

**Product Features**

- GaAs p-HEMT chip on board
- No matching circuit needed
- High Maximum input power(+25dBm)
- High IP3 & Low Noise
- Single Supply Voltage (+5V)
- Surface Mount Hybrid Type
- Tape & Reel Packaging
- Small Size, High Heatsink
- Alumina Substrate
- Pb Free / RoHS Standard

**Applications**

- 2G & 3G Repeater
- Base Station
- PCS, CDMA, W-CDMA
- GSM, DCS, UMTS
- WiMAX, Wibro, WLAN
- RF Sub-Systems



Package : CP-16A

**Descriptions**

RFHIC's LOW Noise Amplifier series are all hybrid LNA type products which includes all matching for the convenience of customers. CL series are focused on giving lowest noise possible. The structure of the device is built with GaAs p-HEMT die attached on a ceramic thick film substrate. The device is still smaller than the area one would use for the application notes all together. Depending on the part number, one can use this in different frequency applications. All LNA hybrids are possible to have custom frequency & spec without any additional NRE cost involved.

All RFHIC products are RoHS compliant.

**Electrical Specifications**

Parameter	Units	CL0902-L		CL1502-L	CL1802-L	CL2102-L
		824~894 (Cellular)	890~960 (GSM)	1400~1600	1700~2000	1850~2200
Frequency Range	MHz	824~894 (Cellular)	890~960 (GSM)	1400~1600	1700~2000	1850~2200
Small Signal Gain (S <sub>21</sub> )	dB	21	20	17	16	15
Gain Flatness	dB	±0.5	±0.5	±0.5	±0.5	±1.0
Input Return Loss (S <sub>11</sub> )	dB	-17	-17	-17	-18	-18
Output Return Loss (S <sub>22</sub> )	dB	-8.5	-8.5	-10	-10	-10
1dB Compression Point (P <sub>1dB</sub> )	dBm	20	20	21	21	20
Output 3 <sup>rd</sup> Order Intercept Point (OIP3) (TYP.)	dBm	31	31	33	33	33
Noise Figure (TYP.)	dB	0.7	0.7	0.6	0.6	0.6
DC Supply Current (V <sub>dc</sub> =+5V)	mA	100	100	90	100	100

**Test Condition**

- ① Supply voltage = +5V, 50ohm System, Ta = 25°C
- ② OIP3 is measured with two tones, at an output power of +0dBm/tone separated by 1MHz.

Noise Figure

CL0902-L(Cell)

\* Agilent 11:01:57 May 17, 2007

DUT Amplifier Sys Downconv Off			Frequency
Freq	NoiseFig dB	Gain dB	Freq Mode Sweep
824.00000 MHz	0.711	20.577	Start Freq 824.000000 MHz
829.00000 MHz	0.712	20.577	Stop Freq 894.000000 MHz
834.00000 MHz	0.696	20.510	Center Freq 859.000000 MHz
839.00000 MHz	0.696	20.407	Freq Span 70.0000000 MHz
844.00000 MHz	0.613	20.300	Fixed Freq 1.50500000 GHz
849.00000 MHz	0.705	20.089	More 1 of 2
854.00000 MHz	0.646	19.938	
859.00000 MHz	0.583	19.795	
864.00000 MHz	0.621	19.645	
869.00000 MHz	0.745	19.495	
874.00000 MHz	0.711	19.470	
879.00000 MHz	0.635	19.503	
884.00000 MHz	0.658	19.510	
889.00000 MHz	0.655	19.512	
894.00000 MHz	0.612	19.535	

Start 824.00 MHz BW 4 MHz Points 15 Stop 894.00 MHz  
Tcold 302.90 K Aavs Off Att 0 dB Loss Off Corr

CL0902-L(GSM)

