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## Features

- Temperature and Voltage Compensated Frequency
- Warning Indication of Lamp Failure by Means of Frequency Doubling only in Direction Mode
- Voltage Dependence of the Car Indicator Lamps also Compensated for Lamp Failure
- Relay Output with High Current-carrying Capacity and Low Saturation Voltage
- Load-dump Protection
- Minimum Lamp Load for Flasher Operation  $\geq 1$  W
- Low Susceptibility to EMI
- Extremely Low Standby Current of 10  $\mu$ A
- Protection According to ISO/TR 7637/1 Level 4 with External Capacitor (C<sub>2</sub>)

## Description

The U6432B is an advanced automotive flasher IC which provides low standby current. Its basic function is equal to Atmel's flasher IC U6043B but low current consumption and frequency doubling disabling make outstanding differences.



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## Low-power Flasher IC with 18-m $\Omega$ Shunt

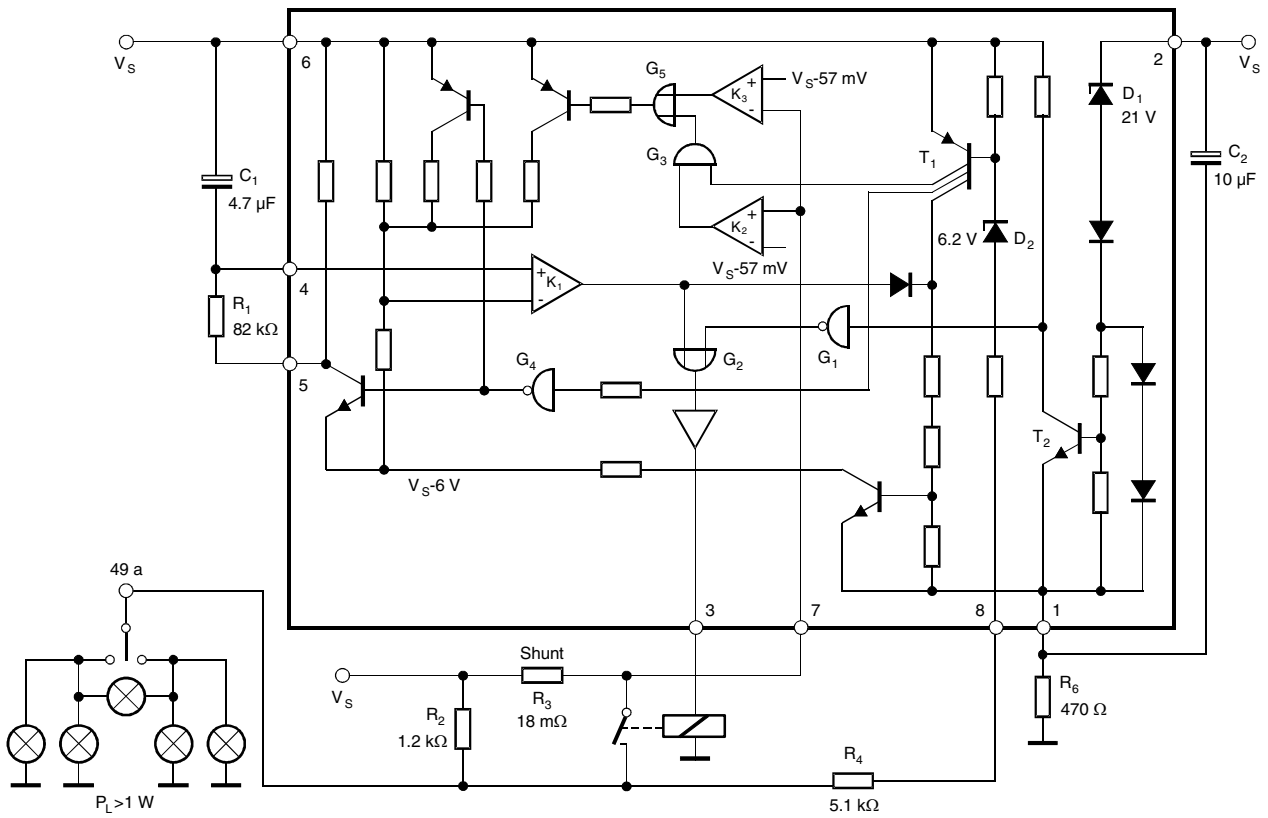
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**U6432B**



