

# TC74HC4518P TC74HC4520P/F

TC74HC4518P/F DUAL BCD COUNTER  
TC74HC4520P/F DUAL 4-BIT BINARY COUNTER

The TC74HC4518 and TC74HC4520 are high speed CMOS DUAL BCD/4-BIT BINARY COUNTER fabricated with silicon gate C<sup>2</sup>MOS technology. It operates ten times as fast as that of metal-gate C<sup>2</sup>MOS IC (4518B/4520B) with the same power dissipation.

Since both of TC74HC4518 and TC74HC4520 contain two independent circuits of counters with the same functions in one package, counting or frequency division of two BCD digits or eight binary bits can be achieved with one IC. The counters can be reset to "0" (Q<sub>0</sub> ~ Q<sub>3</sub>="L") by giving "H" level signal to CLEAR input regardless of other inputs. The counting condition is changed by the positive going transition of CLOCK input if CE="H" or by the negative going transition of CE if CLOCK="L". All inputs are equipped with protection circuits against static discharge or transient excess voltage.

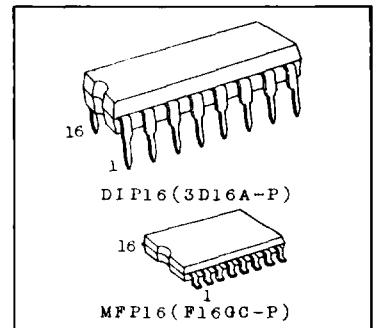
## FEATURES:

- High Speed .....  $f_{MAX}=53\text{MHz(Typ.)}$  at  $V_{CC}=5\text{V}$
- Low Power Dissipation .....  $I_{CC}=4\mu\text{A(Max.)}$  at  $T_a=25^\circ\text{C}$
- High Noise Immunity .....  $V_{NIH}=V_{NIL}=28\% V_{CC}(\text{Min.})$
- Output Drive Capability ..... 10 LSTTL Loads
- Symmetrical Output Impedance .....  $|I_{OH}|=I_{OL}=4\text{mA}(\text{Min.})$
- Balanced Propagation Delays .....  $t_{pLH}=t_{pHL}$
- Wide Operating Voltage Range .....  $V_{CC}(\text{Opr.})=2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 4518B/4520B

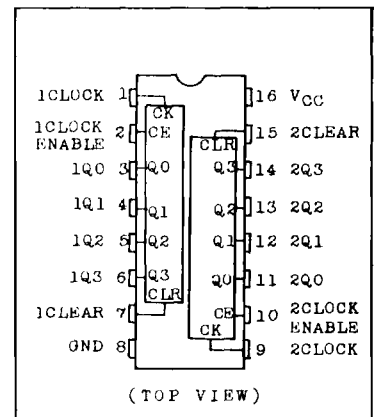
## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	$V_{CC}$	-0.5 ~ 7	V
DC Input Voltage	$V_{IN}$	-0.5 ~ $V_{CC}+0.5$	V
DC Output Voltage	$V_{OUT}$	-0.5 ~ $V_{CC}+0.5$	V
Input Diode Current	$I_{IK}$	±20	mA
Output Diode Current	$I_{OK}$	±20	mA
DC Output Current	$I_{OUT}$	±25	mA
DC $V_{CC}$ /Ground Current	$I_{CC}$	±50	mA
Power Dissipation	$P_D$	500(DIP)* 180(MFP)	mW
Storage Temperature	$T_{stg}$	-65 ~ 150	°C
Lead Temperature 10sec	$T_L$	300	°C

\* 500mW in the range of  $T_a=-40^\circ \sim 65^\circ\text{C}$  and from  $T_a=65^\circ\text{C}$  up to  $85^\circ\text{C}$  derating factor of  $-10\text{mW}/^\circ\text{C}$  shall be applied until 300mW.



