Features

- **Temperature and Supply Voltage Compensated Flashing Frequency**
- **Frequency Doubling Indicates Lamp Outage**
- **Relay Driver Output with High Current Carrying Capacity and Low Saturation Voltage**
- **Minimum Lamp Load for Flasher Operation: ≥ 1 W**
- **Very Low Susceptibility to EMI**
- **Protection According to ISO/TR 7637/1 Level 4**

Flasher IC with 18-mΩ Shunt

U6043B

1. Description

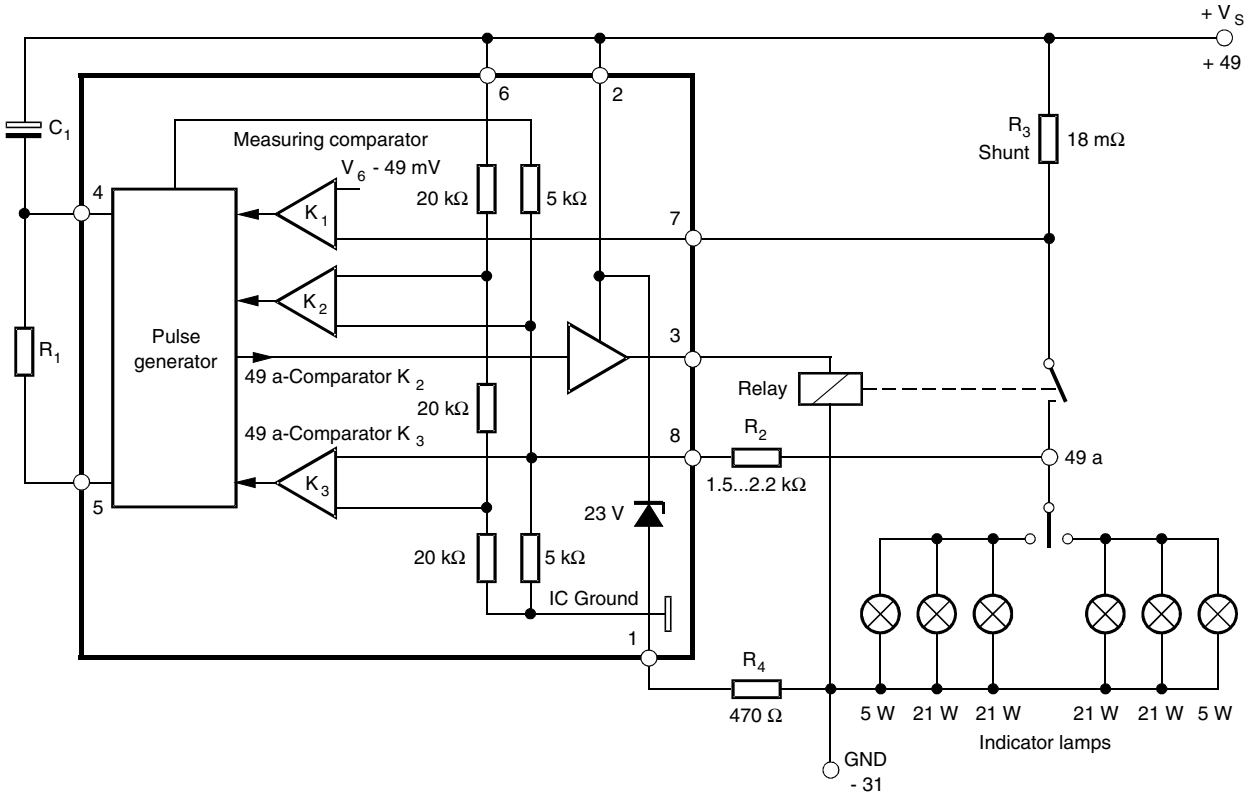
The bipolar integrated circuit U6043B is used in relay-controlled automotive flashers where a high level EMC is required.

Lamp outage is indicated by frequency doubling during hazard warning as well as direction mode.

