

CHT-74-4040-DATASHEET

Version: 1.5
15-Feb-21
(Last Modification Date)

High Temperature, 12 stage binary counter

General Description

The CHT-74-4040 is a 12-stage asynchronous binary counter.

The device is incremented on the falling edge (negative transition) of the CLOCK input. All the outputs are reset to a low level by applying a logical high on the CLEAR input.

In frequency divider applications, the clock can be divided by up to 4096.

The device is pin compatible with the industry standards 74xx4040, / CD4040. As such, CISSOID CHT-74-4040 can replace advantageously the above devices and bring a lifetime increase of 1 to 2 decades depending on the temperature range; it also increases the operating temperature capability to -55~+225°C which cannot be achieved by traditional products.

The CHT-74-4040 can operate with supply voltages from 3.3 to 5V (±10%).

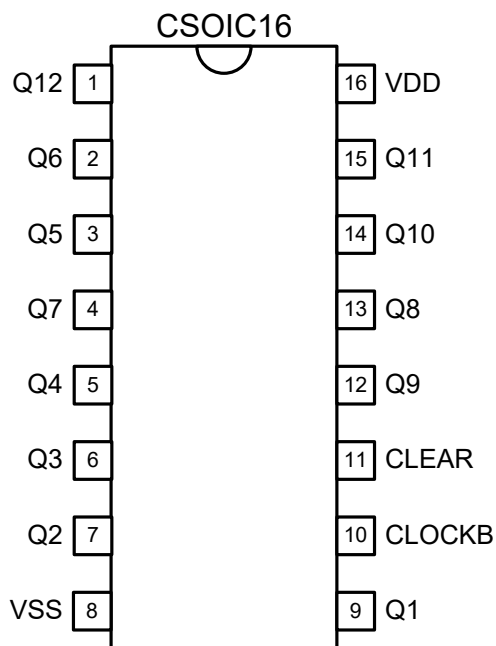
Features

- Functional from -55 to +225°C (Tj)
- 3.3 to 5V (±10%) supply voltages
- Latchup-free at any supply and temperature condition
- Available in CSOIC16 hermetic standard package
- Typical propagation delay: 19 ns
- Low quiescent current: 21µA Max (@225°C, 5V)
- Output drive capability: 4mA Max
- Validated at 225°C for 1000 hours (and still on-going)

