



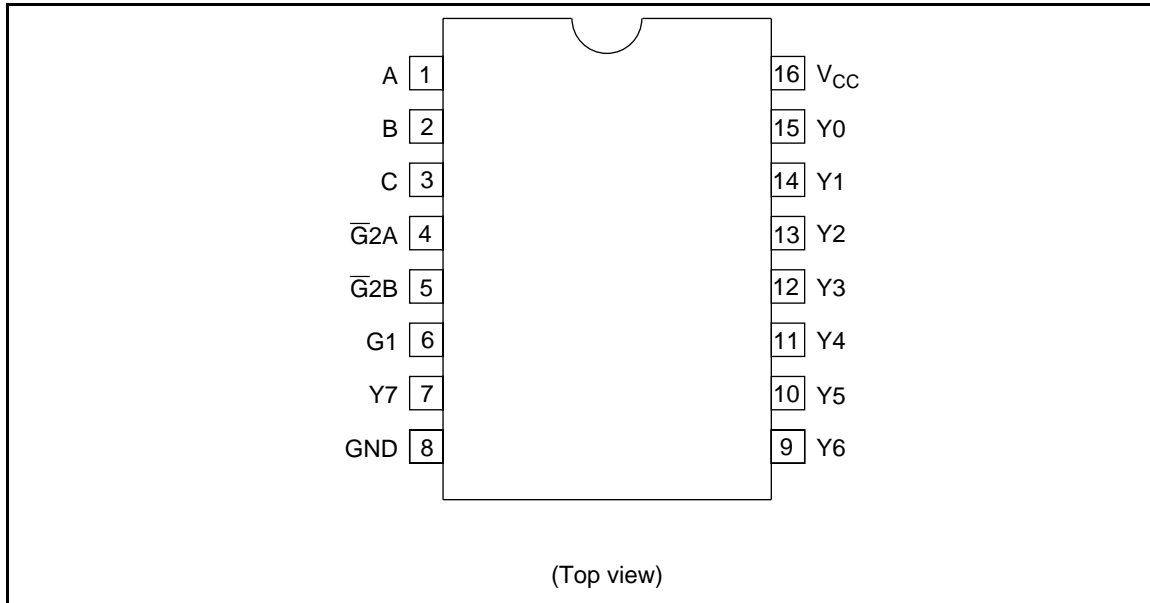
# HD74LV138A

Note: H:High level

L:Low level

X:Immaterial

## Pin Arrangement



## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V	
Input voltage range*1	$V_I$	-0.5 to 7.0	V	
Output voltage range*1, 2	$V_O$	-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 $P_T$ $T_a = 25^\circ\text{C}$ (in still air)*3		785 500	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.

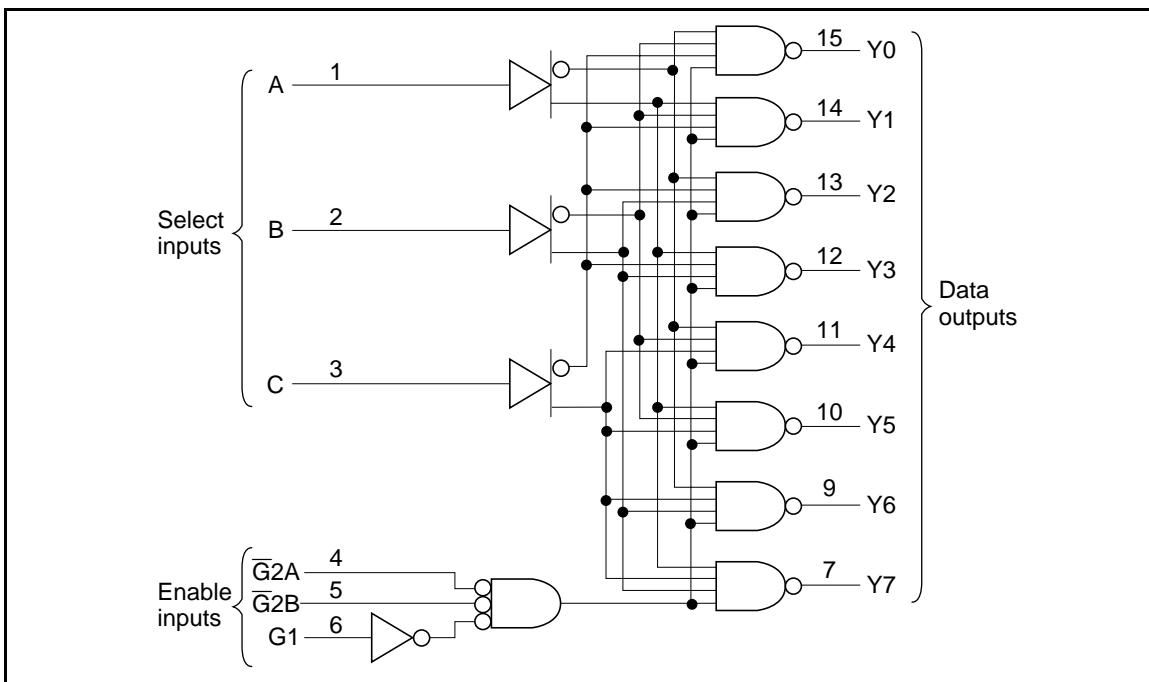
3. The maximum package power dissipation was calculated using a junction temperature of  $150^\circ\text{C}$ .

