Order this document by MC33193/D

MOTOROLA

MC33193

Automotive Direction Indicator

The MC33193 is a new generation industry standard UAA1041 “Flasher”. It has been developed for enhanced EMI sensitivity, system reliability, and improved wiring simplification. The MC33193 is pin compatible with the UAA1041 and UAA1041B in the standard application configuration as shown in Figure 9, without lamp short circuit detection and using a 20 mΩ shunt resistor. The MC33193 has a standby mode of operation requiring very low standby supply current and can be directly connected to the vehicle’s battery. It includes an RF filter on the Fault detection pin (Pin 7) for EMI purposes. Fault detection thresholds are reduced relative to those of the UAA1041, allowing a lower shunt resistance value (20 mΩ) to be used.

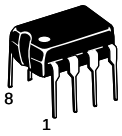
- Pin Compatible with the UAA1041
- Defective Lamp Detection Threshold
- RF Filter for EMI Purposes
- Load Dump Protection
- Double Battery Capability for Jump Start Protection
- Internal Free Wheeling Diode Protection
- Low Standby Current Mode

AUTOMOTIVE DIRECTION INDICATOR

SEMICONDUCTOR TECHNICAL DATA

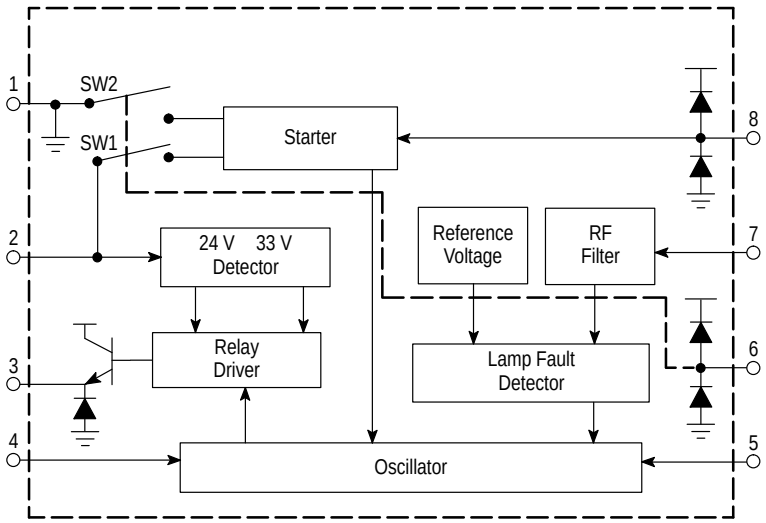


D SUFFIX
PLASTIC PACKAGE
CASE 751
(SO–8)



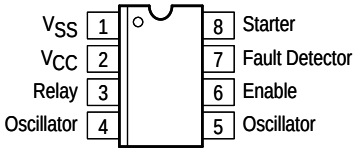
P SUFFIX
PLASTIC PACKAGE
CASE 626

Simplified Block Diagram



This device contains 60 active transistors.

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC33193D	T_A = –40° to 125°C	SO–8
MC33193P		DIP–8

© Motorola, Inc. 1998

For More Information On This Product,
Go to: www.freescale.com

Freescale Semiconductor, Inc.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Pin 1 Positive Current (Continuous/Pulse)	I1+	150 to 500	mA
Pin 1 Negative Current (Continuous/Pulse)	I1–	–35 to –500	mA
Pin 2 Current (Continuous/Pulse)	I2	±350 to ±1900	mA
Pin 3 Current (Continuous/Pulse)	I3	±300 to ±1400	mA
Pin 8 Current (Continuous/Pulse)	I8	±25 to ±50	mA
ESD (All Pins Except Pin 4 for Negative Pulse)	V_{ESD}	±2000	V
ESD (Pin 4 Negative Pulse)	$V_{ESD4–}$	–1000	V
Junction Temperature	T_J	150	°C
Operation Ambient Temperature Range	T_A	–40 to 125	°C
Storage Temperature Range	T_{stg}	–65 to 150	°C

NOTE: ESD data available upon request.

