

HD74LS195A • 4-bit Parallel-Access Shift Registers

This 4-bit register features parallel inputs, parallel outputs, J-K serial inputs, shift/load control input, and a direct overriding clear. All inputs are buffered to lower the input drive requirements. The registers have two modes of operation:

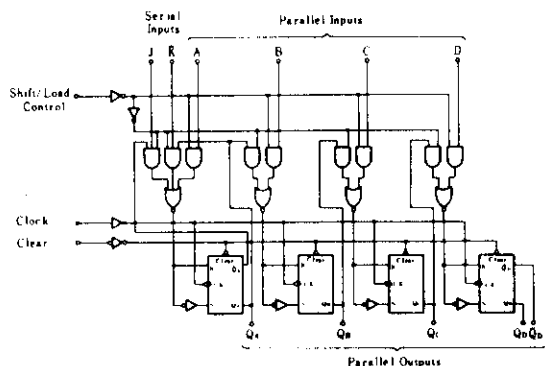
Parallel (broadside) load

Shift (in the direction Q_A toward Q_D)

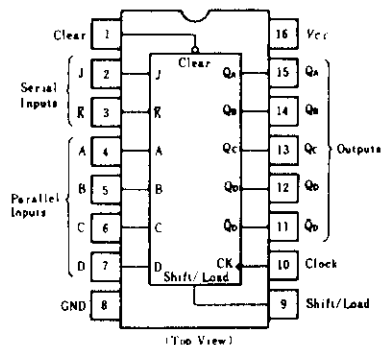
Parallel loading is accomplished by applying the four bits of data and taking the shift/load control input low. The data

is loaded into the associated flip-flop and appears at the outputs after the positive transition of the clock input. During loading, serial data flow is inhibited. Shifting is accomplished synchronously when the shift/load control input is high. Serial data for this mode is entered at the J-K inputs. These inputs permit the first stage to perform as a J-K, D-, or T-type flip-flop as shown in the function table.

■ BLOCK DIAGRAM



■ PIN ARRANGEMENT



■ RECOMMENDED OPERATING CONDITIONS

Item	Symbol	min	typ	max	Unit
Clock frequency	f_{clock}	0	—	30	MHz
Clock pulse width	$t_w(CLK)$	16	—	—	ns
Clear pulse width	$t_w(CLR)$	12	—	—	ns
Setup time	Shift/load	25	—	—	ns
	Serial and parallel data	15	—	—	
	Clear inactive-state	25	—	—	
Release time	$t_{release}$	—	—	5	ns
Hold time	t_h	0	—	—	ns

■ FUNCTION TABLE

Clear	Shift/Load	Inputs								Outputs				
		Clock	Serial		Parallel				Q_A	Q_B	Q_C	Q_D	\bar{Q}_D	
			J	\bar{K}	A	B	C	D						
L	X	X	X	X	X	X	X	X	X	L	L	L	L	H
H	L	↑	X	X	a	b	c	d	a	b	c	d	\bar{d}	
H	H	L	X	X	X	X	X	X	Q_{A0}	Q_{B0}	Q_{C0}	Q_{D0}	\bar{Q}_{D0}	
H	H	↑	L	H	X	X	X	X	Q_{A0}	Q_{A0}	Q_{Bn}	Q_{Cn}	Q_{Cn}	
H	H	↑	L	L	X	X	X	X	L	Q_{An}	Q_{Bn}	Q_{Cn}	Q_{Cn}	
H	H	↑	H	H	X	X	X	X	H	Q_{An}	Q_{Bn}	Q_{Cn}	Q_{Cn}	
H	H	↑	H	L	X	X	X	X	\bar{Q}_{An}	Q_{An}	Q_{Bn}	Q_{Cn}	\bar{Q}_{Cn}	

Notes 1. H; high level, L; low level, X; irrelevant
 2. ↑; transition from low to high level
 3. ↓; transition from high to low level
 4. a~d; the level of steady-state input at inputs A, B, C, or D, respectively

5. Q_{A0} ~ Q_{D0} : the level of Q_A , Q_B , Q_C , or Q_D , respectively, before the indicated steady-state input conditions were established.
 6. Q_{An} ~ Q_{Dn} : the level of Q_A , Q_B , Q_C , or Q_D , respectively, before the most-recent ↑ transition of the clock.

