TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

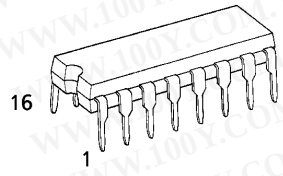
TC4094BP, TC4094BF, TC4094BFN

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

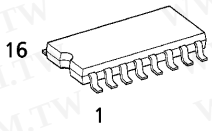
TC4094B 8 – STAGE SHIFT – AND – STORE BUSREGISTE

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.

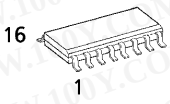
This register can be applied to Serial - to - parallel conversion, data receivers, etc.



P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)



F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

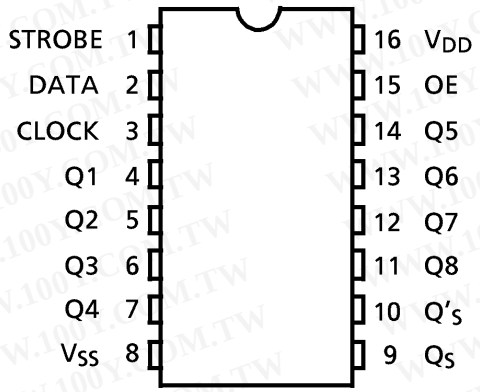


FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)

MAXIMUM RATINGS

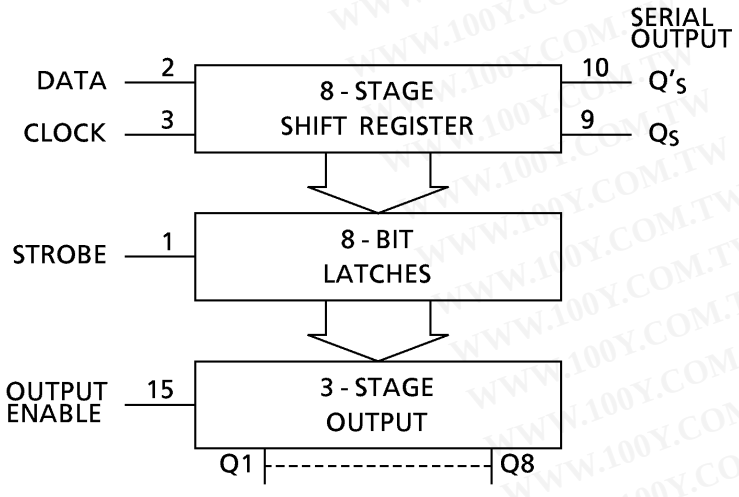
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS}-0.5 \sim V_{SS}+20$	V
Input Voltage	V_{IN}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Voltage	V_{OUT}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range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

PIN ASSIGNMENT



(TOP VOEW)

