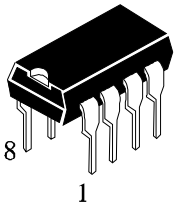
AUTOMOTIVE DIRECTION INDICATOR

The IL33193-03 is a new generation industry standard UAA1041 “Flasher”. It has been developed for enhanced EMI sensitivity, system reliability, and improved wiring simplification. The ILC33193-03 is pin compatible with the UAA1041B.

It includes an RF filter on the fault detection pin (Pin 7) for EMI purposes.

- Pin to pin Compatible with the UAA1041B
- Defective Lamp Detection Threshold
- Short Circuit Detection and Relay Shutdown
- RF Filter for EMI Purposes
- Load Dump Protection
- Double Battery Capability for Jump Start Protection
- Internal Free Wheeling Diode Protection



N Suffix	D Suffix
Plastic DIP	SO-8
IL33193N-03	Plastic DIP
IL33193D-03	SO-8

T_A = -40° C to 125 ° C for all packages

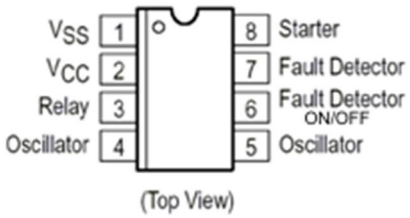


Figure 1. Pin connections

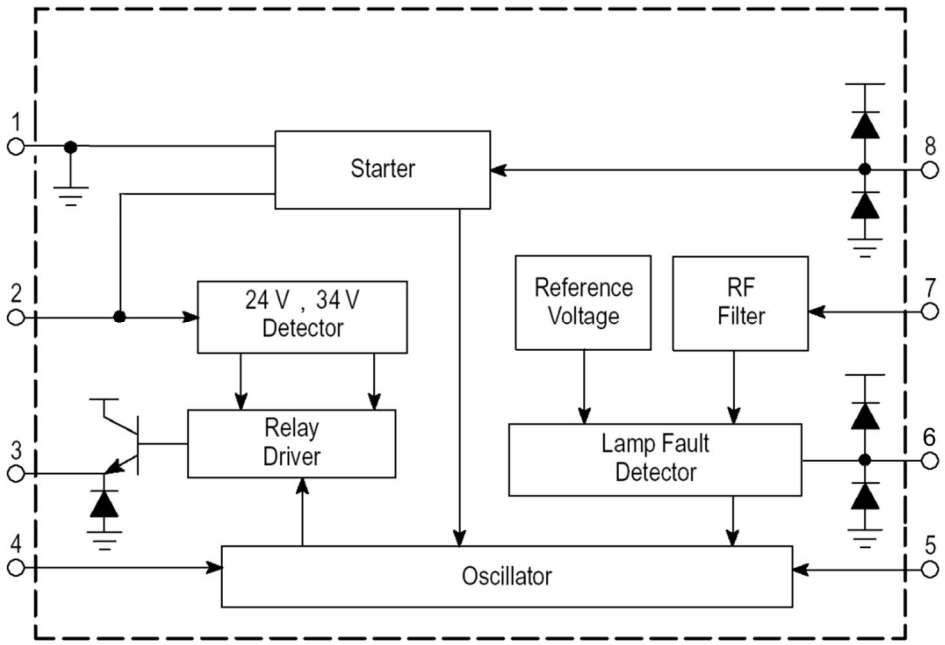


Figure 2. Simplified Block Diagram

This device contains 60 active transistors.

Table 1. Electrical Characteristics (8,0V ≤Vcc=Vbat≤18V)

