



# 9321/DM9321

## Dual 1-of-4 Decoder

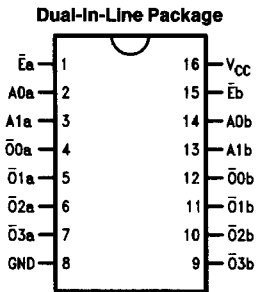
### General Description

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

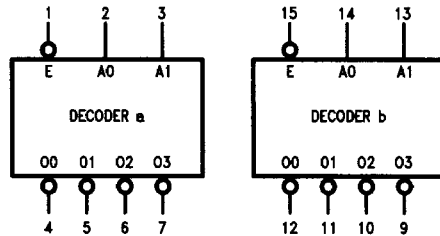
### Connection Diagram



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

### Logic Symbol



V<sub>CC</sub> = Pin 16  
 GND = Pin 8

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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)

## 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 <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 (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> = -10 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, V <sub>IH</sub> = Min	2.4			V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min, V <sub>IL</sub> = Max			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			40	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V			-1.6	mA
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)	MIL	-20	-70	mA
			COM	-1.3	-3.7	
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max (Note 3)			50	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, and the duration should not exceed one second.

Note 3: I<sub>CC</sub> is measured with all outputs open and all inputs grounded.

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

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

**Functional Description**

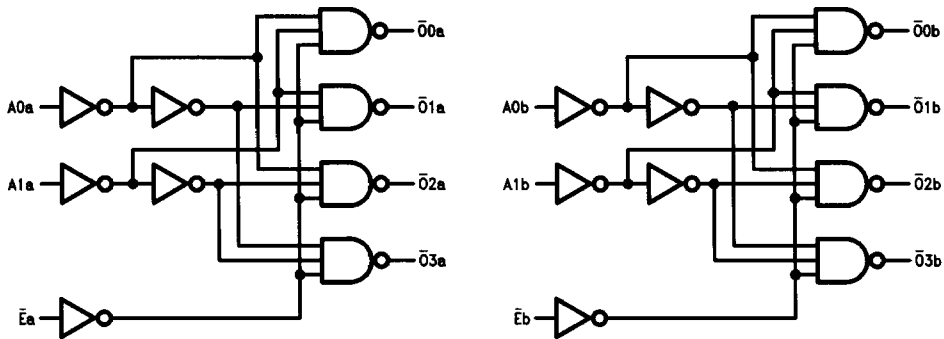
The 9321 consists of two separate decoders each designed to accept two binary weighted inputs and provide four mutually exclusive active LOW outputs as shown in the logic symbol. Each decoder can be used as a 4-output demultiplexer by using the enable as a data input.

**Truth Table** (Each Decoder)

Inputs			Outputs			
$\bar{E}$	A0	A1	$\bar{O}0$	$\bar{O}1$	$\bar{O}2$	$\bar{O}3$
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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