

# PRELIMINARY DATASHEET

## CGY2392SHV/C1 6 -18 GHz 6 bit Phase Shifter

### DESCRIPTION

The CGY2392SHV/C1 is a high performance GaAs MMIC 6-Bit Phase Shifter operating from 6 GHz up to 18 GHz.

The CGY2392SHV/C1 has a nominal phase shifting range of 0 - 360° in 5.625° steps and has a low RMS Phase Error. It is part of Ommic's new 6 - 18 GHz chipset that is dedicated to Radar, Telecommunication and Instrumentation applications.

The die is manufactured using ED02AH OMMIC's 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.

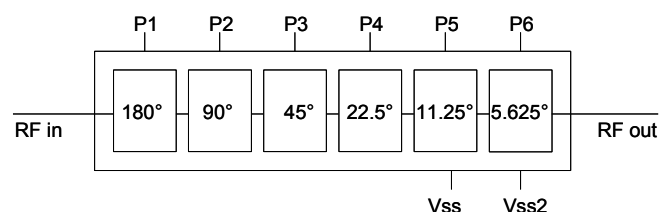
### APPLICATIONS

- ▶ Radar
- ▶ Telecommunication
- ▶ Instrumentation



### FEATURES

- ▶ Operating Range : 6 GHz to 18 GHz
- ▶ Insertion Loss = 10.8 dB @ 12 GHz
- ▶ Phase Shift Range = 360°
- ▶ RMS Phase Error = 1.9° @ 12 GHz
- ▶ RMS Amplitude Variation = 0.45 dB @ 12 GHz
- ▶  $S_{11} < -12$  dB
- ▶  $S_{22} < -14$  dB
- ▶ 0 / +5V Control Lines
- ▶ Package size = 5x5 mm
- ▶ Tested, Inspected Known Good Die (KGD)
- ▶ Space and MIL-STD Available



CGY2392S 6-18 GHz 6-Bit Phase Shifter Block diagram

**LIMITING VALUES**
 $T_{amb} = 25\text{ °C}$  unless otherwise specified

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
$P_N$	Phase Control Inputs		0	+5,5	V
$V_{SS}$	Source supply voltage	When $V_{SS2}$ pad is not used	-5	0,5	V
$V_{SS2}$	Source supply voltage	When $V_{SS1}$ pad is not used	-6	0,5	V
$P_{IN}$	Input power	At $RF_{IN}$		TBD	dBm
$T_{amb}$	Ambient temperature		-40	+85	° C
$T_j$	Junction temperature			+150	° C
$T_{stg}$	Storage temperature		-55	+150	° C

**THERMAL CHARACTERISTICS**

Symbol	Parameter	Value	UNIT
$R_{th(j-a)}$	Thermal resistance from junction to ambient ( $T_a = 25\text{ °C}$ )	TBD	° C/W

**CHARACTERISTICS**

 Conditions :  $V_{SS2} = -4.5\text{ V}$ ;  $I_{SS2} = 8\text{ mA}$ ;  $T_{amb} = 25\text{ °C}$ 

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
<i>Supplies</i>						
$V_{SS2}$	Source supply voltage	$V_{SS}$ pad is open	-6	-4,5	-4	V
$I_{SS2}$	Source supply current			8		mA
$V_{SS}$	Source supply voltage	$V_{SS2}$ pad is open	-5	-3,5	-3	V
$I_{SS}$	Source supply current			8		mA
<i>RF Performance 6 GHz to 18GHz unless otherwise stated</i>						
BW	Bandwidth		6		18	GHz
IL	Insertion Loss	Reference state		11,2		dB
$PH_{range}$	Phase range			360		°
$PH_{error(max)}$	RMS Phase Error			2,7		°
$ATT_{error(RMS)}$	RMS Attenuation Error			0,5		dB
$S_{11}$	Input reflection coefficient, All States	50 $\Omega$ source	-15	-12	-10	dB
$S_{22}$	Output reflection coefficient, All States	50 $\Omega$ load	-15	-12	-10	dB

**LOGIC TRUTH TABLE (1/2)**

	P1	P2	P3	P4	P5	P6
Nominal Phase Shift	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

