

PRELIMINARY DATASHEET

CGY2392SUH/C1 6 -18 GHz 6 bit Phase Shifter

DESCRIPTION

The CGY2392SUH/C1 is a high performance GaAs MMIC 6-Bit Phase Shifter operating from 6 GHz up to 18 GHz.

The CGY2392SUH/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.

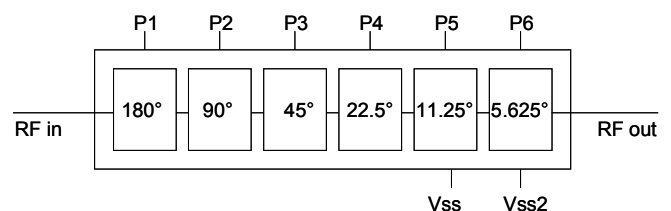
The die is manufactured using ED02AH OMMIC's 0.18 μm gate length PHEMT process. The MMIC uses gold bonding pads, backside metallization and is fully protected with Silicon Nitride passivation to obtain the highest level of reliability. This technology has been evaluated for Space applications and is 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 = 1.7° @ 12 GHz
- ▶ RMS Amplitude Variation = 0.45 dB @ 12 GHz
- ▶ $S_{11} < -12$ dB
- ▶ $S_{22} < -14$ dB
- ▶ 0 / +5V Control Lines
- ▶ Chip size = 3500 x 3200 μm
- ▶ 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		10,7		dB
PH_{range}	Phase range			360		°
$PH_{error(max)}$	RMS Phase Error			2,5		°
$ATT_{error(RMS)}$	RMS Attenuation Error			0,5		dB
S_{11}	Input reflection coefficient, All States	50 Ω source		-15		dB
S_{22}	Output reflection coefficient, All States	50 Ω load		-15		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

