

# SN54LS354, SN54LS355, SN54LS356 SN74LS354, SN74LS355, SN74LS356

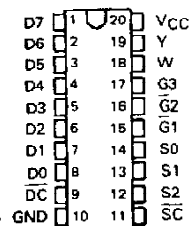
## 8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS

D2544, JULY 1979—REVISED MARCH 1988

- Transparent Latches on Data Select Inputs
- Complementary Outputs
- Easily Expandable
- High-Density 20-Pin Package

SN54LS354, SN54LS355 . . . J PACKAGE  
SN74LS354, SN74LS355 . . . DW OR N PACKAGE

(TOP VIEW)



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

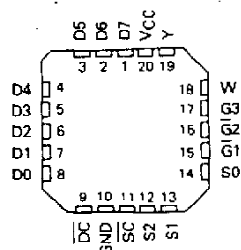
### description

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  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74LS354 through SN74LS356 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

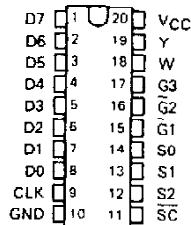
SN54LS354, SN54LS355 . . . FK PACKAGE

(TOP VIEW)



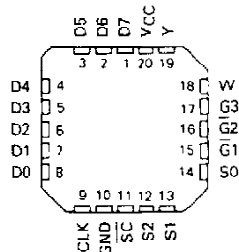
SN54LS356 . . . J OR W PACKAGE  
SN74LS356 . . . DW OR N PACKAGE

(TOP VIEW)



SN54LS356 . . . FK PACKAGE

(TOP VIEW)



PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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

**FUNCTION TABLE**

SELECT			DATA CONTROL		CLOCK	OUTPUT ENABLES			OUTPUTS	
S2	S1	S0	'LS354, 'LS355	'LS356		G1	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	D0	D0
L	L	L	H		H or L	L	L	H	D0 <sub>n</sub>	D0 <sub>n</sub>
L	L	H	L		↑	L	L	H	D1	D1
L	L	H	H		H or L	L	L	H	D1 <sub>n</sub>	D1 <sub>n</sub>
L	H	L	L		↑	L	L	H	D2	D2
L	H	L	H		H or L	L	L	H	D2 <sub>n</sub>	D2 <sub>n</sub>
L	H	H	L		↑	L	L	H	D3	D3
L	H	H	H		H or L	L	L	H	D3 <sub>n</sub>	D3 <sub>n</sub>
H	L	L	L		↑	L	L	H	D4	D4
H	L	L	H		H or L	L	L	H	D4 <sub>n</sub>	D4 <sub>n</sub>
H	L	H	L		↑	L	L	H	D5	D5
H	L	H	H		H or L	L	L	H	D5 <sub>n</sub>	D5 <sub>n</sub>
H	H	L	L		↑	L	L	H	D6	D6
H	H	L	H		H or L	L	L	H	D6 <sub>n</sub>	D6 <sub>n</sub>
H	H	H	L		↑	L	L	H	D7	D7
H	H	H	H		H or L	L	L	H	D7 <sub>n</sub>	D7 <sub>n</sub>

H = high level (steady state)

L = low level (steady state)

X = irrelevant (any input, including transitions)

Z = high-impedance state (off state)

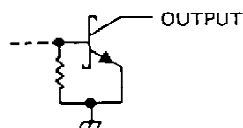
↑ = transition from low to high level

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 case of 'LS356.

D0<sub>n</sub> . . . D7<sub>n</sub> = 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

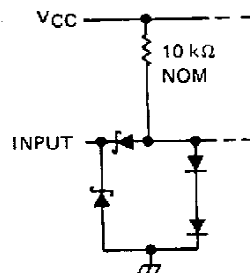
This column shows the input address setup with  $\overline{SC}$  low.

