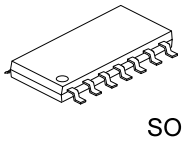
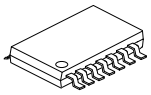
QUAD 2-INPUT NAND SCHMITT TRIGGER



SOP-14U



TSSOP-14U

■ 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).

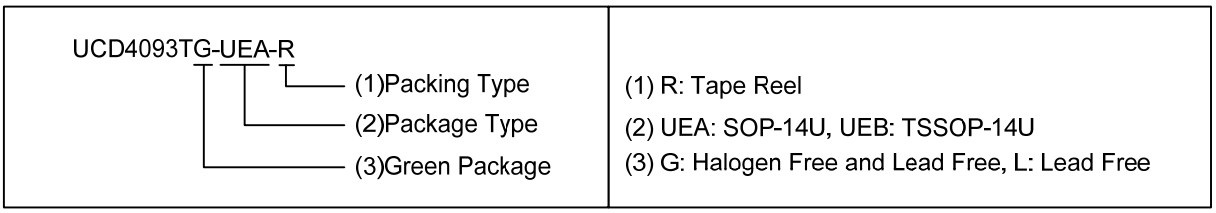
This device is fully specified for partial-power-down applications using I_{OFF}. The I_{OFF} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

■ FEATURES

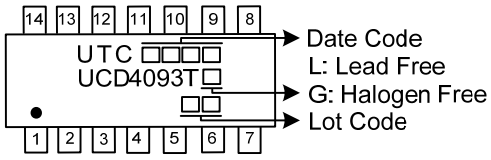
* Schmitt trigger action on each input with no external components
* Hysteresis voltage typically 0.8V at V_{DD}=5V and 2.0V at V_{DD}=10V
* Noise immunity greater than 50%
* No limit on input rise and fall times
* Standardized, symmetrical output characteristics
* 5V, 10V and 15V parametric ratings

■ ORDERING INFORMATION

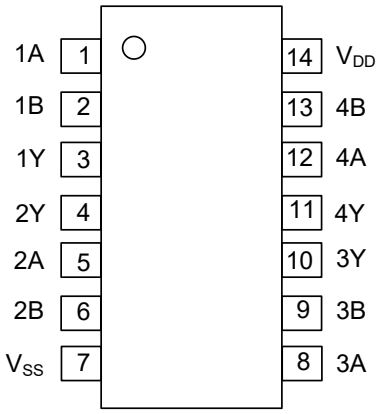
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UCD4093TL-UEA-R	UCD4093TG-UEA-R	SOP-14U	Tape Reel
UCD4093TL-UEB-R	UCD4093TG-UEB-R	TSSOP-14U	Tape Reel



■ MARKING



■ PIN CONFIGURATION

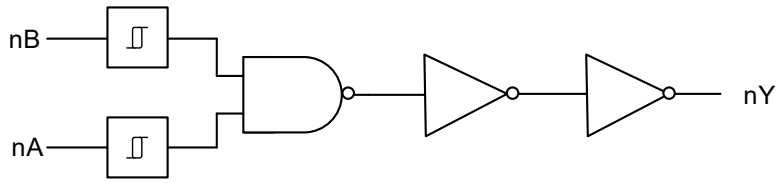


■ FUNCTION TABLE (each gate)

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°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	°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	°C

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Output Voltage	V_{OH}	V_{DD}=5V, $\|I_{OH}\|$<1μA	4.95			V
		V_{DD}=10V, $\|I_{OH}\|$<1μA	9.95			V
		V_{DD}=15V, $\|I_{OH}\|$<1μA	14.95			V
Low-Level Output Voltage	V_{OL}	V_{DD}=5V, $\|I_{OH}\|$<1μA			0.5	V
		V_{DD}=10V, $\|I_{OH}\|$<1μA			0.5	V
		V_{DD}=15V, $\|I_{OH}\|$<1μA			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

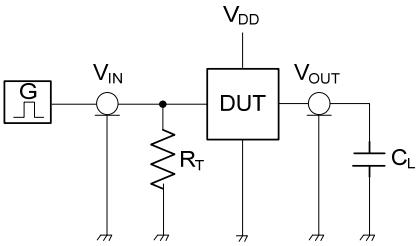
(Input: t_R=t_F=20ns, C_L=50pF, R_L=200KΩ, T_A=25°C, unless otherwise specified)

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

■ OPERATING CHARACTERISTICS (T_A=25°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: C_L includes probe and jig capacitance.