ELECTRICAL CHARACTERISTICS (–40°C ≤ T_A ≤ 125°C, 8.0 V ≤ V_{CC} ≤ 18 V, unless otherwise noted. Typical values reflect approximate mean at T_A = 25°C, V_{CC} = 14 V at the time of initial device characterization.)

Characteristic	Symbol	Min	Typ	Max	Unit
Battery Voltage Range (Normal Operation)	V_b	8.0	–	18	V
Overvoltage Detector Threshold ($V_{Pin2} – V_{Pin1}$)	V_{ih}	19	20.2	22	V
Clamping Voltage (R2 = 220 Ω)	V_{cl}	27	29.2	34	V
Output Voltage [I = –250 mA ($V_{Pin2} – V_{Pin3}$)]	V_{sat}	–	–	1.5	V
Starter Resistance (R_{st} = R2 + R_{Lamp})	R_{st}	–	3.3	3.6	kΩ
Oscillator Constant (Normal Operation, T_A = 25°C)	K_n	1.3	1.5	1.75	X
Temperature Coefficient of K_n	TC_{Kn}	–	0.001	–	1/°C
Duty Cycle (Normal Operation)	–	45	50	55	%
Oscillator Constant (One 21 W Lamp Defect, T_A = 25°C)	K_f	0.63	0.68	0.73	X
Duty Cycle (One 21 W Lamp Defect)	–	35	40	45	%
Oscillator Constant (T_A = 25°C)	K1 K2	0.167 0.250	0.180 0.270	0.193 0.290	–
Standby Current (Ignition “Off”)	I_{CC}	–	2.0	100	μA
Current Consumption (Relay “Off,” Enable Pin 6 High) V_{bat} = 8.0 V, R3 = 220 Ω, T_A = 25°C V_{bat} = 13.5 V, R3 = 220 Ω V_{bat} = 18 V, R3 = 220 Ω, T_A = 25°C	I_{CC}	 – – –	 1.40 2.16 2.64	 – 3.5 –	mA
Current Consumption (Relay “On”) V_{bat} = 8.0 V, R3 = 220 Ω, T_A = 25°C V_{bat} = 13.5 V, R3 = 220 Ω V_{bat} = 18 V, R3 = 220 Ω, T_A = 25°C	I_{CC}	 – – –	 1.62 2.06 3.30	 – 6.0 –	mA
Defect Lamp Detector Threshold [R3 = 220 Ω, ($V_{Pin2} – V_{Pin7}$)] V_{bat} = 8.0 V, T_A = 25°C V_{bat} = 13.5 V V_{bat} = 18 V, T_A = 25°C	V_S	 – 46.5 –	 43.6 51.0 57.0	 – 56 –	mV
Temperature Coefficient of V_S	TC_{Vs}	–	0.3×10^{-3}	–	1/°C

Freescale Semiconductor, Inc.

For More Information On This Product,
Go to: www.freescale.com

Figure 1. Normal Operation Oscillator Timing Diagram

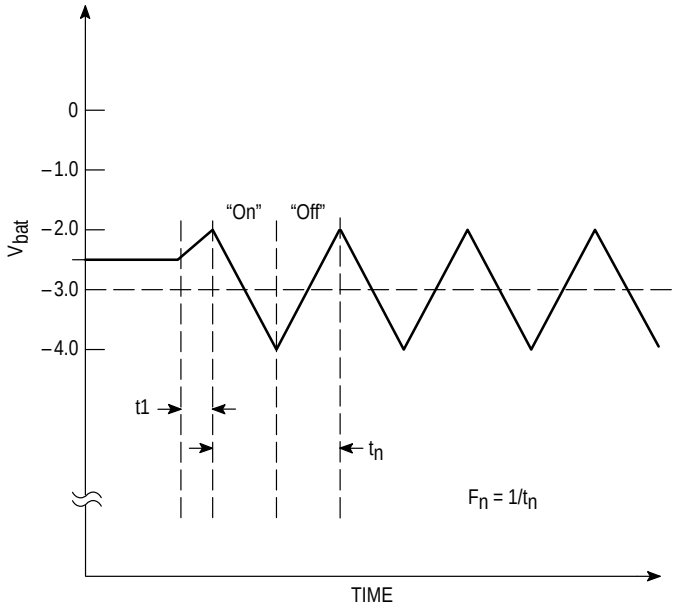
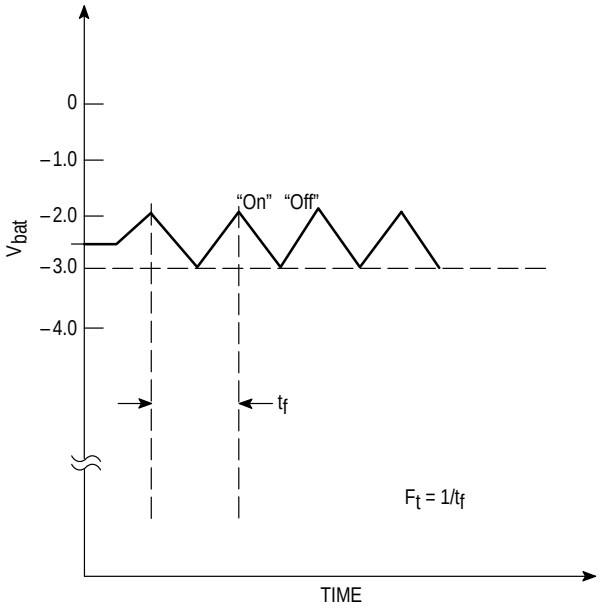


