



U74AUP1T04

CMOS IC

LOW POWER, 1.8V/2.5V/3.3V INPUT, 3.3V CMOS OUTPUT, SINGLE INVERTER GATE

■ DESCRIPTION

The UTC **U74AUP1T04** performs the Boolean function $Y = A$ with designation for logic-level translation applications with output referenced to supply V_{CC} .

The UTC U74AUP1T04 accepts 1.8V LVCMOS signals at all input levels while operating from either a single 2.5V or 3.3V V_{CC} supply. This product also maintains excellent signal integrity.

Schmitt-trigger inputs ($\Delta V_T = 210\text{mV}$ between positive and negative input transitions) offer improved noise immunity during switching transitions, which is especially useful on analog mixed-mode designs. Schmitt-trigger inputs reject input noise, ensure integrity of output signals, and allow for slow input signal transition.

The wide V_{CC} range of 2.3V to 3.6V allows the possibility of switching output level to connect to external controllers or processors.

I_{OFF} is a feature that allows for powered-down conditions ($V_{CC} = 0\text{V}$) and is important in portable and mobile applications. When $V_{CC} = 0\text{V}$, signals in the range from 0V to 3.6V can be applied to the inputs and outputs of the device. No damage occurs to the device under these conditions.

The UTC **U74AUP1T04** is designed with optimized current-drive capability of 4mA to reduce line reflections, overshoot, and undershoot caused by high-drive outputs.

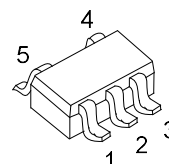
■ FEATURES

- * Wide supply voltage range from 2.3V to 3.6V
- * Inputs accept voltages up to 3.6V
- * I_{OFF} supports partial-power-down mode
- * Low static power consumption; $I_{CC} = 1.2\mu\text{A}$ (Max.)
- * Green & Pb Free

■ ORDERING INFORMATION

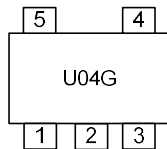
Ordering Number	Package	Packing
U74AUP1T04G-AL5-R	SOT-353	Tape Reel

U74AUP1T04G-AL5-R (1) Packing Type (2) Package Type (3) Green Package	(1) R: Tape Reel (2) AL5: SOT-353 (3) G: Halogen Free and Lead Free
--	---

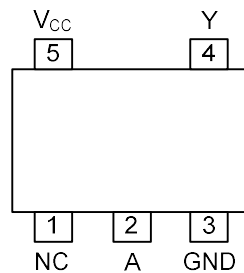


SOT-353

MARKING



PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	NC	Note: No connect
2	A	Logic Input
3	GND	Ground
4	Y	Logic output
5	V _{CC}	Supply Voltage

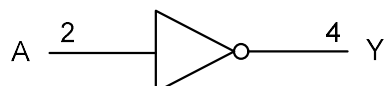
FUNCTION TABLE

INPUT (Lower Level Input)	OUTPUT (V _{CC} CMOS)
A	Y
H	L
L	H

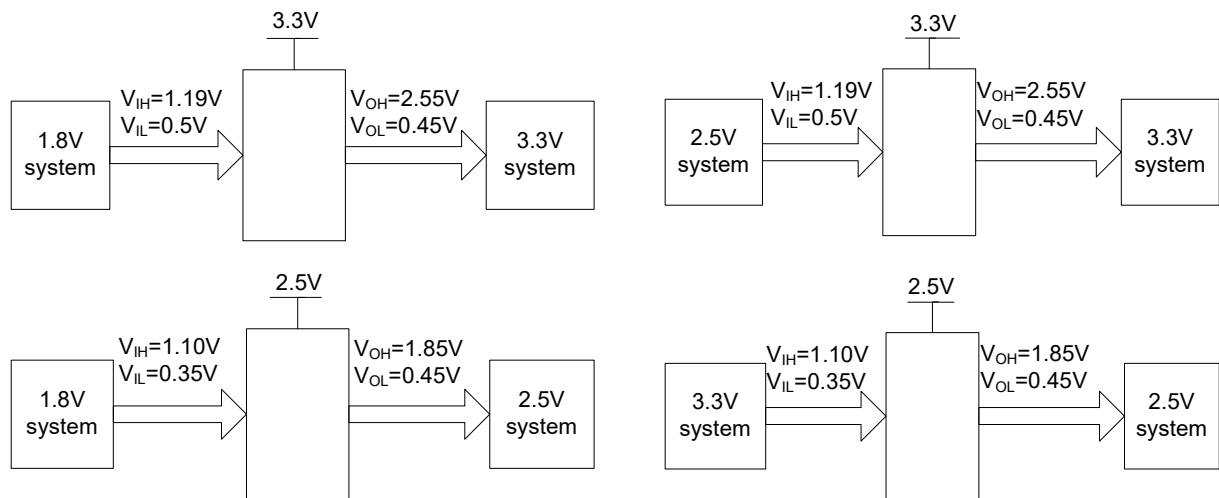
Note: H: HIGH voltage level; L: LOW voltage level.