■ ELECTRICAL CHARACTERISTICS ($T_a = -20 \sim +75^\circ\text{C}$)

Item	Symbol	Test Conditions	min	typ*	max	Unit
Input voltage	V_{IH}		2.0	—	—	V
	V_{IL}		—	—	0.8	V
Output voltage	V_{OH}	$V_{CC}=4.75\text{V}, V_{IH}=2\text{V}, V_{IL}=0.8\text{V}, I_{OH}=-400\mu\text{A}$	2.7	—	—	V
	V_{OL}	$V_{CC}=4.75\text{V}, V_{IH}=2\text{V}, V_{IL}=0.8\text{V}$	—	—	0.4	V
Input current	I_{IH}	$V_{CC}=5.25\text{V}, V_i=2.7\text{V}$	—	—	20	μA
	I_{IL}	$V_{CC}=5.25\text{V}, V_i=0.4\text{V}$	—	—	-0.4	mA
	I_i	$V_{CC}=5.25\text{V}, V_i=7\text{V}$	—	—	0.1	mA
Short-circuit output current	I_{OS}	$V_{CC}=5.25\text{V}$	-20	—	-100	mA
Supply current**	I_{CC}	$V_{CC}=5.25\text{V}$	—	14	21	mA
Input clamp voltage	V_{IK}	$V_{CC}=4.75\text{V}, I_{IN}=-18\text{mA}$	—	—	-1.5	V

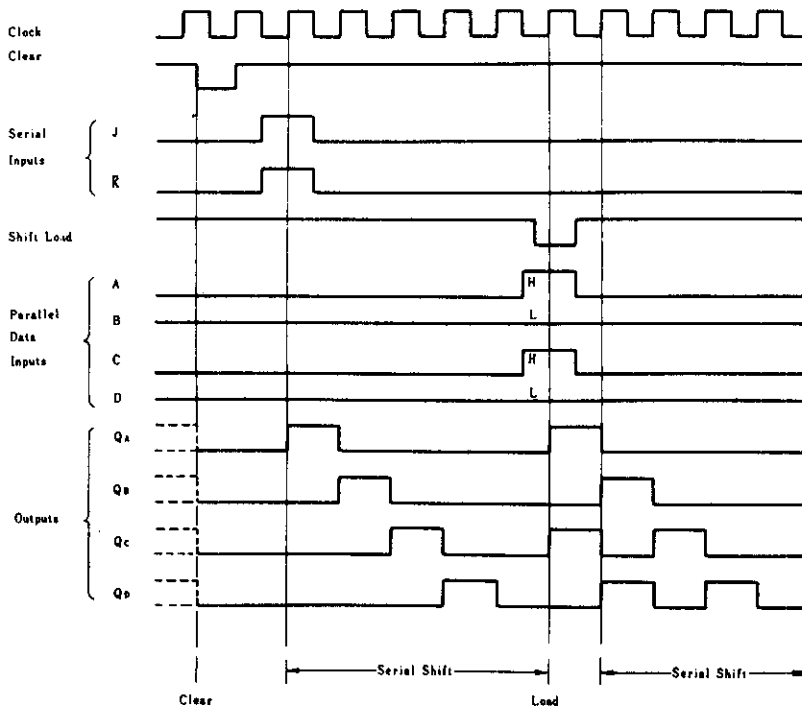
* $V_{CC}=5\text{V}, T_a=25^\circ\text{C}$

** With all outputs open, shift/load grounded, and 4.5V applied to the J, \bar{K} , and data inputs, I_{CC} is measured by applying a momentary ground, followed by 4.5V, to clear and then applying a momentary ground, followed by 4.5V, to clock.

■ SWITCHING CHARACTERISTICS ($V_{CC}=5\text{V}, T_a=25^\circ\text{C}$)

Item	Symbol	Inputs	Outputs	Test Conditions	min	typ	max	Unit
Maximum clock frequency	f_{max}	Clock	$Q_A \sim Q_D$	$C_L=15\text{pF}$ $R_L=2\text{k}\Omega$	30	39	—	MHz
Propagation delay time	t_{PHL}	Clear	$Q_A \sim Q_D$		—	19	30	ns
	t_{PLH}	Clock	$Q_A \sim Q_D, \bar{Q}_D$		—	14	22	ns
	t_{PHL}				—	17	26	ns

