PRELIMINARY DATASHEET

CGY2150HV

Single Ended Ultra Low Noise High IP3 Amplifier

DESCRIPTION

The CGY2150HV is an extremely Low Noise Figure **Single Ended** Amplifier with state of the art Noise Figure and Linearity optimised for applications from 0.3 GHz to 1 GHz.

The minimum Noise Figure of the CGY2150HV itself is 0.21 dB at 0.9 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.

FEATURES

- Usable frequency range from 0.3 GHz to 1 GHz

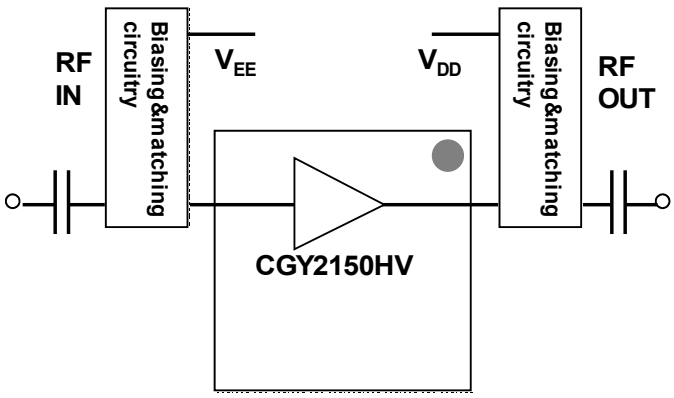
Central Frequency (GHz)	NF (dB)	Gain (dB)	OIP3 (dBm)	Bias cond.
0.8	0.36	17	28	3V 60 mA
0.8	0.43	19.4	32	5V 50 mA

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

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

APPLICATIONS

- High performance LNA in the band 1 – 2 GHz
- Base Station applications (GSM, CDMA, etc...)
- IF amplifiers
- Tower mounted amplifiers
- Repeaters



Schematic diagram of the CGY2150HV in a Single Ended configuration.

RoHS Compliant

www.ommic.com

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LIMITING VALUES

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

Symbol	Parameter	Conditions	MIN.	MAX.	UNIT
V_{EE}	Gate voltage	V_{DD} open-circuited	-3	0	V
V_{DD}	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		0.3		1	GHz
Performance at QFN package lead; f_i = 0.8 GHz						
V_D	Supply voltage			5		V
I_D	Supply current	V_{EE} = - 0.45 V		50		mA
G	Gain			19.9		dB
NF_{min}	Minimum Noise Figure			0.21		dB
*Performance * of Reference Board (Single Ended configuration with on-board bias resistors);* f_i = 0.8 GHz						
V_{DD}	Supply voltage			5		V
I_D	Supply current	V_{EE1} = - 0.69 V		50		mA
G	Gain			19.4		dB
NF	Noise Figure			0.43		dB
ISO_{rev}	Reverse Isolation	OUT/IN		29		dB
OIP3	Output third order intercept point			32		dBm
P_{1dB}	Output Power @ 1dB gain compression			TBM		dBm
S_{11}	Input reflection coefficient	50 Ω source		-22		dB
S_{22}	Output reflection coefficient	50 Ω load		-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.

