Features

- **Temperature and Voltage Compensated Frequency**
- **Warning Indication of Lamp Failure by Means of Frequency Doubling**
- **Minimum Lamp Load for Flasher Operation ≥ 10W**
- **Relay Output with High Current Carrying Capacity and Low Saturation Voltage**
- **Low Susceptibility to EMI**

Pb Lead Free

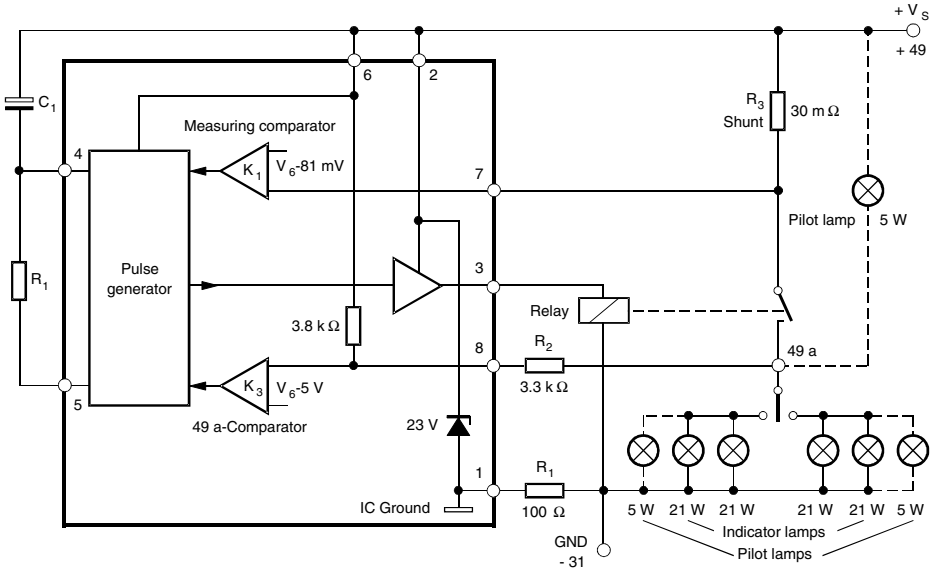
Flasher, 30 mΩ Shunt, Pilot Lamp to GND or V_{Batt}

U2043B

1. 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. The pilot lamp can be connected either to V_{Batt} or GND.

Figure 1-1. Block Diagram



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2. Pin Configuration

Figure 2-1. Pinning DIP8/SO8

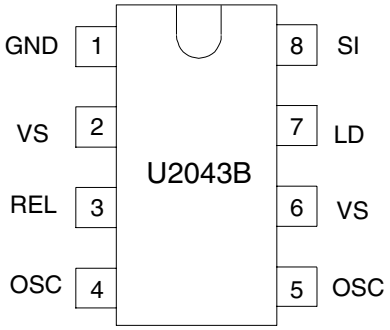


Table 2-1. Pin Description

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

3. Functional Description

3.1 GND (Pin 1)

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.

3.2 Supply Voltage, V_S Power (Pin 2)

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.

3.3 Relay Control Output (Driver, Pin 3)

The relay control output is a high-side driver with a low saturation voltage and capable of driving a typical automotive relay with a minimum coil resistance of 60Ω

3.4 Oscillator (Pin 4 and 5)

Flashing frequency, f_1, is determined by the R_1C_1 components as follows (see Figure 1-1 on page 1):

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

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 $f_2 \approx 2.2 \times f_1$.

Duty cycle in normal flashing mode:	50%
Duty cycle in lamp outage mode:	40% (bright phase)

3.5 Supply Voltage, Sense (Pin 6)

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

3.6 Lamp Outage Detection (Pin 7)

The lamp current is monitored via an external shunt resistor R_3 and an internal comparator K1 with its reference voltage of typically 81 mV (V_S = 12V). The outage of one lamp out of two lamps is detected according to the following calculation:

Nominal current of 1 lamp: 21W/(VS = 12V): I_{lamp} = 1.75A

Nominal current of 2 lamps: $2 \times$ 21W/(V_S = 12V): I_{lamp} = 3.5A

We recommend setting the detection threshold in the middle of the current range:
$I_{outage} \approx$ 2.7A

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 section "Control Signal Threshold").

The combination of the shunt resistor and the resistance of the wire harness prevents pin 7 from a too high voltage in the case of shorted lamps.

3.7 Start Input (Pin 8)

Start condition for flashing:
The voltage at pin 8 has to be less than V_S – 5V (flasher switch closed).

Humidity and dirt may decrease the resistance between 49a 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 – 5V.

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 10W is required.

4. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Reference point: pin 1

Parameters	Symbol	Value	Unit
Supply voltage, pins 2 and pin 6	V_S	16.5	V
Surge forward current t_p = 0.1 ms t_p = 2 ms t_p = 2 ms	 I_{FSM} I_{FSM} I_{FSM}	 1.5 1.0 50	 A A mA
Output current, pin 3	I_O	0.3	A
Power Dissipation			
T_{amb} = 95°C, DIP8 SO8	P_{tot} P_{tot}	420 340	mW mW
T_{amb} = 60°C, DIP8 SO8	P_{tot} P_{tot}	690 560	mW 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

5. Thermal Resistance

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

6. Electrical Characteristics

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

Parameters	Test Conditions	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 = 9V (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 tolerance of the external components R_1 and C_1	Δf_1	–5		+5	%
Bright period	Basic frequency f_1	Δf_1	47		53	%
	Control frequency f_2	Δf_2	37		45	%
Frequency increase	Lamp outage	f_2	2.15 × f_1		2.3 × f_1	Hz
Control signal threshold	V_S = 15V (pin 7) V_S = 9V V_S = 12V	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

