

MD701

GaAs MMIC x2 passive frequency multiplier 5...13 GHz



- frequency range input 5...13 GHz
- frequency range output 10...26 GHz
- conversion loss < 14 dB
- F0 Isolation > 35 dB
- RF max power input $P_{max} = +27$ dBm
- RF power input $P_{in} = +15$ dBm
- die size 2100 × 1300 μm

Application

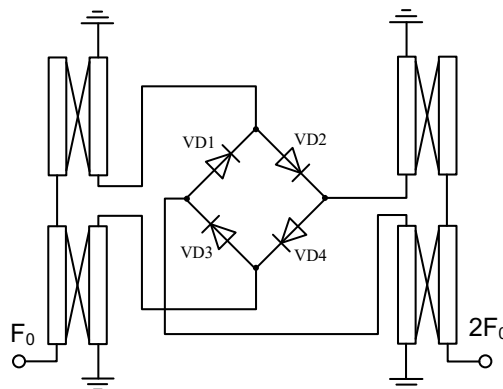
- communications
- radars
- test and measurement equipment

The MD701 is a x2 passive frequency multiplier based on GaAs Schottky diode technology. Requires no external components or matching circuitry. It is ideally suited for applications where small size is needed. Does not require DC biasing. Input frequency range of 5 to 13 GHz, output frequency range of 10 to 26 GHz. Suppression of undesired fundamental and higher order harmonics is up to 35 dB typical with respect to input signal level. The MD701 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. | Min. | Typ. | Max. | Min. | Typ. | Max. | Unit |
|------------------|------------------------|------|---------|------|------|---------|------|------|---------|------|------|
| P_{IN} | RF power input | | +10 | | | +12 | | | +15 | | dBm |
| ΔF_{IN} | Frequency range input | | 5...13 | | | 5...13 | | | 5...13 | | GHz |
| ΔF_{OUT} | Frequency range output | | 10...26 | | | 10...26 | | | 10...26 | | GHz |
| CL | Conversion loss | — | 16 | 19 | — | 14 | 17 | — | 12 | 14 | dB |
| ISO_{F_0} | F0 isolation | — | — | — | — | 35 | — | 38 | 40 | 45 | dB |
| ISO_{3F_0} | 3F0 isolation | — | — | — | — | 40 | — | 43 | 45 | 50 | dB |
| ISO_{4F_0} | 4F0 isolation | — | — | — | — | 30 | — | 27 | 30 | 33 | dB |
| P_{MAX} | RF max power input | | | | | +27 | | | | | dBm |

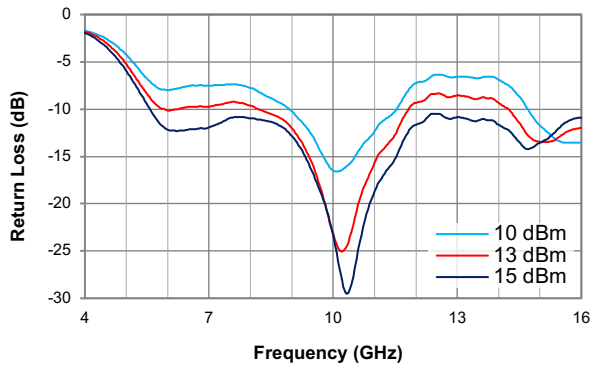
Circuit schematic



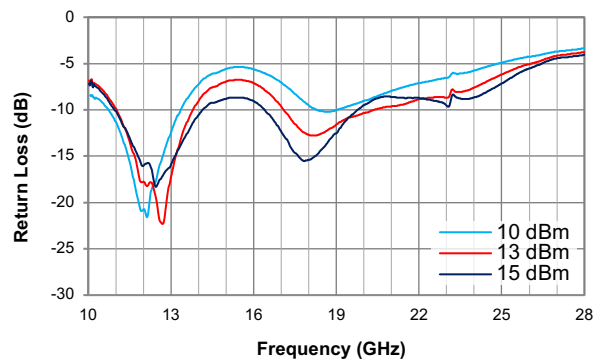
Specifications are subject to change without notice.