\* Agilent 11:01:14 May 17, 2007

DUT Amplifier Sys Downconv Off			Frequency
Freq	NoiseFig dB	Gain dB	Freq Mode Sweep
890.00000 MHz	0.642	19.532	Start Freq 890.000000 MHz
895.00000 MHz	0.633	19.566	Stop Freq 960.000000 MHz
900.00000 MHz	0.671	19.559	Center Freq 925.000000 MHz
905.00000 MHz	0.658	19.499	Freq Span 70.0000000 MHz
910.00000 MHz	0.584	19.460	Fixed Freq 1.50500000 GHz
915.00000 MHz	0.642	19.342	More 1 of 2
920.00000 MHz	0.673	19.221	
925.00000 MHz	0.569	19.149	
930.00000 MHz	0.582	19.055	
935.00000 MHz	0.618	18.898	
940.00000 MHz	0.600	18.817	
945.00000 MHz	0.593	18.816	
950.00000 MHz	0.616	18.800	
955.00000 MHz	0.538	18.852	
960.00000 MHz	0.559	18.845	

Start 890.00 MHz BW 4 MHz Points 15 Stop 960.00 MHz  
Tcold 302.73 K Aavs Off Att 0 dB Loss Off Corr

CL1502-L

\* Agilent 09:19:13 May 22, 2007

DUT Amplifier Sys Downconv Off			Frequency
Freq	NoiseFig dB	Gain dB	Freq Mode Sweep
1.4000000 GHz	0.586	17.762	Start Freq 1.40000000 GHz
1.414286 GHz	0.586	18.017	Stop Freq 1.60000000 GHz
1.428571 GHz	0.578	17.422	Center Freq 1.50000000 GHz
1.442857 GHz	0.657	16.726	Freq Span 200.000000 MHz
1.457143 GHz	0.604	16.960	Fixed Freq 1.50500000 GHz
1.471429 GHz	0.539	17.627	More 1 of 2
1.485714 GHz	0.570	17.234	
1.500000 GHz	0.577	16.576	
1.514286 GHz	0.513	16.550	
1.528571 GHz	0.587	16.938	
1.542857 GHz	0.534	16.704	
1.557143 GHz	0.551	16.265	
1.571429 GHz	0.505	16.391	
1.585714 GHz	0.496	16.787	
1.600000 GHz	0.564	16.489	

Start 1.40000 GHz BW 4 MHz Points 15 Stop 1.60000 GHz  
Tcold 302.90 K Aavs Off Att 0 dB Loss Off Corr

CL1802-L

\* Agilent 09:24:27 May 22, 2007

DUT Amplifier Sys Downconv Off			Frequency
Freq	NoiseFig dB	Gain dB	Freq Mode Sweep
1.7500000 GHz	0.578	15.278	Start Freq 1.75000000 GHz
1.758571 GHz	0.643	15.438	Stop Freq 1.87000000 GHz
1.767143 GHz	0.621	15.563	Center Freq 1.81000000 GHz
1.775714 GHz	0.575	15.485	Freq Span 120.000000 MHz
1.784286 GHz	0.610	15.206	Fixed Freq 1.50500000 GHz
1.792857 GHz	0.626	15.053	More 1 of 2
1.801429 GHz	0.606	15.026	
1.810000 GHz	0.554	15.128	
1.818571 GHz	0.600	15.147	
1.827143 GHz	0.609	15.090	
1.835714 GHz	0.582	14.880	
1.844286 GHz	0.616	14.607	
1.852857 GHz	0.613	14.488	
1.861429 GHz	0.602	14.569	
1.870000 GHz	0.599	14.816	

