

# SN54157, SN54LS157, SN54LS158, SN54S157, SN54S158, SN74157, SN74LS157, SN74LS158, SN74S157, SN74S158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

MARCH 1974 — REVISED MARCH 1988

- Buffered Inputs and Outputs
- Three Speed/Power Ranges Available

TYPES	TYPICAL AVERAGE PROPAGATION TIME	TYPICAL POWER DISSIPATION
'157	9 ns	150 mW
'LS157	9 ns	49 mW
'S157	5 ns	250 mW
'LS158	7 ns	24 mW
'S158	4 ns	195 mW

**applications**

- Expand Any Data Input Point
- Multiplex Dual Data Buses
- Generate Four Functions of Two Variables (One Variable Is Common)
- Source Programmable Counters

**description**

These monolithic data selectors/multiplexers contain inverters and drivers to supply full on-chip data selection to the four output gates. A separate strobe input is provided. A 4-bit word is selected from one of two sources and is routed to the four outputs. The '157, 'LS157, and 'S157 present true data whereas the 'LS158 and 'S158 present inverted data to minimize propagation delay time.

FUNCTION TABLE

STROBE $\bar{G}$	INPUTS		OUTPUT Y		
	SELECT $\bar{A}/\bar{B}$	A	B	'157, 'LS157, 'S157	'LS158 'S158
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

H = high level, L = low level, X = irrelevant

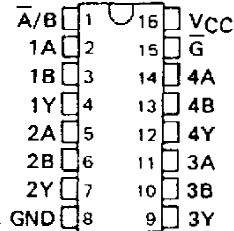
**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)**

Supply voltage, $V_{CC}$ (See Note 1)	7 V
Input voltage: '157, 'S158	5.5 V
'LS157, 'LS158	7 V
Operating free-air temperature range: SN54'	-55°C to 125°C
SN74'	0°C to 70°C
Storage temperature range	-65°C to 150°C

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

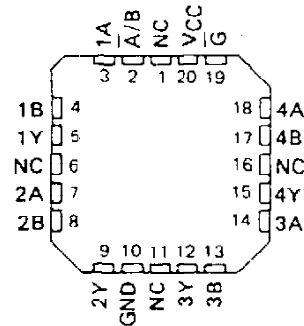
SN54157, SN54LS157, SN54S157,  
SN54LS158, SN54S158 . . . J OR W PACKAGE  
SN74157 . . . N PACKAGE  
SN74LS157, SN74S157,  
SN74LS158, SN74S158 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS157, SN54S157, SN54LS158,  
SN54S158 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

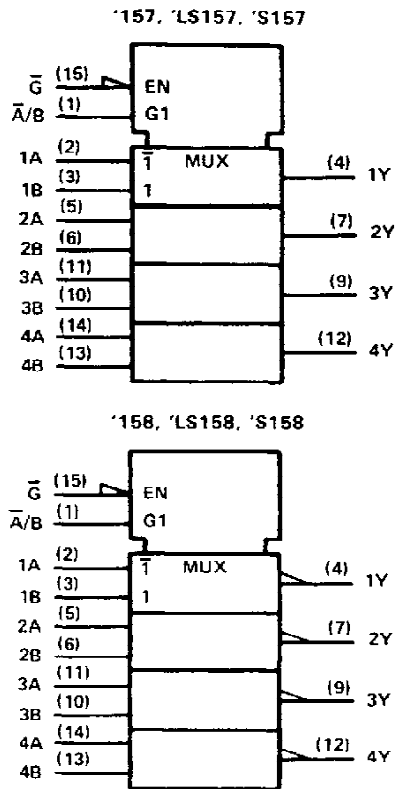
PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