S-PARAMETERS

V_D = 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	0.9919	-6.6151	10.0101	173.5359	0.0040	87.4479	0.1007	171.8475
0.2	0.9835	-13.1910	9.9339	167.1123	0.0081	87.7739	0.0991	163.6804
0.3	0.9700	-19.6908	9.8106	160.7673	0.0123	87.3151	0.0966	155.4800
0.4	0.9519	-26.0820	9.6451	154.5348	0.0166	86.5196	0.0932	147.2195
0.5	0.9298	-32.3378	9.4439	148.4428	0.0211	85.4625	0.0891	138.8616
0.6	0.9046	-38.4380	9.2137	142.5126	0.0257	84.1714	0.0845	130.3572
0.7	0.8770	-44.3690	8.9615	136.7592	0.0306	82.6695	0.0797	121.6463
0.8	0.8478	-50.1232	8.6940	131.1911	0.0356	80.9820	0.0748	112.6620
0.9	0.8176	-55.6984	8.4171	125.8115	0.0407	79.1358	0.0701	103.3407
1	0.7870	-61.0967	8.1358	120.6193	0.0459	77.1576	0.0658	93.6373
1.1	0.7566	-66.3235	7.8545	115.6098	0.0512	75.0719	0.0621	83.5487
1.2	0.7267	-71.3866	7.5763	110.7760	0.0566	72.9009	0.0592	73.1392
1.3	0.6977	-76.2951	7.3039	106.1091	0.0621	70.6633	0.0571	62.5581
1.4	0.6697	-81.0591	7.0391	101.5994	0.0676	68.3748	0.0560	52.0345
1.5	0.6429	-85.6888	6.7833	97.2367	0.0731	66.0481	0.0558	41.8412
1.6	0.6176	-90.1943	6.5373	93.0105	0.0786	63.6934	0.0565	32.2381
1.7	0.5937	-94.5853	6.3014	88.9108	0.0842	61.3187	0.0579	23.4221
1.8	0.5713	-98.8706	6.0761	84.9276	0.0897	58.9302	0.0600	15.5041
1.9	0.5504	-103.0584	5.8611	81.0516	0.0952	56.5327	0.0626	8.5149
2	0.5311	-107.1559	5.6563	77.2740	0.1007	54.1296	0.0655	2.4271
2.1	0.5133	-111.1692	5.4615	73.5864	0.1062	51.7235	0.0688	-2.8203
2.2	0.4971	-115.1037	5.2763	69.9811	0.1116	49.3161	0.0723	-7.3036
2.3	0.4823	-118.9636	5.1002	66.4510	0.1170	46.9085	0.0759	-11.1025
2.4	0.4690	-122.7526	4.9329	62.9894	0.1224	44.5015	0.0798	-14.2939
2.5	0.4572	-126.4731	4.7738	59.5902	0.1278	42.0954	0.0838	-16.9497
2.6	0.4468	-130.1273	4.6225	56.2476	0.1331	39.6901	0.0879	-19.1364
2.7	0.4378	-133.7165	4.4785	52.9565	0.1384	37.2854	0.0924	-20.9156
2.8	0.4301	-137.2417	4.3415	49.7120	0.1436	34.8809	0.0970	-22.3453
2.9	0.4237	-140.7036	4.2109	46.5096	0.1488	32.4761	0.1020	-23.4801
3	0.4186	-144.1027	4.0863	43.3452	0.1539	30.0706	0.1074	-24.3721
3.2	0.4119	-150.7146	3.8538	37.1158	0.1641	25.2543	0.1193	-25.6226
3.4	0.4100	-157.0832	3.6408	30.9975	0.1740	20.4271	0.1334	-26.4552
3.6	0.4123	-163.2185	3.4449	24.9684	0.1837	15.5843	0.1498	-27.1675
3.8	0.4187	-169.1361	3.2636	19.0111	0.1930	10.7224	0.1688	-27.9831
4	0.4289	-174.8566	3.0947	13.1122	0.2021	5.8395	0.1904	-29.0489
4.5	0.4683	171.5446	2.7162	-1.4315	0.2227	-6.4536	0.2559	-33.2085
5	0.5231	158.6710	2.3836	-15.7001	0.2397	-18.8040	0.3345	-39.4383
5.5	0.5865	146.3133	2.0846	-29.6027	0.2523	-31.0501	0.4203	-47.1421
6	0.6515	134.4503	1.8141	-42.9599	0.2601	-42.9650	0.5064	-55.6238

