TC74HC7292P
TC74HC7294P

T-45-23-33

TC74HC7292P PROGRAMMABLE DIVIDER/TIMER
TC74HC7294P PROGRAMMABLE DIVIDER/TIMER

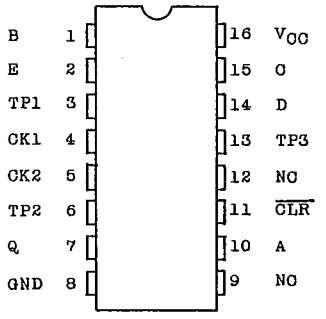
The TC74HC7292 and TC74HC7294 are high speed CMOS PROGRAMMABLE DIVIDER/TIMER fabricated with silicon C^2MOS technology.
They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
These devices are programmable frequency divider. Both types have two clock inputs, either one may be used for clock gating. (See the function table (1)).
The TC74HC7292 can divide from 2^2 to 2^{31}, and the TC74HC7294 can divide from 2^2 to 2^{15}.
Both types feature an active-low clear input to initialize the state of all flip-flops.
To facilitate incoming inspection, test points are provided. (TP1, TP2 and TP3 on the 74HC7292 and TP on the 74HC7294).
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

- High Speed ..... f_{MAX} = 50MHz [7292], 60MHz [7294] (Typ.) at V_{CC}=5V
- Low Power Dissipation ..... I_{CC}=4μA(Max.) at Ta=25°C
- High Noise Immunity ..... $V_{NIH}=V_{NIL}$=28% V_{CC}(Min.)
- Output Drive Capability ..... 10 LSTTL Loads
- Summetrical 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 74LS292/294

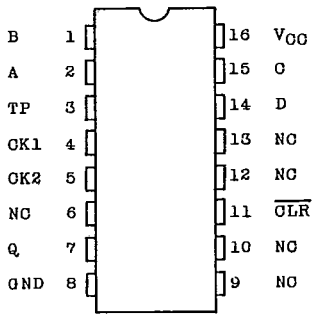
PIN ASSIGNMENT

TC74HC7292



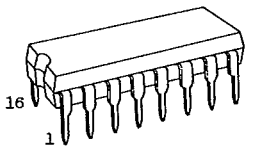
(TOP VIEW)

TC74HC7294



(TOP VIEW)

NC: NO CONNECTION



DIP16(3D16A-P)

TC74HC7292P
TC74HC7294P

T-45-23-33

TRUTH TABLE

$\overline{\text{CLEAR}}$	CLOCK1	CLOCK2	Q OUTPUT MODE
L	X	X	Cleared to L
H	↓	L	UP Count
H	L	↓	
H	H	X	NO Change
H	X	H	

TC74HC7292

PROGRAMMING INPUTS					FREQUENCY DIVISION							
					Q		TP1		TP2		TP2	
E	D	C	B	A	BINARY	DECIMAL	BINARY	DECIMAL	BINARY	DECIMAL	BINARY	DECIMAL
L	L	L	L	L	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	L	H	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	H	L	2^2	4	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	L	H	H	2^3	8	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	L	L	2^4	16	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	L	H	2^5	32	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	H	L	2^6	64	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	H	H	2^7	128	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	H	L	L	L	2^8	256	2^9	512	2^{17}	131,072	2^2	4
L	H	L	L	H	2^9	512	2^9	512	2^{17}	131,072	2^2	4
L	H	L	H	L	2^{10}	1,024	2^9	512	2^{17}	131,072	2^4	16
L	H	L	H	H	2^{11}	2,048	2^9	512	2^{17}	131,072	2^4	16
L	H	H	L	L	2^{12}	4,096	2^9	512	2^{17}	131,072	2^6	64
L	H	H	L	H	2^{13}	8,192	2^9	512	2^{17}	131,072	2^6	64
L	H	H	H	L	2^{14}	16,384	2^9	512	Disabled Low		2^8	256
L	H	H	H	H	2^{15}	32,768	2^9	512	Disabled Low		2^8	256
H	L	L	L	L	2^{16}	65,536	2^9	512	2^3	8	2^{10}	1,024
H	L	L	L	H	2^{17}	131,072	2^9	512	2^3	8	2^{10}	1,024
H	L	L	H	L	2^{18}	262,144	2^9	512	2^5	32	2^{12}	4,096
H	L	L	H	H	2^{19}	524,288	2^9	512	2^5	32	2^{12}	4,096
H	L	H	L	L	2^{20}	1,048,576	2^9	512	2^7	128	2^{14}	16,384
H	L	H	L	H	2^{21}	2,097,152	2^9	512	2^7	128	2^{14}	16,384
H	L	H	H	L	2^{22}	4,194,304	Disabled Low		2^9	512	2^{16}	65,536
H	L	H	H	H	2^{23}	8,388,608	Disabled Low		2^9	512	2^{16}	65,536
H	H	L	L	L	2^{24}	16,777,216	2^3	8	2^{11}	2,048	2^{18}	262,144
H	H	L	L	H	2^{25}	33,554,432	2^3	8	2^{11}	2,048	2^{18}	262,144
H	H	L	H	L	2^{26}	67,108,864	2^5	32	2^{13}	8,192	2^{20}	1,048,576
H	H	L	H	H	2^{27}	134,217,728	2^5	32	2^{13}	8,192	2^{20}	1,048,576
H	H	H	L	L	2^{28}	268,435,456	2^7	128	2^{15}	32,768	2^{22}	4,194,304
H	H	H	L	H	2^{29}	536,870,912	2^7	128	2^{15}	32,768	2^{22}	4,194,304
H	H	H	H	L	2^{30}	1,073,741,824	2^9	512	2^{17}	131,072	2^{24}	16,777,216
H	H	H	H	H	2^{31}	2,147,483,648	2^9	512	2^{17}	131,072	2^{24}	16,777,216

