

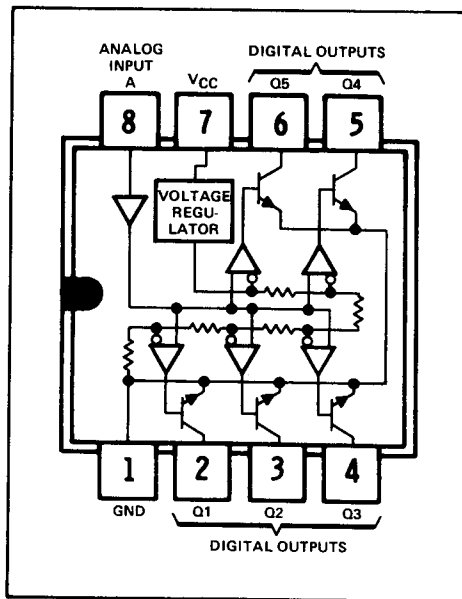
- 5 Comparators to Digitize Analog Input Signals in 200 mV Increments
- High Input Impedance . . . 100 k Ω Typ
- Open-Collector Outputs Capable of Sinking up to 40 mA and Withstanding up to 18 V
- Supply Voltage Range of 10 to 18 V
- Economical 8-Pin Dual-in-Line Plastic Package

FUNCTION TABLE

INPUT A (NOM)	OUTPUTS				
	Q1	Q2	Q3	Q4	Q5
0— \approx 200 mV	H	H	H	H	H
\approx 200— \approx 400 mV	L	H	H	H	H
\approx 400— \approx 600 mV	L	L	H	H	H
\approx 600— \approx 800 mV	L	L	L	H	H
\approx 800— \approx 1000 mV	L	L	L	L	H
$>$ \approx 1000 mV	L	L	L	L	L

H = high level, L = low level

P DUAL-IN-LINE PACKAGE (TOP VIEW)



description

The TL489C consists of five comparators and a reference voltage network to detect the level of an analog input signal at the A input. Output Q1 is switched to a low logic level at a typical input voltage of 200 millivolts. After each 200-millivolt step, the next output is switched to low logic levels. All outputs are at low logic levels at a typical input voltage of 1000 millivolts. The open-collector outputs are capable of sinking currents up to 40 milliamperes and may be operated at voltages up to 18 volts. The analog input has a high impedance of typically 100 kilohms.

6

Since all five trigger points have a switching hysteresis of typically 10 millivolts, the circuit may be operated with slow input signals without the danger of oscillation at the outputs. To prevent pickup of noise, a capacitor should be connected between the high-impedance input and ground, especially when the input is driven from a high-impedance source.

The TL489C is especially designed to detect and indicate analog signal levels. The device may be used in various industrial, consumer, or automotive applications such as low-precision meters, warning signal indicators, A/D converters, feedback regulators, pulse shapers, delay elements, and automatic range switching. The power outputs are suitable for driving a variety of display elements such as LED's or filament lamps. The outputs may also drive digital integrated logic such as TTL, CMOS, or other high-level logic.

The TL489C is characterized for operation from 0°C to 70°C.

TYPE TL489C

5-STEP ANALOG LEVEL DETECTOR

absolute maximum ratings

Supply voltage, V_{CC} (see Note 1)	20 V
Voltage at analog input A	8 V
Off-state output voltage	20 V
Current through analog input A	-10 mA
Low-level output current (each output)	80 mA
Total low-level output current	200 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1000 mW
Operating free-air temperature range	0°C to 70°C
Lead temperature 1/16 inch (1,6 mm) from case for 10 seconds	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. Derate linearly to 640 mW at 70°C free-air temperature at the rate of 8.0 mW/°C.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	10	12	18	V
Output voltage, V_O			18	V
Low-level output current			40	mA
Operating free-air temperature, T_A	0		70	°C

