

# HD74AC373/HD74ACT373

## Octal Transparent Latch with 3-State Output

REJ03D0273-0200Z  
(Previous ADE-205-394 (Z))  
Rev.2.00  
Jul.16.2004

### Description

The HD74AC373/HD74ACT373 consists of eight latches with 3-state outputs from bus organized system applications. The flip-flops appear transparent to the data when Latch Enable (LE) is High. When LE is Low, the data that meets the setup time is latched. Data appears on the bus when the Output Enable ( $\overline{OE}$ ) is Low. When  $\overline{OE}$  is High, the bus output is in the high impedance state.

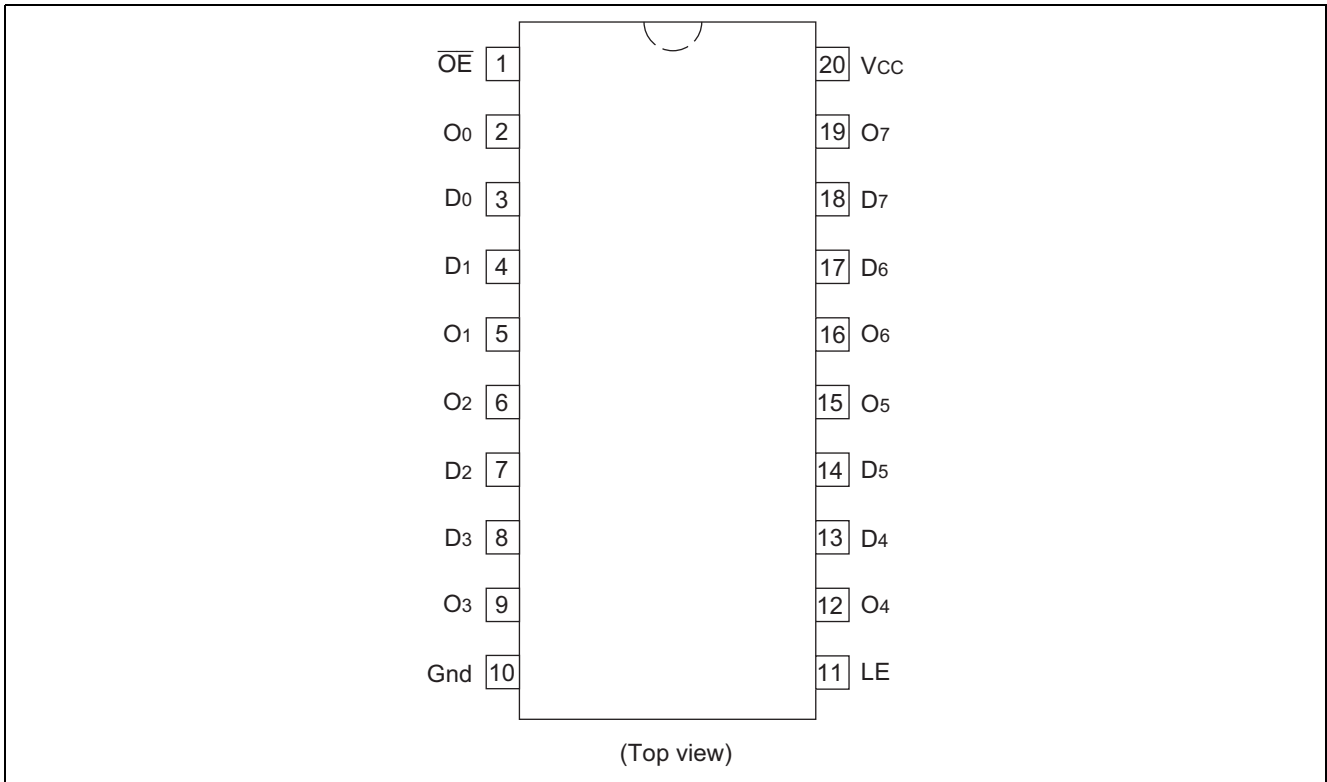
### Features

- Eight Latches in a Single Package
- 3-State Outputs for Bus Interfacing
- Outputs Source/Sink 24 mA
- HD74AC373 has TTL-Compatible Inputs
- Ordering Information: Ex. HD74AC373

