

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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Not recommended  
for new design

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# HD74AC538

## 1-of-8 Decoder with 3-State Output

REJ03D0276-0200Z  
 (Previous ADE-205-397 (Z))  
 Rev.2.00  
 Jul.16.2004

### Description

The HD74AC538 decoder/demultiplexer accepts three Address (A0 to A2) input signal and decodes them to select one of eight mutually exclusive outputs. A polarity control input (P) determines whether the outputs are active LOW or active HIGH. A HIGH signal on either of the active LOW output Enable ( $\overline{OE}$ ) inputs forces all outputs to the high impedance state. Two active HIGH and two active LOW input enables are available for easy expansion to 1-of-32 decoding with four packages, or for data demultiplexing to 1-of-8 or 1-of-16 destinations.

### Features

- Output Polarity Control
- Data Demultiplexing Capability
- Multiple Enables for Expansion
- Outputs Source/Sink 24 mA
- Ordering Information

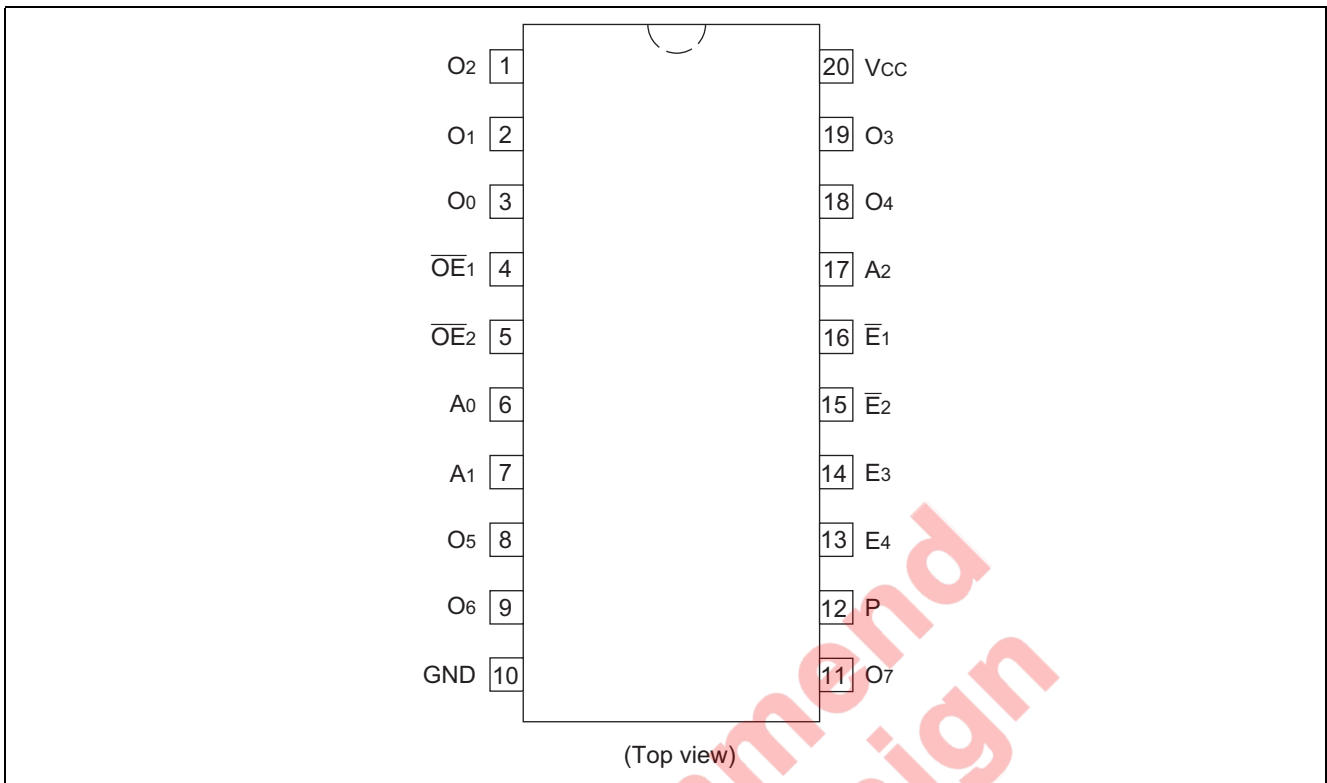
Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74AC538FPEL	SOP-20 pin (JEITA)	FP-20DAV	FP	EL (2,000 pcs/reel)
HD74AC538RPEL	SOP-20 pin (JEDEC)	FP-20DBV	RP	EL (1,000 pcs/reel)

