

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

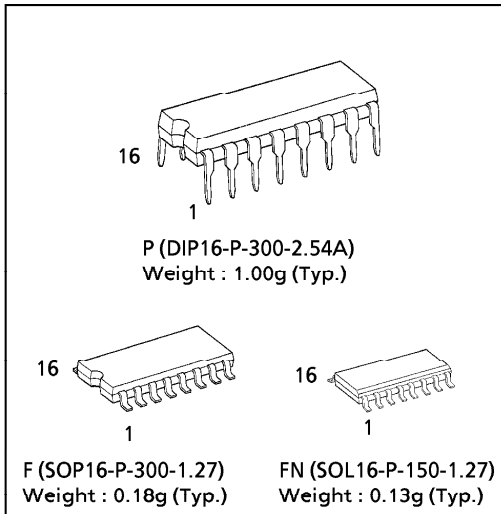
**TC4049BP, TC4049BF, TC4049BFN**  
**TC4050BP, TC4050BF, TC4050BFN**

**TC4049B HEX BUFFER / CONVERTER (Inverting Type)**  
**TC4050B HEX BUFFER / CONVERTER (Non - Inverting Type)**

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

TC4049B, TC4050B contain six circuits of buffers. TC4049B is inverter type and TC4050B is non-inverter type. Since one TTL or DTL can be directly driven having large output current, these are useful for interfacing from CMOS to TTL or DTL. As voltage up to  $V_{SS} + 18$  volts can be applied to the input regardless of  $V_{DD}$ , these can be also used as the level converter IC's which converts CMOS logical circuits of 15 volts or 10 volts system to CMOS /TTL logical circuits of 5 volts system.

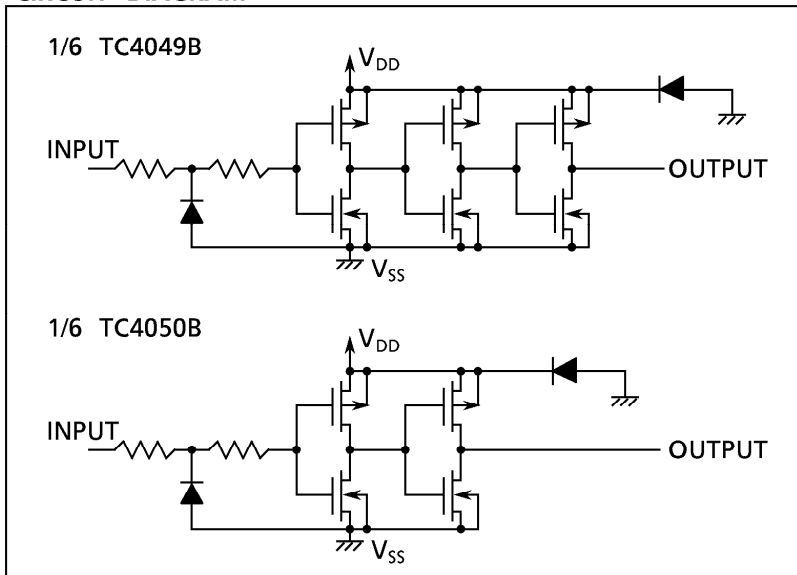
Ideal switching characteristic has been obtained by the circuit diagram of three stage inverters for TC4049B and two stage inverters for TC4050B.



**MAXIMUM RATINGS**

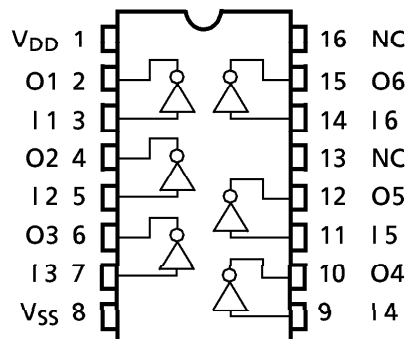
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	$V_{DD}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	$V_{IN}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Output Voltage	$V_{OUT}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Current	$I_{IN}$	$\pm 10$	mA
Power Dissipation	$P_D$	300 (DIP) / 180 (SOIC)	mW
Operating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

