TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC4049BP, TC4049BF
TC4050BP, TC4050BF

TC4049B Hex Buffer/Converter (inverting type)

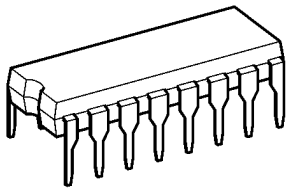
TC4050B Hex Buffer/Converter (non-inverting type)

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.

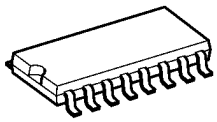
Ideal switching characteristic has been obtained by the circuit diagram of three stage inverters for TC4049B and two stage inverters for TC4050B.

TC4049BP, TC4050BP



DIP16-P-300-2.54A

TC4049BF, TC4050BF



SOP16-P-300-1.27A

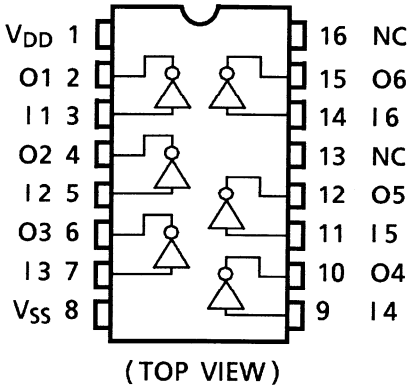
Weight

DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

Start of commercial production
1978-05

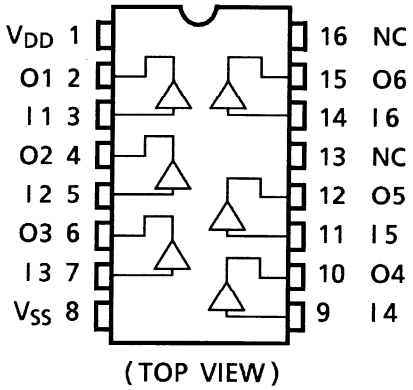
Pin Assignment

TC4049B



(TOP VIEW)

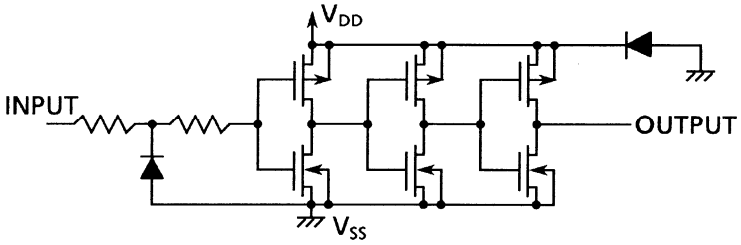
TC4050B



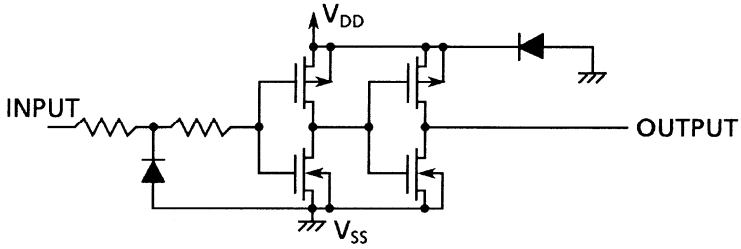
(TOP VIEW)

Circuit Diagram

1/6 TC4049B



1/6 TC4050B



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
DC supply voltage	V_{DD}	V_{SS} − 0.5 to V_{SS} + 20	V
Input voltage	V_{IN}	V_{SS} − 0.5 to V_{SS} + 20	V
Output voltage	V_{OUT}	V_{SS} − 0.5 to V_{DD} + 0.5	V
DC input current	I_{IN}	−10	mA
Power dissipation	P_D	300 (DIP)/180 (SOP)	mW
Operating temperature range	T_{opr}	−40 to 85	°C
Storage temperature range	T_{stg}	−65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Operating Ranges (V_{SS} = 0 V) (Note)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
DC supply voltage	V_{DD}	—	3	—	18	V
Input voltage	V_{IN}	—	0	—	18	V

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{DD} or V_{SS}.

