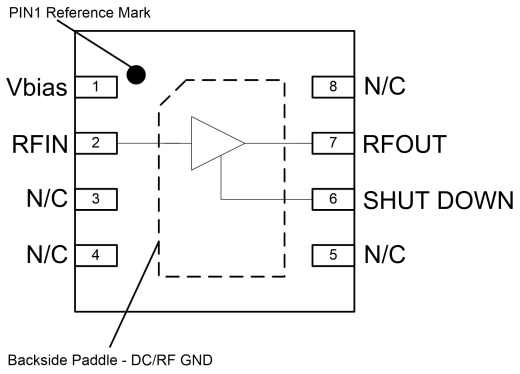
GHLN-001B

High Linearity Low Noise Gain Amplifier , 0.6 - 5.0 GHz

Product Introduction

GHLN- 001B is a flat gain, high linearity, ultra-low noise amplifier in a DFN 2×2 package. The amplifier has a gain flatness of < 2dB in the 1.5~3.6G and 3.5 ~ 5.0 GHz bands . At 2.6GHz, the amplifier provides 2 1 dB gain, 0.7dB noise, and +3 4 dBm OIP3. The amplifier supports +3.0~+5.0V operation and 65mA current. GHLN- 001B integrates shutdown bias capability, supports TDD operation mode, and all pins are equipped with ESD protection. The product quality level is industrial grade.

Block Diagram



Top view

Product Features

- Operating frequency: 0.6 - 5.0 GHz
- Small signal gain: >20dB Gain (full band)
- Gain flatness: ≤2.0dB (1.5~3.6G, 3.5~ 5.0GHz)
- Noise figure: <0.9dB (full band)
- Output IP3：34dBm
- P1dB: 18dBm
- Integrated shutdown function
- Power, OIP3, current can be adjusted by external choke resistor
- Input and output: 50Ohm
- Support +3V ~ +5V operation
- 2x2 mm 8 Pin DFN plastic package

Electrical performance parameters (TA = +25°C, Vd = +5V, 50Ω system)

Index	Test Conditions	Minimum	Typical Value	Maximum	Unit
Frequency Range		0.6	-	5	GHz
Test frequency		-	2.6	-	GHz
Small Signal Gain		-	21	-	dB
Input return loss		-	15	-	dB
Output return loss		-	15	-	dB
Reverse Isolation		-	36	-	dB
P-1		-	18.5	-	dBm
OIP3	Pout = + 5 dBm/tone, Δf = 5 MHz	-	34	-	dBm
Noise Figure*	Not deembedded	-	0.7	-	dB
Switching speed		-	30	-	ns
Shutdown control	On state	0	-	0.8	V
	Off state (Power down)	+ 1.2	-	VDD	V
Current	On state	-	65	-	mA
	Off state (Power down)	-	3	-	mA
Thermal resistance	channel to case	-	-	50	°C/W

*The noise figure result does not deduct the input loss of the test DEMO board .

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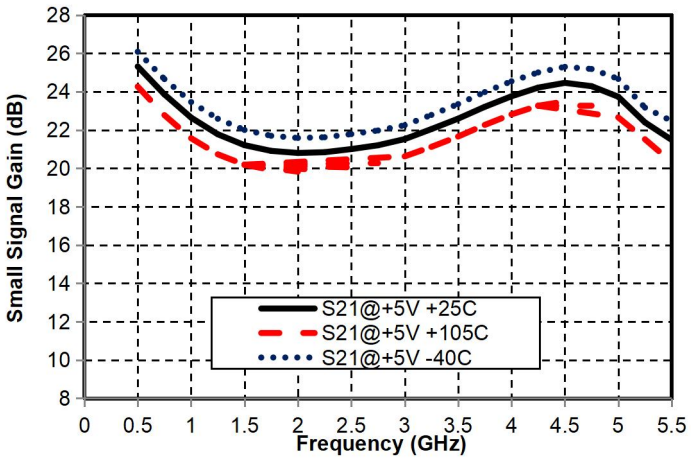
Electrical performance parameters:

