National Semiconductor 54LS155/DM54LS155/DM74LS155, 54LS156/DM54LS156/DM74LS156 **Dual 2-Line to 4-Line Decoders/Demultiplexers General Description**

These TTL circuits feature dual 1-line-to-4-line demultiplexers with individual strobes and common binary-address inputs in a single 16-pin package. When both sections are enabled by the strobes, the common address inputs sequentially select and route associated input data to the appropriate output of each section. The individual strobes permit activating or inhibiting each of the 4-bit sections as desired. Data applied to input C1 is inverted at its outputs and data applied at C2 is true through its outputs. The inverter following the C1 data input permits use as a 3-to-8-line decoder, or 1-to-8-line demultiplexer, without external gating. Input clamping diodes are provided on these circuits to minimize transmission-line effects and simplify system design.

Features

- Applications: Dual 2-to-4-line decoder Dual 1-to-4-line demultiplexer 3-to-8-line decoder 1-to-8-line demultiplexer
- Individual strobes simplify cascading for decoding or demultiplexing larger words
- Input clamping diodes simplify system design
- Choice of outputs: Totem-pole (LS155) Open-collector (LS156)
- Alternate Military/Aerospace device (54LS155/156) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagram and Function Tables Dual-In-Line Package



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3-Line-to-8-Line Decoder or 1-Line-to-8-Line Demultiplexer

	I	np	uts	Outputs							
		Strobe Or Data	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
C†	в	A	G‡	2Y0	2Y1	2Y2	2Y3	1Y0	1Y1	1Y2	1Y3
X	Х	Х	н	н	н	н	н	н	н	н	н
L	L	L	L	L	н	н	н	н	н	н	н
L	L	н	L	н	L	н	н	н	н	н	н
L	н	L	L	н	н	L	н	н	н	н	н
L	н	н	L	н	н	н	L	н	н	н	н
H	L	L	L	н	н	н	н	L	н	н	н
H	L	н	I L	H	н	н	н	н	L	н	н
н	н	L	L	н	н	н	н	н	н	L	н
H	н	Н	L	н	н	н	н	н	н	н	L
П		<u></u>			<u> </u>		<u> </u>	п	<u> </u>		-

Order Number 54LS155DMQB, 54LS155FMQB, 54LS155LMQB, DM54LS155J, DM54LS155W, DM74LS155M, DM74LS155N, 54LS156DMQB, 54LS156FMQB, DM54LS156J, DM54LS156W, DM74LS156M or DM74LS156N See NS Package Number E20A, J16A, M16A, N16E or W16A

	1-Line-to-4-Line Demultiplexer									
	Inputs			Outputs						
Sel	ect	Strobe	Data							
В	Α	G1	C1	1Y0	1Y1	1Y2	1Y3			
х	х	н	х	н	н	н	Н			
L	L	L	н	L	н	н	н			
L	н	L	н	н	L	н	н			
н	L	L	н	н	н	L	н			
н	н	L	н	н	н	н	L			
х	х	Х	L	н	Н	н	Н			

2-Line-to-4-Line Decoder or

		Inputs		Outputs					
Sel	ect	Strobe	Data	1					
в	Α	G2	C2	2Y0	2Y1	2Y2	2Y3		
X	Х	Н	Х	н	н	н	н		
L	L	L	L	L	н	н	н		
L	H	L	L	н	L	н	н		
н	L (L	L	н	н	L	н		
н	H	L	L	н	н	н	L		
Х	Х	Х	н	н	н	н	н		

†C = inputs C1 and C2 connected together

‡G = inputs G1 and G2 connected together

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	7V
Operating Free Air Temperature Range	
DM54LS and 54LS	-55°C to +125°C
DM74LS	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	DM54LS155				Units		
Cymbol	i aluneter	Min	Nom	Max	Min	Nom	Max	onito
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	v
VIH	High Level Input Voltage	2			2			v
VIL	Low Level Input Voltage			0.7			0.8	v
V _{OH}	High Level Output Current			-0.4			-0.4	mA
IOL	Low Level Output Current			4			8	mA
TA	Free Air Operating Temperature	-55		125	0		70	°C