Figure 2. One Defective Lamp Oscillator Timing Diagram



INTRODUCTION

The MC33193 is designed to drive the direction indicator flasher relay. It is a new generation industry standard UAA1041 "Flasher". It consists of the following functions:

- Supply and Protections
- On–Chip Relay Driver
- Oscillator
- Starter Functions
- Lamp Fault Detector with Internal RF Filter
- Standby Mode

Supply and Protection Systems

Pin 1 is connected to ground via resistor R3 which limits the current in the event of any high voltage transients. Pin 2 (V_{CC}) is the positive supply and may be connected directly to the vehicle's battery voltage.

Overvoltage and Double Battery Protection: When the applied V_{CC} to V_{SS} voltage is greater than 22 V, the overvoltage detector circuit turns the relay driver off. Both the device and the lamps are protected if two 12 V batteries are connected in series and used to jump start the vehicle.

Load Dump Overvoltage Protection: A 29 V overvoltage detector protects the circuits against high voltage transients due to load dumps and other low energy spikes. The relay driver is automatically turned on whenever the V_{CC} to V_{SS} voltage is greater than 34 V.

Overvoltage Protection, High Voltage Transients: The Enable and the Starter pins are protected against positive and negative transients by internal on–chip diodes.

On–Chip Relay Driver

The device directly drives the flasher relay. The output structure is an Emitter of an NPN transistor. It contains the free wheeling diode circuitry necessary to protect the device whenever the relay is switched off.

Oscillator

The device uses a sawtooth oscillator (Figure 1).

The frequency is determined by the external components C1 and R1. In the normal operating mode, the flashing frequency is: $F_n = 1/R1*C1*K_n$. With a defective (open) 21 W lamp (Figure 2), the flashing frequency changes to: $F_n = 2.2*F_n$.

The typical first flash delay (the time between the moment when the indicator switch is closed and the first lamp flash occurs) is: t1 = K1*R1*C1

The fault detection delay is from the time relay R1 is on and fault detection is enabled. Where a 21 W lamp opens, the delay is expressed as: t2 = K2*R1*C1

Starter

Pin 8 is connected through a 3.3 kΩ resistor to the flashing lamp. Pin 8 is the input to the Starter function and senses the use of S1 by sensing ground through the lamp (Figures 9 and 10).

Lamp Fault Detector with Internal RF Filter

A Lamp defect is sensed by the lamp fault detector's monitoring of the voltage developed across the external shunt resistor R_S via the RF filter. The R_S voltage drop is compared to a V_{bat} dependent internal reference voltage (V_{ref}) to validate the comparison over the full battery voltage range. A detected fault causes the oscillator to change frequency (Figure 2).

Standby Mode

When the ignition key and warning switches are open; Enable is in a low state and the internal switches, SW1 and SW2, are open and no current passes through the circuit. In this condition, the device's current consumption is zero (I_{CC} = 0). When ignition key and warning switches are closed; Enable is in a high state with SW1 and SW2 being closed and the circuit is powered on.