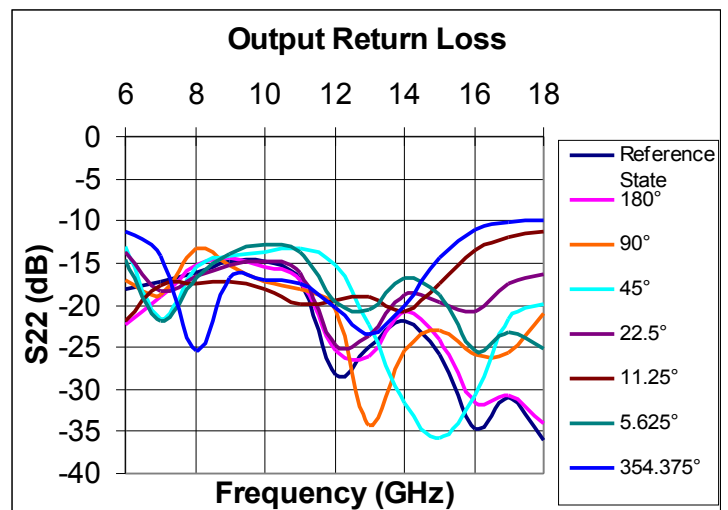
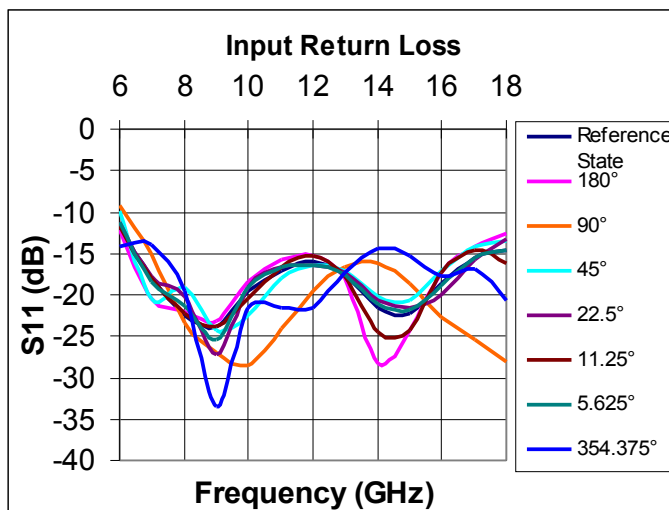
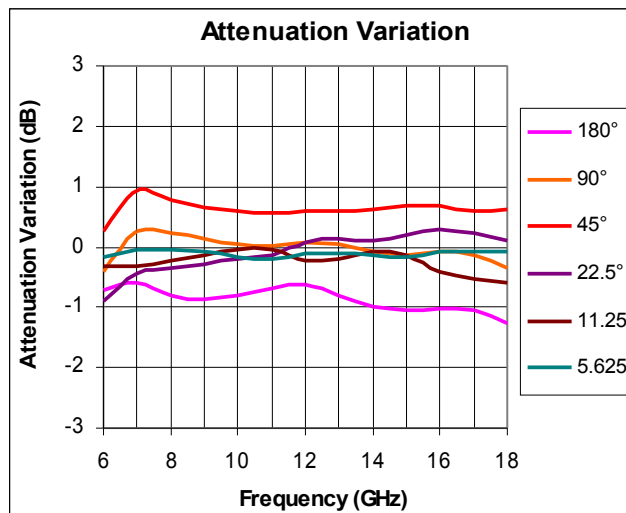
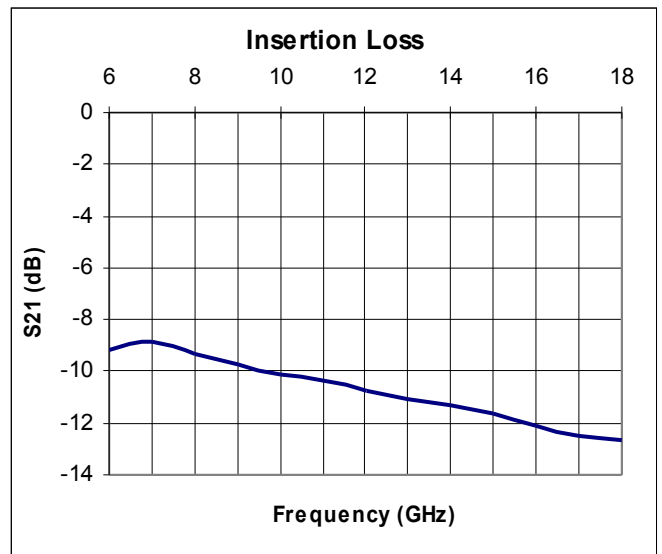
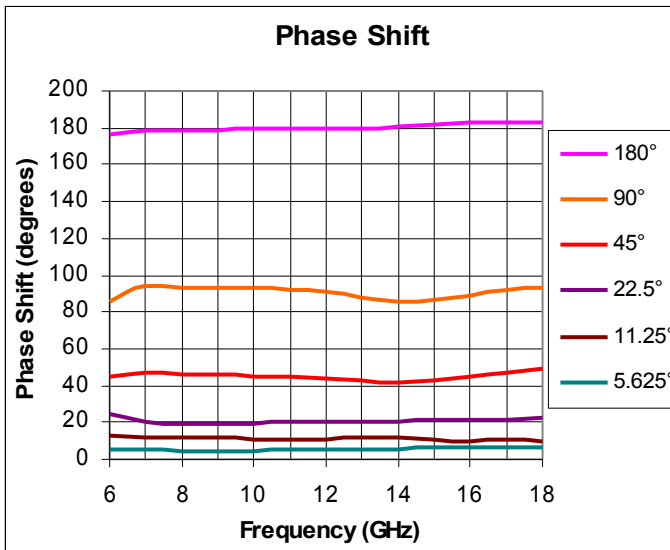
LOGIC TRUTH TABLE (2/2)

