PRODUCT DATASHEET

Rev 0.2

CGY2107HV

Dual High Gain Low Noise High IP3 Amplifier

DESCRIPTION

The CGY2107HV is an extremely Low Noise cascode Amplifier with state of the art Noise Figure and Linearity suitable for applications from 500 MHz to 6 000 MHz.

The CGY2107HV consists of two identical amplifiers on the same MMIC, and is ideal for use in a balanced configuration or as two single ended amplifiers. Used as a balanced amplifier with 3 dB couplers, a 0.63 dB Noise Figure, 34 dBm Output IP3 and 23.5 dB Gain is obtained at 1.9 GHz. At 3.5 GHz a balanced demonstrator exhibits 0.85 dB Noise Figure, 19.5 dB Gain and OIP3 of 37 dBm. These are measured values and include the noise contribution of the couplers, connectors and biasing circuitry. The minimum Noise Figure of the CGY2107HV itself is 0.32 dB at 1.9 GHz.

The MMIC is manufactured using OMMIC's qualified 0.25 µm PHEMT GaAs MMIC technology. The device is available in a 4x4 mm QFN plastic package.

APPLICATIONS

- High performance LNA in the band 0.5 – 6 GHz
- Base Station applications (LTE, GSM, CDMA, WCDMA, TD-SCDMA, CDMA2000, WiMAX, etc)
- Tower mounted amplifiers
- Repeaters

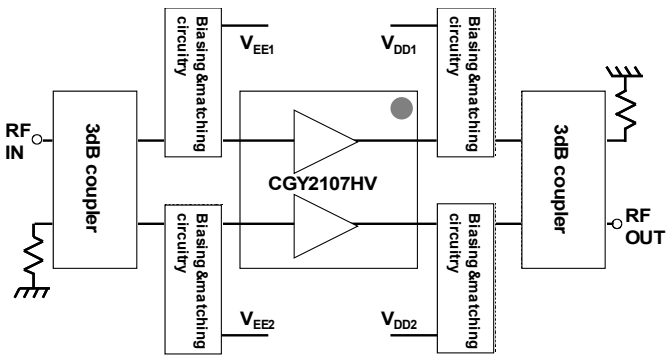
FEATURES

- Usable frequency range from 500 MHz to 6000 MHz
- Dual MMIC LNA with excellent tracking
- Amplifier **NFmin@1.9GHz = 0.32 dB**
- Low Noise, High Gain and high IP3 in balanced configuration :

  NF=0.63 dB, Gain=23.5 dB, OIP3=34 dBm @ 1.9 GHz

  NF=0.7 dB, Gain=21 dB, OIP3=33 dBm @ 2.5 GHz

  NF=0.85 dB, Gain=19.5 dB, OIP3=37 dBm @ 3.5 GHz
- Uses a highly reliable PHEMT MMIC process
- Delivered as 100 % RF tested devices
- Samples and Demonstration Boards Available
- Space and MIL-STD Available



Schematic diagram of the CGY2107HV used in a balanced configuration.

RoHS Compliant

The CGY2107HV is RoHS compliant.

LIMITING VALUES

T_{amb} = + 23 °C, at QFN package lead; unless otherwise specified.

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
V_{EE1} , V_{EE2}	Gate voltage	V_{DD} open-circuited	-3	+ 1	V
V_{DD1}, V_{DD2}	Drain voltage	V_{EE} open-circuited	-1	+ 10	V
I_{D1}, I_{D2}	Drain current			100	mA
P_{IN}	Input power			10	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)	70	° C/W

CHARACTERISTICS

T_{amb} = + 23 °C

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
f_i	Input frequency		0.5		6	GHz
Performance at QFN package lead; f_i = 1.9 GHz						
V_D	Supply voltage			4		V
I_D	Supply current	V_{EE} = - 0.55 V		50		mA
G	Gain			22.7		dB
NF_{min}	Minimum Noise Figure			0.32		dB
*Performance * of Reference Board (Single Ended configuration with on-board bias resistors);* f_i = 1.95 GHz						
V_{DD}	Supply voltage			5		V
I_D	Supply current	V_{EE1} = V_{EE2} = - 0.55 V		50		mA
G	Gain		23	24		dB
NF	Noise Figure			0.5		dB
ISO_{rev}	Reverse Isolation	OUT/IN		32		dB
IIP3	Input third order intercept point	I_D = 70 mA	3.5	7		dBm
S_{11}	Input reflection coefficient	50 Ω source		- 4.5		dB
S_{22}	Output reflection coefficient	50 Ω load		- 10		dB
$ISO_{IN1-IN2}$	Isolation between IN1 and IN2	IN1/IN2	30			dB
*Performance * of Demonstration Board (Balanced configuration with on-board bias resistors);* f_i = 1.9 GHz						
V_{DD1}, V_{DD2}	Supply voltage			5		V
I_{D1}, I_{D2}	Supply current	V_{EE1} = V_{EE2} = - 0.66 V		50		mA
G	Gain			23.4		dB
NF	Noise Figure			0.63		dB
IIP3	Input third order intercept point			11		dBm
P_{1dB}	Output Power @ 1dB gain compression			22		dBm
S_{11}	Input reflection coefficient	50 Ω source		- 25.6		dB
S_{22}	Output reflection coefficient	50 Ω load		- 23.9		dB

