Automotive Lamp Outage Monitor

Description

The IC U2480B is designed for individual monitoring of 11 lamps in automobiles. Three double comparators and five single comparators, which can be optionally interconnected, permit realization of many monitoring variants. An integrated latch is available to memorize the outage of indicator or brake lamps.

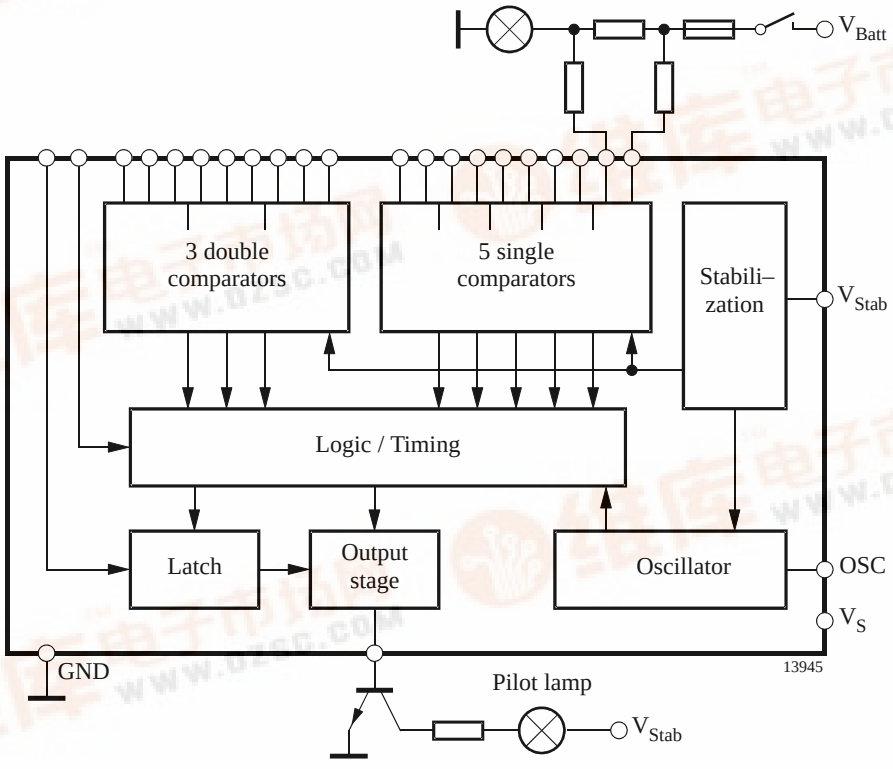
Features

- 10 mV comparator thresholds
- Temperature compensated
- Voltage characteristic of the lamps is taken into account
- Input voltage range up to 23 V independent of supply
- Typical input currents 25 µA, so that protective resistors can be connected in series
- Internal protection measures for pulses according to ISO TR 7637/1
- ESD according to MIL-SID-883 C test method 3015.7
  – Human body model: 4 kV
  – Machine model: 200 V
  EMI protection (TEM cell up to 100 V/m)

