SN54LS354, SN54LS355, SN54LS356
SN74LS354, SN74LS355, SN74LS356
8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

SDLS164 – JULY 1979 – REVISED MARCH 1988

- **Transparent Latches on Data Select Inputs**

- **Complementary Outputs**
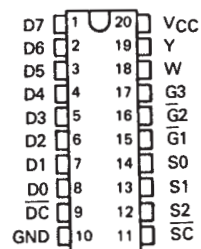
- **Easily Expandable**

- **High-Density 20-Pin Package**

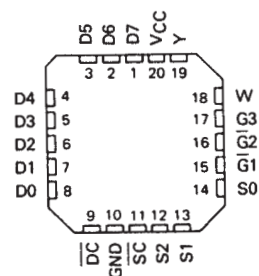|	DATA REGISTERS	OUTPUTS
'LS354	Transparent	3-State
'LS355	Transparent	Open-Collector
'LS356	Edge-Triggered	3-State

description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select one of eight data sources. The data-select address is stored in transparent latches that are enabled by a low level on pin 11, $\overline{SC}$. On the 'LS354 and 'LS355 a similar enable for data is obtained by a low level on pin 9, $\overline{DC}$. The edge-triggered data registers of the 'LS356 is clocked by a low-to-high transition on pin 9, CLK. Complementary outputs are available in either three-state versions ('LS354 and 'LS356) or open-collector version ('LS355).

The SN54LS354 through SN54LS356 are characterized for operation over the full military temperature range of −55°C to 125°C. The SN74LS354 through SN74LS356 are characterized for operation from 0°C to 70°C.

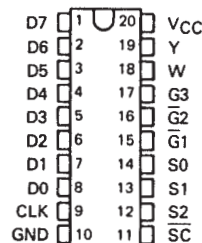**SN54LS354, SN54LS355 . . . J PACKAGE**
SN74LS354, SN74LS355 . . . DW OR N PACKAGE
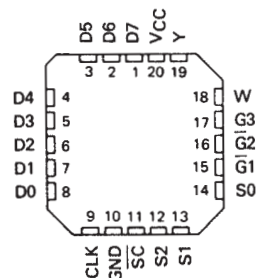**(TOP VIEW)**

	Pin		Pin	
D7	1	20		VCC
D6	2	19		Y
D5	3	18		W
D4	4	17		G3
D3	5	16		$\overline{G2}$
D2	6	15		$\overline{G1}$
D1	7	14		S0
D0	8	13		S1
$\overline{DC}$	9	12		S2
GND	10	11		$\overline{SC}$

SN54LS354, SN54LS355 . . . FK PACKAGE
(TOP VIEW)

Top pins (left to right): D5 (3), D6 (2), D7 (1), VCC (20), Y (19)

Left	Pin		Pin	Right
D4	4		18	W
D3	5		17	G3
D2	6		16	$\overline{G2}$
D1	7		15	$\overline{G1}$
D0	8		14	S0

Bottom pins (left to right): $\overline{DC}$ (9), GND (10), $\overline{SC}$ (11), S2 (12), S1 (13)

SN54LS356 . . . J OR W PACKAGE
SN74LS356 . . . DW OR N PACKAGE
(TOP VIEW)

	Pin		Pin	
D7	1	20		VCC
D6	2	19		Y
D5	3	18		W
D4	4	17		G3
D3	5	16		$\overline{G2}$
D2	6	15		$\overline{G1}$
D1	7	14		S0
D0	8	13		S1
CLK	9	12		S2
GND	10	11		$\overline{SC}$

SN54LS356 . . . FK PACKAGE
(TOP VIEW)

Top pins (left to right): D5 (3), D6 (2), D7 (1), VCC (20), Y (19)

Left	Pin		Pin	Right
D4	4		18	W
D3	5		17	G3
D2	6		16	$\overline{G2}$
D1	7		15	$\overline{G1}$
D0	8		14	S0

Bottom pins (left to right): CLK (9), GND (10), $\overline{SC}$ (11), S2 (12), S1 (13)

