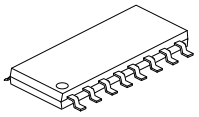
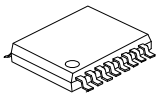
U74HC590

CMOS IC

8-BIT BINARY COUNTERS WITH 3-STATE OUTPUT REGISTERS



SOP-16



TSSOP-16

■ DESCRIPTION

The UTC **74HC590** contains an 8-bit binary counter that feeds an 8-bit storage register and 3-state outputs.. The storage register has parallel (Q_A~Q_H) outputs.

The binary counter features direct clear ($\overline{CCLR}$) and count-enable ($\overline{CCKEN}$) inputs. A ripple-carry output ($\overline{RCO}$) is provided for cascading. Expansion is accomplished easily for two stages by connecting ($\overline{RCO}$) of the first stage to $\overline{CCKEN}$ of the second stage. Cascading for larger count chains can be accomplished by connecting($\overline{RCO}$)of each stage to the counter clock (CCLK) input of the following stage.

■ FEATURES

* Wide supply voltage range from 2.0V to 6.0V
* Low static power consumption; I_{CC}=8μA (Max.)
* 8 bit counter with register

■ ORDERING INFORMATION

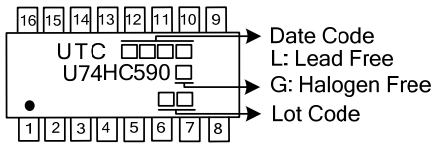
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC590L-S16-R	U74HC590G-S16-R	SOP-16	Tape Reel
U74HC590L-P16-R	U74HC590G-P16-R	TSSOP-16	Tape Reel

U74HC590G-S16-R

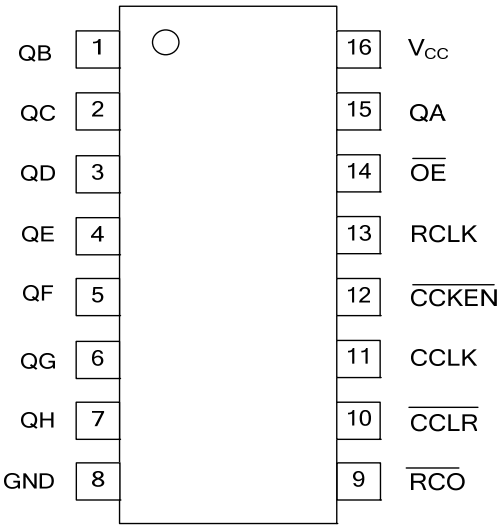
(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) S16: SOP-16, P16: TSSOP-16
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ PIN CONFIGURATION



