



## U74HCT374

CMOS IC

### OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

#### DESCRIPTION

The **U74HCT374** is a octal edge-triggered D-type flip-flops with 3-state outputs and it has 8 channels.

When the  $\overline{OE}$  input is low, on the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels of the data (D) inputs.

When the  $\overline{OE}$  input is high, the outputs are in the high-impedance.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

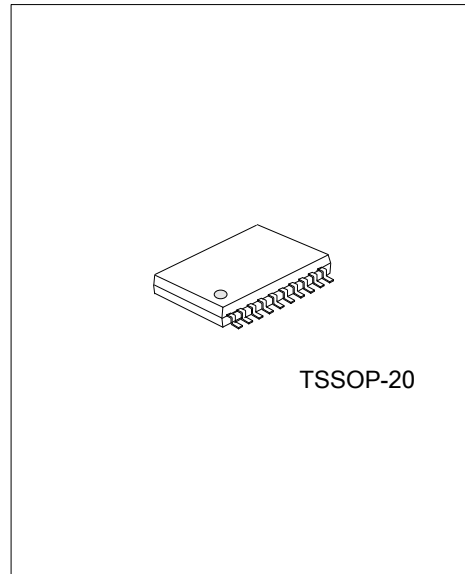
#### FEATURES

- \* Inputs are TTL-Voltage Compatible
- \* Operate from 4.5V to 5.5V
- \* Inputs Accept Voltages to 5.5V
- \* Max  $t_{pd}$  of 25ns at  $V_{CC}=5.5V$ ,  $C_L=50pF$
- \* Typ  $V_{OL} < 0.26V$  at  $V_{CC}=4.5V$ ,  $I_{OL}=6mA$ ,  $T_A=25^\circ C$
- \* Typ  $V_{OH} > 3.98V$  at  $V_{CC}=4.5V$ ,  $I_{OH}=-6mA$ ,  $T_A=25^\circ C$

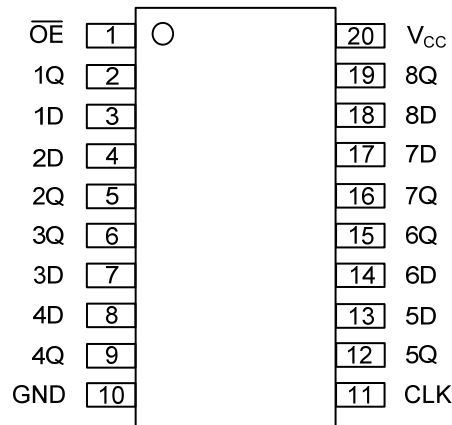
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HCT374L-P20-R	U74HCT374G-P20-R	TSSOP-20	Tape Reel
U74HCT374L-P20-T	U74HCT374G-P20-T	TSSOP-20	Tube

	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) P20: TSSOP-20</p> <p>(3) G: Halogen Free, L: Lead Free</p>
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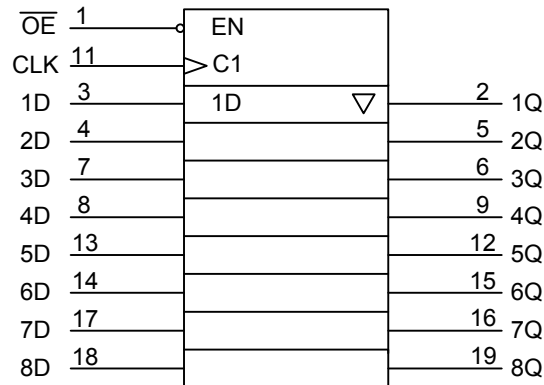
## ■ PIN CONFIGURATION



