

C²MOS DIGITAL INTEGRATED CIRCUIT
SILICON MONOLITHIC

TC4014BP

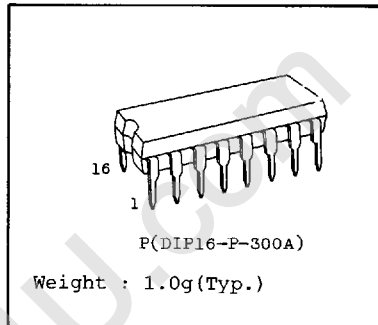
TOSHIBA (LOGIC/MEMORY)

TC4014BP 8-STAGE STATIC SHIFT REGISTER
(SYNCHRONOUS PARALLEL OR SERIAL INPUT/SERIAL OUTPUT)

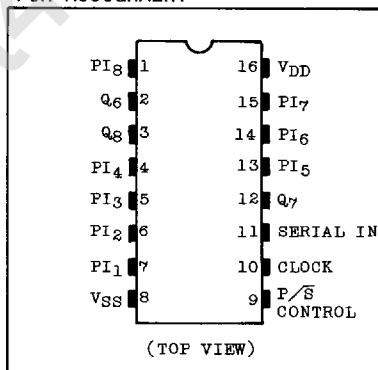
TC4014BP is 8 stage shift register having PARALLEL IN/SERIAL OUT operation, which can also perform SERIAL IN/SERIAL OUT operation. In both parallel operation and serial operation, the input data is obtained on the output of each F/F by rising edge of CLOCK input. (SYNCHRONOUS PARALLEL OR SYNCHRONOUS SERIAL INPUT)
Switching of parallel operation and serial operation is achieved by P/S CONTROL input. PARALLEL operation is performed when P/S CONTROL is "H" and SERIAL operation is performed when it is "L".

MAXIMUM RATINGS

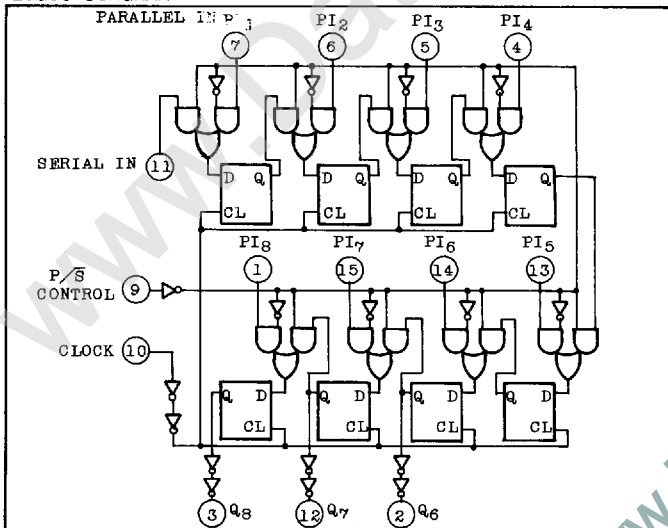
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V _{DD}	V _{SS} -0.5 ~ V _{SS} +20	V
Input Voltage	V _{IN}	V _{SS} -0.5 ~ V _{DD} +0.5	V
Output Voltage	V _{OUT}	V _{SS} -0.5 ~ V _{DD} +0.5	V
DC Input Current	I _{IN}	±10	mA
Power Dissipation	P _D	300	mW
Operating Ambient Temperature Range	T _A	-40 ~ 85	°C
Storage Temperature Range	T _{stg}	-65 ~ 150	°C
Lead Temp./Time	T _{sol}	260°C · 10sec	



PIN ASSIGNMENT



LOGIC DIAGRAM



TRUTH TABLE

CLOCK	INPUTS				OUTPUTS Δ	
	P/S	PI ₁	PI _n	SI	Q ₁	Q _n
┐	L	*	*	L	L	Q _{n-1}
┐	L	*	*	H	H	Q _{n-1}
┐	H	L	L	*	L	L
┐	H	H	L	*	H	L
┐	H	L	H	*	L	H
┐	H	H	H	*	H	H
┐	*	*	*	*	No Change	

