PRELIMINARY DATASHEET

CGY2169UH/C1

6-bit 10-18 GHz Attenuator

DESCRIPTION

The CGY2169UH is a high performance GaAs MMIC 6–bit Attenuator operating from 10 to 18 GHz.

The CGY2169UH has a nominal attenuation range of 23.5 dB in 0.5 dB steps. It covers the frequency range of 10 to 18 GHz and can be used in Radar, Telecommunication and Instrumentation applications.

The die is manufactured using OMMIC's 0.18 µm gate length PHEMT Technology. The MMIC uses gold bonding pads and 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.

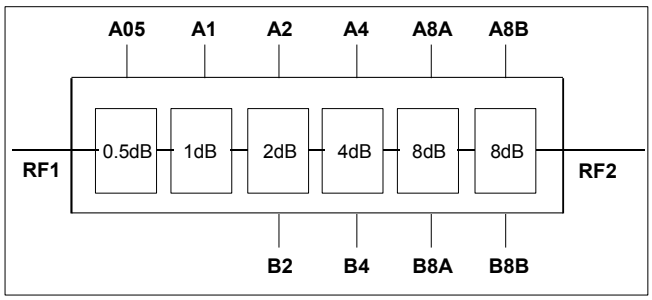
FEATURES

- Operating Range : 10 GHz to 18 GHz
- Insertion Loss : 4 dB @ 14 GHz
- Attenuation Range = 23.5 dB
- RMS Attenuation Error ≈ 0.4 dB @ 14 GHz
- Input P1dB ≈ +20 dBm
- S_{11} & S_{22} < -10 dB @ 14 GHz (All states)
- 0 / -3.3V Control Lines
- Chip size = 2600 x 1100 µm ± 5 µm
- Tested, Inspected Known Good Die (KGD)
- Samples Available
- Demonstration Boards Available
- Space and MIL-STD Available

APPLICATIONS

- Radar
- Telecommunication
- Instrumentation

RoHS Compliant



Block Diagram of the 6-Bit 10-18 GHz Attenuator

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LIMITING VALUES

T_{amb} = 25 °C unless otherwise noted

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
A_N, B_N	Attenuation control inputs		-4.7	0	V
P_{IN}	Input power	P_{RF} at RF1		+28	dBm
T_j	Junction temperature			+150	° C
T_{stg}	Storage temperature		-55	+150	° C

OPERATING CONDITIONS

T_{amb} = 25 °C unless otherwise noted

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
A_N, B_N	Attenuation control inputs		-4	0	V
P_{IN}	Input power	P_{RF} at RF1		+25	dBm
T_{amb}	Ambient temperature		-40	+85	°C

THERMAL CHARACTERISTICS

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

CHARACTERISTICS

T_{amb} = 25 °C – RF Performance measured on wafer.

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
BW	Bandwidth		10		18	GHz
RF Performance at 14 GHz unless specified						
IL	Insertion Loss			4		dB
NF	Noise Figure at reference state			4		dB
ATT_{range}	Attenuation range			23.5		dB
S_{11}	Input reflection coefficient	At RF1		-15	-10	dB
S_{22}	Output reflection coefficient	At RF2		-20	-15	dB
$ATT_{variation\ (RMS)}$	RMS Attenuation error with attenuation setting (see Note 1)			0.4		dB
$ATT_{variation\ (MAX)}$	Maximum Attenuation error with attenuation setting			+/- 1		dB
$PH_{error\ (RMS)}$	RMS Phase variation with attenuation setting (see Note 1)			11		°
$PH_{error\ (MAX)}$	Maximum Phase variation with attenuation setting			+/- 20		°
P_{1dB}	Input 1 dB compression point			20		dBm

Note : The RMS value is the root mean square of the error defined as below :

$$x_{RMS} = \sqrt{\frac{1}{N}\sum_{i=1}^{N} x_i^2} = \sqrt{\bar{x}_i^{\,2} + \sigma_{x_i}^2}$$

Where x_i is the difference between the measured value and the theoretical value, $\bar{x}_i$ is the mean value of the N x_i, and σ_{xi} is the standard deviation of x_i.

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.