Ordering Information

Extended Type Number	Package	Remarks
U2480B	SDIP28	

Block Diagram



Detailed Block Diagram

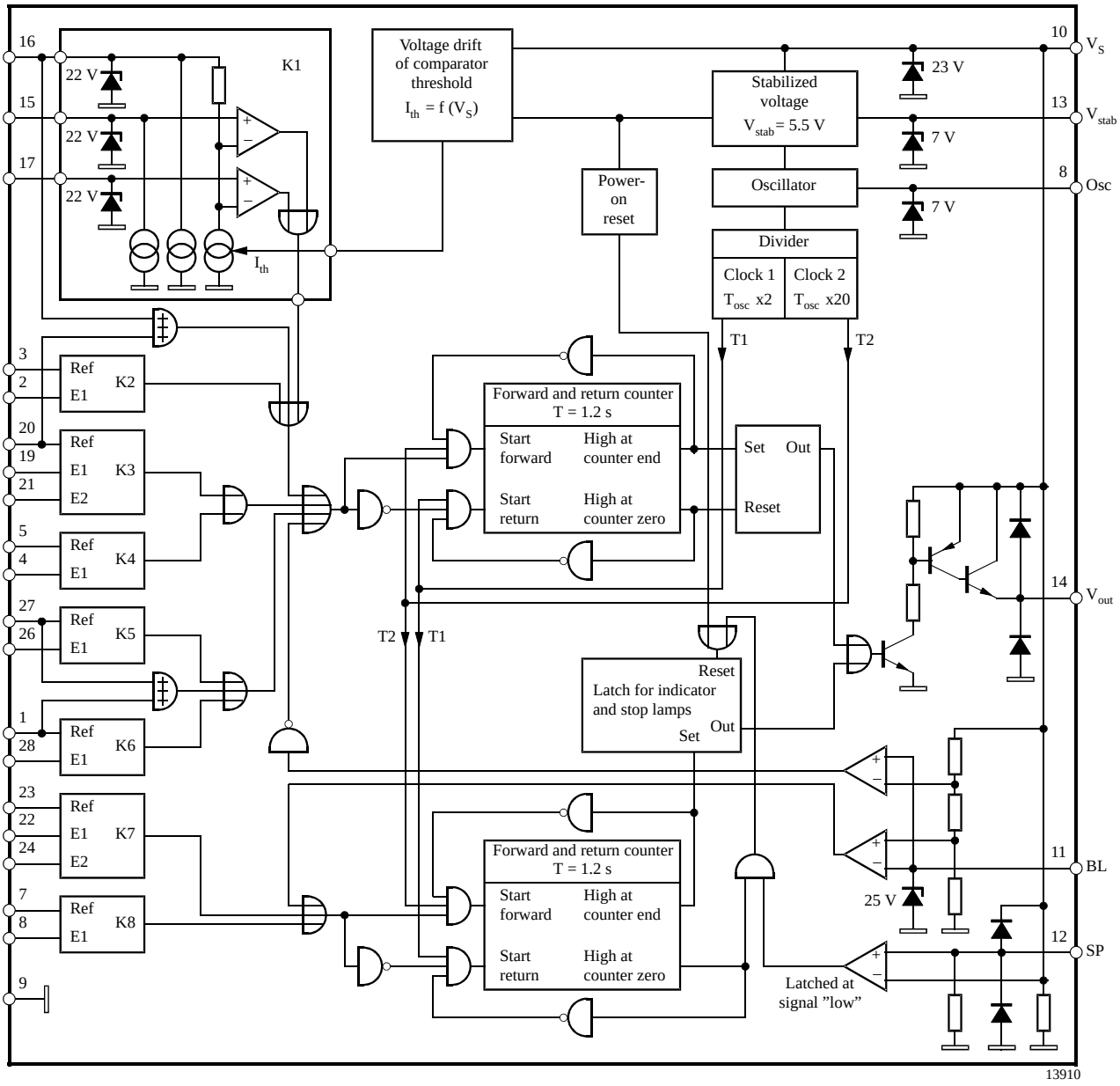


Figure 1. Block diagram

Pin Description

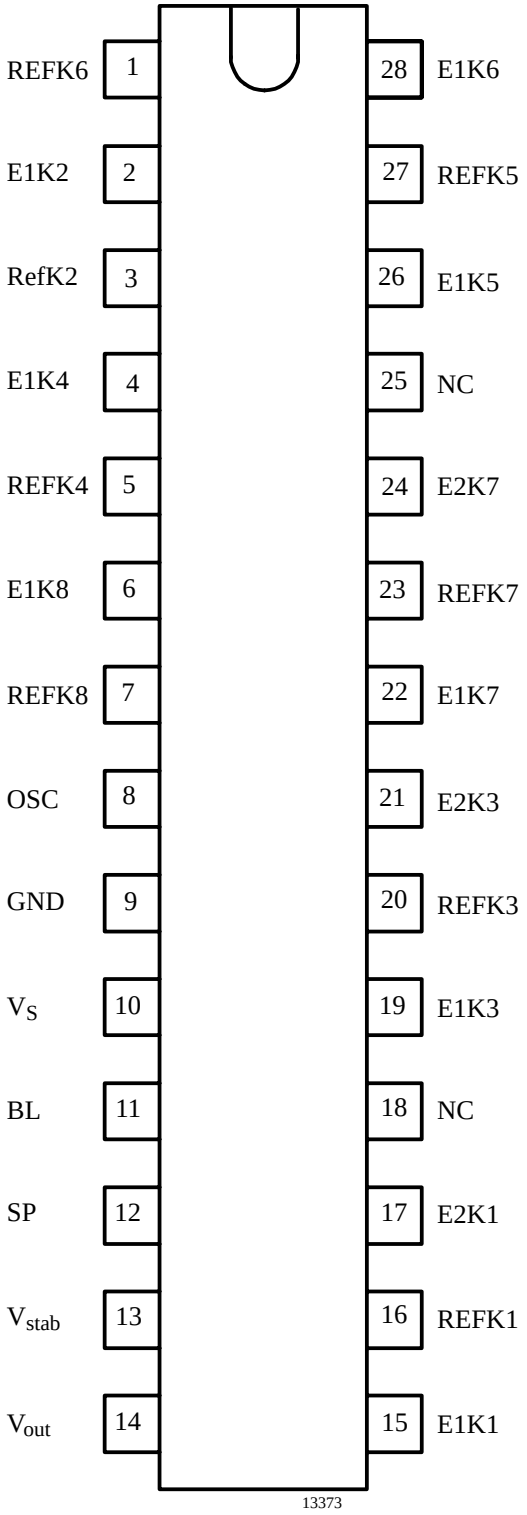


Figure 2. Pin configuration

Pin	Symbol	Function
1	REFK6	Reference for threshold voltage single comparator K6
2	E1K2	Input 1; single comparator K2
3	REFK2	Reference for threshold voltage; double comparator K5
4	E1K4	Input 1; single comparator K4
5	REFK4	Reference for threshold voltage; double comparator K4
6	E1K8	Input 1; single comparator K8
7	REFK8	Reference for threshold voltage; triple comparator K8
8	OSC	Oscillator input
9	GND	Ground
10	V_S	Supply voltage
11	BL	Input window comparator for direction indicator
12	SP	Programming pin for memory function
13	V_{stab}	Stabilized voltage
14	V_{out}	Output for tell-tale lamp
15	E1K1	Input 1; double comparator K1
16	REFK1	Reference for threshold voltage; double comparator K1
17	E2K1	Input 2; double comparator K1
18	NC	Not connected
19	E1K3	Input 1; double comparator K3
20	REFK3	Reference for threshold voltage double comparator 3
21	E2K3	Input 2; double comparator K2
22	E1K7	Reference for threshold voltage; double comparator K7
23	REFK7	Reference for threshold voltage double comparator 7
24	E2K7	Input 2; double comparator K7
25	NC	Not connected
26	E1K5	Input 1; single comparator K5
27	REFK5	Reference for threshold voltage single comparator 5
28	E1K6	Input 1; single comparator K6

Functional Description

