FEATURES

- For Use In Digital Computer Systems
- For Use In Data-Handling Systems
- For Use In Control Systems

DESCRIPTION

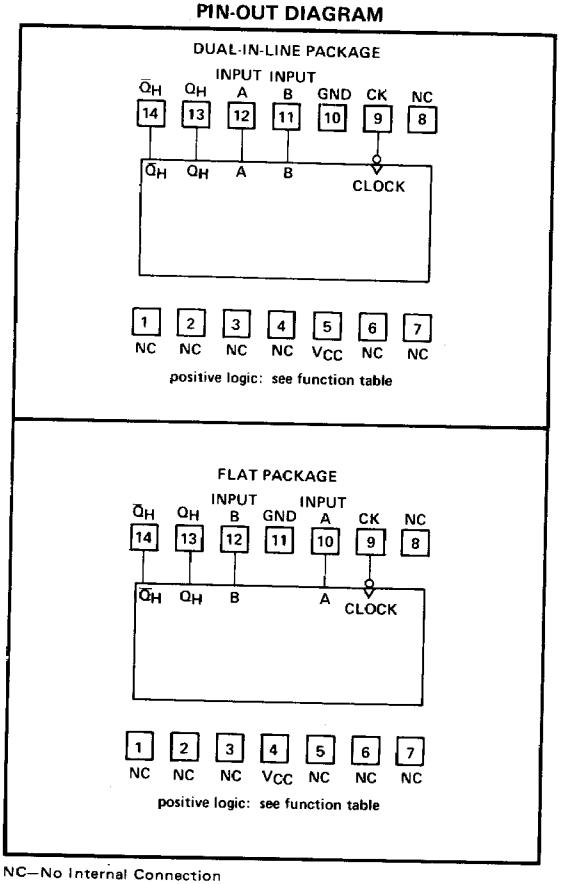
These monolithic serial-in, serial-out, 8-bit shift registers utilize transistor-transistor logic (TTL) circuits and are composed of eight R-S master-slave flip-flops, input gating, and a clock driver. Single-rail data and input control are gated through inputs A and B and an internal inverter to form the complementary inputs to the first bit of the shift register. Drive for the internal common clock line is provided by an inverting clock driver. This clock pulse inverter/driver causes these circuits to shift information one bit on the positive edge of an input clock pulse.

FUNCTION TABLE

Inputs AT t_n		Outputs AT t_{n+8}	
A	B	Q_H	$\bar{Q}_H$
H	H	H	H
L	X	L	H
X	L	L	H

H = high, L = low,
X = irrelevant
t_n = Reference bit time, clock low
t_{n+8} = Bit time after 8 low-to-high clock transitions.

PIN-OUT DIAGRAM



NC—No Internal Connection

SCHEMATICS OF INPUTS AND OUTPUTS

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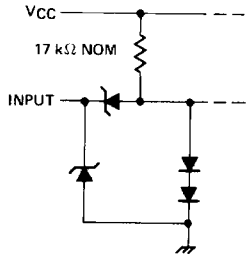
EQUIVALENT OF EACH INPUT



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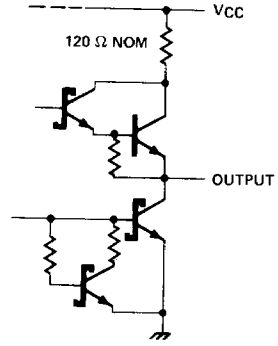
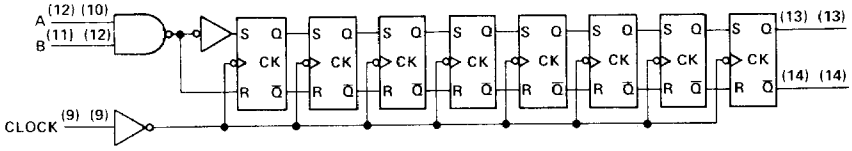
TYPICAL OF BOTH OUTPUTS



FUNCTIONAL BLOCK DIAGRAM

(DUAL-IN-LINE) (FLAT PACKAGE)



Recommended Operating Conditions

	9LS/54LS			9LS/74LS			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	μA
Low-level output current, I_{OL}			4			8	mA
Width of clock input pulse, t_W	25			25			ns
Setup time, t_{su} (See Figure 1)	25			25			ns
Hold time, t_n (See Figure 1)	0			0			ns
Operating free-air temperature, T_A	−55		125	0		70	°C

Electrical Characteristics Over Recommended Operating Free-Air Temperature Range (Unless Otherwise Noted)