'LS155 Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
VI	Input Clamp Voltage	$V_{CC} = Min, I_I = -18 mA$				-1.5	v
VOH	High Level Output	V _{CC} = Min, I _{OH} = Max	DM54	2.5	3.4		v
	Voltage	V _{IL} = Max, V _{IH} = Min	DM74	2.7	3.4		v
VOL	Low Level Output	V _{CC} = Min, I _{OL} = Max	DM54		0.25	0.4	
	Voltage	V _{IL} = Max, V _{IH} = Min	DM74		0.35	0.5	v
		$I_{OL} = 4 \text{ mA}, V_{CC} = Min$	DM74		0.25	0.4	
lj –	Input Current @ Max Input Voltage	$V_{CC} = Max, V_I = 7V$				0.1	mA
liμ	High Level Input Current	$V_{CC} = Max, V_1 = 2.7V$				20	μΑ
կլ	Low Level Input Current	$V_{CC} = Max, V_I = 0.4V$				-0.36	mA
los	Short Circuit	V _{CC} = Max	DM54	-20		- 100	
	Output Current	(Note 2)	DM74	-20		-100	mA
Icc	Supply Current	V _{CC} = Max (Note 3)			6.1	10	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, A,B, and C1 inputs at 4.5V, and C2, G1, and G2 inputs grounded.

'LS155 Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

		From (Input)					
Symbol	Parameter	To (Output)	C _L = 15 pF		C _L = 50 pF		Units
			Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	A, B, C2, G1 or G2 to Y		18		22	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A, B, C2, G1 or G2 to Y		27		35	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	A or B to Y		18		24	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A or B to Y		27		35	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	C1 to Y		20		24	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	C1 to Y		27		35	ns

Recommended Operating Conditions

Symbol	Parameter	DM54LS156				Units		
Cymbol	i alameter	Min	Nom	Max	Min	Nom	Max	••••••
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	v
VIH	High Level Input Voltage	2			2			v
VIL	Low Level Input Voltage			0.7			0.8	v
V _{OH}	High Level Output Voltage			5.5			5.5	v
l _{OL}	Low Level Output Current			4			8	mA
T _A	Free Air Operating Temperature	-55		125	0		70	°C

'LS156 Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
VI	Input Clamp Voltage	$V_{CC} = Min$, $I_I = -18 mA$				-1.5	v
ICEX	High Level Output Current	$V_{CC} = Min, V_O = 5.5V$ $V_{IL} = Max, V_{IH} = Min$				100	μΑ
VOL		V _{CC} = Min, I _{OL} = Max	DM54		0.25	· 0.4	
	Voltage	V _{IL} = Max, V _{IH} = Min	DM74		0.35	0.5	v
		$I_{OL} = 4 \text{ mA}, V_{CC} = \text{Min}$	DM74		0.25	0.4	
ų	Input Current @ Max Input Voltage	$V_{CC} = Max, V_I = 7V$				0.1	mA
łн	High Level Input Current	$V_{CC} = Max, V_1 = 2.7V$				20	μΑ
l _{IL}	Low Level Input Current	$V_{CC} = Max, V_{I} = 0.4V$				-0.36	mA
Icc	Supply Current	V _{CC} = Max (Note 2)			6.1	10	mA

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

Note 2: I_{CC} is measured with all outputs open, A, B, and C1 inputs at 4.5V, and C2, G1, and G2 grounded.

'LS156 Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25^{\circ}C$ (See Section 1 for Test Waveforms and Output Load)

		From (Input) To (Output)					
Symbol	Parameter		C _L = 15 pF		C _L = 50 pF		Units
			Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	A, B, C2, G1 or G2 to Y		28		53	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A, B, C2, G1 or G2 to Y		33		43	ns
^t PLH	Propagation Delay Time Low to High Level Output	A or B to Y		28		53	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	A or B to Y		33		43	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	C1 to Y		28		53	ns
tPHL	Propagation Delay Time High to Low Level Output	C1 to Y		34		43	ns

Logic Diagram



TL/F/6395-2