



## U74LVC2G240

CMOS IC

### DUAL BUFFER/DRIVER WITH 3-STATE OUTPUTS

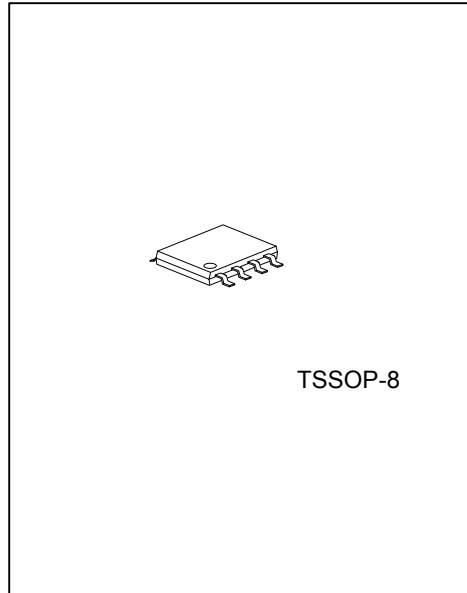
#### DESCRIPTION

The **U74LVC2G240** is a dual buffer or driver with 3-state outputs. It is designed for 1.65V to 5.5V operation.

The **U74LVC2G240** is composed of two 1-bit buffers/drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, data passes from A (input) to Y (output). When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pull-up resistor, and the minimum value of the resistor is determined by the current-sinking capability of the driver.

The **U74LVC2G240** is fully specified for partial-power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the outputs and prevents damaging current backflow through the device when it is powered down.



#### FEATURES

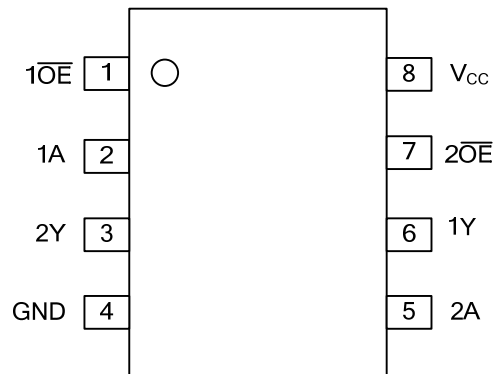
- \* Wide Supply Voltage Range from 1.65V to 5.5V
- \* Max  $t_{PD}$  of 4.6 ns at 3.3V
- \* Up to 5.5V Inputs Accept Voltages
- \* Low Power Consumption,  $I_{CC} = 10 \mu A$  (Max.)
- \*  $\pm 24$  mA Output Driver at 3.3V
- \* Typical  $V_{OLP}$  (Output Ground Bounce) < 0.8V,  $V_{CC} = 3.3$  V,  $T_A = 25$  °C
- \* Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot) > 2V,  $V_{CC} = 3.3$  V,  $T_A = 25$  °C

#### ORDERING INFORMATION

Ordering Number	Package	Packing
U74LVC2G240G-P08-R	TSSOP-8	Tape Reel

U74LVC2G240G-P08-R	(1) Packing Type	(1) R: Tape Reel
	(2) Package Type	(2) P08:TSSOP-8
	(3) Halogen Free	(3) G: Halogen Free

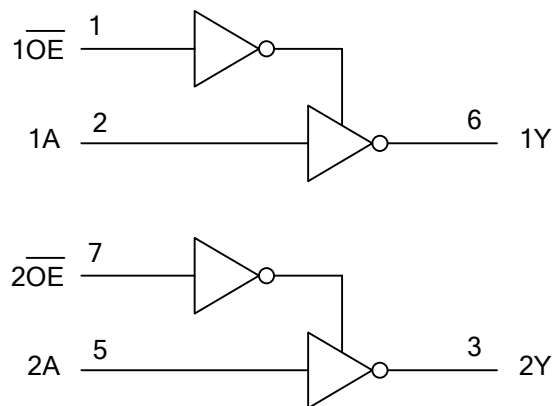
■ PIN CONFIGURATION



■ FUNCTION TABLE (Each Buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	L
L	L	H
H	X	Z

■ LOGIC DIAGRAM (Positive Logic)



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{CC}$	-0.5~6.5	V
Input Voltage	$V_{IN}$	-0.5~6.5	V
Output Voltage (any output in the high-impedance or power-off state)	$V_{OUT}$	-0.5~6.5	V
Output Voltage (any output in the high or low state)	$V_{OUT}$	-0.5~ $V_{CC}+0.5$	V
Input Clamp Current	$I_{IK}$	-50	mA
Output Clamp Current	$I_{OK}$	-50	mA
Output Current	$I_{OUT}$	±50	mA
$V_{CC}$ or GND Current	$I_{CC}$	±100	mA
Storage Temperature	$T_{STG}$	-65 ~ +150	°C

Note: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 2. 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.