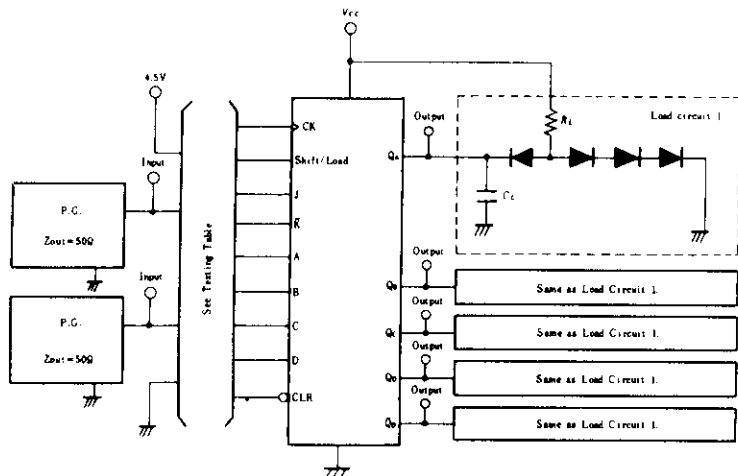
■ COUNT SEQUENCE



HD74LS195A

TESTING METHOD

1) Test Circuit

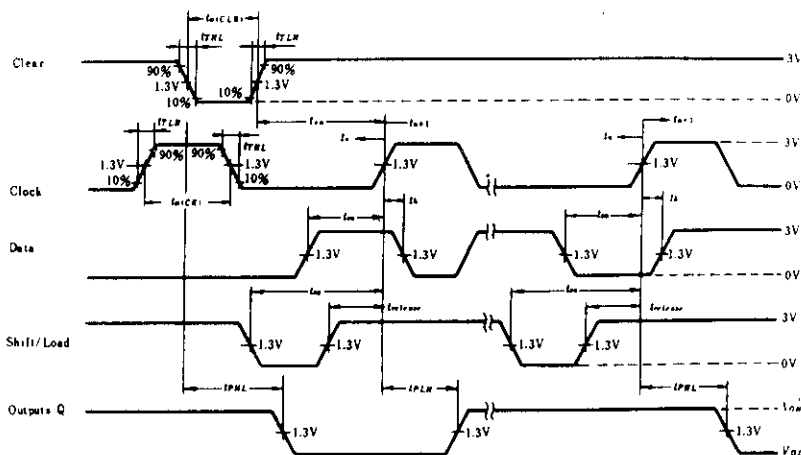


- Notes) 1. C_L includes probe and jig capacitance.
2. All diodes are 1S2074 (H).

2) Testing Table

Item	From input to output	Inputs									Outputs				
		CLR	Shift/Load	J	\bar{K}	CK	A	B	C	D	QA	QB	QC	QD	\bar{Q}_D
f_{max}		4.5V	4.5V	4.5V	GND	IN	4.5V	4.5V	4.5V	4.5V	OUT	OUT	OUT	OUT	OUT
t_{PHL}	Clear → QA~QD	IN	GND	4.5V	4.5V	IN	4.5V	4.5V	4.5V	4.5V	OUT	OUT	OUT	OUT	—
t_{PLH}	Clock → QA~QD, \bar{Q}_D	4.5V	4.5V	4.5V	GND	IN	4.5V	4.5V	4.5V	4.5V	OUT	OUT	OUT	OUT	OUT
t_{PHL}		4.5V	GND	4.5V	4.5V	IN	IN	IN	IN	IN	IN	OUT	OUT	OUT	OUT

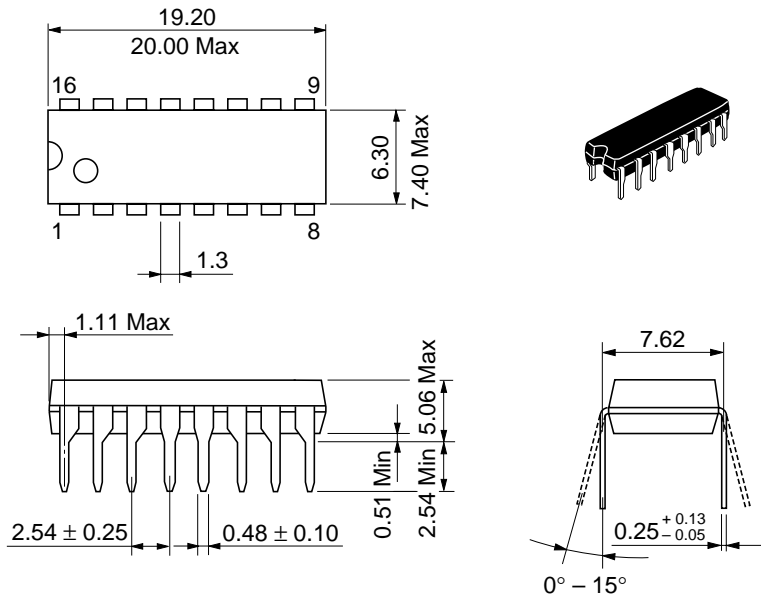
Waveform



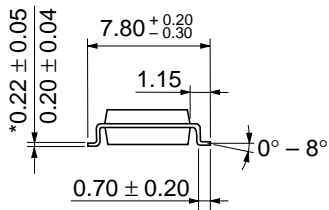
- Notes) 1. Input pulse: $t_{TLH} \leq 15\text{ns}$, $t_{THL} \leq 6\text{ns}$, $PRR=1\text{MHz}$, duty cycle 50%

2. A clear pulse is applied prior to each test.
3. Propagation delay times (t_{PLH} and t_{PHL}) are measured at t_{m+j} . Proper shifting of data is verified at t_{m+4} with a functional test.
4. J and \bar{K} inputs are tested the same as data A, B, C, and D

- inputs except that shift/load input remains high.
5. t_m : bit time before clocking transition.
6. t_{m+j} : bit time after one clocking transition.
7. t_{m+4} : bit time after four clocking transition.



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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