

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4015BP, TC4015BF, TC4015BFN

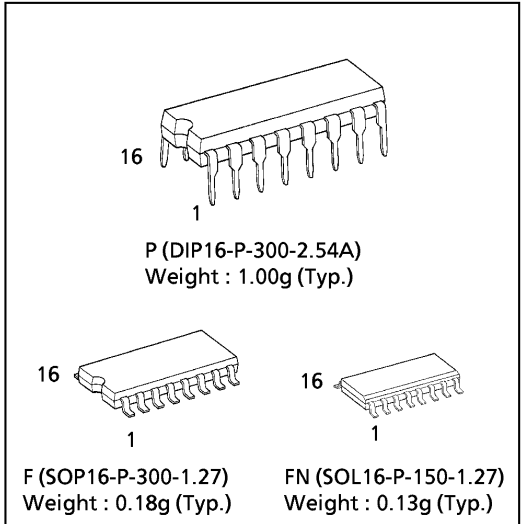
TC4015B DUAL 4-STAGE STATIC SHIFT REGISTER (With Serial Input/Parallel Output)

(Note) The JEDEC SOP (FN) is not available in Japan.

TC4015B contains two circuits of 4 stage shift registers and the independent output is driven from each stage. As all the D type flip-flops of every stage have common RESET input, asynchronous clear operation can be achieved by an external signal at arbitrary timing. The flip-flop of each stage is triggered by rising edge of CLOCK input.

RESET input of "H" level resets the contents of all the stages to "L" regardless of CLOCK and DATA inputs and all of data outputs Q1 through Q4 become "L".

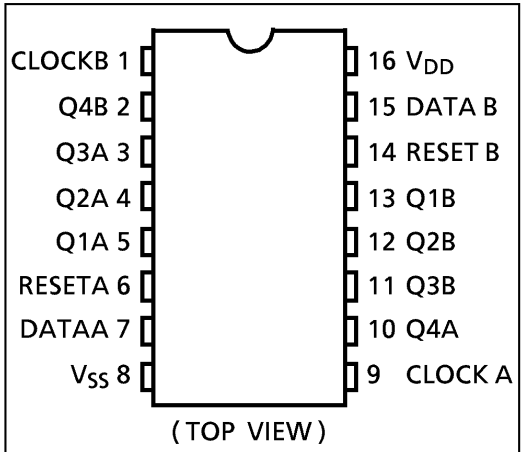
This can be used for converting serial data to parallel one and for ring counters of any numbering systems.



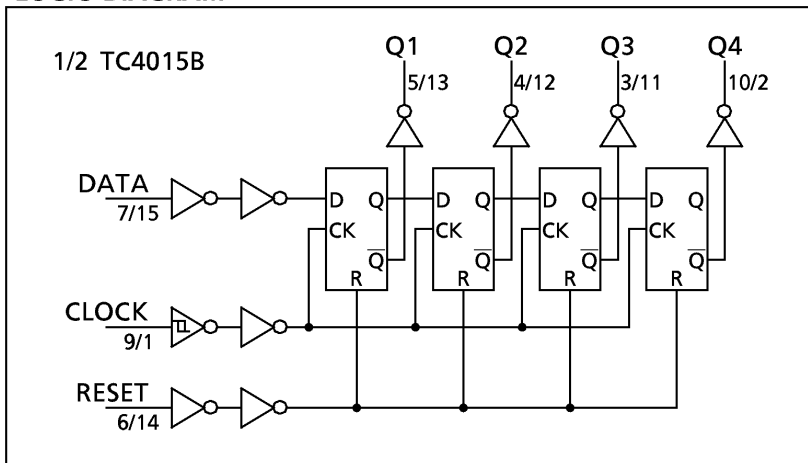
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	V_{IN}	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Output Voltage	V_{OUT}	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T_{opr}	-40~85	°C
Storage Temperature Range	T_{stg}	-65~150	°C

