PRELIMINARY DATASHEET

CGY2152HV

Single Ended Ultra Low Noise High IP3 Amplifier

DESCRIPTION

The CGY2152HV is an extremely Low Noise Figure **Single Ended** Amplifier with state of the art Noise Figure and Linearity suitable for applications from 2 GHz to 3 GHz.

The minimum Noise Figure of the CGY2152HV itself is 0.23 dB at 2.5 GHz.

The MMIC is manufactured using OMMIC's qualified 0.13 µm PHEMT GaAs D01PH technology. The D01PH process is one of the European Space Agency (ESA) european preferred part list (EPPL) technologies. The device is available in a 4x4 mm QFN plastic package.

APPLICATIONS

- High performance LNA in the band 2 – 3 GHz
- Base Station applications (LTE, GSM, CDMA, WCDMA, TD-SCDMA, CDMA2000, WiMAX, etc)
- Tower mounted amplifiers
- Repeaters

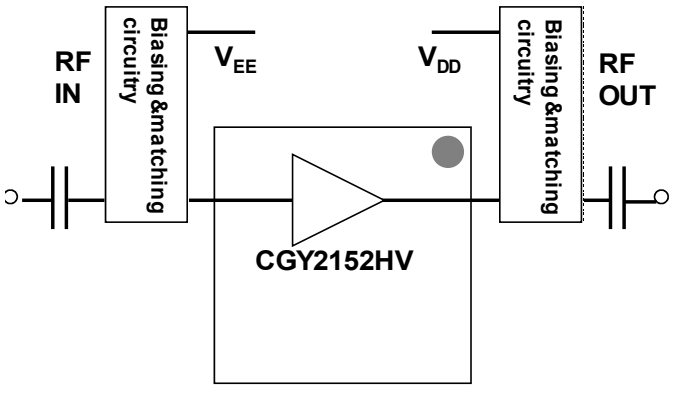
FEATURES

- Usable frequency range from 2 GHz to 3 GHz

central frequency (GHz)	NF (dB)	Gain (dB)	OIP3 (dBm)	Bias cond.
2,5	0,49	17	29	3V 60 mA
2,5	0,57	16,5	30	5V 40 mA

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

- Uses a highly reliable PHEMT MMIC process
- Samples and Demonstration Boards Available
- Space and MIL-STD Available



Schematic diagram of the CGY2152HV in a Single Ended configuration.

RoHS Compliant

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LIMITING VALUES

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

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
V_{EE1}	Gate voltage	V_{DD} open-circuited	-3	0	V
V_{DD1}	Drain voltage	V_{EE} open-circuited	0	+ 6	V
I_{D1}	Drain current			150	mA
P_{IN}	Input power			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} = + 23 °C

