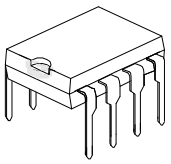
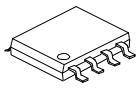
U2043

LINEAR INTEGRATED CIRCUIT

FLASHER, SHUNT, PILOT LAMP TO GND OR V_{BATT}



DIP-8



SOP-8

■ DESCRIPTION

The UTC **U2043** is designed to use 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.

■ FEATURES

*Temperature and voltage compensated frequency
*Warning indication of lamp failure by means of frequency doubling
* Minimum lamp load for flasher operation ⩾10 W
*Relay output with high current carrying capacity and low saturation voltage
*Low susceptibility to EMI

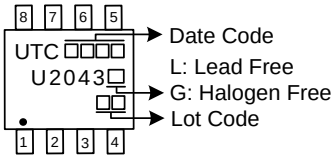
■ ORDERING INFORMATION

Order Number		Package	Packing
Lead Free	Halogen Free		
U2043L-D08-T	U2043G-D08-T	DIP-8	Tube
U2043L-S08-R	U2043G-S08-R	SOP-8	Tape Reel

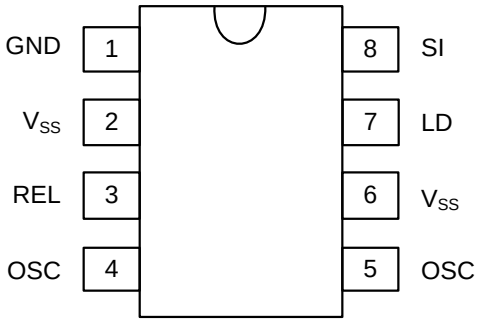
Note: Pin Assignment: G: Gate D: Drain S: Source

U2043G-D08-T (1)Packing Type	(1) T: Tube, R: Tape Reel
(2)Package Type	(2) D08: DIP-8, S08: SOP-8
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



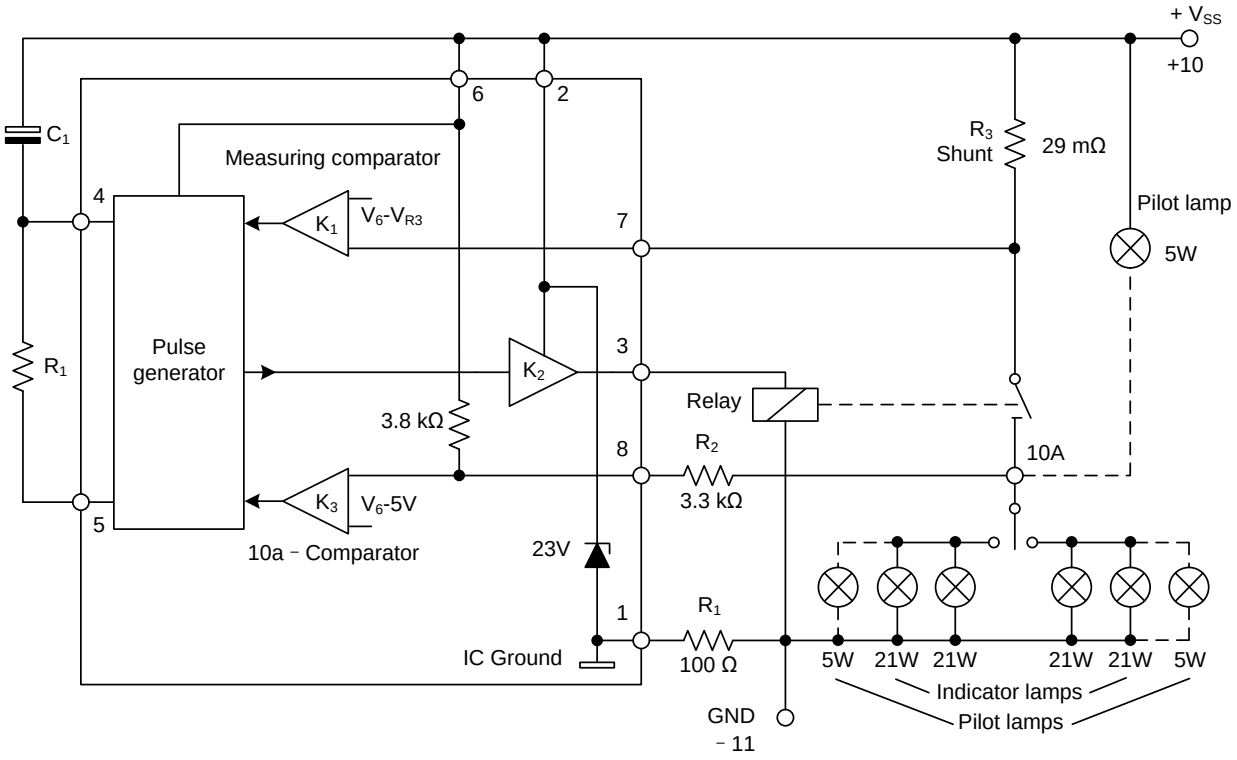
■ PIN CONFIGRATION



■ PIN DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION
1	GND	IC ground
2	V_{SS}	Supply voltage, V_{SS} - Power
3	REL	Relay control output (driver)
4	OSC	Oscillator (C1)
5	OSC	Oscillator (R_1)
6	V_{SS}	Supply voltage, Sense
7	LD	Lamp failure detection
8	SI	Start input (10a)