Applications

- Clock generation
- Frequency division

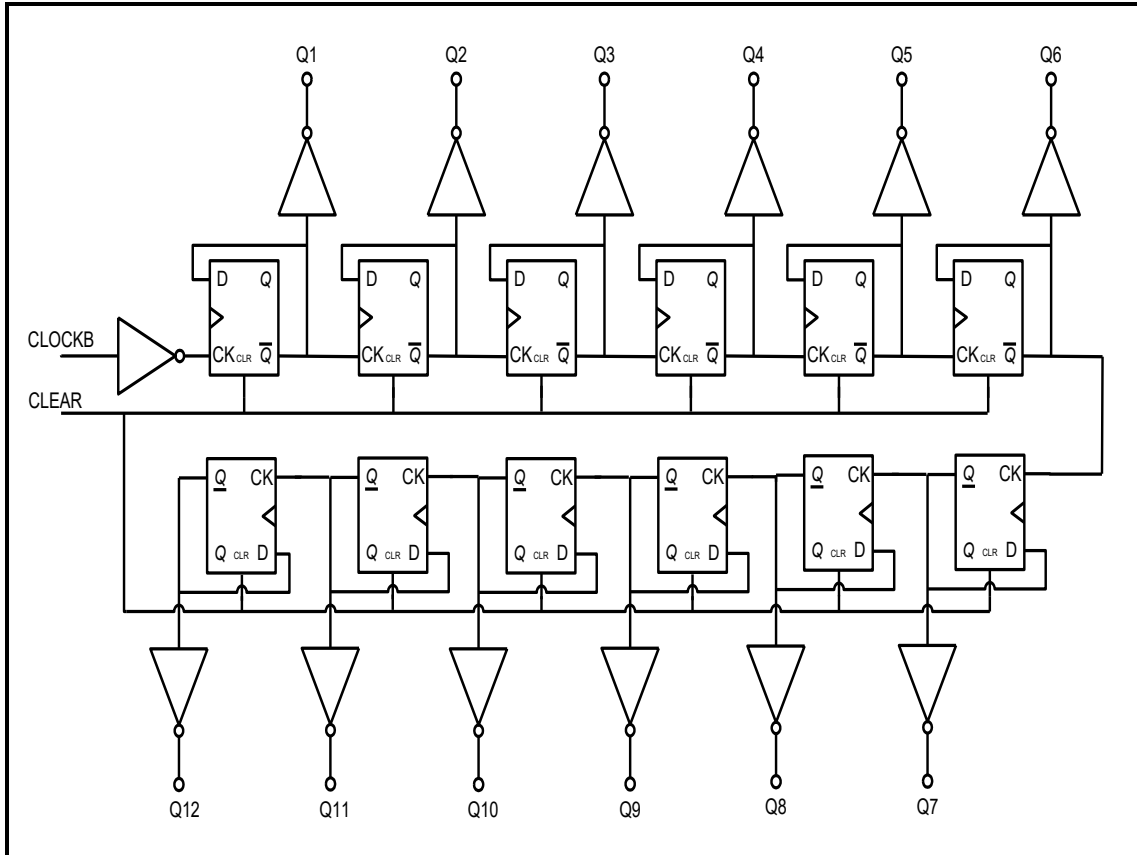
Package and Pin Configuration



Pin	Symbol	Description
1	Q12	Parallel output <12>
2	Q6	Parallel output <6>
3	Q5	Parallel output <5>
4	Q7	Parallel output <7>
5	Q4	Parallel output <4>
6	Q3	Parallel output <3>
7	Q2	Parallel output <2>
8	VSS	Negative power supply
9	Q1	Parallel output <1>
10	CLOCKB	Clock input (HIGH to LOW, edge triggered)
11	CLEAR	Reset input (active HIGH)
12	Q9	Parallel output <9>
13	Q8	Parallel output <8>
14	Q10	Parallel output <10>
15	Q11	Parallel output <11>
16	VDD	Positive power supply

Function Table

CLOCKB	CLEAR	OUTPUT STATE
X	H	All "LOW"
Rising edge	L	NO CHANGE
Falling edge	L	INCREMENT by "one"

Function and Logical Diagrams

Figure 1. CHT-74-4040: simplified block diagram.

Absolute Maximum Ratings

Supply Voltage V_{DD} to GND -0.5 to 5.5V
Voltage on any Pin to GND -0.5 to $V_{DD}+0.5V$

ESD Rating

Human Body Model Class 2

Operating Conditions

Supply Voltage V_{DD} to GND 3.3V to 5V ($\pm 10\%$)
Junction temperature -55°C to +225°C
Voltage on any input pin 0V to VDD

DC Electrical Characteristics

Unless otherwise stated: $T_j=25^{\circ}\text{C}$. **Bold** figures indicate values valid over the whole temperature range ($-55^{\circ}\text{C} < T_j < +225^{\circ}\text{C}$).