Characteristic, Unit	Symbol	Limits		Temperature T_A, °C
		Min	Max	
Battery Voltage Range (Normal Operation) V	Vb	8,0	18	-45÷+125
Overvoltage Detector Threshold (VPin2 – VPin1), V	Vih	19	22	-45÷+125
Clamping Voltage (R2 = 220 Ω), V	Vcl	27	34	-45÷+125
Short Circuit Detector Threshold (Vpin2-Vpin7), V	Dth(sc)	0,63	0,77	25±10
Output Voltage [I = -250 mA (VPin2 - VPin3)], V	Vsat	-	1,5	-45÷+125
Oscillator Constant (Normal Operation)	Kn	1,3 1.25	1,75 1.85	25±10 -45÷+125
Duty Cycle (Normal Operation) , %	-	45	55	-45÷+125
Oscillator Constant (One 21 W Lamp Defect)	Kf	0,45 0.41	0,75 0.85	25±10 -45÷+125
Oscillator Constant	K1 K2 K3	0.150 0.200 0.126	0.240 0.290 0.14	25±10
Duty Cycle (One 21 W Lamp Defect)	-	35	45	-45÷+125
Current Consumption (Relay “Off ”), Vbat = 13.5 V, R2 = 220 Ω	Icc	-	5,3	-45÷+125
Current Consumption (Relay “On ”), Vbat = 13.5 V, R2 = 220 Ω	Icc		7,8	-45÷+125
Defect Lamp Detector Threshold [R2 = 220 Ω, (VPin2 – VPin7] , Vbat = 13.5 V], mV	Vs	75	95	-45÷+125

Table 2. MAXIMUM RATINGS

Rating, Symbol, Unit	Min	Max
Operation Ambient Temperature Range, °C	-45	125
Storage Temperature Range, °C	-65	150
Pin 1 Positive Current (Continuous/Pulse), I1+, mA		150/500
Pin 1 Negative Current (Continuous/Pulse), I1-, mA		-35/-500
Pin 2 Current (Continuous/Pulse), I2, mA		±350/±1900
Pin 3 Current (Continuous/Pulse), I3, mA		±300/±1400
Pin 2 Current (Continuous/Pulse), I8, mA		±25/±50
ESD (All Pins Except Pin 4 for Negative Pulse), V_{ESD}, V		±2000
ESD (Pin 4 Negative Pulse), V_{ESD4-}, V		-1000

