

SPDT Reflective Switch

6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

Features

- Broadband Performance
- Low Insertion Loss: 0.8 dB
- High Isolation: 30 dB
- Input IP3: 57 dBm
- Power Handling including Hot Switching: 20 dBm
- Control Logic: 1.8 V, 2.5 V, or 3.3 V
- Switching Speed: 350 ns
- Lead-Free 1.5 mm 6-Lead PDFN Package with Wettable Flanks
- RoHS* Compliant
- AEC-Q100 Grade 2 Qualified

Applications

- Test Equipment
- GPS/Navigation
- Infotainment
- Remote Keyless Entry
- Automotive V2X
- Automated Toll Systems
- Automotive Smart Home Control Systems

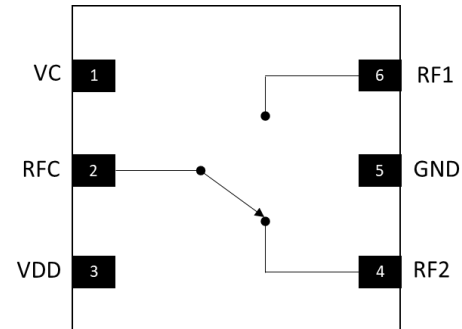
Description

The MASW-011186-Q is a SOI single pole double throw (SPDT) switch with 0.8 dB of insertion loss at 8.5 GHz. The power handling capability is 20 dBm. The input and output return losses in the thru path are typically 18 dB. The logic levels are compatible with standard 1.8 V, 2.5 V, and 3.3 V CMOS, and required bias supply is +3.3 V.

The MASW-011186-Q is designed for ultra wideband automotive applications and test equipment requiring ultra fast switching speeds.

The MASW-011186-Q features full passivation for performance and reliability.

Functional Schematic



Pin Function¹

Pin #	Function	Pin #	Function
1	Voltage Control	4	RF Output ²
2	RF Common ²	5	Ground
3	Supply Voltage	6	RF Output ¹

1. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.
2. RF ports are dc-coupled to GND. There are no internal dc blocking capacitors. External dc blocking capacitors are not necessary if the RF line dc bias is 0 V.

Ordering Information^{3,4}

Part Number	Package
MASW-011186-QR3000	3000 Piece Reel
MASW-011186-Q01SMB	Sample Board

3. Reference Application Note M513 for reel size information.
4. All sample boards include 5 loose parts.

¹ * Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

SPDT Reflective Switch

6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

Pin Description

Pin #	Name	Description
1	VC	Control Voltage
2	RFC	RF Common, DC grounded internally
3	VDD	Supply Voltage
4	RF2	RF Output 2, DC grounded internally
5	GND	Ground, internally connected to package exposed pad
6	RF1	RF Output 1, DC grounded internally
7	Backside	Exposed pad centered on the package bottom must be connected to RF, DC, and thermal ground

SPDT Reflective Switch

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MASW-011186-Q

Rev. V1

AC Electrical Specifications: $V_{DD} = +3.3\text{ V}$, $V_C = 0/+3.3\text{ V}$, $Z_0 = 50\ \Omega$, $T_A = 25^\circ\text{C}$ unless otherwise specified

