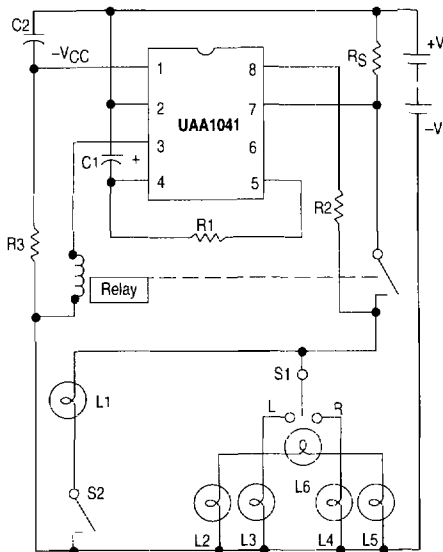


# Automotive Direction Indicator

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

**Figure 1. Typical Automotive System**



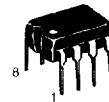
L1: 1.2 W, warning light handbrake ON  
L2, L3, L4, L5: 21 W, turn signals

R1 = 75 k                      R<sub>S</sub> = 20 mΩ  
R2 = 3.3 k                     C1 = 5.6 μF  
R3 = 220 Ω                    C2 = 0.047 μF

## UAA1041B

### AUTOMOTIVE DIRECTION INDICATOR

#### SEMICONDUCTOR TECHNICAL DATA

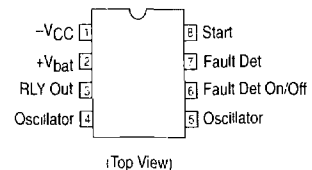


**NO SUFFIX**  
PLASTIC PACKAGE  
CASE 626



**D SUFFIX**  
PLASTIC PACKAGE  
CASE 751  
(SO-8)

#### PIN CONNECTIONS



#### ORDERING INFORMATION

Device	Operating Temperature Range	Package
UAA1041BD	T <sub>A</sub> = - 40 to +100° C	SO-8
UAA1041B		Plastic DIP

# UAA1041B

## 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 <sub>J</sub>	150	°C
Operating Ambient Temperature Range	T <sub>A</sub>	-40 to + 100	°C
Storage Temperature Range	T <sub>stg</sub>	-65 to + 150	°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	100	°C/W (Typ)

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

## ELECTRICAL CHARACTERISTICS (T<sub>1</sub> = 25°C)

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

† See Note 1 of Application Information

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# UAA1041B

## 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<sub>S</sub>) 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 t<sub>1</sub> (in our example t<sub>1</sub> = 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<sub>S</sub>. When one of the lightbulbs is defective, the failure is indicated by doubling the flashing frequency.

### Short Circuit Detector

Detects excessive current (I<sub>sh</sub> > 25 A) flowing in the shunt resistor R<sub>S</sub>. The detection takes place after a time delay of t<sub>3</sub> (t<sub>3</sub> = 55 ms). In this case, the relay will be turned off. The circuit is reset by switching S1 to the off position.

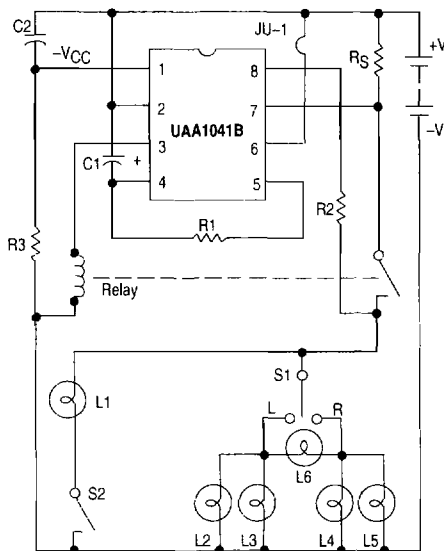
### Operation with Short Circuit Detection

Pin 6 has to be left open and a capacitor C<sub>2</sub> 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 C<sub>2</sub> 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 <sub>S</sub> = 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<sub>Lamp</sub> by Input 8.

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

The condition for the start is: R<sub>St</sub> < 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:

$$f_F = \frac{1}{R_1 C_1 K_F} \quad K_n = 2.2 K_F$$

- t<sub>1</sub>: delay at the moment when S1 is closed and first flash  $t_1 = K_1 R_1 C_1$
- t<sub>2</sub>: defective lightbulb detection delay  $t_2 = K_2 R_1 C_1$
- t<sub>3</sub>: short circuit detection delay  $t_3 = K_1 R_1 C_1$   
In the case of short circuit – it is assumed that the voltage (V<sub>Pin2</sub> - V<sub>Pin1</sub>) ≥ 8.0V. The relay will be turned off after delay t<sub>3</sub>. 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<sub>Pin2</sub> - V<sub>Pin1</sub>) the relay is turned off to protect the relay and the lightbulbs against excessive currents.