

LINEAR INTEGRATED CIRCUITS

TYPE TL490C 10-STEP ADJUSTABLE ANALOG LEVEL DETECTOR

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- 10 Comparators to Digitize Analog Input Signals
- Cascade Feature Allows Stacking Output Display Strings
- Threshold Intervals Adjustable from 200 mV to 100 mV
- Open-Collector Outputs Capable of Sinking up to 40 mA and Withstanding up to 32 V
- Supply Voltage Range of 10 to 18 V

description

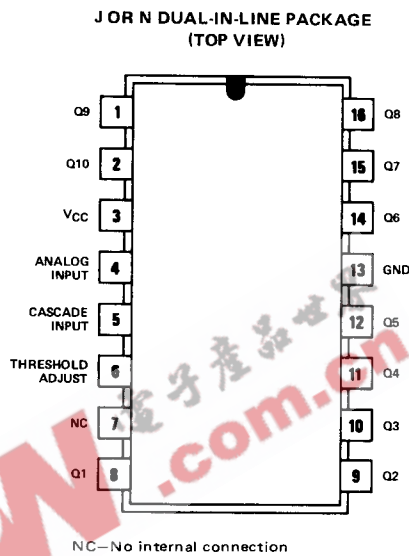
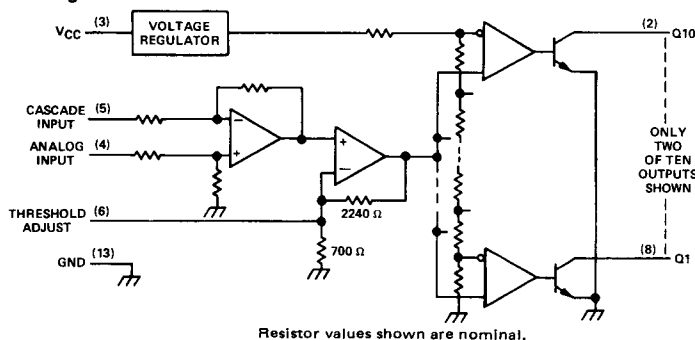
The TL490C consists of ten comparators and a reference voltage network to detect the level of a signal at the analog input. Output Q1 is switched to a low logic level at a typical input voltage of 200 millivolts with Threshold-Adjust open and the cascade input grounded. After each 200-millivolt increment, the next output is switched to a low logic level. All outputs are at low logic levels at a typical input voltage of 2000 millivolts. The threshold-adjust terminal allows the user to decrease the input voltage steps from 200-millivolt to 100-millivolt increments by connecting an external resistor from Threshold Input to ground.

This level detector is directly cascadable requiring only two external resistors. The maximum number of devices that can be cascaded is determined by the threshold level and the maximum input voltage. See Figure 4 in Typical Application Data. If the cascade feature is not utilized, the cascade input must be grounded for proper operation.

The TL490C is especially designed to detect and indicate analog signal levels and 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 for automatic range switching. The open-collector outputs are capable of sinking currents up to 40 milliamperes and may be operated at voltages up to 32 volts. 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 TL490C is characterized for operation from 0°C to 70°C.

functional block diagram



TYPE TL490C

10-STEP LOGARITHMIC ANALOG LEVEL DETECTOR

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	20 V
Input voltage: Analog input	8 V
Cascade input	8 V
Off-state output voltage	40 V
On-state output current (each output)	60 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2): J package	1025 mW
N package	1150 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch (1,6 mm) from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch (1,6 mm) from case for 10 seconds: N package	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Table. In the J package, chips are glass-mounted.

DISSIPATION DERATING TABLE

PACKAGE	POWER RATING	DERATING FACTOR	ABOVE T_A
J (Glass-Mounted Chip)	1025 mW	8.2 mW/°C	25°C
N	1150 mW	9.2 mW/°C	25°C

Also see Dissipation Derating Curves, Section 2.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	10	12	18	V
Output voltage, V_O			32	V
Cascade input voltage (Pin 5) (when not grounded)	1		8	V
Output current, I_O			40	mA
Operating free-air temperature, T_A	0		70	°C