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	6.0 GHz; $T_A = -40^\circ\text{C}$ 7.2 GHz; $T_A = -40^\circ\text{C}$ 8.5 GHz; $T_A = -40^\circ\text{C}$	dB	—	0.6 0.6 0.7	1.1 — 1.2
	6.0 GHz; $T_A = 25^\circ\text{C}$ 7.2 GHz; $T_A = 25^\circ\text{C}$ 8.5 GHz; $T_A = 25^\circ\text{C}$	dB	—	0.6 0.6 0.8	1.1 — 1.2
	6.0 GHz; $T_A = 105^\circ\text{C}$ 7.2 GHz; $T_A = 105^\circ\text{C}$ 8.5 GHz; $T_A = 105^\circ\text{C}$	dB	—	0.8 0.9 1.0	1.4 — 1.5
Isolation	6.0 GHz 7.2 GHz 8.5 GHz	dB	—	34 31 28	—
RFC Return Loss	6.0 - 8.5 GHz	dB	—	18	—
RF1 / RF2 Return Loss	6.0 - 8.5 GHz (ON state)	dB	—	18	—
Group Delay Variation	6.0 - 8.5 GHz; $T_A = -40^\circ\text{C}$	ps	—	5	8.6
	6.0 - 8.5 GHz; $T_A = 25^\circ\text{C}$	ps	—	5	9
	6.0 - 8.5 GHz; $T_A = 105^\circ\text{C}$	ps	—	5	10
Input IP3	2-Tone, +14 dBm/Tone, 5 MHz Spacing @ 6 GHz & 8.5 GHz	dBm	—	57	—
Input P0.1dB	6.0 - 8.5 GHz	dBm	—	20	—
T_{RISE} , T_{FALL}	10% to 90% RF / 90% to 10% RF	ns	—	100	—
T_{ON} , T_{OFF}	50% control to 90% / 10% RF	ns	—	350	—
Switching Rate	—	kHz	—	—	10

DC Electrical Specifications:

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Voltage Supply, VDD	—	V	+3.15	+3.3	+3.45
Logic Voltage, Input Low (V_{IL})	—	V	0.0	—	0.7
Logic Voltage, Input High (V_{IH})	—	V	1.5	—	VDD
VDD Quiescent Current	$V_C = 0\text{ V}$ or VDD	μA	—	6	13
Control Leakage Current	—	nA	—	1	—

SPDT Reflective Switch

6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

Recommended Operating Conditions

Parameter	Symbol	Unit	Min.	Typ.	Max.
Input Power, Any RF Port	P_{IN}	dBm	—	—	20
DC Supply VDD	V_{DD}	V	3.15	3.3	3.45
Junction Temperature	T_J	°C	—	—	+125
Operating Temperature ⁵	T_C	°C	-40	—	+105
Storage Temperature	-	°C	-65	—	+135

5. Operating temperature is measured at exposed pad.

Absolute Maximum Ratings^{6,7}

Parameter	Symbol	Unit	Min.	Max.
Input Power, Any RF Port	P_{IN}	dBm	—	23
DC Supply	V_{DD}	V	-0.3	+3.6
Control Voltage	V_C	V	-0.3	+3.6
Junction Temperature ^{8,9}	T_J	°C	—	+135
Storage Temperature	-	°C	-65	+135

6. Exceeding any one or combination of these limits may cause permanent damage to this device.

7. MACOM does not recommend sustained operation near these survivability limits.

8. Operating at nominal conditions with $T_J \leq +125^\circ\text{C}$ will ensure MTTF > 1×10^6 hours.

9. Typical thermal resistance (Θ_{jc}) = 60°C/W .

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1C and CDM Class C3 devices.

SPDT Reflective Switch

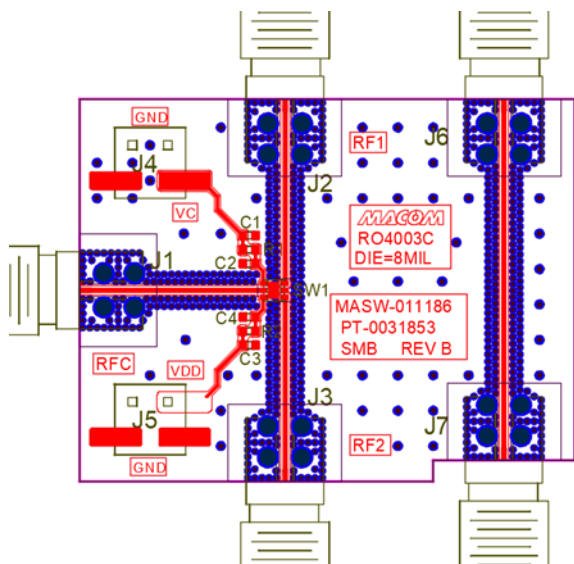
6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

