

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74HC4017AP, TC74HC4017AF

DECADE COUNTER / DIVIDER

The TC74HC4017A is a high speed CMOS DECADE JOHNSON COUNTER fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

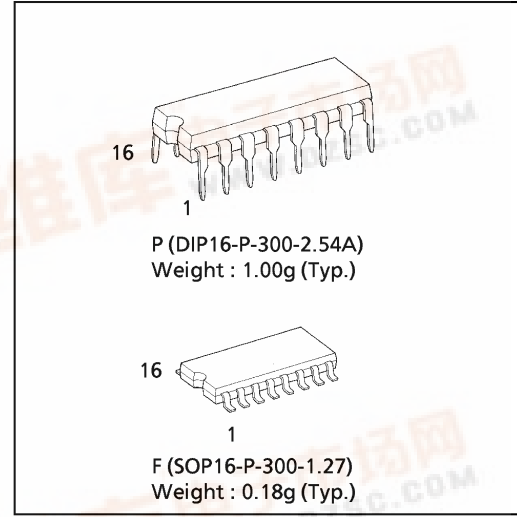
It contains 5 - stage divided - by - 10 Johnson counter with 10 decoded output (Q0 - Q9) and carry - out bit.

This counter is advanced on the positive edge of clock signal when clock enable signal (\overline{CE}) input is held low, or it is advanced on the negative edge of the \overline{CE} when CK input is held high, and selected one of ten outputs goes high. Holding high the CLR input, this counter is cleared to its zero state without regard to the other input conditions.

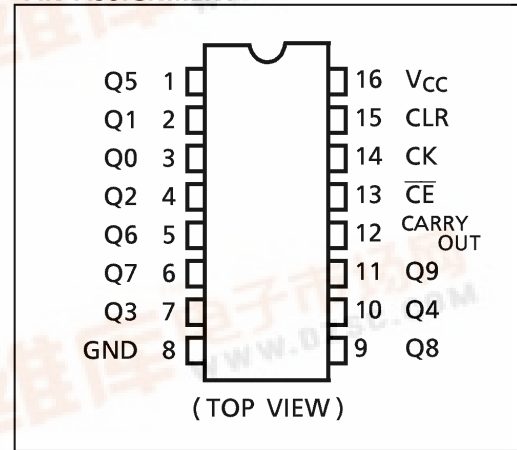
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES :

- High Speed..... $f_{MAX} = 87\text{MHz}$ (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..... $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Output drive Capability..... 10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 4\text{mA}$ (Min.)
- Balanced Propagation Delays... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range... V_{CC} (opr.) = 2V~6V
- Pin and Function Compatible with 4017B



PIN ASSIGNMENT

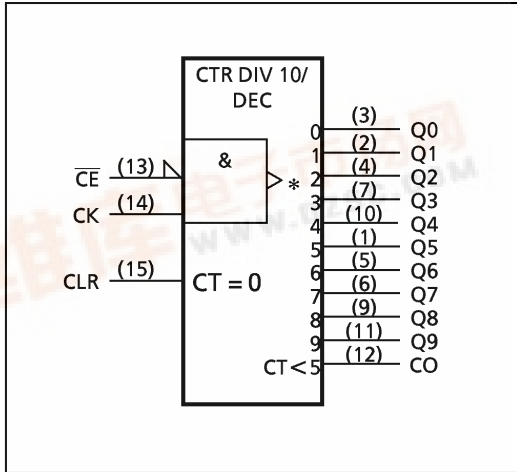


IEC LOGIC SYMBOL

INPUTS			DECODE OUTPUT (H)
CK	\overline{CE}	CLR	
X	X	H	Q0
L	X	L	Qn
X	H	L	Qn
\uparrow	L	L	Qn + 1
\downarrow	L	L	Qn
H	\uparrow	L	Qn
H	\downarrow	L	Qn + 1

X : Don't Care
CARRY OUT { "H" Q0~Q4 = "H"
 " L " Q5~Q9 = "H"

