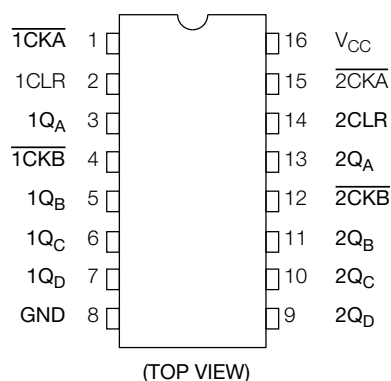


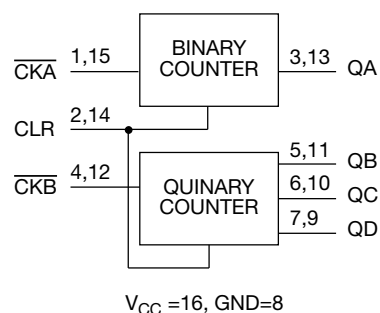
Features:

- **High Speed:** $f_{MAX} = 160\text{MHz}$ (typ.) at $V_{CC} = 5\text{V}$
- **Low Power Dissipation:** $I_{CC} = 8\mu\text{A}$ (max.) at $T_a = 25^\circ\text{C}$
- **High Noise Immunity:** $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min.)
- **Symmetrical Output Impedance:** $I_{OH} = I_{OL} = 24\text{mA}$ (min.). Capability of driving 50Ω transmission lines.
- **Balanced Propagation Delays:** $t_{pLH} = t_{pHL}$
- **Wide Operating Voltage Range:** V_{CC} (opr.) = $2\text{V} \sim 5.5\text{V}$
- **Pin and Function Compatible with 74HC390**
- **Available in 16-pin DIP and 150 mil SOIC**

Pin Assignment



Block Diagram



The TC74AC390 is an advanced high speed CMOS DUAL DECADE COUNTER fabricated with silicon gate and double-layer metal wiring C^2 MOS technology.

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

It consists of two independent 4-bit counters, each composed of a divide-by-two and a divide-by-five counter. The divide-by-two counter is incremented on the negative going transition of clock A ($\overline{CKA}$). The divide-by-five counter is incremented on the negative going transition of clock B ($\overline{CKB}$). The counter can be cascaded to form decade, bi-quinary, or various combinations up to a divide-by-100 counter. When the CLEAR input is set high, the Q outputs are set to low independent of the clock inputs.

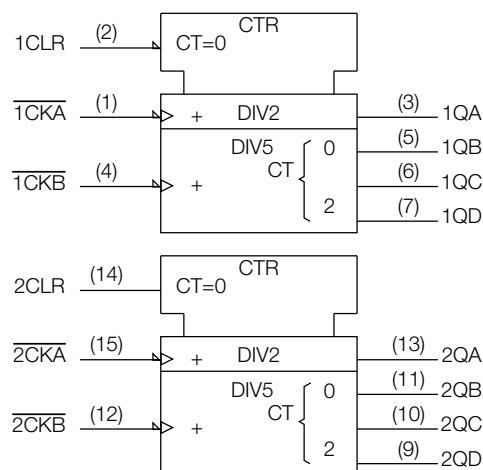
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Truth Table

INPUTS			OUTPUTS			
$\overline{CKA}$	$\overline{CKB}$	CLR	QA	QB	QC	QD
X	X	H	L	L	L	L
$\downarrow$	X	L	BINARY COUNT UP			
X	$\downarrow$	L	QUINARY COUNT UP			

X: Don't Care

IEC Logic Symbol



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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 $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$.
From $T_a = 65^{\circ}\text{C}$ to 85°C a derating factor of
-10mW/°C should be applied up to 300mW.

Recommended Operating Conditions

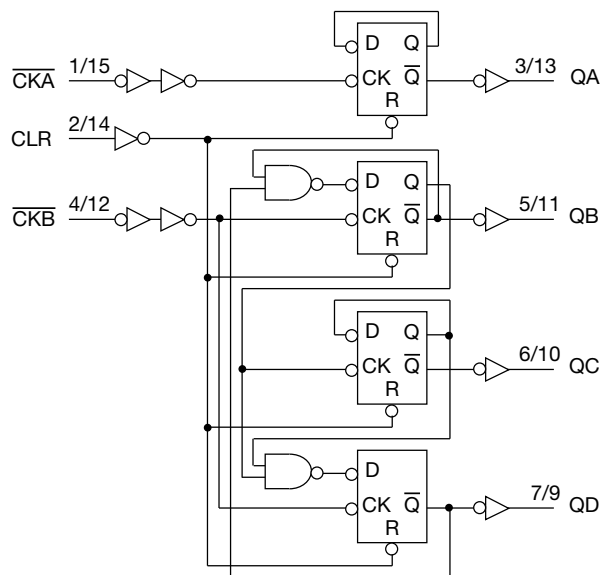
PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~ V_{CC}	V
Output Voltage	V_{OUT}	0~ V_{CC}	V
Operating Temperature	T_{opr}	-40~85	°C
Input Rise and Fall Time	dt/dv	0~100 ($V_{CC} = 3.3 \pm 0.3\text{V}$) 0~20 ($V_{CC} = 5 \pm 0.5\text{V}$)	ns/v

