



U74AUP1T08

CMOS IC

LOW-POWER 1.8V, 2.5V, 3.3V INPUT, 3.3V CMOS OUTPUT, SINGLE 2-INPUT POSITIVE-AND GATE

■ DESCRIPTION

The UTC **U74AUP1T08** performs the Boolean function $Y = A \cdot B$ or $Y = A + B$ with designation for logic-level translation applications with output referenced to supply V_{CC} .

The UTC **U74AUP1T08** technology is the industry's lowest-power logic technology designed for use in extending battery-life in operating. All input levels that accept 1.8V LVCMOS signals, while operating from either a single 3.3V or 2.5V V_{CC} supply. This product also maintains excellent signal integrity.

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.

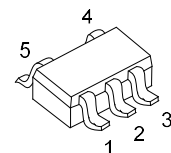
Schmitt-trigger inputs ($\Delta V_T = 210\text{mV}$ between positive and negative input transitions) offer improved noise immunity during switching transitions, which is especially useful on analog mixed-mode designs. Schmitt-trigger inputs reject input noise, ensure integrity of output signals, and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

loff 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 **U74AUP1T08** is designed with optimized current-drive capability of 4mA to reduce line reflections, overshoot, and undershoot caused by high-drive outputs.

■ FEATURES

- * Low power dissipation
- * Wide supply voltage range from 2.3V to 3.6V
- * Inputs accept voltages up to 3.6V
- * I_{OFF} supports partial-power-down mode
- * High noise immunity
- * Green & Pb Free



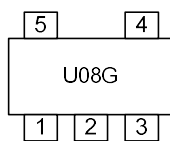
SOT-353

■ ORDERING INFORMATION

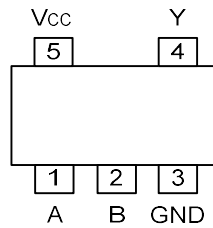
Ordering Number	Package	Packing
U74AUP1T08G-AL5-R	SOT-353	Tape Reel

U74AUP1T08TG-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
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■ MARKING



PIN CONFIGURATION



PIN DESCRIPTION

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

FUNCTION TABLE (each gate)

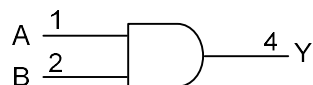
INPUT (Lower Level Input)		OUTPUT (V _{CC} CMOS)
A		Y
H	H	H
L	X	L
X	L	L

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

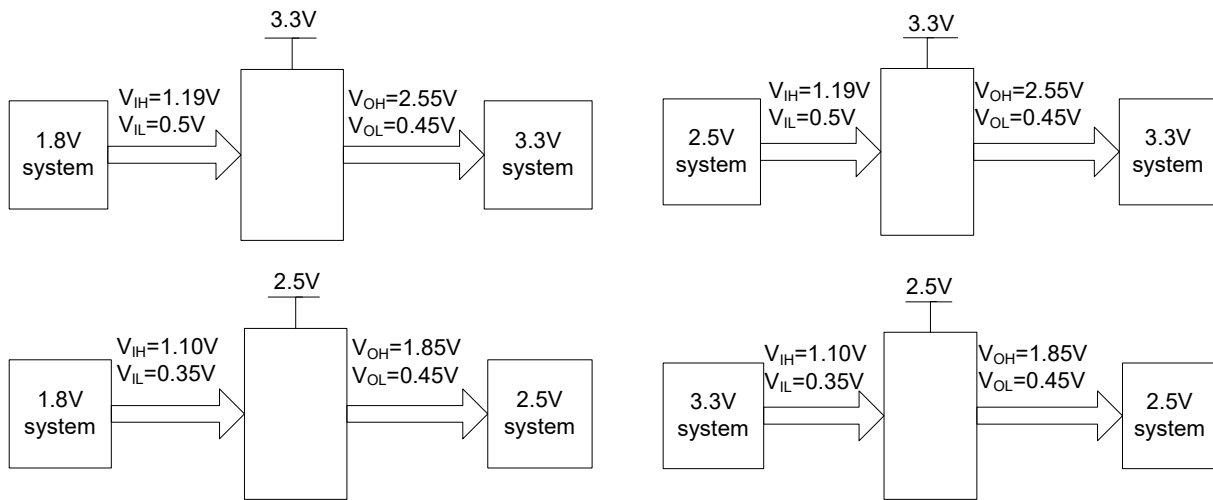
Supply Voltage	INPUT V _T ⁺ Max. = V _{IH} Min. V _T ⁻ Max. = V _{IL} Min.		OUTPUT CMOS
	A	B	Y
V _{CC} = 2.3V ~ 2.7V (2.5V)	V _{IH} = 1.1V, V _{IL} = 0.35V		V _{OH} = 1.85V, V _{OL} = 0.45V
V _{CC} = 3V ~ 3.6V (3.3V)	V _{IH} = 1.19V, V _{IL} = 0.5V		V _{OH} = 2.55V, V _{OL} = 0.45V