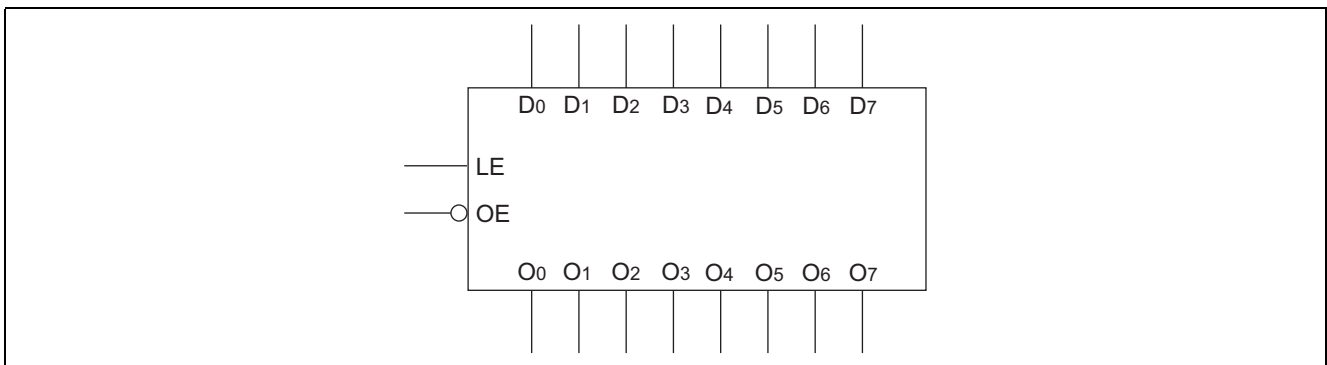
Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74AC373P	DIP-20 pin	DP-20N, -20NEV	P	—
HD74AC373FPEL	SOP-20 pin (JEITA)	FP-20DAV	FP	EL (2,000 pcs/reel)
HD74AC373RPEL	SOP-20 pin (JEDEC)	FP-20DBV	RP	EL (1,000 pcs/reel)
HD74AC373TELL	TSSOP-20 pin	TTP-20DAV	T	ELL (2,000 pcs/reel)

- Notes: 1. Please consult the sales office for the above package availability.  
2. The packages with lead-free pins are distinguished from the conventional products by adding V at the end of the package code.

## Pin Arrangement



## Logic Symbol



## Pin Names

- D<sub>0</sub> – D<sub>7</sub> Data Inputs
- LE Latch Enable Input
- $\overline{OE}$  Output Enable Input
- O<sub>0</sub> – O<sub>7</sub> 3-State Latch Outputs

