

PRODUCT DATASHEET

CGY2108HV

Dual High Gain Low Noise High IP3 Amplifier

DESCRIPTION

The CGY2108HV 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 CGY2108HV consists of two identical amplifiers on the same MMIC, and is ideal for use in a balanced configuration or as two single ended amplifiers.

The minimum Noise Figure of the CGY2108HV 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

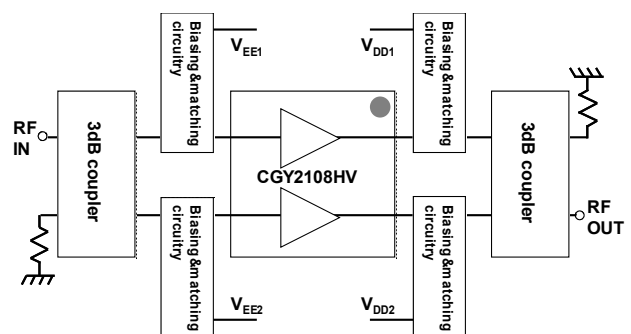
FEATURES

- ▶ Usable frequency range from 500 MHz to 6000 MHz

central frequency (GHz)	NF (dB)	Gain (dB)	OIP3 (dBm)	P1dB (dBm)
0.9	0.7	23	36.5	-
1.9	0.65	20	-	-
1.9 in dual mode	0.5	21.5	32.5	22
3.2 in SE conf.	0.8	17.5	29	

(*) measured figures including noise contribution of couplers, connectors and biasing circuitry

- ▶ Dual MMIC LNA with excellent tracking
- ▶ 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 CGY2108HV used in a balanced configuration.

LIMITING VALUES

$T_{amb} = +23\text{ }^{\circ}\text{C}$, 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	-3	+10	V
I_{D1}, I_{D2}	Drain current			100	mA
P_{IN}	Input power			10	dBm
T_{amb}	Ambient temperature		-40	+85	$^{\circ}\text{C}$
T_j	Junction temperature			+150	$^{\circ}\text{C}$
T_{stg}	Storage temperature		-55	+150	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	UNIT
$R_{th(j-a)}$	Thermal resistance from junction to ambient ($T_a = 25\text{ }^{\circ}\text{C}$)	70	$^{\circ}\text{C/W}$

CHARACTERISTICS

$T_{amb} = +23\text{ }^{\circ}\text{C}$

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
f_i	Input frequency		0.5		6	GHz
<i>Performance at QFN package lead; $f_i = 1.9\text{ GHz}$</i>						
V_D	Supply voltage			4		V
I_D	Supply current	$V_{EE} = -0.55\text{ V}$		50		mA
G	Gain			22.7		dB
NF_{min}	Minimum Noise Figure			0.32		dB
<i>Performance * of Reference Board (Single Ended configuration with on-board bias resistors); $f_i = 1.95\text{ GHz}$</i>						
V_{DD}	Supply voltage			5		V
I_D	Supply current	$V_{EE1} = V_{EE2} = -0.55\text{ V}$		50		mA
G	Gain			21.5		dB
NF	Noise Figure			0.5		dB
ISO_{rev}	Reverse Isolation	OUT/IN		32		dB
IIP3	Input third order intercept point	$I_D = 70\text{ mA}$	3.5	8.3		dBm
S_{11}	Input reflection coefficient	50 Ω source		-11		dB
S_{22}	Output reflection coefficient	50 Ω load		-10		dB
$ISO_{IN1-IN2}$	Isolation between IN1 and IN2	IN1/IN2		30		dB
<i>Performance * of Demonstration Board (Balanced configuration with on-board bias resistors); $f_i = 1.9\text{ GHz}$</i>						
V_{DD1}, V_{DD2}	Supply voltage			5		V
I_{D1}, I_{D2}	Supply current	$V_{EE1} = V_{EE2} = -0.66\text{ V}$		50		mA
G	Gain			20.3		dB
NF	Noise Figure			0.65		dB
IIP3	Input third order intercept point					dBm
P_{1dB}	Output Power @ 1dB gain compression					dBm
S_{11}	Input reflection coefficient	50 Ω source		-26		dB
S_{22}	Output reflection coefficient	50 Ω load		-25		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.

