



UCD4093T

Preliminary

CMOS IC

QUAD 2-INPUT NAND SCHMITT TRIGGER

DESCRIPTION

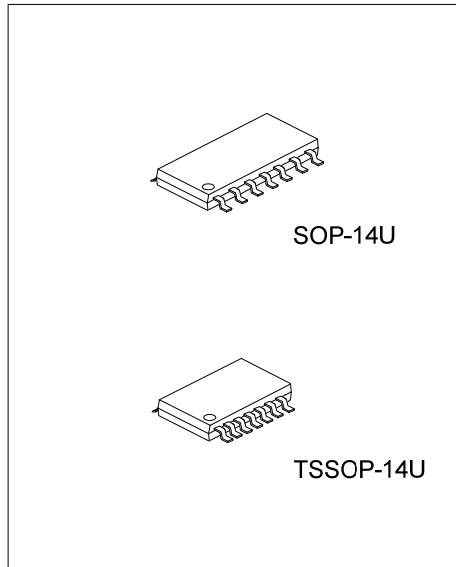
The **UCD4093T** device is designed for 3V to 15V V_{CC} operation, but is designed specifically for 0.5V to 20V V_{CC} operation.

This device consists of four Schmitt trigger circuits. Each circuit functions as a two-input NAND gate with Schmitt trigger action on both inputs. The gate switches at different points for positive and negative going signals. The difference between the positive voltage (V_{T+}) and the negative voltage (V_{T-}) is defined as hysteresis voltage (V_H).

This device is fully specified for partial-power-down applications using I_{OFF} . The I_{OFF} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

FEATURES

- * Schmitt trigger action on each input with no external components
- * Hysteresis voltage typically 0.8V at $V_{DD}=5V$ and 2.0V at $V_{DD}=10V$
- * Noise immunity greater than 50%
- * No limit on input rise and fall times
- * Standardized, symmetrical output characteristics
- * 5V, 10V and 15V parametric ratings

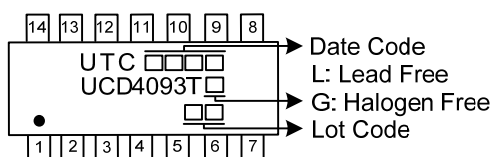


ORDERING INFORMATION

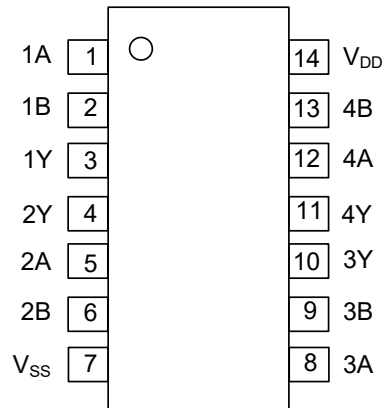
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UCD4093TL-UEA-R	UCD4093TG-UEA-R	SOP-14U	Tape Reel
UCD4093TL-UEB-R	UCD4093TG-UEB-R	TSSOP-14U	Tape Reel

<p>UCD4093TG-UEA-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) UEA: SOP-14U, UEB: TSSOP-14U</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



■ PIN CONFIGURATION

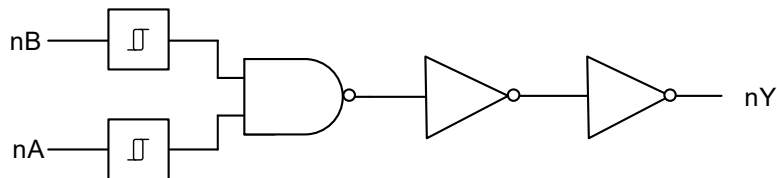


■ FUNCTION TABLE (each gate)

INPUT	INPUT	OUTPUT
A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

Note: H: HIGH Voltage Level L: LOW Voltage Level

■ LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING ($T_A=25^\circ\text{C}$, unless otherwise specified) (Note 2)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{DD}		-0.5 ~ +20	V
Input Voltage	V_{IN}		-0.5 ~ $V_{DD}+0.5$	V
Input Clamp Current	I_{IK}	$V_{IN}<0V$	± 10	mA
Output Clamp Current	I_{OK}	$V_{OUT}<0V$	± 10	mA
Output Current	I_{OUT}		± 10	mA
V_{CC} or GND Current	I_{CC}		± 100	mA
Supply Current	I_{DD}		50	mA
Storage Temperature	T_{STG}		-65 ~ +150	$^\circ\text{C}$

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	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{DD}	Operating	3		15	V
Input Voltage	V_{IN}		0		V_{DD}	V
Operating Temperature	T_A		-40		+125	$^\circ\text{C}$