Supply Voltage	INPUT V _{T+} Max. = V _{IH} Min. V _{T-} Max. = V _{IL} Min.		OUTPUT CMOS
	A	B	Y
V _{CC} = 2.3V ~ 2.7V (2.5V)	V _{IH} = 1.1V, V _{IL} = 0.35V		V _{OH} = 1.85V, V _{OL} = 0.45V
V _{CC} = 3V ~ 3.6V (3.3V)	V _{IH} = 1.19V, V _{IL} = 0.5V		V _{OH} = 2.55V, V _{OL} = 0.45V

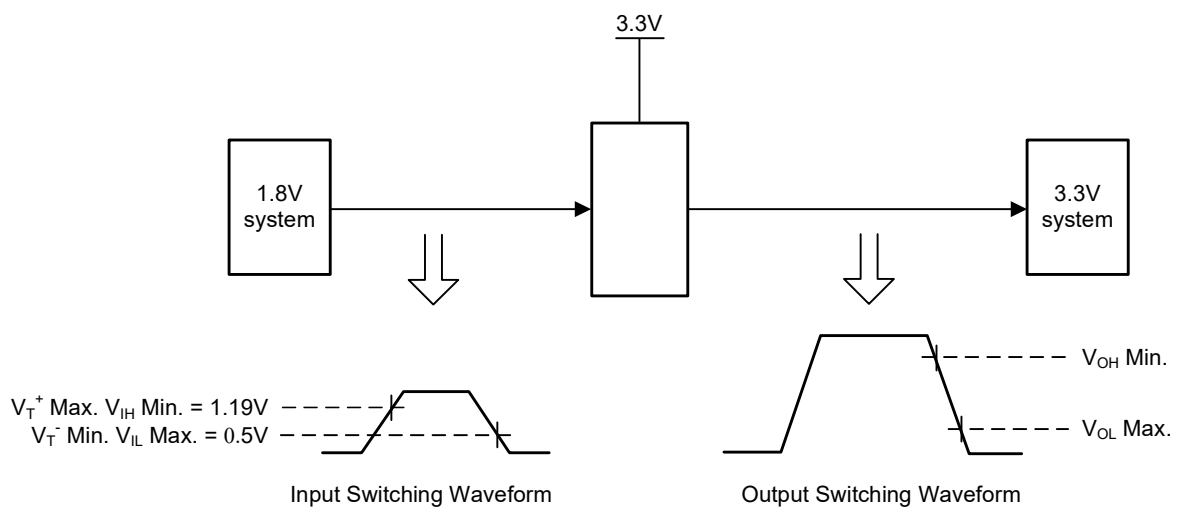
LOGIC DIAGRAM (INVERTER GATE)



■ TYPICAL DESIGN EXAMPLES



■ SWITCHING THRESHOLDS FOR 1.8V TO 3.3V TRANSLATION



■ ABSOLUTE MAXIMUM RATING ($T_A = 25^\circ\text{C}$, unless otherwise specified) (Note 1、2)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}		-0.5 ~ +4.6	V
Input Voltage	V_{IN}		-0.5 ~ +4.6	V
Output Voltage	V_{OUT}	Output in the high or low state	-0.5 ~ $V_{CC} + 0.5$	V
		Output in the power-off state	-0.5 ~ +4.6	V
Continuous Current Through V_{CC} or GND	I_{CC}		± 50	mA
Continuous Output Current	I_{OUT}		± 20	mA
Input Clamp Current	I_{IK}	$V_{IN} < 0$	-50	mA
Output Clamp Current	I_{OK}	$V_{OUT} < 0$	-50	mA
Storage Temperature Range	T_{STG}		-65 ~ +150	$^\circ\text{C}$

