

HD14015B

Dual 4-bit Static Shift Register

The HD14015B dual 4-bit static shift register consists of two identical, independent 4-state serial-input/parallel-output registers. Each register has independent Clock and Reset inputs with a single serial Data input. The register states are type D master-slave flip-flops. Data is shifted from one stage to the next during the positive-going clock transition. Each register can be cleared when a high level is applied on the Reset line.

FEATURES

Quiescent Current = 5nA/pkg typ @5V

Supply Voltage Range = 3 to 18V

High Fanout > 50

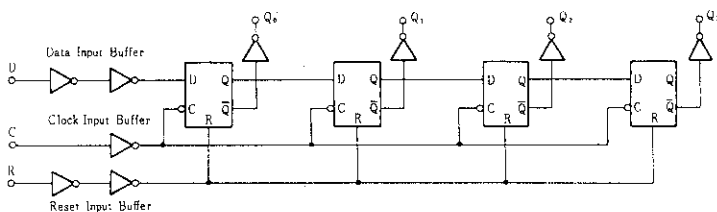
Input Impedance = $10^{12} \Omega$ typ.

Low Input Capacitance = 5pF typ.

Toggle Rate = 6MHz @10V

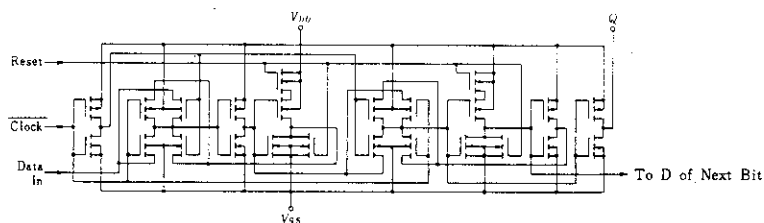
Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

LOGIC DIAGRAM (1/2)

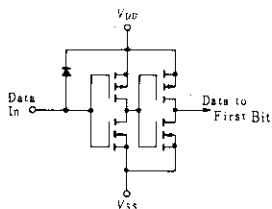


CIRCUIT SCHEMATIC

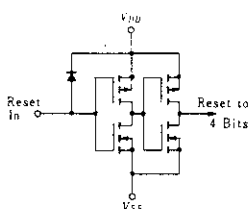
Single Bit



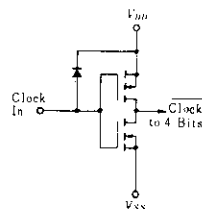
Data Input Buffer



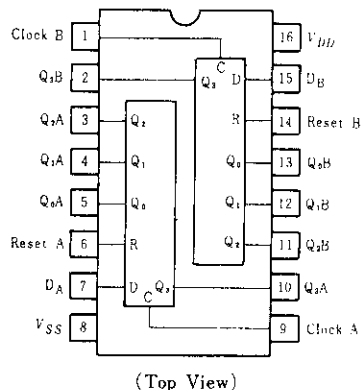
Reset Input Buffer



Clock Input Buffer



PIN ARRANGEMENT



TRUTH TABLE

Clocked Operation(Synchronous)

D	Qn	Q _{n+1}
0	0	0
0	1	0
1	0	1
1	1	1

Note) Q_{n+1} = Dn, Reset=0

Direct Operation(Asynchronous)