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Output Voltage	V_{OH}	$V_{DD}=5V, I_{OH} <1\mu\text{A}$	4.95			V
		$V_{DD}=10V, I_{OH} <1\mu\text{A}$	9.95			V
		$V_{DD}=15V, I_{OH} <1\mu\text{A}$	14.95			V
Low-Level Output Voltage	V_{OL}	$V_{DD}=5V, I_{OH} <1\mu\text{A}$			0.5	V
		$V_{DD}=10V, I_{OH} <1\mu\text{A}$			0.5	V
		$V_{DD}=15V, I_{OH} <1\mu\text{A}$			0.5	V
Positive-Going Threshold Voltage	V_{T+}	$V_{DD}=5V$	2.2	2.9	3.6	V
		$V_{DD}=10V$	4.6	5.8	7.1	V
		$V_{DD}=15V$	6.3	9.0	12.7	V
Negative-Going Threshold Voltage	V_{T-}	$V_{DD}=5V$	0.9	2.2	2.8	V
		$V_{DD}=10V$	2.5	4.0	5.2	V
		$V_{DD}=15V$	4.8	5.7	9.6	V
Hysteresis Voltage	V_H	$V_{DD}=5V$	0.3	0.8	1.6	V
		$V_{DD}=10V$	1.2	2.0	3.4	V
		$V_{DD}=15V$	1.6	3.5	5.0	V
High-Level Output Current	I_{OH}	$V_{DD}=5V, V_{OUT}=2.5V$			-1.6	mA
		$V_{DD}=5V, V_{OUT}=4.6V$			-0.51	mA
		$V_{DD}=10V, V_{OUT}=9.5V$			-1.3	mA
		$V_{DD}=15V, V_{OUT}=13.5V$			-3.4	mA
Low-Level Output Current	I_{OL}	$V_{DD}=5V, V_{OUT}=0.4V$	0.51			mA
		$V_{DD}=10V, V_{OUT}=0.5V$	1.3			mA
		$V_{DD}=15V, V_{OUT}=1.5V$	3.4			mA
Input Leakage Current	$I_{I(LEAK)}$	$V_{DD}=15V$			± 0.1	μA
Quiescent Supply Current	I_{DD}	$V_{DD}=5V, I_{OUT}=0$			1	μA
		$V_{DD}=10V, I_{OUT}=0$			2	μA
		$V_{DD}=15V, I_{OUT}=0$			4	μA
		$V_{DD}=20V, I_{OUT}=0$			20	μA

Note: I_{OL} and I_{OH} are tested one output at a time.

■ SWITCHING CHARACTERISTICS

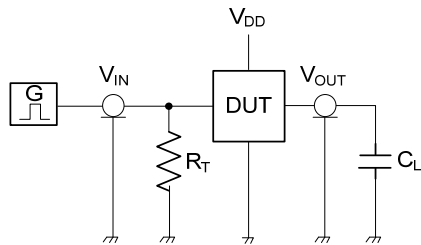
(Input: $t_R=t_F=20\text{ns}$, $C_L=50\text{pF}$, $R_L=200\text{K}\Omega$, $T_A=25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from Input(nA or nB) to Output(nY)	t_{PHL}/t_{PLH}	$V_{DD}=5\text{V}$		190	380	ns
		$V_{DD}=10\text{V}$		90	180	ns
		$V_{DD}=15\text{V}$		65	130	ns
Transition Time, Input (nY) to Output(nA or nB)	t_{THL}/t_{TLH}	$V_{DD}=5\text{V}$		100	200	ns
		$V_{DD}=10\text{V}$		50	100	ns
		$V_{DD}=15\text{V}$		40	80	ns

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	C_{IN}	Any Input		5	7.5	pF

■ TEST CIRCUIT AND WAVEFORMS



Note: CL includes probe and jig capacitance.