Comparators

The voltage threshold of all internal comparators has a typical value of V_{th} = 10 mV.

A voltage drop accross the shunt of $V_{sh} \geq V_{th}$ means no fault in the lamp circuit and the output is disabled.

In the event of a voltage drop $V_{sh} \leq V_{th}$, the output supplies the current I_O, and the pilot lamp is activated by the external transistor.

The output is reliably disabled for a voltage at the reference pin of the comparators of $V_{minRef} \leq 1/3\ V_S$

The typical values of the input currents are 25 µA and are equally large at the switch-over instant, thus making it possible to connect protective resistors in series. The internal threshold is independent of the value of the protective resistor as long as all resistors of a comparator have the same value.

Fuse Monitoring

It is possible to monitor the fuses of the lamp circuits by means of an EXCLUSIVE OR function between K1 and K3 and between K5 and K6.

If the Ref pin of K1 (orK5) is low and the Ref pin of K2 (or K6) is simultaneously high, or vice versa, a fault is indicated.

Simultaneous failure of both fuses is not detected.

A fuse is faulty if the input voltage at the pin Ref falls below the voltage V_{minRef} (1/3 V_S).

Time Delay

A fault is indicated only if it is present for $t_d = 1.2 \pm 0.2$ s. If an OK pulse ≥ 100 ms occurs during this time, time counting is reset to ”0”. An OK pulse is generated if the comparators K1 to K8 and the input BL do not signal a fault.

