

HD74AC374/HD74ACT374

Octal D-Type Flip-Flops with 3-State Output

REJ03D0274-0200Z
(Previous ADE-205-395 (Z))
Rev.2.00
Jul.16.2004

Description

The HD74AC374/HD74ACT374 is a high-speed, low-power octal D-type flip-flop featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable (\overline{OE}) are common to all flip-flops.

Features

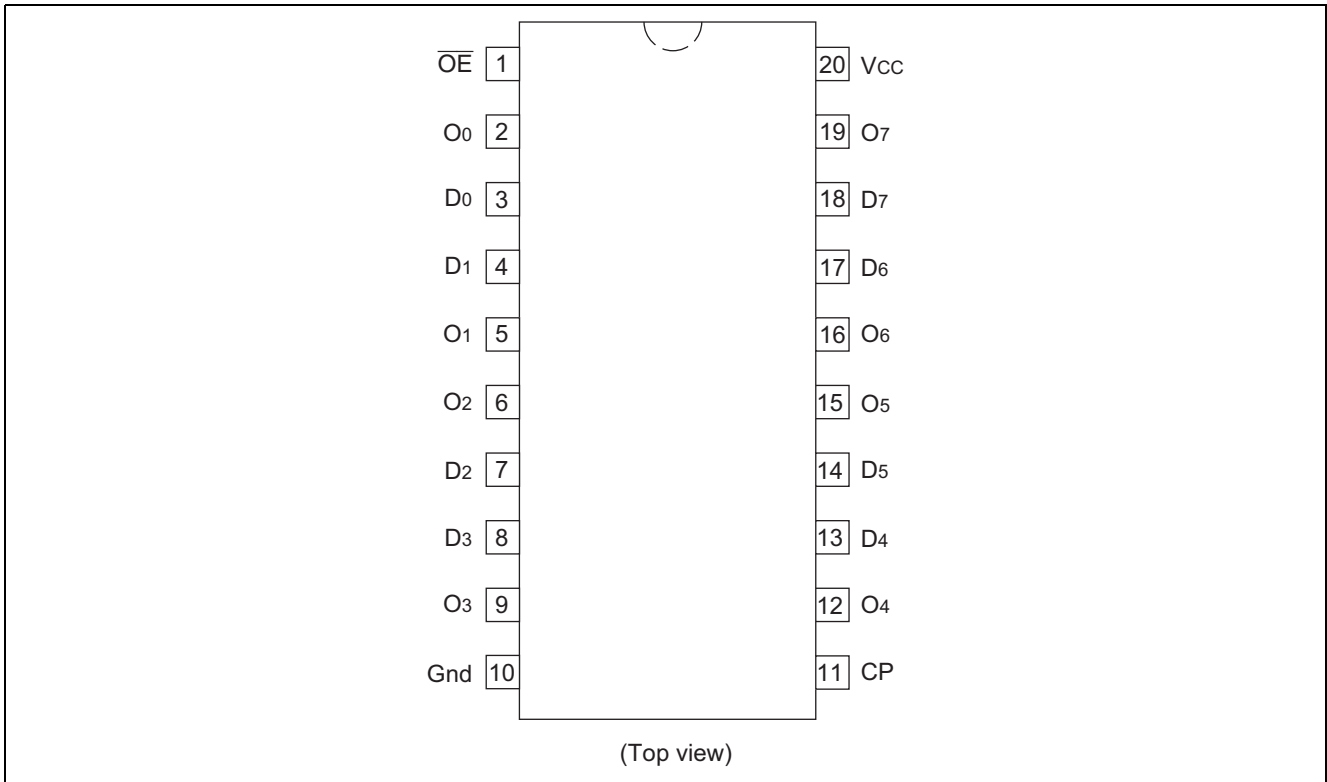
- Buffered Positive Edge-Triggered Clock
- 3-State Outputs for Bus-Oriented Applications
- Outputs Source/Sink 24 mA
- See HD74AC273/HD74ACT273 for Reset Version
- See HD74AC373/HD74ACT373 for Transparent Latch Version
- See HD74AC574/HD74ACT574 for Broadside Pinout Version
- See HD74AC564/HD74ACT564 for Broadside
- Pinout Version with Inverted Outputs
- HD74ACT374 has TTL-Compatible Inputs
- Ordering Information: Ex. HD74AC374

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74AC374P	DIP-20 pin	DP-20N, -20NEV	P	—
HD74AC374FPEL	SOP-20 pin (JEITA)	FP-20DAV	FP	EL (2,000 pcs/reel)
HD74AC374RPEL	SOP-20 pin (JEDEC)	FP-20DBV	RP	EL (1,000 pcs/reel)
HD74AC374TELL	TSSOP-20 pin	TTP-20DAV	T	ELL (2,000 pcs/reel)