LOGIC TRUTH TABLE

	A05	A1	A2	B2	A4	B4	A8A	B8A	A8B	B8B
Nominal Attenuation	0.5 dB	1 dB	2 dB	2 dB	4 dB	4 dB	8 dB	8 dB	8 dB	8 dB
Pad	C05	C1	C2A	C2B	C4A	C4B	C8A	C8B	C8AA	C8BB
Attenuation activated	0V	0V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V
Reference state	-3.3V	-3.3V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V

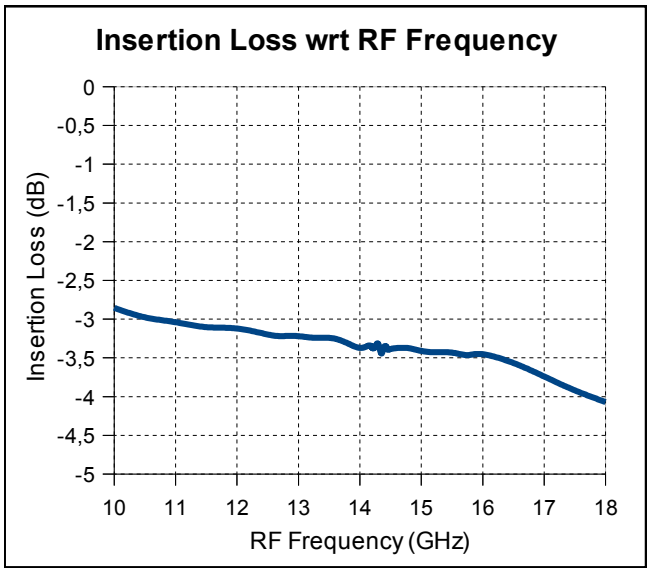
	A05	A1	A2	B2	A4	B4	A8A	B8A	A8B	B8B
Attenuation (dB)	**0.5**	**1**	**2**	**2**	**4**	**4**	**8**	**8**	**8**	**8**
0	-3.3V	-3.3V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V
0.5	0V	-3.3V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V
1	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V
2	-3.3V	-3.3V	0V	-3.3V	-3.3V	0V	-3.3V	0V	-3.3V	0V
4	-3.3V	-3.3V	-3.3V	0V	0V	-3.3V	-3.3V	0V	-3.3V	0V
8A	-3.3V	-3.3V	-3.3V	0V	-3.3V	0V	0V	-3.3V	-3.3V	0V
8B	-3.3V	-3.3V	-3.3V	0V	-3.3V	0V	-3.3V	0V	0V	-3.3V
10A	-3.3V	-3.3V	0V	-3.3V	-3.3V	0V	0V	-3.3V	-3.3V	0V
10B	-3.3V	-3.3V	0V	-3.3V	-3.3V	0V	-3.3V	0V	0V	-3.3V
16	-3.3V	-3.3V	-3.3V	0V	-3.3V	0V	0V	-3.3V	0V	-3.3V
23.5	0V	0V	0V	-3.3V	0V	-3.3V	0V	-3.3V	0V	-3.3V

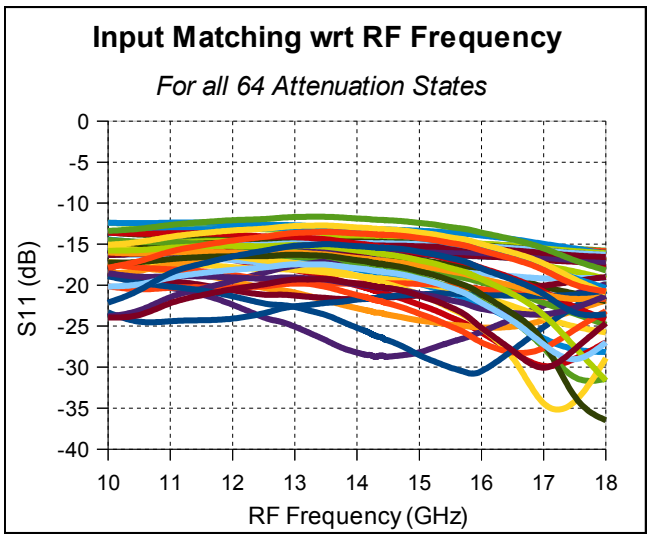
CONTROL VOLTAGE

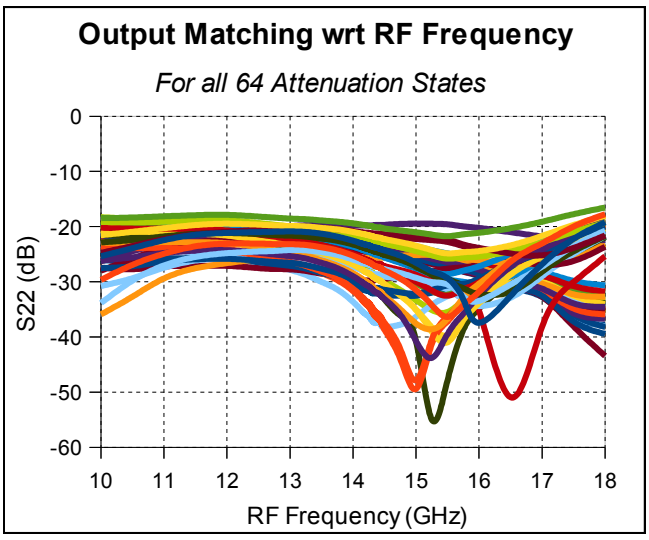
State	MIN.	TYP.	MAX.	UNIT
Low	-3.6	-3.3	-3	V
High	-0.1	0	+0.1	V

