



U74LVC374

CMOS IC

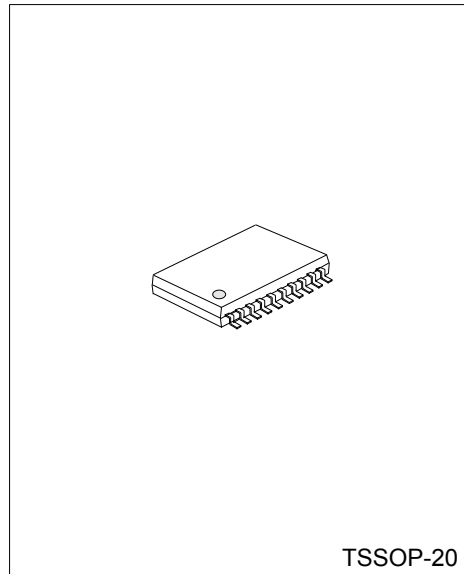
OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

■ DESCRIPTION

The **U74LVC374** is an octal edge-triggered D-type flip-flop with 3-state outputs and 8 channels.

■ FEATURES

- * Operate from 1.65V to 3.6V
- * Max t_{pd} of 6.5ns at 3.3 V
- * Typical $V_{OL} < 0.8V$ @ $V_{CC}=3.3V$ ($T_a=25^{\circ}C$)
- * Typical $V_{OH} > 2.0V$ @ $V_{CC}=3.3V$ ($T_a=25^{\circ}C$)
- * Power off disables outputs, permitting live insertion
- * Halogen Free

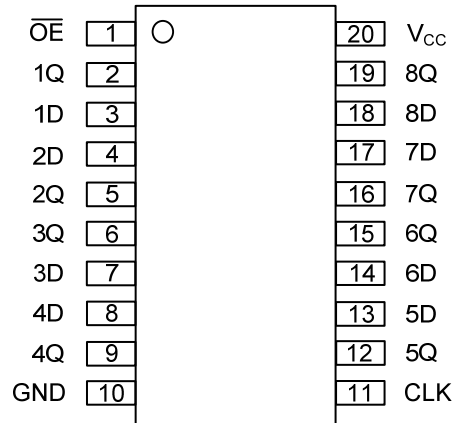


■ ORDERING INFORMATION

Ordering Number	Package	Packing
U74LVC374G-P20-T	TSSOP-20	Tape Reel

<p>U74LVC374G-P20-R</p>	<p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Halogen Free</p>	<p>(1) R: Tape Reel</p> <p>(2) P20: TSSOP-20</p> <p>(3) G: Halogen Free</p>
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■ PIN CONFIGURATION

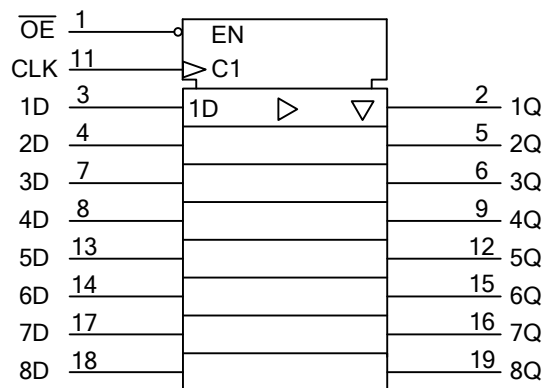


■ FUNCTION TABLE

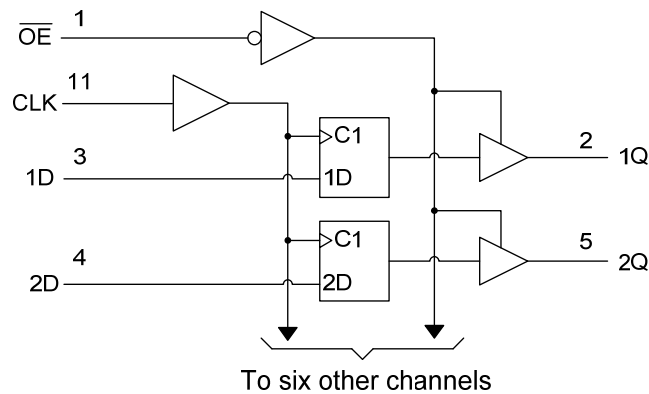
INPUTS(\overline{OE})	INPUTS(CLK)	INPUTS(D)	OUTPUT(Q)
L	\uparrow	H	H
L	\uparrow	L	L
L	L/H	X	Q0
H	X	X	Z

Note: H: HIGH voltage level; L: LOW voltage level.