Parameter	Condition	Min	Typ	Max	Units
Supply voltage V_{DD}			5		V
Quiescent current I_{DD}	$T_j=-55^{\circ}\text{C}$			30	nA
	$T_j=225^{\circ}\text{C}$			21	μA
Minimum HIGH level output voltage V_{OH}	$I_{OH}<4\text{mA}$ (source)	4.67	4.82		V
Maximum LOW level output voltage V_{OL}	$I_{OL}<4\text{mA}$ (sink)		0.2	0.4	V
Minimum HIGH level input voltage V_{IH}		3.7	3.49		V
Maximum LOW level input voltage V_{IL}			2.16	2	V

Parameter	Condition	Min	Typ	Max	Units
Supply voltage V_{DD}			3.3		V
Quiescent current I_{DD}	$T_j=-55^{\circ}\text{C}$			20	nA
	$T_j=225^{\circ}\text{C}$			21	μA
Minimum HIGH level output voltage V_{OH}	$I_{OH}<4\text{mA}$ (source)	2.91	3.03		V
Maximum LOW level output voltage V_{OL}	$I_{OL}<4\text{mA}$ (sink)		0.28	0.5	V
Minimum HIGH level input voltage V_{IH}		2.4	2.1		V
Maximum LOW level input voltage V_{IL}			1.72	1.5	V

AC Electrical Characteristics

Unless otherwise stated: VDD=5V, $T_j=25^\circ\text{C}$. **Bold** figures indicate values valid over the whole temperature range ($-55^\circ\text{C} < T_j < +225^\circ\text{C}$).

Parameter	Condition	Temperature	Min	Typ	Max	Units
Output transition time t_{THL}, t_{TLH}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	5.5	6.9	9	ns
		$T_j=25^\circ\text{C}$	6.7	8.6	11.1	
		$T_j=225^\circ\text{C}$	9.8	13.2	18.2	
Propagation delay time ($Q_n \Rightarrow Q_{n+1}$) t_{PHL}, t_{PLH}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	2.3	3.3	4.7	ns
		$T_j=25^\circ\text{C}$	3	4.4	6.32	
		$T_j=225^\circ\text{C}$	4.8	7.3	10.7	
Propagation delay time (CLOCKB \Rightarrow Q1) t_{PHL}, t_{PLH}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	11.6	15.7	21.7	ns
		$T_j=25^\circ\text{C}$	14.2	19	27.5	
		$T_j=225^\circ\text{C}$	20.8	29.7	43	
Propagation delay time (CLEAR \Rightarrow Qn) t_{PHL}, t_{PLH}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	14.3	19.1	26	ns
		$T_j=25^\circ\text{C}$	16.9	23.2	32.5	
		$T_j=225^\circ\text{C}$	24.2	34.6	49.6	
Max clock frequency f_{MAX}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$		30.0		MHz
		$T_j=25^\circ\text{C}$		23.8		
		$T_j=225^\circ\text{C}$		15.6		
Minimum pulse width (CLOCKB) t_{WH}, t_{WL}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	12			ns
		$T_j=25^\circ\text{C}$	18			
		$T_j=225^\circ\text{C}$	22			
Minimum pulse width (CLEAR) t_{WH}	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	8			ns
		$T_j=25^\circ\text{C}$	8			
		$T_j=225^\circ\text{C}$	12			
Minimum setup time (CLEAR \leftrightarrow CLOCK) t_s	$C_L=50\text{pF}$, Input $t_r=t_f=6\text{ns}$	$T_j=-55^\circ\text{C}$	6			ns
		$T_j=25^\circ\text{C}$	7			
		$T_j=225^\circ\text{C}$	11			

AC Electrical Characteristics

Unless otherwise stated: VDD=3.3V, T_J=25°C. **Bold** figures indicate values valid over the whole temperature range (-55°C < T_J < +225°C).

