

# HD74LVC2244A

## Octal Buffers / Line Drivers with 3-state Outputs

REJ03D0376-0300  
 (Previous ADE-205-234A (Z))  
 Rev.3.00  
 Aug. 20, 2004

### Description

The HD74LVC2244A has eight line drivers with three state outputs in a 20 pin package. This device is a noninverting buffer and has two active low enables ( $\overline{1G}$  and  $\overline{2G}$ ). Each enable independently controls four buffers.

All outputs, which are designed to sink up to 12mA, include equivalent 26  $\Omega$  resistors to reduce overshoot and undershoot.

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

- $V_{CC} = 1.65$  to  $5.5$  V
- All inputs  $V_{IH} (\text{Max}) = 5.5$  V (@ $V_{CC} = 0$  to  $5.5$  V)
- All outputs  $V_O (\text{Max}) = 5.5$  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 output current  $\pm 12\text{mA}$  (@ $V_{CC} = 3.0$  to  $5.5$  V)
- All outputs have equivalent 26  $\Omega$  series resistors, so no external resistors are required
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVC2244AFPEL	SOP-20 pin (JEITA)	FP-20DAV	FP	EL (2,000 pcs/reel)
HD74LVC2244ATELL	TSSOP-20 pin	TTP-20DAV	T	ELL (2,000 pcs/reel)

Note: Please consult the sales office for the above package availability.

