MD211

SPDT reflective switch

- frequency range 0.2…40 GHz
- insertion loss < 0.6 dB
- isolation < 35 dB

Application

- telecommunications
- radars
- test and measurement equipment

The MD211 is a Single-Pole Double-Throw (SPDT) reflective switch, based on AlGaAs / GaAs PIN diode technology.

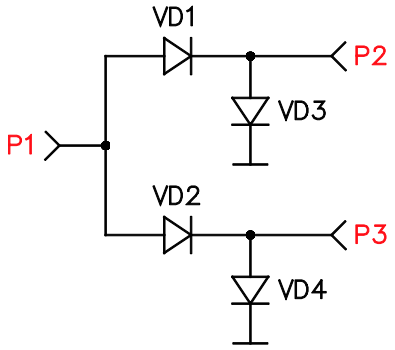
Electrical specifications (T = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
ΔF	Frequency range	0.2	—	40	GHz
IL_{ON}	Insertion loss	—	—	0.6	dB
IL_{OFF}	Isolation	35	—	—	dB
T_{SW}	Switching speed	—	—	20	ns

Absolute maximum ratings

Parameter	Value	Unit
RF Input Power	+24	dBm
Breakdown voltage	−20	V
Bias current	±30	mA
Operating temperature	−40…+85	°C
Storage temperature	−55…+150	°C

Circuit diagram



Operation

The switch is controlled by using external power circuits in accordance with the MMIC switching diagram and the state table. To comply with the required operating frequency range, the values of external capacitances and inductances should be selected. A resistor is installed to limit the forward current through diodes. In order to obtain a forward current in the range of +5...+15 mA (−5...−15 mA), it is necessary to apply a total voltage in the range of +1.1...+1.5 V (−1.1...−1.5 V) to the port P2 or P3. To control the microwave signal with power exceeding 7 dBm, use external power circuits with reverse voltage supplied to:

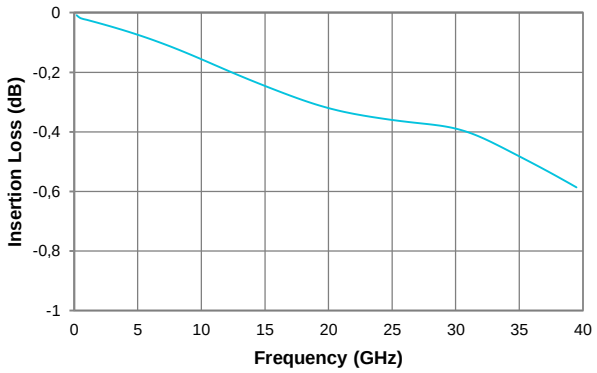
— diodes VD2 and VD3 for the St1 state;
— diodes VD1 and VD4 for the St2 state.

State table

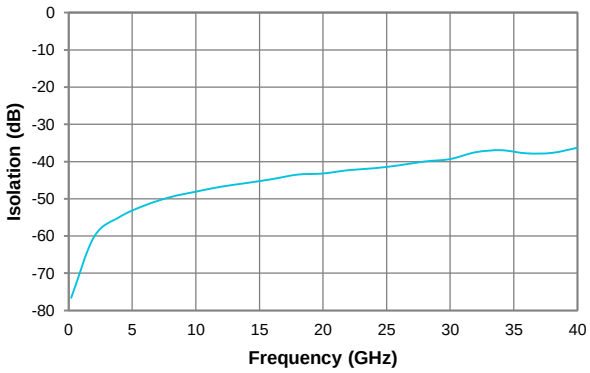
MMIC state	Control signal, mA		State description	
	CTRL 2	CTRL 3	P1↔P2	P1↔P3
St1	−5…−15	+5…+15	Low loss	Isolation
St2	+5…+15	−5…−15	Isolation	Low loss

Typical characteristics (T = 25 °C)