Electrical performance parameters (TA = +25°C, Vd = +5V, 50Ω system)										
Index	Typical Value									Unit
Test frequency	0.7	0.9	1.9	2.6	3.0	3.6	4.0	4.5	5.0	GHz
Small Signal Gain	24.0	23.0	20.5	21.0	21.5	22.5	23.5	24.0	23.5	dB
Input return loss	11.0	13.0	16.5	15.0	14.0	12.5	11.5	10.5	10.5	dB
Output return loss	14.0	14.5	18.0	16.0	13.5	10.0	9.0	9.5	13.0	dB
Noise Figure*	0.6	0.6	0.6	0.7	0.8	0.7	0.7	0.8	0.9	dB
P-1	14.0	15.0	19.5	19.0	18.0	18.5	18.5	19.0	18.5	dBm
OIP3**	33.0	33.0	32.5	34.0	36.5	35.0	33.5	31.0	29.5	dBm
Quiescent Current	65									mA

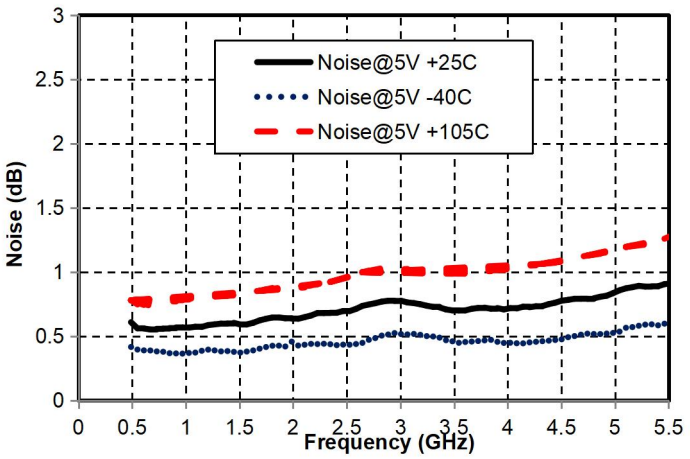
*The noise figure result does not deduct the input loss of the test DEMO board .

