

# HD74ALVC2G241

Dual Bus Buffer Noninverted with 3-state Output

## HITACHI

ADE-205-573 (Z)

Rev.0  
July, 2001

### Description

The HD74ALVC2G241 has dual bus buffer noninverted with 3-state output in a 8 pin package. Two noninverters are included in one circuit. Each circuit can be independently controlled by the enable signal  $\overline{OE}$  or OE, which enables outputs when receiving a low or high level signal, respectively. To ensure the high impedance state during power up or power down,  $\overline{OE}$  should be connected to  $V_{CC}$  through a pull-up resistor; the minimum value of the resistor is determined by the current sinking capability of the driver. Low voltage and high speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

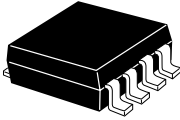
### Features

- The basic gate function is lined up as hitachi uni logic series.
- Supplied on emboss taping for high speed automatic mounting.
- Supply voltage range : 1.2 to 3.6 V  
Operating temperature range :  $-40$  to  $+85^{\circ}\text{C}$
- All inputs  $V_{IH}$  (Max.) = 3.6 V (@  $V_{CC} = 0$  V to 3.6 V)  
All outputs  $V_o$  (Max.) = 3.6 V (@  $V_{CC} = 0$  V)
- Output current      $\pm 2$  mA (@  $V_{CC} = 1.2$  V)  
                           $\pm 4$  mA (@  $V_{CC} = 1.4$  V to 1.6 V)  
                           $\pm 6$  mA (@  $V_{CC} = 1.65$  V to 1.95 V)  
                           $\pm 18$  mA (@  $V_{CC} = 2.3$  V to 2.7 V)  
                           $\pm 24$  mA (@  $V_{CC} = 3.0$  V to 3.6 V)
- Package type

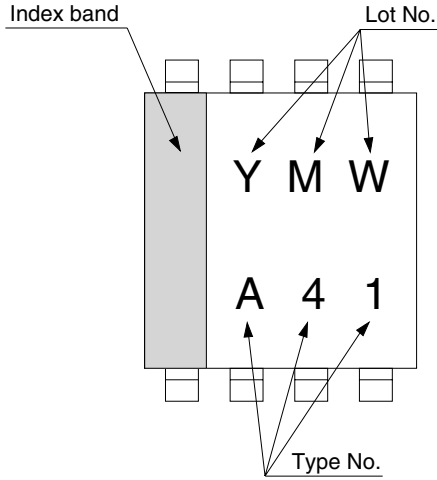
Package type	Package code	Package suffix	Taping code
SSOP-8 pin	TTP-8DB	US	E (3,000 pcs / Reel)

## Outline and Article Indication

- HD74ALVC2G241



SSOP-8



Y : Year code  
(the last digit of year)  
M : Month code  
W : Week code

## Function Table

### Inputs

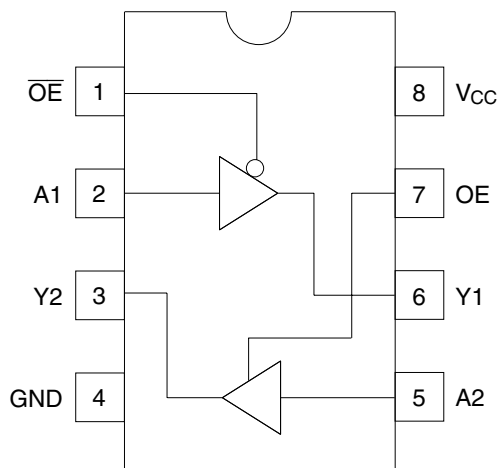
$\overline{OE}$	A	Output Y
L	L	L
L	H	H
H	X	Z

### Inputs

OE	A	Output Y
H	L	L
H	H	H
L	X	Z

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

**Pin Arrangement**



(Top view)