Copyright © 1988, Texas Instruments Incorporated

TEXAS INSTRUMENTS

SN54LS354, SN54LS355, SN54LS356
SN74LS354, SN74LS355, SN74LS356
8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

SDLS164 – JULY 1979 – REVISED MARCH 1988

FUNCTION TABLE

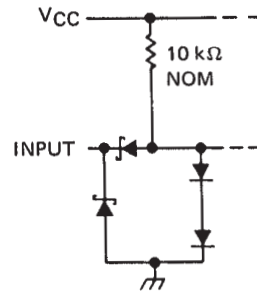| INPUTS									OUTPUTS	
SELECT			DATA CONTROL ('LS354, 'LS355)	CLOCK ('LS356)	OUTPUT ENABLES					
S2	S1	S0			$\overline{G1}$	$\overline{G2}$	G3		W	Y
X	X	X	X	X	H	X	X		Z	Z
X	X	X	X	X	X	H	X		Z	Z
X	X	X	X	X	X	X	L		Z	Z
L	L	L	L	↑	L	L	H		$\overline{D0}$	D0
L	L	L	H	H or L	L	L	H		$\overline{D0}_n$	D0$_n$
L	L	H	L	↑	L	L	H		$\overline{D1}$	D1
L	L	H	H	H or L	L	L	H		$\overline{D1}_n$	D1$_n$
L	H	L	L	↑	L	L	H		$\overline{D2}$	D2
L	H	L	H	H or L	L	L	H		$\overline{D2}_n$	D2$_n$
L	H	H	L	↑	L	L	H		$\overline{D3}$	D3
L	H	H	H	H or L	L	L	H		$\overline{D3}_n$	D3$_n$
H	L	L	L	↑	L	L	H		D4	D4
H	L	L	H	H or L	L	L	H		$\overline{D4}_n$	D4$_n$
H	L	H	L	↑	L	L	H		$\overline{D5}$	D5
H	L	H	H	H or L	L	L	H		$\overline{D5}_n$	D5$_n$
H	H	L	L	↑	L	L	H		$\overline{D6}$	D6
H	H	L	H	H or L	L	L	H		$\overline{D6}_n$	D6$_n$
H	H	H	L	↑	L	L	H		$\overline{D7}$	D7
H	H	H	H	H or L	L	L	H		$\overline{D7}_n$	D7$_n$

H = high level (steady state)
L = low level (steady state)
X = irrelevant (any input, including transitions)
Z = high-impedance state (off state)
↑ = transition from low to high level
D0 . . . D7 = the level of steady-state inputs at inputs D0 through D7, respectively, at the time of the low-to-high clock transition in the cae of 'LS356.
D0$_n$ . . . D7$_n$ = the level of steady state inputs at inputs D0 through D7, respectively, before the most recent low-to-high transition of data control or clock

This column shows the input address setup with $\overline{SC}$ low.
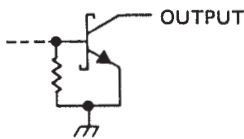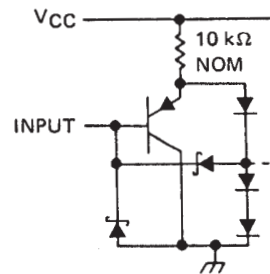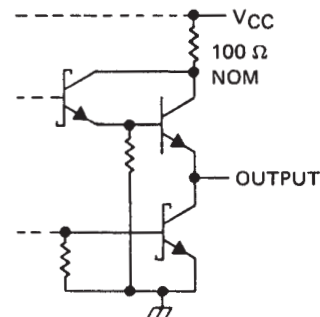
schematics of inputs and outputs

EQUIVALENT OF EACH DATA OR SELECT INPUT

EQUIVALENT OF ALL OTHER INPUTS

TYPICAL OF BOTH OUTPUTS ON 'LS354 AND 'LS356

TYPICAL OF BOTH OUTPUTS ON 'LS355

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range: SN54LS'	−55°C to 125°C
SN74LS'	0°C to 70°C
Storage temperature range	−65°C to 150°C

