PRELIMINARY DATASHEET

CGY2171XBUH

6-bit 1-15 GHz Attenuator

DESCRIPTION

The CGY2171XBUH is a high performance GaAs MMIC 6–bit Attenuator operating in L, S, C, and X-band.

The CGY2171XBUH has a nominal attenuation range of 31.5 dB in 0.5 dB steps. It covers the frequency range of 1 to 15 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.

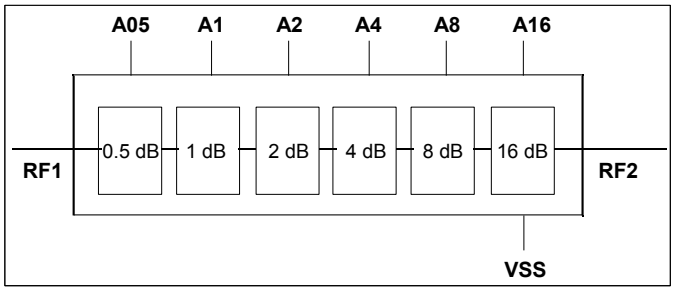
FEATURES

- Operating Range : 1 GHz to 15 GHz
- Insertion Loss : 5 dB at 10 GHz
- Attenuation Range = 31.5 dB
- RMS Attenuation Error ≈ 0.25 dB @ 10GHz
- Input P1dB ≈ +20 dBm
- S_{11} & S_{22} < -13 dB @ 10 GHz (All states)
- 0 / +5V Control Lines
- Chip size = 2600 x 1200 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 X-Band Attenuator

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LIMITING VALUES

T_{amb} = 25 °C unless otherwise noted

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
A_N	Attenuation control inputs		0	+7	V
V_{SS}	Source Supply Voltage		-7	0	V
P_{IN}	Input power	P_{RF} at RF1		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 °C)	TBD	° C/W

CHARACTERISTICS

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

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
Supplies						
V_{SS}	Negative Supply Voltage			-5		V
I_{SS}	Negative Supply Current			8		mA
RF Performance at 10 GHz unless specified						
BW	Bandwidth		1		15	GHz
IL	Insertion Loss			5		dB
NF	Noise Figure at reference state			5		dB
ATT_{range}	Attenuation range			31.5		dB
S_{11} , S_{22}	Input & Output reflection coefficients	At RF1 & RF2		-15		dB
$ATT_{variation\ (RMS)}$	RMS Attenuation error with attenuation setting (see Note 1)			0.25		dB
$ATT_{variation\ (MAX)}$	Maximum Attenuation error with attenuation setting			+/- 1		dB
$PH_{error\ (RMS)}$	RMS Phase variation with attenuation setting (see Note 1)			5		°
$PH_{error\ (MAX)}$	Maximum Phase variation with attenuation setting			+/- 8		°
P_{1dB}	Input 1 dB compression point			20		dBm

Note 1 : The RMS value is the root mean square of the error defined as below

$$x_{\mathrm{rms}} = \sqrt{\frac{1}{N}\sum_{i=1}^{N} x_i^2} = \sqrt{\frac{x_1^2 + x_2^2 + \cdots + x_N^2}{N}}$$

Where x_i is the difference between the measured value and the expected value.

LOGIC TRUTH TABLE

	A05	A1	A2	A4	A8	A16
Nominal Attenuation	0.5 dB	1 dB	2 dB	4 dB	8 dB	16 dB
Pad	A05	A1	A2	A4	A8	A16
Attenuation activated	+5V	+5V	+5V	+5V	+5V	+5V
Reference state	0V	0V	0V	0V	0V	0V

