# TEMIC

TELEFUNKEN Semiconductors

# U2535B-FP

# Preamplifier for IR Remote Control

## Description

The IC U2535B-FP is a complete IR receiver for data communication. The PIN-photodiode converts the transmitted IR-telegram into the electronic input signals. This is separated by a special input circuit. The characteristics (filter, gain) of the following amplifier is 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 between 20 to 100 kHz

- Supply voltages: 5 or 7 to 16 V with internal stabilisation

- Filter characteristics and gain are specified by few external components

- Demodulator with Schmitt-trigger

- Open collector output

## Applications

- Keyless entry

- Remote control
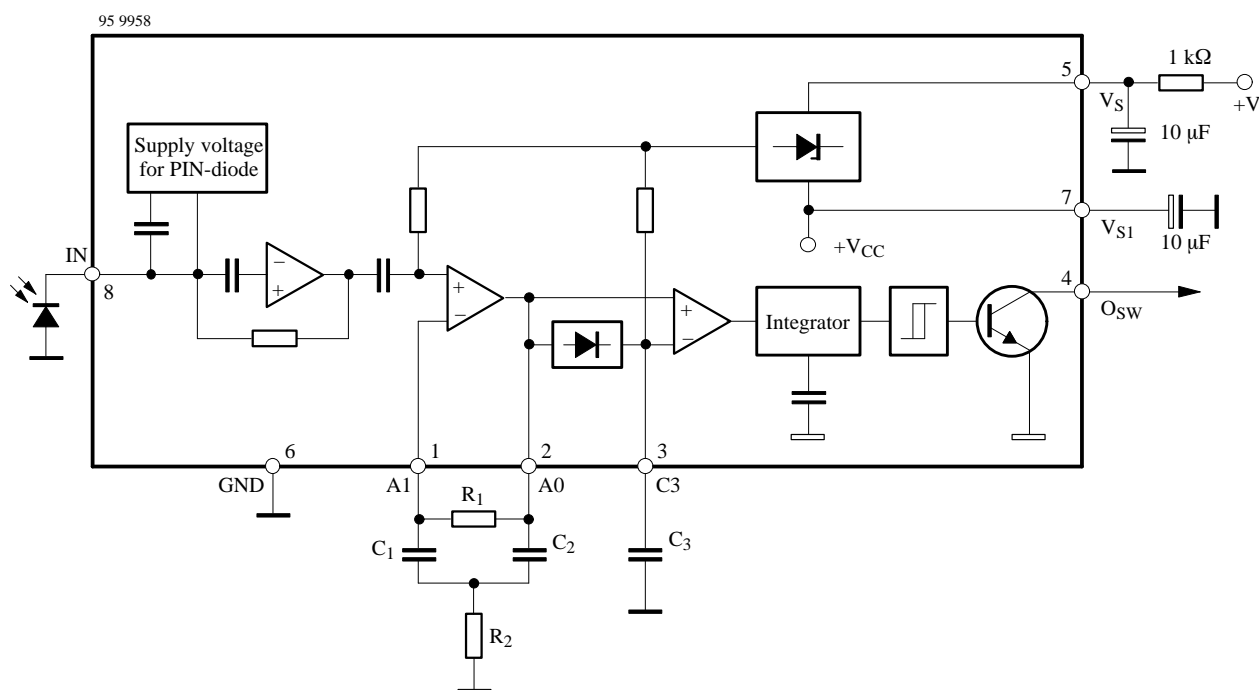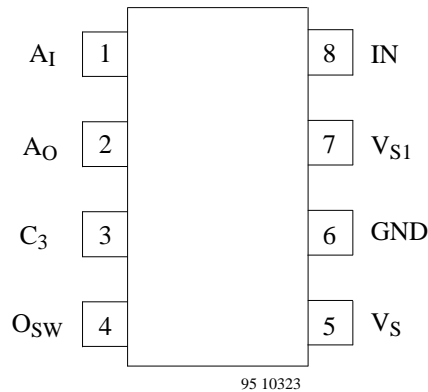
- Wireless data transfer

**Case:** SO8

## Block Diagram



Figure 1.  Block diagram

## Pin Description



95 10323

| Pin | Symbol | Function |
|---|---|---|
| 1 | $A_I$ | Inverting input of band pass amplifier, pin connection for external filter function |
| 2 | $A_O$ | Output of band pass 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 It is an open collector output which switches with time delay and goes LOW (transistor switched ON), when the signal is identified at Pin 2. |
| 5 | $V_S$ | Supply voltage The integrated Z-diode (typical 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 |

Preliminary Information

## 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 | $I_{S1}$ | 140 | | 200 | µA |
| | $V_S = 12$ V, $I_{IN} = 0$,      Pin 5 | $I_S$ | 200 | | 320 | µA |
| Internal stabilisation | $V_S = 12$ 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 | | $f_L$ | | | 15 | kHz |
| | | $f_H$ | 100 | | | kHz |
| Gain | $v_i = 2$ mV$_{rms}$, | | | | | |
| | $f = 40$ kHz | $G_v$ | 47 | 50 | | dB |
| | $f = 100$ kHz | $G_v$ | 46 | 49 | | dB |
| **Detector** | | | | | | |
| Threshold voltage | $t_d \le 200$ µs, $f = 40$ kHz,   Pin 2 | $V_{A0}$ | | 150 | | mV$_{rms}$ |
| Delay time | $f = 40$ kHz, $V_{A0} = 1$ V$_{rms}$ see figure 3 | $t_d$ | 50 | 90 | | µs |
| Storage time | $f = 40$ kHz, $V_{A0} = 1$ V$_{rms}$ see figure 3 | $t_s$ | 100 | | 150 | µs |

## Test Circuit



Figure 2.