(*) Measurement reference planes are the INPUT and OUTPUT SMA connectors.

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.

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S-PARAMETERS

V_D = 4 V; I_D = 50 mA; T_{amb} = + 23 °C

Frequency (GHz)	|S11|	Ang S11 (°)	|S21|	Ang S21 (°)	|S12|	Ang S12 (°)	|S22|	Ang S22 (°)
0.1	-0.40	-6.74	27.29	179.05	-51.76	34.78	-3.38	10.85
0.2	-0.49	-13.03	27.48	170.31	-49.24	44.75	-2.86	1.85
0.3	-0.61	-19.28	27.41	163.03	-47.09	50.59	-2.79	-3.36
0.4	-0.77	-25.39	27.26	156.37	-45.28	53.31	-2.80	-7.36
0.5	-0.97	-31.32	27.05	150.10	-43.78	54.23	-2.86	-10.79
0.6	-1.19	-37.03	26.81	144.15	-42.53	54.14	-2.93	-13.89
0.7	-1.44	-42.52	26.54	138.49	-41.47	53.47	-3.01	-16.77
0.8	-1.71	-47.77	26.24	133.09	-40.56	52.47	-3.09	-19.48
0.9	-1.98	-52.78	25.93	127.95	-39.77	51.28	-3.18	-22.07
1	-2.27	-57.56	25.61	123.05	-39.07	49.99	-3.27	-24.56
1.1	-2.55	-62.12	25.28	118.37	-38.45	48.65	-3.36	-26.98
1.2	-2.84	-66.46	24.94	113.90	-37.90	47.30	-3.44	-29.34
1.3	-3.13	-70.61	24.61	109.61	-37.39	45.93	-3.53	-31.66
1.4	-3.40	-74.58	24.27	105.51	-36.92	44.57	-3.61	-33.96
1.5	-3.68	-78.37	23.94	101.56	-36.49	43.22	-3.68	-36.23
1.6	-3.94	-82.00	23.62	97.75	-36.09	41.87	-3.75	-38.50
1.7	-4.20	-85.49	23.30	94.08	-35.71	40.52	-3.82	-40.77
1.8	-4.44	-88.85	22.98	90.52	-35.35	39.18	-3.89	-43.05
1.9	-4.68	-92.07	22.67	87.06	-35.01	37.83	-3.95	-45.35
2	-4.91	-95.19	22.37	83.70	-34.68	36.48	-4.01	-47.66
2.1	-5.13	-98.19	22.08	80.43	-34.37	35.13	-4.06	-50.00
2.2	-5.33	-101.10	21.79	77.22	-34.07	33.76	-4.11	-52.37
2.3	-5.53	-103.92	21.51	74.09	-33.79	32.38	-4.16	-54.77
2.4	-5.72	-106.64	21.23	71.01	-33.51	30.99	-4.21	-57.21
2.5	-5.90	-109.29	20.96	67.99	-33.25	29.58	-4.25	-59.68
2.6	-6.07	-111.86	20.70	65.02	-32.99	28.15	-4.29	-62.20
2.7	-6.24	-114.35	20.45	62.08	-32.74	26.70	-4.33	-64.75
2.8	-6.39	-116.78	20.20	59.19	-32.50	25.23	-4.37	-67.36
2.9	-6.54	-119.14	19.95	56.32	-32.27	23.75	-4.40	-70.00
3	-6.68	-121.43	19.72	53.49	-32.04	22.24	-4.43	-72.69
3.2	-6.94	-125.84	19.25	47.89	-31.62	19.15	-4.48	-78.22
3.4	-7.18	-130.02	18.81	42.36	-31.21	15.98	-4.52	-83.94
3.6	-7.39	-133.98	18.38	36.90	-30.84	12.71	-4.54	-89.84
3.8	-7.58	-137.73	17.96	31.47	-30.49	9.35	-4.55	-95.93
4	-7.75	-141.28	17.55	26.07	-30.17	5.91	-4.54	-102.19
4.5	-8.09	-149.25	16.55	12.63	-29.48	-3.07	-4.42	-118.46
5	-8.31	-156.00	15.57	-0.76	-28.97	-12.49	-4.16	-135.27
5.5	-8.41	-161.61	14.56	-14.09	-28.62	-22.23	-3.79	-152.09
6	-8.35	-166.31	13.52	-27.29	-28.46	-32.12	-3.34	-168.39