■ BLOCK DIAGRAM AND APPLICATION CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (Reference point Pin 1)

PARAMETERS		SYMBOL	RATINGS	UNIT
Supply Voltage Pins 2, 6		V_{SS}	16.5	V
Surge Forward Current				
t_p = 0.1ms Pins 2, 6		I_{FSM}	1.5	A
t_p = 2ms Pins 2, 6		I_{FSM}	1.0	A
t_p = 2ms Pin 8		I_{FSM}	50	mA
Output Current Pin 3		I_{OUT}	0.3	A
Power Dissipation T_A = 95°C	DIP-8	P_D	420	mW
	SOP-8		340	mW
Power Dissipation T_A = 60°C	DIP-8	P_D	690	mW
	SOP-8		560	mW
Junction Temperature		T_J	+150	°C
Ambient Temperature		T_A	-40 ~ +95	°C
Storage Temperature		T_{STG}	-55 ~ +150	°C

■ THERMAL DATA

PARAMETERS		SYMBOL	RATINGS	UNIT
Thermal Resistance (Junction to Ambient)	DIP-8	θ_{JA}	110	K/W
	SOP-8		160	K/W

■ ELECTRICAL CHARACTERISTICS

(V_{SS} (+10, Pins 2 and 6) = 12V. Reference point ground (-11), T_A = 25°C, unless otherwise specified)

PARAMETERS	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage Range	V_{SS}(+10)			9~15		V
Relay Output	V_{OUT}	Saturation voltage, I_{OUT}=150mA, V_{SS} = 9V			1.0	V
Supply current	I_{SS}	Dark phase or stand-by		4.5	8	mA
		Bright phase		7.0	11	mA
Relay Output Reverse Current	I_{OUT}				0.1	mA
Relay Coil Resistance	R_L		60			Ω
Start Delay	t_{ON}	First bright phase			10	ms
Frequency Determining Resistor	R_1		6.8		510	kΩ
Frequency Determining Capacitor	C_1				47	μF
Frequency Tolerance	Δf_1	Normal flashing, f1 excluding the tolerance of R_1 and C_1	-5		+5	%
Bright Period	Δf_1	Basic frequency f_1	47		53	%
	Δf_2	Control frequency f_2	37		45	%
Frequency Increase	f_2	Lamp outage	2.15xf1		2.3xf1	Hz
Control Signal Threshold	V_{R3}	V_{SS} = 15V Pin 7	75	86	97	mV
	V_{R3}	V_{SS} = 9V	56	66	76	mV
	V_{R3}	V_{SS} = 12V	66	77	87	mV
Leakage Resistance	R_{LEAK}	10a to GND		2	5	kΩ
Lamp Load	P_L		10			W

Note: Typical values under normal operation in application circuit.

■ FUNCTIONAL DESCRIPTION

Pin 1, GND, IC ground

In the case of battery reversal, resistor R_4 to ground (-11) will protect the IC against damage. An integrated protection circuit together with external resistances R_2 and R_4 limits the current pulses in the IC.

Pin 2, Supply voltage, V_{SS} - Power

On the PCB connection, the arrangement of the supply connections to Pin 2 must be so as to ensure that, the resistance of V_{SS} to Pin 6 is lower than that to Pin 2.

Pin 3, Relay control output (driver)

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

Pin 4 and 5 Oscillator (C_1 and R_1)

Flashing frequency, f_1, is determined by the R_1 C_1 components as follows (see Application Citcuit):

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

where $C_1 \leq 47\mu F$

R_1 = 6.8kΩ to 510kΩ

In case of a lamp outage, 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)

Pin 6, Supply voltage, Sense

A minimized layer resistance from point V_S/shunt to Pin 6 is recommended to accurate monitoring via the shunt resistor.

Pin 7, Lamp outage detection

The lamp current is monitored via an external shunt resistor R_3 and an internal comparator K_1 with its reference voltage of typ. 77mV (V_{SS} = 12V). The outage of one lamp out of two lamps is detected according to the following calculation:

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

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

The detection threshold is recommended to be set 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 = 77mV / 2.7A ≈ 29mΩ.

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.

Pin 8, Start input

Start condition for flashing: the voltage at Pin 8 has to be less than V_{SS} - 5V (flasher switch closed).

Humidity and dirt may decrease the resistance between 10a and GND. If this leakage resistance is > 5kΩ the IC is still kept in its off-condition. In this case the voltage at Pin 8 is greater than V_{SS} - 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.

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