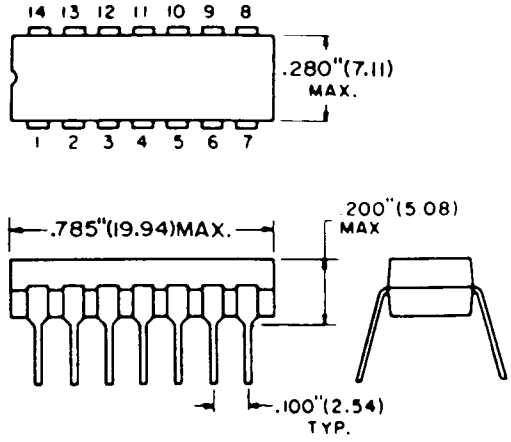
ECG® Semiconductors

ECG834

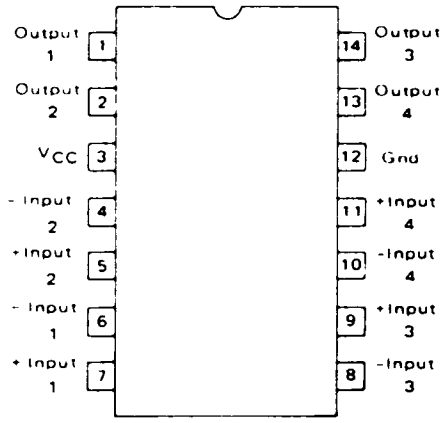
Quad Comparator

Features

- Power supply options
  Single supply = 2.0 to 36 VDC
  Split supplies = ±1.0 to ±18 VDC
- Wide operating temperature range— −40 to +85°C
- Low supply current drain— 2.0 mA (max)
- Low input biasing current— 25 nA (typ)
- Low input offset voltage— 2.0 mV (max)
- Low output saturation voltage
- TTL and CMOS compatible



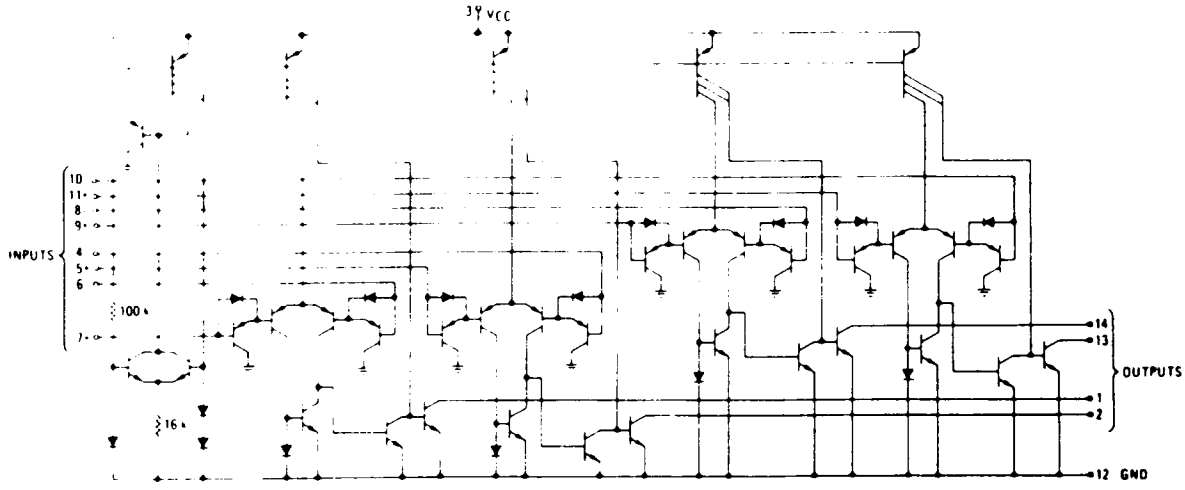
ECG834 is a silicon monolithic integrated circuit used as a quad comparator. It is designed for application in consumer automotive and industrial electronic areas as limit comparators; analog to digital converters; pulse, squarewave and time delay generatos; MOS clock timers; multivibrators and high voltage digital logic gates.



Maximum Ratings

Characteristic	Symbol	Rating	Unit
Power Supply Voltage	V_{cc}	+16 or ±18	Vdc
Input Differential Voltage Range	V_{IDR}	36	Vdc
Input Common Mode Voltage Range	V_{ICR}	−0.3 to +36	Vdc
Output Sink Current	I_{sink}	20	mA
Power Dissipation at T_A = 25°C Derate above 25°C	P_D	1.25 10	Watts mW/°C
Operating Ambient Temperature Range	T_{opg}	−40 to +85	°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