Note : Measurement reference planes are the QFN Package Leads, a TRL calibration method is used.

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NOISE-PARAMETERS

V_D = 4 V; I_D = 50 mA; T_{amb} = + 23 °C.

Frequency (GHz)	NF_{min} (dB)	$\|\Gamma_{opt}\|$	Ang Γ_{opt} (°)	R_{n0}
0.10	0.19	0.94	4.09	0.13
0.20	0.20	0.91	6.73	0.10
0.30	0.21	0.88	9.34	0.10
0.40	0.22	0.85	11.97	0.09
0.50	0.23	0.82	14.62	0.09
0.60	0.24	0.79	17.29	0.09
0.70	0.26	0.77	19.98	0.09
0.80	0.27	0.74	22.68	0.08
0.90	0.28	0.71	25.41	0.08
1.00	0.29	0.69	28.17	0.08
1.10	0.31	0.67	30.95	0.08
1.20	0.32	0.64	33.76	0.08
1.30	0.33	0.62	36.61	0.08
1.40	0.34	0.60	39.48	0.08
1.50	0.36	0.58	42.40	0.08
1.60	0.37	0.56	45.35	0.08
1.70	0.38	0.54	48.34	0.07
1.80	0.39	0.53	51.37	0.07
1.90	0.41	0.51	54.45	0.07
2.00	0.42	0.50	57.56	0.07
2.10	0.43	0.48	60.72	0.07
2.20	0.44	0.47	63.92	0.07
2.30	0.46	0.45	67.17	0.07
2.40	0.47	0.44	70.46	0.07
2.50	0.48	0.43	73.78	0.07
2.60	0.49	0.42	77.15	0.06
2.70	0.51	0.41	80.54	0.06
2.80	0.52	0.40	83.97	0.06
2.90	0.53	0.39	87.43	0.06
3.00	0.54	0.39	90.90	0.06
3.20	0.57	0.37	97.90	0.06
3.40	0.59	0.36	104.90	0.05
3.60	0.62	0.35	111.87	0.05
3.80	0.64	0.35	118.75	0.05
4.00	0.67	0.35	125.48	0.05
4.50	0.72	0.35	141.42	0.04
5.00	0.78	0.36	155.77	0.04
5.50	0.84	0.37	168.47	0.04
6.00	0.89	0.39	179.63	0.04

Note : The reference planes are the QFN Package Leads.
R_{n0} is the Noise Resistance normalised to 50 Ω.