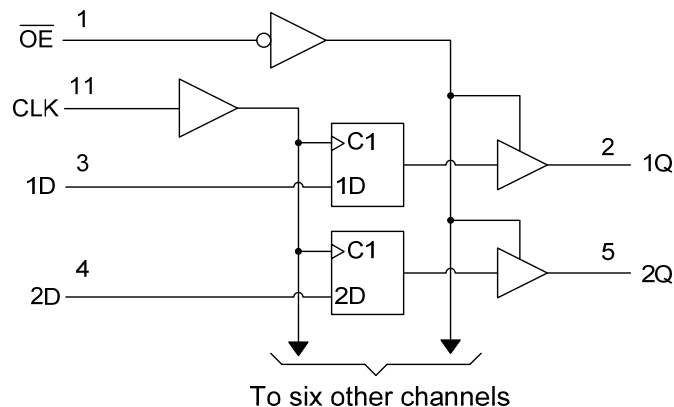
## ■ FUNCTION TABLE

INPUTS( $\overline{OE}$ )	INPUTS(CLK)	INPUTS(D)	OUTPUT(Q)
L	$\uparrow$	H	H
L	$\uparrow$	L	L
L	H or L	X	$Q_0$
H	X	X	Z

## ■ LOGIC SYMBOL



## ■ LOGIC DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ 7	V
Input Voltage	$V_{IN}$	-0.5 ~ 7	V
Output Voltage	$V_{OUT}$	-0.5 ~ $V_{CC} + 0.5$	V
$V_{CC}$ or GND Current	$I_{CC}$	±70	mA
Output Current	$I_{OUT}$	±35	mA
Input Clamp Current	$I_{IK}$	-20	mA
Output Clamp Current	$I_{OK}$	±20	mA
Operating Temperature	$T_{OPR}$	-40 ~ + 85	°C
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	RATINGS	UNIT
Supply Voltage	$V_{CC}$	4.5 ~ 5.5	V
High-level Input Voltage	$V_{IH}$	2	V
Low-level Input Voltage	$V_{IL}$	0.8	V
Input Voltage	$V_{IN}$	0 ~ $V_{CC}$	V
Output Voltage	$V_{OUT}$	0 ~ $V_{CC}$	V
High-level Output Current	$I_{OH}$	-8	mA
Low-level Output Current	$I_{OL}$	8	mA
Input Rise or Fall Times	$t_R, t_F$	500	ns/V
Operating temperature	$T_A$	-40 ~ 85	°C

### ■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage High-Level	$V_{OH}$	$V_{CC}=4.5V, I_{OH}=-20\mu A$	4.4	4.499		V
		$V_{CC}=4.5V, I_{OH}=-6mA$	3.98	4.3		
Output Voltage Low-Level	$V_{OL}$	$V_{CC}=4.5V, I_{OL}=20\mu A$		0.001	0.1	V
		$V_{CC}=4.5V, I_{OL}=6mA$		0.17	0.26	
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=5.5V, V_{IN}=0$ or $5.5V$		±0.1	±100	nA
Leakage Current (For output in high-impedance state)	$I_{OZ}$	$V_{CC}=5.5V, V_{IN}=V_{IH}$ or $V_{IH}, V_{OUT}=0$ or $5.5V$		±0.01	±0.5	µA
Quiescent Supply Current	$I_{CC}$	$V_{CC}=5.5V, V_{IN}=V_{CC}$ or $GND, I_{OUT}=0$			8	µA
Additional quiescent supply current	$\Delta I_{CC}$	$V_{CC}=5.5V, \text{one input at } 0.5V \text{ or } 3.4V, \text{Other inputs at } V_{CC} \text{ or } GND$		1.4	2.4	mA
Input Capacitance	$C_I$	$V_{CC}=4.5V$ to $5V$		3	10	pF

### ■ TIMING REQUIREMENTS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Clock Frequency	$f_{\text{CLOCK}}$	$V_{\text{CC}}=4.5\text{V}$			31	MHz
		$V_{\text{CC}}=5.5\text{V}$			36	
Pulse Width, CLK High or Low	$t_w$	$V_{\text{CC}}=4.5\text{V}$	16			ns
		$V_{\text{CC}}=5.5\text{V}$	14			
Setup Time, Data Before CLK $\uparrow$	$t_{\text{SU}}$	$V_{\text{CC}}=4.5\text{V}$	20			ns
		$V_{\text{CC}}=5.5\text{V}$	17			
Hold Time, Data After CLK $\uparrow$	$t_{\text{H}}$	$V_{\text{CC}}=4.5\text{V}$	10			ns
		$V_{\text{CC}}=5.5\text{V}$	10			