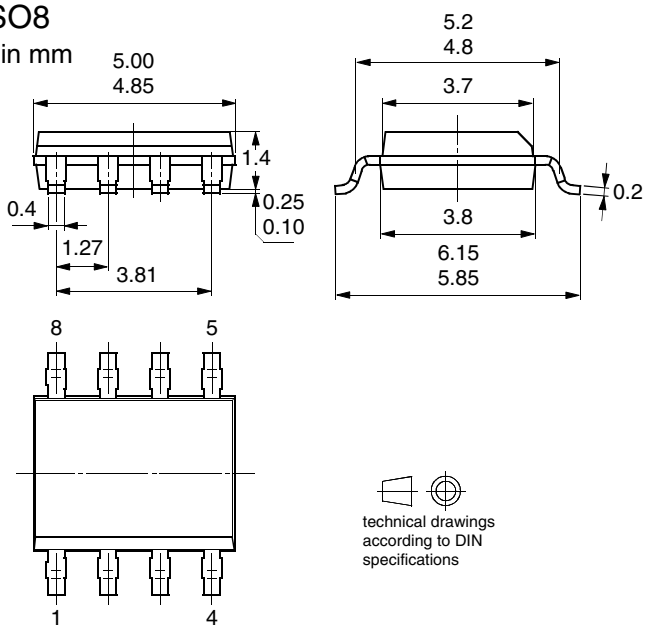
7. Ordering Information

Extended Type Number	Package	Remarks
U2043B-MY	DIP8	Tubed, Pb-free
U2043B-MFPY	SO8	Tubed, Pb-free
U2043B-MFPG3Y	SO8	Taped and reeled, Pb-free

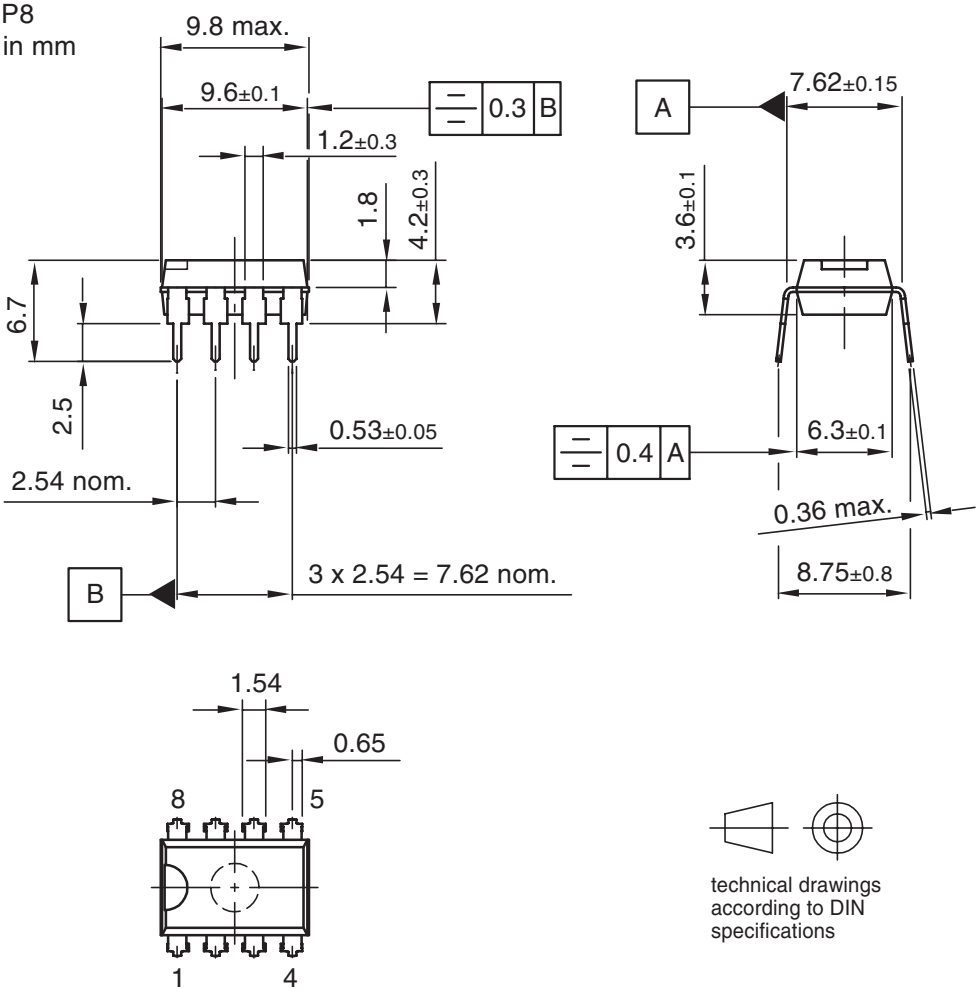
8. Package Information

Package SO8

Dimensions in mm



Package: DIP8
Dimensions in mm



Drawing-No.: 6.543-5040.01-4

Issue: 1; 16.01.02

9. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

Revision No.	History
4720B-AUTO-09/05	• Put datasheet in a new template • Pb-free logo on page 1 added • New heading rows in Table “Absolute Maximum Rating” on page 5 added • Ordering Information on page 7 changed

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