

# HD74LVCZ16245A

## 16-bit Bidirectional Transceivers with 3-state Outputs

REJ03D0375-0200  
 (Previous ADE-205-233 (Z))  
 Rev.2.00  
 Aug. 20.2004

### Description

The HD74LVCZ16245A has sixteen two direction buffers, for the fittest at two direction bus lines with three state outputs in a 48 pin package. When (DIR) is high, data flows from the A inputs to the B outputs, and when (DIR) is low, data flows from the B inputs to the A outputs. A and B bus are separated by making enable input ( $\overline{G}$ ) high level.

When  $V_{CC}$  is between 0 and 1.5 V, the device is in the high impedance state during power up or power down.

Low voltage and high-speed operation is suitable at battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

### Features

- $V_{CC} = 2.7$  to 5.5 V
- All inputs  $V_{IH} (\text{Max}) = 5.5$  V (@ $V_{CC} = 0$  to 5.5 V)
- All inputs / outputs  $V_{IO} (\text{Max}) = 5.5$  V (@ $V_{CC} = 0$  V or output off state)
- Typical  $V_{OL}$  ground bounce < 0.8 V (@ $V_{CC} = 3.3$  V,  $T_a = 25^\circ\text{C}$ )
- Typical  $V_{OH}$  undershoot > 2.0 V (@ $V_{CC} = 3.3$  V,  $T_a = 25^\circ\text{C}$ )
- High impedance state during power up and power down
- Power off disables outputs, permitting live insertion
- High output current  $\pm 24$  mA (@ $V_{CC} = 3.0$  to 5.5 V)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVCZ16245ATEL	TSSOP-48 pin	TTP-48DBV	T	EL (1,000 pcs/reel)

