

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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# HD74HC595

8-bit Shift Register/Latch (with 3-state outputs)



ADE-205-514 (Z)

1st. Edition

Sep. 2000

## Description



This device each contains an 8-bit serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. The storage register has parallel 3-state outputs. Separate clocks are provided for both the shift register and the storage register. The shift register has a direct-overriding clear, serial input, and serial output pins for cascading.

Both the shift register and storage register clocks are positive-edge triggered. If the user wishes to connect both clocks together, the shift register state will always be one clock pulse ahead of the storage register.

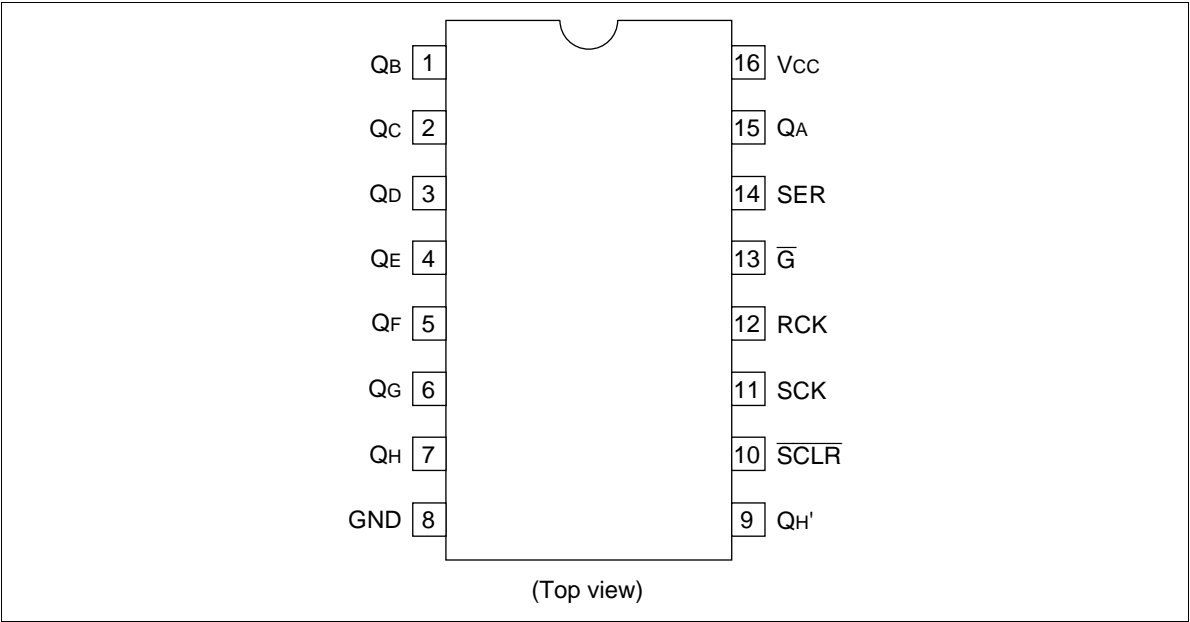
## Features

- High Speed Operation:  $t_{pd}$  (RCK to Q) = 17 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 15 LSTTL Loads ( $Q_A$  to  $Q_H$  outputs)
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )

## Function Table

RCK	SCK	$\overline{\text{SCLR}}$	$\overline{\text{G}}$	Function
X	X	X	H	$Q_A$ to $Q_H$ high impedance
X	X	L	X	Shift register cleared $Q_H' = L$
X		H	X	Shift register clocked $Q_n = Q_{n-1}$ , $Q_A = \text{SER}$
	X	H	X	Contents of shift register transferred to output latches

