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

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	Vcc	0	6.0	V	
Output Voltage	Vout	0	6.0	V	
Output Current	Iout	0	2.5	mA	
Operating Temperature	Topr	-25	85		
Storage Temperature	Tst	-40	125		

* 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 (VIN>Vcc or VIN<GND), those voltage on Vcc pins with respect to ground must not exceed the values defined by the absolute maximum ratings.

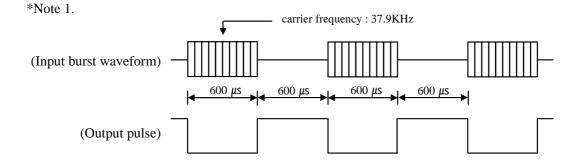### 2.2 Recommended Operating Conditions

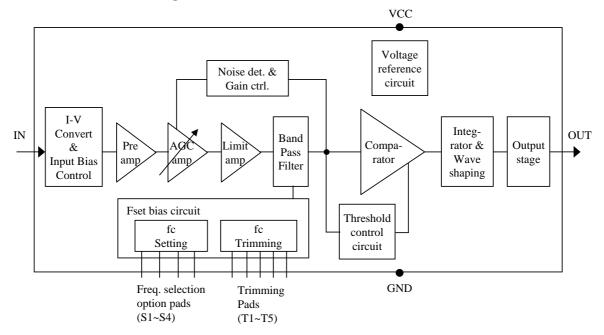| Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating Voltage	Vcc	2.7	-	5.5	V	
Input Frequency	fin	30	38	60	kHz	
Operating Temperature	Top	-20	25	80		

2.3 Electrical Specifications

Specifications hold over the recommended operating conditions, unless otherwise noted herein.
All values are at **25** and **Vcc=3.0V/5.0V**.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Current	Icc	-	1.3	2.5	mA	Iin = 0 , Vcc=3V
		-	1.2	2.5	mA	Iin = 0 , Vcc=5V
Max. Input current	IIN	0.8	-	1.75	mA	Iin = 0 , Vcc=5V
Max. Voltage gain	Av	85	95	110	dB	fin=37.9kHz, Vin=30 p-p, Vcc=3V
		85	95	110	dB	fin=37.9kHz, Vin=30 p-p, Vcc=5V
BPF Bandwidth	fBW	5	7	9	kHz	-3dB Bandwidth Vin=30 p-p
Output Pulse Width	tPW1	500	-	800		fin=37.9kHz, burst wave Vin=500 p-p *Note 1
	tPW2	500	-	800		fin=37.9kHz, burst wave Vin= 50mVp-p *Note 1
Low Level Output Voltage	VOL	-	-	0.25	V	Isink=2.0mA
High Level Output Voltage	VOH	2.7	3.0	-	V	Vcc=3V
		4.7	5.0	-	V	Vcc=5V

*Note 1.

carrier frequency : 37.9KHz

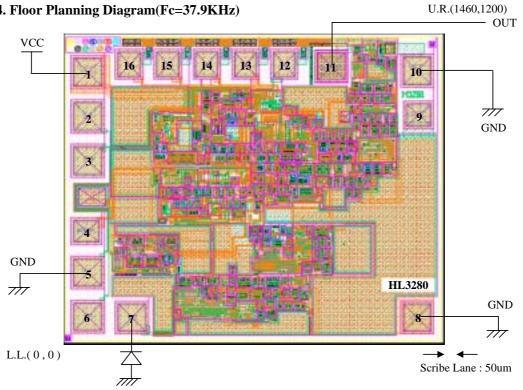(Input burst waveform)

600   600   600   600

(Output pulse)

3. Functional Block Diagram

* fc(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(Fc=37.9KHz)

U.R.(1460,1200)
OUT
VCC
GND
GND
GND
L.L.(0 , 0)
Scribe Lane : 50um

HL3280

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

5. PADs Description

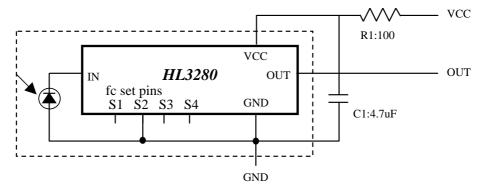| PAD Number	PAD Name	Description	PAD (X,Y)
1	VCC	VCC Pad	132.5 , 1023
2	S4	BPF Frequency selection pad	132.5 , 863
3	S3	BPF Frequency selection pad	132.5 , 703
4	MP2	Pad for Test	127.5 , 448
5	S2	BPF Frequency selection pad	132.5 , 298
6	S1	BPF Frequency selection pad	132.5 , 138
7	IN	Signal Input Pad	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 considerately.
- 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.
  (~10*Tfc) You can easily understand as see the Figure 1.

Figure 1.