Freescale Semiconductor, Inc.

MAIN DIFFERENCES BETWEEN UAA1041B & MC33193

The MC33193 is pin compatible with the UAA1041.

Supply Current

Supply current is more stable on the MC33193 when the device is in “on” or “off” state. In “on” state the supply current is only 40% higher than when in the “off” state, as compared to a ratio of 3 times for the UAA1041. This results in a lower voltage drop across the ground resistor R3 (see On–Chip Relay Driver).

Short Circuit Detection

The MC33193 has no short circuit detection.

Standby Mode (Pin 6)

The UAA1041 has no standby mode. Pin 6 is used as an Enable/Disable for the short circuit detection.

The MC33193 uses Pin 6 to set the device in standby mode. If Pin 6 is connected to ground, the MC33193 is in the standby mode. In this mode, standby current is very low and Pin 8’s starter resistor R2 and a 2.0 kΩ internal resistor are switched off. As soon as Pin 6 is at a high level (typical threshold = $2V_{be}$) the device becomes active. In the application, the MC33193 can be connected directly to the battery and awakened whenever Pin 6 is connected to the vehicle’s battery by way of a protection resistor and the ignition key switch.

Lamp Defect Detection (Pin 7)

The UAA1041 operates with a 30 mΩ shunt resistor to sense the lamp current. It’s lamp defect detection threshold of Pin 7 is typically 85 mV.

The MC33193 is designed to operate with 20 mΩ shunt resistor and at a reduced threshold of 50 mV. This reduces power generation in the flasher module. In addition, the MC33193 incorporates an RF filter to enhance RFI immunity.

Load Dump and Overvoltage Behavior

The UAA1041 and MC33193 both behave the same in this regard. Both have double battery detection and lamp turn–off protection in the event of a jump start. During load dump, both devices are protected by an internal 30 V zener diode with the relay activated during a load dump.

Relay Driver

Drive capability of both devices is the same. Free wheeling diode protection is internal to both devices. The free wheeling voltage is $2V_{be}$ for the UAA1041 and $3V_{be}$ for the MC33193. This results in a higher clamp voltage across the relay and thus in a faster turn–off. In addition, the lower “on” state supply current is lower on the MC33193 and thus the voltage drop across the ground resistor R3 is reduced. This results in an even higher clamp voltage across the relay.

Oscillator Phase

The oscillator phase is opposite on the MC33193 as compared to the UAA1041. The Oscillator voltage is falling during “on” state and rising during “off” state for the MC33193.

Freescale Semiconductor, Inc.