Symbol	Parameter	Conditions	MIN.	TYP.	MAX.	UNIT
f_i	Input frequency		2		3	GHz
Performance at QFN package lead; f_i = 2.5 GHz						
V_D	Supply voltage			4,5		V
I_D	Supply current	V_{EE} = - 0.45 V		50		mA
G	Gain			16,5		dB
NF_{min}	Minimum Noise Figure			0.23		dB
*Performance * of Reference Board (Single Ended configuration with on-board bias resistors);* f_i = 2.5 GHz						
V_{DD1}	Supply voltage			5		V
I_{D1}	Supply current	V_{EE1} = - 0.58 V		40		mA
G	Gain			16,2		dB
NF	Noise Figure			0,57		dB
ISO_{rev}	Reverse Isolation	OUT/IN		22		dB
OIP3	Output third order intercept point			30		dBm
P_{1dB}	Output Power @ 1dB gain compression			21,3		dBm
S_{11}	Input reflection coefficient	50 Ω source		-17		dB
S_{22}	Output reflection coefficient	50 Ω load		-16		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 = 4.5 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	0.9955	-5.751	10.0360	174.044	0.0035	87.494	0.0280	156.029
0.2	0.9885	-11.474	9.9752	168.117	0.0070	87.902	0.0308	134.028
0.3	0.9773	-17.143	9.8762	162.245	0.0105	87.539	0.0350	114.844
0.4	0.9620	-22.736	9.7421	156.452	0.0142	86.860	0.0401	98.344
0.5	0.9433	-28.231	9.5772	150.760	0.0181	85.941	0.0458	84.047
0.6	0.9216	-33.611	9.3860	145.186	0.0221	84.805	0.0520	71.485
0.7	0.8974	-38.865	9.1734	139.744	0.0262	83.467	0.0585	60.298
0.8	0.8715	-43.985	8.9443	134.442	0.0305	81.948	0.0651	50.227
0.9	0.8442	-48.964	8.7034	129.287	0.0349	80.266	0.0718	41.087
1	0.8162	-53.803	8.4547	124.281	0.0394	78.445	0.0785	32.742
1.1	0.7877	-58.503	8.2019	119.422	0.0440	76.507	0.0852	25.093
1.2	0.7593	-63.066	7.9481	114.709	0.0487	74.471	0.0919	18.059
1.3	0.7313	-67.500	7.6959	110.138	0.0535	72.356	0.0984	11.577
1.4	0.7038	-71.809	7.4473	105.702	0.0583	70.178	0.1048	5.595
1.5	0.6771	-76.002	7.2039	101.395	0.0632	67.951	0.1110	0.071
1.6	0.6514	-80.086	6.9669	97.210	0.0681	65.685	0.1170	-5.035
1.7	0.6268	-84.070	6.7371	93.141	0.0730	63.391	0.1229	-9.754
1.8	0.6034	-87.962	6.5151	89.180	0.0779	61.075	0.1285	-14.113
1.9	0.5813	-91.770	6.3013	85.320	0.0828	58.745	0.1339	-18.137
2	0.5604	-95.502	6.0957	81.553	0.0876	56.404	0.1390	-21.846
2.1	0.5409	-99.164	5.8986	77.874	0.0925	54.056	0.1440	-25.259
2.2	0.5228	-102.765	5.7096	74.275	0.0974	51.704	0.1487	-28.391
2.3	0.5060	-106.310	5.5288	70.751	0.1022	49.350	0.1533	-31.258
2.4	0.4906	-109.804	5.3558	67.295	0.1070	46.995	0.1576	-33.871
2.5	0.4765	-113.254	5.1904	63.903	0.1118	44.640	0.1618	-36.242
2.6	0.4638	-116.664	5.0322	60.570	0.1166	42.287	0.1659	-38.382
2.7	0.4523	-120.038	4.8810	57.290	0.1213	39.934	0.1699	-40.300
2.8	0.4422	-123.379	4.7365	54.058	0.1260	37.582	0.1738	-42.005
2.9	0.4334	-126.689	4.5982	50.872	0.1306	35.231	0.1776	-43.507
3	0.4258	-129.971	4.4659	47.726	0.1352	32.881	0.1815	-44.817
3.2	0.4143	-136.457	4.2179	41.542	0.1444	28.180	0.1895	-46.900
3.4	0.4076	-142.841	3.9898	35.481	0.1533	23.474	0.1982	-48.352
3.6	0.4054	-149.126	3.7793	29.520	0.1621	18.759	0.2079	-49.288
3.8	0.4074	-155.309	3.5842	23.639	0.1706	14.031	0.2193	-49.846
4	0.4134	-161.387	3.4025	17.825	0.1789	9.285	0.2327	-50.176
4.5	0.4442	-176.117	2.9955	3.505	0.1982	-2.661	0.2765	-50.962
5	0.4930	169.800	2.6390	-10.560	0.2148	-14.697	0.3359	-53.013
5.5	0.5535	156.329	2.3186	-24.336	0.2279	-26.711	0.4074	-56.941
6	0.6188	143.485	2.0273	-37.684	0.2370	-38.513	0.4849	-62.472

