

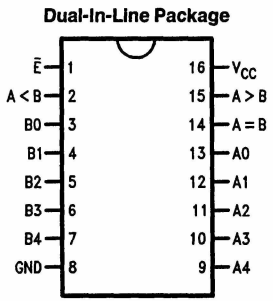


# 9324/DM9324 5-Bit Comparator

## General Description

The 9324 expandable comparators provide comparison between two 5-bit words and give three outputs—"less than", "greater than" and "equal to". A HIGH on the active LOW Enable Input forces all three outputs LOW.

## Connection Diagram



TL/F/9792-1

**Order Number 9324DMQB, 9324FMQB, or DM9324N**  
**See NS Package Number J16A, N16E or W16A**

Pin Names	Description
$\bar{E}$	Enable Input (Active LOW)
A0–A4	Word A Parallel Inputs
B0–B4	Word B Parallel Inputs
A < B	A Less than B Output (Active HIGH)
A > B	A Greater than B Output (Active HIGH)
A = B	A Equal to B Output (Active HIGH)

## 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	
Military	−55°C to +125°C
Commercial	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	Military			Commercial			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.8			0.8	V
I <sub>OH</sub>	High Level Output Current			−0.8			−0.8	mA
I <sub>OL</sub>	Low Level Output Current			16			16	mA
T <sub>A</sub>	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 <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = −12 mA			−1.5	V
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OH</sub> = Max V <sub>IL</sub> = Max	2.4	3.4		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max V <sub>IH</sub> = Min		0.2	0.4	V
I <sub>I</sub>	Input Current @ Max Input Voltage	V <sub>CC</sub> = Max, V <sub>I</sub> = 5.5V			1	mA
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.4V			80	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			−3.2	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	MIL	−20	−70	mA
			COM	−20	−70	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max			81	mA

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

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

## Switching Characteristics

$V_{CC} = +5.0V$ ,  $T_A = +25^\circ C$  (See Section 1 for waveforms and load configurations)

Symbol	Parameter	$C_L = 15\text{ pF}$		Units
		Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation Delay $\bar{E}$ to $A = B$		14 14	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $A_n, B_n$ to $A > B$		25 22	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $A_n, B_n$ to $A < B$		26 21	ns
$t_{PLH}$ $t_{PHL}$	Propagation Delay $A_n, B_n$ to $A = B$		30 32	ns

## Functional Description

The '24 5-bit comparators use combinational circuitry to directly generate "A greater than B" and "A less than B" outputs. As evident from the logic diagram, these outputs are generated in only three gate delays. The "A equals B" output is generated in one additional gate delay by decoding the "A neither less than nor greater than B" condition with a NOR gate. All three outputs are activated by the active LOW Enable Input ( $\bar{E}$ ).

Tying the  $A > B$  output from one device into an A input on another device and the  $A < B$  output into the corresponding B input permits easy expansion.

The A4 and B4 inputs are the most significant inputs and A0, B0 the least significant. Thus if A4 is HIGH and B4 is LOW, the  $A > B$  output will be HIGH regardless of all other inputs except  $\bar{E}$ .

## Truth Table

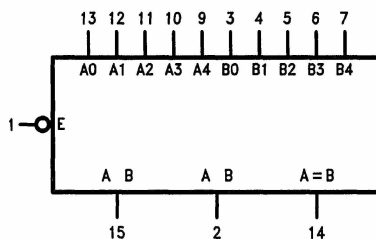
Inputs			Outputs		
$\bar{E}$	$A_n$	$B_n$	$A < B$	$A > B$	$A = B$
H	X	X	L	L	L
L	Word A = Word B		L	L	H
L	Word A > Word B		L	H	L
L	Word B > Word A		H	L	L

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

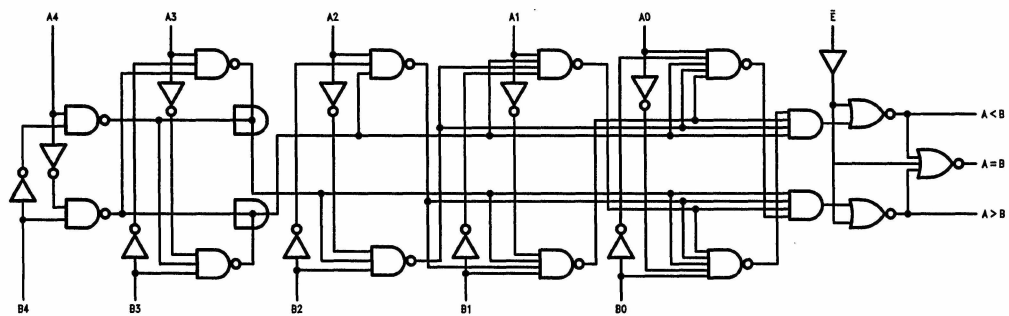
## Logic Symbol



$V_{CC}$  = Pin 16  
GND = Pin 6

TL/F/9792-2

## Logic Diagram



TL/F/9792-3