	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

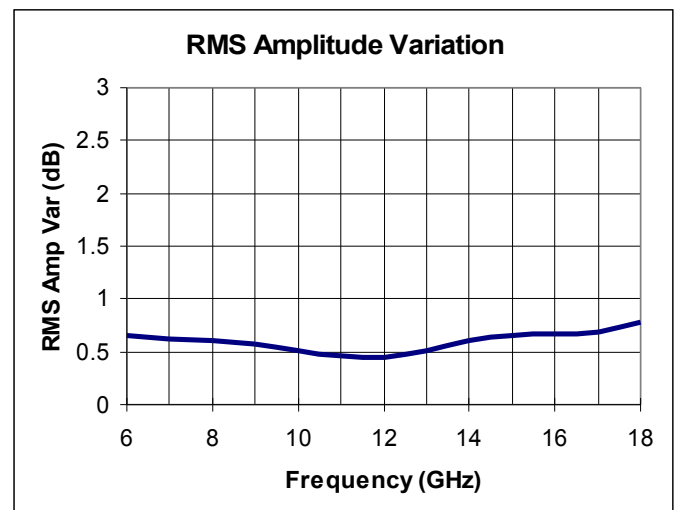
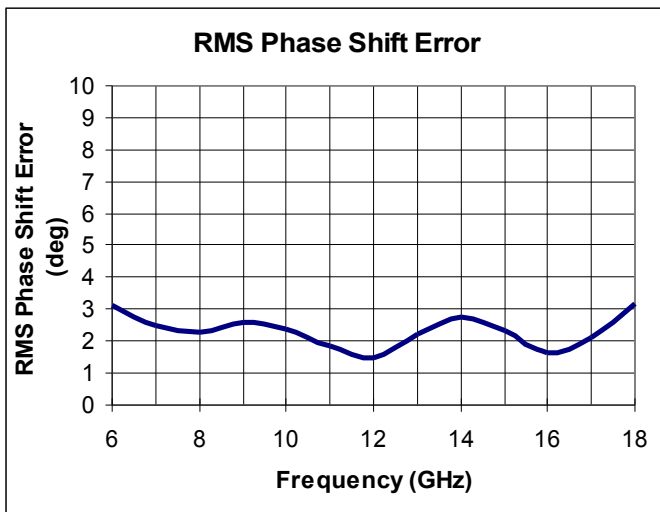
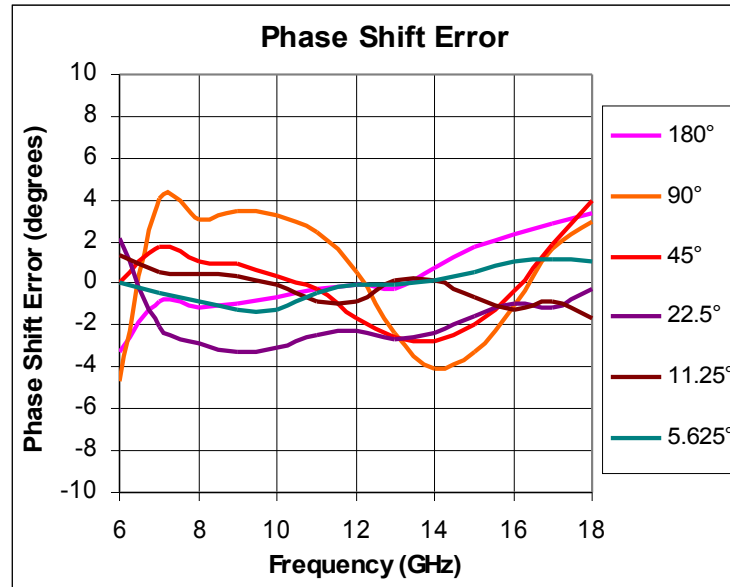
CONTROL VOLTAGE

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

ON WAFER MEASUREMENTS – S PARAMETERS

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


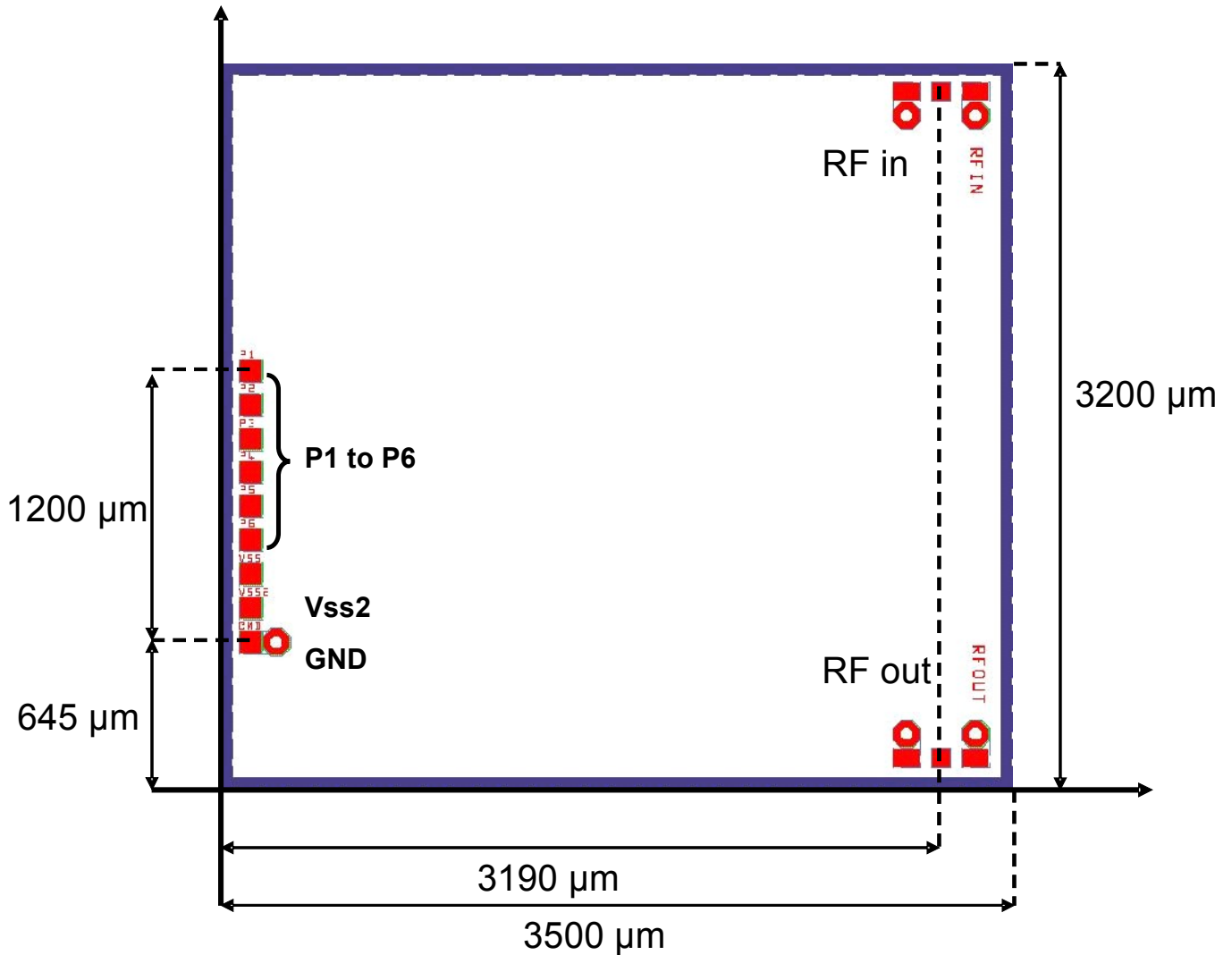
ON WAFER MEASUREMENTS – PHASE SHIFTING / ATTENUATION ERRORS