**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	$V_{CC}$	-0.5 to 4.6	V	
Input voltage range <sup>1</sup>	$V_I$	-0.5 to 4.6	V	
Output voltage range <sup>1,2</sup>	$V_O$	-0.5 to $V_{CC}+0.5$ -0.5 to 4.6	V	Output : H or L or Z $V_{CC}$ : OFF
Input clamp current	$I_{IK}$	-50	mA	$V_I < 0$
Output clamp current	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 50$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 100$	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>3</sup>	$P_T$	200	mW	
Storage temperature	$T_{stg}$	-65 to 150	$^\circ\text{C}$	

- Notes: 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.
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
  2. This value is limited to 4.6 V maximum.
  3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

**Recommended Operating Conditions**

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	$V_{CC}$	1.2	3.6	V	
Input voltage range	$V_I$	0	3.6	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	
Output current	$I_{OH}$	—	-2	mA	$V_{CC} = 1.2\text{ V}$
		—	-4		$V_{CC} = 1.4\text{ V}$
		—	-6		$V_{CC} = 1.65\text{ V}$
		—	-18		$V_{CC} = 2.3\text{ V}$
		—	-24		$V_{CC} = 3.0\text{ V}$
	$I_{OL}$	—	2	$V_{CC} = 1.2\text{ V}$	
		—	4	$V_{CC} = 1.4\text{ V}$	
		—	6	$V_{CC} = 1.65\text{ V}$	
		—	18	$V_{CC} = 2.3\text{ V}$	
		—	24	$V_{CC} = 3.0\text{ V}$	
Input transition rise or fall rate	$\Delta t / \Delta v$	0	20	ns / V	$V_{CC} = 1.2\text{ to }2.7\text{ V}$
		0	10		$V_{CC} = 3.3\pm 0.3\text{ V}$
Operating free-air temperature	$T_a$	-40	85	°C	

Note: Unused or floating inputs must be held high or low.

## 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>	1.2	V <sub>cc</sub> ×0.75	—	—	V	
		1.4 to 1.6	V <sub>cc</sub> ×0.7	—	—		
		1.65 to 1.95	V <sub>cc</sub> ×0.7	—	—		
		2.3 to 2.7	1.7	—	—		
		3.0 to 3.6	2.0	—	—		
	V <sub>IL</sub>	1.2	—	—	V <sub>cc</sub> ×0.25		
		1.4 to 1.6	—	—	V <sub>cc</sub> ×0.3		
		1.65 to 1.95	—	—	V <sub>cc</sub> ×0.3		
		2.3 to 2.7	—	—	0.7		
		3.0 to 3.6	—	—	0.8		
Output voltage	V <sub>OH</sub>	Min to Max	V <sub>cc</sub> -0.2	—	—	V	I <sub>OH</sub> = -100 μA
		1.2	0.9	—	—		I <sub>OH</sub> = -2 mA
		1.4	1.1	—	—		I <sub>OH</sub> = -4 mA
		1.65	1.2	—	—		I <sub>OH</sub> = -6 mA
		2.3	1.7	—	—		I <sub>OH</sub> = -18 mA
		3.0	2.2	—	—		I <sub>OH</sub> = -24 mA
	V <sub>OL</sub>	Min to Max	—	—	0.2	I <sub>OL</sub> = 100 μA	
		1.2	—	—	0.3	I <sub>OL</sub> = 2 mA	
		1.4	—	—	0.3	I <sub>OL</sub> = 4 mA	
		1.65	—	—	0.3	I <sub>OL</sub> = 6 mA	
		2.3	—	—	0.55	I <sub>OL</sub> = 18 mA	
		3.0	—	—	0.55	I <sub>OL</sub> = 24 mA	
		—	—	—	—	—	
Input current	I <sub>IN</sub>	3.6	—	—	±5	μA	V <sub>IN</sub> = 3.6 V or GND
Off state output current	I <sub>OZ</sub>	3.6	—	—	±5	μA	V <sub>O</sub> = V <sub>cc</sub> or GND
Quiescent supply current	I <sub>CC</sub>	3.6	—	—	10	μA	V <sub>IN</sub> = V <sub>cc</sub> or GND, I <sub>O</sub> = 0
Output leakage current	I <sub>OFF</sub>	0	—	—	5	μA	V <sub>IN</sub> or V <sub>O</sub> = 0 to 3.6 V
Input capacitance	C <sub>IN</sub>	3.3	—	4.5	—	pF	V <sub>IN</sub> = V <sub>cc</sub> or GND

