

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

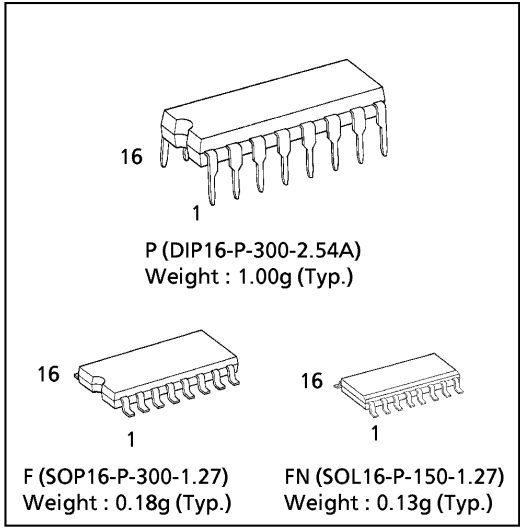
# TC4094BP, TC4094BF, TC4094BFN

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

## TC4094B 8 - STAGE SHIFT - AND - STORE BUSREGISTE

TC4094B is a SHIFT and STORE REGISTER that consists of an 8-bit shift register and an 8-bit latch. The read data in the shift register can be taken in the latch through the asynchronous STROBE input; therefore, the data transfer mode can hold output. And, since the parallel outputs is of 3-state construction, it can be directly connected to the 8-bit busline.

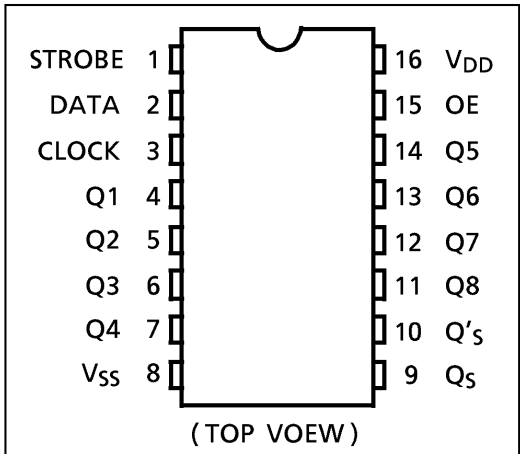
This register can be applied to Serial - to - parallel conversion, data receivers, etc.



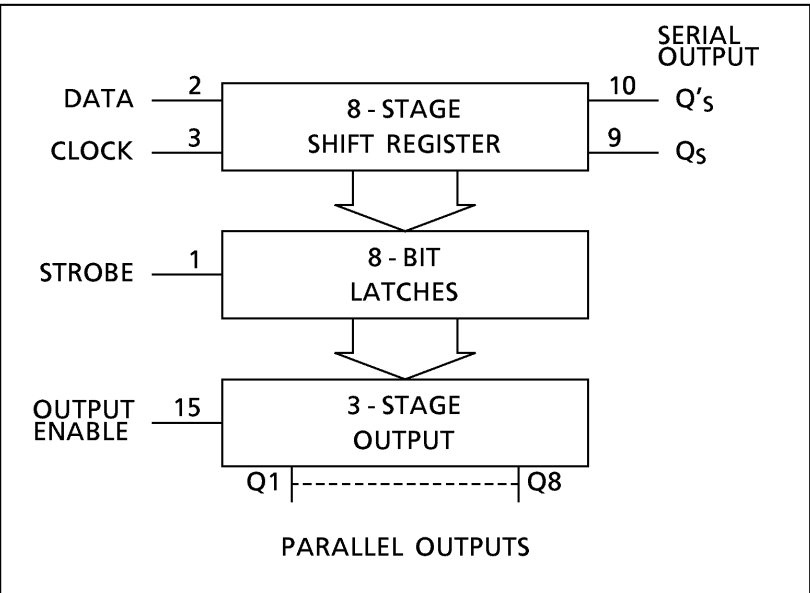
### MAXIMUM RATINGS

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	$I_{IN}$	$\pm 10$	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



