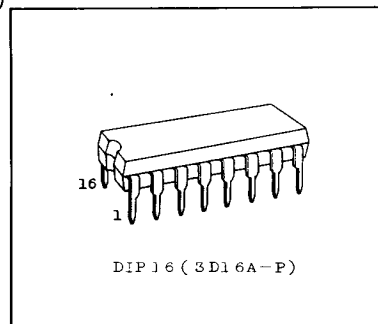


## TC5020BP HEX LOW-TO-HIGH VOLTAGE TRANSLATOR (INVERTING)

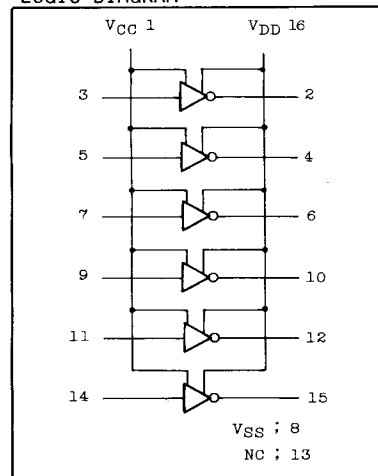
TC5020BP contains six circuits of level converters which convert the signals from low power supply voltage logical systems to the logical signals for high power supply voltage C<sup>2</sup>MOS systems. This is most suitable for interfacing between TTL, MDTL systems and C<sup>2</sup>MOS systems, and between two power supply voltage C<sup>2</sup>MOS systems. Normally, V<sub>CC</sub> is connected to low voltage power supply and V<sub>DD</sub> is connected to high voltage power supply, however this can also operate having V<sub>CC</sub> and V<sub>DD</sub> common. When the input is "H", some amount of I<sub>CC</sub> flows because of circuit structure.



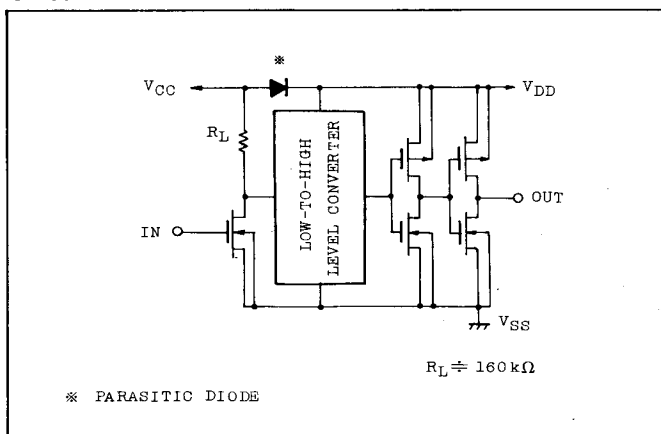
### ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> -0.5 ~ V <sub>SS</sub> +20	V
	V <sub>CC</sub>	V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.5 ~ V <sub>CC</sub> +0.5	V
Output Voltage	V <sub>OUT</sub>	V <sub>SS</sub> -0.5 ~ V <sub>DD</sub> +0.5	V
DC Input Current	I <sub>IN</sub>	±10	mA
Power Dissipation	P <sub>D</sub>	300	mW
Storage Temperature Range	T <sub>stg</sub>	-65 ~ 150	°C
Lead Temp./Time	T <sub>sol</sub>	260°C · 10sec	

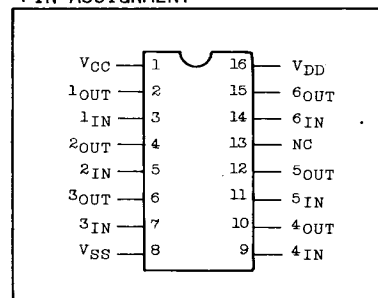
### LOGIC DIAGRAM



### CIRCUIT DIAGRAM



### PIN ASSIGNMENT



# TC5020BP

## RECOMMENDED OPERATING CONDITIONS (VSS=0V)

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Voltage (1)	V <sub>CC</sub> V <sub>DD</sub>	V <sub>CC</sub> = V <sub>DD</sub>	3	-	18	V
Supply Voltage (2)	V <sub>CC</sub>	V <sub>CC</sub> < V <sub>DD</sub>	5	-	V <sub>DD</sub>	V
	V <sub>DD</sub>		5	-	18	V
Input Voltage	V <sub>IN</sub>		0	-	V <sub>CC</sub>	V
Operataing Temp.	Topr		-40	-	85	°C