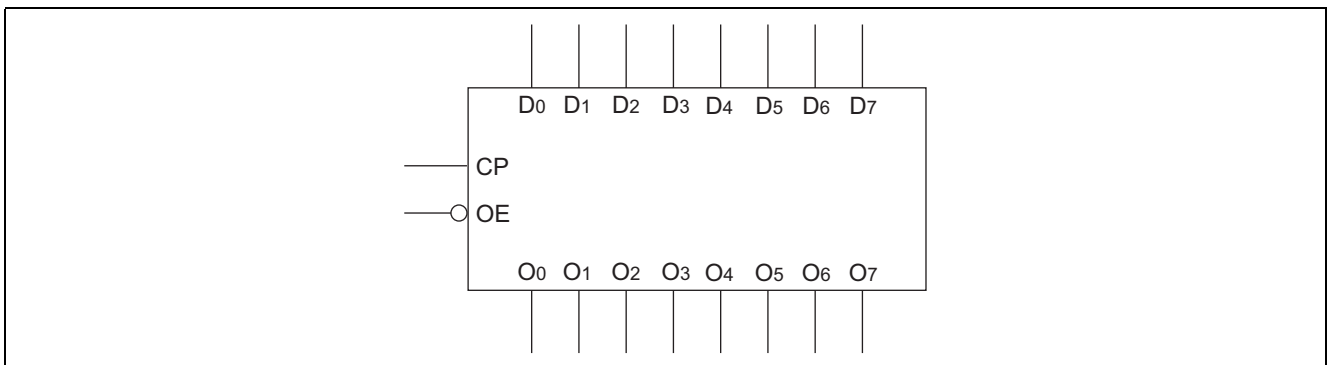
Notes: 1. Please consult the sales office for the above package availability.

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

- D₀ – D₇ Data Inputs
- CP Clock Pulse Input
- \overline{OE} 3-State Output Enable Input
- O₀ – O₇ 3-State Outputs

Functional Description

The HD74AC374/HD74ACT374 consists of eight edge-triggered flip-flops with individual D-type inputs and 3-state true outputs. The buffered clock and buffered Output Enable are common to all flip-flops. The eight flip-flops will store the state of their individual D inputs that meet the setup and hold time requirements on the Low-to-High Clock (CP) transition. With the Output Enable (\overline{OE}) Low, the contents of the eight flip-flops are available at the outputs. When the \overline{OE} is High, the outputs go to the high impedance state. Operation of the \overline{OE} input does not affect the state of the flip-flops.

Truth Table

Inputs			Outputs
D_n	CP	\overline{OE}	O_n
H		L	H
L		L	L
X	X	H	Z

H : High Voltage Level

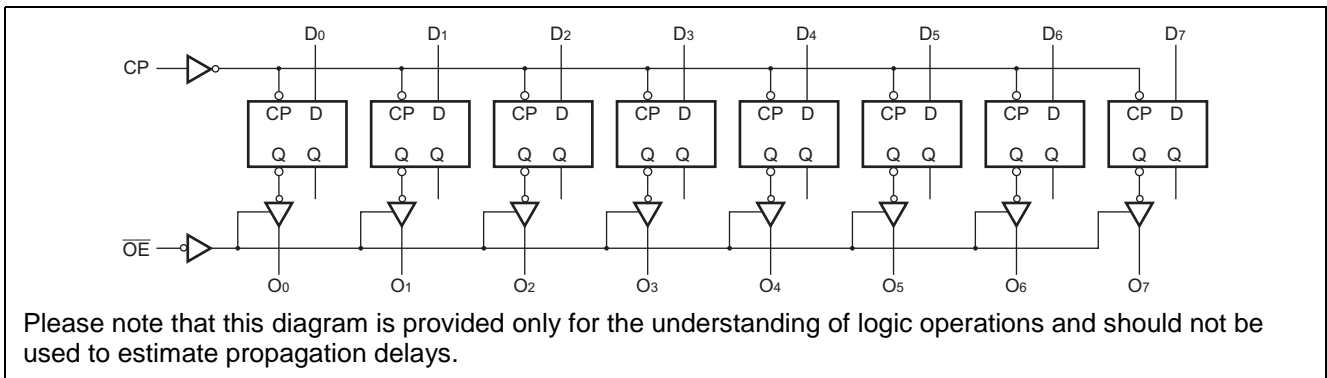
L : Low Voltage Level

X : Immaterial

Z : High Impedance

: Low-to-High Transition

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	± 50	mA	
DC V_{CC} or ground current per output pin	I_{CC}, I_{GND}	± 50	mA	
Storage temperature	T_{stg}	-65 to +150	$^{\circ}C$	