S-PARAMETERS
 $V_D = 4 \text{ V}; I_D = 50 \text{ mA}; T_{\text{amb}} = + 23 \text{ }^\circ\text{C}$

Frequency (GHz)	S11	Ang S11 (°)	S21	Ang S21 (°)	S12	Ang S12 (°)	S22	Ang S22 (°)
0.1	0.97322	-6.58414	23.57163	176.13541	0.00245	52.11044	0.70211	10.60726
0.2	0.95109	-12.14739	23.72555	165.05527	0.00342	56.29639	0.74298	2.70614
0.3	0.92192	-17.48830	23.06635	155.66167	0.00446	60.77167	0.75002	-1.65578
0.4	0.88658	-22.41731	22.11695	147.20802	0.00558	63.28578	0.75075	-4.89710
0.5	0.84775	-26.86021	21.02926	139.50044	0.00672	64.47227	0.74944	-7.64587
0.6	0.80788	-30.80858	19.89177	132.45422	0.00788	64.84617	0.74730	-10.13258
0.7	0.76874	-34.29243	18.76239	126.00159	0.00905	64.70856	0.74481	-12.46506
0.8	0.73148	-37.36183	17.67722	120.07571	0.01022	64.23167	0.74218	-14.70282
0.9	0.69669	-40.07445	16.65644	114.61091	0.01140	63.51693	0.73950	-16.88239
1	0.66463	-42.48790	15.70932	109.54531	0.01258	62.62662	0.73679	-19.02796
1.1	0.63531	-44.65555	14.83809	104.82285	0.01377	61.60073	0.73408	-21.15631
1.2	0.60859	-46.62468	14.04081	100.39397	0.01496	60.46608	0.73135	-23.27960
1.3	0.58428	-48.43596	13.31321	96.21568	0.01616	59.24137	0.72860	-25.40697
1.4	0.56215	-50.12376	12.64996	92.25105	0.01737	57.94009	0.72580	-27.54552
1.5	0.54196	-51.71668	12.04533	88.46857	0.01859	56.57225	0.72296	-29.70096
1.6	0.52349	-53.23837	11.49372	84.84135	0.01981	55.14542	0.72005	-31.87807
1.7	0.50654	-54.70818	10.98978	81.34653	0.02104	53.66546	0.71707	-34.08094
1.8	0.49090	-56.14192	10.52863	77.96456	0.02228	52.13693	0.71403	-36.31322
1.9	0.47642	-57.55238	10.10581	74.67875	0.02352	50.56341	0.71090	-38.57822
2	0.46296	-58.94993	9.71732	71.47474	0.02477	48.94776	0.70769	-40.87901
2.1	0.45038	-60.34289	9.35959	68.34016	0.02603	47.29225	0.70440	-43.21849
2.2	0.43858	-61.73790	9.02943	65.26430	0.02730	45.59866	0.70103	-45.59943
2.3	0.42746	-63.14027	8.72404	62.23785	0.02857	43.86846	0.69759	-48.02450
2.4	0.41693	-64.55416	8.44088	59.25269	0.02985	42.10277	0.69407	-50.49630
2.5	0.40694	-65.98282	8.17773	56.30170	0.03113	40.30252	0.69050	-53.01733
2.6	0.39742	-67.42876	7.93259	53.37861	0.03242	38.46842	0.68687	-55.59004
2.7	0.38832	-68.89384	7.70370	50.47790	0.03370	36.60107	0.68320	-58.21678
2.8	0.37960	-70.37946	7.48946	47.59470	0.03499	34.70092	0.67950	-60.89983
2.9	0.37123	-71.88655	7.28845	44.72466	0.03629	32.76835	0.67579	-63.64132
3	0.36318	-73.41574	7.09938	41.86396	0.03758	30.80368	0.67208	-66.44330
3.2	0.34796	-76.54152	6.75261	36.15730	0.04015	26.77908	0.66474	-72.23598
3.4	0.33383	-79.75712	6.44116	30.45187	0.04271	22.62911	0.65767	-78.29037
3.6	0.32076	-83.06078	6.15847	24.72993	0.04522	18.35589	0.65106	-84.61471
3.8	0.30874	-86.44992	5.89907	18.97809	0.04768	13.96204	0.64515	-91.21166
4	0.29785	-89.92234	5.65841	13.18675	0.05007	9.45108	0.64020	-98.07668
4.5	0.27618	-98.97054	5.11498	-1.49685	0.05553	-2.30456	0.63377	-116.30161
5	0.26412	-108.61978	4.62182	-16.46979	0.05997	-14.64542	0.63882	-135.61570
5.5	0.26369	-119.06646	4.15284	-31.64137	0.06300	-27.39637	0.65732	-155.21044
6	0.27614	-130.48278	3.69664	-46.84370	0.06436	-40.33009	0.68816	-174.18116

