

# TYPES SN54150, SN54151A, SN54152A, SN54LS151, SN54LS152, SN54S151, SN74150, SN74151A, SN74LS151, SN74S151 DATA SELECTORS/MULTIPLEXERS

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- '150 Selects One-of-Sixteen Data Sources
- Others Select One-of-Eight Data Sources
- Performs Parallel-to-Serial Conversion
- Permits Multiplexing from N Lines to One Line
- Also For Use as Boolean Function Generator
- Input-Clamping Diodes Simplify System Design
- Fully Compatible with Most TTL and DTL Circuits

TYPE	TYPICAL AVERAGE PROPAGATION DELAY TIME DATA INPUT TO W OUTPUT	TYPICAL POWER DISSIPATION
'150	11 ns	200 mW
'151A	8 ns	145 mW
'152A	8 ns	130 mW
'LS151	11 ns <sup>†</sup>	30 mW
'LS152	11 ns <sup>†</sup>	28 mW
'S151	4.5 ns	225 mW

<sup>†</sup>Tentative data

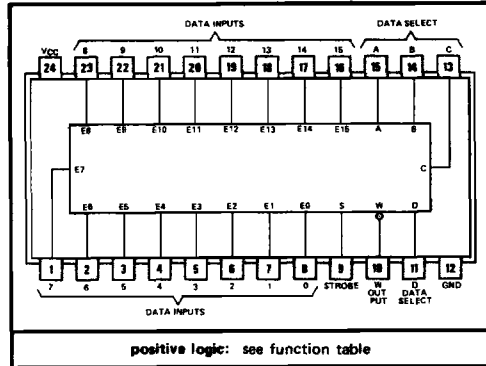
## description

These monolithic data selectors/multiplexers contain full on-chip binary decoding to select the desired data source. The '150 selects one-of-sixteen data sources; the '151A, '152A, 'LS151, 'LS152, and 'S151 select one-of-eight data sources. The '150, '151A, 'LS151, and 'S151 have a strobe input which must be at a low logic level to enable these devices. A high level at the strobe forces the W output high, and the Y output (as applicable) low.

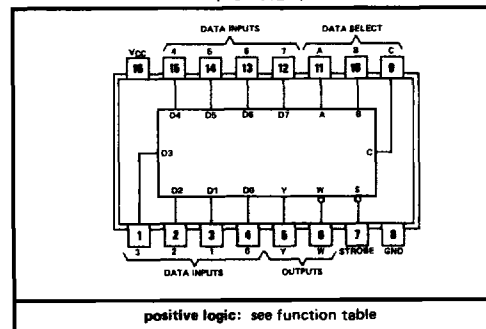
The '151A, 'LS151, and 'S151 feature complementary W and Y outputs whereas the '150, '152A, and 'LS152 have an inverted (W) output only.

The '151A and '152A incorporate address buffers which have symmetrical propagation delay times through the complementary paths. This reduces the possibility of transients occurring at the output(s) due to changes made at the select inputs, even when the '151A outputs are enabled (i.e., strobe low).

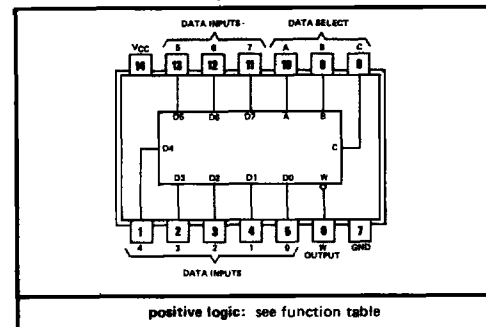
SN54150 . . . J OR W PACKAGE  
SN74150 . . . J OR N PACKAGE  
(TOP VIEW)



SN54151A, SN54LS151, SN54S151 . . . J OR W PACKAGE  
SN74151A, SN74LS151, SN74S151 . . . J OR N PACKAGE  
(TOP VIEW)



SN54152A, SN54LS152 . . . W PACKAGE  
(TOP VIEW)



# TYPES SN54150, SN54151A, SN54152A, SN54LS151, SN54LS152, SN54S151, SN74150, SN74151A, SN74LS151, SN74S151

## DATA SELECTORS/MULTIPLEXERS

REVISED OCTOBER 1976

logic

'150  
FUNCTION TABLE

INPUTS				STROBE S	OUTPUT W
D	C	B	A		
X	X	X	X	H	H
L	L	L	L	L	$\overline{E0}$
L	L	L	H	L	$\overline{E1}$
L	L	H	L	L	$\overline{E2}$
L	L	H	H	L	$\overline{E3}$
L	H	L	L	L	$\overline{E4}$
L	H	L	H	L	$\overline{E5}$
L	H	H	L	L	$\overline{E6}$
L	H	H	H	L	$\overline{E7}$
H	L	L	L	L	$\overline{E8}$
H	L	L	H	L	$\overline{E9}$
H	L	H	L	L	$\overline{E10}$
H	L	H	H	L	$\overline{E11}$
H	H	L	L	L	$\overline{E12}$
H	H	L	H	L	$\overline{E13}$
H	H	H	L	L	$\overline{E14}$
H	H	H	H	L	$\overline{E15}$

