



## U74HC4060

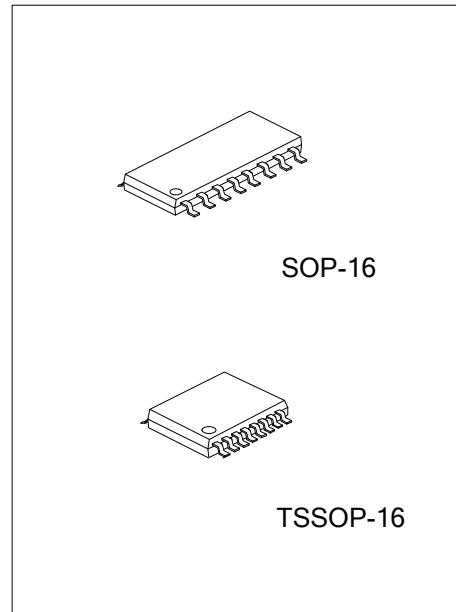
CMOS IC

### 14-STAGE ASYNCHRONOUS BINARY COUNTERS AND OSCILLATORS

#### DESCRIPTION

The **U74HC4060** are high-speed Si-gate CMOS device.

The **U74HC4060** devices consist of an oscillator section and 14 ripple-carry binary counter stages. The oscillator configuration allows design of either RC or crystal oscillator circuits with three oscillator terminals (CLKI, CLKO, CLKO), ten buffered outputs (Q<sub>D</sub> to Q<sub>J</sub> and Q<sub>L</sub> to Q<sub>M</sub>) and an overriding asynchronous master reset (CLR). The oscillator may be replaced by an external clock signal at input CLKI. In this case keep the other oscillator pins (CLKO, CLKO) floating. The counter advances on the negative-going transition of CLKI. A high level at the clear (CLR) input disables the oscillator and resets the counter to zero (all Q output low).



#### FEATURES

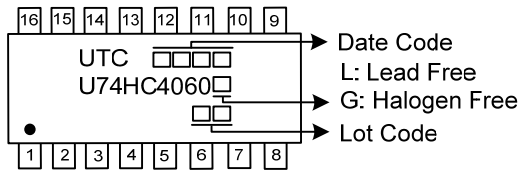
- \* Operate from 2.0V to 6.0V
- \* Low Input Current:1.0uA
- \* Outputs Can Drive Up To 10 LSTTL Loads
- \* Low Power Consumption ,80uA Max I<sub>CC</sub>
- \* 4mA Output Drive at 5V
- \* Typical t<sub>PD</sub>=14ns
- \* Allow Design of Either RC or Crystal Oscillator Circuits

#### ORDERING INFORMATION

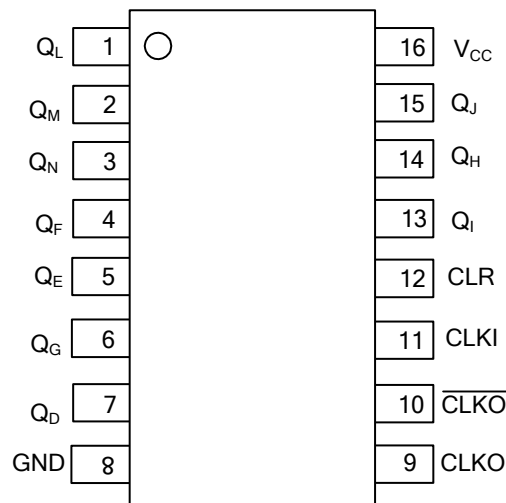
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC4060L-S16-R	U74HC4060G-S16-R	SOP-16	Tape Reel
U74HC4060L-P16-R	U74HC4060G-P16-R	TSSOP-16	Tape Reel

<p>U74HC4060G-S16-R</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) S16: SOP-16, P16: TSSOP-16</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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## MARKING



