
PREAMPLIFIER FOR REMOTE CONTROL USE

1. OVERVIEW

1.1 Description

The HL3280 is a miniaturized receiver IC for use in the infrared remote control system. It has a wide voltage operating such as 2.7~5.5V, a high sensitivity, and good noise immunity. Wide operating is very suitable to the hand-held battery operating systems, such as electrical toy.

This can also be suitable for high optical and electrical disturbances.

It has the frequency selecting Pads for setting the center frequency of band-pass filter and also has 5 trimming Pads for the fine adjustment of center frequency.

The HL3280 is capable of accepting a photodiode directly and include many excellent circuit such as an internal voltage reference for wide voltage operating, a high gain initial amplifier, a gain control amplifier, a limiter, a band pass filter, a detection circuit, two comparator circuits, gain control circuits, integrator circuits, a waveform shaping circuit assembled on a single chip.

1.2 Features

- Wide operating supply voltage 2.7V ~ 5.5 V
- Built-in internal voltage reference circuit for wide operating
- Maximum interference safety against optical and electrical disturbances
- No external components necessary
- The center frequency can be varied with option PADs
(32.7kHz, 36.7kHz, 37.9kHz, 40kHz, 56.7kHz)
- Internal filter for a high frequency lighting fluorescent lamp
- Open collector output (Open collector output with a pull-up resistor)
- Output active low

Version 2

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2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	V _{cc}	0	6.0	V	
Output Voltage	V _{out}	0	6.0	V	
Output Current	I _{out}	0	2.5	mA	
Operating Temperature	T _{opr}	-25	85	°C	
Storage Temperature	T _{st}	-40	125	°C	

* Stress above those listed under Absolute Maximum Ratings may cause permanent damage of device.

This is stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for longer periods may affect device reliability.

During overload conditions (V_{IN}>V_{cc} or V_{IN}<GND), those voltage on V_{cc} pins with respect to ground must not exceed the values defined by the absolute maximum ratings.

2.2 Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating Voltage	V _{cc}	2.7	-	5.5	V	
Input Frequency	f _{in}	30	38	60	kHz	
Operating Temperature	T _{op}	-20	25	80	°C	

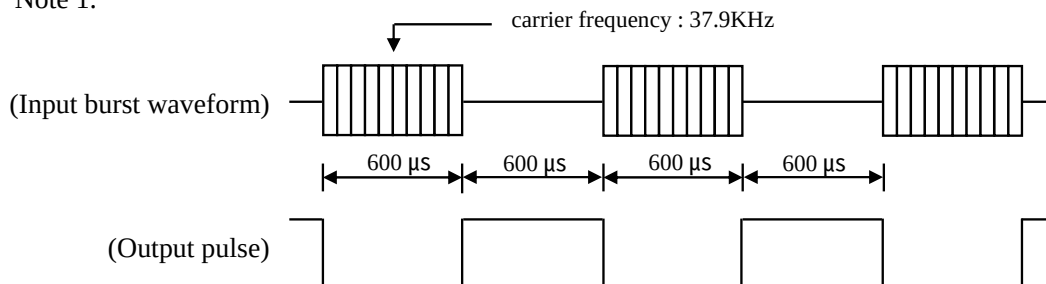
2.3 Electrical Specifications

Specifications hold over the recommended operating conditions, unless otherwise noted herein.