**TYPICAL OF BOTH OUTPUTS ON 'LS355**

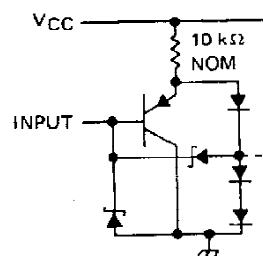


**schematics of inputs and outputs**

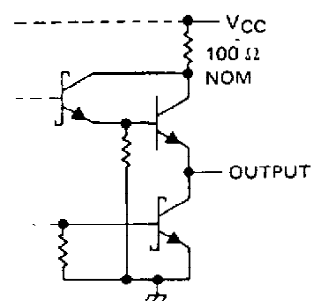
**EQUIVALENT OF EACH DATA OR SELECT INPUT**



**EQUIVALENT OF ALL OTHER INPUTS**



**TYPICAL OF BOTH OUTPUTS ON 'LS354 AND 'LS356**



**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

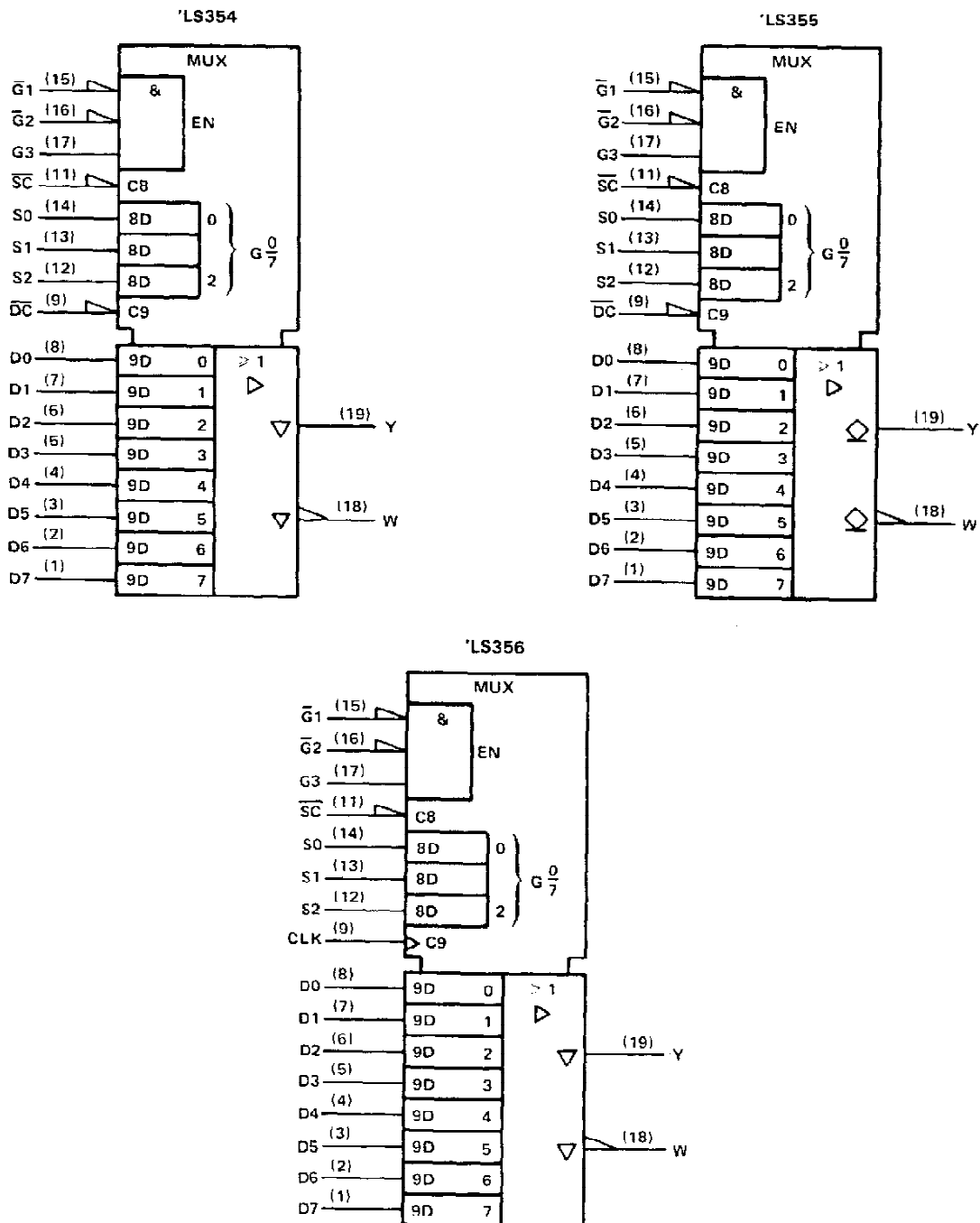
NOTE 1: Voltage values are with respect to network ground terminal.