Static Electrical Characteristics (V_{SS} = 0 V)

Characteristics	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}	$\|I_{OUT}\| < 1$ μA $V_{IN} = V_{SS}, V_{DD}$	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}	$\|I_{OUT}\| < 1$ μA $V_{IN} = V_{SS}, V_{DD}$	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} = 4.6 V	5	−0.73	—	−0.65	−1.2	—	−0.58	—	mA
		V_{OH} = 2.5 V	5	−2.40	—	−2.10	−3.9	—	−1.90	—	
		V_{OH} = 9.5 V	10	−1.80	—	−1.65	−2.5	—	−1.35	—	
		V_{OH} = 13.5 V	15	−4.80	—	−4.30	−8.0	—	−3.50	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Output low current	I_{OL}	V_{OL} = 0.4 V	5	3.8	—	3.2	6.4	—	2.9	—	mA
		V_{OL} = 0.5 V	10	9.6	—	8.0	16.0	—	6.6	—	
		V_{OL} = 1.5 V	15	28.0	—	24.0	48.0	—	20.0	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Input high voltage	V_{IH}	V_{OUT} = 0.5 V, 4.5 V	5	3.5	—	3.5	2.75	—	3.5	—	V
		V_{OUT} = 1.0 V, 9.0 V	10	7.0	—	7.0	5.50	—	7.0	—	
		V_{OUT} = 1.5 V, 13.5 V	15	11.0	—	11.0	8.25	—	11.0	—	
		$\|I_{OUT}\| < 1$ μA									
Input low voltage	V_{IL}	V_{OUT} = 0.5 V, 4.5 V	5	—	1.5	—	2.25	1.5	—	1.5	V
		V_{OUT} = 1.0 V, 9.0 V	10	—	3.0	—	4.50	3.0	—	3.0	
		V_{OUT} = 1.5 V, 13.5 V	15	—	4.0	—	6.75	4.0	—	4.0	
		$\|I_{OUT}\| < 1$ μA									
Input current "H" level	"H" level	I_{IH}	V_{IH} = 18 V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
Input current "L" level	"L" level	I_{IL}	V_{IL} = 0 V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	
Quiescent supply current	I_{DD}	$V_{IN} = V_{SS}, V_{DD}$ (Note)	5	—	1	—	0.002	1	—	30	μA
			10	—	2	—	0.004	2	—	60	
			15	—	4	—	0.008	4	—	120	

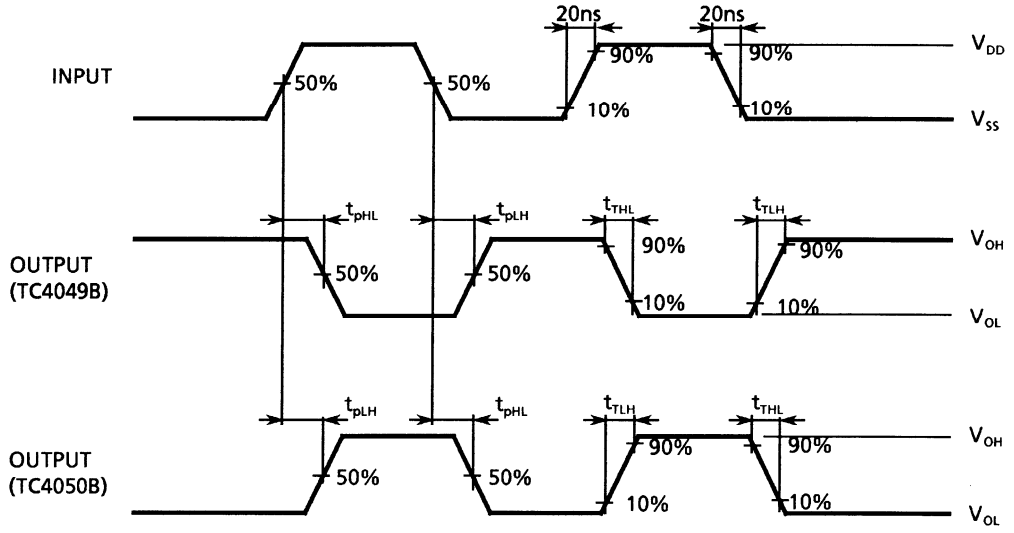
Note: All valid input combinations.