T-45-23-33

TRUTH TABLE

TC74HC7294

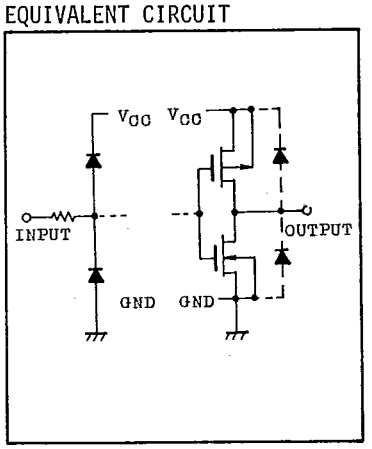
PROGRAMMING INPUTS				FREQUENCY DIVISION			
				Q		TP	
D	C	B	A	BINARY	DECIMAL	BINARY	DECIMAL
L	L	L	L	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	H	Inhibit	Inhibit	Inhibit	Inhibit
L	L	H	L	2^2	4	2^9	512
L	L	H	H	2^3	8	2^9	512
L	H	L	L	2^4	16	2^9	512
L	H	L	H	2^5	32	2^9	512
L	H	H	L	2^6	64	2^9	512
L	H	H	H	2^7	128	Disabled Low	
H	L	L	L	2^8	256	2^2	4
H	L	L	H	2^9	512	2^3	8
H	L	H	L	2^{10}	1,024	2^4	16
H	L	H	H	2^{11}	2,048	2^5	32
H	H	L	L	2^{12}	4,096	2^6	64
H	H	L	H	2^{13}	8,192	2^7	128
H	H	H	L	2^{14}	16,384	2^8	256
H	H	H	H	2^{15}	32,768	2^9	512

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*	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	°C
Lead Temperature 10sec	T_L	300	°C

