

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: $\geq 1\text{ W}$
- Very Low Susceptibility to EMI
- Protection According to ISO/TR 7637/1 Level 4



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.



**Flasher IC with
18-m Ω Shunt**

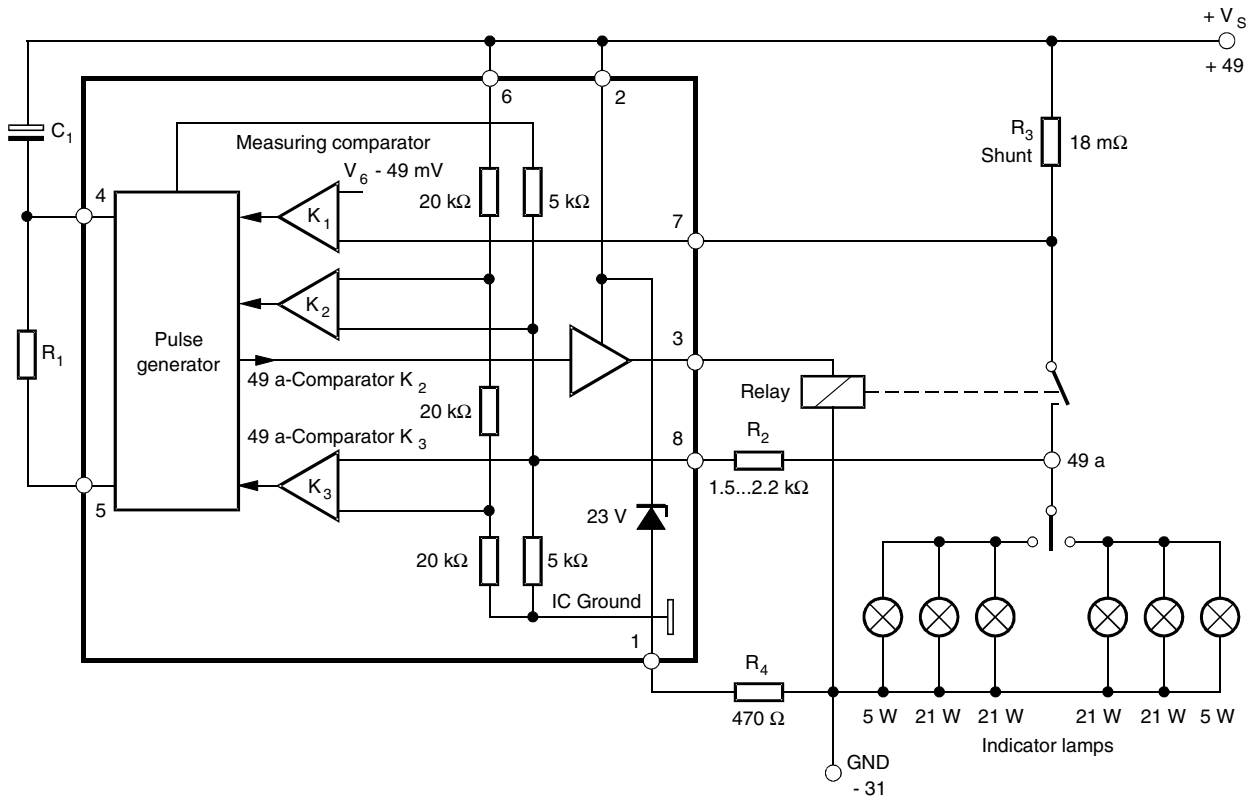
U6043B

Rev. 4726B-AUTO-11/05



2. Block Diagram

Figure 2-1. Car Flasher Application Circuit



3. Pin Configuration

Figure 3-1. Pinning

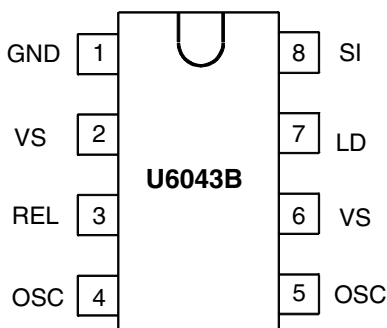


Table 3-1. Pin Description

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 $C_1 \leq 47 \mu\text{F}$, $R_1 = 6.8 \text{ k}\Omega$ to $510 \text{ k}\Omega$