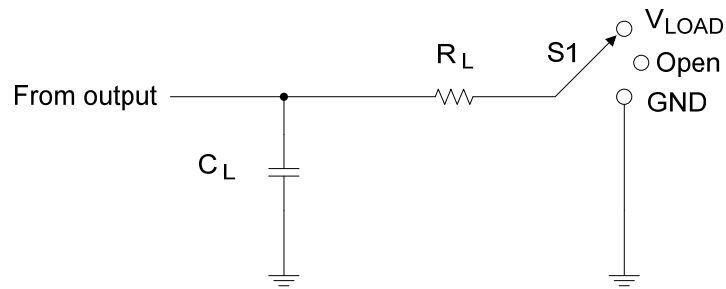
### ■ SWITCHING CHARACTERISTICS (See TEST CIRCUIT AND WAVEFORMS)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Maximum Clock Frequency	$f_{\text{(MAX)}}$	$V_{\text{CC}}=4.5\text{V}, C_L=50\text{pF}$	31	36		MHz
		$V_{\text{CC}}=5.5\text{V}, C_L=50\text{pF}$	36	40		
From CLK to Q	$t_{\text{PD}}$ ( $t_{\text{PLH}}/t_{\text{PHL}}$ )	$V_{\text{CC}}=4.5\text{V}, C_L=50\text{pF}$		30	36	ns
		$V_{\text{CC}}=5.5\text{V}, C_L=50\text{pF}$		25	32	
		$V_{\text{CC}}=4.5\text{V}, C_L=150\text{pF}$		40	46	
		$V_{\text{CC}}=5.5\text{V}, C_L=150\text{pF}$		35	41	
From $\overline{\text{OE}}$ to Q	$t_{\text{EN}}$ ( $t_{\text{PZL}}/t_{\text{PZH}}$ )	$V_{\text{CC}}=4.5\text{V}, C_L=50\text{pF}$		26	30	ns
		$V_{\text{CC}}=5.5\text{V}, C_L=50\text{pF}$		23	27	
		$V_{\text{CC}}=4.5\text{V}, C_L=150\text{pF}$		34	40	
		$V_{\text{CC}}=5.5\text{V}, C_L=150\text{pF}$		29	36	
From $\overline{\text{OE}}$ to Q	$t_{\text{DIS}}$ ( $t_{\text{PLZ}}/t_{\text{PHZ}}$ )	$V_{\text{CC}}=4.5\text{V}, C_L=50\text{pF}$		23	30	ns
		$V_{\text{CC}}=5.5\text{V}, C_L=50\text{pF}$		22	27	
Output transition rise/fall time	$t_{\text{r}}$ ( $t_{\text{R}}/t_{\text{F}}$ )	$V_{\text{CC}}=4.5\text{V}, C_L=50\text{pF}$		10	12	ns
		$V_{\text{CC}}=5.5\text{V}, C_L=50\text{pF}$		9	11	
		$V_{\text{CC}}=4.5\text{V}, C_L=150\text{pF}$		18	42	
		$V_{\text{CC}}=5.5\text{V}, C_L=150\text{pF}$		16	38	

### ■ OPERATING CHARACTERISTICS ( $T_a=25^\circ\text{C}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	RATINGS	UNIT
Power Dissipation Capacitance	$C_{\text{PD}}$	No load, $V_{\text{CC}} = 5\text{V}, f=1\text{MHz}$	85	pF

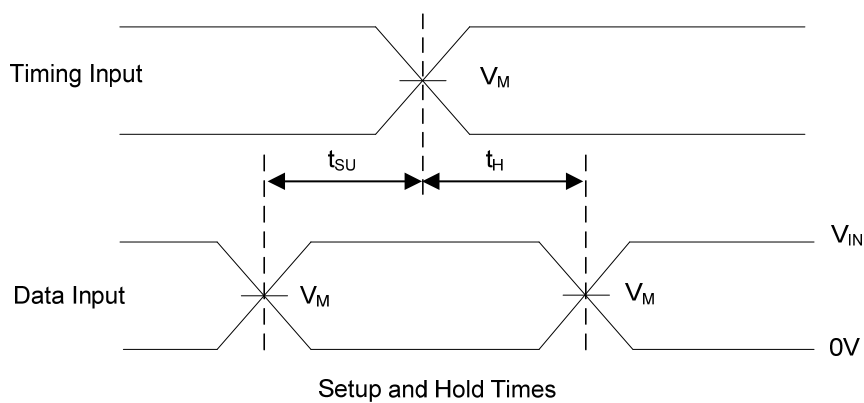
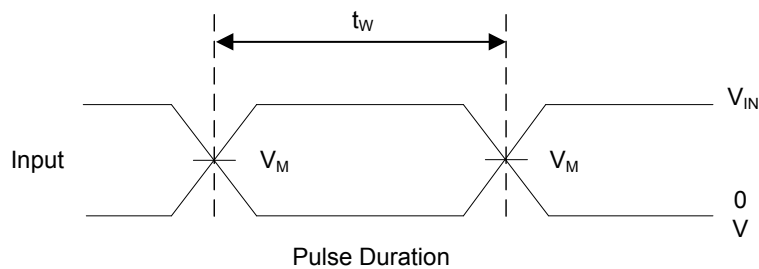
## ■ TEST CIRCUIT AND WAVEFORMS