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

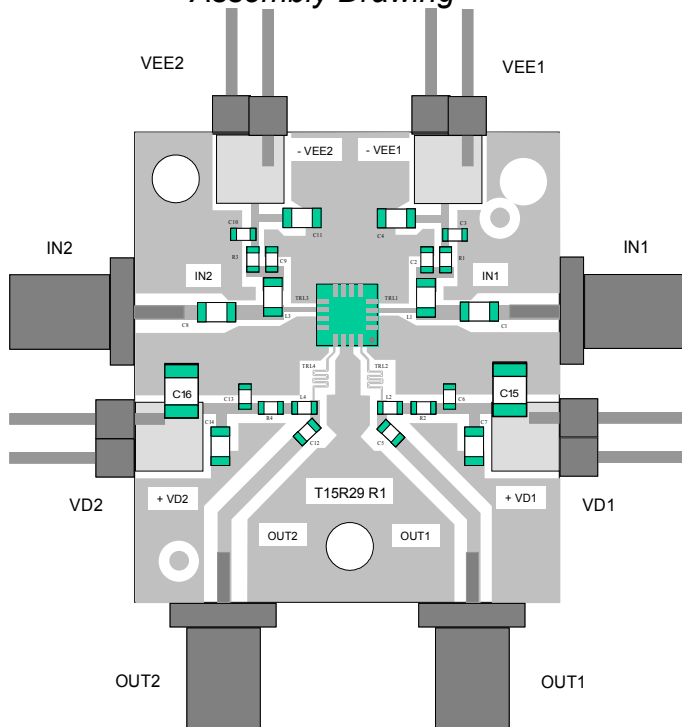
NOISE-PARAMETERS
 $V_D = 4 \text{ V}; I_D = 50 \text{ mA}; T_{\text{amb}} = + 23 \text{ }^\circ\text{C}.$

Frequency (GHz)	NF _{min} (dB)	$ \Gamma_{\text{opt}} $	Ang Γ_{opt} (°)	R _{n0}
0.1	0.166	0.938	3.674	0.128
0.2	0.175	0.906	5.866	0.103
0.3	0.185	0.877	8.034	0.095
0.4	0.197	0.848	10.217	0.091
0.5	0.208	0.818	12.415	0.088
0.6	0.221	0.790	14.627	0.086
0.7	0.233	0.761	16.852	0.085
0.8	0.245	0.733	19.093	0.083
0.9	0.258	0.706	21.349	0.082
1	0.270	0.679	23.624	0.080
1.1	0.283	0.653	25.919	0.079
1.2	0.296	0.627	28.237	0.077
1.3	0.308	0.602	30.581	0.076
1.4	0.321	0.577	32.954	0.075
1.5	0.333	0.553	35.359	0.073
1.6	0.346	0.529	37.802	0.072
1.7	0.358	0.505	40.287	0.070
1.8	0.371	0.482	42.819	0.069
1.9	0.383	0.460	45.405	0.067
2	0.396	0.437	48.052	0.066
2.1	0.408	0.416	50.770	0.064
2.2	0.420	0.394	53.568	0.063
2.3	0.432	0.373	56.458	0.062
2.4	0.445	0.353	59.455	0.060
2.5	0.457	0.333	62.575	0.059
2.6	0.469	0.313	65.837	0.057
2.7	0.481	0.294	69.264	0.056
2.8	0.493	0.276	72.885	0.055
2.9	0.505	0.258	76.732	0.053
3	0.516	0.241	80.843	0.052
3.2	0.540	0.209	90.039	0.050
3.4	0.563	0.180	100.899	0.048
3.6	0.586	0.157	113.865	0.047
3.8	0.608	0.140	129.148	0.046
4	0.630	0.131	146.252	0.045
4.5	0.685	0.143	-172.861	0.046
5	0.738	0.184	-145.354	0.051
5.5	0.790	0.232	-127.803	0.059
6	0.842	0.277	-115.356	0.071