**TEXAS**  
**INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

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

logic symbols†

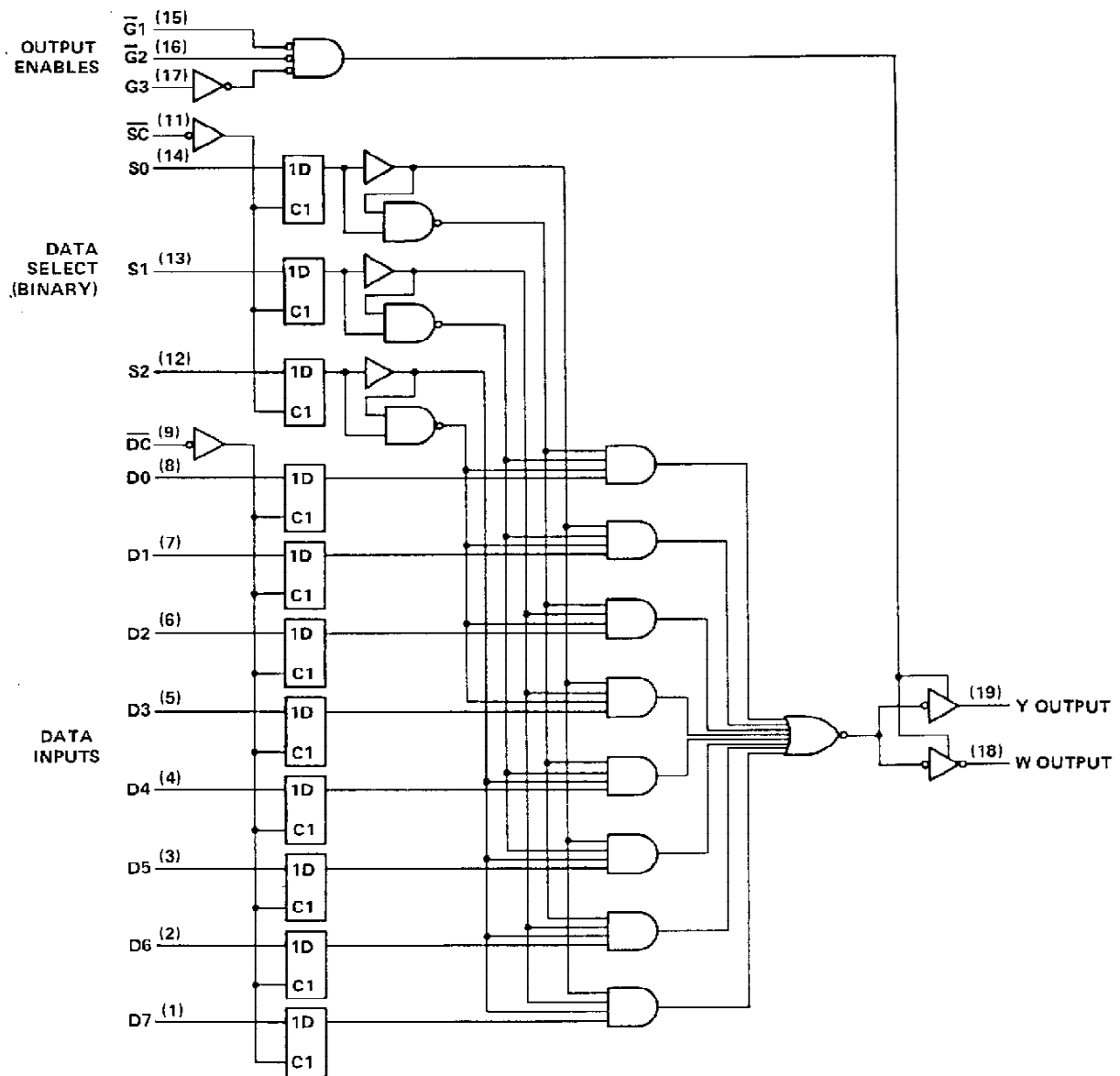


† This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12. Pin numbers shown are for DW, J, N, and W packages.