### Function Table

#### Inputs

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

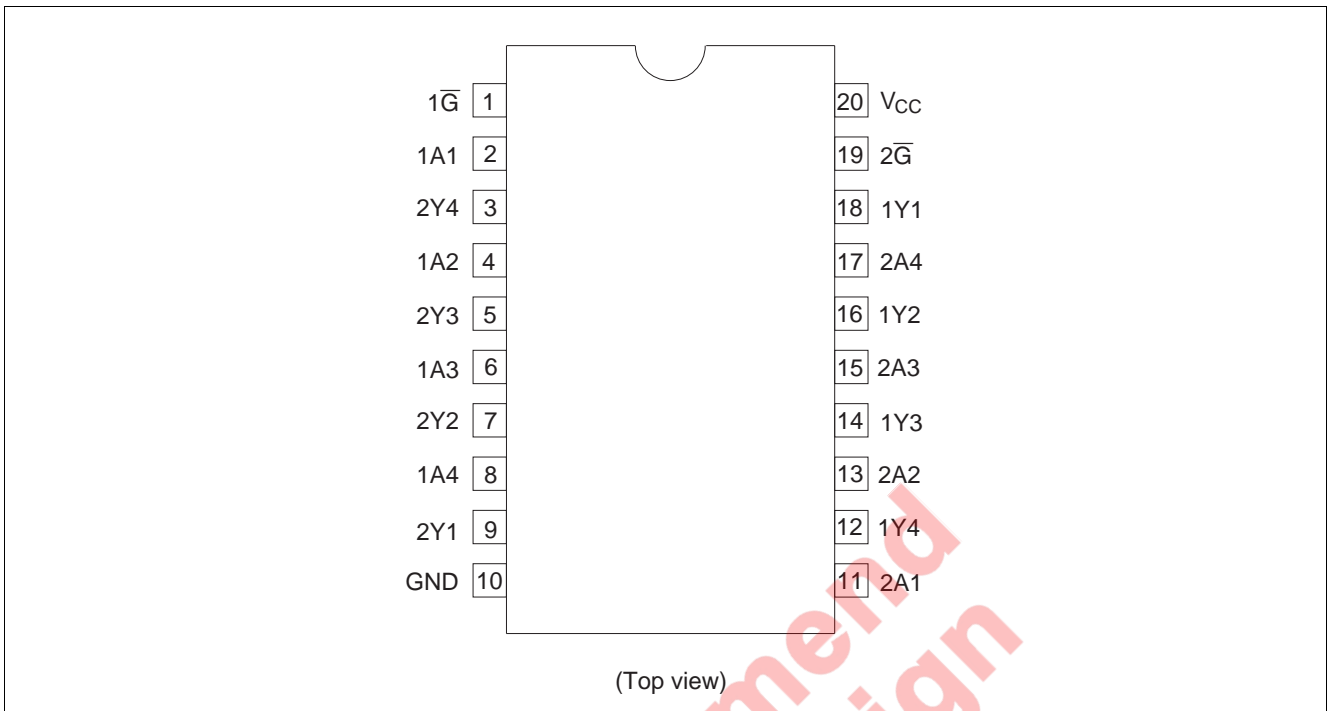
H: High level

L: Low level

X: Immaterial

Z: High impedance

Pin Arrangement



Absolute Maximum Ratings

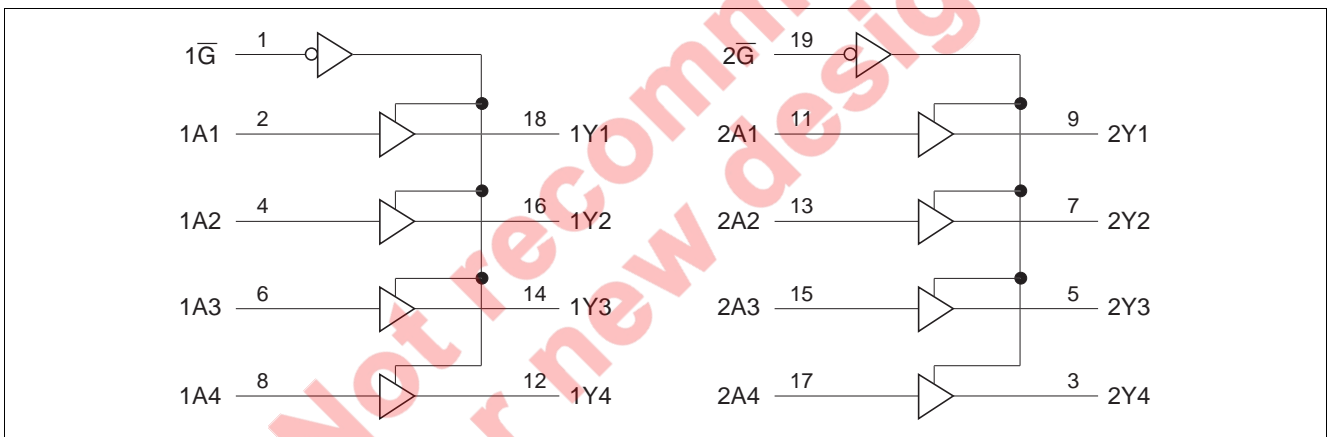
Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V <sub>CC</sub>	-0.5 to 7.0	V	
Input voltage	V <sub>I</sub>	-0.5 to 7.0	V	
Output voltage	V <sub>O</sub>	-0.5 to 7.0	V	Output "Z" or V <sub>CC</sub> : OFF
		-0.5 to V <sub>CC</sub> +0.5		Output "H" or "L"
Input diode current	I <sub>IK</sub>	-50	mA	V <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	$V_{CC}$	1.65 to 5.5	V	At operation
		1.5 to 5.5		Data retention only
Input voltage	$V_I$	0 to 5.5	V	
Output voltage	$V_O$	0 to 5.5	V	Output "Z" or $V_{CC}$ : OFF
		0 to $V_{CC}$		Output "H" or "L"
Output current	$I_{OH}$	-2	mA	$V_{CC} = 1.65\text{ V}$
		-4		$V_{CC} = 2.3\text{ V}$
		-8		$V_{CC} = 2.7\text{ V}$
		-12		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
	$I_{OL}$	2	mA	$V_{CC} = 1.65\text{ V}$
		4		$V_{CC} = 2.3\text{ V}$
		8		$V_{CC} = 2.7\text{ V}$
		12		$V_{CC} = 3.0\text{ to }5.5\text{ V}$
Input rise / fall time	$t_r, t_f$	0 to 6	ns / V	
Operating temperature	$T_a$	-40 to +85	°C	