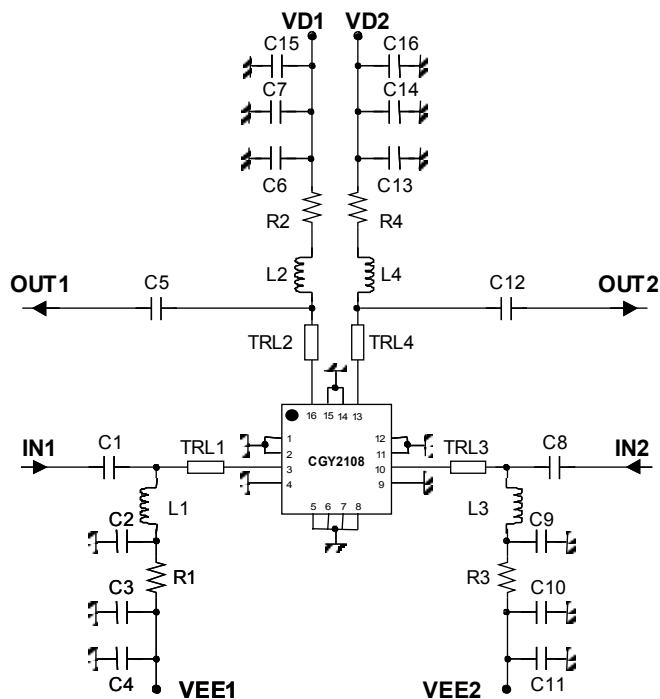
Note : The reference planes are the QFN Package Leads, R_{n0} is the Noise Resistance normalised to 50 Ω.

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 COG
C2, C9	10 pF	0603 COG
C3, C10	15 pF	0603 COG
C4, C11, C7, C14	10 nF	0805
C5, C12, C6, C13	100 pF	0603 COG
C15, C16	47 μF	1210 X5R

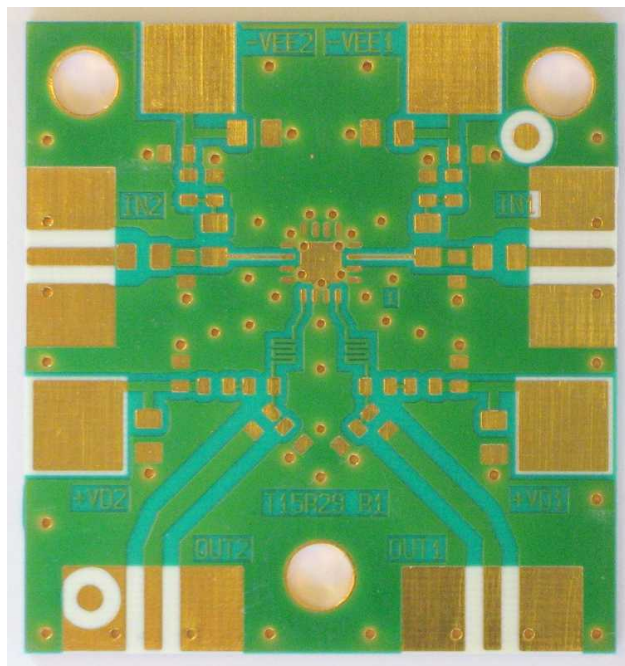
Component	Z0 (Ω)	Length in λ @1.95 GHz	Length (μm)	Width (μm)
TRL1, TRL3	117	0.03	3000	1500
TRL2, TRL4	117	0.102	10 000	1500

Notes:

Capacitors C15 and C16 prevent low frequency oscillations when the board is biased from laboratory power supplies. They are not required when on-board voltage regulators are used.