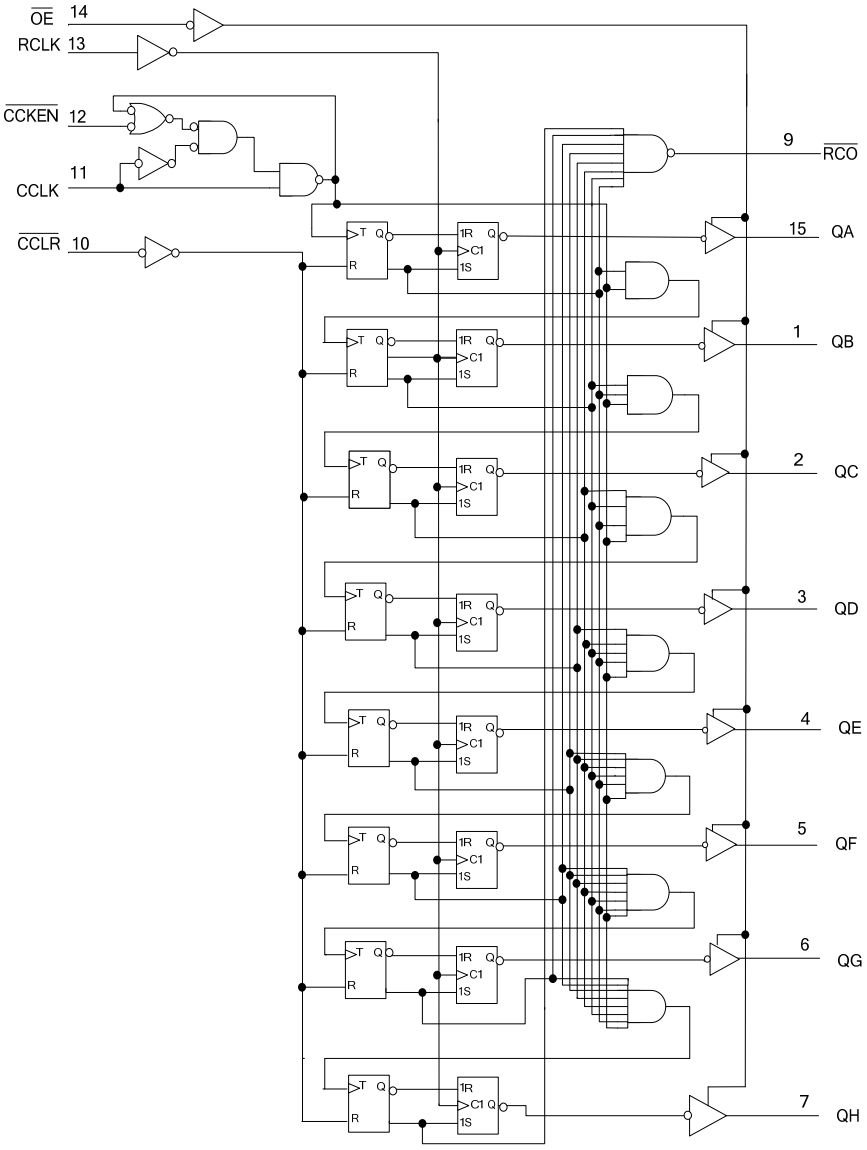
■ FUNCTION TABLE

INPUTS					FUNCTION
$\overline{OE}$	RCLK	$\overline{CCLR}$	$\overline{CCKEN}$	CCLK	
H	X	X	X	X	Outputs Q_A-Q_H are disabled.
L	X	X	X	X	Outputs Q_A-Q_H are enabled.
X	↑	X	X	X	Counter data stored into register
X	↓	X	X	X	Register stage is not changed.
X	X	L	X	X	Counter clear.
X	X	H	L	↑	Advance one count.
X	X	H	L	↓	No count
X	X	H	H	X	No count

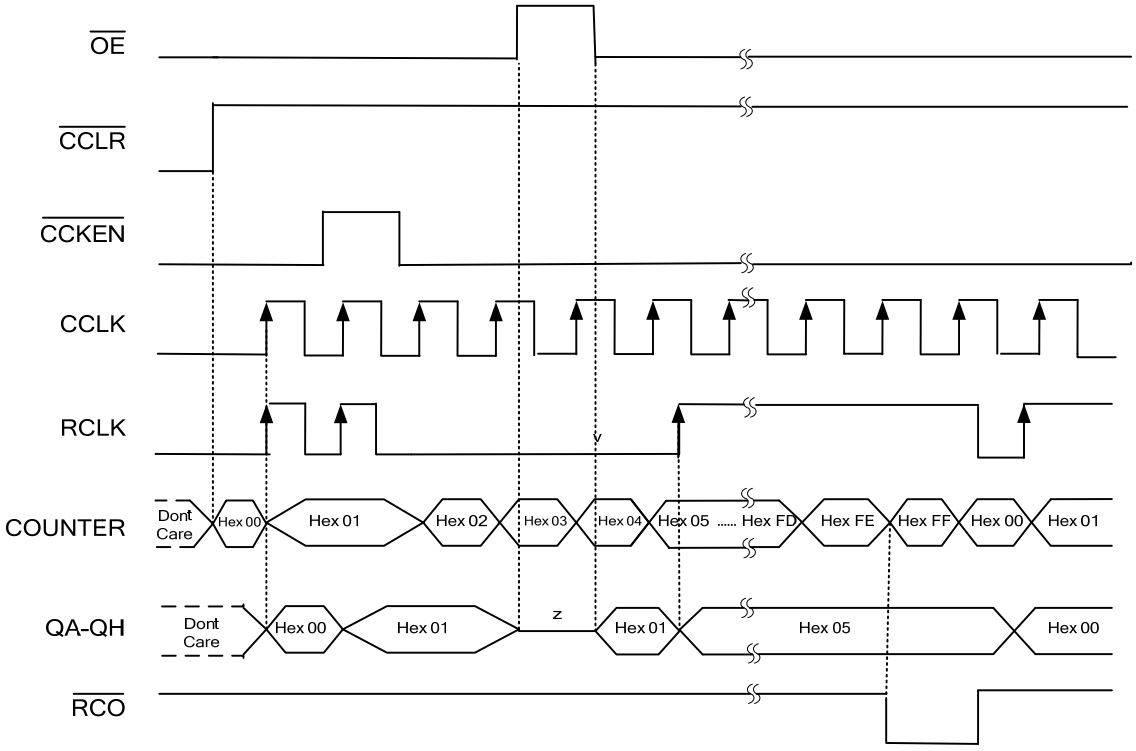
Notes: 1. H: High voltage level; L: Low voltage level; ↑: Low-to-High; X: Don't care

