

MP540

0.01...20 GHz Wideband Amplifier



- frequency range 0.01...20 GHz
- small-signal gain 14 dB
- output power (P1dB) 23 dBm
- noise figure 4 dB

Application

- telecommunications
- radars
- test and measurement equipment

The distributed amplifier MP540 is well suited for a range of microwave application and systems. This chip is manufactured using 0.25 μm pHEMT technology. The MMIC uses gold bond pads and backside metallization and are fully protected with Silicon Nitride passivation to obtain the highest level of reliability.

Electrical Specifications (T = 25 °C)

Symbol	Parameter	Min.	Type	Max.	Unit
ΔF	Frequency range	0.01	—	20	GHz
S21	Small-signal gain	13.5	—	15	dB
S11	Input return loss	12	—	—	dB
S22	Output return loss	8	—	—	dB
S12	Reverse isolation	25	—	—	dB
NF	Noise figure 1...6 GHz	—	4	5.5	dB
NF	Noise figure 6...12 GHz	—	3.5	4	dB
NF	Noise figure 12...20 GHz	—	4	4.5	dB
P1dB	Output power for 1 dB compression	22	22.5	23	dBm
VDD	Supply voltage	—	+7.0	—	V
VGG1	Gate control voltage	—	-0.5	—	V
VGG2	Gate control voltage	—	+1.5	—	V
I _{DD}	DC current for circuit (VDD = +7.0 V)	—	120	—	mA

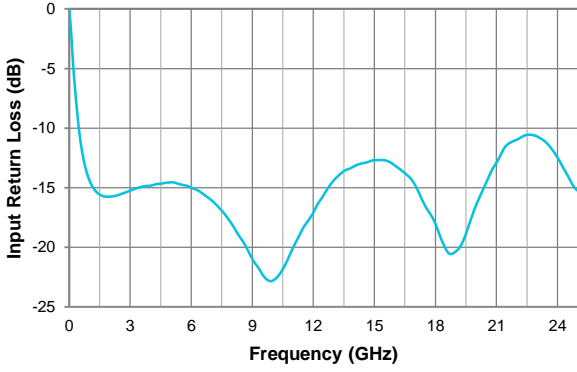
NOTE *Adjust VGG1 between -2 и 0 V (typ. -0.5 V), to achieve I_{DD} = 120 mA.

Absolute maximum ratings

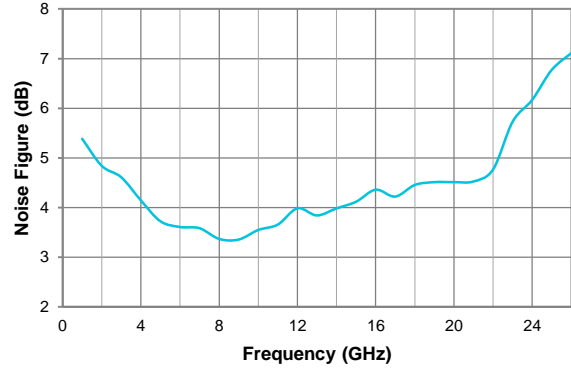
Parameter	Value	Unit
Supply voltage	+9	V
Operating temperature	-40...+85	°C
Storage temperature	-55...+125	°C

Typical characteristics (Vdd = +7 V, Vg1 = +1.5 V, Vgg2 = 1 V, T = 25 °C, Idd = 120 mA)