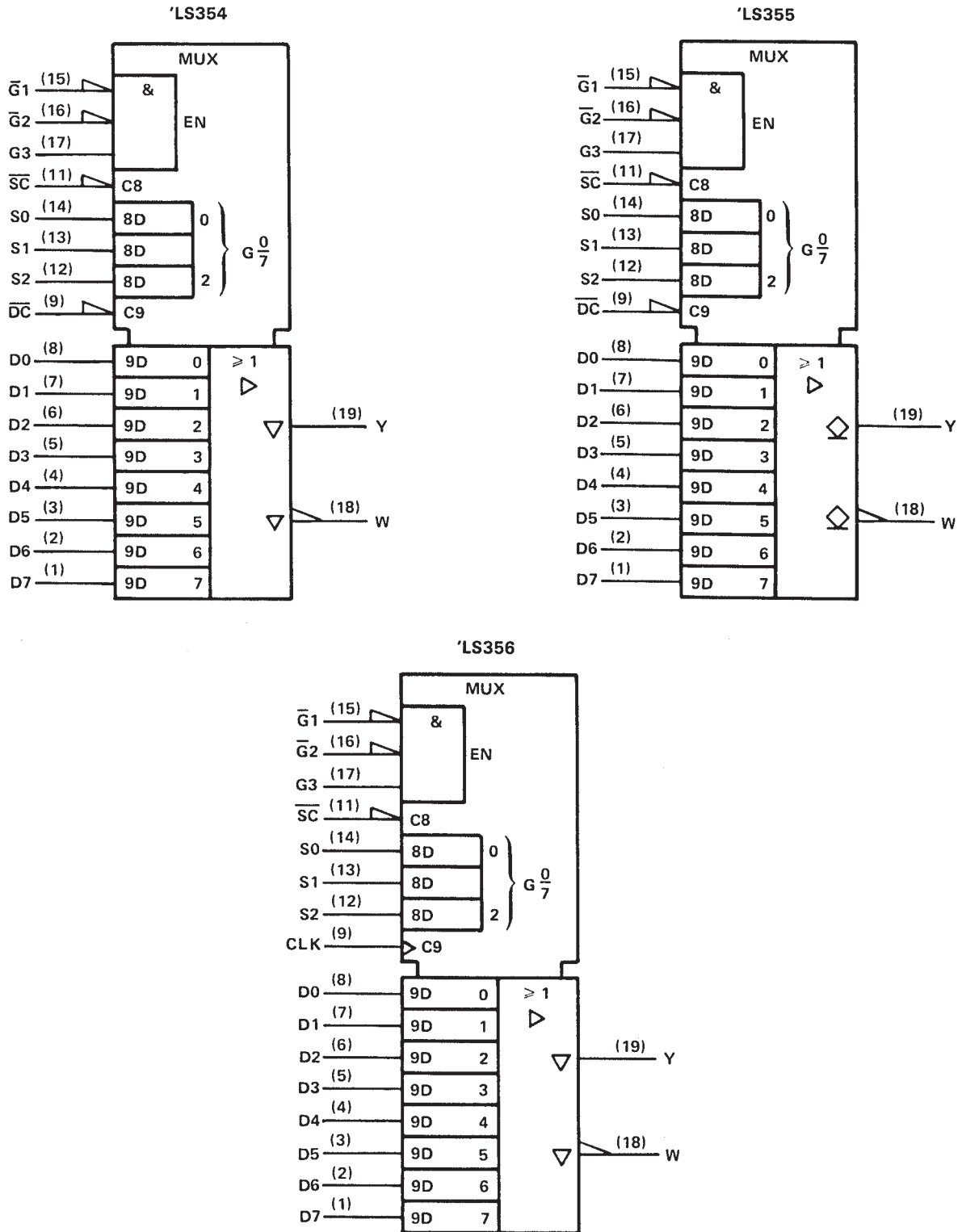NOTE 1: Voltage values are with respect to network ground terminal.

