



## U74HC164

CMOS IC

### 8-BIT SERIAL-IN AND PARALLEL-OUT SHIFT REGISTER

#### DESCRIPTION

The **U74HC164** is an 8-bit edge-triggered shift registers with serial input and parallel output. A LOW-to-HIGH transition on the CP will shifts the data one place to the right which is the logical AND of DSA and DSB.

A Low level on the  $\overline{MR}$  will clear the registers asynchronously and force the outputs LOW.

#### FEATURES

- \* Operation Voltage Range: 2~6V
- \* Asynchronous Reset Input
- \* Specified from -40~ +125°C

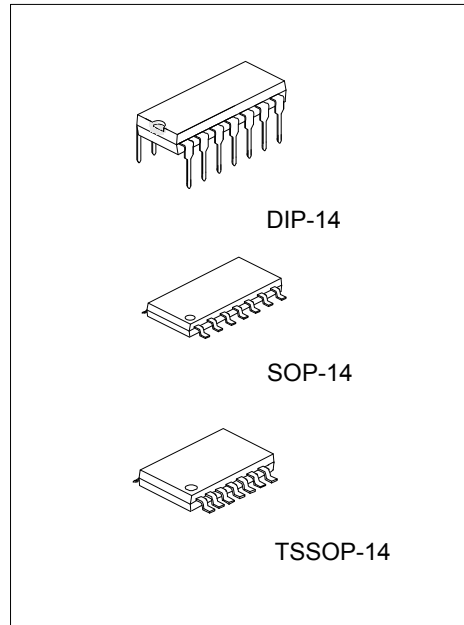
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC164L-D14-T	U74HC164G-D14-T	DIP-14	Tube
U74HC164L-S14-R	U74HC164G-S14-R	SOP-14	Tape Reel
U74HC164L-P14-R	U74HC164G-P14-R	TSSOP-14	Tape Reel

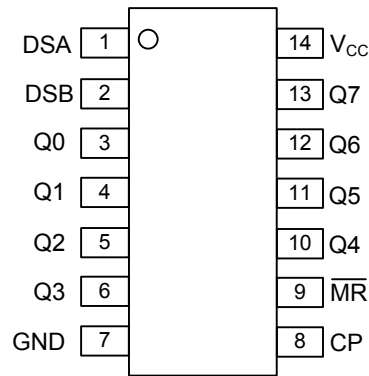
<p>U74HC164G-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING

DIP-14	SOP-14 / TSSOP-14
<p>Date Code L: Lead Free G: Halogen Free Lot Code</p>	<p>Date Code L: Lead Free G: Halogen Free Lot Code</p>



■ PIN CONFIGURATION

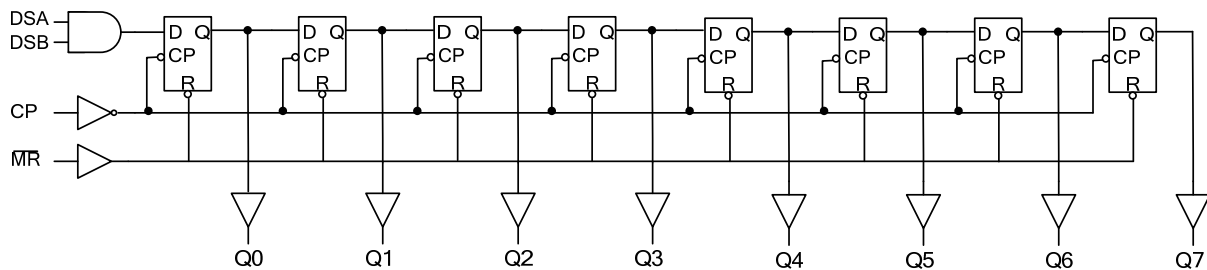


■ FUNCTION TABLE

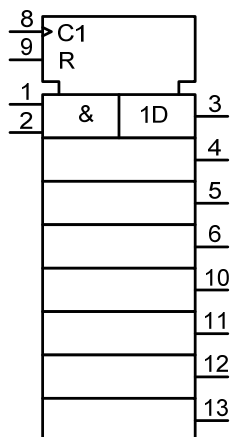
INPUT				OUTPUT	
$\overline{MR}$	CP	DSA	DSB	Q0	Q1 to Q7
L	X	X	X	L	L to L
H	L	X	X	Q0	Q1 to Q7
H	↑	H	L	L	Q0 to Q6
H	↑	H	H	H	Q0 to Q6
H	↑	L	H	L	Q0 to Q6
H	↑	L	L	L	Q0 to Q6