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

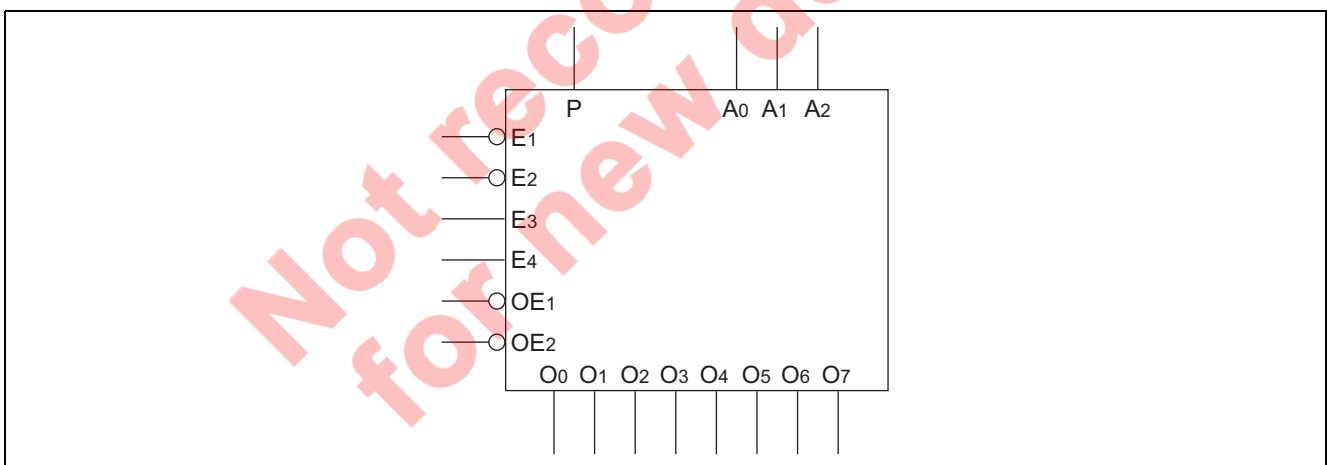
2. The packages with lead-free pins are distinguished from the conventional products by adding V at the end of the package code.