Recommended Operating Conditions: HD74AC374

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	$^{\circ}C$	
Input rise and fall time (except Schmitt inputs) V_{IN} 30% to 70% V_{CC}	tr, tf	8	ns/V	$V_{CC} = 3.0V$
				$V_{CC} = 4.5 V$
				$V_{CC} = 5.5 V$

DC Characteristics: HD74AC374

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°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 μA		
		4.5	4.4	4.49	—	4.4	—				
		5.5	5.4	5.49	—	5.4	—				
		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	—				I _{OH} = -24 mA
	V _{OL}	3.0	—	0.002	0.1	—	0.1	V	V _{IN} = V _{IL} or V _{IH} I _{OUT} = 50 μA		
		4.5	—	0.001	0.1	—	0.1				
		5.5	—	0.001	0.1	—	0.1				
		3.0	—	—	0.32	—	0.37			V _{IN} = V _{IL} or V _{IH}	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	—	—	±0.1	—	±1.0	μA	V _{IN} = V _{CC} or GND		
3 State current	I _{OZ}	5.5	—	—	±0.5	—	±5.0	μA	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	μA	V _{IN} = V _{CC} or ground		

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

Recommended Operating Conditions: HD74ACT374

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	Ta	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) V _{IN} 0.8 to 2.0 V	tr, tf	8	ns/V	V _{CC} = 4.5V V _{CC} = 5.5V

DC Characteristics: HD74ACT374

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Condition				
			min.	typ.	max.	min.	max.						
Input voltage	V _{IH}	4.5	2.0	1.5	—	2.0	—	V	V _{OUT} = 0.1 V or V _{CC} -0.1 V				
		5.5	2.0	1.5	—	2.0	—						
	V _{IL}	4.5	—	1.5	0.8	—	0.8		V _{OUT} = 0.1 V or V _{CC} -0.1 V				
		5.5	—	1.5	0.8	—	0.8						
Output voltage	V _{OH}	4.5	4.4	4.49	—	4.4	—	V	V _{IN} = V _{IL} or V _{IH} I _{OUT} = -50 μA				
		5.5	5.4	5.49	—	5.4	—						
		4.5	3.94	—	—	3.80	—			V _{IN} = V _{IL} I _{OH} = -24 mA			
		5.5	4.94	—	—	4.80	—				I _{OH} = -24 mA		
	V _{OL}	4.5	—	0.001	0.1	—	0.1		V _{IN} = V _{IL} or V _{IH} I _{OUT} = 50 μA				
		5.5	—	0.001	0.1	—	0.1						
		4.5	—	—	0.32	—	0.37			V _{IN} = V _{IL} I _{OL} = 24 mA			
		5.5	—	—	0.32	—	0.37				I _{OL} = 24 mA		
		Input current	I _{IN}	5.5	—	—	±0.1			—	±1.0	μA	V _{IN} = V _{CC} or GND
		3 State current	I _{OZ}	5.5	—	—	±0.5			—	±5.0	μA	V _{IN} = V _{IL} , V _{IH} V _{OUT} = V _{CC} or GND
I _{CC} /input current	I _{CCT}	5.5	—	0.6	—	—	1.5	mA	V _{IN} = V _{CC} -2.1 V				
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	μA	V _{IN} = V _{CC} or ground				

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

AC Characteristics: HD74AC374

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF			Ta = -40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Maximum clock frequency	f _{max}	3.3	60	110	—	60	—	MHz
		5.0	100	155	—	100	—	
Propagation delay CP to O _n	t _{PLH}	3.3	1.0	11.0	13.5	1.0	15.5	ns
		5.0	1.0	8.0	9.5	1.0	10.5	
Propagation delay CP to O _n	t _{PHL}	3.3	1.0	10.0	12.5	1.0	14.0	ns
		5.0	1.0	7.0	9.0	1.0	10.0	
Output enable time	t _{ZH}	3.3	1.0	9.5	11.5	1.0	13.0	ns
		5.0	1.0	7.0	8.5	1.0	9.5	
Output enable time	t _{ZL}	3.3	1.0	9.0	11.5	1.0	13.0	ns
		5.0	1.0	6.5	8.5	1.0	9.5	
Output disable time	t _{HZ}	3.3	1.0	10.5	12.5	1.0	14.5	ns
		5.0	1.0	8.0	11.0	1.0	12.5	
Output disable time	t _{LZ}	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 Operating Requirements: HD74AC374

