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 external 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 µA/ 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

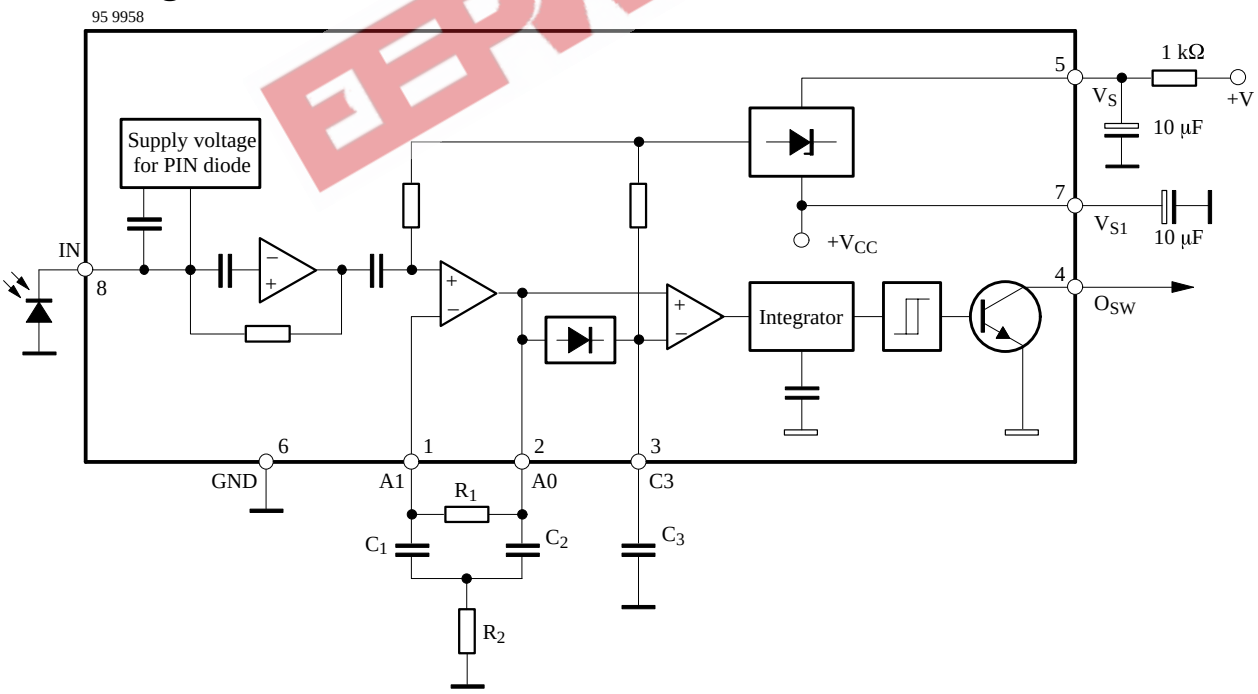


Figure 1. Block diagram

Pin Description

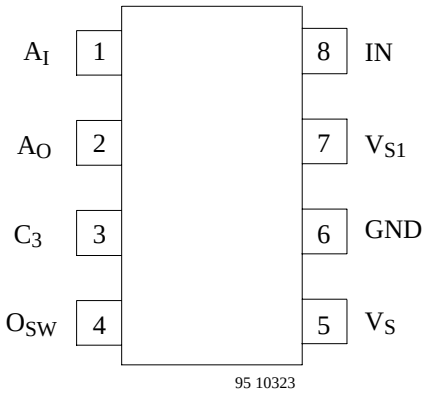


Figure 2. Pinning

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	Pin 5	V_S	–0.3 to +16	V
Supply currents:	Pin 5	I_S	20	mA
tp ≤ 250 ms	Pin 5	i_S	150	mA
Input voltages	Pin 1	$V_{A(I)}$	–0.3 to 5	V
	Pin 4	$V_{0(SW)}$	–0.3 to 16	V
	Pin 8	V_{IN}	–0.3 to 5	V
Output currents	Pins 2 and 4	I_0	±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°C, reference point Pin 6, test circuit, unless otherwise specified

