



## U74AUP1G02

CMOS IC

### SINGLE 2-INPUT NOR GATE

#### DESCRIPTION

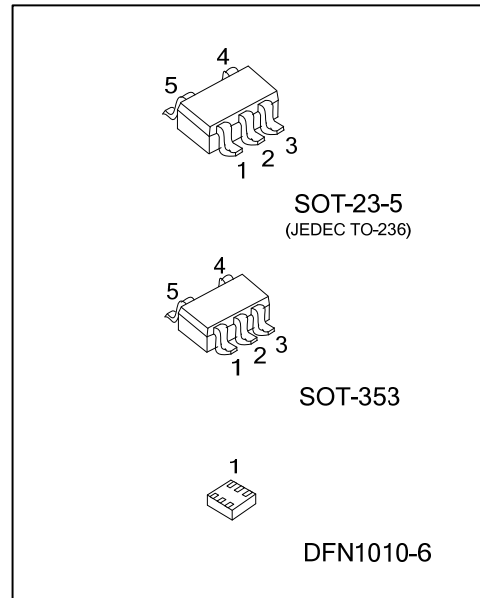
The **U74AUP1G02** is a low-power single 2-input positive-NOR gate which provides the Function  $Y = \overline{A+B}$  or  $Y = \overline{A} \cdot \overline{B}$  in positive logic.

This device ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range from 0.8V to 3.6V.

This device has power-down protective circuit, preventing device destruction when it is powered down.

#### FEATURES

- \* Wide supply voltage range from 0.8V to 3.6V
- \* Inputs accept voltages up to 3.6V
- \*  $I_{OFF}$  supports partial-power-down mode
- \* Low static power consumption;  $I_{CC} = 0.5\mu A$  (Max.)
- \* Optimized for 3.3V Operation



#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74AUP1G02L-AE5-R	U74AUP1G02G-AE5-R	SOT-23-5	Tape Reel
U74AUP1G02L-AL5-R	U74AUP1G02G-AL5-R	SOT-353	Tape Reel
U74AUP1G02L-K06-1010-R	U74AUP1G02G-K06-1010-R	DFN1010-6	Tape Reel

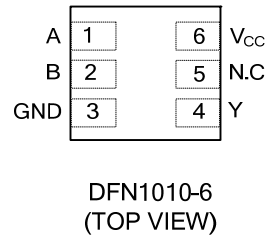
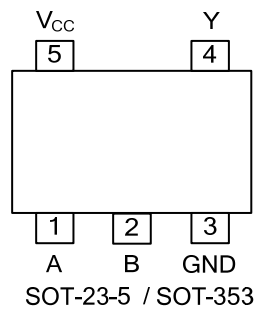
<p>U74AUP1G02G-AE5-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE5: SOT-23-5, AL5: SOT-353, K06-1010: DFN1010-6 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING

SOT-23-5 / SOT-353	DFN1010-6
<p>P02</p>	<p>P2</p>



## PIN CONFIGURATION



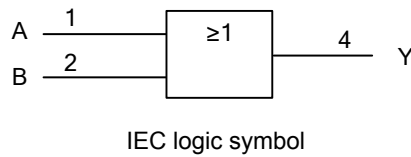
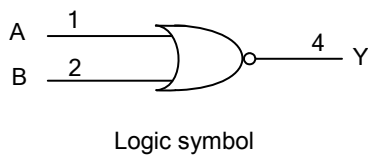
## FUNCTION TABLE

INPUT(A)	INPUT(B)	OUTPUT(Y)
L	L	H
L	H	L
H	L	L
H	H	L

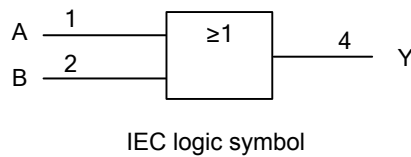
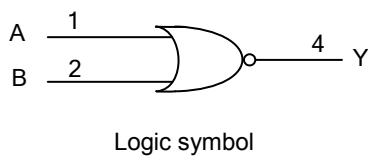
Note: H: HIGH voltage level; L: LOW voltage level.

