National Semiconductor

June 1989

9321/DM9321
Dual 1-of-4 Decoder

General Description

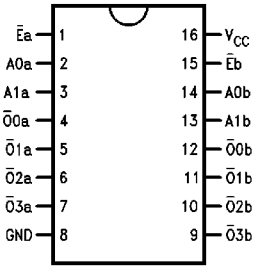
The 9321 consists of two independent multipurpose decoders, each designed to accept two inputs and provide four mutually exclusive outputs. In addition an active LOW enable input, which gives demultiplexing capability, is provided for each decoder.

Features

- Multifunction capability
- Mutually exclusive outputs
- Demultiplexing capability
- Active low enable for each decoder

Connection Diagram

Dual-In-Line Package



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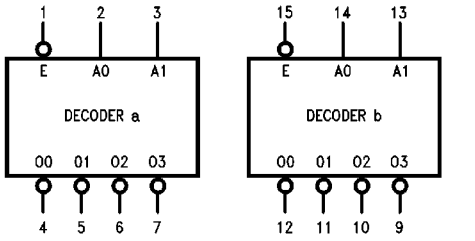
Order Number 9321DMQB, 9321FMQB or DM9321N
See NS Package Number J16A, N16E or W16A

Logic Symbol



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V_{CC} = Pin 16
GND = Pin 8

Pin Names	Description
$\bar{E}a$, $\bar{E}b$	Enable Inputs (Active LOW)
A0a, A1a, A0b, A1b	Address Inputs
$\bar{O}0a$–$\bar{O}3a$ $\bar{O}0b$–$\bar{O}3b$	Decoder Outputs (Active LOW)

RRD-B30M105/Printed in U. S. A.

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	
MIL	−55°C to +125°C
COMM	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_{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 (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −10 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				40	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−1.6	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	MIL	−20		−70	mA
			COM	−1.3		−3.7	
I_{CC}	Supply Current	V_{CC} = Max (Note 3)				50	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, and the duration should not exceed one second.

Note 3: I_{CC} is measured with all outputs open and all inputs grounded.

Switching Characteristics $V_{CC} = +5.0V$, $T_A = +25°C$ (See Section 1 for test waveforms and output load)

Symbol	Parameter	$C_L = 15$ pF		Units
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay, An to $\overline{On}$		20 21	ns
t_{PLH} t_{PHL}	Propagation Delay, $\overline{E}$ to $\overline{On}$		14 18	ns

Functional Description

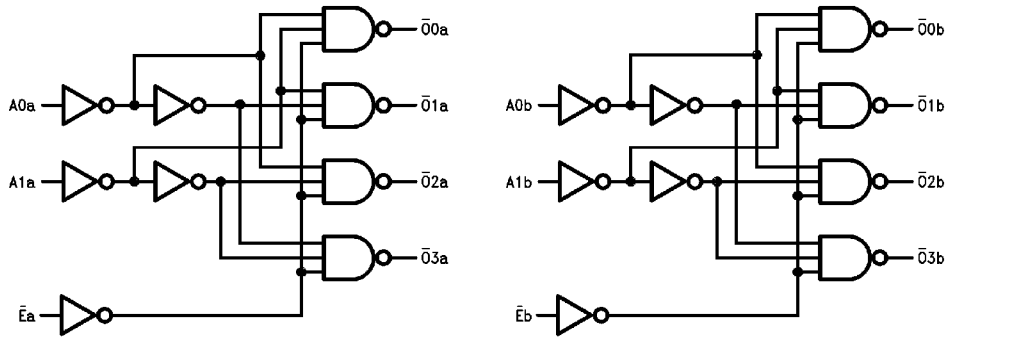
The 9321 consists of two separate decoders each designed to accept two binary weighted inputs and provide four mutually exclusive active LOW outputs as shown in the logic symbol. Each decoder can be used as a 4-output demultiplexer by using the enable as a data input.

