

June 1989

DM54S251/DM74S251 TRI-STATE® 1 of 8 Line Data Selector/Multiplexer

General Description

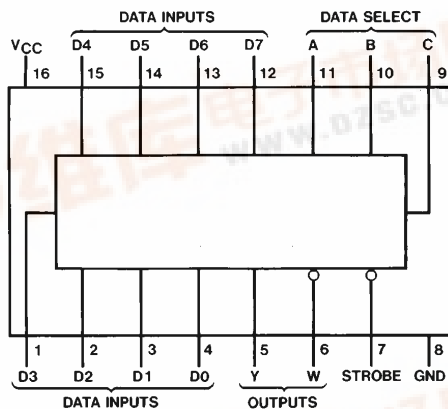
These data selectors/multiplexers contain full on-chip binary decoding to select one-of-eight data sources, and feature a strobe-controlled TRI-STATE output. The strobe must be at a low logic level to enable these devices. The TRI-STATE outputs permit direct connection to a common bus. When the strobe input is high, both outputs are in a high-impedance state in which both the upper and lower transistors of each totem pole output are off, and the output neither drives nor loads the bus significantly. When the strobe is low, the outputs are activated and operate as standard TTL totem-pole outputs.

To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output control circuitry is designed so that the average output disable time is shorter than the average output enable time.

Features

- TRI-STATE version of S151
- Interface directly with system bus
- Perform parallel-to-serial conversion
- Permit multiplexing from N-lines to one line
- Complementary outputs provide true and inverted data
- Max no. of common outputs
54S 39
74S 129
- Typical propagation delay time (D to Y) 8 ns
- Typical power dissipation 275 mW

Connection Diagram



TL/F/6480-1

Order Number DM54S251J or DM74S251N
See NS Package Number J16A or N16E

Function Table

Inputs				Outputs	
Select			Strobe S	Y	W
C	B	A			
X	X	X	H	Z	Z
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

H = High Logic Level, L = Low Logic Level

X = Don't Care, Z = High Impedance (Off)

D0, D1 . . . D7 = The Level of the respective D input

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

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	
DM54S	−55°C to +125°C
DM74S	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	DM54S251			DM74S251			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			−2			−6.5	mA
I _{OL}	Low Level Output Current			20			20	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 = −18 mA			−1.2	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	DM54 2.4	3.4		V
			DM74 2.4	3.2		
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max			0.5	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input	V _{CC} = Max, V _I = 2.7V			50	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.5V			−2	mA
I _{OZH}	Off-State Output Current with High Level Output Voltage Applied	V _{CC} = Max, V _O = 2.4 V _{IH} = Min, V _{IL} = Max			50	μA
I _{OZL}	Off-State Output Current with Low Level Output Voltage Applied	V _{CC} = Max, V _O = 0.5 V _{IH} = Min, V _{IL} = Max			−50	μA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54 −40		−100	mA
			DM74 −40		−100	
I _{CC}	Supply Current	V _{CC} = Max (Note 3)		55	85	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.

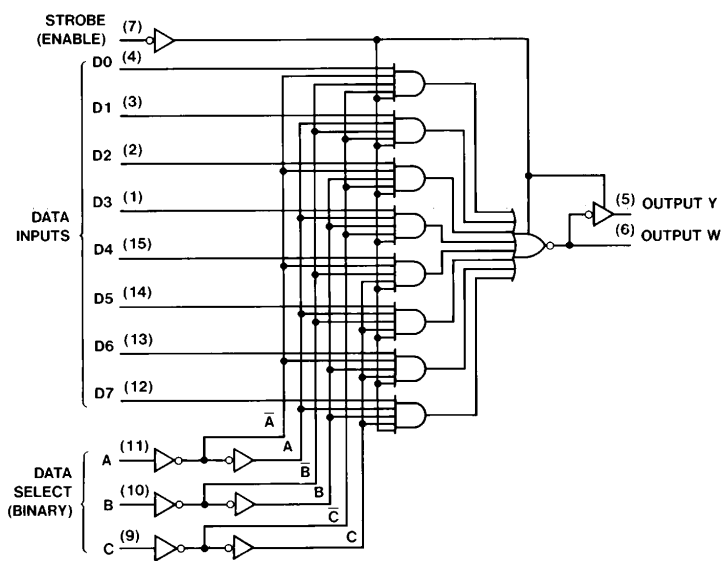
Note 3: I_{CC} is measured with the outputs open and all inputs at 4.5V.

