

Phase Shifter, 6-Bit 6 - 18 GHz



CGY2392SHV/C1

Rev. V1

Features

- Insertion Loss: 11.2 dB @ 12 GHz
- Phase Shift Range: 360°
- RMS Phase Error: 1.9° @ 12 GHz
- RMS Amplitude Variation: 0.45 dB @ 12 GHz
- Input Return Loss: 12 dB
- Output Return Loss: 14 dB
- 0 / +5 V Control Lines
- Package Size: 5 x 5 mm
- Tested, Inspected Known Good Die (KGD)
- Space and MIL-STD Available
- RoHS* Compliant

Applications

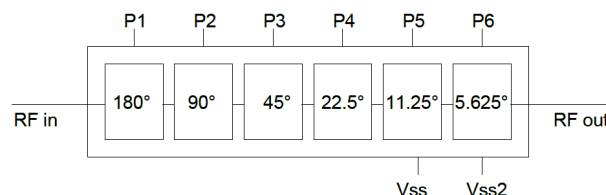
- Radar
- Telecommunication
- Instrumentation

Description

The CGY2392SHV/C1 is a high performance GaAs MMIC 6-Bit phase shifter operating from 6 - 18 GHz. This device has a nominal phase shifting range of 0 - 360° in 5.625° steps and has a low RMS Phase Error. It is part of a new 6 - 18 GHz chipset that is dedicated to Radar, Telecommunication and Instrumentation applications.

The die is manufactured using 0.18 μm gate length pHEMT process. The MMIC uses gold bonding pads, backside metallization and is fully protected with Silicon Nitride passivation to obtain the highest level of reliability. This technology has been evaluated for Space applications and is on the European Preferred Parts List of the European Space Agency.

Block Diagram



Ordering Information

Part Number	Package
CGY2392SHV/C1	DIE

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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Electrical Specifications: Measured On Wafer,
Freq. = 6 - 18 GHz, $V_{SS2} = -4.5\text{ V}$, $I_{SS2} = 8\text{ mA}$, $T_A = +25^\circ\text{C}$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	—	dB	—	11.2	—
Phase Range	—	°	—	360	—
Input Return Loss	@ RFIN	dB	—	12	—
Output Return Loss	@ RFOUT	dB	—	12	—
RMS Phase Error	—	°	—	2.7	—
RMS Attenuation Error	—	dB	—	0.5	—

Absolute Maximum Ratings^{2,3}

Parameter	Absolute Maximum
Phase Control Inputs	0 to +5.5 V
Source Supply Voltage When VSS2 pad is not used When VSS1 pad is not used	-5.0 to +0.5 -6.0 to +0.5
Input Power	TBD dBm
Junction Temperature	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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Logic Truth Table (1/2)

Nominal Phase Shift	P1	P2	P3	P4	P5	P6
	180°	90°	45°	-22.5°	11.25°	5.625°
Reference State	0	0	0	0	0	0
Phase Shift Activated	1	1	1	1	1	1

Logic Truth Table (V)

Phase Shift (°)	P1	P2	P3	P4	P5	P6
	180°	90°	45°	-22.5°	11.25°	5.625°
0	0	0	0	0	0	0
5.625	0	0	0	0	0	1
11.25	0	0	0	0	1	0
16.875	0	0	0	0	1	1
22.5	0	0	0	1	0	0
28.125	0	0	0	1	0	1
33.75	0	0	0	1	1	0
39.375	0	0	0	1	1	1
45	0	0	1	0	0	0
50.625	0	0	1	0	0	1
56.25	0	0	1	0	1	0
61.875	0	0	1	0	1	1
67.5	0	0	1	1	0	0
73.125	0	0	1	1	0	1
78.75	0	0	1	1	1	0
84.375	0	0	1	1	1	1
90	0	1	0	0	0	0
95.625	0	1	0	0	0	1
101.25	0	1	0	0	1	0
106.875	0	1	0	0	1	1
112.5	0	1	0	1	0	0
118.125	0	1	0	1	0	1
123.75	0	1	0	1	1	0
129.375	0	1	0	1	1	1
135	0	1	1	0	0	0
140.625	0	1	1	0	0	1
146.25	0	1	1	0	1	0
151.875	0	1	1	0	1	1
157.5	0	1	1	1	0	0
163.125	0	1	1	1	0	1
168.75	0	1	1	1	1	0
174.375	0	1	1	1	1	1
180	1	0	0	0	0	0

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Logic Truth Table (2/2)