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 ($V_S = 12 \text{ V}$). The outage of one lamp is detected according to the following calculation:

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

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

We recommend setting the detection threshold in the middle of the current range:

$$I_{outage} \approx 2.7 \text{ A}$$

Thus, the shunt resistor is calculated as:

$$R_{sh} = V_T (K1)/I_{outage}$$

$$R_{sh} = 49 \text{ mV}/2.7 \text{ A} = 18 \text{ m}\Omega$$

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 $> 5 \text{ k}\Omega$, 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 1 W 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 Pin 2 and 6	I_{FSM}	1.5	A
$t_P = 300$ ms Pin 2 and 6	I_{FSM}	1.0	A
$t_P = 300$ ms Pin 8	I_{FSM}	50	mA
Output current Pin 3	I_O	0.3	A
Power Dissipation			
$T_{amb} = 95^\circ\text{C}$ DIP8	P_{tot}	420	mW
$T_{amb} = 95^\circ\text{C}$ SO8	P_{tot}	340	mW
$T_{amb} = 60^\circ\text{C}$ DIP8	P_{tot}	690	mW
$T_{amb} = 60^\circ\text{C}$ SO8	P_{tot}	560	mW
Junction temperature	T_J	150	$^\circ\text{C}$
Ambient temperature range	T_{amb}	-40 to +95	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to +150	$^\circ\text{C}$

6. Thermal Resistance

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

7. Electrical Characteristics

Typical values under normal operation in application circuit (see [Figure 2-1](#)), V_S (+49, Pin 2 and 6) = 12 V.

Reference point ground (-31), $T_{amb} = 25^\circ\text{C}$, unless otherwise specified.

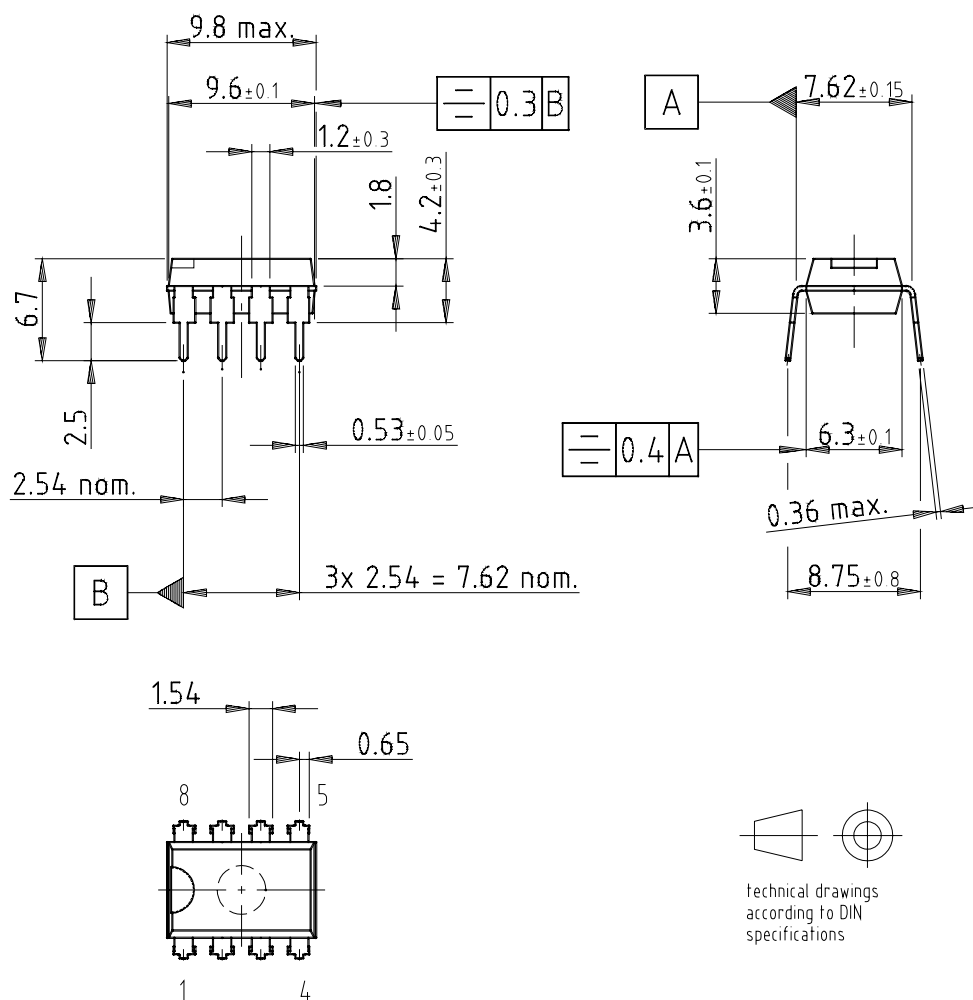
Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pin 2 and 6	V_S	9		15	V
Supply current	Dark phase, Pin 2 and 6	I_S		4.5	8	mA
	Bright phase, Pin 2 and 6	I_S		7.0	11	mA
Relay control output:	Pin 3					
Saturation voltage	$I_O = 150$ mA, $V_S = 9$ V	V_O			1.0	V
Reverse current		I_O			0.1	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	Δf_1	47		53	%
	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_{RS}	50	53	57	mV
	$V_S = 9$ V, Pin 7	V_{RS}	43	45	47	mV
	$V_S = 12$ V, Pin 7	V_{RS}	47	49	51	mV
Leakage resistance	49a to GND	R_P		4	5	k Ω
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