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

Symbol	Parameter	From (Input) To (Output)	R _L = 280Ω				Units
			C _L = 15 pF		C _L = 50 pF		
			Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	A, B, or C (4 Levels) to Y		18		21	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A, B, or C (4 Levels) to Y		19.5		23	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	A, B, or C (3 Levels) to W		15		18	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A, B, or C (3 Levels) to W		13.5		17	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	D to Y		12		15	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	D to Y		12		15	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	D to W		7		10	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	D to W		7		10	ns
t _{PZH}	Output Enable Time to High Level Output	Strobe to Y				19.5	ns
t _{PZL}	Output Enable Time to Low Level Output	Strobe to Y				21	ns
t _{PHZ}	Output Disable Time to High Level Output (Note 1)	Strobe to Y		8.5			ns
t _{PLZ}	Output Disable Time to Low Level Output (Note 1)	Strobe to Y		14			ns
t _{PZH}	Output Enable Time to High Level Output	Strobe to W				19.5	ns
t _{PZL}	Output Enable Time to Low Level Output	Strobe to W				21	ns
t _{PHZ}	Output Disable Time to High Level Output (Note 1)	Strobe to W		8.5			ns
t _{PLZ}	Output Disable Time to Low Level Output (Note 1)	Strobe to W		14			ns

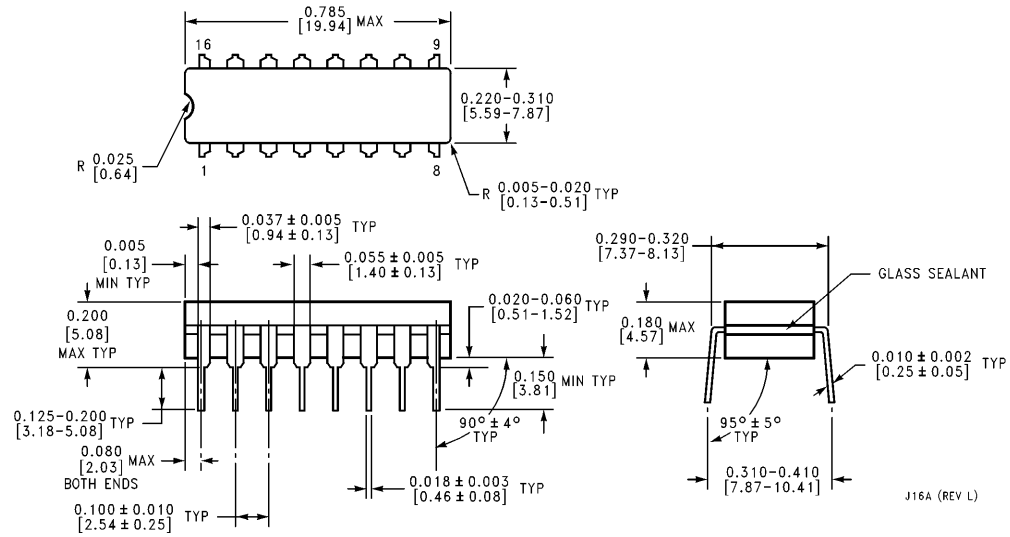
Note 1: $C_L = 5\text{ pF}$.

Logic Diagram



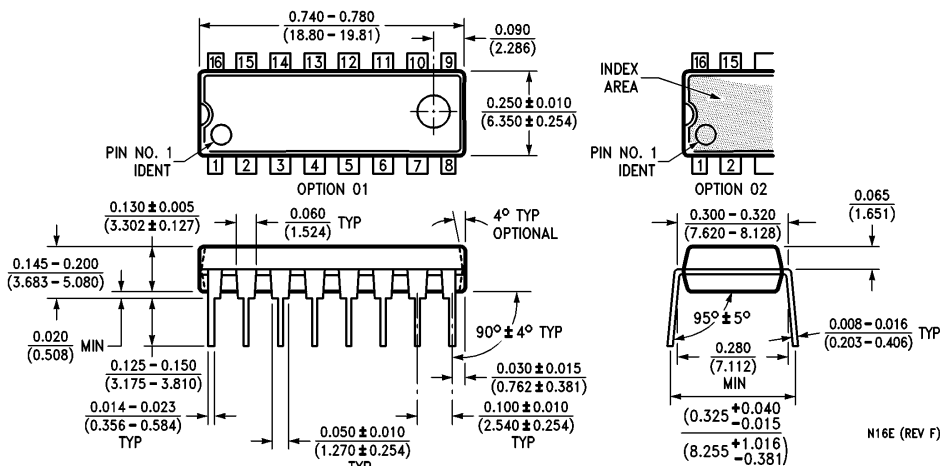
TL/F/6480-2

Physical Dimensions inches (millimeters)



16-Lead Ceramic Dual-In-Line Package (J)
Order Number DM54S251J
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74S251N
NS Package Number N16E

LIFE SUPPORT POLICY

NATIONAL'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 NATIONAL 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 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 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.



National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408