

# HD74LV273A

## Octal D-type Flip-Flops with Clear

REJ03D0330-0300Z  
(Previous ADE-205-273A (Z))  
Rev.3.00  
Jun. 25, 2004

### Description

The HD74LV273A has eight edges trigger D-type flip-flops with clear in a 20-pin package. Data on the D input having the specified setup and hold times is transferred to the Q output on the low to high transition of the clock input. The clear input when low sets all outputs to a low state. Low-voltage and high-speed operation is suitable for battery-powered products (e.g., notebook computers), and the low-power consumption extends the battery life.

### Features

- $V_{CC} = 2.0\text{ V}$  to  $5.5\text{ V}$  operation
- All inputs  $V_{IH}(\text{Max.}) = 5.5\text{ V}$  ( $@V_{CC} = 0\text{ V}$  to  $5.5\text{ V}$ )
- All outputs  $V_O(\text{Max.}) = 5.5\text{ V}$  ( $@V_{CC} = 0\text{ V}$ )
- 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  $> 2.3\text{ V}$  ( $@V_{CC} = 3.3\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )
- Output current  $\pm 6\text{ mA}$  ( $@V_{CC} = 3.0\text{ V}$  to  $3.6\text{ V}$ ),  $\pm 12\text{ mA}$  ( $@V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$ )

### Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV273AFPEL	SOP-20 pin (JEITA)	FP-20DAV	FP	EL (2,000 pcs/reel)
HD74LV273ARPEL	SOP-20 pin (JEDEC)	FP-20DBV	RP	EL (1,000 pcs/reel)
HD74LV273ATELL	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			
$\overline{\text{CLR}}$	CLK	D	Output Q
L	X	X	L
H	$\uparrow$	H	H
H	$\uparrow$	L	L
H	$\downarrow$	X	$Q_0$

Note: H: High level

L: Low level

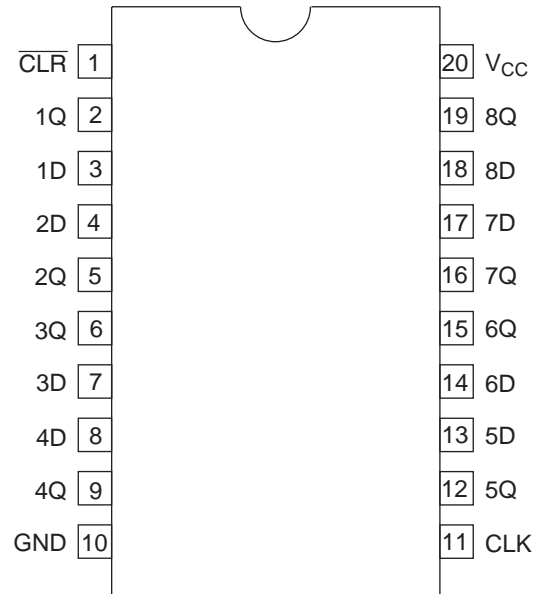
X: Immaterial

$\uparrow$ : Low to high transition

$\downarrow$ : High to low transition

$Q_0$ : Output level before the indicated steady state input conditions were established.

## Pin Arrangement



(Top view)

## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to 7.0	V	
Output voltage range <sup>*1, 2</sup>	$V_O$	-0.5 to $V_{CC} + 0.5$ -0.5 to 7.0	V	Output: H or L $V_{CC}$ : OFF
Input clamp current	$I_{IK}$	-20	mA	$V_I < 0$
Output clamp current	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 25$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 50$	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>*3</sup>	$P_T$	835 757	mW	SOP TSSOP
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.

