

TYPES SN54157, SN54L157, SN54LS157, SN54LS158, SN54S157, SN54S158, SN74157, SN74L157, SN74LS157, SN74LS158, SN74S157, SN74S158 QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

BULLETIN NO. DL-6 7711847, MARCH 1974—REVISED AUGUST 1977

features

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

TYPES	TYPICAL AVERAGE PROPAGATION TIME	TYPICAL POWER DISSIPATION
'157	9 ns	150 mW
'L157	18 ns	75 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, 'L157, 'LS157, and 'S157 present true data whereas the 'LS158 and 'S158 present inverted data to minimize propagation delay time.

FUNCTION TABLE

INPUTS		OUTPUT Y			
STROBE	SELECT	A	B	'157, 'L157, '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

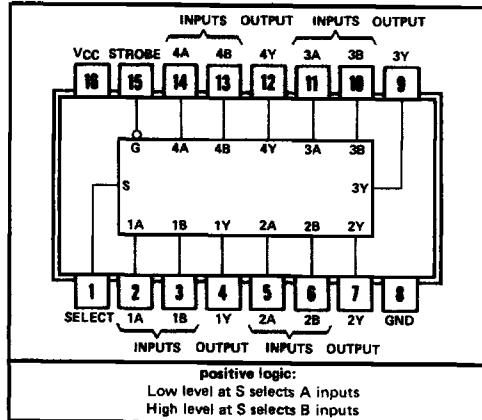
H = high level, L = low level, X = irrelevant

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

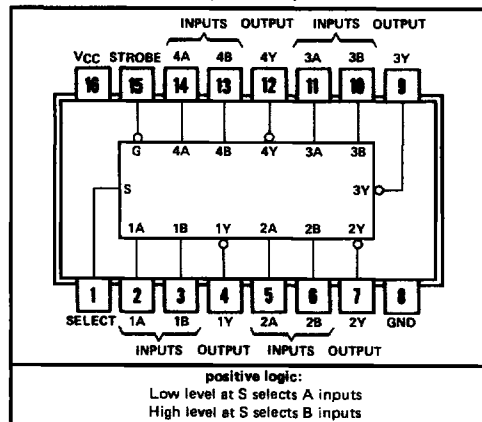
Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage: '157, 'L157, 'S158	5.5 V
'LS157, 'LS158	7 V
Operating free-air temperature range: SN54', SN54L', SN54LS', SN54S' Circuits	-55°C to 125°C
SN74', SN74L', SN74LS', SN74S' Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

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

SN54157, SN54LS157, SN54S157 . . . J OR W PACKAGE
SN54L157 . . . J PACKAGE
SN74157, SN74L157, SN74LS157, SN74S157 . . . J OR N PACKAGE
(TOP VIEW)



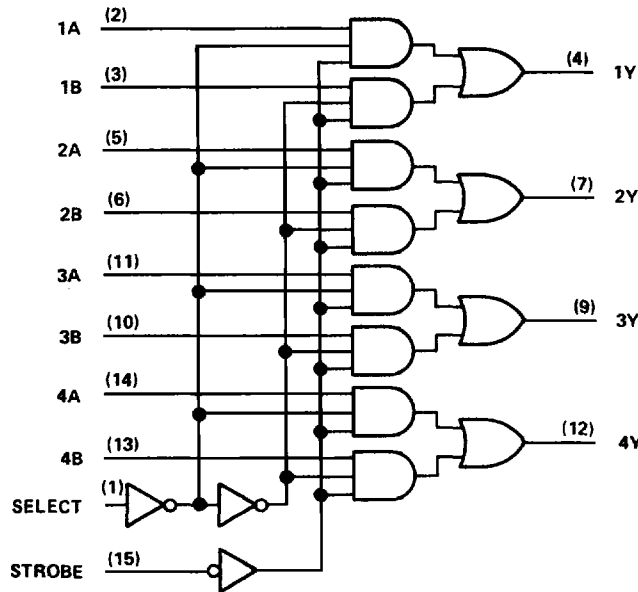
SN54LS158, SN54S158 . . . J OR W PACKAGE
SN74LS158, SN74S158 . . . J OR N PACKAGE
(TOP VIEW)