For More Information On This Product,
Go to: www.freescale.com

Figure 3. Clamping Voltage versus Temperature

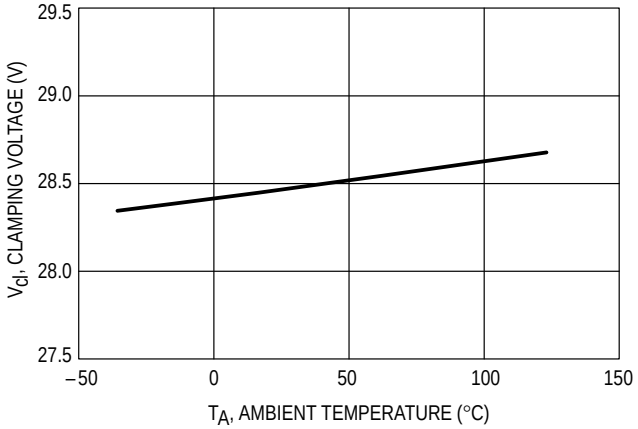


Figure 4. Overvoltage Detection versus Temperature

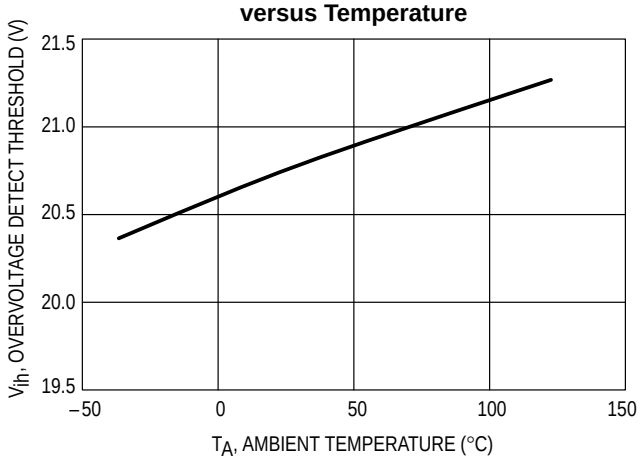


Figure 5. Supply Current versus Temperature

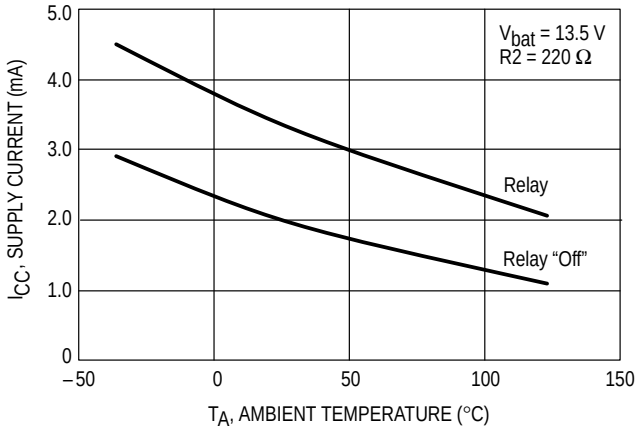


Figure 6. Output Voltage versus Temperature

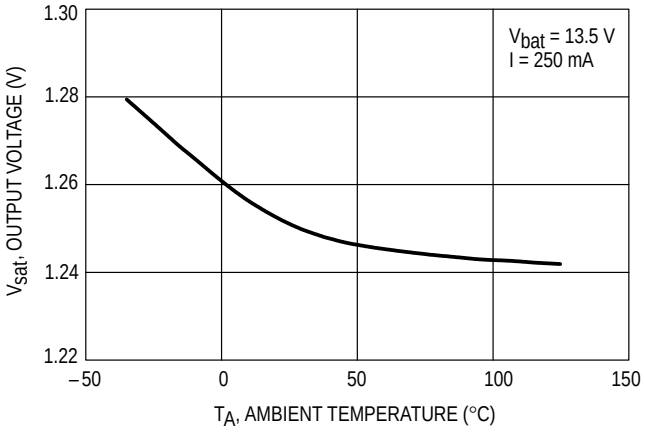


Figure 7. Defect Lamp Detection versus Temperature

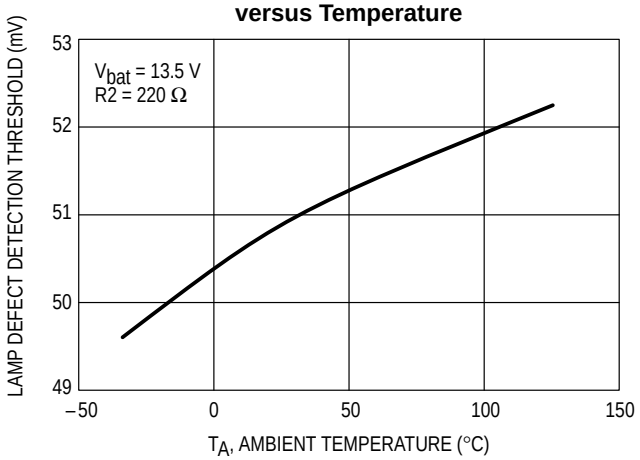
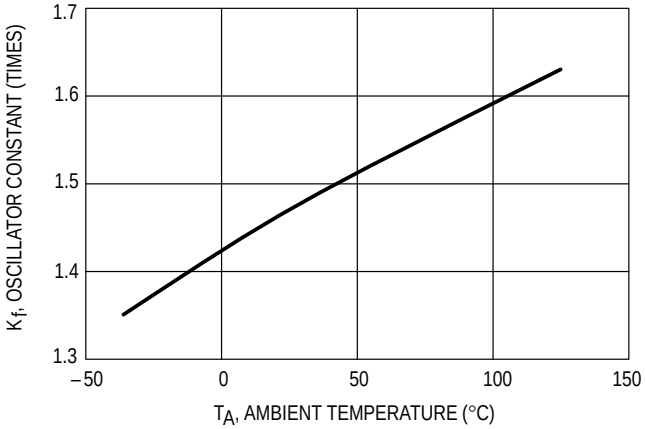


