these ports.

CHARACTERIZATION & APPLICATION CIRCUIT



Component	Value	Size
DUT	HSWA2-63DR+	4x4mm
C1	0.1µF	0402
C4	22pF	0402
R3,R4	0Ω	0402

Figure 2. Block Diagram of test Circuit used for characterization
(DUT soldered on Mini-Circuits' TB-919+)
Note: Cblock is required only when DC is present on RF ports.

PRODUCT MARKING

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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs
Case Style	DG983-3 Plastic package, exposed paddle , termination finish=NiPdAu
Tape & Reel **Standard quantities available on reel**	F87 7" reels with 20, 50, 100, 200, 500, 1000 & 3000 devices
Suggested Layout for PCB Design	PL-510
Evaluation Board	TB-919+
Environmental Ratings	ENV83

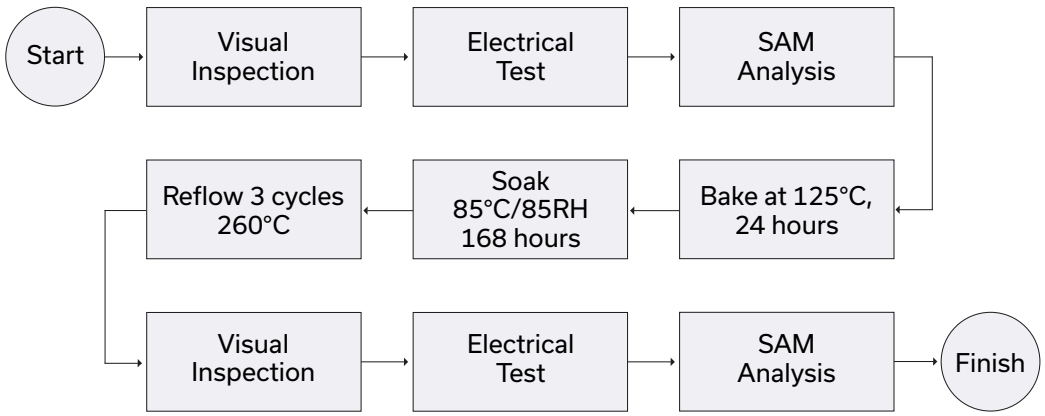
ESD RATING

Human Body Model (HBM): Class 2 (Pass 2000V) in accordance with MIL-STD-883, Method 3015

MSL RATING

Moisture Sensitivity: MSL3 in accordance with IPC/JEDEC J-STD-020D

MSL TEST FLOW CHART



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/terms/viewterm.html