

## MM74C85 4-Bit Magnitude Comparator

### General Description

The MM74C85 is a four-bit magnitude comparator which will perform comparison of straight binary or BCD codes. The circuit consists of eight comparing inputs (A0, A1, A2, A3, B0, B1, B2, B3), three cascading inputs (A > B, A < B and A = B), and three outputs (A > B, A < B and A = B). This device compares two four-bit words (A and B) and determines whether they are "greater than," "less than," or "equal to" each other by a high level on the appropriate output. For words greater than four-bits, units can be cascaded by connecting the outputs (A > B, A < B, and A = B) of the least significant stage to the cascade inputs (A > B, A < B and A = B) of the next-significant stage. In addition the least significant stage must have a high level voltage ( $V_{IN(1)}$ ) applied to the A = B input and low level voltage ( $V_{IN(0)}$ ) applied to A > B and A < B inputs.

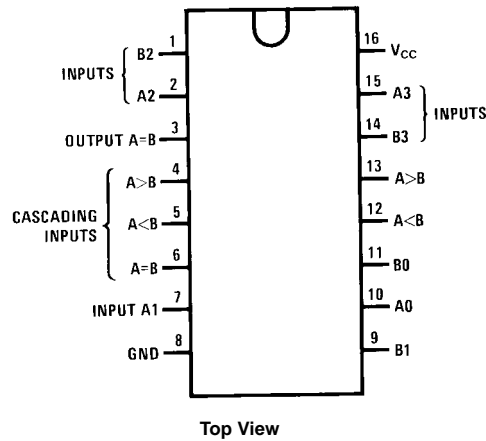
### Features

- Wide supply voltage range: 3.0V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity:  $0.4 V_{CC}$  (typ.)
- Low power: TTL compatibility:  
fan out of 2 driving 74L
- Expandable to 'N' stages
- Applicable to binary or BCD
- Low power pinout: 74L85

### Ordering Code:

Order Number	Package Number	Package Description
MM74C85N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

### Connection Diagram

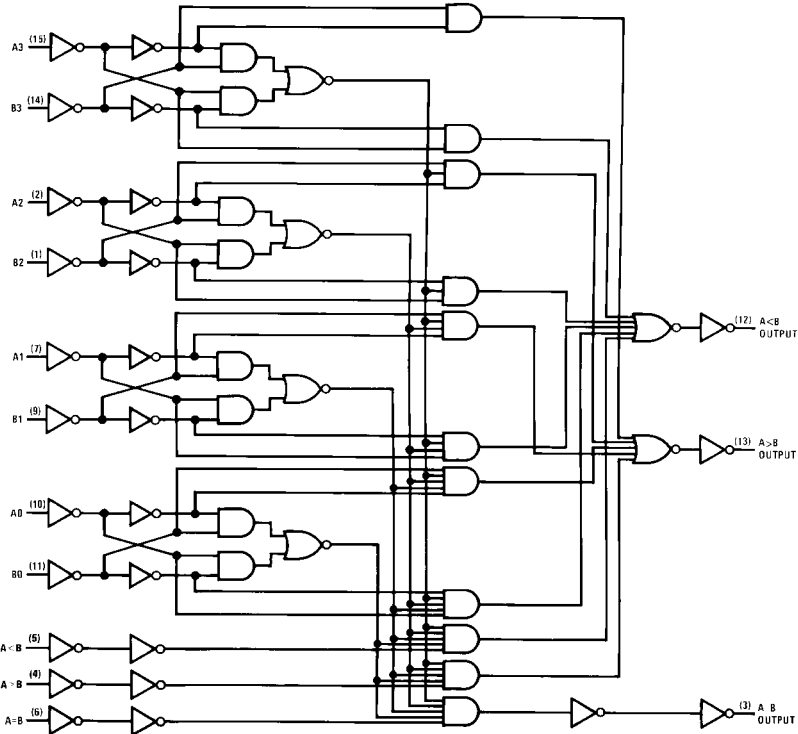


Truth Table

Comparing Inputs				Cascading Inputs			Outputs		
A3, B3	A2, B2	A1, B1	A0, B0	A > B	A < B	A = B	A > B	A < B	A = B
A3 > B3	X	X	X	X	X	X	H	L	L
A3 < B3	X	X	X	X	X	X	L	H	L
A3 = B3	A2 > B2	X	X	X	X	X	H	L	L
A3 = B3	A2 < B2	X	X	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 > B1	X	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 < B1	X	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 > B0	X	X	X	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 < B0	X	X	X	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	L	L	H	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	L	L	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	H	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	H	H	L	H	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	L	H	H	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	H	H	H	H	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	H	L	H	H	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	L	L	L	L