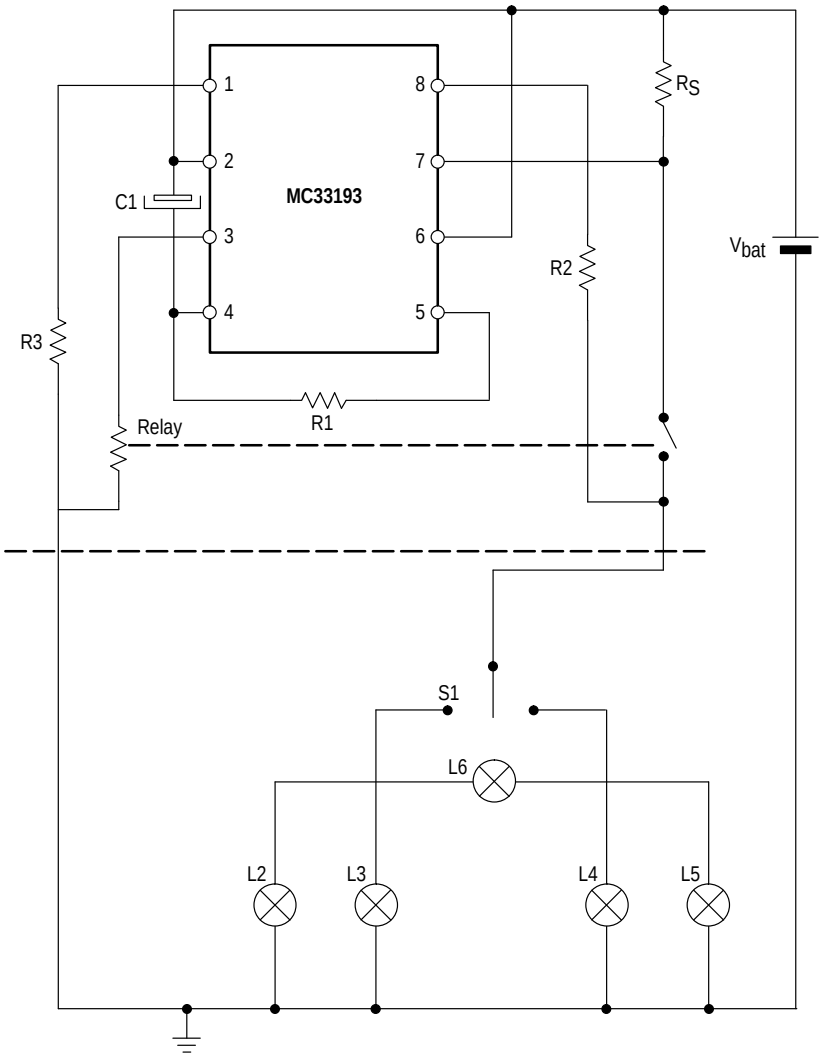
Figure 8. Oscillator Constant versus Temperature



Freescale Semiconductor, Inc.

For More Information On This Product,
Go to: www.freescale.com

Figure 9. MC33193 Typical Application



R_S = 20 mΩ
R1 = 75 kΩ
C1 = 5.6 µF
R2 = 3.3 kΩ
R3 = 200 Ω
L2, L3, L4, L5 = 21 W Turn Signal Lamps