Dynamic Electrical Characteristics (Ta = 25°C, V_{SS} = 0 V, C_L = 50 pF)

Characteristics		Symbol	Test Condition		Min	Typ.	Max	Unit
				V_{DD} (V)				
Output transition time (low to high)		t_{TLH}	—	5	—	60	160	ns
				10	—	30	80	
				15	—	25	60	
Output transition time (high to low)		t_{THL}	—	5	—	120	60	ns
				10	—	10	40	
				15	—	8	30	
TC4049B	Propagation delay time (low to high)	t_{pLH}	—	5	—	60	120	ns
				10	—	35	65	
				15	—	30	50	
	Propagation delay time (high to low)	t_{pHL}	—	5	—	40	60	ns
				10	—	20	30	
				15	—	15	20	
TC4050B	Propagation delay time (low to high)	t_{pLH}	—	5	—	50	130	ns
				10	—	30	70	
				15	—	25	55	
	Propagation delay time (high to low)	t_{pHL}	—	5	—	30	70	ns
				10	—	17	35	
				15	—	14	25	
Input capacitance		C_{IN}	—		—	5	7.5	pF

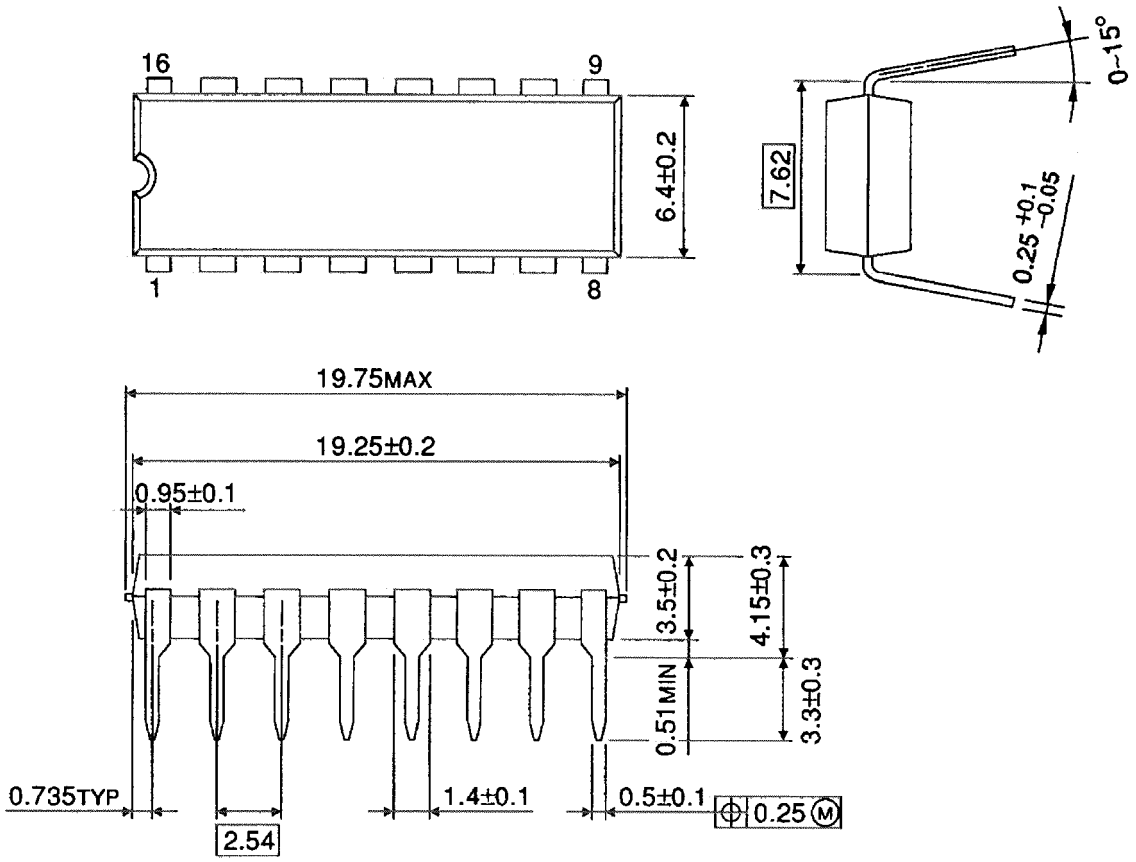
Waveform for Measurement of Dynamic Characteristics

