TC74HC4518AP/AF
TC74HC4520AP/AF

TC74HC4518AP/AF DUAL BCD COUNTER
TC74HC4520AP/AF DUAL 4-BIT BINALY COUNTER

The TC74HC4518A and TC74HC4520A are high speed CMOS DUAL BCD/4-BIT BINARY COUNTER fabricated with silicon gate C^2MOS technology.

They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

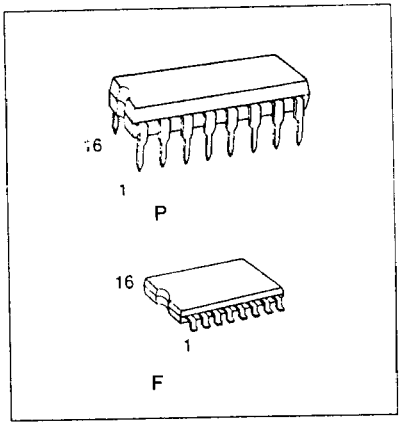
Since the TC74HC4518A and the TC74HC4520A each contain two independent counter circuits in one package, counting or frequency division of two BCD digits or eight binary bits can be achieved with one device. The counters are reset to "O" (Q0~Q3 low) by setting the CLEAR input high regardless of the other inputs.

Counting occurs on the positive going (rising edge) transition of CLOCK if CE is high or the negative going (falling edge) transition of CLOCK if CE is low.

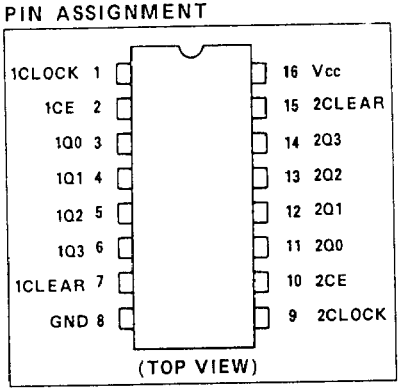
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

- High Speed ····· f_{MAX}=55MHz(Typ.)at V_{CC}=5V
- Low Power Dissipation ····· I_{CC}=4μA(Max.)at Ta=25℃
- High Noise Immunity ····· $V_{NIH}=V_{NIL}$=28% V_{CC}(Min.)
- Output Drive Capability ····· 10 LSTTL Loads
- Symmetrical Output Impedance ··· $|I_{OH}|=I_{OL}$=4mA(Min.)
- Balanced Propagation Delays ····· $t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range ··· V_{CC}(opr)=2V~6V
- Pin and Function Compatible with 4518B/4520B