Not recommended for new design

## Pin Arrangement



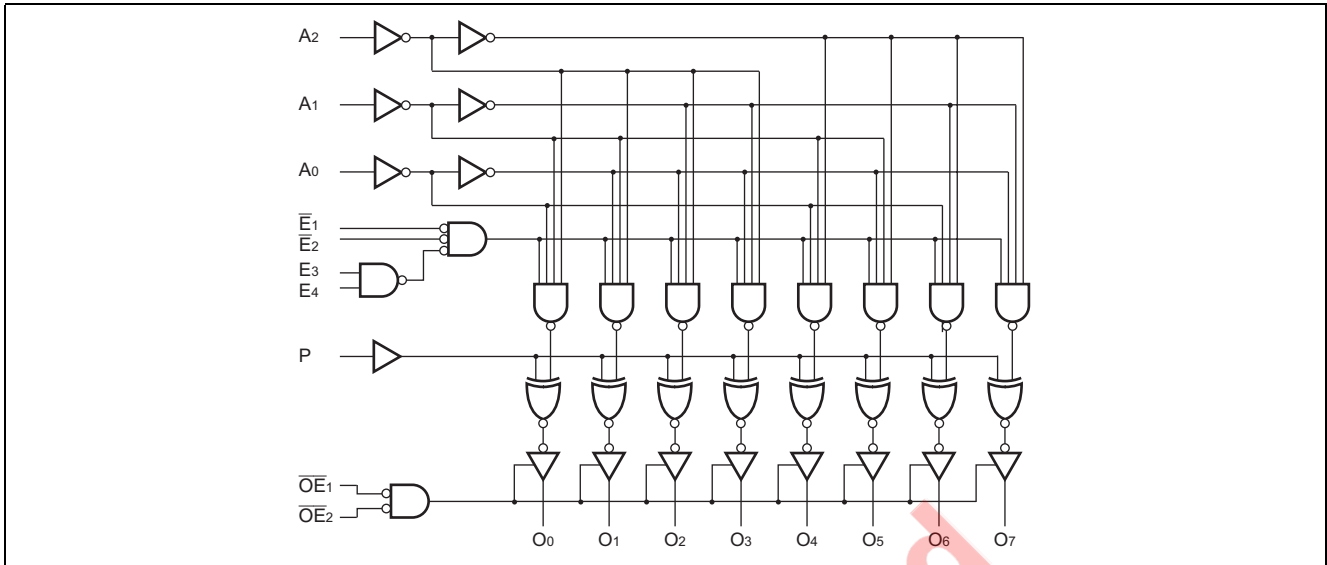
## Logic Symbol



## Pin Names

- A<sub>0</sub> to A<sub>2</sub>     Address Inputs
- $\overline{E}1, \overline{E}2$      Enable Inputs (Active LOW)
- E<sub>3</sub>, E<sub>4</sub>        Enable Inputs (Active HIGH)
- P                Polarity Control Input
- $\overline{OE}1, \overline{OE}2$     Output Enable Inputs (Active LOW)
- O<sub>0</sub> to O<sub>7</sub>      3-State Outputs

Logic Diagram



Truth Table

Function	Inputs									Outputs							
	$\overline{OE}_1$	$\overline{OE}_2$	$\overline{E}_1$	$\overline{E}_2$	$E_3$	$E_4$	$A_2$	$A_1$	$A_0$	$O_0$	$O_1$	$O_2$	$O_3$	$O_4$	$O_5$	$O_6$	$O_7$
High impedance	H	X	X	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z
	Z	H	X	X	X	X	X	X	X	Z	Z	Z	Z	Z	Z	Z	Z
Disable	L	L	H	X	X	X	X	X	X	Outputs equal input							
	L	L	X	H	X	X	X	X	X	Outputs equal input							
	L	L	X	X	L	X	X	X	X	Outputs equal input							
	L	L	X	X	X	L	X	X	X	Outputs equal input							
Active HIGH output (P = L)	L	L	L	L	H	H	L	L	L	H	L	L	L	L	L	L	L
	L	L	L	L	H	H	L	L	H	L	H	L	L	L	L	L	L
	L	L	L	L	H	H	L	H	L	L	L	H	L	L	L	L	L
	L	L	L	L	H	H	L	H	H	L	L	L	L	H	L	L	L
	L	L	L	L	H	H	H	L	H	L	L	L	L	L	H	L	L
	L	L	L	L	H	H	H	H	L	L	L	L	L	L	L	H	L
	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	H
	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	H
Active LOW output (P = L)	L	L	L	L	H	H	L	L	L	L	H	H	H	H	H	H	H
	L	L	L	L	H	H	L	L	H	H	L	H	H	H	H	H	H
	L	L	L	L	H	H	L	H	L	H	H	L	H	H	H	H	H
	L	L	L	L	H	H	L	H	H	H	H	H	L	H	H	H	H
	L	L	L	L	H	H	H	L	L	H	H	H	H	L	H	H	H
	L	L	L	L	H	H	H	L	H	H	H	H	H	H	L	H	H
	L	L	L	L	H	H	H	H	L	H	H	H	H	H	H	L	H
	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	L

H : High Voltage Level  
 L : Low Voltage Level  
 X : Immaterial  
 Z : High Impedance

## 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

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	$V_{CC} = 3.0V$
				$V_{CC} = 4.5 V$
				$V_{CC} = 5.5 V$

Not recommended  
for new design

## DC Characteristics

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>	3.0	2.1	1.5	—	2.1	—	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V		
		4.5	3.15	2.25	—	3.15	—				
		5.5	3.85	2.75	—	3.85	—				
	V <sub>IL</sub>	3.0	—	1.50	0.9	—	0.9		V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V		
		4.5	—	2.25	1.35	—	1.35				
		5.5	—	2.75	1.65	—	1.65				
Output voltage	V <sub>OH</sub>	3.0	2.9	2.99	—	2.9	—	V	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OUT</sub> = -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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OH</sub> = -12 mA
		4.5	3.94	—	—	3.80	—				I <sub>OH</sub> = -24 mA
		5.5	4.94	—	—	4.80	—				I <sub>OH</sub> = -24 mA
	V <sub>OL</sub>	3.0	—	0.002	0.1	—	0.1	V	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OUT</sub> = 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 <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>	I <sub>OL</sub> = 12 mA
		4.5	—	—	0.32	—	0.37				I <sub>OL</sub> = 24 mA
		5.5	—	—	0.32	—	0.37				I <sub>OL</sub> = 24 mA
	Input leakage 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(OE)</sub> = V <sub>IL</sub> , V <sub>IH</sub> V <sub>IN</sub> = V <sub>CC</sub> or GND V <sub>OUT</sub> = V <sub>CC</sub> or GND	
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**

