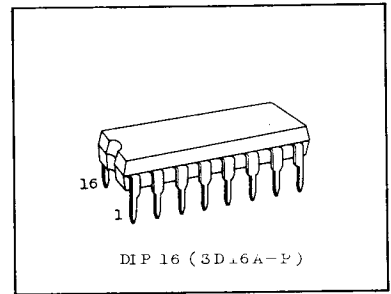


## TC5002BP, TC5022BP BCD TO 7-SEGMENT DECODER/DRIVER

TC5002BP and TC5022BP are decoders to convert BCD code input to the driving signal for 7-segment display element and equipped with NPN transistors as the output buffers enabling direct driving of common cathode type LED.

When BI input is set at "H" level, all the segment outputs are turned "OFF" (not illumination) regardless of other inputs.

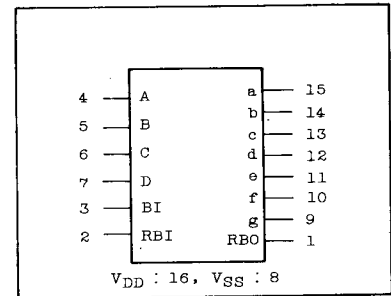
RBI input is to turn the output "OFF" and RBO output is to generate "H" level output only for "0" code input and these are used for leading zero suppress when connected in cascade.



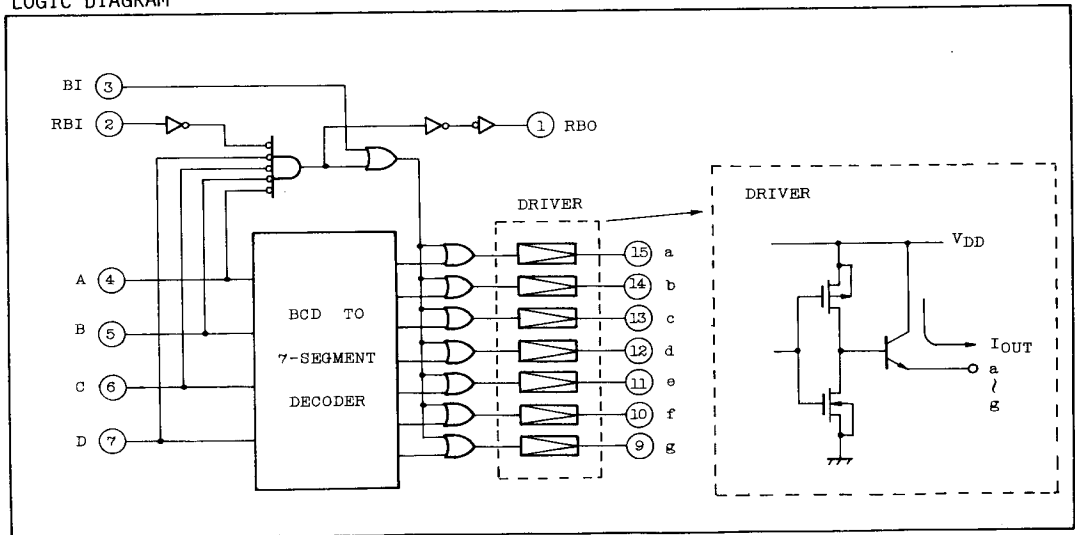
### ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> -0.5 ~ V <sub>SS</sub> +20	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> -0.5 ~ V <sub>DD</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	

### PIN ASSIGNMENT



### LOGIC DIAGRAM



# TC5002BP, TC5022BP

## TRUTH TABLE

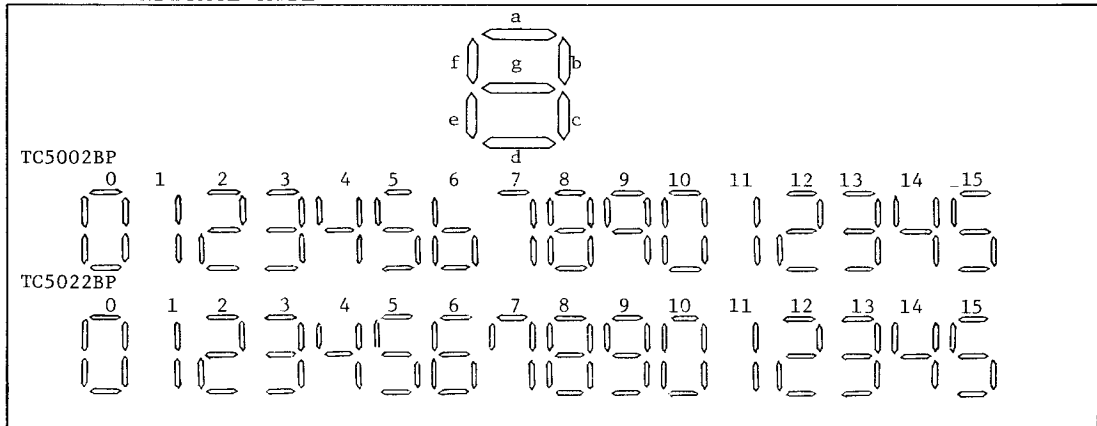
(TC5002BP)