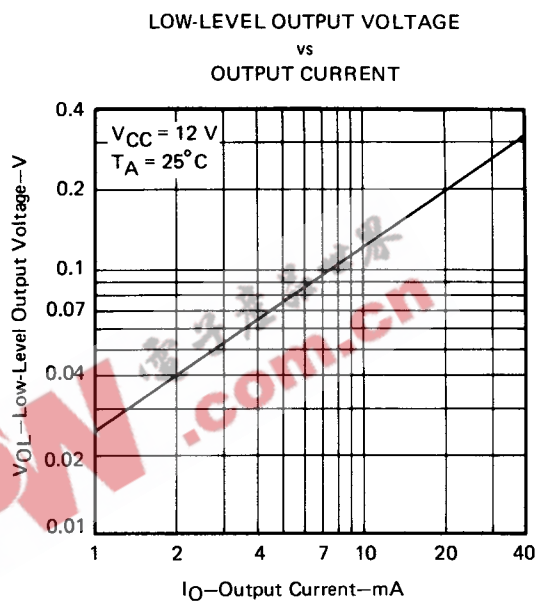
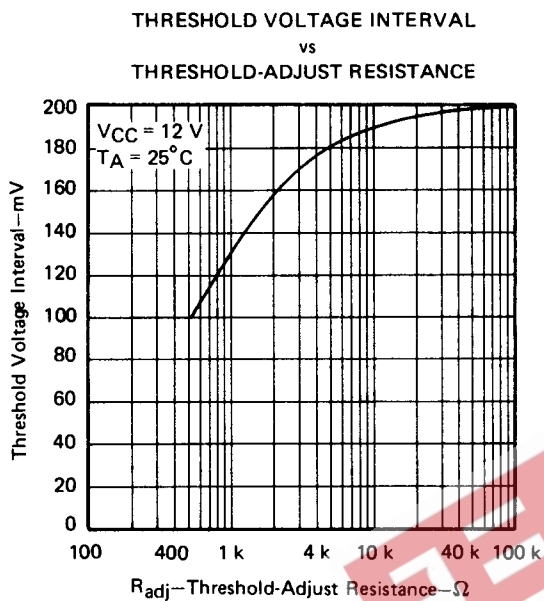
electrical characteristics over recommended operating free-air temperature and supply voltage ranges, pin 5 at gnd, pin 6 open (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{T+} Positive-going threshold voltage at input A	Switching Q1	125	200	275	mV
	Switching Q2	325	400	475	
	Switching Q3	525	600	675	
	Switching Q4	725	800	875	
	Switching Q5	925	1000	1075	
	Switching Q6	1125	1200	1275	
	Switching Q7	1325	1400	1475	
	Switching Q8	1525	1600	1675	
	Switching Q9	1725	1800	1875	
	Switching Q10	1925	2000	2075	
$V_{T+} - V_{T-}$ Input hysteresis			10		mV
I_{OH} High-level output current	$V_{OH} = 32$ V		0.5	200	μA
V_{OL} Low-level output voltage	$I_{OL} = 10$ mA		0.12	0.3	V
	$I_{OL} = 40$ mA		0.3	0.6	
I_I Input current	Analog input		260	400	μA
	Cascade input	$V_I = 2$ V	1000	1700	
I_{CC} Supply current	All outputs high	$V_{CC} = 12$ V,	10	15	mA
	All outputs low	All outputs open	30	45	

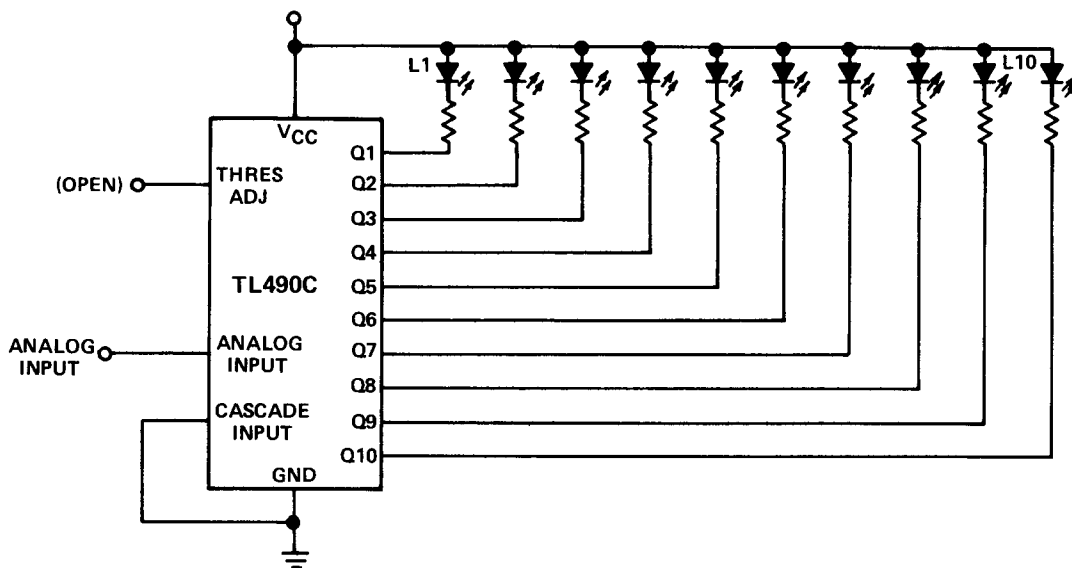
†All typical values are at $V_{CC} = 12$ V and $T_A = 25$ °C

