Features

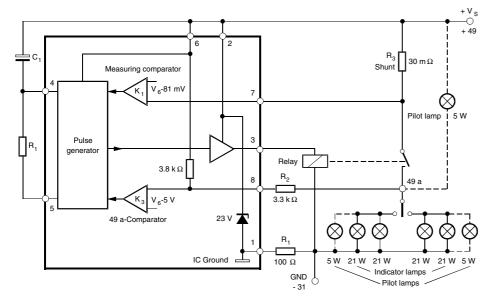
- Temperature and Voltage Compensated Frequency
- Warning Indication of Lamp Failure by Means of Frequency Doubling
- Minimum Lamp Load for Flasher Operation ≥ 10W
- Relay Output with High Current Carrying Capacity and Low Saturation Voltage
- Low Susceptibility to EMI



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





Flasher, 30 m Ω Shunt, Pilot Lamp to GND or $V_{\rm Batt}$

U2043B





2. Pin Configuration

Figure 2-1. Pinning DIP8/SO8

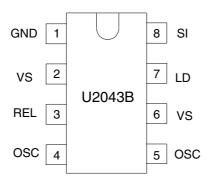


Table 2-1.Pin Description

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):

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

where $C_1 \leq 47 \mu F$

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

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: $2 \times 21 \text{W}/(\text{V}_{\text{S}} = 12 \text{V})$: $I_{\text{lamp}} = 3.5 \text{A}$

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:

$$R_3 = V_T (K1)/I_{outage}$$

$$R_3 = 81 \text{ mV}/2.7 \text{ A} = 30 \text{ m}\Omega$$

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 k Ω 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				
$t_{\rm p} = 0.1 {\rm ms}$	I _{FSM}	1.5	Α	
$t_p = 2 \text{ ms}$	I _{FSM}	1.0	Α	
$t_p^r = 2 \text{ ms}$	I _{FSM}	50	mA	
Output current, pin 3	Io	0.3	А	
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	

5. Thermal Resistance

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





6. Electrical Characteristics

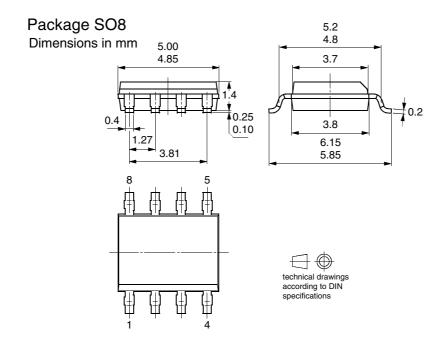
Typical values under normal operation in application circuit Figure 1-1 on page 1, V_S (+49, pin 2 and pin 6) = 12V. Reference point ground (–31), T_{amb} = 25°C, unless otherwise specified

Parameters	Test Conditions	Symbol	Min.	Тур.	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	Is		4.5	8	mA
Supply current	Bright phase, pins 2, 6	Is		7.0	11	mA
Relay output	Saturation voltage $I_O = 150 \text{ mA},$ $V_S = 9V \text{ (pin 3)}$	V _o			1.0	V
Relay output reverse current	Pin 3	Io			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	%
Duinlet o avia d	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 × f ₁		$2.3 \times f_1$	Hz
Control signal threshold	$V_S = 15V \text{ (pin 7)}$ $V_S = 9V$ $V_S = 12V$	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		PL	10			W

7. Ordering Information

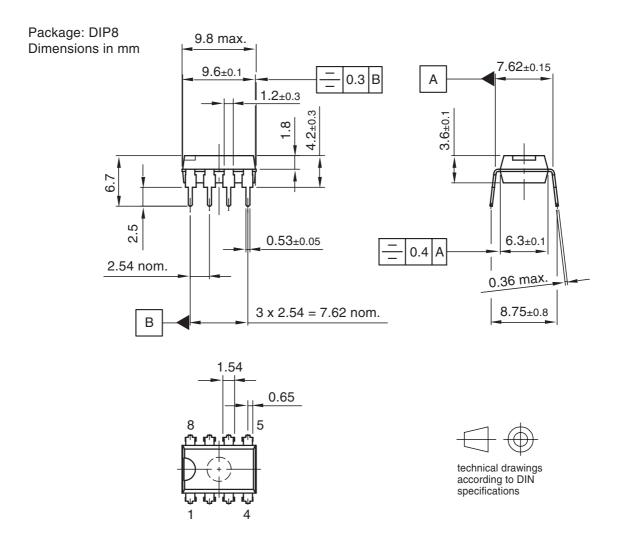
Extended Type Number	Package	Remarks
U2043B-MY	DIP8	Tubed, Pb-free
U2043B-MFPY	SO8	Tubed, Pb-free
U2043B-MFPG3Y	SO8	Taped and reeled, Pb-free

8. Package Information









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





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

ASIC/ASSP/Smart Cards

Fax: (33) 2-40-18-19-60

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

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