4726C–AUTO–02/10

2. Block Diagram

Figure 2-1. Car Flasher Application Circuit



3. Pin Configuration

Figure 3-1. Pinning

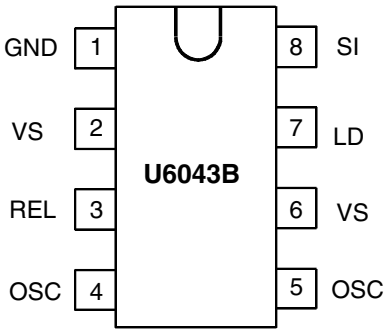


Table 3-1. Pin Description

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, Sense
7	LD	Lamp outage detection
8	SI	Start input (49a)

4. Functional Description

4.1 Pin 1, GND

The U6043B 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.

4.2 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.

4.3 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 Ω.

4.4 Pin 4 and 5, Oscillator

The flashing frequency, f_1, is determined by the R_1C_1 components as given by the following formula below (see Figure 2-1):

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

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

In 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)

4.5 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.

4.6 Pin 7, Lamp Outage Detection

The lamp current is monitored via an external shunt resistor R_{sh} and an internal comparator K1 with its reference voltage of typically 49 mV (V_S = 12V). The outage of one lamp is detected according to the following calculation:

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

Nominal current of 2 lamps: 2 × 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:
$R_{sh} = V_T$ (K1)/I_{outage}
R_{sh} = 49 mV/2.7 A = 18 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 case of shorted lamps.

4.7 Pin 8, Start Input

Start condition for flashing: the voltage at pin 8 has to be below the 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 the 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 1W is required.

5. Absolute Maximum Ratings

Reference point pin 1

Parameters		Symbol	Value	Unit
Supply voltage	Pin 2 and 6	V_S	16.5	V
Surge Forward Current				
t_P = 0.1 ms t_P = 300 ms t_P = 300 ms	Pin 2 and 6 Pin 2 and 6 Pin 8	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 T_{amb} = 60°C 	DIP8 SO8 DIP8 SO8	P_{tot} P_{tot} P_{tot} P_{tot}	420 340 690 560	mW mW 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

