MD902

Directional power detector 0.1…40 GHz

- frequency range 0.1…40 GHz
- dynamic range −35…+23 dBm
- square-law detection range −35…+5 dBm
- insertion loss < 3 dB
- negative output voltage

Application

- test and measurement equipment
- communications
- radars

MD902 is a broadband directional power detector operating at a frequency range of 100 MHz to 40 GHz with typical insertion loss of < 3 dB. This MMIC is utilizing QZBD process based on a vertical GaAs zero bias diode. The MD902 is compatible with conventional die attach methods which make it ideal for MCM and hybrid microcircuit applications.

Electrical specifications (T = 25 °C)

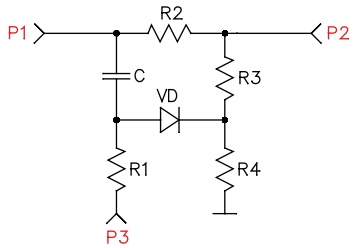
Symbol	Parameter	Min.	Typ.	Max.	Unit
ΔF	Frequency range	0.1	—	40	GHz
G	Voltage sensitivity	—	10	—	μV / μW
TSS	Tangential sensitivity	−34	—	—	dBm
D	Directivity *	8	12	—	dB

REMARK *Directivity is calculated as V21/V12, where V12 is output voltage in conditions when RF signal goes from port P1 (input) to port P2 (output), and V21 is output voltage in conditions when RF signal goes from port P2 (output) to port P1 (input) . V21 and V12 are obtained at the same frequency and power of RF signal.

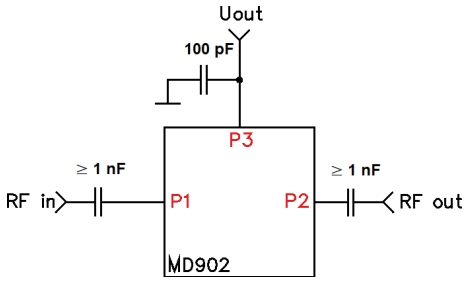
Absolute maximum ratings

Parameter	Value	Unit
RF input power	+30 (under load RF output 50 Ohm) +25 (without load RF output)	dBm
Operating temperature	−60…+100	°C
Storage temperature	−60…+150	°C

Schematic circuit

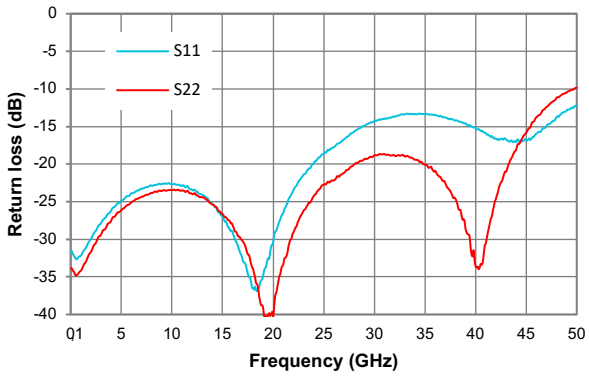


Application circuit

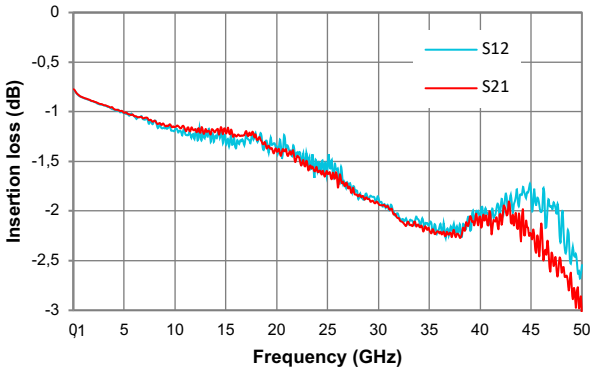


Typical characteristics (T = 25 °C)

