National *Semiconductor*

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# 9309/DM9309 Dual 4-Bit Data Selectors/Multiplexers

General Description

These data selectors/multiplexers contain inverter/drivers to supply full complementary, on-chip, binary decoded data selection.

The 9309/DM9309 contains two separate 4-bit multiplexers with complementary Y and $\overline{Y}$ outputs; however, the two sections have common address select inputs.

Features

- Complementary outputs
- Dual one-of-four data selectors

Connection Diagram

Dual-In-Line Package
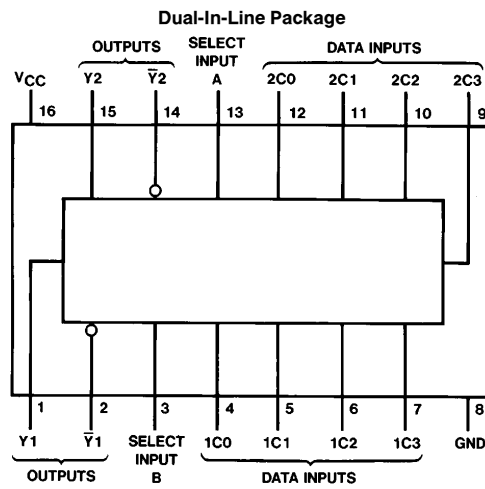
TL/F/6602–1

Order Number 9309DMQB, 9309FMQB or DM9309N
See NS Package Number J16A, N16E or W16A

Function Table

Inputs						Outputs	
Select		Data				Y	$\overline{Y}$
B	A	C0	C1	C2	C3		
L	L	L	X	X	X	L	H
L	L	H	X	X	X	H	L
L	H	X	L	X	X	L	H
L	H	X	H	X	X	H	L
H	L	X	X	L	X	L	H
H	L	X	X	H	X	H	L
H	H	X	X	X	L	L	H
H	H	X	X	X	H	H	L

Select inputs A and B are common to both sections.

H = High Level, L = Low Level, X = Don't Care.

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_{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 range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = $ Min, $I_I = -12$ mA				-1.5	V
V_{OH}	High Level Output Voltage	$V_{CC} = $ Min, $I_{OH} = $ Max $V_{IL} = $ Max, $V_{IH} = $ Min		2.4	3.4		V
V_{OL}	Low Level Output Voltage	$V_{CC} = $ Min, $I_{OL} = $ Max $V_{IH} = $ Min, $V_{IL} = $ Max			0.2	0.4	V
I_I	Input Current @ Max Input Voltage	$V_{CC} = $ Max, $V_I = 5.5$V				1	mA
I_{IH}	High Level Input Current	$V_{CC} = $ Max, $V_I = 2.4$V				40	μA
I_{IL}	Low Level Input Current	$V_{CC} = $ Max, $V_I = 0.4$V				-1.6	mA
I_{OS}	Short Circuit Output Current	$V_{CC} = $ Max (Note 2)	MIL	-20		-70	mA
			COM	-30		-85	
I_{CC}	Supply Current	$V_{CC} = $ Max (Note 3)			27	44	mA

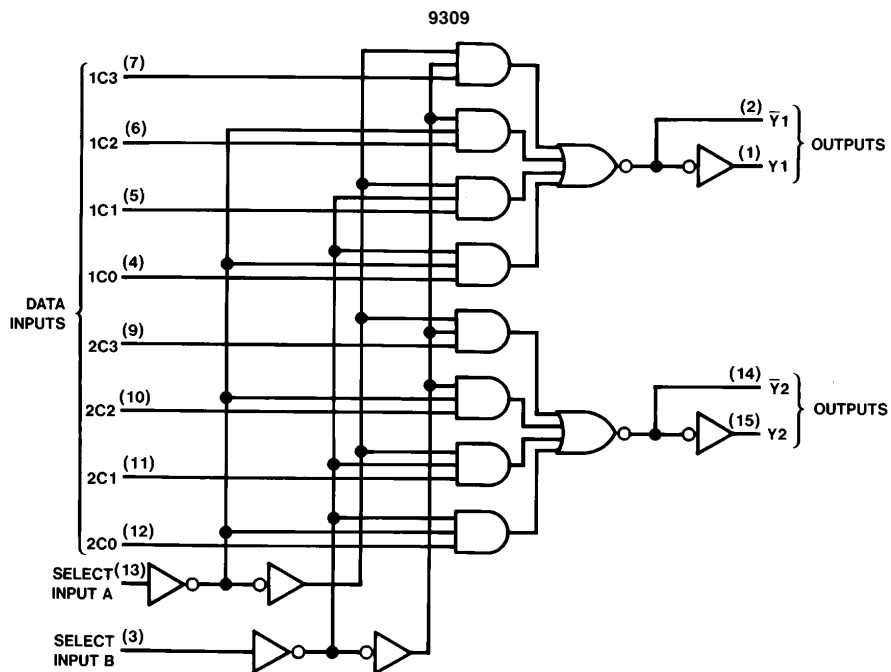**Note 1:** All typicals are at $V_{CC} = 5$V, $T_A = 25°C$.

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

Note 3: I_{CC} is measured with the outputs open and all inputs at 4.5V.

Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25°C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	Military $R_L = 400\Omega, C_L = 15$ pF		Commercial $R_L = 400\Omega, C_L = 15$ pF		Units
			Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	Select to Y		29		40	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select to Y		27		36	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Select to $\overline{Y}$		21		24	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select to $\overline{Y}$		21		29	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Data to Y		20		27	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Data to Y		21		34	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Data to $\overline{Y}$		12		21	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Data to $\overline{Y}$		13		13	ns

Logic Diagram

TL/F/6602–2

3

Physical Dimensions inches (millimeters)

0.785
[19.94] MAX

16   9

0.220-0.310
[5.59-7.87]

R 0.025
[0.64]

1   8

R 0.005-0.020 TYP
[0.13-0.51]

0.037 ± 0.005 TYP
[0.94 ± 0.13]

0.055 ± 0.005 TYP
[1.40 ± 0.13]

0.005
[0.13]
MIN TYP

0.020-0.060 TYP
[0.51-1.52]

0.200
[5.08]
MAX TYP

0.290-0.320
[7.37-8.13]

GLASS SEALANT

0.180 MAX
[4.57]

0.010 ± 0.002 TYP
[0.25 ± 0.05]

0.150 MIN TYP
[3.81]

0.125-0.200 TYP
[3.18-5.08]

90° ± 4° TYP

95° ± 5° TYP

0.080 MAX
[2.03]
BOTH ENDS

0.018 ± 0.003 TYP
[0.46 ± 0.08]

0.310-0.410
[7.87-10.41]

J16A (REV L)

0.100 ± 0.010 TYP
[2.54 ± 0.25]
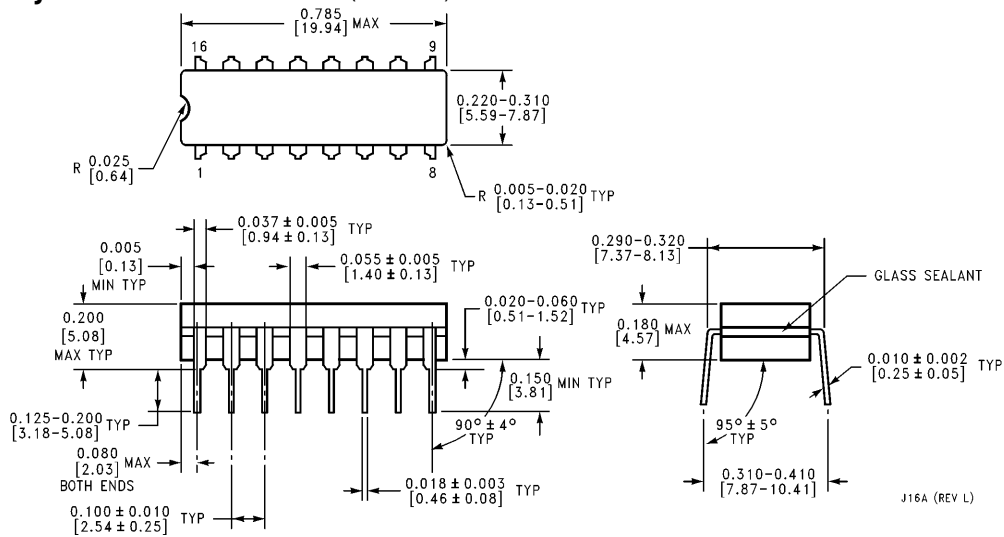
16-Lead Ceramic Dual-In-Line Package (J)
Order Number 9309DMQB
NS Package Number J16A

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)

INDEX
AREA

PIN NO. 1
IDENT

1 2 3 4 5 6 7 8

OPTION 01

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

0.300 - 0.320
(7.620 - 8.128)

0.145 - 0.200
(3.683 - 5.080)

0.020 MIN
(0.508)

90° ± 4° TYP

95° ± 5°

0.008 - 0.016 TYP
(0.203 - 0.406)

0.125 - 0.150
(3.175 - 3.810)

0.030 ± 0.015
(0.762 ± 0.381)

0.280
(7.112)
MIN

0.014 - 0.023 TYP
(0.356 - 0.584)

0.100 ± 0.010
(2.540 ± 0.254)
TYP

0.050 ± 0.010 TYP
(1.270 ± 0.254)

+0.040
(0.325 -0.015)

+1.016
(8.255 -0.381)

N16E (REV F)

16-Lead Molded Dual-In-Line Package (N)
Order Number DM9309N
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)

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

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

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

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

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

0.000 MIN TYP

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

16 15 14 13 12 11 10 9

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

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

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

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

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

W16A (REV H)
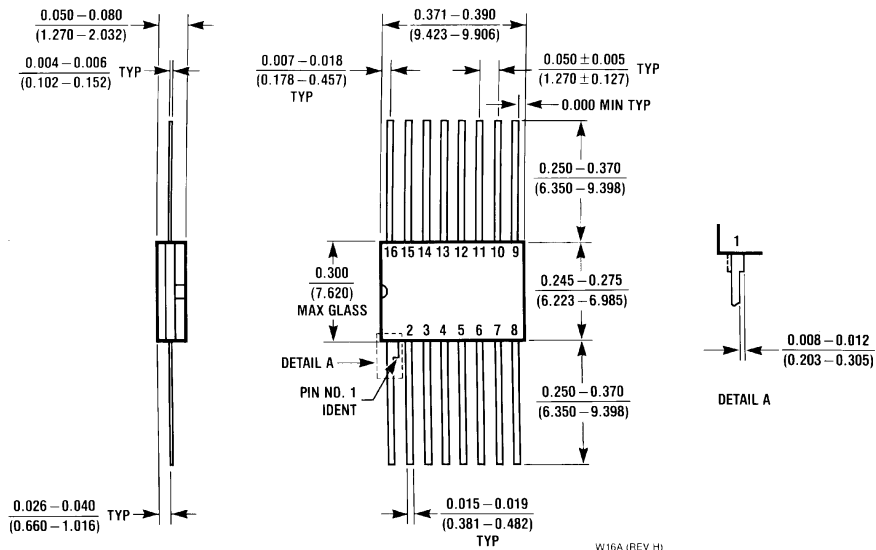
16-Lead Ceramic Flat Package (W)
Order Number 9309FMQB
NS Package Number W16A

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