** Pout = +5dBm/tone, Δf = 5 MHz.

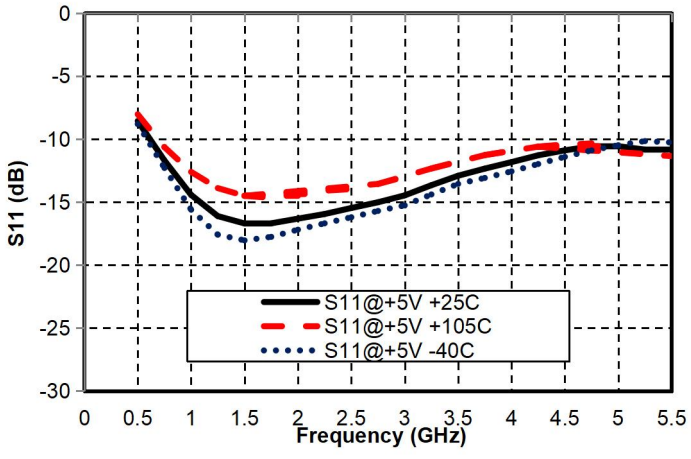
Small Signal Gain vs. Frequency



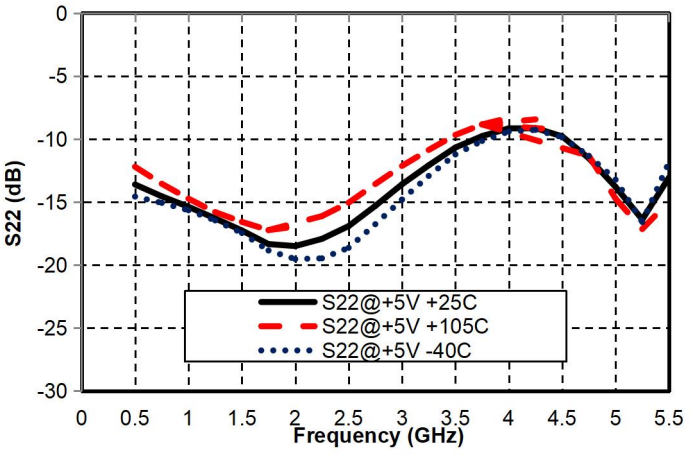
Noise Figure vs. Frequency



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



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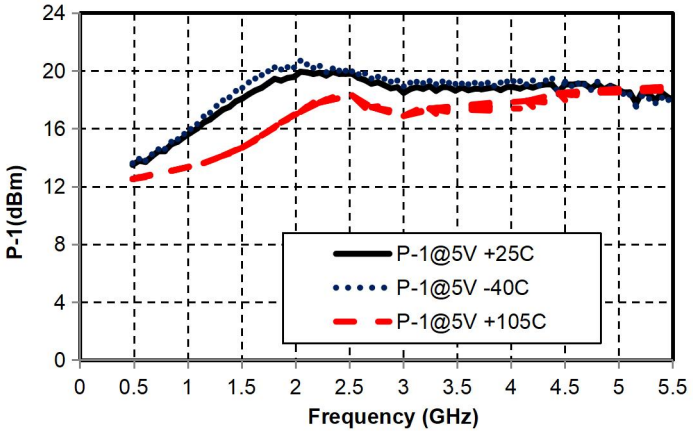
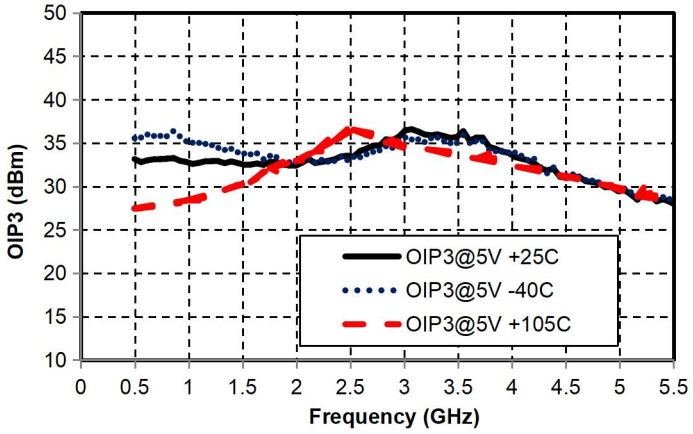
P-1dB vs. Frequency



OIP3 vs. Frequency



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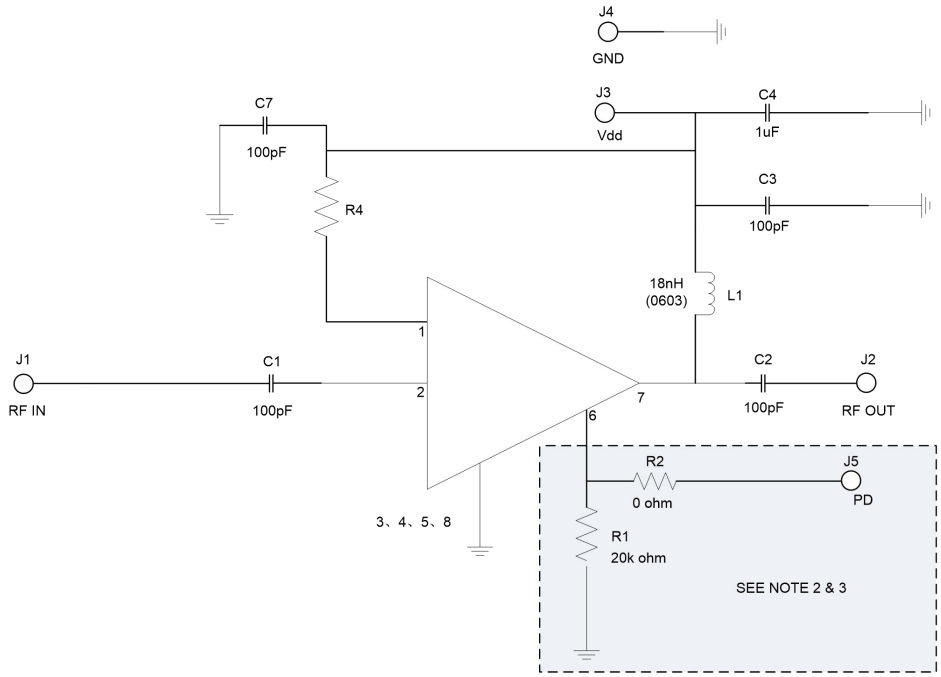
Recommended circuit diagram



Precautions:

1、 All components are of 0402 size unless stated on the schematic.

2、 TDD Applications：R1=20K & R2=0Ω

3、 For FDD Application : R1=20K 'OR' Pin 6 tied to ground.R2=DNP/Omitted .

4、 R4 sets the current draw. Can be changed for the desired bias point. See table below.