PIN ASSIGNMENT



LOGIC DIAGRAM



TRUTH TABLE

INPUTS			OUTPUTS			
CLOCK Δ	DATA	RESET	Q1	Q2	Q3	Q4
\uparrow	L	L	L	Q1	Q2	Q3
\uparrow	H	L	H	Q1	Q2	Q3
\downarrow	*	L	NO CHANGE			
*	*	H	L	L	L	L

Δ : Level Change
* : Don't Care

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 ($V_{SS} = 0V$)

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} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	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} < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	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	-2.50	—	-2.10	-4.0	—	-1.70	—		
			10	-1.50	—	-1.30	-2.2	—	-1.10	—		
			15	-4.00	—	-3.40	-9.0	—	-2.80	—		
Output Low Current	I_{OL}	$V_{OL} = 0.4V$ $V_{OL} = 0.5V$ $V_{OL} = 1.5V$ $V_{IN} = V_{SS}, V_{DD}$	5	0.61	—	0.51	1.2	—	0.42	—	mA	
			10	1.50	—	1.30	3.2	—	1.10	—		
			15	4.00	—	3.40	12.0	—	2.80	—		
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} < 1\mu A$	5	3.5	—	3.5	2.75	—	3.5	—	V	
			10	7.0	—	7.0	5.50	—	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} < 1\mu A$	5	—	1.5	—	2.25	1.5	—	1.5	V	
			10	—	3.0	—	4.50	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 Supply 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		

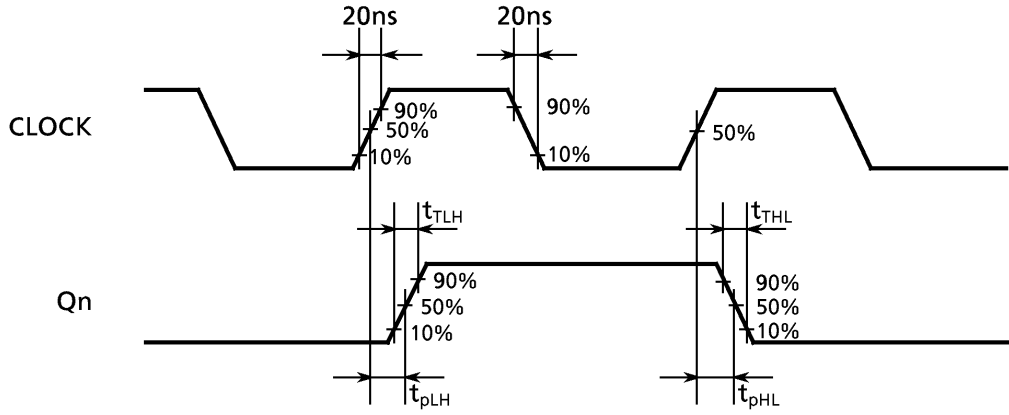
* All valid input combinations.