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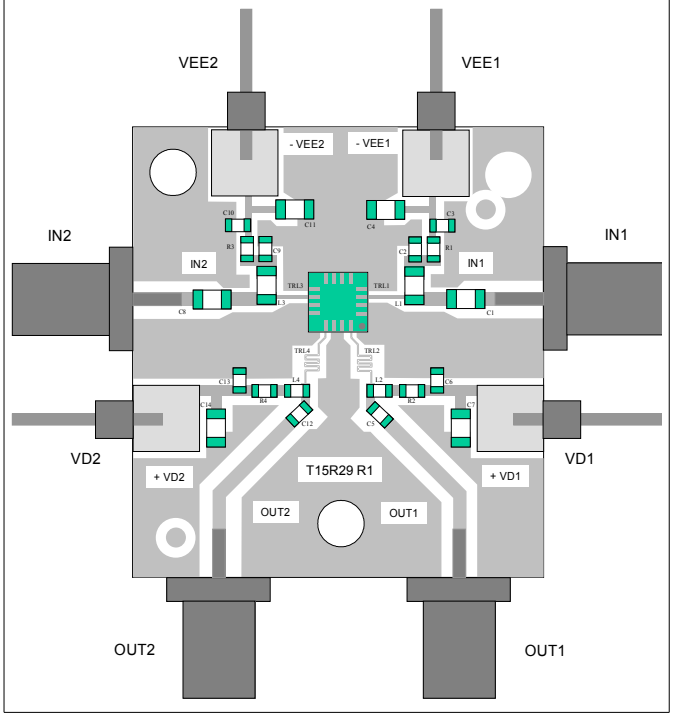
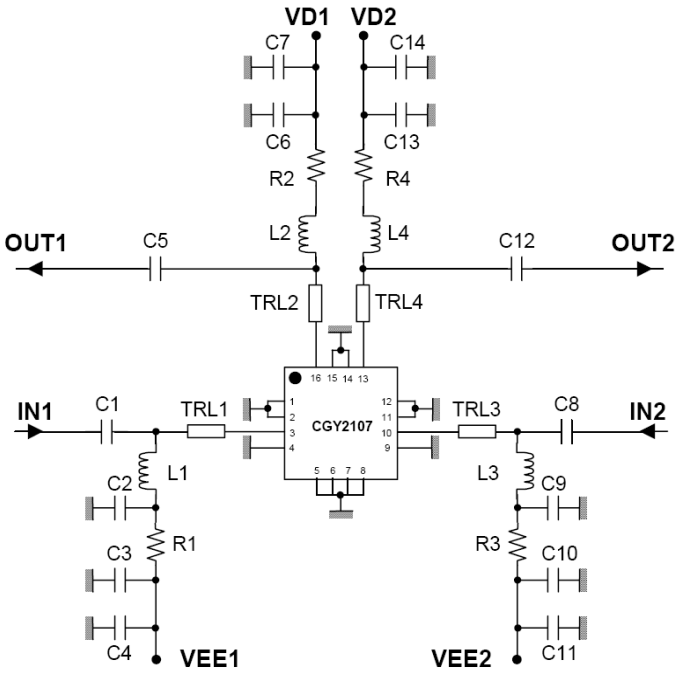
SINGLE ENDED REFERENCE BOARD 1900 MHz

Assembly Drawing.



Circuit Diagram (centre frequency 1900 MHz).



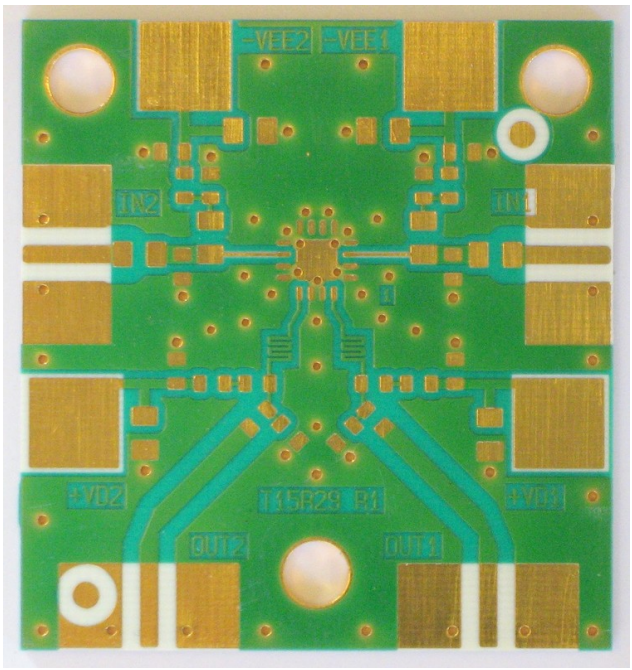
Bill of materials

Component	Value	Reference
R1, R3	470 Ω	0603
R2, R4	22 Ω	0603
L1, L3	22 nH	Coilcraft 0805CS
L2, L4	22 nH	Toko 0603
C1,C8	47 pF	0603 C0G
C2,C9	10 pF	0603 C0G
C3,C10	15 pF	0603 C0G
C4,C11,C7,C14	10 nF	0805
C5, C12,C6,C13	100 pF	0603 C0G
C15,C16	47 µF	1210 X5R
TRL1, TRL3		W=150 µm l=3000 µm
TRL2, TRL4		W=150 µm l=10 000 µm

Notes:
Capacitors C17 and C18 prevent low frequency oscillations when the board is biased from laboratory power supplies. They are not required when on-board voltage regulators are used.

Board material is Rogers RO4350 with height 508 µm.