	P1	P2	P3	P4	P5	P6
Phase Shift (°)	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

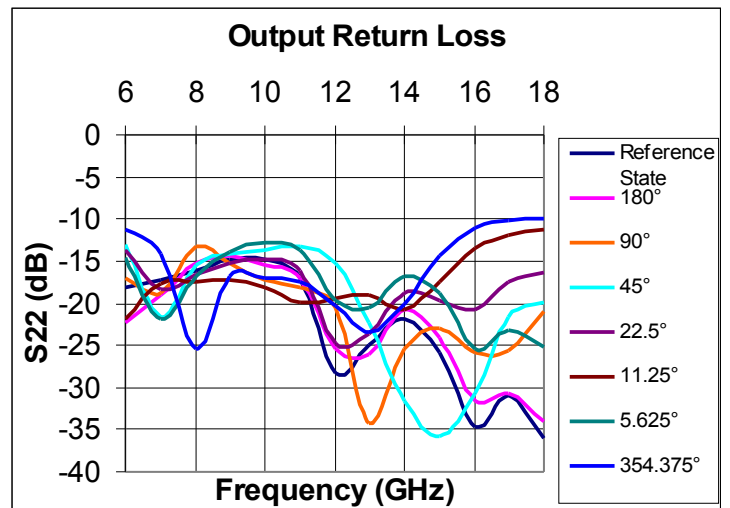
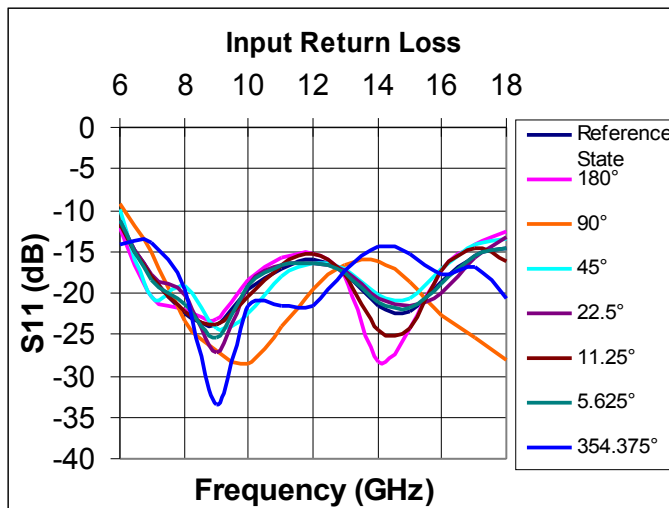
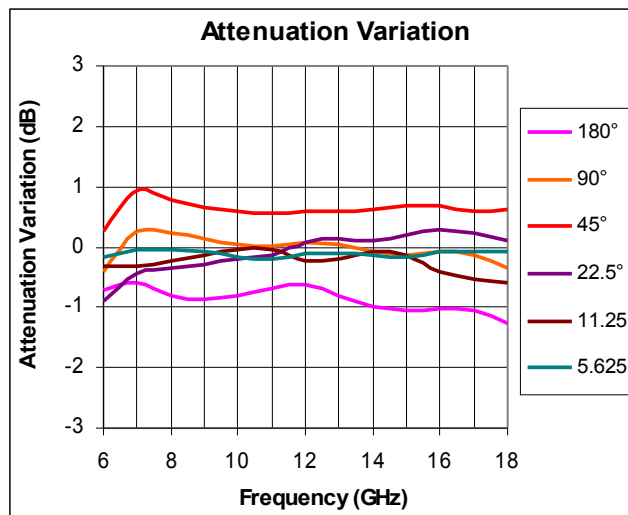
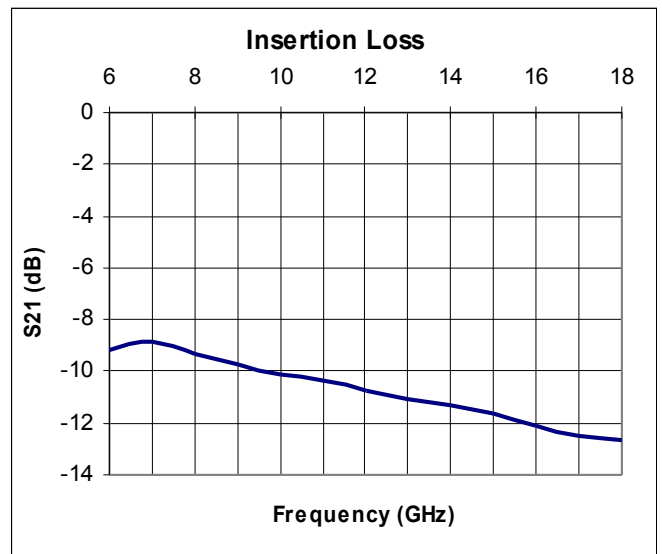
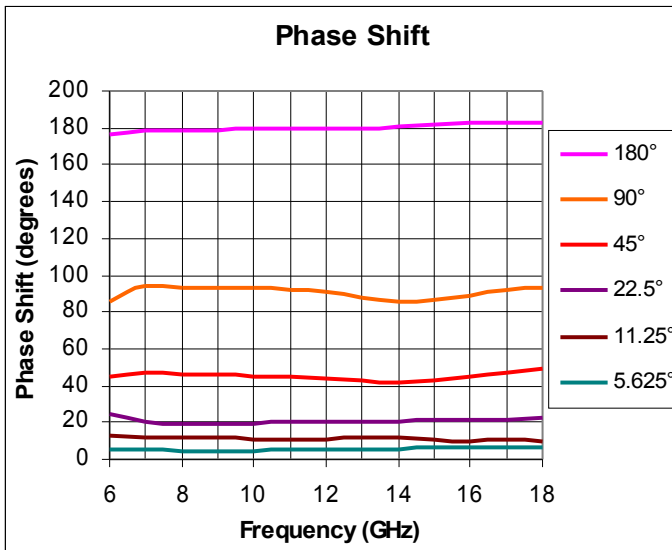
**LOGIC TRUTH TABLE (2/2)**