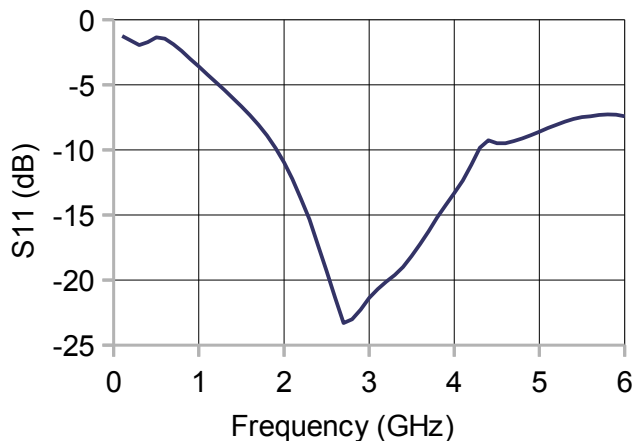
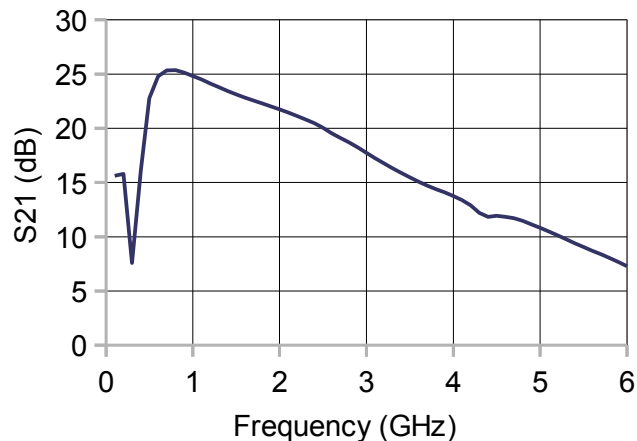
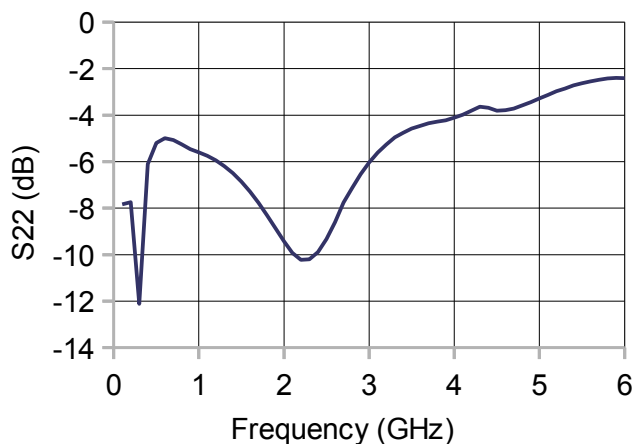
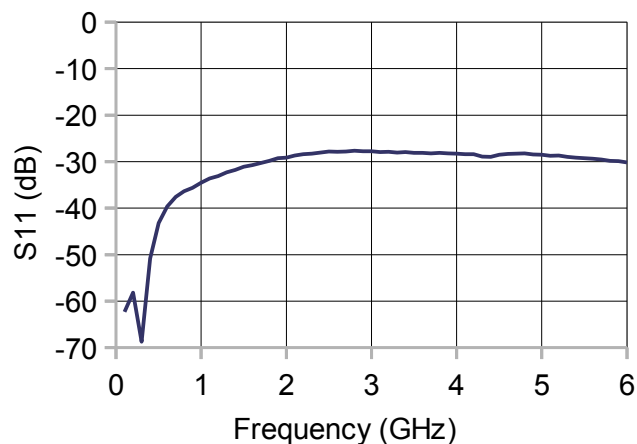
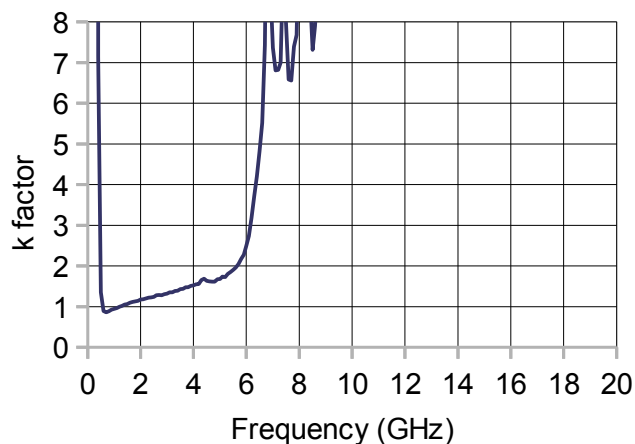
Board material is Rogers RO4350 with height 508 μm.

