

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.

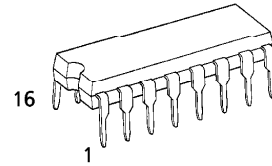
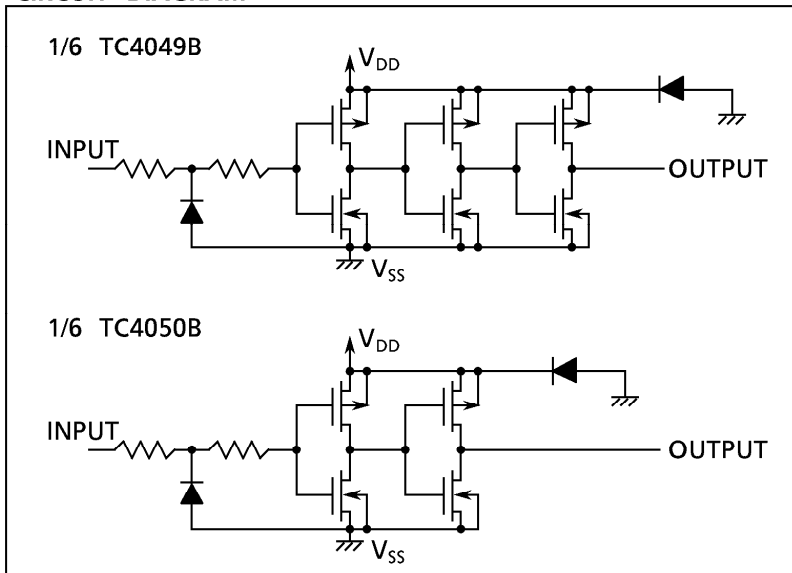
Since one TTL or DTL can be directly driven having large output current, these are useful for interfacing from CMOS to TTL or DTL. As voltage up to $V_{SS} + 18$ volts can be applied to the input regardless of V_{DD} , these can be also used as the level converter IC's which converts CMOS logical circuits 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.

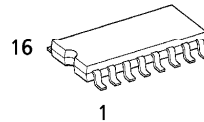
MAXIMUM RATINGS

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}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T_{opr}	$-40 \sim 85$	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	$-65 \sim 150$	$^{\circ}\text{C}$

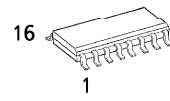
CIRCUIT DIAGRAM



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



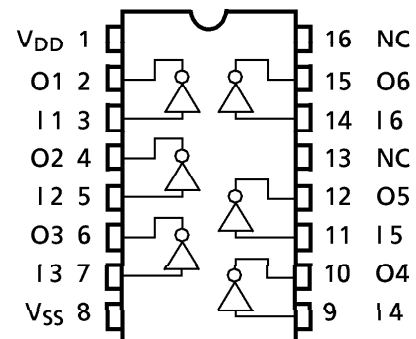
F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)



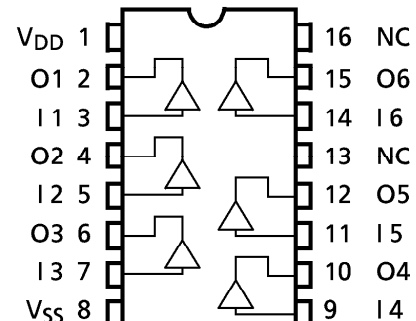
FN (SOIC16-P-150-1.27)
Weight : 0.13g (Typ.)

PIN ASSIGNMENT

TC4049B



TC4050B



(TOP VIEW)

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

* All valid input combinations.

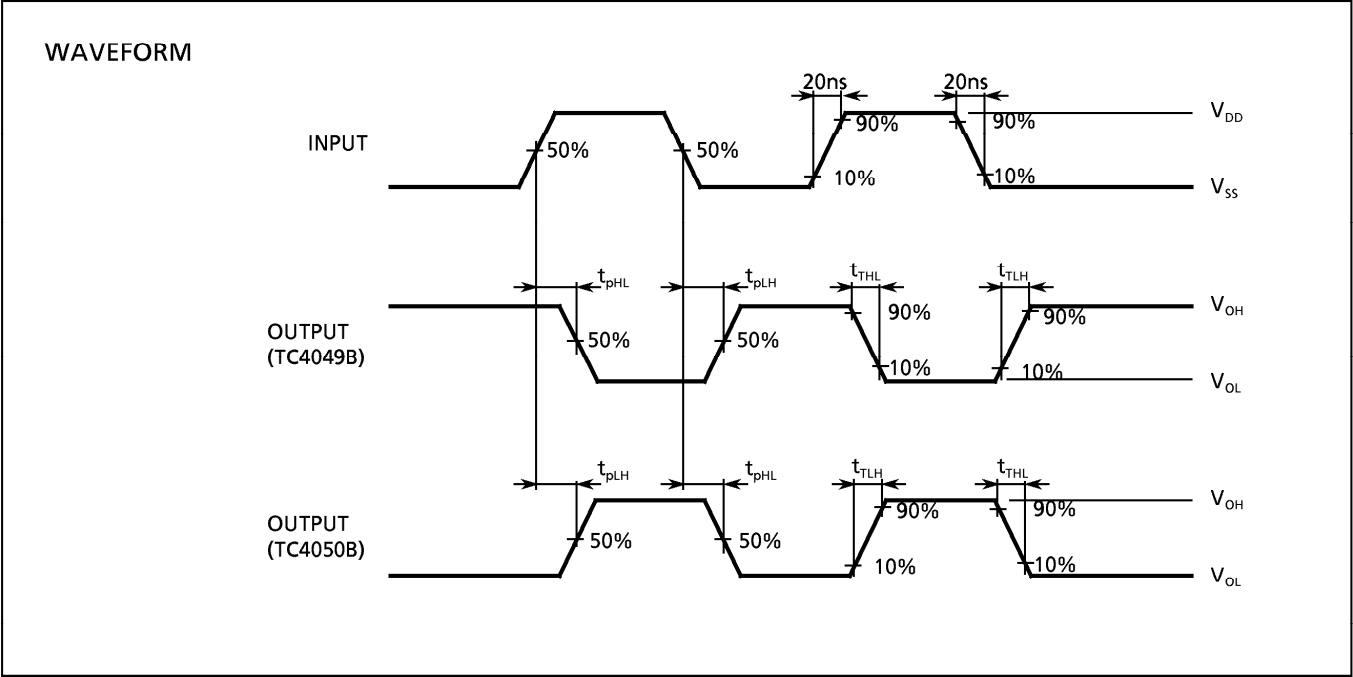
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DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)

