

Preamplifier for IR Remote Control

Description

The IC U2535B is a complete IR receiver for data communication. The PIN photodiode converts the transmitted IR telegram into electronic input signals. This is separated by a special input circuit. The characteristics (filter, gain) of the following amplifier are determined by exter-

nal components. The signal detector, consisting of a comparator, an integrator and a Schmitt trigger, forms the input signal to an output pulse that can be interfaced to a microcomputer.

Features

- Low current requirement (typical 260 μ A/ 12 V)
- Carrier frequencies 20 to 100 kHz
- Supply voltages:
5 or 7 to 16 V with internal stabilization
- Filter characteristics and gain are specified by few external components
- Demodulator with Schmitt trigger
- Open collector output

Applications

- Keyless entry
- Remote control
- Wireless data transfer

Ordering Information

Extended Type Number	Package	Remarks
U2535B-FP	SO8	

Block Diagram

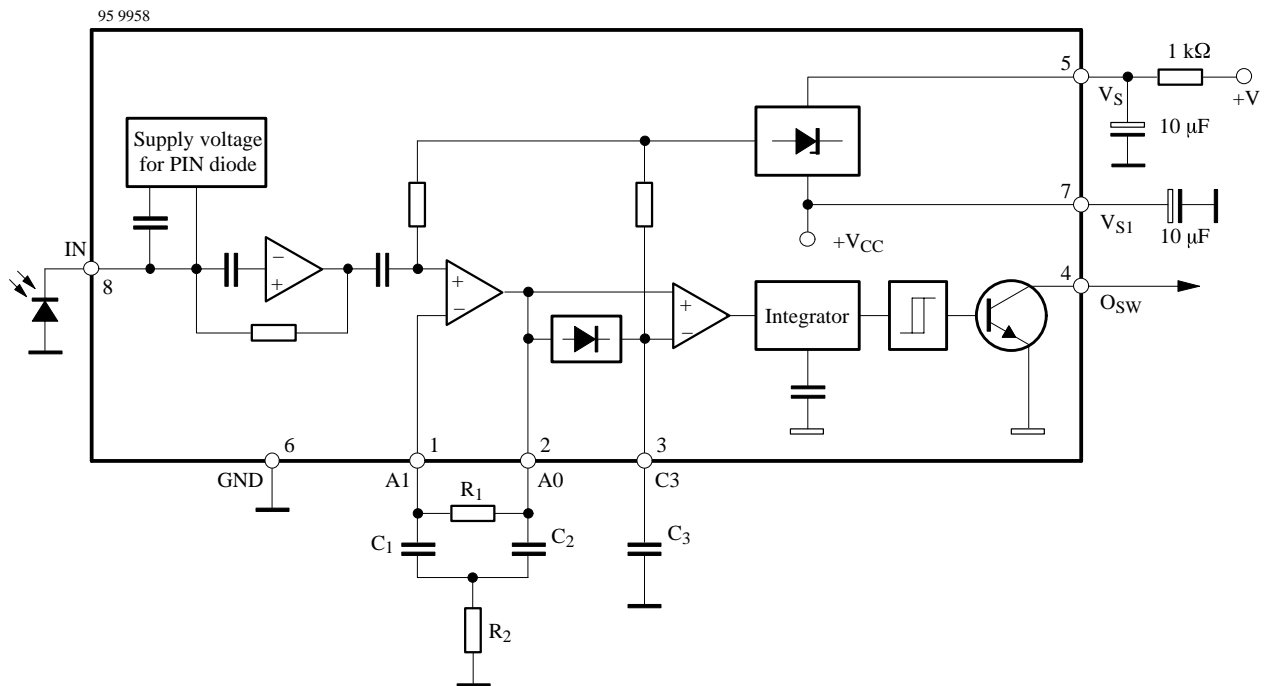


Figure 1. Block diagram

Pin Description

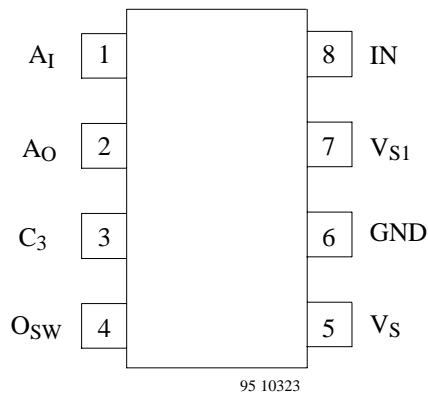


Figure 2. Pinning

Pin	Symbol	Function
1	A _I	Inverting input of bandpass amplifier, pin connection for external filter function
2	A _O	Output of bandpass amplifier
3	C ₃	Capacitor at Pin 3 to reject (suppress) ripple during transmission, also functions as delay time for reference voltage of the comparator
4	O _{SW}	Switching output Open collector output which switches with time delay and turns to LOW (transistor switched ON) when the signal is identified at Pin 2.
5	V _S	Supply voltage The integrated Z-diode (typically 17 V) protects the circuit against positive voltage spikes
6	GND	Ground
7	V _{S1}	Unregulated supply voltage for 5 V operation
8	IN	Input connection for photodiode with regulated bias voltage