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

NOISE-PARAMETERS

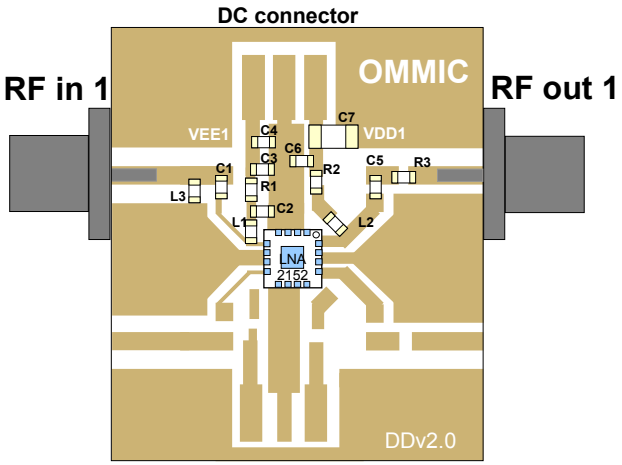
V_D = 4.5 V; I_D = 50 mA; T_{amb} = + 23 °C.

Frequency (GHz)	NF_{min} (dB)	$\|\Gamma_{opt}\|$	Ang Γ_{opt} (°)	R_{n0}
0,1	0.128454164	0.981391762	3.326121	0.0991771576
0.2	0.135213713	0.961430571	6.508432	0.0870192728
0.3	0.141971591	0.941752824	9.684679	0.0826500528
0.4	0.148723384	0.922384094	12.868611	0.0801186209
0.5	0.155468087	0.903307840	16.066640	0.0782366482
0.6	0.162204633	0.884503186	19.283674	0.0766100545
0.7	0.168931857	0.865950532	22.524169	0.0750721019
0.8	0.175648529	0.847633051	25.792429	0.0735416622
0.9	0.182353389	0.829537293	29.092711	0.0719759652
1	0.189045160	0.811653520	32.429271	0.0703516914
1.1	0.195722552	0.793975950	35.806382	0.0686563697
1.2	0.202384270	0.776502961	39.228344	0.0668840687
1.3	0.209029018	0.759237279	42.699479	0.0650330691
1.4	0.215655494	0.742186149	46.224122	0.0631045252
1.5	0.222262398	0.725361489	49.806602	0.0611016545
1.6	0.228848428	0.708780027	53.451218	0.0590292221
1.7	0.235412283	0.692463401	57.162199	0.0568932001
1.8	0.241952662	0.676438226	60.943656	0.0547005314
1.9	0.248468265	0.660736098	64.799519	0.0524589608
2	0.254957792	0.645393532	68.733460	0.0501769080
2.1	0.261419944	0.630451816	72.748789	0.0478633692
2.2	0.267853423	0.615956747	76.848345	0.0455278373
2.3	0.274256932	0.601958250	81.034353	0.0431802350
2.4	0.280629175	0.588509839	85.308271	0.0408308569
2.5	0.286968857	0.575667910	89.670616	0.0384903169
2.6	0.293274683	0.563490857	94.120781	0.0361695012
2.7	0.299545360	0.552037988	98.656845	0.0338795229
2.8	0.305779595	0.541368252	103.275398	0.0316316794
2.9	0.311976095	0.531538798	107.971381	0.0294374108
3	0.318133571	0.522603391	112.737972	0.0273082597
3.2	0.330326283	0.507602820	122.446616	0.0232917534
3.4	0.342347413	0.496665955	132.311347	0.0196750419
3.6	0.354186645	0.489938268	142.219164	0.0165501206
3.8	0.365833669	0.487381894	152.044671	0.0140068489
4	0.377278170	0.488772693	161.664093	0.0121317005
4.5	0.404935627	0.506719040	-175.838956	0.0108891934
5	0.431101071	0.538519380	-156.212330	0.0154110460
5.5	0.455611686	0.576123429	-139.520095	0.0264438406
6	0.478302788	0.613813445	-125.370527	0.0442785292

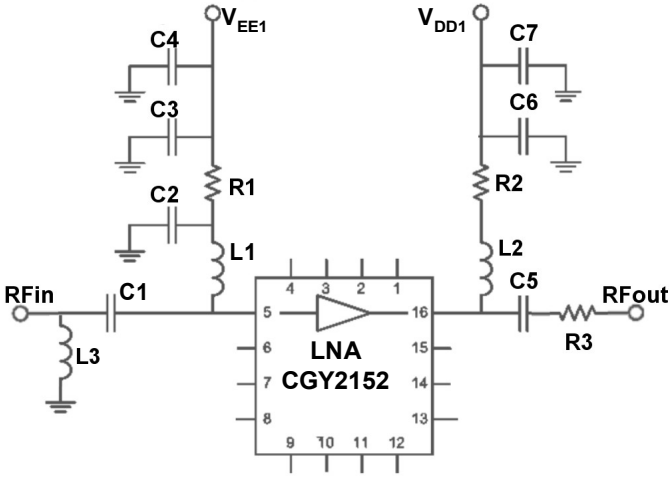
Note : The reference planes are the QFN Package Leads, Rn0 is the Noise Resistance normalised to 50 Ω.

