FAIRCHILD SEMICONDUCTOR™

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DM74LS85
4-Bit Magnitude Comparators

General Description

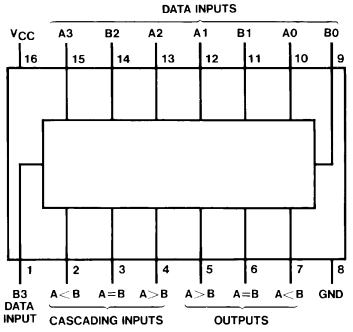
These 4-bit magnitude comparators perform comparison of straight binary or BCD codes. Three fully-decoded decisions about two, 4-bit words (A, B) are made and are externally available at three outputs. These devices are fully expandable to any number of bits without external gates. Words of greater length 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
- Alternate Military/Aerospace device (54LS85) is available. Contact a Fairchild Semiconductor Sales Office/Distributor for specifications.

Connection Diagram

Dual-In-Line Package



DS006379-1

Order Number 54LS85DMQB, 54LS85FMQB, 54LS85LMQB, DM54LS85J, DM54LS85W, DM74LS85M or DM74LS85N
See Package Number E20A, J16A, M16A, N16E or W16A

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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

Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS and 54LS	−55˚C to +125˚C
DM74LS	0˚C to +70˚C
Storage Temperature Range	−65˚C to +150˚C

Recommended Operating Conditions

Symbol	Parameter	DM54LS85			DM74LS85			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.7			0.8	V
I_{OH}	High Level Output Current			−0.4			−0.4	mA
I_{OL}	Low Level Output Current			4			8	mA
T_A	Free Air Operating Temperature	−55		125	0		70	˚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" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

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} = Min, I_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max	DM54	2.5	3.4		V
		V_{IL} = Max, V_{IH} = Min	DM74	2.7	3.4		
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max	DM54		0.25	0.4	V
		V_{IL} = Max, V_{IH} = Min	DM74		0.35	0.5	
		I_{OL} = 4 mA, V_{CC} = Min	DM74		0.25	0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 7V	A < B			0.1	mA
			A > B			0.1	
			Others			0.3	
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V	A < B			20	µA
			A > B			20	
			Others			60	
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V	A < B			−0.4	mA
			A > B			−0.4	
			Others			−1.2	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 3)	DM54	−20		−100	mA
			DM74	−20		−100	
I_{CC}	Supply Current	V_{CC} = Max (Note 4)			10	20	mA

Note 2: All typicals are at V_{CC} = 5V, T_A = 25˚C.

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

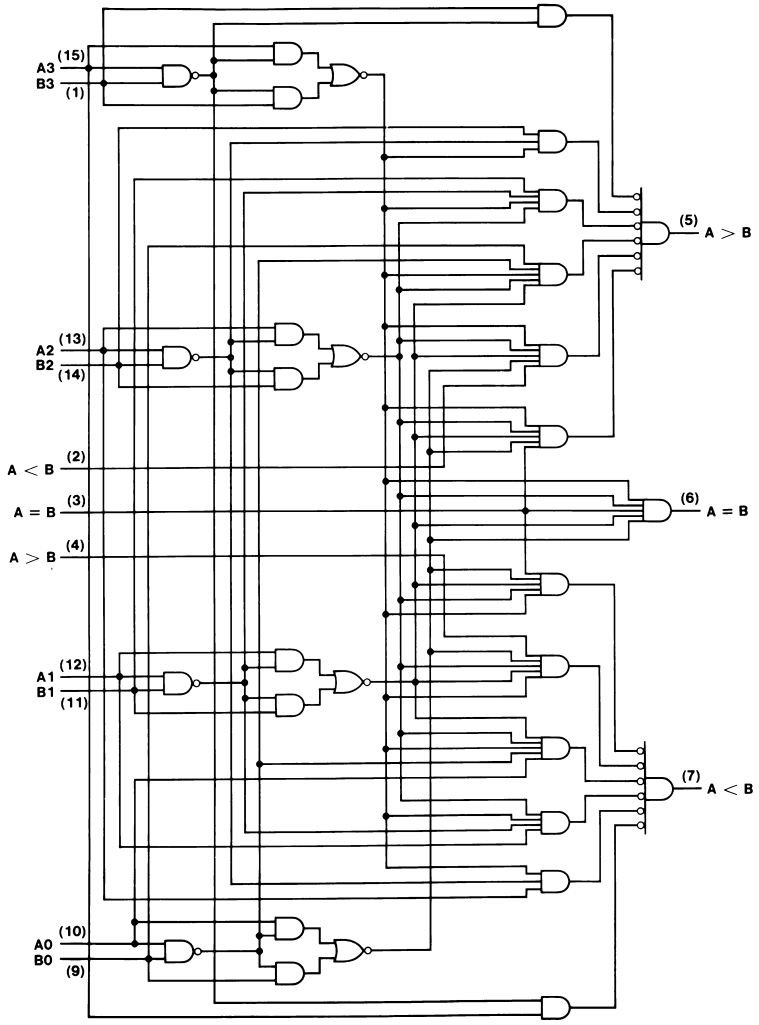
Note 4: I_{CC} is measured with all outputs open, A = B grounded and all other inputs at 4.5V.

