

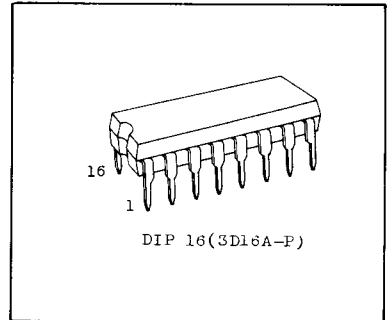
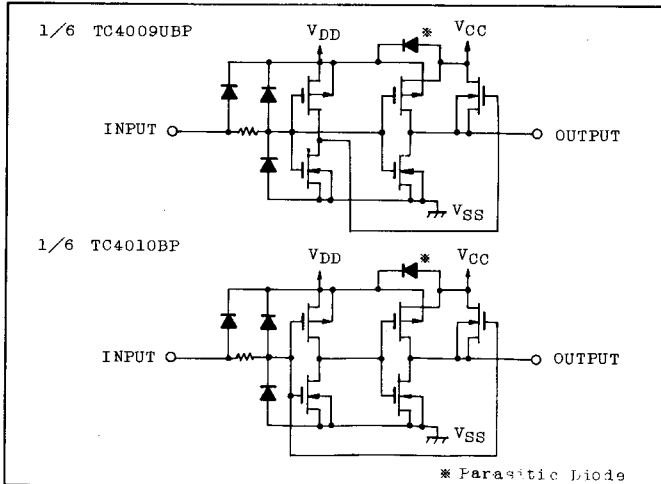
TC4009UBP HEX BUFFER/CONVERTER (INVERTING TYPE)
TC4010BP HEX BUFFER/CONVERTER (NON-INVERTING TYPE)

TC4009UBP and TC4010BP contain six circuits of buffers with the level shift function. TC4009UBP provides inverted outputs and TC4010BP provides non-inverted outputs. Large output current enables to directly drive one TTL/MDTL input. Furthermore, since the logical amplitude of V_{DD} - V_{SS} can be converted to the logical amplitude of V_{CC} - V_{SS} by supplying two separate power supplies with the condition of ($V_{DD} > V_{CC}$), these are suitable for the interface from C²MOS system operating with the power supply voltage of 5 volts or higher to TTL/MDTL system.

MAXIMUM RATINGS

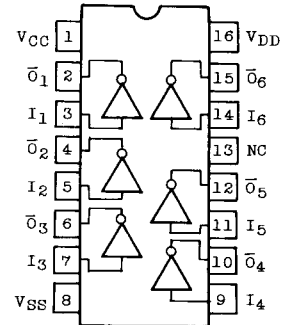
CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS}-0.5 \sim V_{SS}+20$	V
	V_{CC}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Input Voltage	V_{IN}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Voltage	V_{OUT}	$V_{SS}-0.5 \sim V_{CC}+0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300	mW
Operating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

CIRCUIT DIAGRAM

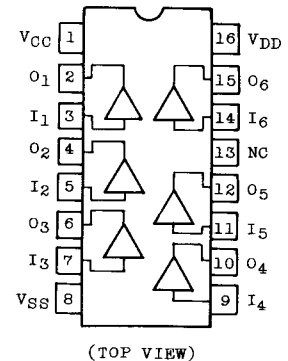


PIN ASSIGNMENT

TC4009UBP



TC4010BP



TC4009UBP, TC4010BP

RECOMMENDED OPERATING CONDITIONS (V_{SS}=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V _{DD}		3	-	18	V
	V _{CC}		3	-	V _{DD}	V
Input Voltage	V _{IN}		0	-	V _{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V, V_{DD}=V_{CC})