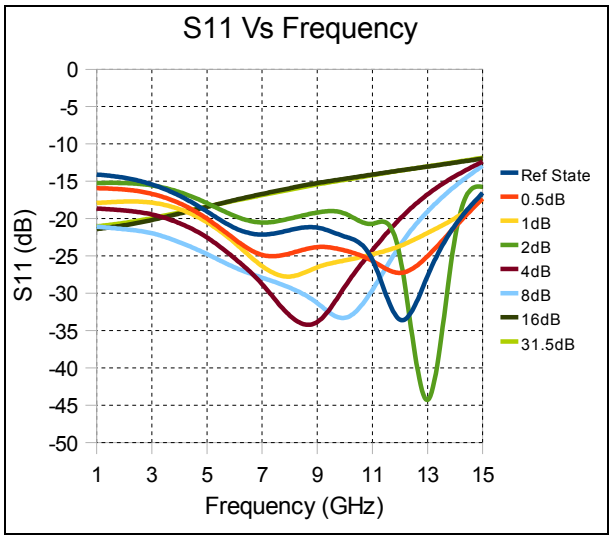
	A05	A1	A2	A4	A8	A16
Attenuation (dB)	**0.5**	**1**	**2**	**4**	**8**	**16**
0	0	0	0	0	0	0
0.5	1	0	0	0	0	0
1	0	1	0	0	0	0
2	0	0	1	0	0	0
3	0	1	1	0	0	0
4	0	0	0	1	0	0
5	0	1	0	1	0	0
6	0	0	1	1	0	0
8	0	0	0	0	1	0
10	0	0	1	0	1	0
15	0	1	1	1	1	0
16	0	0	0	0	0	1
20	0	0	0	1	0	1
25	0	1	0	0	1	1
30	0	0	1	1	1	1
31.5	1	1	1	1	1	1

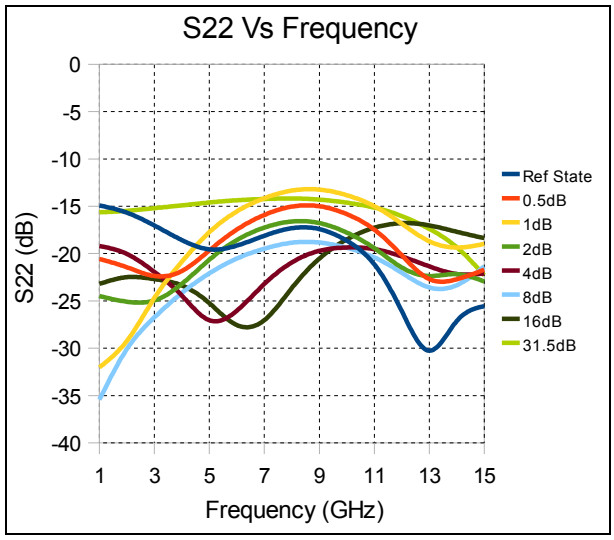
CONTROL VOLTAGE

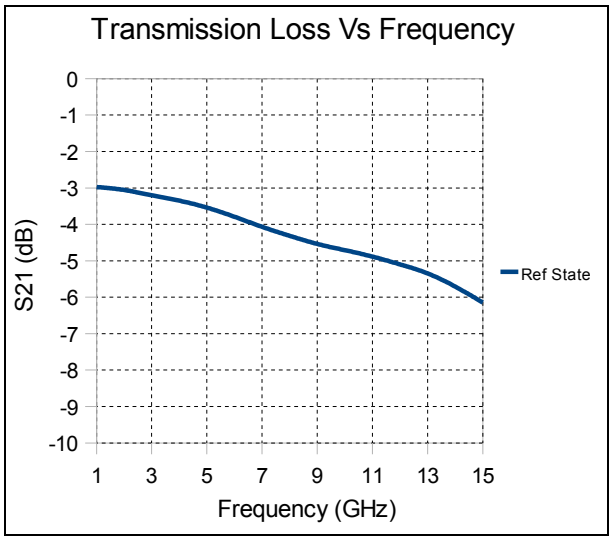
State	MIN.	TYP.	MAX.	UNIT
Low	-0.01	0	+0.01	V
High	4.75	5	5.25	V