Ingredients list

Raw material	RC Inductance	Describe	Brand
R4	2.4K	Resistor，Chip，0402，5%，1/16W	various
R1	20K	Resistor，chip，0402， 5%，1/16W	various
R2	0Ω	Resistor，Chip，0402，5%，1/16W	various
L1	18nH	Inductor，0603， 5%，Ceramic	various
C4	1.0uF	Cap.，Chip，0402，10%，10V，X5R	various
C1，C2，C3，C7	100pF	Cap.，Chip，0402，5%，50V，NPO/COG	various

R4 Resistor Values for Various ICQ settings (Vdd=5V)

ICQ (mA)	45	55	65	75	85	95	105	115
R4	3.5K	-K	2.2K	-K	-K	-K	-	-K

The device can adjust the output power and current by adjusting the external choke resistor. For example: R4=2.4K for I_{DD} =65mA; R4=1.6K for I_{DD} =80mA.

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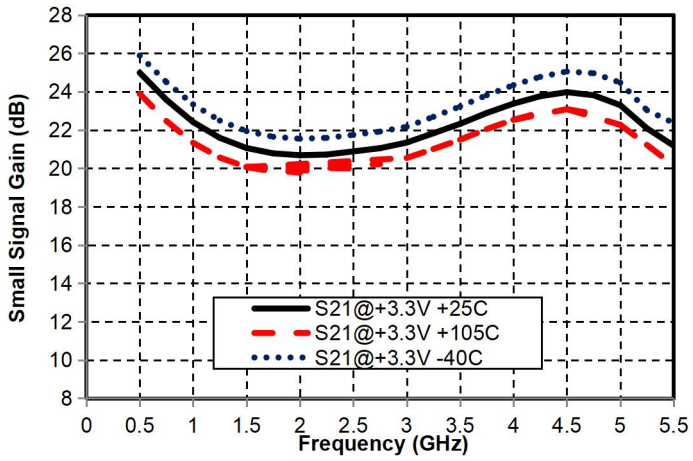
Performance parameters: (The following table shows the +3.3V test results. The device can achieve different power, OIP3 and current by adjusting the Vbias port).

Electrical performance parameters (TA =+25°C, Vd =+3.3V, 50Ω system)										
Index	Typical Value									Unit
Test frequency	0.7	0.9	1.9	2.6	3.0	3.6	4.0	4.5	5.0	GHz
Small Signal Gain	23.5	22.5	20.5	21.0	21.0	22.5	23.0	24.0	23.0	dB
Input return loss	10.5	13.5	17.0	15.0	14.0	12.0	10.5	10.0	9.5	dB
Output return loss	16.0	16.5	19.0	16.0	13.5	10.5	9.5	10.5	14.5	dB
Noise Figure*	0.5	0.5	0.5	0.6	0.7	0.6	0.6	0.7	0.8	dB
P-1	9.5	10.5	17.0	17.5	17.0	17.0	17.0	16.5	15.5	dBm
OIP3**	15.0	19.5	35.5	41.5	39.0	38.5	36.0	33.0	31.0	dBm
Quiescent Current	65									mA

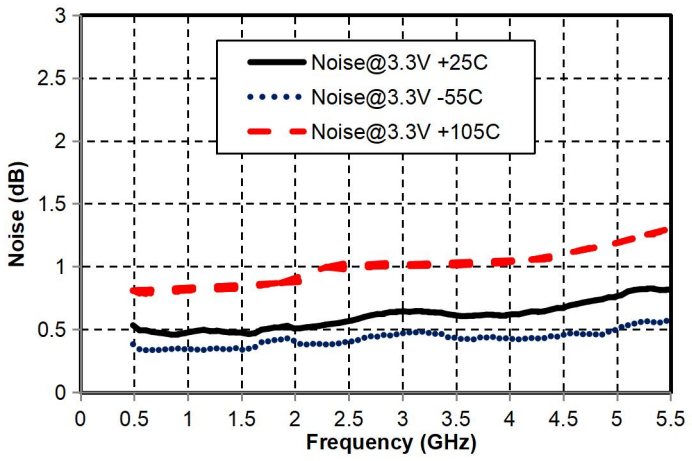
*The noise figure result does not deduct the input loss of the test DEMO board .