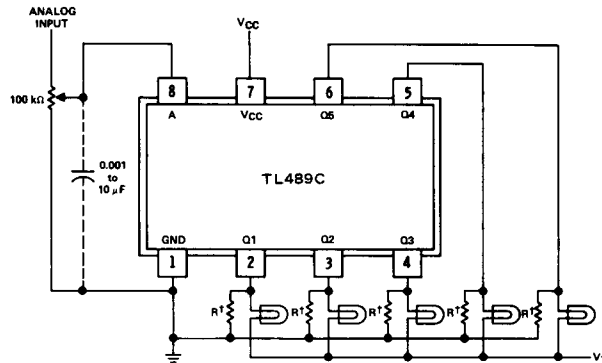
electrical characteristics over recommended range of V_{CC} and operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT	
V_{T+}	Positive-going threshold voltage at input A	$T_A = 25^\circ\text{C}$	Switching Q1	160	200	240	mV
			Switching Q2	350	400	450	
			Switching Q3	540	600	660	
			Switching Q4	730	800	870	
			Switching Q5	920	1000	1080	
$V_{T+} - V_{T-}$	Input hysteresis		10		mV		
I_{OH}	High-level output current	$V_{OH} = 18\text{ V}$	0.5	20	μA		
V_{OL}	Low-level output voltage	$I_{OL} = 16\text{ mA}$	0.15		V		
		$I_{OL} = 40\text{ mA}$	0.25	0.5			
I_I	Input current	$V_I = 1\text{ V}$	0.5		μA		
I_{CC}	Supply current	All outputs high	8	12	mA		
		All outputs low	15	25			

[†]All typical values are at $V_{CC} = 12\text{ V}$, $T_A = 25^\circ\text{C}$.

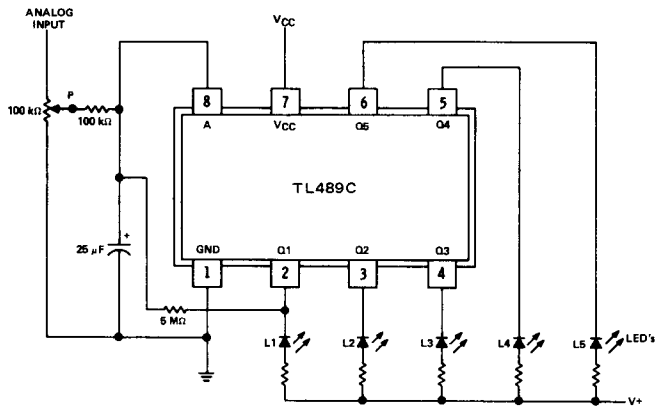
TYPE TL489C 5-STEP ANALOG LEVEL DETECTOR

TYPICAL APPLICATIONS DATA



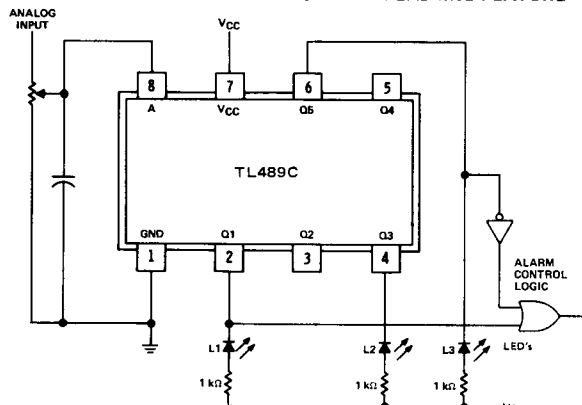
† Keep-alive resistors to avoid high switching current.

FIGURE 1—INTERFACING WITH INCANDESCENT LAMPS



Lamps L1 through L5 illuminate as the input voltage increases in nominally 200-mV steps. Additionally, lamp L1 will flash periodically when the input voltage at point P is below 200 mV.

FIGURE 2—LEVEL INDICATION WITH FLASHING FEATURE



Lamp L1 is turned on at input voltages (pin 8) ≥ 200 mV and the alarm turns off. Lamp L2 is turned on at input voltages ≥ 600 mV to indicate correct operation. Lamp L3 is turned on at input voltages ≥ 1000 mV and the over-range alarm turns on.