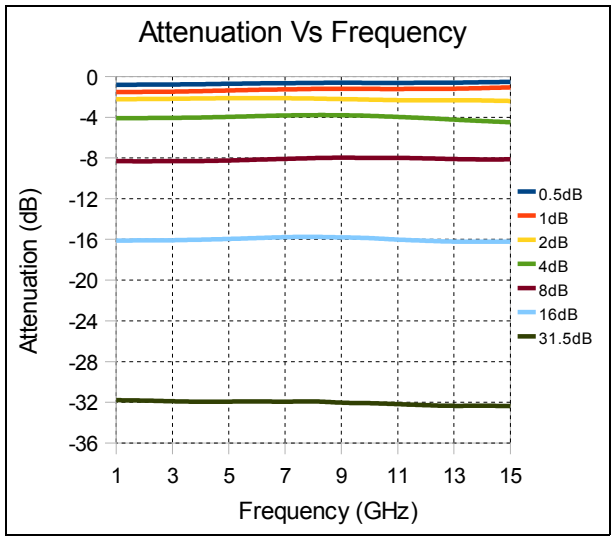
ON WAFER MEASUREMENTS – S PARAMETERS

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



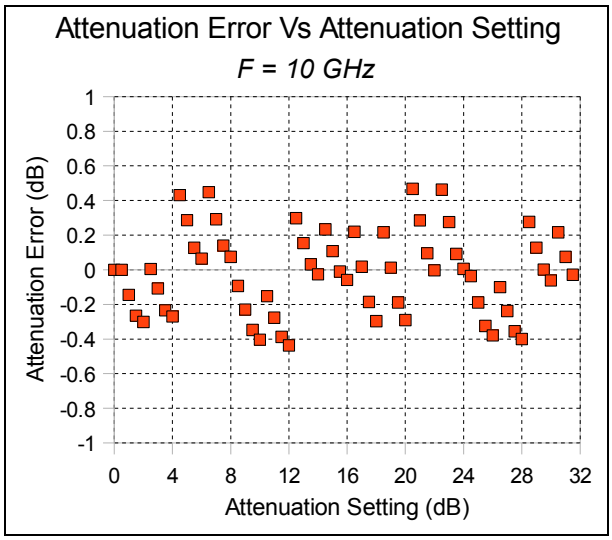


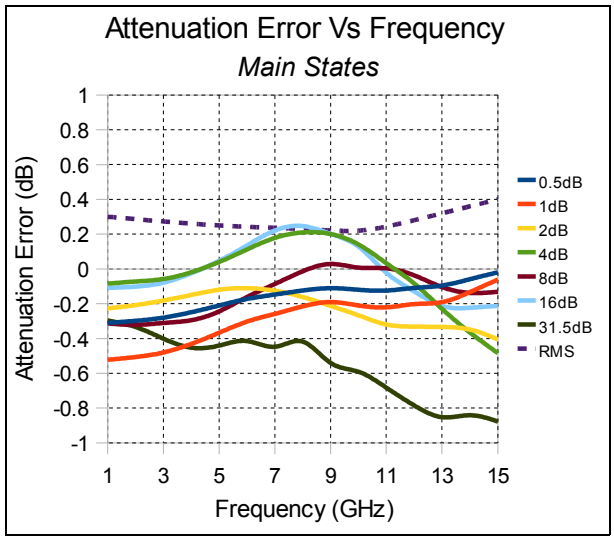




ON WAFER MEASUREMENTS – ATTENUATION ERRORS

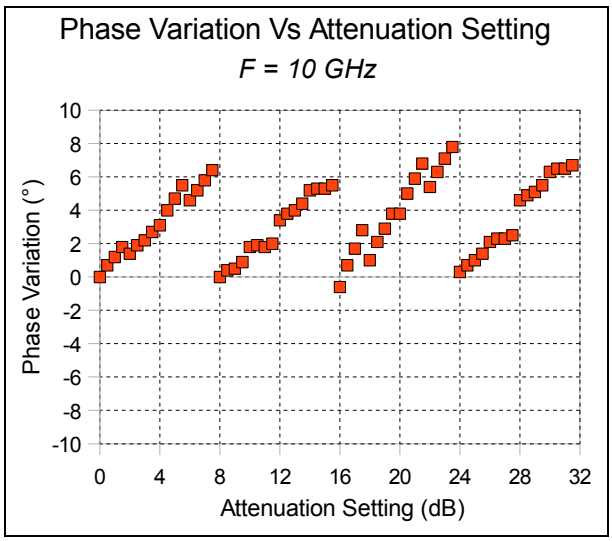
Measured on wafer @ T = 25 °C
Calculated with input and output inductance of 0.3 nH