## FUNCTION TABLE (positive logic)

For SOT-23-5/SOT-353



For DFN1010-6



### ■ ABSOLUTE MAXIMUM RATING

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 $V_{CC}$ or GND Current	$I_{CC}$		±50	mA
Continuous Output Current	$I_{OUT}$	$V_{OUT}=0 \sim V_{CC}$	±20	mA
Input Clamp Current	$I_{IK}$	$V_{IN} < 0$	-50	mA
Output Clamp Current	$I_{OK}$	$V_O > V_{CC}$ or $V_{OUT} < 0$	-50	mA
Storage Temperature Range	$T_{STG}$		-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	$V_{CC}$	Operating	0.8		3.6	V
Input Voltage	$V_{IN}$		0		3.6	V
Output Voltage	$V_{OUT}$	High or low state	0		$V_{CC}$	V
Operating Temperature	$T_A$		-40		85	°C
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC}=0.8V \sim 3.6V$			200	ns/V

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
High-level Input Voltage	$V_{IH}$	$V_{CC}=0.8V$	$V_{CC}$			V	
		$V_{CC}=1.1V \sim 1.95V$	$0.65 \times V_{CC}$			V	
		$V_{CC}=2.3V \sim 2.7V$	1.6			V	
		$V_{CC}=3V \sim 3.6V$	2			V	
Low-level Input Voltage	$V_{IL}$	$V_{CC}=0.8V$			0	V	
		$V_{CC}=1.1V \sim 1.95V$			$0.35 \times V_{CC}$	V	
		$V_{CC}=2.3V \sim 2.7V$			0.7	V	
		$V_{CC}=3V \sim 3.6V$			0.9	V	
High-Level Output Voltage	$V_{OH}$	$V_{CC}=0.8 \sim 3.6V, I_{OH}=-20\mu A$	$V_{CC}-0.1$			V	
		$V_{CC}=1.1V, I_{OH}=-1.1mA$	$0.75 \times V_{CC}$			V	
		$V_{CC}=1.4V, I_{OH}=-1.7mA$	1.11			V	
		$V_{CC}=1.65V, I_{OH}=-1.9mA$	1.32			V	
		$V_{CC}=2.3V$	$I_{OH}=-2.3mA$	2.05			V
			$I_{OH}=-3.1mA$	1.9			V
		$V_{CC}=3V$	$I_{OH}=-2.7mA$	2.72			V
	$I_{OH}=-4mA$	2.6			V		
Low-Level Output Voltage	$V_{OL}$	$V_{CC}=0.8 \sim 3.6V, I_{OL}=-20\mu A$			0.1	V	
		$V_{CC}=1.1V, I_{OL}=-1.1mA$			$0.3 \times V_{CC}$	V	
		$V_{CC}=1.4V, I_{OL}=-1.7mA$			0.31	V	
		$V_{CC}=1.65V, I_{OL}=-1.9mA$			0.31	V	
		$V_{CC}=2.3V$	$I_{OL}=2.3mA$			0.31	V
			$I_{OL}=3.1mA$			0.44	V
		$V_{CC}=3V$	$I_{OL}=2.7mA$			0.31	V
	$I_{OL}=4mA$			0.44	V		

### ■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=0 \sim 3.6V, V_{IN}=GND \sim 3.6V$			$\pm 0.1$	$\mu A$
Power OFF Leakage Current	$I_{off}$	$V_{CC}=0V, V_{IN}$ or $V_{OUT}=0 \sim 3.6V$			$\pm 0.2$	$\mu A$
Additional Power OFF Leakage Current	$\Delta I_{off}$	$V_{CC}=0V \sim 0.2V,$ $V_{IN}$ or $V_{OUT}=0 \sim 3.6V$			$\pm 0.2$	$\mu A$
Quiescent Supply Current	$I_{CC}$	$V_{CC}=0.8 \sim 3.6V, V_{IN}=V_{CC}$ or $GND,$ $I_{OUT}=0$			0.5	$\mu A$
Additional Quiescent Supply Current Per Input Pin	$\Delta I_{CC}$	$V_{CC}=3.3V, V_{IN}=V_{CC}-0.6V, I_{OUT}=0$			40	$\mu A$
Input Capacitance	$C_I$	$V_{CC}=0V, V_{IN}=V_{CC}$ or $GND$		1.5		pF
		$V_{CC}=3.6V, V_{IN}=V_{CC}$ or $GND$		1.5		pF
Output Capacitance	$C_{OUT}$	$V_{CC}=0V, V_{OUT}=GND$		3		pF

