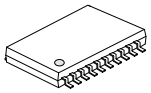
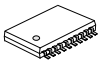
U74LVC374

CMOS IC

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



SOP-20



TSSOP-20U

■ 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°C)
* Typical V_{OH} > 2.0V @ V_{CC}=3.3V (T_A=25°C)
* Power off disables outputs, permitting live insertion

■ ORDERING INFORMATION

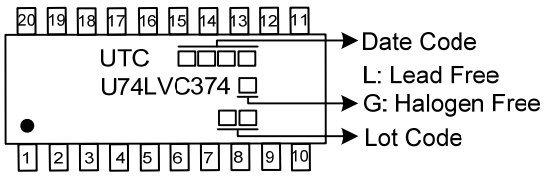
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC374L-S20-R	U74LVC374G-S20-R	SOP-20	Tape Reel
U74LVC374L-ULA-R	U74LVC374G-ULA-R	TSSOP-20U	Tape Reel

U74LVC374G-S20-R

(1)Packing Type
(2)Package Type
(3)Green Package

(1) R: Tape Reel
(2) S20: SOP-20, ULA: TSSOP-20U
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



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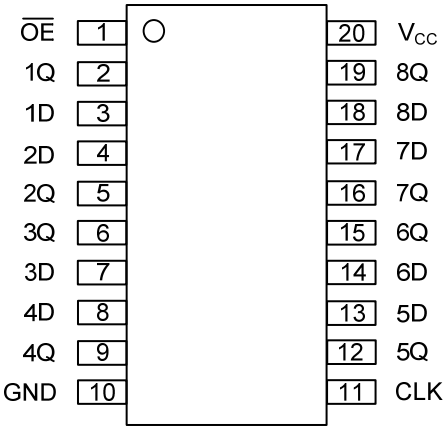
■ PIN CONFIGURATION

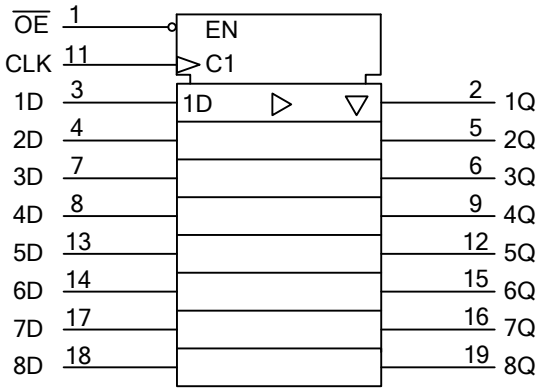


■ FUNCTION TABLE

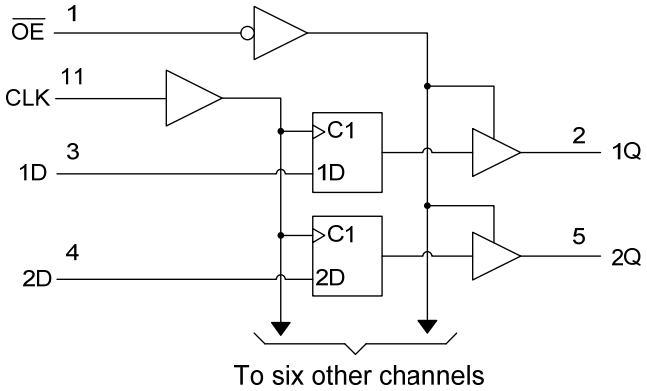
INPUTS ($\overline{OE}$)	INPUTS(CLK)	INPUTS(D)	OUTPUT(Q)
L	↑	H	H
L	↑	L	L
L	L /H	X	Q0
H	X	X	Z

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	SOP-20	θ_{JA}	85	°C/W
	TSSOP-20U		110	°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 ×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 ×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	Δt / Δv				10	ns/V

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

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.

