MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

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UAA1044

Designer's Data Sheet

Automotive direction indicator

. . . designed for use in conjunction with a relay in automotive applications.

- Defective Lamp Detection
- Overvoltage Protection
- Reverse Battery Connection Protection
- Integrated Suppression Clamp Diode

AUTOMOTIVE DIRECTION INDICATOR

SILICON MONOLITHIC INTEGRATED CIRCUIT

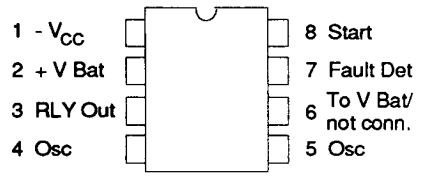
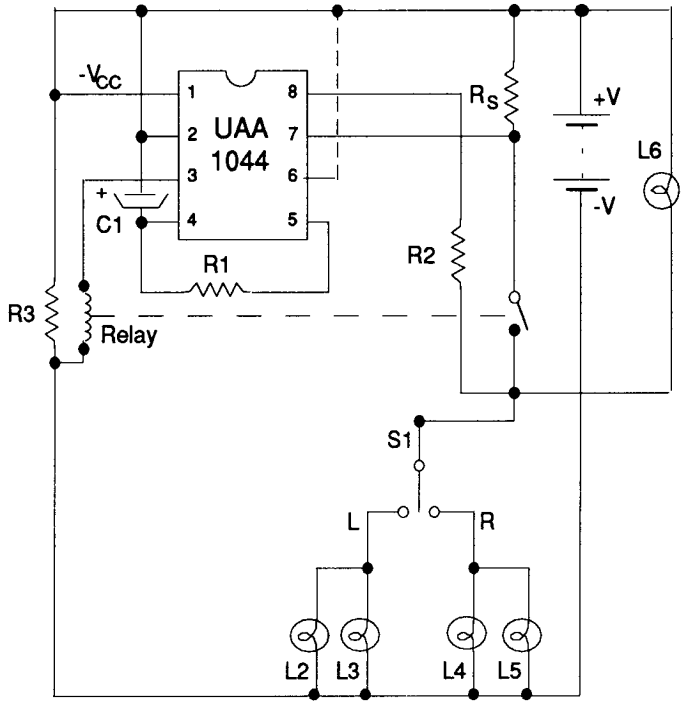
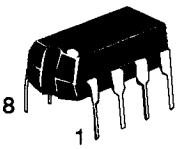


FIGURE 1 – TYPICAL AUTOMOTIVE SYSTEM

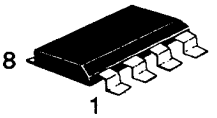


L6: dashboard light (3W typical) L2, L3, L4, L5: 21W, turn signals

R1 = 75 kΩ R2 = 3.3 kΩ R3 = 220 Ω
Rs = 30 mΩ C1 = 5.6 µF



PLASTIC PACKAGE
CASE 626-04



D SUFFIX
PLASTIC PACKAGE
CASE 751-01
SO-8

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MAXIMUM RATINGS

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

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

ELECTRICAL CHARACTERISTICS (T_1 = 25°C)

Characteristics	Symbol	Min	Typ	Max	Unit
Battery Voltage Range (normal operation)	V_B	8	—	18	V
Overvoltage Detector Threshold	$V_{Pin2} - V_{Pin1}$	19	20.2	21.5	V
Clamping Voltage	$V_{Pin2} - V_{Pin1}$	29	31.5	34	V
Starting Threshold Voltage	$V_{Pin2} - V_{Pin7}$	25	—	—	mV
Output Voltage (I_{relay} = – 250 mA)	$V_{Pin2} - V_{Pin3}$	—	—	1.5	V
Oscillator Constant (normal operation)	K_n	1.4	1.5	1.6	—
Temperature Coefficient of Kn	kn	—	$- 1.5 \times 10^{-3}$	—	1/°C
Duty Cycle (normal operation)	—	45	50	55	%
Oscillator Constant — (1 lamp defect of 21 W)	KF	0.63	0.68	0.73	—
Duty Cycle (1 lamp defect of 21 W)	—	35	40	45	%
Oscillator Constant	K1 K2 K3	— — —	0.180 0.270 0.130	— — —	—
Current Consumption (relay off) Pin 1; at $V_{Pin2} - V_{Pin1}$ = 8.0 V = 13.5V = 18V	I_{CC}	 — - 2 —	 - 0.9 - 1.6 - 2.2	 — — —	mA
Current Consumption (relay on) Pin 1; at $V_{Pin2} - V_{Pin1}$ = 8.0 V = 13.5 V = 18 V	—	 — — —	 - 3.8 - 5.6 - 6.9	 — — —	mA
Defect Lamp Detector Threshold (with R3 = 220Ω) at V_{Pin2} to - V_B = 8.0 V = 13.5 V = 18 V	 $V_{Pin2} - V_{Pin7}$ $V_{Pin2} - V_{Pin7}$ $V_{Pin2} - V_{Pin7}$	 — — —	 67 85.3 100	 — — —	mV

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 in the system, and two current limiting resistors (R_2/R_3) to protect the IC against load dump transients.