'151A, 'LS151, 'S151  
FUNCTION TABLE

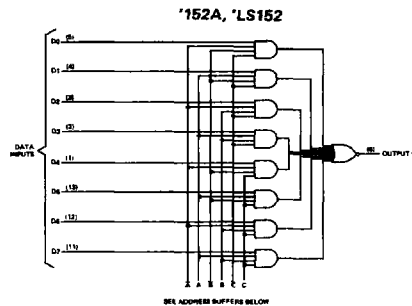
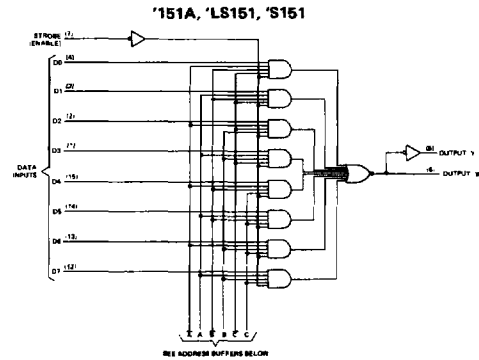
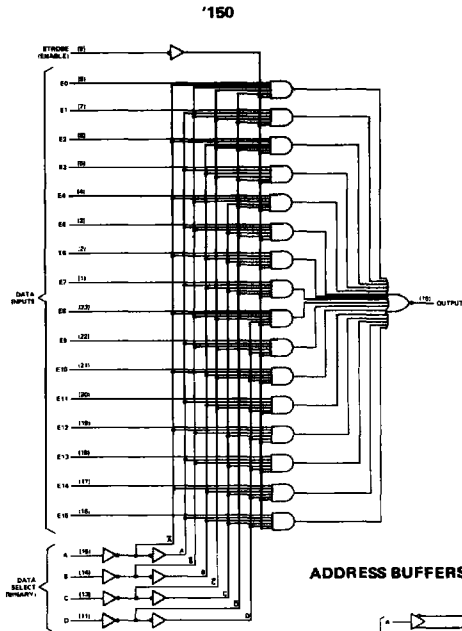
INPUTS				OUTPUTS	
SELECT			STROBE S	Y	W
C	B	A			
X	X	X	H	L	H
L	L	L	L	D0	$\overline{D0}$
L	L	H	L	D1	$\overline{D1}$
L	H	L	L	D2	$\overline{D2}$
L	H	H	L	D3	$\overline{D3}$
H	L	L	L	D4	$\overline{D4}$
H	L	H	L	D5	$\overline{D5}$
H	H	L	L	D6	$\overline{D6}$
H	H	H	L	D7	$\overline{D7}$

'152A, 'LS152  
FUNCTION TABLE

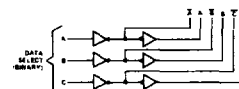
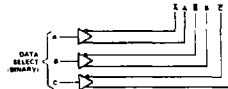
SELECT INPUTS			OUTPUT W
C	B	A	
L	L	L	$\overline{D0}$
L	L	H	$\overline{D1}$
L	H	L	$\overline{D2}$
L	H	H	$\overline{D3}$
H	L	L	$\overline{D4}$
H	L	H	$\overline{D5}$
H	H	L	$\overline{D6}$
H	H	H	$\overline{D7}$

H = high level, L = low level, X = irrelevant  
 $\overline{E0}, \overline{E1} \dots \overline{E15}$  = the complement of the level of the respective E input  
 $\overline{D0}, \overline{D1} \dots \overline{D7}$  = the level of the D respective input

functional block diagrams



ADDRESS BUFFERS FOR '151A, '152A      ADDRESS BUFFERS FOR 'LS151, 'S151, 'LS152



# TYPES SN54150, SN54151A, SN54152A, SN74150, SN74151A

## DATA SELECTORS/MULTIPLEXERS

REVISED OCTOBER 1976

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage (see Note 2)	5.5 V
Operating free-air temperature range: SN54' Circuits	-55°C to 125°C
SN74' Circuits	0°C to 70°C
Storage temperature range:	-65°C to 150°C

NOTES: 1. Voltage values are with respect to network ground terminal.  
 2. For the '150, input voltages must be zero or positive with respect to network ground terminal.