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	190	°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			
High-Level Input Voltage	$V_{IH}$	$V_{CC} = 1.65V$ to $1.95V$	$0.65^* V_{CC}$			V
		$V_{CC} = 2.3V$ to $2.7V$	1.7			
		$V_{CC} = 3V$ to $3.6V$	2			
		$V_{CC} = 4.5V$ to $5.5V$	$0.7^* V_{CC}$			
Low-Level Input Voltage	$V_{IL}$	$V_{CC} = 1.65V$ to $1.95V$			$0.35^* V_{CC}$	V
		$V_{CC} = 2.3V$ to $2.7V$			0.7	
		$V_{CC} = 3V$ to $3.6V$			0.8	
		$V_{CC} = 4.5V$ to $5.5V$			$0.3^* V_{CC}$	
Input Voltage	$V_{IN}$		0		5.5	V
Output Voltage	$V_{OUT}$	High or low state	0		$V_{CC}$	V
		3-state	0		5.5	
High-Level Output Current	$I_{OH}$	$V_{CC}=1.65V$			-4	mA
		$V_{CC}=2.3V$			-8	
		$V_{CC}=3V$			-16	
		$V_{CC}=4.5V$			-24	
Low-Level Output Current	$I_{OL}$	$V_{CC}=1.65V$			4	mA
		$V_{CC}=2.3V$			8	
		$V_{CC}=3V$			16	
		$V_{CC}=4.5V$			24	
Input Transition Rise or Fall Rate	$t_R / t_F$	$V_{CC}=1.8\pm 0.15V, 2.5\pm 0.2V$			20	ns/ V
		$V_{CC}=3.3\pm 0.3V$			10	
		$V_{CC}=5.0\pm 0.5V$			5	
Operating Temperature	$T_{OPR}$		-40		85	°C

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> =25°C , V<sub>CC</sub> = 3.3 V, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Output Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -100 μA, V <sub>CC</sub> = 1.65V to 5.5V	V <sub>CC</sub> -0.1			V
		I <sub>OH</sub> = -4 mA, V <sub>CC</sub> = 1.65V	1.2			
		I <sub>OH</sub> = -8 mA, V <sub>CC</sub> = 2.3V	1.9			
		I <sub>OH</sub> = -16 mA, V <sub>CC</sub> = 3V	2.4			
		I <sub>OH</sub> = -24 mA, V <sub>CC</sub> = 3V	2.3			
		I <sub>OH</sub> = -32 mA, V <sub>CC</sub> = 4.5V	3.8			
Low-Level Output Voltage	V <sub>OL</sub>	I <sub>OL</sub> = 100 μA, V <sub>CC</sub> = 1.65V to 5.5V			0.1	V
		I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = 1.65V			0.45	
		I <sub>OL</sub> = 8 mA, V <sub>CC</sub> = 2.3V			0.3	
		I <sub>OL</sub> = 16 mA, V <sub>CC</sub> = 3V			0.4	
		I <sub>OL</sub> = 24 mA, V <sub>CC</sub> = 3V			0.55	
		I <sub>OL</sub> = 32 mA, V <sub>CC</sub> = 4.5V			0.55	
Input Leakage Current (A or $\overline{OE}$ inputs)	I <sub>I(LEAK)</sub>	V <sub>IN</sub> = 5.5V or GND, V <sub>CC</sub> = 0 to 5.5V			±5	μA
OFF-State Current	I <sub>OFF</sub>	V <sub>IN</sub> or V <sub>O</sub> = 5.5V, V <sub>CC</sub> = 0V			±10	μA
High-Impedance State Current	I <sub>OZ</sub>	V <sub>O</sub> = 0 to 5.5V, V <sub>CC</sub> = 3.6V			10	μA
Quiescent Supply Current	I <sub>Q</sub>	V <sub>IN</sub> = 5.5V or GND, I <sub>OUT</sub> = 0, V <sub>CC</sub> = 1.65V to 5.5V			10	μA
Additional quiescent Supply Current	Δ I <sub>Q</sub>	One input at V <sub>CC</sub> - 0.6V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> =3V to 5.5V			500	μA
Input Capacitance	C <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> =3.3V		4		pF
Output Capacitance	C <sub>OUT</sub>	V <sub>OUT</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> =3.3V		6		pF