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

NOISE-PARAMETERS

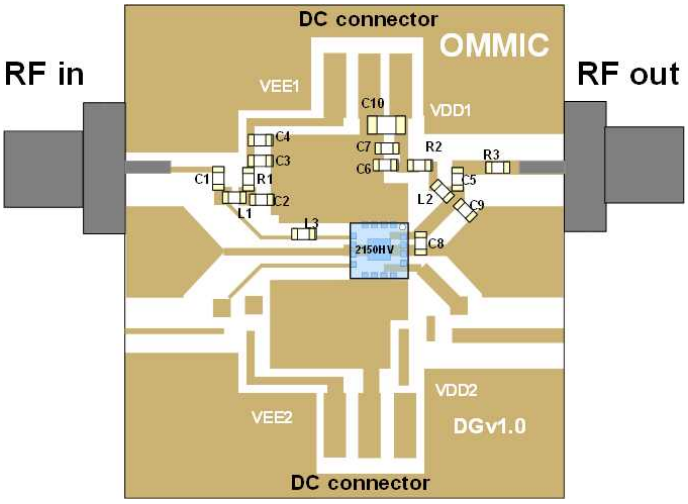
V_D = 5 V; I_D = 50 mA; T_{amb} = + 23 °C.

Frequency (GHz)	NF_{min} (dB)	$\|\Gamma_{opt}\|$	Ang Γ_{opt} (°)	R_{n0}
0.1	0.1592	0.9785	3.5720	0.0854
0.2	0.1657	0.9561	6.9773	0.0751
0.3	0.1723	0.9340	10.3756	0.0714
0.4	0.1789	0.9123	13.7825	0.0692
0.5	0.1855	0.8909	17.2052	0.0676
0.6	0.1921	0.8700	20.6492	0.0661
0.7	0.1987	0.8494	24.1194	0.0647
0.8	0.2053	0.8291	27.6208	0.0633
0.9	0.2119	0.8092	31.1580	0.0619
1	0.2184	0.7896	34.7358	0.0604
1.1	0.2250	0.7703	38.3591	0.0589
1.2	0.2315	0.7514	42.0325	0.0572
1.3	0.2380	0.7327	45.7608	0.0555
1.4	0.2445	0.7145	49.5488	0.0537
1.5	0.2509	0.6965	53.4012	0.0519
1.6	0.2574	0.6790	57.3225	0.0500
1.7	0.2638	0.6619	61.3171	0.0481
1.8	0.2701	0.6452	65.3892	0.0461
1.9	0.2765	0.6290	69.5425	0.0440
2	0.2828	0.6134	73.7803	0.0420
2.1	0.2891	0.5983	78.1052	0.0399
2.2	0.2953	0.5839	82.5190	0.0378
2.3	0.3015	0.5702	87.0224	0.0357
2.4	0.3077	0.5572	91.6150	0.0336
2.5	0.3138	0.5450	96.2949	0.0315
2.6	0.3199	0.5337	101.0585	0.0295
2.7	0.3260	0.5234	105.9005	0.0275
2.8	0.3320	0.5140	110.8136	0.0255
2.9	0.3379	0.5056	115.7883	0.0237
3	0.3438	0.4983	120.8135	0.0219
3.2	0.3555	0.4870	130.9607	0.0186
3.4	0.3670	0.4802	141.1330	0.0157
3.6	0.3782	0.4778	151.1957	0.0133
3.8	0.3892	0.4795	161.0182	0.0116
4	0.4000	0.4849	170.4887	0.0105
4.5	0.4258	0.5106	-167.8443	0.0113
5	0.4499	0.5466	-149.3198	0.0177
5.5	0.4720	0.5854	-133.6832	0.0302
6	0.4921	0.6224	-120.4255	0.0488