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 A <sub>n</sub> to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	10.5	17.5	1.0	20.0	ns
		5.0	1.0	8.0	12.5	1.0	14.0	
Propagation delay A <sub>n</sub> to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	9.5	17.5	1.0	20.0	ns
		5.0	1.0	7.0	12.0	1.0	14.0	
Propagation delay E <sub>1</sub> , or E <sub>2</sub> to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	11.0	19.5	1.0	23.0	ns
		5.0	1.0	8.0	14.5	1.0	16.5	
Propagation delay E <sub>1</sub> , or E <sub>2</sub> to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	10.0	19.5	1.0	23.0	ns
		5.0	1.0	8.0	14.5	1.0	16.5	
Propagation delay E <sub>3</sub> , or E <sub>4</sub> to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	11.0	19.5	1.0	23.0	ns
		5.0	1.0	8.5	14.5	1.0	17.0	
Propagation delay E <sub>3</sub> , or E <sub>4</sub> to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	10.5	20.0	1.0	23.5	ns
		5.0	1.0	8.0	15.0	1.0	18.0	
Propagation delay P to O <sub>n</sub>	t <sub>PLH</sub>	3.3	1.0	10.5	15.5	1.0	17.5	ns
		5.0	1.0	9.0	11.0	1.0	12.5	
Propagation delay P to O <sub>n</sub>	t <sub>PHL</sub>	3.3	1.0	9.0	15.0	1.0	17.0	ns
		5.0	1.0	7.5	10.5	1.0	11.5	
Propagation delay OE <sub>n</sub> to O <sub>n</sub>	t <sub>PZH</sub>	3.3	1.0	7.0	14.0	1.0	15.5	ns
		5.0	1.0	5.0	8.5	1.0	9.5	
Propagation delay OE <sub>n</sub> to O <sub>n</sub>	t <sub>PZL</sub>	3.3	1.0	8.5	16.5	1.0	19.0	ns
		5.0	1.0	5.5	9.5	1.0	11.5	
Propagation delay OE <sub>n</sub> to O <sub>n</sub>	t <sub>PHZ</sub>	3.3	1.0	7.0	14.0	1.0	15.5	ns
		5.0	1.0	6.0	10.5	1.0	11.5	
Propagation delay OE <sub>n</sub> to O <sub>n</sub>	t <sub>PLZ</sub>	3.3	1.0	9.0	14.5	1.0	17.0	ns
		5.0	1.0	7.0	10.5	1.0	12.0	