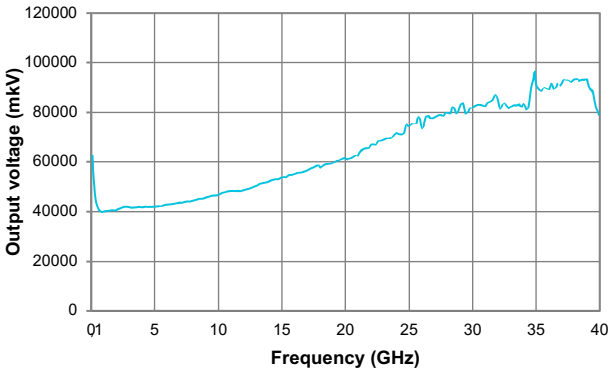
Return loss



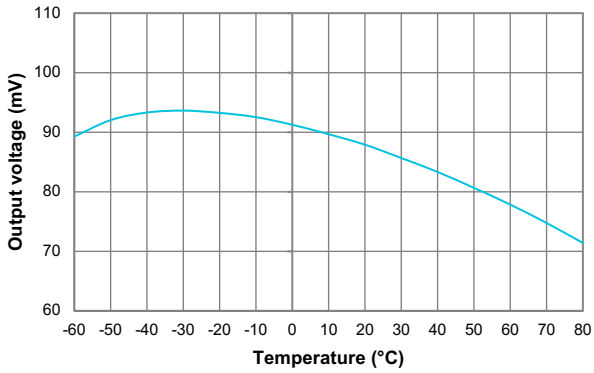
Insertion loss



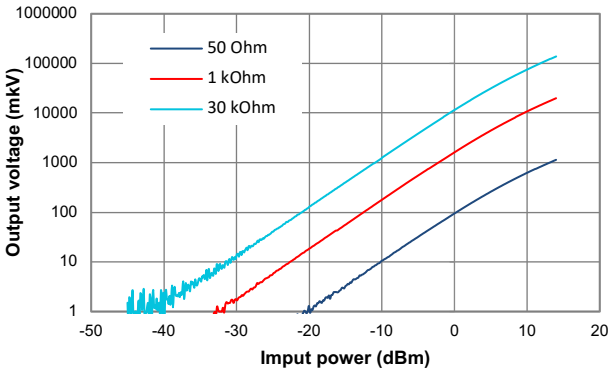
Vdet vs. Frequency, PIN = 10 dBm



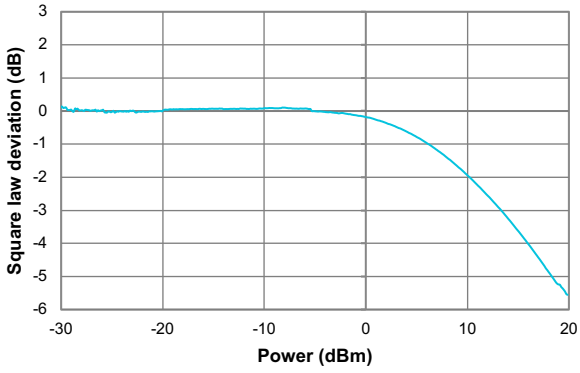
Vdet vs. Temp., f = 1 GHz, P_{IN} = 10 dBm



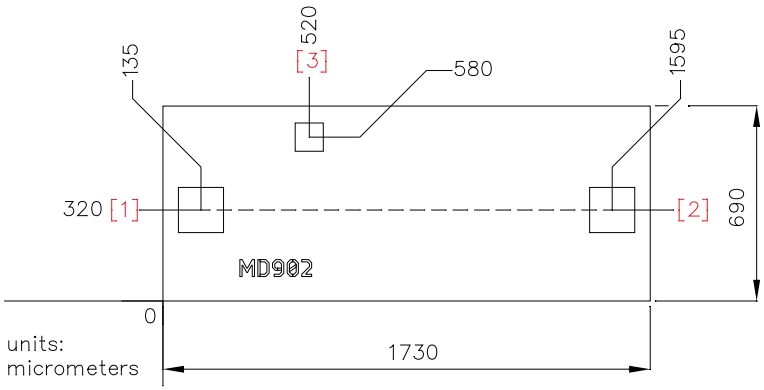
Transfer characteristics for different R_{Load}



Square-law deviation



Mechanical data



— All specified dimensions are valid before wafer dicing. Assume following tolerances: –30…–40 µm for chip size dimensions, 0…–40 µm for bond pad location distances;
— Die thickness 100±5 µm.

Pad number	Port	Description	Pad size (X × Y), µm
1	P1	RF input	160 × 160
2	P2	RF output	
3	P3	Negative voltage output (over GND)	100 × 100

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
Bond pad metallization: gold. Thermo-compression or thermo-sonic bonding techniques may be used to attach bonding wires, foil stripe or ribbon to bond pads. The length of connections should be as short as possible to obtain the best microwave performance.

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.

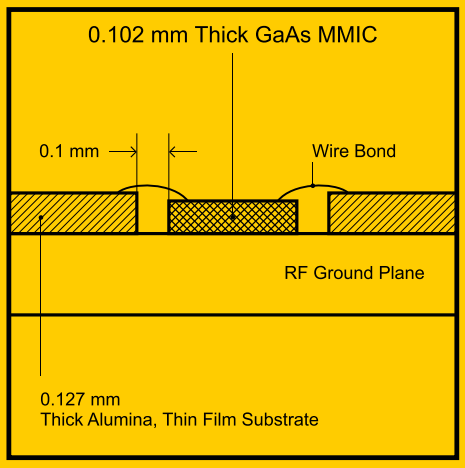


Figure 1.

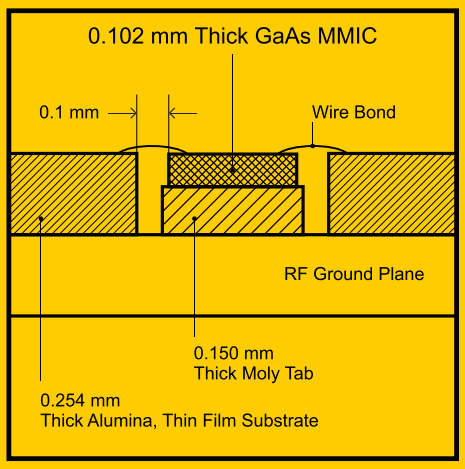


Figure 2.

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.