Notes: 1. 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.
 2. It's guarantee by design, this parameter is not production tested.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	Operating	2.3		3.6	V
Input Voltage	V_{IN}		0		3.6	V
Output Voltage	V_{OUT}		0		V_{CC}	V
High-Level Output Current	I_{OH}	$V_{CC}=2.3\text{V}$			-3.1	mA
		$V_{CC}=3\text{V}$			-4.0	mA
Low-Level Output Current	I_{OL}	$V_{CC}=2.3\text{V}$			-3.1	mA
		$V_{CC}=3\text{V}$			-4.0	mA
Ambient Operating Temperature	T_A		-40		+125	$^\circ\text{C}$

Note: It's guarantee by design, this parameter is not production tested.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	350	$^\circ\text{C/W}$

ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	T _A =25°C			T _A =-40°C~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Positive-Going Threshold	V _{T+}	V _{CC} =2.3V ~ 2.7V	0.6		1.1	0.6		1.1	V
		V _{CC} =3V ~ 3.6V	0.75		1.22	0.75		1.22	V
Negative-Going Threshold	V _{T-}	V _{CC} =2.3V ~ 2.7V	0.35		0.6	0.33		0.64	V
		V _{CC} =3V ~ 3.6V	0.5		0.85	0.46		0.85	V
Hysteresis (V _{T+} - V _{T-})	ΔV _T	V _{CC} =2.3V ~ 2.7V	0.23		0.6	0.1		0.6	V
		V _{CC} =3V ~ 3.6V	0.25		0.56	0.15		0.56	V
High-Level Output Voltage	V _{OH}	V _{CC} =2.3V ~ 3.6V, I _{OH} =-20μA	V _{CC} -0.1			V _{CC} -0.1			V
		V _{CC} =2.3V, I _{OH} =-2.3mA	2.05			1.77			V
		V _{CC} =2.3V, I _{OH} =-3.1mA	1.9			1.67			V
		V _{CC} =3V, I _{OH} =-2.7mA	2.72			2.4			V
		V _{CC} =3V, I _{OH} =-4mA	2.6			2.3			V
Low-Level Output Voltage	V _{OL}	V _{CC} =2.3V ~ 3.6V, I _{OH} =20μA			0.1			0.1	V
		V _{CC} =2.3V, I _{OH} =2.3mA			0.31			0.36	V
		V _{CC} =2.3V, I _{OH} =3.1mA			0.44			0.5	V
		V _{CC} =3V, I _{OH} =2.7mA			0.31			0.36	V
		V _{CC} =3V, I _{OH} =4mA			0.44			0.5	V
Input Leakage Current	I _{I(LEAK)}	V _{CC} =0~3.6V, V _{IN} =3.6V or GND			0.1			0.75	μA
Power OFF Leakage Current	I _{OFF}	V _{CC} =0V, V _{IN} or V _{OUT} =0~3.6V			0.1			0.75	μA
Additional Power OFF Leakage Current	ΔI _{OFF}	V _{CC} =0~0.2V, V _{IN} or V _{OUT} =3.6V			0.2			0.75	μA
Quiescent Supply Current	I _Q	V _{CC} =2.3V ~ 3.6V V _{IN} or V _{OUT} =3.6V, I _{OUT} =0A			1.2			3.5	μA
Additional Quiescent Supply Current Per Input Pin	ΔI _Q	V _{CC} =2.3V ~ 2.7V, I _{OUT} =0A One input at 0.3V or 1.1V, Other inputs at 0 or V _{CC}			2			4	μA
		V _{CC} =3V ~ 3.6V, I _{OUT} =0A One input at 0.45V or 1.2V, Other inputs at 0 or V _{CC}			10			18	μA

Note: It's guarantee by design, this parameter is not production tested.