Printed Circuit Board



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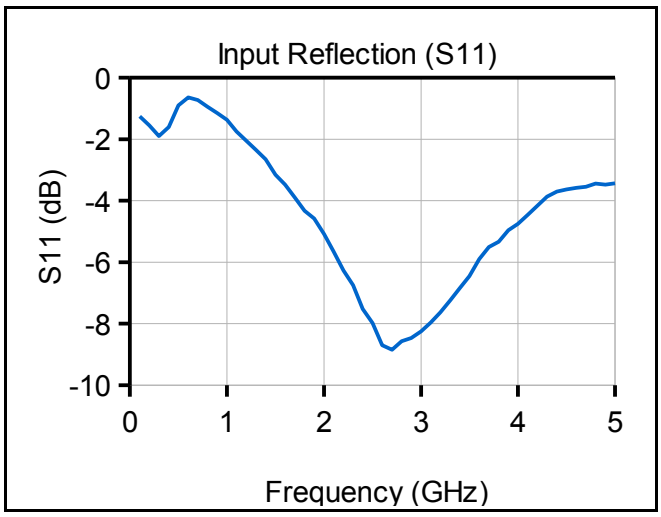
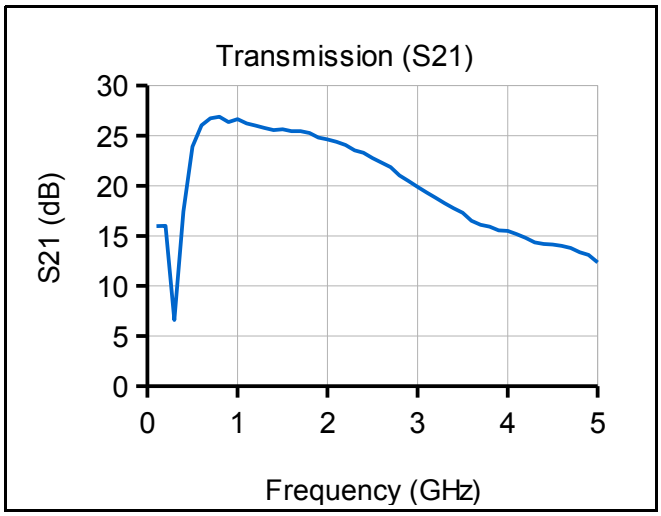
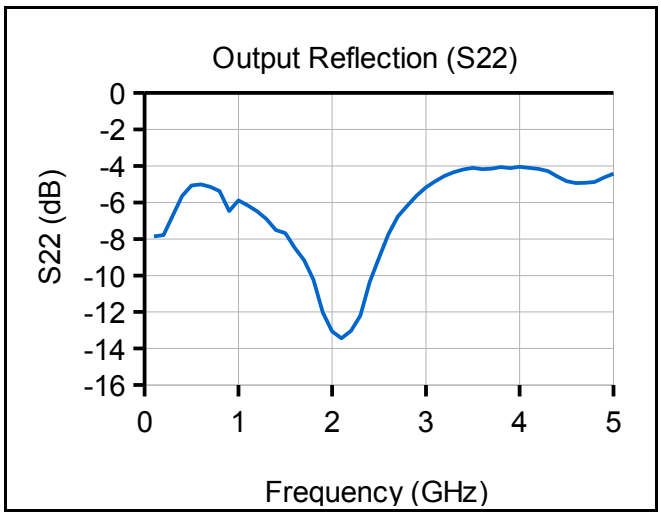
MEASURED PERFORMANCE OF REFERENCE BOARD 1900 MHz

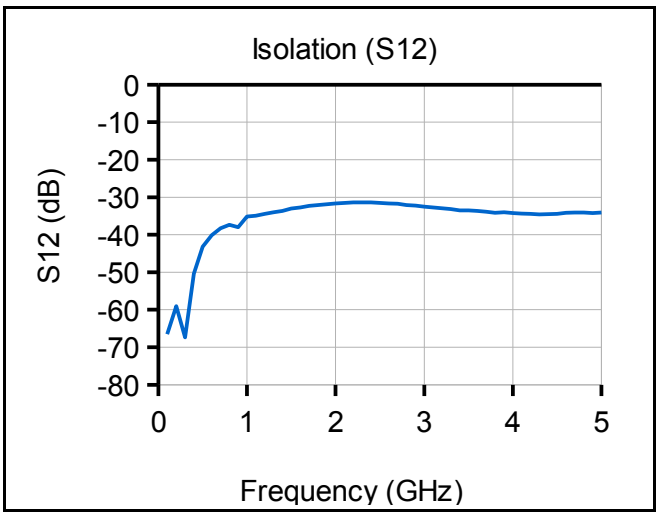
Conditions : $V_{DD1} = V_{DD2} = 5$ V, $I_{D1} + I_{D2} = 100$ mA;$T_{amb} = +23$°C, unless otherwise stated.