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} < 1μA 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} < 1μA 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	-2.4	-	-2.1	-4.5	-	-1.9	-	
		V _{OH} =9.5V	10	-1.8	-	-1.65	-2.8	-	-1.35	-	
		V _{OH} =13.5V	15	-4.8	-	-4.3	-11	-	-3.5	-	
		V _{IN} =V _{SS} , V _{DD}									
Output Low Current	I _{OL}	V _{OL} =0.4V	5	3.8	-	3.2	7	-	2.9	-	mA
		V _{OL} =0.5V	10	9.6	-	8.0	13	-	6.6	-	
		V _{OL} =1.5V	15	25.0	-	24.0	47	-	20.0	-	
		V _{IN} =V _{SS} , V _{DD}									
Input High Voltage (TC4009UBP)	V _{IH}	V _{OUT} =0.5V	5	4.0	-	4.0	2.5	-	4.0	-	V
		V _{OUT} =1.0V	10	8.0	-	8.0	5.0	-	8.0	-	
		V _{OUT} =1.5V	15	12.0	-	12.0	7.5	-	12.0	-	
		I _{OUT} < 1μA									
Input Low Voltage (TC4009UBP)	V _{IL}	V _{OUT} =4.5V	5	-	1.0	-	1.7	1.0	-	1.0	V
		V _{OUT} =9.0V	10	-	1.5	-	2.3	1.5	-	1.5	
		V _{OUT} =13.5V	15	-	1.5	-	2.5	1.5	-	1.5	
		I _{OUT} < 1μA									
Input High Voltage (TC4010BP)	V _{IH}	V _{OUT} =4.5V	5	3.5	-	3.5	2.75	-	3.5	-	V
		V _{OUT} =9.0V	10	7.0	-	7.0	5.5	-	7.0	-	
		V _{OUT} =13.5V	15	11.0	-	11.0	8.25	-	11.0	-	
		I _{OUT} < 1μA									

STATIC ELECTRICAL CHARACTERISTICS (V_{SS}=0V, V_{DD}=V_{CC})

CHARACTERISTIC		SYM-BOL	TEST CONDITION	V _{DD} (V)	-40°C		25°C			85°C		UNIT
					MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
Input Low Voltage (TC4010BP)		V _{IL}	V _{OUT} =0.5V	5	-	1.5	-	2.25	1.5	-	1.5	V
			V _{OUT} =1.0V	10	-	3.0	-	4.5	3.0	-	3.0	
			V _{OUT} =1.5V	15	-	4.0	-	6.75	4.0	-	4.0	
			I _{OUT} < 1μA									
Input Current	"H" Level	I _{IH}	V _{IH} =18V	18	-	0.1	-	10 ⁻⁵	0.1	-	1.0	μA
	"L" Level	I _{IL}	V _{IL} =0V	18	-	-0.1	-	-10 ⁻⁵	-0.1	-	-1.0	
Quiescent Device Current		I _{DD}	**	5	-	1.0	-	0.002	1.0	-	30	μA
			V _{IN} =V _{SS} , V _{DD}	10	-	2.0	-	0.004	2.0	-	60	
			*	15	-	4.0	-	0.008	4.0	-	120	

* All valid input combination. ** Include I_{CC}.

DYNAMIC ELECTRICAL CHARACTERISTICS (T_a=25°C, V_{SS}=0V, C_L=50pF, V_{DD}=V_{CC})

CHARACTERISTIC		SYMBOL	TEST CONDITION	V _{DD} (V)	MIN.	TYP.	MAX.	UNIT	
Output Transition Time (Low to High)		t _{TLH}		5	-	75	350	ns	
				10	-	30	150		
				15	-	20	110		
Output Transition Time (High to Low)		t _{THL}		5	-	25	70	ns	
				10	-	15	40		
				15	-	12	30		
TC4009UBP	Propagation Delay Time (Low to High)		t _{pLH}		5	-	40	140	ns
					10	-	25	80	
					15	-	15	60	
	Propagation Delay Time (High to Low)		t _{pHL}		5	-	25	60	
					10	-	15	40	
					15	-	15	30	
TC4010BP	Propagation Delay Time (Low to High)		t _{pLH}		5	-	45	200	ns
					10	-	25	100	
					15	-	15	70	
	Propagation Delay Time (High to Low)		t _{pHL}		5	-	50	130	
					10	-	25	70	
					15	-	15	50	
Input Capacitance		C _{IN}	TC4009UBP		-	15	22.5	pF	
			TC4010BP		-	5	7.5		

TC4009UBP, TC4010BP

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