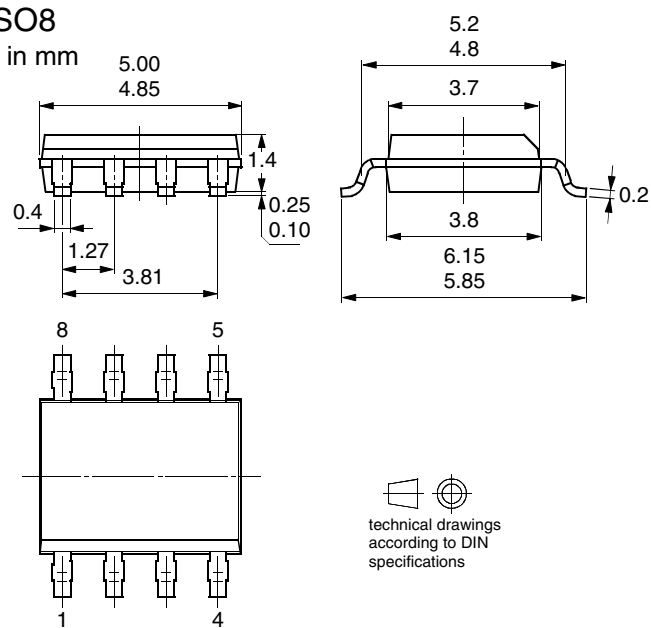
Package: DIP 8
Dimensions in mm



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

Package SO8

Dimensions in mm



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
4726B-AUTO-11/05	• Put datasheet in a new template • First page: Pb-free logo added • Page 6: Ordering Information changed



Atmel Corporation

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

Regional Headquarters

Europe

Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

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

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
Tel: (33) 2-40-18-18-18
Fax: (33) 2-40-18-19-60

ASIC/ASSP/Smart Cards

Zone Industrielle
13106 Rousset Cedex, France
Tel: (33) 4-42-53-60-00
Fax: (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive

Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.
Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

*Biometrics/Imaging/Hi-Rel MPU/
High Speed Converters/RF Datacom*
Avenue de Rochepleine
BP 123
38521 Saint-Egreve Cedex, France
Tel: (33) 4-76-58-30-00
Fax: (33) 4-76-58-34-80

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.

© Atmel Corporation 2005. All rights reserved. Atmel®, logo and combinations thereof, Everywhere You Are® and others, are registered trademarks or trademarks of Atmel Corporation or its subsidiaries. Other terms and product names may be trademarks of others.



Printed on recycled paper.