	P1	P2	P3	P4	P5	P6
Phase Shift (°)	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**

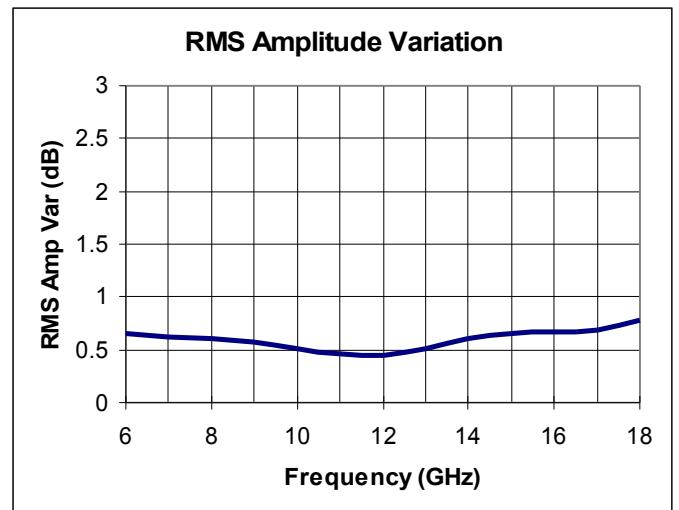
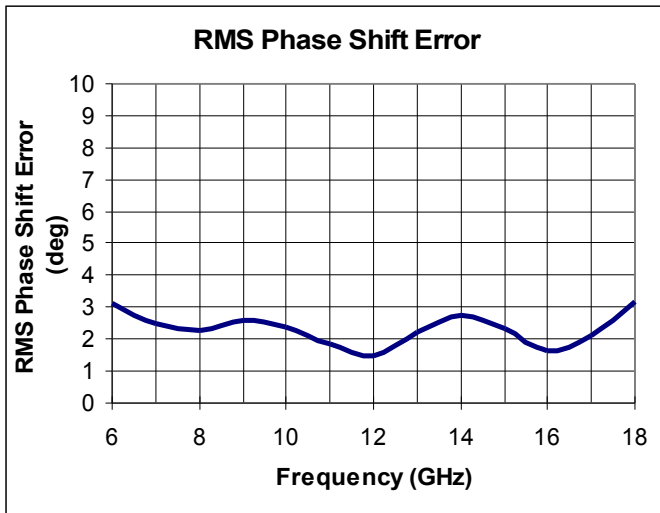
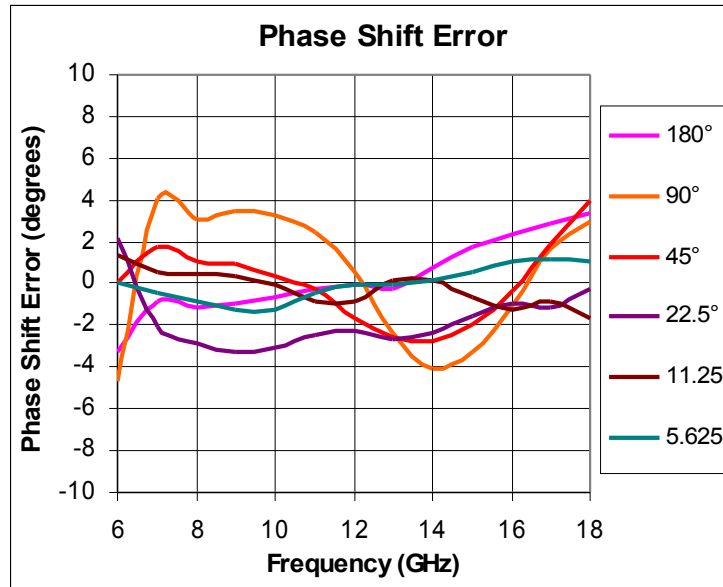
State	MIN.	MAX.	UNIT
Low (0)	0	1	V
High (1)	4	6	V