Waveform



Package Dimensions

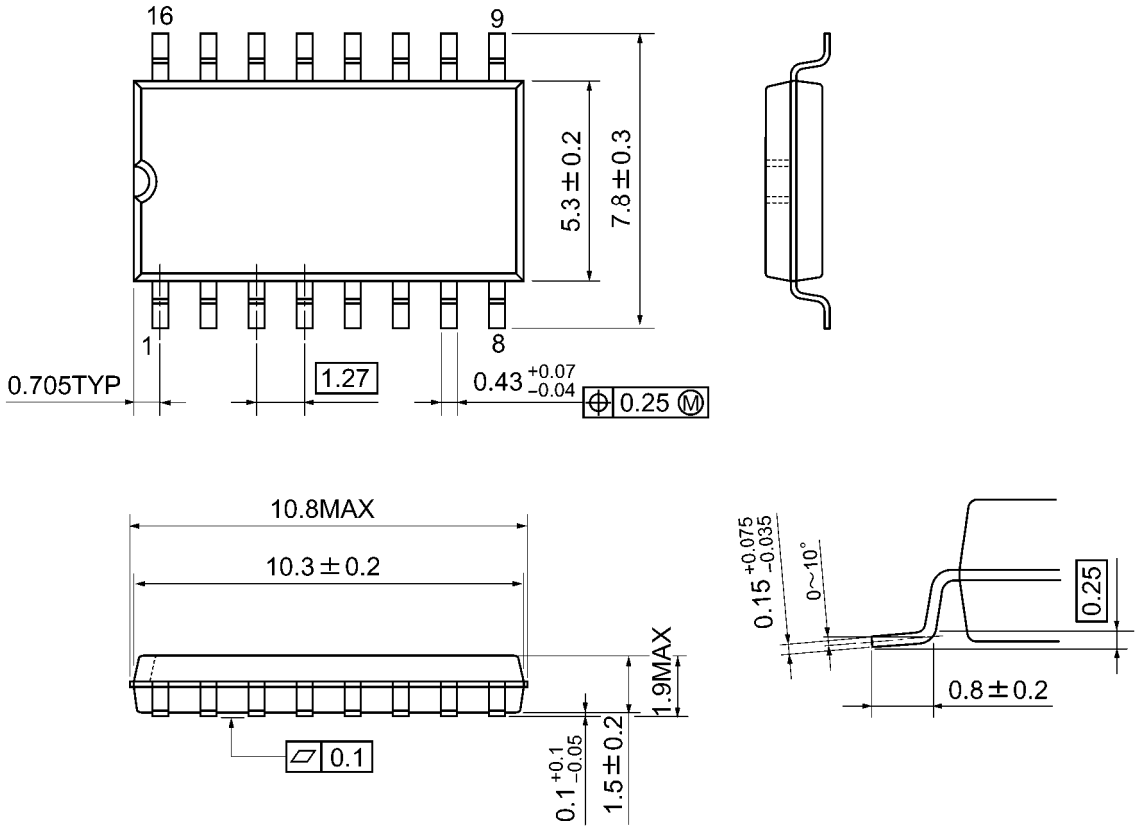
DIP16-P-300-2.54A Unit : mm



Weight: 1.00 g (typ.)

Package Dimensions

SOP16-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

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