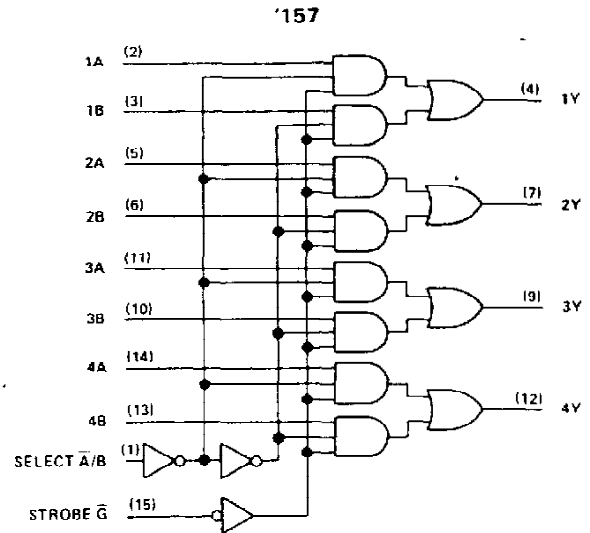
POST OFFICE BOX 655812 • DALLAS, TEXAS 75265

**SN54157, SN54LS157, SN54LS158, SN54S157, SN54S158,  
SN74157, SN74LS157, SN74LS158, SN74S157, SN74S158  
QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS**

logic symbols†



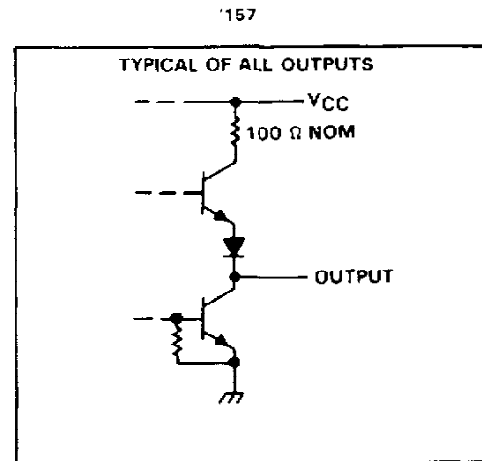
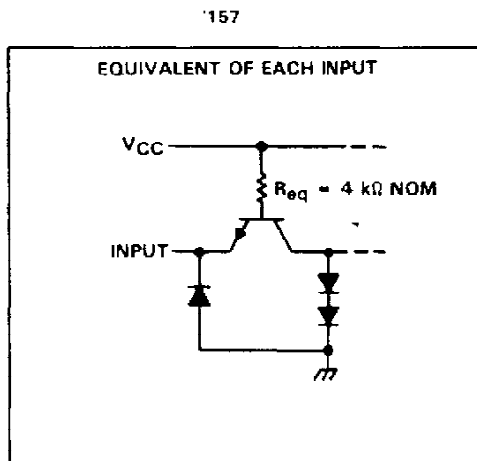
logic diagram (positive logic)