## ELECTRICAL CHARACTERISTICS (VSS=0V, VCC=VDD)

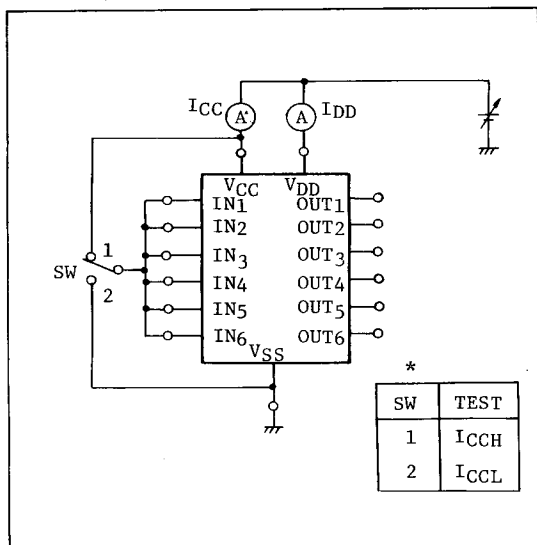
CHARACTERISTIC	SYMBOL	TEST CONDITIONS	V <sub>DD</sub> (V)	-40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
High Level Output Voltage	V <sub>OH</sub>	I <sub>OUT</sub>   < 1μA V <sub>IN</sub> = V <sub>SS</sub>	5	4.95	-	4.95	5.00	-	4.95	-	V	
			10	9.95	-	9.95	10.00	-	9.95	-		
			15	14.95	-	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>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		
High Level Output Current	I <sub>OH</sub>	V <sub>OH</sub> = 4.6V V <sub>OH</sub> = 9.5V V <sub>OH</sub> = 13.5V V <sub>IN</sub> = V <sub>SS</sub>	5	-0.2	-	-0.16	-	-	-0.12	-	mA	
			10	-0.5	-	-0.4	-	-	-0.3	-		
			15	-1.4	-	-1.2	-	-	-1.0	-		
Low Level Output 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>DD</sub>	5	0.52	-	0.44	-	-	0.36	-	mA	
			10	1.3	-	1.1	-	-	0.9	-		
			15	3.6	-	3.0	-	-	2.4	-		
High Level Input Voltage	V <sub>IH</sub>	V <sub>OUT</sub> = 0.5V V <sub>OUT</sub> = 1.0V V <sub>OUT</sub> = 1.5V  I <sub>OUT</sub>   < 1μA	5	4.0	-	4.0	-	-	4.0	-	V	
			10	7.0	-	7.0	-	-	7.0	-		
			15	10.0	-	10.0	-	-	10.0	-		
Low Level Input Voltage	V <sub>IL</sub>	V <sub>OUT</sub> = 4.5V V <sub>OUT</sub> = 9.0V V <sub>OUT</sub> = 13.5V  I <sub>OUT</sub>   < 1μA	5	-	1.0	-	-	1.0	-	1.0	V	
			10	-	1.2	-	-	1.2	-	1.2		
			15	-	1.5	-	-	1.5	-	1.5		
Input Current	H Level	I <sub>IH</sub>	V <sub>IH</sub> = 18V	18	-	0.3	-	10 <sup>-5</sup>	0.3	-	1.0	μA
	L Level	I <sub>IL</sub>	V <sub>IL</sub> = 0V	18	-	-0.3	-	-10 <sup>-5</sup>	-0.3	-	-1.0	
Quiescent Current Consumption	I <sub>DD</sub>	V <sub>IN</sub> = V <sub>SS</sub> , V <sub>DD</sub> *	5	-	1.0	-	0.001	1.0	-	7.5	μA	
			10	-	2.0	-	0.001	2.0	-	15.0		
			15	-	4.0	-	0.002	4.0	-	30.0		
Quiescent Current Consumption	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>DD</sub>	5	-	0.9	-	0.2	0.48	-	0.9	mA	
			10	-	1.6	-	0.4	0.96	-	1.6		
			15	-	2.1	-	0.6	1.5	-	2.1		
Quiescent Current Consumption	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>SS</sub>	5	-	1.0	-	0.001	1.0	-	7.5	μA	
			10	-	2.0	-	0.001	2.0	-	15.0		
			15	-	4.0	-	0.002	4.0	-	30.0		

\* All valid input combinations

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

CHARACTERISTIC	SYMBOL	CONDITIONS	VCC(V)		MIN.	TYP.	MAX.	UNIT
			VCC(V)	VDD(V)				
Output Rise Time	t <sub>TLH</sub>		-	5	-	130	400	ns
			-	10	-	65	200	
			-	15	-	50	160	
Output Fall Time	t <sub>THL</sub>		-	5	-	100	200	ns
			-	10	-	50	100	
			-	15	-	40	80	
(LOW-HIGH) Propagation Delay Time	t <sub>pLH</sub>		5	5	-	780	1600	ns
			10	10	-	330	800	
			15	15	-	230	600	
			5	10	-	750	1600	
			5	15	-	850	1800	
			10	15	-	330	800	
(HIGH-LOW) Propagation Delay Time	t <sub>pHL</sub>		5	5	-	220	600	ns
			10	10	-	75	300	
			15	15	-	50	200	
			5	10	-	130	300	
			5	15	-	150	400	
			10	15	-	60	200	
Input Capacity	C <sub>IN</sub>				-	5	7.5	pF

IDD, ICC TEST CIRCUIT



SWITCHING TIME TEST CIRCUIT AND WAVEFORM

