National Semiconductor

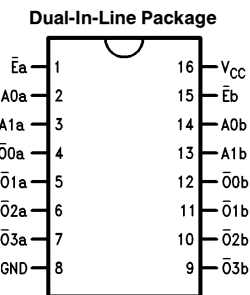## 9321/DM9321
Dual 1-of-4 Decoder

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.
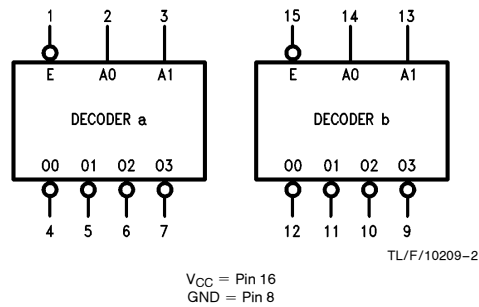
Features

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

Connection Diagram

Dual-In-Line Package

$\overline{E}a$	1	16	V_{CC}
A0a	2	15	$\overline{E}b$
A1a	3	14	A0b
$\overline{O}0a$	4	13	A1b
$\overline{O}1a$	5	12	$\overline{O}0b$
$\overline{O}2a$	6	11	$\overline{O}1b$
$\overline{O}3a$	7	10	$\overline{O}2b$
GND	8	9	$\overline{O}3b$

TL/F/10209–1

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

Logic Symbol

TL/F/10209–2

V_{CC} = Pin 16
GND = Pin 8

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

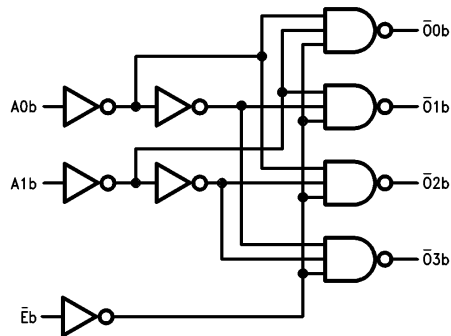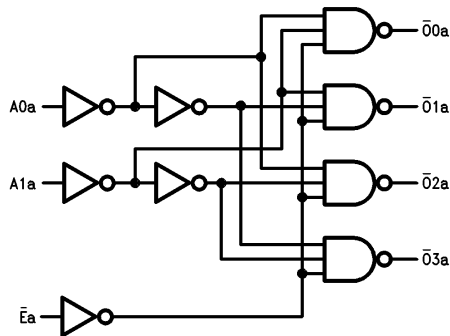| Symbol	Parameter	$C_L = 15\,pF$		Units
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay, An to $\overline{O}$n		20 21	ns
t_{PLH} t_{PHL}	Propagation Delay, $\overline{E}$ to $\overline{O}$n		14 18	ns

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			
$\overline{E}$	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

TL/F/10209–3

Physical Dimensions inches (millimeters)

0.785
[19.94] MAX

16   9

0.220–0.310
[5.59–7.87]

1   8

R 0.025
[0.64]

R 0.005–0.020 TYP
[0.13–0.51]

0.037 ± 0.005 TYP
[0.94 ± 0.13]

0.005
[0.13]
MIN TYP

0.055 ± 0.005 TYP
[1.40 ± 0.13]

0.200
[5.08]
MAX TYP

0.020–0.060 TYP
[0.51–1.52]

0.150 MIN TYP
[3.81]

0.125–0.200 TYP
[3.18–5.08]

90° ± 4°
TYP

0.080 MAX
[2.03]
BOTH ENDS

0.018 ± 0.003 TYP
[0.46 ± 0.08]

0.100 ± 0.010 TYP
[2.54 ± 0.25]

0.290–0.320
[7.37–8.13]

GLASS SEALANT

0.180 MAX
[4.57]

0.010 ± 0.002 TYP
[0.25 ± 0.05]

95° ± 5°
TYP

0.310–0.410
[7.87–10.41]