### recommended operating conditions

	SN54'			SN74'			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, $T_A$	-65		125	0		70	°C

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

PARAMETER	TEST CONDITIONS†	'150		'151A, '152A		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	$V_{CC} = \text{MIN}, I_I = -8 \text{ mA}$					-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§	$V_{CC} = \text{MAX}$	SN54'	-20	-55	-20	-55	mA	
		SN74'	-18	-55	-18	-55		
$I_{CC}$ Supply current	$V_{CC} = \text{MAX},$ See Note 3	'150	40	68			mA	
		'151A			29	48		
		'152A			26	43		

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

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

§ Not more than one output of the '151A should be shorted at a time.

NOTE 3:  $I_{CC}$  is measured with the strobe and data select inputs at 4.5 V, all other inputs and outputs open.

# TYPES SN54150, SN54151A, SN54152A, SN74150, SN74151A DATA SELECTORS/MULTIPLEXERS

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

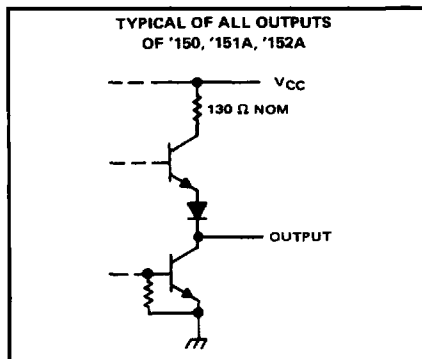
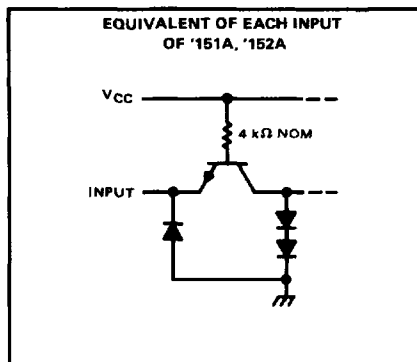
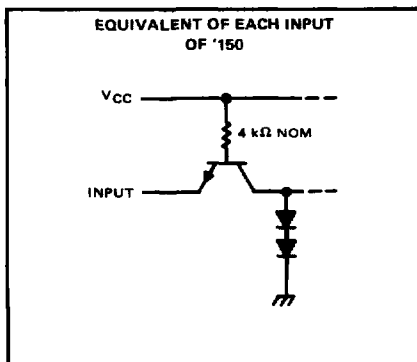
PARAMETER †	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	'150			'151A, '152A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
$t_{PLH}$	A, B, or C (4 levels)	Y	$C_L = 15\text{ pF}$ , $R_L = 400\ \Omega$ , See Note 4				25	38	ns	
$t_{PHL}$							25	38		
$t_{PLH}$	A, B, C, or D (3 levels)	W		23	35		17	26	ns	
$t_{PHL}$				22	33		19	30		
$t_{PLH}$	Strobe	Y					21	33	ns	
$t_{PHL}$							22	33		
$t_{PLH}$	Strobe	W		15.5	24		14	21	ns	
$t_{PHL}$				21	30		15	23		
$t_{PLH}$	D0 thru D7	Y					13	20	ns	
$t_{PHL}$							18	27		
$t_{PLH}$	E0 thru E15, or D0 thru D7	W	13	20		8	14	ns		
$t_{PHL}$			8.5	14		8	14			

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

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

NOTE 4: Load circuit and voltage waveforms are shown on page 3-10.

## schematics of inputs and outputs



## TYPES SN54LS151, SN54LS152, SN74LS151 DATA SELECTORS/MULTIPLEXERS

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	7 V
Operating free-air temperature range: SN54LS' Circuits	-55°C to 125°C
SN74LS' Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

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

### recommended operating conditions

	SN54LS'			SN74LS'			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			$\mu$ A
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†	SN54LS'			SN74LS'			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	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V},$ $V_{IL} = V_{IL \text{ max}}$	$I_{OL} = 4 \text{ mA}$		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			$\mu$ 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	$V_{CC} = \text{MAX},$ Outputs open, All inputs at 4.5 V	'LS151		6.0	10	6.0	10	mA
		'LS152		5.6	9			

