

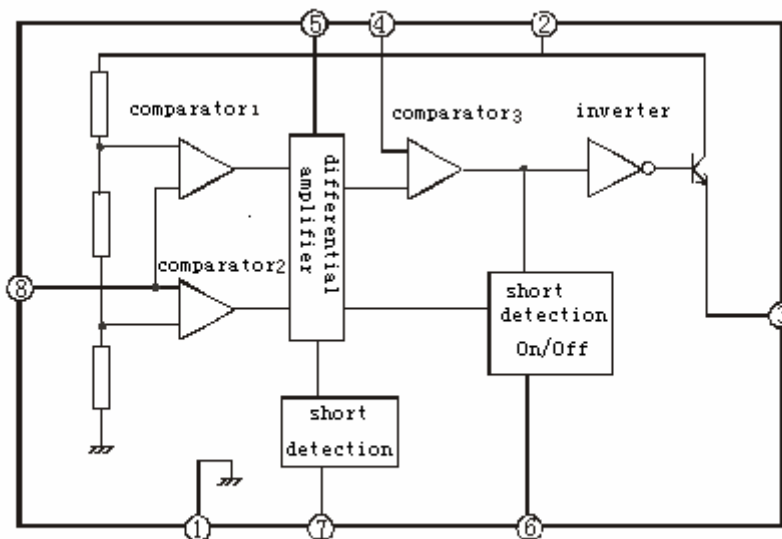
## Automotive Direction Indicator-TSE4041

TSE4041 is designed for use in conjunction with a relay in automotive applications .It is also application for other warning lamp such as “handbrake ON”,etc

### Features

- Defective Lamp Detection
- Overvoltage Protection
- Short Circuit Detection and Relay Shutdown to Prevent Risk of Fire
- Reverse Battery Connection Protection
- Package:DIP8
- Compatible :CV1041EP

### Function diagram



## Pin Functions

| Pin | Symbol | Functions  | Pin | Symbol    | Functions               |
|-----|--------|------------|-----|-----------|-------------------------|
| 1   | -Vcc   | Power -    | 5   | OSC       | Oscillator              |
| 2   | +Vbat  | Battery +  | 6   | F.Don/off | Fault Detection On /Off |
| 3   | OUTRLY | Output     | 7   | F.D       | Fault Detection         |
| 4   | OSC    | Oscillator | 8   | Sta       | Start Pin               |

## Absolute Rating(Tamb = 25°C unless otherwise noted)

| Parameter                       | Symbol             | Rating     | Unit |
|---------------------------------|--------------------|------------|------|
| Current Continuous/Pulse (Note) | I <sub>1</sub> (-) | -35/-500   | mA   |
|                                 | I <sub>1</sub> (+) | +150/+1500 |      |
|                                 | I <sub>2</sub> (-) | -350/-1400 |      |
|                                 | I <sub>2</sub> (+) | +350/+1400 |      |
|                                 | I <sub>3</sub> (-) | -300/-1400 |      |
|                                 | I <sub>3</sub> (+) | +300/+1400 |      |
|                                 | I <sub>8</sub> (-) | -25/-50    |      |
|                                 | I <sub>8</sub> (+) | +25/+50    |      |
| Junction Temperature            | T <sub>1</sub>     | 150        | °C   |
| Operating Temperature           | T <sub>amb</sub>   | -40~100    | °C   |
| Storage Temperature             | T <sub>stg</sub>   | -65~100    | °C   |

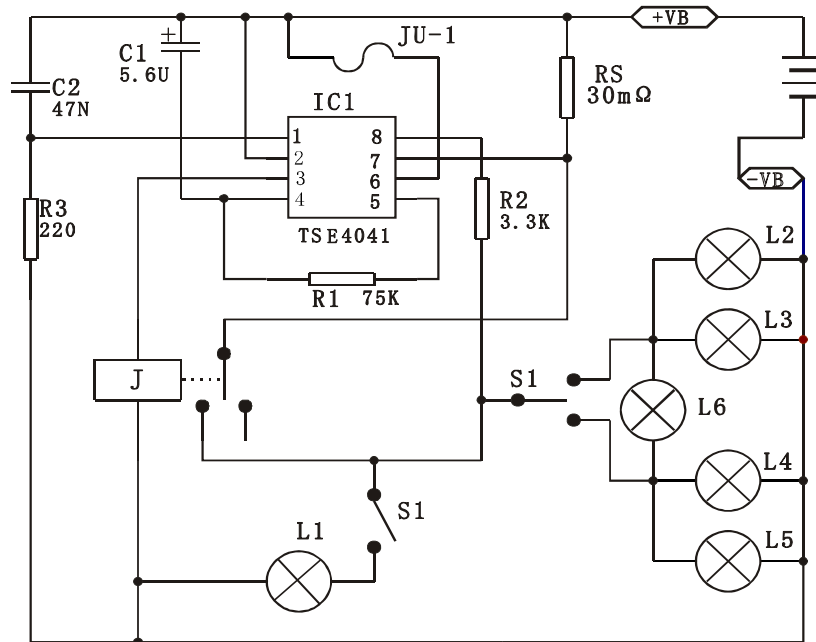
Note :One plus with an exponential decay and with a time constant of 500ms