SN54LS354, SN54LS355, SN54LS356
SN74LS354, SN74LS355, SN74LS356
8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

SDLS164 – JULY 1979 – REVISED MARCH 1988
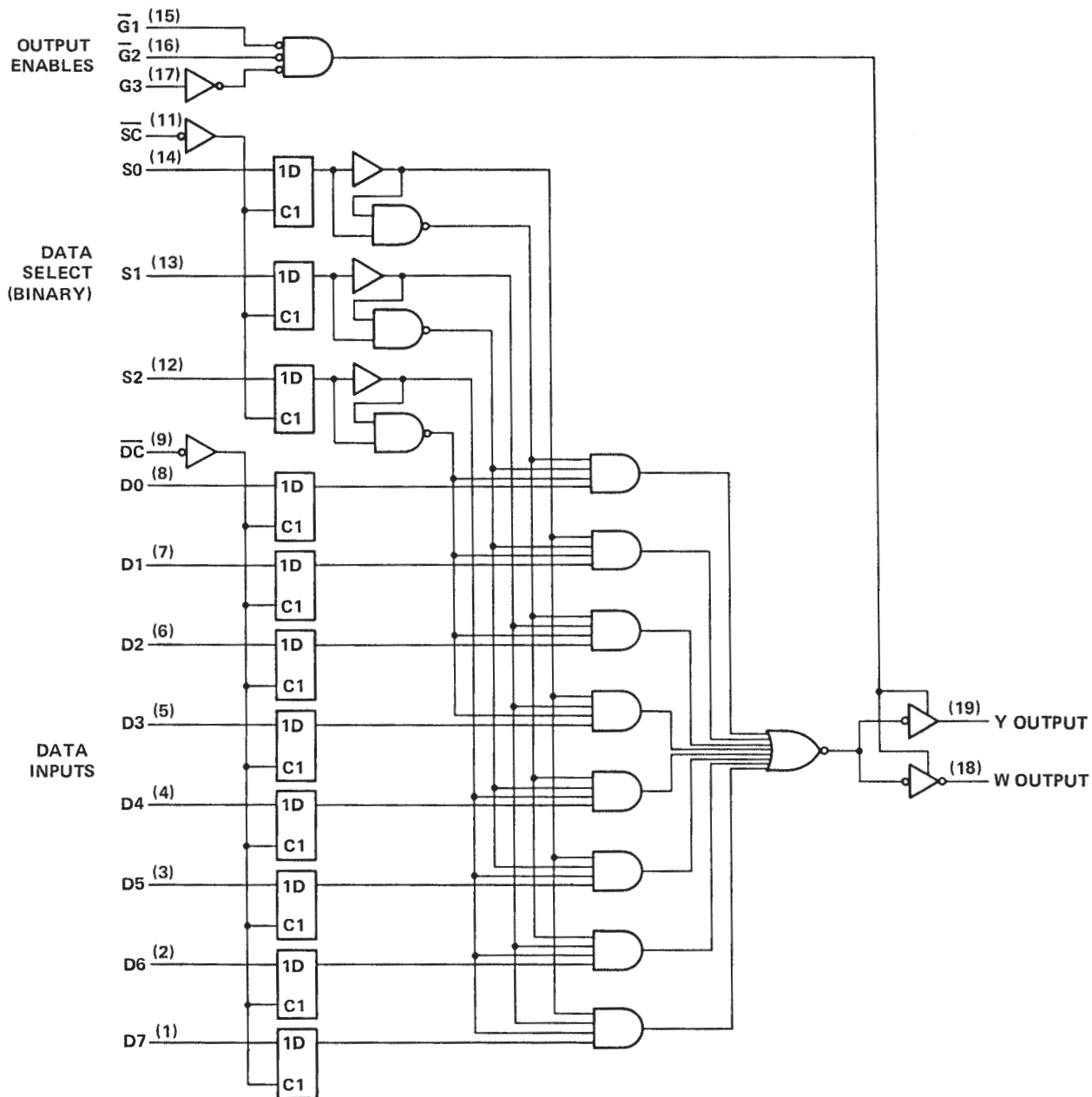
logic symbols†

'LS354

'LS355

'LS356

†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, N, and W packages.

