

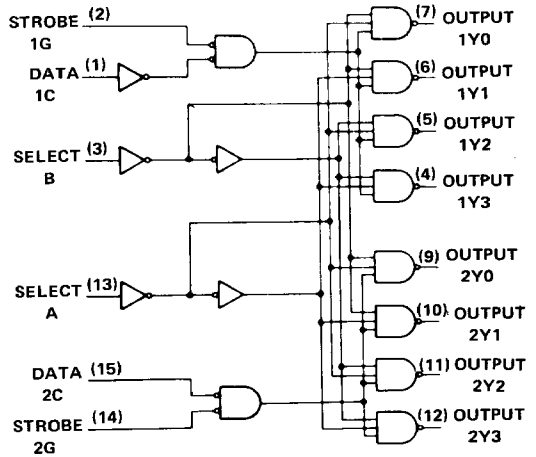
FEATURES

- LS156 has open-collector outputs
- Applications:
 - Dual 2-Line-to-4-Line Decoder
 - Dual 1-Line-to-4-Line Demultiplexer
 - 3-Line-to-8-Line Decoder
 - 1-Line-to-8-Line Demultiplexer

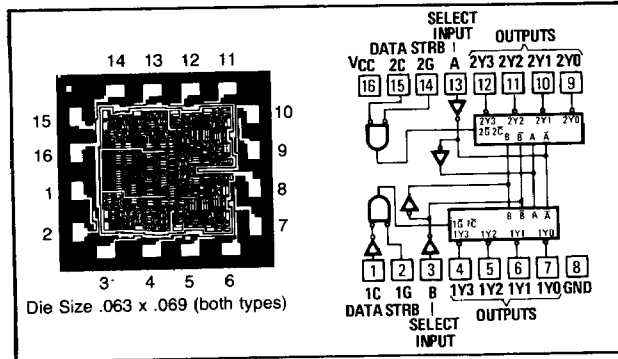
DESCRIPTION

These 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 binary-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 1C is inverted at its outputs and data applied at 2C is not inverted through its outputs. The inverter following the 1C 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 all of these circuits to minimize transmission-line effects and simplify system design.

LOGIC DIAGRAM



PIN-OUT DIAGRAM



FUNCTION TABLES
2-LINE-TO-4-LINE DECODER
OR 1-LINE-TO-4-LINE DEMULTIPLEXER

INPUTS				OUTPUTS			
SELECT	STROBE	DATA		1Y0	1Y1	1Y2	1Y3
B	A	1G	1C				
X	X	H	X	H	H	H	H
L	L	L	H	L	H	H	H
L	H	L	H	H	L	H	H
H	L	L	H	H	H	L	H
H	H	L	H	H	H	H	L
X	X	X	L	H	H	H	H

INPUTS				OUTPUTS			
SELECT	STROBE	DATA		2Y0	2Y1	2Y2	2Y3
B	A	2G	2C				
X	X	H	X	H	H	H	H
L	L	L	L	L	L	H	H
L	H	L	L	H	L	H	H
H	L	L	L	H	H	L	H
H	H	L	L	H	H	H	L
X	X	X	H	H	H	H	H

FUNCTION TABLE
3-LINE-TO-8-LINE DECODER
OR 1-LINE-TO-8-LINE DEMULTIPLEXER

INPUTS				OUTPUTS							
SELECT	STROBE	OR DATA		(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
C [†]	B	A	G [‡]	2Y0	2Y1	2Y2	2Y3	1Y0	1Y1	1Y2	1Y3
X	X	X	H	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	H
L	H	L	L	H	H	L	H	H	H	H	H
L	H	H	L	H	H	H	L	H	H	H	H
H	L	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	L	H	H
H	H	L	L	H	H	H	H	H	H	L	H
H	H	H	L	H	H	H	H	H	H	H	L
X	X	X	L	H	H	H	H	H	H	H	L

†C = inputs 1C and 2C connected together
 ‡G = inputs 1G and 2G connected together
 H = high level, L = low level, X = don't care

Dual 2-Line-To-4-Line Decoders/Demultiplexers

LS155 LS156

Electrical Characteristics Over Recommended Free-Air Temperature Range (Unless Otherwise Noted)

	9LS/54LS			9LS/74LS			Unit
	Min	Typ**	Max	Min	Typ**	Max	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-400			-400	μA
Output voltage, V_{OH} (LS156 only)			5.5			5.5	V
Low-level output, I_{OL}			4			8	mA
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}C$

Electrical Characteristics Over Recommended Free-Air Temperature Range (Unless Otherwise Noted)