A periodic fault signal (period of less than 1 s) is indicated only if the mark-to-space ratio is ≥ 10/1, whereby the pulse time corresponds to an item of fault information. The time delay until the fault is indicated exceeds the time t_d = 1.2 s in this case.

Storage

A failure in the break light circuit which is present for longer than t_d is stored.

A voltage of $V_{BL} \leq 0.15\ V_S$ which is present at the input BL for longer than t_d leads to fault indication with storage. This allows the possibility of additional flashing monitoring.

A voltage of $V_{BL} \geq 0.2\ V_S$ and of $V_{BL} \leq 0.65\ V_S$ which is present at the input BL for longer than t_d leads to fault indication without storage. It is thus possible to extend the scope of monitoring beyond 11 lamps by means of additional comparators ICs.

A voltage of $V_{BL} \geq 0.7\ V_S$ at the input BL does not cause a fault signal.

The turn indicator and the brake light memory is maintained by V_S (terminal 15)

Power-on Reset

When V_{Batt} (terminal 15) is applied to Pin V_S, a brief signal is produced which generates the power-on reset. As a result, the turn indicator, the brake light memory and the counters are reset.

Outputs

A fault signal at the comparators K1 to K8 or at the comparator Pin BL enables the output so that current I_O can flow. The output blocking voltage ($V_S - V_{out}$) is typically 1 V.

Threshold Testing without Time Delay t_d

To connect the input comparators directly to the output pin, a voltage of 6 V at Pin OSC is necessary (omit R_{OSC} and C_{OSC}).

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	V_S, V_{Batt}	16.5	V
Pulse current (2 ms)	I_S	1.1	A
Short circuit current (reversed battery)	I_{SC}	170	mA
Output current	I_{out}	–12	mA
Ambient temperature range	T_{amb}	–40 to +100	°C

Parameters	Symbol	Value	Unit
Storage temperature range	T_{stg}	–55 to +125	°C
Junction temperature	T_j	150	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Thermal resistance	SDIP 28	R_{thJA}	75	K/W

Electrical Characteristics

V_{Batt} (Kl. 15) = 10 to 15 V, T_{amb} = –40 to +95°C, supply series resistors and input protection resistors connected (see figure 1 “Block diagram” and figure 3 “Basic application schematic”) unless otherwise specified.

