

UAA1041

Automotive Direction Indicator

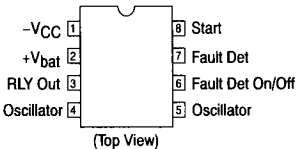
This device was designed for use in conjunction with a relay in automotive applications. It is also applicable for other warning lamps such as "handbrake ON," etc.

- Defective Lamp Detection
- Overvoltage Protection
- Short Circuit Detection and Relay Shutdown to Prevent Risk of Fire
- Reverse Battery Connection Protection
- Integrated Suppression Clamp Diode

Automotive Direction Indicator
Silicon Monolithic Integrated Circuit



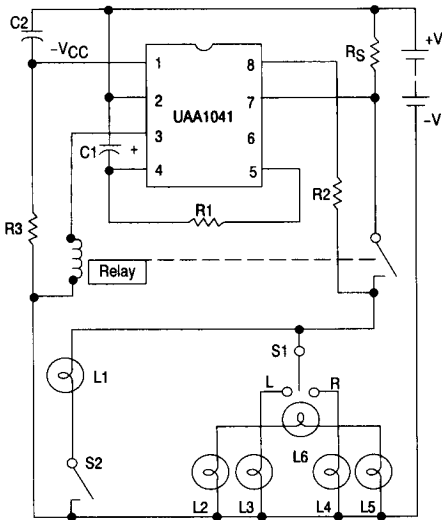
PIN CONNECTIONS



ORDERING INFORMATION

Device	Ambient Temperature Range	Package
UAA1041D	-40° to + 100°C	SO-8
UAA1041P		Plastic DIP

Figure 1. Typical Automotive System



L1: 1.2 W, warning light handbrake ON
L2, L3, L4, L5: 21 W, turn signals
R1 = 75 k RS = 30 mΩ
R2 = 3.3 k C1 = 5.6 μF
R3 = 220 Ω C2 = 0.047 μF

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MAXIMUM RATINGS

Rating	Pin	Value	Unit
Current: Continuous/Pulse*	1	+150/+500 -35/-500	mA
	2	+/-350/1900	
	3	+/-300/1400	
	8	+/-25/50	
Junction Temperature	T _J	150	°C
Operating Ambient Temperature Range	T _A	-40 to + 100	°C
Storage Temperature Range	T _{stg}	-65 to + 150	°C

* One pulse with an exponential decay and with a time constant of 500 ms.

ELECTRICAL CHARACTERISTICS (T₁ = 25°C)

Characteristics	Symbol	Min	Typ	Max	Unit
Battery Voltage Range (normal operation)	V _B	8.0	—	18	V
Overvoltage Detector Threshold (V _{Pin2} -V _{Pin1})	D _{th} (OV)	19	20.2	21.5	V
Clamping Voltage (V _{Pin2} -V _{Pin1})	V _{IK}	29	31.5	34	V
Short Circuit Detector Threshold (V _{Pin2} -V _{Pin7})	D _{th} (SC)	0.63	0.7	0.77	V
Output Voltage (I _{relay} = -250 mA) (V _{Pin2} -V _{Pin3})	V _O	—	—	1.5	V
Starter Resistance R _{st} = R ₂ + R _{Lamp}	R _{st}	—	—	3.6	kΩ†
Oscillator Constant (normal operation)	K _n	1.4	1.5	1.6	—
Temperature Coefficient of K _n	K _n	—	-1.5x10 ⁻³	—	1/°C
Duty Cycle (normal operation)	—	45	50	55	%
Oscillator Constant — (1 lamp defect of 21 W)	K _F	0.63	0.68	0.73	—
Duty Cycle (1 lamp defect of 21 W)	—	35	40	45	%
Oscillator Constant	K1	0.167	0.18	0.193	—
	K2	0.25	0.27	0.29	
	K3	0.126	0.13	0.14	
Current Consumption (relay off) Pin 1; at V _{Pin2} - V _{Pin1} = 8.0 V = 13.5 V = 18 V	I _{CC}	—	-0.9	—	mA
		-2.5	-1.6	-1.0	
		—	-2.2	—	
Current Consumption (relay on) Pin 1; at V _{Pin2} - V _{Pin1} = 8.0 V = 13.5 V = 18 V	—	—	-3.8	—	mA
		—	-5.6	—	
		—	-6.9	—	
Defect Lamp Detector Threshold at V _{Pin2} to V _B = 8.0 V and R ₃ = 220 Ω = 13.5 V = 18 V	V _{Pin2} -V _{Pin7}	—	68	—	mV
	V _{Pin2} -V _{Pin7}	79	85.3	91	
	V _{Pin2} -V _{Pin7}	—	100	—	

† See Note 1 of Application Information

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CIRCUIT DESCRIPTION

The circuit is designed to drive the direction indicator flasher relay. Figure 2 shows the typical system configuration with the external components. It consists of a network (R1, C1) to determine the oscillator frequency, shunt resistor (R_S) to detect defective bulbs and short circuits in the system, and two current limiting resistors (R₂/R₃) to protect the IC against load dump transients. The circuit can be used either with or without short circuit detection, and features overvoltage, defective lamp and short circuit detection.