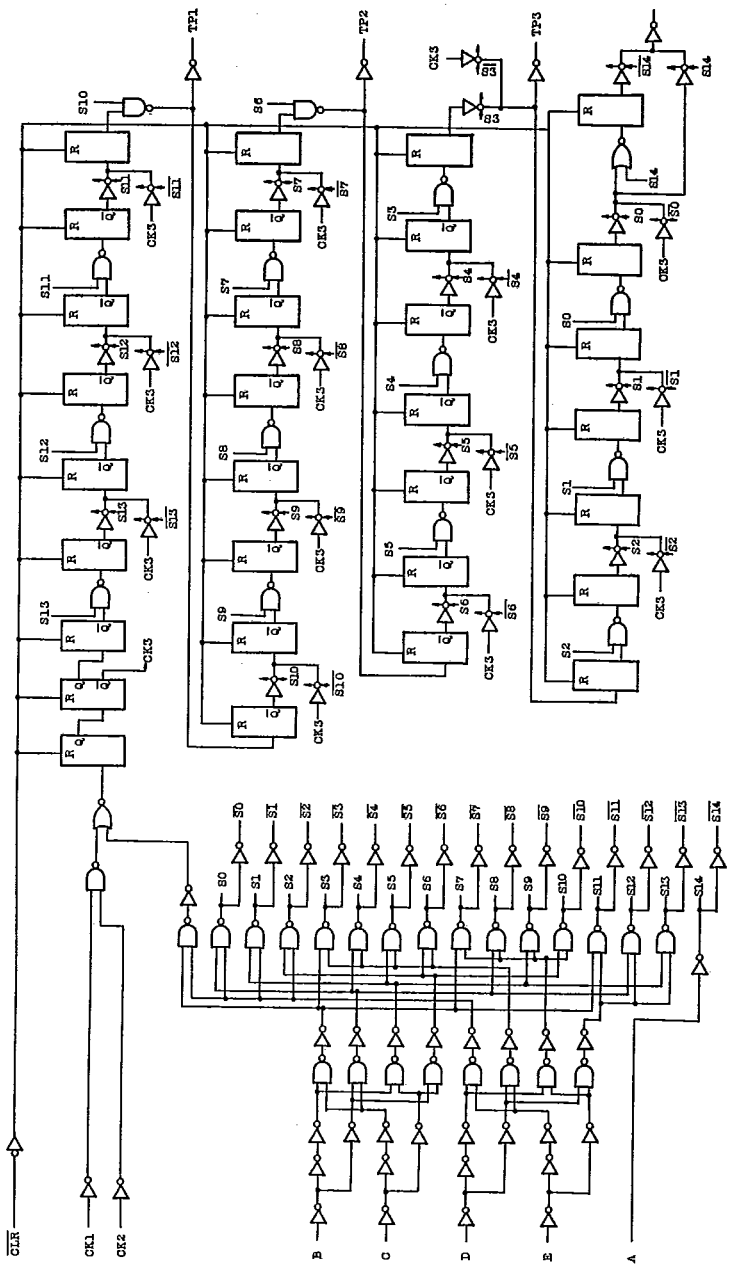
* 500mW in the range of Ta=-40°C ∿ 65°C and from Ta=65°C up to 85°C derating factor of -10mW/°C shall be applied until 300mW.