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF		Ta = -40°C to +85°C C _L = 50 pF	Unit
			Typ	Guaranteed Minimum		
Setup time, HIGH or LOW D _n to CP	t _{su}	3.3	2.0	5.5	6.5	ns
			5.0	1.0	4.0	
Hold time, HIGH or LOW D _n to CP	t _h	3.3	-1.0	1.0	1.0	ns
			5.0	-4.0	1.5	
CP pulse width, HIGH or LOW	t _w	3.3	4.0	5.5	6.0	ns
			5.0	2.5	4.0	

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: HD74ACT374

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF			Ta = -40°C to +85°C C _L = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Maximum clock frequency	f _{max}	5.0	100	160	—	90	—	MHz
Propagation delay CP to O _n	t _{PLH}	5.0	1.0	8.5	10.0	1.0	11.5	ns
Propagation delay CP to O _n	t _{PHL}	5.0	1.0	8.0	9.5	1.0	11.0	ns
Output enable time	t _{ZH}	5.0	1.0	8.0	9.5	1.0	10.5	ns
Output enable time	t _{ZL}	5.0	1.0	8.0	9.0	1.0	10.5	ns
Output disable time	t _{HZ}	5.0	1.0	8.5	11.5	1.0	12.5	ns
Output disable time	t _{LZ}	5.0	1.0	7.0	8.5	1.0	10.0	ns

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

AC Operating Requirements: HD74ACT374

Item	Symbol	V _{CC} (V)*1	Ta = +25°C C _L = 50 pF		Ta = -40°C to +85°C C _L = 50 pF	Unit
			Typ	Guaranteed Minimum		
Setup time, HIGH or LOW D _n to CP	t _{su}	5.0	1.0	7.0	5.5	ns
Hold time, HIGH or LOW D _n to CP	t _h	5.0	0.0	1.5	1.5	ns
CP pulse width, HIGH or LOW	t _w	5.0	2.0	7.0	5.0	ns

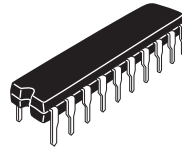
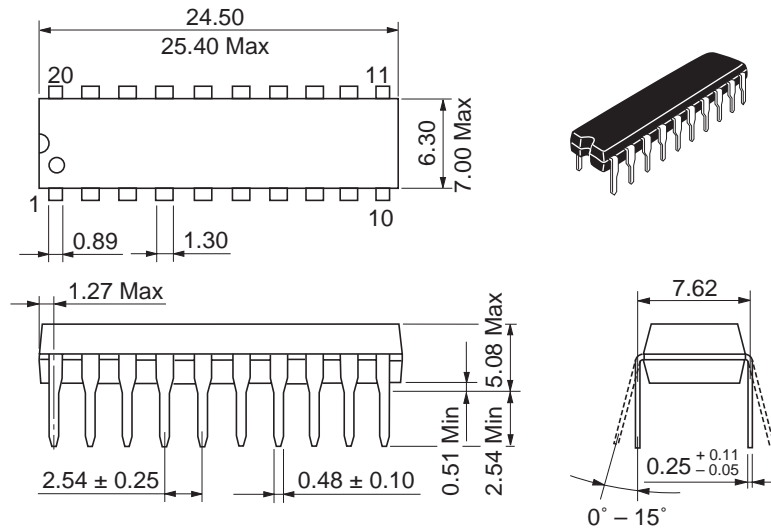
Note: 1. Voltage Range 5.0 is 5.0 V ± 0.5 V

Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C _{IN}	4.5	pF	V _{CC} = 5.5 V
Power dissipation capacitance	C _{PD}	80.0	pF	V _{CC} = 5.0 V