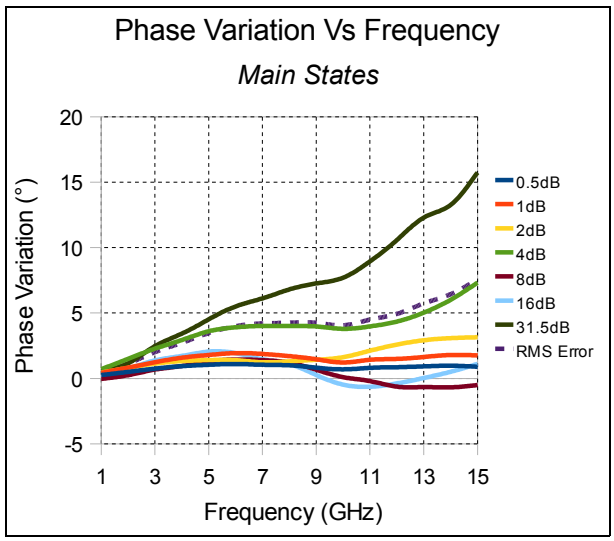




ON WAFER MEASUREMENTS – PHASE SHIFTING VARIATIONS

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

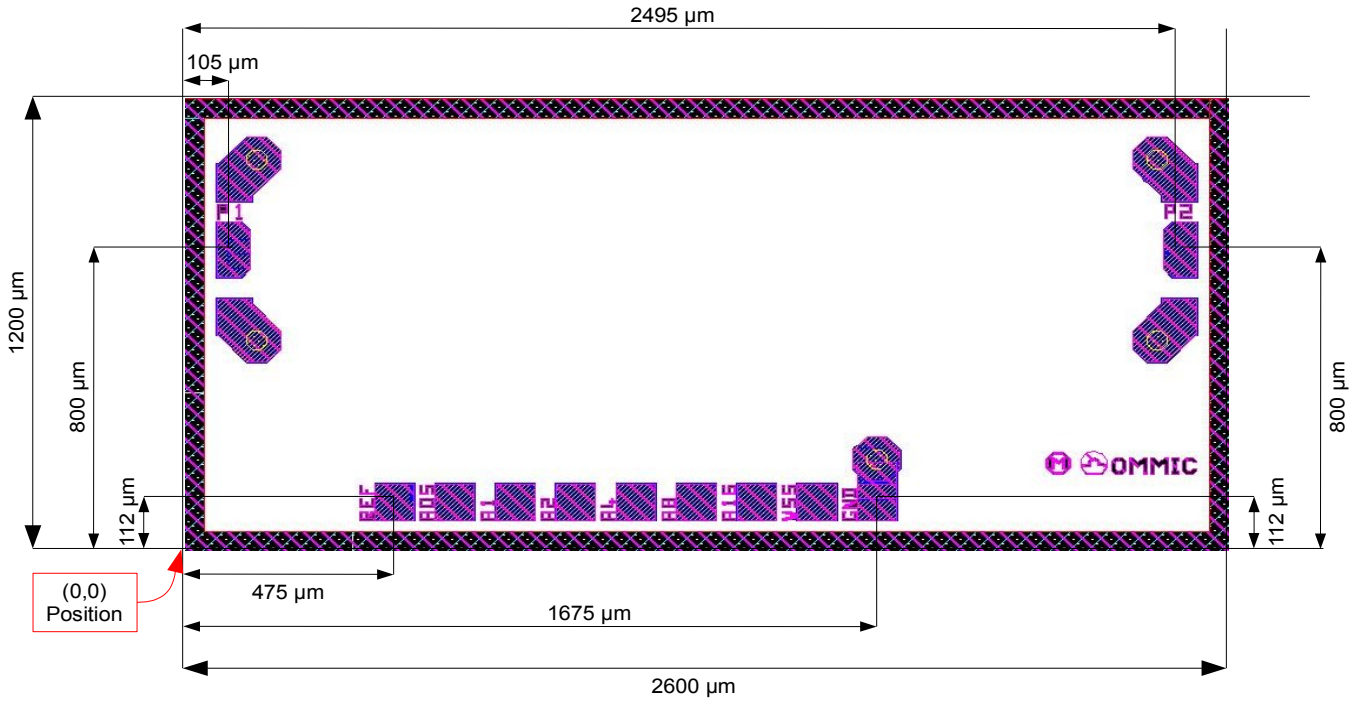




MECHANICAL INFORMATION

Chip size = 2600 x 1200 µm (2565 x 1165 µm ± 5 µm after dicing)