Absolute Maximum Ratings

Reference point Pin 6, unless otherwise specified

Parameters	Symbol	Value	Unit
Supply-voltage range	V _S	-0.3 to +16	V
Supply currents: tp ≤ 250 ms	I _S	20	mA
	i _S	150	mA
Input voltages	V _{A(I)}	-0.3 to 5	V
	V _{O(SW)}	-0.3 to 16	V
	V _{IN}	-0.3 to 5	V
Output currents	I _O	±5	mA
Junction temperature	T _j	125	°C
Storage-temperature range	T _{stg}	-40 to +125	°C
Ambient-temperature range	T _{amb}	-40 to +105	°C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient	R _{thJA}	180	K/W

Electrical Characteristics

$T_{amb} = 25^{\circ}\text{C}$, reference point Pin 6, test circuit, unless otherwise specified

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply currents	$V_{S1} = 5\text{ V}$, $I_{IN} = 0$, Pin 7	I_{S1}	140		200	μA
	$V_S = 12\text{ V}$, $I_{IN} = 0$, Pin 5	I_S	200		320	μA
Internal stabilization	$V_S = 12\text{ V}$, $I_{IN} = 0$, Pin 7	V_{S1}	4.9		5.4	V
Maximum input current	$V_{S1} = 5\text{ V}$, $V_{IN} = 0$, Pin 8	$-I_{IN}$	0.8		1.2	mA
Low-level voltage	$V_{S1} = 5\text{ V}$, $I_{OL} = 0.5\text{ mA}$ Pin 4	V_{OL}			0.2	V
Leakage current	$V_{S1} = 5\text{ V}$, $V_0 = 12\text{ V}$, Pin 4	I_{OH}			1	μA
Input stage, amplifier						
Cut-off frequency		f_L			15	kHz
		f_H	100			kHz
Gain	$v_i = 2\text{ mV}_{\text{rms}}$, $f = 40\text{ kHz}$ $f = 100\text{ kHz}$	G_v	47	50		dB
		G_v	46	49		dB
Detector						
Threshold voltage	$t_d \leq 200\ \mu\text{s}$, $f = 40\text{ kHz}$, Pin 2	V_{A0}		150		mV_{rms}
Delay time	$f = 40\text{ kHz}$, $V_{A0} = 1\text{ V}_{\text{rms}}$ see figure 4	t_d	50	90		μs
Storage time	$f = 40\text{ kHz}$, $V_{A0} = 1\text{ V}_{\text{rms}}$ see figure 4	t_s	100		150	μs