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

## Switching Characteristics

( $T_a = -40$  to  $85^\circ\text{C}$ )

- $V_{CC} = 1.2\text{ V}$

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time	$t_{PLH}$	—	5.5	—	ns	$C_L = 15\text{ pF}$	A	Y
	$t_{PHL}$	—	5.5	—	ns	$C_L = 15\text{ pF}$	A	Y
Enable time	$t_{ZH}$	—	6.5	—	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{ZL}$	—	6.5	—	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
Disable time	$t_{HZ}$	—	4.5	—	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{LZ}$	—	4.5	—	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y

- $V_{CC} = 1.5 \pm 0.1\text{ V}$

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time	$t_{PLH}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	A	Y
	$t_{PHL}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	A	Y
Enable time	$t_{ZH}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{ZL}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
Disable time	$t_{HZ}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{LZ}$	2.0	—	7.0	ns	$C_L = 15\text{ pF}$	OE, $\overline{OE}$	Y

- $V_{CC} = 1.8 \pm 0.15\text{ V}$

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time	$t_{PLH}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	A	Y
	$t_{PHL}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	A	Y
Enable time	$t_{ZH}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{ZL}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	OE, $\overline{OE}$	Y
Disable time	$t_{HZ}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	OE, $\overline{OE}$	Y
	$t_{LZ}$	1.5	—	5.0	ns	$C_L = 30\text{ pF}$	OE, $\overline{OE}$	Y

**Switching Characteristics (cont)**

- $V_{CC} = 2.5 \pm 0.2$  V

Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.0	—	4.0	ns	$C_L = 30$ pF	A	Y
Enable time	$t_{ZH}$ $t_{ZL}$	1.0	—	4.0	ns	$C_L = 30$ pF	OE, $\overline{OE}$	Y
Disable time	$t_{HZ}$ $t_{LZ}$	1.0	—	4.0	ns	$C_L = 30$ pF	OE, $\overline{OE}$	Y

- $V_{CC} = 3.3 \pm 0.3$  V

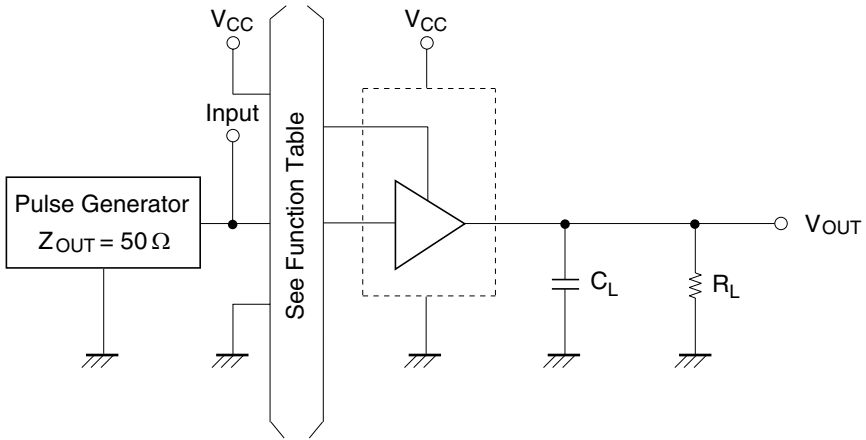
Item	Symbol	Min	Typ	Max	Unit	Test conditions	FROM (Input)	TO (Output)
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.0	—	3.0	ns	$C_L = 30$ pF	A	Y
Enable time	$t_{ZH}$ $t_{ZL}$	1.0	—	3.0	ns	$C_L = 30$ pF	OE, $\overline{OE}$	Y
Disable time	$t_{HZ}$ $t_{LZ}$	1.0	—	3.0	ns	$C_L = 30$ pF	OE, $\overline{OE}$	Y

