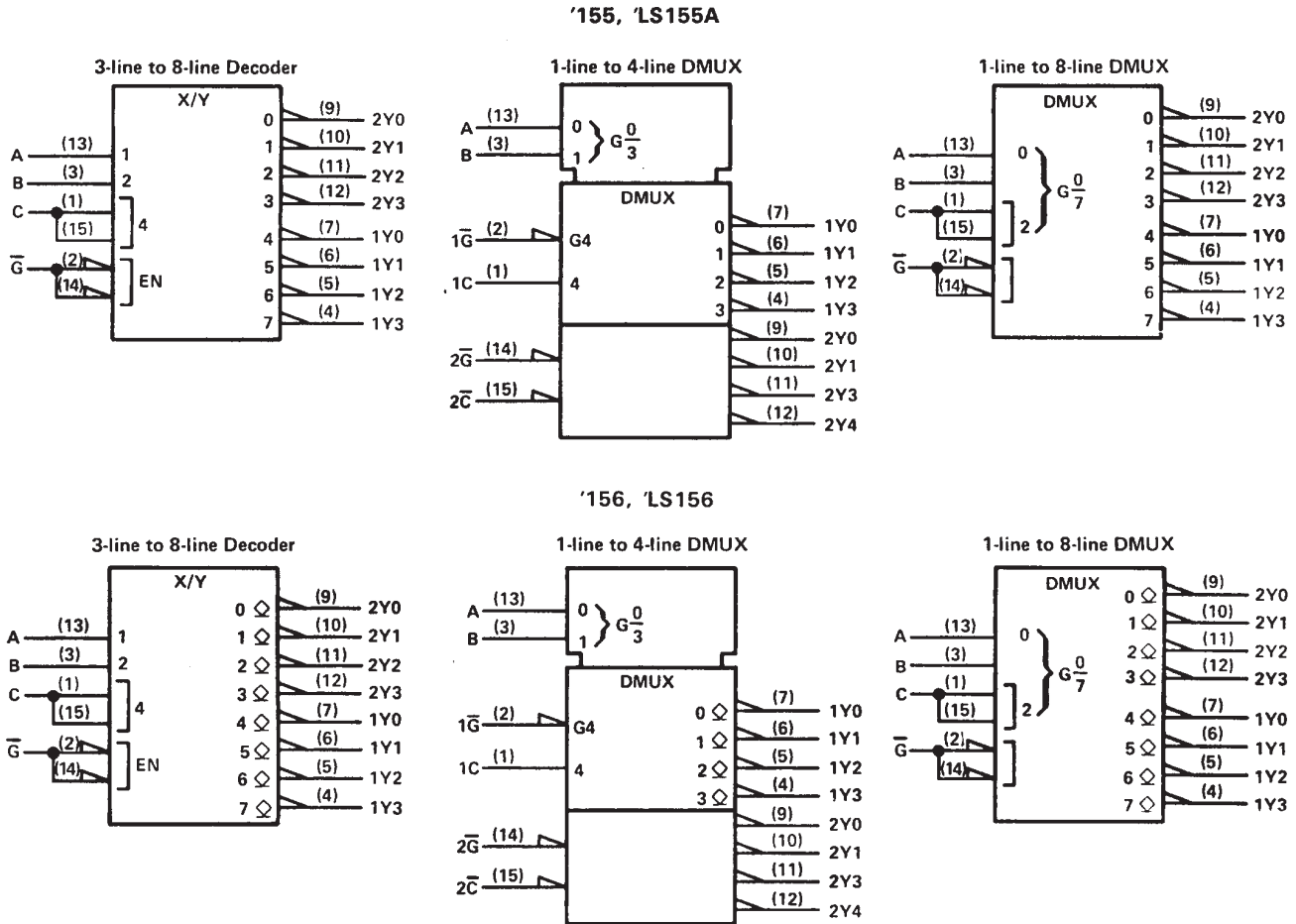


SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156

DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

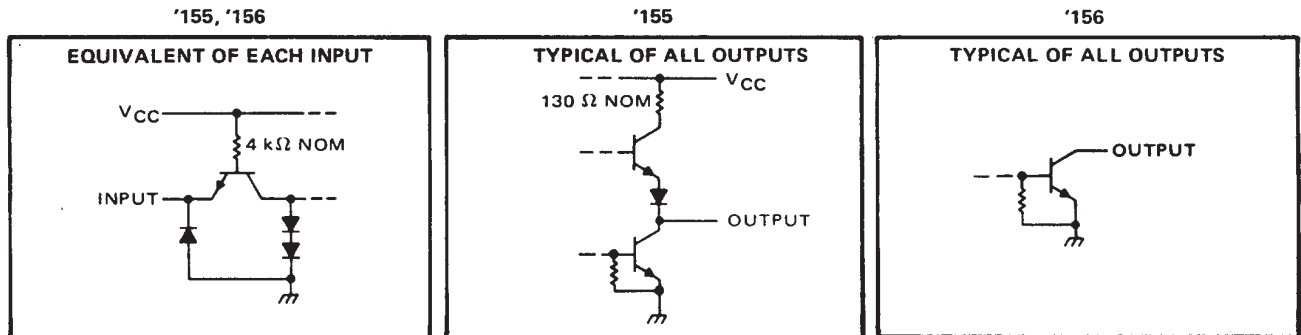
SDLS057 – MARCH 1974 – REVISED MARCH 1988

additional logic symbols (alternatives)†



†These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs

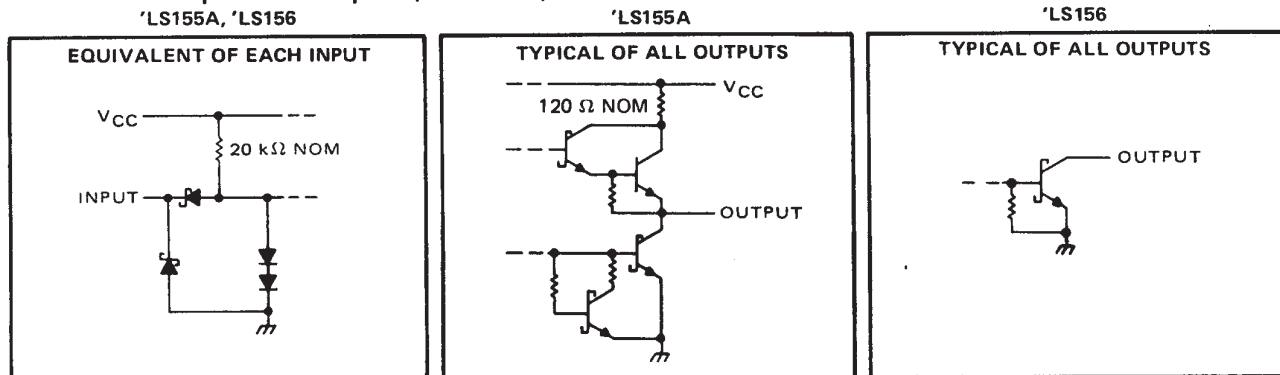


SN54155, SN54156, SN54LS155A, SN54LS156, SN74155, SN74156, SN74LS155A, SN74LS156

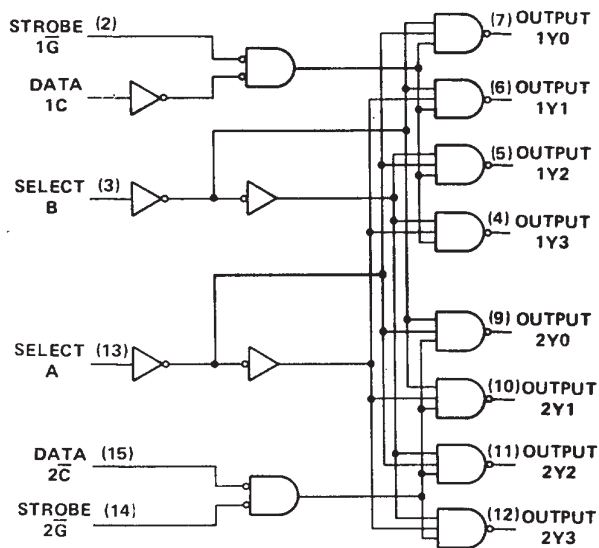
DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 - MARCH 1974 - REVISED MARCH 1988

schematics of inputs and outputs (continued)



logic diagram (positive logic)



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	X	H	X	H	H	H	H
L L	L	L	H	L	H	H	H
L H	L	L	H	H	L	H	H
H L	L	L	H	H	H	L	H
H H	L	L	H	H	H	H	L
X X	X	X	L	H	H	H	H

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

SN54155A, SN74155A DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

recommended operating conditions

	SN54156			SN74156			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output voltage, V_{OH}	5.5			5.5			V
Low-level output current, I_{OL}	16			16			mA
Operating free-air temperature, T_A	-55			125			°C

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

PARAMETER	TEST CONDITIONS†	SN54156 SN74156		UNIT
		MIN	TYP‡	
V_{IH} High-level input voltage		2		V
V_{IL} Low-level input voltage		0.8		V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$	-1.5		V
I_{OH} High-level output current	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, V_{OH} = 5.5 \text{ V}$	250		μA
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA}$	0.2	0.4	V
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$	1		mA
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$	40		μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1.6		mA
I_{CC} Supply current	$V_{CC} = \text{MAX},$			mA
	See Note 2	SN54156	25 35	
		SN74156	25 40	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