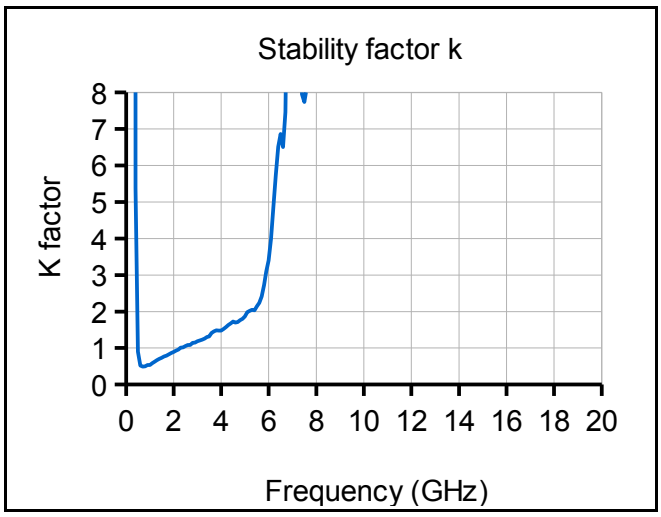
Measurements include RF connector contributions.











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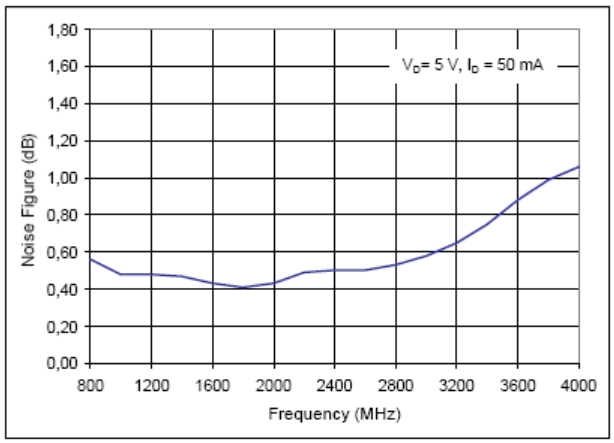
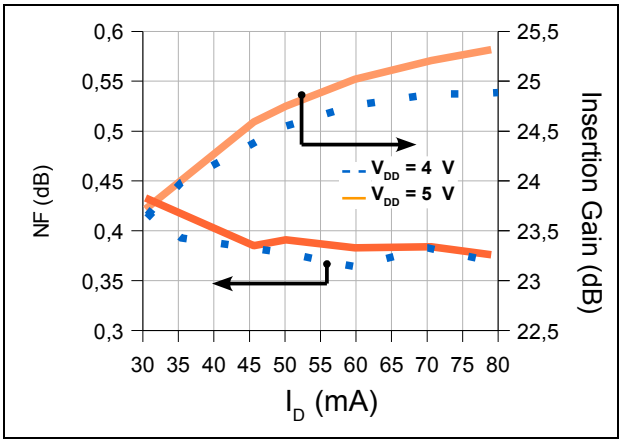
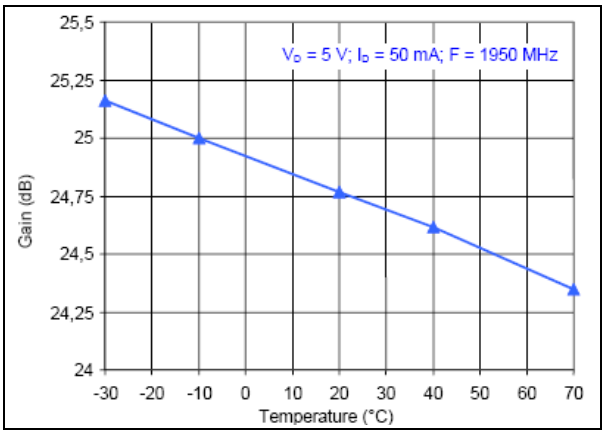
NF versus Frequency