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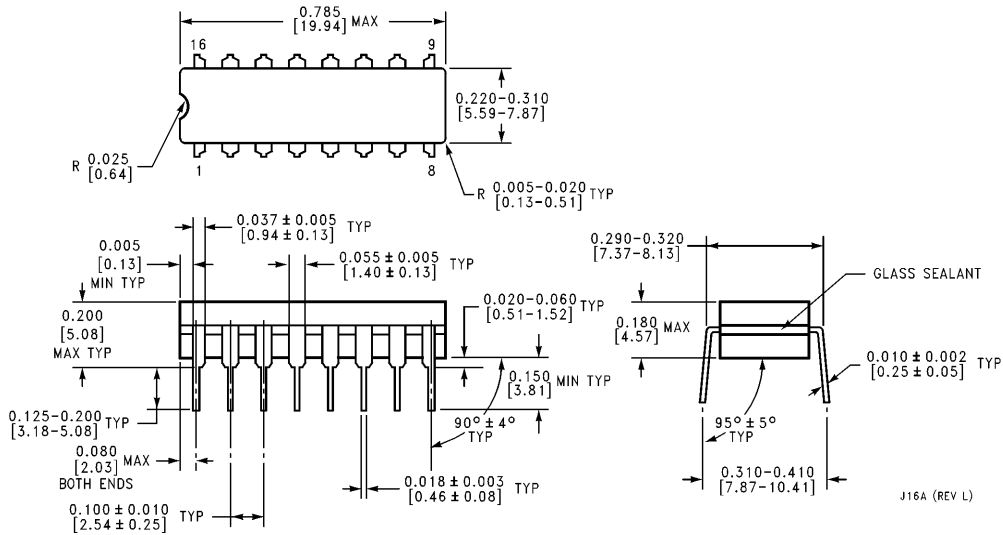
16-Lead Ceramic Dual-In-Line Package (J)
Order Number 9321DMQB
NS Package Number J16A

0.740 – 0.780
(18.80 – 19.81)

0.090
(2.286)

16 15 14 13 12 11 10 9

0.250 ± 0.010
(6.350 ± 0.254)

PIN NO. 1
IDENT

1   2   3   4   5   6   7   8

OPTION 01

INDEX
AREA

16 15

PIN NO. 1
IDENT

1   2

OPTION 02

0.065
(1.651)

0.130 ± 0.005
(3.302 ± 0.127)

0.060 TYP
(1.524)

4° TYP
OPTIONAL

0.145 – 0.200
(3.683 – 5.080)

0.300 – 0.320
(7.620 – 8.128)

0.020 MIN
(0.508)

0.125 – 0.150
(3.175 – 3.810)

90° ± 4° TYP

0.030 ± 0.015
(0.762 ± 0.381)

95° ± 5°

0.008 – 0.016 TYP
(0.203 – 0.406)

0.014 – 0.023
(0.356 – 0.584)
TYP

0.050 ± 0.010
(1.270 ± 0.254)
TYP

0.100 ± 0.010
(2.540 ± 0.254)
TYP

0.280
(7.112)
MIN

$(0.325^{+0.040}_{-0.015})$

$(8.255^{+1.016}_{-0.381})$

N16E (REV F)

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

Physical Dimensions inches (millimeters) (Continued)

$\frac{0.050 - 0.080}{(1.270 - 2.032)}$

$\frac{0.004 - 0.006}{(0.102 - 0.152)}$ TYP

$\frac{0.371 - 0.390}{(9.423 - 9.906)}$

$\frac{0.007 - 0.018}{(0.178 - 0.457)}$ TYP

$\frac{0.050 \pm 0.005}{(1.270 \pm 0.127)}$ TYP

0.000 MIN TYP

$\frac{0.250 - 0.370}{(6.350 - 9.398)}$

$\frac{0.300}{(7.620)}$ MAX GLASS

16 15 14 13 12 11 10 9

$\frac{0.245 - 0.275}{(6.223 - 6.985)}$

2 3 4 5 6 7 8

DETAIL A

PIN NO. 1 IDENT

$\frac{0.250 - 0.370}{(6.350 - 9.398)}$

$\frac{0.008 - 0.012}{(0.203 - 0.305)}$

DETAIL A

$\frac{0.026 - 0.040}{(0.660 - 1.016)}$ TYP

$\frac{0.015 - 0.019}{(0.381 - 0.482)}$ TYP

W16A (REV H)

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

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2. A critical component is 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.