## PIN CONFIGURATION

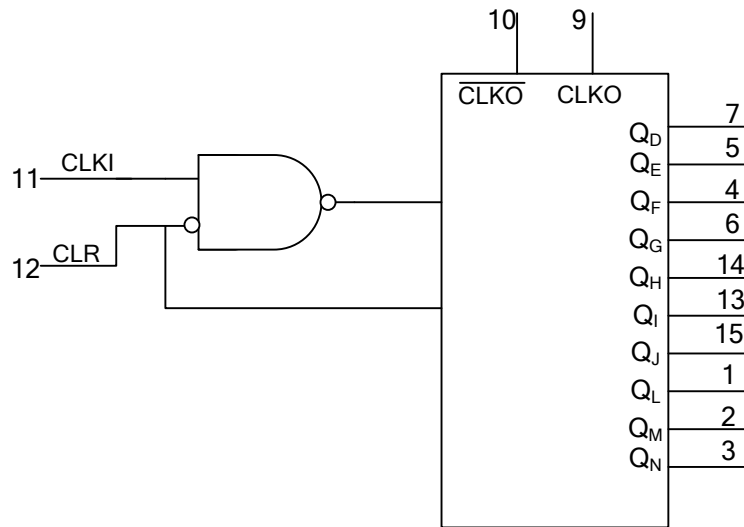


## FUNCTION TABLE

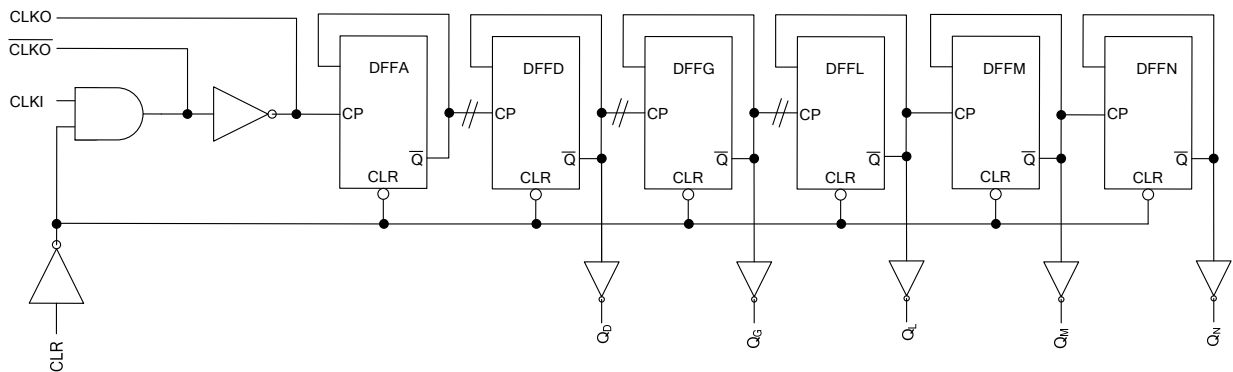
INPUTS		FUNCTION
CLK	CLR	
↑	L	No change
↓	L	Advance to next stage
X	H	All outputs L

Note: H: HIGH voltage level  
 L: LOW voltage level  
 X: Don't care.High impedance OFF-state  
 ↑: Low-to-High CP transition  
 ↓: High-to-Low CP transition

