TEMIC
Semiconductors

Warning or Car-Direction Indicator

Technology: Bipolar

Features

- Can be protected against damage or interference with a minimum of external circuitry

- Temperature- and voltage-compensated frequency

- Warning indication of lamp failure by means of frequency doubling

- Voltage dependence of the car indicator lamps also compensated for lamp failure

- Relay output with high-current carrying capacity and low saturation voltage

Figure 1. Application circuit as a car flasher
(Resistor R_1, R_2 and R_t: 1/4 Watt)
R_1 for protection against continuous reversed polarity: 2 Watt)

Order Information

Extended Type Number	Package	Remarks
U243B	8 pin dual-inline plastic	
U243B-FP	8 pin SO plastic	

Preliminary Information

Circuit Description

The application circuit shows the operation of the U243B as a car-direction indicator signal generator. The flashing frequency is determined by the components R_t and C_t, and the frequency can be calculated from

$$f_1 \approx \frac{1}{R_t \times C_t \times 1.5} \quad (Hz)$$

where f_1 is the frequency in normal flashing operation (basic frequency). The control frequency f_2 is typically 2.2 times the value of f_1 and is the frequency in the case of lamp failure. The bright periods for f_1 and f_2 are internally set in the IC and are 50% for f_1 and 40% for f_2.

The resistors R_1 and R_2 are needed to protect the circuit against possible damage. An integrated Z-diode in addition to these external resistors limits the impulse current in the integrated circuit to ≤ 1.5 A. Connecting the circuit with the wrong polarity leads to current limitation by R_1, R_2 and the resistance of the coil of the relay. A current of about 150 mA would then flow over R_1, so that for unlimited protection against continuous reversal of the polarity of the supply, a 2-W resistor would be necessary. A short circuit between the indicator lamp (49a) and ground (31) can give rise to a voltage drop of about 4 V across the measuring resistance, R_3. The circuit is not damaged by such a short circuit.

The use of this application circuit ensures damage and interference protection accordance to VDE 0839. The recognition point for lamp failure can be calculated from the control signal threshold, typically 81 mV with $V_S = 12$ V.

With 81 mV and a measuring resistance of $R_3 = 30$ mΩ, it corresponds to a lamp current of 2.7 A, i.e., the frequency change-over with a lamp load of 21 W + 11.4 W. The variation of the control-signal threshold with the supply voltage takes into account the PTC characteristic of the filament lamps. A resistance $R_p \geq 5$ kΩ between the lamp indicator (49a) and ground (31) ensures that in case the direction indicator switch is open, the flashing generator is in stand-by mode.

With a control lamp of max. 4 W between 49 and 49a the IC still starts with the bright phase.

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

Defined operation is ensured with a lamp load of $P_L \approx 10$ W or more. Defined operation with lamp loads ≥ 2 W require an additional external resistance as described in "Applications". With considerably reduced external circuitry, the integrated circuit U243B can be used as an instable multivibrator in the frequency range f = 0.05 to 10 Hz.

Absolute Maximum Ratings

Reference point Pin 1

Parameters		Symbol	Value	Unit
Supply voltage	Pins 2 and 6	V_S	16.5	V
Surge forward current				
$t_p = 0.1$ ms	Pins 2 and 6	I_{FSM}	1.5	A
$t_p = 2$ ms	Pins 2 and 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 +125	°C

Preliminary Information

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 / Pin	Symbol	Min	Typ	Max	Unit
Supply voltage range	Pins 2 and 6	V_S (+49)		9 ... 15		V
Supply current, dark phase or stand-by	Pins 2 and 6	I_S		4.5	8	mA
Supply current, bright phase	Pins 2 and 6	I_S		7.0	11	mA
Z–diode limitation						
$I_{S2, 6}$ = 70 mA	Pins 2 and 6	V_S		23		V
Relay output, saturation voltage						
I_0 = 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_t	6.8		510	kΩ
Frequency-determining capacitor		C_t			47	μF
Frequency tolerance (normal flashing, basic frequency f_1 not including the tolerance of the external components R_1 and C_t)		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 failure)		f_2	2.15 f_1		2.3f_1	
Control-signal threshold						
V_S = 15 V	Pin 7	V_{R3}	85	91	97	mV
V_S = 9 V	Pin 7	V_{R3}	66	71	76	mV
V_S = 12 V	Pin 7	V_{R3}	76	81	87	mV
Transfer resistance						
49a to common for stand-by		R_P		2	5	kΩ
Lamp load		P_L	10			W