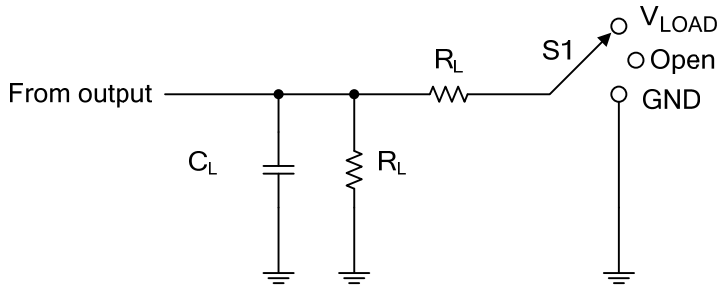
■ SWITCHING CHARACTERISTICS (T<sub>A</sub> =25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay from Input A to Output Y	t <sub>PLH</sub> / t <sub>PHL</sub> (t <sub>PD</sub> )	V <sub>CC</sub> =1.8±0.15V, R <sub>L</sub> =1KΩ, C <sub>L</sub> =30pF	2		11.3	ns
		V <sub>CC</sub> =2.5±0.2V, R <sub>L</sub> =500Ω, C <sub>L</sub> =30pF	1.4		5.5	
		V <sub>CC</sub> =3.3±0.3V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	1.1		4.6	
		V <sub>CC</sub> =5±0.5V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	1		4	
Propagation Delay from Input $\overline{OE}$ to Output Y	t <sub>PZL</sub> / t <sub>PZH</sub> (t <sub>EN</sub> )	V <sub>CC</sub> =1.8±0.15V, R <sub>L</sub> =1KΩ, C <sub>L</sub> =30pF	2.7		11.7	ns
		V <sub>CC</sub> =2.5±0.2V, R <sub>L</sub> =500Ω, C <sub>L</sub> =30pF	1.9		6.6	
		V <sub>CC</sub> =3.3±0.3V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	1.4		5.4	
		V <sub>CC</sub> =5±0.5V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	1.1		5	
Propagation Delay from Input $\overline{OE}$ to Output Y	t <sub>PLZ</sub> / t <sub>PHZ</sub> (t <sub>DIS</sub> )	V <sub>CC</sub> =1.8±0.15V, R <sub>L</sub> =1KΩ, C <sub>L</sub> =30pF	1.7		12.8	ns
		V <sub>CC</sub> =2.5±0.2V, R <sub>L</sub> =500Ω, C <sub>L</sub> =30pF	0.8		5.7	
		V <sub>CC</sub> =3.3±0.3V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	1.2		5.5	
		V <sub>CC</sub> =5±0.5V, R <sub>L</sub> =500Ω, C <sub>L</sub> =50pF	0.5		4.2	

■ OPERATING CHARACTERISTICS (T<sub>A</sub> =25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance per buffer/driver	C <sub>PD</sub>	Outputs enabled	V <sub>CC</sub> = 1.8V			pF
			V <sub>CC</sub> = 2.5V			
			V <sub>CC</sub> = 3.3V		15	
			V <sub>CC</sub> = 5V		17	
		Outputs disabled	V <sub>CC</sub> = 1.8V		1	pF
			V <sub>CC</sub> = 2.5V		1	
			V <sub>CC</sub> = 3.3V		2	
			V <sub>CC</sub> = 5V		2	

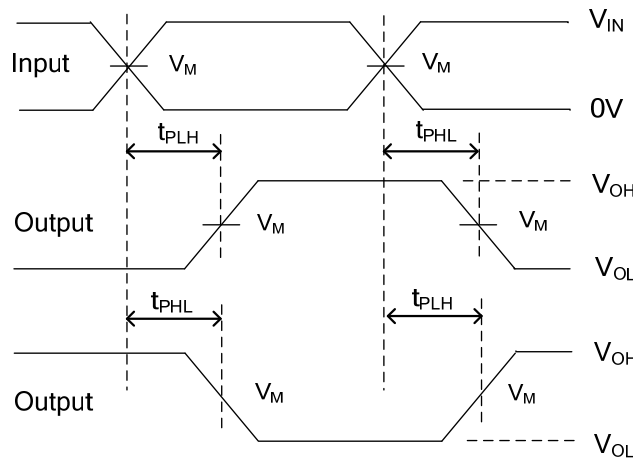
## TEST CIRCUIT AND WAVEFORMS



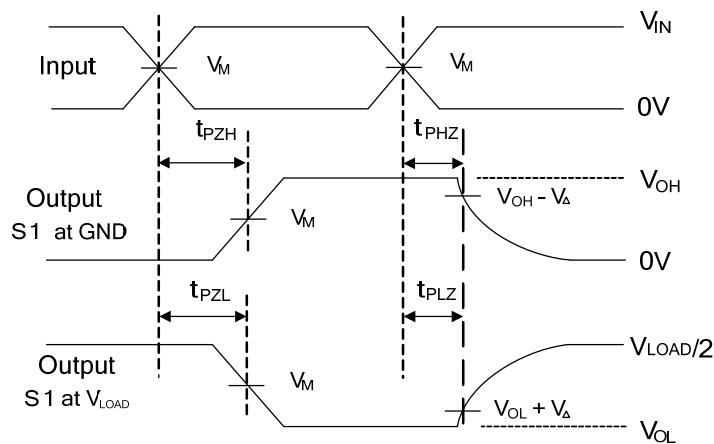
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

TEST CIRCUIT

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



Propagation delay times  
Inverting and noninverting outputs



Enable and disable times  
Low and high level enabling

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

2. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10MHz$ ,  $Z_0 = 50\Omega$ .

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