ON WAFER MEASUREMENTS – S PARAMETERS

Measured on wafer @ T = 25 °C
Calculated with input and output inductance of 0.3 nH

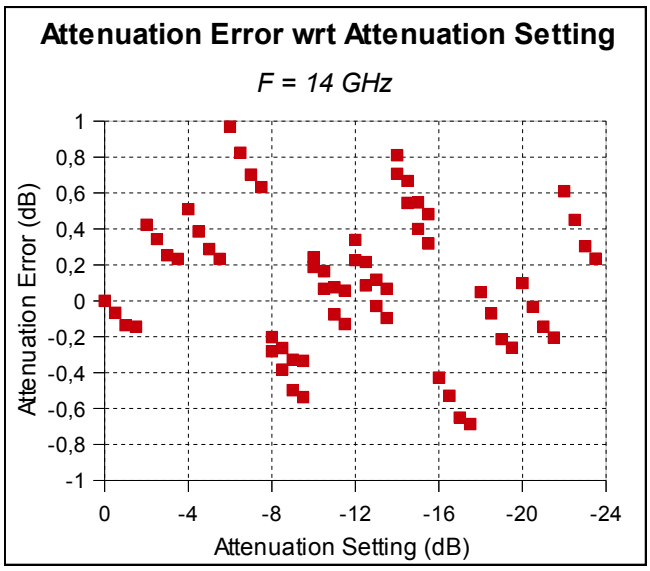


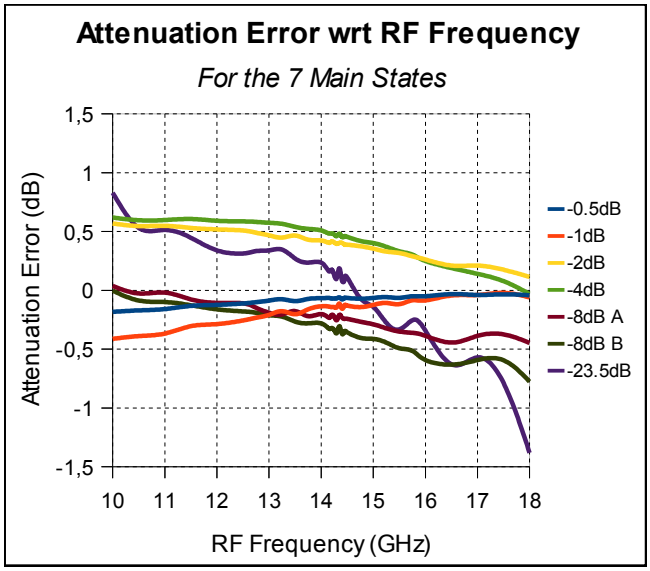


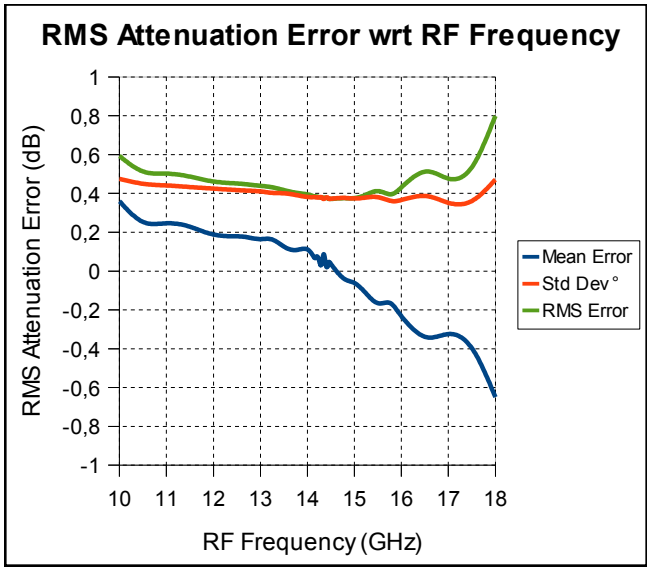


ON WAFER MEASUREMENTS – ATTENUATION ERRORS

Measured on wafer @ T = 25 °C
Calculated with input and output inductance of 0.3 nH