### Function Table

#### Inputs

$\overline{G}$	DIR	Operation
L	L	B data to A bus
L	H	A data to B bus
H	X	Z

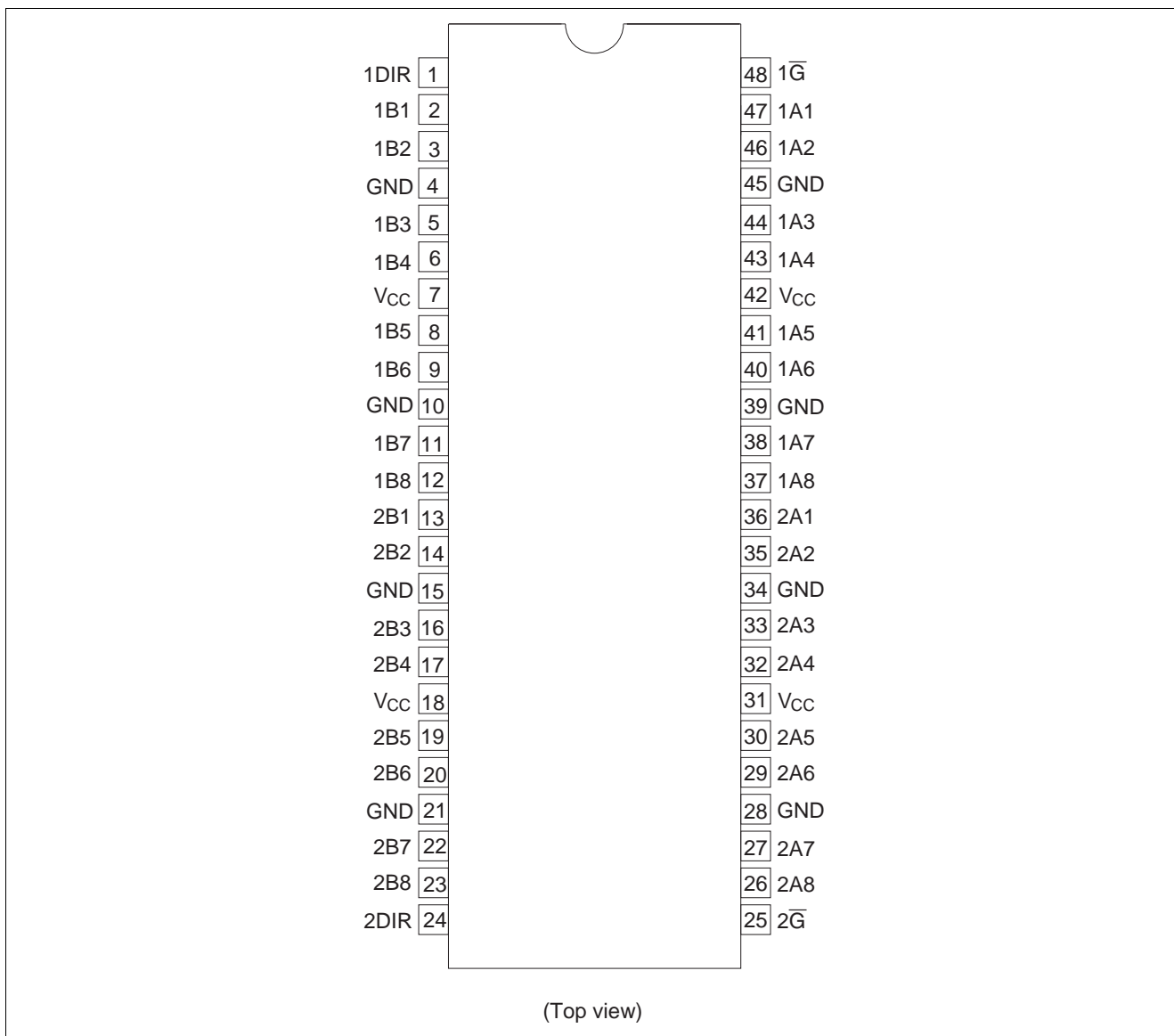
H: High level

L: Low level

X: Immaterial

Z: High impedance

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V <sub>CC</sub>	-0.5 to 7.0	V	
Input voltage	V <sub>I</sub>	-0.5 to 7.0	V	
Input / output voltage	V <sub>I/O</sub>	-0.5 to 7.0 -0.5 to V <sub>CC</sub> +0.5	V	Output "Z" or V <sub>CC</sub> : OFF Output "H" or "L"
Input diode current	I <sub>IK</sub>	-50	mA	V <sub>I</sub> < 0
Output diode current	I <sub>OK</sub>	-50	mA	V <sub>O</sub> < 0
Output current	I <sub>O</sub>	±50	mA	
V <sub>CC</sub> , GND current	I <sub>CC</sub> or I <sub>GND</sub>	±100	mA	
Storage temperature	T <sub>stg</sub>	-65 to 150	°C	

