HD14015B

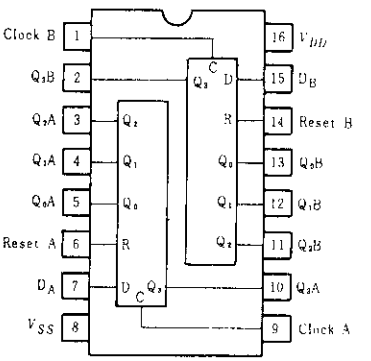
Dual 4-bit Static Shift Register

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

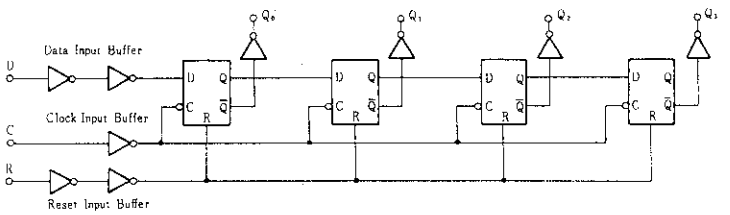
Quiescent Current = 5nA/pkg typ @5V
Supply Voltage Range = 3 to 18V
High Fanout > 50
Input Impedance = $10^{12}\Omega$ typ.
Low Input Capacitance = 5pF typ.
Toggle Rate = 6MHz @10V
Capable of Driving One Low-power Schottky TTL Load Over the Rated Temperature Range

■ PIN ARRANGEMENT



(Top View)

■ LOGIC DIAGRAM (1/2)



■ 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

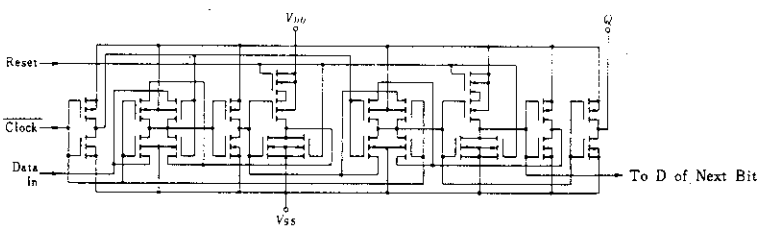
● Direct Operation(Asynchronous)

Reset	Q
0	Q
1	0

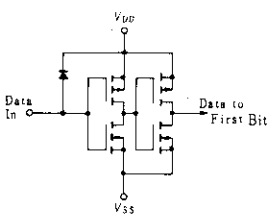
Note) Clock = D = Don't Care

■ CIRCUIT SCHEMATIC

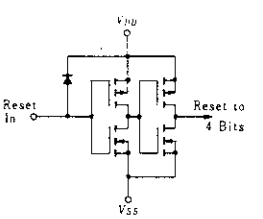
● Single Bit



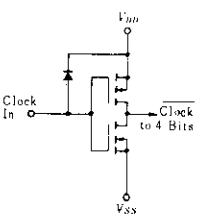
● Data Input Buffer



● Reset Input Buffer



● Clock Input Buffer



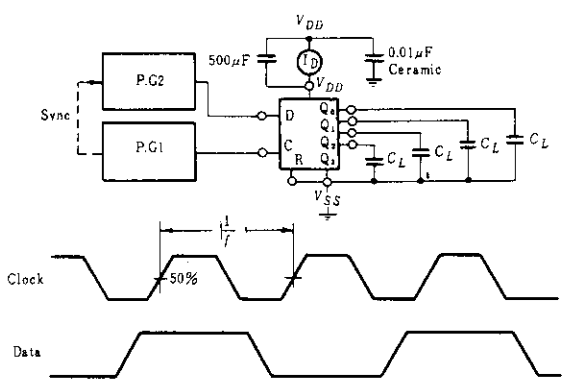
■ ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	V_{DD}(V)	Test Conditions	−40°C min	−40°C max	25°C min	25°C typ	25°C max	85°C min	85°C max	Unit
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	−	±0.00001	±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 f= 1 kHz, per Gate	−	−	−	1.2	−	−	−	μA
		10		−	−	−	2.4	−	−	−	
		15		−	−	−	3.6	−	−	−	

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

@ V_{DD} = 5.0V I_T = 1.2μA/kHz · f + I_{DD} @ V_{DD} = 10V I_T = 2.4μA/kHz · f + I_{DD} @ V_{DD} = 15V I_T = 3.6μA/kHz · f + I_{DD}

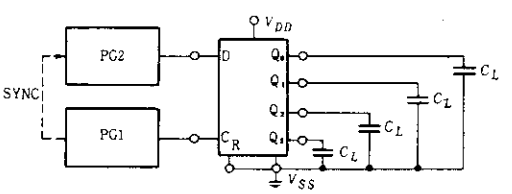
●POWER DISSIPATION TEST CIRCUIT AND WAVEFORM

