DHA®

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LD2044

Dual Output Flasher IC

Description

The integrated circuit LD2044 (analog U2044B) is used in relay controlled automotive flashers. With two output stages each side of the vehicle is controlled separately. A left and a right direction indicator input with only a small control current makes switch contacts for small loads possible.

The separate hazard warning input simplifies the construction of the hazard switch. Lamp outage is indicated by frequency doubling during direction mode. Thanks to the extreme low current consumption LD2044 can be connected to the battery directly. The IC can used for 24V circuit and control LED.

Features

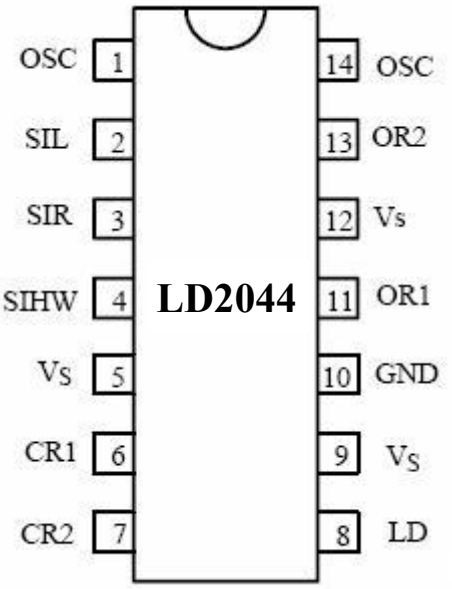
- Temperature and supply voltage compensated flashing frequency
- Frequency doubling indicates lamp outage
- Two relay driver outputs with high current-carrying capacity and low saturation voltage
- Minimum lamp load for flasher operation: ⩾1 W
- Very low susceptibility to EMI
- Extremely low current consumption < 10 μA (@switches open)
- Reverse polarity protection
- Three control inputs: left, right and hazard warning

Ordering Information

Package	Remarks
SOP14	Tubed, Reeled, Pb-free
DIP14	Tubed, Pb-free

Pin Description

Pin	Symbol	Function
1	OSC	Oscillator
2	SIL	Start input left
3	SIR	Start input right
4	SIHW	Start input hazard warning
5	Vs	Vs
6	CR1	Control input relay 1
7	CR2	Control input relay 2
8	LD	Lamp failure detection
9	Vs	Vs
10	GND	IC ground
11	OR1	Output relay 1
12	Vs	Vs
13	OR2	Output relay 2
14	OSC	Oscillator