**Truth Table**

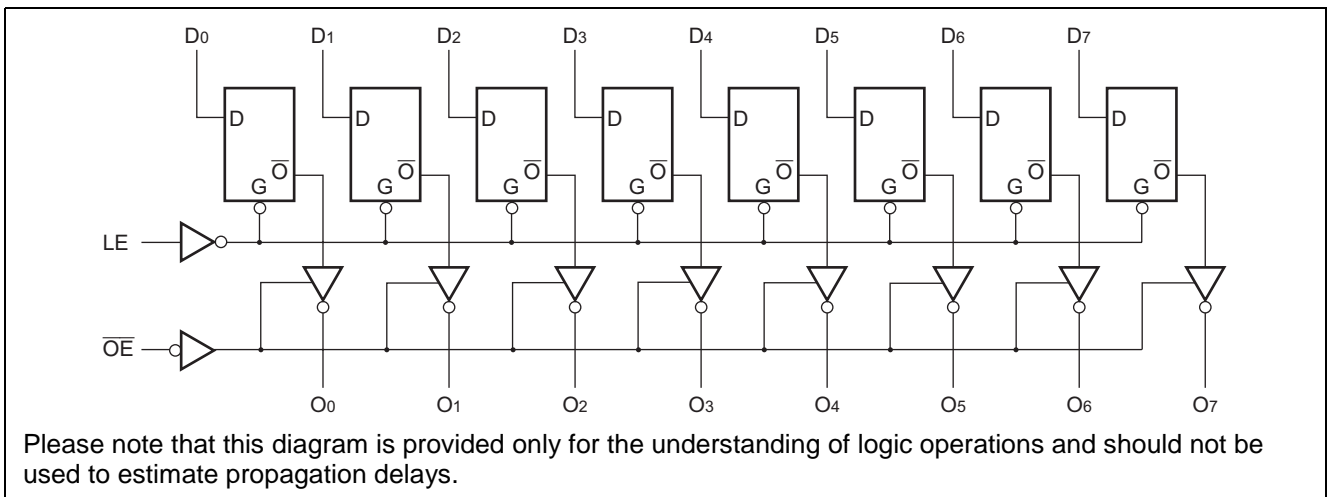
Inputs			Outputs
$\overline{OE}$	LE	$D_n$	$O_n$
H	X	X	Z
L	H	L	L
L	H	H	H
L	L	X	$O_0$

H : High Voltage Level  
 L : Low Voltage Level  
 Z : High Impedance  
 X : Immaterial  
 $O_0$  : Previous  $O_0$  before Low-to-High Transition of Clock

**Functional Description**

The HD74AC373/HD74ACT373 contains eight D-type latches with 3-state standard outputs. When the Latch Enable (LE) input is High, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is Low, the latches store the information that was present on the D inputs setup time preceding the High-to-Low transition of LE. The 3-state standard outputs are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is Low, the standard outputs are in the 2-state mode. When  $\overline{OE}$  is High, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the latches.

**Logic Diagram**



**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	-0.5 to 7	V	
DC input diode current	$I_{IK}$	-20	mA	$V_I = -0.5V$
		20	mA	$V_I = V_{CC}+0.5V$
DC input voltage	$V_I$	-0.5 to $V_{CC}+0.5$	V	
DC output diode current	$I_{OK}$	-50	mA	$V_O = -0.5V$
		50	mA	$V_O = V_{CC}+0.5V$
DC output voltage	$V_O$	-0.5 to $V_{CC}+0.5$	V	
DC output source or sink current	$I_O$	$\pm 50$	mA	
DC $V_{CC}$ or ground current per output pin	$I_{CC}, I_{GND}$	$\pm 50$	mA	
Storage temperature	$T_{stg}$	-65 to +150	$^{\circ}C$	

**Recommended Operating Conditions: HD74AC373**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	2 to 6	V	
Input and Output voltage	$V_I, V_O$	0 to $V_{CC}$	V	
Operating temperature	$T_a$	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) $V_{IN}$ 30% to 70% $V_{CC}$	$t_r, t_f$	8	ns/V	$V_{CC} = 3.0V$
				$V_{CC} = 4.5 V$
				$V_{CC} = 5.5 V$