**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>	1.65 to 1.95	V <sub>CC</sub> ×0.65	—	—	V	
		2.3 to 2.7	1.7	—	—		
		2.7 to 3.6	2.0	—	—		
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—	—		
	V <sub>IL</sub>	1.65 to 1.95	—	—	V <sub>CC</sub> ×0.35	V	
		2.3 to 2.7	—	—	0.7		
		2.7 to 3.6	—	—	0.8		
		4.5 to 5.5	—	—	V <sub>CC</sub> ×0.3		
Output voltage	V <sub>OH</sub>	1.65 to 5.5	V <sub>CC</sub> -0.2	—	—	V	I <sub>OH</sub> = -100 μA
		1.65	1.2	—	—		I <sub>OH</sub> = -2 mA
		2.3	1.7	—	—		I <sub>OH</sub> = -4 mA
		2.7	2.2	—	—		
		3.0	2.4	—	—		I <sub>OH</sub> = -6 mA
		2.7	2.0	—	—		I <sub>OH</sub> = -8 mA
		3.0	2.0	—	—		I <sub>OH</sub> = -12 mA
		4.5	3.6	—	—		
	V <sub>OL</sub>	1.65 to 5.5	—	—	0.2	V	I <sub>OL</sub> = 100 μA
		1.65	—	—	0.45		I <sub>OL</sub> = 2 mA
		2.3	—	—	0.7		I <sub>OL</sub> = 4 mA
		2.7	—	—	0.4		
		3.0	—	—	0.55		I <sub>OL</sub> = 6 mA
		2.7	—	—	0.6		I <sub>OL</sub> = 8 mA
3.0	—	—	0.8	I <sub>OL</sub> = 12 mA			
4.5	—	—	0.8				
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>	1.65 to 5.5	—	—	±5	μA	V <sub>OUT</sub> = 0 to 5.5 V
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>	1.65 to 3.6	—	—	10	μA	V <sub>IN</sub> = 3.6 to 5.5 V <sup>*1</sup> , I <sub>O</sub> = 0
		1.65 to 5.5	—	—	10		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	—	3.4	—	pF	V <sub>IN</sub> = V <sub>CC</sub> or GND
Output capacitance	C <sub>O</sub>	3.3	—	9.0	—	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>	1.8±0.15	—	—	10.5	ns	A	Y
		2.5±0.2	—	—	7.0			
	2.7	—	—	6.4				
	3.3±0.3	1.5	—	5.5				
	5.0±0.5	—	—	4.1				
Output enable time	t <sub>ZH</sub>	1.8±0.15	—	—	13.0	ns	$\bar{G}$	Y
		2.5±0.2	—	—	9.0			
	2.7	—	—	8.1				
	3.3±0.3	1.0	—	7.1				
	5.0±0.5	—	—	5.6				
Output disable time	t <sub>HZ</sub>	1.8±0.15	—	—	10.0	ns	$\bar{G}$	Y
		2.5±0.2	—	—	8.0			
	2.7	—	—	7.3				
	3.3±0.3	1.5	—	6.8				
	5.0±0.5	—	—	5.7				
Between output pin skew <sup>*1</sup>	t <sub>OSLH</sub>	1.8±0.15	—	—	2.0	ns		
		2.5±0.2	—	—	2.0			
	2.7	—	—	1.5				
	3.3±0.3	—	—	1.0				
	5.0±0.5	—	—	1.0				