Fig. 1 Test Circuit

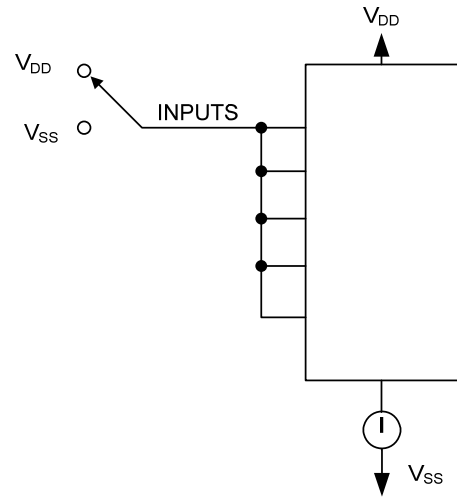


Fig. 2 Quiescent Device Current Test Circuit

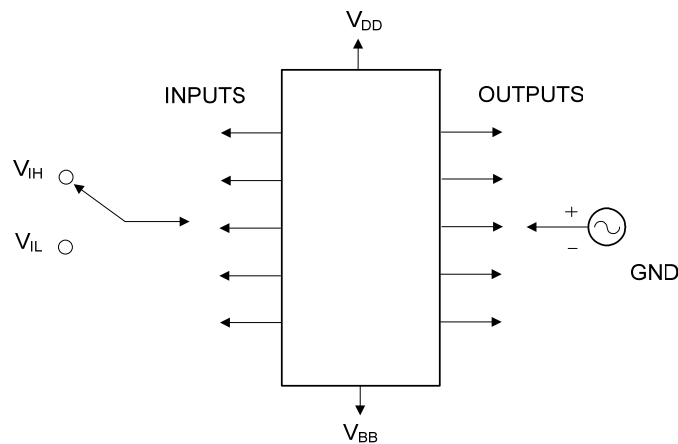


Fig.3 Input Voltage Test Circuit

V _{DD}	Inputs		V _M	V _{LOAD}	C _L	R _L	V _Δ
	V _{IN}	t _R / t _F					
5V~15V	V _{SS} Or V _{DD}		0.5V _{DD}		50pF		

■ TEST CIRCUIT AND WAVEFORMS (Cont.)

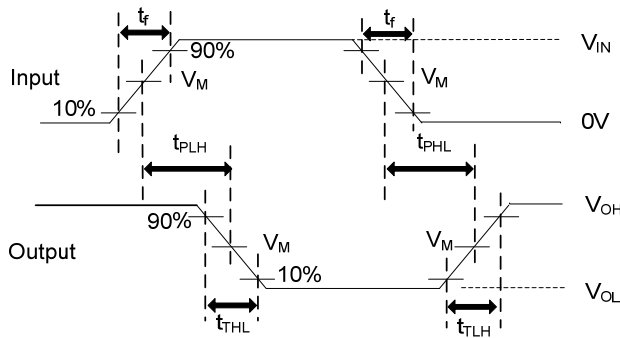


Fig.4 Propagation Delay And Output Transition Time

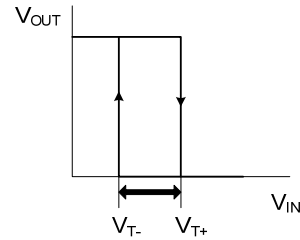


Fig.5 Transfer Characteristic

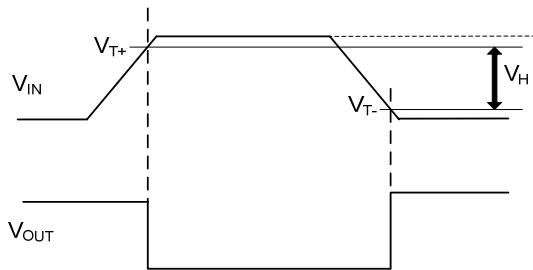


Fig.6 Waveforms Showing Definition Of V_{T+} And V_{T-} (Between Limits At 30 % And 70 %) And V_H

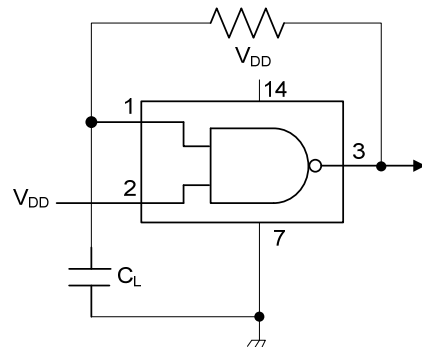


Fig.7 Astable Multivibrator

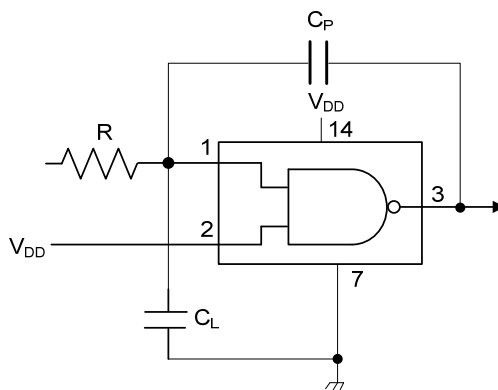


Fig.8 Schmitt Trigger Driven Via A High-Impedance Input

Notes: 1. C_L includes probe and jig capacitance.

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

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