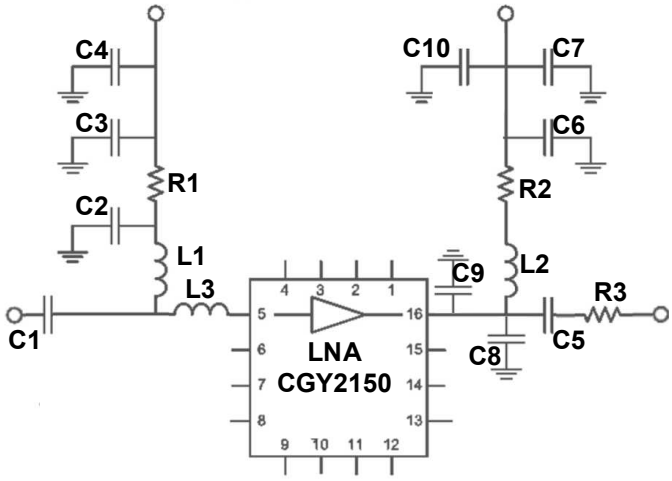
Note : The reference planes are the QFN Package Leads, Rn0 is the Noise Resistance normalised to 50 W.

SINGLE ENDED REFERENCE BOARD 800 MHz

Assembly Drawing



Circuit Diagram (centre frequency 800 MHz)



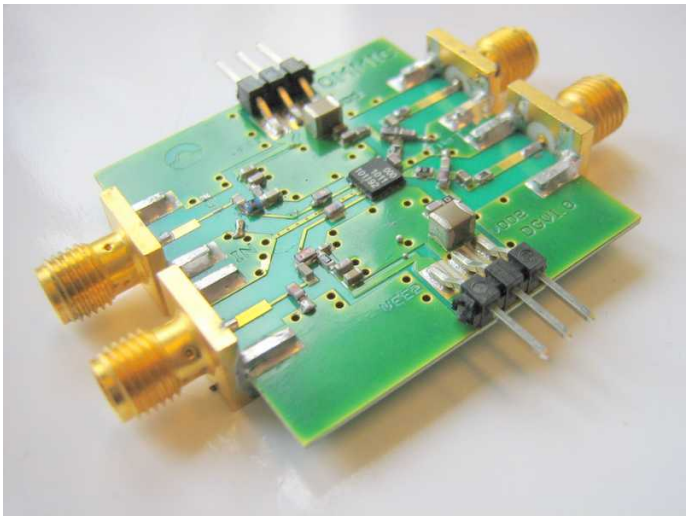
Bill of materials

Component	Value	Reference
R1	600 Ω	0603
R2	0 Ω	0603
R3	15 Ω	0603
L1	51 nH	Coilcraft 0603CS
L2	330 nH	Coilcraft 0603CS
L3	16 nH	Coilcraft 0603CS
C1	15 pF	Dielectric labs C06UL
C2	4.7 pF	0603 C0G
C3, C6	100 pF	0603 C0G
C4, C7	10 nF	0603 X7R
C5	330 pF	0603 C0G
C8	3.3 pF	0603 C0G
C9	1.5 pF	0603 C0G
C10	47 µF	1210 X5R

Notes:
Capacitor C10 prevents low frequency oscillations when the board is biased from laboratory power supplies. It is not required when on-board voltage regulators are used.

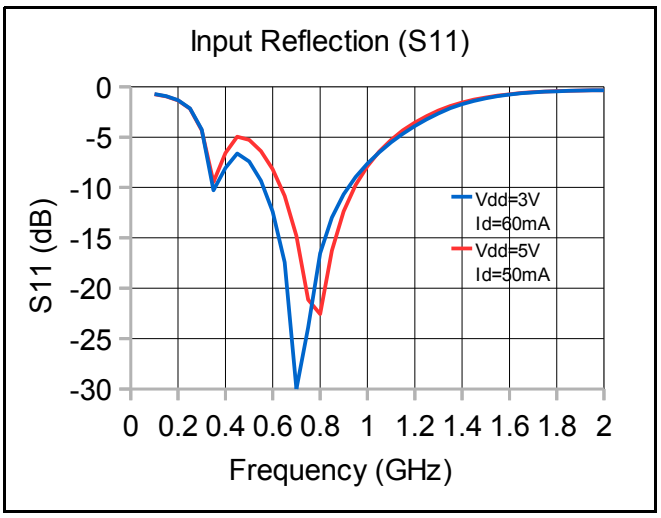
Board material is Rogers RO4350, height 508 µm.

