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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# HD74LVC16244A

## 16-bit Buffers / Line Drivers with 3-state Outputs

REJ03D0364-0400Z  
 (Previous ADE-205-119B (Z))  
 Rev.4.00  
 Jul. 29, 2004

### Description

The HD74LVC16244A has sixteen line drivers with three state outputs in a 48 pin package. This device is a non inverting buffer and has two active low enables ( $\overline{1G}$  to  $4\overline{G}$ ). Each enable independently controls four buffers. Low voltage and high-speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

### Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs  $V_{IH} (\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V to }5.5\text{ V})$
- All outputs  $V_{OUT} (\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V or output off state})$
- Typical  $V_{OL}$  ground bounce  $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V, }T_a = 25^\circ\text{C})$
- Typical  $V_{OH}$  undershoot  $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V, }T_a = 25^\circ\text{C})$
- High output current  $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVC16244ATEL	TSSOP-48 pin	TTP-48DBV	T	EL (1,000 pcs/reel)

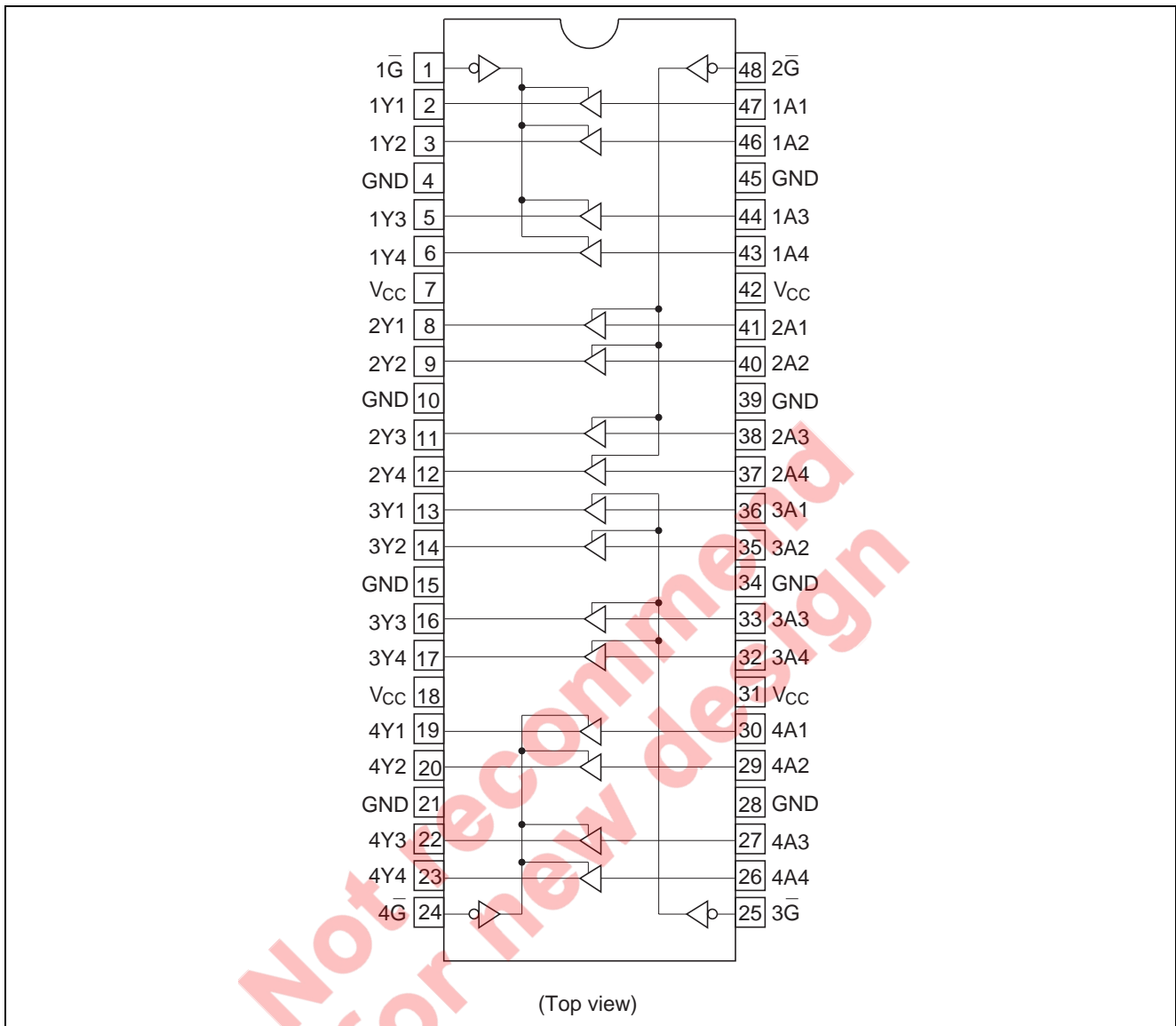
### Function Table

#### Inputs

$\overline{G}$	A	Output Y
H	X	Z
L	H	H
L	L	L

H: High level  
 L: Low level  
 X: Immaterial  
 Z: High impedance

Pin Arrangement



### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	-0.5 to 6.0	V	
Input diode current	$I_{IK}$	-50	mA	$V_I = -0.5$ V
Input voltage	$V_I$	-0.5 to 6.0	V	
Output diode current	$I_{OK}$	-50	mA	$V_O = -0.5$ V
		50		$V_O = V_{CC} + 0.5$ V
Output voltage	$V_O$	-0.5 to $V_{CC} + 0.5$	V	Output "H" or "L"
		-0.5 to 6.0		Output "Z" or $V_{CC}$ :OFF
Output current	$I_O$	$\pm 50$	mA	
$V_{CC}$ , GND current / pin	$I_{CC}$ or $I_{GND}$	100	mA	
Storage temperature	Tstg	-65 to +150	$^{\circ}$ C	