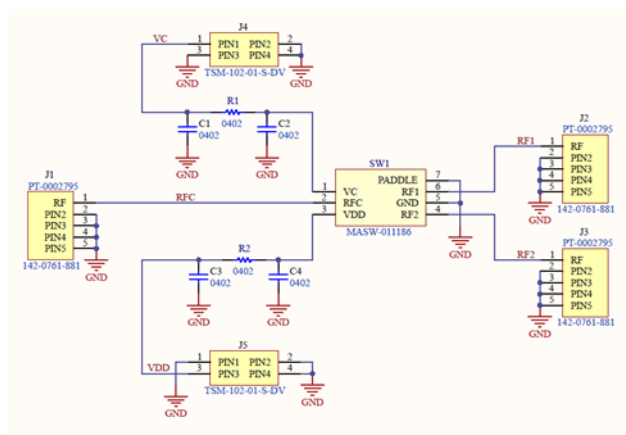
PCB Layout



Parts List

Part	Value	Case Style
C1	5 pF	0402
C2	DNP	—
C3	0.01 μ F	0402
C4	100 pF	0402
J1~J3	-	SMA Connector
J4~J5	TSM-102-01-S-DV	DC header
R1, R2	10 Ω	0402

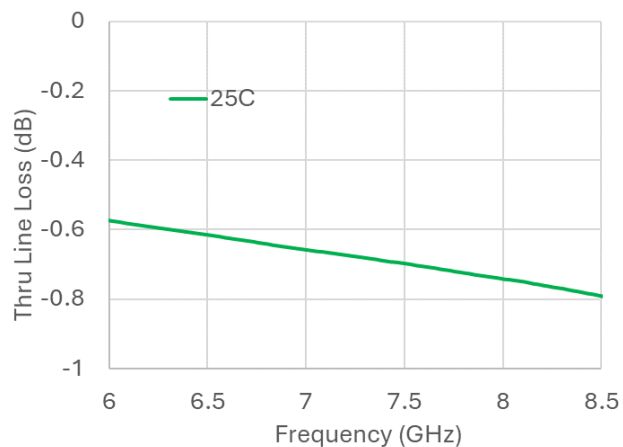
Application Schematic



Truth Table

Control Input	Condition of Switch	
	RFC - RF1 Path	RFC - RF2 Path
VC	On	Off
V _{IH}	Off	On

Thru Line Loss



SPDT Reflective Switch

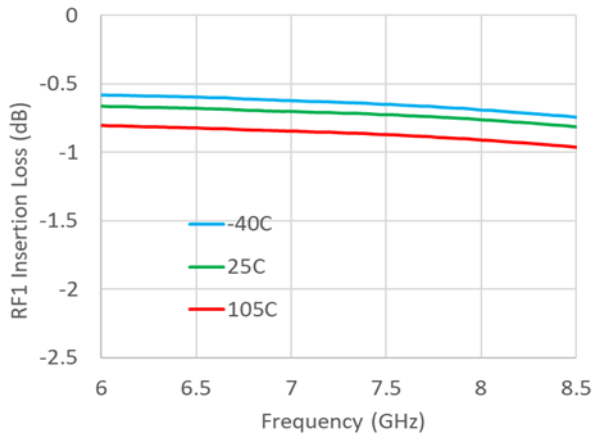
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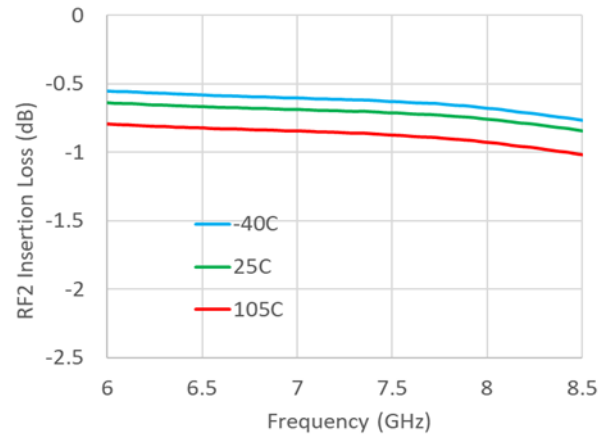
MASW-011186-Q
Rev. V1