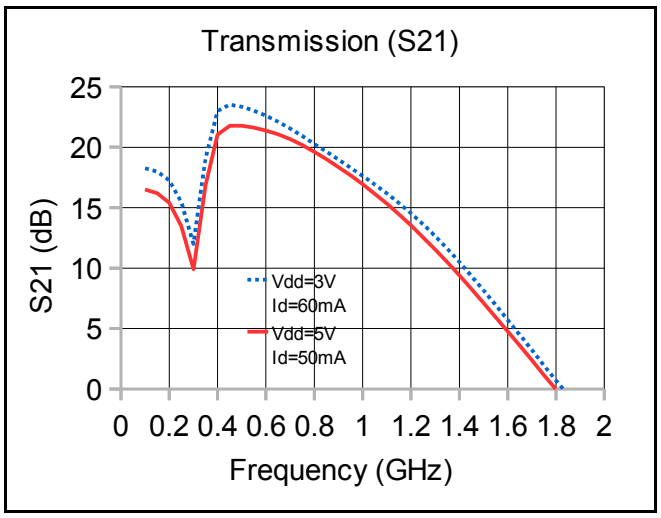
Populated Printed Circuit Board (ref DDv20)

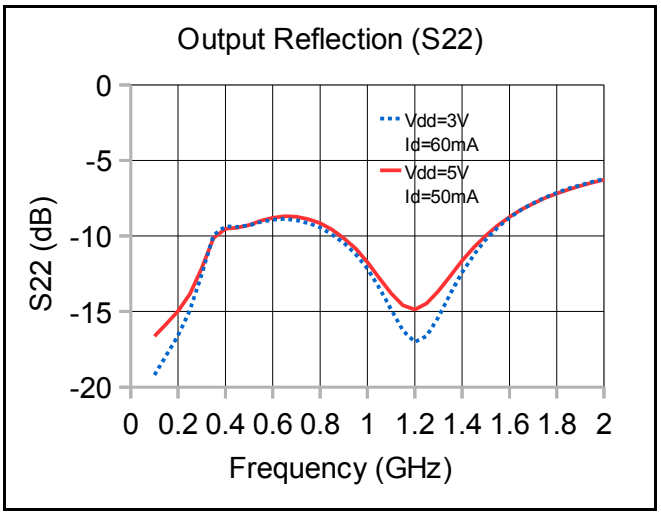


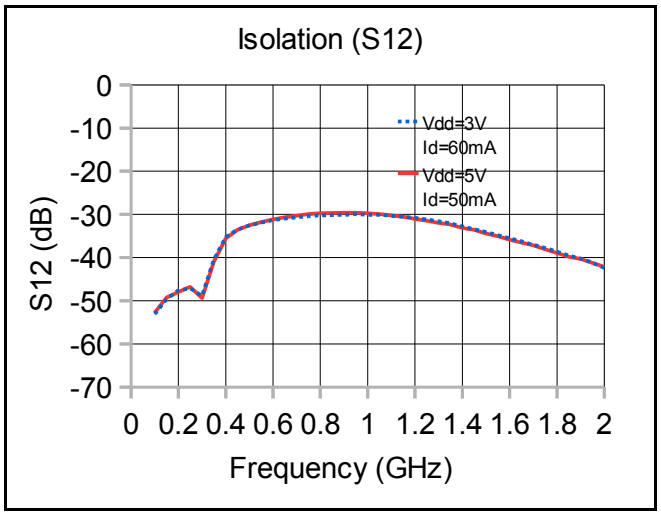
MEASURED PERFORMANCE OF SINGLE ENDED REFERENCE BOARD 1.9 GHZ