Note: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

### Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	1.5 to 5.5	V	Data hold
		2.0 to 5.5		At operation
Input / output voltage	$V_I$	0 to 5.5	V	G, A
	$V_O$	0 to $V_{CC}$	V	Output "H" or "L"
		0 to 5.5		Output "Z" or $V_{CC}$ :OFF
Operating temperature	$T_a$	-40 to 85	$^{\circ}$ C	
Output current	$I_{OH}$	-12	mA	$V_{CC} = 2.7$ V
		-24 <sup>*2</sup>		$V_{CC} = 3.0$ V to 5.5 V
	$I_{OL}$	12	mA	$V_{CC} = 2.7$ V
		24 <sup>*2</sup>		$V_{CC} = 3.0$ V to 5.5 V
Input rise / fall time <sup>*1</sup>	$t_r, t_f$	10	ns/V	

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform: Refer to test circuit of switching characteristics.

2. Duty cycle  $\leq 50\%$

Electrical Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C		Unit	Test Conditions
			Min	Max		
Input voltage	V <sub>IH</sub>	2.7 to 3.6	2.0	—	V	
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—		
	V <sub>IL</sub>	2.7 to 3.6	—	0.8	V	
		4.5 to 5.5	—	V <sub>CC</sub> ×0.3		
Output voltage	V <sub>OH</sub>	2.7 to 5.5	V <sub>CC</sub> -0.2	—	V	I <sub>OH</sub> = -100 μA
		2.7	2.2	—		I <sub>OH</sub> = -12 mA
		3.0	2.4	—		
		3.0	2.2	—		I <sub>OH</sub> = -24 mA
		4.5	3.8	—		
	V <sub>OL</sub>	2.7 to 5.5	—	0.2	V	I <sub>OL</sub> = 100 μA
		2.7	—	0.4		I <sub>OL</sub> = 12 mA
		3.0	—	0.55		I <sub>OL</sub> = 24 mA
		3.0	—	0.55		
		4.5	—	0.55		
Input current	I <sub>IN</sub>	0 to 5.5	—	±5.0	μA	V <sub>IN</sub> = 5.5 V or GND
Off state output current	I <sub>OZ</sub>	2.7 to 5.5	—	±5.0	μA	V <sub>IN</sub> = V <sub>CC</sub> , GND V <sub>OUT</sub> = 5.5 V or GND
Output leak current	I <sub>OFF</sub>	0	—	20	μA	V <sub>IN</sub> / V <sub>OUT</sub> = 5.5 V
Quiescent supply current	I <sub>CC</sub>	2.7 to 3.6	—	±20	μA	V <sub>IN</sub> / V <sub>OUT</sub> = 3.6 to 5.5 V
		2.7 to 5.5	—	20		V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	3.0 to 3.6	—	500	μA	V <sub>IN</sub> = one input at (V <sub>CC</sub> -0.6)V, other inputs at V <sub>CC</sub> or GND

