

ULN-2457A AND ULN-2457L QUAD LAMP MONITORS FOR 24 V SYSTEMS

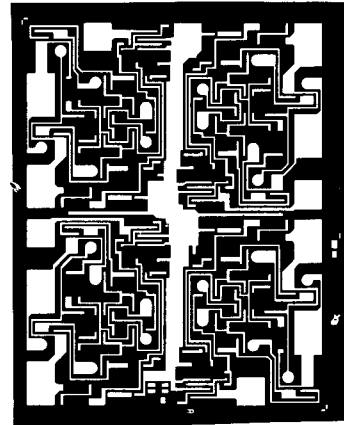
FEATURES

- 18 to 32 V Operation
- No Standby Power
- Integral to Wiring Assembly
- Fair-Safe
- Reverse-Voltage Protected
- Internal Transient Protection

CAPABLE of monitoring lamps in truck or bus, railroad, marine, and other applications using 24 V power systems, the ULN-2457A and ULN-2457L lamp monitors provide LED outputs (to 35 mA) to indicate the circuit in which a lamp failure has occurred. Differential amplifiers sense the voltage drops in the wiring assemblies (approximately 20 mV) for similar lamps. When the monitor detects a difference in voltage due to an open filament or lamp socket, the appropriate output driver is turned ON. Both devices are general-purpose quad comparators that can also be used to monitor multiple low-voltage power supplies and, with appropriate sensors, industrial processes.

The installation and operation of these quad lamp monitors has negligible effect on normal lamp operation. Comparators sense the normal voltage drop in the lamp wiring for each of the monitored lamp circuits. Little additional wiring is necessary for installation because the system can be completely integral to the wiring assembly. No standby power is required. The operating voltage is obtained from the sense leads; the system is energized only when the lamps are turned ON.

These integrated circuits were designed to withstand the severe environment of heavy-duty automotive applications. Lateral PNP transistors and thin-film resistors provide high-frequency noise immunity, transient-voltage protection, and reverse voltage protection. Internal regulators and temper-



ature compensation are included in the circuit design. A failure within the device will not affect lamp operation. For low-voltage applications (10 to 16 V) the pin-compatible ULN-2455A is suggested.

The ULN-2457A is supplied in a standard 14-pin dual in-line plastic package. The ULN-2457L is supplied in a surface-mount 14-lead SOIC plastic package. Both devices are rated for operation over the temperature range of -40°C to $+85^{\circ}\text{C}$.

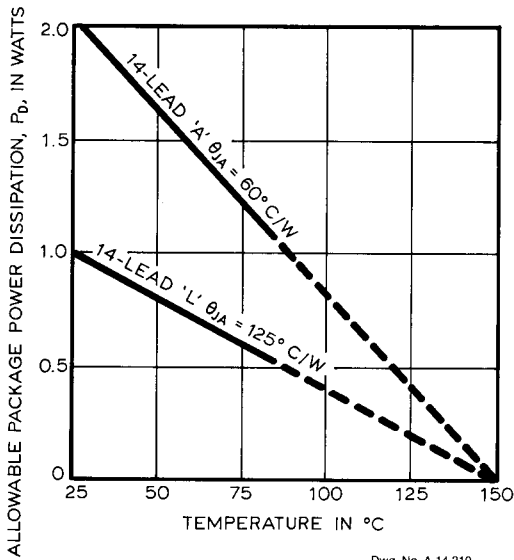
ABSOLUTE MAXIMUM RATINGS at $+25^{\circ}\text{C}$ Free-Air Temperature

Supply Voltage, V_{CC}	34 V
Peak Supply Voltage, V_{CC} (0.1 s)	80 V
Peak Reverse Voltage, V_R	30 V
Output Current, I_{OUT}	35 mA
Package Power Dissipation, P_D	See Graph
Operating Temperature Range, T_A	-40°C to $+85^{\circ}\text{C}$
Storage Temperature Range, T_S	-65°C to $+150^{\circ}\text{C}$