 Supply voltage : $V_{SS2} = -4.5$ V, Calculated with Input/Output Inductance of 0.5 nH


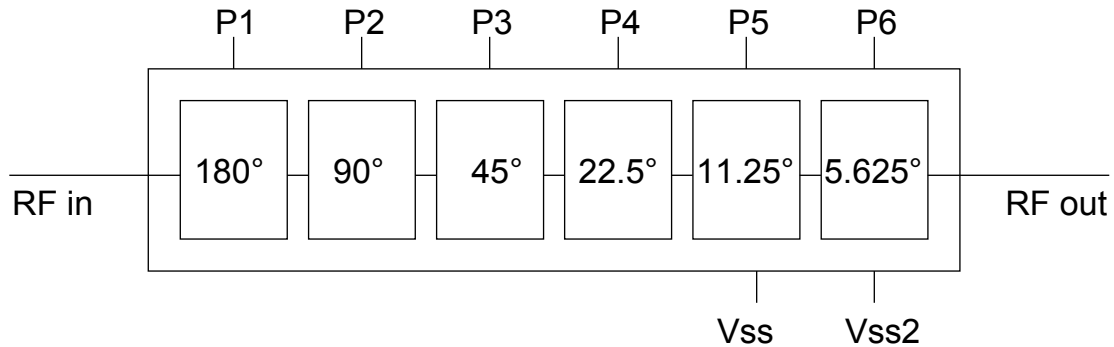
MECHANICAL INFORMATION

Chip size = 3500 x 3200 μm including the dicing street

- DC Pads = 100 x 100 μm , spacing = 150 μm , Top metal=Au
- RF Pads = 100 x 100 μm , pitch = 150 μm , Top metal=Au
- Chip Thickness 100 μm



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.