## PIN ASSIGNMENT



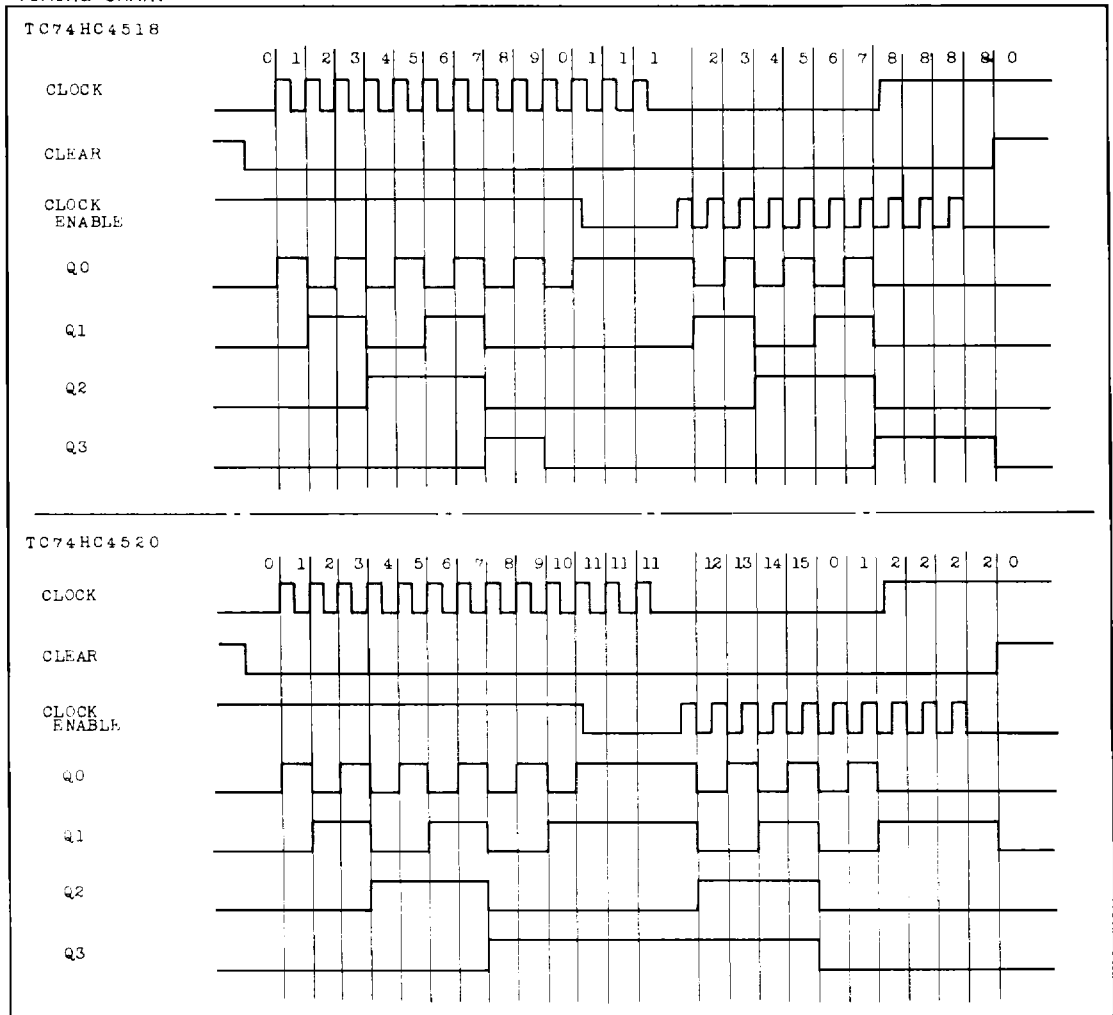
**TC74HC4518P**  
**TC74HC4520P/F**

**TRUTH TABLE**

CLOCK	INPUTS		FUNCTION
	CLOCK ENABLE	CLEAR	
	H	L	INCREMENT COUNTER
L		L	INCREMENT COUNTER
	X	L	NO CHANGE
X		L	NO CHANGE
	L	L	NO CHANGE
H		L	NO CHANGE
X	X	H	Q0 THRU Q3=L