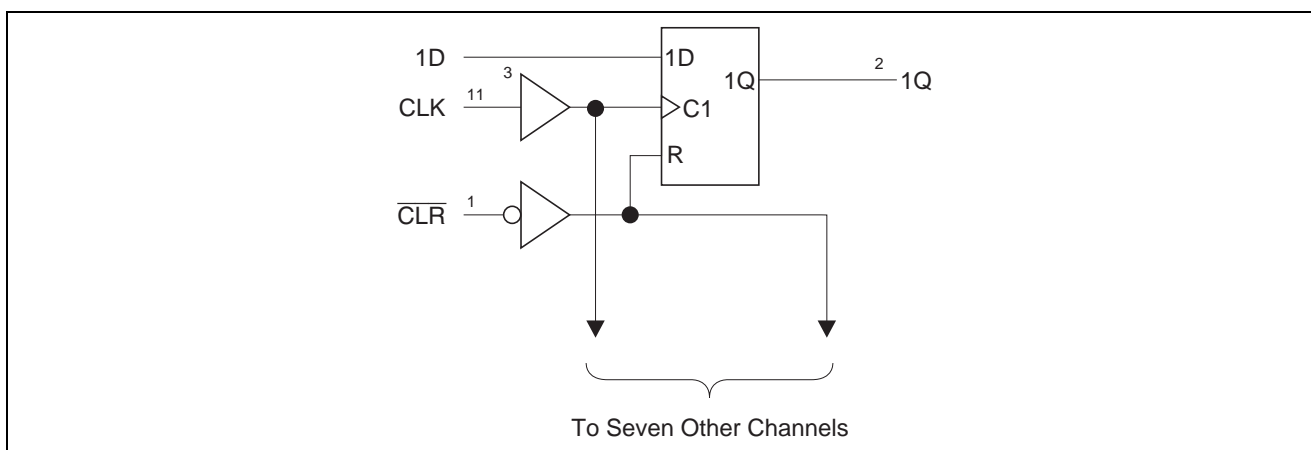
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

# Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	$V_{CC}$	2.0	5.5	V	
Input voltage range	$V_I$	0	5.5	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	H or L
Output current	$I_{OH}$	—	−50	$\mu A$	$V_{CC} = 2.0\text{ V}$
		—	−2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	−6		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	−12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
	$I_{OL}$	—	50	$\mu A$	$V_{CC} = 2.0\text{ V}$
		—	2	mA	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		—	6		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		—	12		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Input transition rise or fall rate	$\Delta t / \Delta v$	0	200	ns/V	$V_{CC} = 2.3\text{ to }2.7\text{ V}$
		0	100		$V_{CC} = 3.0\text{ to }3.6\text{ V}$
		0	20		$V_{CC} = 4.5\text{ to }5.5\text{ V}$
Operating free-air temperature	$T_a$	−40	85	°C	

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

# Logic Diagram



## DC 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>	2.0	1.5	—	—	V	
		2.3 to 2.7	V <sub>CC</sub> × 0.7	—	—		
		3.0 to 3.6	V <sub>CC</sub> × 0.7	—	—		
		4.5 to 5.5	V <sub>CC</sub> × 0.7	—	—		
	V <sub>IL</sub>	2.0	—	—	0.5		
		2.3 to 2.7	—	—	V <sub>CC</sub> × 0.3		
		3.0 to 3.6	—	—	V <sub>CC</sub> × 0.3		
		4.5 to 5.5	—	—	V <sub>CC</sub> × 0.3		
Output voltage	V <sub>OH</sub>	Min to Max	V <sub>CC</sub> - 0.1	—	—	V	I <sub>OH</sub> = -50 μA
		2.3	2.0	—	—		I <sub>OH</sub> = -2 mA
		3.0	2.48	—	—		I <sub>OH</sub> = -6 mA
		4.5	3.8	—	—		I <sub>OH</sub> = -12 mA
	V <sub>OL</sub>	Min to Max	—	—	0.1		I <sub>OL</sub> = 50 μA
		2.3	—	—	0.4		I <sub>OL</sub> = 2 mA
		3.0	—	—	0.44		I <sub>OL</sub> = 6 mA
		4.5	—	—	0.55		I <sub>OL</sub> = 12 mA
Input current	I <sub>IN</sub>	0 to 5.5	—	—	±1	μA	V <sub>I</sub> = 5.5 V or GND
Quiescent supply current	I <sub>CC</sub>	5.5	—	—	20	μA	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0
Output leakage current	I <sub>OFF</sub>	0	—	—	5	μA	V <sub>I</sub> or V <sub>O</sub> = 0 V to 5.5 V
Input capacitance	C <sub>IN</sub>	3.3	—	2	—	pF	V <sub>I</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

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	fmax	55	95	—	45	—	MHz	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		
Propagation delay time	t <sub>PHL</sub>	—	10.3	19.0	1.0	21.0	ns	C <sub>L</sub> = 15 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	10.4	18.3	1.0	20.5			CLK	Q
	t <sub>PHL</sub>	—	13.1	22.8	1.0	25.5		C <sub>L</sub> = 50 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	12.9	22.1	1.0	25.0			CLK	Q
Setup time	t <sub>SU</sub>	8.5	—	—	10.5	—	ns		Data	
		4.0	—	—	4.0	—			$\overline{\text{CLR}}$ inactive	
Hold time	t <sub>H</sub>	0.5	—	—	1.0	—	ns			
Pulse width	t <sub>W</sub>	6.5	—	—	7.0	—	ns		$\overline{\text{CLR}}$ L	
		7.0	—	—	8.5	—			CLK H or L	