Pins Figure

Block Diagram

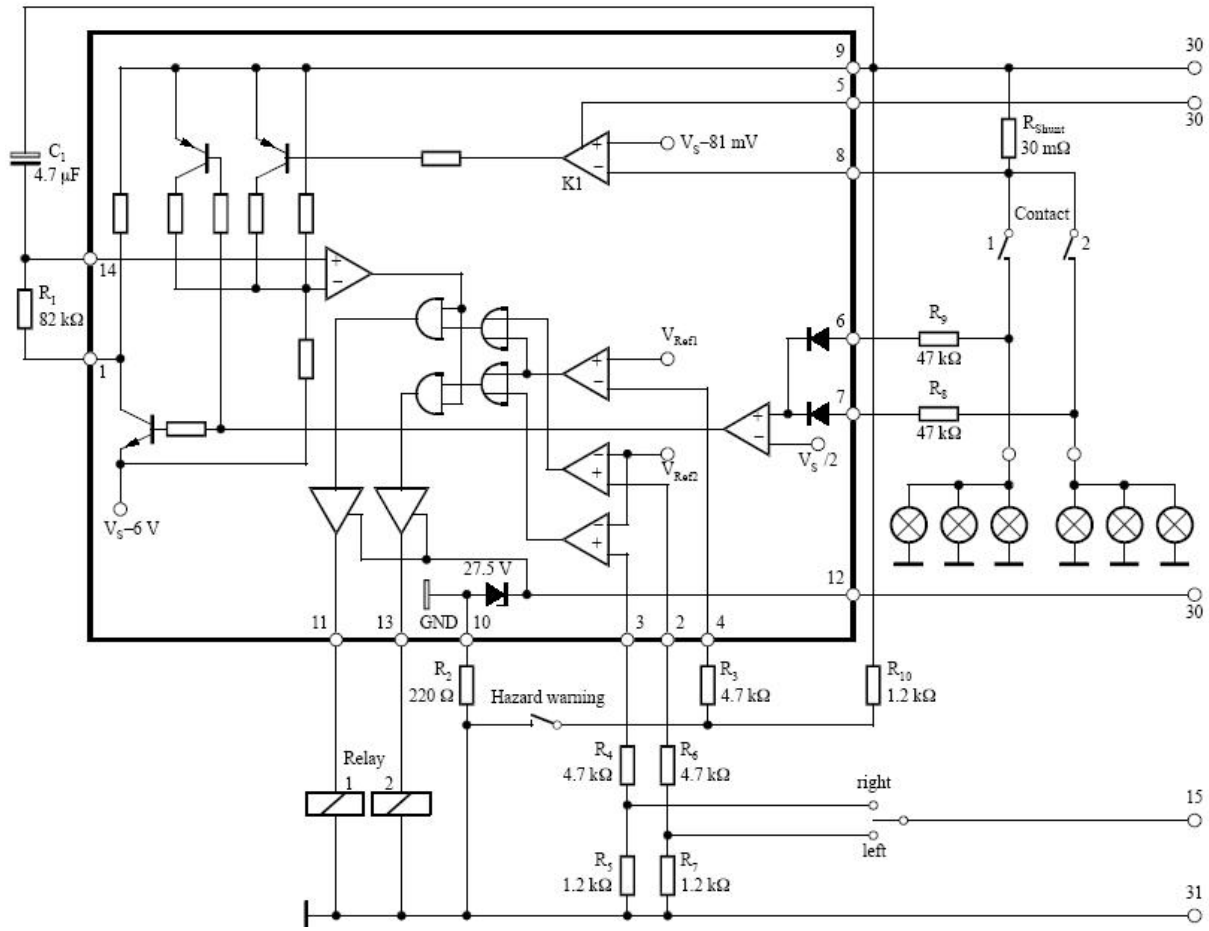


Figure 2. Application circuit

R_2 for protection against continuous reversed polarity: 1W

Functional Description

Pin 1 and Pin 14, Oscillator

Flashing frequency, f1, is determined by the R1C1 components as follows (see figure 2):

f1≈1 / (R1×C1×1.5) Hz, where C1＜47 µF, R1= 6.8 kΩ to 510 kΩ

In the case of a lamp outage the oscillator frequency is switched to the lamp outage frequency f2 with

f2≈2.2×f1.

Pin 2 and Pin 3, Start input right and left

Flashing is disabled as long as the input comparator is tied to GND (pull-down resistor R7 or R5). The high side flasher switch “left” or “right” changes the comparator status and enables the output stage at Pin 11 or Pin 13. R6 and R4 are protection resistors for the input stage.

With an open flasher switch the current consumption is only I＜10uA. The IC kept in stand-by mode until there is a voltage drop of V≈6.9 V at the pull-down resistor.

Direction mode can only be activated when the ignition switch is in ON-position as shown in figure 2.

Pin 4, Start input hazard warning

In contrast to the direction switches, the hazard input is a low-side type. The pull-up resistor R10 provides the off state. R3 is a protection resistor for the input stage.

Hazard warning can be activated independent of the ignition switch position.

Pin 5, Supply voltage sense

This pin supplies the lamp outage comparator at Pin 8 and is externally connected to the battery (30) .

Pin 6 and 7, Control input relay 1 and 2

The feedback detects the bright phase and the dark phase and enables the oscillator.

Pin 8, Lamp outage detection

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

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

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

The detection threshold is recommended to be set in the middle of the current range: I_{outage} ≈2.7 A

Thus the shunt resistor is calculated as: $R_{Shunt} = V_T(K1) / I_{outage}$

$$R_{Shunt} = 81\ mV/2.7\ A = 30\ m\Omega .$$

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 8 from a too high voltage in the case of shorted lamps.

Pin 9, Supply voltage

This pin supplies the oscillator, the comparators and the logic parts of the IC.

Pin 10, GND

The integrated circuit is protected against transients according to ISO-TR 7637-3 level 3 via resistor R2 to ground (-31). An integrated protection circuit together with external resistors R2, R3, R4, R6, R8 and R9 limits the current pulses in the IC. Against reversed battery the IC is also protected .

Pin 11 and 13, Control output relay 1 and 2

The relay control outputs are high-side driver with a low saturation voltage and capable to drive a typical automotive relay with a coil resistance of 60Ω.

Pin 12, Supply voltage power

This pin supplies the relay drivers connected directly to the battery (Kl 30). It is internally clamped by a 27V Z-diode.

Absolute Maximum Ratings

Reference point ground (terminal 31), with external circuitry.

Parameters	Symbol	Value	Unit
Supply voltage, 1 min Pins 5, 9, 12	V_S	24	V
Junction temperature	T_j	150	℃
Storage temperature range	T_{stg}	–55 to +150	℃
Short Circuit Detector Threshold	$D_{th(SV)}$	$V_2 - V_7$	℃

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	DIP14	R_{thJA}	90	K/W
	SOP14	R_{thJA}	120	K/W

Electrical Characteristics

Typical values under normal operation in application circuit figure 1, VS (+30) = 12 V.