X : DON'T CARE

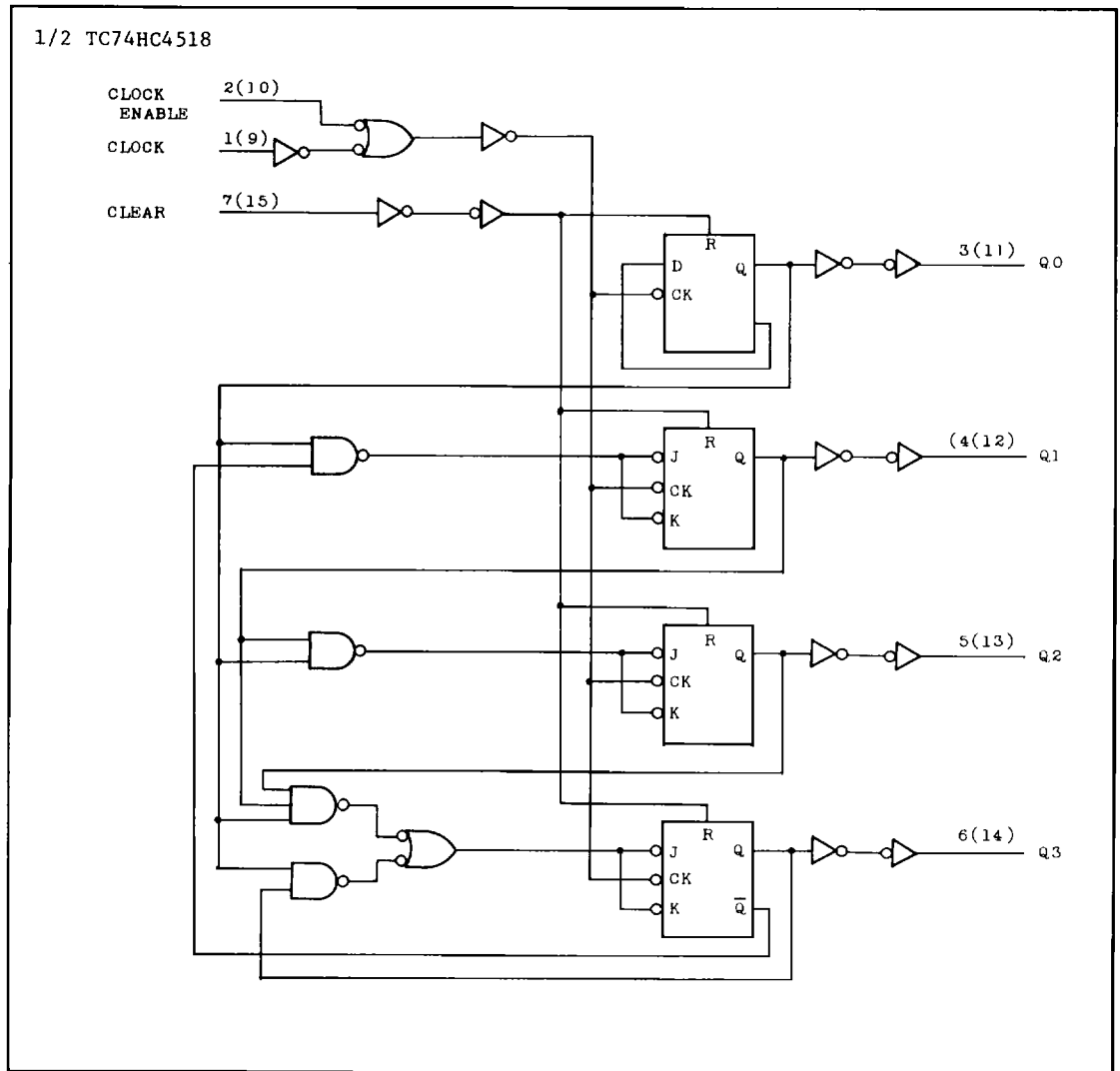
**TIMING CHART**



# TC74HC4518P

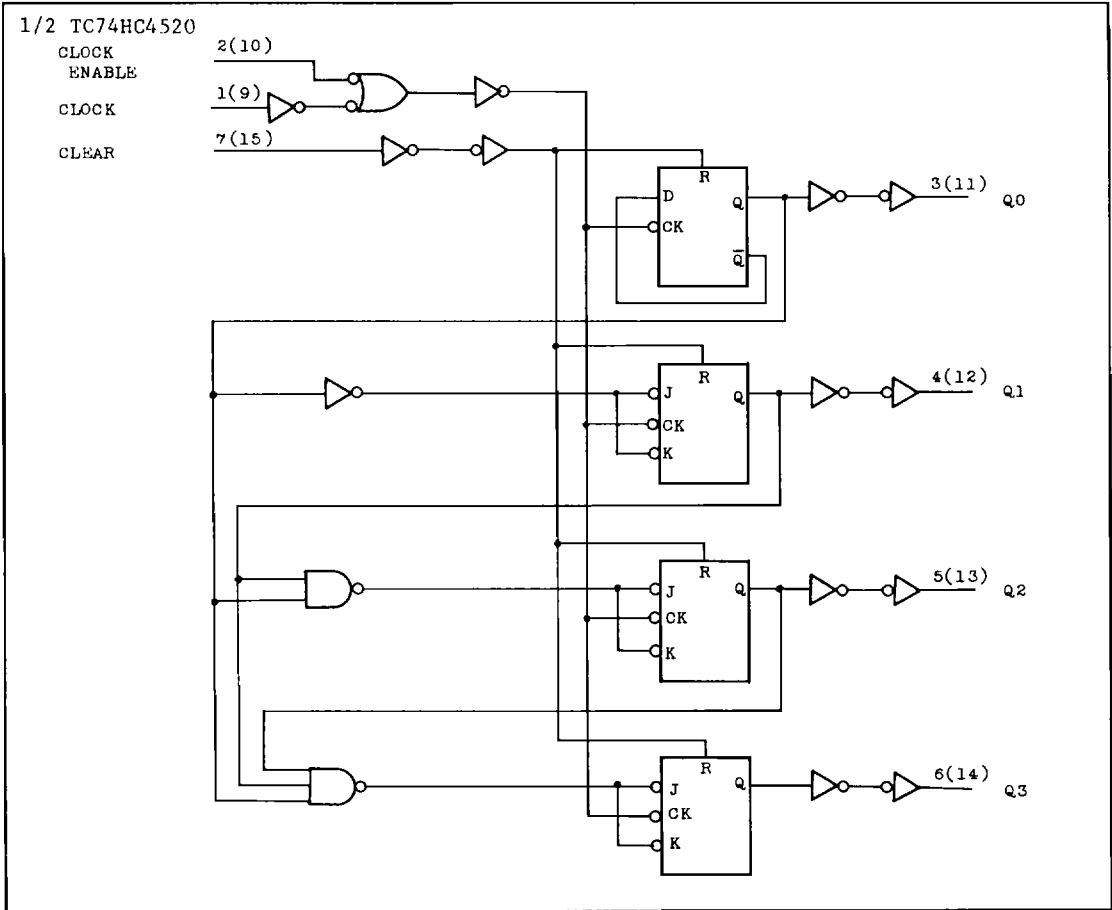
## TC74HC4520P/F

### LOGIC DIAGRAM



# TC74HC4518P TC74HC4520P/F

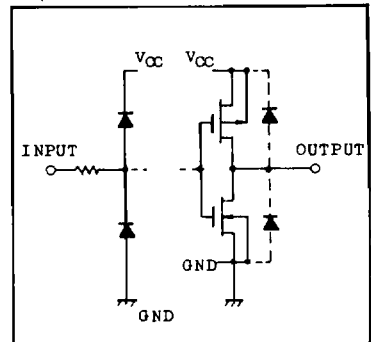
## LOGIC DIAGRAM (Continued)



### RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	$V_{CC}$	2 ~ 6	V
Input Voltage	$V_{IN}$	0 ~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0 ~ $V_{CC}$	V
Operating Temperature	$T_{opr}$	-40 ~ 85	°C
Input Rise and Fall Time	$t_r, t_f$	0 ~ 1000 ( $V_{CC}=2.0V$ ) 0 ~ 500 ( $V_{CC}=4.5V$ ) 0 ~ 400 ( $V_{CC}=6.0V$ )	ns

### INPUT and OUTPUT EQUIVALENT CIRCUIT



# TC74HC4518P

## TC74HC4520P/F

### DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	Ta=25°C			Ta=-40~85°C		UNIT		
			VCC	MIN.	TYP.	MAX.	MIN.		MAX.	
High-Level Input Voltage	V <sub>IH</sub>		2.0	1.5	-	-	1.5	-	V	
			4.5	3.15	-	-	3.15	-		
			6.0	4.2	-	-	4.2	-		
Low-Level Input Voltage	V <sub>IL</sub>		2.0	-	-	0.5	-	0.5	V	
			4.5	-	-	1.35	-	1.35		
			6.0	-	-	1.8	-	1.8		
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> =-20μA	2.0	1.9	2.0	-	1.9	-	V
				4.5	4.4	4.5	-	4.4	-	
		I <sub>OH</sub> =-4mA I <sub>OH</sub> =-5.2mA	4.5	4.18	4.31	-	4.13	-		
			6.0	5.68	5.80	-	5.63	-		
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> =20μA	2.0	-	0.0	0.1	-	0.1	V
				4.5	-	0.0	0.1	-	0.1	
		I <sub>OL</sub> =4mA I <sub>OL</sub> =5.2mA	4.5	-	0.17	0.26	-	0.33		
			6.0	-	0.18	0.26	-	0.33		
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0	-	-	±0.1	-	±1.0	μA	
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> =V <sub>CC</sub> or GND	6.0	-	-	4.0	-	40.0		

### AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub>=50pF, Input t<sub>r</sub>=t<sub>f</sub>=6ns)

PARAMETER	SYMBOL	TEST CONDITION	Ta=25°C			Ta=-40~85°C		UNIT	
			VCC	MIN.	TYP.	MAX.	MIN.		MAX.
Output Transition Time	t <sub>TLH</sub> t <sub>THL</sub>		2.0	-	30	75	-	95	ns
			4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Propagation Delay Time (CK, CE - Qn)	t <sub>pLH</sub> t <sub>pHL</sub>		2.0	-	100	190	-	240	ns
			4.5	-	25	38	-	48	
			6.0	-	21	32	-	41	
Propagation Delay Time (CLR - Qn)	t <sub>pHL</sub>		2.0	-	104	205	-	255	ns
			4.5	-	26	41	-	51	
			6.0	-	22	35	-	43	
Maximum Clock Frequency	f <sub>MAX</sub>		2.0	5	12	-	4	-	MHz
			4.5	25	48	-	20	-	
			6.0	29	56	-	24	-	

