



## U74LVC1G04

CMOS IC

### SINGLE INVERTER GATE

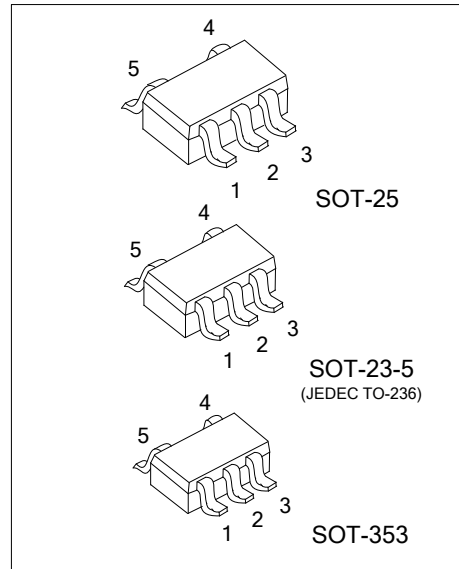
#### DESCRIPTION

The UTC **U74LVC1G04** is a single inverter gate, it provides the function  $Y = \bar{A}$ .

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

#### FEATURES

- \* Operation voltage range: 1.65~5.5V
- \* Low power current:  $I_{CC}=10\mu A(\text{Max})$
- \*  $\pm 24\text{mA}$  output drive ( $V_{CC}=3.3\text{V}$ )
- \* High noise immunity
- \* Power down protection

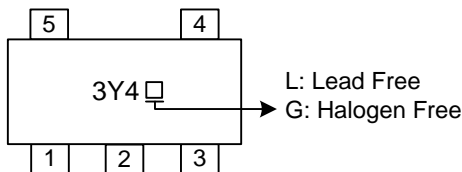


#### ORDERING INFORMATION

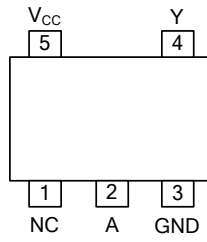
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G04L-AE5-R	U74LVC1G04G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G04L-AF5-R	U74LVC1G04G-AF5-R	SOT-25	Tape Reel
U74LVC1G04L-AL5-R	U74LVC1G04G-AL5-R	SOT-353	Tape Reel

<p>U74LVC1G04G-AE5-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



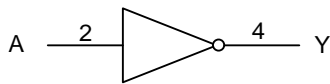
## ■ PIN CONFIGURATION



## ■ FUNCTION TABLE (each gate)

INPUT	OUTPUT
A	Y
H	L
L	H

## ■ LOGIC DIAGRAM (positive logic)



### ■ ABSOLUTE MAXIMUM RATINGS (unless otherwise specified)(Note 2)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		$V_{CC}$	-0.5 ~ 6.5	V
Input Voltage		$V_{IN}$	-0.5 ~ 6.5	V
Output Voltage(Active Mode)		$V_{OUT}$	-0.5 ~ $V_{CC}+0.5$	V
Output Voltage(Power-Down Mode)		$V_{OUT}$	-0.5 ~ 6.5	V
Input Clamp Current( $V_{IN}<0$ )		$I_{IK}$	-50	mA
Output Clamp Current( $V_{OUT}<0$ )		$I_{OK}$	-50	mA
Output Current		$I_{OUT}$	$\pm 50$	mA
$V_{CC}$ or GND Current		$I_{CC}$	$\pm 100$	mA
Power Dissipation ( $T_A=-40\sim+125^\circ\text{C}$ )	SOT-23-5	$P_D$	300	mW
	SOT-25		360	mW
	SOT-353		250	mW
Junction Temperature		$T_J$	+150	$^\circ\text{C}$
Storage Temperature		$T_{STG}$	-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. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Case	SOT-23-5	$\theta_{JC}$	75	$^\circ\text{C/W}$
	SOT-25		55	$^\circ\text{C/W}$
	SOT-353		145	$^\circ\text{C/W}$

### ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$	Operating	1.65		5.5	V
		Data retention only	1.5			
Input Voltage	$V_{IN}$		0		5.5	V
Output Voltage	$V_{OUT}$		0		$V_{CC}$	V
Input Transition Rise or Fall Rate	$t_R, t_F$	$V_{CC} = 1.8\text{V}\pm 0.15\text{V}, 2.5\text{V}\pm 0.2\text{V}$			20	ns/V
		$V_{CC} = 3.3\text{V}\pm 0.3\text{V}$			10	ns/V
		$V_{CC} = 5\text{V}\pm 0.5\text{V}$			5	ns/V
Operating Temperature	$T_A$		-40		+125	$^\circ\text{C}$

### ■ STATIC CHARACTERISTICS (T<sub>A</sub>=-40~+125°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage High-Level	V <sub>IH</sub>	V <sub>CC</sub> = 1.65V~1.95V	0.65×V <sub>CC</sub>			V
		V <sub>CC</sub> = 2.3V~2.7V	1.7			
		V <sub>CC</sub> = 2.7V~3.6V	2			
		V <sub>CC</sub> = 4.5V~5.5V	0.7×V <sub>CC</sub>			
Input Voltage Low-Level	V <sub>IL</sub>	V <sub>CC</sub> = 1.65V~1.95V			0.35×V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3V~2.7V			0.7	
		V <sub>CC</sub> = 2.7V~3.6V			0.8	
		V <sub>CC</sub> = 4.5V~5.5V			0.3×V <sub>CC</sub>	
Output Voltage High-Level	V <sub>OH</sub>	V <sub>CC</sub> = 1.65V~5.5V, I <sub>OH</sub> =-100μA	V <sub>CC</sub> -0.1			V
		V <sub>CC</sub> = 1.65V, I <sub>OH</sub> =-4mA	0.95			
		V <sub>CC</sub> = 2.3V, I <sub>OH</sub> =-8mA	1.7			
		V <sub>CC</sub> = 3V, I <sub>OH</sub> =-16mA	1.9			
		V <sub>CC</sub> = 3V, I <sub>OH</sub> =-24mA	2.0			
Output Voltage Low-Level	V <sub>OL</sub>	V <sub>CC</sub> = 1.65V~5.5V, I <sub>OL</sub> =100μA			0.1	V
		V <sub>CC</sub> = 1.65V, I <sub>OL</sub> =4mA			0.7	
		V <sub>CC</sub> = 2.3V, I <sub>OL</sub> =8mA			0.45	
		V <sub>CC</sub> = 3V, I <sub>OL</sub> =16mA			0.6	
		V <sub>CC</sub> = 3V, I <sub>OL</sub> =24mA			0.8	
Input Leakage Current	I <sub>I(LEAK)</sub>	V <sub>CC</sub> = 0~5.5V, V <sub>IN</sub> =5.5V or GND		±0.1	±5	μA

### ■ STATIC CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power OFF Leakage Current	I <sub>OFF</sub>	V <sub>CC</sub> = 0V, V <sub>IN</sub> or V <sub>OUT</sub> =5.5V		±0.1	±10	μA
Quiescent Supply Current	I <sub>Q</sub>	V <sub>CC</sub> = 1.65V~5.5V, V <sub>IN</sub> =5.5 or GND, I <sub>OUT</sub> =0		0.1	10	μA
Additional Quiescent Supply Current	Δ I <sub>Q</sub>	V <sub>CC</sub> = 3V~5.5V, One input at V <sub>CC</sub> -0.6V, other inputs at V <sub>CC</sub> or GND		5	500	μA
Input Capacitance	C <sub>IN</sub>	V <sub>CC</sub> = 3.3V, V <sub>IN</sub> =V <sub>CC</sub> or GND		3.5		pF

Note: All typical values are measured at V<sub>CC</sub>=3.3V and T<sub>A</sub>=25°C.