Phase Shift (°)	P1	P2	P3	P4	P5	P6
	180°	90°	45°	-22.5°	11.25°	5.625°
185.625	1	0	0	0	0	1
191.25	1	0	0	0	1	0
198.875	1	0	0	0	1	1
202.5	1	0	0	1	0	0
208.125	1	0	0	1	0	1
213.75	1	0	0	1	1	0
219.375	1	0	0	1	1	1
225	1	0	1	0	0	0
230.625	1	0	1	0	0	1
236.25	1	0	1	0	1	0
241.875	1	0	1	0	1	1
247.5	1	0	1	1	0	0
253.125	1	0	1	1	0	1
258.75	1	0	1	1	1	0
264.375	1	0	1	1	1	1
270	1	1	0	0	0	0
275.625	1	1	0	0	0	1
281.25	1	1	0	0	1	0
286.875	1	1	0	0	1	1
292.5	1	1	0	1	0	0
298.125	1	1	0	1	0	1
303.75	1	1	0	1	1	0
309.375	1	1	0	1	1	1
315	1	1	1	0	0	0
320.625	1	1	1	0	0	1
326.25	1	1	1	0	1	0
331.875	1	1	1	0	1	1
337.5	1	1	1	1	0	0
343.125	1	1	1	1	0	1
348.75	1	1	1	1	1	0
354.375	1	1	1	1	1	1

Control Voltage

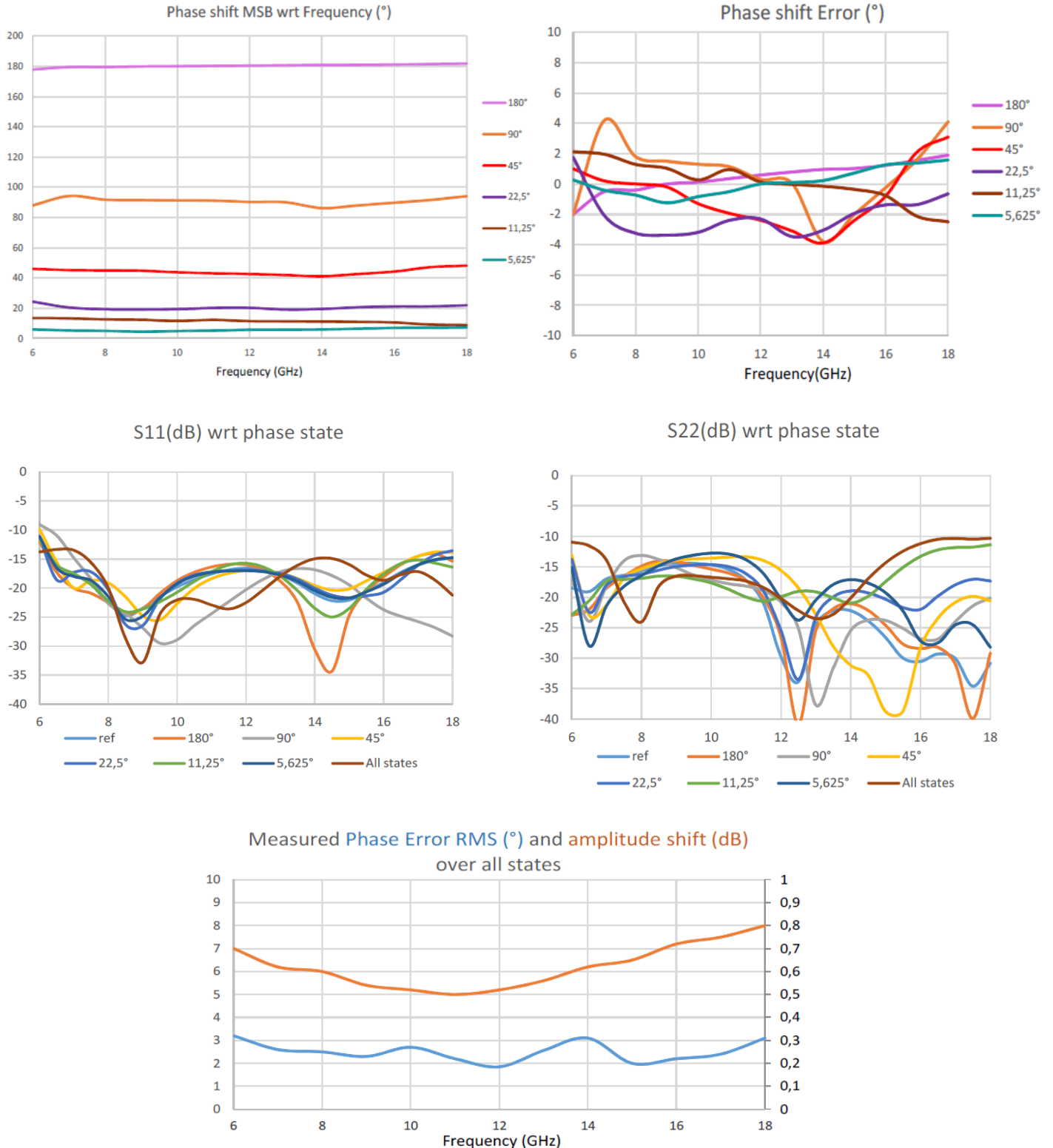
State	Min.	Max.	Unit
Low (0)	0	1	V
High (1)	4	6	V