† 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



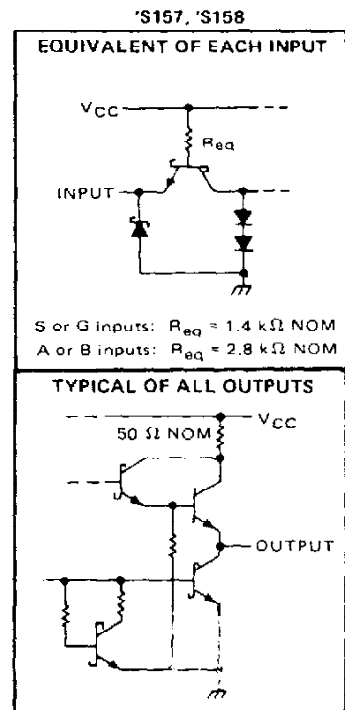
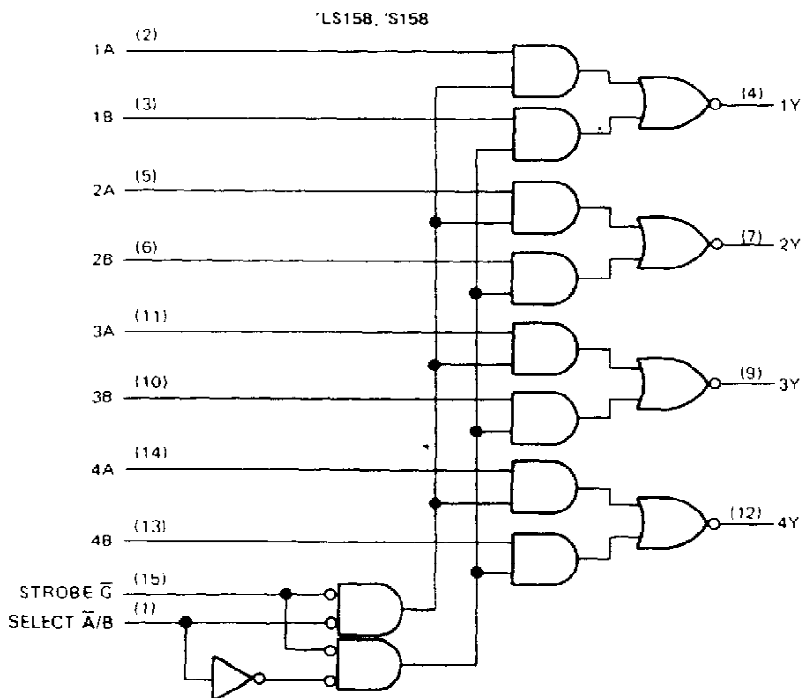
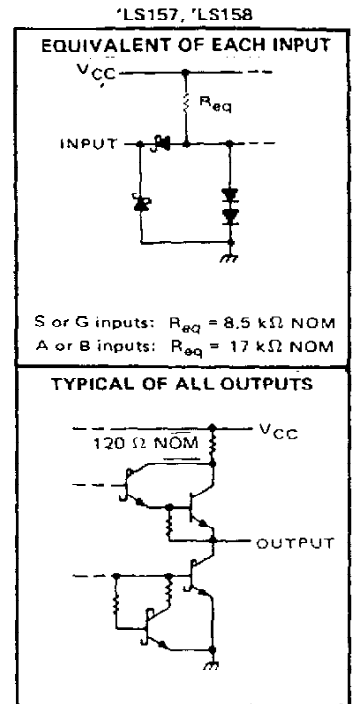
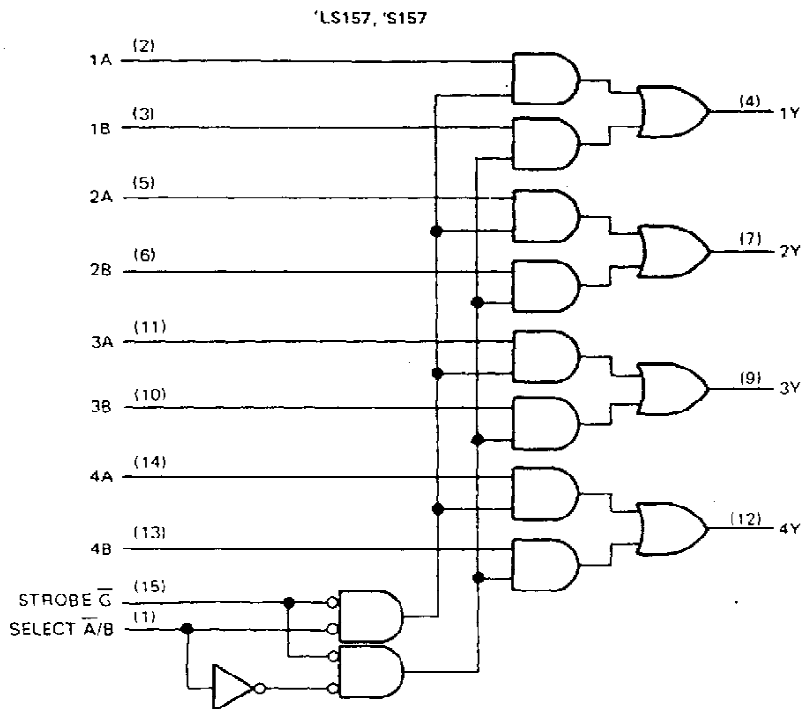
**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 635012 • DALLAS, TEXAS 75265