Note : The RMS value is the root mean square of the error defined as below :

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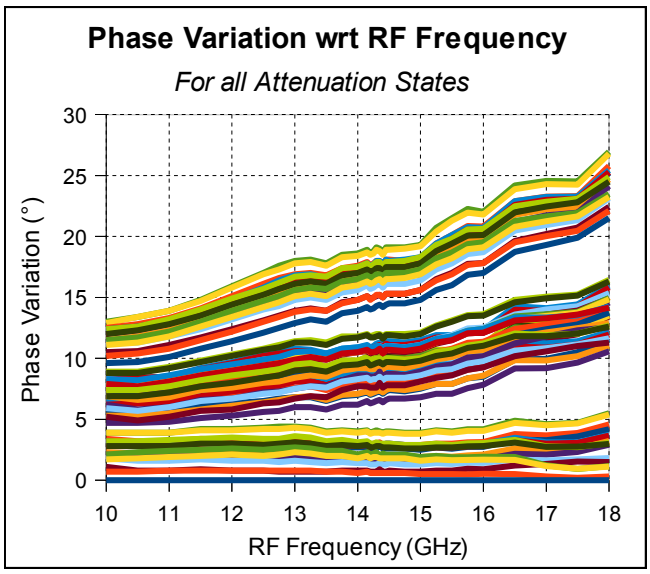
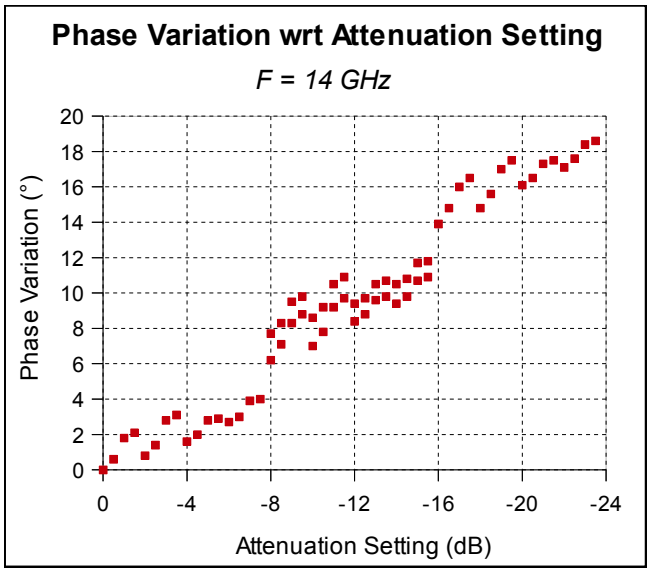
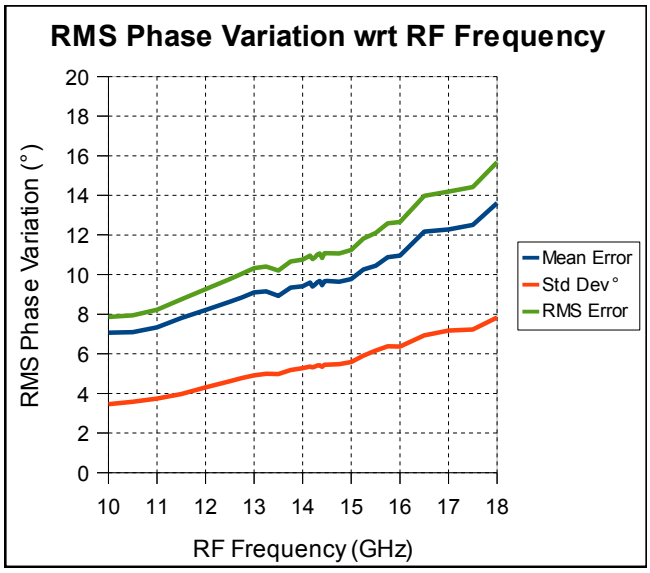
Where x_i is the difference between the measured value and the theoretical value, $\bar{x}_i$ is the mean value of the N x_i, and σ_{xi} is the standard deviation of x_i.