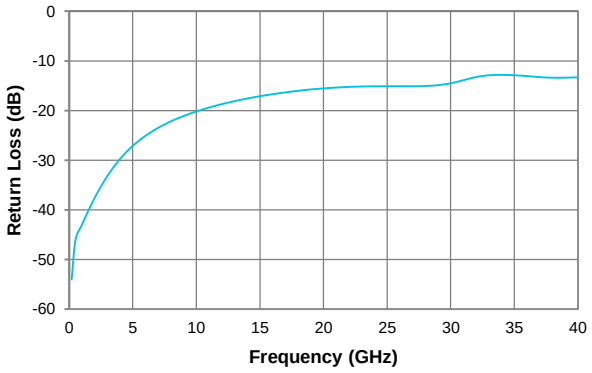
Insertion Loss



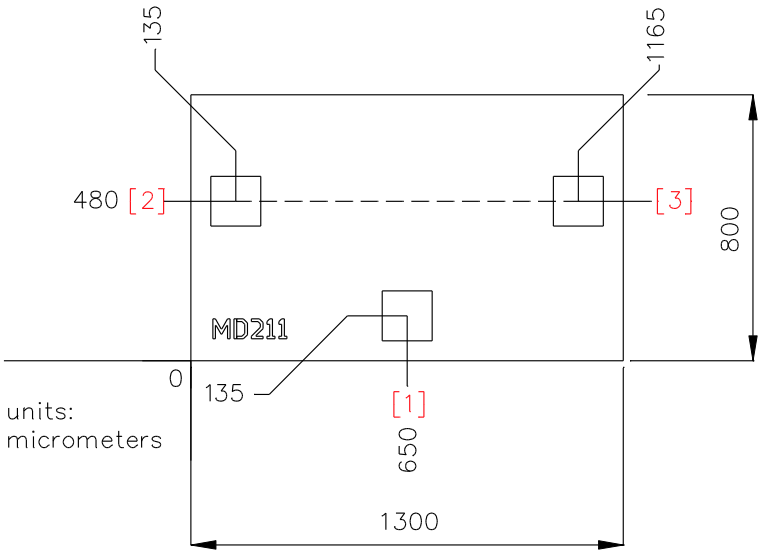
Isolation



Return Loss



Mechanical data



— Die thickness 100 µm ±5.
— These parameters are specified for the switch before wafer dicing. The following deviations should be taken into account: −30…−40 µm for size measurement of die and 0…−40 µm for pad coordinates.
— Bond pad and backside are metallized with gold.
— RF pads are 100 × 100 µm.

Pad number	Port	Description	Pad size (X, Y), μm^2
1	P1	RF COM	100 × 100
2	P2	RF input 1	
3	P3	RF input 2	

Application notes

Mounting
The chip is back-metallized with gold and can be die mounted with AuSn eutectic alloy or with electrically conductive adhesive. The mounting surface should be clean and flat. The 50 Ohm Microstrip transmission, mounted on 0.127 mm thick alumina and thin film substrates, is recommended for bringing RF to and from the chip (Figure 1). One way to accomplish this is to attach the 0.102 mm thick die to a 0.150 mm thick molybdenum heat spreader (molytab) which is then attached to the ground plane (Figure 2). Typical die-to-substrate spacing is 0.1 mm. Do not expose die to a temperature above 300 degrees for more than 10 seconds.

Wire Bonding
Microstrip substrates should be brought as close to the die as possible in order to minimize ribbon bond length. Recommendation for RF pads is two wires diameter 25 µm or a foil stripe with minimal length.

DC coupling
All ports are DC coupled. RF Input port should be DC blocked externally using a series capacitor whose value has been chosen
to pass the necessary frequency range.

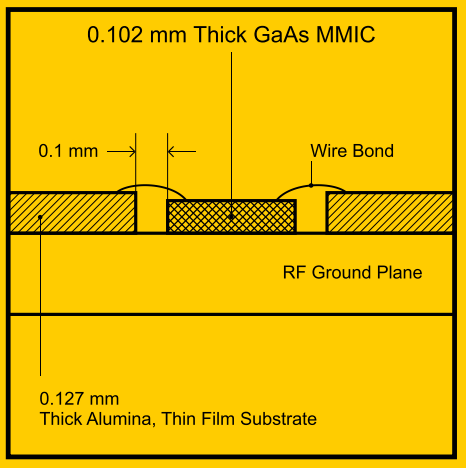


Figure 1.

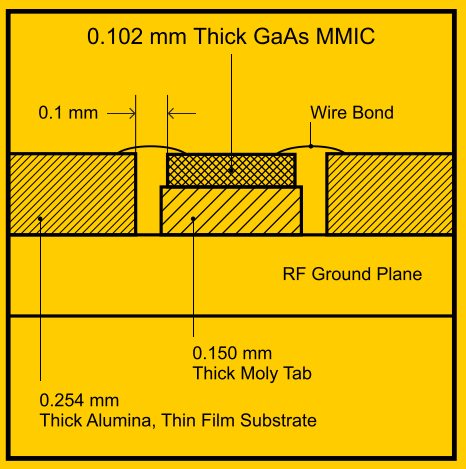


Figure 2.

Recommended ESD Management

This device is susceptible to electrostatic and mechanical damage. Dies are supplied in antistatic containers, which should be opened in cleanroom conditions at an appropriately grounded antistatic workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.