

IR Preamplifier for Remote Control Systems

FEATURES

- Only two external components required other than the photodiode.
- Easy to integrate into modules due to its small package size.
- Minimal chance of malfunction due to ambient light.
- Low power consumption.
- Band-pass filter center frequency set using an external resistor
- Microcomputer compatible.

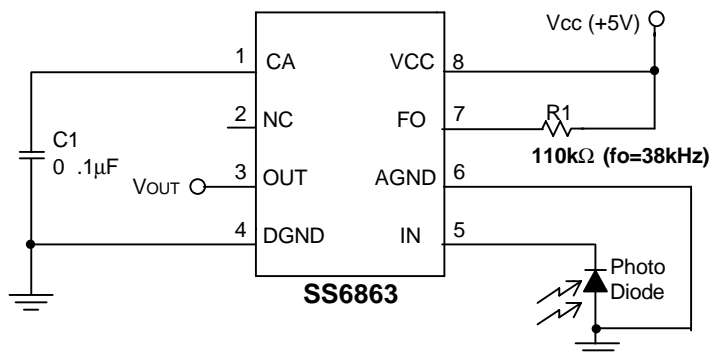
APPLICATIONS

IR remote control receivers for consumer electronic products, such as TVs, VCRs, VCD/DVD players, audio devices, electric fans, air-conditioners, etc.

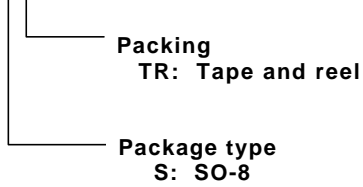
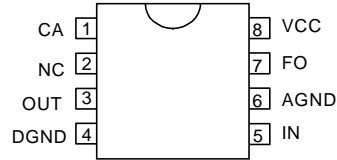
DESCRIPTION

The SS6863 is a high-performance infra-red remote-control pre-amplifier, offering excellent interference-suppression capability. The infra-red pulses received by the photo-diode are processed by the trans-impedance amplifier and amplified by the AGC amplifier, limiter amplifier and band-pass filter. The evaluation stages that follow, including the comparator, Integrator and schmitt-trigger, demodulate the transmitted digital signal. Reduced sensitivity to external interference is achieved by using short-term boost and long-term control circuits to prevent Interference from affecting the output.

TYPICAL APPLICATION CIRCUIT



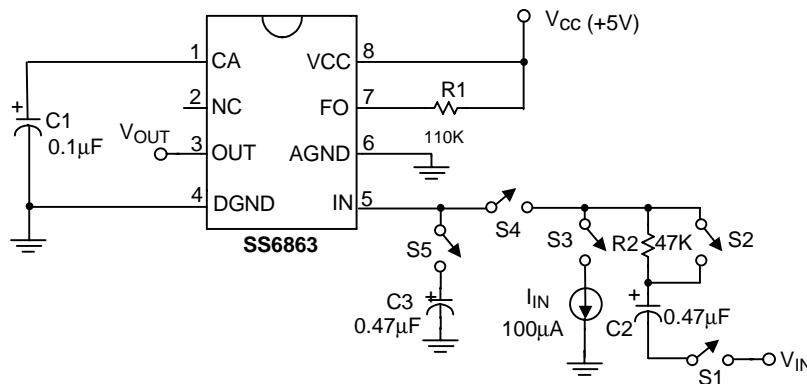
IR Remote Control Receiver

ORDERING INFORMATION
SS6863CXXX

PIN CONFIGURATION
SO-8
TOP VIEW


Example: SS6863CSTR
 → in SO-8 package supplied on tape and reel

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	5.5V
Input Voltage	5V P-P
Operating Temperature Range	-20°C ~ 80°C
Storage Temperature Range	-65°C ~ 150°C