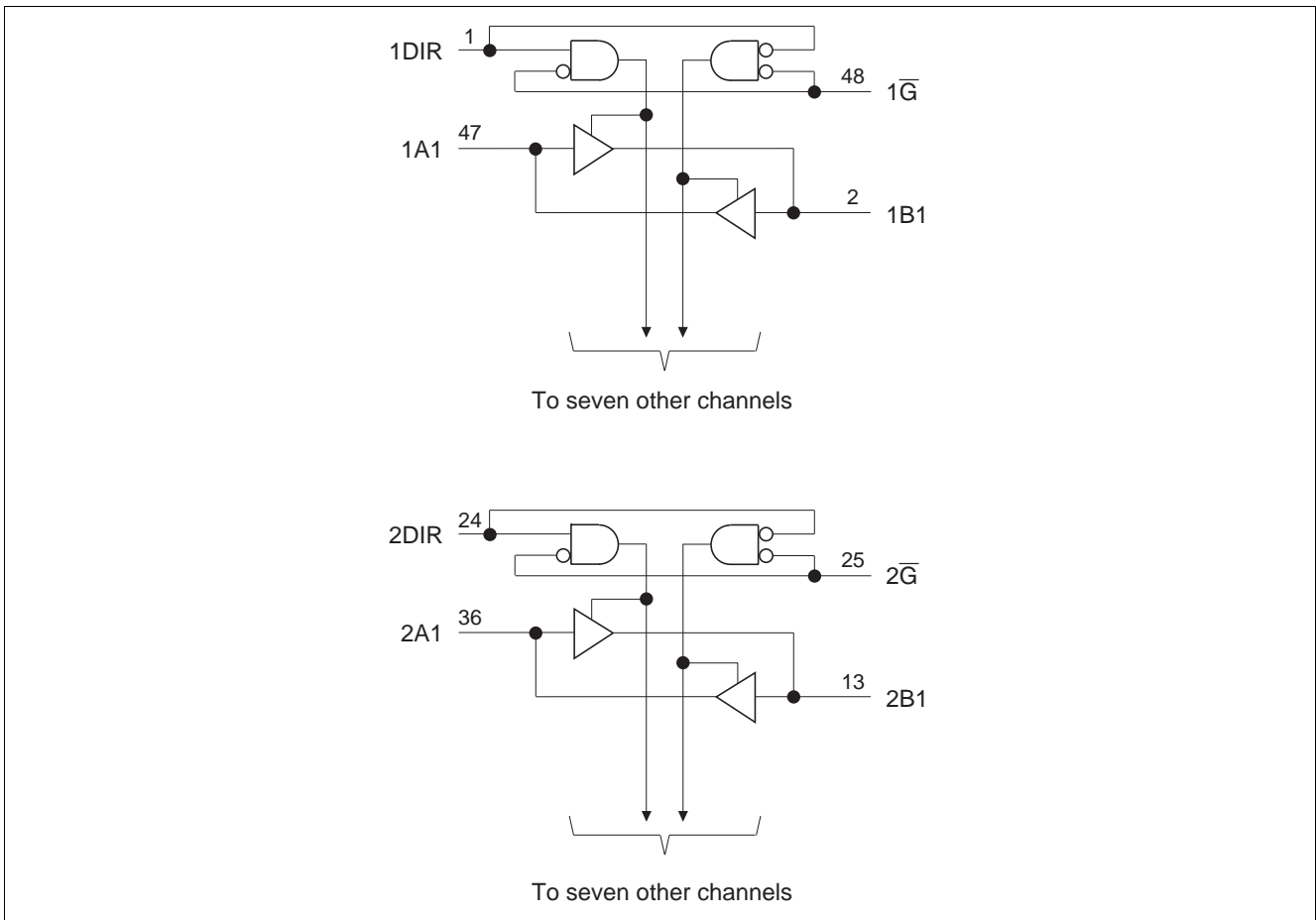
Note: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

**Recommended Operating Conditions**

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	2.7 to 5.5	V	At operation
Input voltage	$V_I$	0 to 5.5	V	
Input / output voltage	$V_{I/O}$	0 to 5.5	V	Output "Z" or $V_{CC}$ : OFF
		0 to $V_{CC}$		Output "H" or "L"
Output current	$I_{OH}$	-12	mA	$V_{CC} = 2.7\text{ V}$
		-24 <sup>*1</sup>		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
	$I_{OL}$	12	mA	$V_{CC} = 2.7\text{ V}$
		24 <sup>*1</sup>		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
Input rise / fall time	$t_r, t_f$	0 to 6	ns / V	
Operating temperature	$T_a$	-40 to +85	°C	