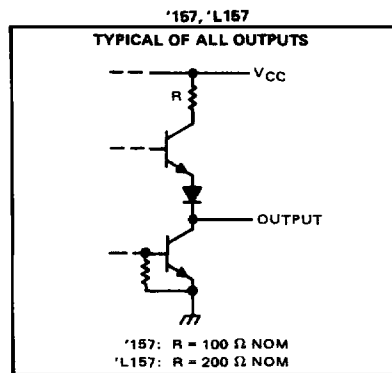
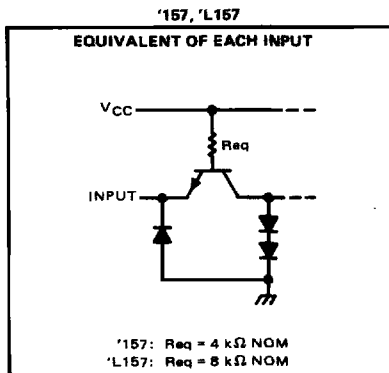
TYPES SN54157, SN54L157, SN74157, SN74L157, QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

functional block diagram

'157, 'L157



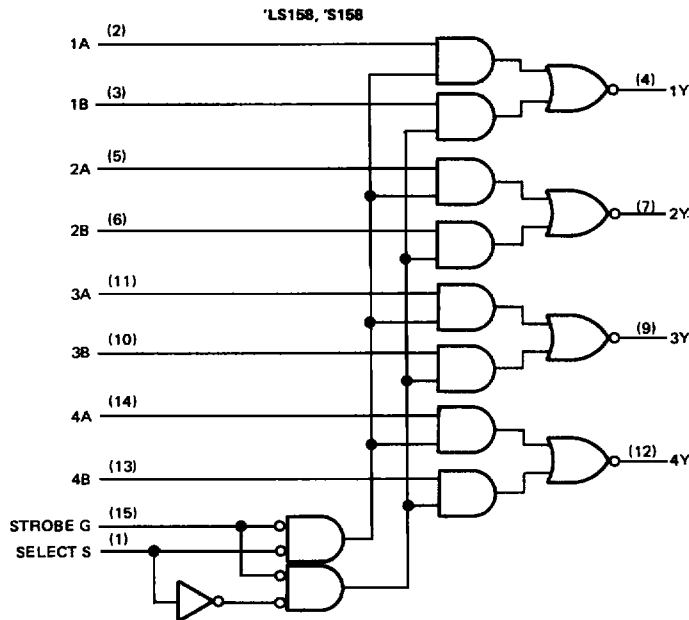
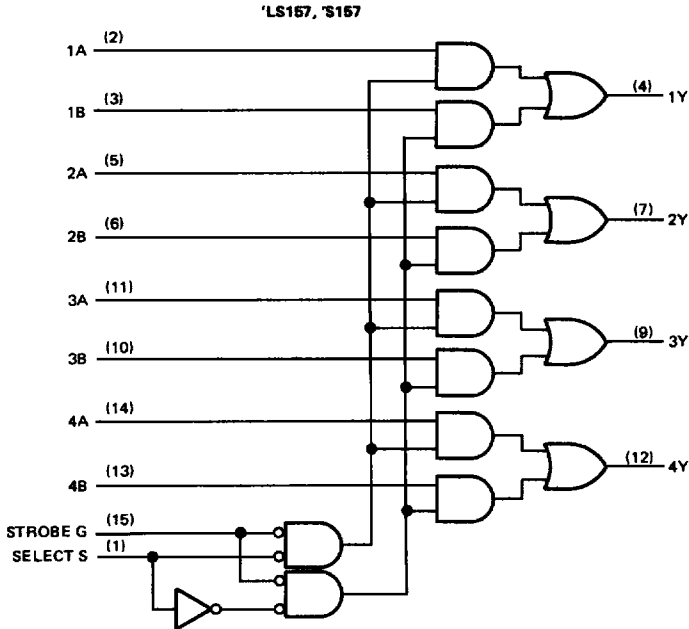
schematics of inputs and outputs