TEST CIRCUIT


ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, T_A = 25 °C unless otherwise specified)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage		V _{CC}	4.5	5.0	5.5	V
Input Pin Voltage (1)	I _{IN} =0μA	V _{IN1}	3.8	4.2	4.4	V
Input Pin Voltage (2)	I _{IN} =100μA	V _{IN2}	1.5	2.1	2.7	V
Low Level Output Voltage		V _{OL}		0.1	0.3	V
High Level Output Voltage		V _{OH}	4.70	4.94		V
Voltage Gain	100μV _{P-P} , 38kHz	A _V	76	81		dB
BPF Characteristics	100μV _{P-P} , 28kHz, 35kHz, 41kHz, 48kHz (note 1)	A _Q	4	9		dB
Input Impedance	0.5V _{P-P} , 38kHz (note 2)	R _{in}	4	11		k Ω
Detecting Ability (1)	100μV _{P-P} , 38kHz 600μs ON Time, 0.2 Duty Cycle	T _{D1}	360	520	680	μs
Detecting Ability (2)	50mV _{P-P} , 38kHz 600μs ON Time, 0.2 Duty Cycle	T _{D2}	540	670	800	μs
Switch On Delay Time	100μV _{P-P} , 38kHz 600μs ON Time, 0.2 Duty Cycle	T _{ON}	100	250	400	μs
Switch Off Delay Time	100μV _{P-P} , 38kHz 600μs ON Time, 0.2 Duty Cycle	T _{OFF}	150	220	400	μs
LCC Slew Rate	C1=0.1μF	dv/dt		0.8		V/s
Quiescent Current		I _{CC}	0.4	0.7	1.0	mA

NOTE 1: Ratio of the AC level at 35kHz and the AC level at 28kHz denotes A_{Q1}.

$$A_{Q1} = 20 \log \frac{\text{measured value (f = 35kHz)}}{\text{measured value (f = 28kHz)}}$$

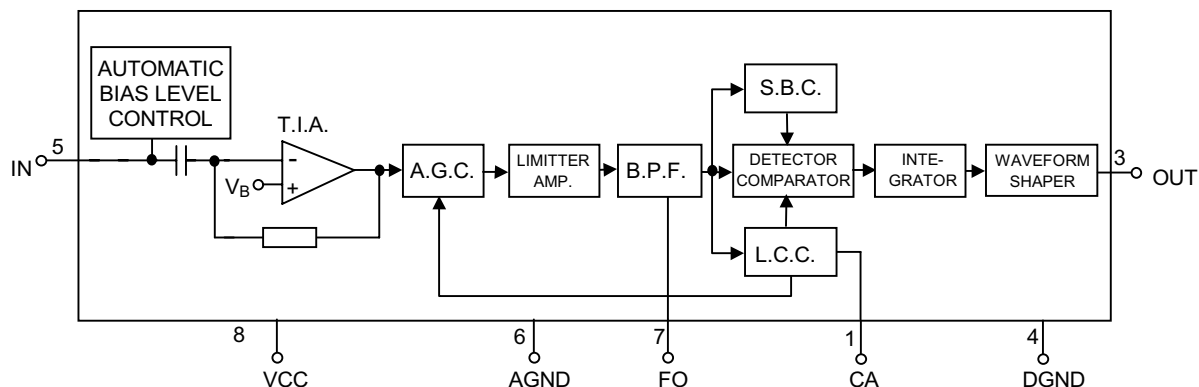
Ratio of the AC level at 41kHz and the AC level at 48kHz denotes A_{Q2}.

$$A_{Q2} = 20 \log \frac{\text{measured value (f = 41kHz)}}{\text{measured value (f = 48kHz)}}$$

NOTE 2: Input level denotes V_I and measured level denotes V_X, then

$$R_{IN} = \frac{47k\Omega}{V_I / V_X - 1}$$

BLOCK DIAGRAM



PIN DESCRIPTIONS

- PIN 1: CA - LCC capacitor connection pin.
- PIN 2: NC - No Connection.
- PIN 3: OUT - Output pin.
- PIN 4: DGND - Digital ground.
- PIN 5: IN - Input pin (photodiode connection pin).
- PIN 6: AGND - Analog ground.
- PIN 7: FO - Band pass filter center frequency setting pin.
- PIN 8: VCC - Power supply pin.

APPLICATION INFORMATION

OPERATION

AUTOMATIC BIAS LEVEL CONTROL

An ABLC (Automatic Bias Level Control) circuit is built into the input section to prevent the input level from being saturated by the external disturbing lights, such that this circuit is actuated by a strong external disturbing light to fix the bias level of the input terminal.

