MASW-011036



Ka-Band High Power Terminated SPDT PIN Switch 26-40 GHz

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

Description

The MASW-011036 is a high power SPDT with 50 Ω terminated RF ports. This broadband, high linearity, SPDT switch 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 airbridge during handling and assembly. The die has backside metallization to facilitate an epoxy die attach process.

Ordering Information¹

| Part Number | Package |
|--------------------|-----------------------------------------------|
| MASW-011036-1413WR | Separated Die on 7" Grip Ring ¹ |
| MASW-011036-14130G | Die in Gel Pack ¹ |

1. Die quantity varies.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

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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.

Functional Diagram



Pin Configuration:

(Back Metal is RF, D.C., and Thermal Ground)

| Pin | Function | | |
|-----|----------------------|--|--|
| 1 | RF _{COMMON} | | |
| 2 | BIAS 1 | | |
| 3 | RF1 | | |
| 4 | RF2 | | |
| 5 | BIAS 2 | | |

Die Outline



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

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Rev. V5

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Electrical Specifications:

Freq. = 28 - 30 GHz, T_A = +25°C, +4.0 V @ +25 mA / -15 V @ 0 mA, Z_0 = 50 Ω

| Parameter | Test Conditions | Units | Min. | Тур. | 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 | | |
|----------------------------------------|------------------|--|--|
| Reverse Bias Voltage | -50 V | | |
| Forward Bias Current | 40 mA | | |
| CW Incident Power | 43 dBm | | |
| CW Incident Power (Terminated Port) | 26 dBm | | |
| 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.

M/ACOM does not recommend sustained operation near these survivability limits.

Truth Table^{3,4}

| 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) |

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Typical Performance @ 25°C

Insertion Loss (On State)



RF_{COMMON} Return Loss (On State)







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RF1, 2 Return Loss (Off State)



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