SN54LS354, SN54LS355, SN54LS356
SN74LS354, SN74LS355, SN74LS356
8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

SDLS164 – JULY 1979 – REVISED MARCH 1988

logic diagram (positive logic)

'LS354, 'LS355

Pin numbers shown are for DW, J and N packages.

SN54LS354, SN54LS355, SN54LS356
SN74LS354, SN74LS355, SN74LS356
8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

SDLS164 – JULY 1979 – REVISED MARCH 1988

logic diagram (positive logic)

'LS356

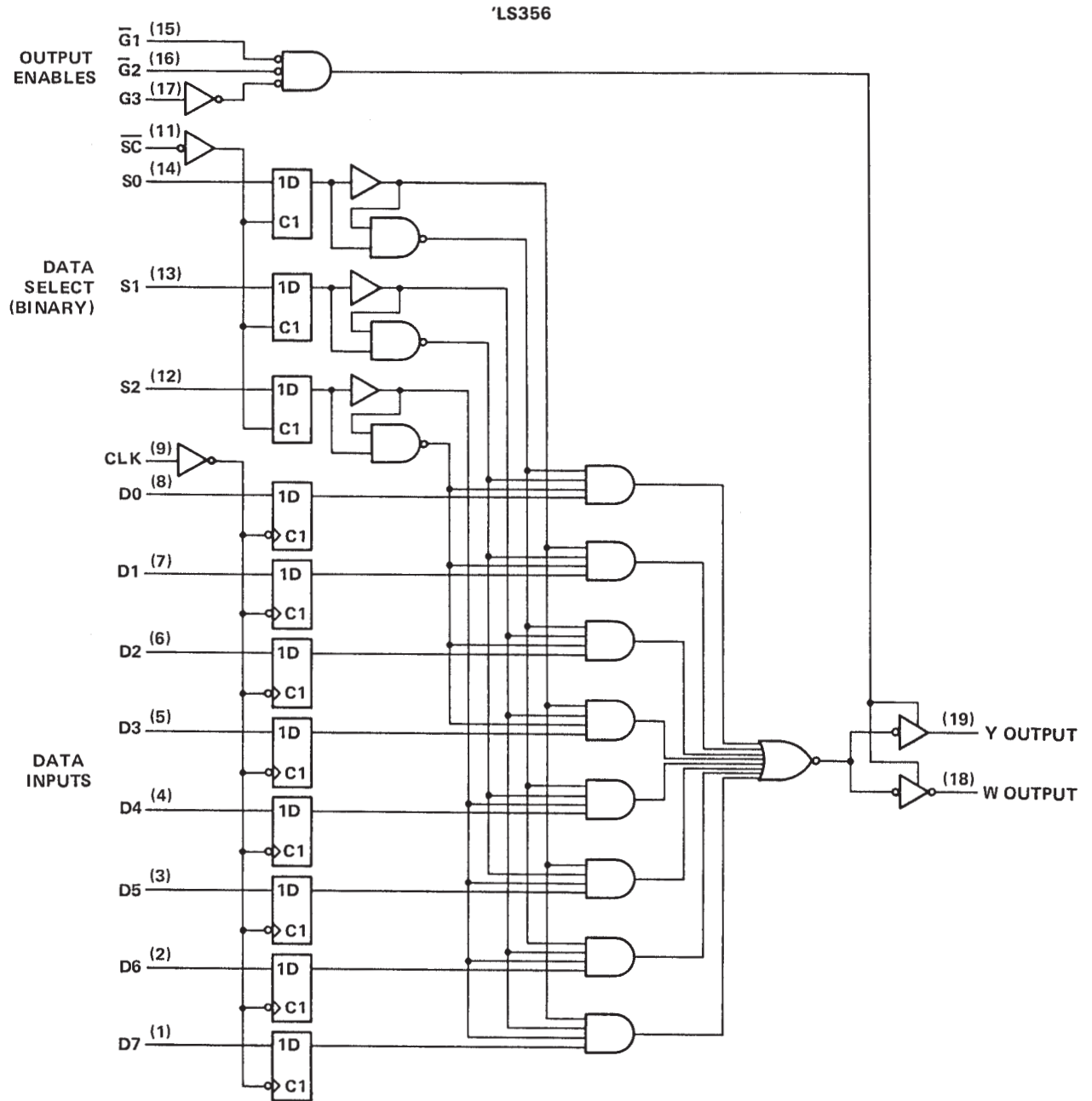Pin numbers shown are for DW, J, N, and W packages.