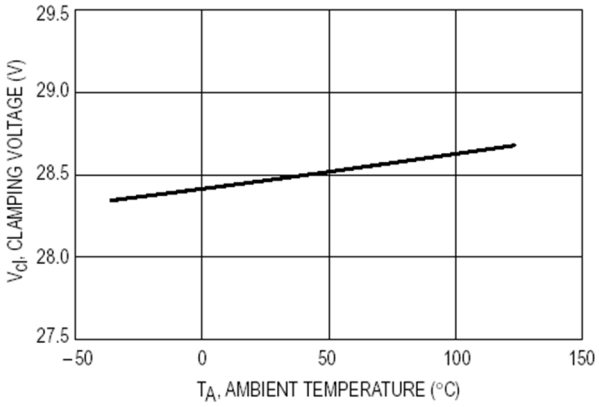


Figure 3. Clamping Voltage versus Temperature

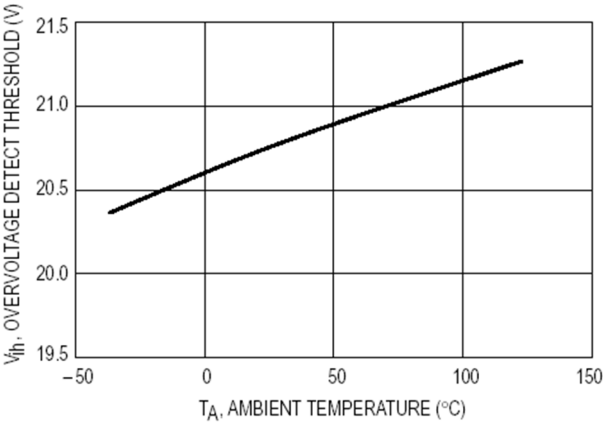


Figure 4. Overvoltage Detection versus Temperature

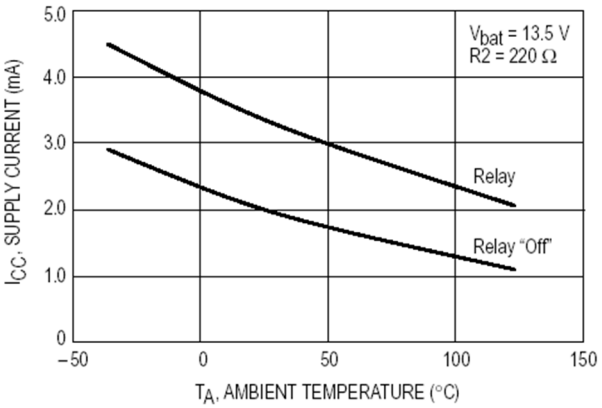


Figure 5. Supply Current versus Temperature

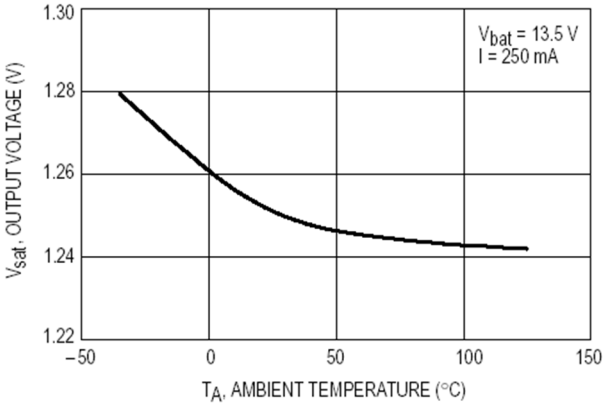


Figure 6. Output Voltage versus Temperature

Function Description

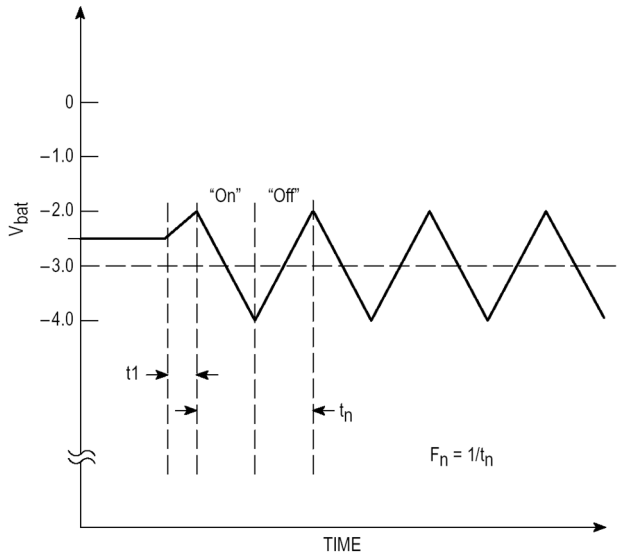


Figure 7. Normal Operation Oscillator Timing Diagram

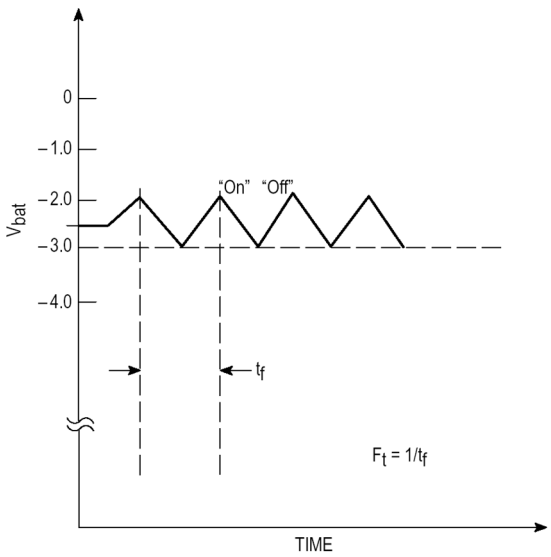


Figure 8. One Defective Lamp Oscillator Timing Diagram

Supply and Protection Systems

Pin 1 is connected to ground via resistor R2 which limits the current in the event of any high voltage transients.

Pin 2 (VCC) is the positive supply and may be connected directly to the vehicle's battery voltage.

Overvoltage and Double Battery Protection: When the applied VCC to VSS 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 VCC to VSS 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 7). The frequency is determined by the external components C1 and R1. In the normal operating mode, the flashing frequency is: Fn = 1/R1*C1*Kn. With a defective (open) 21 W lamp (Figure 8), the flashing frequency changes to: Fn = 2.5*Fn.

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 Where a 21 W lamp opens, the delay is expressed as: t2 = K2*R1*C1

Short circuit detection delay t3 = K1*R1*C1.

Starter

Pin 8 is connected through a 2.2 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 (Figure 9).