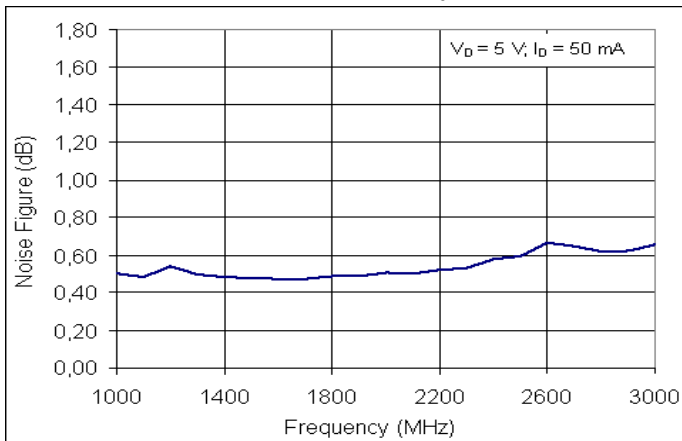
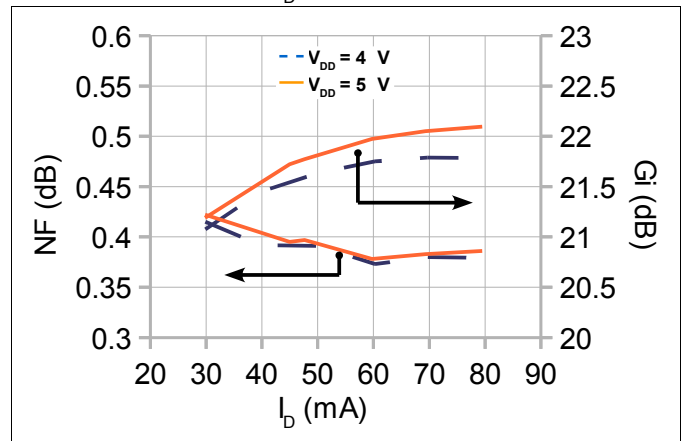
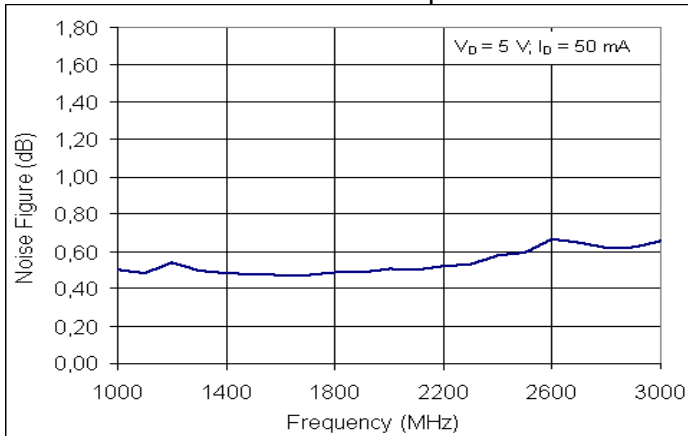
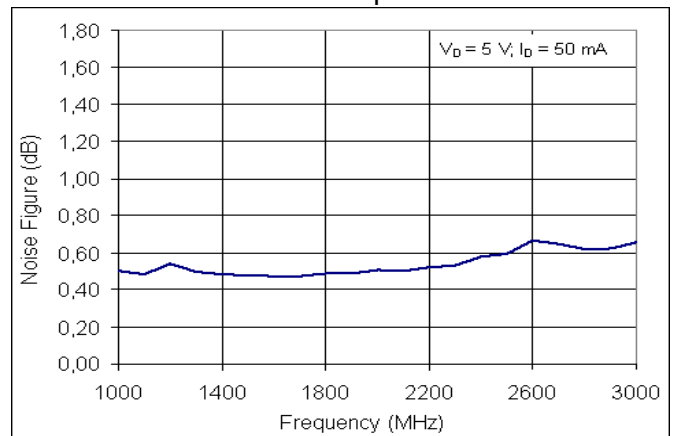
Printed Circuit Board