** Pout = +5dBm/tone, Δf = 5 MHz.

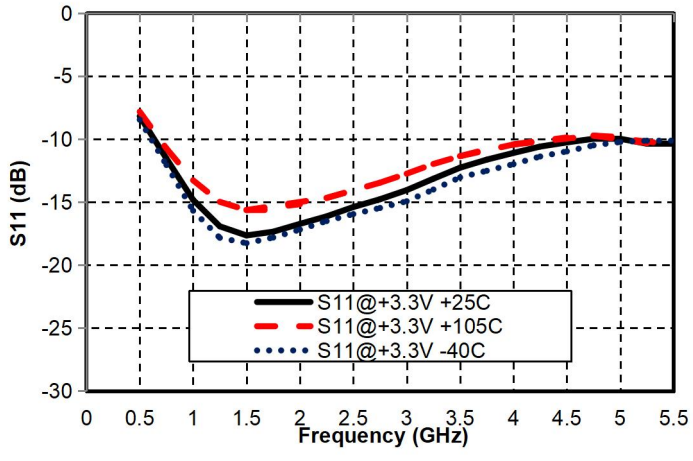
Small Signal Gain vs. Frequency



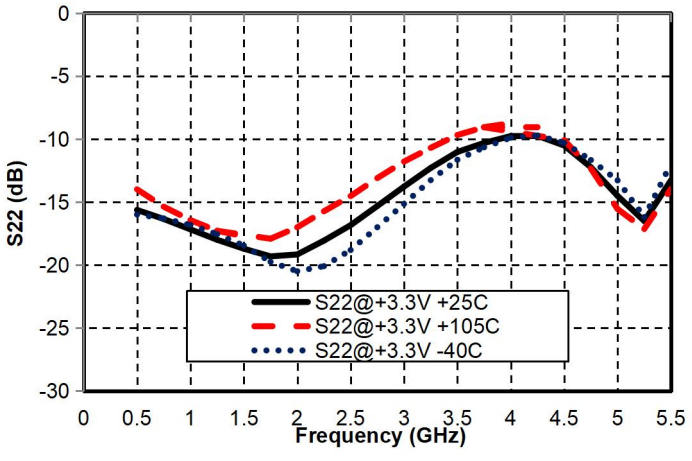
Noise Figure vs. Frequency



Input Return Loss vs. Frequency



Output Return Loss vs. Frequency



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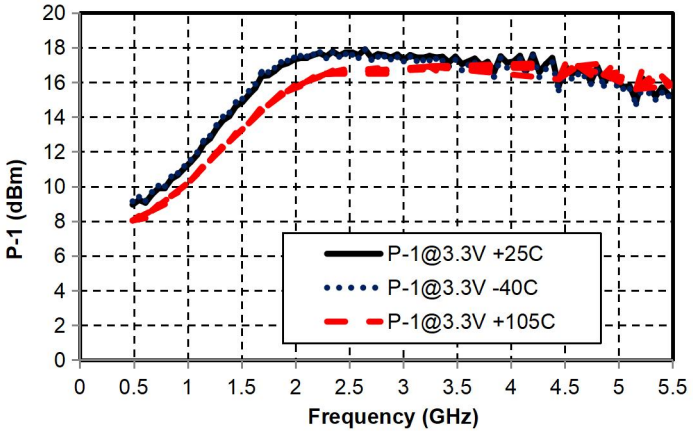
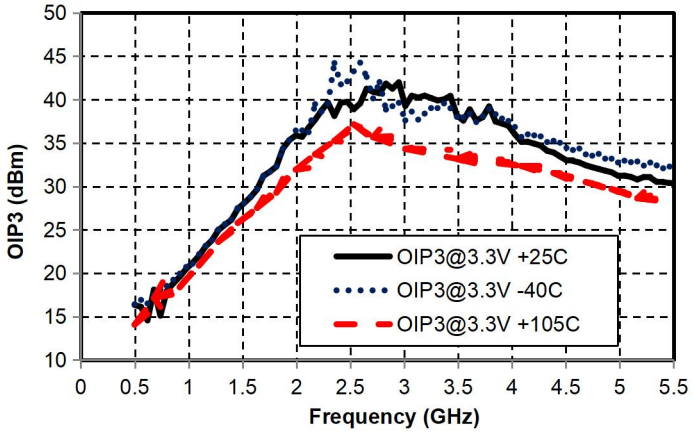
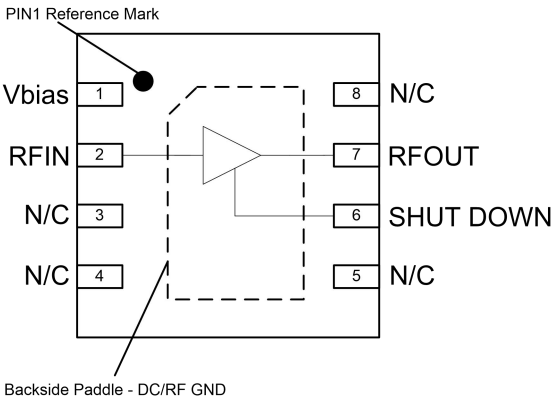
P-1dB vs. Frequency