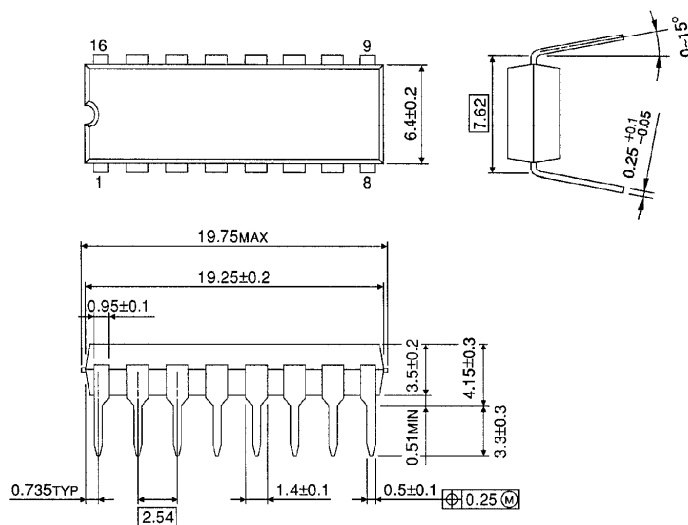
CHARACTERISTIC		SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)		t _{TLH}		5	—	60	160	ns
				10	—	30	80	
				15	—	25	60	
Output Transition Time (High to Low)		t _{THL}		5	—	120	60	
				10	—	10	40	
				15	—	8	30	
TC4049B	Propagation Delay Time (Low to High)	t _{pLH}		5	—	60	120	ns
				10	—	35	65	
				15	—	30	50	
	Propagation Delay Time (High to Low)	t _{pHL}		5	—	40	60	
				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	
				10	—	17	35	
				15	—	14	25	
Input Capacitance		C _{IN}			—	5	7.5	pF

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS



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

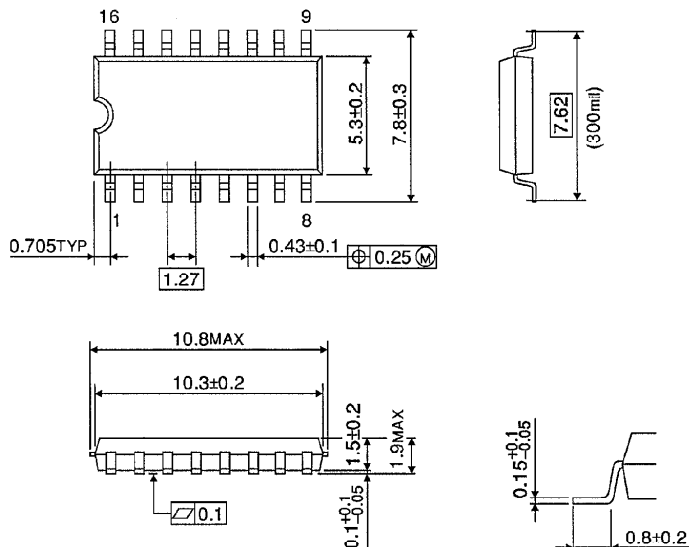
Unit in mm



Weight : 1.00g (Typ.)

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

Unit in mm

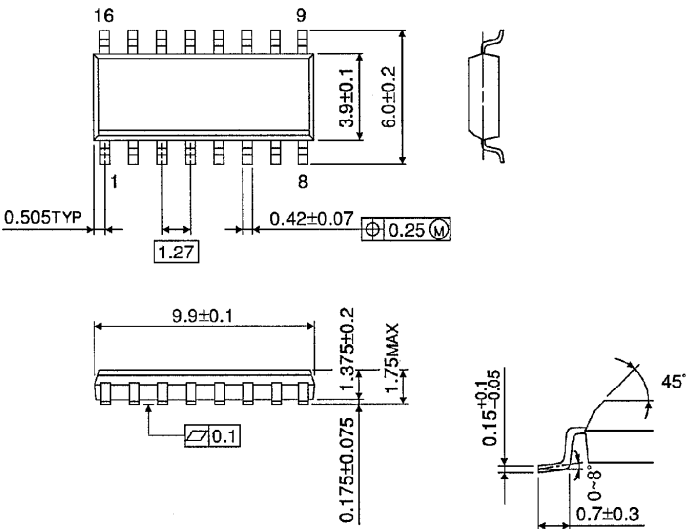


Weight : 0.18g (Typ.)

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.)