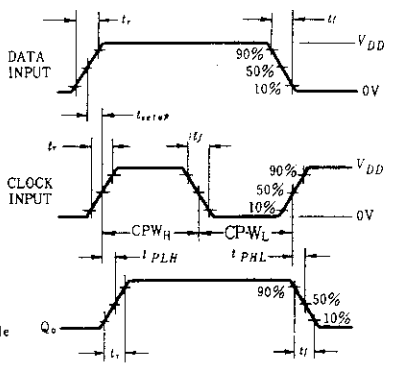


■ SWITCHING CHARACTERISTICS (C_L=50pF, Ta=25℃)

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	–	

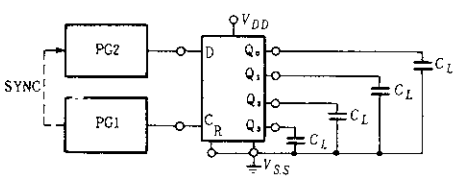
■ SWITCHING TIME TEST CIRCUIT

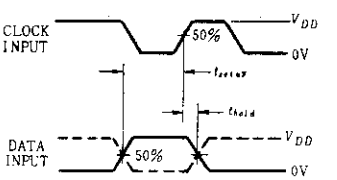




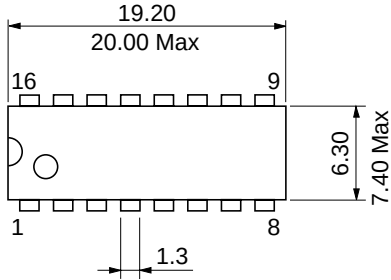
$CPW_L = CPW_H = 50\%$ Duty Cycle
$t_r = t_f \leq 20$ns

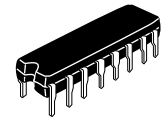
● Setup and Hold Time Test Circuit and Waveforms

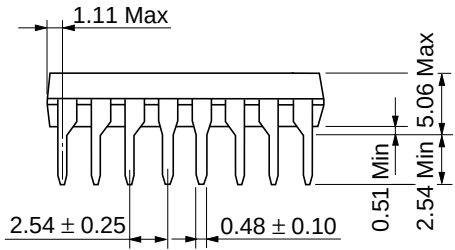


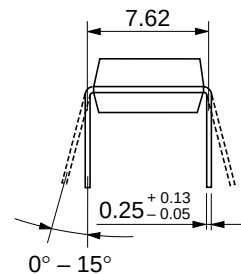


Unit: mm



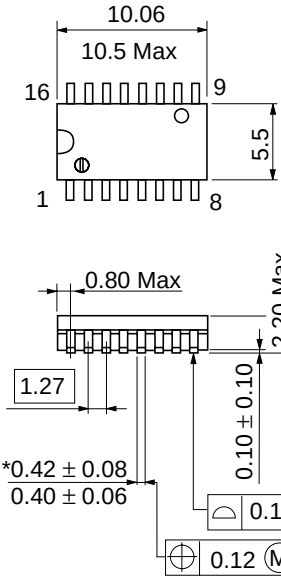


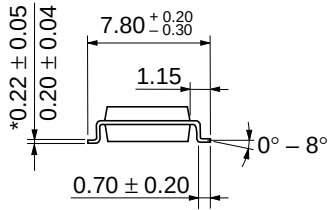


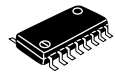


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

Unit: mm



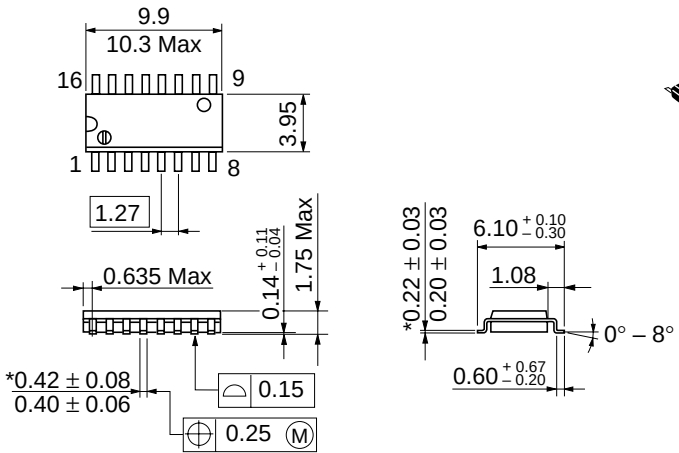




*Dimension including the plating thickness
Base material dimension

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

Unit: mm



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

*Dimension including the plating thickness
Base material dimension

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