## Electrical Characteristics (Tamb = 25°C unless otherwise noted)

| Parameter                        | Symbol              | Test Conditions                   | Criterion |      |      | Unit |
|----------------------------------|---------------------|-----------------------------------|-----------|------|------|------|
|                                  |                     |                                   | Min       | Typ  | Max  |      |
| Power supply                     | V <sub>b</sub>      | Normal Operation                  | 8         |      | 18   | V    |
| Overvoltage Detector Threshold   | D <sub>th(ov)</sub> | (V <sub>2</sub> -V <sub>1</sub> ) | 19        | 20.2 | 21.5 | V    |
| Clamping Voltage                 | V <sub>IK</sub>     | (V <sub>2</sub> -V <sub>1</sub> ) | 29        | 31.5 | 34   | V    |
| Short Circuit Detector Threshold | D <sub>th(sc)</sub> | (V <sub>2</sub> -V <sub>7</sub> ) | 0.63      | 0.7  | 0.77 | V    |

|                                                  |                                |                                                    |      |                       |      |      |    |
|--------------------------------------------------|--------------------------------|----------------------------------------------------|------|-----------------------|------|------|----|
| Output Voltage (V <sub>2</sub> -V <sub>3</sub> ) | V <sub>0</sub>                 | I <sub>relay</sub> =-250mA                         |      |                       | 1.5  | V    |    |
| Starter Resistance                               | R <sub>st</sub>                | R <sub>st</sub> =R <sub>2</sub> +R <sub>lamp</sub> |      |                       | 3.6  | kΩ   |    |
| Oscillator Constant                              | K <sub>n</sub>                 | Normal Operation                                   | 1.4  | 1.5                   | 1.6  |      |    |
| Temperature Coefficient (K <sub>n</sub> )        | K <sub>n</sub>                 |                                                    |      | -1.5×10 <sup>-3</sup> |      | 1/°C |    |
| Oscillator Constant                              | K <sub>F</sub>                 | 21W1lamp defect                                    | 0.63 | 0.68                  | 0.73 |      |    |
| Duty Cycle                                       |                                | 21W1 lamp defect                                   | 35   | 40                    | 45   | %    |    |
|                                                  |                                | Normal Operation                                   | 45   | 50                    | 55   | %    |    |
| Oscillator Constant                              | K <sub>1</sub>                 |                                                    | 0.17 | 0.18                  | 0.19 |      |    |
|                                                  | K <sub>2</sub>                 |                                                    | 0.25 | 0.27                  | 0.29 |      |    |
|                                                  | K <sub>3</sub>                 |                                                    | 0.13 | 0.13                  | 0.14 |      |    |
| Supply Current (Pin1)                            | I <sub>cc</sub>                | Relay off                                          |      |                       |      |      | mA |
|                                                  |                                | V <sub>2</sub> -V <sub>1</sub> =8.0V               |      |                       | -3.4 |      |    |
|                                                  |                                | V <sub>2</sub> -V <sub>1</sub> =13.5V              | -6.5 |                       | -5.5 | -2.7 |    |
|                                                  |                                | V <sub>2</sub> -V <sub>1</sub> =18V                |      |                       | -6.6 |      |    |
|                                                  |                                | Relay On                                           |      |                       |      |      | mA |
|                                                  |                                | V <sub>2</sub> -V <sub>1</sub> =8.0V               |      |                       | -3.8 |      |    |
|                                                  |                                | V <sub>2</sub> -V <sub>1</sub> =13.5V              | -8.0 |                       | -5.6 | -2.7 |    |
| V <sub>2</sub> -V <sub>1</sub> =18V              |                                |                                                    | -6.9 |                       |      |      |    |
| Defect Lamp Detector Threshold                   | V <sub>2</sub> -V <sub>7</sub> | R <sub>3</sub> =220Ω                               |      |                       |      |      | mV |
|                                                  |                                | V <sub>2</sub> ~V <sub>B</sub> =8.0V               |      |                       | 68   |      |    |
|                                                  |                                | V <sub>2</sub> ~V <sub>B</sub> =13.5V              | 79   |                       | 85.3 | 91   |    |
|                                                  |                                | V <sub>2</sub> ~V <sub>B</sub> =18V                |      |                       | 100  |      |    |

## Application Circuit



If use JU-1 as shunt detector, the use of capacitor C2 is not necessary.  
Short circuit detection is used, Pin6 must be open

## Circuit Description

The circuit is designed to drive the direction indicator flasher relay. It consists of a network (R1,C1) to determine the oscillator frequency. Shunt resistor (Rs) 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 over-voltage, defective lamp and short circuit detection. The light bulbs L2, L3, L4, L5 are the turn signal indicators. When switch S1 is closed, after a time delay of  $t_1$  (in our example  $t_1 = 75$  ms), the relay will be actuated. The corresponding light bulbs (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

Sense 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

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

### 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).

## Application Information

1. The flashing cycle is started by closing S1. The switch position is sensed across resistor R2 and RLamp by Input 8.

$R_{st} = R2 + RLamp$ . The condition for the start is:  $R_{st} < 3.6 \text{ kW}$ . For correct operation, leakage resistance from Pin 8 to ground must be greater than 5.6 kW.

2. Flashing frequency:  $f_n = \frac{1}{R_1 C_1 K_n}$

3. Flashing frequency in the case of one defective lightbulb of 21 W:

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

4. t1: delay at the moment when S1 is closed and first flash:

$$t_1 = K_1 R_1 C$$

5. t2: defective lightbulb detection delay  $t_2 = K_2 R_1 C_1$

6. t3: short circuit detection delay  $t_3 = K_1 R_1 C_1$  In the case of short circuit – it is assumed that the voltage  $(V_{Pin2} - V_{Pin1}) \geq 8.0V$ . The relay will be turned off after delay t3. The circuit is reset by switching S1 to the off position.

7. Detector is not used. the capacitor C1 is not obligatory. In this case Pin 6 has to be connected to Pin 2.

8. When overvoltage is sensed  $(V_{Pin2} - V_{Pin1})$  the relay is turned off to protect the relay and the lightbulbs against excessive currents.