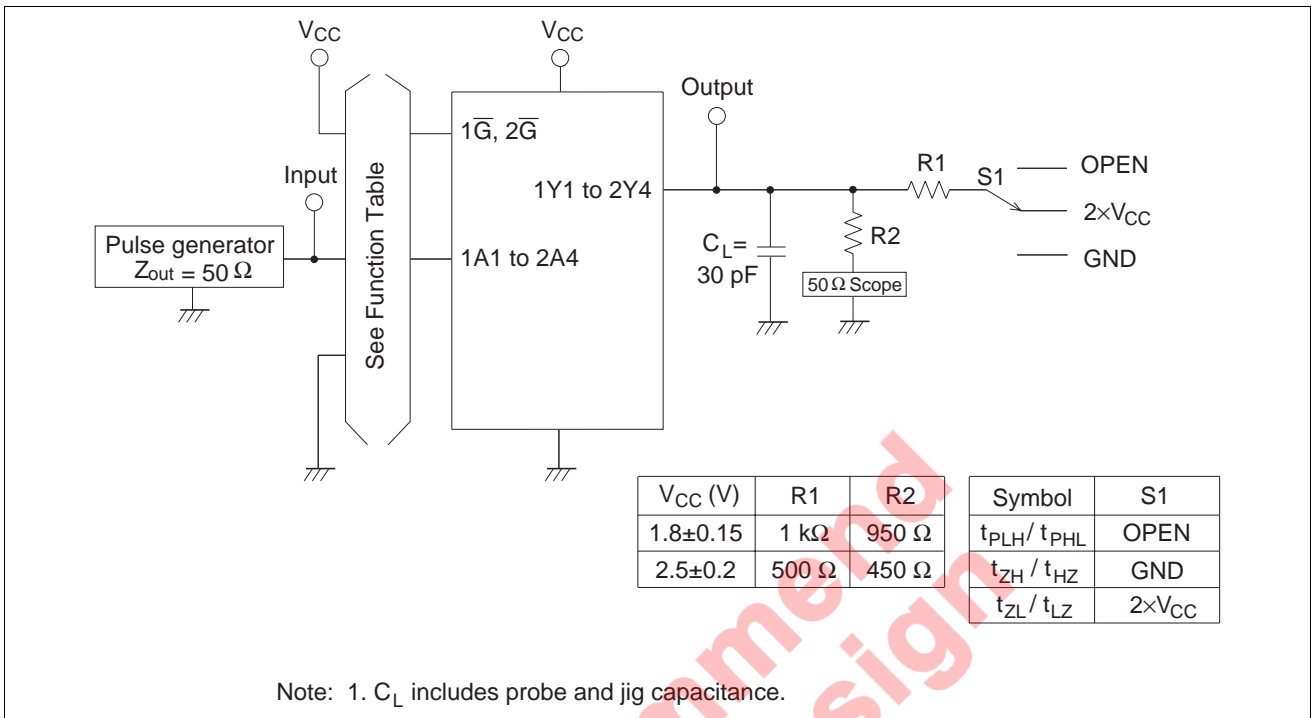
Note: 1. This parameter is characterized but not tested.

