



# 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

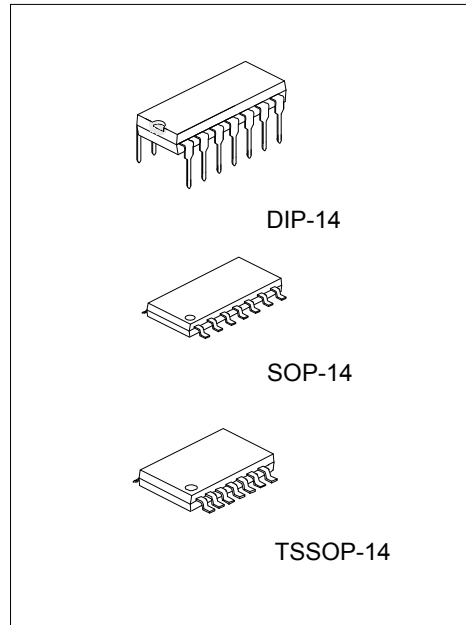
### ORDERING INFORMATION

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

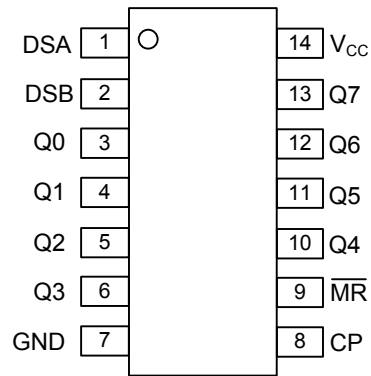
<p>U74HC164G-D14-T</p>	<p>(1) T: Tube, R: Tape Reel          (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14          (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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### MARKING

DIP-14	SOP-14 / TSSOP-14



■ PIN CONFIGURATION

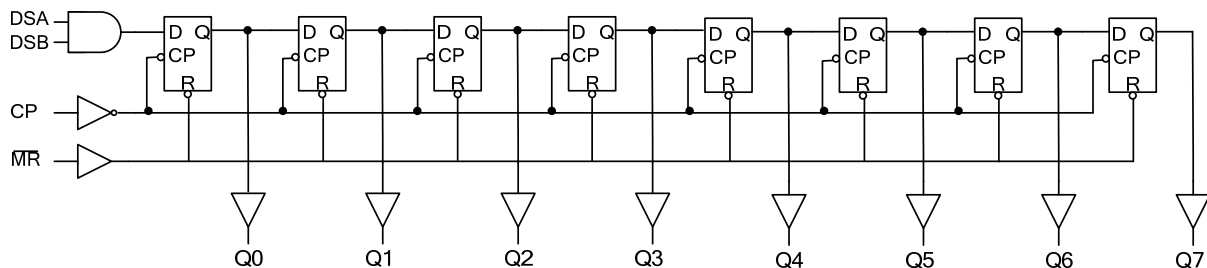


■ FUNCTION TABLE

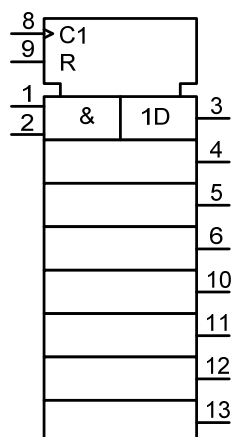
INPUT				OUTPUT	
$\overline{MR}$	CP	DSA	DSB	Q0	Q1 to Q7
L	X	X	X	L	L to L
H	L	X	X	Q0	Q1 to Q7
H	↑	H	L	L	Q0 to Q6
H	↑	H	H	H	Q0 to Q6
H	↑	L	H	L	Q0 to Q6
H	↑	L	L	L	Q0 to Q6

■ FUNCTIONAL DIAGRAM

Logic Diagram



IEC Logic Symbol



### ■ ABSOLUTE MAXIMUM RATING (Unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ 7.0	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 (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

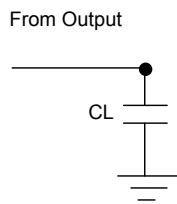
■ DYNAMIC CHARACTERISTICS (GND=0V;  $t_R=t_F=6ns$ ;  $C_L=50pF$ , unless otherwise specified)

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

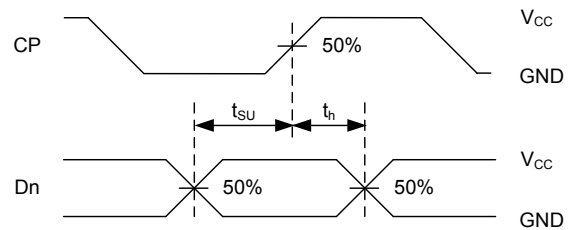
■ OPERATING CHARACTERISTICS (Unless otherwise specified)

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

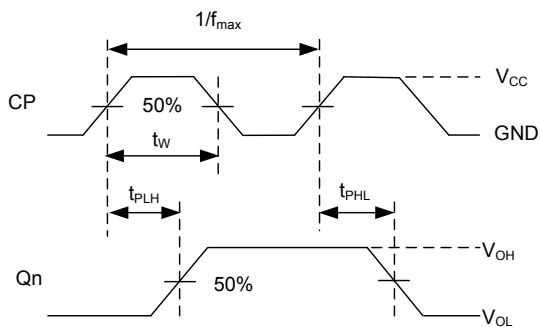
## ■ TEST CIRCUIT AND WAVEFORMS



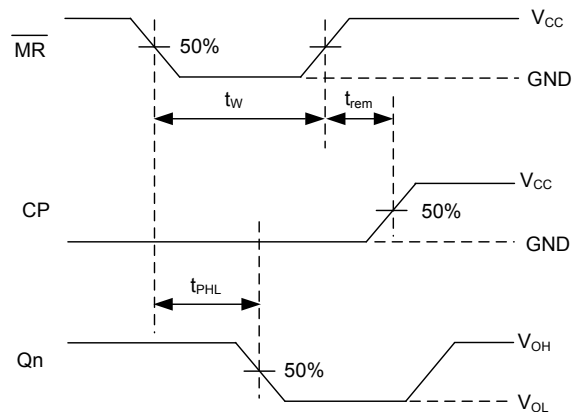
**TEST CIRCUIT**



**SETUP TIME AND HOLD TIME**



**PROPAGATION DELAY TIMES FROM CP TO Qn**



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

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