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TYPICAL CHARACTERISTICS



TYPICAL APPLICATION DATA



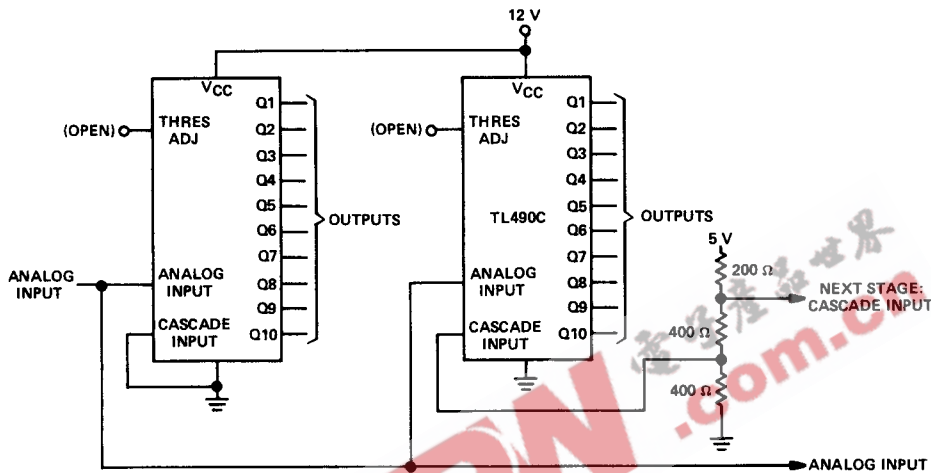
Lamps L1 through L10 sequentially illuminate as the input voltage increases in nominally 200-millivolt steps.

FIGURE 3—LEVEL INDICATION WITH LIGHT-EMITTING DIODES

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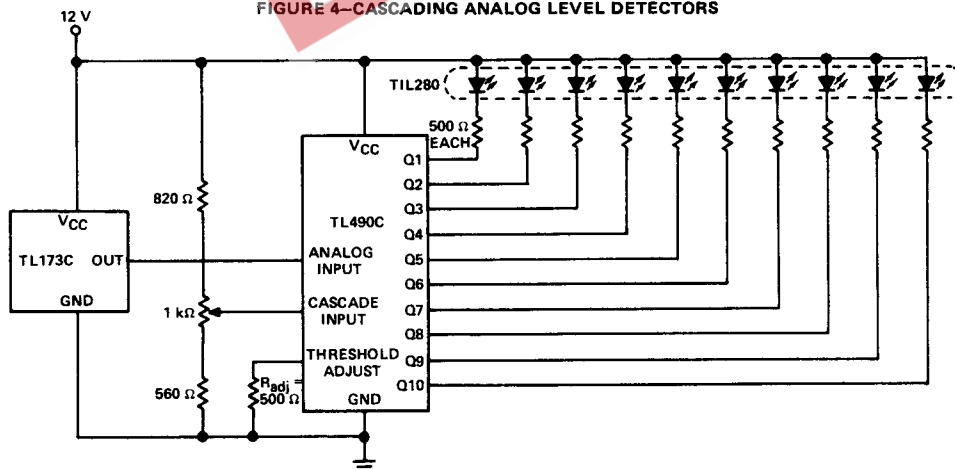
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TYPICAL APPLICATION DATA



To cascade three TL490C detectors, parallel all analog inputs, connect cascade input 1 to ground, bias cascade input 2 to 2 volts (or 10 times the threshold interval), and bias cascade input 3 to 4 volts (or 20 times the threshold interval). This provides drive for 30 output steps with one continuous 0- to 6-volt input. The maximum number of devices that can be cascaded is determined by the threshold level and the maximum input voltage rating.

FIGURE 4—CASCADING ANALOG LEVEL DETECTORS



The appropriate value of R_{adj} , the external resistance between the threshold-adjust terminal and ground, may be calculated from:

$$\frac{0.84}{V_T} \approx \frac{(R_{adj} + 700 \Omega) \cdot 2240 \Omega}{700 \Omega \cdot R_{adj}} + 1; \text{ or } R_{adj} \approx \frac{533 V_T}{0.2 - V_T}$$

where: V_T = threshold voltage interval, V

Alternatively, R_{adj} can be estimated using Figure 1.

In the circuit shown with $R_{adj} = 500 \Omega$, $V_T \approx 100 \text{ mV}$.

FIGURE 5—LINEAR HALL-EFFECT SENSOR WITH 10-STEP ANALOG LEVEL INDICATOR