SINGLE ENDED REFERENCE BOARD 2500 MHz

Assembly Drawing



Circuit Diagram (centre frequency 2500 MHz)



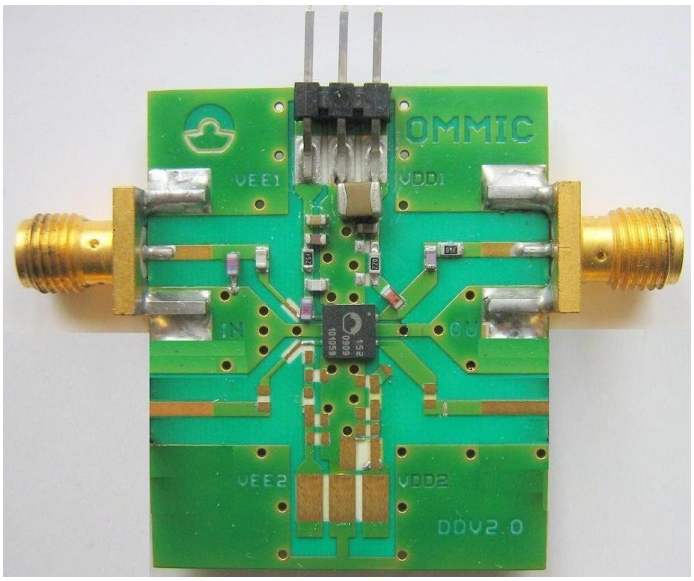
Bill of materials

Component	Value	Reference
R1	470 Ω	0603
R2	10 Ω	0603
R3	10 Ω	0603
L1	5.2 nH	Coilcraft 0603CS
L2	330 nH	Coilcraft 0603CS
L3	5.5 nH	Coilcraft 0603CS
C1	1.4 pF	Dielectric labs C06UL
C2	2 pF	0603 C0G
C3	100 pF	0603 C0G
C4, C6	10 nF	0603 X7R
C5	3.7 pF	0603 C0G
C17	47 µF	1210 X5R

Notes:
Capacitor C7 prevents low frequency oscillations when the board is biased from laboratory power supplies. It is not required when on-board voltage regulators are used.

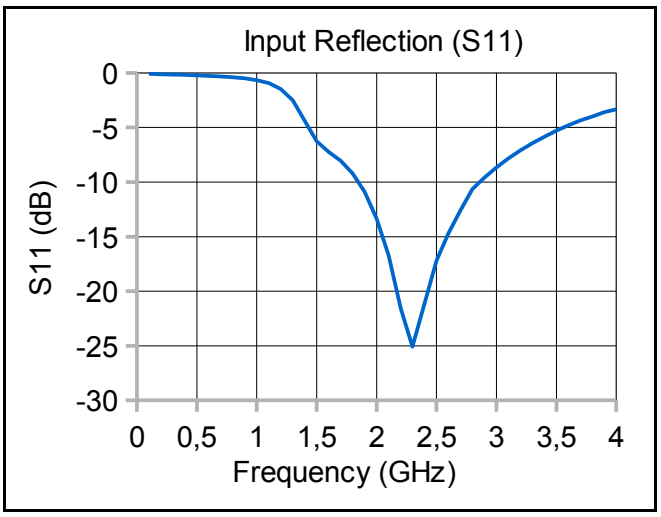
Board material is Rogers RO4350, height 508 µm.