■ LOGIC SYMBOL



■ LOGIC DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	-0.5 ~ +6.5	V
Input Voltage	V_{IN}	-0.5 ~ +6.5	V
Voltage Range Applied To Any Output In The High-Impedance Or Power-Off State	V_{OUT}	-0.5 ~ +6.5	V
Voltage Range Applied To Any Output In The High Or Low State		-0.5 ~ $V_{CC}+0.5$	V
V_{CC} or GND Current	I_{CC}	±100	mA
Output Current	I_{OUT}	±50	mA
Input Clamp Current	I_{IK}	-50	mA
Output Clamp Current	I_{OK}	-50	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.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	83	°C/W

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	Operating	1.65		3.6	V
		Data retention only	1.5			V
High-level Input Voltage	V_{IH}	$V_{CC}=1.65V$ to 1.95V	0.65 $\times V_{CC}$			V
		$V_{CC}=2.3V$ to 2.7V	1.7			V
		$V_{CC}=2.7V$ to 3.6V	2			V
Low-level Input Voltage	V_{IL}	$V_{CC}=1.65V$ to 1.95V			0.35 $\times V_{CC}$	V
		$V_{CC}=2.3V$ to 2.7V			0.7	V
		$V_{CC}=2.7V$ to 3.6V			0.8	V
Input Voltage	V_{IN}		0		5.5	V
Output Voltage	V_{OUT}	High or low state	0		V_{CC}	V
		3 state	0		5.5	V
High-level Output Current	I_{OH}	$V_{CC}=1.65V$			-4	mA
		$V_{CC}=2.3V$			-8	mA
		$V_{CC}=2.7V$			-12	mA
		$V_{CC}=3V$			-24	mA
Low-level Output Current	I_{OL}	$V_{CC}=1.65V$			4	mA
		$V_{CC}=2.3V$			8	mA
		$V_{CC}=2.7V$			12	mA
		$V_{CC}=3V$			24	mA
Input transition Rise or Fall rate	$\Delta t/\Delta v$				10	ns/V

■ ELECTRICAL CHARACTERISTICS (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP (Note1)	MAX	UNIT
Output Voltage High-Level	V _{OH}	V _{CC} =1.65~3.6V, I _{OH} =-100μA	V _{CC} -0.2			V
		V _{CC} =1.65V, I _{OH} =-4mA	1.2			V
		V _{CC} =2.3V, I _{OH} =-8mA	1.7			V
		V _{CC} =2.7V, I _{OH} =-12mA	2.2			V
		V _{CC} =3V, I _{OH} =-12mA	2.4			V
		V _{CC} =3V, I _{OH} =-24mA	2.2			V
Output Voltage Low-Level	V _{OL}	V _{CC} =1.65~3.6V, I _{OL} =100μA			0.2	V
		V _{CC} =1.65V, I _{OL} =4mA			0.45	V
		V _{CC} =2.3V, I _{OL} =8mA			0.7	V
		V _{CC} =2.7V, I _{OL} =12mA			0.4	V
		V _{CC} =3V, I _{OL} =24mA			0.55	V
Input Leakage Current	I _{I(LEAK)}	V _{CC} =3.6V, V _{IN} =0 to 5.5V			±5	μA
Power OFF Leakage Current	I _{OFF}	V _{CC} =0V, V _{IN} OR V _{OUT} =5.5V			±10	μA
3-state Output Off-state Current	I _{OZ}	V _{CC} =3.6V, V _{OUT} =0 to 5.5V			±10	μA
Quiescent Supply Current	I _{CC}	V _{CC} =3.6V, V _{IN} =V _{CC} or GND, I _{OUT} =0			10	μA
		V _{CC} =3.6V, 3.6V ≤ V _{IN} ≤ 5.5V, I _{OUT} =0(Note 2)			10	μA
Additional Quiescent Supply Current	ΔI _{CC}	V _{CC} =2.7~3.6V One input at V _{CC} -0.6V Other inputs at V _{CC} or GND			500	μA
Input Capacitance	C _I	V _{CC} =3.3V, V _{IN} =V _{CC} or GND		4		pF
Output Capacitance	C _O	V _{CC} =3.3V, V _{OUT} =V _{CC} or GND		5.5		pF

Notes: 1. V_{CC}=3.3V.