6. Thermal Resistance

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

7. Electrical Characteristics

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

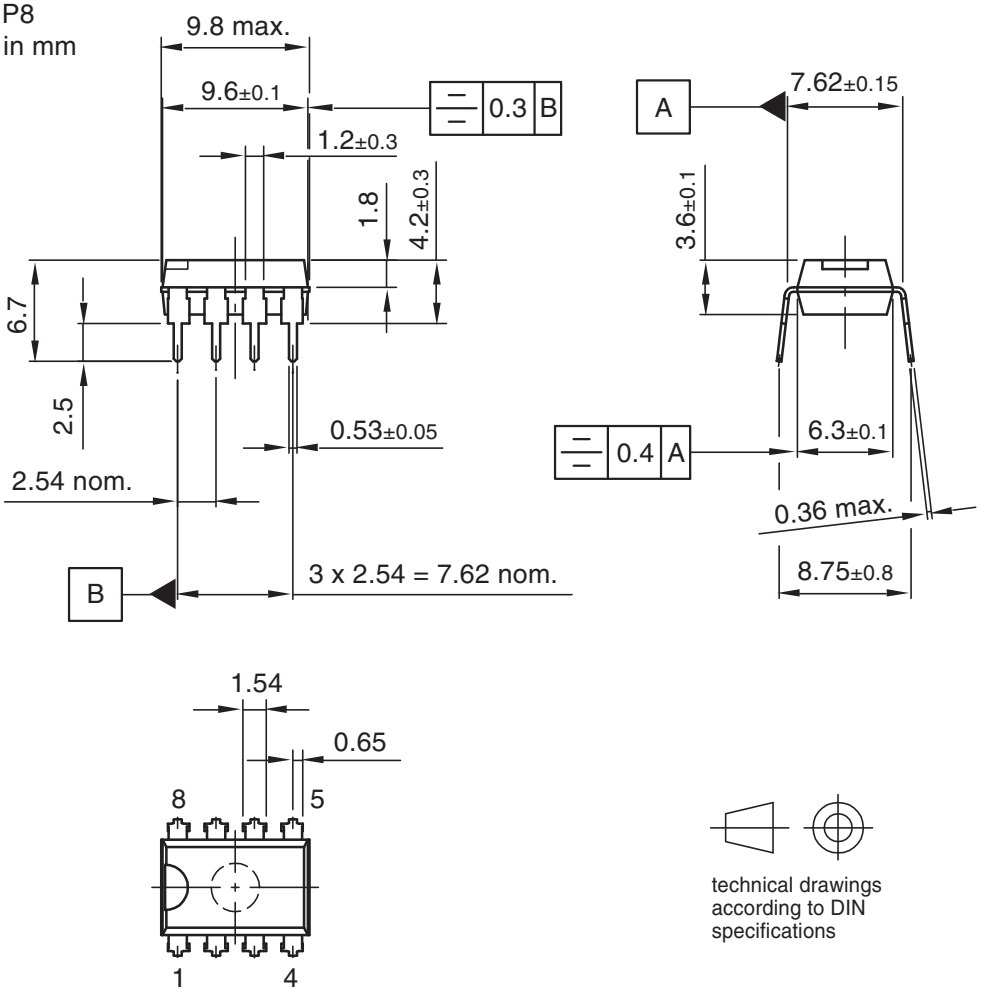
Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pin 2 and 6	V_S	9		15	V
Supply current	Dark phase, Pin 2 and 6 Bright phase, Pin 2 and 6	I_S I_S		4.5 7.0	8 11	mA mA
Relay control output: Saturation voltage Reverse current	Pin 3 I_O = 150 mA, V_S= 9V	 V_O I_O			 1.0 0.1	 V mA
Start delay (Delay time)	First bright phase	t_{on}			10	ms
Frequency tolerance	Normal flashing	Δf_1	–5		+5	%
Bright period	Basic frequency f_1 Control frequency f_2	Δf_1 Δf_2	47 37		53 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, pin 7 V_S = 12V, pin 7	V_{Rs} V_{Rs} V_{Rs}	50 43 47	53 45 49	57 47 52	mV mV mV
Leakage resistance	49a to GND	R_P		4	5	kΩ
Lamp load		P_L	1			W

8. Ordering Information

Extended Type Number	Package	Remarks
U6043B-MY	DIP8	Pb-free
U6043B-MFPY	SO8	Tubed, Pb-free
U6043B-MFPG3Y	SO8	Taped and reeled, Pb-free