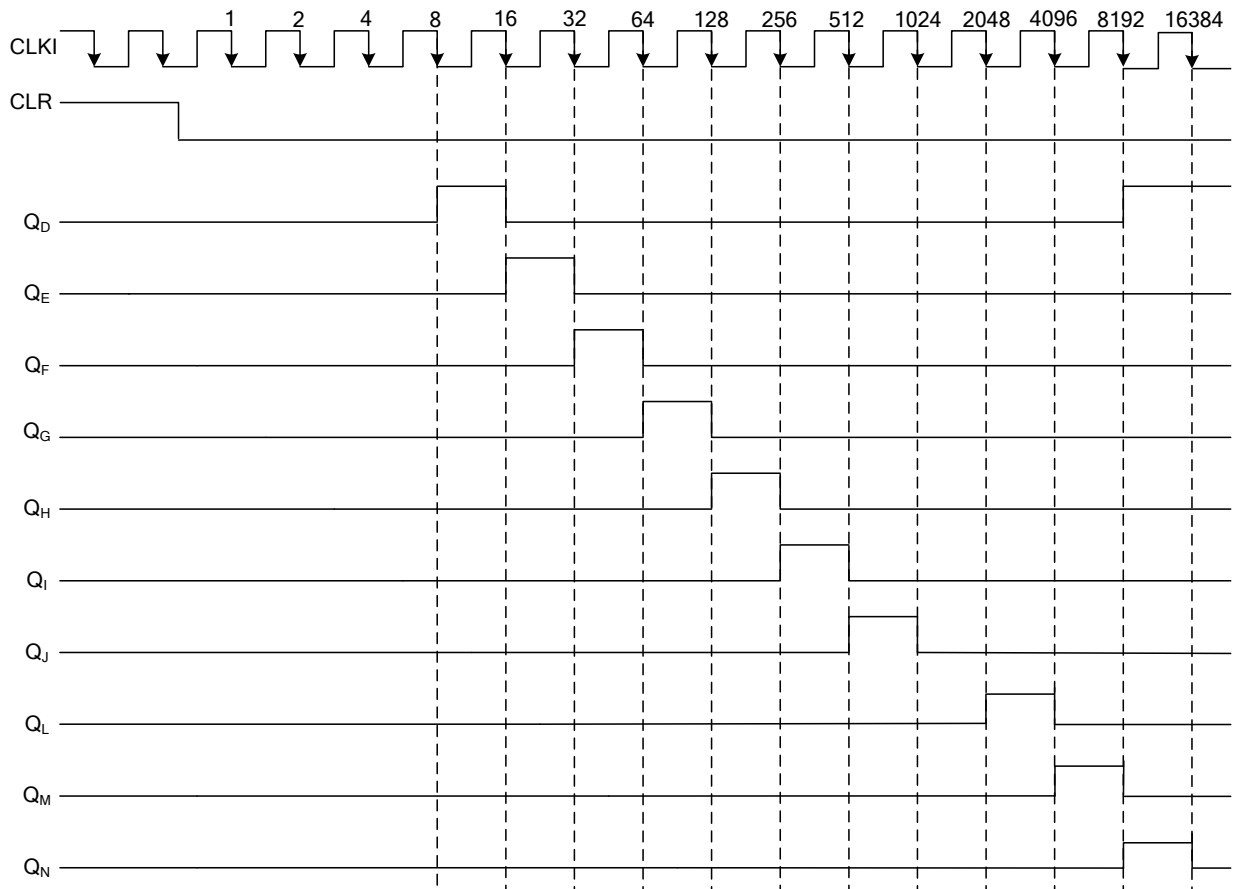
■ LOGIC SYMBOL



■ LOGIC DIAGRAM



## ■ TIMING DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ 7.0	V
Input Clamp Current ( $V_I < 0$ or $V_I > V_{CC}$ )	$I_{IK}$	±20	mA
Output Clamp Current ( $V_O < 0$ or $V_O > V_{CC}$ )	$I_{OK}$	±20	mA
$V_{CC}$ or GND Current	$I_{CC}$	±50	mA
Continuous Output Current ( $V_O = 0$ to $V_{CC}$ )	$I_{OUT}$	±25	mA
Storage Temperature	$T_{STG}$	-65 ~ + 150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
 Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$	Operating	2.0		6.0	V
Input Voltage	$V_{IN}$		0		$V_{CC}$	V
Output Voltage	$V_{OUT}$		0		$V_{CC}$	V
Operating Temperature	$T_A$		-40		+85	°C
Input Rise or Fall Times	$t_R, t_F$	$V_{CC}=2.0V$			1000	ns
		$V_{CC}=4.5V$			500	
		$V_{CC}=6.0V$			400	