■ SWITCHING CHARACTERISTICS

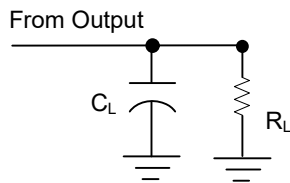
PARAMETER	SYMBOL	TEST CONDITIONS	T _A =25°C			T _A =-40°C~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay From Input (A) to Output (Y)	t _{PLH} / t _{PHL}	C _L =5pF	V _{CC} =2.5V±0.2V V _I =1.8V±0.15V		12.1			14.5	ns
			V _{CC} =2.5V±0.2V V _I =2.5V±0.2V		12.3			13.6	ns
			V _{CC} =2.5V±0.2V V _I =3.3V±0.3V		11.8			13.1	ns
			V _{CC} =3.3V±0.3V V _I =1.8V±0.15V		10.8			15.8	ns
			V _{CC} =3.3V±0.3V V _I =2.5V±0.2V		11.2			12.9	ns
			V _{CC} =3.3V±0.3V V _I =3.3V±0.3V		11.3			12.2	ns
		C _L =10pF	V _{CC} =2.5V±0.2V V _I =1.8V±0.15V		12.9			15.7	ns
			V _{CC} =2.5V±0.2V V _I =2.5V±0.2V		13			14.9	ns
			V _{CC} =2.5V±0.2V V _I =3.3V±0.3V		12.5			14.2	ns
			V _{CC} =3.3V±0.3V V _I =1.8V±0.15V		11.5			16.4	ns
			V _{CC} =3.3V±0.3V V _I =2.5V±0.2V		11.9			13.8	ns
			V _{CC} =3.3V±0.3V V _I =3.3V±0.3V		12			13.3	ns
		C _L =15pF	V _{CC} =2.5V±0.2V V _I =1.8V±0.15V		13.4			16.6	ns
			V _{CC} =2.5V±0.2V V _I =2.5V±0.2V		13.5			15.7	ns
			V _{CC} =2.5V±0.2V V _I =3.3V±0.3V		13.1			15.2	ns
			V _{CC} =3.3V±0.3V V _I =1.8V±0.15V		12.1			17.1	ns
			V _{CC} =3.3V±0.3V V _I =2.5V±0.2V		12.5			14.5	ns
			V _{CC} =3.3V±0.3V V _I =3.3V±0.3V		12.6			13.9	ns
		C _L =30pF	V _{CC} =2.5V±0.2V V _I =1.8V±0.15V		14.8			18.9	ns
			V _{CC} =2.5V±0.2V V _I =2.5V±0.2V		15			18	ns
			V _{CC} =2.5V±0.2V V _I =3.3V±0.3V		14.5			17.5	ns
			V _{CC} =3.3V±0.3V V _I =1.8V±0.15V		13.5			17.8	ns
			V _{CC} =3.3V±0.3V V _I =2.5V±0.2V		13.9			16.4	ns
			V _{CC} =3.3V±0.3V V _I =3.3V±0.3V		13.9			15.6	ns

Note: It's guarantee by design, this parameter is not production tested.

■ OPERATING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	C_i	$V_{CC}=3.3V$, $V_{IN} = V_{CC}$ or GND		1.5		pF
Input Output Internal Capacitance	C_o	$V_{CC}=3.3V$, $V_{OUT} = V_{CC}$ or GND		3		pF
Power Dissipation Capacitance	C_{PD}	$V_{CC}=2.5V$		4		pF
		$V_{CC}=3.3V$		5		pF

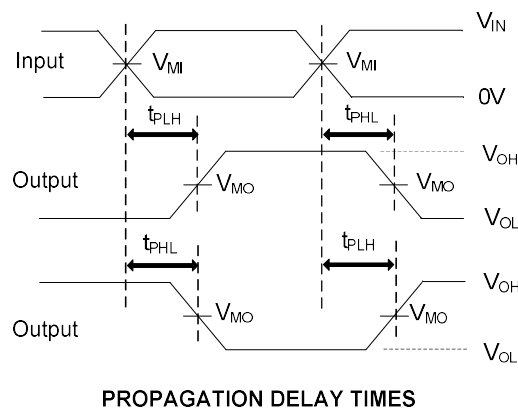
■ TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT

Fig.1 Load circuitry for switching times.

V_{CC}	C_L	V_{MI}	V_{MO}
$2.5V \pm 0.2V$	5, 10, 15, 30pF	$V_I/2$	$V_{CC}/2$
$3.3V \pm 0.3V$	5, 10, 15, 30pF	$V_I/2$	$V_{CC}/2$



PROPAGATION DELAY TIMES

Fig. 2 Propagation delay from input to output and input voltage waveforms.

Notes: 1. C_L includes probe and jig capacitance.

2. All input pulses are supplied by generators having the following characteristics: $P_{RR} \leq 10 \text{ MHz}$, $Z_O = 50\Omega$, slew rate $\geq 1 \text{ V/ns}$.

3. The outputs are measured one at a time, with one transition per measurement.

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.