### BLOCK DIAGRAM



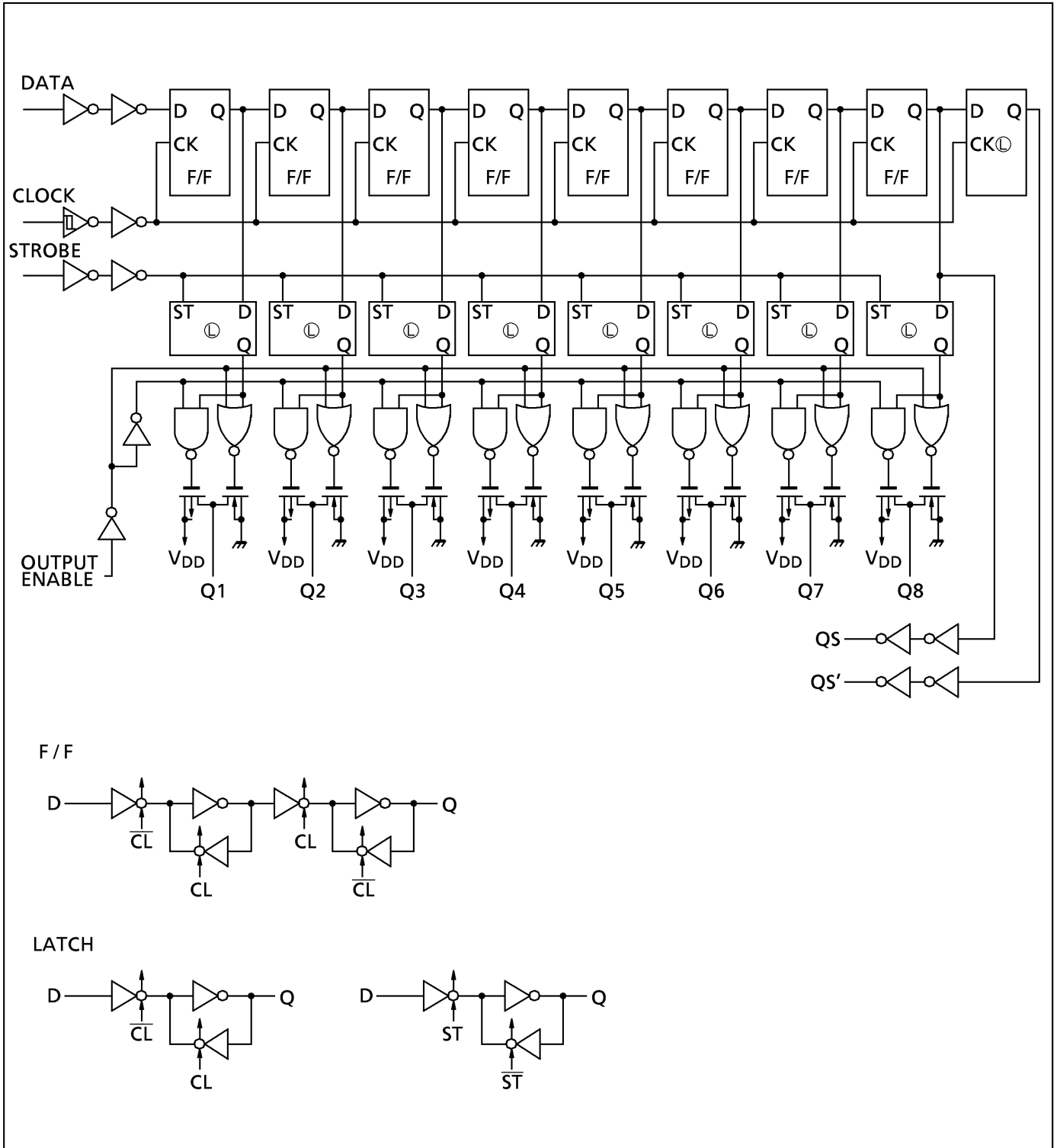
### TRUTH TABLE

CL	OE	ST	D	PO		SO	
				Q1	Qn	Qs	Q's
$\uparrow$	H	H	L	L	Qn - 1	Q7	NC
$\uparrow$	H	H	H	H	Qn - 1	Q7	NC
$\uparrow$	H	L	X	NC	NC	Q7	NC
$\uparrow$	L	X	X	HZ	HZ	Q7	NC
$\downarrow$	H	X	X	NC	NC	NC	Qs
$\downarrow$	L	X	X	HZ	HZ	NC	Qs