INPUT and OUTPUT EQUIVALENT CIRCUIT



LOGIC DIAGRAM

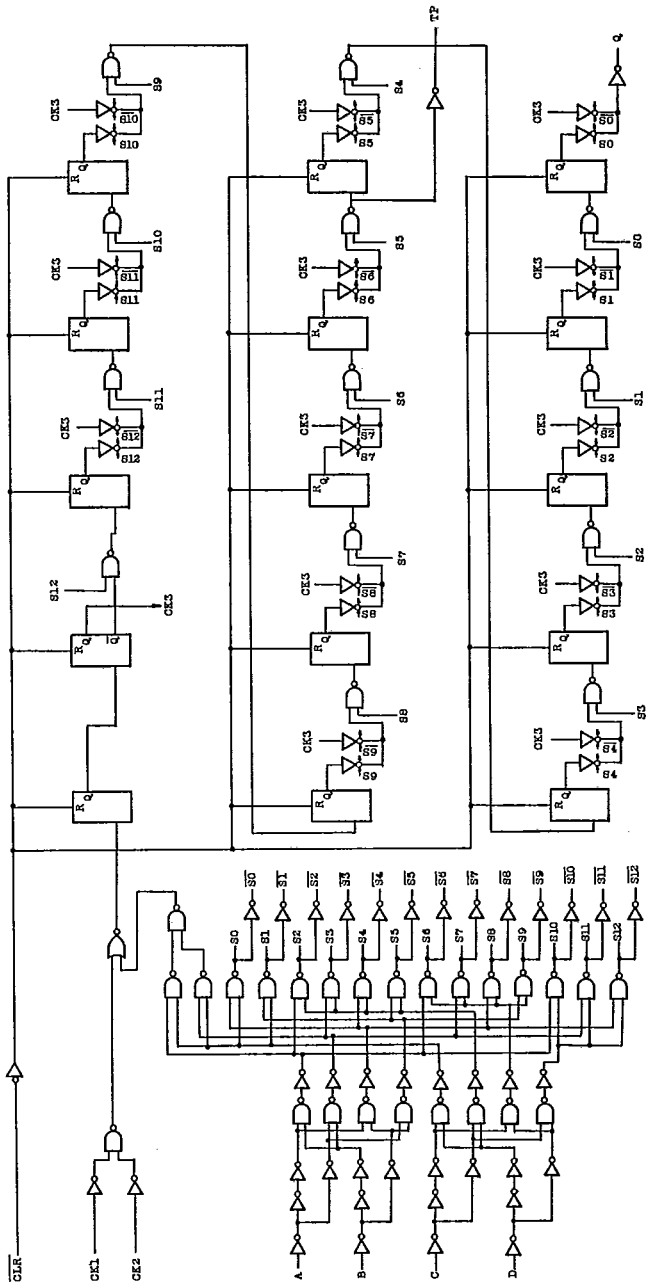
TC74HC7292



T-45-23-33

LOGIC DIAGRAM

TC74HC7294



RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	V_{CC}	2 ∿ 6	V
Input Voltage	V_{IN}	0 ∿ V_{CC}	
Output Voltage	V_{OUT}	0 ∿ V_{CC}	
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

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40∿85°C MIN.	Ta=-40∿85°C 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	
				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}=-20μA	2.0	1.9	2.0	-	1.9	-	
				4.5	4.4	4.5	-	4.4	-	
				6.0	5.9	6.0	-	5.9	-	
			I_{OH}=-4mA	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}=20μA	2.0	-	0.0	0.1	-	0.1	
				4.5	-	0.0	0.1	-	0.1	
				6.0	-	0.0	0.1	-	0.1	
			I_{OL}=4mA	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	

TC74HC7292P
TC74HC7294P

T-45-23-33

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

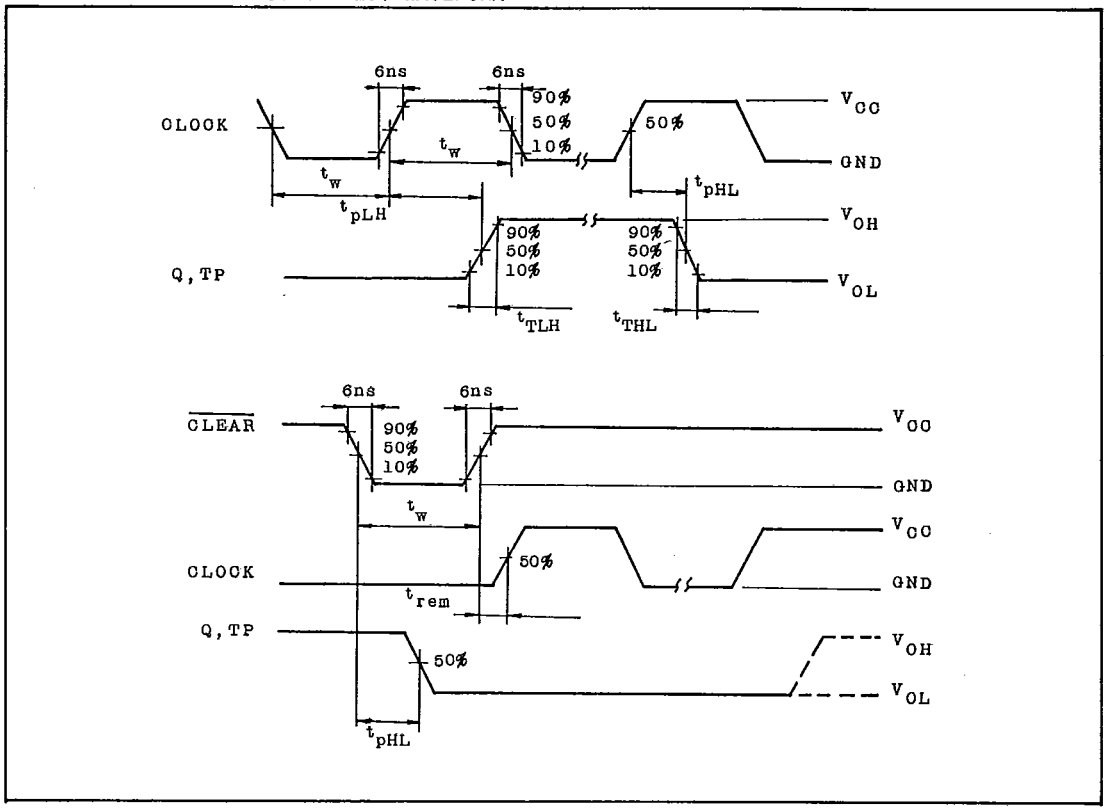
PARAMETER	SYMBOL	TEST CONDITION	Vcc	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40~85°C MIN.	Ta=-40~85°C MAX.	UNIT
Output Transition Time (Q)	t_{TLH} t_{THL}		2.0	-	30	75	-	95	ns
			4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Output Transition Time (TP)	t_{TLH} t_{THL}		2.0	-	132	255	-	320	
			4.5	-	33	51	-	64	
			6.0	-	28	43	-	54	
Propagation Delay Time (CLOCK - Q) *	t_{pLH} t_{pHL}	B="H" A=C=D=E="L"	2.0	-	264	500	-	625	
			4.5	-	66	100	-	125	
			6.0	-	56	85	-	106	
Propagation Delay Time (CLOCK - Q) **	t_{pLH} t_{pHL}	B="H" A=C=D="L"	2.0	-	236	455	-	570	
			4.5	-	59	91	-	114	
			6.0	-	50	77	-	97	
Propagation Delay Time ($\overline{CLEAR}$ - Q) *	t_{pHL}		2.0	-	224	425	-	530	
			4.5	-	56	85	-	106	
			6.0	-	48	72	-	90	
Propagation Delay Time ($\overline{CLEAR}$ - Q) **	t_{pHL}		2.0	-	204	390	-	490	
			4.5	-	51	78	-	98	
			6.0	-	43	66	-	83	
Maximum Clock Frequency *	f_{MAX}		2.0	6	12	-	5	-	MHz
			4.5	32	48	-	26	-	
			6.0	38	56	-	31	-	
Maximum Clock Frequency **	f_{MAX}		2.0	7	14	-	6	-	ns
			4.5	32	55	-	30	-	
			6.0	44	65	-	35	-	
Minimum Pulse Width (CLOCK)	$t_{w(H)}$ $t_{w(L)}$		2.0	-	36	100	-	125	
			4.5	-	9	20	-	25	
			6.0	-	8	17	-	21	
Minimum Pulse Width ($\overline{CLEAR}$) *	$t_{w(L)}$		2.0	-	60	150	-	190	
			4.5	-	15	30	-	38	
			6.0	-	13	26	-	32	
Minimum Pulse Width ($\overline{CLEAR}$) **	$t_{w(L)}$		2.0	-	72	175	-	220	
			4.5	-	18	35	-	44	
			6.0	-	15	30	-	37	
Minimum Removal Time ($\overline{CLEAR}$)	t_{rem}		2.0	-	-	5	-	5	
			4.5	-	-	5	-	5	
			6.0	-	-	5	-	5	
Input Capacitance	C_{IN}			-	5	10	-	10	pF
Power Dissipation Capacitance	C_{PD}(1)	74HC7292		-	22	-	-	-	
		74HC7294		-	23	-	-	-	

