WINSOURCE ELECTRONICS

THE DATASHEET OF

M3SW-2-50DRA+

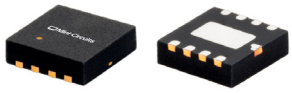
FAST SWITCHING

SPDT RF Switch M3SW-2-50DRA+

50Ω DC to 4500 MHz Reflective RF Switch with Internal Driver

THE BIG DEAL

- High Isolation, 48 dB Typ.
- High Input IP3, +47.3 dBm Typ.
- Low Insertion Loss, 0.6 dB Typ.
- Fast Rise/Fall Time, 3.3 ns / 4.6 ns Typ.
- Tiny Size, 3.25x3.25 mm 8-Lead QFN-Style



Generic photo used for illustration purposes only

CASE STYLE: DL805

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

APPLICATIONS

- Defense
- Communication Infrastructure
- Test and Measurement Equipment

PRODUCT OVERVIEW

M3SW-2-50DRA+ is a high isolation, fast switching, reflective GaAs pHEMT SPDT switch with an internal driver. It operates at +5 V & -5 V power supplies and has a single TLL compatible control port. It has been designed for wideband operation and packaged in a tiny 3.25x3.25 mm 8-lead QFN-style package.

KEY FEATURES

Features	Advantages
Wideband, DC to 4.5 GHz	One model can be used in many applications, saving component count. Also ideal for wideband applications in defense and test and measurement instrumentation.
High Isolation (Common Port & Output Ports): • 59 dB at 1000 MHz • 35 dB at 4500 MHz	High isolation significantly reduces leakage of power into OFF ports.
High Linearity: • Input Power at P1dB, +25 dBm Typ. • Input IP3, +47.3 dBm Typ.	High linearity minimizes unwanted inter modulation 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.
Form-Fit Compatible with M3SW-2-50DR+	Fits into existing PCB footprint designed for M3SW-2-50DR+ with minor electrical differences.
3.25x3.25 mm QFN-Style Package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

REV. A
ECO-014399
M3SW-2-50DRA+
MCL NY
250904

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RF ELECTRICAL SPECIFICATIONS[1], T_{AMB} = +25°C, 50Ω, V_{DD} = +5 V, V_{EE} = -5 V

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range[2]		DC		4500	MHz
Insertion Loss	10-100		0.5	1.0	dB
	100-1000		0.5	1.2	
	1000-2000		0.6	1.4	
	2000-4000		0.7	2.1	
	4000-4500		1.4	2.5	
Isolation Between Output Port 1 & 2	10-100		78		dB
	100-1000		59		
	1000-2000		48		
	2000-4000		40		
	4000-4500		34		
Isolation Between Common Port & Output Ports	10-100	70	79		dB
	100-1000	49	59		
	1000-2000	41	48		
	2000-4000	30	39		
	4000-4500	30	35		
Input Return Loss	10-100		30		dB
	100-1000		30		
	1000-2000		25		
	2000-4000		21		
	4000-4500		21		
Output Return Loss (ON STATE)	10-100		29		dB
	100-1000		27		
	1000-2000		21		
	2000-4000		18		
	4000-4500		13		
Output Return Loss (OFF STATE)	10-100		3		dB
	100-1000		3		
	1000-2000		3		
	2000-4000		3		
	4000-4500		3		
Input Power at P1dB[3]	10-100		+18.8		dBm
	100-1000		+24.1		
	1000-2000		+25		
	2000-4000		+24.8		
	4000-4500		+23.6		
Input IP3 (P_{OUT} = 0 dBm/Tone)	10-100		+38.5		dBm
	100-1000		+45.3		
	1000-2000		+47.3		
	2000-4000		+44.9		
	4000-4500		+40.2		
Thermal Resistance (Junction-to-Ground Lead at +85°C Stage Temperature)			34.2		degC/W

1. Tested on Mini-Circuits' test board TB-M3SW-250DRA+ (see Fig. 1).
2. All RF-ports must be DC blocked or held at 0 V DC.
3. Input Power at P1dB compression drops to +13 dBm at 10 MHz.

