

MD214

SP5T reflective switch



- frequency range 0.2...40 GHz
- insertion loss < 1.2 dB
- isolation < 35 dB

Application

- telecommunications
- radars
- test and measurement equipment

The MD214 is a Single-Pole Five-Throw (SP5T) reflective switch, based on AlGaAs / GaAs PIN diode technology.

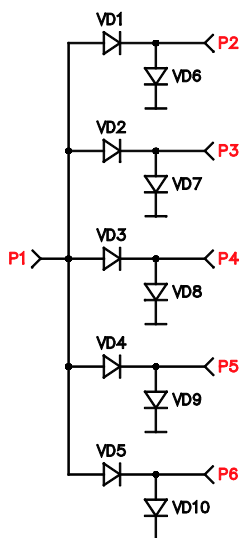
Electrical specifications (T = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
ΔF	Frequency range	0.2	—	40	GHz
IL_{ON}	Insertion loss	—	—	1.2	dB
IL_{OFF}	Isolation	35	—	—	dB
T_{SW}	Switching speed	—	—	20	ns

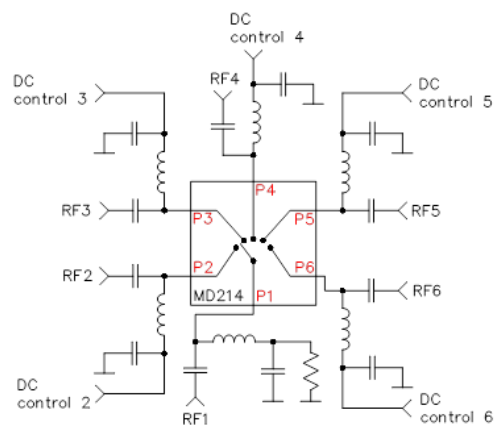
Absolute maximum ratings

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



Application circuit



Operation

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. 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, P3, P4, P5 and P6. To control the microwave signal with power exceeding 7 dBm, use external power circuits with reverse voltage supplied to:

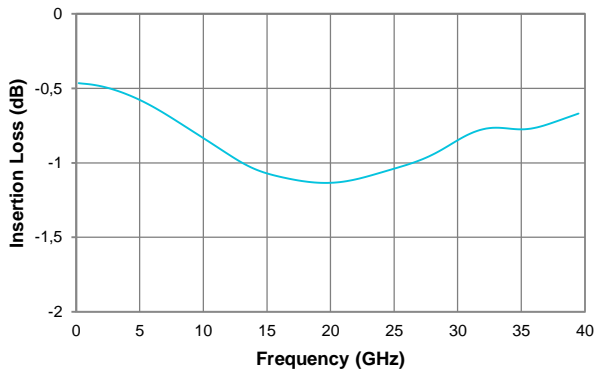
- diodes VD2, VD3, VD4, VD5 and VD6 for the St1 state;
- diodes VD1, VD3, VD4, VD5 and VD7 for the St2 state;
- diodes VD1, VD2, VD4, VD5 and VD8 for the St3 state;
- diodes VD1, VD2, VD3, VD5 and VD9 for the St4 state.
- diodes VD1, VD2, VD3, VD4 and VD10 for the St5 state.

State table

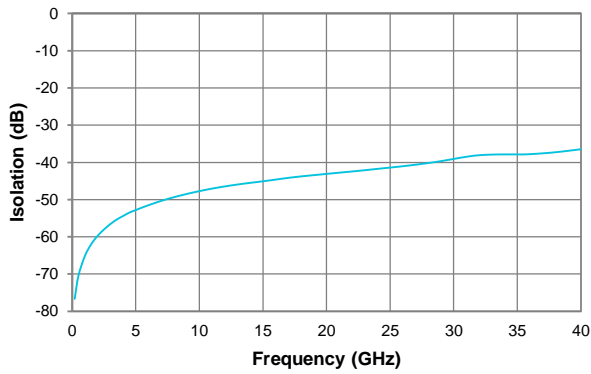
MMIC state	Control signal, mA					State description				
	CTRL 2...CTRL6					P1↔P2	P1↔P3	P1↔P4	P1↔P5	P1↔P6
St1	-5...-15	+5...+15	+5...+15	+5...+15	+5...+15	Low loss	Isolation	Isolation	Isolation	Isolation
St2	+5...+15	-5...-15	+5...+15	+5...+15	+5...+15	Isolation	Low loss	Isolation	Isolation	Isolation
St3	+5...+15	+5...+15	-5...-15	+5...+15	+5...+15	Isolation	Isolation	Low loss	Isolation	Isolation
St4	+5...+15	+5...+15	+5...+15	-5...-15	+5...+15	Isolation	Isolation	Isolation	Low loss	Isolation
St5	+5...+15	+5...+15	+5...+15	+5...+15	-5...-15	Isolation	Isolation	Isolation	Isolation	Low loss