Fig. 1 Test Circuit

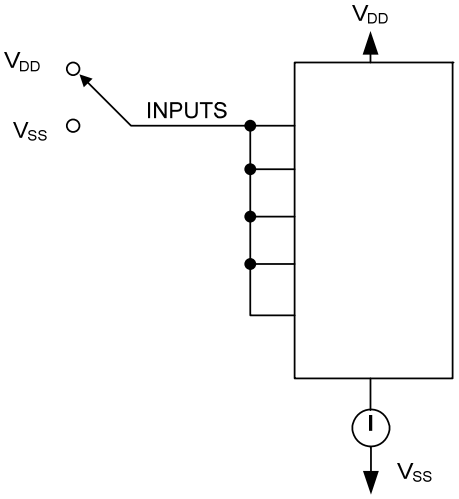


Fig. 2 Quiescent Device Current Test Circuit

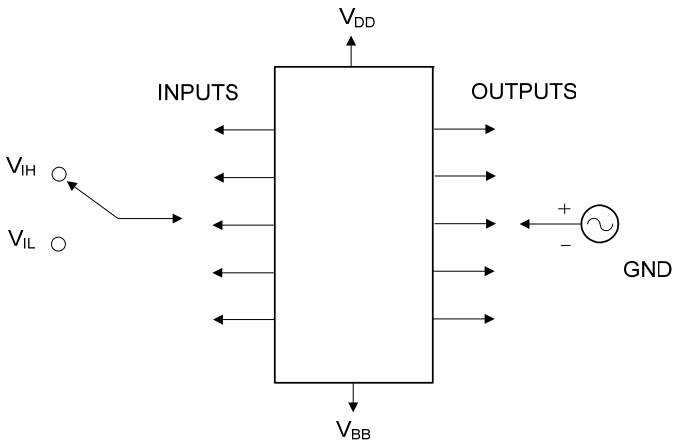


Fig.3 Input Voltage Test Circuit

V_{DD}	Inputs		V_M	V_{LOAD}	C_L	R_L	$V_{\triangle}$
	V_{IN}	t_R / t_F					
5V~15V	V_{SS} Or V_{DD}		$0.5V_{DD}$		50pF		

■ TEST CIRCUIT AND WAVEFORMS (Cont.)

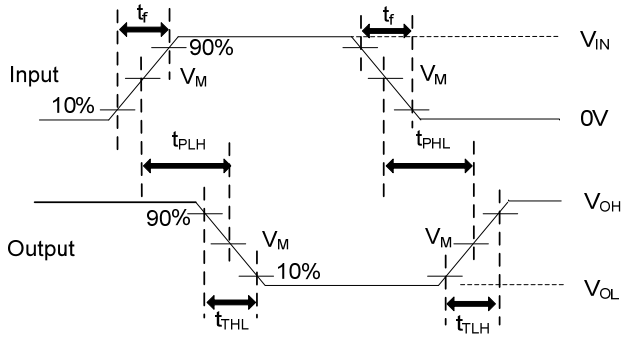


Fig.4 Propagation Delay And Output Transition Time

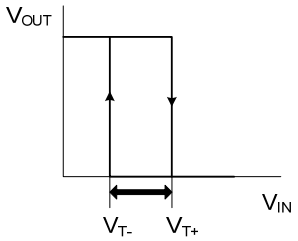


Fig.5 Transfer Characteristic

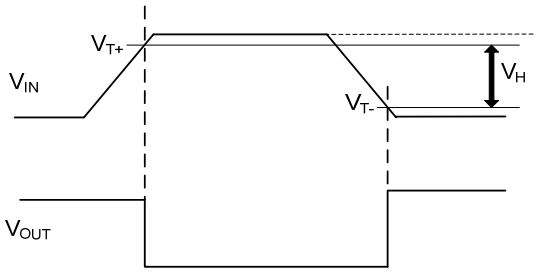


Fig.6 Waveforms Showing Definition Of V_{T+} And V_{T-} (Between Limits At 30 % And 70 %) And V_H

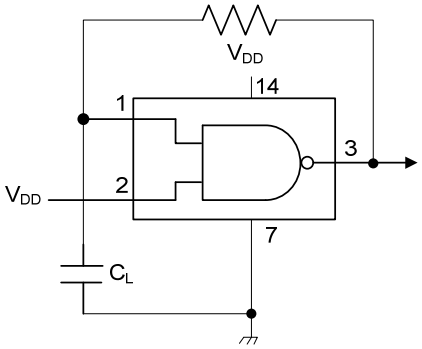


Fig.7 Astable Multivibrator

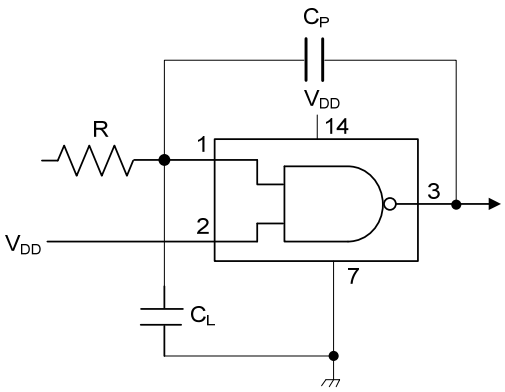


Fig.8 Schmitt Trigger Driven Via A High-Impedance Input

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