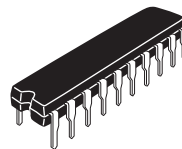
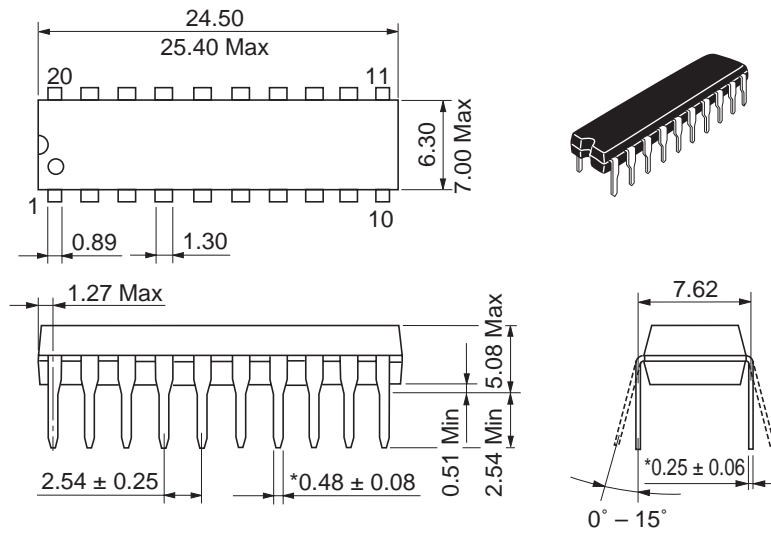
Package Dimensions

As of January, 2003
Unit: mm



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

Unit: mm

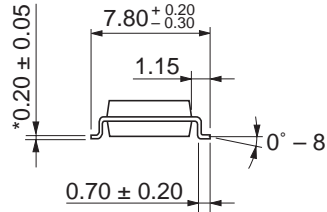
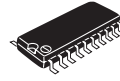
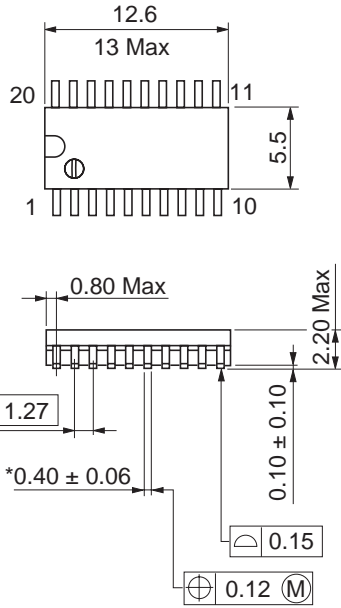


*Ni/Pd/AU Plating

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

As of January, 2003

Unit: mm

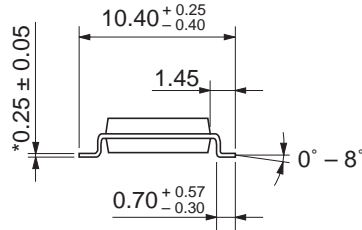
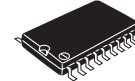
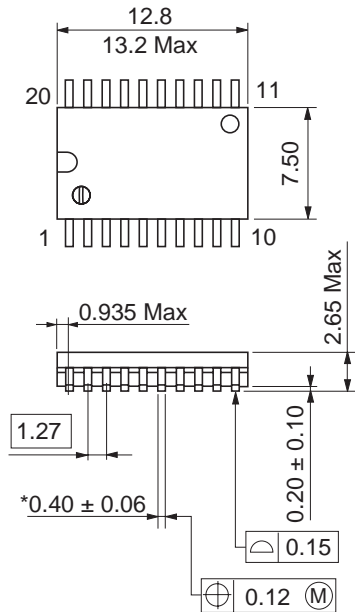


*Ni/Pd/Au plating

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

As of January, 2003

Unit: mm

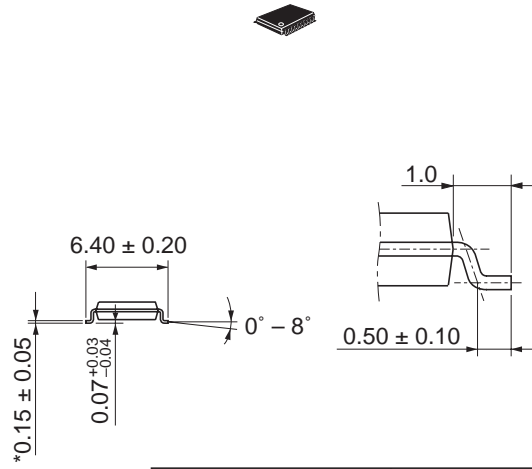
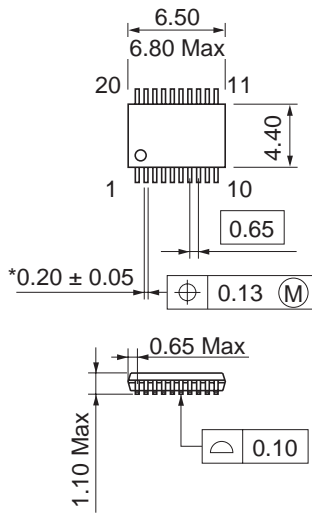


*Ni/Pd/Au plating

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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