Note: H: High voltage level; L: Low voltage level.

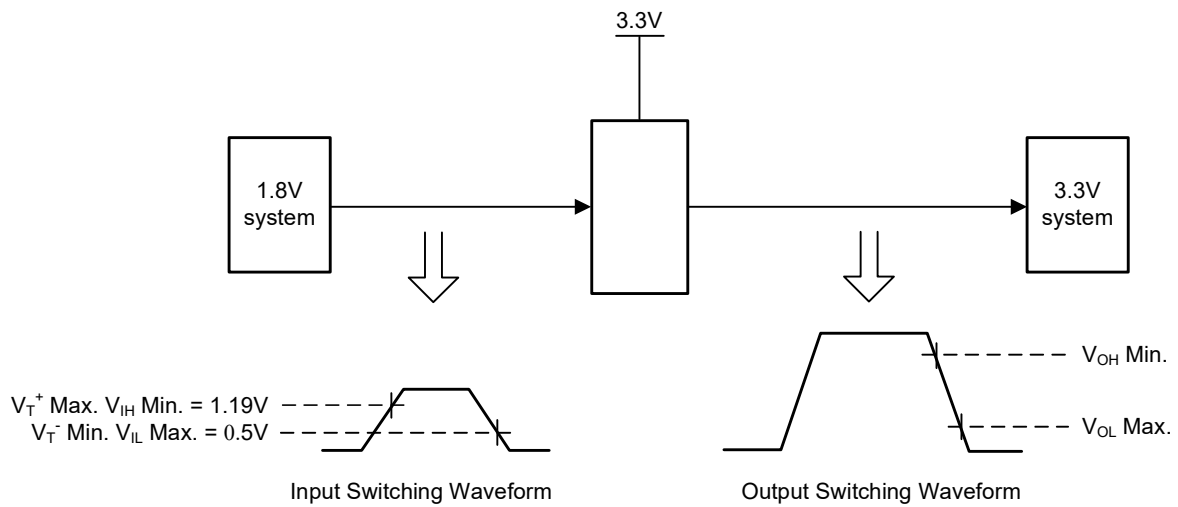
LOGIC DIAGRAM (AND Gate)



■ TYPICAL DESIGN EXAMPLES



■ SWITCHING THRESHOLDS FOR 1.8V TO 3.3V TRANSLATION



■ ABSOLUTE MAXIMUM RATING (T_A = 25°C, unless otherwise specified) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V _{CC}		-0.5 ~ +4.6	V
Input Voltage (Note 2)	V _{IN}		-0.5 ~ +4.6	V
Output Voltage (Note 2)	V _{OUT}	Active mode and power-down mode	-0.5 ~ +4.6	V
Continuous V _{CC} or GND Current	I _{CC}		±50	mA
Continuous Output Current	I _{OUT}		±20	mA
Input Clamp Current	I _{IK}	V _{IN} <0V	-50	mA
Output Clamp Current	I _{OK}	V _{OUT} <0 V	-50	mA
Ground Current	I _{GND}		-50	mA
Storage Temperature Range	T _{STG}		-65 ~ +150	°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. The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ 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} =2.3V			-3.1	mA
		V _{CC} =3V			-4.0	mA
Low-Level Output Current	I _{OL}	V _{CC} =2.3V			-3.1	mA
		V _{CC} =3V			-4.0	mA
Ambient Operating Temperature	T _A		-40		+125	°C