■ FUNCTIONAL DIAGRAM

Logic Diagram



IEC Logic Symbol



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5~ +7	V
$V_{CC}$ or GND Current	$I_{CC}$	±50	mA
Output Current	$I_{OUT}$	±25	mA
Input Diode Current	$I_{IK}$	±20	mA
Switch Diode Current	$I_{OK}$	±20	mA
Power Dissipation	DIP-14	750	mW
	SOP-14	500	mW
	TSSOP-14	500	mW
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	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
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC}=2V$			1000	ns
		$V_{CC}=4.5V$		6.0	500	ns
		$V_{CC}=6V$			400	ns
Operating Temperature	$T_A$		-40		125	°C

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage High-Level	$V_{IH}$	$V_{CC}=2.0V$	1.5	1.2		V
		$V_{CC}=4.5V$	3.15	2.4		V
		$V_{CC}=6.0V$	4.2	3.2		V
Input Voltage Low-Level	$V_{IL}$	$V_{CC}=2.0V$		0.8	0.5	V
		$V_{CC}=4.5V$		2.1	1.35	V
		$V_{CC}=6.0V$		2.8	1.8	V
Output Voltage High-Level	$V_{OH}$	$V_{CC}=2.0V, I_{OH}=20\mu A$	1.9	2.0		V
		$V_{CC}=4.5V, I_{OH}=20\mu A$	4.4	4.5		V
		$V_{CC}=6.0V, I_{OH}=20\mu A$	5.9	6.0		V
		$V_{CC}=4.5V, I_{OH}=4mA$	3.98	4.32		V
		$V_{CC}=6.0V, I_{OH}=5.2mA$	5.48	5.81		V
Output Voltage Low-Level	$V_{OL}$	$V_{CC}=2.0V, I_{OL}=20\mu A$		0	0.1	V
		$V_{CC}=4.5V, I_{OL}=20\mu A$		0	0.1	V
		$V_{CC}=6.0V, I_{OL}=20\mu A$		0	0.1	V
		$V_{CC}=4.5V, I_{OL}=4mA$		0.15	0.26	V
		$V_{CC}=6.0V, I_{OL}=5.2mA$		0.16	0.26	V
Input Leakage Current	$I_{(LEAK)}$	$V_{IN}=V_{CC}$ or GND, $V_{CC}=6.0V$			±0.1	μA
Quiescent Supply Current	$I_Q$	$V_{IN}=V_{CC}$ or GND, $V_{CC}=6.0V, I_{OUT}=0$			8	μA
Input Capacitance	$C_{IN}$			3.5		pF