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

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

PARAMETER§	FROM (INPUT)	TO (OUTPUT)	LEVELS OF LOGIC	TEST CONDITIONS	SN54156 SN74156			UNIT
					MIN	TYP	MAX	
t_{PLH}	A, B, $2\bar{C}$, $1\bar{G}$, or $2\bar{G}$	Y	2	$C_L = 15 \text{ pF}, R_L = 400 \Omega,$ See Note 3	15	23	ns	
t_{PHL}	A, B, $2\bar{C}$, $1\bar{G}$, or $2\bar{G}$	Y	2		20	30	ns	
t_{PLH}	A or B	y	3		23	34	ns	
t_{PHL}	A or B	Y	3		23	34	ns	
t_{PLH}	1C	Y	3		18	27	ns	
t_{PHL}	1C	Y	3		22	33	ns	

§ t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

SN54LS155A, SN74LS155A DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

recommended operating conditions

	SN54LS155A			SN74LS155A			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-400			-400	μ A
Low-level output current, I_{OL}			4			8	mA
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}$ C

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

PARAMETER	TEST CONDITIONS [†]	SN54LS155A			SN74LS155A			UNIT	
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX		
V_{IH} High-level input voltage		2			2			V	
V_{IL} Low-level input voltage				0.7			0.8	V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V	
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu\text{A}$	2.5	3.4		2.7	3.4		V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$			0.25	0.4		0.25	0.4	V
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA	
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μ A	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA	
I_{OS} Short-circuit output current [§]	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA	
I_{CC} Supply current	$V_{CC} = \text{MAX}, \text{ See Note 2}$		6.1	10		6.1	10	mA	

[†]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

[§]Not more than one output should be shorted at a time.

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

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}\text{C}$

PARAMETER [¶]	FROM (INPUT)	TO (OUTPUT)	LEVELS OF LOGIC	TEST CONDITIONS	SN54LS155A SN74LS155A			UNIT
					MIN	TYP	MAX	
t_{PLH}	A, B, $2\bar{C}$, $1\bar{G}$, or $2\bar{G}$	Y	2	$C_L = 15 \text{ pF}, R_L = 2 \text{ k}\Omega,$ See Note 3		10	15	ns
t_{PHL}	A, B, $2\bar{C}$, $1\bar{G}$, or $2\bar{G}$	Y	2			19	30	ns
t_{PLH}	A or B	Y	3			17	26	ns
t_{PHL}	A or B	Y	3			19	30	ns
t_{PLH}	1C	Y	3			18	27	ns
t_{PHL}	1C	Y	3			18	27	ns

[¶] t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



SN54LS156A, SN74LS156A DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

SDLS057 – MARCH 1974 – REVISED MARCH 1988

recommended operating conditions

	SN54LS156			SN74LS156			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output voltage, V_{OH}			5.5			5.5	V
Low-level output current, I_{OL}			4			8	mA
Operating free-air temperature, T_A	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†	SN54LS156			SN74LS156			UNIT	
		MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{IH} High-level input voltage		2			2			V	
V_{IL} Low-level input voltage				0.7			0.8	V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V	
I_{OH} High-level output current	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, V_{OH} = 5.5 \text{ V}$			100			100	μA	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 4 \text{ mA}$		0.25	0.4	0.25	0.4	V	
		$I_{OL} = 8 \text{ mA}$				0.35	0.5		
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA	
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μA	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.4			-0.4	mA	
I_{CC} Supply current	$V_{CC} = \text{MAX}, \text{ See Note 2}$			6.1	10		6.1	10	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

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

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$

PARAMETER§	FROM (INPUT)	TO (OUTPUT)	LEVELS OF LOGIC	TEST CONDITIONS	SN54LS156 SN74LS156			UNIT
					MIN	TYP	MAX	
t_{PLH}	A, B, 2C 1G, or 2G	Y	2	$C_L = 15 \text{ pF},$ $R_L = 2 \text{ k}\Omega,$ See Note 3	25	40	ns	
t_{PHL}	A, B, 2C, 1G, or 2G	Y	2		34	51	ns	
t_{PLH}	A or B	Y	3		31	46	ns	
t_{PHL}	A or B	Y	3		34	51	ns	
t_{PLH}	1C	Y	3		32	48	ns	
t_{PHL}	1C	Y	3		32	48	ns	

§ t_{PLH} = propagation delay time, low-to-high-level output

t_{PHL} = propagation delay time, high-to-low-level output

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.