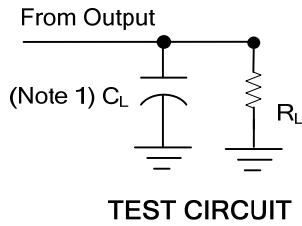
### ■ SWITCHING CHARACTERISTICS ( $R_L=1M\Omega, T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
Propagation delay from input (A or B) to output(Y)	$t_{PLH} / t_{PHL}$	$C_L=5pF,$ $R_L=1M\Omega$	$V_{CC}=0.8V$		19.3		ns	
			$V_{CC}=1.2\pm 0.1V$	2.6	7.3		ns	
			$V_{CC}=1.5\pm 0.1V$	1.4	5.2		ns	
			$V_{CC}=1.8\pm 0.15V$	1	4.2		ns	
			$V_{CC}=2.5\pm 0.2V$	1	3		ns	
			$V_{CC}=3.3\pm 0.3V$	1	2.4		ns	
		$C_L=10pF,$ $R_L=1M\Omega$	$V_{CC}=0.8V$			22.3		ns
			$V_{CC}=1.2\pm 0.1V$	1.5	8.5		ns	
			$V_{CC}=1.5\pm 0.1V$	1	6.2		ns	
			$V_{CC}=1.8\pm 0.15V$	1	5		ns	
			$V_{CC}=2.5\pm 0.2V$	1	3.6		ns	
			$V_{CC}=3.3\pm 0.3V$	1	2.9		ns	
		$C_L=15pF,$ $R_L=1M\Omega$	$V_{CC}=0.8V$			25		ns
			$V_{CC}=1.2\pm 0.1V$	3.6	9.9		ns	
			$V_{CC}=1.5\pm 0.1V$	2.3	7.2		ns	
			$V_{CC}=1.8\pm 0.15V$	1.6	5.8		ns	
			$V_{CC}=2.5\pm 0.2V$	1	4.3		ns	
			$V_{CC}=3.3\pm 0.3V$	1	3.4		ns	
		$C_L=30pF,$ $R_L=1M\Omega$	$V_{CC}=0.8V$			34.6		ns
			$V_{CC}=1.2\pm 0.1V$	4.9	13.1		ns	
			$V_{CC}=1.5\pm 0.1V$	3.4	9.5		ns	
			$V_{CC}=1.8\pm 0.15V$	2.5	7.7		ns	
			$V_{CC}=2.5\pm 0.2V$	1.8	5.7		ns	
			$V_{CC}=3.3\pm 0.3V$	1.5	4.7		ns	

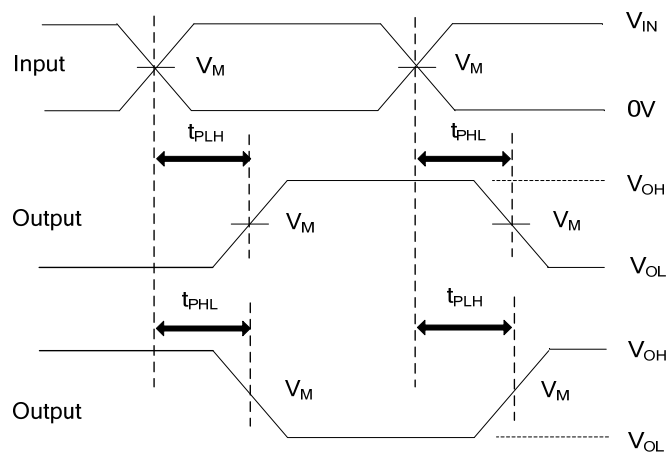
### ■ OPERATING CHARACTERISTICS ( $f=10MHz, T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	$C_{PD}$	$V_{CC}=0.8V$		4.1		pF
		$V_{CC}=1.2\pm 0.1V$		4.1		pF
		$V_{CC}=1.5\pm 0.1V$		4.1		pF
		$V_{CC}=1.8\pm 0.15V$		4.1		pF
		$V_{CC}=2.5\pm 0.2V$		4.2		pF
		$V_{CC}=3.3\pm 0.3V$		4.3		pF

## TEST CIRCUIT AND WAVEFORMS



$V_{CC}$	$V_{IN}$	$t_R / t_F$	$V_M$	$C_L$	$R_L$
0.8V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$
1.2V $\pm$ 0.1V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$
1.5V $\pm$ 0.1V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$
1.8V $\pm$ 0.15V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$
2.5V $\pm$ 0.2V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$
3.3V $\pm$ 0.3V	$V_{CC}$	$\leq 3\text{ns}$	$V_{CC}/2$	5, 10, 15, 30pF	1M $\Omega$



Notes: 1.  $C_L$  includes probe and jig capacitance.

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

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