Truth Table (Each Decoder)

Inputs			Outputs			
$\overline{E}$	A0	A1	$\overline{O}0$	$\overline{O}1$	$\overline{O}2$	$\overline{O}3$
L	L	L	L	H	H	H
L	H	L	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L
H	X	X	H	H	H	H

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

Logic Diagram



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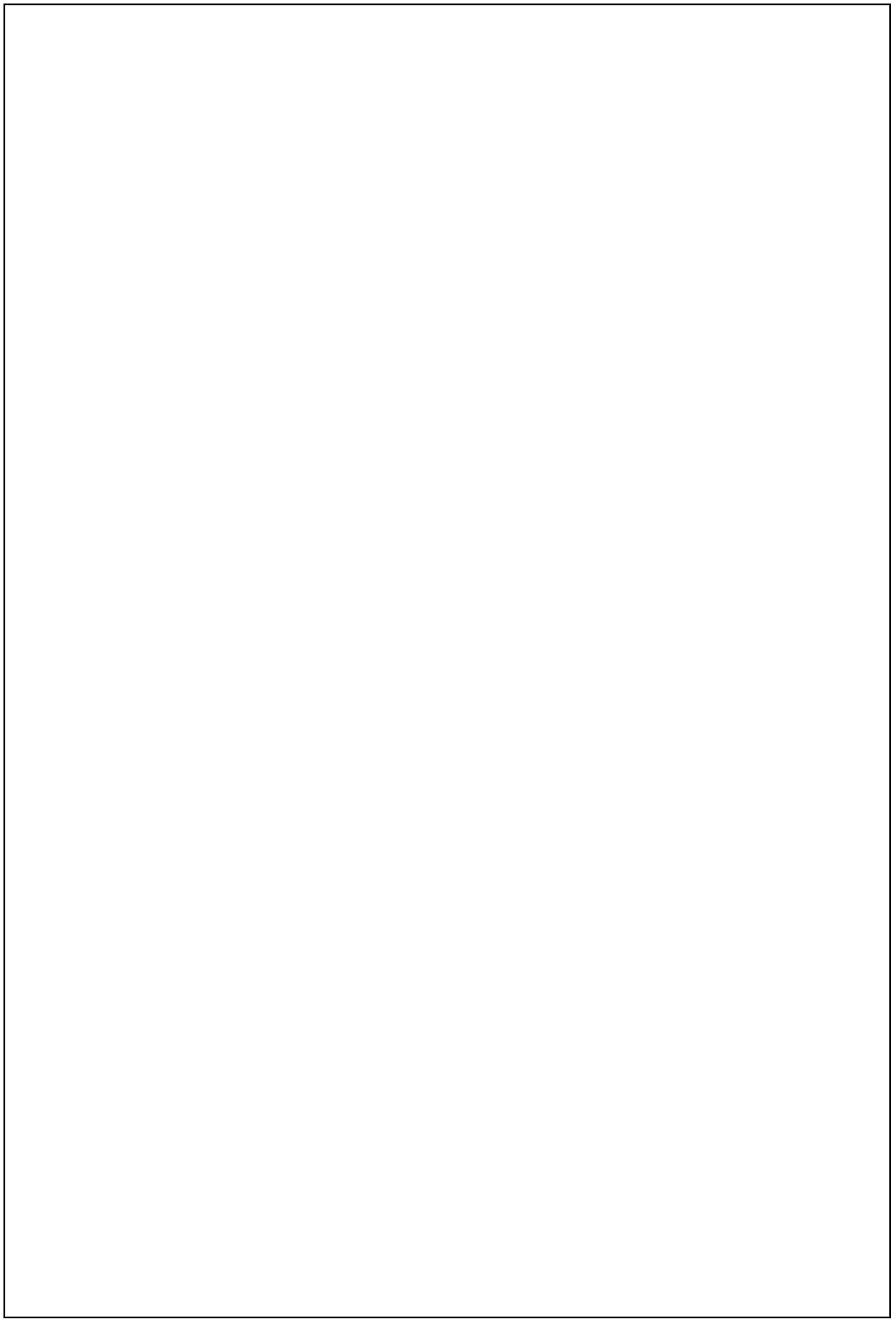
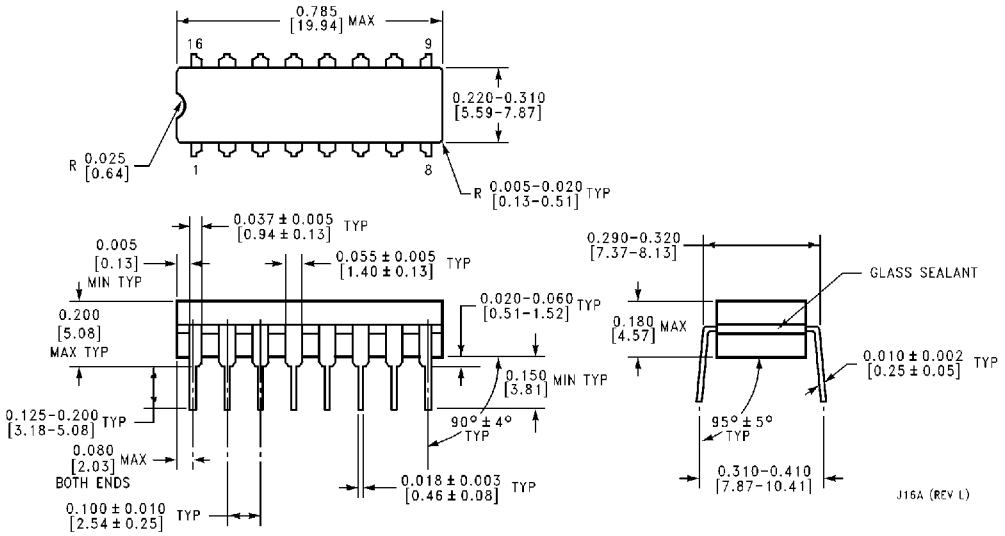
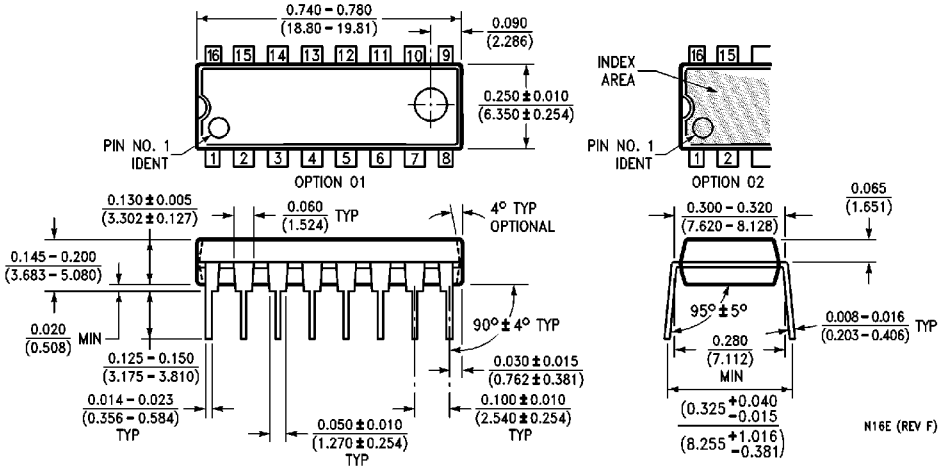