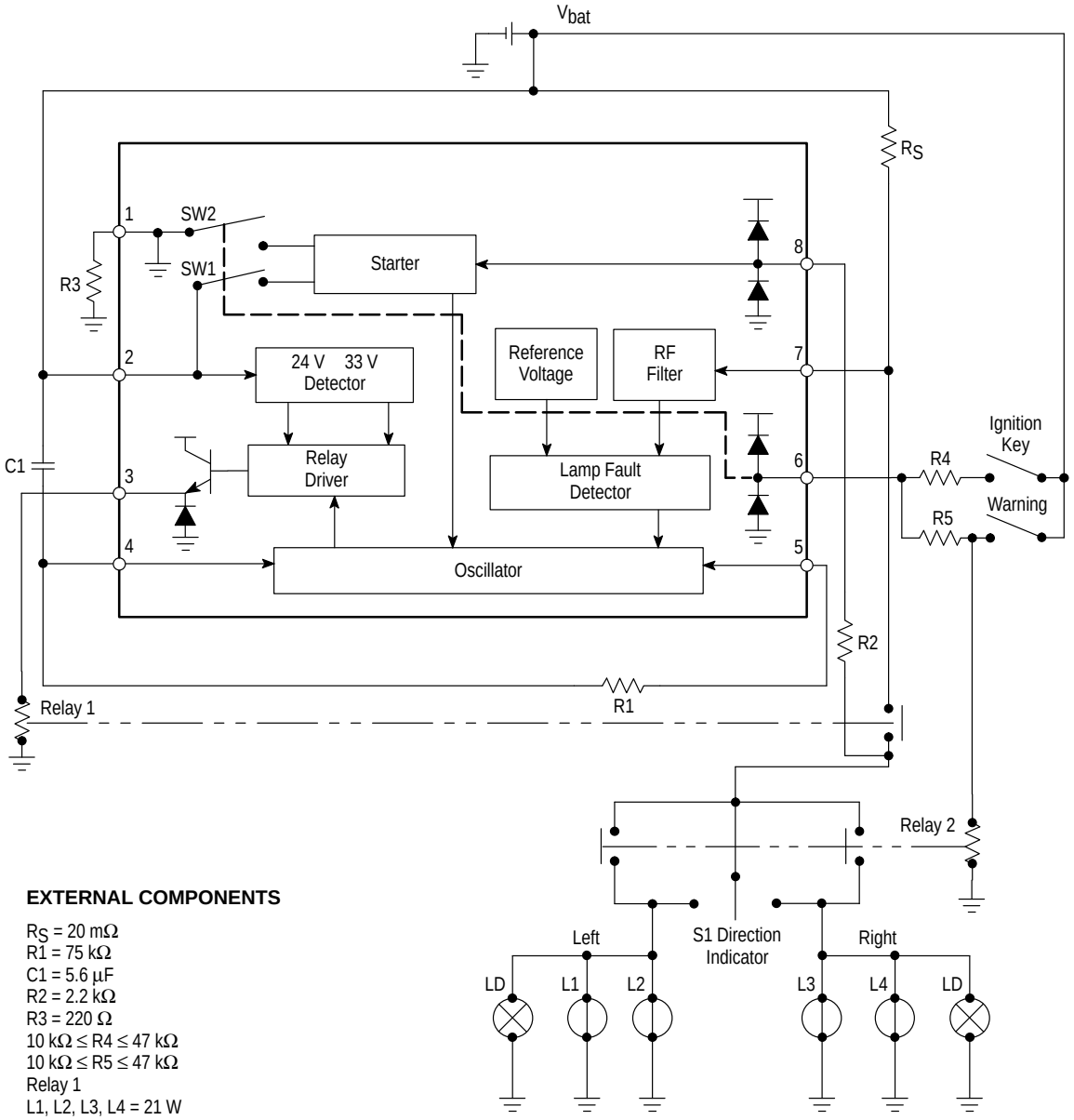
Application Information

NOTES: 1. In the above application, the MC33193 is compatible with the UAA1041 and UAA1041B except for the shunt resistor value (R_S = 20 mΩ).
2. The flashing cycle is started by the closing of switch S1.
3. The position of switch S1 is sensed across resistor R2 and R_{Lamp} by the input, Pin 8.

Freescale Semiconductor, Inc.