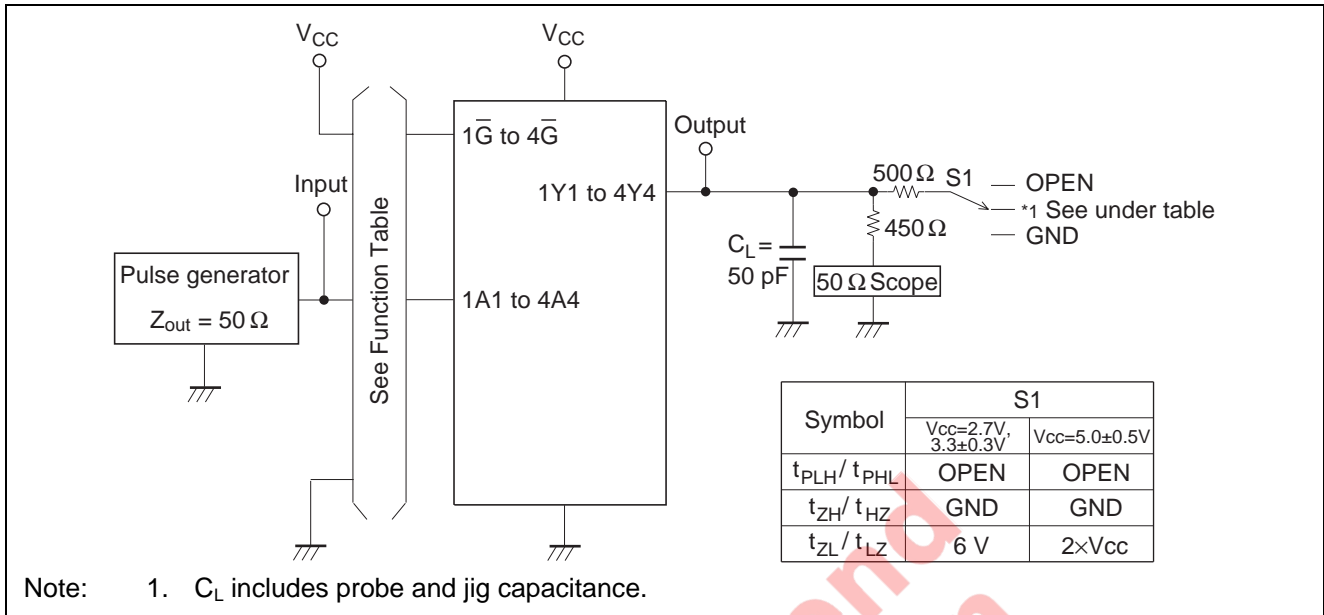
Switching Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = -40 to 85°C			Unit	From (Input)	To (Output)
			Min	Typ	Max			
Propagation delay time	t <sub>PLH</sub>	2.7	—	—	5.8	ns	A	Y
	t <sub>PHL</sub>	3.3±0.3	1.5	—	5.2			
		5.0±0.5	—	—	4.0			
Output enable time	t <sub>ZH</sub>	2.7	—	—	8.2	ns	G	Y
	t <sub>ZL</sub>	3.3±0.3	1.5	—	7.5			
		5.0±0.5	—	—	5.5			
Output disable time	t <sub>HZ</sub>	2.7	—	—	7.7	ns	G	Y
	t <sub>LZ</sub>	3.3±0.3	1.5	—	7.0			
		5.0±0.5	—	—	6.0			
Between output pins skew <sup>*1</sup>	t <sub>OSLH</sub>	2.7	—	—	—	ns		
	t <sub>OSSL</sub>	3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			
Input capacitance	C <sub>IN</sub>	2.7	—	3.0	—	pF		
Output capacitance	C <sub>O</sub>	2.7	—	15.0	—	pF		