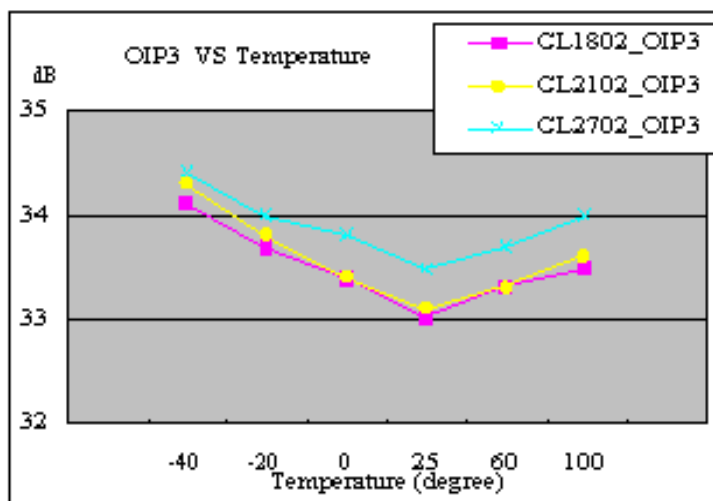
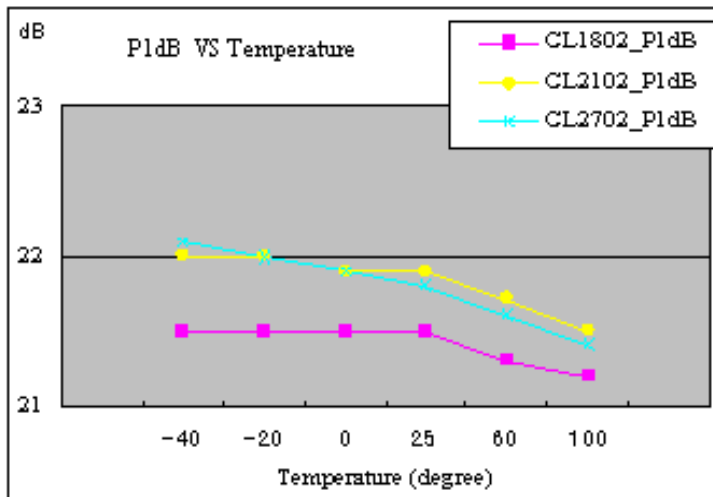
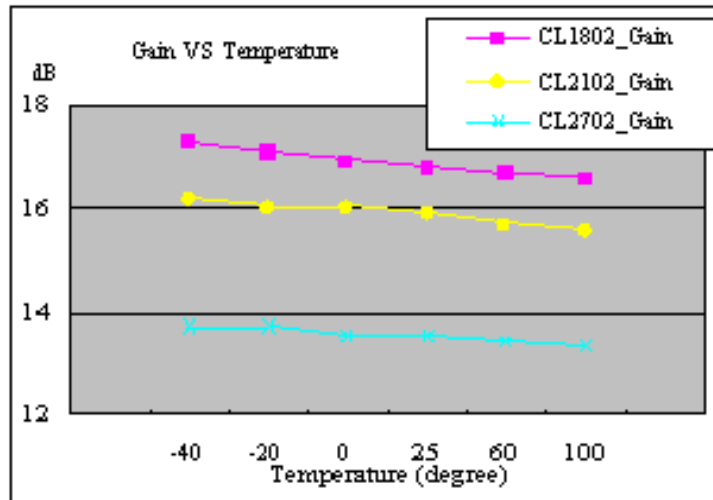
Start 1.75000 GHz BW 4 MHz Points 15 Stop 1.87000 GHz  
Tcold 303.15 K Aavs Off Att 0 dB Loss Off Corr

CL2102-L

\* Agilent 09:31:14 May 22, 2007

DUT Amplifier Sys Downconv Off			Frequency
Freq	NoiseFig dB	Gain dB	Freq Mode Sweep
1.9200000 GHz	0.508	14.575	Start Freq 1.92000000 GHz
1.937857 GHz	0.557	14.656	Stop Freq 2.17000000 GHz
1.955714 GHz	0.589	14.467	Center Freq 2.04500000 GHz
1.973571 GHz	0.500	14.457	Freq Span 250.000000 MHz
1.991429 GHz	0.572	14.424	Fixed Freq 1.50500000 GHz
2.009286 GHz	0.602	14.225	More 1 of 2
2.027143 GHz	0.624	13.973	
2.045000 GHz	0.536	14.151	
2.062857 GHz	0.577	13.949	
2.080714 GHz	0.578	13.706	
2.098571 GHz	0.653	13.715	
2.116429 GHz	0.646	13.812	
2.134286 GHz	0.531	13.565	
2.152143 GHz	0.617	13.396	
2.170000 GHz	0.590	13.555	