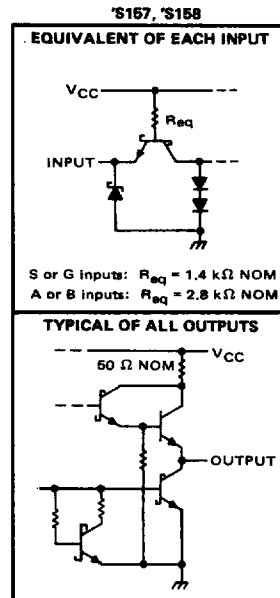
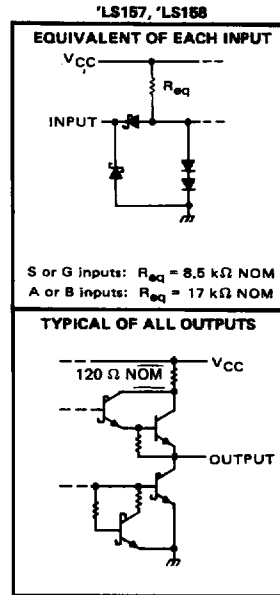
TYPES SN54LS157, SN54LS158, SN54S157, SN54S158, SN74LS157, SN74LS158, SN74S157, SN74S158

QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

functional block diagrams



schematics of inputs and outputs



TYPES 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			μ 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			μ 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	$C_L = 15 \text{ pF},$ $R_L = 400 \Omega,$ See Note 3	9	14		ns
t_{PHL}			9	14		
t_{PLH}	Strobe		13	20		ns
t_{PHL}			14	21		
t_{PLH}	Select		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 circuit and voltage waveforms are shown on page 3-10.

TYPES SN54L157, SN74L157

QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

recommended operating conditions

	SN54L157			SN74L157			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}	8			8			mA
Operating free-air temperature, T_A	-55			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	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$			-1.5	V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -400 \mu\text{A}$	2.4	3.4		V
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 8 \text{ mA}$		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	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			20	μ A
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$			-0.8	mA
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-9		-28	mA
I_{CC} Supply current	$V_{CC} = \text{MAX}$, See Note 2		15	24	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 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	$C_L = 15 \text{ pF}, R_L = 800 \Omega,$ See Note 3	18	28	ns	
t_{PHL}			18	28		
t_{PLH}	Strobe		26	40	ns	
t_{PHL}			28	42		
t_{PLH}	Select		30	46	ns	
t_{PHL}			36	54		

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

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

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

TYPES SN54LS157, SN54LS158, SN74LS157, SN74LS158

QUADRUPLE 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

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	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 [†]	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	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = \text{MAX}$, $I_{OH} = -400 \mu\text{A}$	2.5	3.4		2.7	3.4		V
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = \text{MAX}$							V
					$I_{OL} = 4 \text{ mA}$	0.25	0.4	0.25	0.4
					$I_{OL} = 8 \text{ mA}$			0.35	0.5
I_I	Input current at maximum input voltage	S or G input	$V_{CC} = \text{MAX}$, $V_I = 7 \text{ V}$			0.2			0.2
		A or B input				0.1			0.1
I_{IH}	High-level input current	S or G input	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$			40			40
		A or B input				20			20
I_{IL}	Low-level input current	S or G input	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-0.8			-0.8
		A or B input				-0.4			-0.4
I_{OS}	Short-circuit output current [§]	$V_{CC} = \text{MAX}$	-20		-100	-20		-100	mA
I_{CC}	Supply current	$V_{CC} = \text{MAX}$, See Note 2	'LS157			'LS158			
			9.7	16		9.7	16		mA
			4.8	8		4.8	8		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	'LS157			'LS158			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH}	Data	$C_L = 15 \text{ pF}$, $R_L = 2 \text{ k}\Omega$, See Note 4	9	14		7	12		ns
t_{PHL}			9	14		7	12		ns
t_{PLH}	Strobe		13	20		11	17		ns
t_{PHL}			14	21		12	18		ns
t_{PLH}	Select		15	23		13	20		ns
t_{PHL}			18	27		16	24		ns

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

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

NOTE 4: Load circuit and voltage waveforms are shown on page 3-11.

TYPES SN54S157, SN54S158, SN74S157, SN74S158

QUADRUPL 2-LINE-TO-1-LINE DATA SELECTORS/MULTIPLEXERS

REVISED AUGUST 1977

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‡
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	
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	S or G input		100		100	μ A	
	A or B input		50		50		
I_{IL} Low-level input current	S or G input		-4		-4	mA	
	A or B input		-2		-2		
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}$	-40	-100	-40	-100	mA	
I_{CC} Supply current	$V_{CC} = \text{MAX},$ All inputs at 4.5 V, See Note 2		50	78	39	61	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		8.5	12.5		6.5	11.5	ns	
t_{PHL}			7.5	12		7	12		
t_{PLH}	Select		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 circuit and voltage waveforms are shown on page 3-10.