Light bulbs 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_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 the switch S1 is open.

The circuit features overvoltage and defective lamp detection.

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 light bulbs.

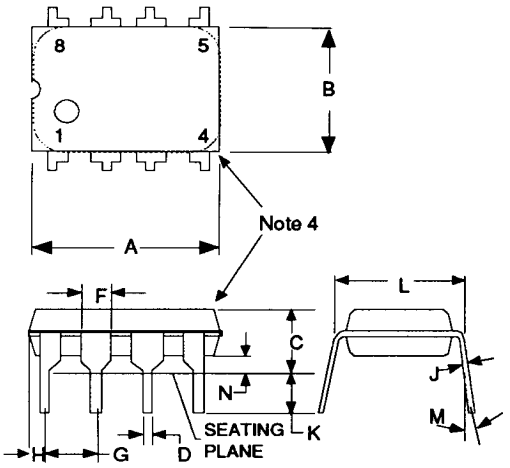
Light bulb defect detector:
Senses the current through the shunt resistor R_s. When one of the light bulbs is defective, the failure is indicated by doubling the flashing frequency.

APPLICATION INFORMATION

1. The flashing cycle is started by closing S1. The switch position is sensed across resistor R_2 and R_S.
   The maximum starting load is 40Ω
2. f_n : Flashing frequency: $f_n = \frac{1}{R_1 C_1 K_n}$
3. f_F: Flashing frequency in the case of one defective light bulb of 21 W.
   $f_F = \frac{1}{R_1 C_1 K_1}$ $K_n = 2.2 K_F$
4. t_1 : delay at the moment when S1 is closed and first flash $t_1 = K_1 R_1 C_1$
5. t_2 : defective light bulb detection delay $t_2 = K_2 R_1 C_1$
6. When overvoltage is sensed ($V_{Pin2} - V_{Pin1}$) the relay is turned off to protect the relay and the light bulbs against excessive currents.

PLASTIC PACKAGE
CASE 626-04

$R_{\theta JA}$ = 100°C/W (Typ)



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.52	0.040	0.060
G	2.54 BSC		2.54 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	—	10°	—	10°
N	0.51	0.76	0.020	0.030

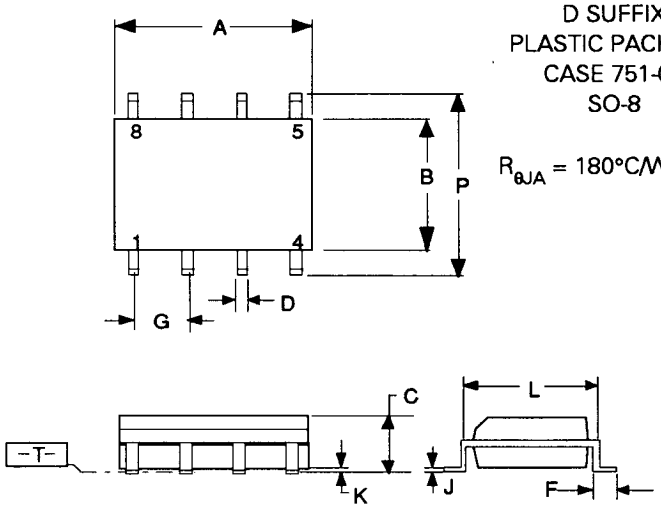
NOTES:
1. LEAD POSITIONAL TOLERANCE

⊕	ϕ 0.13 (0.005) Ⓜ	T	A Ⓜ	B Ⓜ

2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
4. DIMENSIONS A AND B ARE DATUMS.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

D SUFFIX
PLASTIC PACKAGE
CASE 751-01
SO-8

$R_{\theta JA}$ = 180°C/W (Typ)



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.78	5.00	0.188	0.197
B	3.81	4.01	0.150	0.158
C	1.35	1.75	0.053	0.069
D	0.35	0.46	0.014	0.018
F	0.67	0.77	0.026	0.030
G	1.27 BSC		0.050 BSC	
J	0.19	0.22	0.007	0.009
K	0.10	0.20	0.004	0.008
L	4.82	5.21	0.189	0.205
P	5.79	6.20	0.228	0.244

NOTES:
1. -T- IS SEATING PLANE.
2. DIMENSION A IS DATUM.
3. POSITIONAL TOLERANCE FOR LEADS:

⊕	0.25 (0.010) Ⓜ	A Ⓢ

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