# TC74HC4518P TC74HC4520P/F

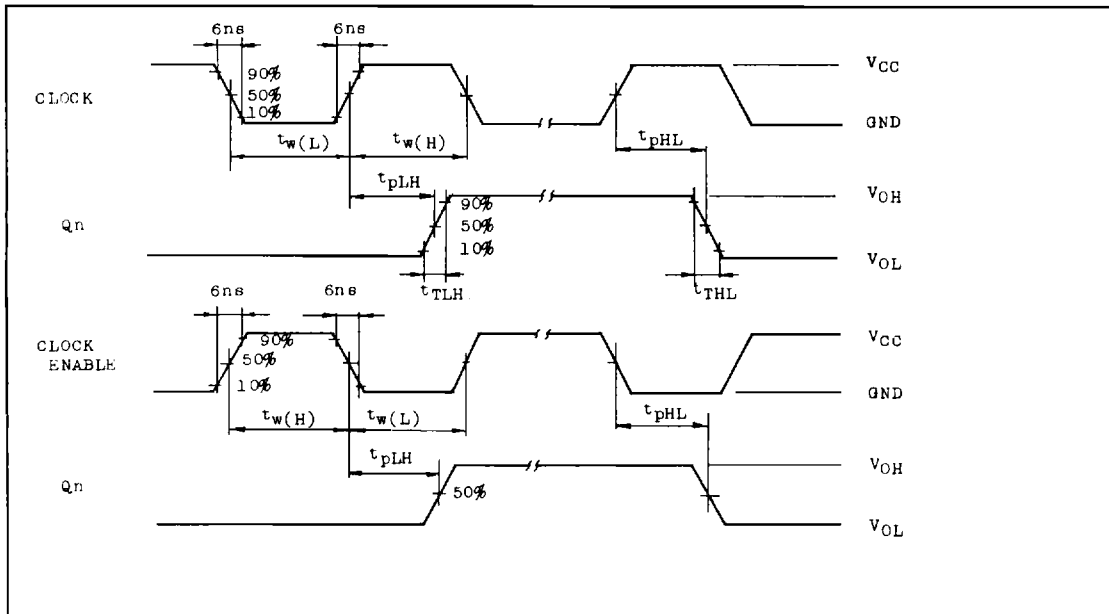
## AC ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	SYMBOL	TEST CONDITION	V <sub>CC</sub>	Ta=25°C			Ta=-40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	
Minimum Pulse Width (CK, CE)	t <sub>w(L)</sub> t <sub>w(H)</sub>		2.0	-	30	75	-	95	
			4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Minimum Pulse Width (CLR)	t <sub>w(H)</sub>		2.0	-	35	100	-	125	ns
			4.5	-	9	20	-	25	
			6.0	-	8	17	-	21	
Minimum Removal Time (CLR)	t <sub>rem</sub>		2.0	-	-	0	-	0	
			4.5	-	-	0	-	0	
			6.0	-	-	0	-	0	
Input Capacitance	C <sub>IN</sub>			-	5	10	-	10	pF
Power Dissipation Capacitance	C <sub>PD(1)</sub>	TC74HC4518		-	145	-	-	-	
		TC74HC4520		-	145	-	-	-	

Note(1) C<sub>pd</sub> is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit). Average operating current can be obtained by the equation hereunder.

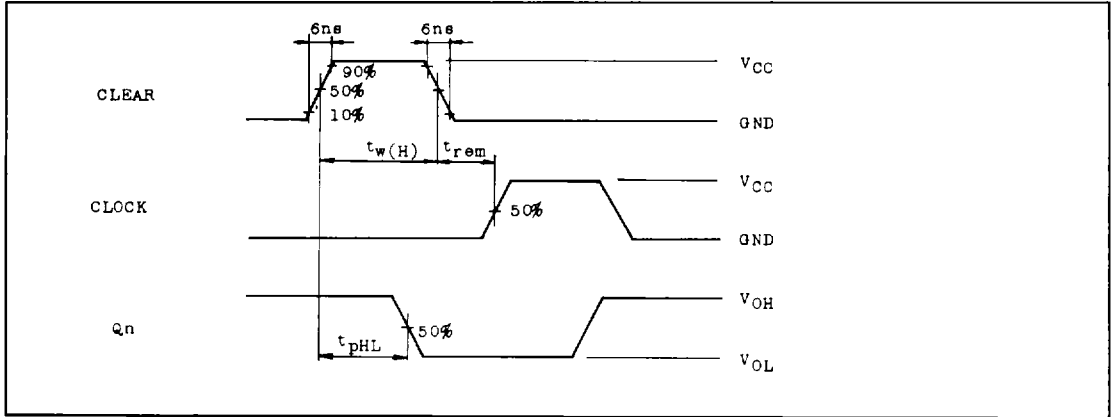
$$I_{CC(Oper.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \quad (\text{per circuit})$$

## SWITCHING CHARACTERISTICS TEST WAVEFORM



# TC74HC4518P TC74HC4520P/F

## SWITCHING CHARACTERISTICS TEST WAVEFORM (Continued)



## $I_{CC(Opr.)}$ TEST CIRCUIT