n : 2~8
 Δ : Q₁~Q₅=Internal
 Δ : Level Change
 * : Don't Care

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RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V _{DD}		3	-	18	V
Input Voltage	V _{IN}		0	-	V _{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V _{DD} (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Output Voltage	V _{OH}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	4.95	-	4.95	5.00	-	4.95	-	V	
			10	9.95	-	9.95	10.00	-	9.95	-		
			15	14.95	-	14.95	15.00	-	14.95	-		
Low-Level Output Voltage	V _{OL}	I _{OUT} < 1μA V _{IN} =V _{SS} , V _{DD}	5	-	0.05	-	0.00	0.05	-	0.05	V	
			10	-	0.05	-	0.00	0.05	-	0.05		
			15	-	0.05	-	0.00	0.05	-	0.05		
Output High Current	I _{OH}	V _{OH} =4.6V V _{OH} =2.5V V _{OH} =9.5V V _{OH} =13.5V V _{IN} =V _{SS} , V _{DD}	5	-0.61	-	-0.51	-1.0	-	-0.42	-	mA	
			5	-2.5	-	-2.1	-4.0	-	-1.7	-		
			10	-1.5	-	-1.3	-2.2	-	-1.1	-		
			15	-4.0	-	-3.4	-9.0	-	-2.8	-		
Output Low Current	I _{OL}	V _{OL} =0.4V V _{OL} =0.5V V _{OL} =1.5 V _{IN} =V _{SS} , V _{DD}	5	0.61	-	0.51	1.5	-	0.42	-	mA	
			10	1.5	-	1.3	3.8	-	1.1	-		
			15	4.0	-	3.4	15.0	-	2.8	-		
Input High Voltage	V _{IH}	V _{OUT} =0.5V, 4.5V V _{OUT} =1.0V, 9.0V V _{OUT} =1.5V, 13.5V I _{OUT} < 1μA	5	3.5	-	3.5	2.75	-	3.5	-	V	
			10	7.0	-	7.0	5.5	-	7.0	-		
			15	11.0	-	11.0	8.25	-	11.0	-		
Input Low Voltage	V _{IL}	V _{OUT} =0.5V, 4.5V V _{OUT} =1.0V, 9.0V V _{OUT} =1.5V, 13.5V I _{OUT} < 1μA	5	-	1.5	-	2.25	1.5	-	1.5	V	
			10	-	3.0	-	4.5	3.0	-	3.0		
			15	-	4.0	-	6.75	4.0	-	4.0		
Input Current	"H" Level	I _{IH}	V _{IH} =18V	18	-	0.1	-	10 ⁻⁵	0.1	-	1.0	μA
	"L" Level	I _{IL}	V _{IL} =0V	18	-	-0.1	-	-10 ⁻⁵	-0.1	-	-1.0	
Quiescent Device Current	I _{DD}	V _{IN} =V _{SS} , V _{DD} *	5	-	5	-	0.005	5	-	150	μA	
			10	-	10	-	0.010	10	-	300		
			15	-	20	-	0.015	20	-	600		

* All valid input combinations.

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DYNAMIC ELECTRICAL CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION	VDD (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	tTLH		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Output Transition Time (High to Low)	tTHL		5	-	80	200	ns
			10	-	50	100	
			15	-	40	80	
Propagation Delay Time (CLOCK - Q)	t _{pLH} t _{pHL}		5	-	160	320	ns
			10	-	70	160	
			15	-	50	120	
Max. Clock Frequency	fCL		5	3	7.5	-	MHz
			10	6	20	-	
			15	8.5	26	-	
Min. Clock Pulse Width	t _w		5	-	65	180	ns
			10	-	25	80	
			15	-	20	50	
Max. Clock Rise Time Max. Clock Fall Time	t _{rCL} t _{fCL}		5	20	-	-	μs
			10	2.5	-	-	
			15	1.0	-	-	
Min. Set-Up Time (SI - CLOCK)	t _{SU}		5	-	40	120	ns
			10	-	15	80	
			15	-	10	60	
Min. Set-Up Time (PI - CLOCK)	t _{SU}		5	-	35	80	ns
			10	-	15	50	
			15	-	10	40	
Min. Set-Up Time (P/S - CLOCK)	t _{SU}		5	-	80	180	ns
			10	-	30	80	
			15	-	20	60	
Min. Hold Time (SI, PI, - CLOCK) P/S	t _H		5	-	-10	60	ns
			10	-	-2	30	
			15	-	0	20	
Input Capacitance	C _{IN}			-	5	7.5	pF

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WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