**DC Characteristics: HD74AC373**

Item	Sym- bol	Vcc (V)	$T_a = 25^\circ C$			$T_a = -40$ to $+85^\circ C$		Unit	Condition				
			min.	typ.	max.	min.	max.						
Input Voltage	$V_{IH}$	3.0	2.1	1.5	—	2.1	—	V	$V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$				
		4.5	3.15	2.25	—	3.15	—						
		5.5	3.85	2.75	—	3.85	—						
	$V_{IL}$	3.0	—	1.50	0.9	—	0.9		$V_{OUT} = 0.1 V$ or $V_{CC} - 0.1 V$				
		4.5	—	2.25	1.35	—	1.35						
		5.5	—	2.75	1.65	—	1.65						
Output voltage	$V_{OH}$	3.0	2.9	2.99	—	2.9	—	V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OUT} = -50 \mu A$				
		4.5	4.4	4.49	—	4.4	—						
		5.5	5.4	5.49	—	5.4	—						
		$V_{OL}$	3.0	2.58	—	—	2.48		—	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OH} = -12 mA$			
			4.5	3.94	—	—	3.80		—			$I_{OH} = -24 mA$	
			5.5	4.94	—	—	4.80		—				
	3.0		—	0.002	0.1	—	0.1		$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OUT} = 50 \mu A$				
	4.5		—	0.001	0.1	—	0.1						
	5.5		—	0.001	0.1	—	0.1						
	$V_{IN} = V_{IL}$ or $V_{IH}$	3.0	—	—	0.32	—	0.37		$I_{OL} = 12 mA$				
		4.5	—	—	0.32	—	0.37				$I_{OL} = 24 mA$		
		5.5	—	—	0.32	—	0.37						$I_{OL} = 24 mA$
Input leakage current	$I_{IN}$	5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu A$	$V_{IN} = V_{CC}$ or GND				
3 State current	$I_{OZ}$	5.5	—	—	$\pm 0.5$	—	$\pm 5.0$	$\mu A$	$V_{IN(OE)} = V_{IL}, V_{IH}$ $V_{IN} = V_{CC}$ or GND $V_{OUT} = V_{CC}$ or GND				
Dynamic output current*	$I_{OLD}$	5.5	—	—	—	86	—	mA	$V_{OLD} = 1.1 V$				
	$I_{OHD}$	5.5	—	—	—	-75	—	mA	$V_{OHD} = 3.85 V$				
Quiescent supply current	$I_{CC}$	5.5	—	—	8.0	—	80	$\mu A$	$V_{IN} = V_{CC}$ or ground				

\*Maximum test duration 2.0 ms, one output loaded at a time.

**Recommended Operating Conditions: HD74ACT373**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	2 to 6	V	
Input and output voltage	$V_I, V_O$	0 to $V_{CC}$	V	
Operating temperature	$T_a$	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) $V_{IN}$ 0.8 to 2.0 V	$t_r, t_f$	8	ns/V	$V_{CC} = 4.5V$ $V_{CC} = 5.5V$

**DC Characteristics: HD74ACT373**

Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Condition				
			min.	typ.	max.	min.	max.						
Input voltage	V <sub>IH</sub>	4.5	2.0	1.5	—	2.0	—	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> -0.1 V				
		5.5	2.0	1.5	—	2.0	—						
	V <sub>IL</sub>	4.5	—	1.5	0.8	—	0.8		V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> -0.1 V				
		5.5	—	1.5	0.8	—	0.8						
Output voltage	V <sub>OH</sub>	4.5	4.4	4.49	—	4.4	—	V	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OUT</sub> = -50 μA				
		5.5	5.4	5.49	—	5.4	—						
		4.5	3.94	—	—	3.80	—			V <sub>IN</sub> = V <sub>IL</sub> I <sub>OH</sub> = -24 mA			
		5.5	4.94	—	—	4.80	—				I <sub>OH</sub> = -24 mA		
	V <sub>OL</sub>	4.5	—	0.001	0.1	—	0.1		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OUT</sub> = 50 μA				
		5.5	—	0.001	0.1	—	0.1						
		4.5	—	—	0.32	—	0.37			V <sub>IN</sub> = V <sub>IL</sub> I <sub>OL</sub> = 24 mA			
		5.5	—	—	0.32	—	0.37				I <sub>OL</sub> = 24 mA		
		Input current	I <sub>IN</sub>	5.5	—	—	±0.1			—	±1.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
		3 State current	I <sub>OZ</sub>	5.5	—	—	±0.5			—	±5.0	μA	V <sub>IN</sub> = V <sub>IL</sub> , V <sub>IH</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND
I <sub>CC</sub> /input current	I <sub>CCT</sub>	5.5	—	0.6	—	—	1.5	mA	V <sub>IN</sub> = V <sub>CC</sub> -2.1 V				
Dynamic output current*	I <sub>OLD</sub>	5.5	—	—	—	86	—	mA	V <sub>OLD</sub> = 1.1 V				
	I <sub>OHD</sub>	5.5	—	—	—	-75	—	mA	V <sub>OHD</sub> = 3.85 V				
Quiescent supply current	I <sub>CC</sub>	5.5	—	—	8.0	—	80	μA	V <sub>IN</sub> = V <sub>CC</sub> or ground				