Reference point ground (-31), T_{amb} = 25℃, unless otherwise specified.

Characteristics	Test Condition/Pins	Symbol	Min	Typ	Max	Unit
Supply voltage range	Pins 5, 9, 12	V_S	8.0		18.0	V
Supply current, switches open	Pins 5, 9, 12	I_S			10.0	μA
Output current for relay driver	Pins 11, 13	I_O			300	mA
Saturation voltage	R_L = 82Ω Pins 11, 13 V_S = 8 V V_S = 12 V	V_O			 1.0 1.2	 V V
Relay coil resistance		R_L	60			Ω
Relay output, reverse current	Pins 11, 13	I_O			0.1	mA
Start delay (first bright phase)		T_{on}			10	ms
Control signal threshold	V_S = 9 V Pin 8 V_S = 13.5 V V_S = 16 V	V_S			70.6 85.0 93.0	mV mV mV
Tolerance of control signal threshold	V_S = 9 to 16 V, Pin 8 T_{amb} =-40 to +100℃		-6		+6	%
Temperature coefficient of control signal threshold	V_S = 13.5 V, Pin 8	T_k		10		μV/K
Clamping voltage	T_{amb}= -40 to +100℃	V_{12}	25.0	27.5	30.0	V
Relay output overvoltage detection (relay disabled)	T_{amb}= -40 to +100℃	V_{12}	18	20	22	V

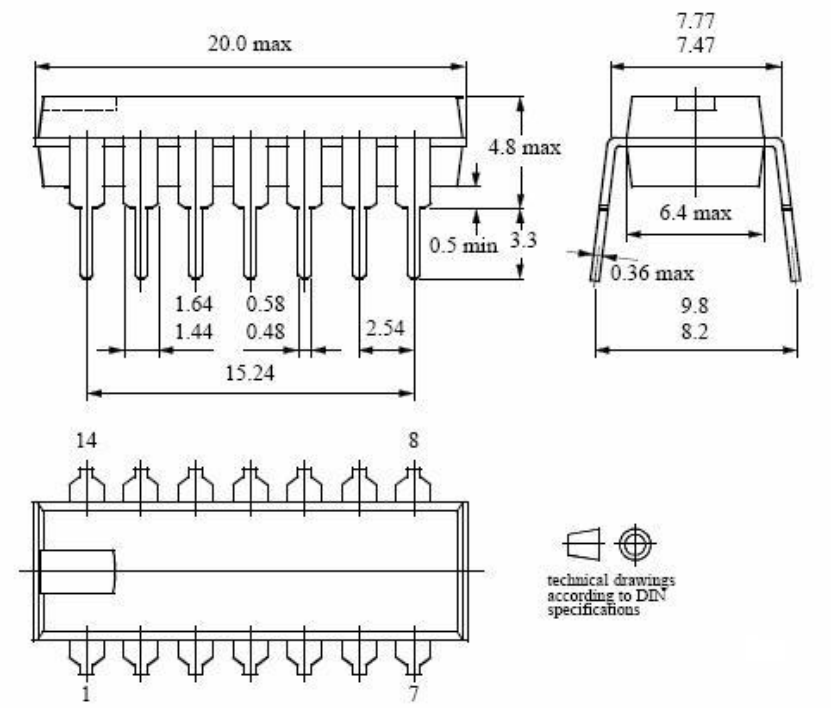
Tolerances VS = 9 to 18 V, T_{amb} = －40 to +100℃

Characteristics	Symbol	Min	Typ	Max	Unit
Frequency determining resistor	R_1	6.8		510	kΩ
Frequency determining capacitor	C_1			47	μF
Frequency tolerance(normal flashing basic frequency f1 not including the tolerance of the external components R1 and C1)	$\triangle f_1$	-5		+5	%
Bright period (basic frequency f1)	$\triangle f_1$	47	50	53	%
Bright period (control frequency f2)	$\triangle f_2$	37	40	45	%
Frequency increase (lamp failure)	f_2	$2.15f_1$	2.2	$2.3f_1$	Hz
Lamp load	P_L	1			W

