

## 9324/DM9324 5-Bit Comparator

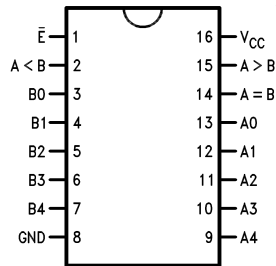
### General Description

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

Dual-In-Line Package



DS009792-1

Order Number 9324DMQB, 9324FMQB, or DM9324N  
See 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 1)

Supply Voltage	7V	Military	-55°C to +125°C
Input Voltage	5.5V	Commercial	0°C to +70°C
Operating Free Air Temperature Range		Storage Temperature Range	-65°C to +150°C

### 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

**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 <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 3)	MIL	-20	-70	mA
			COM	-20	-70	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max			81	mA

**Note 2:** All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

**Note 3:** 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	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.

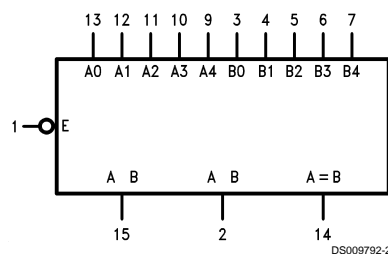
The A4 and B4 inputs are the most significant inputs and A0, B0 the least significant. Thus if A4 is HIGH and B4 is LOW, the  $A > B$  output will be HIGH regardless of all other inputs except  $\bar{E}$ .

## 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

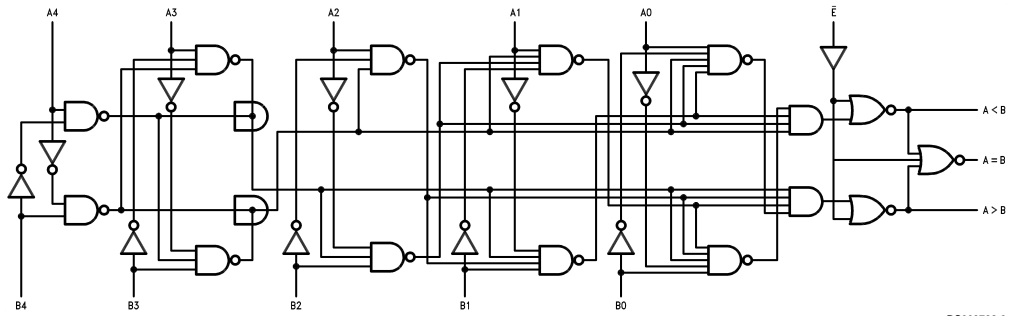
H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