ICE LOGIC SYMBOL

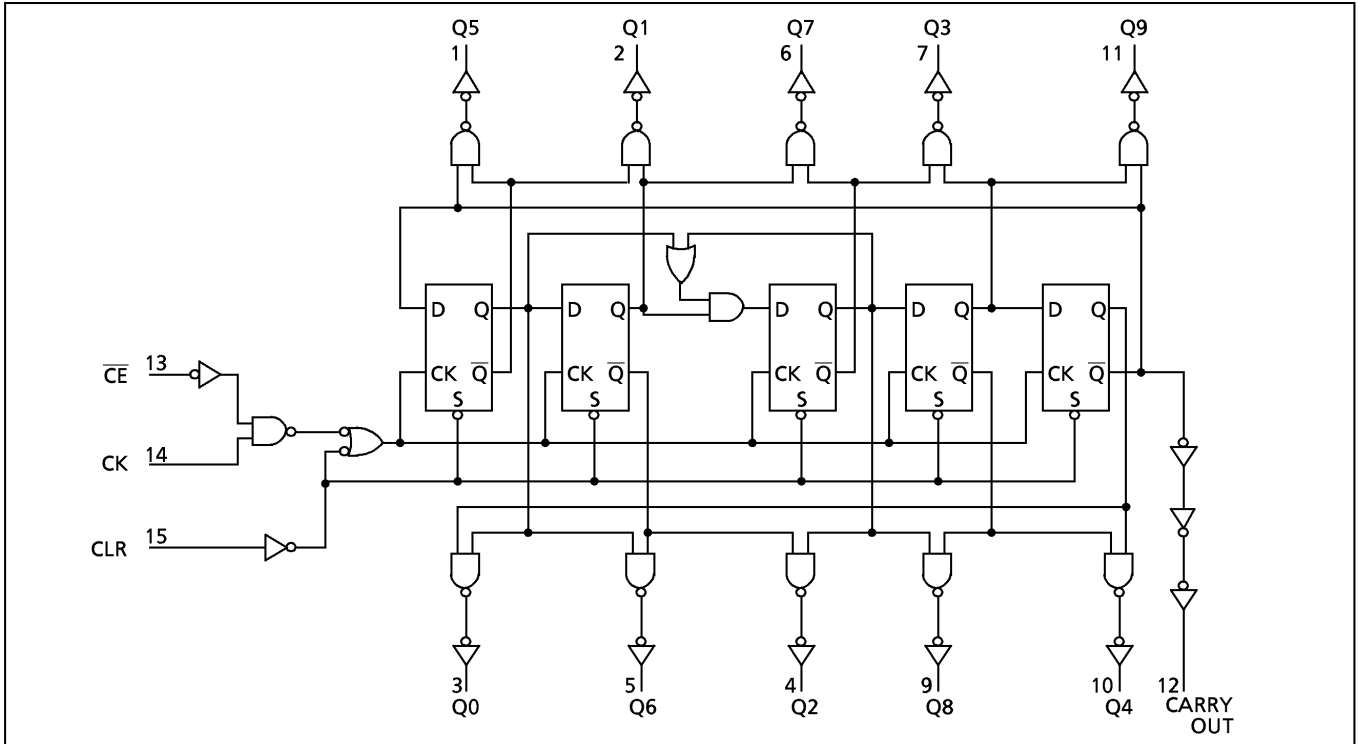


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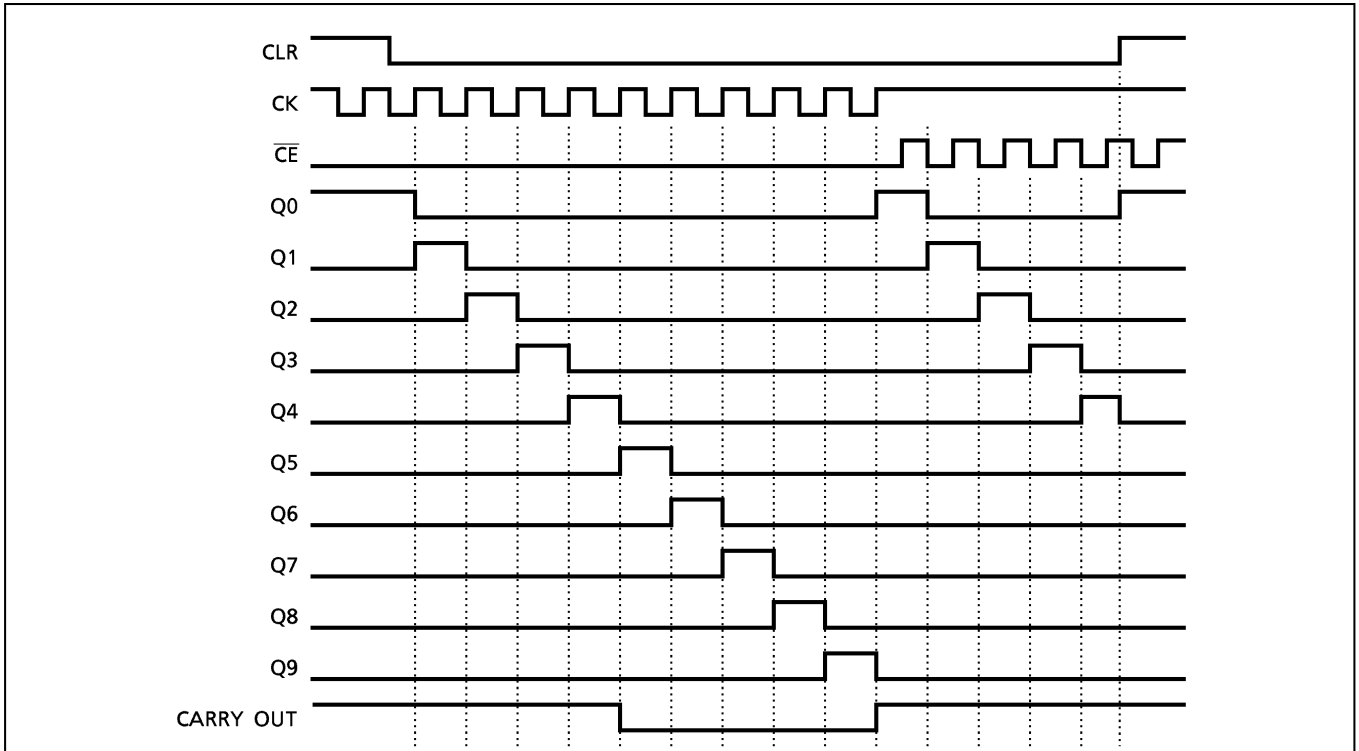
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SYSTEM DIAGRAM



TIMING CHART



980910EBA2'

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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 (SOP)	mW
Storage Temperature	T_{stg}	-65~150	°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 $-10\text{mW}/^\circ\text{C}$ shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	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 ($V_{CC} = 2.0\text{V}$) 0~500 ($V_{CC} = 4.5\text{V}$) 0~400 ($V_{CC} = 6.0\text{V}$)	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	V_{IH}		2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low - Level Input Voltage	V_{IL}		2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High - Level Output Voltage	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -20\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			$I_{OH} = -4\text{ mA}$ $I_{OH} = -5.2\text{ mA}$	4.5	4.18	4.31	—	4.13	—	