Parameter	Condition	Temperature	Min	Typ	Max	Units
Output transition time t _{THL} , t _{TLH}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	8.8	12.7	19.5	ns
		T _J =25°C	10.7	16	24.3	
		T _J =225°C	15	22.6	33.6	
Propagation delay time (Q _n => Q _{n+1}) t _{PHL} , t _{PLH}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	4.2	6.8	11.4	ns
		T _J =25°C	5.4	9	14.9	
		T _J =225°C	8	13	21.4	
Propagation delay time (CLOCKB => Q1) t _{PHL} , t _{PLH}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	20.5	32	51.2	ns
		T _J =25°C	24.7	38.6	62.1	
		T _J =225°C	33.4	52.8	84.2	
Propagation delay time (CLEAR => Q _n) t _{PHL} , t _{PLH}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	25.6	39.3	62.5	ns
		T _J =25°C	30	46.4	74.2	
		T _J =225°C	39.6	62.3	99.1	
Max clock frequency f _{MAX}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C		14.2		MHz
		T _J =25°C		11.6		
		T _J =225°C		8.5		
Minimum pulse width (CLOCKB) t _{WH} , t _{WL}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	23			ns
		T _J =25°C	32			
		T _J =225°C	40			
Minimum pulse width (CLEAR) t _{WH}	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	16			ns
		T _J =25°C	21			
		T _J =225°C	25			
Minimum setup time (CLEAR ↔ CLOCK) t _s	C _L =50pF, Input t _r =t _f =6ns	T _J =-55°C	14			ns
		T _J =25°C	17			
		T _J =225°C	22			

AC Waveforms

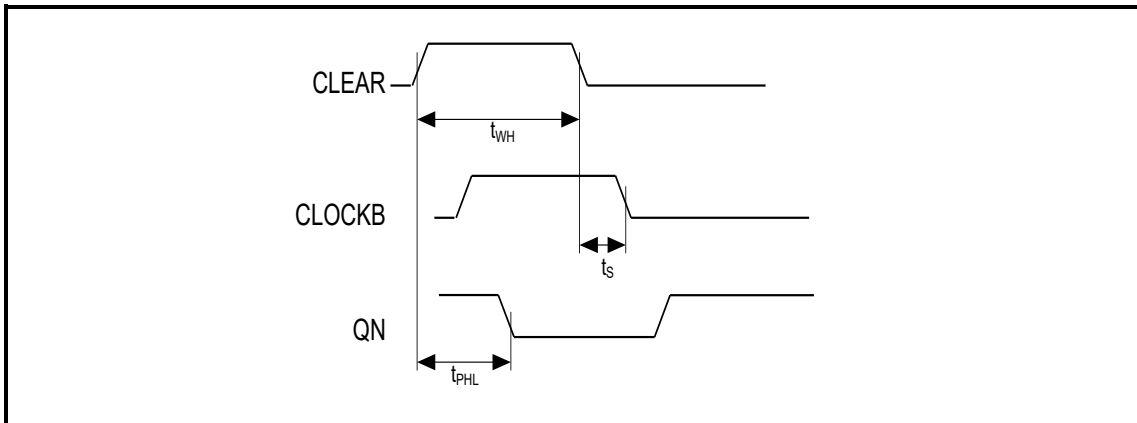


Figure 2. Waveform: minimum pulse width (CLEAR) and setup time (CLEAR to CLOCKB)