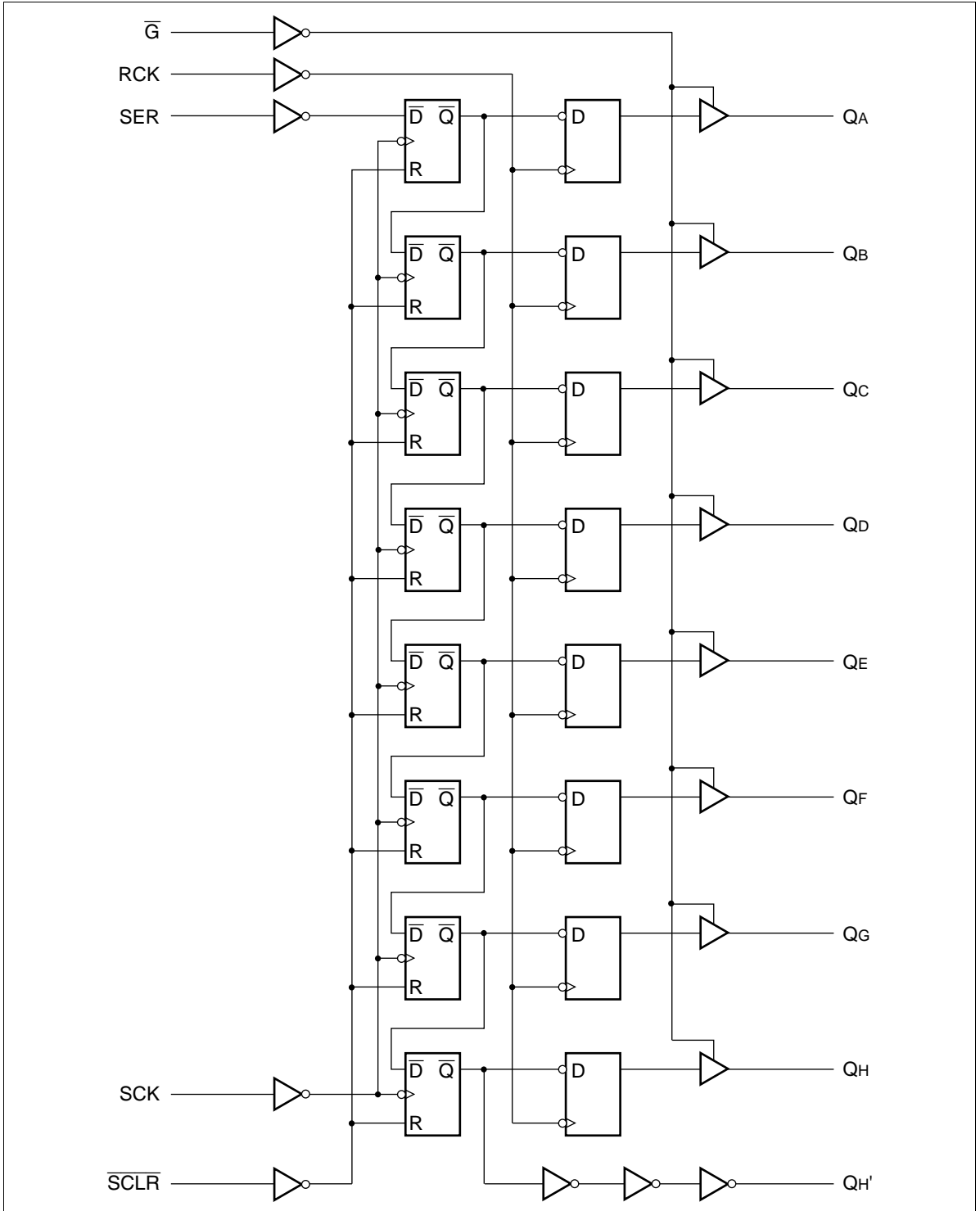
Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5 to +7.0	V
Input voltage	$V_{IN}$	-0.5 to $V_{CC} + 0.5$	V
Output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Output current	$I_{OUT}$	$\pm 35$	mA
DC current drain per $V_{CC}$ , GND	$I_{CC}$ , $I_{GND}$	$\pm 75$	mA
DC input diode current	$I_{IK}$	$\pm 20$	mA
DC output diode current	$I_{OK}$	$\pm 20$	mA
Power dissipation per package	$P_T$	500	mW
Storage Temperature	$T_{stg}$	-65 to +150	°C