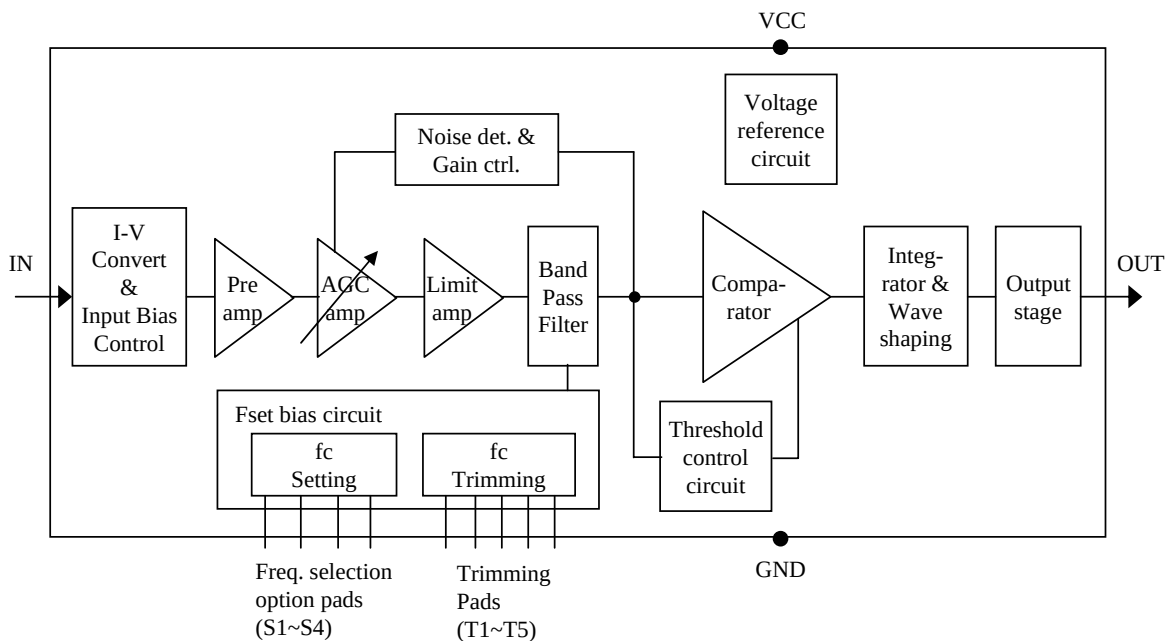
All values are at 25°C and V_{cc}=3.0V/5.0V.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Current	I _{cc}	-	1.3	2.5	mA	I _{in} = 0 μ A, V _{cc} =3V
		-	1.2	2.5	mA	I _{in} = 0 μ A, V _{cc} =5V
Max. Input current	I _{IN}	0.8	-	1.75	mA	I _{in} = 0 μ A, V _{cc} =5V
Max. Voltage gain	A _v	85	95	110	dB	f _{in} =37.9kHz, V _{in} =30 μ Vp-p, V _{cc} =3V
		85	95	110	dB	f _{in} =37.9kHz, V _{in} =30 μ Vp-p, V _{cc} =5V
BPF Bandwidth	f _{BW}	5	7	9	kHz	-3dB Bandwidth V _{in} =30 μ Vp-p
Output Pulse Width	t _{PW1}	500	-	800	μ s	f _{in} =37.9kHz, burst wave V _{in} =500 μ Vp-p *Note 1
	t _{PW2}	500	-	800	μ s	f _{in} =37.9kHz, burst wave V _{in} = 50mVp-p *Note 1
Low Level Output Voltage	V _{OL}	-	-	0.25	V	I _{sink} =2.0mA
High Level Output Voltage	V _{OH}	2.7	3.0	-	V	V _{cc} =3V
		4.7	5.0	-	V	V _{cc} =5V

*Note 1.



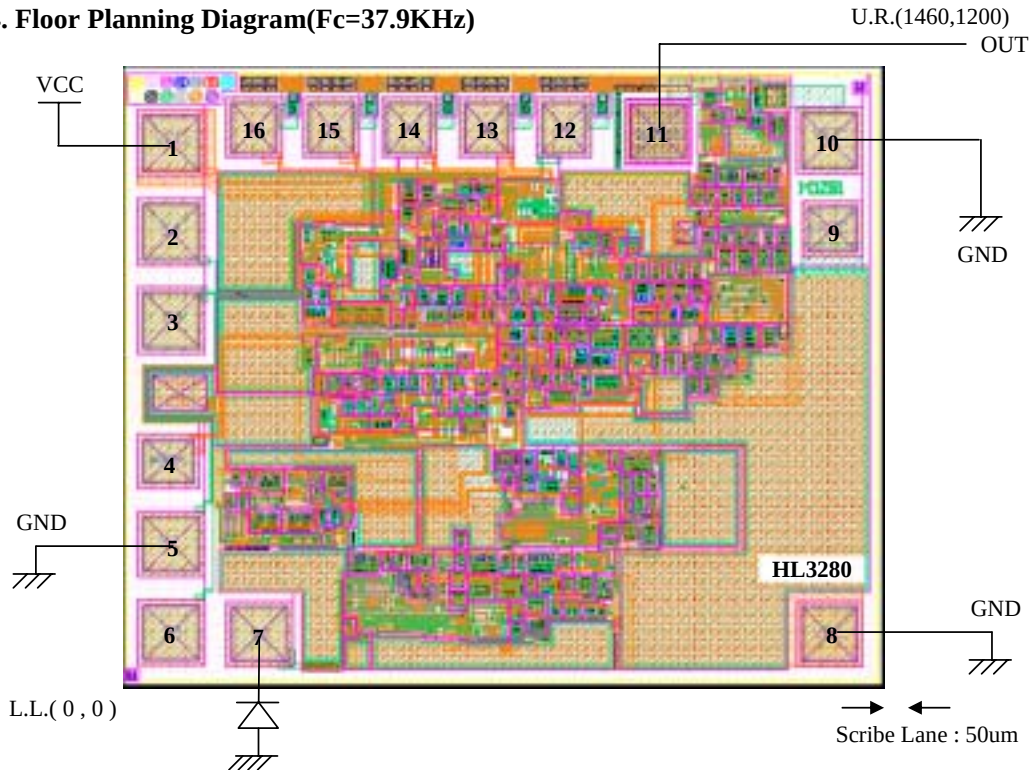
3. Functional Block Diagram



* f_c (center frequency) can be varied with 4 option pins.
: 32.7KHz, 36.7KHz, 37.9KHz, 40.0KHz, 56.7KHz