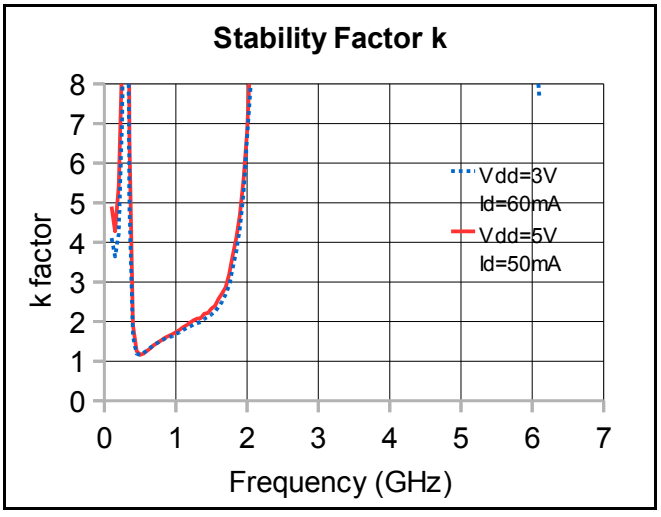
Conditions : V_{DD} = 5 V, I_D = 50 mA in straight line, V_{DD} = 3 V, I_D = 60 mA in dash line,T_{amb} = + 23°C, unless otherwise stated.
Measurements include RF connector contributions.