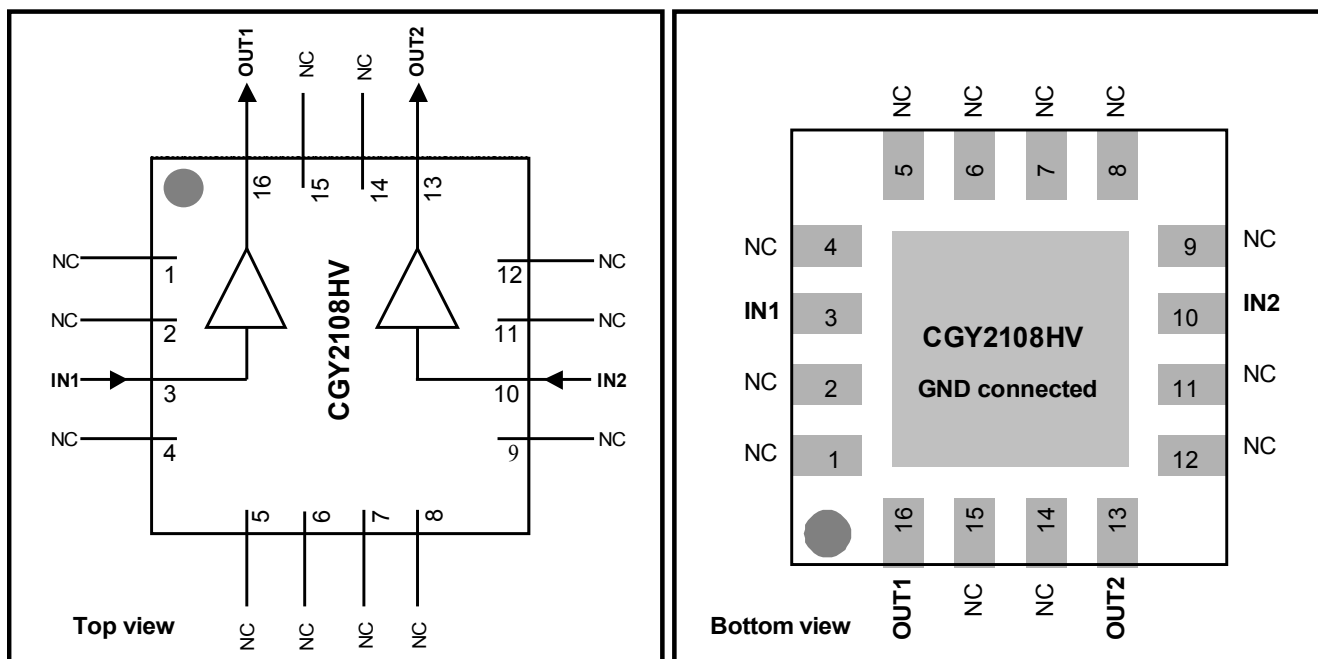
MEASURED PERFORMANCE OF REFERENCE BOARD 1900 MHz

Conditions : $V_{DD1} = 5\text{ V}$, $I_{D1} = 50\text{ mA}$; $T_{amb} = + 23^{\circ}\text{C}$, unless otherwise stated.
 Measurements include RF connector contributions.