BLOCK DIAGRAM



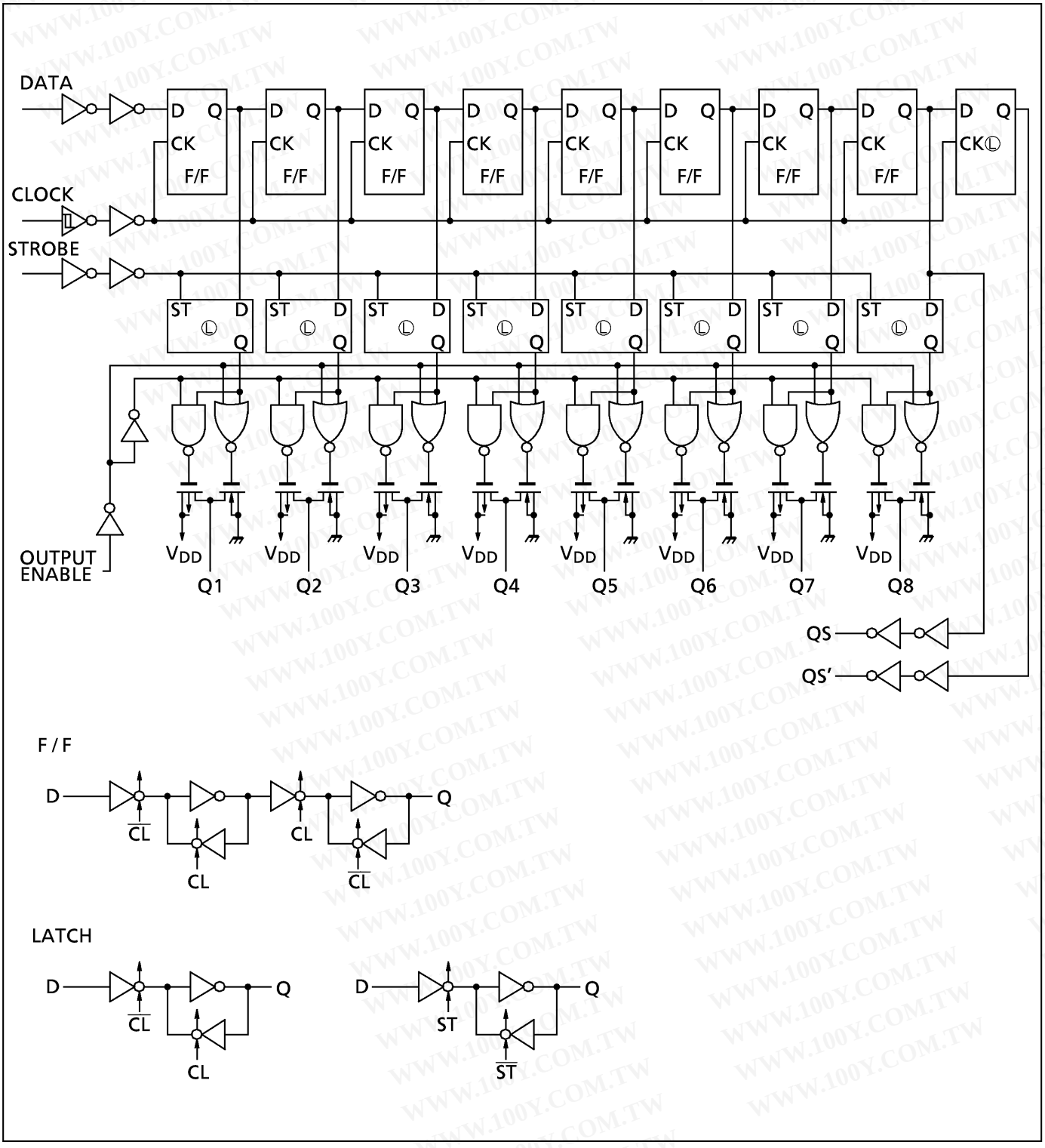
TRUTH TABLE

CL	OE	ST	D	PO		SO	
				Q1	Qn	Qs	Q's
↑	H	H	L	L	Qn - 1	Q7	NC
↑	H	H	H	H	Qn - 1	Q7	NC
↑	H	L	X	NC	NC	Q7	NC
↑	L	X	X	HZ	HZ	Q7	NC
↓	H	X	X	NC	NC	NC	Qs
↓	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