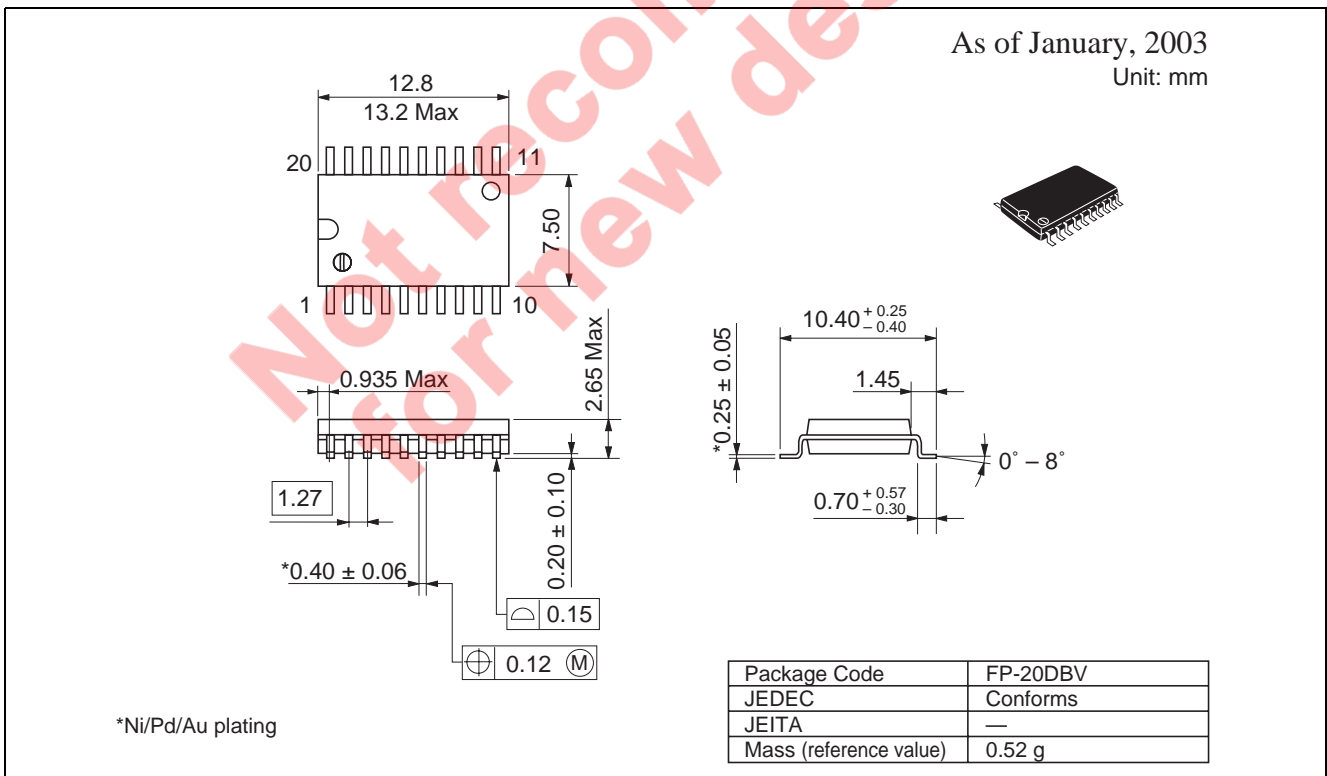
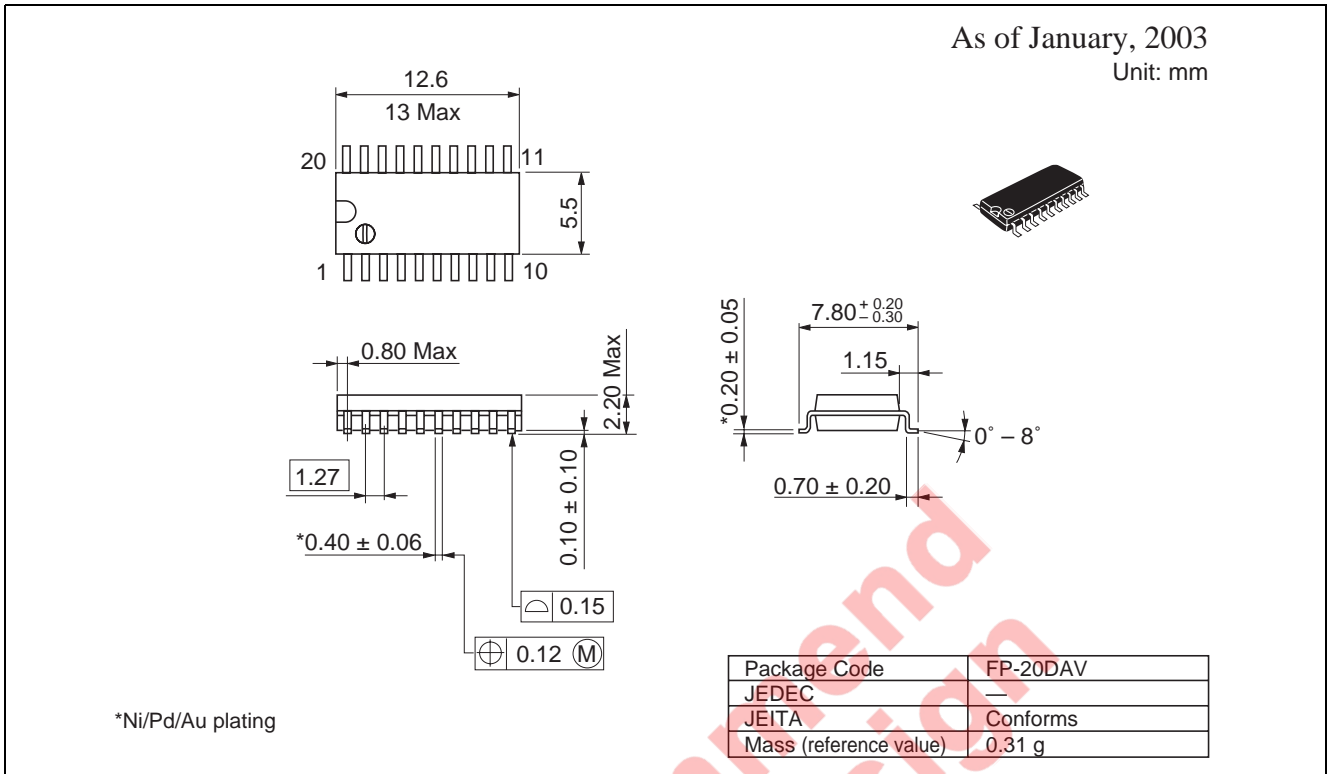
Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

**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>	100	pF	V <sub>CC</sub> = 5.0 V



Package Dimensions



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