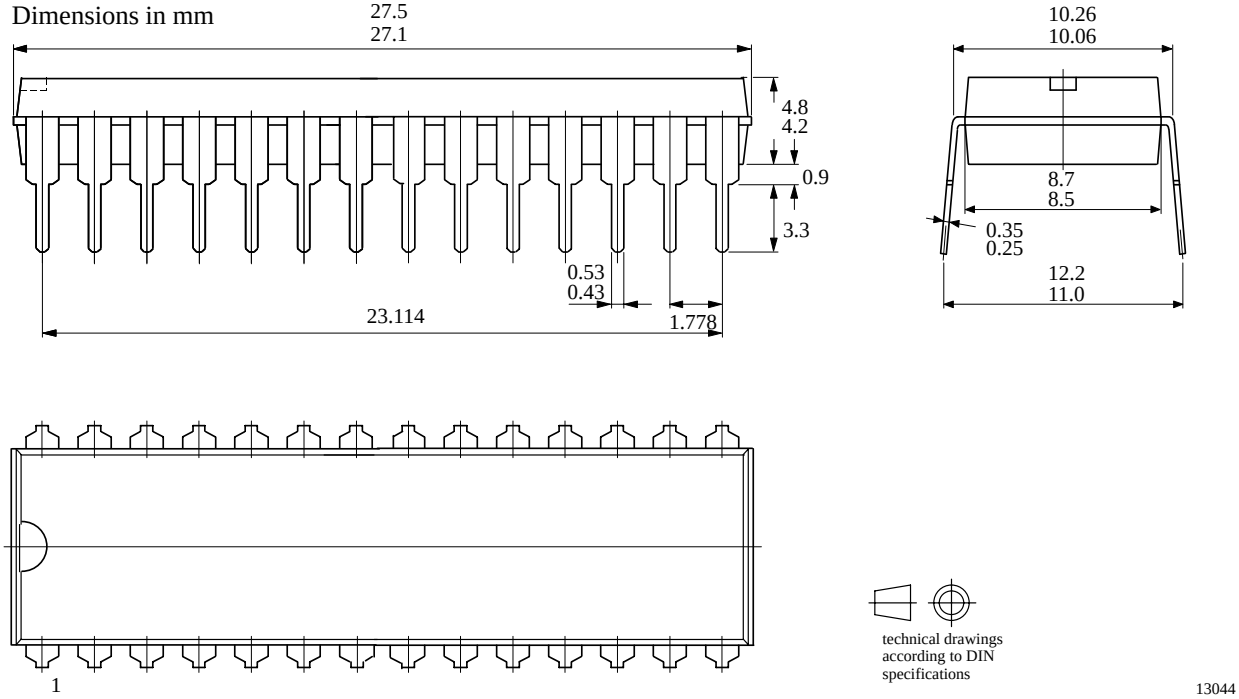
Parameters	Test Conditions / Pins		Symbol	Min.	Typ.	Max.	Unit
Supply							
Supply current	V_{Batt} = 12 V, V_{out} = low		I_S			6	mA
Power on reset (POR)			V_S	3.5		5.2	V
Comparators							
Comparator input current during switch over	V_{Batt} = 12 V	Pin 2 Pin 4 Pin 6 Pins 15, 16 Pins 19, 21 Pins 22, 24 Pin 26 Pin 28	I_{K2} I_{K4} I_{K8} I_{K11},I_{K12} I_{K31},I_{K32} I_{K71},I_{K72} I_{K5} I_{K6}		25		µA
Comparator output current	V_{Batt} = 12 V	Pin 1 Pin 3 Pin 5 Pin 7 Pin 15 Pin 20 Pin 23 Pin 27	I_{O6} I_{O2} I_{O4} I_{O8} I_{O1} I_{O3} I_{O7} I_{O5}		–10		mA
Comparator thresholds $V_{thx} = V_{REFKx} - V_{ExKx}$ x = Pin–No.	V_{Batt} = 12 V V_{Batt} = 15 V		V_{thx} V_{thx}	5.0 6.3	10.0 11.4	15.0 16.5	mV mV
Minimum comparator input voltage			V_{minRef}		$0.33 \times V_S$		V
Output V_{out}	**Pin 14**						
Output current	V_S = 12 V		I_{14}		–10.0		mA
Output saturation voltage	$V_{sat} = V_S - V_{out}$ I_{out} = –10 mA		V_{sat}			1.5	V
Protection							
Voltage of Zener diodes	all REFKx and ExKx. pins Pin VS Pin BL Pin V_{stab} and OSC		V_{Z1} V_{Z2}, V_{ZBL} V_{Z3}		22 23 25 7		V V V V
Oscillator	**Pin 8**						
Oscillator frequency	R_{osc} = 82 kΩ, C_{osc} = 10 nF,		f_{osc}		1.67		kHz