# Logic Diagram



## DC Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to +85°C						Unit	Test Conditions	
			Ta = 25°C								
			Min	Typ	Max	Min	Max				
Input voltage	V <sub>IH</sub>	2.0	1.5	—	—	1.5	—	V	Q <sub>A</sub> to Q <sub>H</sub> V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OH</sub> = -20 μA		
		4.5	3.15	—	—	3.15	—				
		6.0	4.2	—	—	4.2	—				
	V <sub>IL</sub>	2.0	—	—	0.5	—	0.5	V			
		4.5	—	—	1.35	—	1.35				
		6.0	—	—	1.8	—	1.8				
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	Q <sub>A</sub> to Q <sub>H</sub> V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OH</sub> = -20 μA		
		4.5	4.4	4.5	—	4.4	—				
		6.0	5.9	6.0	—	5.9	—				
		4.5	4.18	—	—	4.13	—				I <sub>OH</sub> = -6 mA
		6.0	5.68	—	—	5.63	—				I <sub>OH</sub> = -7.8 mA
	V <sub>OL</sub>	2.0	—	0.0	0.1	—	0.1	V	Q <sub>A</sub> to Q <sub>H</sub> V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OL</sub> = 20 μA		
		4.5	—	0.0	0.1	—	0.1				
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33				I <sub>OL</sub> = 6 mA
		6.0	—	—	0.26	—	0.33				I <sub>OL</sub> = 7.8 mA
Output voltage	V <sub>OH</sub>	2.0	1.9	2.0	—	1.9	—	V	Q' <sub>H</sub> V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OH</sub> = -20 μA		
		4.5	4.4	4.5	—	4.4	—				
		6.0	5.9	6.0	—	5.9	—				
		4.5	4.18	—	—	4.13	—				I <sub>OH</sub> = -4 mA
		6.0	5.68	—	—	5.63	—				I <sub>OH</sub> = -5.2 mA
	V <sub>OL</sub>	2.0	—	0.0	0.1	—	0.1	V	Q' <sub>H</sub> V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub>  I <sub>OL</sub> = 20 μA		
		4.5	—	0.0	0.1	—	0.1				
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33				I <sub>OL</sub> = 4 mA
		6.0	—	—	0.26	—	0.33				I <sub>OL</sub> = 5.2 mA
Off-state output current	I <sub>OZ</sub>	6.0	—	—	±0.5	—	±5.0	μA	V <sub>in</sub> = V <sub>IH</sub> or V <sub>IL</sub> , V <sub>out</sub> = V <sub>CC</sub> or GND		
Input current	I <sub>in</sub>	6.0	—	—	±0.1	—	±1.0	μA	V <sub>in</sub> = V <sub>CC</sub> or GND		
Quiescent supply current	I <sub>CC</sub>	6.0	—	—	4.0	—	40	μA	V <sub>in</sub> = V <sub>CC</sub> or GND, I <sub>out</sub> = 0 μA		

AC Characteristics ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

Item	Symbol	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	$f_{\max}$	2.0	—	—	5	—	4	MHz	
		4.5	—	—	27	—	21		
		6.0	—	—	31	—	24		
Propagation delay time	$t_{PLH}$	2.0	—	—	115	—	145	ns	SCK to $Q_H'$
		4.5	—	12	23	—	29		
		6.0	—	—	20	—	25		
	$t_{PHL}$	2.0	—	—	150	—	190	ns	RCK to Q
		4.5	—	17	30	—	38		
		6.0	—	—	26	—	33		
	$t_{PLH}$	2.0	—	—	175	—	220	ns	$\overline{\text{SCLR}}$ to $Q_H'$
		4.5	—	20	35	—	44		
		6.0	—	—	30	—	37		
Output enable time	$t_{ZL}$	2.0	—	—	150	—	190	ns	
		4.5	—	13	30	—	38		
		6.0	—	—	26	—	33		
Output disable time	$t_{LZ}$	2.0	—	—	150	—	190	ns	
		4.5	—	15	30	—	38		
		6.0	—	—	26	—	33		
Setup time	$t_{su}$	2.0	100	—	—	125	—	ns	SER to SCK
		4.5	20	1	—	25	—		
		6.0	17	—	—	21	—		
	$t_{su}$	2.0	200	—	—	250	—	ns	SCK to RCK
		4.5	40	8	—	50	—		
		6.0	34	—	—	43	—		
Pulse width	$t_w$	2.0	80	—	—	100	—	ns	
		4.5	16	8	—	20	—		
		6.0	14	—	—	17	—		
Removal time	$t_{rem}$	2.0	100	—	—	125	—	ns	
		4.5	20	—	—	25	—		
		6.0	17	—	—	21	—		