**Operating Characteristics**

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	$V_{CC}$ (V)	Min	Typ	Max	Unit	Test conditions
Power dissipation capacitance	$C_{PD}$	1.5	—	10.5	—	pF	$f = 10$ MHz
		1.8	—	10.5	—		
		2.5	—	11.0	—		
		3.3	—	13.0	—		

## Test Circuit - 1

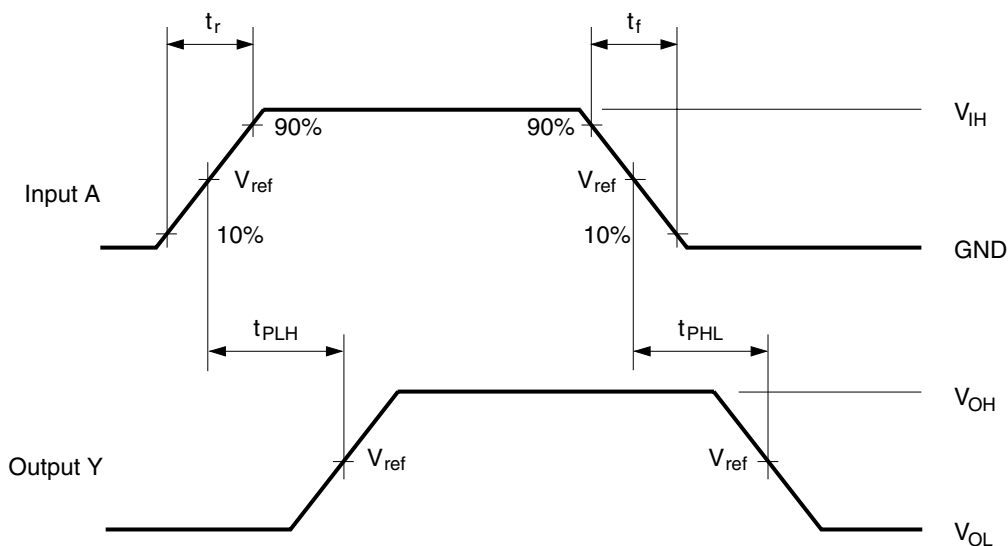


Symbol	$V_{CC} = 1.2 \text{ V},$ $1.5 \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V},$ $3.3 \pm 0.3 \text{ V}$
$R_L$	2.0 k $\Omega$	1.0 k $\Omega$	500 $\Omega$
$C_L$	15 pF	30 pF	30 pF

Note:  $C_L$  includes probe and jig capacitance.



