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DM74LS85 4-Bit Magnitude Comparator

General Description

These 4-bit magnitude comparators perform comparison of straight binary or BCD codes. Three fully-decoded decisions about two, 4-bit words (A, B) are made and are externally available at three outputs. These devices are fully expandable to any number of bits without external gates. Words of greater length may be compared by connecting comparators in cascade. The A > B, A < B, and A = B outputs of a stage handling less-significant bits are connected to the corresponding inputs of the next stage handling more-significant bits. The stage handling the least-significant bits must have a high-level voltage applied to the A = B input. The cascading path is implemented with only a two-gate-level delay to reduce overall comparison times for long words.

Features

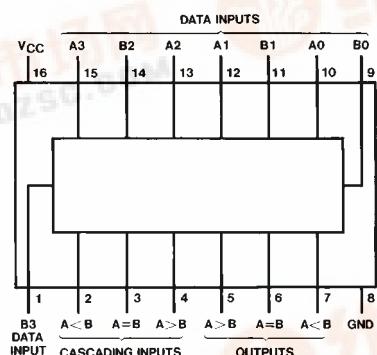
- Typical power dissipation 52 mW
- Typical delay (4-bit words) 24 ns

Ordering Code:

Order Number	Package Number	Package Description
DM74LS85M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
DM74LS85N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



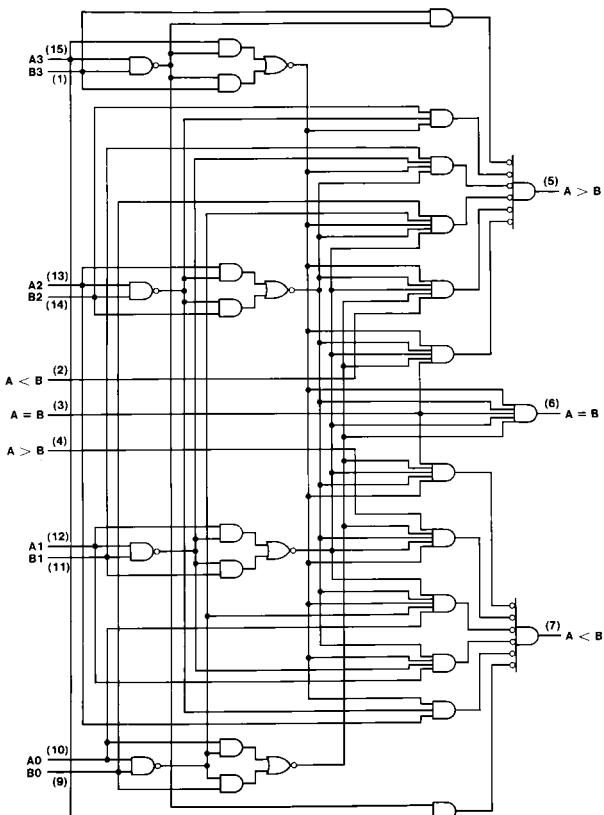
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Function Table

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	X	X	H	L	L	H
A3 = B3	A2 = B2	A1 = B1	A0 = B0	H	H	L	L	L	L
A3 = B3	A2 = B2	A1 = B1	A0 = B0	L	L	L	H	H	L

H = HIGH Level, L = LOW Level, X = Don't Care

Logic Diagram



Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	-65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
I_{OH}	HIGH Level Output Current			-0.4	mA
I_{OL}	LOW Level Output Current			8	mA
T_A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}$, $I_I = -18 \text{ mA}$			-1.5	V
V_{OH}	HIGH Level Output Voltage	$V_{CC} = \text{Min}$, $I_{OH} = \text{Max}$ $V_{IL} = \text{Max}$, $V_{IH} = \text{Min}$	2.7	3.4		V
V_{OL}	LOW Level Output Voltage	$V_{CC} = \text{Min}$, $I_{OL} = \text{Max}$ $V_{IL} = \text{Max}$, $V_{IH} = \text{Min}$ $I_{OL} = 4 \text{ mA}$, $V_{CC} = \text{Min}$		0.35	0.5	V
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}$ $V_I = 7V$	A < B A > B Others	0.1 0.1 0.3		mA
I_{IH}	HIGH Level Input Current	$V_{CC} = \text{Max}$ $V_I = 2.7V$	A < B A > B Others	20 20 60		μA
I_{IL}	LOW Level Input Current	$V_{CC} = \text{Max}$ $V_I = 0.4V$	A < B A > B Others	-0.4 -0.4 -1.2		mA
I_{os}	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 3)	-20		-100	mA
I_{cc}	Supply Current	$V_{CC} = \text{Max}$ (Note 4)		10	20	mA

Note 2: All typicals are at $V_{CC} = 5V$, $T_A = 25^\circ\text{C}$.