Note(1): C_{PD} 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.

$$I_{CC}(Opr.) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

(2): * ; for TC74HC7292
**; for TC74HC7294

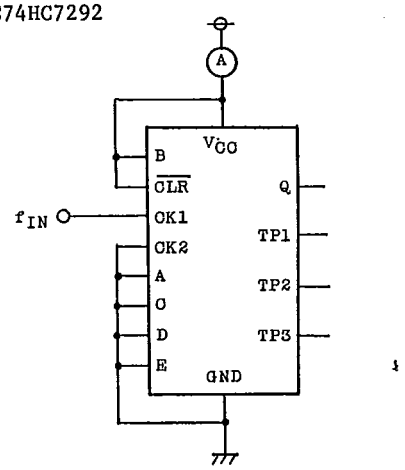
SWITCHING CHARACTERISTICS TEST WAVEFORM



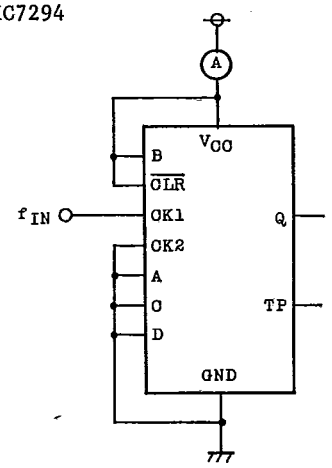
T-45-23-33

I_{CC}(Opr.) TEST CIRCUIT

TC74HC7292



TC74HC7294



* Input transition time is the same as that in case of switching characteristics test.