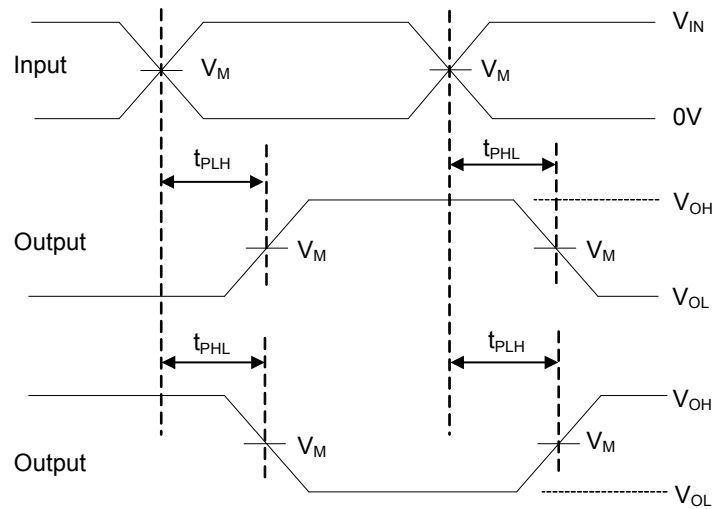
Test Circuit

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

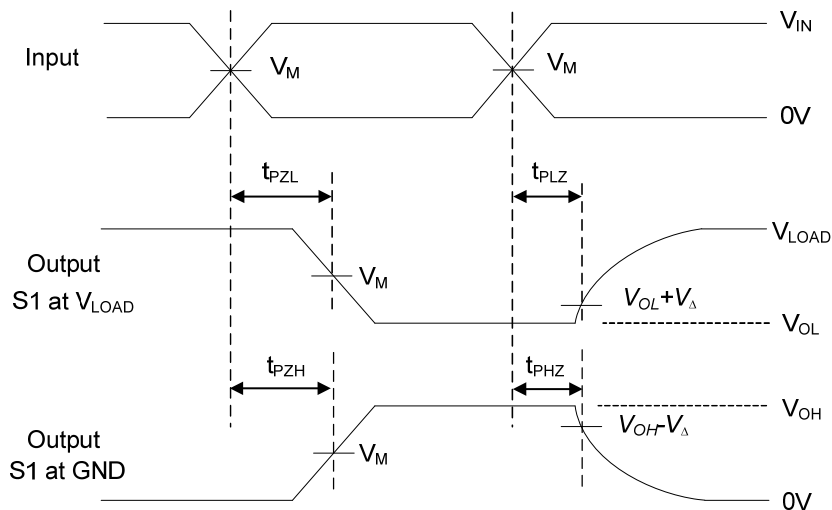
$V_{CC}$	Input		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_{IN}$	$t_R, t_F$					
$5V \pm 0.5V$	$V_{CC}$	$\leq 3ns$	$V_{CC}/2$	$V_{CC}$	15pF	1k $\Omega$	0.5V
					50pF		



## ■ TEST CIRCUIT AND WAVEFORMS(Cont.)



Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable and Disable Times

Note: A.  $C_L$  includes probe and jig capacitance.

B.  $P_{RR} \leq 1\text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_r \leq 3\text{ns}$ ,  $t_f \leq 3\text{ns}$ .

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