Note: 1. Duty cycle ≤ 50%

**Logic Diagram**



**Electrical Characteristics**

(Ta = -40 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	Test Conditions
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	—	—		I <sub>OH</sub> = -24 mA
		3.0	2.2	—	—		
	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
		4.5	—	—	0.55		
Input current	I <sub>IN</sub>	0 to 5.5	—	—	±5	μA	V <sub>IN</sub> = 0 to 5.5 V
Off state output current	I <sub>OZ</sub>	2.7 to 5.5	—	—	±5	μA	V <sub>OUT</sub> = 0 to 5.5 V
	I <sub>OZPU</sub>	0 to 1.5	—	—	±5	μA	V <sub>OUT</sub> = 0.5 to 5.5 V, Output enable = don't care
	I <sub>OZPD</sub>	1.5 to 0	—	—	±5		
Output leak current	I <sub>OFF</sub>	0	—	—	±5	μA	V <sub>IN</sub> or V <sub>O</sub> = 5.5 V
Quiescent supply current	I <sub>CC</sub>	2.7 to 3.6	—	—	225	μA	V <sub>IN</sub> = 3.6 to 5.5 V <sup>*1</sup> , I <sub>O</sub> = 0
		2.7 to 5.5	—	—	350		V <sub>IN</sub> = V <sub>CC</sub> or GND
	ΔI <sub>CC</sub>	2.7 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
Input capacitance	C <sub>IN</sub>	3.3	—	4.1	—	pF	V <sub>IN</sub> = V <sub>CC</sub> or GND
Input / output capacitance	C <sub>I/O</sub>	3.3	—	9.2	—	pF	V <sub>OUT</sub> = V <sub>CC</sub> or GND

Note: 1. This applies in the disabled state only.

**Switching Characteristics**

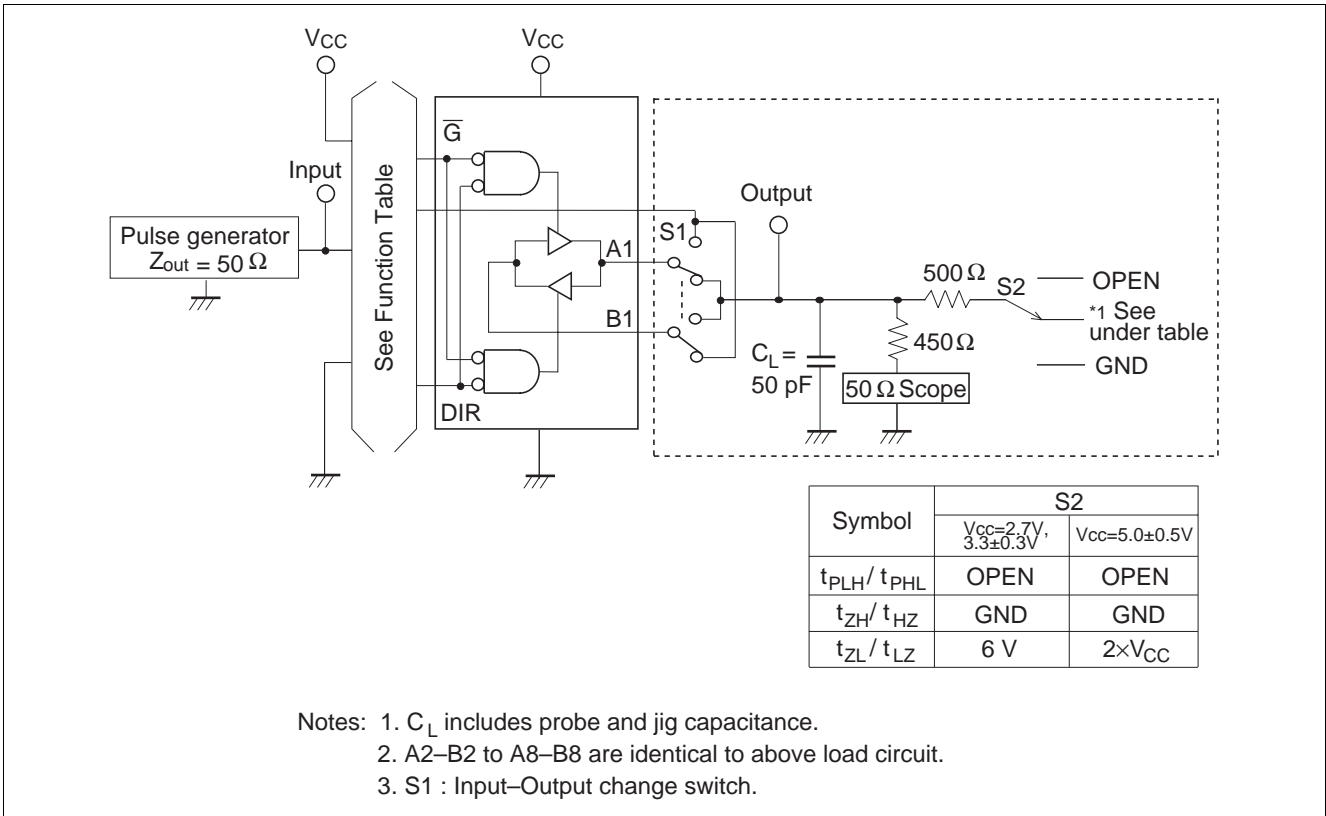
(Ta = -40 to 85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t <sub>PLH</sub>	2.7	—	—	5.2	ns	A or B	B or A
	t <sub>PHL</sub>	3.3±0.3	1.0	—	4.6			
		5.0±0.5	—	—	4.0			
Output enable time	t <sub>ZH</sub>	2.7	—	—	7.3	ns	G	A or B
	t <sub>ZL</sub>	3.3±0.3	1.5	—	6.3			
		5.0±0.5	—	—	5.2			
Output disable time	t <sub>HZ</sub>	2.7	—	—	7.5	ns	G	A or B
	t <sub>LZ</sub>	3.3±0.3	1.5	—	6.9			
		5.0±0.5	—	—	6.0			
Between output pin 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			