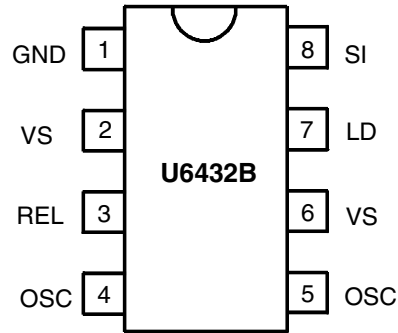
# Block Diagram

Figure 1. Car Flasher Application



## Pin Configuration

Figure 2. Pinning



## Pin Description

| Pin | Symbol | Function               |
|-----|--------|------------------------|
| 1   | GND    | IC ground              |
| 2   | VS     | Supply voltage         |
| 3   | REL    | Relay driver           |
| 4   | OSC    | Oscillator             |
| 5   | OSC    | Oscillator             |
| 6   | VS     | Supply voltage         |
| 7   | LD     | Lamp failure detection |
| 8   | SI     | Start input (49a)      |

## Functional Description

### Pin 1, GND

The U6432B is protected against damage in case of battery reversal via resistor  $R_4$  to ground (-31). An integrated protection circuit together with external resistances  $R_2$  and  $R_4$  limits the current pulses in the IC.

### Pin 2, Supply Voltage, $V_S$ power

The arrangement of the supply connections to Pin 2 (and 6) must be so as to ensure that on the connection printed circuit board (PCB), the resistance of  $V_S$  to Pin 6 is lower than that to Pin 2.

### Pin 3, Relay Control Output (Driver)

The relay control output is a high-side driver with a low saturation voltage. It is capable of driving a typical automotive relay with a minimum coil resistance of 60  $\Omega$ .

### Pin 4 and 5, Oscillator

The flashing frequency,  $f_1$ , is determined by the  $R_1C_1$  components as given by the formula below (see Figure 1):

$$f_1 \approx \frac{1}{R_1 \times C_1 \times 1.5} \text{ Hz}$$

where  $C_1 \leq 47 \mu\text{F}$ ,  $R_1 = 6.8 \text{ k}\Omega$  to 510  $\text{k}\Omega$

In case of a lamp outage (see Pin 7) the oscillator frequency is switched to the lamp outage frequency  $f_2$  with  $f_2 \approx 2.2 \times f_1$ .

Duty cycle in normal flashing mode: 50%

Duty cycle in lamp outage mode: 40% (bright phase)

### Pin 6, Supply Voltage, Sense

For accurate monitoring via the shunt resistor, a minimized layer resistance from point  $V_S$ /shunt to Pin 6 is recommended.

### Pin 7

#### Control Signal Threshold (49 mV Comparator)

The detection point for lamp failure can be calculated from the control signal threshold, typically 49 mV with  $V_S = 12 \text{ V}$ . With a measuring resistance of  $R_3 = 18 \text{ m}\Omega$ , the frequency change-over is reached at a lamp load of 21 W + 11.4 W. The variation of the control signal threshold supply voltage takes into account the PTC characteristic of filament lamps.

#### Control Signal Threshold 2 (15-mV Comparator)

A voltage drop at the shunt resistor  $R_3$  between 49 mV and 15 mV lets the flasher work in frequency doubling mode.

If the voltage drop decreases to a value below  $V_{R3\text{MAX}} = 15 \text{ mV}$ , frequency doubling is disabled.

This can be achieved either with a switch which by-passes the shunt resistor (e.g., a special hazard warning switch) or with a small lamp load.

Flasher operation starts with a lamp load of  $P_L \geq 1 \text{ W}$ .



## Pin 8, Start Input

Start condition for flashing:

- Voltage at Pin 8 (see Figure 1)
- $V_8 \leq V_S - (V_{BE(T1)} + V_{Z(D2)})$

Condition for standby:

The resistor  $R_2$  between  $V_S$  and Pin 8 provides an extremely low standby current ( $I_S \leq 10 \mu A$ ). The leakage current depends on the pull-up resistor  $R_2$  according to the following formula:

$$I_{Leak} \approx (V_{BE(T1)} + V_{Z(D2)})/R_2$$

## Application Hint

In order to achieve a high-level immunity against "electrical interference by conduction and coupling" according to ISO/TR 7637/1 test level 4, an electrolytic capacitor  $C_2 = 10 \mu F$  (25 V) between Pin 1 and 2 – mounted close to the IC – is highly recommended.