Package Information

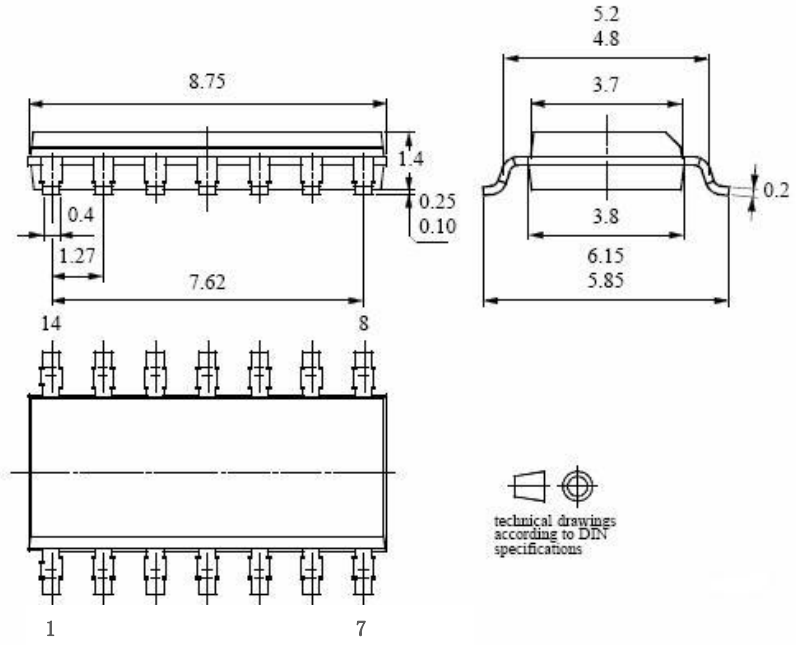
DIP14

Dimensions in mm

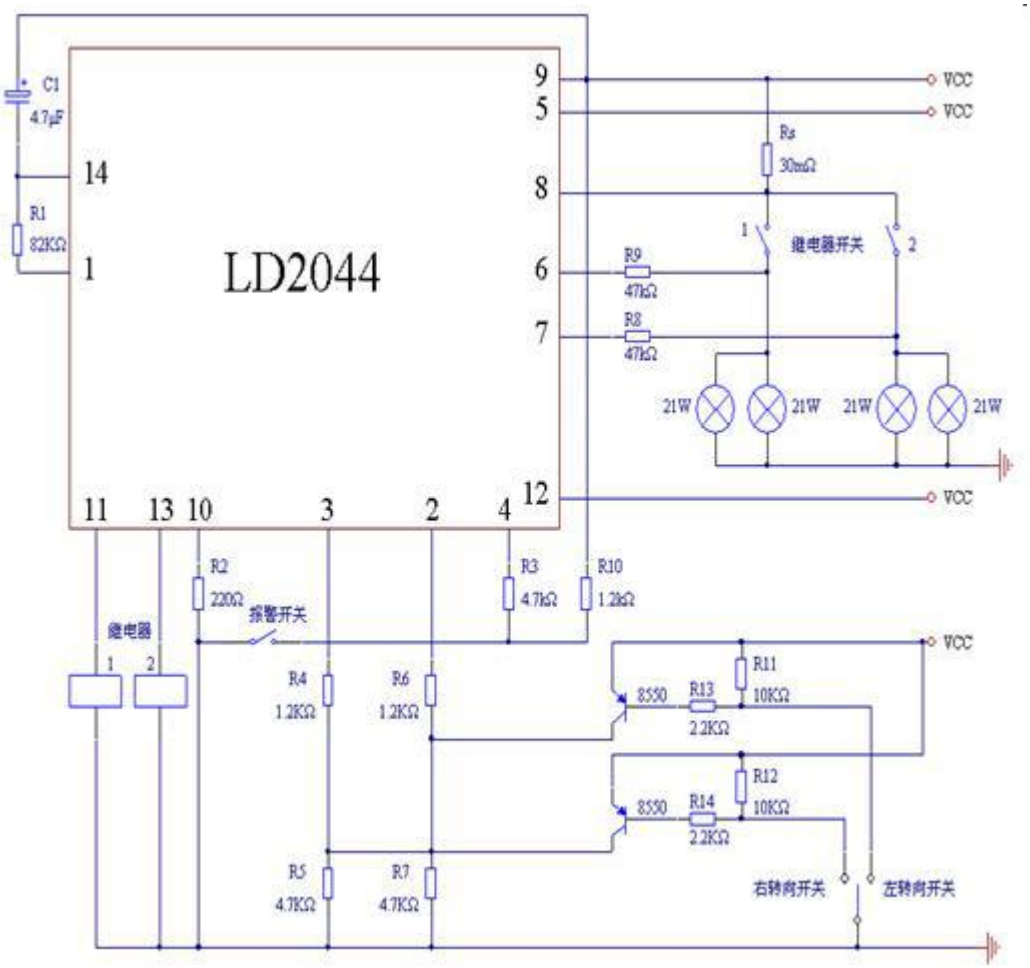


SOP14

Dimensions in mm



Appendix



Negative startup application circuit diagram