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DC ELECTRICAL SPECIFICATIONS

Parameter	Min.	Typ.	Max.	Units
Positive Supply Voltage, V_{DD}	+4.75	+5	+5.25	V
Negative Supply Voltage, V_{EE}	-5.25	-5	-4.75	V
Positive Supply Current, I_{DD}		5	9	mA
Negative Supply Current, I_{EE}	-9	-3		mA
Control Voltage Low		0	+0.8	V
Control Voltage High	+2.1	+2.3	+5	V
Control Current Low		0	0.2	mA
Control Current High		0.4	5	mA

SWITCHING SPECIFICATIONS

Parameter	Condition	Min.	Typ.	Max.	Units
ON Time, 50% Control to 90% RF	RF P_{IN} = 0 dBm RF Freq. = 500 MHz Control Freq. = 500 KHz Control High = +2.3 V Control Low = 0 V		14.4		ns
OFF Time, 50% Control to 10% RF			11.3		ns
Video Leakage			42.5		mV
Rise Time, 10% RF to 90% RF 10 to 90% or 90 to 10%			3.3		ns
Fall Time, 90% RF to 10% RF			4.6		ns

ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature	-55°C to +100°C
Storage Temperature	-55°C to +100°C
RF Input Power	+24 dBm
Junction Temperature	+134°C
Total Power Dissipation	0.4 W
DC Voltage, Pin 5	+6 V
DC Voltage, Pin 7	-6 V

4. Permanent damage may occur if any of these limits are exceeded. Electrical Maximum ratings are not intended for continuous normal operation.

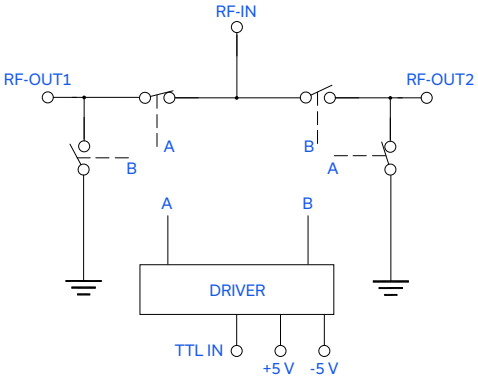
TRUTH TABLE

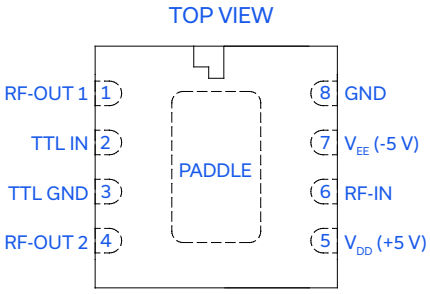
State of Control Voltage	RF-IN to RF-OUT 1	RF-IN to RF-OUT 2
LOW	ON	OFF
HIGH	OFF	ON

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SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION





Function	Pad Number	Description
RF-IN	6	RF Common/SUM port
RF-OUT 1	1	RF Output Port #1
RF-OUT 2	4	RF Output Port #2
TTL IN	2	TTL Compatible Control Voltage Input
TTL GND	3	TTL Ground
V_{DD} (+5 V)	5	Positive Supply Voltage V_{DD}
V_{EE} (-5 V)	7	Negative Supply Voltage V_{EE}
GND	8, Paddle	Ground