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

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	fmax	75	140	—	65	—	MHz	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		
Propagation delay time	t <sub>PHL</sub>	—	6.9	13.6	1.0	16.0	ns	C <sub>L</sub> = 15 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	7.1	13.6	1.0	16.0			CLK	Q
	t <sub>PHL</sub>	—	8.7	17.1	1.0	19.5		C <sub>L</sub> = 50 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	9.1	17.1	1.0	19.5			CLK	Q
Setup time	t <sub>SU</sub>	5.5	—	—	6.5	—	ns		Data	
		2.5	—	—	2.5	—			$\overline{\text{CLR}}$ inactive	
Hold time	t <sub>H</sub>	1.0	—	—	1.0	—	ns			
Pulse width	t <sub>W</sub>	5.0	—	—	6.0	—	ns		$\overline{\text{CLR}}$ L	
		5.5	—	—	6.5	—			CLK H or L	

$$V_{CC} = 5.0 \pm 0.5 \text{ V}$$

Item	Symbol	Ta = 25°C			Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Maximum clock frequency	fmax	120	205	—	100	—	MHz	C <sub>L</sub> = 15 pF C <sub>L</sub> = 50 pF		
Propagation delay time	t <sub>PHL</sub>	—	4.7	8.5	1.0	10.0	ns	C <sub>L</sub> = 15 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	4.8	9.0	1.0	10.5			CLK	Q
	t <sub>PHL</sub>	—	6.0	10.5	1.0	12.0		C <sub>L</sub> = 50 pF	$\overline{\text{CLR}}$	Q
	t <sub>PLH</sub> /t <sub>PHL</sub>	—	6.2	11.0	1.0	12.5			CLK	Q
Setup time	t <sub>SU</sub>	4.5	—	—	4.5	—	ns		Data	
		2.0	—	—	2.0	—			$\overline{\text{CLR}}$ inactive	
Hold time	t <sub>H</sub>	1.0	—	—	1.0	—	ns			
Pulse width	t <sub>W</sub>	5.0	—	—	5.0	—	ns		$\overline{\text{CLR}}$ L	
		5.0	—	—	5.0	—			CLK H or L	

## Output-skew Characteristics

Item	Symbol	$V_{CC} = (V)$	$T_a = 25^{\circ}C$		$T_a = -40 \text{ to } 85^{\circ}C$		Unit
			Min	Max	Min	Max	
Output skew	$t_{sk(O)}$	2.3 to 2.7	—	2.0	—	2.0	ns
		3.0 to 3.6	—	1.5	—	1.5	
		4.5 to 5.5	—	1.0	—	1.0	

Note: Skew between any outputs of the same package switching in the same direction. This parameter is warranted but not production tested.

## Operating Characteristics

$C_L = 50 \text{ pF}$

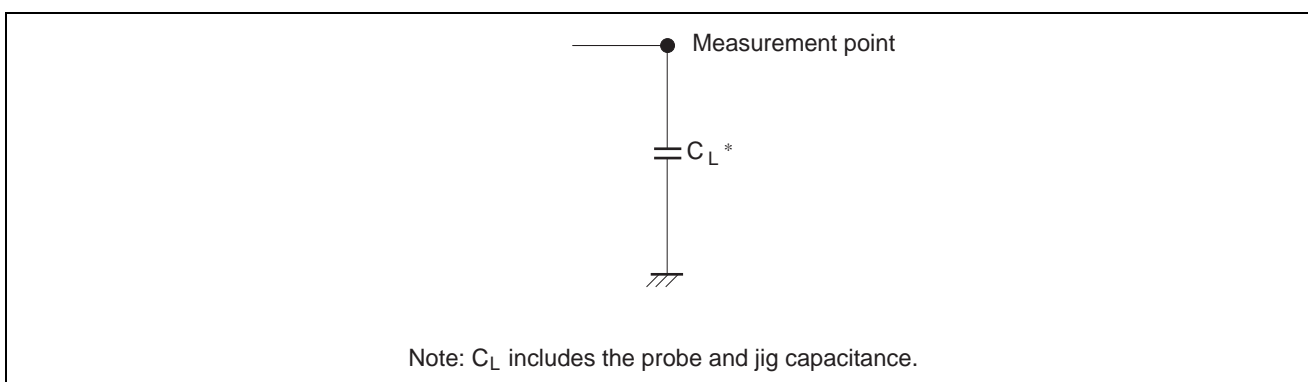
Item	Symbol	$V_{CC} = (V)$	$T_a = 25^{\circ}C$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	3.3	—	15.9	—	pF	$f = 10 \text{ MHz}$
		5.0	—	17.1	—		

