Flasher, 18-mΩ Shunt, Frequency Doubling Disabling

Description

The design of the U6433B is similar to that of U6043B, both devices have the same excellent EMC (Electro Magnetic Capability) and protection features. The U6433B includes an additional 8-mV comparator and a logical connection with the frequency doubling stage. This combination can be used for a hazard switch which bypasses the external shunt resistor to disable the frequency doubling. This feature is especially important with respect to the US automotive industry. During direction mode the U6433B works like other flashers, i.e., frequency doubling in the case of lamp outage.

Features

- Temperature and voltage compensated frequency
- Warning indication of lamp failure by means of frequency doubling can be disabled
- Voltage dependence of the car indicator lamps compensated for lamp failure
- Relay output with high current carrying capacity and low saturation voltage
- Minimum lamp load for flasher operation ≧ 1 W
- Load-dump protection
- Very low susceptibility to EMI
- Protection according to ISO/TR 7637/1 level 4

Block Diagram

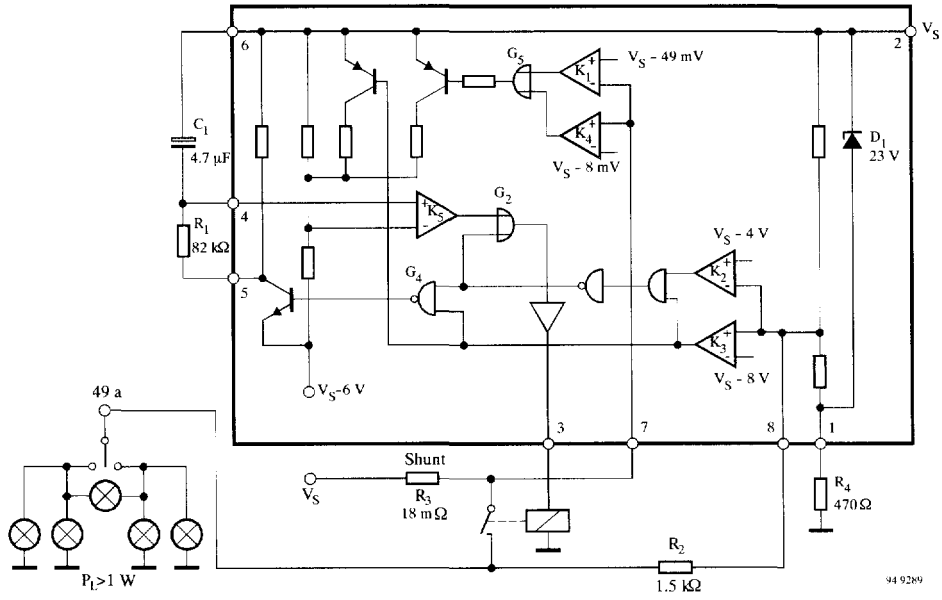

Figure 1. Application circuit as a car flasher

Ordering Information

Extended Type Number	Package	Remarks
U6433B-FP	SO8	

Pin Description

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

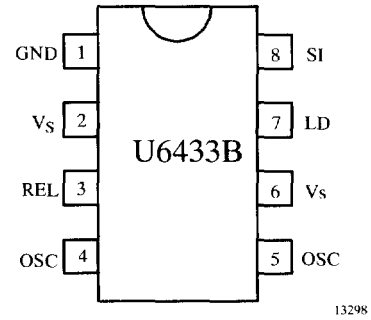

Figure 2. Pinning

Functional Description

Pin 1, GND
The integrated circuit is protected against damage via resistor R_4 to ground (-31) in the case of battery reversal. 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 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 and capable to drive a typical automotive relay with a minimum coil resistance of 60 Ω.