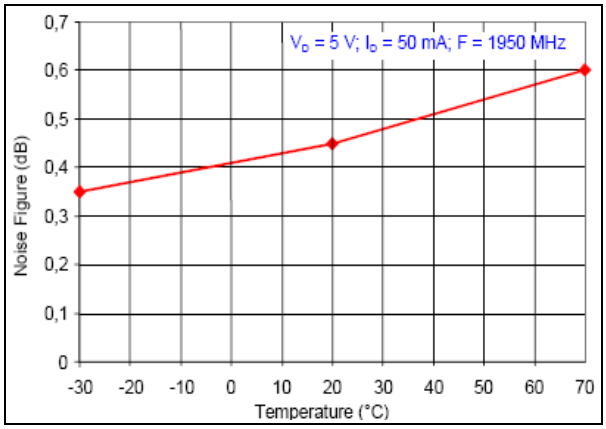
NF versus I_D current at 1900MHz



Gain versus Temperature



NF versus Temperature



Note :

These results have been obtained on a Single Ended Reference Board optimised at 1950 MHz. Excellent results have been reached in balanced configuration. The frequency range of the Balanced Configuration is mainly determined by the couplers used - the CGY2107HV can be used up to 6 GHz, in balanced or single ended applications, with excellent results. For more details on the reference board used, please refer to CGY2107HV application notes.

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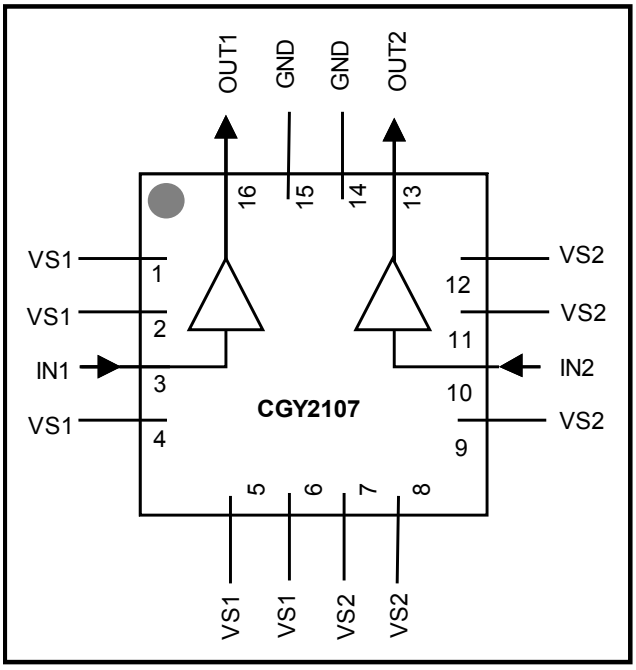
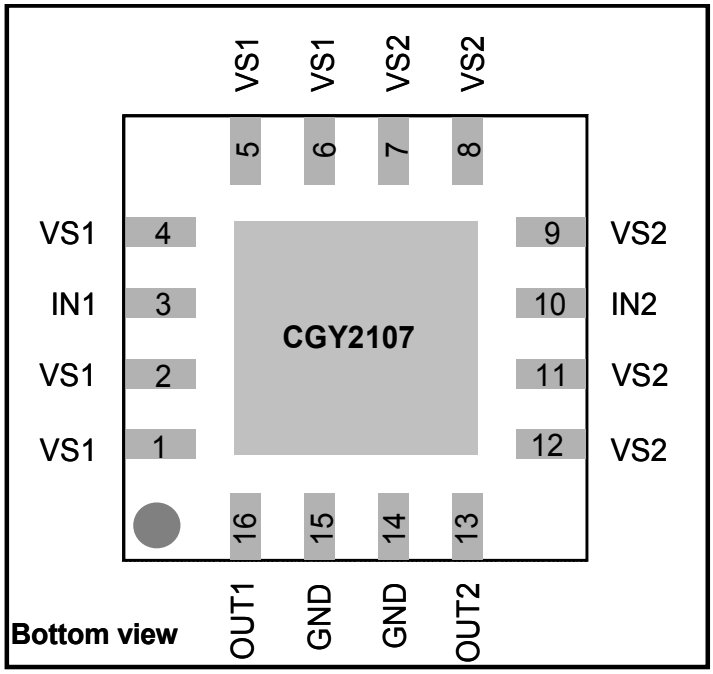
BLOCK DIAGRAM AND PIN CONFIGURATION



Block Diagram of the LNA CGY2107HV.



Pin Diagram of the LNA CGY2107HV.