**CIRCUIT DIAGRAM**

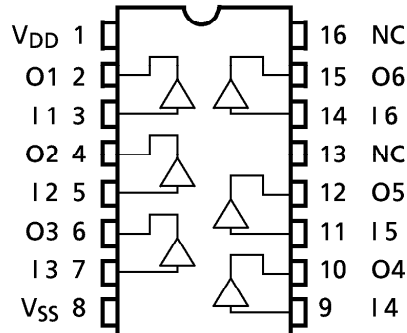


**PIN ASSIGNMENT**

**TC4049B**



**TC4050B**



(TOP VIEW)

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RECOMMENDED OPERATING CONDITIONS (V<sub>SS</sub> = 0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V <sub>DD</sub>		3	—	18	V
Input Voltage	V <sub>IN</sub>		0	—	18	V

STATIC ELECTRICAL CHARACTERISTICS (V<sub>SS</sub> = 0V)

CHARACTERISTIC	SYM-BOL	TEST CONDITION	V <sub>DD</sub> (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High-Level Output Voltage	V <sub>OH</sub>	I <sub>OUT</sub>   < 1μA V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	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 <sub>OL</sub>	I <sub>OUT</sub>   < 1μA V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	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 <sub>OH</sub>	V <sub>OH</sub> = 4.6V V <sub>OH</sub> = 2.5V V <sub>OH</sub> = 9.5V V <sub>OH</sub> = 13.5V V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	5	-0.73	—	-0.65	-1.2	—	-0.58	—	mA	
			5	-2.40	—	-2.10	-3.9	—	-1.90	—		
			10	-1.80	—	-1.65	-2.5	—	-1.35	—		
			15	-4.80	—	-4.30	-8.0	—	-3.50	—		
Output Low Current	I <sub>OL</sub>	V <sub>OL</sub> = 0.4V V <sub>OL</sub> = 0.5V V <sub>OL</sub> = 1.5V V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub>	5	3.8	—	3.2	6.4	—	2.9	—	mA	
			10	9.6	—	8.0	16.0	—	6.6	—		
			15	28.0	—	24.0	48.0	—	20.0	—		
			15	28.0	—	24.0	48.0	—	20.0	—		
Input High Voltage	V <sub>IH</sub>	V <sub>OUT</sub> = 0.5V, 4.5V V <sub>OUT</sub> = 1.0V, 9.0V V <sub>OUT</sub> = 1.5V, 13.5V  I <sub>OUT</sub>   < 1μA	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	—		
			15	11.0	—	11.0	8.25	—	11.0	—		
Input Low Voltage	V <sub>IL</sub>	V <sub>OUT</sub> = 0.5V, 4.5V V <sub>OUT</sub> = 1.0V, 9.0V V <sub>OUT</sub> = 1.5V, 13.5V  I <sub>OUT</sub>   < 1μA	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		
			15	—	4.0	—	6.75	4.0	—	4.0		
Input Current	"H" Level	I <sub>IH</sub>	V <sub>IH</sub> = 18V	18	—	0.1	—	10 <sup>-5</sup>	0.1	—	1.0	μA
	"L" Level	I <sub>IL</sub>	V <sub>IL</sub> = 0V	18	—	-0.1	—	-10 <sup>-5</sup>	-0.1	—	-1.0	
Quiescent Supply Current	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub> *	5	—	1	—	0.002	1	—	30	μA	
			10	—	2	—	0.004	2	—	60		
			15	—	4	—	0.008	4	—	120		

\* All valid input combinations.