### ■ DYNAMIC CHARACTERISTICS (T<sub>A</sub>=-40~+125°C, unless otherwise specified)

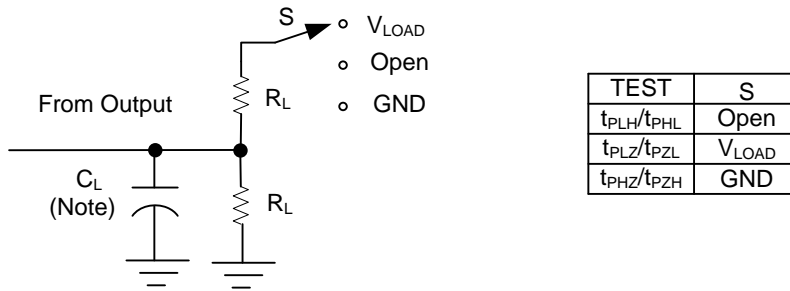
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay From Input (A or B) to Output (Y)	t <sub>PLH</sub> /t <sub>PHL</sub>	V <sub>CC</sub> = 1.8V±0.15V, C <sub>L</sub> =15 pF	1.0		6.4	ns
		V <sub>CC</sub> = 2.5V±0.2V, C <sub>L</sub> =15 pF	0.5		4.2	ns
		V <sub>CC</sub> = 3.3V±0.3V, C <sub>L</sub> =15 pF	0.5		3.3	ns
		V <sub>CC</sub> = 5V±0.5V, C <sub>L</sub> =15 pF	0.5		3.1	ns
		V <sub>CC</sub> = 1.8V±0.15V, C <sub>L</sub> =30pF	1.0		9.5	ns
		V <sub>CC</sub> = 2.5V±0.2V, C <sub>L</sub> =30pF	0.5		6.5	ns
		V <sub>CC</sub> = 3.3V±0.3V, C <sub>L</sub> =50 pF	0.5		5.5	ns
		V <sub>CC</sub> = 5V±0.5V, C <sub>L</sub> =50 pF	0.5		5.0	ns

### ■ OPERATING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C <sub>PD</sub>	V <sub>CC</sub> =1.8V, f=10MHz		16		pF
		V <sub>CC</sub> =2.5V, f=10MHz		18		pF
		V <sub>CC</sub> =3.3V, f=10MHz		18		pF
		V <sub>CC</sub> =5V, f=10MHz		20		pF

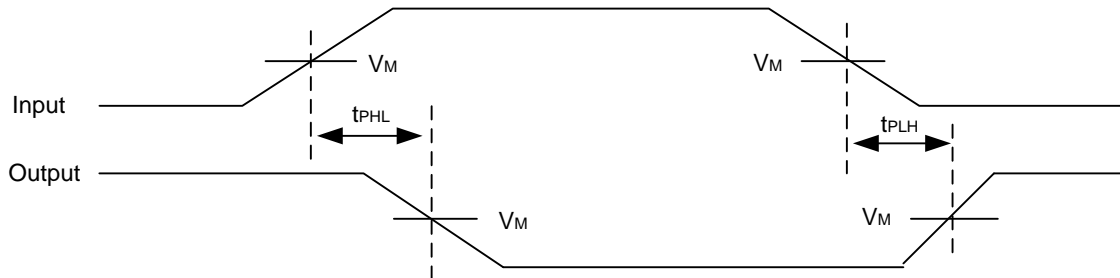
Note: All typical values are measured at T<sub>A</sub>=25°C.

## ■ TEST CIRCUIT AND WAVEFORMS



Note:  $C_L$  includes probe and jig capacitance.

$V_{CC}$	$V_{IN}$	$t_R, t_F$	$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	15pF	1M $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	15pF	1M $\Omega$	0.3V
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 $\Omega$	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 $\Omega$	0.3V



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