For More Information On This Product,
Go to: www.freescale.com

Figure 10. Typical MC33193 Application



EXTERNAL COMPONENTS

R_S = 20 mΩ
R1 = 75 kΩ
C1 = 5.6 µF
R2 = 2.2 kΩ
R3 = 220 Ω
10 kΩ ≤ R4 ≤ 47 kΩ
10 kΩ ≤ R5 ≤ 47 kΩ
Relay 1
L1, L2, L3, L4 = 21 W
L_D = Dashboard Indicator

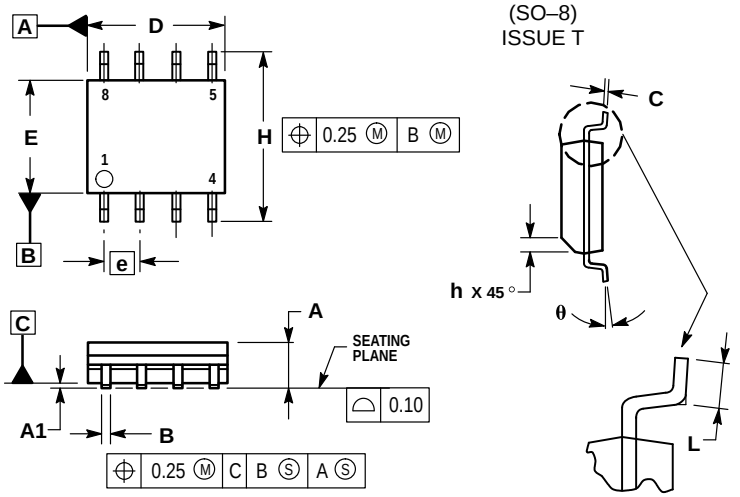
Application Information

NOTES: 1. The flashing cycle is started by the closing of switch S1.
2. The S1 switch position is sensed across the resistor R2 and R_{Lamp} by the input (Pin 8).
3. If the logic state at Pin 6 is [0], the current through R2 is off.

Freescale Semiconductor, Inc.

OUTLINE DIMENSIONS

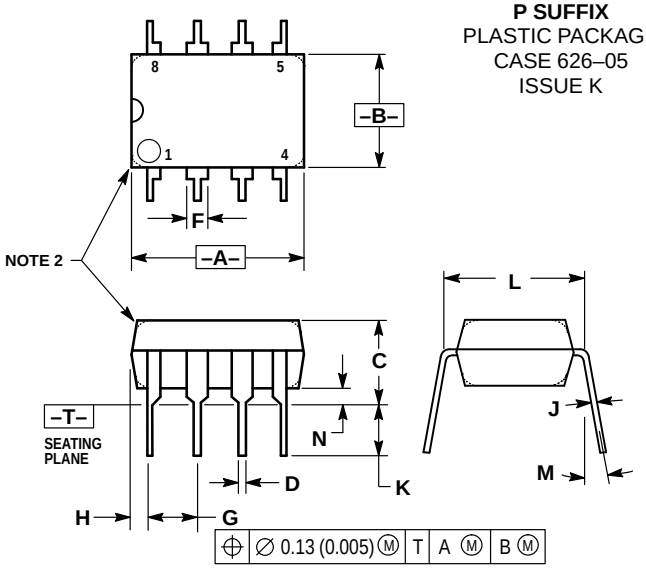
D SUFFIX
PLASTIC PACKAGE
CASE 751–06
(SO–8)
ISSUE T



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. DIMENSIONS ARE IN MILLIMETER.
3. DIMENSION D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	1.35	1.75
A1	0.10	0.25
B	0.35	0.49
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.25
θ	0°	7°

P SUFFIX
PLASTIC PACKAGE
CASE 626–05
ISSUE K



NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	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	1.78	0.040	0.070
G	2.54 BSC		0.100 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	0.76	1.01	0.030	0.040

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and Ⓜ are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:
USA / EUROPE / Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1–303–675–2140 or 1–800–441–2447

JAPAN: Nippon Motorola Ltd.; SPD, Strategic Planning Office, 141,
4–32–1 Nishi–Gotanda, Shinagawa–ku, Tokyo, Japan. 81–3–5487–8488

Customer Focus Center: 1–800–521–6274

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 1–602–244–6609
Motorola Fax Back System – US & Canada ONLY 1–800–774–1848
– http://sps.motorola.com/mfax/

ASIA / PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852–26629298

HOME PAGE: http://motorola.com/sps/

For More Information On This Product,
Go to: www.freescale.com

Freescale Semiconductor, Inc.

Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург, Промышленная ул, дом № 19, литера Н, помещение 100-Н Офис 331