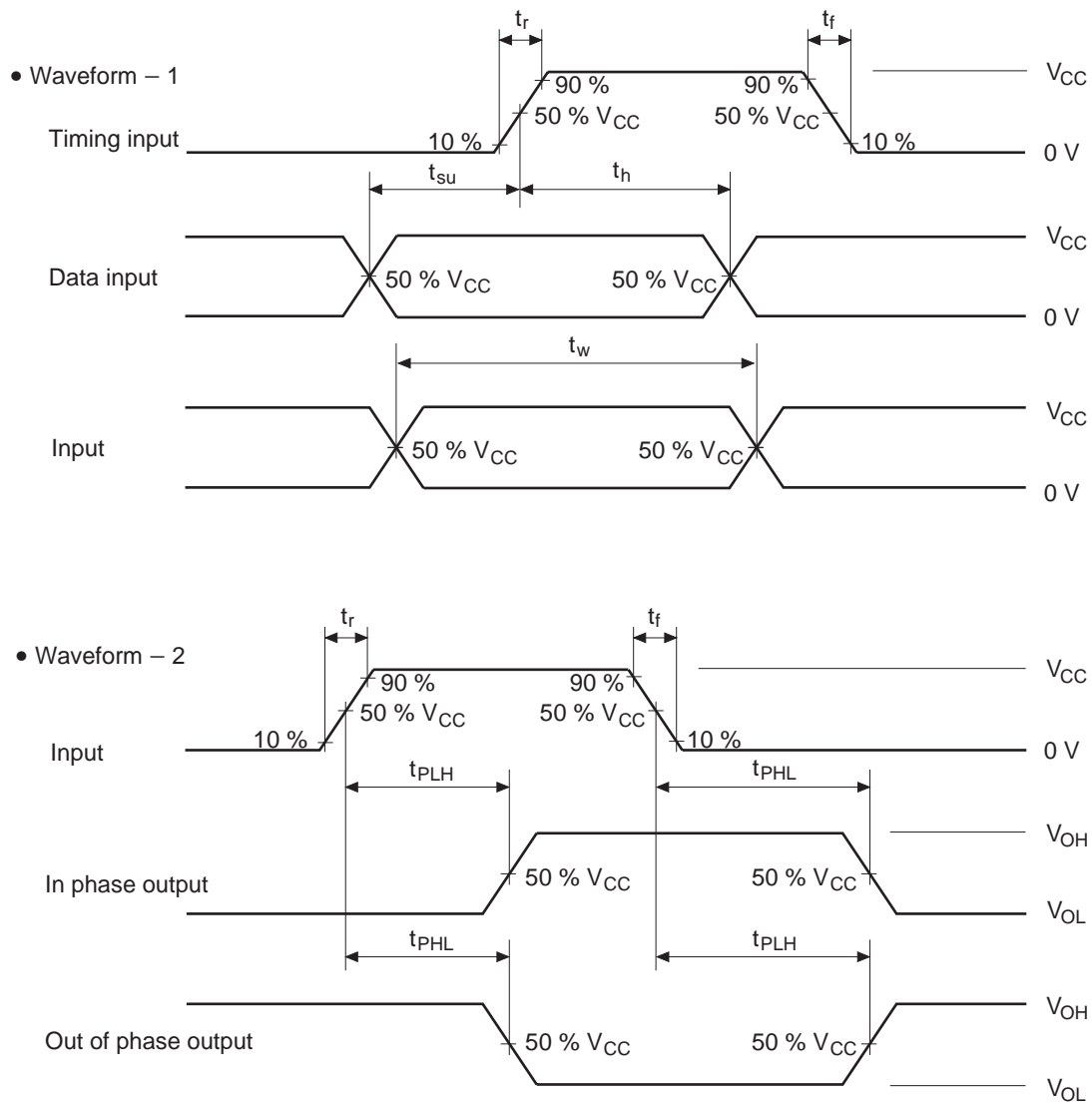
## Noise Characteristics

$C_L = 50 \text{ pF}$

Item	Symbol	$V_{CC} = (V)$	$T_a = 25^{\circ}C$			Unit	Test Conditions
			Min	Typ	Max		
Quiet output, maximum dynamic $V_{OL}$	$V_{OL(P)}$	3.3	—	0.4	0.8	V	
Quiet output, minimum dynamic $V_{OL}$	$V_{OL(V)}$	3.3	—	−0.4	−0.8	V	
Quiet output, minimum dynamic $V_{OH}$	$V_{OH(V)}$	3.3	—	2.9	—	V	
High-level dynamic input voltage	$V_{IH(D)}$	3.3	2.31	—	—	V	
Low-level dynamic input voltage	$V_{IL(D)}$	3.3	—	—	0.99	V	

