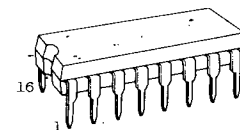


TC4049BP/TC4049BF HEX BUFFER/CONVERTER (Inverting Type)  
TC4050BP/TC4050BF HEX BUFFER/CONVERTER (Non-Inverting Type)

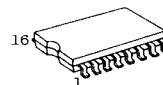
TC4049BP/BF, TC4050BP/BF contain six circuits of buffers. TC4049BP/BF is inverter type and TC4050BP/BF is non-inverter type.

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 TC4049BP/BF and two stage inverters for TC4050BP/BF.



DIP16 (3D16A-P)



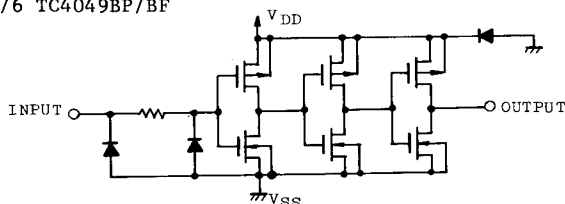
MFP16 (F16GC-P)

## ABSOLUTE MAXIMUM RATINGS

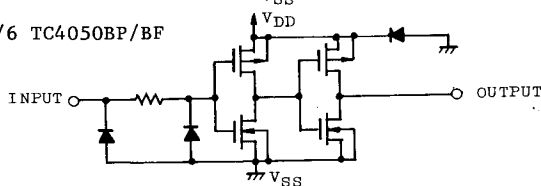
CHARACTERISTIC	SYMBOL	RATING	UNITS
DC Supply Voltage	$V_{DD}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	$V_{IN}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Output Voltage	$V_{OUT}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Voltage	$I_{IN}$	-10	mA
Power Dissipation	$P_D$	300 (DIP) / 180 (MFP)	mW
Operating Temperature Range	$T_A$	$-40 \sim 85$	$^{\circ}\text{C}$
Storage Temperature Range	$T_{stg}$	$-65 \sim 150$	$^{\circ}\text{C}$
Lead Temp./Time	$T_{sol}$	$260^{\circ}\text{C} \cdot 10 \text{ sec}$	

## CIRCUIT DIAGRAM

1/6 TC4049BP/BF

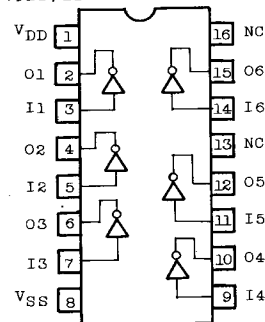


1/6 TC4050BP/BF

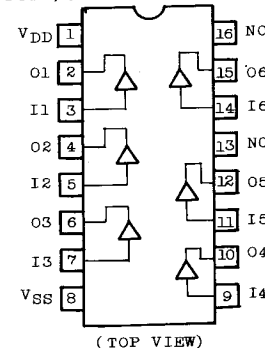


## PIN ASSIGNMENT

TC4049BP/BF



TC4050BP/BF



# TC4049BP/BF, TC4050BP/BF

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

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS
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		SYMBOL	TEST CONDITIONS	V <sub>DD</sub> (V)	-40°C		25°C			85°C		UNITS
					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	5	-0.73	-	-0.65	-1.2	-	-0.58	-	mA	
		V <sub>OH</sub> =2.5V	5	-2.4	-	-2.1	-3.9	-	-1.9	-		
		V <sub>OH</sub> =9.5V	10	-1.8	-	-1.65	-2.5	-	-1.35	-		
		V <sub>OH</sub> =13.5V	15	-4.8	-	-4.3	-8.0	-	-3.5	-		
		V <sub>IN</sub> =V <sub>SS</sub> , V <sub>DD</sub>										
Output Low Current	I <sub>OL</sub>	V <sub>OL</sub> =0.4V	5	3.8	-	3.2	6.4	-	2.9	-	mA	
		V <sub>OL</sub> =0.5V	10	9.6	-	8.0	16	-	6.6	-		
		V <sub>OL</sub> =1.5V	15	25.0	-	24.0	48	-	20.0	-		
		V <sub>IN</sub> =V <sub>SS</sub> , V <sub>DD</sub>										
Input High Voltage	V <sub>IH</sub>	V <sub>OUT</sub> =0.5V, 4.5V	5	3.5	-	3.5	2.75	-	3.5	-	V	
		V <sub>OUT</sub> =1.0V, 9.0V	10	7.0	-	7.0	5.5	-	7.0	-		
		V <sub>OUT</sub> =1.5V, 13.5V	15	11.0	-	11.0	8.25	-	11.0	-		
		I <sub>OUT</sub>   < 1μA										
Input Low Voltage	V <sub>IL</sub>	V <sub>OUT</sub> =0.5V, 4.5V	5	-	1.5	-	2.25	1.5	-	1.5	V	
		V <sub>OUT</sub> =1.0V, 9.0V	10	-	3.0	-	4.5	3.0	-	3.0		
		V <sub>OUT</sub> =1.5V, 13.5V	15	-	4.0	-	6.75	4.0	-	4.0		
		I <sub>OUT</sub>   < 1μA										
Input Corrent	"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 Device 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.

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

CHARACTERISTIC		SYMBOL	TEST CONDITION	V <sub>DD</sub> (V)	MIN.	TYP.	MAX	UNITS
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	–	20	60	
				10	–	10	40	
				15	–	8	30	
TC4049BP/BF	Propagation Delay Time (Low to High)	t <sub>pLH</sub>		5	–	60	120	
				10	–	35	65	
				15	–	30	50	
	Propagation Delay Time (High to Low)	t <sub>pHL</sub>		5	–	40	60	
				10	–	20	30	
				15	–	15	20	
TC4050BP/BF	Propagation Delay Time (Low to High)	t <sub>pLH</sub>		5	–	50	130	
				10	–	30	70	
				15	–	25	55	
	Propagation Delay Time (High to Low)	t <sub>pHL</sub>		5	–	30	70	
				10	–	17	35	
				15	–	14	25	
Input Capacitance		C <sub>IN</sub>			–	5	7.5	pF

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

