Features:

- **High Speed:** f_{MAX} = 180MHz (typ.) at V_{CC} = 5V
- **Low Power Dissipation:** I_{CC} = 8μA (max.) at Ta = 25°C
- **High Noise Immunity:** $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min.)
- **Symmetrical Output Impedance:** $|I_{OH}| = I_{OL}$ = 24mA (min.). Capability of driving 50Ω transmission lines.
- **Balanced Propagation Delays:** $t_{pLH} = t_{pHL}$
- **Wide Operating Voltage Range:** V_{CC} (opr.) = 2V~5.5V
- **Pin and Function Compatible with 74HC393**
- **Available in 14-pin DIP and 150 mil SOIC**

The TC74AC393 is an advanced high speed CMOS DUAL BINARY COUNTER fabricated with silicon gate and double-layer metal wiring C^2MOS technology.

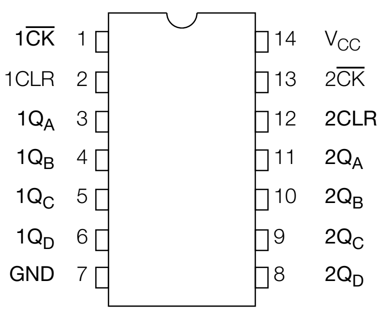
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL, while maintaining the CMOS low power dissipation.

It contains two independent counter circuits in one package, so that counting or frequency division of eight binary bits can be achieved with one IC.

This device changes state on the negative going transition of the CLOCK pulse. The counter can be reset to "Ø" (Q0~Q3="L") by a high at the CLEAR input regardless of other inputs.

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

Pin Assignment

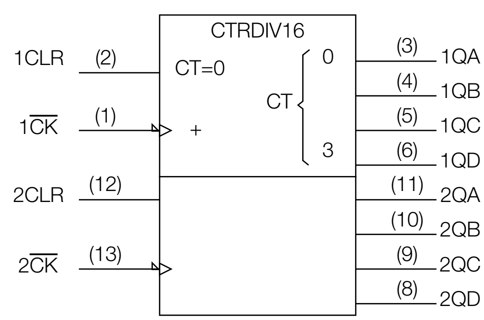


Truth Table

INPUTS		OUTPUTS			
CK	CLR	QA	QB	QC	QD
X	H	L	L	L	L
↓	L	COUNT UP			
↑	L	NO CHANGE			

X: Don't Care

IEC Logic Symbol



Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	-0.5~7.0	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}	±50	mA
DC Output Current	I_{OUT}	±50	mA
DC V_{CC}/Ground Current	I_{CC}	±200	mA
Power Dissipation	P_D	500 (DIP) */180 (SOP)	mW
Storage Temperature	T_{stg}	-65~150	°C
Lead Temperature 10sec	T_L	300	°C

* 500mW in the range of Ta = -40°C~65°C. From Ta = 65°C to 85°C a derating factor of -10mW/°C should be applied up to 300mW.

Recommended Operating Conditions

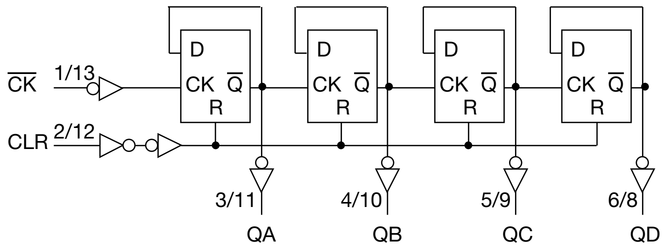
PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~V_{CC}	V
Output Voltage	V_{OUT}	0~V_{CC}	V
Operating Temperature	T_{opr}	-40~85	°C
Input Rise and Fall Time	dt/dv	0~100 (V_{CC} = 3.3±0.3V) 0~20 (V_{CC} = 5±0.5V)	ns/v