CHARACTERIZATION & APPLICATION CIRCUIT

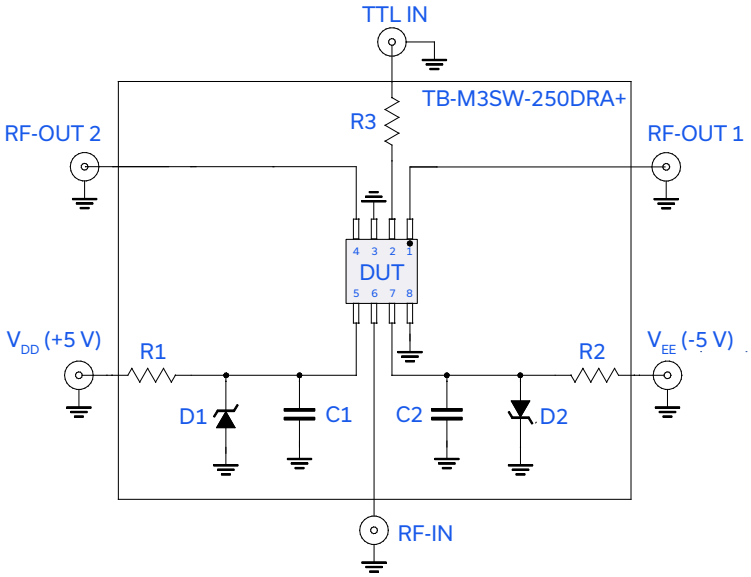


Figure 1. M3SW-2-50DRA+ Characterization & Application Circuit

Component	Size	Value	P/N	Manufacturer
DUT	3.25x3.25	N/A	M3SW-2-50DRA+	MCL
D1, D2	SOD-123	Vz = 5.6V	MMSZ4690T1G	ON Semiconductor
R1, R2	0603	11.5Ω	RK73H1JTTD11R5F	KOA
R3	0603	100Ω	RK73H1JTTD1000F	KOA
C1, C2	0603	10pF	06031A100GAT2A	AVX

Note: D1 & D2 are optional.

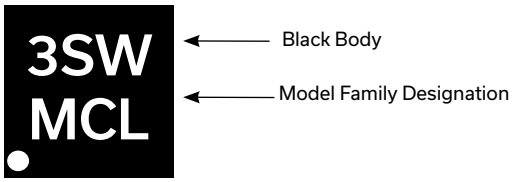
Figure 1. Characterization & Application Circuit

Note: (DUT soldered on Mini-Circuits Characterization & Application Test Board TB-M3SW-2-50DRA+). Insertion Loss, Amplitude Unbalance, Isolation, Return Loss, Input Power at 1 dB Compression (P1dB) & Input IP3 tested using E5071C microwave network analyzer.

Condition:

1. Insertion Loss, Amplitude Unbalance, Isolation & Return Loss: P_{IN} = 0 dBm
2. Input IP3 (IIP3):Two tones, spaced 1 MHz apart, 0 dBm/tone output.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

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

Performance Data	Data Table Swept Graphs
Case Style	DL805 Plastic package, exposed paddle, Lead Finish: Matte Tin
Tape & Reel	F58
Standard Quantities Available on Reel	7" Reels with 1000 devices 13" Reels with 2000 or 4000 devices
Suggested Layout for PCB Design	PL-120
Evaluation Board	TB-M3SW-2-50DRA+
Environmental Ratings	ENV16

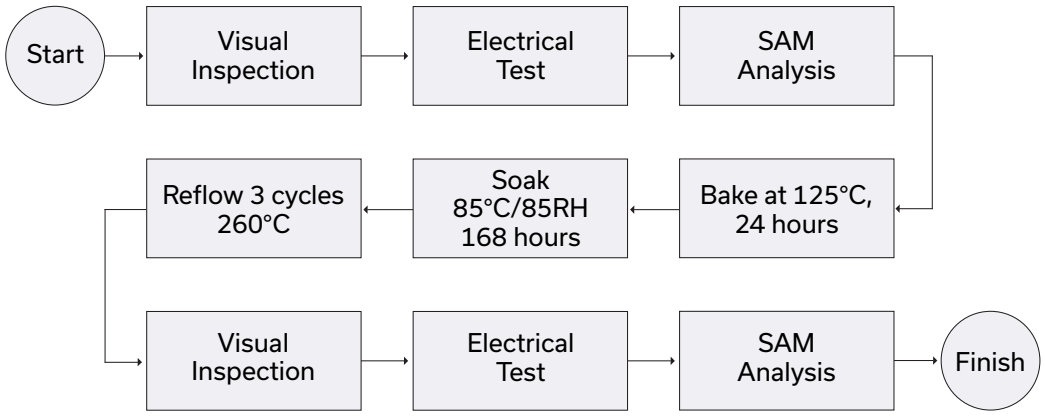
ESD RATING

Human Body Model (HBM): Class 0 (Pass 100 V) in accordance with ESD STM5.1-2001

MSL RATING

Moisture Sensitivity: MSL1 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

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