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

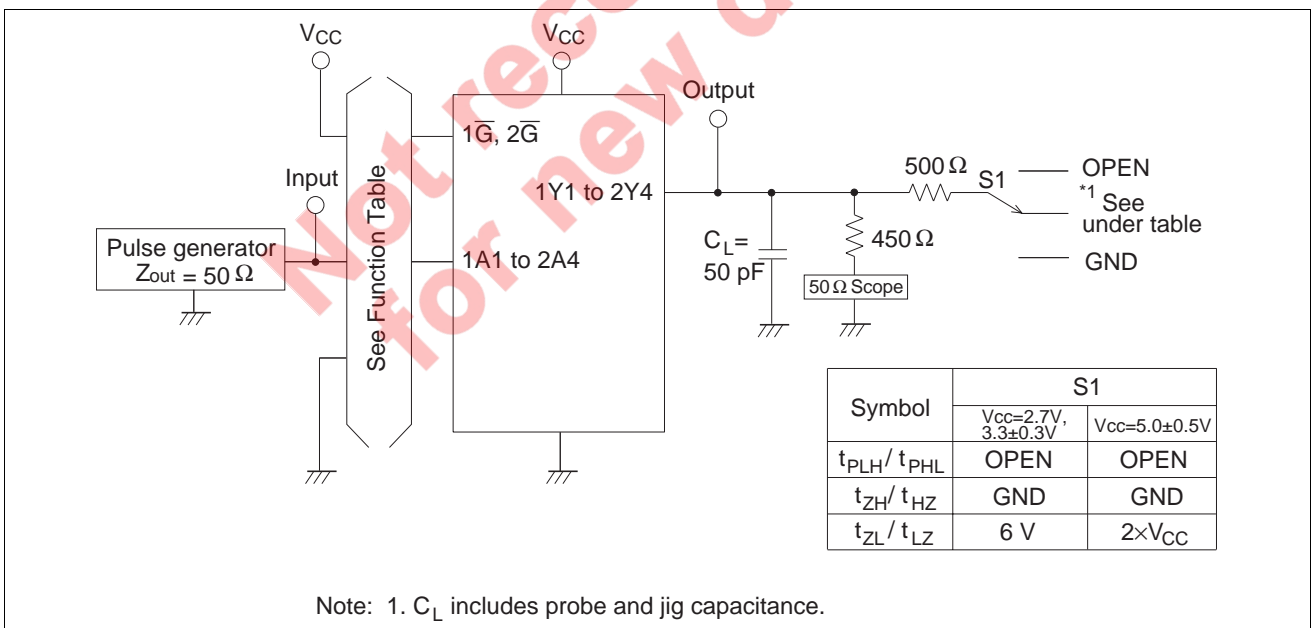
Not recommended for new design

Test Circuit

( $V_{CC} = 1.8 \pm 0.15 \text{ V}$ ,  $V_{CC} = 2.5 \pm 0.2 \text{ V}$ )



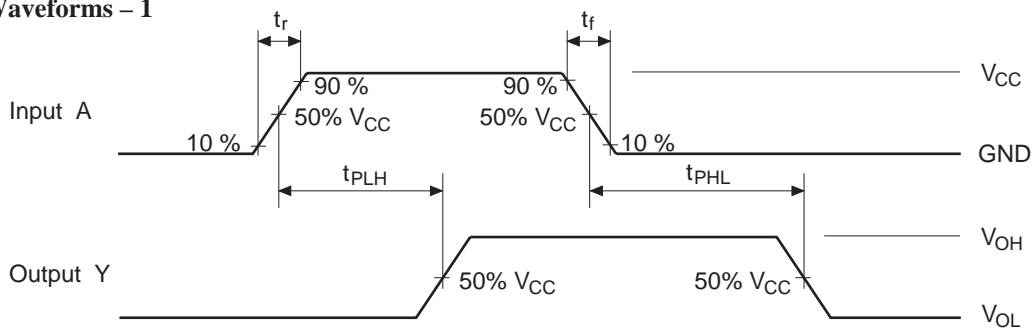
( $V_{CC} = 2.7 \text{ V}$ ,  $V_{CC} = 3.3 \pm 0.3 \text{ V}$ ,  $V_{CC} = 5.0 \pm 0.5 \text{ V}$ )