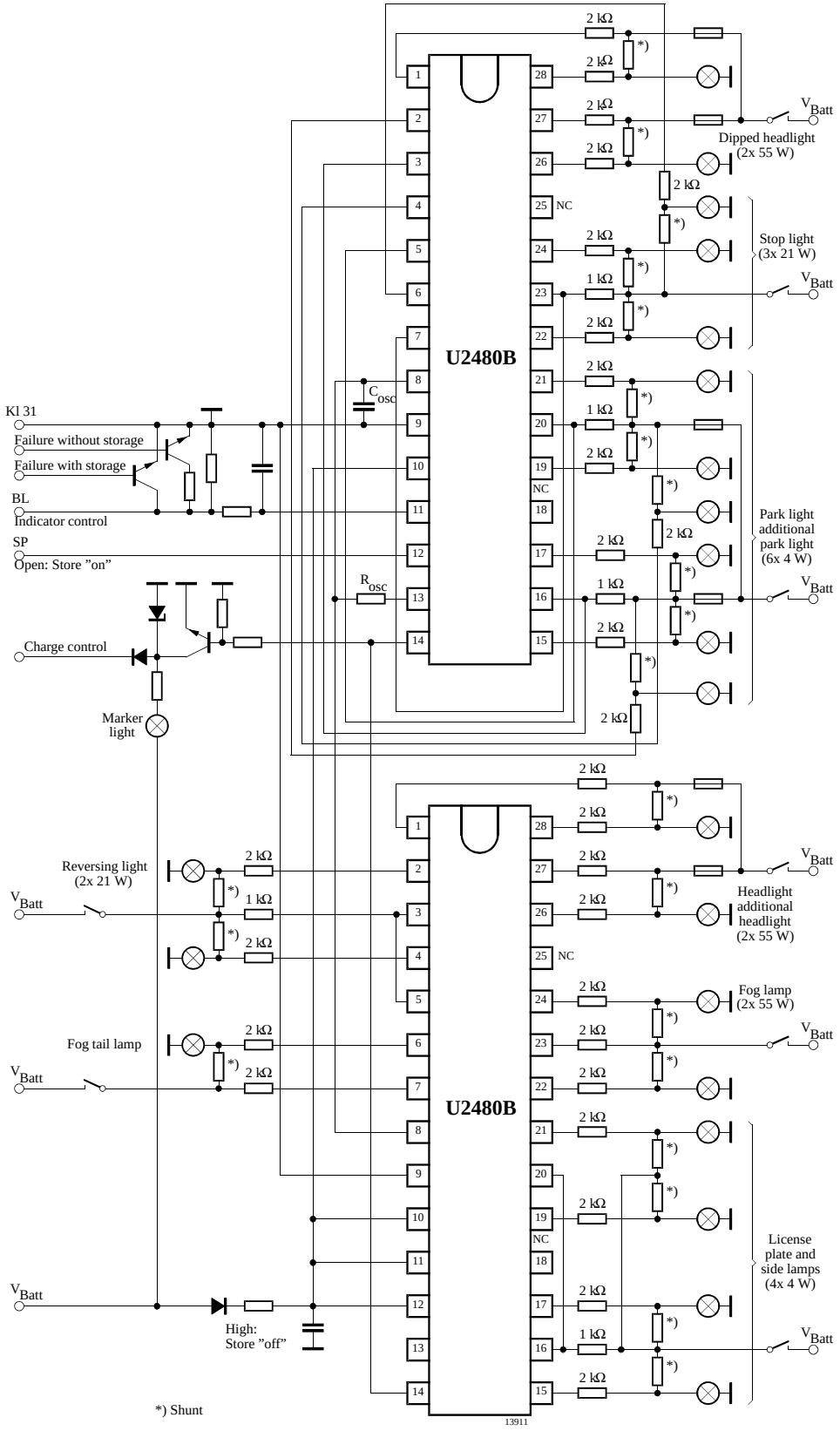
Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Delay time		t_d	1.1	1.2	1.3	s
Debounce time		t_{db}	115	125	135	ms
Flashing frequency recognition	**Pin BL**					
Fault indication with storage		V_{BL}			$0.15 \times V_S$	V
Fault indication without storage		V_{BL}	$0.2 \times V_S$		$0.6 \times V_S$	V
No fault indication		V_{BL}	$0.7 \times V_S$			V
Input current	V_{BL} = low	I_{BL}		–3.0		µA
Programming pin	**Pin SP**					
Latch ON		V_{SP}			$0.35 \times V_S$	V
Latch OFF		V_{SP}	$0.45 \times V_S$			V
Input current	V_{SP} = 0 V	I_{SP}			–6.0	µA
Input current	V_{SP} = 12 V	I_{SP}		300		µA

Package Information

Package SDIP28

Dimensions in mm




U2480B
U2480B
Kl 31
Failure without storage
Failure with storage
BL
Indicator control
SP
Open: Store "on"
Charge control
Marker light
Reversing light (2x 21 W)
Fog tail lamp
High: Store "off"
C_{osc}
R_{osc}
V_{Batt}
Dipped headlight (2x 55 W)
Stop light (3x 21 W)
Park light additional park light (6x 4 W)
Headlight additional headlight (2x 55 W)
Fog lamp (2x 55 W)
License plate and side lamps (4x 4 W)
2 kΩ
1 kΩ
*)
NC
*) Shunt
13911

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.

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