

MP341D

Ka-band Phase Shifter



- frequency range 26...30 GHz
- Insertion loss 9 dB at 28 GHz
- phase shift range 355° (6 bit, 64 states, 5,625° step)

Application

- communications
- radars

The MP341D is a GaAs MMIC high performance 6-bit digital phase shifter which covers a frequency range from 26 to 30 GHz, and it can be used in telecommunication and radar applications. The chip based on 0.5 μm gate length pHEMT process. The MMIC uses gold bond pads and backside metallization and it is fully protected with Silicon Nitride passivation to obtain the highest level of reliability.

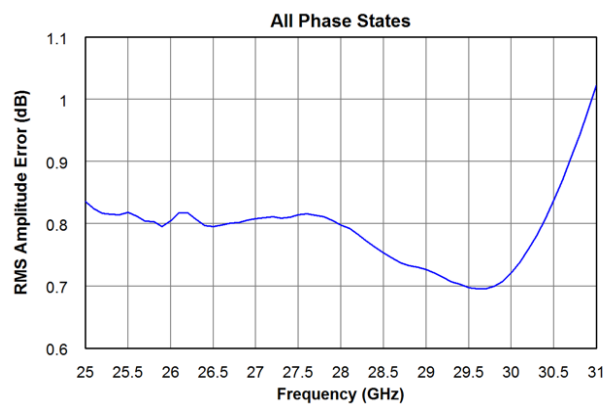
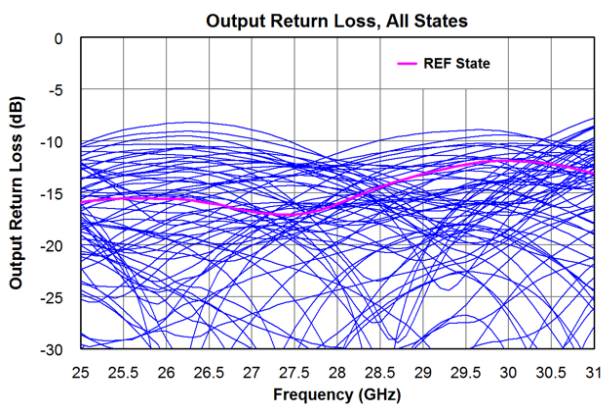
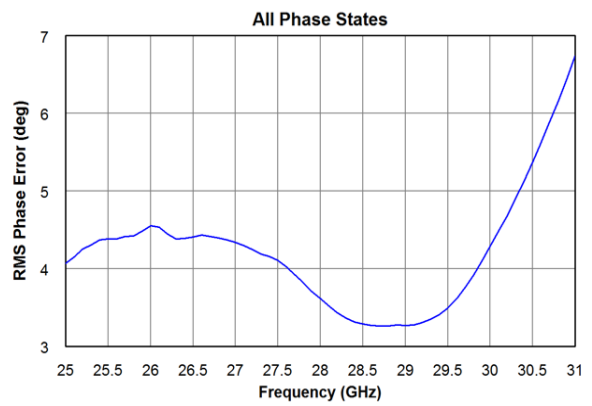
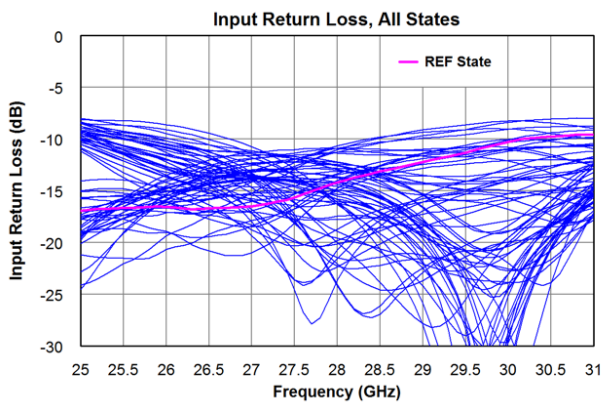
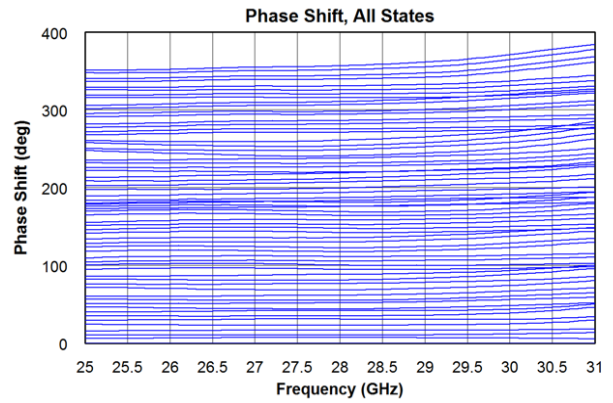
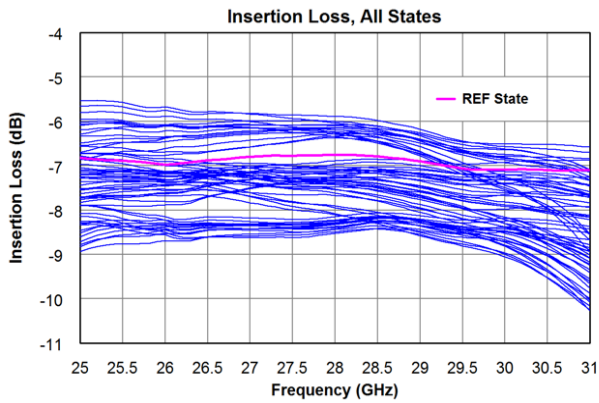
Electrical specification (T = 25 °C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
ΔF	Frequency range	26	—	30	GHz
S21	Insertion loss	—	—	9	dB
S11	Input return loss	—	8	—	dB
S22	Output return loss	—	8	—	dB
RMS_PhS	RMS phase error	—	—	4.5	deg
RMS_S21	RMS amplitude error	—	—	0.8	dB
VLH	Control voltage high	-1.8	-2	-2.5	V
VLL	Control voltage low	—	0	—	V