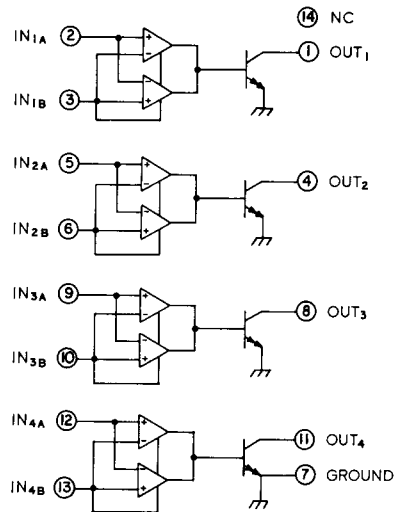
**ULN-2457A AND ULN-2457L
QUAD LAMP MONITORS**

**ALLOWABLE PACKAGE POWER DISSIPATION
AS A FUNCTION OF TEMPERATURE**



Dwg. No. A-14,210

FUNCTIONAL BLOCK DIAGRAM



Dwg. No. A-12,033A

ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $V_{CC} = V_{IN} = 18$ to 32 V (unless otherwise shown)

Characteristic	Test Pins	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Output Leakage Current	1, 4, 8, 11	$V_{OUT} = 80$ V, $\Delta V_{IN} < 7$ mV	—	—	100	μA
Output Saturation Voltage	1, 4, 8, 11	$I_{OUT} = 5$ mA, $\Delta V_{IN} > 20$ mV	—	0.8	1.0	V
		$I_{OUT} = 30$ mA, $\Delta V_{IN} > 20$ mV	—	1.4	2.0	V
Differential Switch Voltage	2-3, 5-6, 9-10, 12-13	Absolute Value $V_{(2)} - V_{(3)}$	7.0	13	20	mV
Input Current	2, 5, 9, 12	$\Delta V_{IN} = V_{(2)} - V_{(3)} = +30$ mV	150	300	800	μA
	3, 6, 10, 13	$\Delta V_{IN} = V_{(2)} - V_{(3)} = -30$ mV	0.5	1.7	3.5	mA

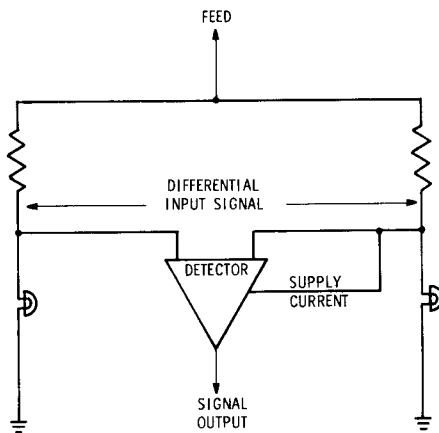
PRINCIPLE OF OPERATION

Operation of these lamp monitors is similar to that of a simple bridge circuit in which the top two legs of the bridge are formed by the wiring assembly resistance or discrete low-value resistors. The bottom legs of the bridge are the monitored lamps. Four differential amplifier circuits sense the voltage drops in the wiring assemblies (approximately 20 mV) for

each of the lamp circuits. When the system detects a difference in voltage due to an open filament, the appropriate output driver is turned ON.

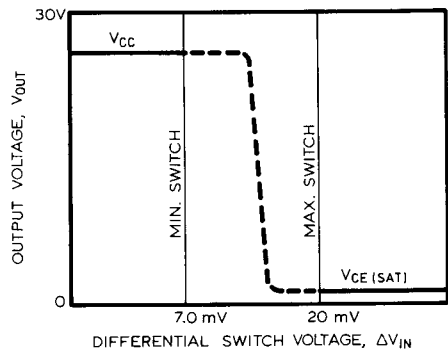
Sprague Technical Paper TP 81-7 discusses the requirements of automotive lamp monitoring systems and presents a more detailed description of the operation of these differential sense amplifiers.