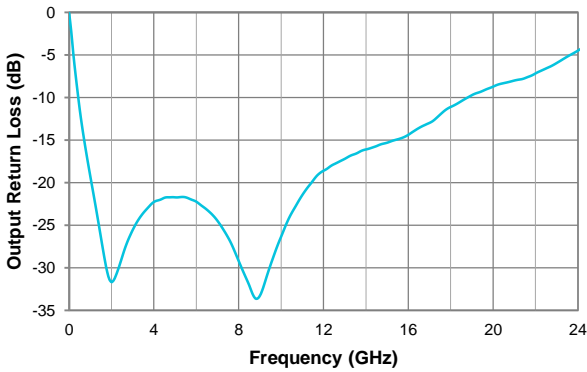
Input Return Loss



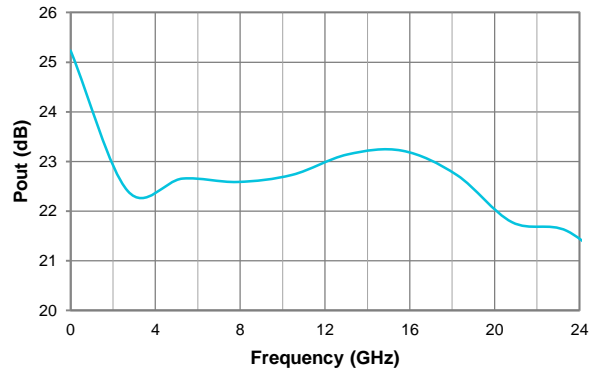
Noise Figure



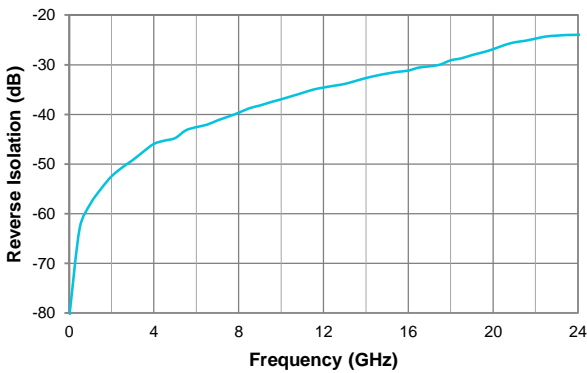
Output Return Loss



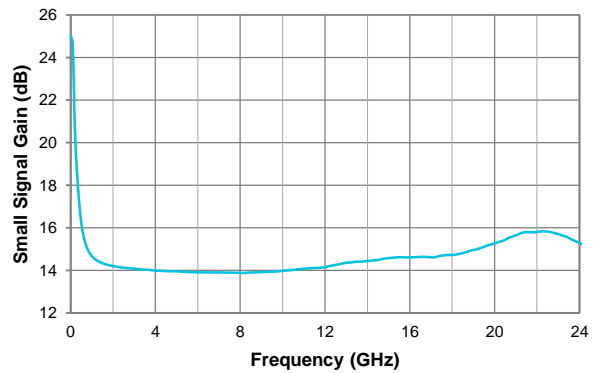
Pout



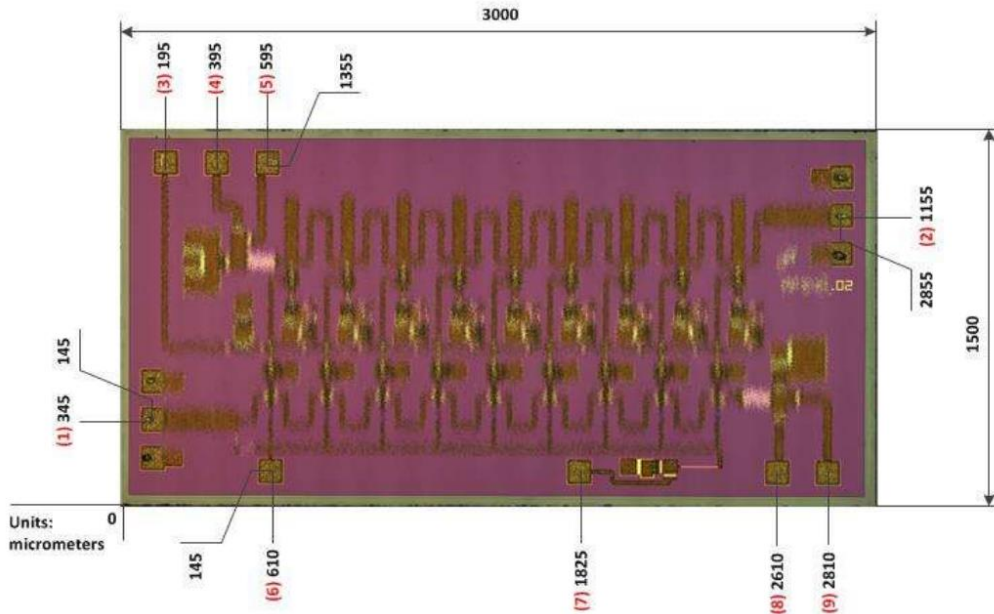
Reverse Isolation



Small Signal Gain



Mechanical data

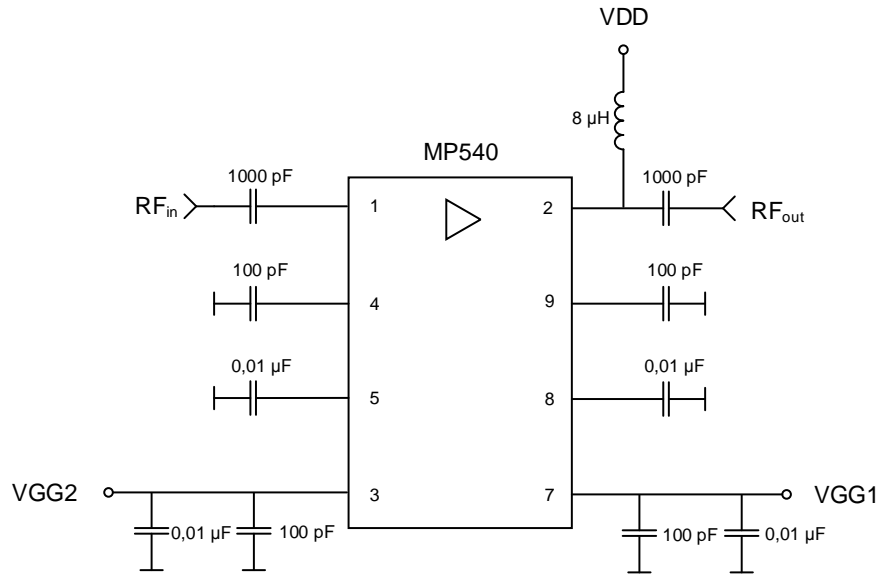


- Chip size is 1500×3000 μm (before wafer dicing), thickness is 100 μm.
- Position coordinates are shown for the bond pad center.
- Bond pad and backside are metallized with gold.
- RF pads are 100 × 100 μm.

Pad number	Pad ID	Voltage, V	Description
1	RF IN	—	RF input
2	RF OUT_DB	+7	RF supply voltage output and drain bias
3	VGG2	+1.5	Gate control VGG2
4,5,8,9	LFT	—	Low frequency termination
6	—	—	The pad is not connected
7	VGG1	-0.5	Gate control VGG1

NOTE *Adjust VGG1 between -2 to 0 V (typ.-0.5 V), to achieve I_{DD} = 120 mA.

Application circuit



Setup instructions

1. Ground the device
2. Set VGG1 to -2 V (no drain current)
3. Set VGG2 to $+1.5$ V (no drain current)
4. Set VDD to $+7$ V (no drain current)