### ■ ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	$V_{IH}$	$V_{CC}=2V$	1.5			V
		$V_{CC}=4.5V$	3.15			V
		$V_{CC}=6V$	4.2			V
Low-Level Input Voltage	$V_{IL}$	$V_{CC}=2V$			0.5	V
		$V_{CC}=4.5V$			1.35	V
		$V_{CC}=6V$			1.8	V
High-Level Output Voltage	$V_{OH}$	$V_{CC}=2V, I_{OH}=-20\mu A$	1.9	1.998		V
		$V_{CC}=4.5V, I_{OH}=-20\mu A$	4.4	4.499		V
		$V_{CC}=6V, I_{OH}=-20\mu A$	5.9	5.999		V
		$V_{CC}=4.5V, I_{OH}=-4.0mA$	3.98	4.3		V
		$V_{CC}=6V, I_{OH}=-5.2mA$	5.48	5.8		V
Low-Level Output Voltage	$V_{OL}$	$V_{CC}=2V, I_{OL}=20\mu A$		0.002	0.1	V
		$V_{CC}=4.5V, I_{OL}=20\mu A$		0.001	0.1	V
		$V_{CC}=6V, I_{OL}=20\mu A$		0.001	0.1	V
		$V_{CC}=4.5V, I_{OL}=4mA$		0.17	0.26	V
		$V_{CC}=6V, I_{OL}=5.2mA$		0.15	0.26	V
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND			±100	nA
Quiescent Supply Current	$I_{CC}$	$V_{CC}=6V, V_{IN}=V_{CC}$ or GND, $I_{OUT}=0$			8	μA

### ■ TIMING REQUIREMENTS

(over recommended operating free-air temperature range, unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
F <sub>COLCK</sub> Clock Frequency		V <sub>CC</sub> =2V			4.3	MHz
		V <sub>CC</sub> =4.5V			22	
		V <sub>CC</sub> =6V			25	
t <sub>w</sub> Pulse Duration	C <sub>LKI</sub> high or low	V <sub>CC</sub> =2V	115			ns
		V <sub>CC</sub> =4.5V	23			
		V <sub>CC</sub> =6V	20			
	C <sub>LR</sub> high	V <sub>CC</sub> =2V	115			
		V <sub>CC</sub> =4.5V	23			
		V <sub>CC</sub> =6V	20			
t <sub>su</sub> , Setup time, C <sub>LR</sub> Inactive Before C <sub>LKI</sub> High To Low		V <sub>CC</sub> =2V	200			ns
		V <sub>CC</sub> =4.5V	40			
		V <sub>CC</sub> =6V	34			