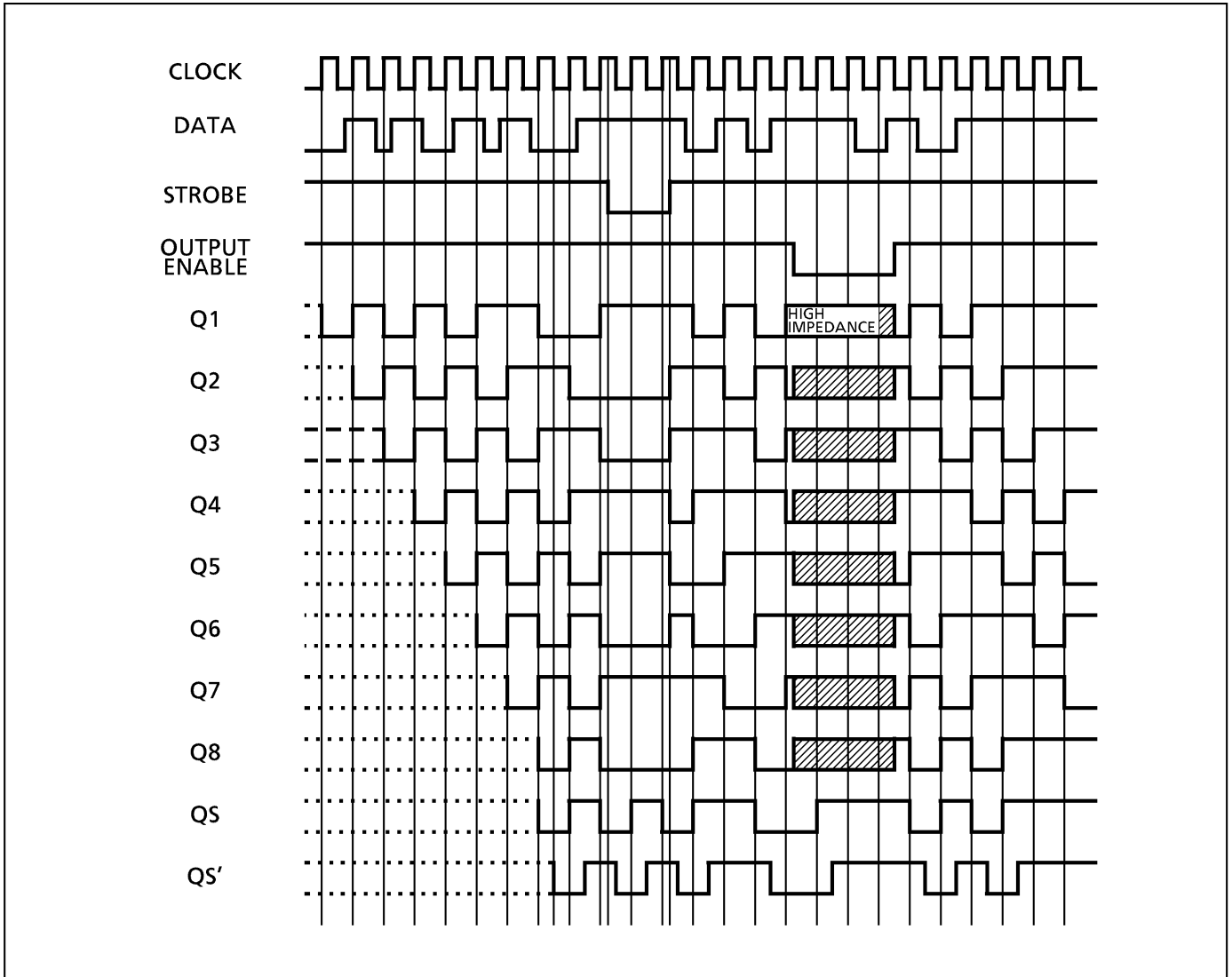
CL = Clock  
 OE = Output Eneble  
 ST = Strobe  
 D = Data  
 PO = Parallel Outputs  
 SO = Serial Output