# SN54LS157, SN54LS158, SN54S157, SN54S158, SN74LS157, SN74LS158, SN74S157, SN74S158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

logic diagrams (positive logic)

schematics of inputs and outputs



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

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

# SN54157, SN74157 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

## recommended operating conditions

	SN54157			SN74157			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, $I_{OH}$			-800			-800	$\mu$ A
Low-level output current, $I_{OL}$			16			16	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†	SN54157			SN74157			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IH}$ High-level input voltage		2			2			V
$V_{IL}$ Low-level input voltage				0.8			0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = -12 \text{ mA}$			-1.5			-1.5	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -800 \mu\text{A}$	2.4	3.4		2.4	3.4		V
$V_{OL}$ 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		0.2	0.4	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$			1			1	mA
$I_{IH}$ High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$			40			40	$\mu$ A
$I_{IL}$ Low level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$			-1.6			-1.6	mA
$I_{OS}$ Short-circuit output current‡	$V_{CC} = \text{MAX}$	-20		-55	-18		-55	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX}$ . See Note 2		30	48		30	48	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 and duration of short-circuit should not exceed one second.

NOTE 2:  $I_{CC}$  is measured with 4.5 V applied to all inputs and all outputs open.

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

PARAMETER¶	FROM (INPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	Data	$C_L = 15 \mu\text{F}$ , $R_L = 400 \Omega$ , See Note 3		9	14	ns
$t_{PHL}$				9	14	
$t_{PLH}$	Strobe $\bar{G}$			13	20	ns
$t_{PHL}$				14	21	
$t_{PLH}$	Select $\bar{A}/\bar{B}$			15	23	ns
$t_{PHL}$				18	27	

¶ $t_{PLH}$  = 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.

TEXAS  
INSTRUMENTS

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

## SN54LS157, SN54LS158, SN74LS157, SN74LS158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

### recommended operating conditions

	SN54LS <sup>1</sup>			SN74LS <sup>1</sup>			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub> Supply voltage	4.5	5	5.5	4.75	5	5.25	V
I <sub>OH</sub> High-level output current			-400			-400	μA
I <sub>OL</sub> Low-level output current			4			8	mA
T <sub>A</sub> Operating free-air temperature	-55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS <sup>†</sup>	SN54LS <sup>1</sup>			SN74LS <sup>1</sup>			UNIT
		MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
V <sub>IH</sub> High-level input voltage		2			2			V
V <sub>IL</sub> Low-level input voltage				0.7			0.8	V
V <sub>IK</sub> Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA			-1.5			-1.5	V
V <sub>OH</sub> High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, I <sub>OH</sub> = -400 μA	2.5	3.4		2.7	3.4		V
V <sub>OL</sub> Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX	I <sub>OL</sub> = 4 mA		0.25	0.4	0.25	0.4	V
		I <sub>OL</sub> = 8 mA				0.35	0.5	
I <sub>I</sub> Input current at maximum input voltage	$\bar{A}/B$ or $\bar{G}$	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.2		0.2		mA
	A or B							
I <sub>IH</sub> High-level input current	$\bar{A}/B$ or $\bar{G}$	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		40		40		μA
	A or B							
I <sub>IL</sub> Low-level input current	$\bar{A}/B$ or $\bar{G}$	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		-0.8		-0.8		mA
	A or B							
I <sub>OS</sub> Short-circuit output current <sup>§</sup>	V <sub>CC</sub> = MAX	-20	-100	-20	-100			mA
I <sub>CC</sub> Supply current	V <sub>CC</sub> = MAX, See Note 2	'LS157		9.7	16	9.7	16	mA
		'LS158		4.8	8	4.8	8	
		All A inputs at 4.5 V, All other inputs at 0 V		'LS158	6.5	11	6.5	

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

<sup>‡</sup> All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

<sup>§</sup> Not more than one output should be shorted at a time and duration of short circuit should not exceed one second.