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

logic diagram (positive logic)

'LS354, 'LS355



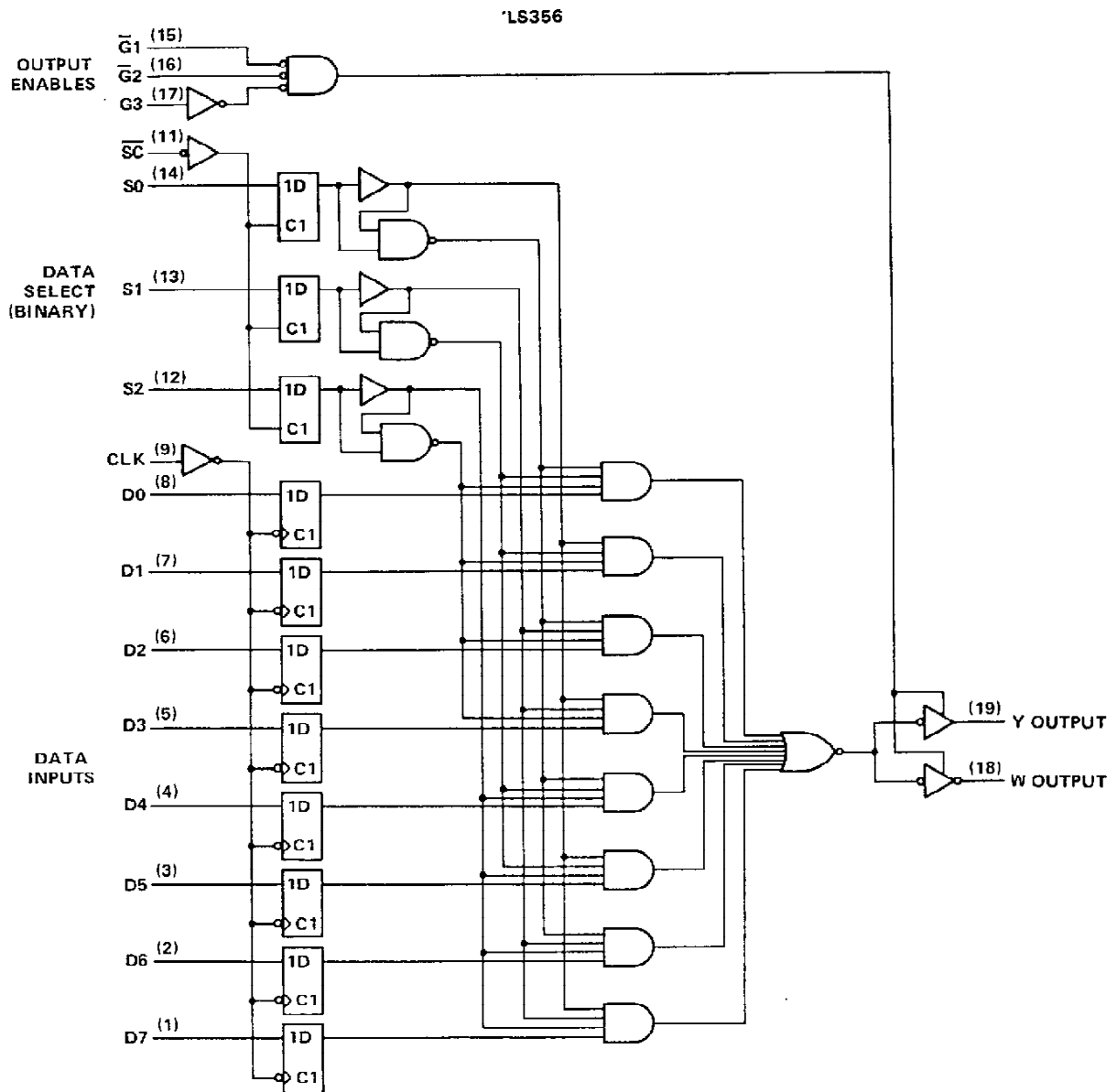
Pin numbers shown are for DW, J and N packages.