H = HIGH Level, L = LOW Level, X = Irrelevant

Logic Diagram



<b>Absolute Maximum Ratings</b> (Note 1)		$V_{CC}$	18V
Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$	Lead Temperature	260°C
Operating Temperature Range	-55°C to +125°C	(Soldering, 10 seconds)	
Storage Temperature Range	-65°C to +150°C		
Power Dissipation ( $P_D$ )			
Dual-In-Line	700 mW		
Small Outline	500 mW		
Operating $V_{CC}$ Range	3.0V to 15V		

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

## DC Electrical Characteristics

Min/Max limits apply across temperature range unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$	3.5 8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5.0V$ $V_{CC} = 10V$			1.5 2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 5.0V, I_O = -10 \mu A$ $V_{CC} = 10V, I_O = -10 \mu A$	4.5 9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5.0V, I_O = +10 \mu A$ $V_{CC} = 10V, I_O = +10 \mu A$			0.5 1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15V, V_{IN} = 15V$		0.005	1.0	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15V, V_{IN} = 0V$	-1.0	-0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.05	300	$\mu A$

### CMOS/LPTTL INTERFACE

$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage	$V_{CC} = 4.75V, I_O = -360 \mu A$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 4.75V, I_O = 360 \mu A$			0.4	V

### OUTPUT DRIVE (See Family Characteristics Data Sheet) (Short Circuit Current)

$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 5.0V, V_{OUT} = 0V$ $T_A = 25^\circ C$	-1.75	-3.3		mA
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 10V, V_{OUT} = 0V$ $T_A = 25^\circ C$	-8.0	-15		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5.0V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	1.75	3.6		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	8.0	16		mA

## AC Electrical Characteristics (Note 2)

$T_A = 25^\circ C$ ,  $C_L = 50$  pF, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd}$	Propagation Delay from any A or B Data Input to any Data Output	$V_{CC} = 50V$ $V_{CC} = 10V$		250 100	600 300	ns
$t_{pd}$	Propagation Delay Time from any Cascade Input to any Output	$V_{CC} = 50V$ $V_{CC} = 10V$		200 100	500 250	ns
$C_{IN}$	Input Capacitance	Any Input		5.0		pF
$C_{PD}$	Power Dissipation Capacitance	Per Package (Note 4)		45		pF

**Note 2:** AC Parameters are guaranteed by DC correlated testing.

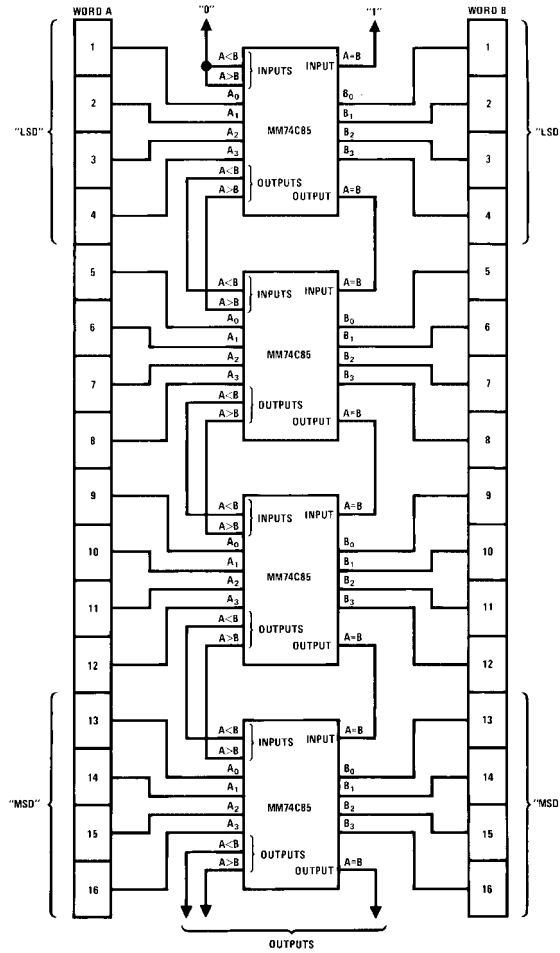
**Note 3:** Capacitance is guaranteed by periodic testing.

**Note 4:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device. For complete explanation see Family Characteristics application note, AN-90.

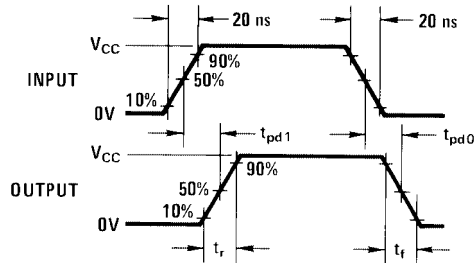
Typical Applications

Four Digit Comparator

- LONGER WORD COMPARISON -  
- COMPARING TWO 16-BIT WORDS



Switching Time Waveforms



Unused inputs must be tied to an appropriate logic level.