BASIC BRIDGE MONITORING SYSTEM



Dwg. No. A-11,473A

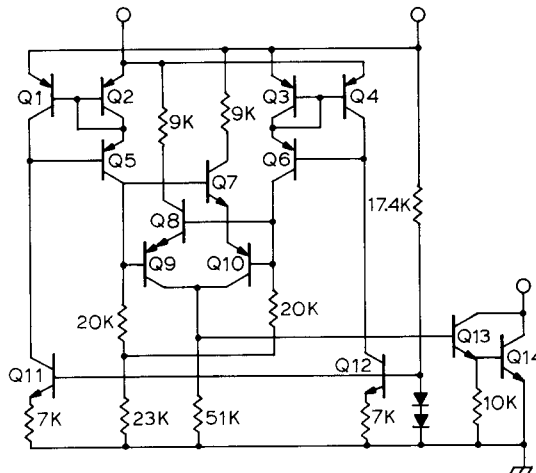
TYPICAL SWITCH CHARACTERISTICS



Dwg. No. A-12,187

SIMPLIFIED SCHEMATIC

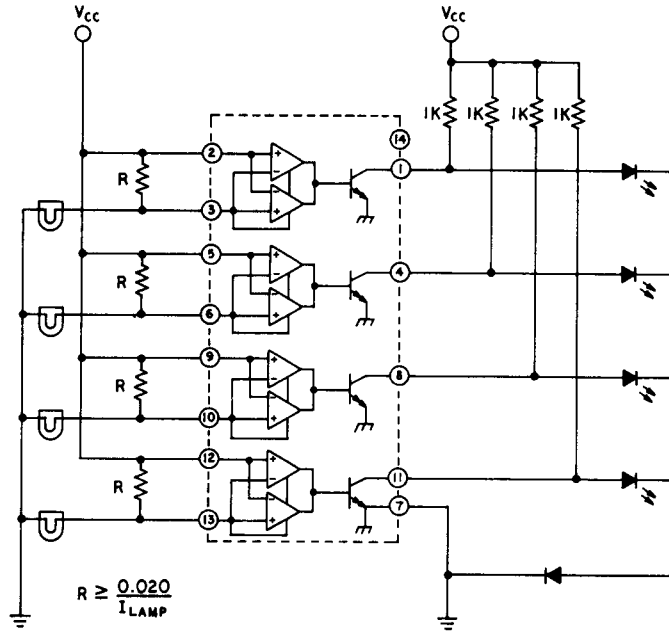
(One of 4 differential sense amplifiers)



Dwg. No. A-14,212

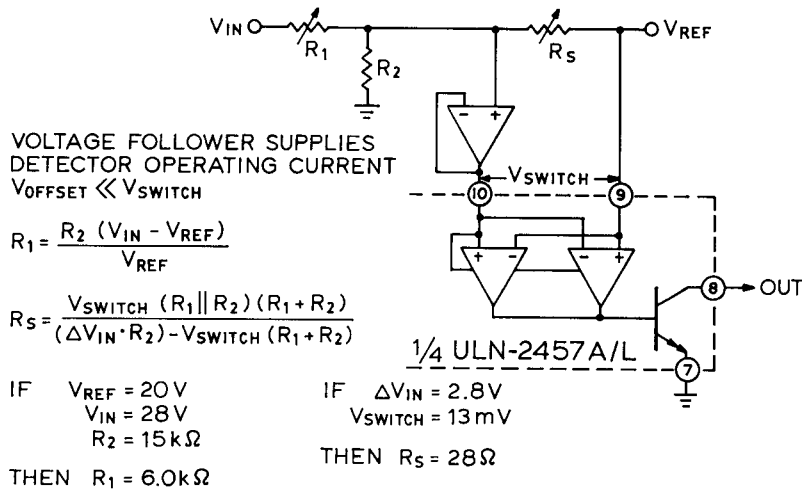
TYPICAL APPLICATIONS

QUAD LAMP MONITOR



Dwg. No. A-14,209

POWER SUPPLY SUPERVISORY CIRCUIT



Dwg. No. A-14,211