X = Don't Care  
 NC = No Change  
 HZ = High Impedance

## LOGIC DIAGRAM



TIMING CHART



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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
DC Supply Voltage	$V_{DD}$		3	—	18	V
Input Voltage	$V_{IN}$		0	—	$V_{DD}$	V

**STATIC ELECTRICAL CHARACTERISTICS ( $V_{SS} = 0V$ )**

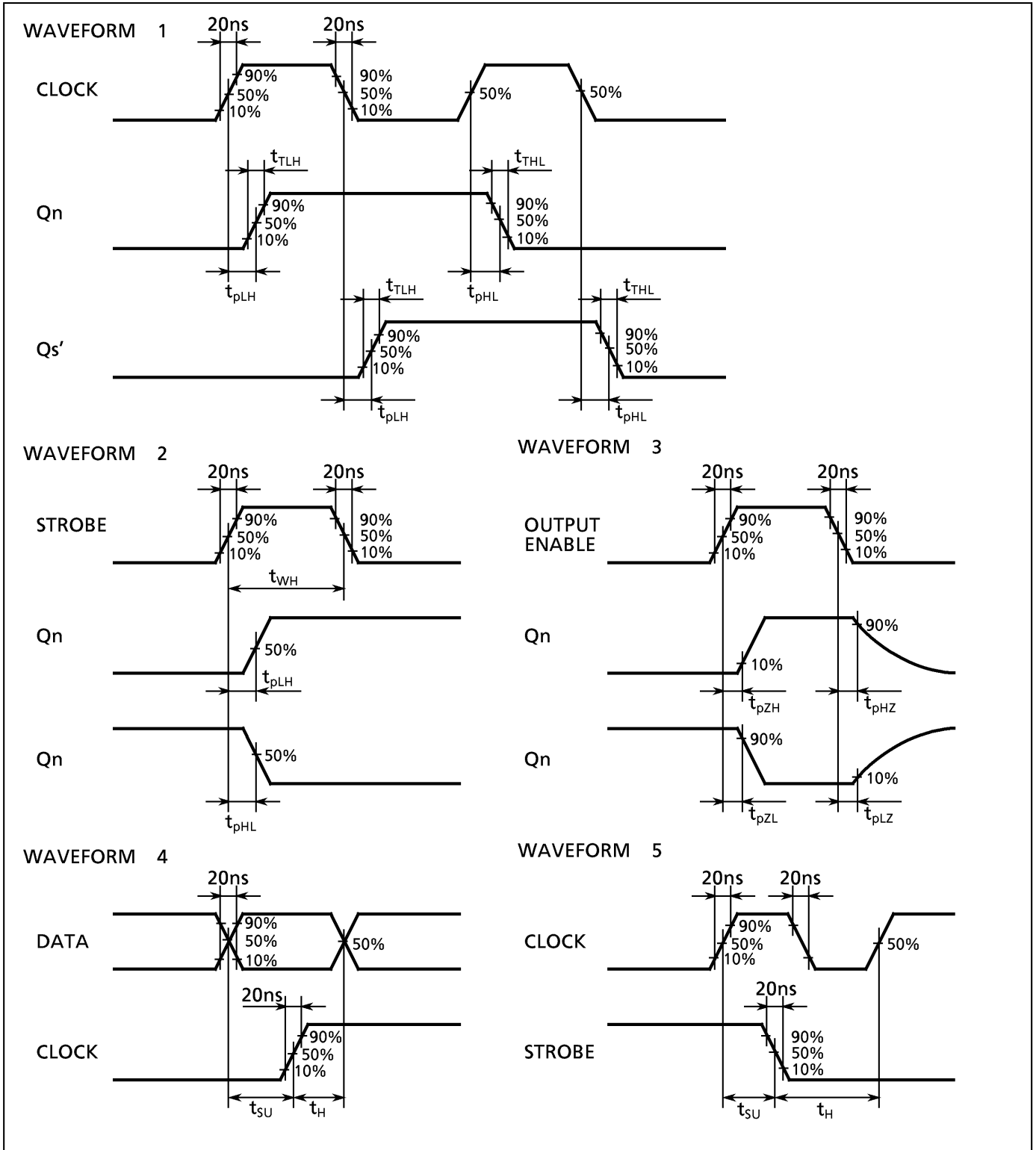
CHARACTERISTIC	SYM-BOL	TEST CONDITION	$V_{DD}$ (V)	- 40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Output Voltage	$V_{OH}$	$ I_{OUT}  < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	4.95	—	4.95	5.00	—	4.95	—	V	
			10	9.95	—	9.95	10.00	—	9.95	—		
			15	14.95	—	14.95	15.00	—	14.95	—		
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	$\mu A$
	"L" Level	$I_{IL}$	$V_{IL} = 0V$	18	—	-0.1	—	$-10^{-5}$	-0.1	—	-1.0	
3-State Output Leakage Current	"H" Level	$I_{DH}$	$V_{OUT} = 18V$	18	—	0.4	—	$10^{-4}$	0.4	—	12	$\mu A$
	"L" Level	$I_{DL}$	$V_{OUT} = 0V$	18	—	-0.4	—	$-10^{-4}$	-0.4	—	-12	
Quiescent Supply Current	$I_{DD}$	$V_{IN} = V_{SS}, V_{DD} *$	5	—	5	—	0.005	5	—	150	$\mu A$	
			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)