Switching Characteristics

at V_{CC} = 5V and T_A = 25˚C

Symbol	Parameter	From Input	To Output	Number of Gate Levels	R_L = 2 kΩ				Units
					C_L = 15 pF		C_L = 50 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

Logic Diagram



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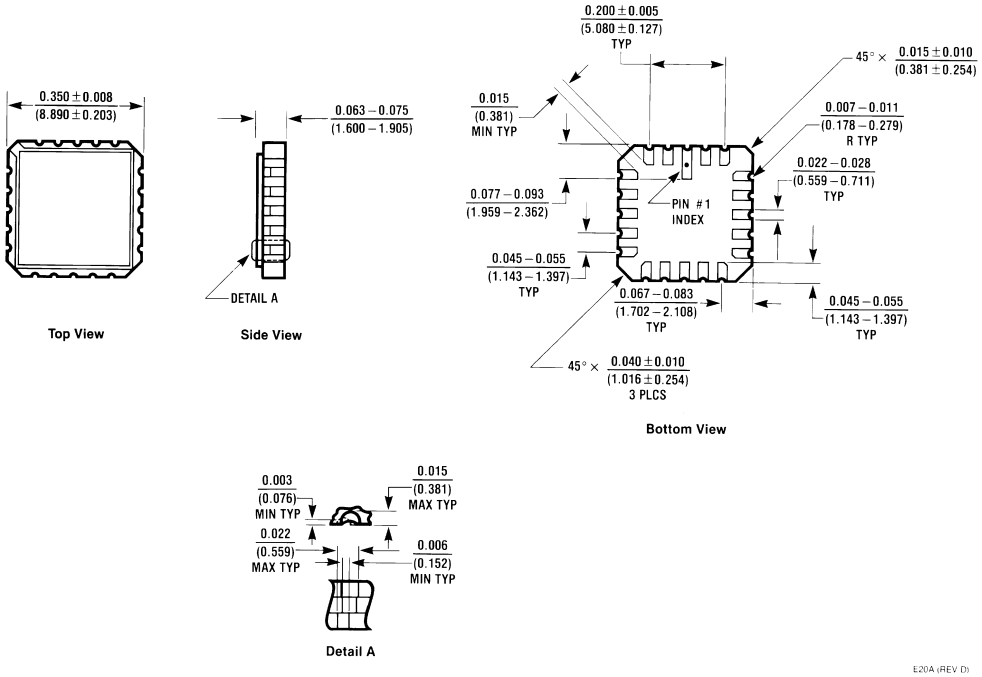
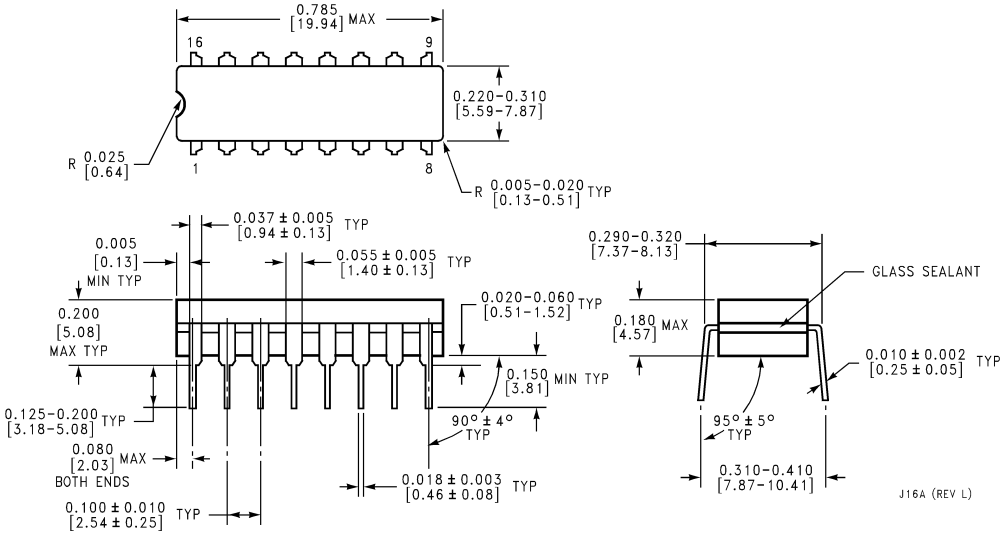
Physical Dimensions inches (millimeters) unless otherwise noted