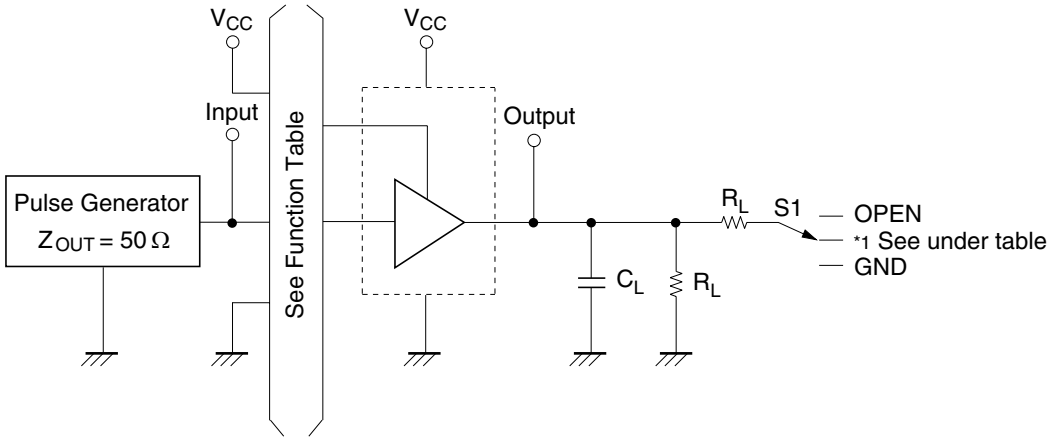
Waveforms - 1



Symbol	$V_{CC} = 1.2\text{ V},$ $1.5 \pm 0.1\text{ V},$ $1.8 \pm 0.15\text{ V}$	$V_{CC} = 2.5 \pm 0.2\text{ V}$	$V_{CC} = 3.3 \pm 0.3\text{ V}$
$t_r / t_f$	2.0 ns	2.5 ns	2.5 ns
$V_{IH}$	$V_{CC}$	$V_{CC}$	2.7 V
$V_{ref}$	50%	50%	1.5 V