Typical Performance Curves

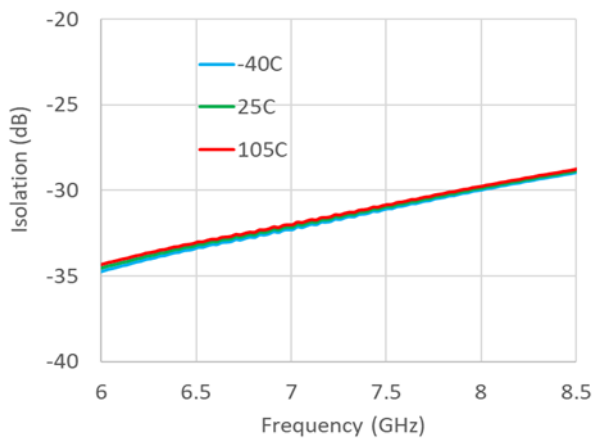
Insertion Loss (RFC-RF1)



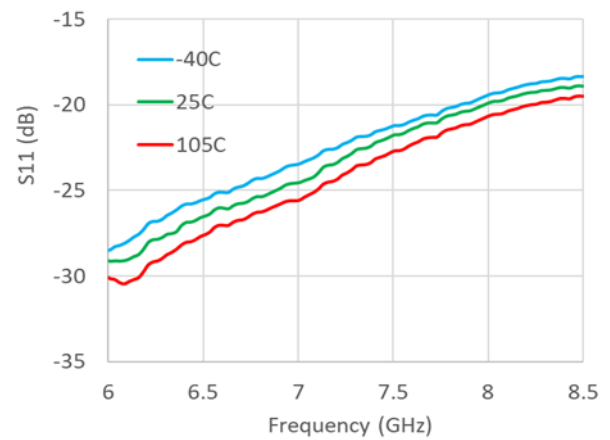
Insertion Loss (RFC-RF2)



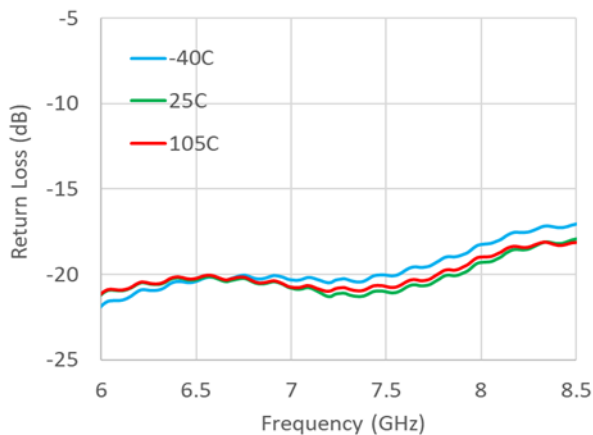
Isolation (RFC-RFX)



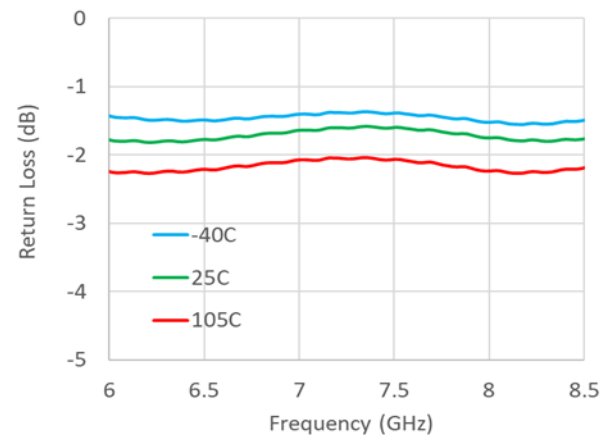
Return Loss (RFC)