Pin 4 and 5 Oscillator
Flashing frequency, f_l, is determined by the R_1C_1 components as follows (see figure 1):

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

where $C_1 \leq 47\ \mu F$
$R_1 = 6.8\ k\Omega$ to $510\ k\Omega$

In the case of a lamp outage (see Pin 7) the oscillator frequency is switched to the lamp outage frequency f_2 with $f_2 \approx 2.2\ f_l$.
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, Lamp outage detection
Control Signal Threshold 1 (49-mV Comparator K1)

The detection point for lamp failure can be calculated from the control signal threshold, typically 49 mV with V_S = 12 V. With a measuring resistance of R_3 = 18 mΩ, 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 (8-mV Comparator K4)

A voltage drop at R_3 between 49 mV and 8 mV shunt resistor lets the flasher work in frequency doubling mode.

If the voltage drop decreases to a value below V_{R3MAX} = 8 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.

The arrangement of the supply connections to Pins 2 and 6 must ensure that, on the connection, PCB, the layer resistance from V_S to Pin 6 is lower than the one to Pin 2.

Flasher operation starts with a lamp load of $P_L \geqq 1$ W.

Pin 8, Start input
Start condition for flashing: the voltage at Pin 8 has to be below K3 threshold (flasher switch closed).
Humidity and dirt may decrease the resistance between 49 a and GND. If this leakage resistance is > 5 kΩ the IC is still kept in its off-condition. In this case the voltage at Pin 8 is between the thresholds of comparators K2 and K3.
During the bright phase the voltage at Pin 8 is above the K2 threshold, during the dark phase it is below the K3 threshold.
For proper start conditions a minimum lamp wattage of 1 W is required.

Absolute Maximum Ratings

Reference point Pin 1

Parameters			Symbol	Value	Unit
Supply voltage		Pins 2 and 6	V_S	18	V
Surge forward current	t_p = 0.1 ms	Pins 2 and 6	I_{FSM}	1.5	A
	t_p = 300 ms	Pins 2 and 6		1.0	A
	t_p = 300 ms	Pin 8		30.0	mA
Output current		Pin 3	I_O	0.3	A
Power dissipation	T_{amb} = 95°C	SO 8	P_{tot}	340	mW
	T_{amb} = 60°C	SO 8		560	mW
Junction temperature			T_j	150	°C
Ambient temperature range			T_{amb}	-40 to +105	°C
Storage temperature range			T_{stg}	-55 to +150	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	SO8	R_{thJA}	160	K/W

Electrical Characteristics

Typical values under normal operation of the application circuit shown in figure 1, V_S = 12 V (Pins 2 and 6). T_{amb} = 25°C, reference point ground (-31), unless otherwise specified.

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pins 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, bright phase	Pins 2 and 6	I_S		7.0	11	mA
Relay output, saturation voltage	I_O = 150 mA, V_S = 9 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			Ω
Start delay	First bright phase	t_{on}			10	ms
Frequency determining resistor		R_1	6.8		510	kΩ
Frequency determining capacitor		C_1			47	µF
Frequency tolerance	Normal flashing, basic frequency f_1 not including the tolerances of the external components R_1 and C_1	Δf_1	-5		+5	%

Electrical Characteristics (continued)

Typical values under normal operation of the application circuit shown in figure 1, V_S = 12 V (Pins 2 and 6). T_{amb} = 25°C, reference point ground (-31), unless otherwise specified.

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Bright period	Basic frequency f_1, V_S = 9 - 15 V	Δf_1	47		53	%
Bright period	Control frequency f_2, V_S = 9 - 15 V	Δf_2	37		45	%
Frequency increase	Lamp failure, V_S = 9 - 15 V	f_2	$2.15 \times f_1$		$2.3 \times f_1$	Hz
Control signal threshold 1	V_S = 15 V Pin 7	V_{R3}	50	53	57	mV
	V_S = 9 V		43	45	47	
	V_S = 12 V		47	49	51	
Control signal threshold 2		V_{R3}	2		10	mV
Leakage resistance	49a to GND	R_p			5	kΩ
Lamp load		P_L	1			W

Package Information

Package SO8

Dimensions in mm