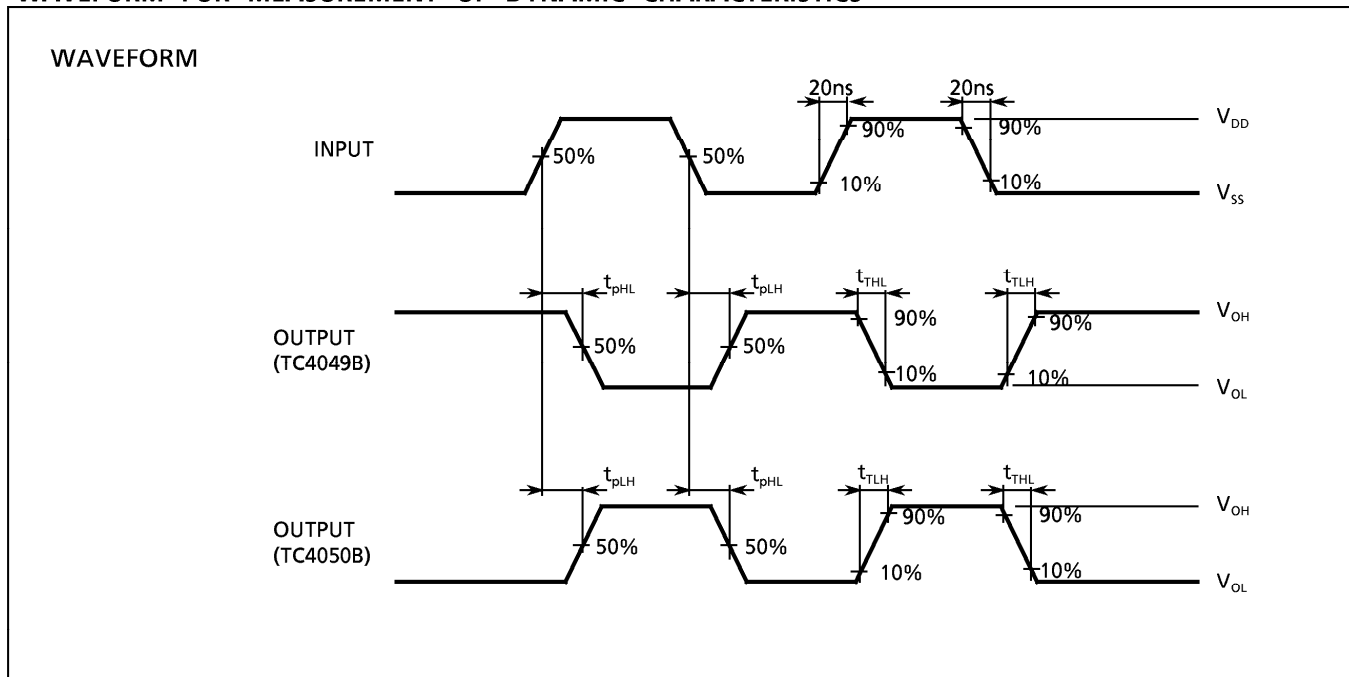
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**DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)**