Applications

- Flashing generator, operation with smaller loads (≥ 2 W)

By adding a resistor to the application circuit (figure 1), defined operation with lamp loads ≥ 2 W is possible. The voltage drop across the resistor R_4 is generated by the current flowing over the relay and should be about 15 mV. With a relay current of 150 mA (relay resistance 73 Q), this requires a resistance of R_4 = 100 mΩ. The change of

the operating point by 15 mV results in a corresponding change of the control signal threshold by 15 mV. For a lamp current of 2.7 A, a measuring resistance of

$$R_3 = \frac{81 \text{ mV} - 15 \text{ mV}}{2.7 \text{ A}} = 25 \text{ mΩ} \qquad \text{results.}$$

Preliminary Information

- Istable multivibrator

The figure shows the minimum of circuitry necessary for the operation as an instable multivibrator. The circuit is suitable for frequencies between 0.05 Hz and approximately 10 kHz. The frequency can be calculated by using the relationship for f_1 given in circuit description. A starting resistor of 3.8 kΩ is integrated into the circuit between pins 8 and 6. This means that, for a load on pin 3 of, for example, 500 Ω (open circuits) and zero current, a voltage of about 1.4 V remains on the load (for 70 $\Omega\Omega$the corresponding voltage is about 220 mV). A load of $R_L \leq$ 3.3 kΩ on pin 3 ensures correct operation of the instable multivibrator. The relationship between the on- and off-periods can be changed in this circuit by inserting a resistor-diode combination parallel to R_1 (see dashed lines in the figure), e.g., to reduce the "bright"-time.
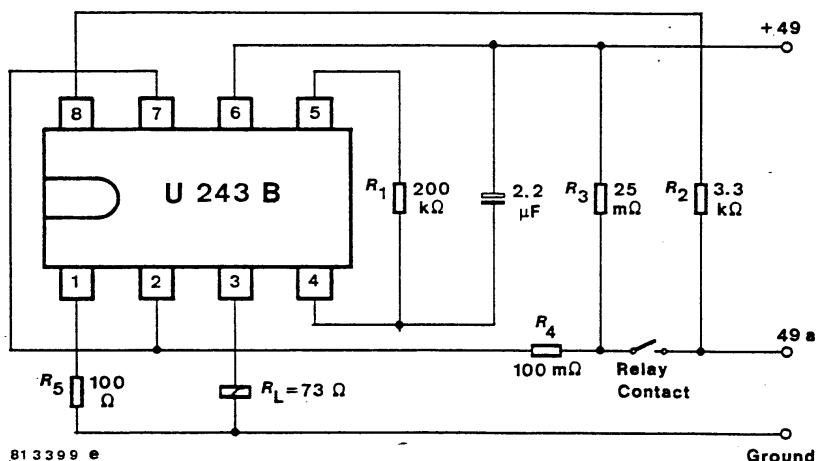
Figure 2. Flashing generator with small loads
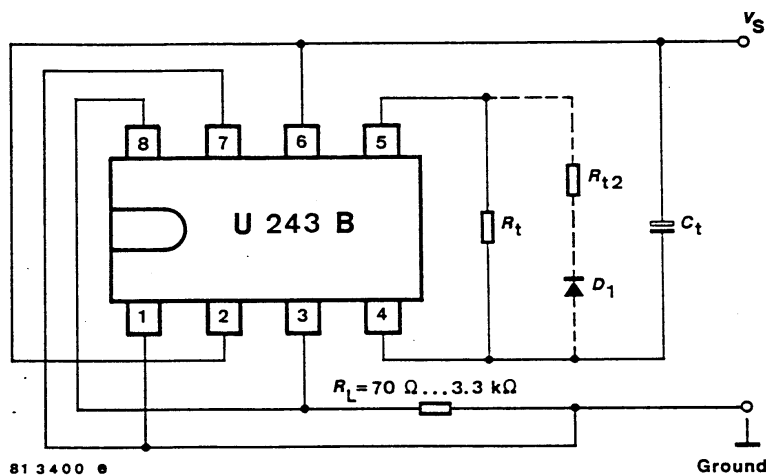
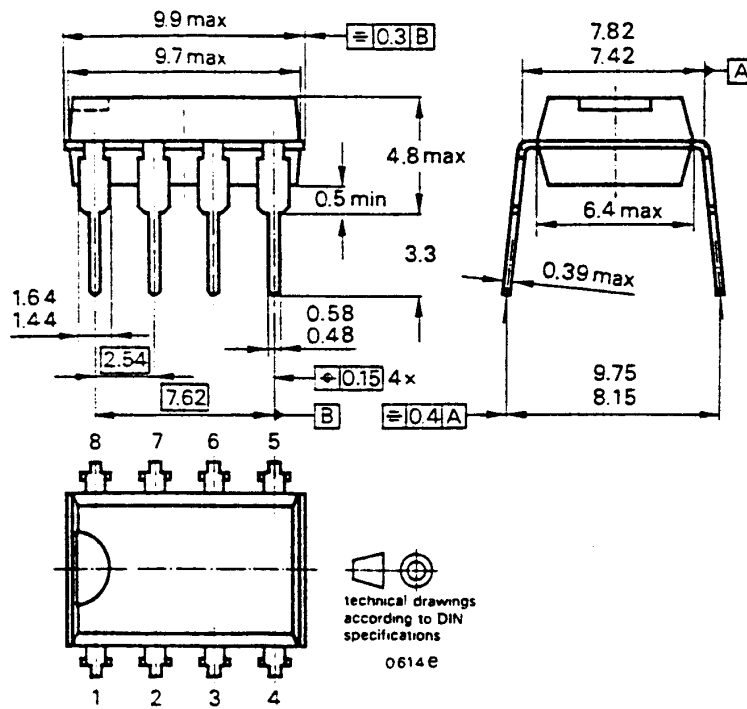Figure 3. Instable multivibrator for general-purpose applications