FIGURE 3—THREE-STAGE LEVEL INDICATION AND CONTROL

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TYPE TL489C

5-STEP ANALOG LEVEL DETECTOR

TYPICAL APPLICATION DATA

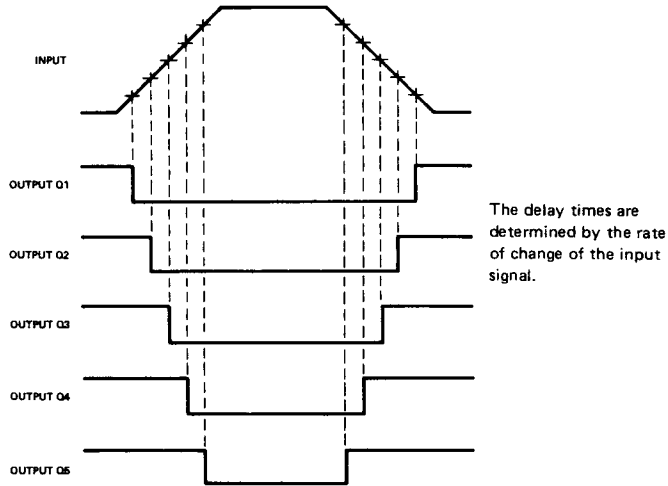


FIGURE 4—WAVEFORMS FOR FIVE DELAYED OUTPUTS

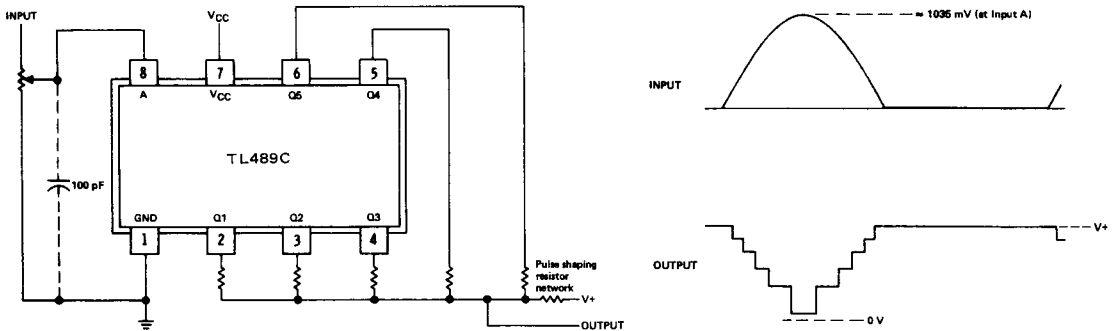
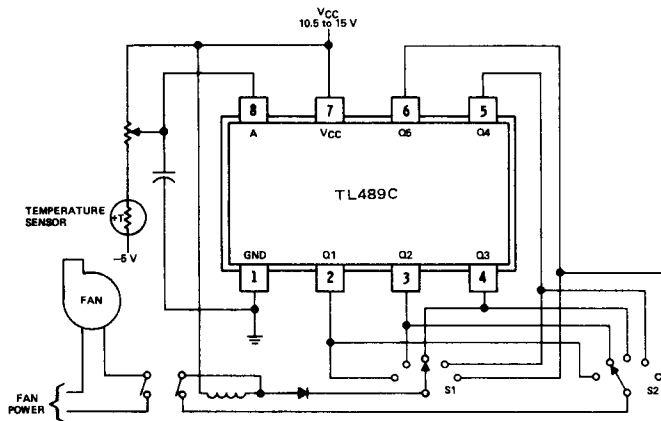


FIGURE 5—PULSE-SHAPE CONVERTER



Switch S1 selects the temperature at which the fan starts operating, and S2 selects the temperature at which the fan stops operating.

FIGURE 6—TEMPERATURE FEEDBACK REGULATION WITH SELECTABLE SYSTEM HYSTERESIS