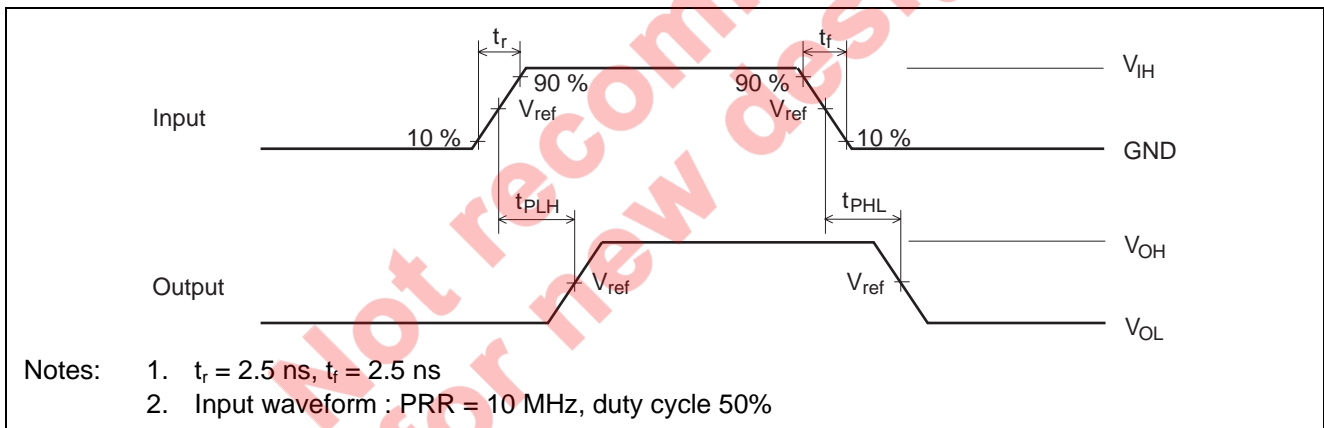
Note: 1. This parameter is characterized but not tested.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSSL} = |t_{PHLm} - t_{PHLn}|$$

