Flasher, 30-mΩ Shunt, Pilot Lamp to GND or V_{Batt}

Description

The integrated circuit U2043B is used in relay controlled automotive flashers where a high EMC level is required. A lamp outage is indicated by frequency doubling during hazard mode as well as direction mode. Pilot lamp can be connected either to V_{Batt} or GND.

Features

- Temperature and voltage compensated frequency
- Warning indication of lamp failure by means of frequency doubling
- Minimum lamp load for flasher operation ≥ 10 W
- Relay output with high current carrying capacity and low saturation voltage
- Low susceptibility to EMI

Ordering Information

Extended Type Number	Package	Remarks
U2043B	DIP8	
U2043B–FP	SO8	

Block Diagram

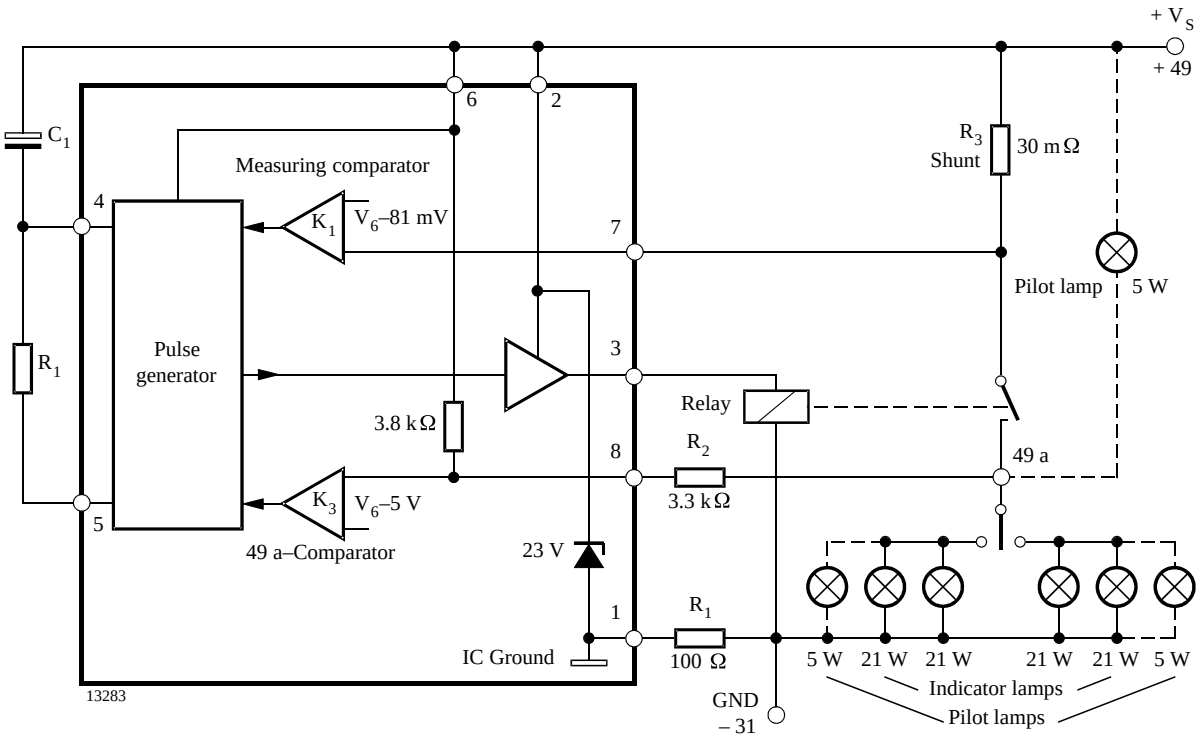


Figure 1.

Pin Description

Pin	Symbol	Function
1	GND	IC ground
2	V_S	Supply voltage V_S
3	REL	Relay driver
4	OSC	C_1 oscillator
5	OSC	R_1 oscillator
6	V_S	Supply voltage V_S
7	LD	Lamp failure detection
8	SI	Start input (49a)

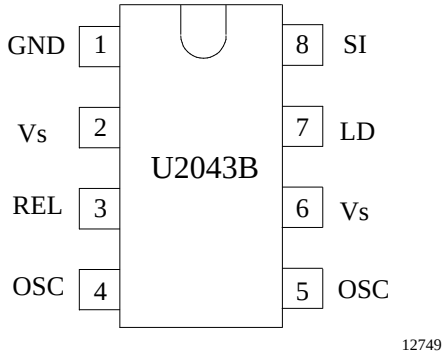


Figure 2. Pinning

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 such as 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_1, is determined by the R_1C_1 components as follows (see figure 1):

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

where $C_1 \leq 47$ µF
$R_1 = 6.8$ kΩ to 510 kΩ

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

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, Lamp outage detection
The lamp current is monitored via an external shunt resistor R_3 and an internal comparator K1 with its reference voltage of typ. 81 mV (V_S = 12 V). The outage of one lamp out of two lamps is detected according to the following calculation:
Nominal current of 1 lamp: 21 W / (V_S = 12 V):
I_{lamp} = 1.75 A
Nominal current of 2 lamps: 2 x 21 W / (V_S = 12 V):
I_{lamp} = 3.5 A.
The detection threshold is recommended to be set in the middle of the current range: $I_{outage} \approx 2.7$ A
Thus the shunt resistor is calculated as:
$R_3 = V_T$ (K1) / I_{outage}
R_3 = 81 mV/2.7 A = 30 mΩ.
Comparator K1's reference voltage is matched to the characteristics of filament lamps (see "control signal threshold" in the data part).
The combination of shunt resistor and resistance of wire harness prevents Pin 7 from a too high voltage in the case of shortet lamps.