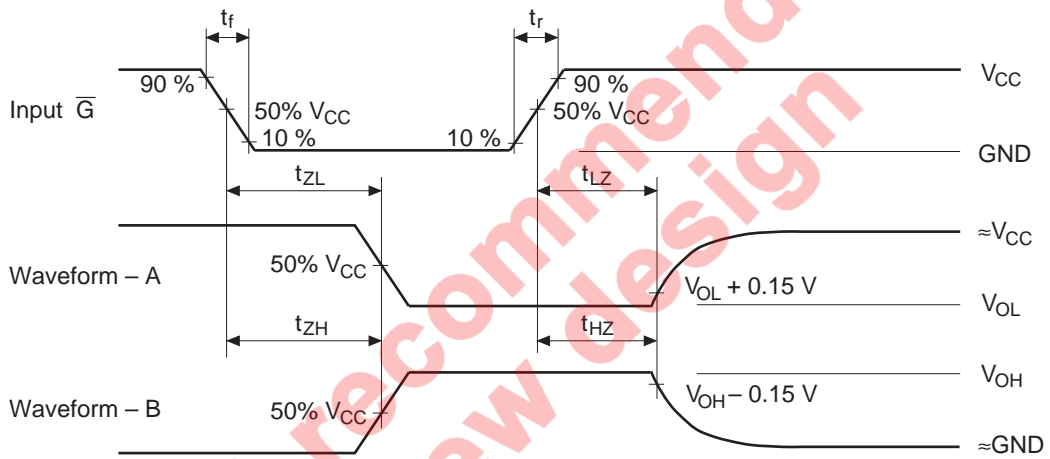
Waveforms

( $V_{CC} = 1.8 \pm 0.15 \text{ V}$ ,  $V_{CC} = 2.5 \pm 0.2 \text{ V}$ )

• Waveforms – 1

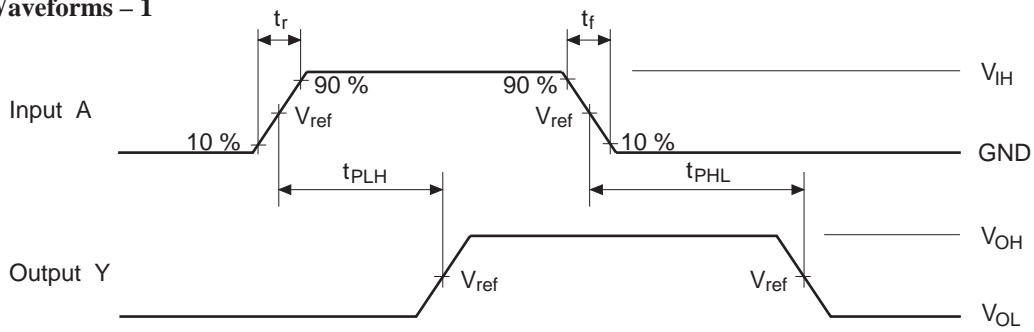


• Waveforms – 2

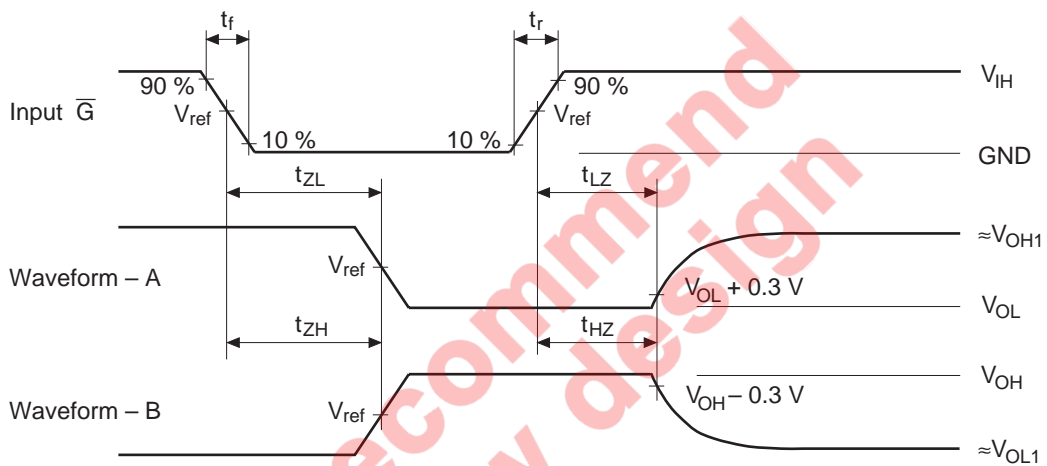


- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%,  $t_r = 2.0 \text{ ns}$ ,  $t_f = 2.0 \text{ ns}$
  2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
  3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