BI	RBI	INPUT				OUTPUT								RBO	NOTE
		A	B	C	D	a	b	c	d	e	f	g			
H	*	*	*	*	*	L	L	L	L	L	L	L	L	☆	
L	H	L	L	L	L	L	L	L	L	L	L	L	L	H	
L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	
L	*	H	L	L	L	L	H	H	L	L	L	L	L	L	
L	*	L	H	L	L	H	H	L	H	H	L	H	L	L	
L	*	H	H	L	L	H	H	H	H	L	L	H	H	L	
L	*	L	L	H	L	L	H	H	L	L	H	H	H	L	
L	*	H	L	H	L	H	L	H	H	L	H	H	H	L	
L	*	L	H	H	L	L	L	H	H	H	H	H	H	L	1
L	*	H	H	H	L	H	H	H	L	L	L	L	L	L	2
L	*	L	L	L	H	H	H	H	H	H	H	H	H	L	
L	*	H	L	L	H	H	H	H	L	L	H	H	H	L	3
L	*	L	H	L	H	H	H	H	H	H	H	H	L	L	
L	*	H	H	L	H	L	H	H	L	L	L	L	L	L	
L	*	L	L	H	H	H	H	L	H	H	L	H	L	L	
L	*	H	L	H	H	H	H	H	L	L	L	H	H	L	
L	*	L	H	H	H	L	H	H	L	L	H	H	H	L	
L	*	H	H	H	H	H	L	H	H	L	H	H	L	L	

NOTE 1 : TC5022BP,  $\longrightarrow$  a = "H"  
 2 : TC5022BP,  $\longrightarrow$  f = "H"  
 3 : TC5022BP,  $\longrightarrow$  d = "H"

☆ : Undetermined  
 \* : Don't Care

## DISPLAY INDICATE MODE



RECOMMENDED OPERATING CONDITIONS (VSS= 0V)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	VDD	3	-	18	V
Input Voltage	VIN	0	-	VDD	V
Operating Temp.	Topr	-40	-	85	°C

ELECTRICAL CHARACTERISTICS (VSS=0V)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	VDD (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High Level Output Voltage (RBO)	VOH	IOUT  < 1μA VIN=VSS, VDD	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 (RBO)	VOL	IOUT  < 1μA VIN=VSS, VDD	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 Voltage (a - g)	VOH	IOUT  < 1μA VIN=VSS, VDD	5	4.0	-	4.0	4.5	-	4.0	-	V
			10	9.0	-	9.0	9.5	-	9.0	-	
			15	14.0	-	14.0	14.5	-	14.0	-	
High Level Output Current (RBO)	IOH	VOH=4.6V VOH=9.5V VOH=13.5V VIN=VSS, VDD	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 (RBO)	IOL	VOL=0.4V VOL=0.5V VOL=1.5V VIN=VSS, VDD	5	0.52	-	0.44	-	-	0.36	-	mA
			10	1.3	-	1.1	-	-	0.9	-	
			15	3.6	-	3.0	-	-	2.4	-	
High Level Output Current (a - g)	IOH	VOH=3.5V VOH=8.5V VOH=13.5V VIN=VSS, VDD	5	-20	-	-20	-	-	-15	-	mA
			10	-25	-	-25	-	-	-20	-	
			15	-30	-	-30	-	-	-25	-	
High Level Input Voltage	VIH **	VOUT=0.5V, 4.0V VOUT=1.0V, 9.0V VOUT=1.5V, 13.5V  IOUT  < 1μA	5	3.5	-	3.5	2.75	-	3.5	-	V
			10	7.0	-	7.0	5.5	-	7.0	-	
			15	11.0	-	11.0	8.25	-	11.0	-	
Low Level Input Voltage	VIL **	VOUT=0.5V, 4.0V VOUT=1.0V, 9.0V VOUT=1.5V, 13.5V  IOUT  < 1μA	5	-	1.5	-	2.25	1.5	-	1.5	V
			10	-	3.0	-	4.5	3.0	-	3.0	
			15	-	4.0	-	6.75	4.0	-	4.0	
Disable Current (a - g)	IDL	VOL=0V	18	-	-3.0	-	-10 <sup>-4</sup>	-3.0	-	-30	μA
Input 'H' Level Current	I <sub>IH</sub>	V <sub>IH</sub> =18V	18	-	0.3	-	10 <sup>-5</sup>	0.3	-	1.0	μA
	I <sub>IIL</sub>	V <sub>IIL</sub> =0V	18	-	-0.3	-	-10 <sup>-5</sup>	-0.3	-	-1.0	
Quiescent Current Consumption	IDD	VIN=VSS, VDD *	5	-	20	-	0.005	20	-	150	μA
			10	-	40	-	0.010	40	-	300	
			15	-	80	-	0.015	80	-	600	