5. Adjust VGG1 (VGG1 may be varied between -2 V and 0 V (typ. -0.5 V) to set I_{DD} to 120 mA)
6. Apply RF signal to input

Switching off Instruction

1. Remove RF signal from input
2. Remove VDD
3. Remove VGG2
4. Remove VGG1

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.

Wire Bonding

It is recommended for RF pads (1 and 2) to use one wire 25 µm in diameter and 450 µm in length. The recommendation for DC and control pads (3-5 and 7-9) is one wire 25 µm in diameter and length 700...1000 µm.

Bias Arrangement

The pads VD3 and VD7 need to have DC bypass capacitances of 100pF and 0.01 µF as close to the device as possible.

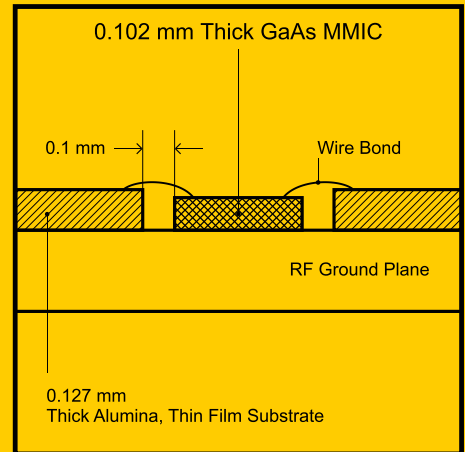


Figure 1.

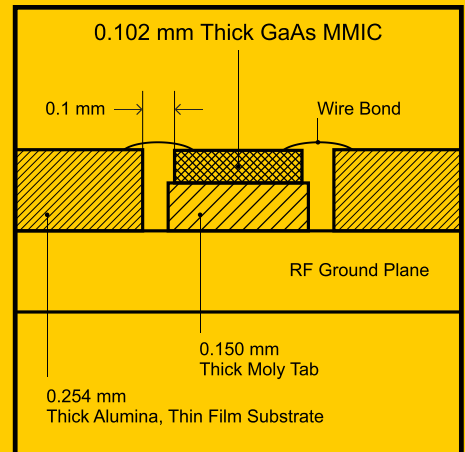


Figure 2.

Recommended ESD Management

This device is susceptible to electrostatic and mechanical damage. Dies are supplied in antistatic containers, which should be opened in a cleanroom conditions at an appropriately grounded antistatic workstation. Devices need careful handling using correctly designed collets, vacuum pickups or, with care, sharp tweezers.