CIRCUIT SCHEMATIC



Electrical Characteristics (T_A = +25°C, V_{CC} = +5.0 Vdc unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Input Offset Voltage (V_{ref} = 1.4 Vdc, V_o = 1.4 Vdc, R_S = 0)	V_{IO}	--	2.0	7.0	mVdc
Input Offset Current	I_{IO}	--	±5.0	±50	nA
Input Bias Current	I_{IB}	--	25	250	nA
Input Common Mode Voltage Range (Note 1)	V_{ICR}	0	--	V_{cc} − 1.5	V
Supply Current (R_L = ∞)	I_{cc}	--	0.8	2.0	mA
Response Time (Note 2) (V_{RL} = 5.0 Vdc, R_L = 5.1 kΩ)	--	--	1.3	--	μs
Output Sink Current ($V_{I(+)}$ ≥ +1.0 Vdc, $V_{I(-)}$ = 0, V_o ≤ +1.5 Vdc)	I_{sink}	6.0	16	--	mA
Saturation Voltage ($V_{I(+)}$ ≥ +1.0 Vdc, $V_{I(-)}$ = 0, I_{sink} = 3.0 mAdc)	V_{sat}	--	--	400	mV
Output Leakage Current ($V_{I(+)}$ ≥ 1.0 Vdc, $V_{I(-)}$ = 0, V_o = 5.0 Vdc)	I_{OL}	--	0.1	--	μA

Note 1: The input common-mode voltage or either input signal voltage should not be allowed to to negative by more than 300 mV. The upper end of the common-mode voltage range is V_{cc} − 1.5 V, but either or both inputs can go to +30 Vdc without damage.

Note 2: The response time specified is for a 100 mV input step with 5 mV overdrive. For large signals, 300 ns is typical.

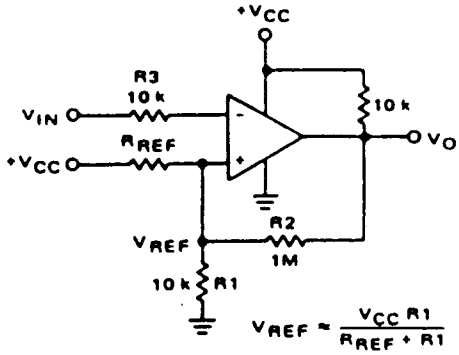
Applications Information

ECG834 is a quad comparator having high gain, wide bandwidth characteristics. This gives the device oscillator tendencies if the outputs capacitively couple to the inputs via stray capacitance. This oscillation manifests itself during output transitions (V_{OL} to V_{OH}). To alleviate this situation input resistors <10 kΩ should not be used. The addition of positive feedback (<10 mV) is also recommended.

It is good design practice to ground all unused pins.

Differential input voltages may be larger than supply voltage without damaging the comparator's input voltages. More negative than −300 mV should not be used.

INVERTING COMPARATOR WITH HYSTERESIS

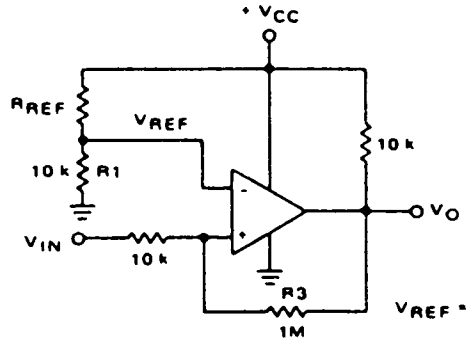


$$V_{REF} \approx \frac{V_{CC}\,R1}{R_{REF} + R1}$$

$$R3 \approx R1 \,//\, R_{REF} \,//\, R1$$

$$V_H = \frac{R1//R_{REF}}{R1//R_{REF} + R2} \quad (V_{Omax} - V_{Omin})$$

NON-INVERTING COMPARATOR WITH HYSTERESIS



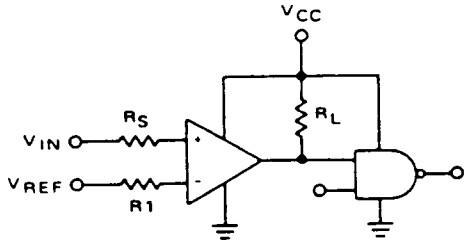
$$V_{REF} = \frac{V_{CC}\,R1}{R_{REF} + R1}$$