OIP3 vs. Frequency



Pin Definition



Bonding point number	Function Symbol	Functional Description
2	RF IN	RF input port, impedance 50ohm , requires external DC blocking capacitor
6	Shut Down	Shutdown control port
7	RF OUT / DC Bias	RF output port, impedance 50ohm, amplifier leakage bias, bias the circuit at the output end through external current-choking inductor and bias resistor, external DC blocking capacitor is required
1	Vbias	Tune the pad voltage to get different power, OIP3 , current
3 , 4 , 5 , 8	NC	No welding required
Chip bottom	GND	The bottom of the chip needs to be well grounded to RF and DC

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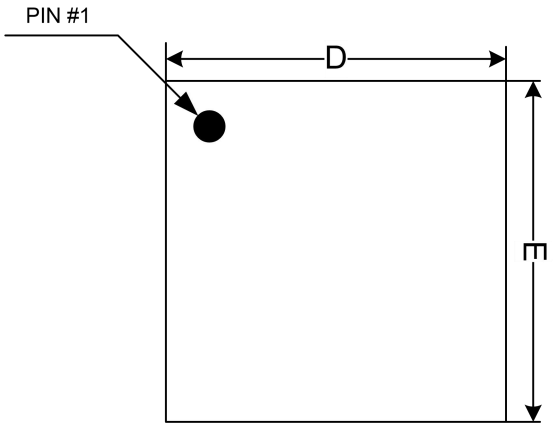
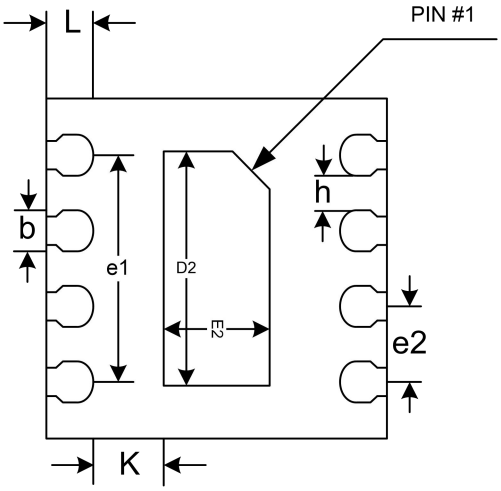
High gain, high linearity, low noise gain amplifier , 50 - 6000 MHz

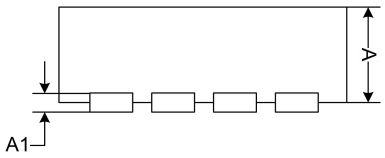
Dimensions



Top view



Bottom view



Side View

structure size							
Annotation	Minimum	Standard	Maximum	Annotation	Minimum	Standard	Maximum
A	0.70	0.75	0.80	E2	0.60	0.70	0.80
A1	0. 1 0	0.12	0. 1 5	e-1	1.40	1.50	1.60
b	0. 20	0. 25	0. 30	e-2	0. 40	0.50	0.60
D	1.90	2.00	2.10	h	0.10	0.20	0.30
D2	1.20	1.30	1.40	L	0.25	0.30	0.35
E	1.90	2.00	2.10	K	0.30	0.35	0.40
All units in the figures are millimeters .							

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GHLN-001B

High gain, high linearity, low noise gain amplifier , 50 - 6000 MHz

Use limit parameters	
Drain voltage: +7V	Input power: 30dBm (on, off)
Maximum current: 120mA	Maximum junction temperature : 150 °C
Operating temperature: -40 ~ +125 ° C	Storage Temperature: -65 ~ +150°C

Exceeding any of these maximum limits may cause permanent damage.

Environmental conditions		
Parameter	Grade	Standard
ESD – Human Body Model (HBM)	1 B	ESDA / JEDEC JS-001-2014
ESD – Charged Device Model (CDM)	C3	ESDA / JEDEC JS-001-2014
MSL – Moisture Sensitivity Level	LEVEL 3	IPC/JEDEC J-STD-020

Precautions for use

- Plastic package material : Low-pressure injection molding plastic that meets ROSH specifications
- Lead frame material: copper alloy
- Lead surface plating: 100% matte tin
- Maximum reflow peak temperature: 260 ℃

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