Return Loss (RFX ON)



Return Loss (RFX OFF)



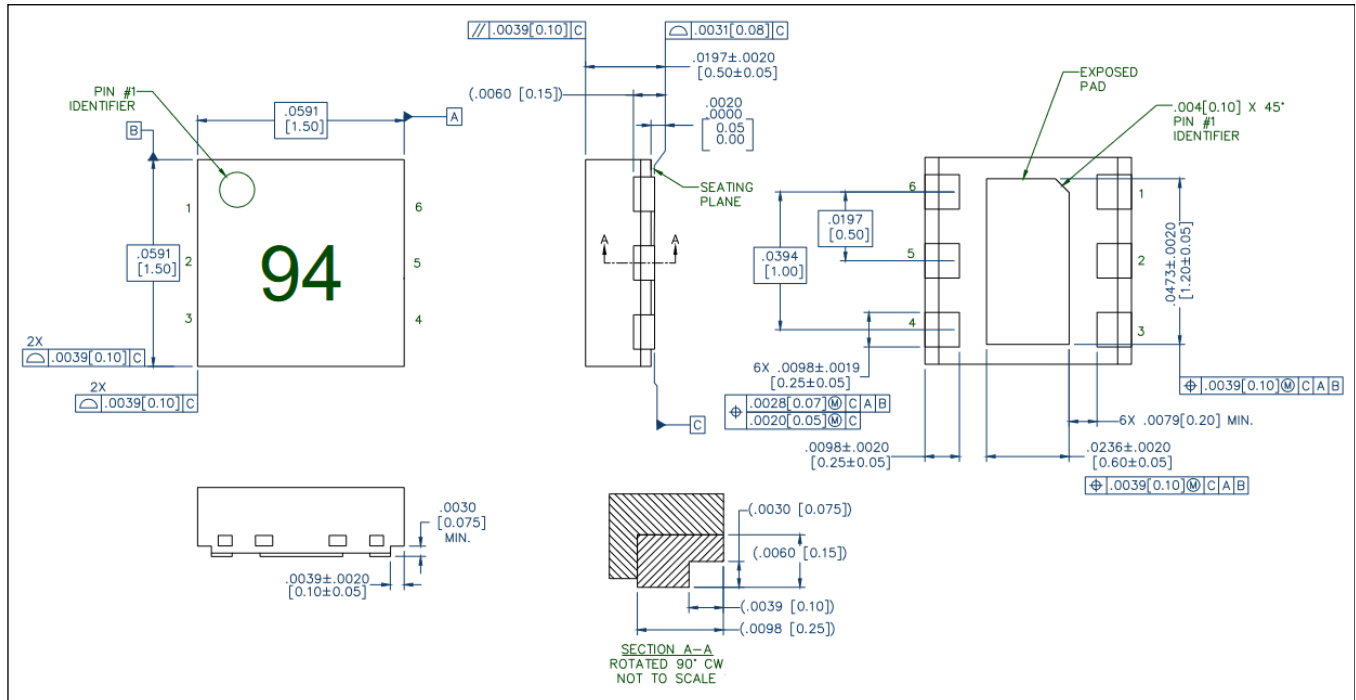
SPDT Reflective Switch 6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

Lead Free 1.5 mm 6-Lead PDFN Package with Wettable Flanks †



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% Matte Tin over Copper.

Revision History

Rev	Date	Change Description
V1	03/28/24	Move from Preliminary to Final. Update specifications table with min/max limits

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6.0 - 8.5 GHz



MASW-011186-Q

Rev. V1

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