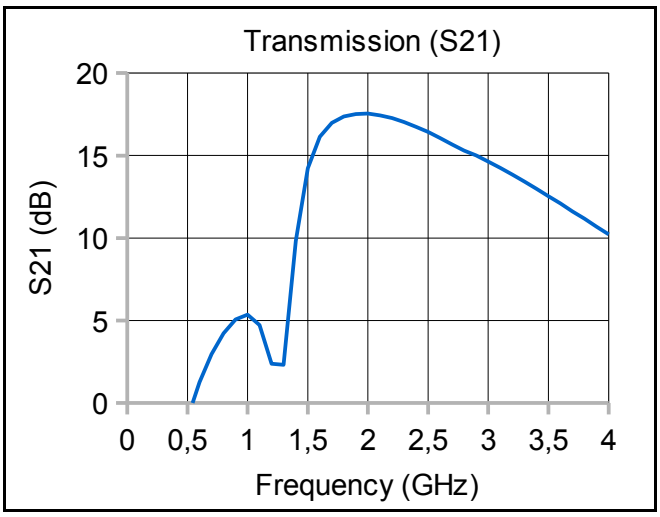
Populated Printed Circuit Board (ref DDv20)

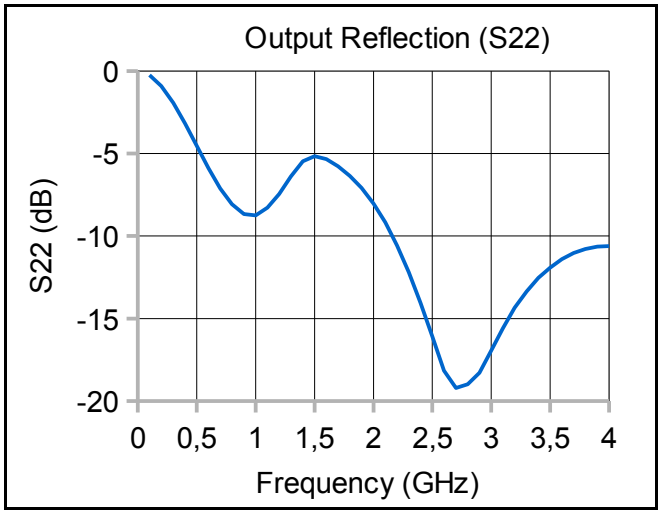


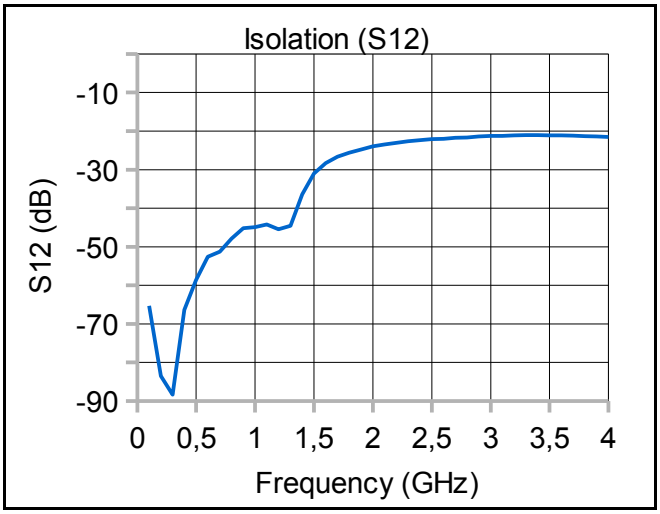
MEASURED PERFORMANCE OF SINGLE ENDED REFERENCE BOARD 2500 MHZ

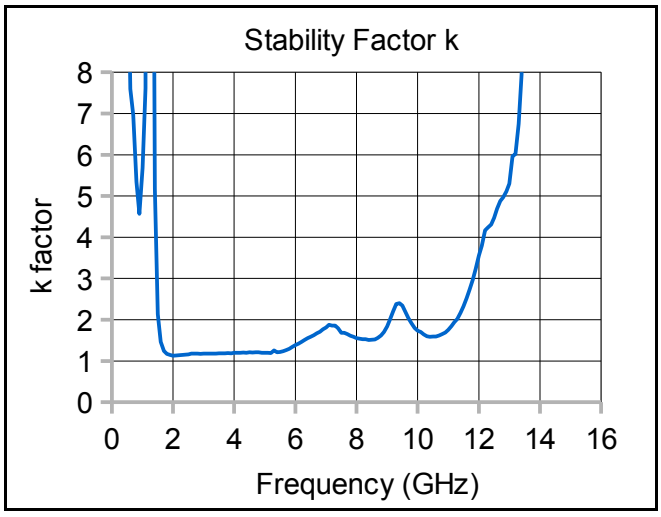
Conditions : V_{DD1} = 5 V, I_{D1} = 50 mA, T_{amb} = + 23°C, unless otherwise stated.
Measurements include RF connector contributions.