95 9960
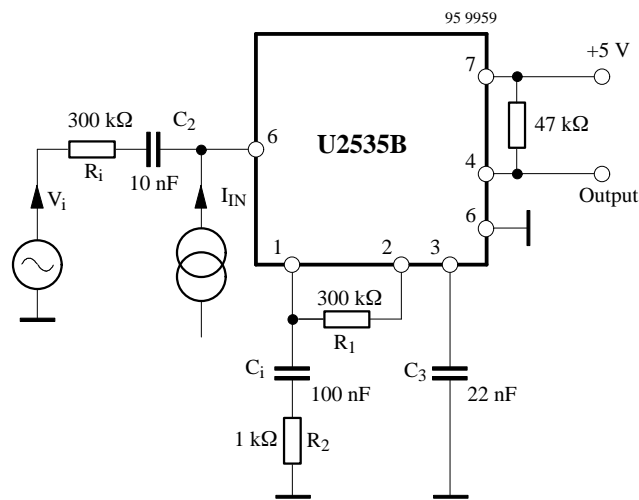
Figure 3.

## Application Circuit



95 9961

Figure 4.

## Preliminary Information
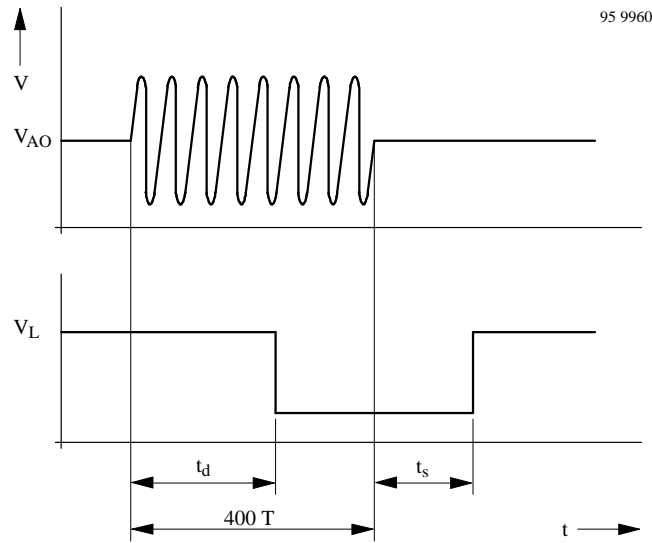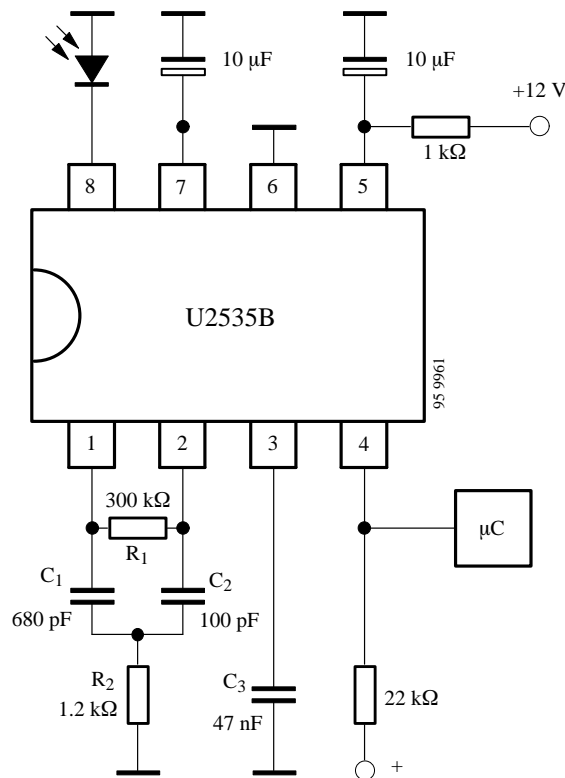
## Band Pass Filter Design

**Center frequency**

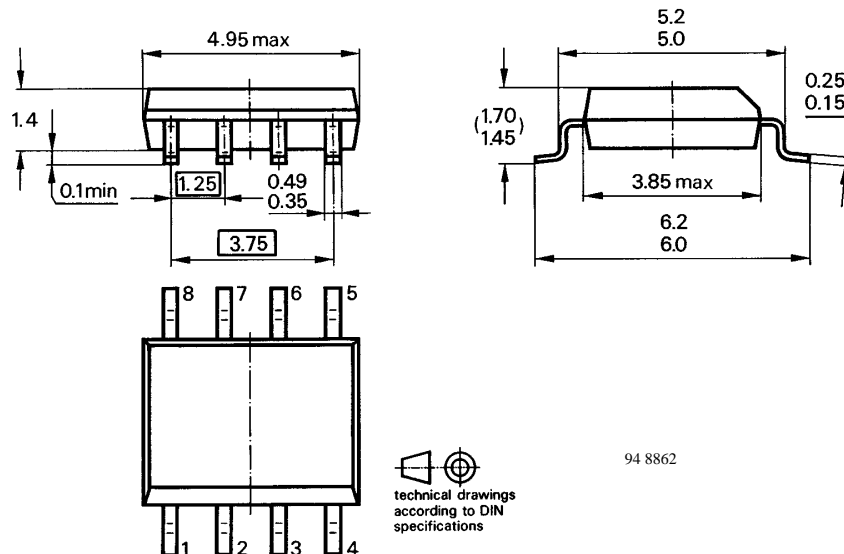$$f_O = \frac{1}{2\pi \sqrt{R_1 \times C_1 \times R_2 \times C_2}}$$

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

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

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

## Dimensions in mm

Package: SO 8



94 8862

technical drawings
according to DIN
specifications

## Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic 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 TELEFUNKEN microelectronic GmbH** semiconductor division 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** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.