Note 3: Not more than one output should be shorted at a time, and the duration should not exceed one second.

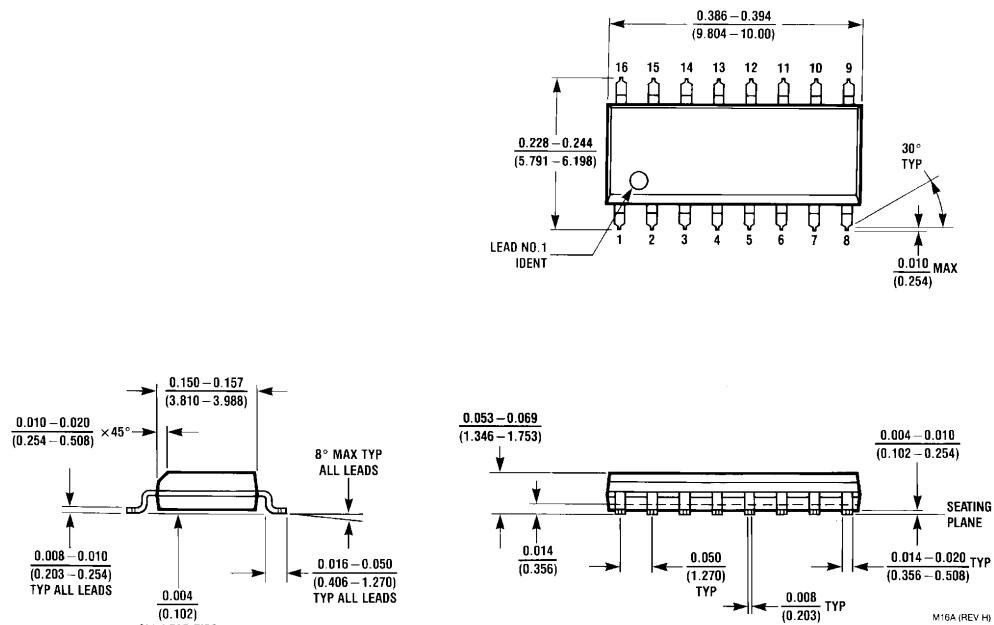
Note 4: I_{cc} is measured with all outputs OPEN, A = B grounded and all other inputs at 4.5V.

Switching Characteristics

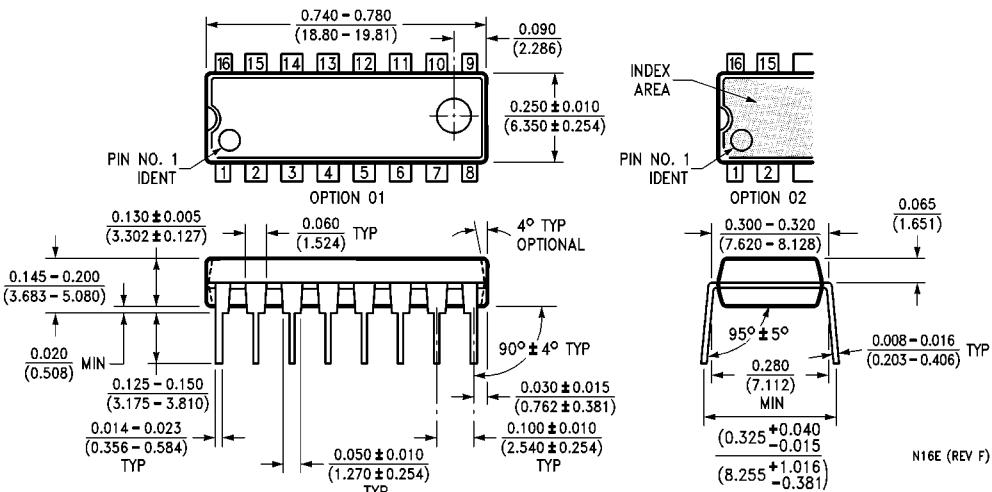
at $V_{CC} = 5V$ and $T_A = 25^\circ C$

Symbol	Parameter	From Input	To Output	Number of Gate Levels	$R_L = 2 k\Omega$				Units	
					$C_L = 15 \text{ pF}$		$C_L = 50 \text{ pF}$			
					Min	Max	Min	Max		
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	Any A or B Data Input	A < B, A > B	3		36		42	ns	
			A = B	4		40		40		
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	Any A or B Data Input	A < B, A > B	3		30		40	ns	
			A = B	4		30		40		
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	A < B or A = B	A > B	1		22		26	ns	
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	A < B or A = B	A > B	1		17		26	ns	
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	A = B	A = B	2		20		25	ns	
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	A = B	A = B	2		17		26	ns	
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output	A > B or A = B	A < B	1		22		26	ns	
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output	A > B or A = B	A < B	1		17		26	ns	

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)

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

N16E (REV F)

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