

T-73-53

# ECG<sup>®</sup> Semiconductors

## ECG1505

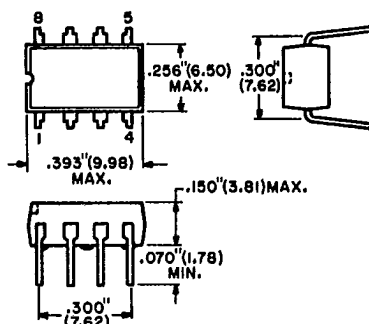
Voltage Level Ind. Dr, 5-Step  
Linear, Open Collector Outputs

**Features**

- 5 comparators to digitize analog input signals in 200 mV increments
- High input impedance . . . 100 kΩ 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

The ECG1505 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 voltage up to 18 volts. The analog input has a high impedance of typically 100 kilohms.

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.

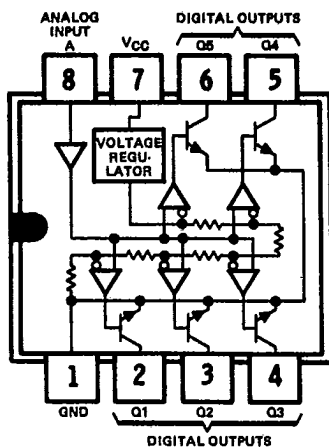
The ECG 1505 is especially designed to detect and indicate analog signal levels. The device may be used in various industrial, consumer, or automotive applications such as low-precision meters, warning signal indicators, A/D converters, feedback regulators, pulse shapers, delay elements, and automatic 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.

**FUNCTION TABLE**

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

H = High Level, L = Low Level

**Top View**



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**Absolute Maximum Ratings**

Characteristics	Symbol	Rating	Unit
Supply Voltage (See Note 1)	$V_{CC}$	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)	$I_{OL}$	80	mA
Total Low-Level Output Current	$I_{OL}$	200	mA
Continuous Total Dissipation at (or Below) 25°C Free-Air Temperature (See Note 2)		1000	mW
Operating Free-Air Temperature Range		0 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.

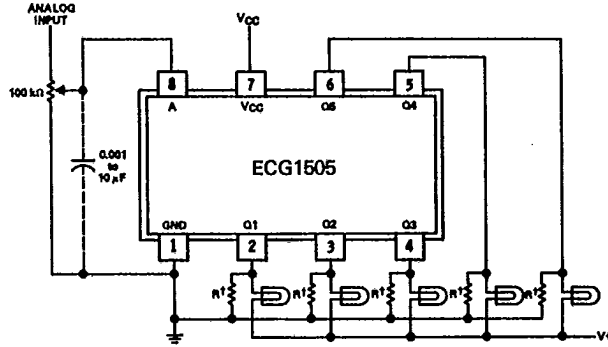
**Recommended Operating Conditions**

Characteristics	Symbol	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$	10	12	18	V
Output Voltage	$V_O$	--	--	18	V
Low-Level Output Current	$I_{OL}$	--	--	40	mA
Operating Free-Air Temperature	$T_A$	0	--	70	°C

**Electrical Characteristics ( $V_{CC} = 12 V$ ,  $T_A = 25^\circ C$  unless otherwise specified)**

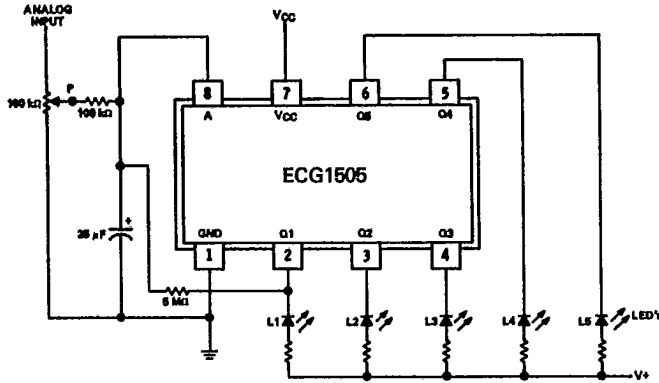
Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit			
Positive-Going Threshold Voltage at Input A	$V_{T+}$					mV			
Switching Q1							160	200	240
Switching Q2							350	400	450
Switching Q3							540	600	660
Switching Q4							730	800	870
Switching Q5			920	1000	1080				
Input Hysteresis	$V_{T+} - V_{T-}$		--	10	--	mV			
High-Level Output Current	$I_{OH}$	$V_{OH} = 18 V$	--	0.5	20	$\mu A$			
Low-Level Output Voltage	$V_{OL}$	$I_{OL} = 16 mA$	--	0.15	--	V			
		$I_{OL} = 40 mA$	--	0.25	0.5				
Input Current	$I_I$	$V_I = 1 V$	--	0.5	--	$\mu A$			
Supply Current	$I_{CC}$	Open outputs				mA			
All Outputs High							--	8	12
All Outputs Low			--	15	25				