Physical Dimensions inches (millimeters)

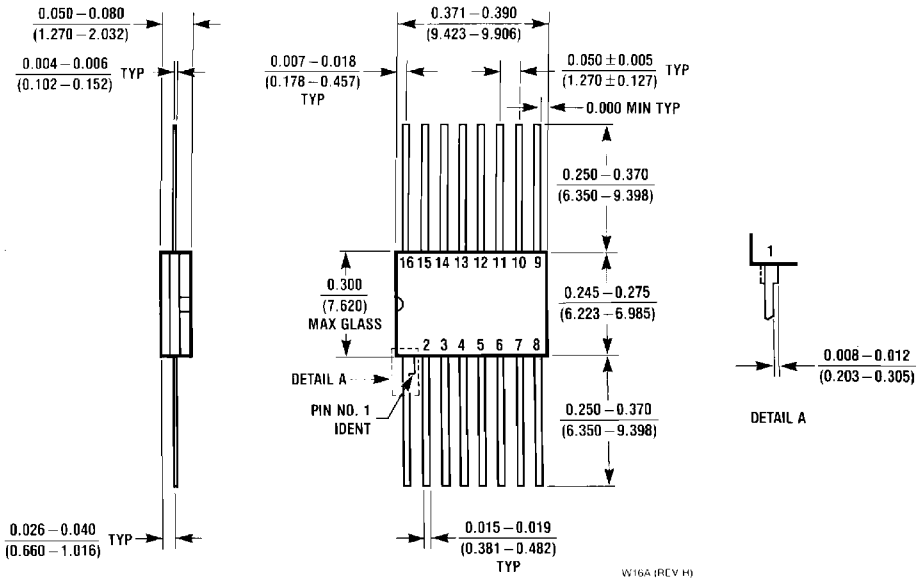


16-Lead Ceramic Dual-In-Line Package (J)
Order Number 9321DMQB
NS Package Number J16A



16 Lead Molded Dual-In-Line Package (N)
Order Number DM9321N
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)



16-Lead Ceramic Flat Package (W)
Order Number 9321FMQB
NS Package Number W16A

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