8-Bit Parallel-Out Serial Shift Registers

FEATURES

- Gated (Enable/Disable) Serial Inputs
- Fully Buffered Clock and Serial Inputs
- Asynchronous Clear

DESCRIPTION

These 8-bit shift registers feature gated serial inputs and an asynchronous clear. The gated serial inputs (A and B) permit complete control over incoming data as a low at either (or both) input(s) inhibits entry of the new data and resets the first flip-flop to the low level at the next clock pulse. A high-level input enables the other input which will then determine the state of the first flip-flop. Data at the serial inputs may be changed while the clock is high or low, but only information meeting the setup requirements will be entered. Clocking occurs on the low-to-high-level transition of the clock input. All inputs are diode-clamped to minimize transmission-line effects.

9LS/54LS devices are characterized for operation over the full military temperature range of -55° C to 125° C; 9LS/74LS devices are characterized for operation from 0°C to 70°C.

FUNCTION TABLES

	INPUTS	OUTPUTS				
CLEAR	CLOCK	A	в	QA	QB.	QH
L	x	X	x	L	L	L
н	L	x	х	QA0	OB0	a _{H0}
н	†	н	н	н	Q _{An}	
н	↑ (L	х	L	QAn	QGn
н	î	x	L	L	Q _{An}	QGn



- H = high level (steady state), L = low level (steady state)
- X = irrelevant (any input, including transitions)
- \uparrow = transition from low to high level.
- Q_{An} , Q_{Gn} = the level of Q_A or Q_G before the most recent \uparrow transition of the clock; indicates a one-bit shift.

TYPICAL CLEAR, SHIFT, AND CLEAR SEQUENCES



8-Bit Parallel-Out Serial Shift Registers



Recommended	Operating	Conditions
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ecommended Operating Conditions	9LS/54LS			9LS/74LS			Unit
	Min	Nom	Max	Min	Nom	Max	
	4.5	5	5.5	4.75	5	5.25	V
Supply voltage, V _{CC}			-400			-400	μA
High-level output current, IOH		<u> </u>	4		f	8	mA
Low-level output current, IOL	0	<u> </u>	25	0		25	MHz
Clock frequency, fclock	20			20			ns
Width of clock or clear input pulse, tw	15		<u> </u>	15			ns
Data setup time, t _{setup} (see Figure 1)			<u> </u>	5			ns
Data hold time, t _{hold} (see Figure 1) Operating free-air temperature, T _A	-55		125	0	1	70	°C

	m	Tomporature B	lanne (Un	ess Otherwise Noted	1)
Electrical Characteristics Over	Recommended Free-Air	Temperature n	lange (om		ń.

iectrical Gilare			SLS/54LS	5	9	Unit			
Parameter	Test Conditions*		Min	Typ**	Max	Min	Typ**	Max	
			2			2			V
V _{IH}					0.7			0.8	V
V _{IL}	V _{CC} =MIN, I _I =-18mA				-1.5			-1.5	V
V ₁ V _{OH}	V_{CC} =MIN, V_{IH} =2V, V_{IL} = V_{IL} max, I_{OH} =-400 μ A		2.5	3.5		2.7	3.5		V
	$V_{IL} = V_{IL} \max_{i, i \in I} V_{iH} = 2V_i$	I _{OL} =4mA	_	0.25	0.4		0.25	0.4	
Vol	V _{CC} =Vilmax	I _{OL} =8mA					0.35	0.5	
 	V _{CC} =MAX, V _i =7V		-		0.1			0.1	m/
li	$V_{CC}=MAX, V_1=2.7V$				20			20	μA
<u>Чн</u>					-0.4		1	-0.4	m/
կլ	V _{CC} =MAX, V _I =0.4V		-15	+	-100	-15	1	-100	m
l _{OS[†]}	V _{CC} =MAX			16	27		16	27	m
loctt	V _{CC} =MAX					· · · · · ·		<u> </u>	

*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 $V_{CC} = 5V$, $T_A = 25^{\circ}C$. †Not more than one output should be shorted at a time.

tillCC is measured with outputs open, serial inputs grounded, the clock input at 2.4V, and a momentary ground, then 4.5V applied to clear.