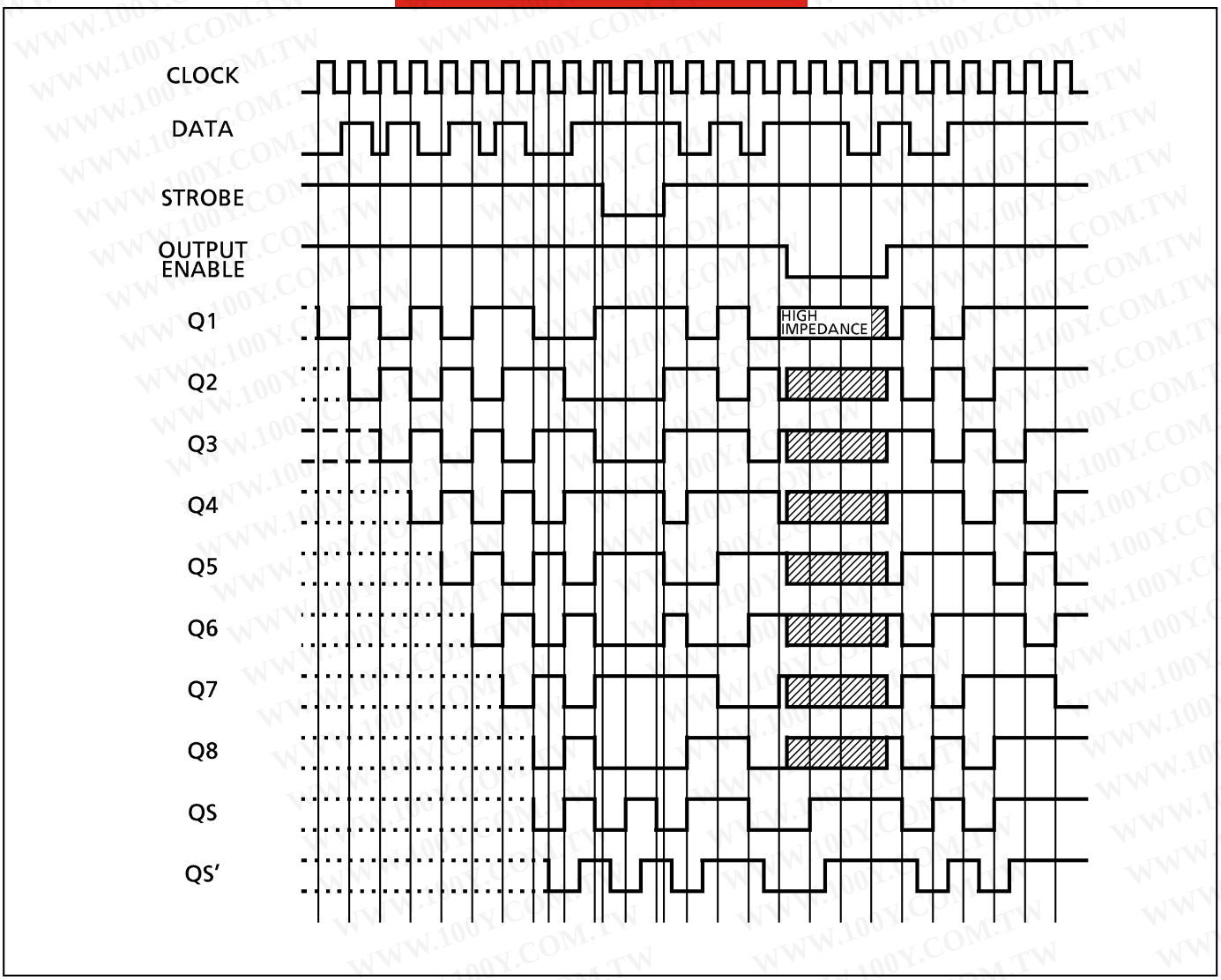
LOGIC DIAGRAM



F / F

LATCH

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 MIN.	−40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNIT
High-Level Output Voltage	V_{OH}	$\|I_{OUT}\| < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5 10 15	4.95 9.95 14.95	— — —	4.95 9.95 14.95	5.00 10.00 15.00	— — —	4.95 9.95 14.95	— — —	V
Low-Level Output Voltage	V_{OL}	$\|I_{OUT}\| < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5 10 15	— — —	0.05 0.05 0.05	— — —	0.00 0.00 0.00	0.05 0.05 0.05	— — —	0.05 0.05 0.05	V
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 5 10 15	−0.61 −2.50 −1.50 −4.00	— — — —	−0.51 −2.10 −1.30 −3.40	−1.0 −4.0 −2.2 −9.0	— — — —	−0.42 −1.70 −1.10 −2.80	— — — —	mA
Output Low Current	I_{OL}	V_{OL} = 0.4V V_{OL} = 0.5V V_{OL} = 1.5V $V_{IN} = V_{SS}, V_{DD}$	5 10 15	0.61 1.50 4.00	— — —	0.51 1.30 3.40	1.2 3.2 12.0	— — —	0.42 1.10 2.80	— — —	mA
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 10 15	3.5 7.0 11.0	— — —	3.5 7.0 11.0	2.75 5.50 8.25	— — —	3.5 7.0 11.0	— — —	V
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 10 15	— — —	1.5 3.0 4.0	— — —	2.25 4.50 6.75	1.5 3.0 4.0	— — —	1.5 3.0 4.0	V
Input Current "H" Level	I_{IH}	V_{IH} = 18V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
Input Current "L" Level	I_{IL}	V_{IL} = 0V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	μA
3-State Output Leakage Current "H" Level	I_{DH}	V_{OUT} = 18V	18	—	0.4	—	10^{-4}	0.4	—	12	μA
3-State Output Leakage Current "L" Level	I_{DL}	V_{OUT} = 0V	18	—	−0.4	—	-10^{-4}	−0.4	—	−12	μA
Quiescent Supply Current	I_{DD}	$V_{IN} = V_{SS}, V_{DD}$ *	5 10 15	— — —	5 10 20	— — —	0.005 0.010 0.015	5 10 20	— — —	150 300 600	μA

