

# MD213

## SP4T GaAs PIN diode switch, reflective



- frequency range 0.2...40 GHz
- insertion loss < 1 dB
- isolation < 35 dB

### Application

- test and measurement equipment
- communications
- radars

The MD213 is a reflective, Single-Pole Four-Throw (SP4T) switch based on AlGaAs / GaAs PIN diode technology.

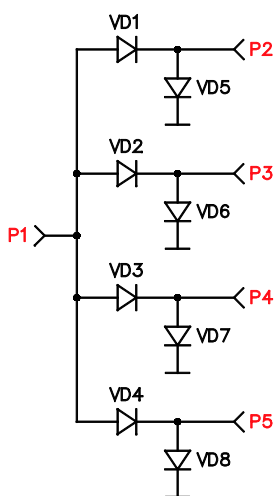
### Electrical specifications (T = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$\Delta F$	Frequency range	0.2	—	40	GHz
$IL_{ON}$	Insertion loss	—	—	1	dB
$IL_{OFF}$	Isolation	35	—	—	dB
$T_{SW}$	Switching speed	—	—	20	ns

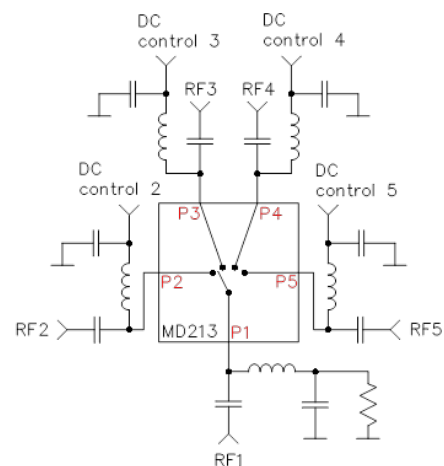
### Absolute maximum ratings

Parameter	Value	Unit
RF Input Power	+24	dBm
Breakdown voltage	-20	V
Bias current	$\pm 30$	mA
Operating temperature	-40...+85	°C
Storage temperature	-55...+150	°C

### Schematic circuit



### Application circuit



Specifications are subject to change without notice.

## 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. 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, P3, P4 and P5. To control the microwave signal with power exceeding 7 dBm, use external power circuits with reverse voltage supplied to:

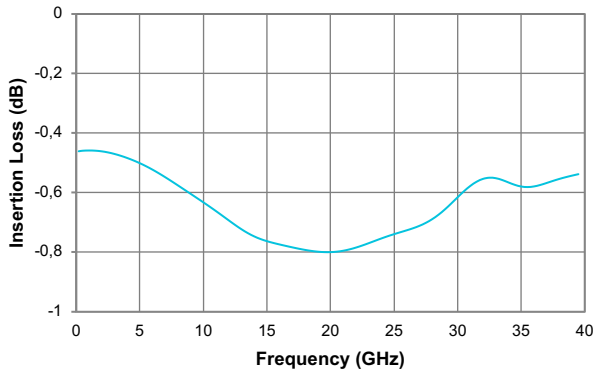
- diodes VD2, VD3, VD4 and VD5 for the St1 state;
- diodes VD1, VD3, VD4 and VD6 for the St2 state;
- diodes VD1, VD2, VD4 and VD7 for the St3 state;
- diodes VD1, VD2, VD3 and VD8 for the St4 state.

## State table

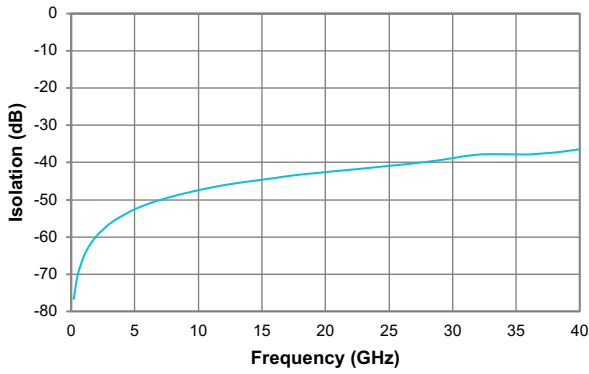
MMIC state	Control bias, mA				State description			
	CTRL 2	CTRL 3	CTRL 4	CTRL 5	P1↔P2	P1↔P3	P1↔P4	P1↔P5
St1	-5...-15	+5...+15	+5...+15	+5...+15	Low loss	Isolation	Isolation	Isolation
St2	+5...+15	-5...-15	+5...+15	+5...+15	Isolation	Low loss	Isolation	Isolation
St3	+5...+15	+5...+15	-5...-15	+5...+15	Isolation	Isolation	Low loss	Isolation
St4	+5...+15	+5...+15	+5...+15	-5...-15	Isolation	Isolation	Isolation	Low loss