				6.0	5.68	5.80	—	5.63	—	
Low - Level Output Voltage	V_{OL}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			$I_{OL} = 4\text{ mA}$ $I_{OL} = 5.2\text{ mA}$	4.5	—	0.17	0.26	—	0.33	
				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	Ta = 25°C			Ta = -40~85°C	UNIT
			V _{CC} (V)	TYP.	LIMIT	LIMIT	
Minimum Pulse Width (CK)	$t_{W(L)}$ $t_{W(H)}$		2.0	—	75	95	ns
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Pulse Width (CLR)	$t_{W(H)}$		2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Set-up Time	t_s		2.0	—	50	60	
			4.5	—	10	12	
			6.0	—	9	11	
Minimum Hold Time	t_h		2.0	—	75	95	
			4.5	—	15	19	
			6.0	—	13	16	
Minimum Removal Time (CLR)	t_{rem}		2.0	—	50	60	
			4.5	—	10	12	
			6.0	—	9	11	
Clock Frequency	f		2.0	—	5	4	MHz
			4.5	—	25	20	
			6.0	—	29	25	

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C, Input $t_r = t_f = 6ns$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}		—	6	12	ns
			Propagation Delay Time (CK, \overline{CE} -Q, CARRY)	t_{pLH} t_{pHL}		
Propagation Delay Time (CLR-Q, CARRY)	t_{pLH} t_{pHL}					
			Maximum Clock Frequency	f_{MAX}		29