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

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

# TYPES SN54LS151, SN54LS152, SN74LS151

## DATA SELECTORS/MULTIPLEXERS

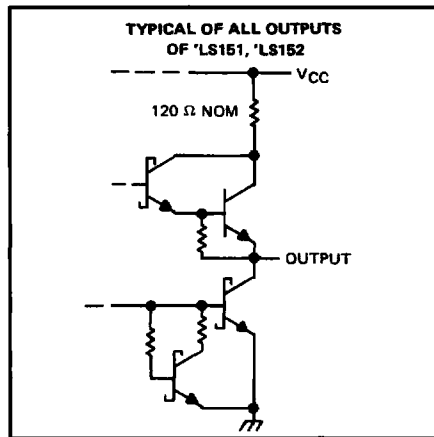
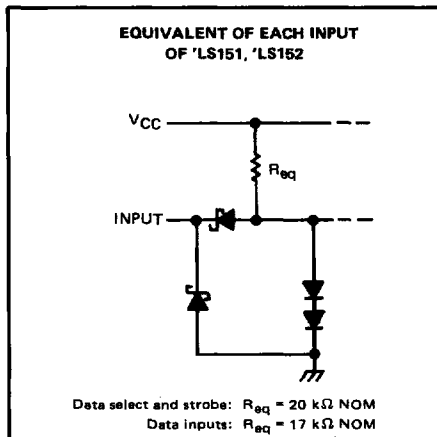
switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER <sup>1</sup>	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	SN54LS <sup>2</sup> , SN74LS <sup>2</sup>			UNIT
				MIN	TYP	MAX	
$t_{PLH}$	A, B, or C (4 levels)	Y	$C_L = 15\text{ pF}$ , $R_L = 2\text{ k}\Omega$ , See Note 5	27	43	ns	
$t_{PHL}$				18	30		
$t_{PLH}$	A, B, or C (3 levels)	W		14	23	ns	
$t_{PHL}$				20	32		
$t_{PLH}$	Strobe	Y		26	42	ns	
$t_{PHL}$				20	32		
$t_{PLH}$	Strobe	W		15	24	ns	
$t_{PHL}$				18	30		
$t_{PLH}$	Any D	Y		20	32	ns	
$t_{PHL}$				16	26		
$t_{PLH}$	Any D	W		13	21	ns	
$t_{PHL}$				12	20		

<sup>1</sup> $t_{PLH} \equiv$  Propagation delay time, low-to-high-level output  
<sup>2</sup> $t_{PHL} \equiv$  Propagation delay time, high-to-low-level output

NOTE 5: See load circuits and waveforms on page 3-11.

### schematics of inputs and outputs



# TYPES SN54S151, SN74S151 DATA SELECTORS/MULTIPLEXERS

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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage	5.5 V
Operating free-air temperature range: SN54S151 Circuits	-55°C to 125°C
SN74S151 Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

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

### recommended operating conditions

	SN54S151			SN74S151			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	°C

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

PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
$V_{IH}$	High-level input voltage			2			V
$V_{IL}$	Low-level input voltage					0.8	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$				-1.2	V
$V_{OH}$	High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -1 \text{ mA}$	SN54S'	2.5	3.4		V
			SN74S'	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	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	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$				50	µA
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.5 \text{ V}$				-2	mA
$I_{OS}$	Short-circuit output current§	$V_{CC} = \text{MAX}$		-40		-100	mA
$I_{CC}$	Supply current	$V_{CC} = \text{MAX}, \text{All inputs at } 4.5 \text{ V}, \text{All outputs open}$			45	70	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  $V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}$ .

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

# TYPES SN54S151, SN74S151

## DATA SELECTORS/MULTIPLEXERS

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

PARAMETER <sup>1</sup>	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	SN54S151, SN74S151			UNIT
				MIN	TYP	MAX	
$t_{PLH}$	A, B, or C	Y	$C_L = 15\text{ pF}$ , $R_L = 280\ \Omega$ , See Note 4 <sup>2</sup>	12	18	ns	
$t_{PHL}$	(4 levels)			12	18		
$t_{PLH}$	A, B, or C	W		10	15	ns	
$t_{PHL}$	(3 levels)			9	13.5		
$t_{PLH}$	Any D	Y		8	12	ns	
$t_{PHL}$				8	12		
$t_{PLH}$	Any D	W		4.5	7	ns	
$t_{PHL}$				4.5	7		
$t_{PLH}$	Strobe	Y		11	16.5	ns	
$t_{PHL}$				12	18		
$t_{PLH}$	Strobe	W		9	13	ns	
$t_{PHL}$				8.5	12		

<sup>1</sup> $t_{PLH}$   $\equiv$  Propagation delay time, low-to-high-level output

$t_{PHL}$   $\equiv$  Propagation delay time, high-to-low-level output

NOTE 4: See load circuits and waveforms on page 3-10.

### schematics of inputs and outputs

