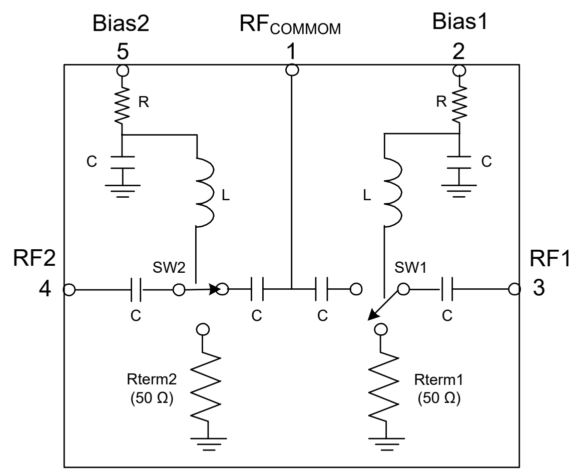
Features
- Broadband Performance, 26 to 40 GHz
- Low Loss <1 dB
- High Isolation >38 dB
- Up to 13 W CW Power, +85°C
- Die with G-S-G RF Pads and DC Bias Pads
- Includes DC Blocks and RF Bias Networks
- 23 dBm power handling in terminated port
- RoHS* Compliant

Applications
- Aerospace & Defense

Description
The MASW-011036 is a high power SPDT with 50 Ω terminated RF ports. This broadband, high linearity, SPDT switch die was developed for Ka–Band applications that require up to 13 Watts CW power handling at an environmental temperature of +85°C while maintaining low insertion loss and high isolation.

The SPDT MMIC utilizes MACOM's proven AlGaAs PIN diode technology. The switch is fully passivated with silicon nitride and has an added polymer layer for scratch protection. The protective coating prevents damage to the junction and the anode air-bridge during handling and assembly. The die has backside metallization to facilitate an epoxy die attach process.

Functional Diagram



Pin Configuration:
(Back Metal is RF, DC, and Thermal Ground)

Pin #	Function
1	RF_{COMMON}
2	BIAS 1
3	RF1
4	RF2
5	BIAS 2

Ordering Information[1]

Part Number	Package
MASW-011036-1413WR	Separated Die on 7” Grip Ring[1], Electronic Map
MASW-011036-1413RI	Separated Die on 7” Grip Ring[1], Inked Wafer
MASW-011036-14130G	Die in Gel Pack[1]
MASW-011036-001SMB	Sample Evaluation Board

1. Die quantity varies.

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

Electrical Specifications:
Freq. = 28 - 30 GHz, T_A = +25°C, +4 V @ +25 mA / -15 V @ 0 mA, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	26 - 28 GHz 28 - 32 GHz 32 - 36 GHz 36 - 40 GHz	dB	—	0.80 0.70 0.70 1.5	— 1.0 — —
Isolation[2]	26 - 28 GHz 28 - 32 GHz 32 - 36 GHz 36 - 40 GHz	dB	— 34 — —	38 40 40 40	—
Input / Output Return Loss On state	26 - 28 GHz 28 - 32 GHz 32 - 36 GHz 36 - 40 GHz	dB	— 13 — —	20 20 20 12	—
RF1, 2 Return Loss, Off state	26 - 28 GHz 28 - 32 GHz 32 - 36 GHz 36 - 40 GHz	dB	— 7.5 — —	8 10 18 18	—
Switching Speed-T_{ON}	50% DC to 90% RF	ns	—	30	—
Switching Speed-T_{OFF}	50% DC to 10% RF	ns	—	21	—
Rise Time -T_{RISE}	10% to 90% RF	ns	—	10	—
Fall Time - T_{FALL}	90% to 10% RF	ns	—	8	—
CW Input Power[3]	-25 V @ +85°C	dBm	—	41.2	—
Reverse Bias Voltage[3]	—	V	-32	-15	-5
Reverse Bias Current[3]	-15 V	nA	—	25	—
Forward Bias Current[4]	+4 V	mA	—	25	—

2. Isolation defined with 1 port in low loss state.
3. Reverse bias voltage should be determined based on working conditions. For example, -25 V @ 41.2 dBm input power. For lower power applications, a less negative voltage can be used. R. Caverly and G. Hiller, “Establishing the Minimum Reverse Bias for a P-I-N Diode in a High Power Switch,” IEEE Transactions on Microwave Theory and Techniques, Vol.38, No.12, December 1990.
4. Forward bias voltage should be determined based on working conditions.