Pin Description

Pin	Function		Pin	Function
1	IC ground		5	R_t oscillator
2	Supply voltage V_S		6	Supply voltage V_S
3	Relay driver		7	Lamp-failure detection
4	C_t oscillator		8	Start input (49a)

Preliminary Information

Dimensions in mm

Package: DIP8

Package: SO8 (SOT96A)

Preliminary Information
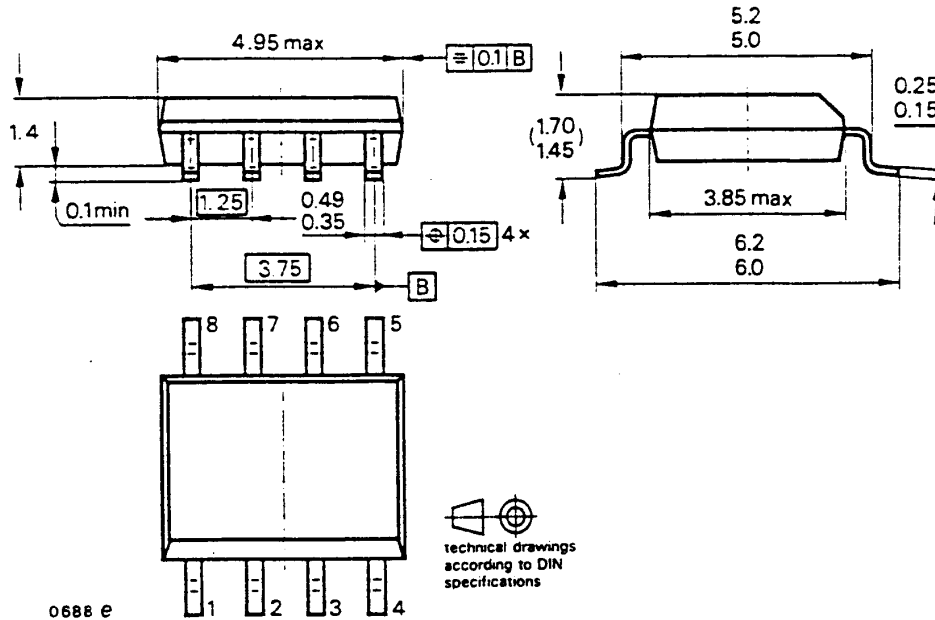
Ozone Depleting Substances Policy Statement

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.