

5485/DM5485/DM7485 4-Bit Magnitude Comparators

General Description

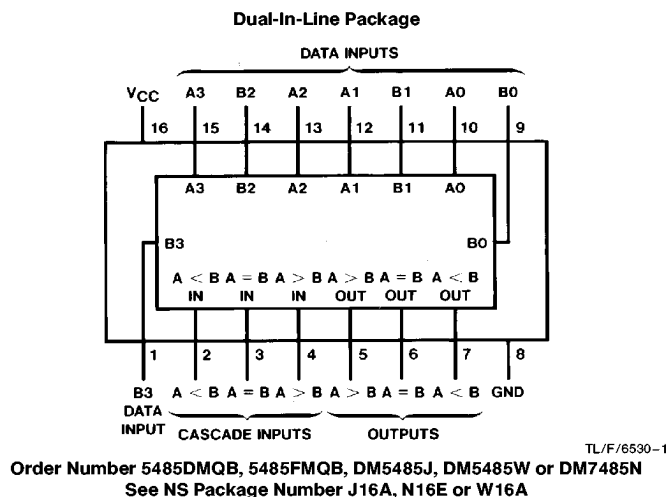
These 4-bit magnitude comparators perform comparison of straight binary or BCD codes. Three fully-decoded decisions about two 4-bit words (A, B) are made and are externally available at three outputs. These devices are fully expandable to any number of bits without external gates. Words of greater length 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 paths are implemented with only a two-gate-level delay to reduce overall comparison times for long words.

Features

- Typical power dissipation 275 mW
- Typical delay (4-bit words) 23 ns
- Alternate Military/Aerospace device (5485) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram



Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54 and 54	−55°C to +125°C
DM74	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: 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.

Recommended Operating Conditions

Symbol	Parameter	DM5485			DM7485			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			0.8			0.8	V
I _{OH}	High Level Output Current			−0.8			−0.8	mA
I _{OL}	Low Level Output Current			16			16	mA
T _A	Free Air Operating Temperature	−55		125	0		70	°C

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

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = −12 mA			−1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	2.4			V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max			0.4	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input Current	V _{CC} = Max V _I = 2.4V	A < B		40	μA
			A > B		40	
			Others		120	
I _{IL}	Low Level Input Current	V _{CC} = Max V _I = 0.4V	A < B		−1.6	mA
			A > B		−1.6	
			Others		−4.8	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54	−20	−55	mA
			DM74	−18	−55	
I _{CC}	Supply Current	V _{CC} = Max (Note 3)		55	88	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC} is measured with all outputs open, A = B input grounded and all other inputs at 4.5V.

Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

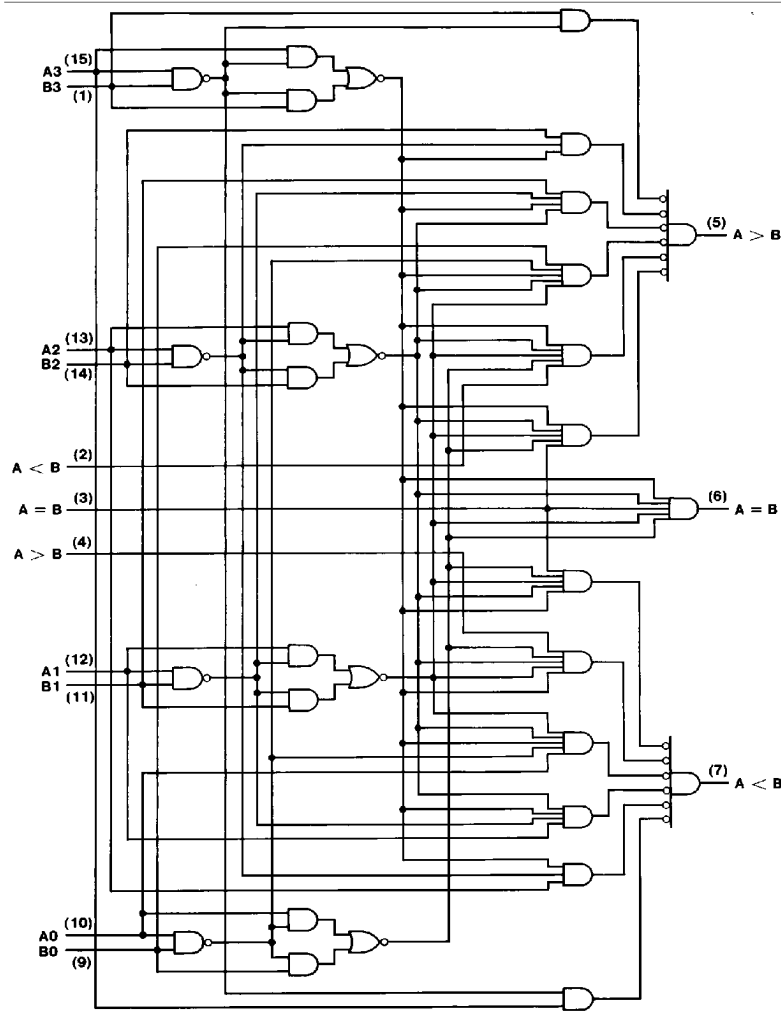
Symbol	Parameter	From Input	To Output	Number of Gate Levels	$R_L = 400\Omega$ $C_L = 15\text{ pF}$		Units
					Min	Max	
t_{PLH}	Propagation Delay Time Low-to-High Level Output	Any A or B Data Input	A < B	3		26	ns
			A > B				
			A = B	4		35	
t_{PHL}	Propagation Delay Time High-to-Low Level Output	Any A or B Data Input	A < B	3		30	ns
			A > B				
			A = B	4		30	
t_{PLH}	Propagation Delay Time Low-to-High Level Output	A < B or A = B	A > B	1		11	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output	A < B or A = B	A > B	1		17	ns
t_{PLH}	Propagation Delay Time Low-to-High Level Output	A = B	A = B	2		20	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output	A = B	A = B	2		17	ns
t_{PLH}	Propagation Delay Time Low-to-High Level Output	A > B or A = B	A < B	1		11	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output	A > B or A = B	A < B	1		17	ns

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



TL/F/6530-2

Technical drawing of a 16-pin D-sub connector showing top, side, and detail views with dimensions in inches and millimeters.

Top View Dimensions:

- Overall width: $0.785 [19.94]$ MAX
- Pin 16 to Pin 9 distance: $0.220-0.310 [5.59-7.87]$
- Pin 1 to Pin 8 distance: $0.005-0.020 [0.13-0.51]$ TYP
- Pin 16 to Pin 1 distance: $0.025 [0.64]$

Side View Dimensions:

- Pin 16 to Pin 9 distance: $0.290-0.320 [7.37-8.13]$
- Pin 1 to Pin 8 distance: $0.180 [4.57]$ MAX
- Pin 16 to Pin 1 distance: $0.005 [0.13]$ MIN TYP
- Pin 1 to Pin 8 distance: $0.037 \pm 0.005 [0.94 \pm 0.13]$ TYP
- Pin 1 to Pin 8 distance: $0.055 \pm 0.005 [1.40 \pm 0.13]$ TYP
- Pin 1 to Pin 8 distance: $0.020-0.060 [0.51-1.52]$ TYP
- Pin 1 to Pin 8 distance: $0.150 [3.81]$ MIN TYP
- Pin 1 to Pin 8 distance: $0.125-0.200 [3.18-5.08]$ TYP
- Pin 1 to Pin 8 distance: $0.080 [2.03]$ MAX BOTH ENDS
- Pin 1 to Pin 8 distance: $0.100 \pm 0.010 [2.54 \pm 0.25]$ TYP
- Pin 1 to Pin 8 distance: $0.018 \pm 0.003 [0.46 \pm 0.08]$ TYP
- Pin 1 to Pin 8 distance: $90^\circ \pm 4^\circ$ TYP

Detail View Dimensions:

- Pin 16 to Pin 9 distance: $0.310-0.410 [7.87-10.41]$
- Pin 1 to Pin 8 distance: $95^\circ \pm 5^\circ$ TYP
- Pin 1 to Pin 8 distance: $0.010 \pm 0.002 [0.25 \pm 0.05]$ TYP
- Pin 1 to Pin 8 distance: GLASS SEALANT

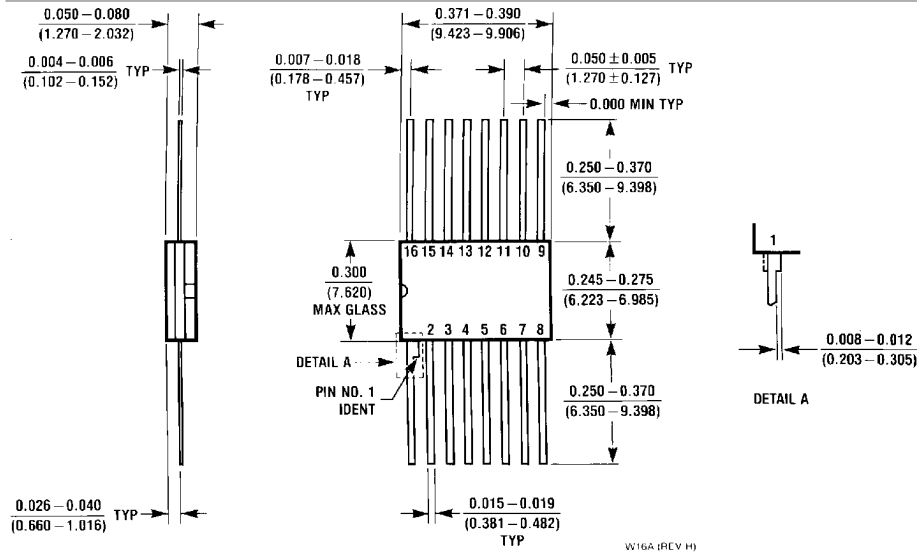
J16A (REV L)

The image displays three mechanical views of the N16E (REV F) package:

- Top View:** Shows the package footprint with dimensions:
 - Overall width: $0.740 - 0.780$ (18.80 - 19.81)
 - Pin pitch: 0.090 (2.286)
 - Pin 1 offset: 0.250 ± 0.010 (6.350 $\pm$ 0.254)
 - Pin numbers 1 through 16 are indicated around the perimeter.
- Side View:** Shows the package height and pin dimensions:
 - Maximum height: $0.145 - 0.200$ (3.683 - 5.080)
 - Pin height: 0.130 ± 0.005 (3.302 $\pm$ 0.127)
 - Pin thickness: 0.060 (1.524) TYP
 - Lead angle: 4° TYP OPTIONAL
 - Lead angle: $90^\circ \pm 4^\circ$ TYP
 - Pin thickness: 0.030 ± 0.015 (0.762 $\pm$ 0.381)
 - Pin thickness: 0.100 ± 0.010 (2.540 $\pm$ 0.254) TYP
 - Pin thickness: 0.050 ± 0.010 (1.270 $\pm$ 0.254) TYP
 - Pin thickness: $0.014 - 0.023$ (0.356 - 0.584) TYP
 - Pin thickness: $0.125 - 0.150$ (3.175 - 3.810)
 - Pin thickness: 0.020 (0.508) MIN
- Index View:** Shows the package with dimensions:
 - Overall width: $0.300 - 0.320$ (7.620 - 8.128)
 - Pin pitch: 0.065 (1.651)
 - Pin angle: $95^\circ \pm 5^\circ$
 - Pin thickness: $0.008 - 0.016$ (0.203 - 0.406) TYP
 - Pin thickness: 0.280 (7.112) MIN
 - Pin thickness: $0.325 + 0.040 - 0.015$ (8.255 + 1.016 - 0.381)

N16E (REV F)

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Physical Dimensions inches (millimeters) (Continued)

16-Lead Ceramic Flat Package (W)
Order Number 5485FMQB or DM5485W
NS Package Number W16A

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