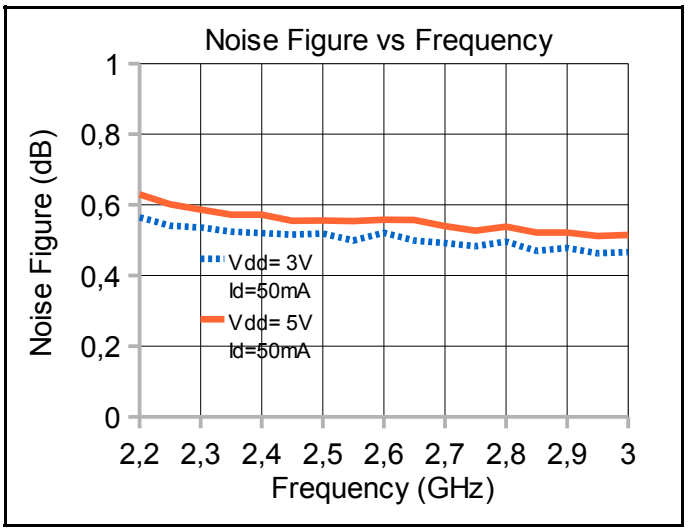


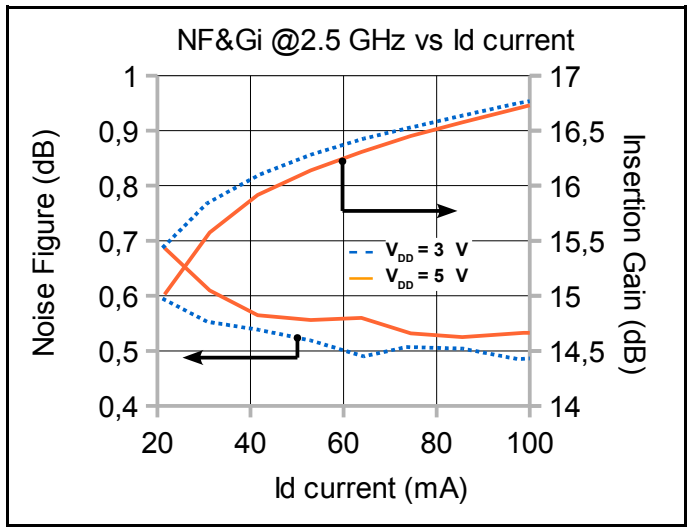












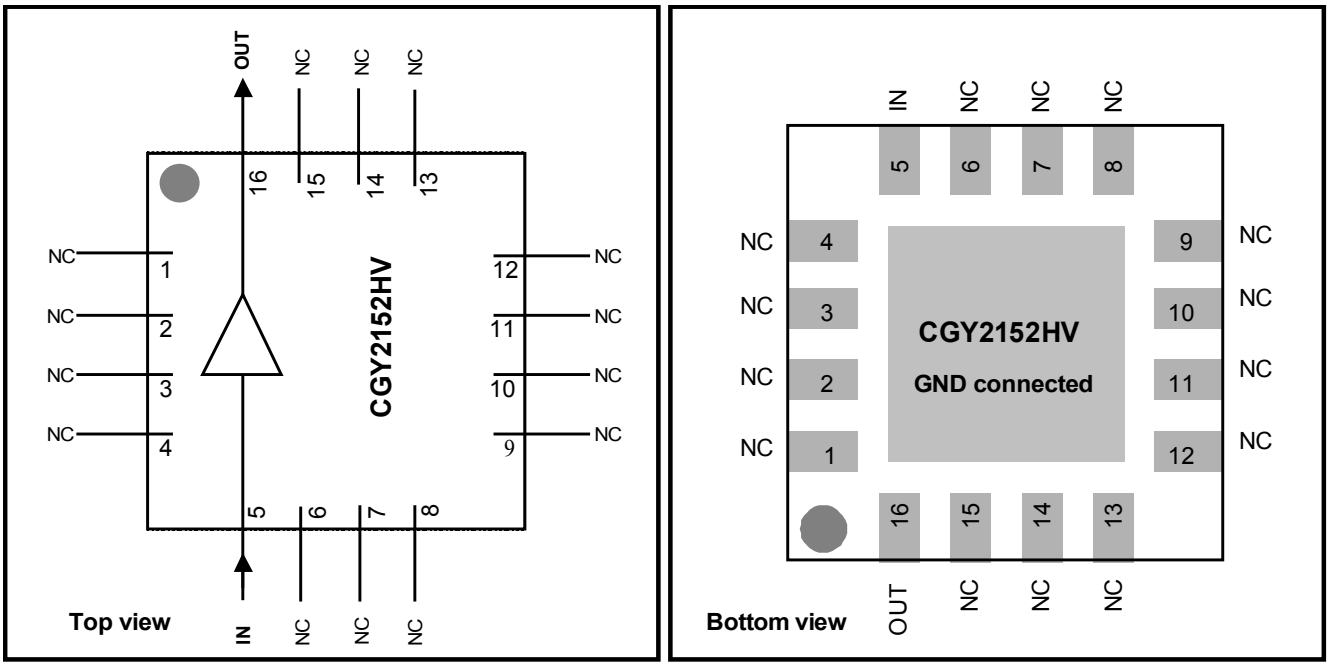
V_{DD} (V)	I_D (mA)	V_{DEE} (V)	NF (dB)	IIP3 (dBm)	OIP3 (dBm)	OP_{1dB} (dBm)	S11 (dB)	S21 (dB)	S22 (dB)
3	20	-0.68	0.6	10.8	26.5	17.2	-14.3	15.8	-13.7
3	29	-0.62	0.55	11.5	27.7	17.1	-16.5	16.2	-15.2
3	40	-0.57	0.54	12.0	28.4	17.1	-17.0	16.5	-16.1
3	50	-0.52	0.52	12.2	28.8	17.2	-16.6	16.7	-16.7
3	**60**	**-0.48**	**0.49**	**12.1**	**28.9**	**17.3**	**-16.1**	**16.8**	**-16.9**
3	69	-0.45	0.51	12.0	28.9	17.2	-15.8	16.9	-17.0
3	80	-0.41	0.5	12.3	29.3	17.1	-15.6	17.0	-17.0
3	90	-0.38	0.49	13.8	30.8	16.6	-15.6	17.2	-16.9
3	99	-0.35	0.49	15.3	32.5	16.1	-15.6	17.2	-16.8
5	21	-0.76	0.69	16.9	32.2	21.2	-11.7	15.2	-13.0
5	30	-0.69	0.61	15.2	31.1	21.0	-14.9	15.8	-14.4
5	**39**	**-0.63**	**0.57**	**13.8**	**29.9**	**21.3**	**-16.8**	**16.2**	**-15.4**
5	50	-0.58	0.56	13.1	29.5	21.3	-17.2	16.4	-16.1
5	60	-0.54	0.56	13.0	29.5	21.3	-16.9	16.6	-16.4
5	70	-0.5	0.53	12.9	29.6	21.3	-16.6	16.8	-16.6
5	80	-0.46	0.53	12.7	29.5	21.3	-16.2	16.9	-16.7
5	92	-0.41	0.53	12.3	29.2	21.1	-15.9	17.0	-16.7
5	100	-0.38	0.53	12.1	29.1	21.0	-15.9	17.2	-16.6

Summary of the performance of the CGY2152HV Single Ended Reference Board at 2500 MHz

Note :

These results have been obtained on a Single Ended Reference Board optimised to work at 2500 MHz. The CGY2152HV can be easily used up to 3 GHz, in single ended applications. For more details on the reference board used, or help in the design of application using the CGY2152HV, please refer to CGY2152HV application notes or contact OMMIC at : information@ommic.com.