2. This applies in the disabled state only.

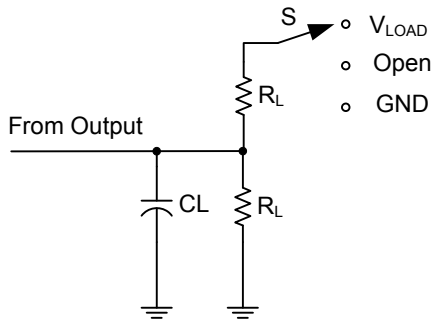
■ SWITCHING CHARACTERISTICS(Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
From CLK to Q	t _{PLH} /t _{PHL}	V _{CC} =2.7V			8.1	ns
		V _{CC} =3.3V±0.3V	1.5		7	ns
From \overline{OE} to Q	t _{PZL} /t _{PZH}	V _{CC} =2.7V			8.5	ns
		V _{CC} =3.3V±0.3V	1.5		7.5	ns
From \overline{OE} to Q	t _{PLZ} /t _{PHZ}	V _{CC} =2.7V			7.1	ns
		V _{CC} =3.3V±0.3V	1.5		6.5	ns
Maximum Clock Frequency	f _{MAX}	V _{CC} =2.7V	80			MHz
		V _{CC} =3.3V±0.3V	100			MHz
Clock Frequency	f _{CLOCK}	V _{CC} =2.7V			80	MHz
		V _{CC} =3.3V±0.3V			100	MHz
Pulse Width	t _w	V _{CC} =2.7V	3.3			ns
		V _{CC} =3.3V±0.3V	3.3			ns
Setup Time	t _{SU}	V _{CC} =2.7V	2			ns
		V _{CC} =3.3V±0.3V	2			ns
Hold Time	t _H	V _{CC} =2.7V	1.5			ns
		V _{CC} =3.3V±0.3V	1.5			ns

■ OPERATING CHARACTERISTICS(Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation	C _{PD}	f=10MHz, V _{CC} =3.3V±0.3V		54.5		pF
Capacitance Per Flip-flop		f=10MHz, V _{CC} =3.3V±0.3V		13.5		pF

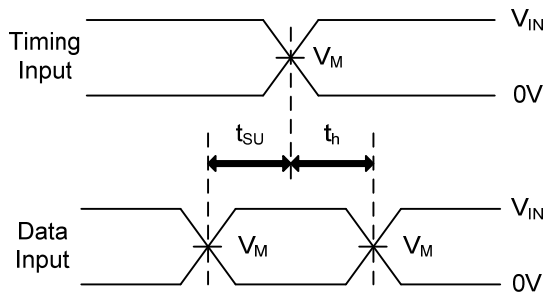
TEST CIRCUIT AND WAVEFORMS



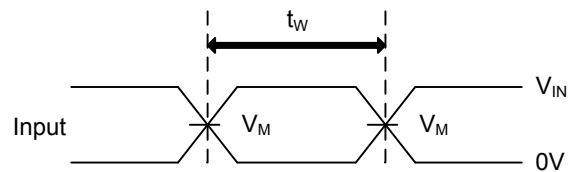
TEST	S
t_{PLH}/t_{PHL}	Open
t_{PHZ}/t_{PZH}	GND
t_{PLZ}/t_{PZL}	V_{LOAD}

TEST CIRCUIT

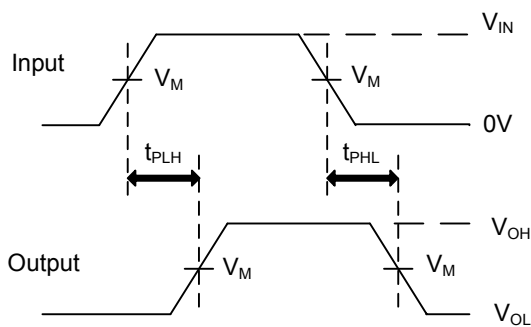
V_{CC}	Inputs		V_M	V_{LOAD}	V_{Δ}	C_L	R_L
	V_{IN}	t_R, t_F					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	0.15V	30pF	1K Ω
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	0.15V	30pF	500 Ω
2.7V	2.7V	$\leq 2.5ns$	1.5V	6V	0.3V	50pF	500 Ω
$3.3V \pm 0.3V$	2.7V	$\leq 2.5ns$	1.5V	6V	0.3V	50pF	500 Ω



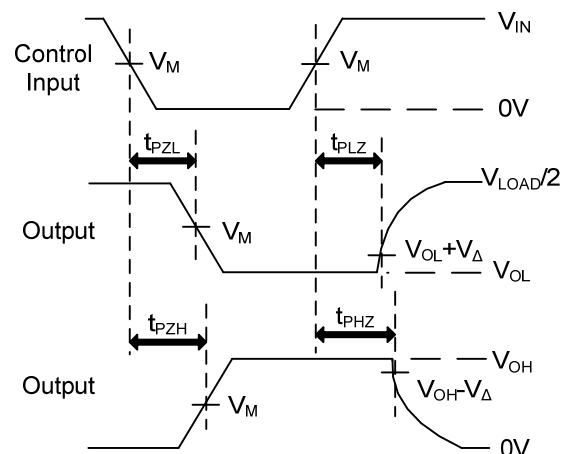
SETUP TIME AND HOLD TIME



PULSE WIDTH



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

Note: C_L includes probe and jig capacitance.

All input pulses are supplied by generators having the following characteristics: PRR $\leq 10MHz$, $Z_o = 50\Omega$.

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