Parameter	Test Conditions*	9LS/54LS			9LS/74LS			Unit
		Min	Typ**	Max	Min	Typ**	Max	
V_{IH}		2			2			V
V_{IL}				0.7			0.8	V
V_I	$V_{CC} = \text{MIN}, I_I = -18\text{mA}$			-1.5			-1.5	V
V_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = V_{IL\text{max}}, I_{OH} = -400\mu A$	2.5	3.4		2.7	3.4		V
I_{OH}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = V_{IL\text{max}}, V_{OH} = 5.5\text{V}$ (LS156 only)			100			100	μA
V_{OL}	$V_{CC} = \text{MIN}, V_{IH} = 2\text{V}, V_{IL} = V_{IL\text{max}}$			0.25	0.4	0.25	0.4	V
	$I_{OL} = 4\text{mA}$ $I_{OL} = 8\text{mA}$					0.35	0.5	
I_I	$V_{CC} = \text{MAX}, V_I = 7\text{V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = \text{MAX}, V_I = 2.7\text{V}$			20			20	μA
I_{IL}	$V_{CC} = \text{MAX}, V_I = 0.4\text{V}$			-0.4			-0.4	mA
$I_{OS}\dagger$	$V_{CC} = \text{MAX}$	-15		-100	-15		-100	mA
$I_{CC}\ddagger$	$V_{CC} = \text{MAX}$		6.1	10		6.1	10	mA

*For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.

**All typical values are at $V_{CC} = 5\text{V}, T_A = 25^{\circ}C$.

†Not more than one output should be shorted at a time.

‡ I_{CC} is measured with outputs open, A, B, and 1C inputs at 4.5V, and 2C, 1G, and 2G inputs grounded.

LS155
Switching Characteristics, $V_{CC} = 5V$ Over Recommended Free-Air Temperature Range

Parameter	Levels of Logic	From (Input)	To (output)	-55°C			+25°C			+125°C			Unit
				Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Test Conditions: $C_L = 15pF, R_L = 2k\Omega$ (See Fig. A, page 2-174)													
t _{PLH}	2	2C, 1G, or 2G	Y		11	17		10	16		12	18	ns
t _{PHL}	2	2C, 1G, or 2G	Y		15	24		15	23		17	26	ns
t _{PLH}	3	A or B	Y		16	23		16	24		19	27	ns
t _{PHL}	3	A or B	Y		20	30		19	30		20	31	ns
t _{PLH}	3	1C	Y		15	21		15	22		19	26	ns
t _{PHL}	3	1C	Y		20	30		19	28		21	31	ns
Test Conditions: $C_L = 50pF, R_L = 2k\Omega$ (See Fig. A, page 2-174)													
t _{PLH}	2	2C, 1G, or 2G	Y		13	19		13	19		15	21	ns
t _{PHL}	2	2C, 1G, or 2G	Y		21	29		18	26		22	31	ns
t _{PLH}	3	A or B	Y		18	25		18	25		22	29	ns
t _{PHL}	3	A or B	Y		26	36		22	30		26	36	ns
t _{PLH}	3	1C	Y		18	23		18	24		22	29	ns
t _{PHL}	3	1C	Y		25	35		23	31		25	35	ns

LS156
Switching Characteristics, $V_{CC} = 5V$ Over Recommended Free-Air Temperature Range

Parameter	Levels of Logic	From (Input)	To (output)	-55°C			+25°C			+125°C			Unit
				Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Test Conditions: $C_L = 15pF, R_L = 2k\Omega$ (See Fig. B, page 2-174)													
t _{PLH}	2	2C, 1G, or 2G	Y		24	34		22	30		24	34	ns
t _{PHL}	2	2C, 1G, or 2G	Y		18	27		16	24		18	27	ns
t _{PLH}	3	A or B	Y		29	40		27	37		29	40	ns
t _{PHL}	3	A or B	Y		24	34		22	30		24	34	ns
t _{PLH}	3	1C	Y		27	38		25	34		27	38	ns
t _{PHL}	3	1C	Y		25	35		23	31		25	35	ns
Test Conditions: $C_L = 50pF, R_L = 2k\Omega$ (See Fig. B, page 2-174)													
t _{PLH}	2	2C, 1G, or 2G	Y		27	39		25	34		27	39	ns
t _{PHL}	2	2C, 1G, or 2G	Y		21	32		19	28		21	32	ns
t _{PLH}	3	A or B	Y		32	45		30	41		32	45	ns
t _{PHL}	3	A or B	Y		27	39		25	34		27	39	ns
t _{PLH}	3	1C	Y		30	43		28	38		30	43	ns
t _{PHL}	3	1C	Y		28	40		26	35		28	40	ns

Note: AC specification shown under -55°C and +125°C are for 9LS devices only. All 50pF specifications are for 9LS only.