### ■ SWITCHING CHARACTERISTICS

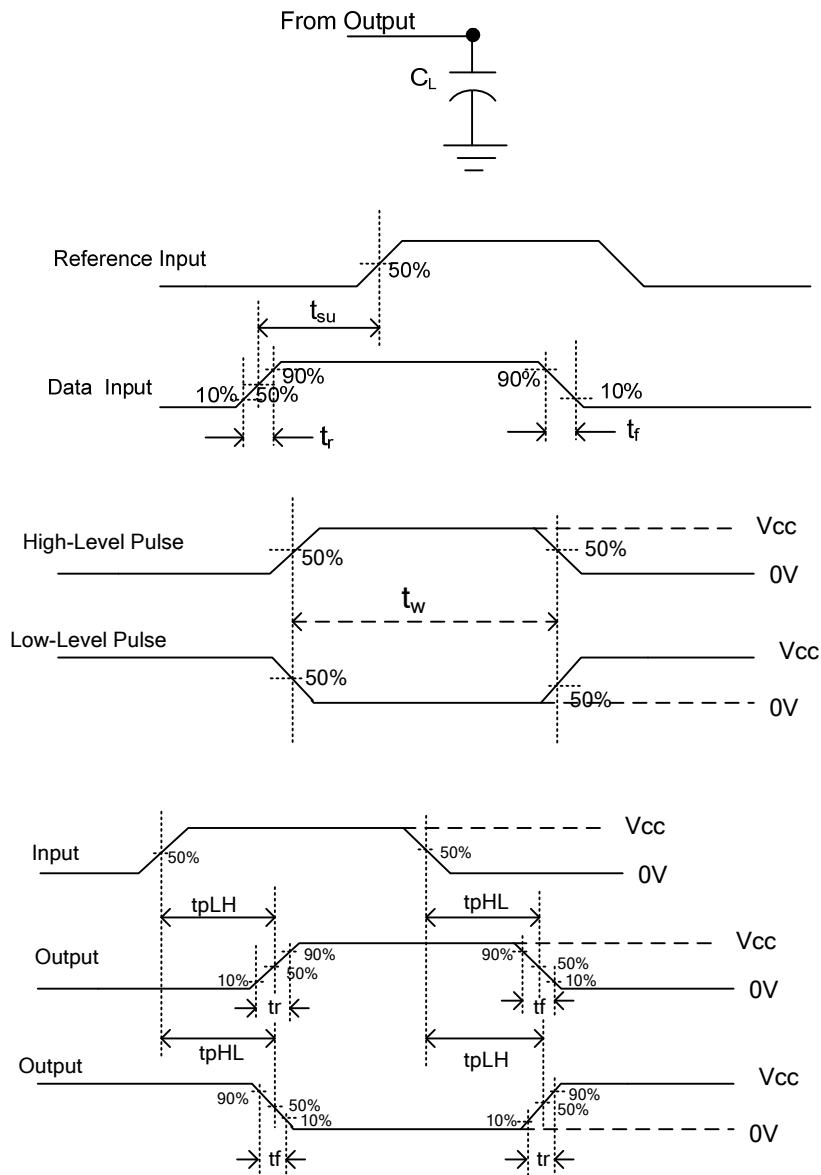
(over recommended operating free-air temperature range, C<sub>L</sub>=50pF, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from C <sub>LKI</sub> to Q <sub>D</sub>	t <sub>PD</sub>	V <sub>CC</sub> =2V		240	490	ns
		V <sub>CC</sub> =4.5V		58	98	
		V <sub>CC</sub> =6V		42	83	
Propagation delay from C <sub>LKI</sub> to Any Q	t <sub>PHL</sub>	V <sub>CC</sub> =2V		66	140	ns
		V <sub>CC</sub> =4.5V		18	28	
		V <sub>CC</sub> =6V		24	24	
Output rise or fall time	t <sub>t</sub>	V <sub>CC</sub> =2V		28	75	ns
		V <sub>CC</sub> =4.5V		8	15	
		V <sub>CC</sub> =6V		6	13	
Maximum Clock Pulse Frequency	f <sub>max</sub>	V <sub>CC</sub> =2V	5.5	10		MHz
		V <sub>CC</sub> =4.5V	28	45		
		V <sub>CC</sub> =6V	33	53		

### ■ OPERATING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C <sub>PD</sub>	No load		88		pF

## ■ TEST CIRCUIT AND WAVEFORMS



Note: A.  $C_L = 50\text{pF}$ ,  $C_L$  includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics : PRR  $\leq 1\text{MHz}$ ,  $Z_o = 50\Omega$ ,  $t_r \leq 6\text{ns}$ ,  $t_f \leq 6\text{ns}$ .

C. For clock inputs,  $f_{max}$  is measured when the input duty cycle is 50%.

D.  $t_{pLH}$  and  $t_{pHL}$  are the same as  $t_{pd}$ .

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