Absolute Maximum Ratings[5,6]

Parameter	Absolute Maximum
DC Reverse Bias Voltage	50 V
Forward Bias Current	60 mA
CW Incident Power (Low Loss Port)	41 dBm @ +85°C 43 dBm @ +25°C
CW Incident Power (Terminated Port)	23 dBm @ +85°C 26 dBm @ +25°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.

Truth Table

RF_{COMMOM} Path	Bias 1	Bias 2
RF1 Insertion Loss RF2 Isolation	-15 V (0 mA)	+4 V (+25 mA)
RF2 Insertion Loss RF1 Isolation	+4 V (+25 mA)	-15 V (0 mA)

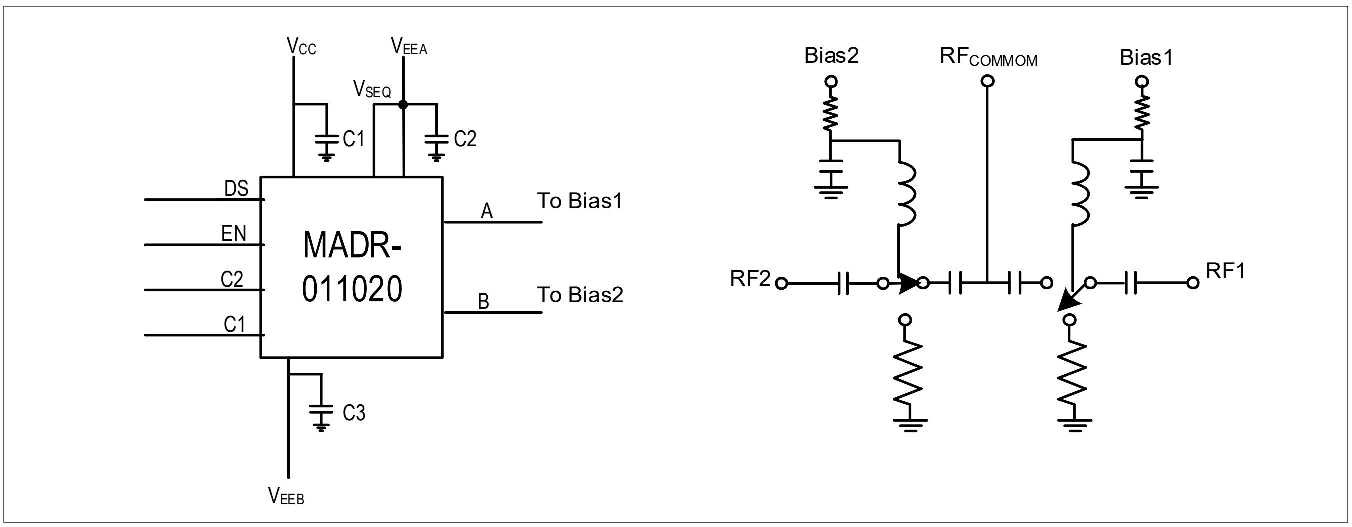
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits 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 1A devices.

MASW-011036 with MADR-011020 Driver Application Schematic[7]