## Absolute Maximum Ratings

Reference point Pin 1

| Parameters                   |             | Symbol    | Value       | Unit       |
|------------------------------|-------------|-----------|-------------|------------|
| Supply voltage               | Pin 2 and 6 | $V_S$     | 18          | V          |
| <b>Surge Forward Current</b> |             |           |             |            |
| $t_p = 0.1 \text{ ms}$       | Pin 2 and 6 | $I_{FSM}$ | 1.5         | A          |
| $t_p = 300 \text{ ms}$       | Pin 2 and 6 | $I_{FSM}$ | 1.0         | A          |
| $t_p = 300 \text{ ms}$       | Pin 8       | $I_{FSM}$ | 30          | mA         |
| Output current               | Pin 3       | $I_O$     | 0.3         | A          |
| <b>Power Dissipation</b>     |             |           |             |            |
| $T_{amb} = 95^\circ C$       | DIP 8       | $P_{tot}$ | 420         | mW         |
|                              | SO8         | $P_{tot}$ | 340         | mW         |
| $T_{amb} = 60^\circ C$       | DIP 8       | $P_{tot}$ | 690         | mW         |
|                              | SO8         | $P_{tot}$ | 560         | mW         |
| Junction temperature         |             | $T_J$     | 150         | $^\circ C$ |
| Ambient temperature range    |             | $T_{amb}$ | -40 to +105 | $^\circ C$ |
| Storage temperature range    |             | $T_{stg}$ | -55 to +150 | $^\circ C$ |

## Electrical Characteristics

$T_{amb} = 25^{\circ}\text{C}$ ; typical values under normal operation in application circuit Figure 1,  $V_S = 12\text{ V}$  (Pins 2 and 6); reference point ground (-31), unless otherwise specified.

| Parameters                       | Test Conditions  | Symbol       | Min.              | Typ.           | Max.             | Unit          |
|----------------------------------|--|--------------|-------------------|----------------|------------------|---------------|
| Supply voltage range             | Pin 2 and 6  | $V_S$        | 9                 |                | 16.5             | V             |
| Supply current, dark phase       | Pins 2 and 6   | $I_S$        |                   | 4.5            | 8                | mA            |
| Supply current, stand-by         | Pins 2 and 6   | $I_S$        |                   |                | 10               | mA            |
| Supply current, bright phase     | Pins 2 and 6   | $I_S$        |                   | 7.0            | 11               | mA            |
| Relay output, saturation voltage | $I_O = 150\text{ mA}$<br>$V_S = 9\text{ V}$ , Pin 3  | $V_O$        |                   |                | 1.0              | V             |
| Relay output reverse current     | Pin 3  | $I_O$        |                   |                | 0.1              | mA            |
| Relay coil resistance            |  | $R_L$        | 60                |                |                  | $\Omega$      |
| Start delay                      | First bright phase   | $t_{on}$     |                   |                | 10               | ms            |
| Frequency determining resistor   |  | $R_1$        | 6.8               |                | 510              | k $\Omega$    |
| Frequency determining capacitor  |  | $C_1$        |                   |                | 47               | $\mu\text{F}$ |
| Frequency tolerance              | Normal flashing, basic frequency $f_1$ not including the tolerances of the external components $R_1$ and $C_1$ | $\Delta f_1$ | -5                |                | +5               | %             |
| Bright period                    | Basic frequency $f_1$<br>$V_S = 9\text{ to }15\text{ V}$   | $\Delta f_1$ | 47                |                | 53               | %             |
| Bright period                    | Control frequency $f_2$<br>$V_S = 9\text{ to }15\text{ V}$   | $\Delta f_2$ | 37                |                | 45               | %             |
| Frequency increase               | Lamp failure, $V_S = 9\text{ to }15\text{ V}$  | $f_2$        | $2.15 \times f_1$ |                | $2.3 \times f_1$ | Hz            |
| Control signal threshold 1       | $V_S = 15\text{ V}$<br>$V_S = 9\text{ V}$<br>$V_S = 12\text{ V}$ , Pin 7                                       | $V_{R3}$     | 50<br>43<br>47    | 53<br>45<br>49 | 57<br>47<br>51   | mV            |
| Control signal threshold 2       |  | $V_{R3}$     |                   |                | 15               | mV            |
| Lamp load                        |  | $P_L$        | 1                 |                |                  | W             |