Note: Input waveform : PRR = 10 MHz, duty cycle 50%

## Test Circuit - 2

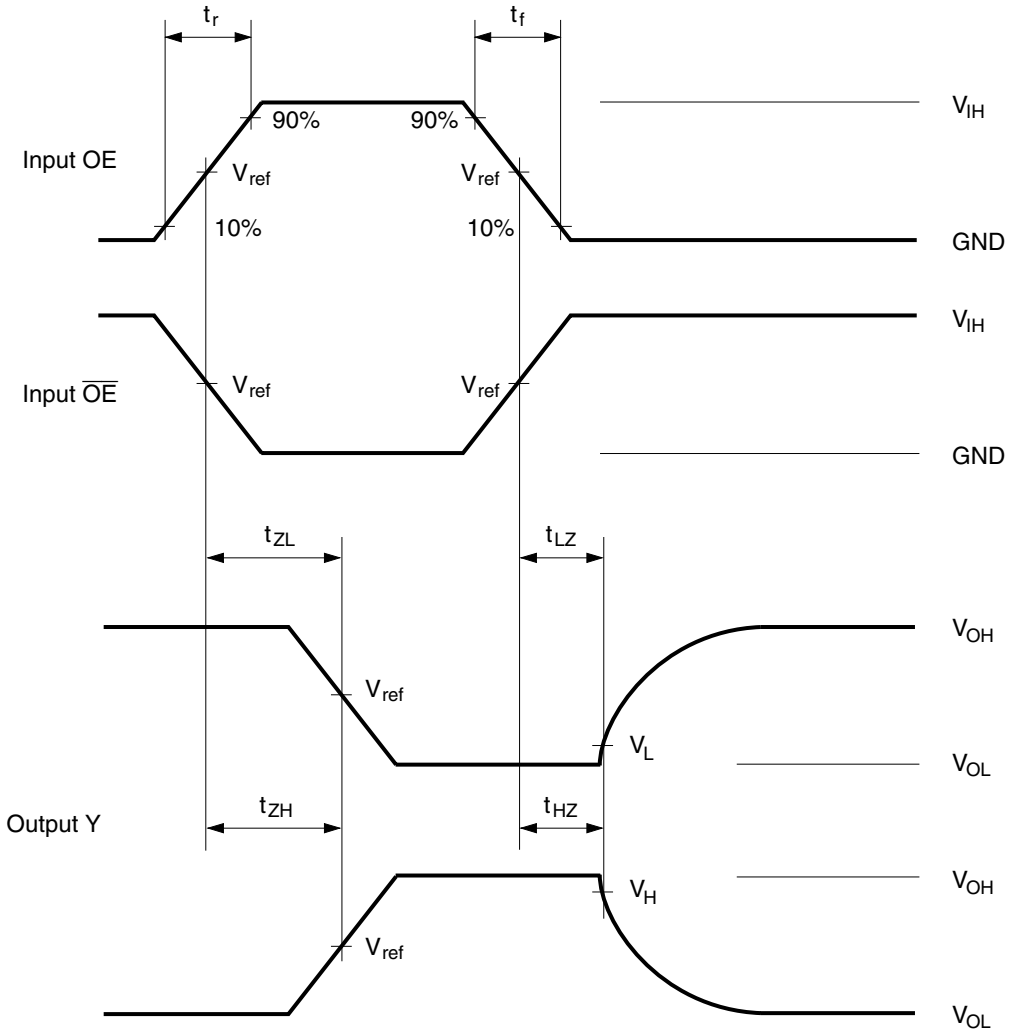


Symbol	S1	
	$V_{CC} = 1.2 \text{ V},$ $1.5 \pm 0.1 \text{ V},$ $1.8 \pm 0.15 \text{ V},$ $2.5 \pm 0.2 \text{ V}$	$V_{CC} = 3.3 \pm 0.3 \text{ V}$
$t_{PLH} / t_{PHL}$	OPEN	OPEN
$t_{HZ} / t_{ZH}$	GND	GND
$t_{LZ} / t_{ZL}$	$V_{CC} \times 2$	6.0

Symbol	$V_{CC} = 1.2 \text{ V},$ $1.5 \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \pm 0.15 \text{ V}$	$V_{CC} = 2.5 \pm 0.2 \text{ V},$ $3.3 \pm 0.3 \text{ V}$
$R_L$	2.0 k $\Omega$	1.0 k $\Omega$	500 $\Omega$
$C_L$	15 pF	30 pF	30 pF

Note:  $C_L$  includes probe and jig capacitance.

Waveforms - 2



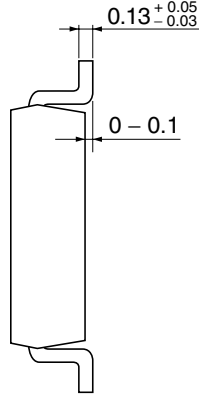
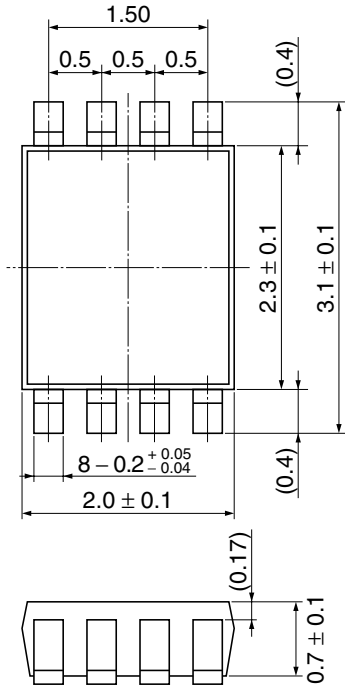
Symbol	$V_{CC} = 1.2\text{ V},$ $1.5 \pm 0.1\text{ V}$	$V_{CC} = 1.8 \pm 0.15\text{ V}$	$V_{CC} = 2.5 \pm 0.2\text{ V}$	$V_{CC} = 3.3 \pm 0.3\text{ V}$
$t_r / t_f$	2.0 ns	2.0 ns	2.5 ns	2.5 ns
$V_{IH}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	2.7 V
$V_{ref}$	50%	50%	50%	1.5 V
$V_H / V_L$	$V_H = V_{OH} - 0.1\text{ V}$ $V_L = V_{OL} + 0.1\text{ V}$	$V_H = V_{OH} - 0.15\text{ V}$ $V_L = V_{OL} + 0.15\text{ V}$	$V_H = V_{OH} - 0.15\text{ V}$ $V_L = V_{OL} + 0.15\text{ V}$	$V_H = V_{OH} - 0.3\text{ V}$ $V_L = V_{OL} + 0.3\text{ V}$

Note: Input waveform : PRR = 10 MHz, duty cycle 50%

## Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	TTP-8DB
JEDEC	—
EIAJ	—
Mass (reference value)	0.25 g

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