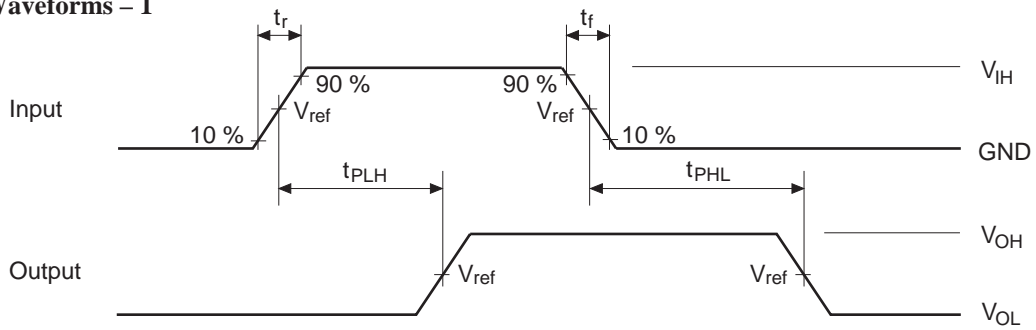
Note: 1. This parameter is characterized but not tested.

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

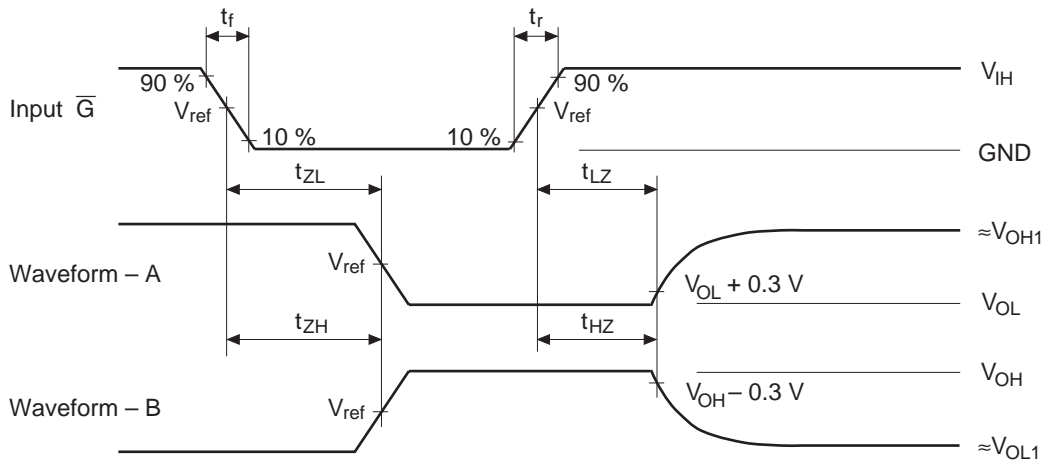
Test Circuit



• Waveforms – 1



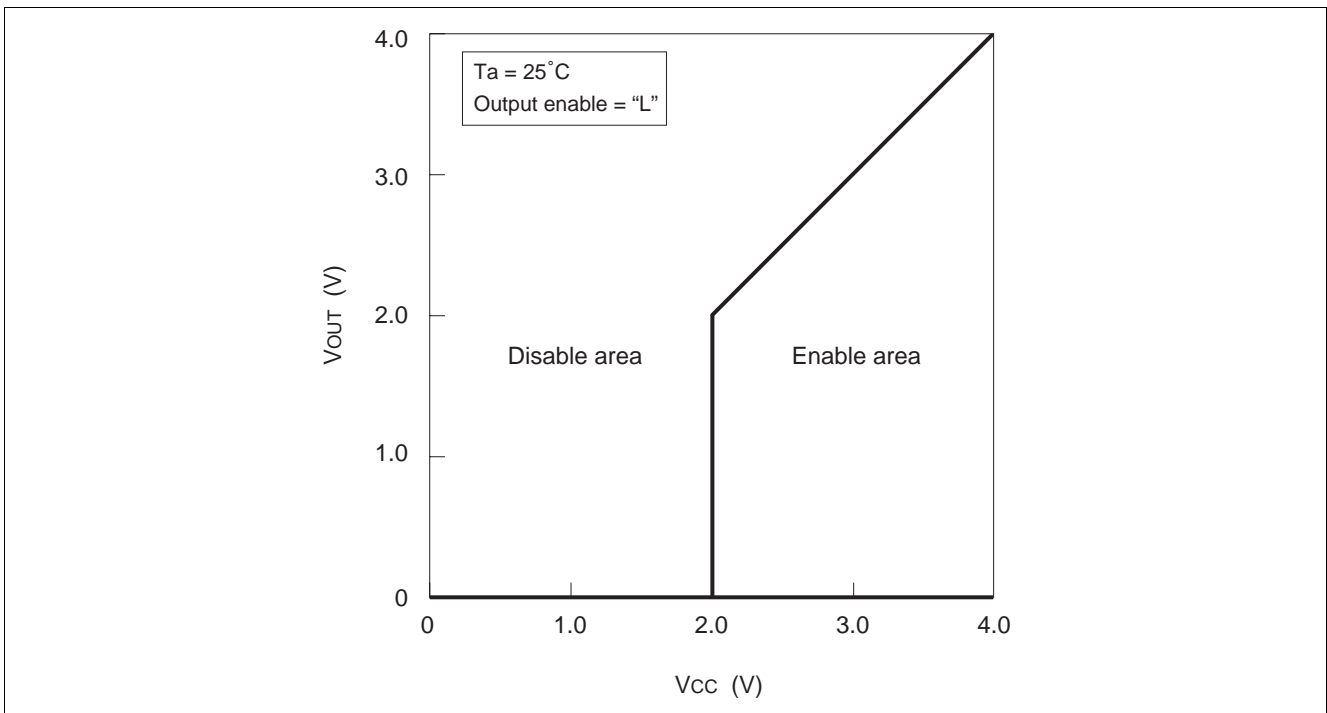
• Waveforms – 2



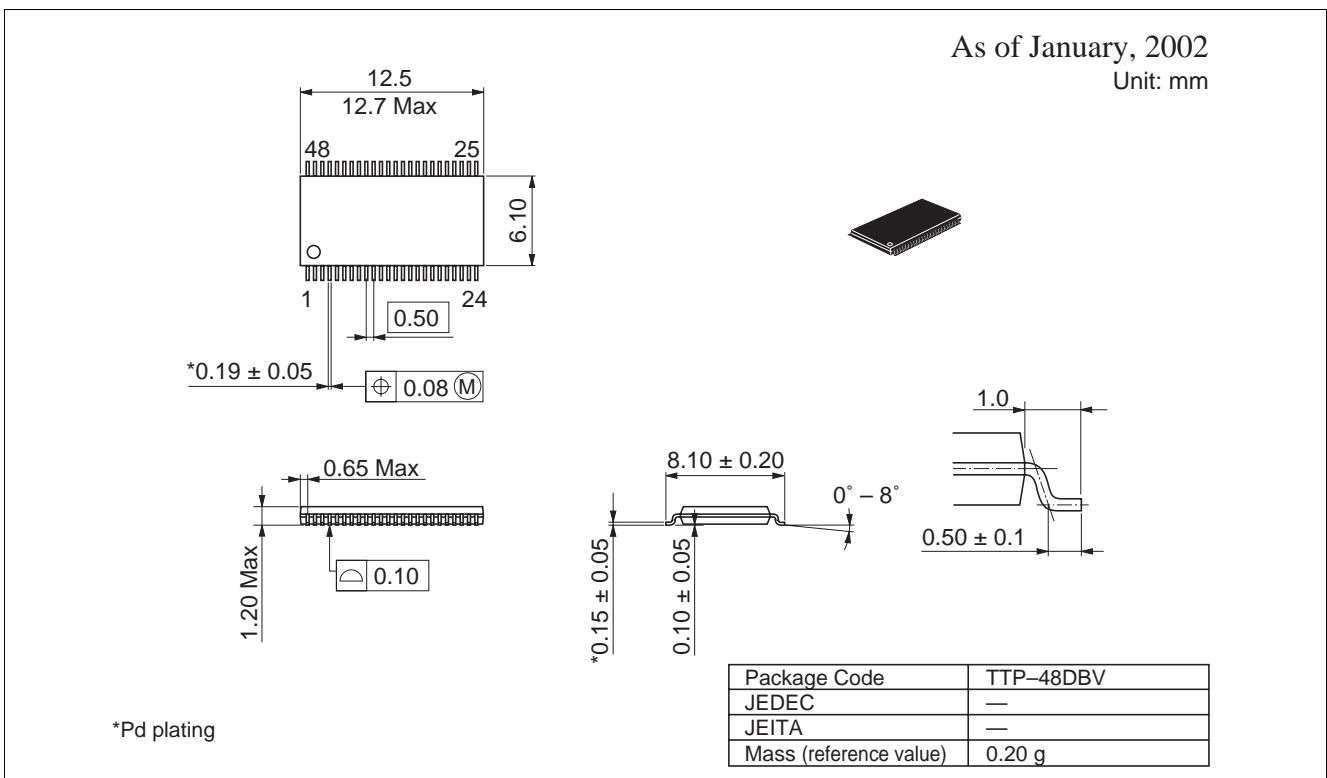
TEST	V <sub>CC</sub> =2.7V, 3.3±0.3V	V <sub>CC</sub> =5.0±0.5V
V <sub>IH</sub>	2.7 V	V <sub>CC</sub>
V <sub>ref</sub>	1.5 V	50%V <sub>CC</sub>
V <sub>OH1</sub>	3 V	V <sub>CC</sub>
V <sub>OL1</sub>	GND	GND

- Notes: 1. Input waveform : PRR = 10 MHz, duty cycle 50%, t<sub>r</sub> = 2.5 ns, t<sub>f</sub> = 2.5 ns  
 2. Waveform – A shows input conditions such that the output is “L” level when enabled by the output control.  
 3. Waveform – B shows input conditions such that the output is “H” level when enabled by the output control.

Power up / down Characteristics



Package Dimensions



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