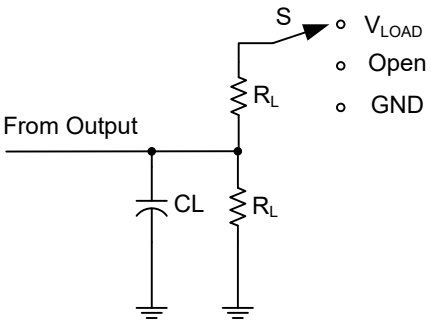
■ SWITCHING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input CLK to output Q	t_{PLH}/t_{PHL}	V_{CC}=2.7V			8.1	ns
		V_{CC}=3.3V±0.3V	1.5		7	ns
Propagation delay from input $\overline{OE}$ to output Q	t_{PZL}/t_{PZH}	V_{CC}=2.7V			8.5	ns
		V_{CC}=3.3V±0.3V	1.5		7.5	ns
Propagation delay from input $\overline{OE}$ to output 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 (T_A=25°C, unless otherwise specified)

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

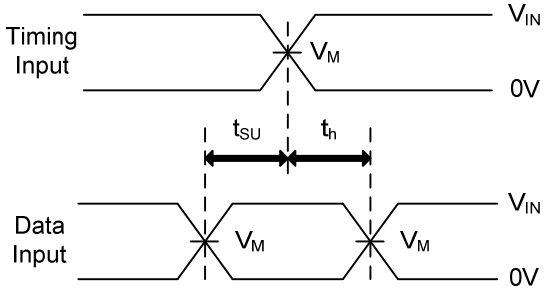
■ TEST CIRCUIT AND WAVEFORMS



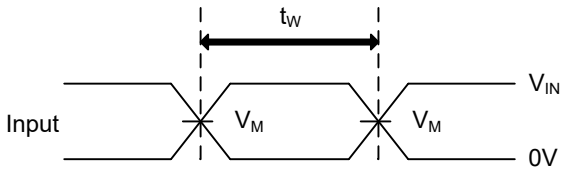
TEST CIRCUIT

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

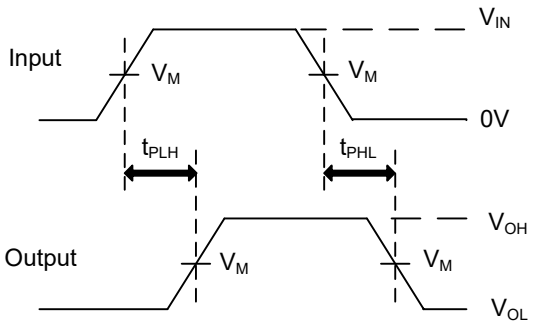
V_{CC}	Inputs		V_M	V_{LOAD}	V_Δ	C_L	R_L
	V_{IN}	t_R, t_F					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	0.15V	30pF	1KΩ
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	2 x V_{CC}	0.15V	30pF	500Ω
2.7V	2.7V	≤2.5ns	1.5V	6V	0.3V	50pF	500Ω
3.3V±0.3V	2.7V	≤2.5ns	1.5V	6V	0.3V	50pF	500Ω



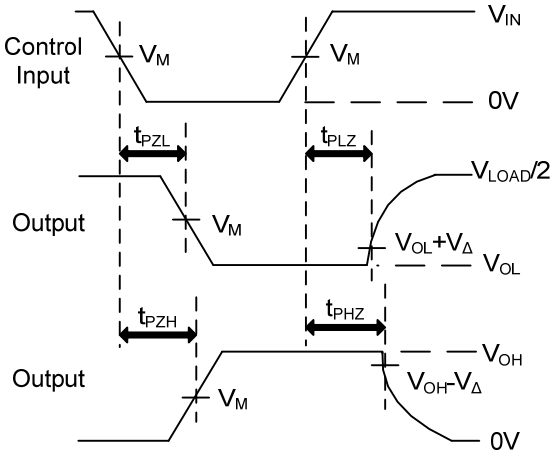
SETUP TIME AND HOLD TIME



PULSE WIDTH



PROPAGATION DELAY TIMES



ENABLE AND DISABLE TIMES

Notes: 1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Z_O = 50Ω.

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