Typical characteristics (T = 25 °C)

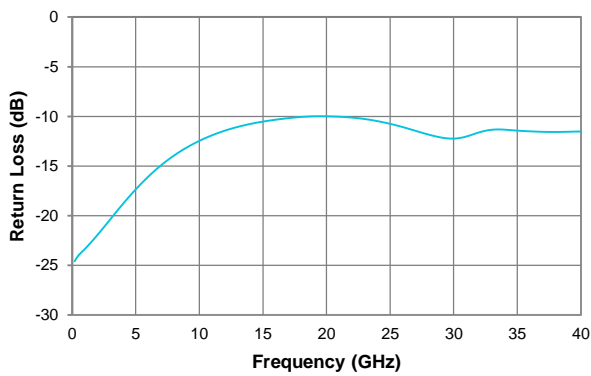
Insertion Loss



Isolation

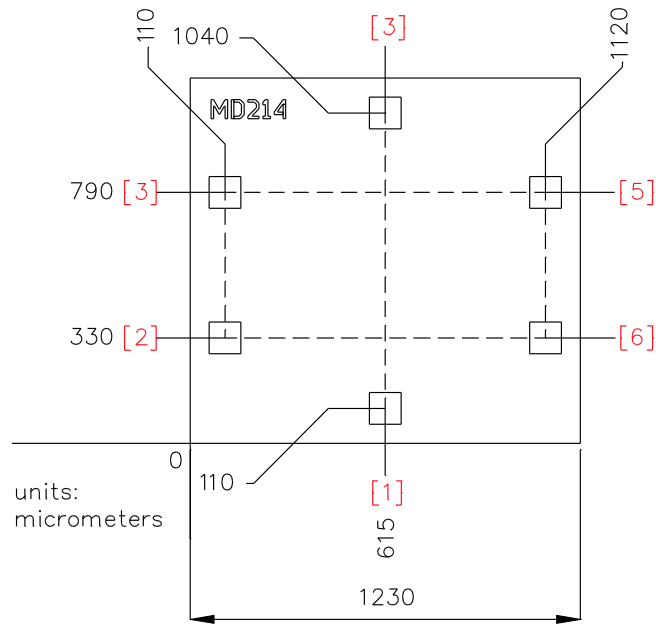


Return Loss



Specifications are subject to change without notice.

Mechanical data



- These parameters are specified for the switch before wafer dicing. The following deviations should be taken into account: $-30 \dots -40 \mu\text{m}$ for size measurement of die and $0 \dots -40 \mu\text{m}$ for pad coordinates.
- Die thickness: $100 \mu\text{m} \pm 5$.
- Bond pad and backside are metallized with gold.
- RF pads: $100 \times 100 \mu\text{m}$.

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	
4	P4	RF input 3	
5	P5	RF input 4	
6	P6	RF input 5	

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). 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. Do not expose die to a temperature above 300 degrees for more than 10 seconds.

Wire Bonding

It is recommended for RF pads to use two wires 25 µm in diameter or a foil stripe with minimal length.

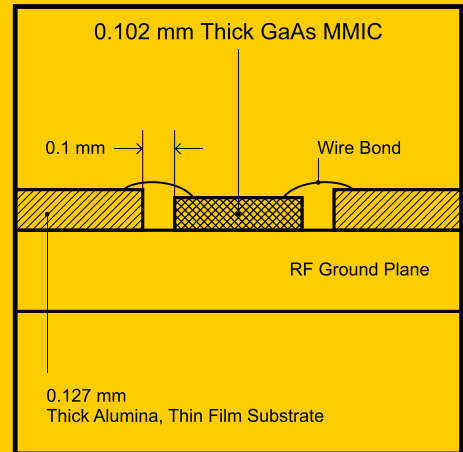


Figure 1.

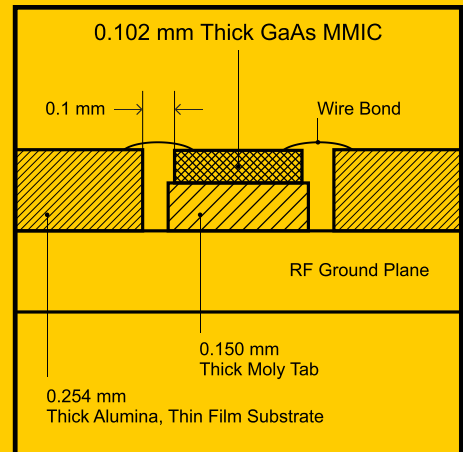


Figure 2.

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.