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

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C			Ta = -40~85°C		UNIT	
			V _{CC} (V)	MIN.	TYP.	MAX.	MIN.		MAX.
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, \overline{CE} -Q, CARRY)	t_{pLH} t_{pHL}		2.0	—	85	195	—	440	
			4.5	—	25	39	—	88	
			6.0	—	20	33	—	75	
Propagation Delay Time (CLR-Q, CARRY)	t_{pLH} t_{pHL}		2.0	—	75	175	—	375	
			4.5	—	22	35	—	75	
			6.0	—	18	30	—	64	
Maximum Clock Frequency	f_{MAX}		2.0	5	18	—	4	—	MHz
			4.5	25	68	—	20	—	
			6.0	29	90	—	24	—	
Input Capacitance	C _{IN}		—	5	10	—	10	pF	
Power Dissipation Capacitance	C _{PD} (1)		—	38	—	—	—		

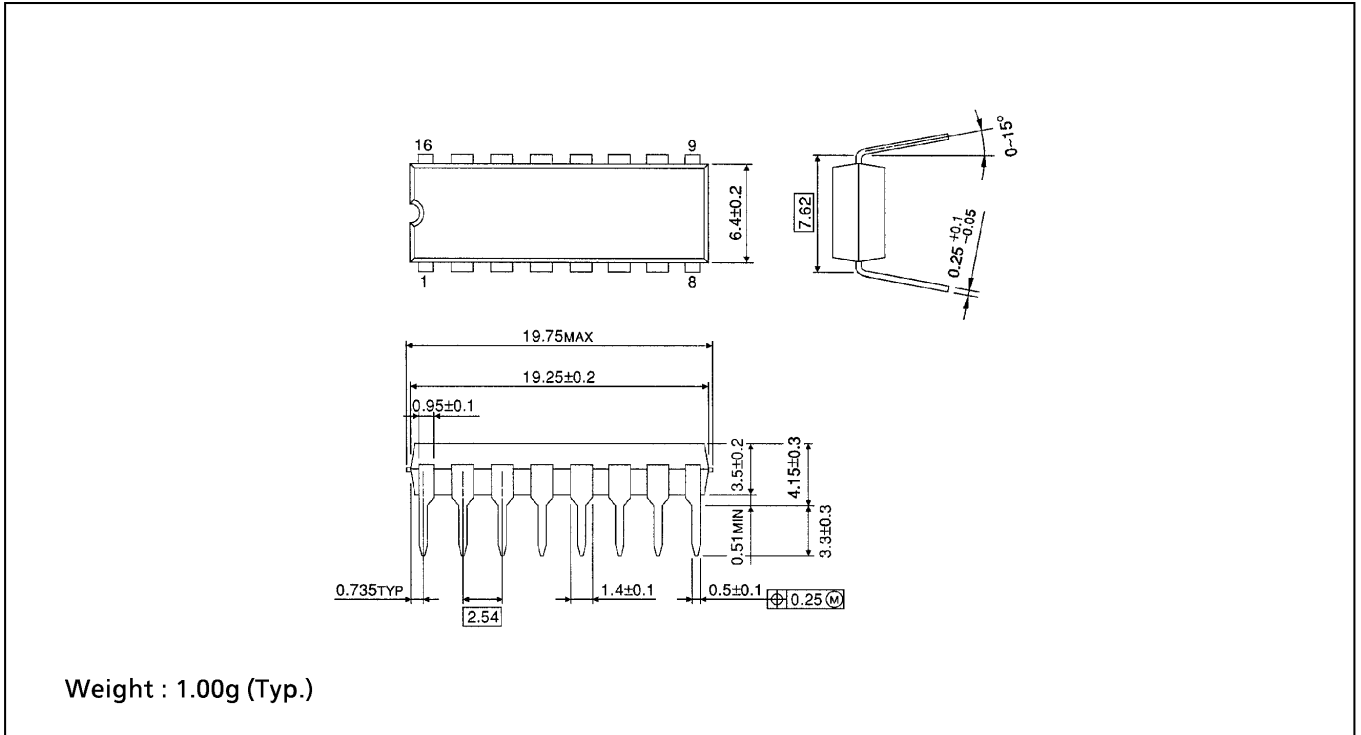
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A)

Unit in mm



SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

Unit in mm