2. $\overline{RCO} = \overline{Q0' \cdot Q1' \cdot Q2' \cdot Q3' \cdot Q4' \cdot Q5' \cdot Q6' \cdot Q7'}$ (Q0' to Q7' are internal outputs of the counter)

■ LOGIC DIAGRAM (positive logic)



■ TIMING DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}		-0.5 ~ +7.0	V
Continuous V_{CC} or GND Current	I_{CC}		±75	μA
Continuous Output Current	I_{OUT}	V_{OUT}=0V ~ V_{CC}	±35	mA
Input Clamp Current	I_{IK}	V_{IN}<0V or V_{IN}>V_{CC}	±20	mA
Output Clamp Current	I_{OK}	V_{OUT}>V_{CC} or V_{OUT}<0V	±20	mA
Storage Temperature Range	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}		2.0	5.0	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 Transition Rise or Fall Rate	Δt/Δv	V_{CC}=2.0V			1000	ns
		V_{CC}=4.5V			500	ns
		V_{CC}=6.0V			400	ns

■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
High-level Input Voltage	V_{IH}	V_{CC}=2.0V		1.5			V
		V_{CC}=4.5V		3.15			V
		V_{CC}=6.0V		4.2			V
Low-level Input Voltage	V_{IL}	V_{CC}=2.0V				0.5	V
		V_{CC}=4.5V				1.35	V
		V_{CC}=6.0V				1.8	V
High-Level Output Voltage	V_{OH}	V_{CC}=2.0V	I_{OH}=-20μA, V_{IN}=V_{CC} or GND	1.9	1.998		V
		V_{CC}=4.5V		4.4	4.499		V
		V_{CC}=6.0V		5.9	5.999		V
		V_{CC}=4.5V	$\overline{RCO}$, I_{OH}=-4mA V_{IN}=V_{CC} or GND	3.98	4.3		V
			Q_A-Q_H, I_{OH}=-6mA V_{IN}=V_{CC} or GND	3.98	4.3		V
		V_{CC}=6.0V	$\overline{RCO}$, I_{OH}=-5.2mA V_{IN}=V_{CC} or GND	5.48	5.8		V
			Q_A-Q_H, I_{OH}=-7.8mA V_{IN}=V_{CC} or GND	5.48	5.8		V
Low-Level Output Voltage	V_{OL}	V_{CC}=2.0V	I_{OH}=20μA, V_{IN}=V_{CC} or GND		0.002	0.1	V
		V_{CC}=4.5V			0.001	0.1	V
		V_{CC}=6.0V			0.001	0.1	V
		V_{CC}=4.5V	$\overline{RCO}$, I_{OH}=4mA V_{IN}=V_{CC} or GND		0.17	0.26	V
			Q_A-Q_H, I_{OH}=6mA V_{IN}=V_{CC} or GND		0.17	0.26	V
		V_{CC}=6.0V	$\overline{RCO}$, I_{OH}=5.2mA V_{IN}=V_{CC} or GND		0.15	0.26	V
			Q_A-Q_H, I_{OH}=7.8mA V_{IN}=V_{CC} or GND		0.15	0.26	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Leakage Current	$I_{I(LEAK)}$	V_{CC}=6.0V, V_{IN}= V_{CC} or GND			±0.1	μA
3-state Output OFF-state Current	I_{OZ}	V_{IN}=V_{IH} or V_{IL}, V_{OUT}=V_{CC} or GND, V_{CC} =6.0V			±0.5	μA
Quiescent Supply Current	I_{CC}	V_{CC}=6.0V, V_{IN}=V_{CC} or 0V, I_{OUT}=0A			8	μA
Input Capacitance	C_I	V_{CC}=6.0V, V_{IN}=V_{CC} or GND		3.5	10	pF