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



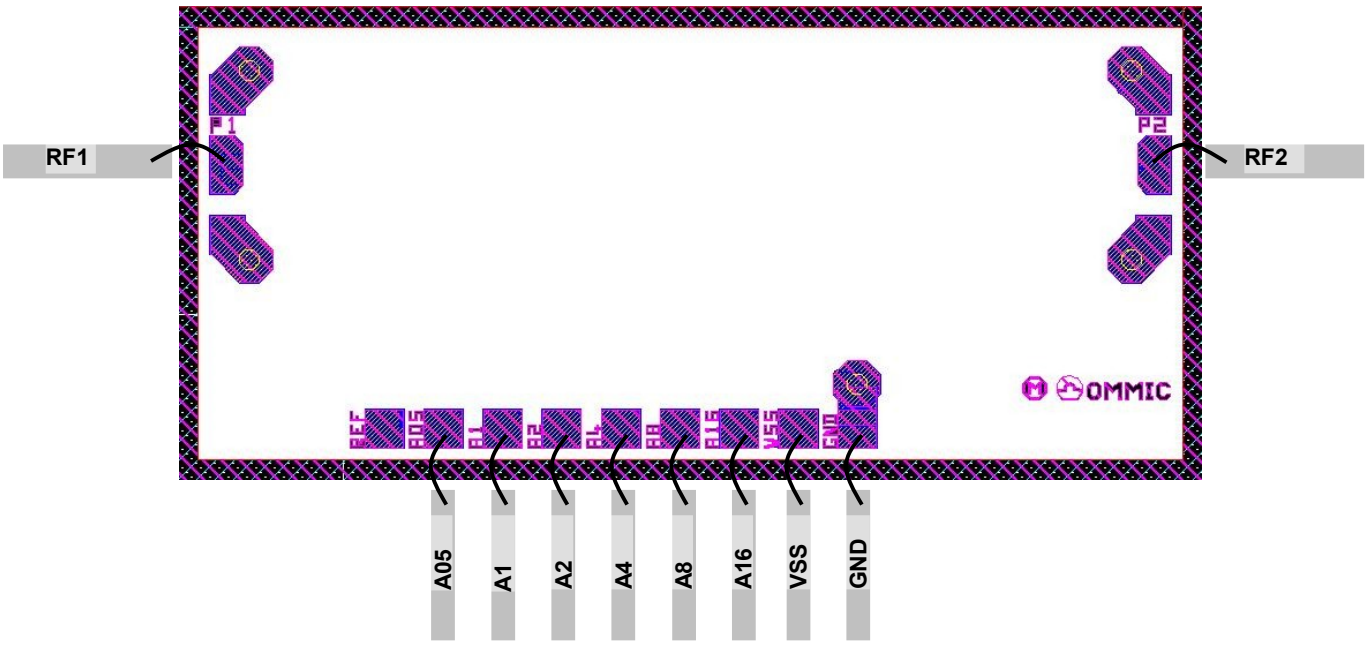
Caution : This device is a high performance RF component and can be damaged by inappropriate handling. Standard ESD precautions should be followed. OMMIC document "OM-CI-MV/ 001/ PG" contains more information on the precautions to take.

PAD POSITION

PAD NAME	SYMBOL	COORDINATES		DESCRIPTION
		X	Y	
P1	RF1	105	800	RF Port 1
P2	RF2	2495	800	RF Port 2
REF	REF	475	112	Reference Output Voltage (Do not connect)
A05	A05	625	112	0.5 dB cell control
A1	A1	775	112	1 dB cell control
A2	A2	925	112	2 dB cell control
A4	A4	1075	112	4 dB cell control
A8	A8	1225	112	8 dB cell control
A16	A16	1375	112	16 dB cell control
VSS	VSS	1525	112	Negative Supply Voltage
GND	GND	1675	112	Ground (back side)

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

BONDING DIAGRAM AND ASSEMBLY INFORMATION



RF interface : coplanar or microstrip, bonding ≈ 400/500 µm.

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PACKAGE

Type	Description	Terminals	Pitch (mm)	Die size (mm)
UH	Bare Die	-	-	2.6 x 1.2 (Before dicing) Die Thickness : 100 µm

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
CGY2171XB	UH	C1	-	6-bit 1-15 GHz Attenuator

RoHS Compliant

Document History : Version 1.0, Last Update 11/4/2010