**TEXAS**  
**INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

**SN54LS356, SN74LS356**  
**8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS**

logic diagram (positive logic)



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

**TEXAS**  
**INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

**SN54LS354, SN54LS356, SN74LS354, SN74LS356**  
**8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS**  
**WITH 3-STATE OUTPUTS**

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 $t$ at pin 9)	'LS354	15		15			ns
		'LS356	15		15			
$t_h$	Hold times, high-or-low-level data (with respect to $t$ 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‡
V <sub>IK</sub>		V <sub>CC</sub> = MIN, I <sub>I</sub> = - 18 mA		- 1.5		- 1.5		V	
V <sub>OH</sub>		V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX I <sub>OH</sub> = MAX,		2.4		2.4		V	
V <sub>OL</sub>		V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX		I <sub>OL</sub> = 12 mA	0.25	0.4	0.25	0.4	V
				I <sub>OL</sub> = 24 mA				0.35	
I <sub>OZ</sub>		V <sub>CC</sub> = MAX		V <sub>O</sub> = 2.7 V	20		20		μA
				V <sub>O</sub> = 0.4 V	- 20		- 20		
I <sub>I</sub>		V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.1		0.1		mA	
I <sub>IH</sub>		V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		20		20		μA	
I <sub>IL</sub>	DC or CLK, G1, G2, G3	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		- 0.2		- 0.2		mA	
	All others			- 0.4		- 0.4			
I <sub>OS</sub> §		V <sub>CC</sub> = MAX		- 30	- 130	- 30	- 130	mA	
I <sub>CC</sub>		V <sub>CC</sub> = 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  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

§ 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.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

**SN54LS354, SN54LS356, SN74LS354, SN74LS356**  
**8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS**  
**WITH 3-STATE OUTPUTS**

switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 667\ \Omega$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'LS354			'LS356			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
tPLH	D0-D7	Y	CL = 45 pF, See Note 3	24	36				ns	
tPHL				23	35					
tPLH		W			18	27				
tPHL					29	44				
tPLH	DC or CLK	Y			28	42	18	27	ns	
tPHL				26	39	33	50			
tPLH		W			22	33	24	36	ns	
tPHL					33	50	18	27		
tPLH	S0, S1 S2	Y			29	44	30	45	ns	
tPHL				24	45	28	48			
tPLH		W			28	42	36	54	ns	
tPHL					34	51	30	45		
tPLH	SC	Y			34	51	36	54	ns	
tPHL				31	47	40	60			
tPLH		W			27	41	32	48	ns	
tPHL					40	60	36	54		
tPZH	G1, G2	Y			14	27	14	25	ns	
tPZL					18	27	17	25		
tPHZ					15	25	16	24	ns	
tPLZ					15	25	16	24		
tPZH		W			12	24	14	23	ns	
tPZL					16	24	16	23		
tPHZ					15	25	16	23	ns	
tPLZ					15	25	16	23		
tPZH	G3	Y			15	29	15	27	ns	
tPZL					19	29	18	27		
tPHZ					15	25	16	25	ns	
tPLZ					15	25	16	25		
tPZH		W			13	25	14	25	ns	
tPZL					17	25	16	25		
tPHZ					15	25	16	25	ns	
tPLZ					15	25	16	25		

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

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

**SN54LS355, SN74LS355**  
**8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS**  
**WITH OPEN-COLLECTOR OUTPUTS**

**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 f at pin 9)	15			15			ns
$t_h$	Hold times, high-or low-level data (with respect to f 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	
$V_{IK}$		$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
$I_{OH}$		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{OL} = \text{MAX}$ $V_{OH} = 5.5 \text{ V}$			0.1			0.1	mA
$V_{OL}$		$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 12 \text{ mA}$	0.25	0.4		0.25	0.4		V
		$V_{IL} = \text{MAX}, I_{OL} = 24 \text{ mA}$				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
$I_{IL}$	DC or CLK, $\bar{G}1, \bar{G}2, G3$	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-0.2			-0.2		mA
	All others			-0.4			-0.4		
$I_{CC}$		$V_{CC} = \text{MAX},$ 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  $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$ .

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



POST OFFICE BOX 655012 • DALLAS, TEXAS 75265



**SN54LS355, SN74LS355**  
**8-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS/REGISTERS**  
**WITH OPEN-COLLECTOR OUTPUTS**

switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $R_L = 667\ \Omega$

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

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

**TEXAS**  
**INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

## IMPORTANT NOTICE

Texas Instruments (TI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

TI warrants performance of its semiconductor products and related software 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, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS.

Inclusion of TI products in such applications is understood to be fully at the risk of the customer. Use of TI products in such applications requires the written approval of an appropriate TI officer. Questions concerning potential risk applications should be directed to TI through a local SC sales office.

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

TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor does TI 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.