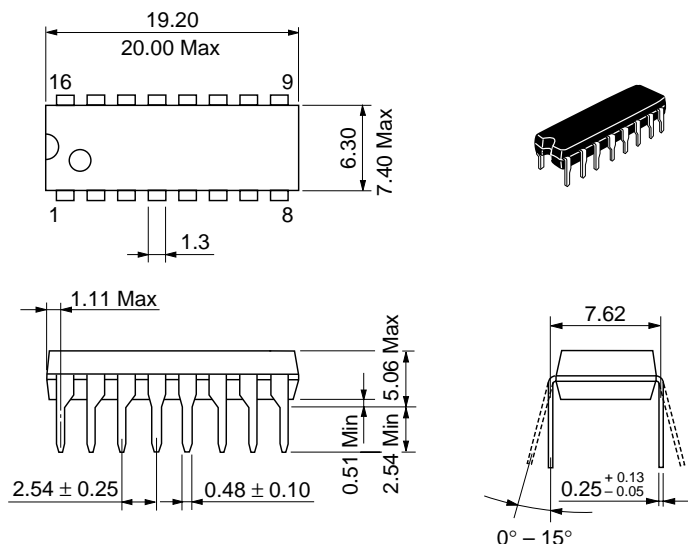
AC Characteristics (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns) (cont)

Item	Symbol	V <sub>cc</sub> (V)	Ta = 25°C					Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max				
Hold time	t <sub>h</sub>	2.0	5	—	—	5	—	—	ns		
		4.5	5	1	—	5	—				
		6.0	5	—	—	5	—				
Output rise/fall time	t <sub>TLH</sub>	2.0	—	—	75	—	95	ns	Q <sub>H</sub> '		
	t <sub>THL</sub>	4.5	—	5	15	—	19				
		6.0	—	—	13	—	16				
			2.0	—	—	60	—	75	ns	Q	
	4.5		—	4	12	—	15				
	6.0		—	—	10	—	13				
Input capacitance	C <sub>in</sub>	—	—	5	10	—	5	pF			



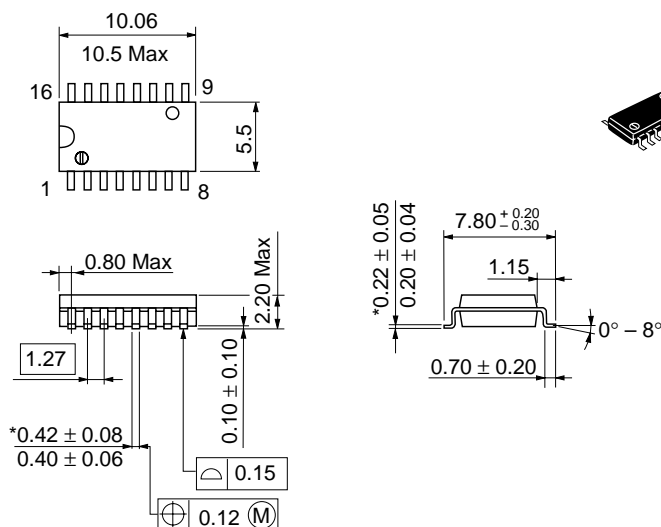
# Package Dimensions

Unit: mm



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

Unit: mm



\*Dimension including the plating thickness  
Base material dimension

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

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