\*Maximum test duration 2.0 ms, one output loaded at a time.

**AC Characteristics: HD74AC373**

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF			Ta = -40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay D <sub>n</sub> to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	10.0	13.5	1.0	15.0	ns
		5.0	1.0	7.0	9.5	1.0	10.5	
Propagation delay D <sub>n</sub> to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	9.5	13.0	1.0	14.5	ns
		5.0	1.0	7.0	9.5	1.0	10.5	
Propagation delay LE to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	10.0	13.5	1.0	15.0	ns
		5.0	1.0	7.5	9.5	1.0	10.5	
Propagation delay LE to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	9.5	12.5	1.0	14.0	ns
		5.0	1.0	7.0	9.5	1.0	10.5	
Output enable time	t <sub>ZH</sub>	3.3	1.0	9.0	11.5	1.0	13.0	ns
		5.0	1.0	7.0	8.5	1.0	9.5	
Output enable time	t <sub>ZL</sub>	3.3	1.0	8.5	11.5	1.0	13.0	ns
		5.0	1.0	6.5	8.5	1.0	9.5	
Output disable time	t <sub>HZ</sub>	3.3	1.0	10.0	12.5	1.0	14.5	ns
		5.0	1.0	8.0	11.0	1.0	12.5	
Output disable time	t <sub>LZ</sub>	3.3	1.0	8.0	11.5	1.0	12.5	ns
		5.0	1.0	6.5	8.5	1.0	10.0	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Characteristics: HD74AC373**

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF			Ta = -40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay D <sub>n</sub> to O <sub>n</sub>	t <sub>PLH</sub>	5.0	1.0	8.5	10.0	1.0	11.5	ns
Propagation delay D <sub>n</sub> to O <sub>n</sub>	t <sub>PHL</sub>	5.0	1.0	8.0	10.0	1.0	11.5	ns
Propagation delay LE to O <sub>n</sub>	t <sub>PLH</sub>	5.0	1.0	8.5	11.0	1.0	11.5	ns
Propagation delay LE to O <sub>n</sub>	t <sub>PHL</sub>	5.0	1.0	8.0	10.0	1.0	11.5	ns
Output enable time	t <sub>ZH</sub>	5.0	1.0	8.0	9.5	1.0	10.5	ns
Output enable time	t <sub>ZL</sub>	5.0	1.0	7.5	9.0	1.0	10.5	ns
Output disable time	t <sub>HZ</sub>	5.0	1.0	9.0	11.0	1.0	12.5	ns
Output disable time	t <sub>LZ</sub>	5.0	1.0	7.5	8.5	1.0	10.0	ns

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Operating Requirements: HD74AC373**

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF		Ta = -40°C to +85°C C <sub>L</sub> = 50 pF	Unit
			Typ	Guaranteed Minimum		
Setup time, HIGH or LOW D <sub>n</sub> to LE	t <sub>su</sub>	3.3	3.5	5.5	6.0	ns
		5.0	2.0	4.0	4.5	
Hold time, HIGH or LOW D <sub>n</sub> to LE	t <sub>h</sub>	3.3	-3.0	0.0	0.0	ns
		5.0	-1.5	0.0	0.0	
LE pulse width, HIGH	t <sub>w</sub>	3.3	4.0	5.5	6.0	ns
		5.0	2.0	4.0	4.5	

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**AC Operating Requirements: HD74ACT373**