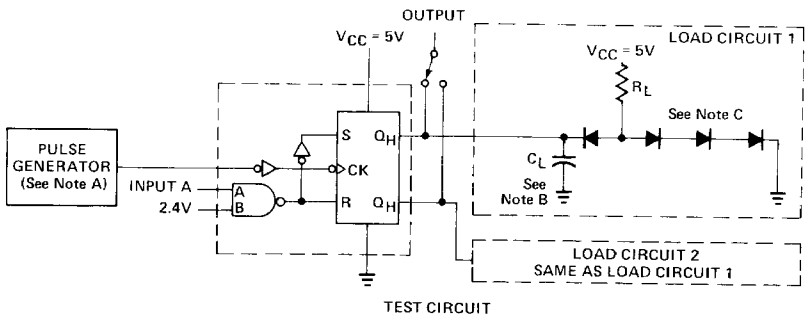
Parameter	Test Conditions†		9LS/54LS			9LS/74LS			Unit
			Min.	Typ.‡	Max.	Min.	Typ.‡	Max.	
V_{IH} High-level input voltage			2			2			V
V_{IL} Low-level input voltage					0.7			0.8	V
V_{IK} Input clamp voltage	V_{CC} = Min, I_I = −18 mA				−1.5			−1.5	V
V_{OH} High-level output voltage	V_{CC} = Min, V_{IH} = 2V V_{IL} = V_{IL} max, I_{OH} = −400μA		2.5	3.5		2.7	3.5		V
V_{OL} Low-level output voltage	V_{CC} = Min, V_{IH} = 2V V_{IL} = V_{IL} max	I_{OL} = 4 mA		0.25	0.4		0.25	0.4	V
		I_{OL} = 8 mA					0.35	0.5	
I_I Input current at maximum input voltage	V_{CC} = Max, V_I = 7V				0.1			0.1	mA
I_{IH} High-level input current	V_{CC} = Max, V_I = 2.7V				20			20	μA
I_{IL} Low-level input current	V_{CC} = Max, V_I = 0.4V				−0.4			−0.4	mA
I_{OS} Short-circuit current§	V_{CC} = Max		15		−100	15		−100	mA
I_{CC} Supply current	V_{CC} = Max, See Note 1			12	20		12	20	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 V, T_A = 25°C.
§Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.
NOTE 1. I_{CC} is measured after the eighth clock pulse with the output open and A and B inputs grounded.

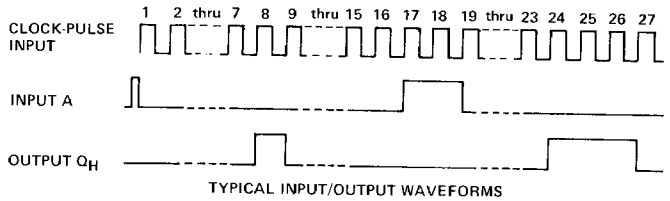
Switching Characteristics V_{CC} = 5.0V Over Recommended Free-Air Temperature Range.

Parameter	From (Input)	To (Output)	9LS/54LS									Unit
			−55°C			+25°C			+125°C			
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Test Conditions: C_L = 15pF, R_L = 2.0kΩ (See Fig. A, page 2-174 and Fig. 1, page 2-55)												
f(max)						10	18					MHz
T_{PLH}	clock	Q_H		26	42		24	40		26	42	ns
T_{PHL}	clock	Q_H		28	45		27	40		28	45	ns
Test Conditions: C_L = 50pF, R_L = 2.0kΩ (See Fig. A, page 2-174 and Fig. 1, page 2-55)												
T_{PLH}	clock	Q_H		30	47		27	45		30	47	ns
T_{PHL}	clock	Q_H		33	52		30	48		33	52	ns

PARAMETER MEASUREMENT INFORMATION

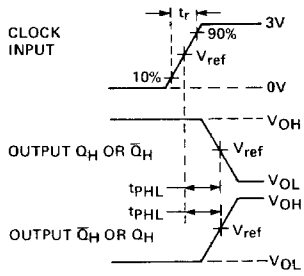


TEST CIRCUIT

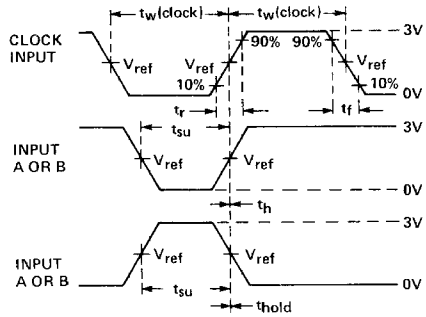


TYPICAL INPUT/OUTPUT WAVEFORMS

PARAMETER MEASUREMENT INFORMATION



PROPAGATION DELAY TIMES VOLTAGE WAVEFORMS



SWITCHING TIMES VOLTAGE WAVEFORMS

FIGURE 1. SWITCHING TIMES

NOTES: A. The generator has the following characteristics: t_w(clock) = 500 ns; PRR ≤ 1 MHz; $Z_{out} \approx 50\ \Omega$; t_r = 15 ns, and t_f = 6 ns.
B. C_L includes probe and j:s capacitance
C. All diodes are 1N3064 or 1N916
D. V_{ref} = 1.3V