■ SWITCHING CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Maximum clock pulse frequency	f_{MAX}	C_L=50pF	V_{CC}=2.0V	4	8		MHz
			V_{CC}=4.5V	20	35		MHz
			V_{CC}=6.0V	24	40		MHz
Propagation delay from input (CCLK↑) to output($\overline{RCO}$)	t_{PD}	C_L=50pF	V_{CC}=2.0V		80	150	ns
			V_{CC}=4.5V		20	30	ns
			V_{CC}=6.0V		15	26	ns
Propagation delay from input (RCLK↑) to output(Qn)	t_{PD}	C_L=50pF	V_{CC}=2.0V		70	140	ns
			V_{CC}=4.5V		18	28	ns
			V_{CC}=6.0V		14	24	ns
		C_L=150pF	V_{CC}=2.0V		100	300	ns
			V_{CC}=4.5V		24	60	ns
			V_{CC}=6.0V		20	51	ns
Propagation delay from input ($\overline{CCLR}$ ↓) to output($\overline{RCO}$)	t_{PLH}	C_L=50pF	V_{CC}=2.0V		70	130	ns
			V_{CC}=4.5V		18	26	ns
			V_{CC}=6.0V		14	22	ns
Propagation delay from input ($\overline{OE}$ ↓) to output(Qn)	t_{en}	C_L=50pF	V_{CC}=2.0V		80	125	ns
			V_{CC}=4.5V		20	25	ns
			V_{CC}=6.0V		15	21	ns
		C_L=150pF	V_{CC}=2.0V		90	200	ns
			V_{CC}=4.5V		23	40	ns
			V_{CC}=6.0V		19	34	ns
Propagation delay from input ($\overline{OE}$ ↑) to output(Qn)	t_{dis}	C_L=50pF	V_{CC}=2.0V		80	125	ns
			V_{CC}=4.5V		20	25	ns
			V_{CC}=6.0V		15	21	ns

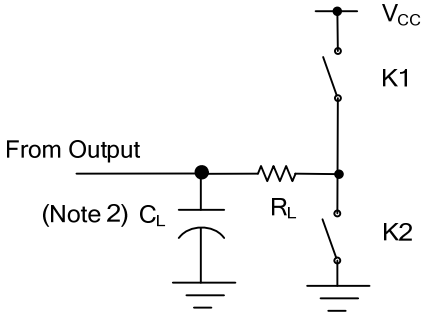
■ TIMING REQUIREMENTS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Clock Frequency	f_{CLOCK}	V_{CC}=2.0V			4	MHz
		V_{CC}=4.5V			20	MHz
		V_{CC}=6.0V			24	MHz
Pulse duration, CCLK or RCLK high or low	t_W	V_{CC}=2.0V	125			ns
		V_{CC}=4.5V	25			ns
		V_{CC}=6.0V	21			ns
Pulse duration, $\overline{CCLR}$ Low		V_{CC}=2.0V	100			ns
		V_{CC}=4.5V	20			ns
		V_{CC}=6.0V	17			ns
Setup Time, $\overline{CCKEN}$ Low Before CCLK↑	t_{SU}	V_{CC}=2.0V	100			ns
		V_{CC}=4.5V	20			ns
		V_{CC}=6.0V	17			ns
Setup Time, $\overline{CCLR}$ Hihg (Inactive) Before CCLK↑		V_{CC}=2.0V	100			ns
		V_{CC}=4.5V	20			ns
		V_{CC}=6.0V	17			ns
Setup Time, CCLK↑ Before RCLK↑		V_{CC}=2.0V	100			ns
		V_{CC}=4.5V	20			ns
		V_{CC}=6.0V	17			ns
Hold Time, $\overline{CCKEN}$ Low After CCLK↑	t_H	V_{CC}=2.0V	50			ns
		V_{CC}=4.5V	10			ns
		V_{CC}=6.0V	9			ns