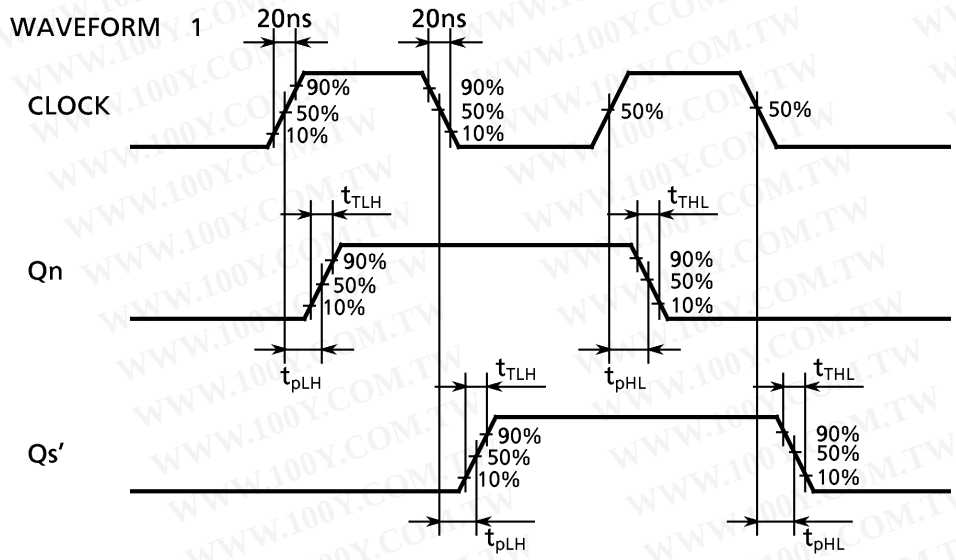
* All valid input combinations.

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

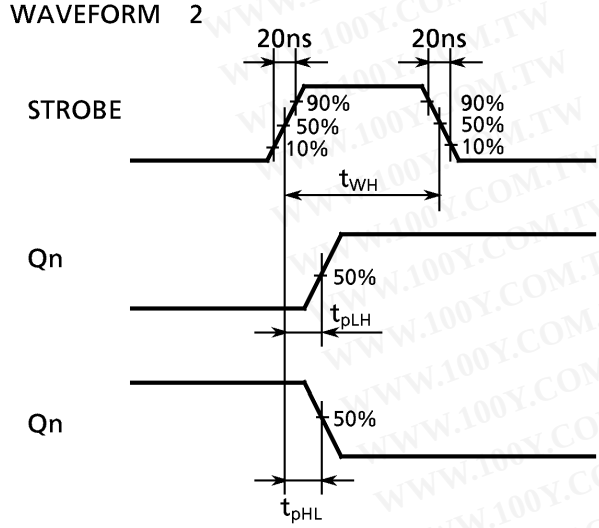
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time (High to Low)	t_{THL}		5	—	70	200	
			10	—	35	100	
			15	—	30	80	
Propagation Delay Time (CLOCK - Q_S)	t_{pLH} t_{pHL}		5	—	150	600	
			10	—	75	250	
			15	—	55	190	
Propagation Delay Time (CLOCK - Q_S')	t_{pLH} t_{pHL}		5	—	155	460	
			10	—	75	220	
			15	—	55	150	
Propagation Delay Time (CLOCK - Q_n)	t_{pLH} t_{pHL}		5	—	190	840	
			10	—	90	390	
			15	—	65	270	
Propagation Delay Time (STROBE - Q_n)	t_{pLH} t_{pHL}		5	—	150	580	
			10	—	70	290	
			15	—	50	200	
Three State Disable Time (OUTPUT ENABLE - Q_n)	t_{pHZ} t_{pZH}	R_L = 1kΩ	5	—	60	200	
			10	—	35	100	
			15	—	30	80	
Three State Disable Time (OUTPUT ENABLE - Q_n)	t_{pLZ} t_{pZL}	R_L = 1kΩ	5	—	70	200	
			10	—	40	100	
			15	—	35	80	
Min. Clock Pulse Width	t_W		5	—	45	200	
			10	—	20	100	
			15	—	15	80	
Min. Pulse Width (STROBE)	t_{WH}		5	—	40	200	
			10	—	20	80	
			15	—	15	70	
Max. Clock Frequency	f_{CL}		5	1.25	6	—	MHz
			10	2.50	12	—	
			15	3.00	16	—	
Min. Set-up Time (DATA - CLOCK)	t_{SU}		5	—	0	125	ns
			10	—	0	55	
			15	—	0	35	
Min. Hold Time (DATA - CLOCK)	t_H		5	—	10	40	
			10	—	10	20	
			15	—	5	15	
Min. Set-up Time (CLOCK - STROBE)	t_{SU}		5	—	90	200	
			10	—	40	100	
			15	—	30	80	
Min. Hold Time (CLOCK - STROBE)	t_H		5	—	—	0	
			10	—	—	0	
			15	—	—	0	
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