ON WAFER MEASUREMENTS – PHASE SHIFTING VARIATIONS

Measured on wafer @ T = 25 °C
Calculated with input and output inductance of 0.3 nH







Note : The RMS value is the root mean square of the error defined as below :

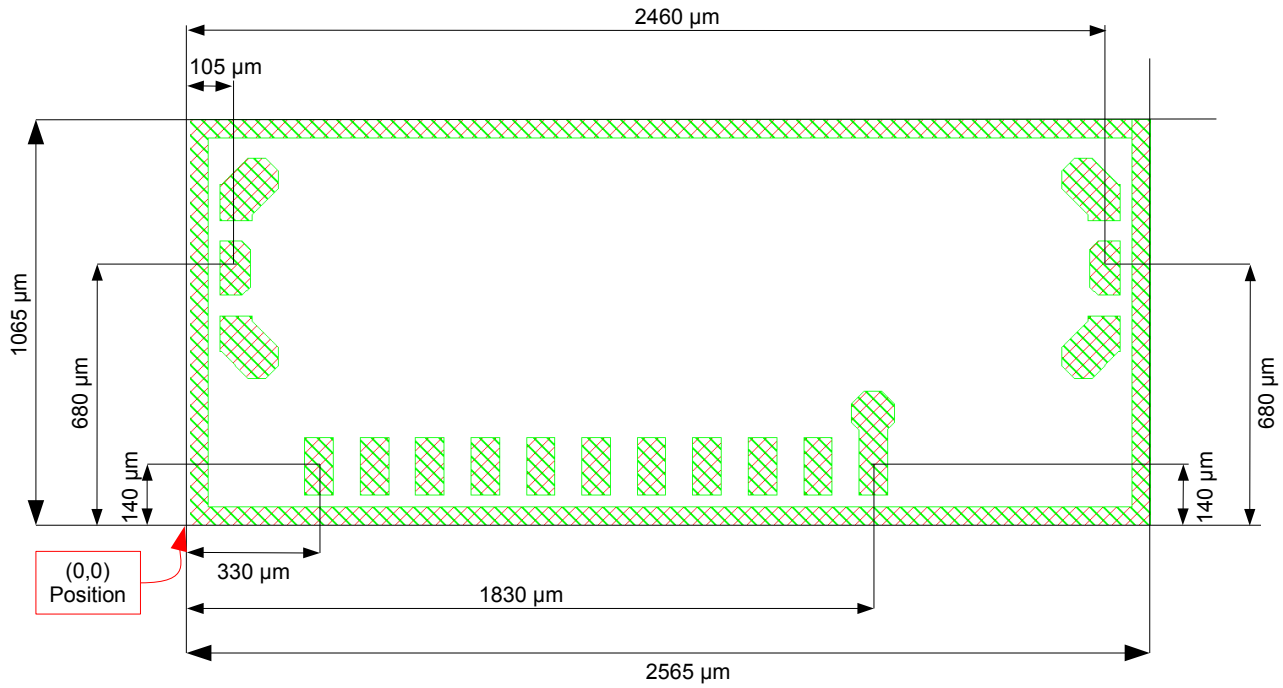
$$x_{RMS} = \sqrt{\frac{1}{N}\sum_{i=1}^{N} x_i^2} = \sqrt{\bar{x}_i^{\,2} + \sigma_{x_i}^2}$$

Where x_i is the difference between the measured value and the theoretical value, $\bar{x}_i$ is the mean value of the N x_i, and σ_{xi} is the standard deviation of x_i.

MECHANICAL INFORMATION

Chip size = 2600 x 1100 µm (2565 x 1065 µm ± 5 µm after dicing)

- DC Pads = 80 x 160 µm, spacing = 70 µm, top metal = Au
- RF Pads = 85 x 150 µm, top metal = Au
- Chip Thickness 100 µm



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PAD POSITION

PAD NAME	SYMBOL	COORDINATES		DESCRIPTION
		X	Y	
IN	RF1	105	680	RF Port 1
OUT	RF2	960	680	RF Port 2
C8A	A8A	330	140	8 dB cell control
C8B	B8A	480	140	8 dB cell control
C2A	A2	630	140	2 dB cell control
C2B	B2	780	140	2 dB cell control
C05	A05	930	140	0.5 dB cell control
C1	A1	1080	140	1 dB cell control
C4A	A4	1230	140	4 dB cell control
C4B	B4	1380	140	4 dB cell control
C8AA	A8B	1530	140	8 dB cell control
C8BB	B8B	1680	140	8 dB cell control
GND	GND	1830	140	Ground (back side)

X=0, Y=0 at bottom left corner.

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
CGY2169	UH	C1	-	6-bit 10-18 GHz Attenuator

RoHS Compliant

Document History : Version 1.0, Last Update 05/10/2011