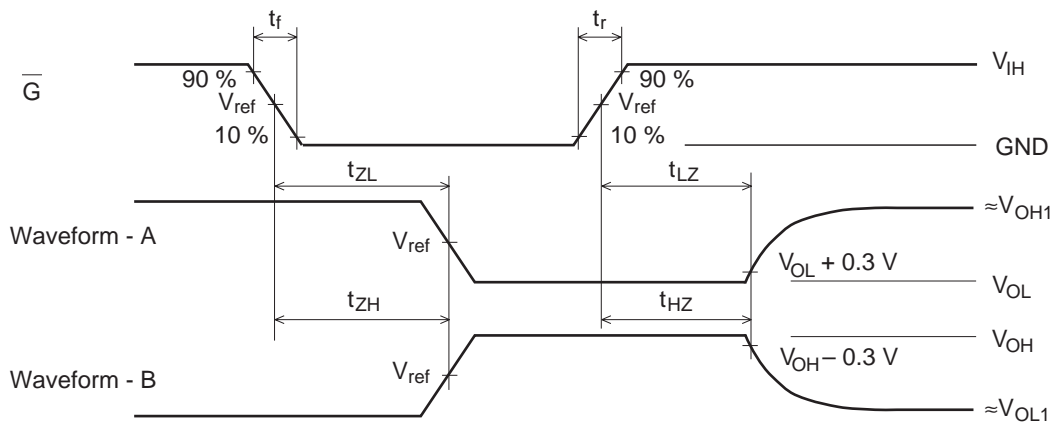
Test Circuit



Waveforms – 1



Waveforms – 2



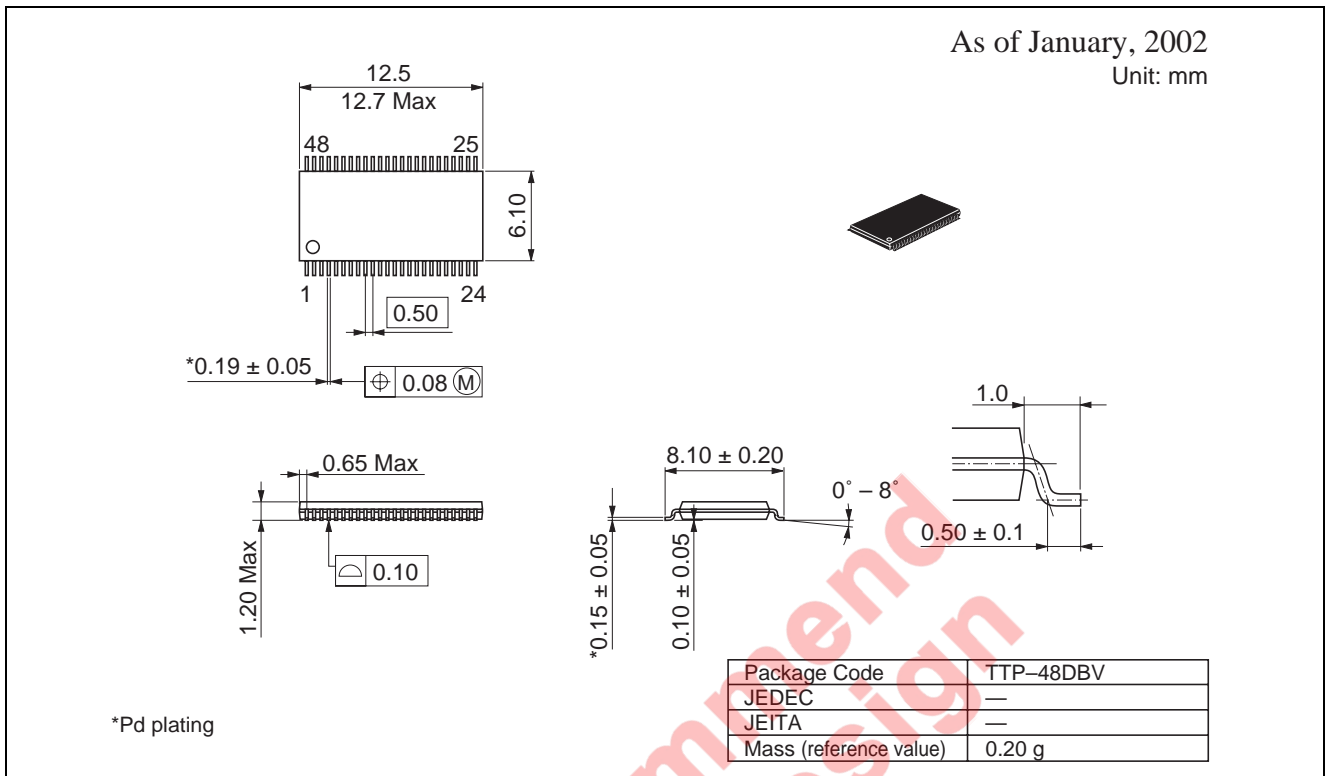
TEST	$V_{CC}=2.7V, 3.3\pm 0.3V$	$V_{CC}=5.0\pm 0.5V$
$V_{IH}$	2.7 V	$V_{CC}$
$V_{ref}$	1.5 V	50% $V_{CC}$
$V_{OH1}$	3 V	$V_{CC}$
$V_{OL1}$	GND	GND

- Notes:
1.  $t_r = 2.5$  ns,  $t_f = 2.5$  ns
  2. Input waveform : PRR = 10 MHz, duty cycle 50%
  3. Waveform – A shows input conditions such that the output is "L" level when enable by the output control.
  4. Waveform – B shows input conditions such that the output is "H" level when enable by the output control.

Not recommended for new designs



Package Dimensions



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