

# HI-8573,4,5

## Quad CMOS Op Amp/Comparator

### General Description

The HI-8573, HI-8574, and HI-8575 devices are designed using low power CMOS technology. The operating current is externally programmable with a resistor to give the optimum tradeoff between power dissipation and slew rate. The operational amplifiers are internally compensated.

All three versions offer a high degree of versatility and are well suited for both line-powered and battery-powered systems. Features include a typical offset voltage of  $\pm 5\text{mV}$ , high input impedance and low current drain. Either single or dual power supply operation may be used up to 15VDC. The comparators are CMOS and TTL compatible. The three devices are direct replacements for the Motorola MC14573, MC14574 and MC14575, respectively.

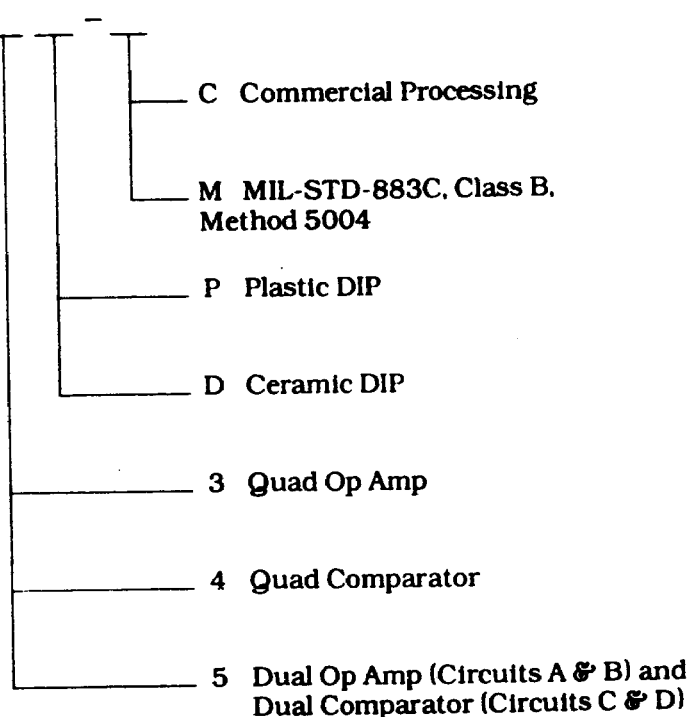
Some typical applications include oscillators, function generators, active filters, logic level converters, A to D converters, voltage reference, zero cross detectors, limit set alarm detectors, and instrumentation.

### Features

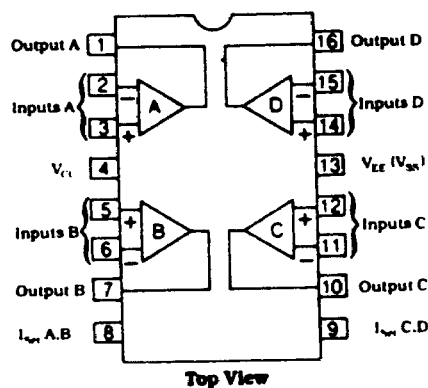
- Single or Dual Power Supply — +3 to 15Vdc or  $\pm 1.5$  to  $\pm 7.5\text{Vdc}$
- Wide Input Voltage Range
- Common Mode Range 0 to  $V_{CC} - 2\text{Vdc}$ , single supply
- Adjustable Current/Slew Rate
- Typical Offset,  $\pm 5\text{mV}$
- Internally Compensated Op Amps
- High Input Impedance
- CMOS and TTL Compatible Comparators
- MIL-STD-883C Equivalent Processing Available
- Direct Replacements for Motorola MC14573, MC14574, and MC14575

### Ordering Information

HI-857



### Pin Configuration



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# Comparator

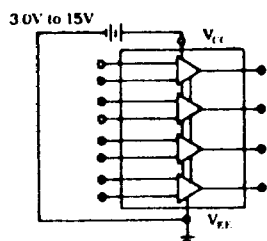
## Electrical Characteristics ( $V_{EE} = 0V, T_A = 25^\circ C$ )