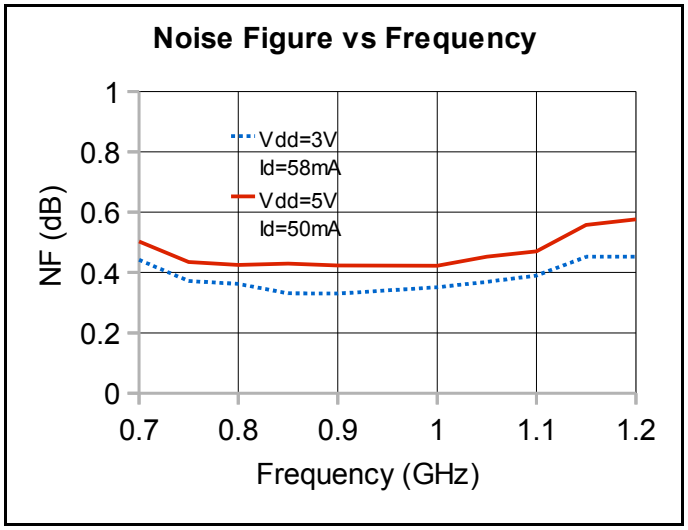


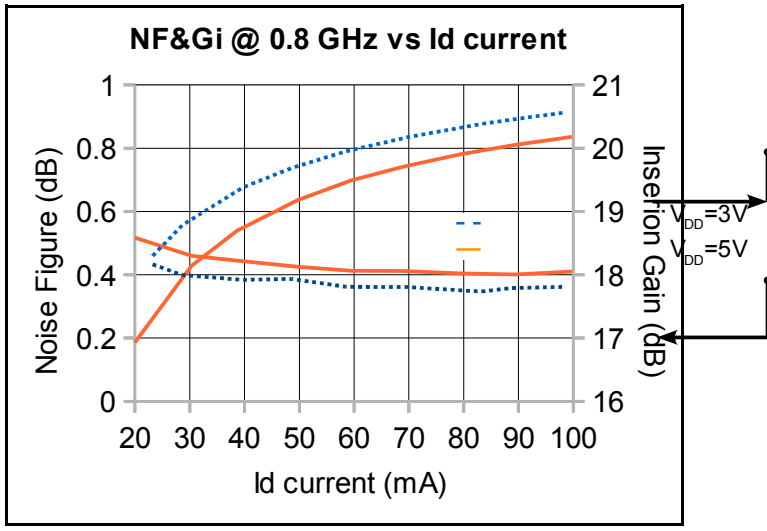












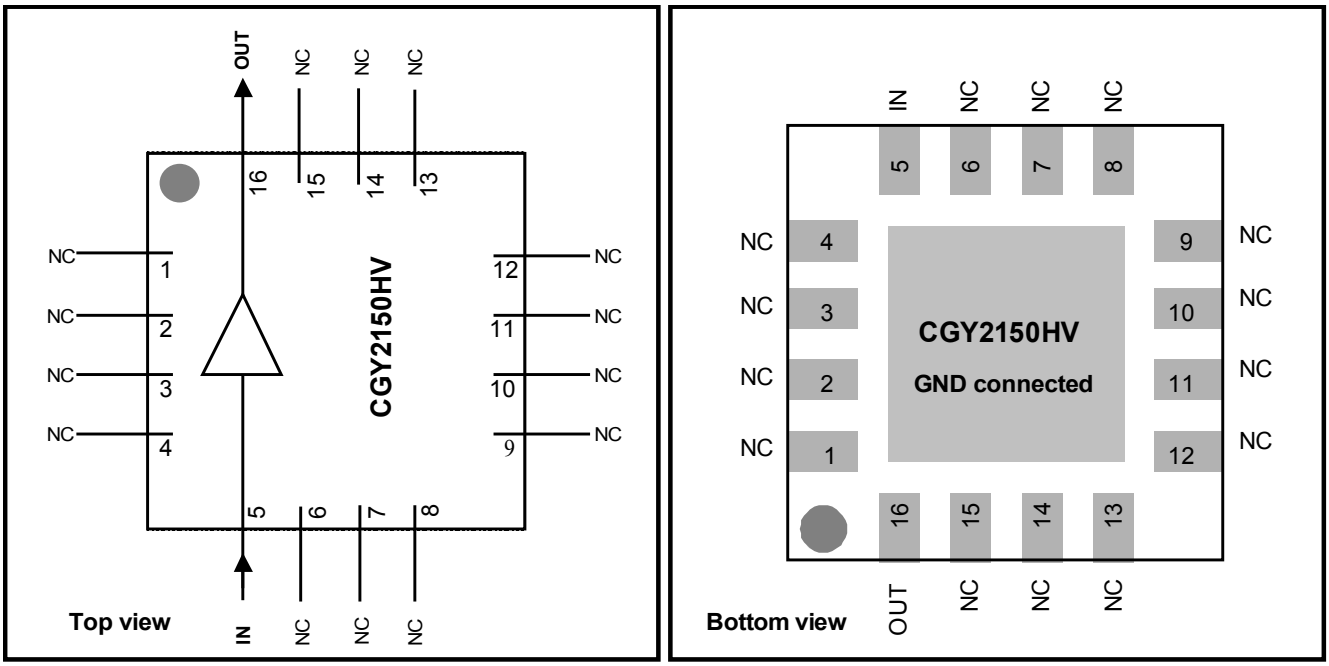
Vdd (V)	Id (mA)	Vgg (in V)	Gain (dB)	NF (in dB)	IIP3 (dBm)	OIP3 (dBm)	S11 (dB)	S21 (dB)	S22 (dB)
3	29	-0.7	18.7	0.40	5.7	24.4	-23.5	19.2	-8.6
3	40	-0.65	19.3	0.38	7.1	26.5	-22.6	19.8	-9.0
3	49	-0.62	19.7	0.39	7.7	27.4	-19.0	20.1	-9.2
3	**59**	**-0.58**	**20.0**	**0.36**	**8.1**	**28.1**	**-16.5**	**20.3**	**-9.4**
3	70	-0.55	20.2	0.36	8.2	28.4	-14.8	20.5	-9.6
3	83	-0.51	20.4	0.35	8.3	28.7	-13.5	20.7	-9.7
5	30	-0.78	18.4	0.46	10.4	28.8	-16.2	18.7	-8.6
5	39	-0.73	18.9	0.45	15.8	34.7	-20.3	19.2	-8.9
5	**50**	**-0.69**	**19.4**	**0.43**	**12.6**	**32.0**	**-22.6**	**19.6**	**-9.1**
5	59	-0.65	19.7	0.41	11.0	30.6	-20.4	19.9	-9.3
5	69	-0.62	19.9	0.41	10.4	30.3	-18.1	20.1	-9.5
5	79	-0.59	20.1	0.40	10.0	30.0	-16.3	20.3	-9.6

Summary of the performance of the CGY2150HV Single Ended Reference Board at 800 MHz

Note :

These results have been obtained on a Single Ended Reference Board optimised to work at 800 MHz. The CGY2150HV can be easily used up to 1 GHz, in single ended applications. The best component for applications between 1 and 2 GHz will be the CGY2151HV, and the CGY2152HV will be the best for application between 2 and 3 GHz. For more details on the reference board used, or help in the design of application using the CGY2150HV, please refer to CGY2150HV application notes or contact OMMIC at : information@ommic.com.