Typical characteristics (T = 25 °C)

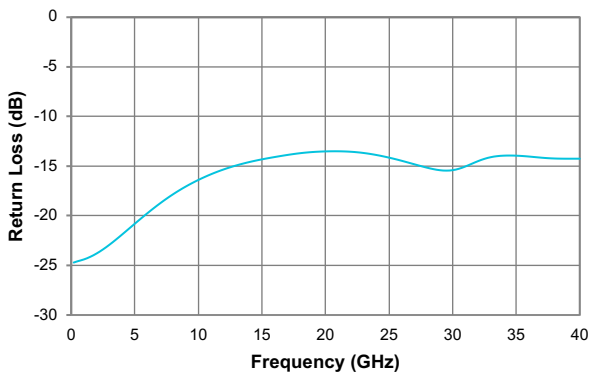
Insertion Loss



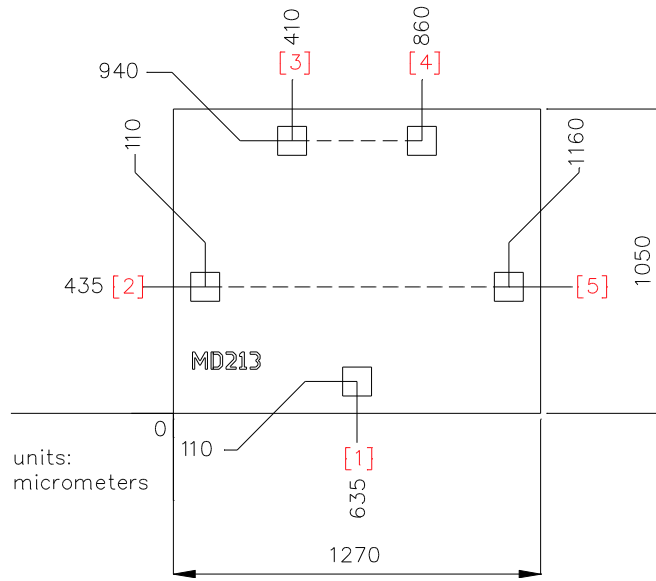
Isolation



Return Loss



**Mechanical data**



- Chip size before wafer dicing;
- Die thickness 100 μm;
- Bond pad and backside metallization: gold;
- RF pads are 100 × 100 μm.

Pad number	Port	Description
1	P1	RF COM
2	P2	RF input 1
3	P3	RF input 2
4	P4	RF input 3
5	P5	RF input 4

**Application notes**

**Mounting**

The chip is back-metallized and can be die mounted with AuSn eutectic preforms or with electrically conductive epoxy. The mounting surface should be clean and flat. The 50 Ohm Microstrip transmission lines on 0.127mm thick alumina thin film substrates are 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). Microstrip substrates should be located as close to the die as possible in order to minimize bond wire length. Typical die-to-substrate spacing is 0.1mm.

**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.

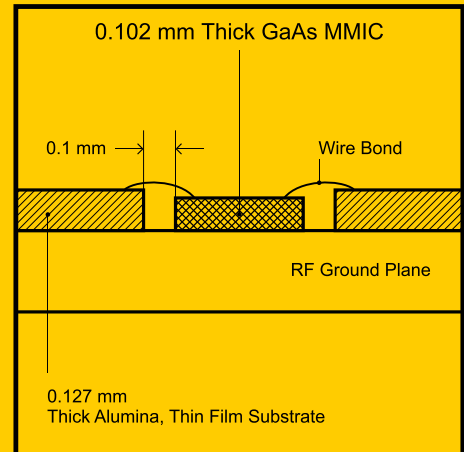


Figure 1.

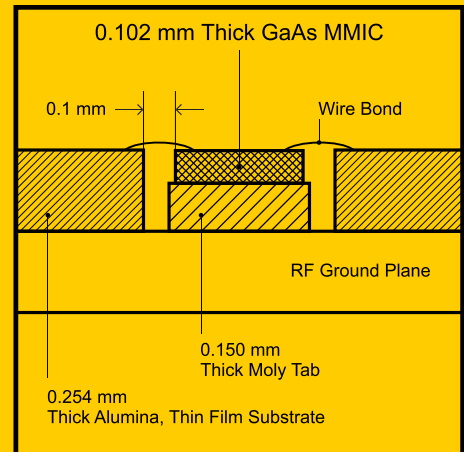


Figure 2.

**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.