7. V_{CC} = +5 V and V_{EEB} = -24 V.

Parts List

Part	Value
C1, C3	0.1 µF
C2	47 pF

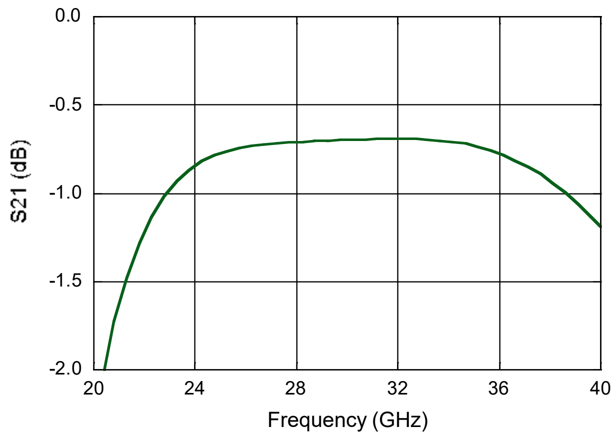
Switch Minimum Reverse Bias Voltage[3,8]

Frequency (GHz)	DC Voltage (V) Bias1 & Bias2
26	-16
30	-14
34	-12
38	-11
40	-11

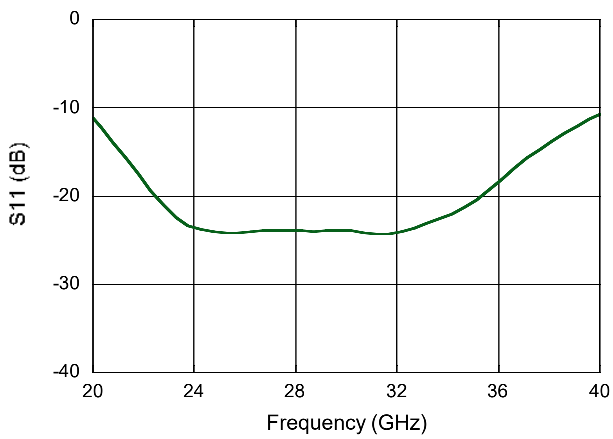
8. Calculated (see note 3) minimum DC bias voltage to maintain low loss under 41.2 dBm of power with 1.5:1 VSWR.

Typical Performance @ +25°C

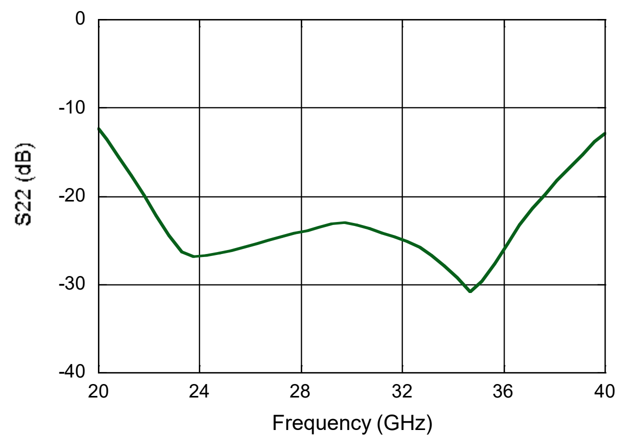
Insertion Loss (On State)



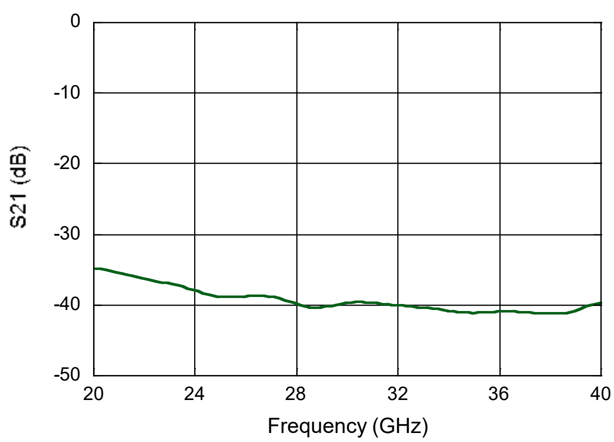
RF_{COMMON} Return Loss (On State)