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

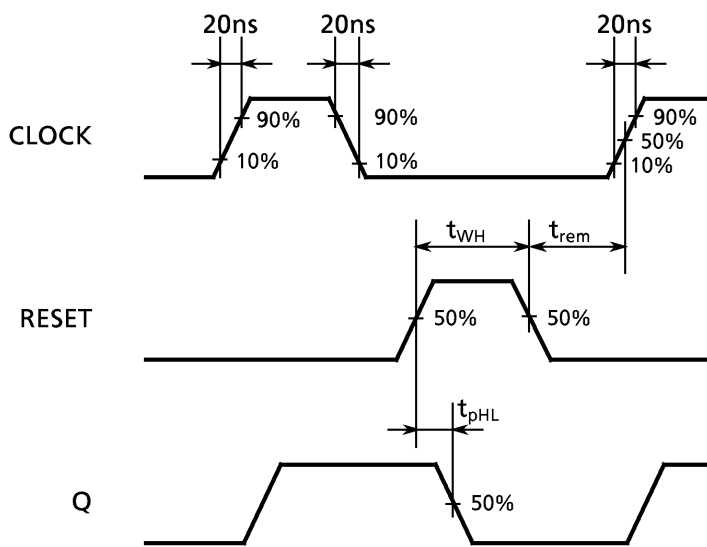
CHARACTERISTIC	SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t _{TLH}		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time (High to Low)	t _{THL}		5	—	70	200	
			10	—	35	100	
			15	—	30	80	
Propagation Delay Time (CLOCK - Q)	t _{pLH} t _{pHL}		5	—	130	320	
			10	—	60	160	
			15	—	50	120	
Propagation Delay Time (RESET - Q)	t _{pHL}		5	—	90	400	
			10	—	45	200	
			15	—	40	160	
Max. Clock Frequency	f _{CL}		5	3.0	8	—	MHz
			10	6.0	17	—	
			15	8.5	20	—	
Min. Clock Pulse Width	t _w		5	—	35	180	ns
			10	—	25	80	
			15	—	20	50	
Min. Pulse Width (RESET)	t _{WH}		5	—	50	200	
			10	—	25	80	
			15	—	20	60	
Min. Set-up Time (DATA - CLOCK)	t _{SU}		5	—	8	70	
			10	—	4	40	
			15	—	0	30	
Min. Hold Time (DATA - CLOCK)	t _H		5	—	6	60	
			10	—	5	30	
			15	—	4	20	
Min. Removal Time (RESET - CLOCK)	t _{rem}		5	—	0	80	
			10	—	0	30	
			15	—	0	20	
Max. Clock Input Rise Time Max. Clock Input Fall Time	t _{rCL} t _{fCL}		5	No Limit			μs
			10				
			15				
Input Capacitance	C _{IN}			—	5	7.5	pF

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

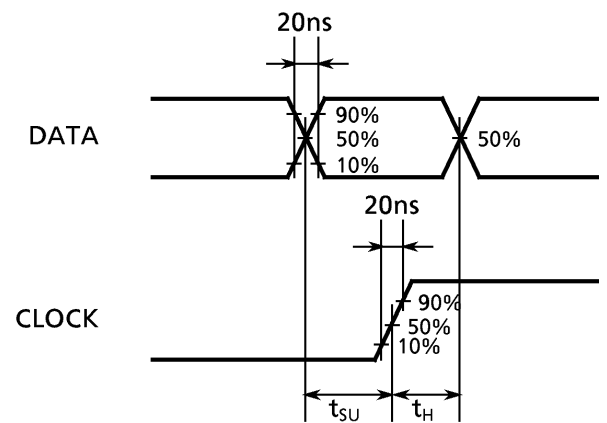
WAVEFORM 1



WAVEFORM 2



WAVEFORM 3



DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A)

Unit in mm



Weight : 1.00g (Typ.)

SOP 16PIN (200mil BODY) PACKAGE DIMENSIONS (SOP16-P-300-1.27)

Unit in mm

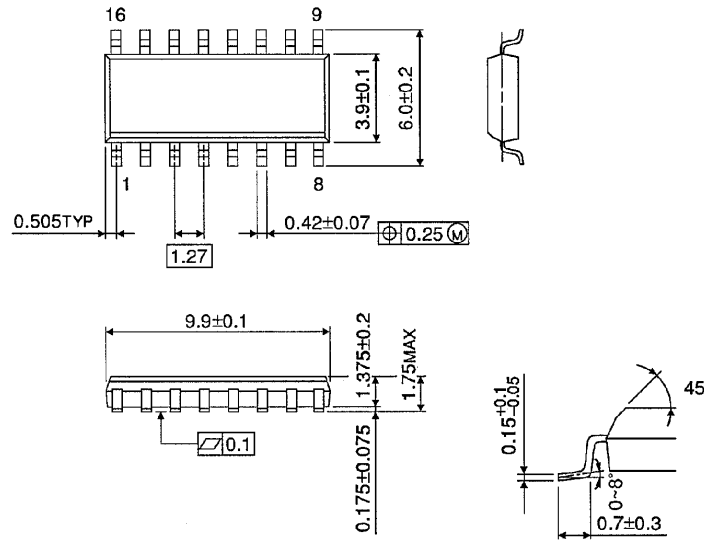


Weight : 0.18g (Typ.)

SOP 16PIN (150mil BODY) PACKAGE DIMENSIONS (SOL16-P-150 -1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.