Reset	Q
0	Q
1	0

Note) Clock=D=Don't Care

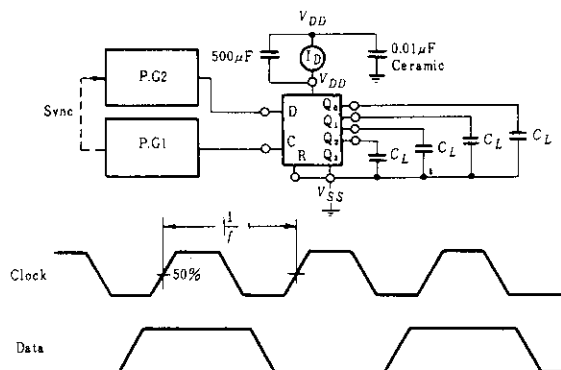
ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	$V_{DD}(V)$	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	V_{OL}	5.0	$V_{in} = V_{DD}$ or 0	—	0.05	—	0	0.05	—	0.05	V
		10		—	0.05	—	0	0.05	—	0.05	
		15		—	0.05	—	0	0.05	—	0.05	
	V_{OH}	5.0	$V_{in} = 0$ or V_{DD}	4.95	—	4.95	5.0	—	4.95	—	V
		10		9.95	—	9.95	10	—	9.95	—	
		15		14.95	—	14.95	15	—	14.95	—	
Input Voltage	V_{IL}	5.0	$V_{out} = 4.5$ or $0.5V$	—	1.5	—	2.25	1.5	—	1.5	V
		10	$V_{out} = 9.0$ or $1.0V$	—	3.0	—	4.50	3.0	—	3.0	
		15	$V_{out} = 13.5$ or $1.5V$	—	4.0	—	6.75	4.0	—	4.0	
	V_{IH}	5.0	$V_{out} = 0.5$ or $4.5V$	3.5	—	3.5	2.75	—	3.5	—	V
		10	$V_{out} = 1.0$ or $9.0V$	7.0	—	7.0	5.50	—	7.0	—	
		15	$V_{out} = 1.5$ or $13.5V$	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current	I_{OH}	5.0	$V_{OH} = 2.5V$	-1.0	—	-0.8	-1.7	—	-0.6	—	mA
		5.0	$V_{OH} = 4.6V$	-0.2	—	-0.16	-0.36	—	-0.12	—	
		10	$V_{OH} = 9.5V$	-0.5	—	-0.4	-0.9	—	-0.3	—	
		15	$V_{OH} = 13.5V$	-1.4	—	-1.2	-3.5	—	-1.0	—	
	I_{OL}	5.0	$V_{OL} = 0.4V$	0.52	—	0.44	0.88	—	0.36	—	mA
		10	$V_{OL} = 0.5V$	1.3	—	1.1	2.25	—	0.9	—	
		15	$V_{OL} = 1.5V$	3.6	—	3.0	8.8	—	2.4	—	
Input Current	I_{in}	15		—	± 0.3	—	± 0.0001	± 0.3	—	± 1.0	μA
Input Capacitance	C_{in}	—	$V_{in} = 0$	—	—	—	5.0	7.5	—	—	pF
Quiescent Current	I_{DD}	5.0	Zero Signal, per Package	—	20	—	0.005	20	—	150	μA
		10		—	40	—	0.010	40	—	300	
		15		—	80	—	0.015	80	—	600	
Total Supply Current*	I_T	5.0	Dynamic + I_{DD} , $C_L = 50pF$	—	—	—	1.2	—	—	—	μA
		10	$f = 1kHz$,	—	—	—	2.4	—	—	—	
		15	per Gate	—	—	—	3.6	—	—	—	

* To calculate total supply current at frequency other than 1kHz.

① $V_{DD} = 5.0V$ $I_T = 1.2\mu A/kHz \cdot f + I_{DD}$ ② $V_{DD} = 10V$ $I_T = 2.4\mu A/kHz \cdot f + I_{DD}$ ③ $V_{DD} = 15V$ $I_T = 3.6\mu A/kHz \cdot f + I_{DD}$

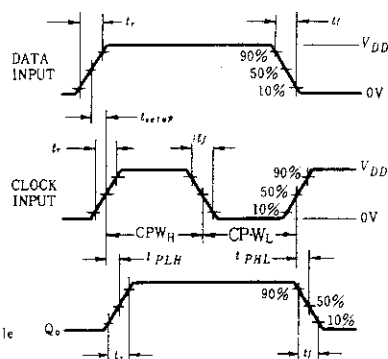
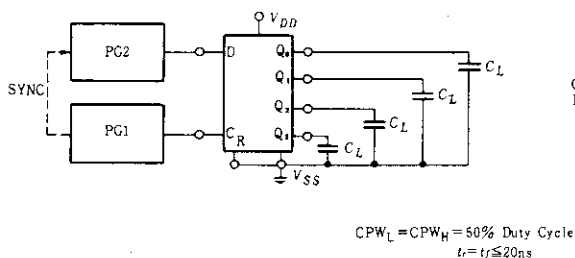
POWER DISSIPATION TEST CIRCUIT AND WAVEFORM



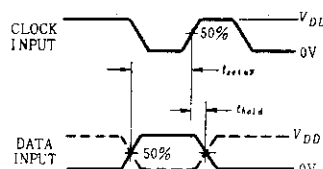
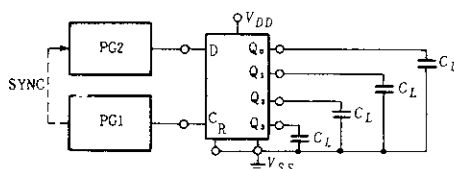
■ SWITCHING CHARACTERISTICS ($C_L=50\text{pF}$, $T_a=25^\circ\text{C}$)