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	VIH	—		2.0	1.50	—	—	1.50	—	V
				3.0	2.10	—	—	2.10	—	
				5.5	3.85	—	—	3.85	—	
Low-Level Input Voltage	VIL	—		2.0	—	—	0.50	—	0.50	V
				3.0	—	—	0.90	—	0.90	
				5.5	—	—	1.65	—	1.65	
High-Level Output Voltage	VOH	VIN = VIH or VIL	IOH = -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	—	
			IOH = -4mA	3.0	2.58	—	—	2.48	—	
			IOH = -24mA	4.5	3.94	—	—	3.80	—	
			IOH = -75mA*	5.5	—	—	—	3.85	—	
Low-Level Output Voltage	VOL	VIN = VIH or VIL	IOL = 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	
			IOL =12mA	3.0	—	—	0.36	—	0.44	
			IOL = 24mA	4.5	—	—	0.36	—	0.44	
			IOL = 75mA*	5.5	—	—	—	—	1.65	
Input Leakage Current	IIN	VIN = VCC or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	ICC	VIN = VCC or GND		5.5	—	—	8.0	—	80.0	

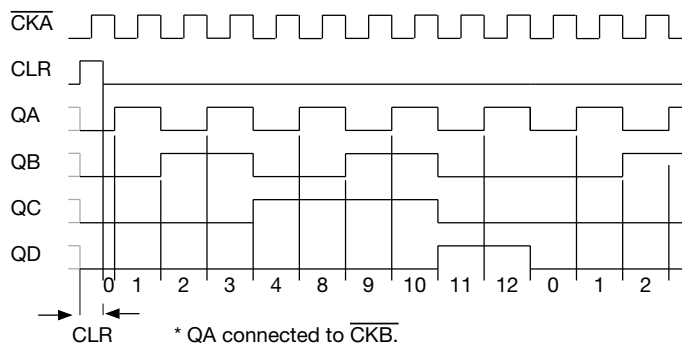
* This spec indicates the capability of driving 50Ω transmission lines.
One output should be tested at a time for a 10ms maximum duration.

System Diagram

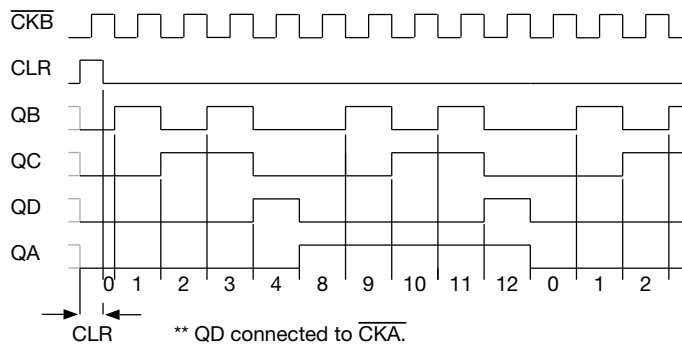


Timing Chart

(1) BCD COUNT SEQUENCE*



(2) BI-QUINARY COUNT SEQUENCE**



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

PARAMETER	SYMBOL	TEST CONDITION	Ta=25°C		Ta= -40~85°		UNIT
			V _{CC}	Typ.	Max.	Max.	
Minimum Pulse Width (CLOCK)	$t_{W(H)}$	—	3.0±0.3	—	7.0	7.0	ns
	$t_{W(L)}$		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	—	7.0	7.0	
			5.0±0.5	—	3.5	3.5	

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

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C				Ta = -40~85°C		UNIT
			V _{CC}	Min.	Typ.	Max.	Min.	Max.	
Propagation Delay Time (CKA-QA)	t _{pLH}	—	3.0±0.3	—	8.2	14.0	1.0	16.0	ns
	t _{pHL}		5.0±0.5	—	5.5	8.4	1.0	9.6	
Propagation Delay Time (CKA-QC)	t _{pLH}	QA connected to $\overline{CKB}$	3.0±0.3	—	17.0	30.0	1.0	34.0	
	t _{pHL}		5.0±0.5	—	10.5	17.5	1.0	20.0	
Propagation Delay Time (CKB-QB, QD)	t _{pLH}	—	3.0±0.3	—	8.8	14.9	1.0	17.0	
	t _{pHL}		5.0±0.5	—	6.0	9.4	1.0	10.7	
Propagation Delay Time (CKB-QC)	t _{pLH}	—	3.0±0.3	—	11.0	18.8	1.0	21.5	
	t _{pHL}		5.0±0.5	—	7.1	11.3	1.0	12.8	
Propagation Delay Time (CKA-Qn)	t _{pHL}	—	3.0±0.3	—	7.7	12.5	1.0	14.3	
			5.0±0.5	—	5.7	8.5	1.0	9.7	
Maximum Clock Frequency (CKA)	f _{MAX}	—	3.0±0.3	60	120	—	60	—	MHz
			5.0±0.5	100	180	—	100	—	
Maximum Clock Frequency (CKB)	f _{MAX}	—	3.0±0.3	45	90	—	45	—	
			5.0±0.5	90	140	—	90	—	
Input Capacitance	C _{IN}	—	—	—	5	10	—	10	pF
Power Dissipation Capacitance	C _{PD} ¹	—	—	—	40	—	—	—	

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