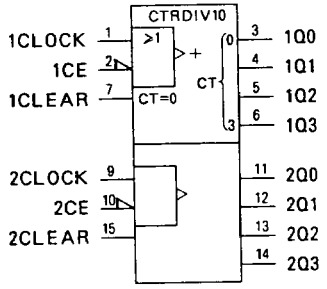


PIN ASSIGNMENT

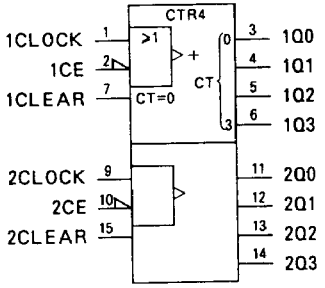


IEC LOGIC SYMBOL

TC74HC4518A



TC74HC4520A



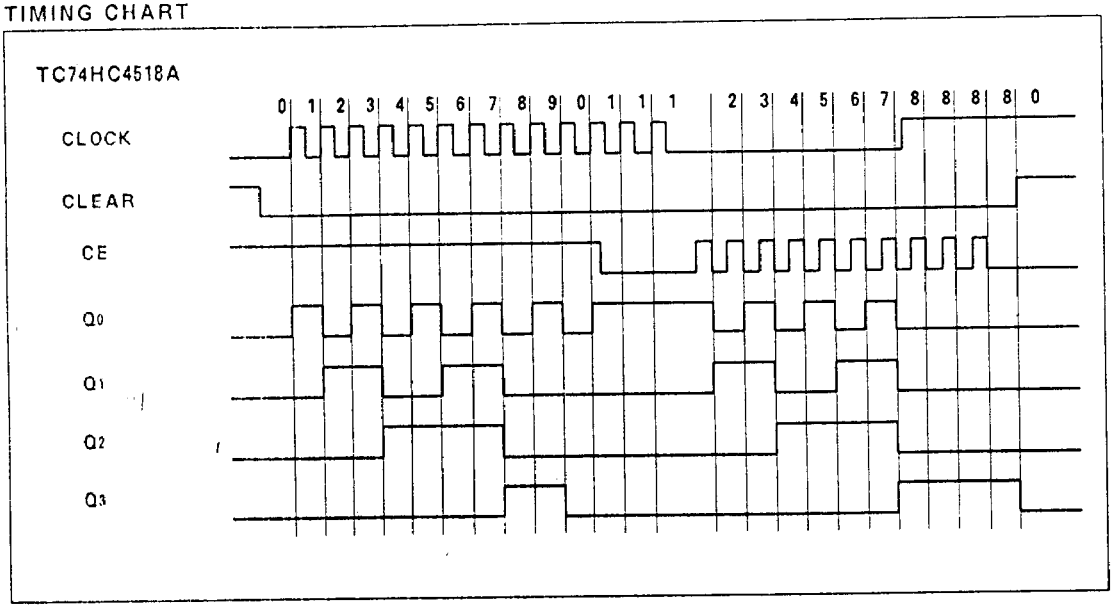
TRUTH TABLE

INPUT			FUNCTION
CLOCK	CE	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

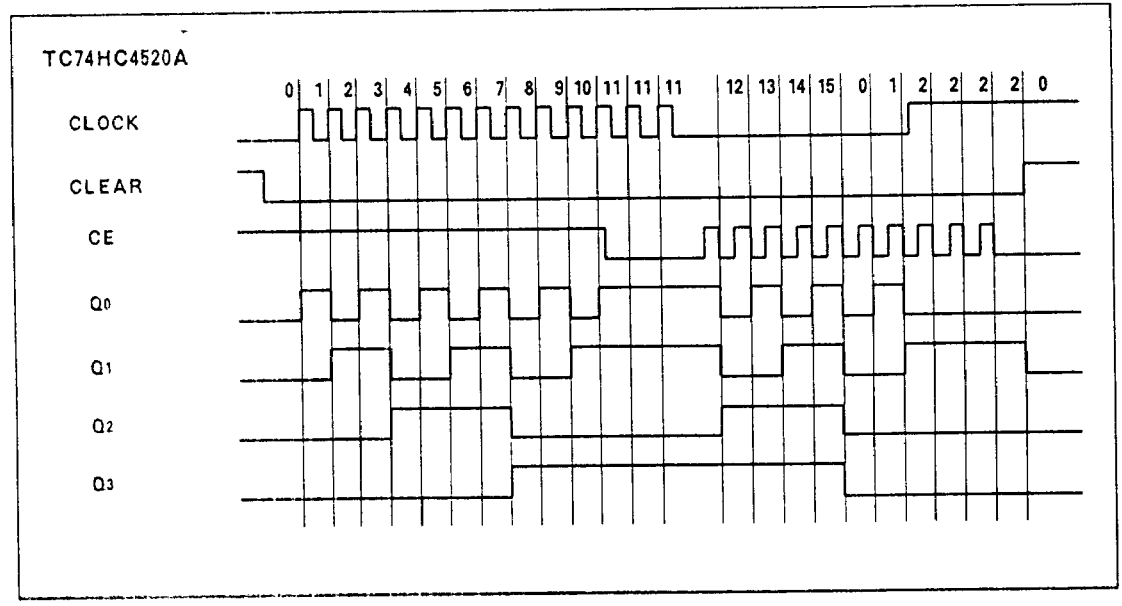
X:Don't Care

TIMING CHART

TC74HC4518A

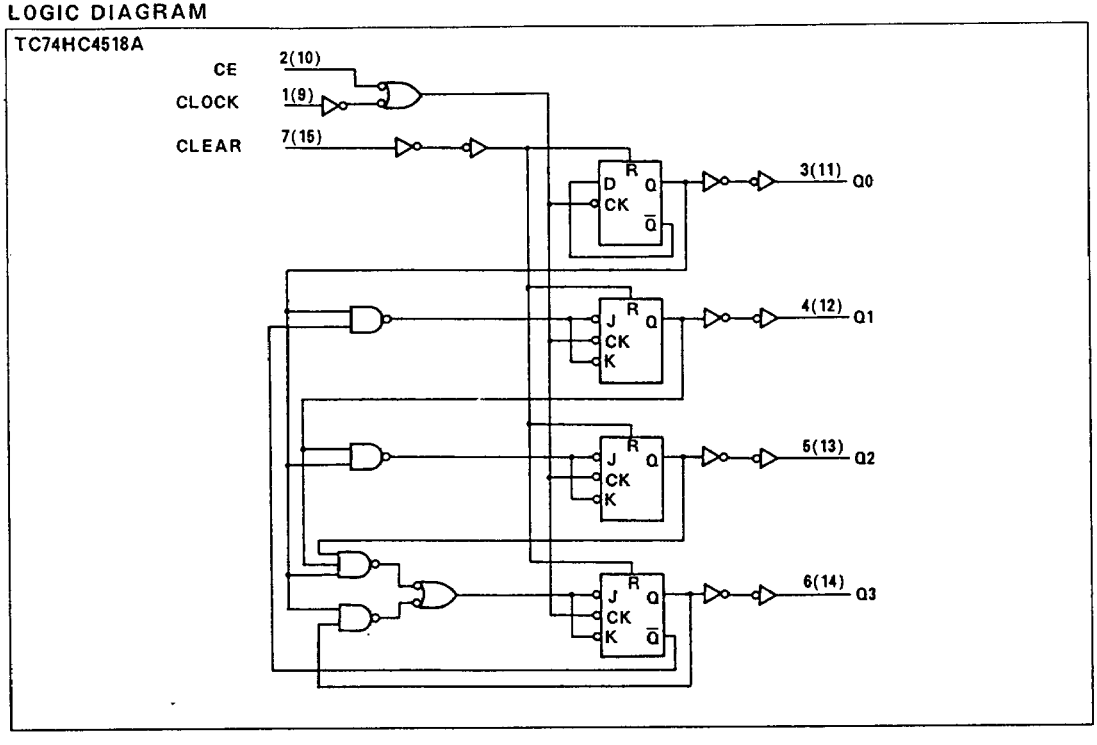