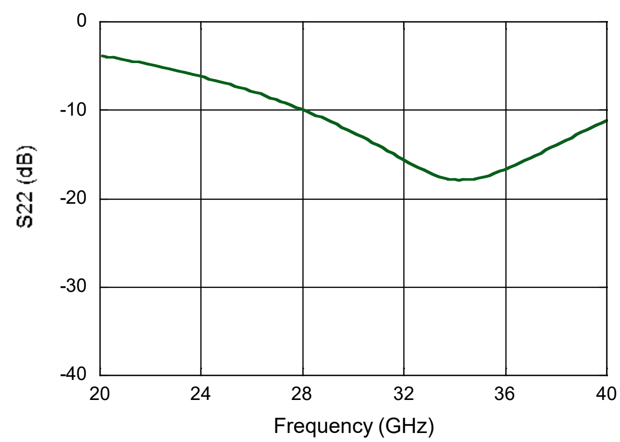
RF1, 2 Return Loss (On State)



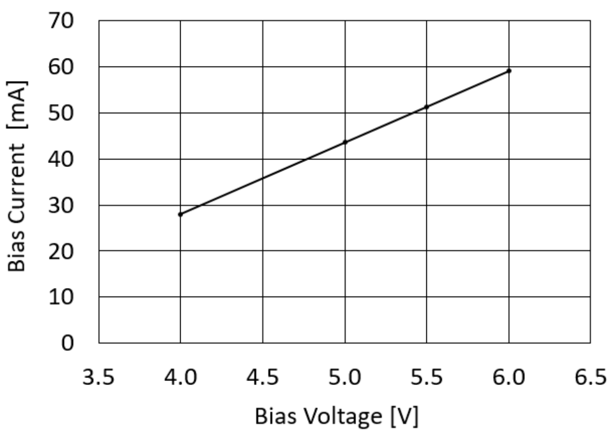
Isolation (Off State)



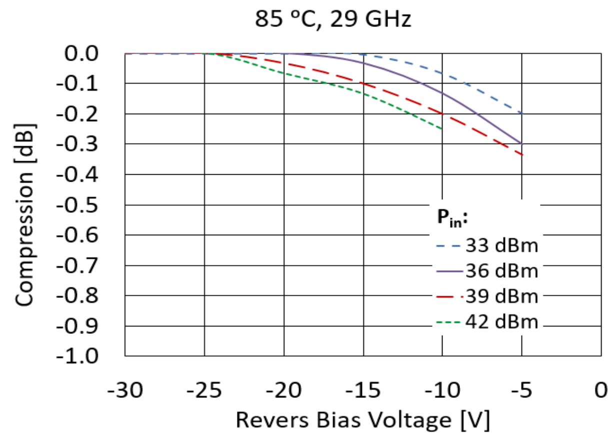
RF1, 2 Return Loss (Off State)



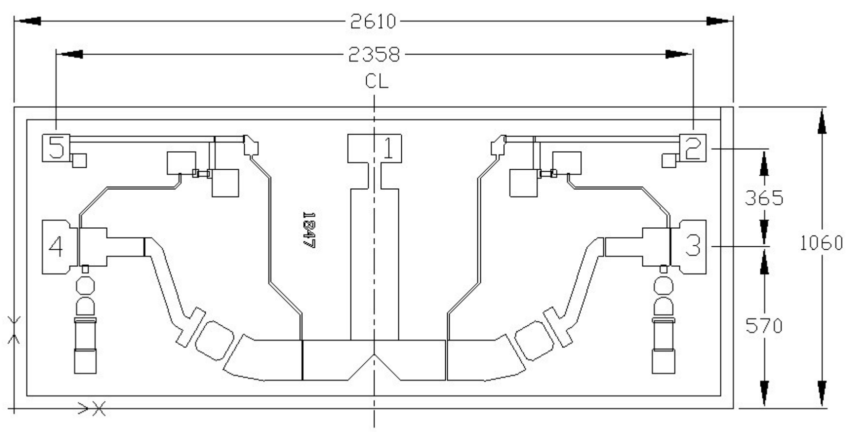
Forward Bias Current vs Bias Voltage



Compression vs Reverse Bias Voltage



Die Outline



Dimensions indicated in µm.
Die Thickness: 100 µm
RF Pads (1, 3, 4): 100 x 200 µm.
DC Bias Pads (2 & 5): 100 x 100 µm.
Meets JEDEC moisture sensitivity level 1 requirements.