National Semiconductor

DM54S157/DM74S157, DM54S158/DM74S158 Quad 1 of 2 Line Data Selectors/Multiplexers

General Description

These data selectors/multiplexers contain inverters and drivers to supply full on-chip data selection to the four output gates. A separate strobe input is provided. A 4-bit word is selected from one of two sources and is routed to the four outputs. The S157 presents true data whereas the S158 presents inverted data to minimize propagation delay time.

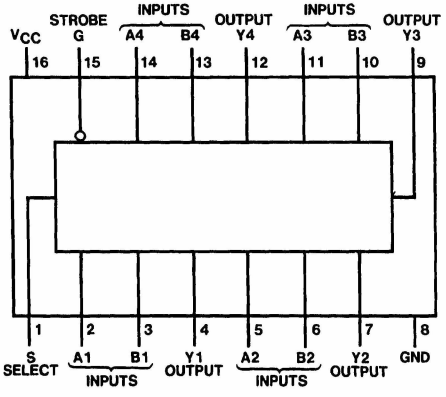
Applications

- Expand any data input point
- Multiplex dual data buses
- Generate four functions of two variables (one variable is common)
- Source programmable counters

Features

- Buffered inputs and outputs
- Typical propagation time
  S157 5 ns
  S158 4 ns
- Typical power dissipation
  S157 250 mW
  S158 195 mW

Connection Diagrams (Dual-In-Line Packages)



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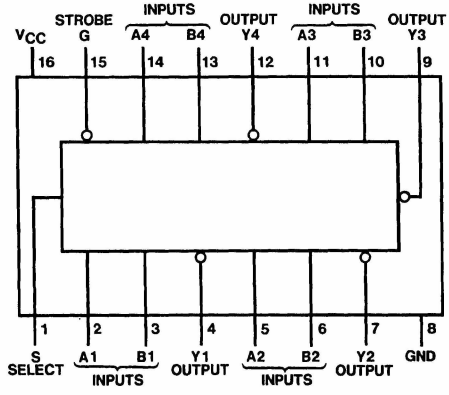
Order Number DM54S157J, DM54S157W or DM74S157N
See NS Package Number J16A, N16E or W16A



TL/F/6470–2

Order Number DM54S158J, DM54S158W or DM74S158N
See NS Package Number J16A, N16E or W16A

Function Table

Inputs				Output Y	
Strobe	Select	A	B	S157	S158
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

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	
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	DM54S157			DM74S157			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			−1			−1	mA
I_{OL}	Low Level Output Current			20			20	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

'S157 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	2.5	3.4		V
			DM74	2.7	3.4		
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 Current	V_{CC} = Max, V_I = 2.7V	S or G			100	μA
			A or B			50	
I_{IL}	High Level Input Current	V_{CC} = Max, V_I = 0.5V	S or G			−4	mA
			A or B			−2	
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)			50	78	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 4.5V applied to all inputs and all outputs open.

'S157 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)	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	Data to Y		7.5		10	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Data to Y		6.5		10	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Strobe to Y		12.5		15	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Strobe to Y		12		15	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Select to Y		15		17	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select to Y		15		17	ns

Recommended Operating Conditions

Symbol	Parameter	DM54S158			DM74S158			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			−1			−1	mA
I_{OL}	Low Level Output Current			20			20	mA
T_A	Free Air Operating Temperature	−55		125	0		70	°C

'S158 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	2.5	3.4		V
			DM74	2.7	3.4		
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 Current	V_{CC} = Max, V_I = 2.7V	S or G			100	μA
			A or B			50	
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.5V	S or G			−4	mA
			A or B			−2	
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM54	−40		−100	mA
			DM74	−40		−100	
I_{CC1}	Supply Current	V_{CC} = Max (Note 3)			39	61	mA
I_{CC2}	Supply Current	V_{CC} = Max (Note 4)				81	mA

'S158 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)	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	Data to Y		6		9	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Data to Y		6		9	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Strobe to Y		11.5		12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Strobe to Y		12		14	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Select to Y		12		15	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Select to Y		12		15	ns

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

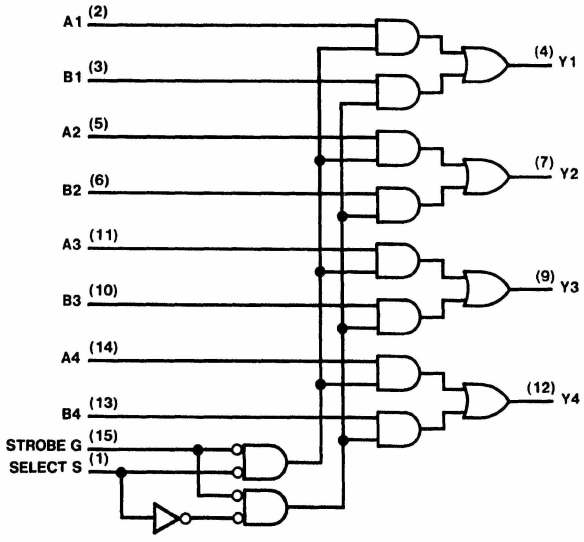
Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I_{CC1} is measured with all outputs open and all inputs at 4.5V.

Note 4: I_{CC2} is measured with B, G, and S inputs grounded, A inputs at 4.5V, and all outputs open.

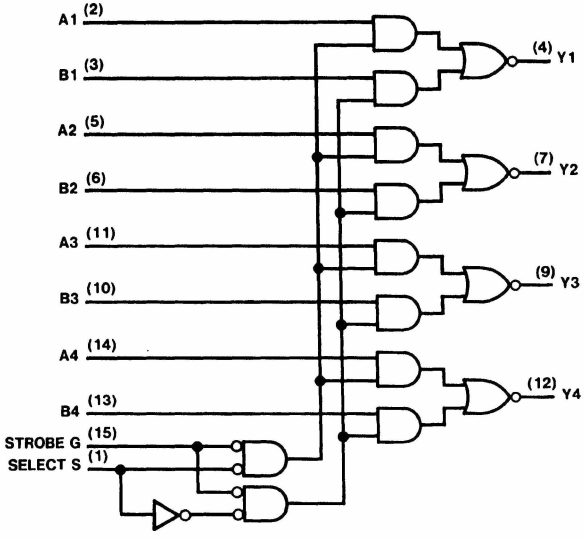
Logic Diagrams

S157



TL/F/6470–3

S158



TL/F/6470–4