recommended operating conditions

			SN54LS354 SN54LS356			SN74LS354 SN74LS356			UNIT
			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				0.7			0.8	V
I_{OH}	High-level output current				−1			−2.6	mA
I_{OL}	Low-level output current				12			24	mA
t_{su}	Setup times, high-or-low-level data (with respect to ↑ at pin 9)	'LS354	15			15			ns
		'LS356	15			15			
t_h	Hold times, high-or-low-level data (with respect to ↑ at pin 9)	'LS354	15			15			ns
		'LS356	0			0			
T_A	Operating free-air temperature		−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS[†]		SN54LS354 SN54LS356			SN74LS354 SN74LS356			UNIT
				MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}		V_{CC} = MIN,	I_I = − 18 mA			− 1.5			− 1.5	V
V_{OH}		V_{CC} = MIN, V_{IH} = 2 V, I_{OH} = MAX,	V_{IL} = MAX	2.4			2.4			V
V_{OL}		V_{CC} = MIN, V_{IH} = 2 V, V_{IL} = MAX	I_{OL} = 12 mA		0.25	0.4		0.25	0.4	V
			I_{OL} = 24 mA					0.35	0.5	
I_{OZ}		V_{CC} = MAX	V_O = 2.7 V			20			20	μA
			V_O = 0.4 V			− 20			− 20	
I_I		V_{CC} = MAX,	V_I = 7 V			0.1			0.1	mA
I_{IH}		V_{CC} = MAX,	V_I = 2.7 V			20			20	μA
I_{IL}	$\overline{DC}$ or CLK, $\overline{G}1$, $\overline{G}2$, G3	V_{CC} = MAX,	V_I = 0.4 V			− 0.2			− 0.2	mA
	All others					− 0.4			− 0.4	
I_{OS}§		V_{CC} = MAX		− 30		− 130	− 30		− 130	mA
I_{CC}		V_{CC} = MAX,	See Note 2		29	46		29	46	mA

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

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

NOTE 2: I_{CC} is measured with the inputs grounded and the outputs open.

switching characteristics, V_{CC} = 5 V, T_A = 25°C, R_L = 667 Ω

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS354 MIN	'LS354 TYP	'LS354 MAX	'LS356 MIN	'LS356 TYP	'LS356 MAX	UNIT
t_{PLH}	D0-D7	Y			24	36				ns
t_{PHL}		Y			23	35				
t_{PLH}		W			18	27				ns
t_{PHL}		W			29	44				
t_{PLH}	$\overline{DC}$ or CLK	Y			28	42		18	27	ns
t_{PHL}		Y			26	39		33	50	
t_{PLH}		W			22	33		24	36	ns
t_{PHL}		W			33	50		18	27	
t_{PLH}	S0, S1 S2	Y	C_L = 45 pF, See Note 3		29	44		30	45	ns
t_{PHL}		Y			24	45		28	48	
t_{PLH}		W			28	42		36	54	ns
t_{PHL}		W			34	51		30	45	
t_{PLH}	$\overline{SC}$	Y			34	51		36	54	ns
t_{PHL}		Y			31	47		40	60	
t_{PLH}		W			27	41		32	48	ns
t_{PHL}		W			40	60		36	54	
t_{PZH}	$\overline{G1}, \overline{G2}$	Y			14	27		14	25	ns
t_{PZL}		Y			18	27		17	25	
t_{PHZ}		Y	C_L = 5 pF, See Note 3		15	25		16	24	ns
t_{PLZ}		Y			15	25		16	24	
t_{PZH}		W	C_L = 45 pF, See Note 3		12	24		14	23	ns
t_{PZL}		W			16	24		16	23	
t_{PHZ}		W	C_L = 5 pF, See Note 3		15	25		16	23	ns
t_{PLZ}		W			15	25		16	23	
t_{PZH}	G3	Y	C_L = 45 pF, See Note 3		15	29		15	27	ns
t_{PZL}		Y			19	29		18	27	
t_{PHZ}		Y	C_L = 5 pF, See Note 3		15	25		16	25	ns
t_{PLZ}		Y			15	25		16	25	
t_{PZH}		W	C_L = 45 pF, See Note 3		13	25		14	25	ns
t_{PZL}		W			17	25		16	25	
t_{PHZ}		W	C_L = 5 pF, See Note 3		15	25		16	25	ns
t_{PLZ}		W			15	25		16	25	