TC74HC4520A

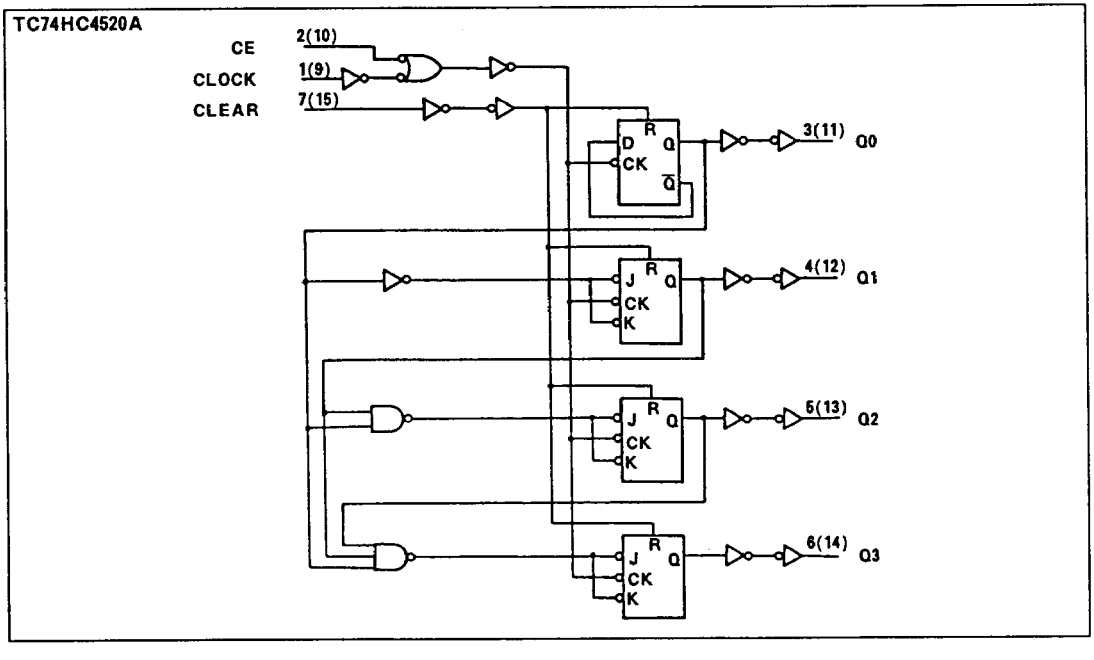


LOGIC DIAGRAM

TC74HC4518A



TC74HC4520A



ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7$	V
DC Input Voltage	V_{IN}	$-0.5 \sim V_{CC}+0.5$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC}+0.5$	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(SOIC)	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	℃
Lead Temperature 10sec	T_L	300	℃