## Test Circuit



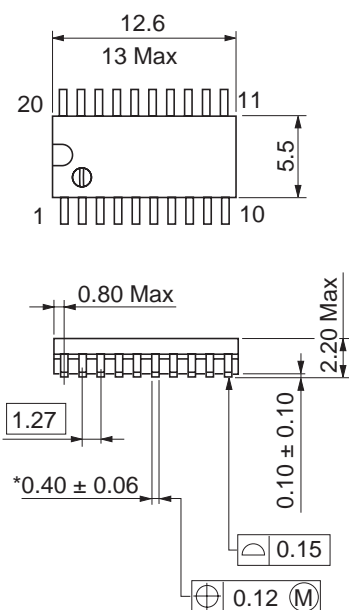


Notes: 1. Input waveform:  $PRR \leq 1\text{ MHz}$ ,  $Z_o = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$   
 2. The output is measured one at a time with one transition per measurement.

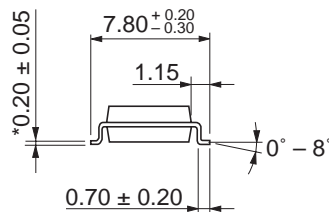
# Package Dimensions

As of January, 2002

Unit: mm



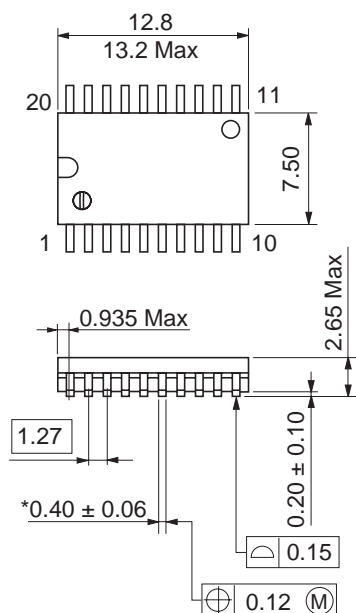
\*Pd plating



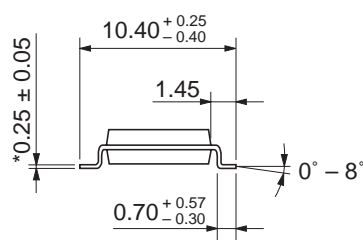
Package Code	FP-20DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.31 g

As of January, 2003

Unit: mm



\*Ni/Pd/Au plating

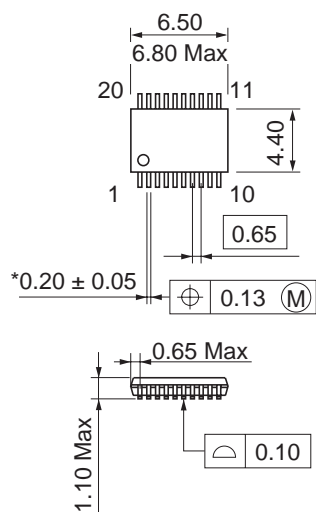


Package Code	FP-20DBV
JEDEC	Conforms
JEITA	—
Mass (reference value)	0.52 g

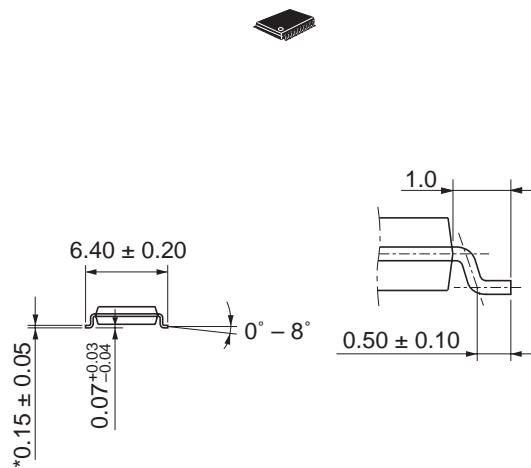


As of January, 2002

Unit: mm



\*Pd plating



Package Code	TTP-20DAV
JEDEC	—
JEITA	—
Mass (reference value)	0.07 g

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