Parameter	Symbol	$V_{CC}$ (Vdc)	Min.	Typ.	Max.	Units
Recommended Operating Range ( $V_{CC} - V_{EE}$ )	—	—	3	—	15	Vdc
Input Common Mode Voltage Range ( $I_{SET} = 200 \mu A$ )	$V_{ICR}$	5 10 15	0 0 0	— — —	3 8 13	Vdc
Output Low Voltage. "0" Level	$V_{OL}$	5 10 15	— — —	0 0 0	0.05 0.05 0.05	Vdc
Output High Voltage. "1" Level	$V_{OH}$	5 10 15	4.95 9.95 14.95	5 10 15	— — —	Vdc
Output Source Current $V_{OH} = 2.5$ Vdc) $V_{OH} = 4.6$ Vdc) $V_{OH} = 9.5$ Vdc) $V_{OH} = 13.5$ Vdc)	$I_{OH}$	5 5 10 15	-0.24 -0.51 -1.3 -3.4	-0.42 -0.88 -2.25 -8.8	— — — —	mAdc
Output Sink Current ( $V_{OL} = 0.4$ Vdc) ( $V_{OL} = 0.5$ Vdc) ( $V_{OL} = 1.5$ Vdc)	$I_{OL}$	5 10 15	1.25 3.25 8.5	2.25 5.6 20	— — —	mAdc
Input Offset Voltage ( $I_{SET} = 50 \mu A$ )	$V_{IO}$	10	—	$\pm 5$	$\pm 25$	mVdc
Average Temperature Coefficient of Input Offset Voltage	—	—	—	20	—	$\mu V/^\circ C$
Input Bias Current	$I_{IB}$	10	—	—	1	nA
Input Offset Current	$I_{IO}$	10	—	—	200	pA
Open Loop Voltage Gain ( $I_{SET} = 50 \mu A$ )	$A_{VOL}$	10	—	96	—	dB
Power Supply Rejection Ratio	PSRR	10	—	70	—	dB
Common Mode Rejection Ratio	CMRR	10	—	80	—	dB
Channel Separation	—	10	—	-100	—	dB
Output Rise and Fall Time ( $C_L = 50$ pF)	$t_{TLH}$ $t_{THL}$	10	—	100	—	ns
Propagation Delay Time. 5 mV Overdrive ( $I_{SET} = 50 \mu A, C_L = 50$ pF)	$t_D$	10	—	1000	—	ns
Supply Current — Per Pair ( $R_{SET} = 1M\Omega$ )	$I_{CC}$	5 10 15	— — —	50 100 150	— — —	$\mu A$
Supply Current — Per Pair ( $R_{SET} = 100K$ )	$I_{CC}$	5 10 15	— — —	0.45 1.0 1.5	— — —	mA

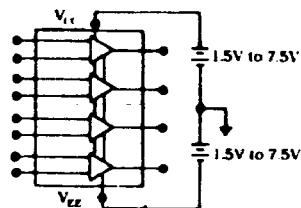
NOTE: Unused inputs should always be tied to either  $V_{DD}$  or  $V_{EE}$ .