BLOCK DIAGRAM AND PAD CONFIGURATION

PAD POSITION

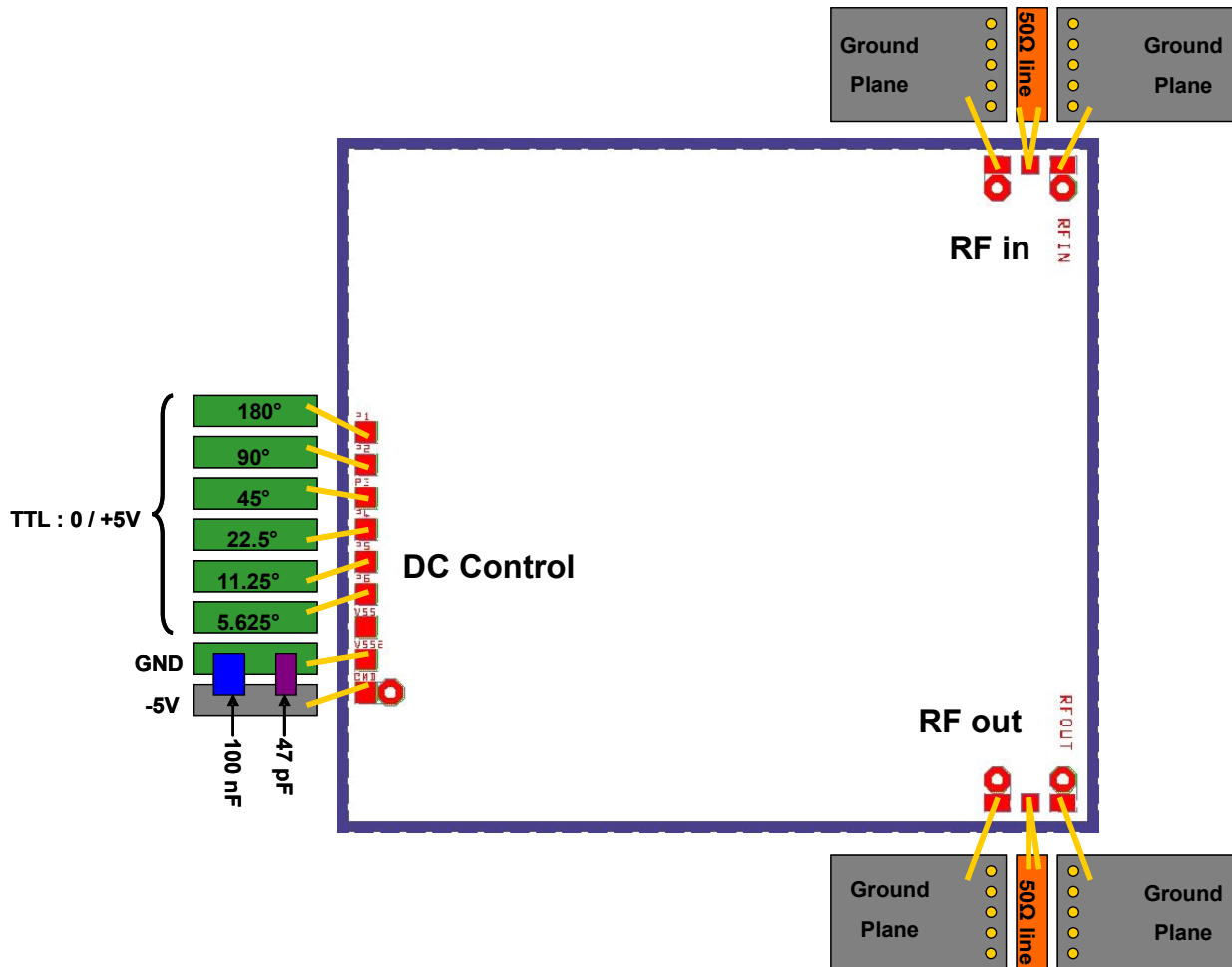
PAD NAME	SYMBOL	COORDINATES		DESCRIPTION
		X	Y	
GND	DC Control	130	645	Ground (connected to MMIC back side metal)
VSS2		130	795	V _{SS2} power supply
VSS		130	945	V _{SS1} power supply
P6		130	1095	5.625° cell control
P5		130	1245	11.25° cell control
P4		130	1395	22.5° cell control
P3		130	1545	45° cell control
P2		130	1695	90° cell control
P1		130	1845	180° cell control
GND	RF _{IN}	3040	3080	Ground (connected to MMIC back side metal)
RF _{IN}		3190	3080	RF Input Port
GND		3340	3080	Ground (connected to MMIC back side metal)
GND	RF _{OUT}	3040	130	Ground (connected to MMIC back side metal)
RF _{OUT}		3190	130	RF Output Port
GND		3340	130	Ground (connected to MMIC back side metal)

X=0, Y=0 at bottom left corner : see Mechanical Information for more details.

NOTES

- 1- Only V_{SS} or V_{SS2} is to be connected. For example: if V_{SS2} is used, V_{SS} must be left open.

BONDING DIAGRAM AND ASSEMBLY INFORMATION



The RF interfacing bond wires or ribbon should be kept as short as possible. The RF lines should be 300um wide or less to minimize discontinuities associated with the connection to the MMIC bond pads. The power supply (VSS or VSS2) must be decoupled to the ground with capacitors as close as possible to the chip.

Decoupling BOM:

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



NO DECOUPLING ON DIGITAL CONTROL PADS

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

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ORDERING INFORMATION

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


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