■ OPERATING CHARACTERISTICS (T_A =25°C , unless otherwise specified)

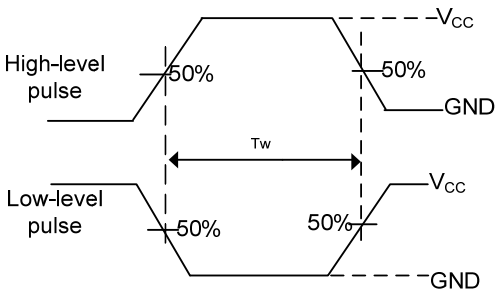
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C_{PD}	No load.		250		pF

■ TEST CIRCUIT AND WAVEFORMS

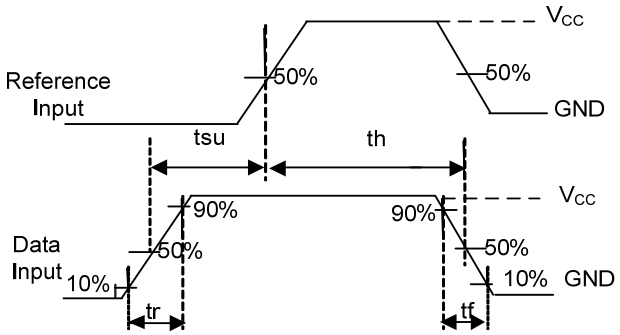


TEST	K1	K2
t_{PLH}/t_{PHL}	Open	Open
t_{PLZ}/t_{PZL}	Close	Open
t_{PHZ}/t_{PZH}	Open	Close

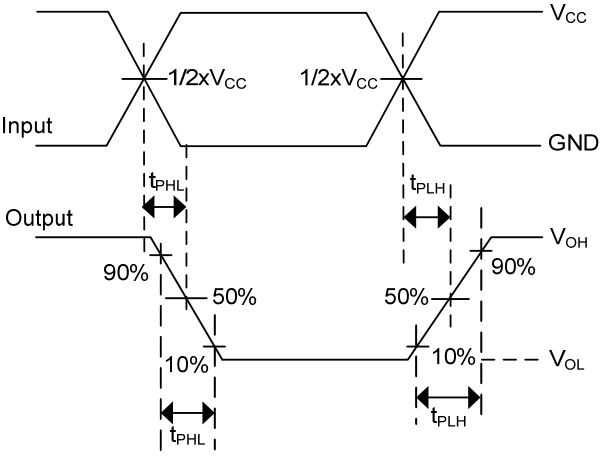
Note: C_L includes probe and jig capacitance. C_L=50pF, R_L=1KΩ.



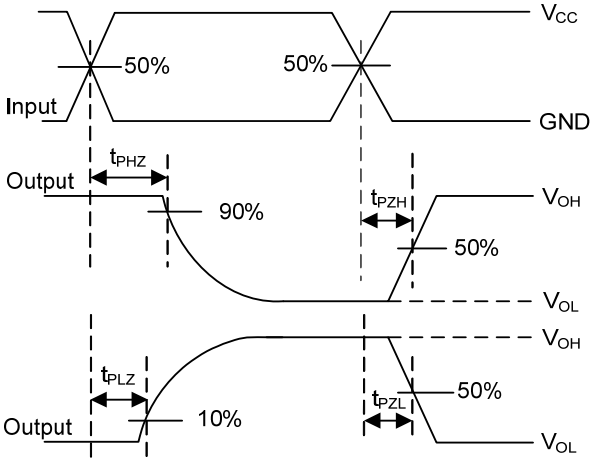
PULSE WIDTH



SETUP TIME AND HOLD TIME



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

Notes: 1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Z_O = 50Ω.