### ■ DYNAMIC CHARACTERISTICS

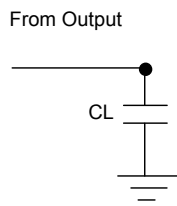
(T<sub>A</sub>=25°C, GND=0V; t<sub>R</sub>=t<sub>F</sub>=6ns; C<sub>L</sub>=50pF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay From CP to Qn	t <sub>PHL</sub> , t <sub>PLH</sub>	V <sub>CC</sub> =2.0V		41	170	ns
		V <sub>CC</sub> =4.5V		15	34	ns
		V <sub>CC</sub> =6.0V		12	29	ns
Propagation Delay From $\overline{\text{MR}}$ to Qn	t <sub>PHL</sub>	V <sub>CC</sub> =2.0V		39	140	ns
		V <sub>CC</sub> =4.5V		14	28	ns
		V <sub>CC</sub> =6.0V		11	24	ns
Output Transition Time	t <sub>THL</sub> , t <sub>TLH</sub>	V <sub>CC</sub> =2.0V		19	75	ns
		V <sub>CC</sub> =4.5V		7	15	ns
		V <sub>CC</sub> =6.0V		6	13	ns
Clock Pulse Width High or Low	t <sub>w</sub>	V <sub>CC</sub> =2.0V	80	14		ns
		V <sub>CC</sub> =4.5V	16	5		ns
		V <sub>CC</sub> =6.0V	14	4		ns
Master Reset Pulse Width Low	t <sub>w</sub>	V <sub>CC</sub> =2.0V	60	17		ns
		V <sub>CC</sub> =4.5V	12	6		ns
		V <sub>CC</sub> =6.0V	10	5		ns
Removal Time $\overline{\text{MR}}$ to CP	t <sub>rem</sub>	V <sub>CC</sub> =2.0V	60	17		ns
		V <sub>CC</sub> =4.5V	12	6		ns
		V <sub>CC</sub> =6.0V	10	5		ns
Setup Time DSA and DSB to CP	t <sub>su</sub>	V <sub>CC</sub> =2.0V	60	8		ns
		V <sub>CC</sub> =4.5V	12	3		ns
		V <sub>CC</sub> =6.0V	10	2		ns
Hold Time DSA and DSB to CP	t <sub>h</sub>	V <sub>CC</sub> =2.0V	+4	-6		ns
		V <sub>CC</sub> =4.5V	+4	-2		ns
		V <sub>CC</sub> =6.0V	+4	-2		ns
Maximum clock pulse frequency	f <sub>MAX</sub>	V <sub>CC</sub> =2.0V	6	23		MHz
		V <sub>CC</sub> =4.5V	30	71		MHz
		V <sub>CC</sub> =6.0V	35	85		MHz
Clock Frequency	f <sub>CLOCK</sub>	V <sub>CC</sub> =2.0V			6	MHz
		V <sub>CC</sub> =4.5V			31	MHz
		V <sub>CC</sub> =6.0V			36	MHz

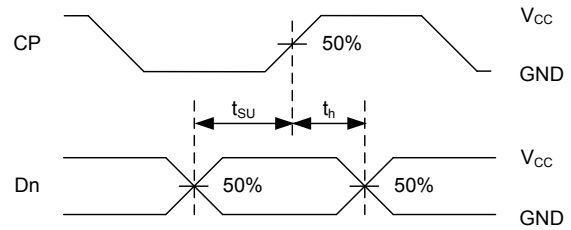
### ■ OPERATING CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C <sub>PD</sub>	No load		40		pF

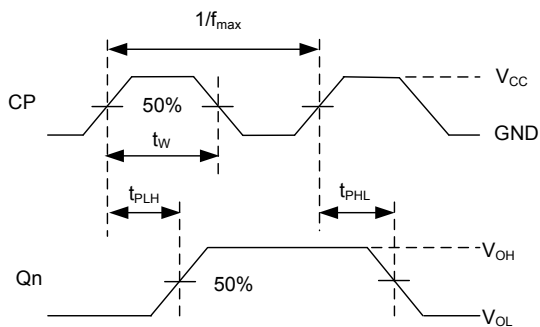
## ■ TEST CIRCUIT AND WAVEFORMS



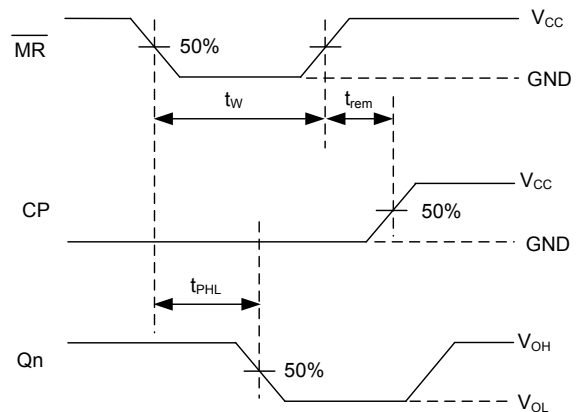
TEST CIRCUIT



SETUP TIME AND HOLD TIME



PROPAGATION DELAY TIMES FROM CP TO Qn



PROPAGATION DELAY TIMES FROM  $\overline{MR}$  TO Qn

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