• Waveforms – 1



• Waveforms – 2

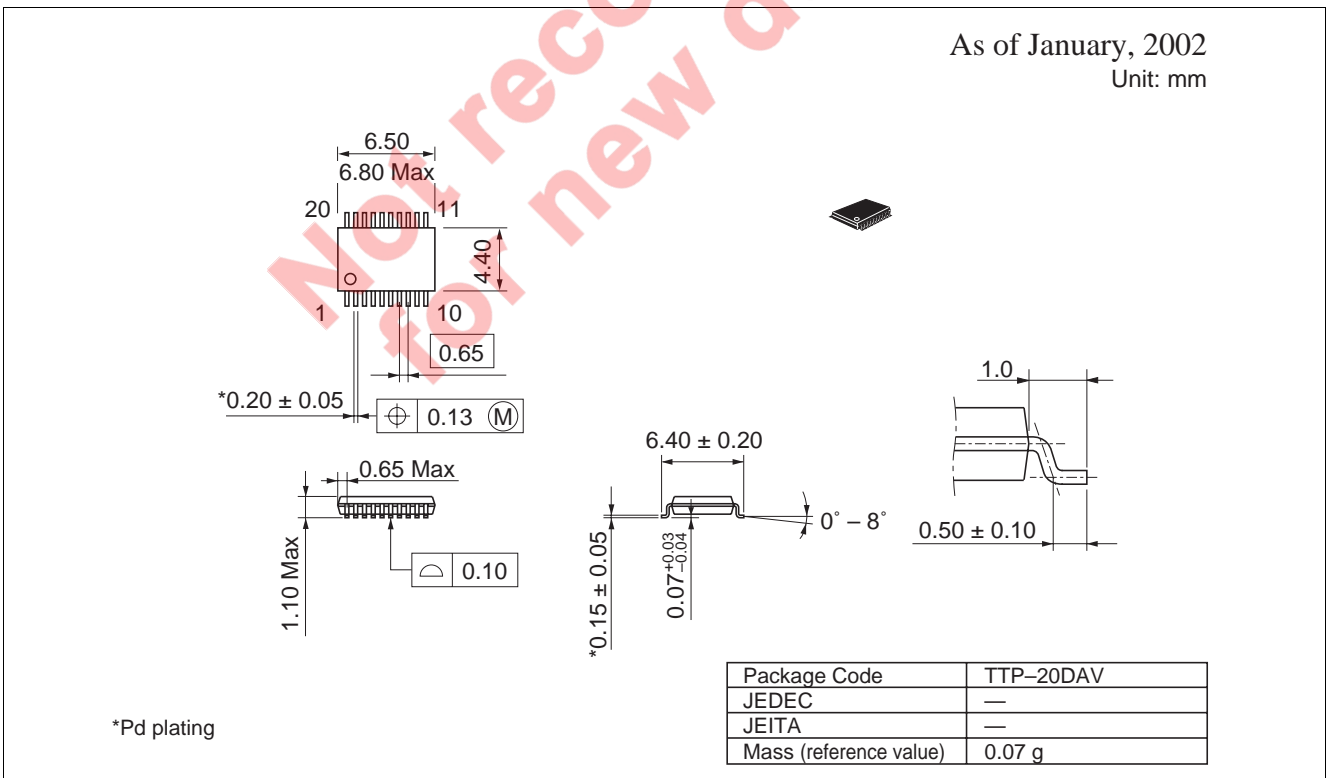
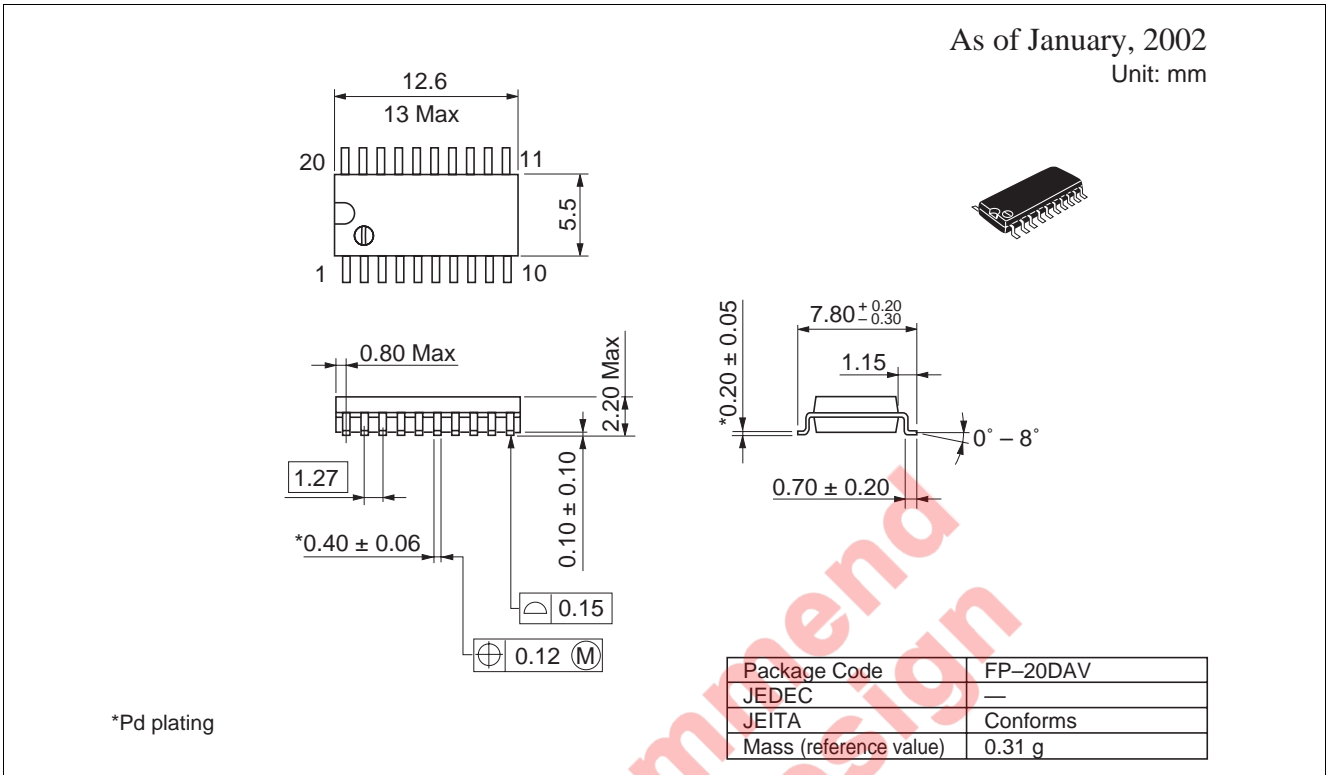


TEST	$V_{CC}=2.7\text{V}, 3.3 \pm 0.3\text{V}$	$V_{CC}=5.0 \pm 0.5\text{V}$
$V_{IH}$	2.7 V	$V_{CC}$
$V_{ref}$	1.5 V	$50\%V_{CC}$
$V_{OH1}$	3 V	$V_{CC}$
$V_{OL1}$	GND	GND

- Notes: 1. Input waveform : PRR = 10 MHz, duty cycle 50%,  $t_r = 2.5\text{ ns}$ ,  $t_f = 2.5\text{ ns}$   
 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.



Package Dimensions



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