**ON WAFER MEASUREMENTS – S PARAMETERS**

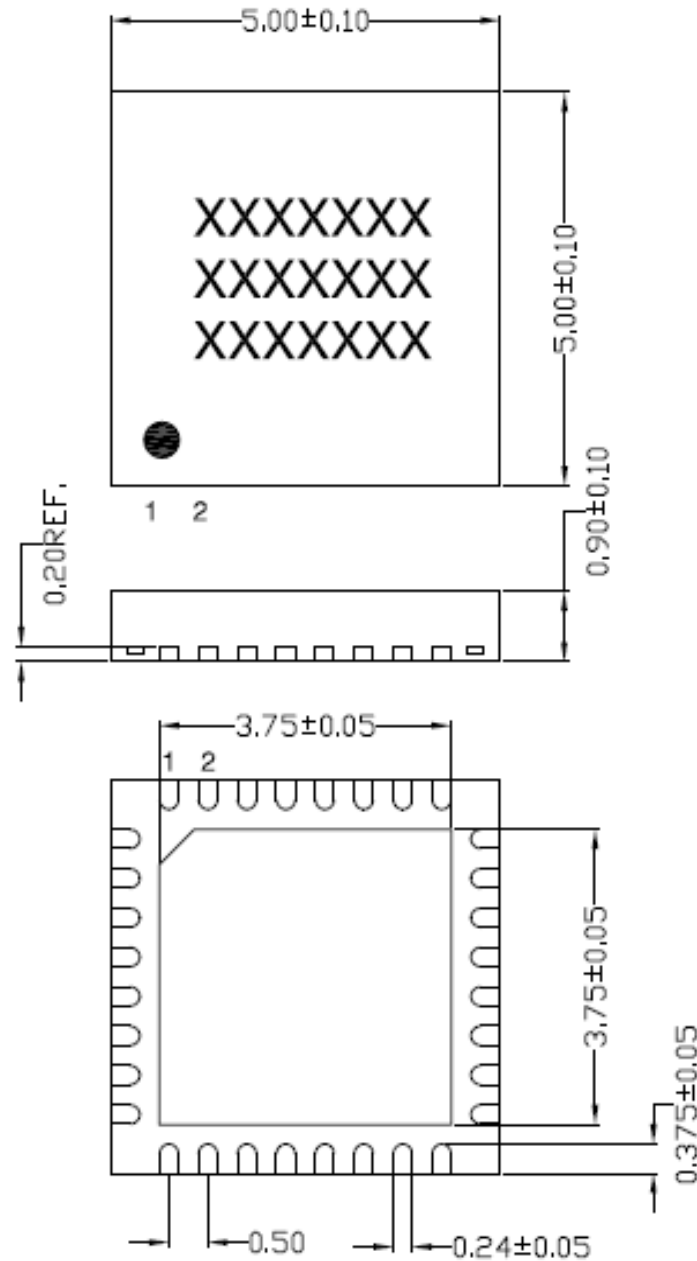
 Supply voltage :  $V_{SS2} = -4,5\text{ V}$ 