Absolute maximum ratings

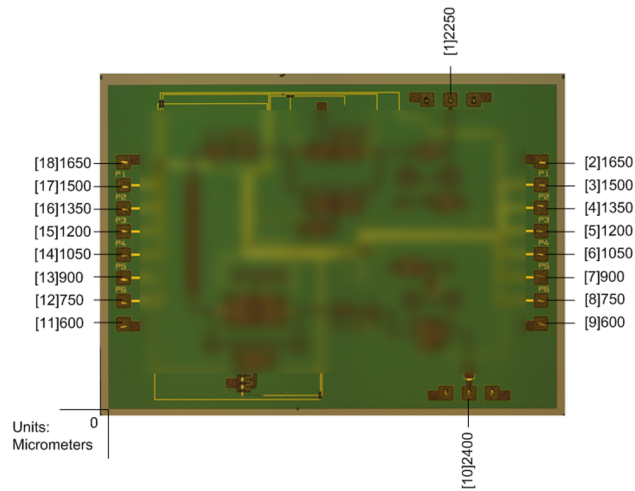
Parameter	Value	Unit
Supply voltage for digital control	TBD	V
Control voltages	0...-2	V
Operating temperature	-40...+85	°C
Storage temperature	-55...+125	°C

Typical characteristics (T = 25 °C)



Specifications are subject to change without notice.

Mechanical data



- Chip size $3000 \times 2200 \mu\text{m}$ (before wafer dicing), thickness $100 \mu\text{m}$;
- Bond pad dimensions are shown in the bond pad center;
- Bond pad and backside metallization: gold;
- RF pads are $100 \times 100 \mu\text{m}$.

Pad number	Port	Voltage, V	Description
1	RF IN	—	RF in port
2	GND	—	GND
3	P1	0 / -2	Control of 5.625° phase shifter bit
4	P2	0 / -2	Control of 11.25° phase shifter bit
5	P3	0 / -2	Control of 22.5° phase shifter bit
6	P4	0 / -2	Control of 45° phase shifter bit
7	P5	0 / -2	Control of 90° phase shifter bit
8	P6	0 / -2	Control of 180° phase shifter bit
9	GND	—	GND
10	RF OUT	—	RF out port
11	GND	—	GND
12	P6	0 / -2	Control of 180° phase shifter bit
13	P5	0 / -2	Control of 90° phase shifter bit
14	P4	0 / -2	Control of 45° phase shifter bit
15	P3	0 / -2	Control of 22.5° phase shifter bit
16	P2	0 / -2	Control of 11.25° phase shifter bit
17	P1	0 / -2	Control of 5.625° phase shifter bit
18	GND	—	GND

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

A recommendation for RF pads (1 and 10) is one wire: diameter 25 µm, length 450 µm. The recommendation for DC and control pads is one wire: diameter 25 µm, length 700- 1000 µm.

Phase Shifter Control Bias

The reference state is enabled with logic low (0 V) on control pads of the phase shifter (3 to 8 and 12 to 17). The binary weighted phase states are switched by applying logic high on the respective control pad.

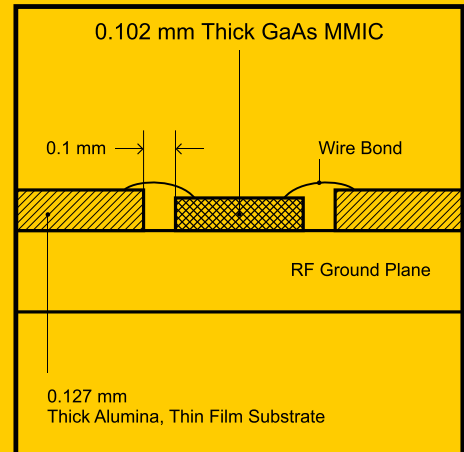


Figure 1.

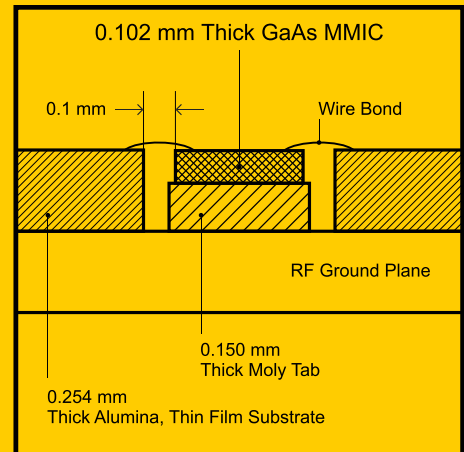


Figure 2.

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.