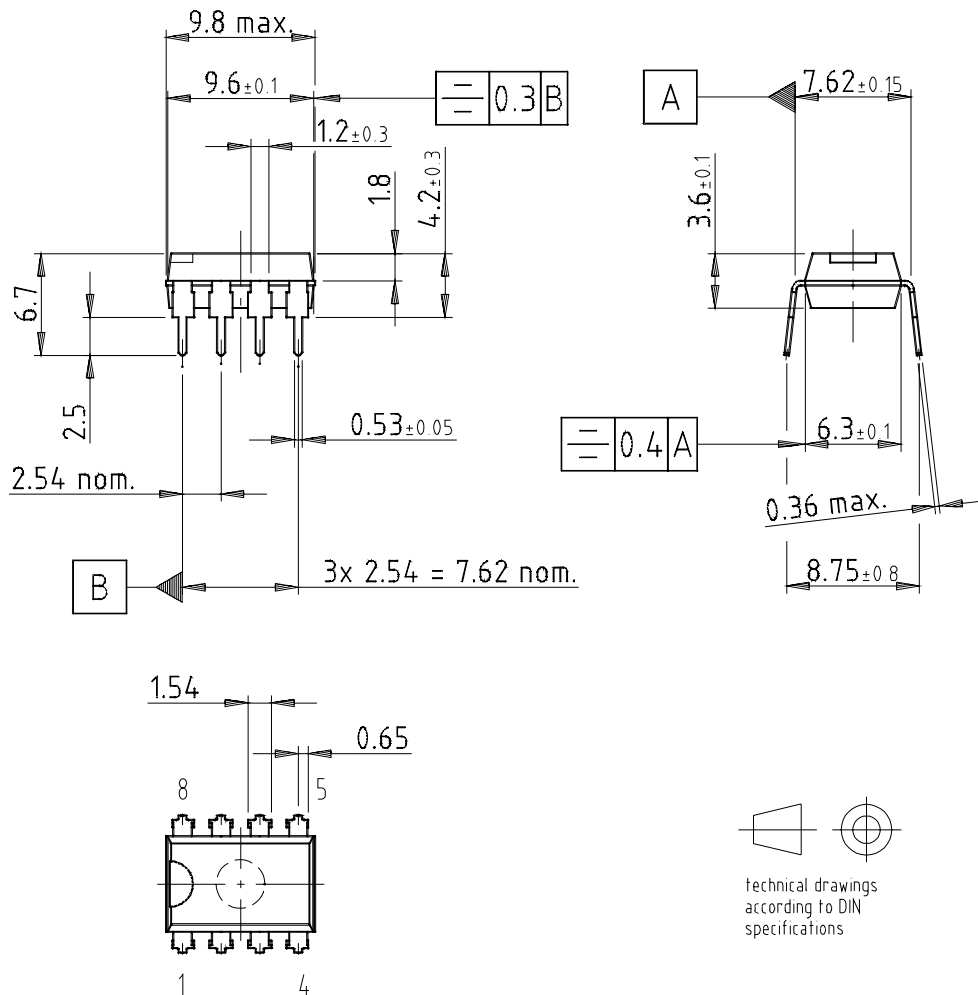
### Ordering Information

| Extended Type Number | Package | Remarks |
|----------------------|---------|---------|
| U6432B               | DIP8    | -       |
| U6432B-FP            | SO8     | -       |

### Package Information

#### DIP8

Package: DIP 8  
Dimensions in mm

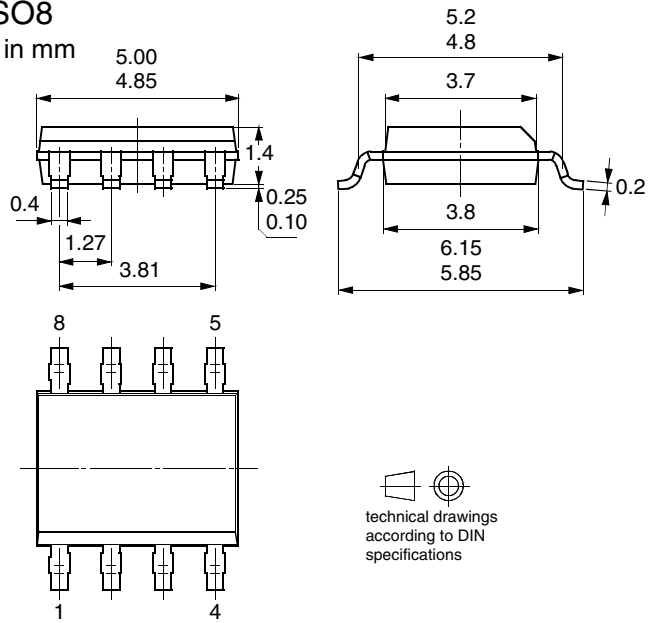


Drawing-No: 6.543-5040.01-4  
Issue: 1, 16.01.02



S08

Package S08  
Dimensions in mm





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