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ _{JA}	259	°C/W

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

PARAMETER	SYMBOL	TEST CONDITIONS	T _A =25°C			T _A =-40~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Positive-Going Input Threshold Voltage	V _{T+}	V _{CC} =2.3V~2.7V	0.6		1.1	0.6		1.1	V
		V _{CC} =3.0V~3.6V	0.75		1.16	0.75		1.19	V
Negative-Going Input Threshold Voltage	V _{T-}	V _{CC} =2.3V~2.7V	0.35		0.6	0.33		0.64	V
		V _{CC} =3.0V~3.6V	0.5		0.85	0.46		0.85	V
Hysteresis Voltage (V _{T+} -V _{T-})	ΔV _T	V _{CC} =2.3V~2.7V	0.23		0.6	0.1		0.6	V
		V _{CC} =3.0V~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} -0.11			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} =3.0V, I _{OH} =-2.7mA	2.72			2.4			V
		V _{CC} =3.0V, I _{OH} =-4.0mA	2.6			2.3			V
Low-Level Output Voltage	V _{OL}	V _{CC} =2.3V ~3.6V, I _{OL} =20μA			0.1			0.11	V
		V _{CC} =2.3V, I _{OL} =2.3mA			0.31			0.36	V
		V _{CC} =2.3V, I _{OL} =3.1mA			0.44			0.5	V
		V _{CC} =3.0V, I _{OL} =2.7mA			0.31			0.36	V
		V _{CC} =3.0V, I _{OL} =4.0mA			0.44			0.5	V
Input Leakage Current	I _{I(LEAK)}	V _{CC} =0V ~3.6V, V _{IN} =GND to 3.6V			±0.1			±0.75	μA
Power OFF Leakage Current	I _{OFF}	V _{CC} =0V, V _{IN} or V _{OUT} =0V ~3.6V			±0.1			±0.75	μA
Additional Power-OFF Leakage Current	ΔI _{OFF}	V _{CC} =0V ~0.2V, V _{IN} or V _{OUT} =0V ~3.6V			±0.1			±0.75	μA
Quiescent Supply Current	I _{CC}	V _{CC} =2.3V~3.6V, V _{IN} =GND or V _{CC} , I _{OUT} =0A			2			3.5	μA
Additional Supply Current	ΔI _{CC}	V _{CC} =2.3V ~2.7V, I _{OUT} =0A (Note 1)		0.3				4	μA
		V _{CC} =3V ~3.6V, I _{OUT} =0A (Note 2)		1.1				18	μA

Notes: 1. One input at 0.3V or 1.1V, other input at V_{CC} or GND.
 2. One input at 0.45V or 1.2V, other input at V_{CC} or GND.