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

recommended operating conditions

		SN54LS355			SN74LS355			UNIT
		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			0.7			0.8	V
V_{OH}	High-level output voltage			5.5			5.5	V
I_{OL}	Low-level output current			12			24	mA
t_{su}	Setup times, high-or-low-level data, (with respect to ↑ at pin 9)	15			15			ns
t_h	Hold times, high-or low-level data (with respect to ↑ at pin 9)	15			15			ns
T_A	Operating free-air temperature	−55		125	0		70	°C

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

PARAMETER		TEST CONDITIONS[†]		SN54LS355			SN74LS355			UNIT
				MIN	TYP[‡]	MAX	MIN	TYP[‡]	MAX	
V_{IK}		$V_{CC} = $ MIN,	$I_I = -18$ mA			−1.5			−1.5	V
I_{OH}		$V_{CC} = $ MIN, $V_{IH} = 2$ V, $V_{OH} = 5.5$ V	$V_{IL} = $ MAX			0.1			0.1	mA
V_{OL}		$V_{CC} = $ MIN, $V_{IH} = 2$ V, $V_{IL} = $ MAX	$I_{OL} = 12$ mA		0.25	0.4		0.25	0.4	V
			$I_{OL} = 24$ mA					0.35	0.5	
I_I		$V_{CC} = $ MAX,	$V_I = 7$ V			0.1			0.1	mA
I_{IH}		$V_{CC} = $ MAX,	$V_I = 2.7$ V			20			20	µA
I_{IL}	$\overline{DC}$ or CLK, $\overline{G}1, \overline{G}2, G3$	$V_{CC} = $ MAX,	$V_I = 0.4$ V			−0.2			−0.2	mA
	All others					−0.4			−0.4	
I_{CC}		$V_{CC} = $ MAX,	See Note 2		29	46		29	46	mA

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

‡ All typical values are at $V_{CC} = 5$ V, $T_A = 25°$C.

NOTE 2: I_{CC} is measured with the inputs grounded and the outputs open.

TEXAS
INSTRUMENTS
POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

switching characteristics, V_{CC} = 5 V, T_A = 25°C, R_L = 667 Ω

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS355			UNIT
				MIN	TYP	MAX	
t_{PLH}	D0-D7	Y			34	41	ns
t_{PHL}					26	39	
t_{PLH}		W			30	45	ns
t_{PHL}					33	50	
t_{PLH}	$\overline{DC}$ or CLK	Y			38	57	ns
t_{PHL}					31	47	
t_{PLH}		W			33	50	ns
t_{PHL}					39	59	
t_{PLH}	S0, S1, S2	Y			39	59	ns
t_{PHL}					36	49	
t_{PLH}		W	C_L = 45 pF, See Note 3		32	48	ns
t_{PHL}					39	58	
t_{PLH}	$\overline{SC}$	Y			45	68	ns
t_{PHL}					42	63	
t_{PLH}		W			44	66	ns
t_{PHL}					45	68	
t_{PHL}	$\overline{G1}$, $\overline{G2}$	Y			21	32	ns
t_{PHL}					22	33	
t_{PLH}		W			18	27	ns
t_{PHL}					19	29	
t_{PLH}	G3	Y			24	36	ns
t_{PHL}					25	40	
t_{PLH}		W			19	31	ns
t_{PHL}					19	29	

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.