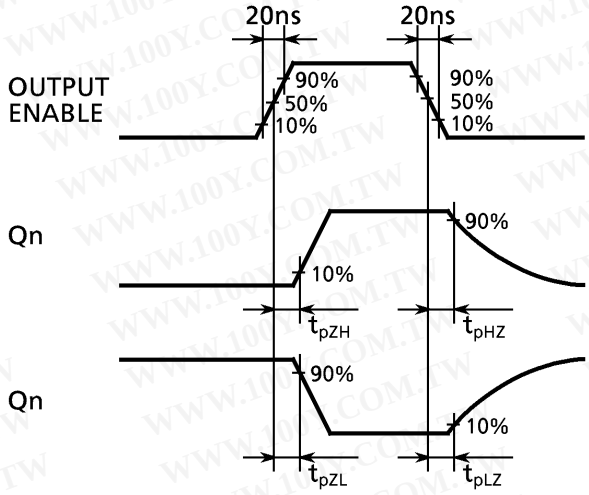
WAVEFORM 1



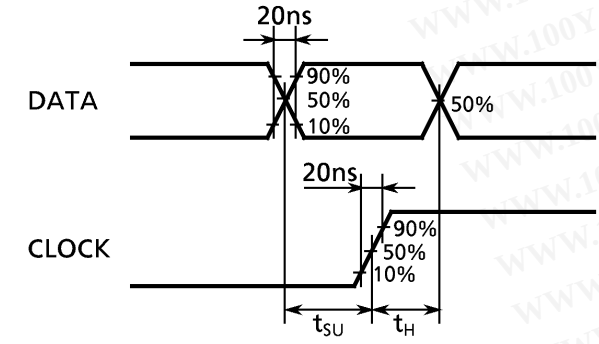
WAVEFORM 2



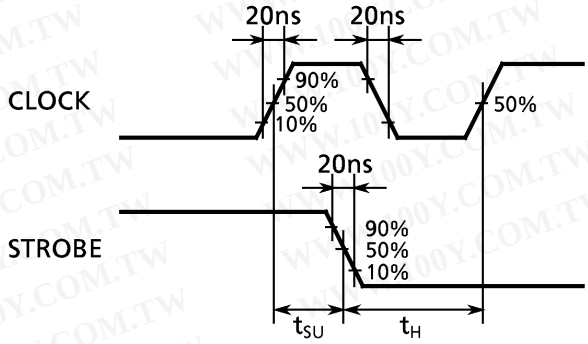
WAVEFORM 3



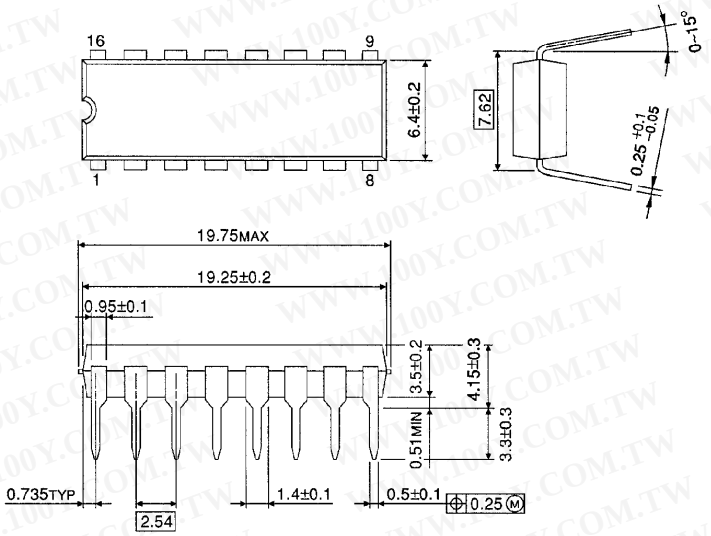
WAVEFORM 4



WAVEFORM 5

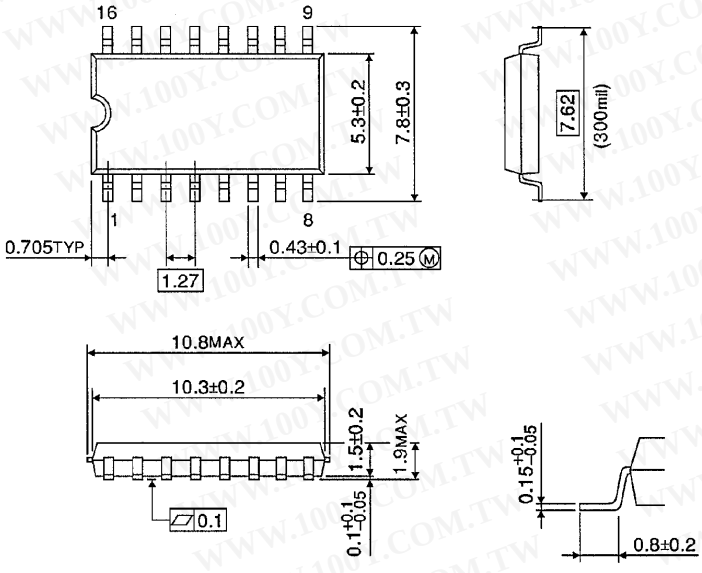