NOTE 2: I<sub>CC</sub> is measured with 4.5 V applied to all inputs and all outputs open.

### switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

PARAMETER <sup>†</sup>	FROM (INPUT)	TEST CONDITIONS	'LS157			'LS158			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t <sub>PLH</sub>	Data	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ, See Note 3	9	14		7	12	ns	
t <sub>PHL</sub>			9	14		10	15		
t <sub>PLH</sub>	Strobe $\bar{G}$		13	20		11	17	ns	
t <sub>PHL</sub>			14	21		18	24		
t <sub>PLH</sub>	Select $\bar{A}/B$		15	23		13	20	ns	
t <sub>PHL</sub>			18	27		16	24		

<sup>†</sup>t<sub>PLH</sub> = propagation delay time, low-to-high-level output

t<sub>PHL</sub> = propagation delay time, high-to-low-level output

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

  
**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655012 • DALLAS, TEXAS 75265

# SN54S157, SN54S158, SN74S157, SN74S158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

recommended operating conditions

	SN54S157 SN54S158			SN74S157 SN74S158			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, $I_{OH}$			-1			-1	mA
Low-level output current, $I_{OL}$			20			20	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†	SN54S157 SN74S157			SN54S158 SN74S158			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IH}$ High-level input voltage		2			2			V
$V_{IL}$ Low-level input voltage				0.8			0.8	V
$V_{IK}$ Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.2			-1.2	V
$V_{OH}$ High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OH} = -1 \text{ mA}$	Series 54S	2.5	3.4	Series 74S	2.5	3.4	V
		Series 74S	2.7	3.4	Series 74S	2.7	3.4	
$V_{OL}$ Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = 0.8 \text{ V}, I_{OL} = 20 \text{ mA}$			0.5			0.5	V
$I_I$ Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA
$I_{IH}$ High-level input current	$\overline{A/B}$ or $\overline{G}$			100			100	$\mu$ A
	A or B			50			50	
$I_{IL}$ Low-level input current	$\overline{A/B}$ or $\overline{G}$			-4			-4	mA
	A or B			-2			-2	
$I_{OS}$ Short-circuit output current §	$V_{CC} = \text{MAX}$			-40			-100	mA
$I_{CC}$ Supply current	$V_{CC} = \text{MAX},$ All inputs at 4.5 V, See Note 2			50			39	mA
	$V_{CC} = \text{MAX},$ A inputs at 4.5 V, B,G,S, inputs at 0 V, See Note 2						81	

† 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, and duration of the short-circuit should not exceed one second.

Note 2:  $I_{CC}$  is measured with all outputs open.

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

PARAMETER ¶	FROM (INPUT)	TEST CONDITIONS	SN54S157 SN74S157			SN54S158 SN74S158			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$	Data	$C_L = 15 \text{ pF},$ $R_L = 280 \Omega,$ See Note 3	5	7.5		4	6	ns	
$t_{PHL}$			4.5	6.5		4	6		
$t_{PLH}$	Strobe $\overline{G}$		8.5	12.5		6.5	11.5	ns	
$t_{PHL}$			7.5	12		7	12		
$t_{PLH}$	Select $\overline{A/B}$		9.5	15		8	12	ns	
$t_{PHL}$			9.5	15		8	12		

¶  $t_{PLH}$  = 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.

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.

## 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.



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.