DC Electrical Characteristics

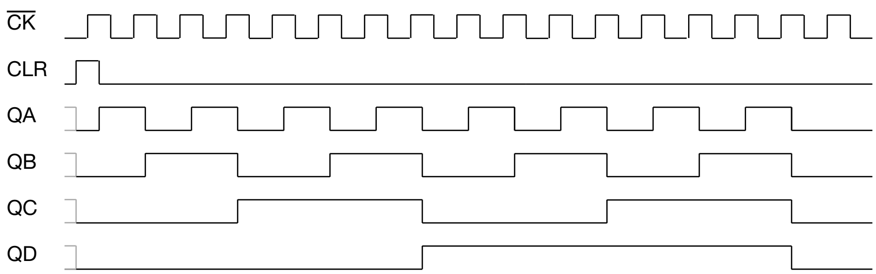
PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta = 25°C Min.	Ta = 25°C Typ.	Ta = 25°C Max.	Ta = -40~85°C Min.	Ta = -40~85°C Max.	UNIT
High-Level Input Voltage	V_{IH}	—		2.0	1.50	—	—	1.50	—	V
				3.0	2.10	—	—	2.10	—	
				5.5	3.85	—	—	3.85	—	
Low-Level Input Voltage	V_{IL}	—		2.0	—	—	0.50	—	0.50	V
				3.0	—	—	0.90	—	0.90	
				5.5	—	—	1.65	—	1.65	
High-Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = -50μA	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			I_{OH} = -4mA	3.0	2.58	—	—	2.48	—	
			I_{OH} = -24mA	4.5	3.94	—	—	3.80	—	
			I_{OH} = -75mA*	5.5	—	—	—	3.85	—	
Low-Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I_{OL} =12mA	3.0	—	—	0.36	—	0.44	
			I_{OL} = 24mA	4.5	—	—	0.36	—	0.44	
			I_{OL} = 75mA*	5.5	—	—	—	—	1.65	
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	8.0	—	80.0	

* This spec indicates the capability of driving 50Ω transmission lines.
One output should be tested at a time for a 10ms maximum duration.

System Diagram



Timing Chart



Timing Requirements (Input $t_r = t_f = 3n$)

PARAMETER	SYMBOL	TEST CONDITION	V_{CC}	Ta=25˚C Typ.	Ta=25˚C Max.	Ta= –40~85˚ Max.	UNIT
Minimum Pulse Width ($\overline{CK}$)	$t_{W(H)}$ $t_{W(L)}$	—	3.0±0.3	—	7.0	7.0	ns
			5.0±0.5	—	5.0	5.0	
Minimum Pulse Width (CLR)	$t_{W(H)}$	—	3.0±0.3	—	7.0	7.0	
			5.0±0.5	—	5.0	5.0	
Minimum Removal Time	t_{rem}	—	3.0±0.3	—	6.0	6.0	
			5.0±0.5	—	3.0	3.0	

AC Electrical Characteristics (C_L = 50pF, R_L = 500Ω, Input $t_r = t_f$ = 3ns)

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
Propagation Delay Time ($\overline{CK}$–QA)	t_{pLH} t_{pHL}	—	3.0±0.3	—	8.0	13.2	1.0	15.0	ns
			5.0±0.5	—	5.0	8.3	1.0	9.5	
Propagation Delay Time ($\overline{CK}$–QB)	t_{pLH} t_{pHL}	—	3.0±0.3	—	10.1	16.7	1.0	19.0	
			5.0±0.5	—	5.9	10.5	1.0	12.0	
Propagation Delay Time ($\overline{CK}$–QC)	t_{pLH} t_{pHL}	—	3.0±0.3	—	12.0	20.2	1.0	23.0	
			5.0±0.5	—	6.8	12.3	1.0	14.0	
Propagation Delay Time ($\overline{CK}$–QD)	t_{pLH} t_{pHL}	—	3.0±0.3	—	13.0	23.0	1.0	26.0	
			5.0±0.5	—	7.5	13.2	1.0	15.0	
Propagation Delay Time (CLR–Qn)	t_{pHL}	—	3.0±0.3	—	8.0	13.2	1.0	15.0	
			5.0±0.5	—	5.1	8.8	1.0	10.0	
Maximum Clock Frequency	f_{MAX}	—	3.0±0.3	65	125	—	65	—	MHz
			5.0±0.5	100	160	—	100	—	
Input Capacitance	C_{IN}	—	—	—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD}[1]	—	—	—	36	—	—	—	

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: $I_{CC\ (opr)} = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC} / 2$ (per Counter).