**ON WAFER MEASUREMENTS – PHASE SHIFTING / ATTENUATION ERRORS**

Supply voltage :  $V_{SS2} = -4.5 V$ ,

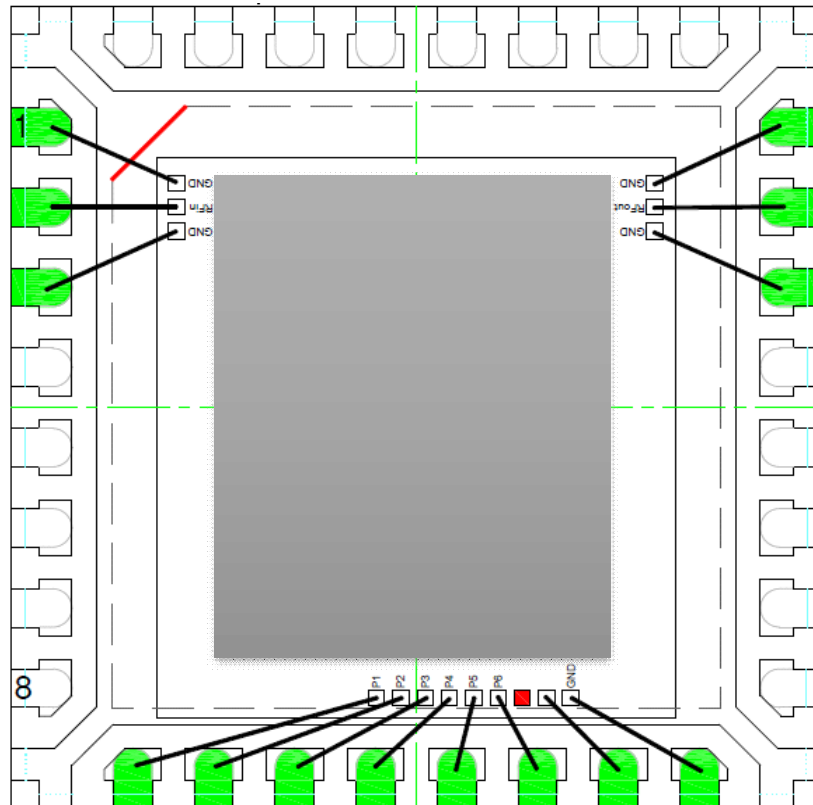


**MECHANICAL INFORMATION**



**Caution :** This device is a high performance RF component and can be damaged by inappropriate handling. Standard ESD precautions should be followed. OMMIC document "OM-CI-MV/ 001/ PG" contains more information on the precautions to take.

## PAD CONFIGURATION



## PAD POSITION

PAD 1 IS MARKED BY A DOT ON THE TOP OF THE LEAD (THEN TURN REVERSE CLOCKWISE)

PAD NAME	PAD Number
GND	1
RFin	2
GND	3
P1	9
P2	10
P3	11
P4	12
P5	13
P6	14
VSS2	15
GND	16
GND	22
RF <sub>OUT</sub>	23
GND	24

### Decoupling BOM:

	VSS2 (or VSS)
Chip SMD capacitor 1	47pF or 100pF
Chip SMD capacitor 2	100nF



## DEFINITIONS

### Limiting values definition

Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

### Application information

Applications that are described herein for any of these products are for illustrative purposes only. OMMIC makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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## ORDERING INFORMATION

Generic type	Package type	Version	Sort Type	Description
CGY2392S	HV	C1		6-bit 6 -18 GHz Phase Shifter



**Document History : Version 1.0, Last Update 01/02/2015**