Test Circuit

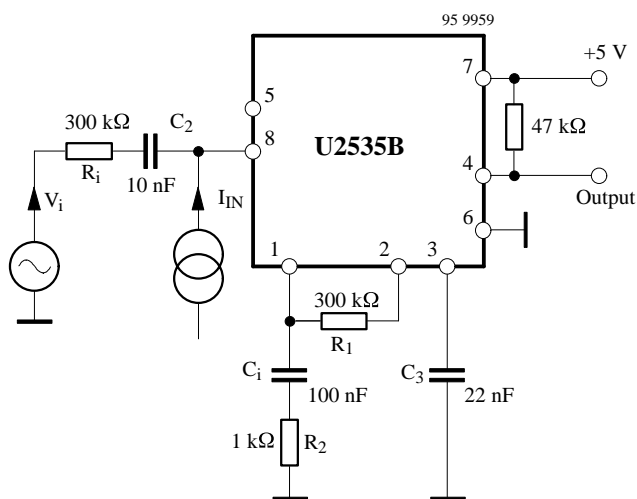


Figure 3. Test circuit

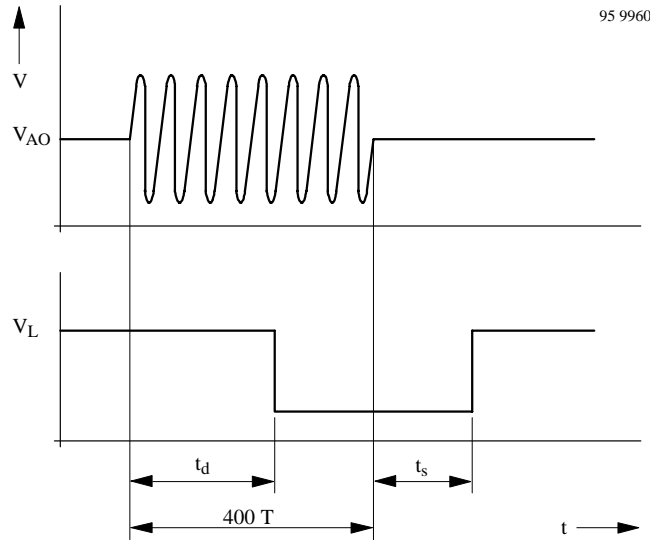


Figure 4. Waveforms for t_d and t_s measurement

Application Circuit

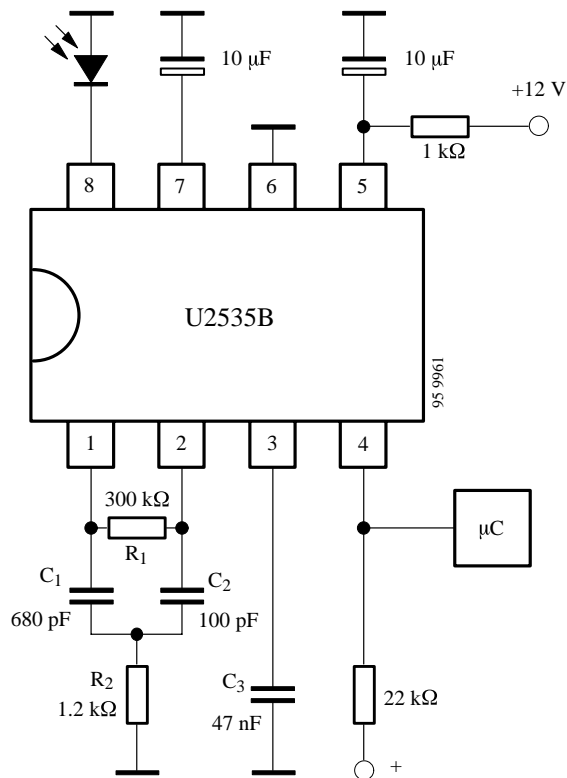


Figure 5. Application circuit

Bandpass Filter Design

Center frequency

$$f_0 = \frac{1}{2\pi \sqrt{R_1 \times C_1 \times R_2 \times C_2}}$$

$$\text{GAIN} \approx \frac{R_1 \times C_1}{R_2 (C_1 + C_2)} \quad \begin{array}{l} R_1 \gg R_2 \\ C_1 \cong C_2 \end{array}$$

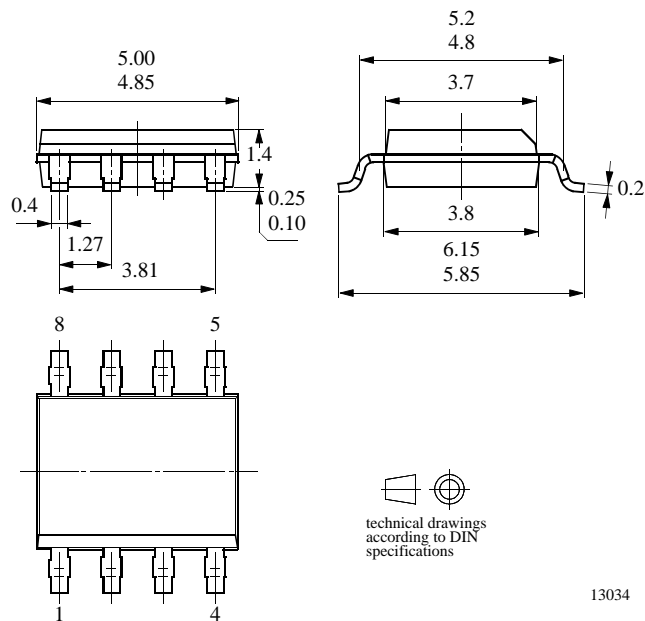
$$\text{Bandwidth} \approx \frac{C_1 + C_2}{2\pi \times R_1 \times C_1 \times C_2} \quad \text{BW} \ll f_0$$

Note: R_1 should be about 300 k Ω .
Results can be influenced by feedback (Pin 2 \rightarrow Pin 8)

Package Information

Package SO8

Dimensions in mm



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1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

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