DIP 16PIN PACKAGE DIMENSIONS (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

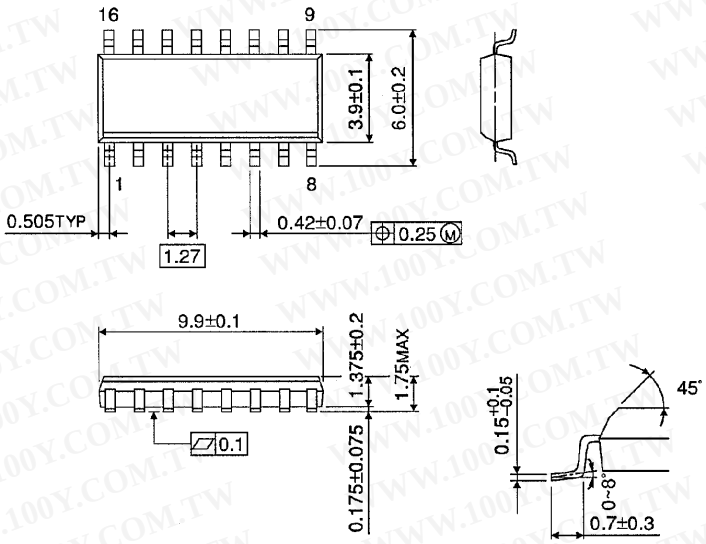
SOP 16PIN (200mil BODY) PACKAGE DIMENSIONS (SOP16-P-300-1.27) Unit in mm



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.