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 R4 via the RF filter. The RS voltage drop is compared to a Vbat dependent internal reference voltage (Vref) to validate the comparison over the full battery voltage range. A detected fault causes the oscillator to change frequency (Figure 8).

Short Circuit Detector

Detects excessive current (Ish > 25 A) flowing in the shunt resistor R4. 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.

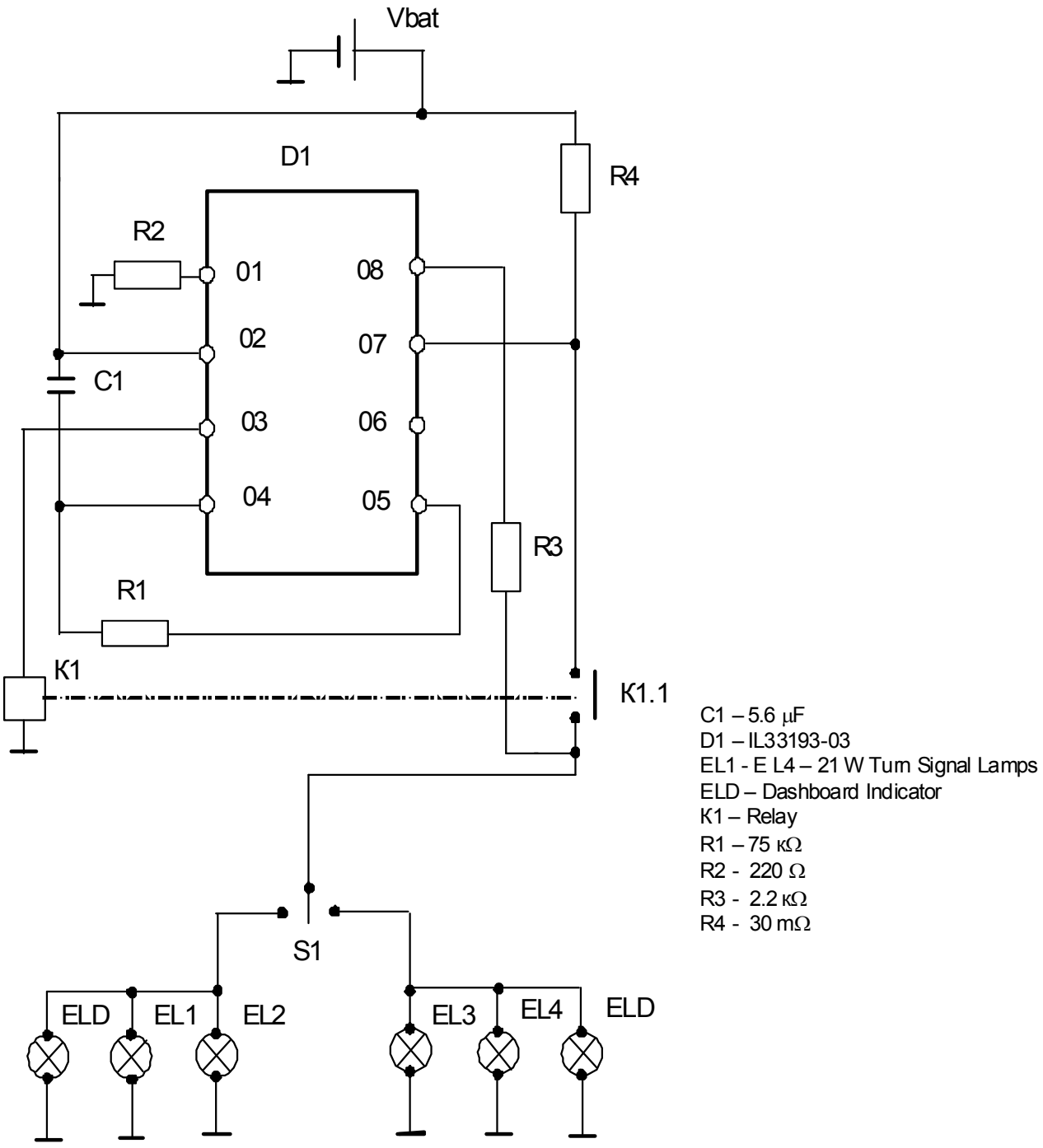


Figure 9 - IL33193-03 Typical Application