\* All valid input combinations. Outputs open.

\*\* Required pull down register RL = 20 kΩ (a ~ g outputs).

# TC5002BP, TC5022BP

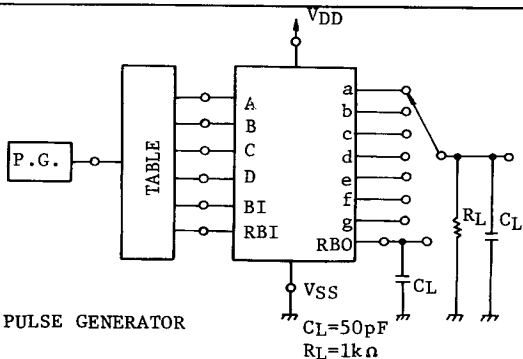
SWITCHING CHARACTERISTICS (Ta=25°C, VSS=0V, CL=50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	VDD (V)	MIN.	TYP.	MAX.	UNIT
Output Rise Time (SEGMENT OUT)	t <sub>TLH</sub>	R <sub>L</sub> =1 kΩ	5	-	100	200	ns
			10	-	50	100	
			15	-	40	80	
Output Rise Time (RBO)	t <sub>TLH</sub>		5	-	130	400	ns
			10	-	65	200	
			15	-	50	160	
Output Fall Time (RBO)	t <sub>THL</sub>		5	-	100	200	ns
			10	-	50	100	
			15	-	40	80	
(LOW-HIGH) Propagation Delay Time (A,B,C,D-SEGMENT OUT)	t <sub>pLH</sub>	R <sub>L</sub> =1 kΩ	5	-	500	1000	ns
			10	-	150	400	
			15	-	120	300	
(HIGH-LOW) Propagation Delay Time (A,B,C,D-SEGMENT OUT)	t <sub>pHL</sub>	R <sub>L</sub> =1 kΩ	5	-	1000	2000	ns
			10	-	450	1000	
			15	-	320	700	
(LOW-HIGH) Propagation Delay Time (A,B,C,D - RBO)	t <sub>pLH</sub>		5	-	1000	2000	ns
			10	-	370	1000	
			15	-	250	750	
(HIGH-LOW) Propagation Delay Time (A,B,C,D - RBO)	t <sub>pHL</sub>		5	-	500	1000	ns
			10	-	200	500	
			15	-	140	300	
(LOW-HIGH) Propagation Delay Time (RBI - RBO)	t <sub>pLH</sub>		5	-	800	1600	ns
			10	-	270	700	
			15	-	190	500	
(HIGH-LOW) Propagation Delay Time (RBI - RBO)	t <sub>pHL</sub>		5	-	180	700	ns
			10	-	70	350	
			15	-	50	250	
Propagation Delay Time (BI - SEGMENT OUT)	t <sub>pLH</sub> t <sub>pHL</sub>	R <sub>L</sub> =1 kΩ	5	-	500	1500	ns
			10	-	200	600	
			15	-	150	500	
Input Capacity	C <sub>IN</sub>			-	5	7.5	pF

SWITCHING TIME TEST CIRCUIT

TABLE (t<sub>pLH</sub>, t<sub>pHL</sub> Test Condition)

TEST	P.G.	"H"	"L"	OUTPUT	Wave- form
A,B,C,D - SEGMENT OUT	A	-	Other Inputs	a	1
A,B,C,D - RBO	A	RBI	Other Inputs	RBO	2
RBI - RBO	RBI	-	Other Inputs	RBO	3
BI - SEGMENT OUT	BI	A,B	Other Inputs	a	4



SWITCHING TIME TEST WAVEFORMS