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF		Ta = -40°C to +85°C C <sub>L</sub> = 50 pF	Unit
			Typ	Guaranteed Minimum		
Setup time, HIGH or LOW D <sub>n</sub> to LE	t <sub>su</sub>	5.0	3.0	7.0	8.0	ns
Hold time, HIGH or LOW D <sub>n</sub> to LE	t <sub>h</sub>	5.0	0.0	0.0	1.0	ns
LE pulse width, HIGH	t <sub>w</sub>	5.0	2.0	7.0	8.0	ns

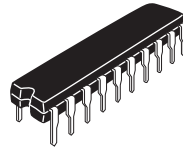
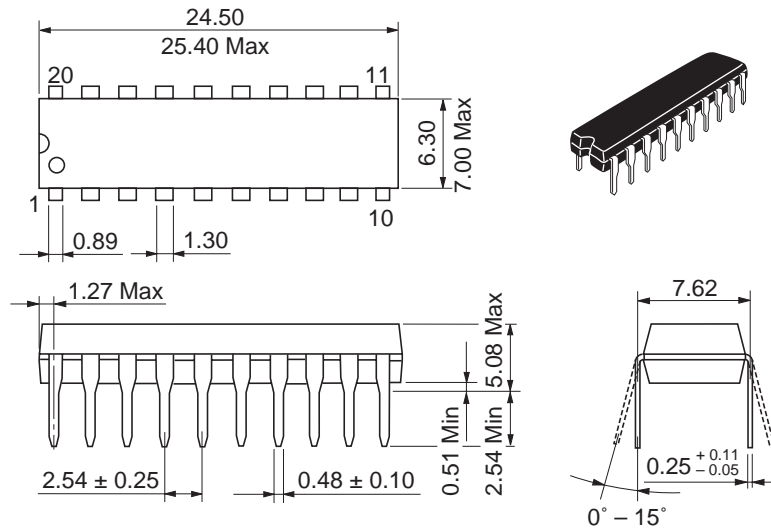
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

**Capacitance**

Item	Symbol	Typ	Unit	Condition
Input capacitance	C <sub>IN</sub>	4.5	pF	V <sub>CC</sub> = 5.5 V
Power dissipation capacitance	C <sub>PD</sub>	40.0	pF	V <sub>CC</sub> = 5.0 V

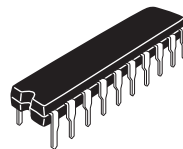
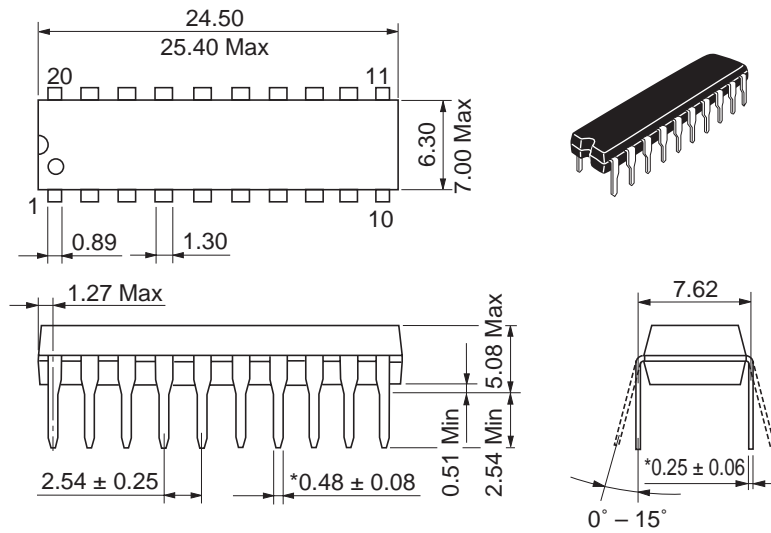
Package Dimensions