Switching Characteristics, V_{cc} = 5V Over Recommended Free-Air Temperature Range

-55°C			+25°C			+125°C			Unit
Min	Тур	Max	Min	Тур	Max	Min	Тур	Max	
= 15pF,	R. = 21	Ω (See	Fig. 1, p	age 2-9	5 and Fi	ig. A, pa	ige 2-17	4)	,
r			25	36		1			MHz
	26	38		24	36		26	38	ns
<u> </u>				17	27		20	30	ns
				21	32		24	35	ns
= 50pF	$R_1 = 2$	kΩ (See	Fig. 1,	page 2-	95 and F	ig. A, p	age 2-17	74)	
1		42	[27	40		29	42	ns
				20	31		23	34	ns
			<u> </u>	24	36		27	39	ns
	Min = 15pF,	-55°C Min Typ = 15pF, R _L = 2k 26 20 24 = 50pF, R _L = 2 29 23	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	-55°C Min Typ Max Min 15pF, $R_L = 2k\Omega$ (See Fig. 1, p 25 26 38 20 30 24 35 50pF, $R_L = 2k\Omega$ (See Fig. 1, 29 42 34 29 42 34	$\begin{tabular}{ c c c c c } \hline $-55^{\circ}C$ & $+25^{\circ}C$ \\ \hline Min Typ Max Min Typ \\ \hline $= 15pF, $R_{L} = 2k\Omega$ (See Fig. 1, page 2-9 \\ \hline 26 38 24 \\ \hline 20 30 17 \\ \hline 24 35 21 \\ \hline $50pF, $R_{L} = 2k\Omega$ (See Fig. 1, page 2-1 \\ \hline 29 42 27 \\ \hline 23 34 20 \\ \hline 24 21 \\ \hline 25 21 $	-55°C +25°C Min Typ Max Min Typ Max 15pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. 1, page 2-95 and Fig. 20 36 25 36 26 38 24 36	-55°C +25°C Min Typ Max Min Typ Max Min = 15pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-95 and Fig.	-55°C +25°C +125°C Min Typ Max Min Typ Max Min Typ 15pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-17 26 36 26 27 20 26 26 28 24 36 26 20 20 20 21 32 24 24 26 24 25 21 32 24 24 26 20 20 24 35 21 32 24 24 26 24 25 36 24 26 20 20 20 20 20 20 20 20 20 20 20 24 25 36 24 20 24 24 24 24 24 24 24 24 24 24 24 24 24 24 24 24 25 24 25 24 25 24 25 24 25 24 24 24 <td>-55°C +25°C +125°C Min Typ Max Min Typ Max 15pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-174) 25 36 - - 26 38 24 36 26 38 20 30 17 27 20 30 24 35 21 32 24 35 50pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-174) - 29 42 27 40 29 42 23 34 20 31 23 34 36 36 34</td>	-55°C +25°C +125°C Min Typ Max Min Typ Max 15pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-174) 25 36 - - 26 38 24 36 26 38 20 30 17 27 20 30 24 35 21 32 24 35 50pF, $R_L = 2k\Omega$ (See Fig. 1, page 2-95 and Fig. A, page 2-174) - 29 42 27 40 29 42 23 34 20 31 23 34 36 36 34

Note: AC specification shown under -55°C and +125°C are for 9LS devices only. All 50pF specifications are for 9LS only.

LS164

PARAMETER MEASUREMENT INFORMATION t_w(clear) -**3**V CLEAR PULSE 1.3V 1.3V GENERATOR (PRR ≤1 MHz) - ov t_w(cłock) t_w(clock) -----3V CLOCK PULSE 1.3V 1.3V 1.3V 1.3V GENERATOR (PRR ≤1 MHz) - ov t_{hold} k ^thold ie 2 SERIAL INPUTS tsetup 1 3V A AND B PULSE GENERATOR 1.3V 1.3V 1.3V 1.3V (PRR ≤1 MHz) t_{setup} -> - ov – ^tPHL (See Note E) لد -6 ^tPLH K ∕трнцк — Vон Q_A OUTPUT (See Note A) 1.3V 1.3V 1.3V VOL

FIGURE 1

VOLTAGE WAVEFORMS

NOTES: A. Q_A output is illustrated. Relationship of serial input A and B data to other Q outputs is illustrated in the typical shift sequence:
B. Outputs are set to the high level prior to the measurement of tpHL from the clear input.