## Power Options

Single Supply

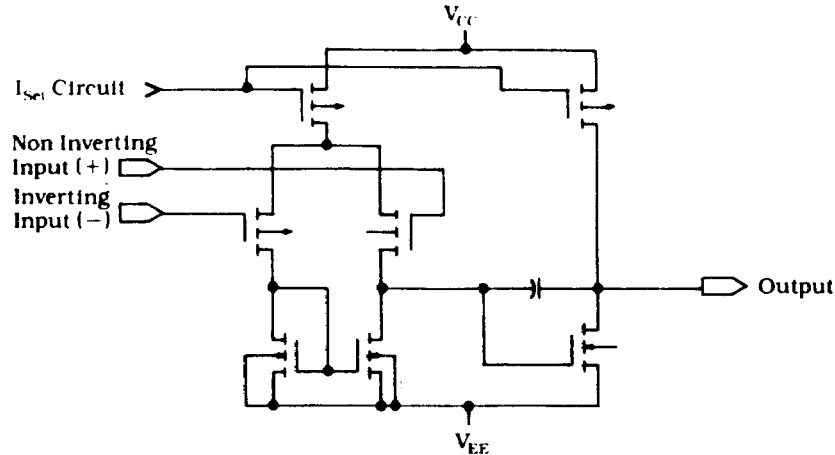


Split Supply

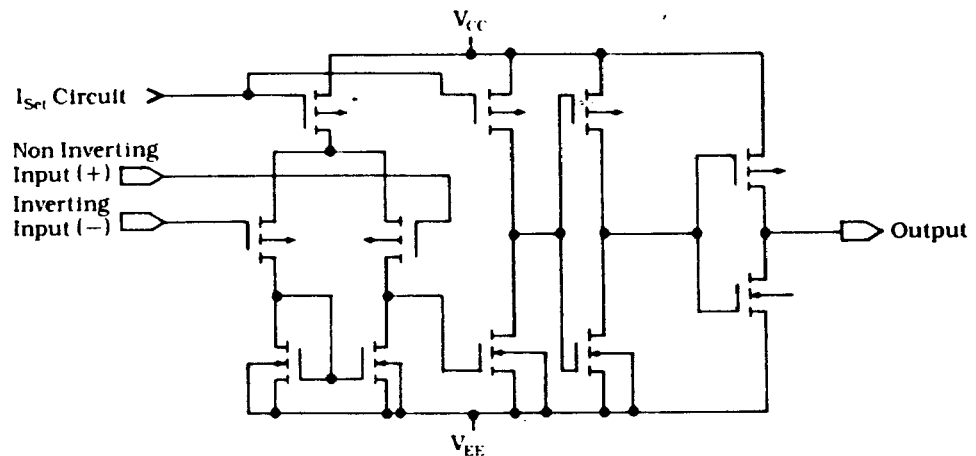


# Circuit Diagrams

Operational Amplifier



Comparator



## Programming Current

The programming current  $I_{Set}$  is fixed by an external resistor  $R_{Set}$  connected between  $V_{EE}$  and either one or both of the  $I_{Set}$  pins (8 and 9). When two external programming resistors are used, the set currents for each op amp pair or comparator are given by:

$$I_{Set} (\mu A) \cong \frac{V_{CC} - V_{EE} - 1}{R_{Set} (M\Omega)}$$

Pins 8 and 9 may be tied together for use with a single programming resistor. The set currents for each op amp pair or comparator pair are then given by:

$$I_{Set A,B} = I_{Set C,D} (\mu A) \cong \frac{V_{CC} - V_{EE} - 1}{2 R_{Set} (M\Omega)}$$

If a pair of op amps or comparators are not used, the  $I_{Set}$  pin for that pair may be tied to  $V_{CC}$  for minimum power consumption.

It should be noted that increasing  $I_{Set}$  for comparators will decrease propagation delay for that comparator.

For operational amplifiers, the maximum obtainable output voltage ( $V_{OH}$ ) for a given load resistor connected to  $V_{EE}$  is given by:

$$V_{OH} = (4 \times 10^{-3} I_{Set}) R_L - 0.05 \text{ v, } R_L \text{ in } K\Omega$$

if  $(4 \times 10^{-3} I_{Set}) R_L < V_{DD}$ ,  $I_{Set}$  in  $\mu A$

Typical op amp slew rates are given by:

$$S_R \cong 0.05 I_{Set} (V/\mu s), I_{Set} \text{ in } \mu A$$

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