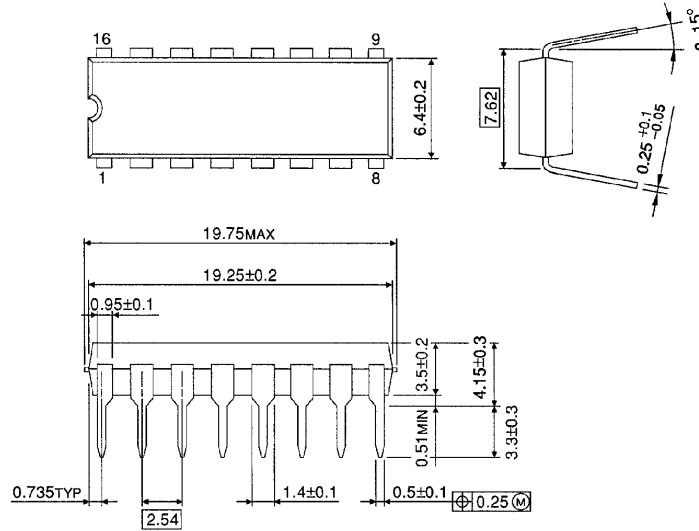
CHARACTERISTIC	SYMBOL	TEST CONDITION	V <sub>DD</sub> (V)	MIN.	TYP.	MAX.	UNIT	
Output Transition Time (Low to High)	t <sub>TLH</sub>		5	—	70	200	ns	
			10	—	35	100		
			15	—	30	80		
Output Transition Time (High to Low)	t <sub>THL</sub>		5	—	70	200		
			10	—	35	100		
			15	—	30	80		
Propagation Delay Time (CLOCK - Q <sub>s</sub> )	t <sub>pLH</sub> t <sub>pHL</sub>		5	—	150	600		
			10	—	75	250		
			15	—	55	190		
Propagation Delay Time (CLOCK - Q <sub>s'</sub> )	t <sub>pLH</sub> t <sub>pHL</sub>		5	—	155	460		
			10	—	75	220		
			15	—	55	150		
Propagation Delay Time (CLOCK - Q <sub>n</sub> )	t <sub>pLH</sub> t <sub>pHL</sub>		5	—	190	840		
			10	—	90	390		
			15	—	65	270		
Propagation Delay Time (STROBE - Q <sub>n</sub> )	t <sub>pLH</sub> t <sub>pHL</sub>		5	—	150	580		
			10	—	70	290		
			15	—	50	200		
Three State Disable Time (OUTPUT ENABLE - Q <sub>n</sub> )	t <sub>pHZ</sub> t <sub>pZH</sub>	R <sub>L</sub> = 1kΩ	5	—	60	200		
			10	—	35	100		
			15	—	30	80		
Three State Disable Time (OUTPUT ENABLE - Q <sub>n</sub> )	t <sub>pLZ</sub> t <sub>pZL</sub>	R <sub>L</sub> = 1kΩ	5	—	70	200		
			10	—	40	100		
			15	—	35	80		
Min. Clock Pulse Width	t <sub>w</sub>		5	—	45	200		
			10	—	20	100		
			15	—	15	80		
Min. Pulse Width (STROBE)	t <sub>WH</sub>		5	—	40	200		
			10	—	20	80		
			15	—	15	70		
Max. Clock Frequency	f <sub>CL</sub>		5	1.25	6	—	MHz	
			10	2.50	12	—		
			15	3.00	16	—		
Min. Set-up Time (DATA - CLOCK)	t <sub>SU</sub>		5	—	0	125	ns	
			10	—	0	55		
			15	—	0	35		
Min. Hold Time (DATA - CLOCK)	t <sub>H</sub>		5	—	10	40		
			10	—	10	20		
			15	—	5	15		
Min. Set-up Time (CLOCK - STROBE)	t <sub>SU</sub>		5	—	90	200		
			10	—	40	100		
			15	—	30	80		
Min. Hold Time (CLOCK - STROBE)	t <sub>H</sub>		5	—	—	0		
			10	—	—	0		
			15	—	—	0		
Max. Clock Input Rise Time Max. Clock Input Fall Time	t <sub>rCL</sub> t <sub>fCL</sub>		5	No Limit				μs
			10					
			15					
Input Capacitance	C <sub>IN</sub>			—	5	7.5	pF	