As of January, 2003  
Unit: mm



Package Code	DP-20N
JEDEC	—
JEITA	Conforms
Mass (reference value)	1.26 g

Unit: mm

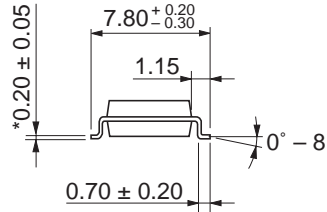
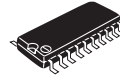
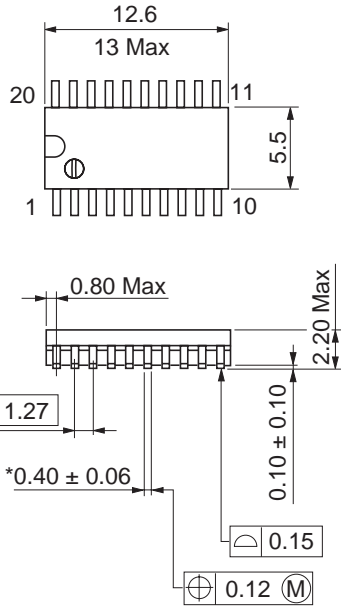


\*Ni/Pd/AU Plating

Package Code	DP-20NEV
JEDEC	—
JEITA	Conforms
Mass (reference value)	1.26 g

As of January, 2003

Unit: mm

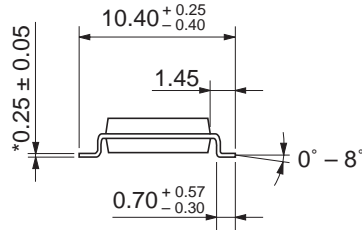
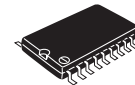
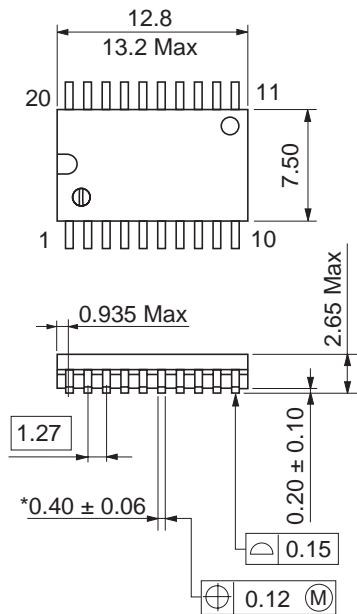


\*Ni/Pd/Au plating

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

As of January, 2003

Unit: mm

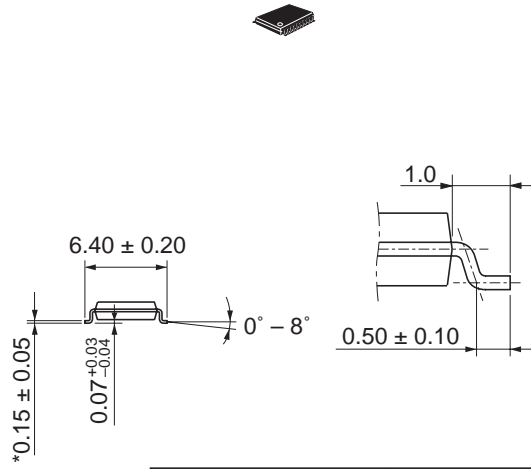
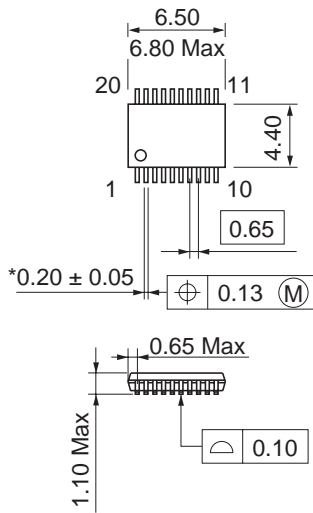


\*Ni/Pd/Au plating

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



As of January, 2003  
Unit: mm



\*Ni/Pd/Au plating

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

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