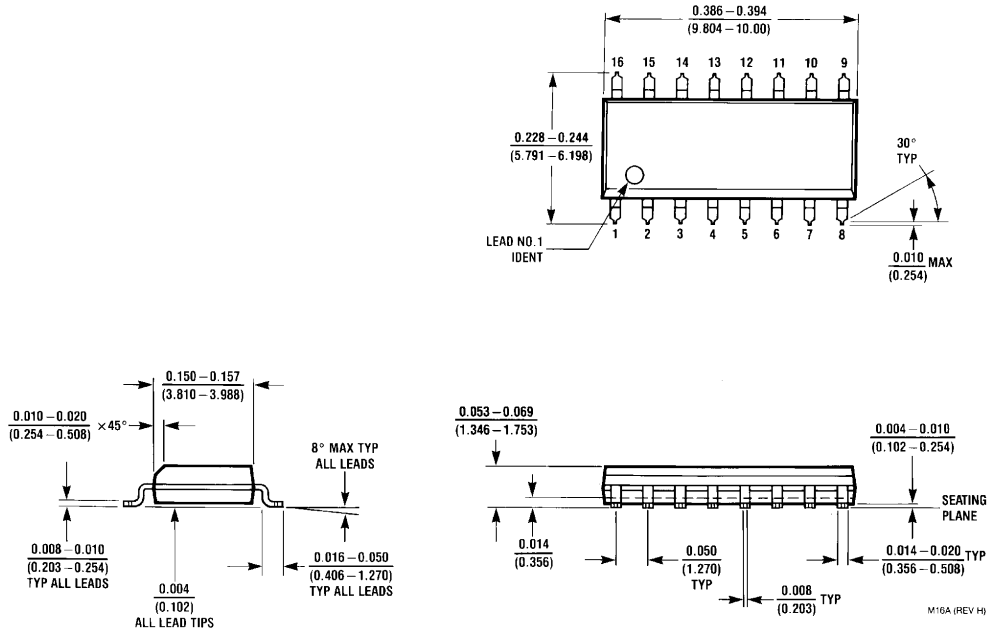


Chip Carrier Package (E)
Order Number 54LS85LMQB
Package Number E20A

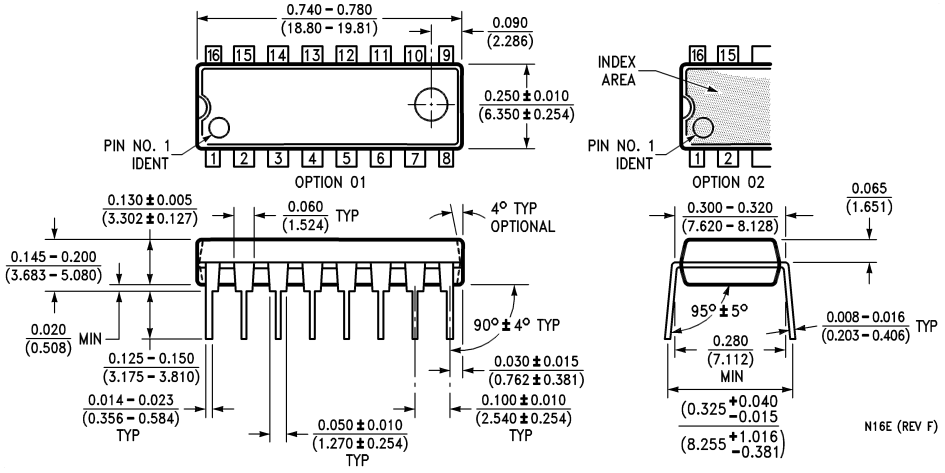


16-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS85DMQB or DM54LS85J
Package Number J16A

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

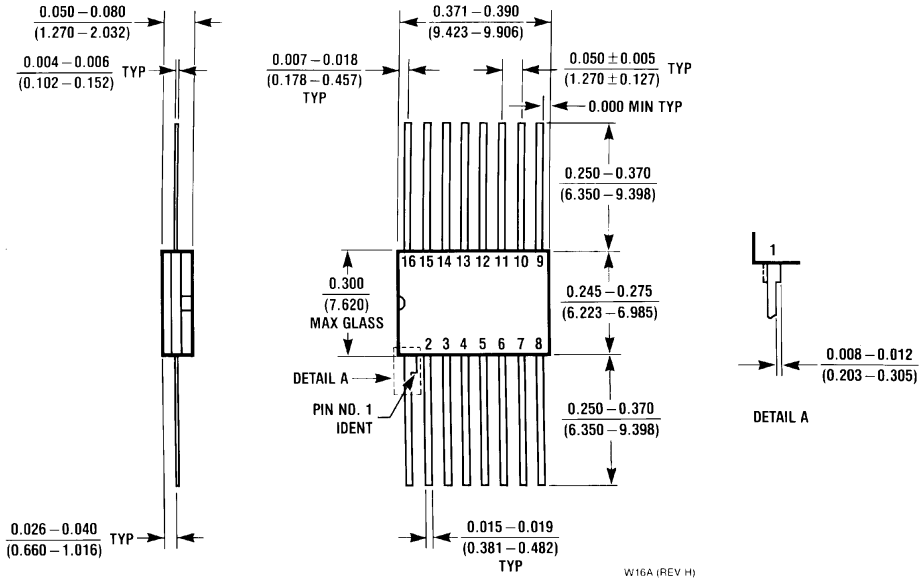


16-Lead Small Outline Molded Package (M)
Order Number DM74LS85M
Package Number M16A



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS85N
Package Number N16E

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



16-Lead Ceramic Flat Package (W)
Order Number 54LS85FMQB or DM54LS85W
Package Number W16A

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Fairchild Semiconductor Corporation
Americas
Customer Response Center
Tel: 1-888-522-5372

Fairchild Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 8 141-35-0
English Tel: +44 (0) 1 793-85-68-56
Italy Tel: +39 (0) 2 57 5631

Fairchild Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: +852 2737-7200
Fax: +852 2314-0061

National Semiconductor Japan Ltd.
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179

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