The lightbulbs L2, L3, L4, L5 are the turn signal indicators with the dashboard-light L6. When switch S1 is closed, after a time delay of t₁ (in our example t₁ = 75 ms), the relay will be actuated. The corresponding lightbulbs (L2, L3 or L4, L5) will flash at the oscillator frequency, independent of the battery voltage of 8.0 V to 18 V. The flashing cycle stops and the circuit is reset to the initial position when switch S1 is open.

Overvoltage Detection

Senses the battery voltage. When this voltage exceeds 20.2 V (this is the case when two batteries are connected in series), the relay will be turned off to protect the lightbulbs

Lightbulb Defect Detector

Senses the current through the shunt resistor R_S. When one of the lightbulbs is defective, the failure is indicated by doubling the flashing frequency.

Short Circuit Detector

Detects excessive current (I_{sh} > 25 A) flowing in the shunt resistor R_S. The detection takes place after a time delay of t₃ (t₃ = 55 ms). In this case, the relay will be turned off. The circuit is reset by switching S1 to the off position.

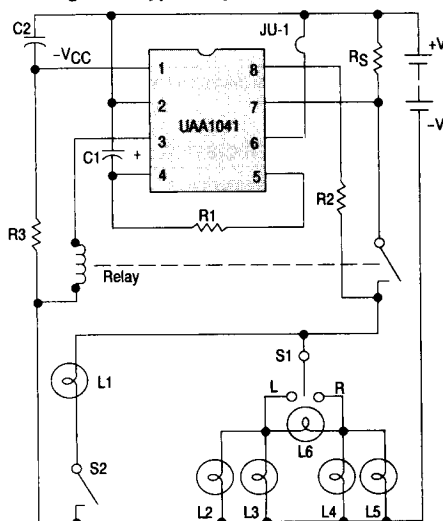
Operation with Short Circuit Detection

Pin 6 has to be left open and a capacitor C₂ has to be connected between Pin 1 and Pin 2.

Operation without Short Circuit Detection

Pin 6 has to be connected to Pin 2, and the use of capacitor C₂ is not necessary. The circuit can also be used for other warning flashers. In this example, when the handbrake is engaged, it is signaled by the light (L1).

Figure 2. Typical System Configuration



PARTS LIST

R1 = 75 kΩ	Relay-Coil Resistance
R2 = 3.3 kΩ	Range 60 Ω to 800 Ω
R3 = 220 Ω	
R _S = 30 mΩ	Note: Per text connect
Wire Resistor	jumper JU-1 bypass
C1 = 5.6 μF	short circuit detector
C2 = 0.047 μF	C2 may be deleted also.

APPLICATION INFORMATION

- The flashing cycle is started by closing S1. The switch position is sensed across resistor R₂ and R_{Lamp} by input 8.

$$R_{St} = R_2 + R_{Lamp}$$

The condition for the start is: R_{St} < 3.6 kΩ.

For correct operation, leakage resistance from Pin 8 to ground must be greater than 5.6 kΩ.

- Flashing frequency: $f_n = \frac{1}{R_1 C_1 K_n}$
- Flashing frequency in the case of one defective lightbulb of 21 W:

$$f_F = \frac{1}{R_1 C_1 K_F} \quad K_n = 2,2 K_F$$

- t₁: delay at the moment when S1 is closed and first flash
t₁ = K₁R₁C₁
- t₂: defective lightbulb detection delay t₂ = K₂R₁C₁
- t₃: short circuit detection delay t₃ = K₃R₁C₁
In the case of short circuit — it is assumed that the voltage (V_{Pin2} - V_{Pin1}) ≥ 8.0 V. The relay will be turned off after delay t₃. The circuit is reset by switching S1 to the off position.
- The capacitor C₂ is not obligatory when the short circuit detector is not used. In this case Pin 6 has to be connected to Pin 2.
- When overvoltage is sensed (V_{Pin2} - V_{Pin1}) the relay is turned off to protect the relay and the lightbulbs against excessive currents.