## Logic Symbol



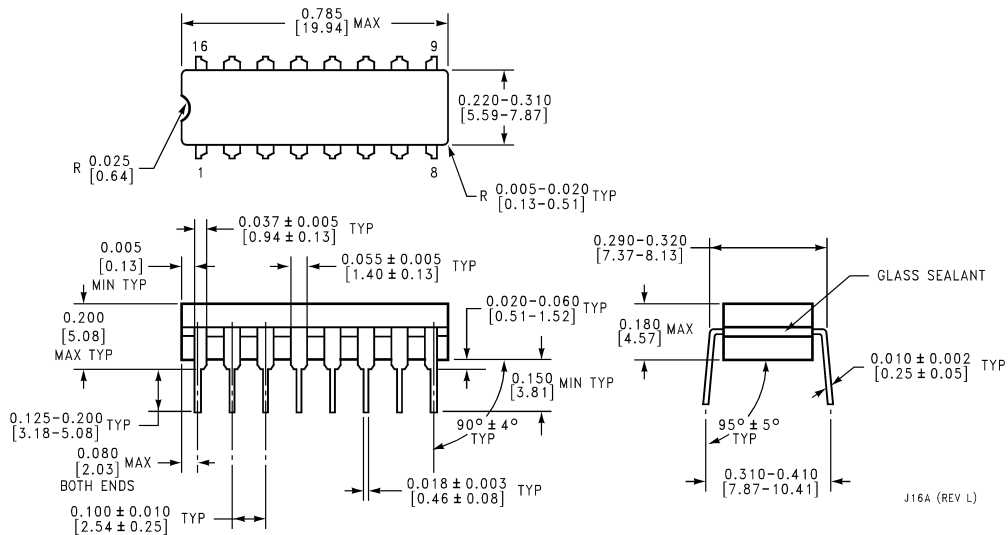
$V_{CC}$  = Pin 16  
GND = Pin 6

# Logic Diagram

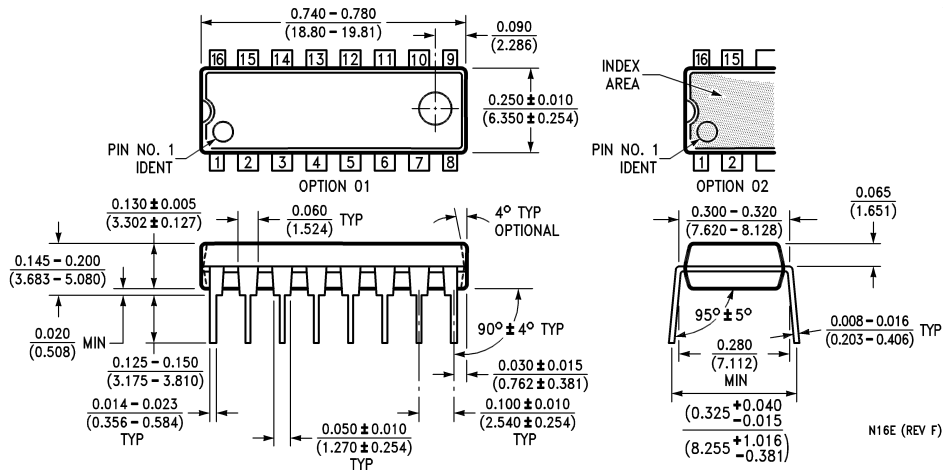


DS009792-3

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

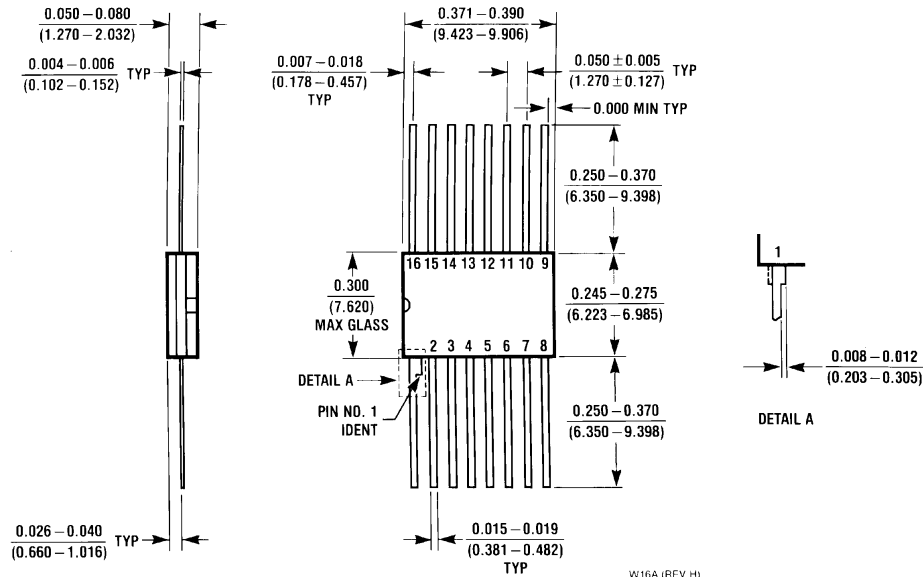


**16-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 9324DMQB**  
**Package Number J16A**



**16-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM9324N**  
**Package Number N16E**

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



**16-Lead Ceramic Flat Package (W)**  
**Order Number 9324FMQB**  
**Package Number W16A**

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**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

[www.fairchildsemi.com](http://www.fairchildsemi.com)