Start 1.92000 GHz BW 4 MHz Points 15 Stop 2.17000 GHz  
Tcold 303.52 K Aavs Off Att 0 dB Loss Off Corr

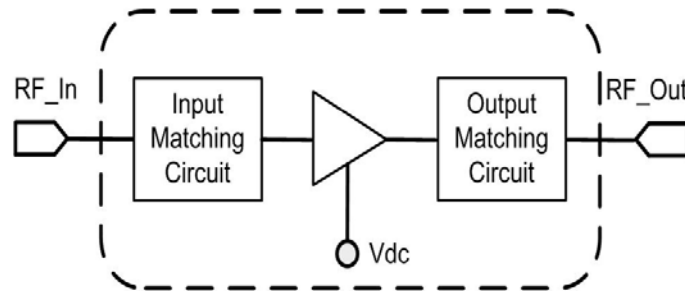


**Absolute Maximum Ratings\***

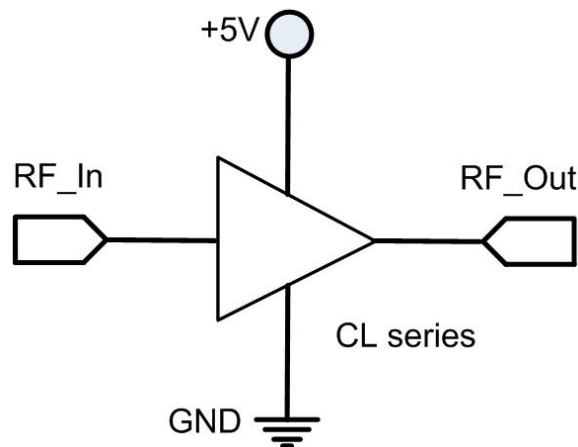
PARAMETER	Unit	Rating	Remark
Device Voltage	V	+8	
RF Input Power	dBm	+25	
Operating Temperature	°C	-40 to +85	
Storage Temperature	°C	-50 to +125	

\* Operation of this device in excess of any one of these parameters may cause permanent damage.

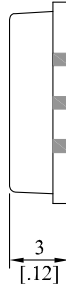
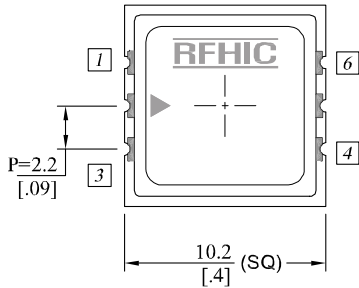
**Functional Diagram**



**Application Circuit**

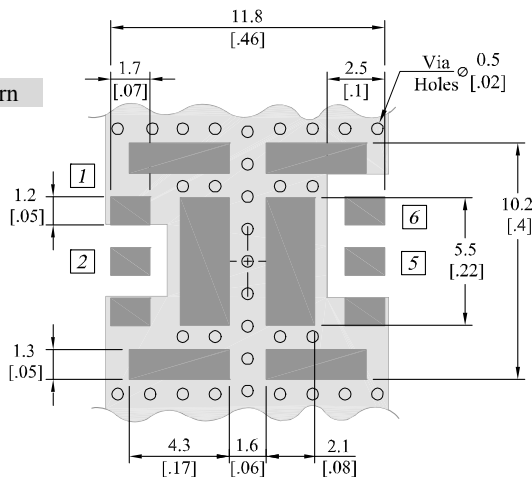


Package Dimensions (Type: CP-16A)



Unit : $\frac{\text{mm}}{\text{[inch]}}$	Tolerance : $\pm \frac{0.2}{.008}$
Pin No.	Function
1, 3, 4	Ground
2	Input
5	Output
6	Vcc

Recommended Pattern



ESD Protection

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices. Some of the precautions recommended are;

- Person at a workbench should be earthed via a wrist strap and a resistor.
- All mains-powered equipment should be connected to the mains via an earth-leakage switch.
- Equipment cases should be grounded.
- Relative humidity should be maintained between 40% and 50%.
- An ionizer is recommended.
- Keep static materials, such as plastic envelopes and plastic trays etc. away from the workbench.

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