■ **SWITCHING CHARACTERISTICS** ($R_L = 1M\Omega$, $T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			$T_A = -40 \sim +125^\circ\text{C}$			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay From Input (A, B) to Output (Y) (Note 1)	t_{PD}	$V_{CC} = 2.5V \pm 0.2V$ $V_{IN} = 1.8V \pm 0.15V$	$C_L = 5pF$	2.0	15.2	0.5		17.5	ns
			$C_L = 10pF$	2.3	16	1.0		18.7	ns
			$C_L = 15pF$	2.7	16.6	1.0		19.6	ns
			$C_L = 30pF$	3.5	18.1	1.5		21.9	ns
		$V_{CC} = 2.5V \pm 0.2V$ $V_{IN} = 2.5V \pm 0.2V$	$C_L = 5pF$	1.6	15.2	0.5		16.6	ns
			$C_L = 10pF$	1.9	16	1.0		17.9	ns
			$C_L = 15pF$	2.3	16.6	1.0		18.7	ns
			$C_L = 30pF$	3.1	18.1	1.5		21	ns
		$V_{CC} = 2.5V \pm 0.2V$ $V_{IN} = 3.3V \pm 0.3V$	$C_L = 5pF$	1.2	14.7	0.5		16.1	ns
			$C_L = 10pF$	1.6	15.4	1.0		17.2	ns
			$C_L = 15pF$	1.9	16.1	1.0		18.2	ns
			$C_L = 30pF$	2.7	17.5	1.5		20.5	ns
		$V_{CC} = 3.3V \pm 0.3V$ $V_{IN} = 1.8V \pm 0.15V$	$C_L = 5pF$	1.8	13.8	0.5		18.8	ns
			$C_L = 10pF$	2.3	14.5	1.0		19.4	ns
			$C_L = 15pF$	2.6	15	1.0		20.1	ns
			$C_L = 30pF$	3.4	16.5	1.5		20.8	ns
		$V_{CC} = 3.3V \pm 0.3V$ $V_{IN} = 2.5V \pm 0.2V$	$C_L = 5pF$	1.5	14	0.5		15.9	ns
			$C_L = 10pF$	1.9	14.8	1.0		16.8	ns
			$C_L = 15pF$	2.1	15.4	1.0		17.5	ns
			$C_L = 30pF$	2.9	16.9	1.5		19.4	ns
		$V_{CC} = 3.3V \pm 0.3V$ $V_{IN} = 3.3V \pm 0.3V$	$C_L = 5pF$	1.1	14.1	0.5		15.2	ns
			$C_L = 10pF$	1.5	14.8	1.0		16.3	ns
			$C_L = 15pF$	1.8	15.5	1.0		16.9	ns
			$C_L = 30pF$	2.5	17	1.5		18.6	ns

Note: t_{PD} is the same as t_{PLH} and t_{PHL} .

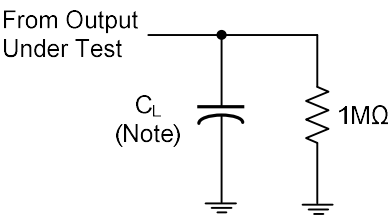
■ **OPERATING CHARACTERISTICS**

($f = 1\text{MHz}$, $V_I = \text{GND to } V_{CC}$, $T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation	C_{PD}	$V_{CC} = 2.3V \text{ to } 2.7V$		4.0		pF
Capacitance (Note)		$V_{CC} = 3.0V \text{ to } 3.6V$		5.0		pF

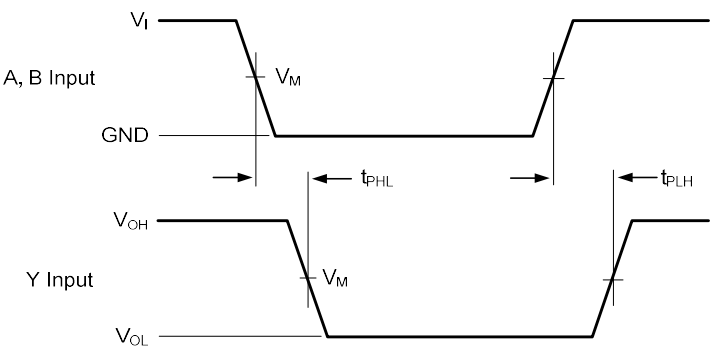
Note: C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

■ TEST CIRCUIT AND WAVEFORMS



LOAD CIRCUIT

Note: C_L includes probe and jig capacitance.



Propagation Delay Times

Supply Voltage	Output	Input			Load	
V_{CC}	V_M	V_M	V_i	$t_r = t_f$	C_L	R_L
2.3V ~ 3.6V	$0.5 \times V_{CC}$	$0.5 \times V_i$	1.65V ~ 3.6V	$\leq 3.0\text{ns}$	5, 10, 15, 30pF	1M Ω

Note: For measuring propagation delays, setup and hold times and pulse width $R_L = 1\text{ M}\Omega$.

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