Typical characteristics (T = 25 °C)

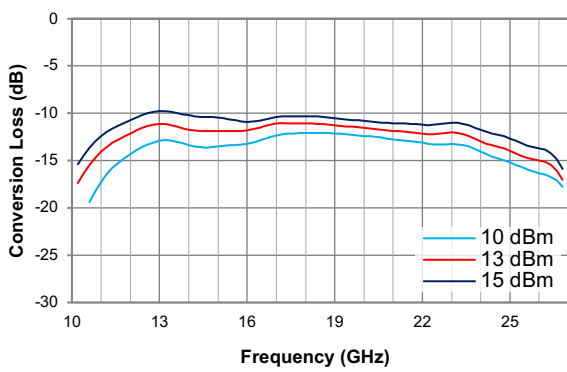
Return Loss, S11



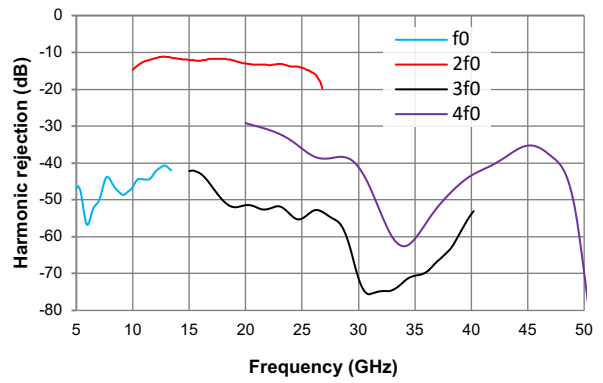
Return Loss, S22



Conversion Loss



Harmonic Rejection



REMARK All measurements performed with RF input power $P_{IN} = +15$ dBm.

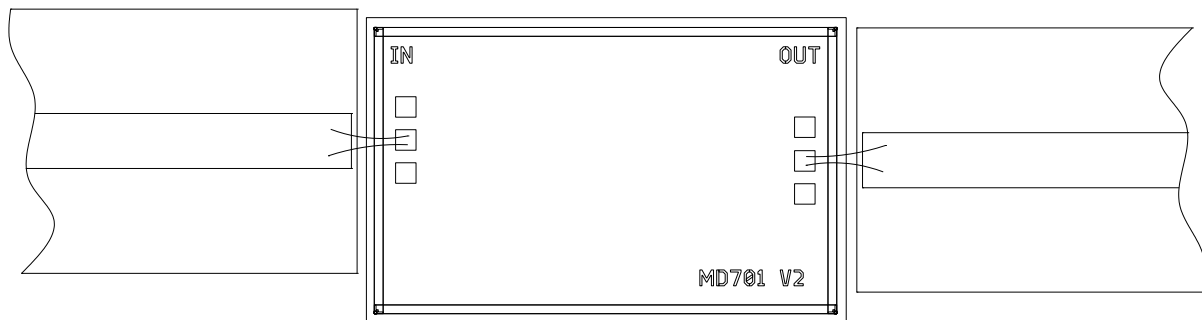
Mechanical data



- Chip size 2100 × 1300 μm (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;
- RF pads 100 × 100 μm.

| Pad number | Port | Description |
|------------|------|------------------|
| 1 | IN | RF input F_0 |
| 2 | OUT | RF output $2F_0$ |
| 3 | — | GND |
| 4 | — | GND |
| 5 | — | GND |

Assembly diagram



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 0.102mm 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

A recommendation for RF pads (1, 2) is two wires: diameter 25 µm, length 300 µm.

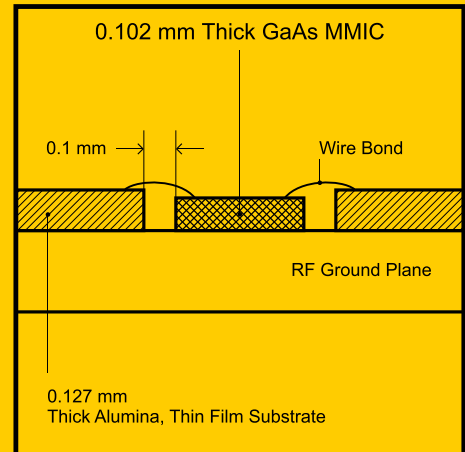


Figure 1.

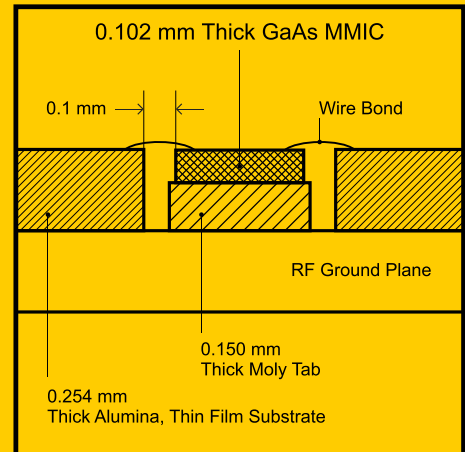


Figure 2.

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.

