MD901

Power detector 0.01…50 GHz

- frequency range 0.01…50 GHz
- dynamic range −50…+20 dBm
- square-law detection up to +20 dBm
- output voltage: positive, negative or differential
- no DC bias required

Application

- test and measurement equipment
- radars
- communications

The MD901 is a single-ended, internally-matched power detector that provides RMS detection from -50 to 20 dBm. MMIC includes two detector paths that can be used to extend the square-law detection range. Wide frequency range from 10 MHz to 50 GHz makes detector effective for different applications. This MMIC utilizes QZBD process that is based on a vertical GaAs zero bias diode.

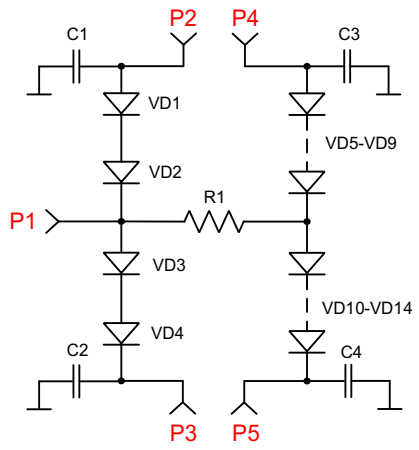
Electrical specifications (T = 25 °C)

Symbol	Parameter	Min.	Typ.	Min.	Unit
ΔF	Frequency range	0.01	—	50	GHz
G	Voltage sensitivity: low-power path high-power path	 — —	 480 0.2	 — —	μV/μW
TSS	Tangential sensitivity: low-power path high-power path	 −52 −24	 — —	 — —	dBm

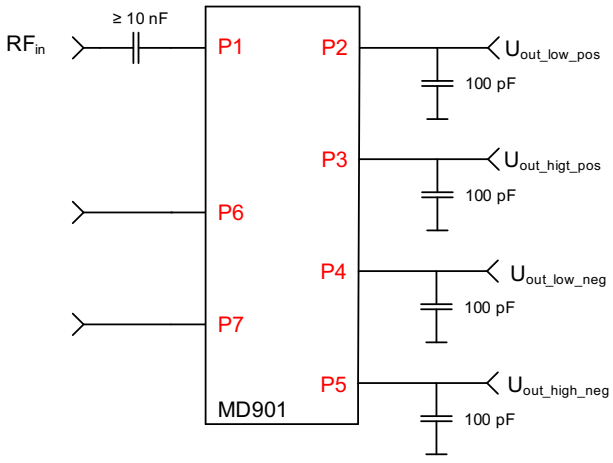
Absolute maximum ratings

Parameter	Value	Unit
RF input power	+23	dBm
Operating temperature	−60…+100	°C
Storage temperature	−60…+150	°C

Schematic Circuit

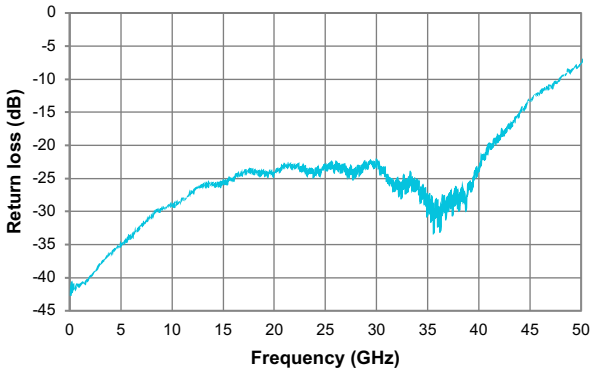


Application circuit

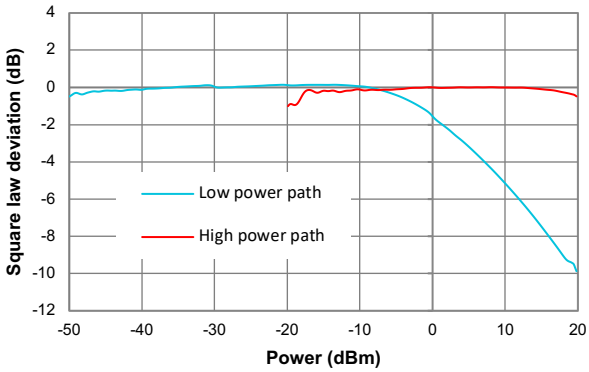


Typical characteristics (T = 25 °C)