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

Test Circuit

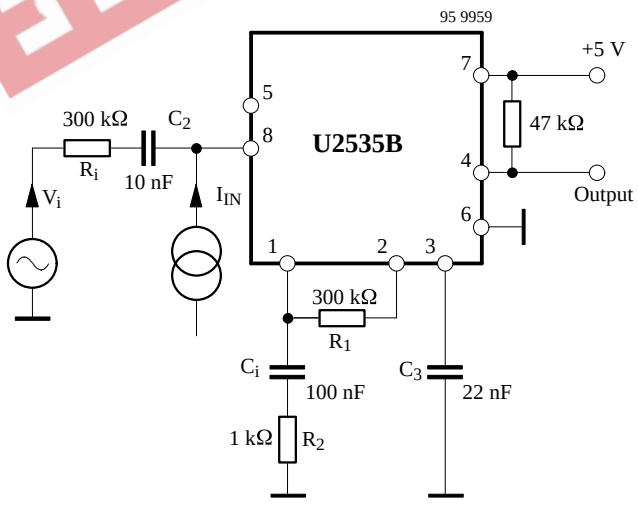


Figure 3. Test circuit

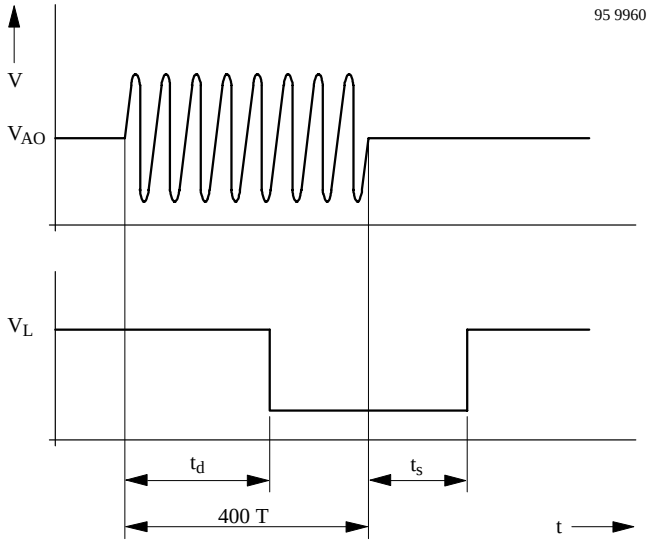


Figure 4. Waveforms for t_d and t_s measurement

Application Circuit

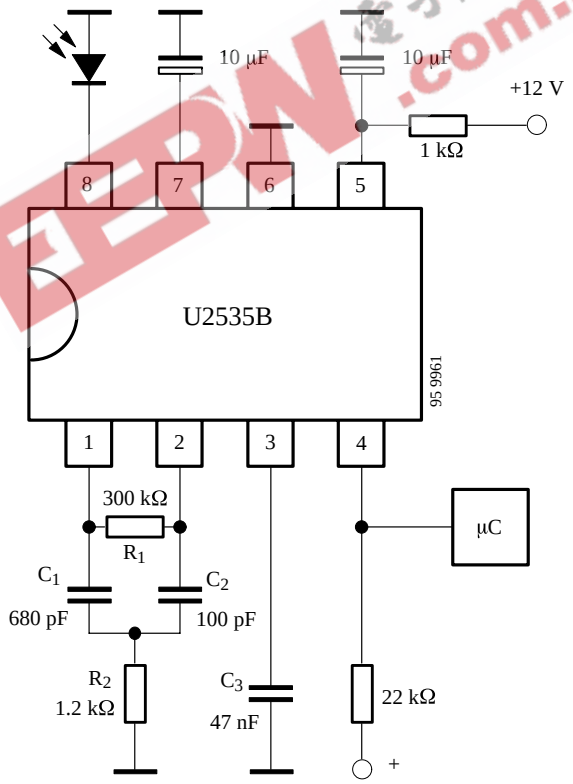


Figure 5. Application circuit

Bandpass Filter Design

Center frequency

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

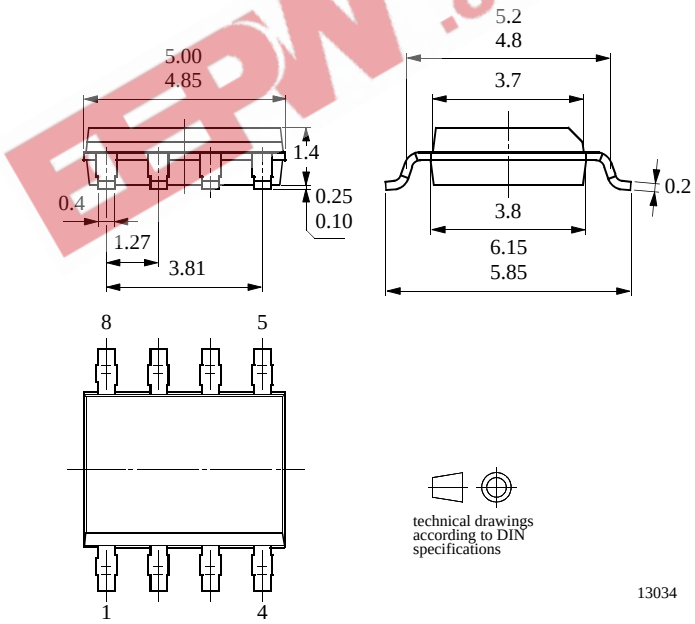
$$\text{GAIN} \approx \frac{R_1 \times C_1}{R_2 (C_1 + C_2)} \qquad R_1 >> R_2,\ C_1 \geqq C_2$$

$$\text{Bandwidth} \approx \frac{C_1 + C_2}{2\pi \times R_1 \times C_1 \times C_2} \qquad BW << f_O$$

Note: R_1 should be about 300 kΩ.
Results can be influenced by feedback (Pin 2 → Pin 8)

Package Information

Package SO8
Dimensions in mm



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC Semiconductor GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

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.

TEMIC Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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