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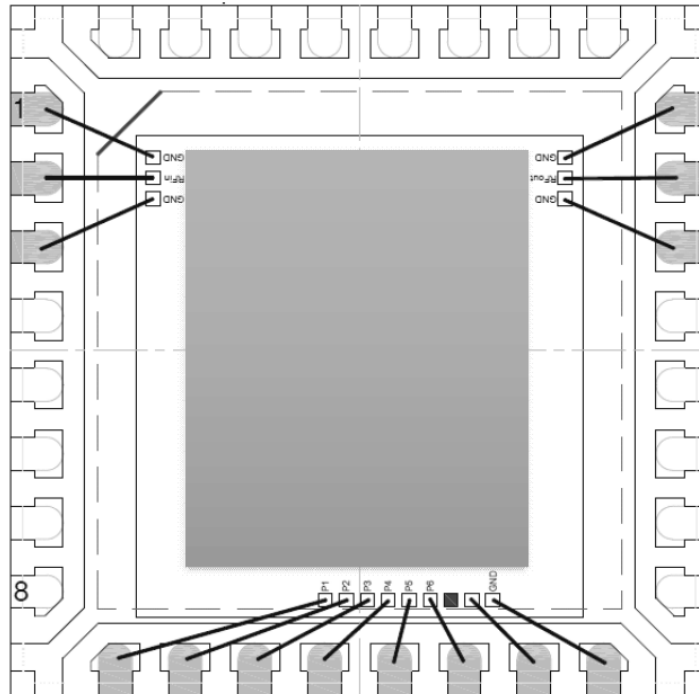


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Typical Performance Curves: $V_{SS2} = -4.5\text{ V}$



Bonding Diagram



Pad Configuration

Pad #	Pad Name
1,3,16,22,24	Ground
4 - 8,17 - 21,25 - 32	No Connection
2	RF Input
9	P1
10	P2
11	P3
12	P4
13	P5
14	P6
15	VSS2
23	RF Output

Decoupling Parts List

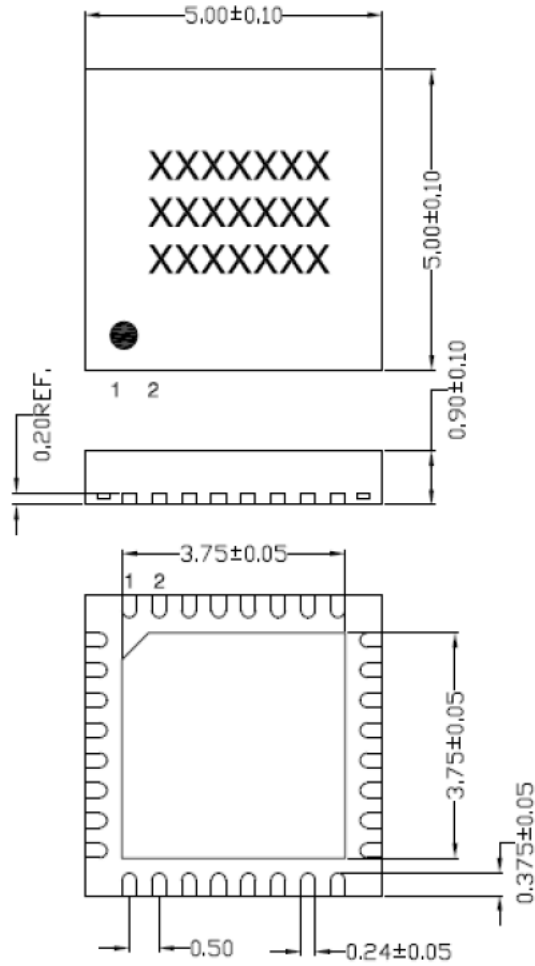
Part	V _{SS2} (or V _{SS})
Chip SMD capacitor 1	47 pF or 100 pF
Chip SMD capacitor 2	100 nF

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Outline



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