**Typical Applications**  
Interfacing with Incandescent Lamps



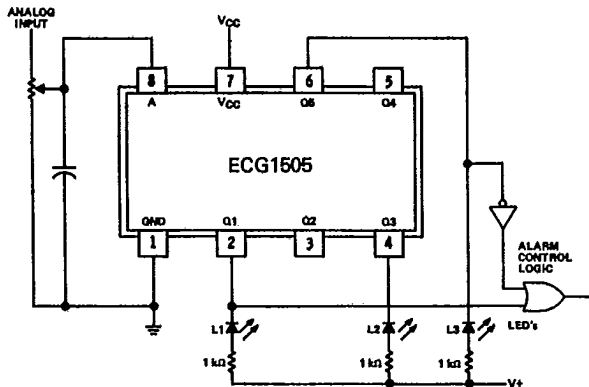
† Keep-alive resistors to avoid high switching current.

**Level Indication with Flashing Feature**



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.

**Three-Stage Level Indication and Control**

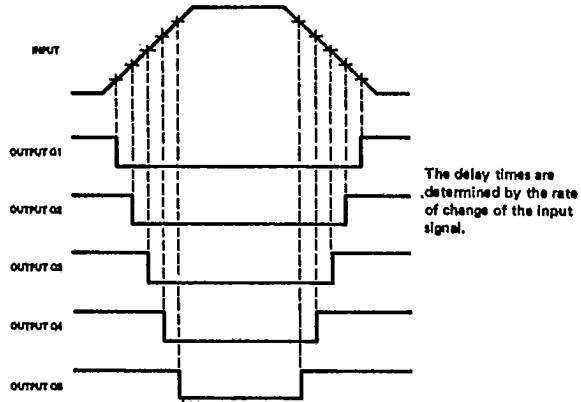


Lamp L1 is turned on at input voltages (pin 8)  $\geq 200$  mV and the alarm turns off.  
Lamp L2 is turned on at input voltages  $\geq 600$  mV to indicate correct operation.  
Lamp L3 is turned on at input voltages  $\geq 1000$  mV and the over-range alarm turns on.

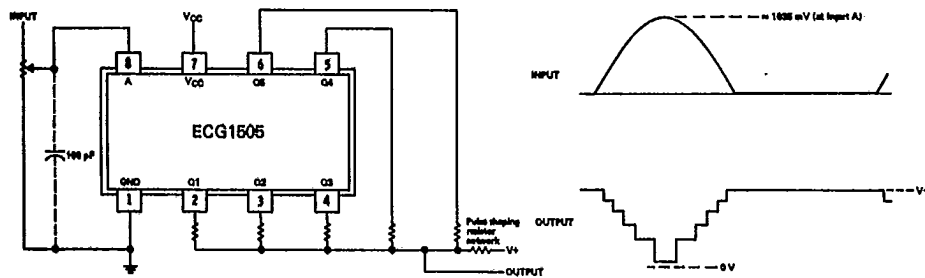
Typical Application Data

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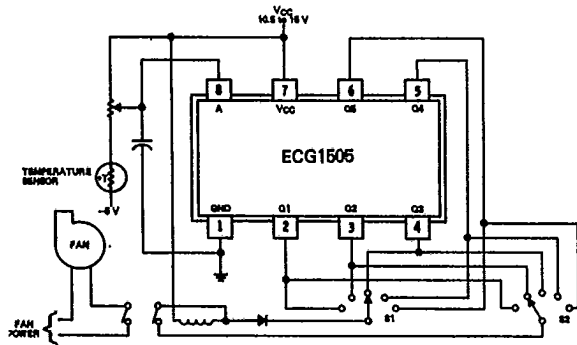
Waveforms for Five Delayed Outputs



Pulse-Shape Converter



Temperature Feedback Regulation with Selectable System Hysteresis



ECG1505