Fc(Center Frequency)	PAD Setting Method (S1,S2,S3,S4)
32.7 kHz	No connection
36.7 kHz	S1(PAD6) is Ground
37.9 kHz	S2(PAD5) is Ground
40.0 kHz	S3(PAD3) is Ground
56.7 kHz	S4(PAD2) is Ground

4. Floor Planning Diagram($F_c=37.9\text{KHz}$)



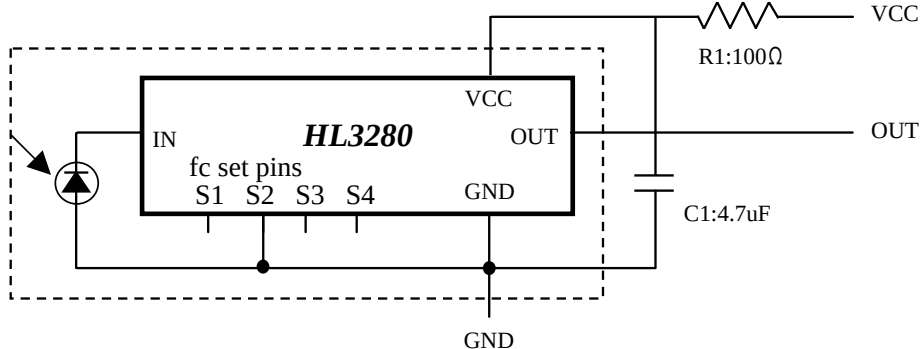
- Chip size : 1460 μm x 1200 μm (with scribe lane)
- PAD Open Size : 100 x 100 μm (80 x 90 μm for trimming and test PAD)

5. PADs Description

PAD Number	PAD Name	Description	PAD (X,Y)
1	VCC	VCC Pad	132.5 , 1023
2	S4	BPF Frequency selection pad	132.5 , 863
3	S3	BPF Frequency selection pad	132.5 , 703
4	MP2	Pad for Test	127.5 , 448
5	S2	BPF Frequency selection pad	132.5 , 298
6	S1	BPF Frequency selection pad	132.5 , 138
7	IN	Signal Input Pad	292.5 , 135
8	GND	Ground Pad	1322.5, 135
9	MP1	Pad for Test	1328 , 868.5
10	GND	Ground Pad for Output	1322.5, 1028.5
11	OUTPUT	Signal Output Pad	1012.5, 1045
12	T5	Trimming Pad	842.5 , 1051.5
13	T4	Trimming Pad	702.5 , 1051.5
14	T1	Trimming Pad	562.5 , 1051.5
15	T2	Trimming Pad	422.5 , 1051.5
16	T3	Trimming Pad	282.5 , 1051.5

6. Application Guide

6.1 Example of Module(37.9KHz) Packaging Using HL3280



6.2 Functional Guide of HL3280

- HL3280 is high gain amplifier for high sensitivity. So if you want better characteristics of receivable distance, you have much careful attention in bonding of GND pads and shielding to GND.
- For more better distance performance, it is important to suppress the supply noise. The supply filter R1, C1 have to be located close to IC if possible.
- The photo diode is important factor in IR receiver module and you select it considerably.
- In packaging of IR module, the photo lens is good for receiving of photo signal. But if the chip is included in the lens, the chip also receives the photo signal and the signal acts as a noise in the chip. So when you design the lens or module frame, the above point must be considered.
- In the detection or demodulation(wave shape) of incoming signal, HL3280 need the minimum burst length of modulated signals.

The incoming photo signal is modulated with proper carrier signal(e.g. 37.9KHz) and if the '1' data bit is modulated with carrier signal, the period of data bit '1' is important.

Because the carrier signals is in this period, the integration need minimum period to the reach of appropriately level in the Integrator & Wave Shape block of HL3280.

Hence the minimum burst length is important characteristic and specification of remote control systems. The minimum burst length of HL3280 is about 10 cycles of carrier.

($\sim 10 \cdot T_{fc}$) You can easily understand as see the Figure 1.