Input Reflection (S11)

Transmission (S21)

Output Reflection (S22)

Isolation (S12)

Stability Factor k


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 CGY2108HV 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 CGY2108HV application notes.

BLOCK DIAGRAM AND PIN CONFIGURATION

PINNING

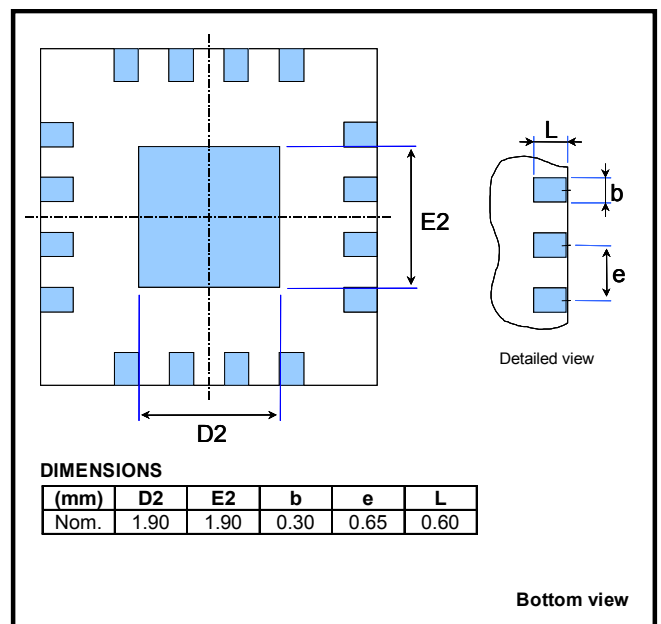
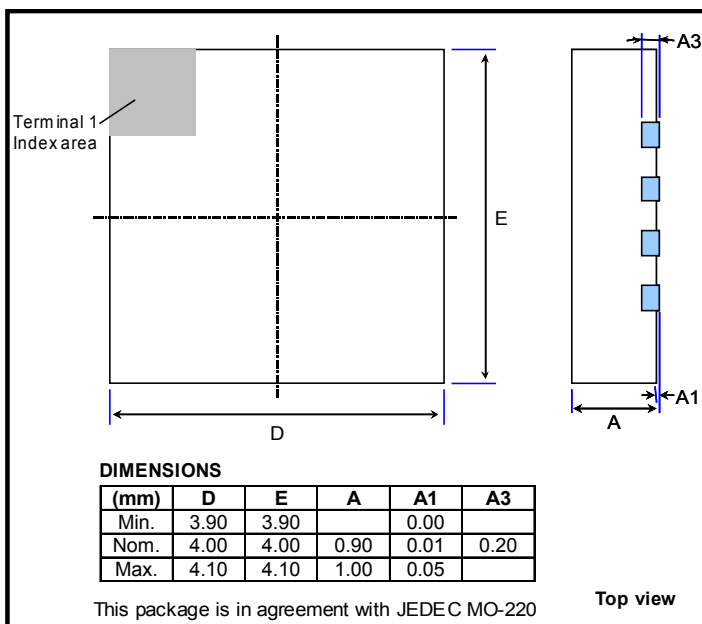
Symbol	Pin	Description
VS1	1, 2, 4, 5 and 6	Amplifier 1 : Source
IN1	3	Amplifier 1 : Gate (RF input)
OUT1	16	Amplifier 1 : Drain (RF output)
VS2	7, 8, 9, 11 and 12	Amplifier 1 : Source
IN2	10	Amplifier 2 : Gate (RF input)
OUT2	13	Amplifier 2 : Drain (RF output)
GND	14 and 15	Ground

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.

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

PACKAGE OUTLINE AND PCB LAND PATTERN


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

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ORDERING INFORMATION

Generic type	Package type	Version	Sort Type	Description
CGY2108	HV	C1		DUAL LNA, QFN Plastic Package
CGY2108	HV	C1	REFBOARD	Single Ended Reference Board 1900MHz
CGY2108	HV	C1	BALBOARD	Balanced Reference Board 1900MHz



Document History : Version 1.2, Last Update 13/4/2010