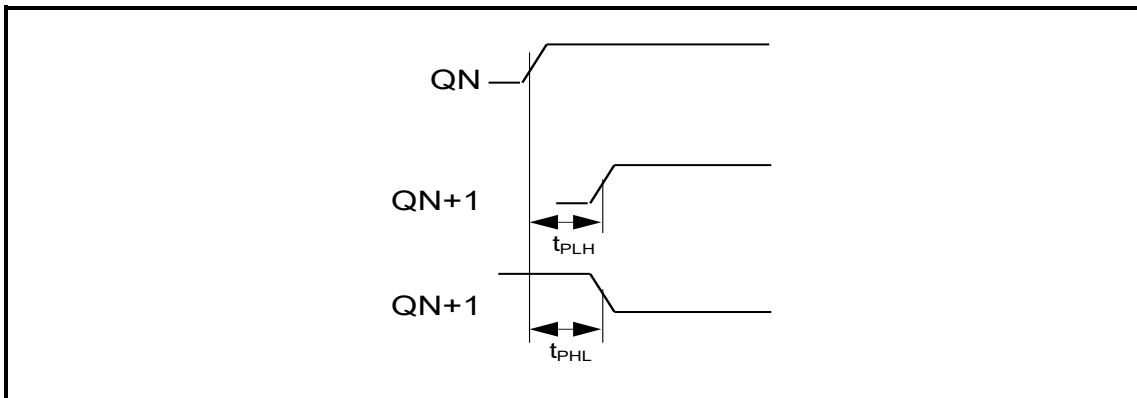


Figure 3. Waveform: propagation delay time

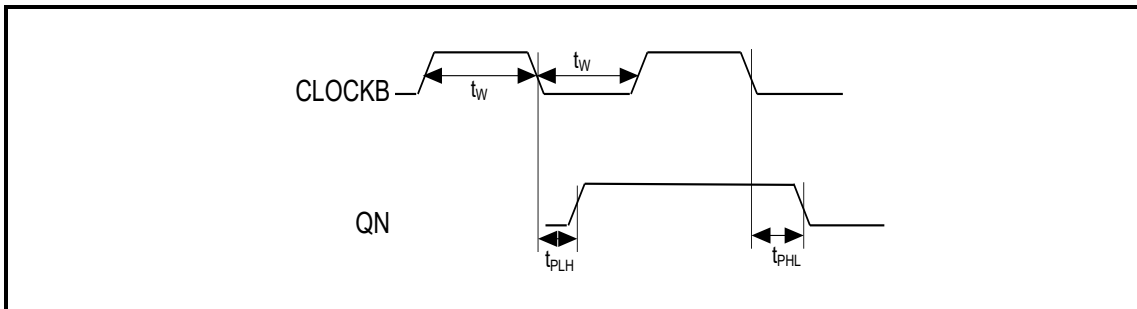
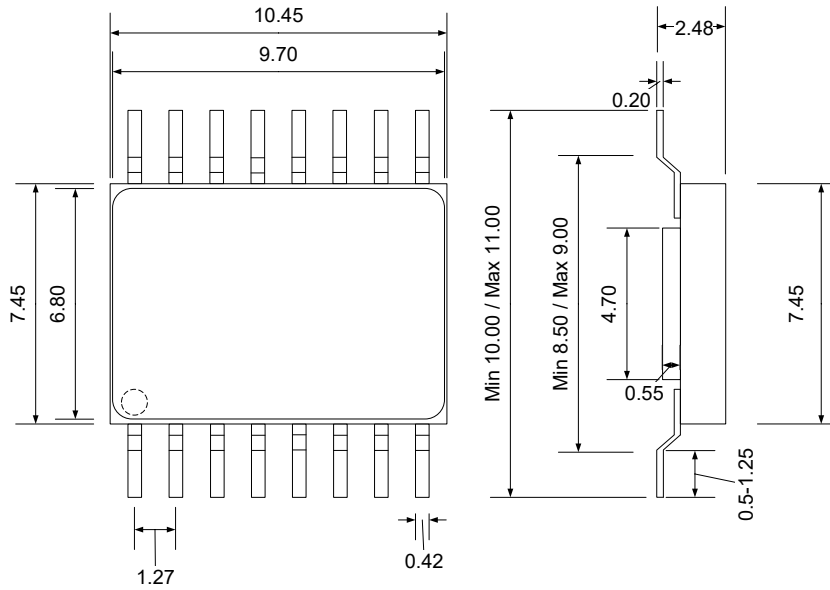


Figure 4: Waveform: propagation delay time, minimum pulse width (CLOCKB)

Ordering Information

Ordering Reference	Package	Temperature Range	Marking
CHT-744040A-CSOIC16-T	Ceramic SOIC16	-55°C to +225°C	CHT-744040A

Package Dimensions



Drawing CSOIC16 (mm +/- 10%)

Contact & Ordering

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