*500mW in the range of Ta= −40℃～ 65℃. From Ta=65℃ to 85℃ a derating factor of −10mW/℃ shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

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

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta=25℃ MIN.	Ta=25℃ TYP.	Ta=25℃ MAX.	Ta=−40～85℃ MIN.	Ta=−40～85℃ MAX.	UNIT
High-Level Input Voltage	V_{IH}			2.0	1.5	−	−	1.5	−	V
				4.5	3.15	−	−	3.15	−	
				6.0	4.2	−	−	4.2	−	
Low-Level Input Voltage	V_{IL}			2.0	−	−	0.5	−	0.5	V
				4.5	−	−	1.35	−	1.35	
				6.0	−	−	1.8	−	1.8	
High-Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20 μA	2.0	1.9	2.0	−	1.9	−	V
				4.5	4.4	4.5	−	4.4	−	
				6.0	5.9	6.0	−	5.9	−	
			I_{OH} = −4 mA	4.5	4.18	4.31	−	4.13	−	
			I_{OH} = −5.2mA	6.0	5.68	5.80	−	5.63	−	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	2.0	−	0.0	0.1	−	0.1	V
				4.5	−	0.0	0.1	−	0.1	
				6.0	−	0.0	0.1	−	0.1	
			I_{OL} = 4 mA	4.5	−	0.17	0.26	−	0.33	
			I_{OL} = 5.2mA	6.0	−	0.18	0.26	−	0.33	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	−	−	±0.1	−	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	−	−	4.0	−	40.0	

TIMING REQUIREMENTS(Input $t_r=t_f=6ns$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25℃ TYP.	Ta=25℃ LIMIT	Ta=−40 ~85℃ LIMIT	UNIT
Minimum Pulse Width (CK, CE)	$t_{W(H)}$ $t_{W(L)}$		2.0	−	75	95	ns
			4.5	−	15	19	
			6.0	−	13	16	
Minimum Pulse Width (CLEAR)	$t_{W(H)}$		2.0	−	75	95	
			4.5	−	15	19	
			6.0	−	13	16	
Minimum Removal Time	t_{rem}		2.0	−	50	60	
			4.5	−	10	12	
			6.0	−	9	11	
Clock Frequency	f		2.0	−	6	4	MHz
			4.5	−	30	24	
			6.0	−	35	28	

AC ELECTRICAL CHARACTERISTICS(C_L =15pF, V_{CC}=5V, Ta=25℃)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		−	4	8	ns
Propagation Delay Time (CK, CE−Qn)	t_{pLH} t_{pHL}		−	17	27	
Propagation Delay Time (CLEAR−Qn)	t_{pHL}		−	15	25	
Maximum Clock Frequency	f_{MAX}		33	55	−	MHz

AC ELECTRICAL CHARACTERISTICS(C_L=50pF, Input $t_r=t_f$=6ns)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25℃ MIN.	Ta=25℃ TYP.	Ta=25℃ MAX.	Ta=−40 ~85℃ MIN.	Ta=−40 ~85℃ MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		2.0	−	30	75	−	95	ns
			4.5	−	8	15	−	19	
			6.0	−	7	13	−	16	
Propagation Delay Time (CK, CE−Qn)	t_{pLH} t_{pHL}		2.0	−	72	160	−	200	
			4.5	−	22	32	−	40	
			6.0	−	18	27	−	34	
Propagation Delay Time (CLEAR−Qn)	t_{pHL}		2.0	−	65	150	−	190	
			4.5	−	20	30	−	38	
			6.0	−	16	26	−	33	
Maximum Clock Frequency	f_{MAX}		2.0	6	23	−	4	−	MHz
			4.5	30	51	−	24	−	
			6.0	35	60	−	28	−	
Input Capacitance	C_{IN}			−	5	10	−	10	pF
Power Dissipation Capacitance	C_{PD}(1)	TC74HC4518A		−	38	−	−	−	
		TC74HC4520A		−	32	−	−	−	

Note(1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:

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