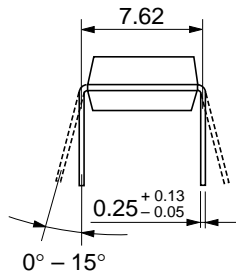
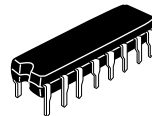
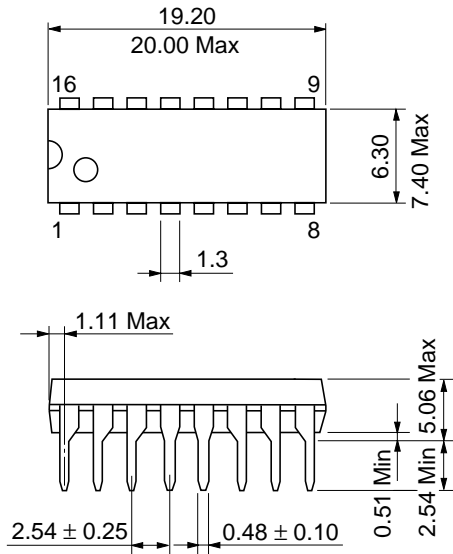
Characteristic		Symbol	V_{DD} (V)	min	typ	max	Unit
Output Rise Time		t_r	5.0	—	180	400	ns
			10	—	90	200	
			15	—	65	160	
Output Fall Time		t_f	5.0	—	170	250	ns
			10	—	70	150	
			15	—	50	80	
Propagation Delay Time	Clock, Data	$t_{PLH},$ t_{PHL}	5.0	—	310	1000	ns
			10	—	125	400	
			15	—	90	265	
	Reset		5.0	—	460	1000	
			10	—	180	400	
			15	—	120	265	
Clock Pulse Width		PW_C	5.0	500	185	—	ns
			10	200	85	—	
			15	150	55	—	
Clock Pulse Frequency		PRF	5.0	—	2.0	1.0	MHz
			10	—	6.0	2.5	
			15	—	7.5	3.0	
Clock Pulse Rise and Fall Time		t_r, t_f	5.0	—	—	15	μs
			10	—	—	15	
			15	—	—	15	
Reset Pulse Width		PW_R	5.0	500	200	—	ns
			10	200	80	—	
			15	150	60	—	
Setup Time		t_{setup}	5.0	500	100	—	ns
			10	100	50	—	
			15	75	40	—	

■ SWITCHING TIME TEST CIRCUIT

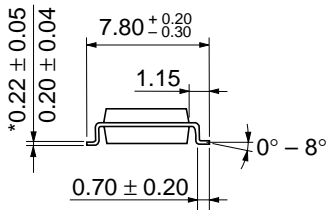
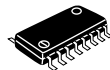
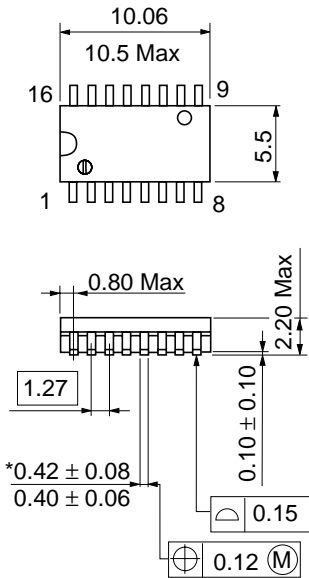


●Setup and Hold Time Test Circuit and Waveforms



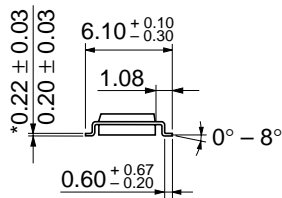
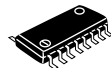
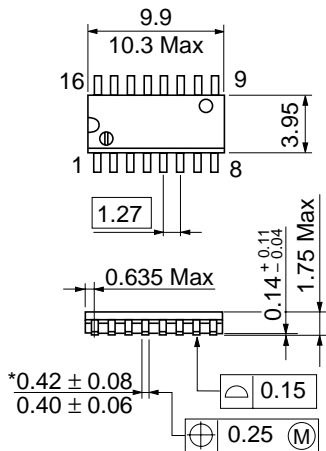


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



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

$$\frac{\text{*Dimension including the plating thickness}}{\text{Base material dimension}}$$



*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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