TRANS-IMPEDANCE AMPLIFIER (T.I.A.)

The Trans-impedance amplifier is an inverted amplifier with a sufficiently low input resistance, which amplifies the input photocurrent pulses. The resistance of the input at the signal frequency should not be too high. Otherwise the wanted signal

would be lost to the junction capacitance of photodiode.

AUTO-GAIN CONTROL AMPLIFIER (A.G.C.)

The voltage gain of auto-gain control amplifier is controlled by the voltage at CA pin. In so doing, it supports the long-time interference suppression of the evaluation circuit.

EVALUATION CIRCUIT

The signal delivered from the band-pass filter is compared with a reference by the detector comparator. This reference is determined by the short-time boost circuit and the long-time control circuit. The inherent offset of the detector comparator and

the reference determine the sensitivity of the evaluation circuit. The integrator is controlled by the above mentioned comparison. Its output is used to control the output stage after being processed through a schmitt-trigger. Use of the integrator keeps the output free of short-time interference. The ground of the evaluation circuit is routed out separately at pin 4, in order to minimize effect of the output switching edges.

SHORT-TIME BOOST CIRCUIT (S.B.C.)

The short-time boost circuit reduces the sensitivity of the evaluation circuit after reception of a signal. This prevents short-time interference from affecting the output. The reduction in sensitivity is achieved by boosting the reference input of the detector comparator.

LONG-TIME CONTROL CIRCUIT (L.C.C.)

The long-time control circuit improves the circuit's resistance to long-time interference by adapting the sensitivity of the evaluation circuit and the amplification of the AGC amplifier. Reduction of the evaluation circuit sensitivity is thereby achieved in the same way, as for the SBC, by raising the reference input of the detector comparator. The external capacitor C1 is charged as long as the signal is delivered from band pass filter and the voltage of C1 provides the necessary control voltage for AGC amplifier.

DESIGN GUIDE

SETTING THE CENTER FREQUENCY OF BAND PASS FILTER

Connect a resistor from pin 7 to VCC to set the center frequency of band pass filter. The center frequency will be lower if the resistor value is higher. The relationships between center frequency of band pass filter and the resistance of external resistor are tabulated as below:

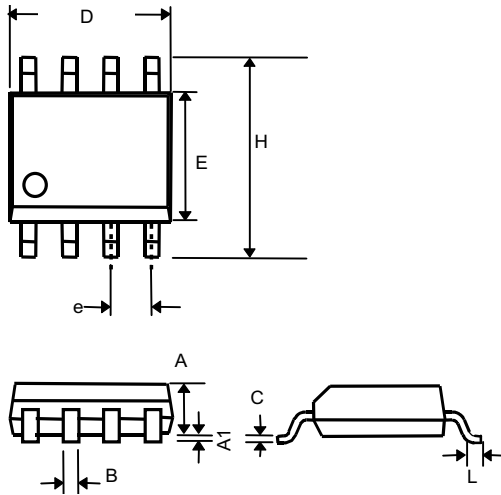
f ₀ (KHz)	33	36	37	38	40	56.8
R1(KΩ)	130	118	114	110	104	72

SETTING LCC CAPACITOR C1

With the transmitted data signal with duty cycle lower than 0.4 (average, during the whole transmission), the detection sensitivity is unchanged all the time. Otherwise, with the transmitted data signal with duty cycle higher than 0.4, the detection sensitivity will maintain unchanged for a proportional time period and gradually be reduced due to increasing control voltage at CA pin. Higher duty cycle enables more reduction of detection sensitivity in specific transmission time. Increasing the capacitance of C1 causes longer transmission time as duty cycle higher than the maximum allowable duty cycle.

GROUNDING

The AGND pin, DGND pin and all the external parts are recommended to be connected as much as possible to "one ground point" for good noise performance.

PHYSICAL DIMENSIONS
● 8 LEAD PLASTIC SO (unit: mm)


SYMBOL	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27(TYP)	
H	5.80	6.20
L	0.40	1.27

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