Pin 8, Start input
Start condition for flashing: the voltage at Pin 8 has to be below less than V_S – 5 V (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 greater than V_S – 5 V.
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 10 W is required.

Absolute Maximum Ratings

Reference point Pin 1

Parameters		Symbol	Value	Unit
Supply voltage	Pins 2, 6	V_S	16.5	V
Surge forward current				
t_p = 0.1 ms	Pins 2, 6	I_{FSM}	1.5	A
t_p = 2 ms	Pins 2, 6	I_{FSM}	1.0	A
t_p = 2 ms	Pin 8	I_{FSM}	50	mA
Output current	Pin 3	I_O	0.3	A
Power dissipation				
T_{amb} = 95°C	DIP8	P_{tot}	420	mW
	SO8	P_{tot}	340	mW
T_{amb} = 60°C	DIP8	P_{tot}	690	mW
	SO8	P_{tot}	560	mW
Junction temperature		T_j	150	°C
Ambient temperature range		T_{amb}	–40 to +95	°C
Storage temperature range		T_{stg}	–55 to +150	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	DIP8	R_{thJA}	110	K/W
	SO8	R_{thJA}	160	K/W

Electrical Characteristics

Typical values under normal operation in application circuit figure 1, V_S (+49, Pins 2 and 6) = 12 V.
Reference point ground (–31), T_{amb} = 25°C, unless otherwise specified

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pins 2, 6	V_S(+49)		9 to 15		V
Supply current	Dark phase or stand-by Pins 2, 6	I_S		4.5	8	mA
Supply current	Bright phase Pins 2, 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

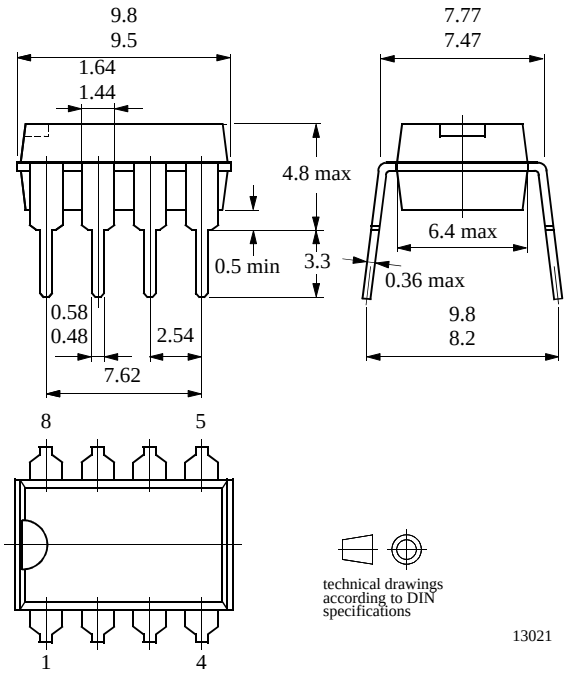
Electrical Characteristics (continued)

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Frequency tolerance	Normal flashing, basisc frequency f_1 not including the tolerance of the external components R_1 and C_1	Δf_1	–5		+5	%
Bright period	Basic frequency f_1	Δf_1	47		53	%
Bright period	Control frequency f_2	Δf_2	37		45	%
Frequency increase	Lamp outage	f_2	$2.15 \times f_1$		$2.3 \times f_1$	Hz
Control signal threshold	V_S = 15 V Pin 7 V_S = 9 V V_S = 12 V	V_{R3} V_{R3} V_{R3}	85 66 76	91 71 81	97 76 87	mV mV mV
Leakage resistance	49a to GND	R_p		2	5	kΩ
Lamp load		P_L	10			W

Package Information

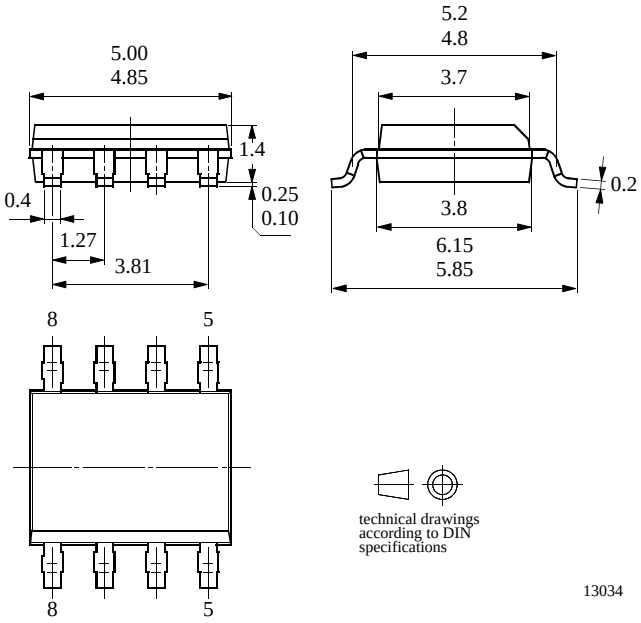
Package DIP8

Dimensions in mm



Package SO8

Dimensions in mm



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.

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