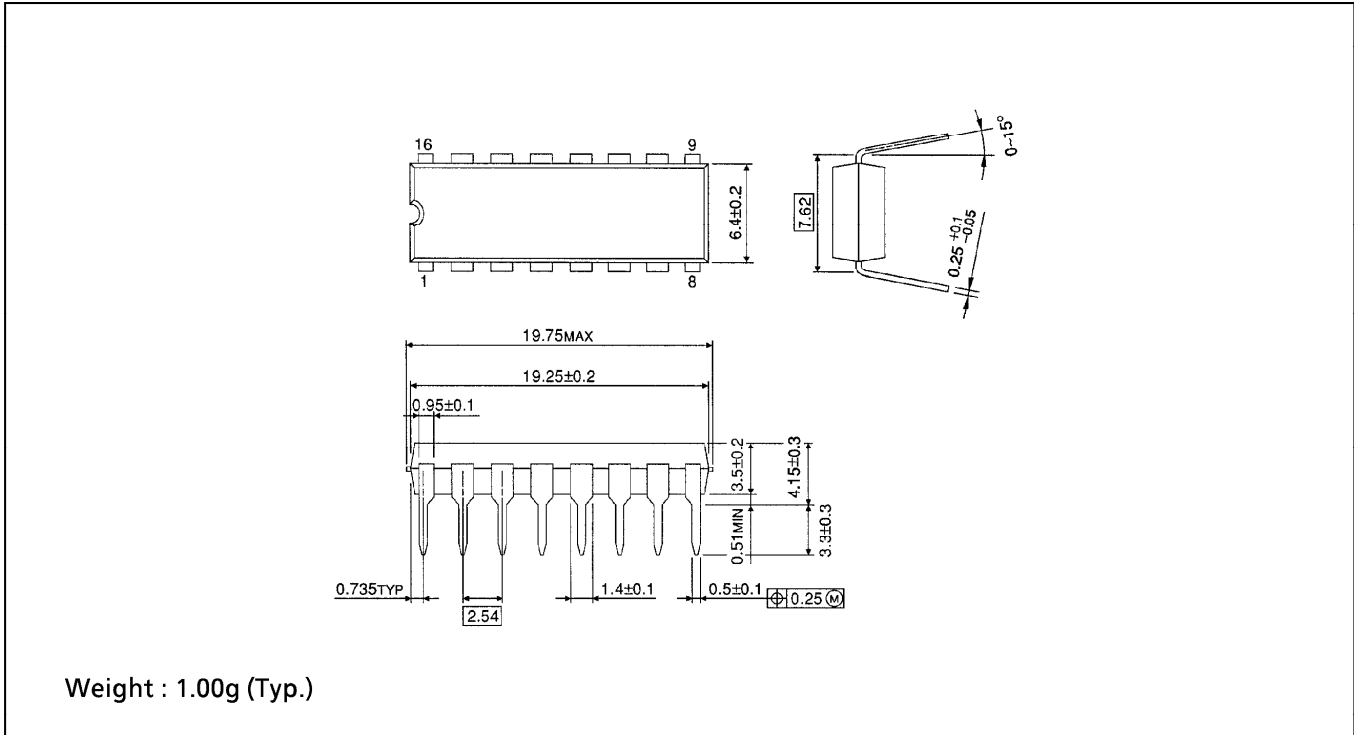
CHARACTERISTIC	SYMBOL	TEST CONDITION	V <sub>DD</sub> (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t <sub>TLH</sub>		5	—	60	160	ns
			10	—	30	80	
			15	—	25	60	
Output Transition Time (High to Low)	t <sub>THL</sub>		5	—	120	60	ns
			10	—	10	40	
			15	—	8	30	
TC4049B	Propagation Delay Time (Low to High)		5	—	60	120	ns
			10	—	35	65	
15			—	30	50		
TC4049B	Propagation Delay Time (High to Low)		5	—	40	60	ns
			10	—	20	30	
			15	—	15	20	
TC4050B	Propagation Delay Time (Low to High)		5	—	50	130	ns
			10	—	30	70	
15			—	25	55		
TC4050B	Propagation Delay Time (High to Low)		5	—	30	70	ns
			10	—	17	35	
			15	—	14	25	
Input Capacitance	C <sub>IN</sub>			—	5	7.5	pF

**WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS**



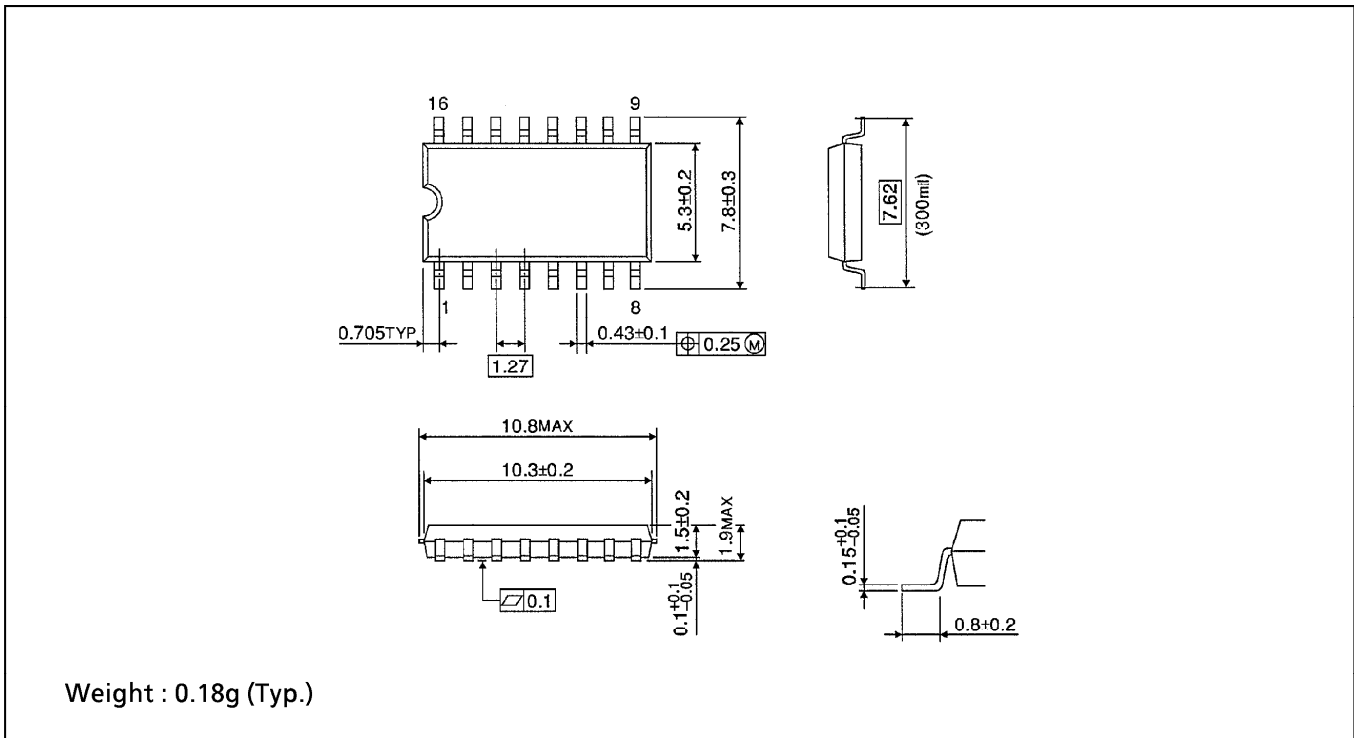
DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A)

Unit in mm



SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

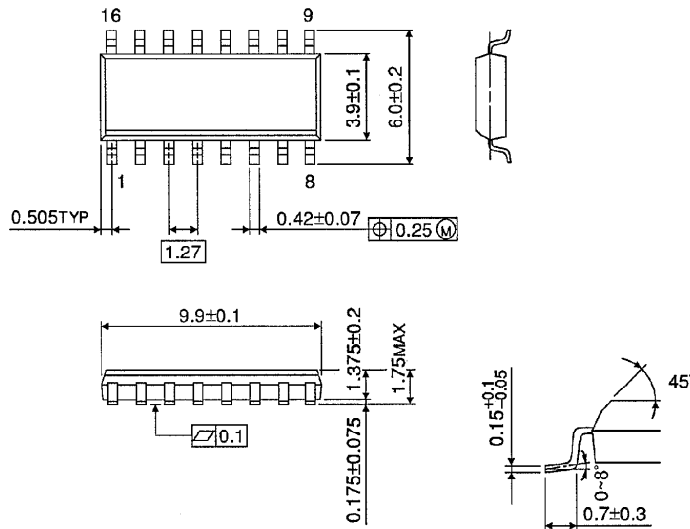
Unit in mm



SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150-1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)