WAVEFORMS FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS



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

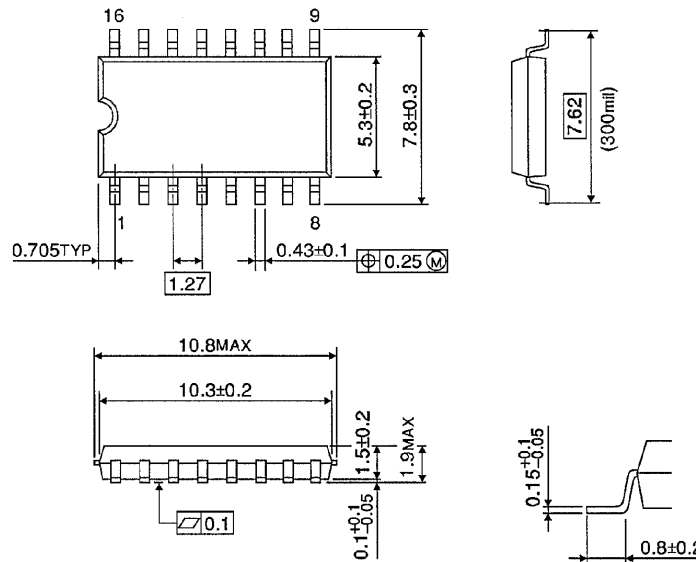
Unit in mm



Weight : 1.00g (Typ.)

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

Unit in mm

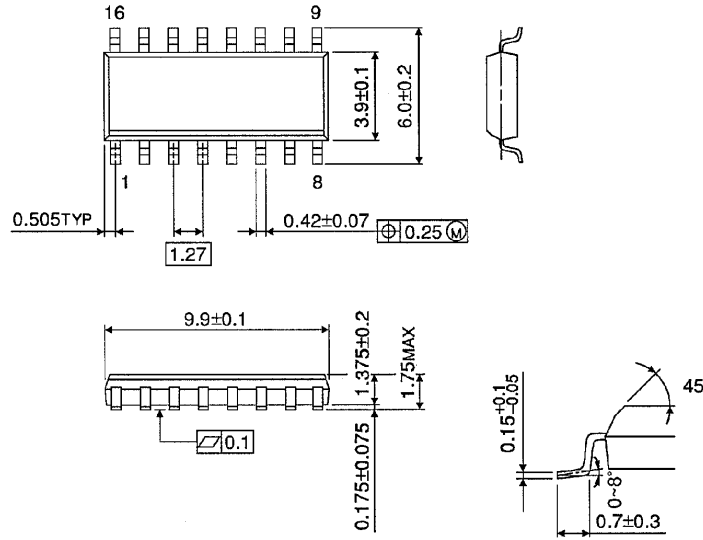


Weight : 0.18g (Typ.)

**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.)



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