BLOCK DIAGRAM AND PIN CONFIGURATION



PINNING

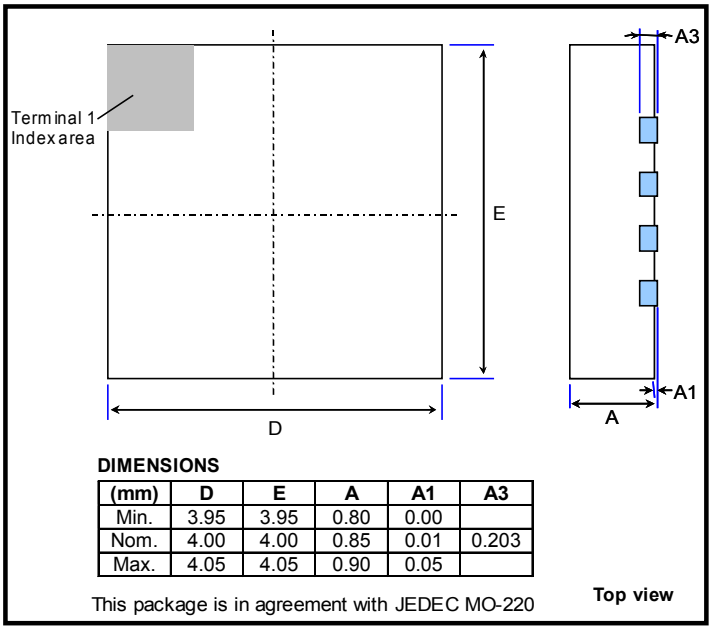
Symbol	Pin	Description
GND	GND	Amplifier : Source
IN1	5	Amplifier : Gate (RF input)
OUT1	16	Amplifier : Drain (RF output)
NC	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	Not Connected

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

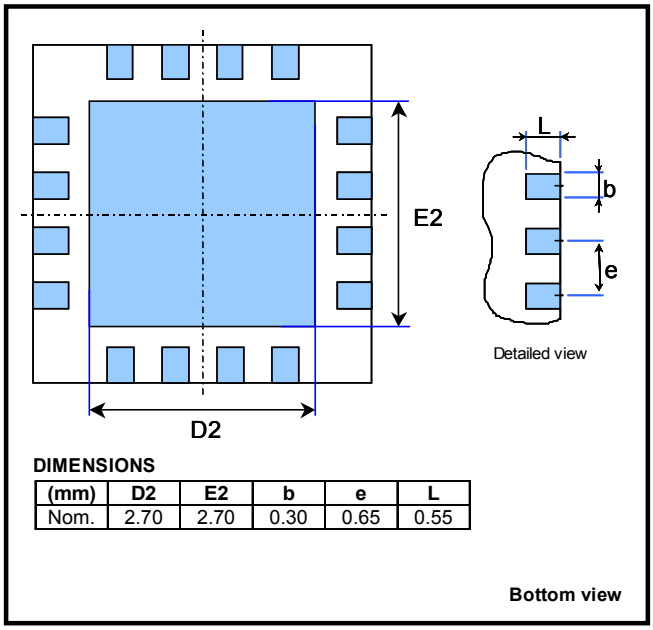


DIMENSIONS

(mm)	D	E	A	A1	A3
Min.	3.95	3.95	0.80	0.00	
Nom.	4.00	4.00	0.85	0.01	0.203
Max.	4.05	4.05	0.90	0.05	

This package is in agreement with JEDEC MO-220

Top view



DIMENSIONS

(mm)	D2	E2	b	e	L
Nom.	2.70	2.70	0.30	0.65	0.55

Bottom view

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.

Right to make changes
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ORDERING INFORMATION

Generic type	Package type	Version	Sort Type	Description
CGY2152	HV	C1		DUAL LNA, QFN Plastic Package
CGY2152	HV	C1	REFBOARD1G9	Single Ended Reference Board 2.5 GHz

RoHS Compliant

Document History : Version 1.0, Last Update 13/4/2010