PINNING

Symbol	Pin	Description
VS1	1, 2, 4, 5 and 6	Amplifier 1 : Source
IN1	3	Amplifier 1 : Gate (RF input)
OUT1	16	Amplifier 1 : Drain (RF output)
VS2	7, 8, 9, 11 and 12	Amplifier 1 : Source
IN2	10	Amplifier 2 : Gate (RF input)
OUT2	13	Amplifier 2 : Drain (RF output)
GND	14 and 15	Ground

Note :

It is essential in order to ensure good performance and stability that the central ground pad of the QFN package is suitably connected to the ground.

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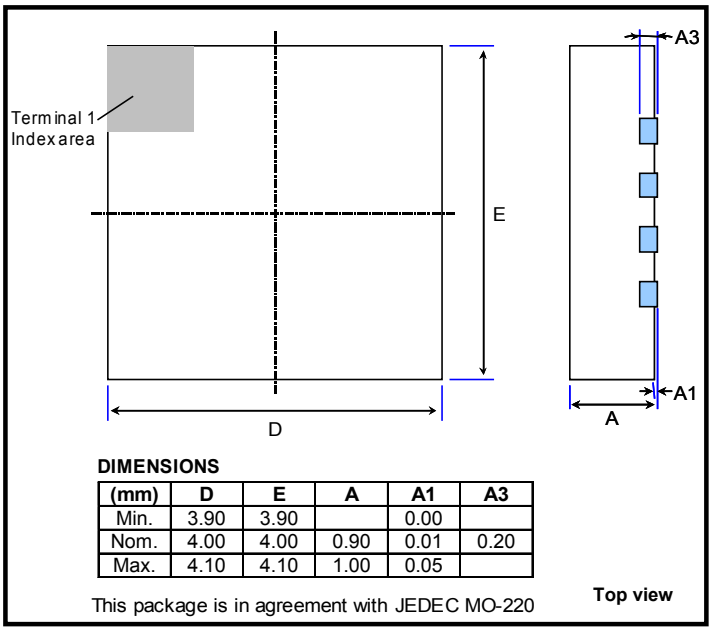
PACKAGE

Type	Description	Terminals	Pitch (mm)	Package size (mm)
QFN	Quad Flat No lead with exposed heat sink	16	0.65	4 x 4 x 0.9

In agreement with JEDEC MO-220.

PACKAGE OUTLINE AND PCB LAND PATTERN

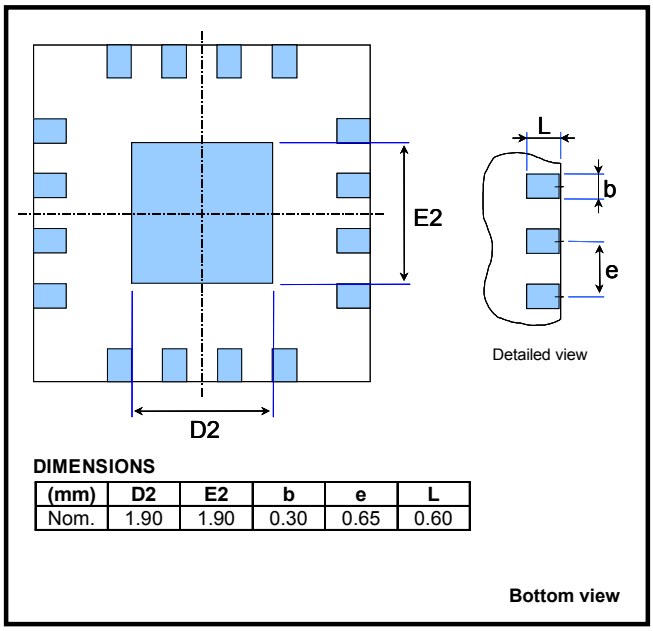


DIMENSIONS

(mm)	D	E	A	A1	A3
Min.	3.90	3.90		0.00	
Nom.	4.00	4.00	0.90	0.01	0.20
Max.	4.10	4.10	1.00	0.05	

This package is in agreement with JEDEC MO-220

Top view



DIMENSIONS

(mm)	D2	E2	b	e	L
Nom.	1.90	1.90	0.30	0.65	0.60

Bottom view

ORDERING INFORMATION

Generic type	Package type	Version	Sort Type	Description
CGY2107	HV	C1		DUAL LNA, QFN Plastic Package
CGY2107	HV	C1	REFBOARD	Single Ended Reference Board 1900MHz
CGY2107	HV	C1	BALBOARD	Balanced Reference Board 1900MHz

RoHS Compliant

THE CGY2107HV IS ROHS COMPLIANT.

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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.

DISCLAIMERS

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. OMMIC's customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify OMMIC for any damages resulting from such application.

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