9. Package Information

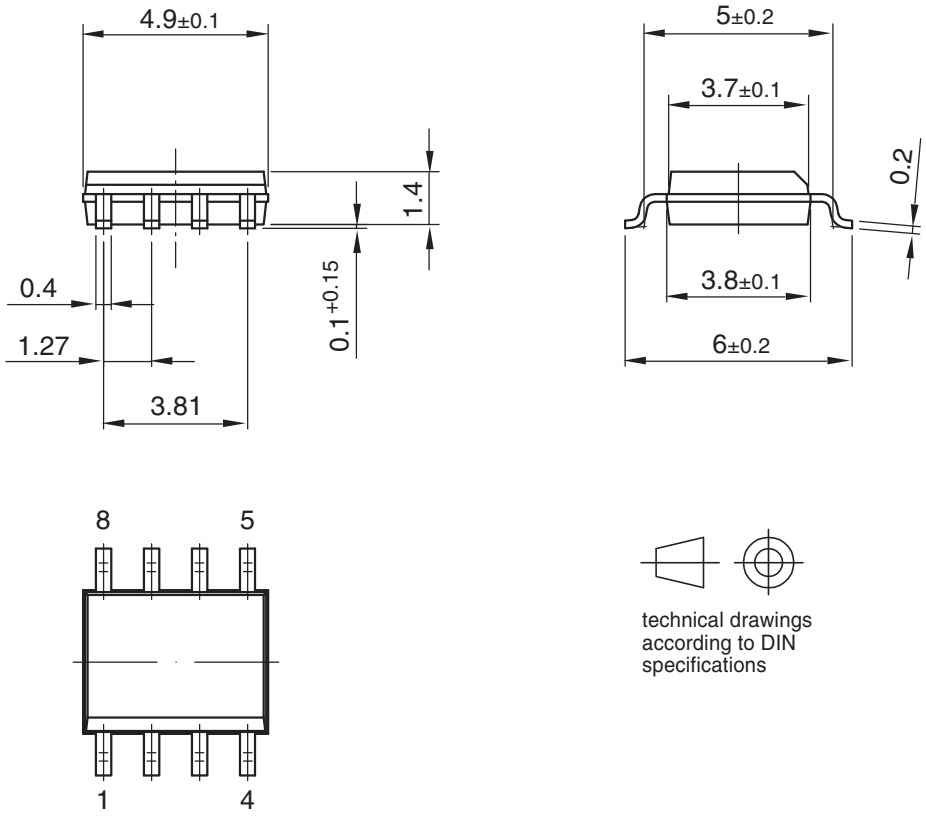
Package: DIP8
Dimensions in mm



Drawing-No.: 6.543-5040.01-4
Issue: 1; 16.01.02

Package: SO 8

Dimensions in mm



technical drawings
according to DIN
specifications

Drawing-No.: 6.541-5031.01-4

Issue: 1; 15.08.06

10. 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
4726C-AUTO-02/10	• Section 7 “Electrical Characteristics” on page 5 changed
4726B-AUTO-11/05	• Put datasheet in a new template • First page: Pb-free logo added • Page 6: Ordering Information changed

Headquarters

Atmel Corporation
2325 Orchard Parkway
San Jose, CA 95131
USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

International

Atmel Asia
Unit 1-5 & 16, 19/F
BEA Tower, Millennium City 5
418 Kwun Tong Road
Kwun Tong, Kowloon
Hong Kong
Tel: (852) 2245-6100
Fax: (852) 2722-1369

Atmel Europe
Le Krebs
8, Rue Jean-Pierre Timbaud
BP 309
78054
Saint-Quentin-en-Yvelines Cedex
France
Tel: (33) 1-30-60-70-00
Fax: (33) 1-30-60-71-11

Atmel Japan
9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Product Contact

Web Site
www.atmel.com

Technical Support
auto_control@atmel.com

Sales Contact
www.atmel.com/contacts

Literature Requests
www.atmel.com/literature

Disclaimer: The information in this document is provided in connection with Atmel products. No license, express or implied, by estoppel or otherwise, to any intellectual property right is granted by this document or in connection with the sale of Atmel products. **EXCEPT AS SET FORTH IN ATMEL'S TERMS AND CONDITIONS OF SALE LOCATED ON ATMEL'S WEB SITE, ATMEL ASSUMES NO LIABILITY WHATSOEVER AND DISCLAIMS ANY EXPRESS, IMPLIED OR STATUTORY WARRANTY RELATING TO ITS PRODUCTS INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT. IN NO EVENT SHALL ATMEL BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, PUNITIVE, SPECIAL OR INCIDENTAL DAMAGES (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, OR LOSS OF INFORMATION) ARISING OUT OF THE USE OR INABILITY TO USE THIS DOCUMENT, EVEN IF ATMEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.** Atmel makes no representations or warranties with respect to the accuracy or completeness of the contents of this document and reserves the right to make changes to specifications and product descriptions at any time without notice. Atmel does not make any commitment to update the information contained herein. Unless specifically provided otherwise, Atmel products are not suitable for, and shall not be used in, automotive applications. Atmel's products are not intended, authorized, or warranted for use as components in applications intended to support or sustain life.

© 2010 Atmel Corporation. All rights reserved. Atmel®, Atmel logo and combinations thereof, and others are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.