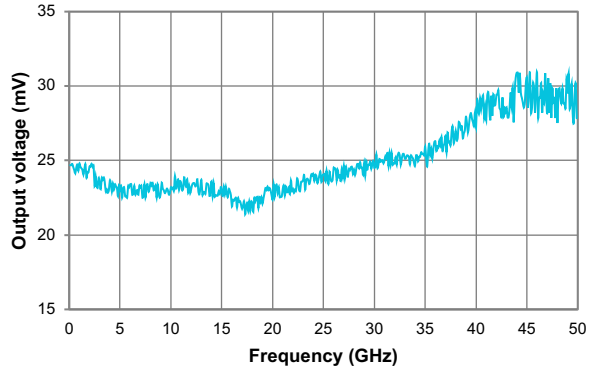
Return loss



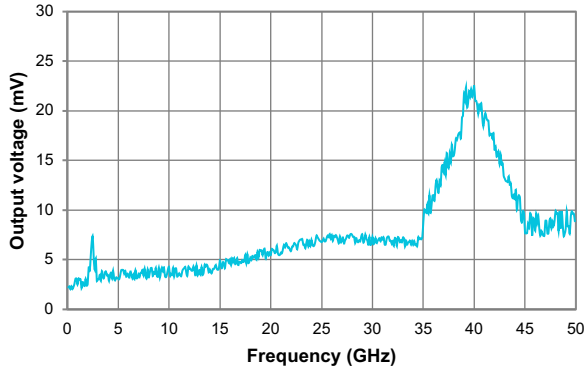
Square-law deviation



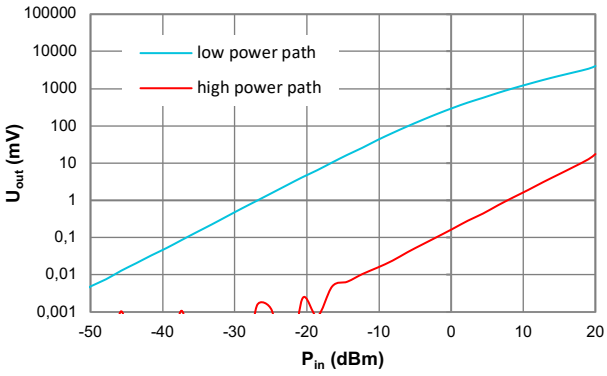
Low power frequency response



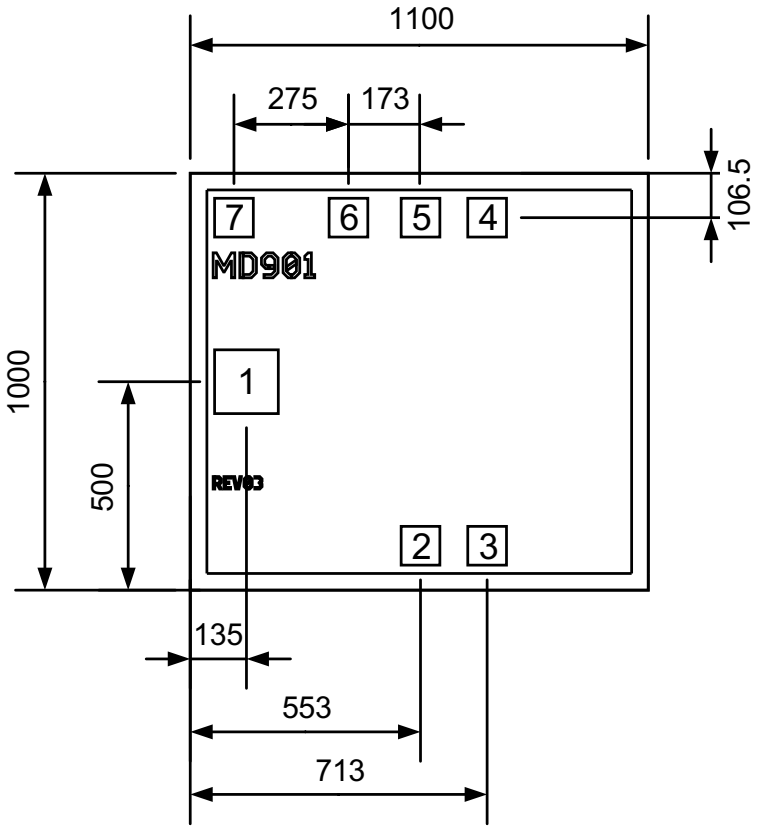
High power frequency response



Transfer characteristic



Mechanical data



- Chip size 1100×1000 μm^2 (before wafer dicing);
- Die thickness 100 μm;
- Bond pad location is shown as a distance from 0-point to the center of the bond pad;
- Bond pad and backside metallization: gold.

Pad number	Port	Description	Pad size (X×Y), μm
1	RF_Input	RF input	160×160
2	V_{High_Pos}	Positive voltage output (High power path)	100×100
3	V_{High_Neg}	Negative voltage output (High power path)	
4	V_{Low_Neg}	Negative voltage output (Low power path)	
5	V_{Low_Pos}	Positive voltage output (Low power path)	
6	—	Reference diode cathode	
7	—	Reference diode anode	

Differential output voltage is obtained between V_{Pos} and V_{Neg} pads:
$V_{Low\_Dif} = |V_{ow\_Pos}| + |V_{Low\_Neg}|$
$V_{High\_Dif} = |V_{High\_Pos}| + |V_{High\_Neg}|$

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. 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 0.102mm thick die to a 0.150mm 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. hittate

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.

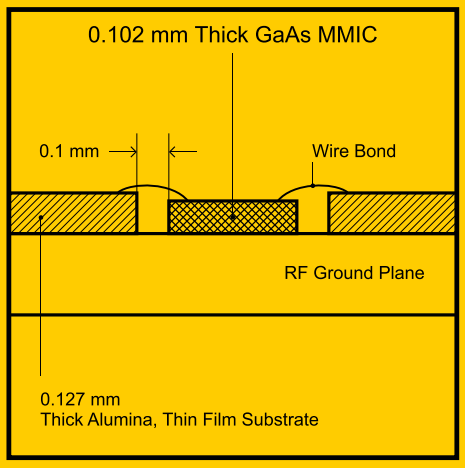


Figure 1.

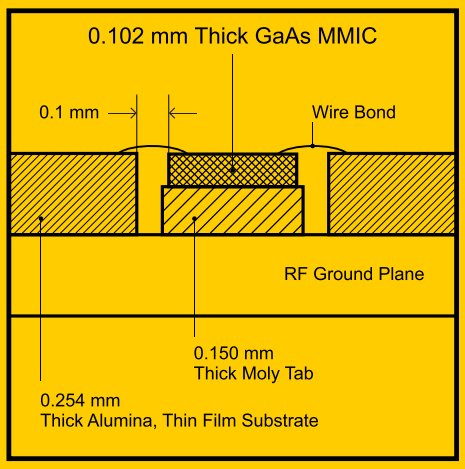


Figure 2.

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.