



## 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

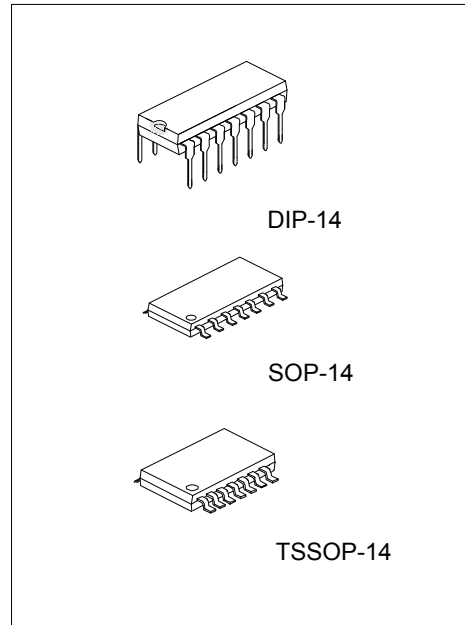
#### ORDERING INFORMATION

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

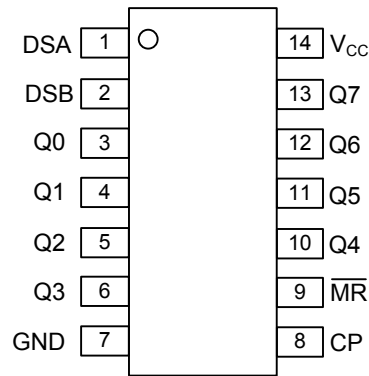
<p>U74HC164G-D14-T</p> <p>(1)Packing Type (2)Package Type (3)Green Package</p>	<p>(1) R: Tape Reel, T: Tube (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING

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

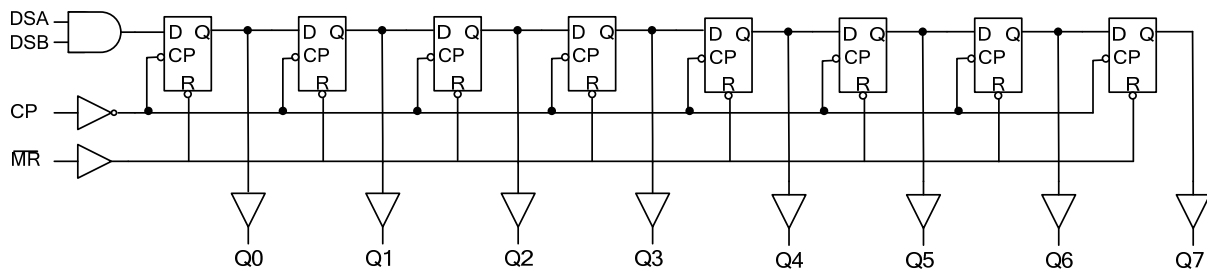


■ FUNCTION TABLE

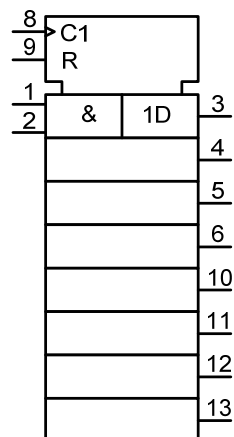
INPUT				OUTPUT	
$\overline{MR}$	CP	DSA	DSB	Q0	Q1 to Q7
L	X	X	X	L	L to L
H	L	X	X	Q0	Q1 to Q7
H	↑	H	L	L	Q0 to Q6
H	↑	H	H	H	Q0 to Q6
H	↑	L	H	L	Q0 to Q6
H	↑	L	L	L	Q0 to Q6

■ 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	$P_D$	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

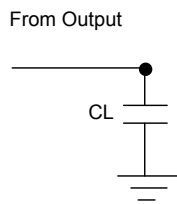
( $T_A=25^\circ\text{C}$ ,  $\text{GND}=0\text{V}$ ;  $t_R=t_F=6\text{ns}$ ;  $C_L=50\text{pF}$ , unless otherwise specified)

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

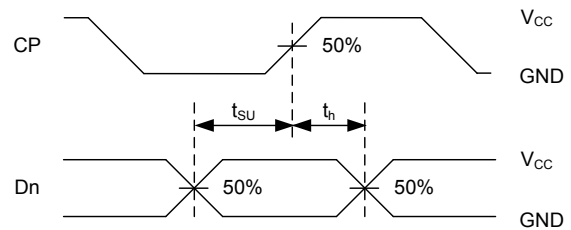
## ■ OPERATING CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	$C_{\text{PD}}$	No load		40		pF

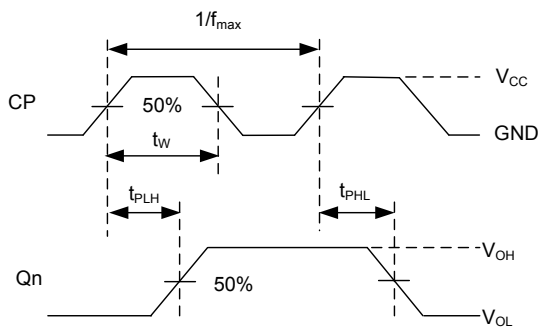
## ■ TEST CIRCUIT AND WAVEFORMS



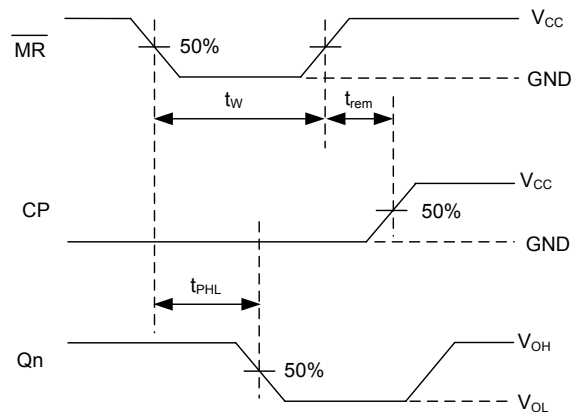
TEST CIRCUIT



SETUP TIME AND HOLD TIME



PROPAGATION DELAY TIMES FROM CP TO Qn



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

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