$$R2 \approx R1//R_{REF}$$

Amount of Hysteresis V_M

$$V_H = \frac{R2}{R2 + R3} \quad (V_{Omax} - V_{Omin})$$

DRIVING LOGIC



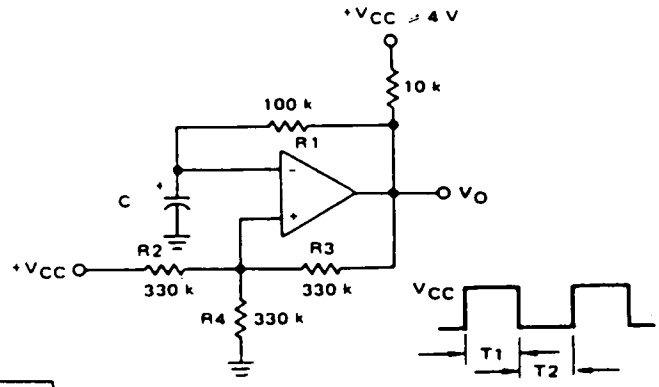
1/4 ECG834

R_S = Source Resistance

$R1 \approx R_S$

Logic	Device	V_{cc} Volts	R_L kΩ
CMOS	1/4 ECG4001B	+15	100
TTL	1/4 ECG7400	+5	10

SQUAREWAVE OSCILLATOR



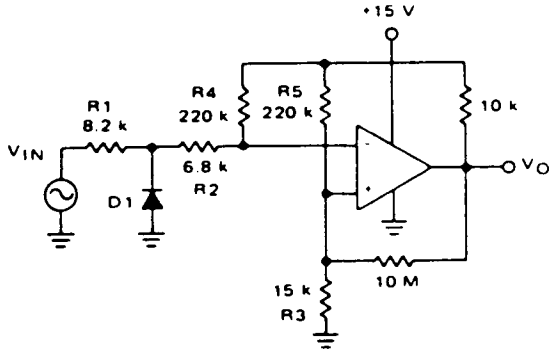
$T1 = T2 = 0.69\,RC$

$$f \approx \frac{7.2}{C(\mu F)}$$

$R2 = R3 = R4$

$R1 \approx R2//R3//R4$

ZERO CROSSING DETECTOR (Single Supply)



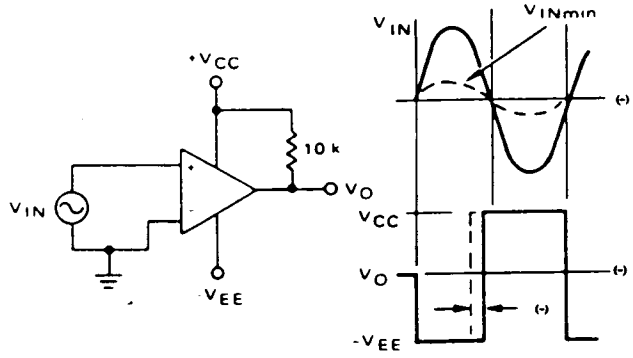
D1 prevents input from going negative by more than 0.6 V

$R1 = R2 = R3$

$R3 \approx \frac{R5}{10}$ for small error in zero crossing

ZERO CROSSING DETECTOR (Split Supplies)

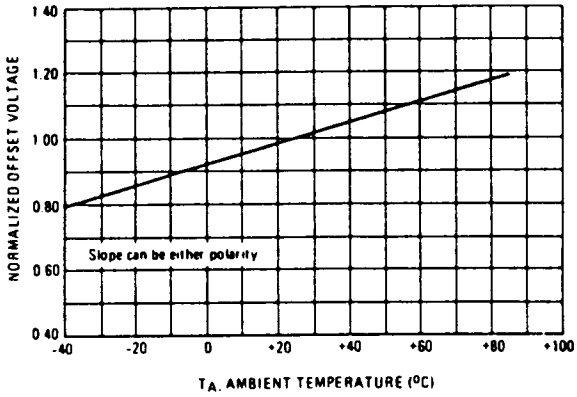
$V_{INmin} \approx 0.4$ V peak for 1% phase distortion (-)



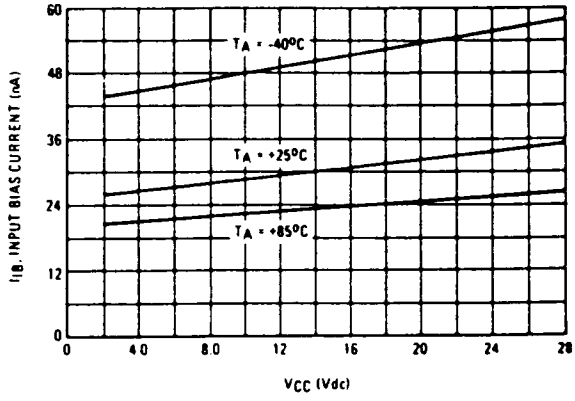
TYPICAL CHARACTERISTICS

(V_{CC} = +15 Vdc, T_A = +25°C unless otherwise noted.)

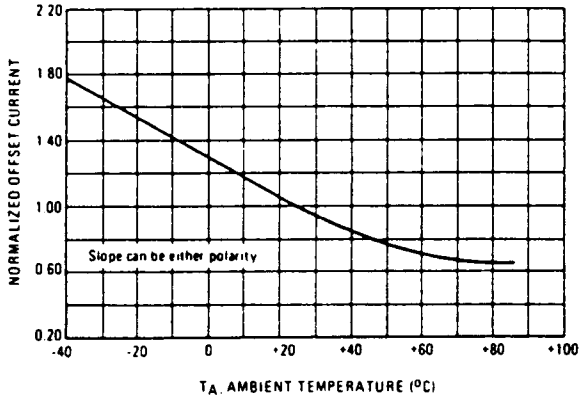
INPUT OFFSET VOLTAGE



INPUT BIAS CURRENT



OFFSET BIAS CURRENT



OUTPUT CURRENT versus OUTPUT VOLTAGE