BLOCK DIAGRAM AND PIN CONFIGURATION



PINNING

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

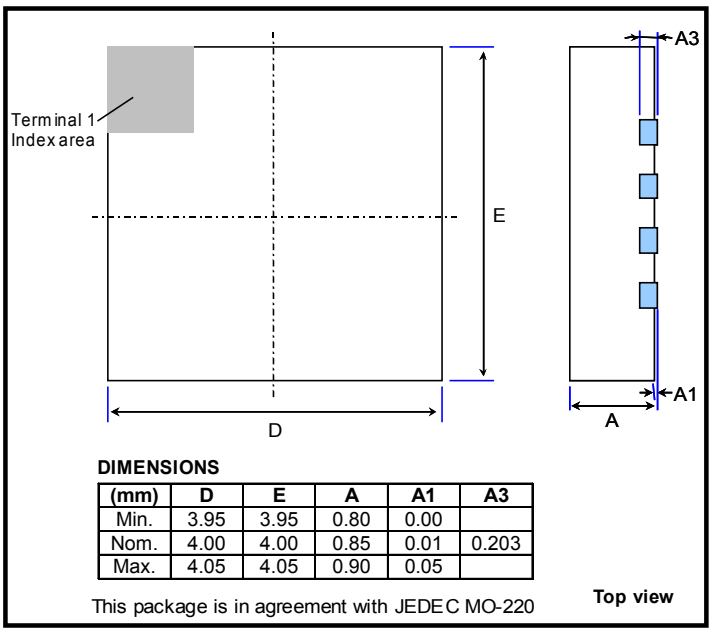
Note :

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

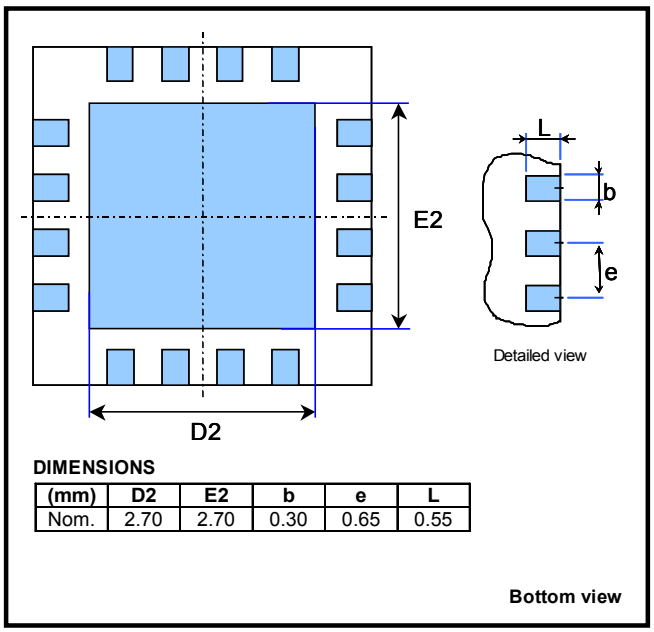


DIMENSIONS

(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.

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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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ORDERING INFORMATION

Generic type	Package type	Version	Sort Type	Description
CGY2150	HV	C1		Single LNA, QFN Plastic Package
CGY2150	HV	C1	REFBOARD0G8	Single Ended Reference Board 0.8GHz

RoHS Compliant

Document History : Version 1.0, Last Update 28/4/2010

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