**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	$\mu A$	$V_{CC} = 2.0 V$
		—	-2	mA	$V_{CC} = 2.3 \text{ to } 2.7 V$
		—	-6		$V_{CC} = 3.0 \text{ to } 3.6 V$
		—	-12		$V_{CC} = 4.5 \text{ to } 5.5 V$
	$I_{OL}$	—	50	$\mu A$	$V_{CC} = 2.0 V$
		—	2	mA	$V_{CC} = 2.3 \text{ to } 2.7 V$
		—	6		$V_{CC} = 3.0 \text{ to } 3.6 V$
—		12		$V_{CC} = 4.5 \text{ to } 5.5 V$	
Input transition rise or fall rate	$\Delta t/\Delta v$	0	200	ns/V	$V_{CC} = 2.3 \text{ to } 2.7 V$
		0	100		$V_{CC} = 3.0 \text{ to } 3.6 V$
		0	20		$V_{CC} = 4.5 \text{ to } 5.5 V$
Operating free-air temperature	$T_a$	-40	85	$^{\circ}C$	

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

**Logic Diagram**



# HD74LV138A

## DC Electrical Characteristics

- $T_a = -40$  to  $85^\circ\text{C}$

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Item	Symbol	$V_{CC}$ (V)*	Min	Typ	Max	Unit	Test Conditions
Input voltage	$V_{IH}$	2.0	1.5	—	—	V	
		2.3 to 2.7	$V_{CC} \times 0.7$	—	—		
		3.0 to 3.6	$V_{CC} \times 0.7$	—	—		
		4.5 to 5.5	$V_{CC} \times 0.7$	—	—		
	$V_{IL}$	2.0	—	—	0.5		
		2.3 to 2.7	—	—	$V_{CC} \times 0.3$		
		3.0 to 3.6	—	—	$V_{CC} \times 0.3$		
		4.5 to 5.5	—	—	$V_{CC} \times 0.3$		
Output voltage	$V_{OH}$	Min to Max	$V_{CC} - 0.1$	—	—	V	$I_{OH} = -50 \mu\text{A}$
		2.3	2.0	—	—		$I_{OH} = -2 \text{ mA}$
		3.0	2.48	—	—		$I_{OH} = -6 \text{ mA}$
		4.5	3.8	—	—		$I_{OH} = -12 \text{ mA}$
	$V_{OL}$	Min to Max	—	—	0.1		$I_{OL} = 50 \mu\text{A}$
		2.3	—	—	0.4		$I_{OL} = 2 \text{ mA}$
		3.0	—	—	0.44		$I_{OL} = 6 \text{ mA}$
		4.5	—	—	0.55		$I_{OL} = 12 \text{ mA}$
Input current	$I_{IN}$	0 to 5.5	—	—	$\pm 1$	$\mu\text{A}$	$V_I = 5.5 \text{ V}$ or GND
Quiescent supply current	$I_{CC}$	5.5	—	—	20	$\mu\text{A}$	$V_I = V_{CC}$ or GND, $I_O = 0$
Output leakage current	$I_{OFF}$	0	—	—	5	$\mu\text{A}$	$V_I$ or $V_O = 0 \text{ V}$ to $5.5 \text{ V}$
Input capacitance	$C_{IN}$	3.3	—	1.7	—	pF	$V_I = V_{CC}$ or GND

- Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

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

		Ta = 25°C			Ta = -40 to 85°C						
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions	FROM (Input)	TO (Output)	
Propagation delay time	t <sub>PLH</sub>	—	11.7	17.6	1.0	21.0	ns	C <sub>L</sub> = 15 pF	A, B, C	Y	
	t <sub>PHL</sub>	—	14.9	21.4	1.0	25.0		C <sub>L</sub> = 50 pF			
			—	12.3	19.2	1.0	22.0		C <sub>L</sub> = 15 pF	G1	
			—	15.7	22.6	1.0	26.0		C <sub>L</sub> = 50 pF		
			—	11.4	18.2	1.0	21.0		C <sub>L</sub> = 15 pF	$\overline{\text{G2A}}$ , $\overline{\text{G2B}}$	
			—	14.8	22.0	1.0	25.0		C <sub>L</sub> = 50 pF		

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

		Ta = 25°C			Ta = -40 to 85°C						
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions	FROM (Input)	TO (Output)	
Propagation delay time	t <sub>PLH</sub>	—	8.1	11.4	1.0	13.5	ns	C <sub>L</sub> = 15 pF	A, B, C	Y	
	t <sub>PHL</sub>	—	10.3	15.8	1.0	18.0		C <sub>L</sub> = 50 pF			
			—	8.4	12.8	1.0	15.0		C <sub>L</sub> = 15 pF	G1	
			—	10.6	16.3	1.0	18.5		C <sub>L</sub> = 50 pF		
			—	7.8	11.4	1.0	13.5		C <sub>L</sub> = 15 pF	$\overline{\text{G2A}}$ , $\overline{\text{G2B}}$	
			—	10.0	14.9	1.0	17.0		C <sub>L</sub> = 50 pF		

Switching Characteristics (cont)

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

		Ta = 25°C			Ta = -40 to 85°C						
Item	Symbol	Min	Typ	Max	Min	Max	Unit	Test Conditions	FROM (Input)	TO (Output)	
Propagation delay time	t <sub>PLH</sub>	—	5.6	8.1	1.0	9.5	ns	C <sub>L</sub> = 15 pF	A, B, C	Y	
	t <sub>PHL</sub>	—	7.0	10.1	1.0	11.5		C <sub>L</sub> = 50 pF			
			—	5.7	8.1	1.0	9.5		C <sub>L</sub> = 15 pF	G1	
			—	7.1	10.1	1.0	11.5		C <sub>L</sub> = 50 pF		
			—	5.4	8.1	1.0	9.5		C <sub>L</sub> = 15 pF	$\overline{\text{G2A}}$ , $\overline{\text{G2B}}$	
			—	6.8	10.1	1.0	11.5		C <sub>L</sub> = 50 pF		

# HD74LV138A

## Operating Characteristics

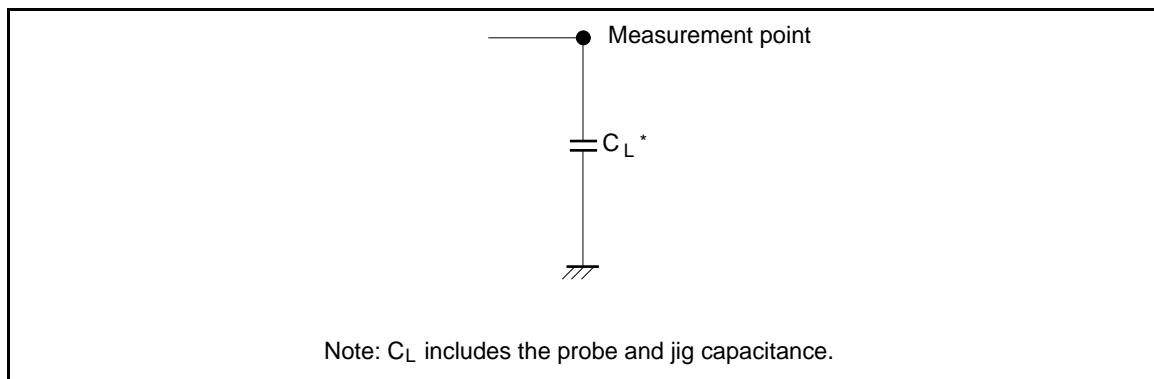
- $C_L = 50 \text{ pF}$

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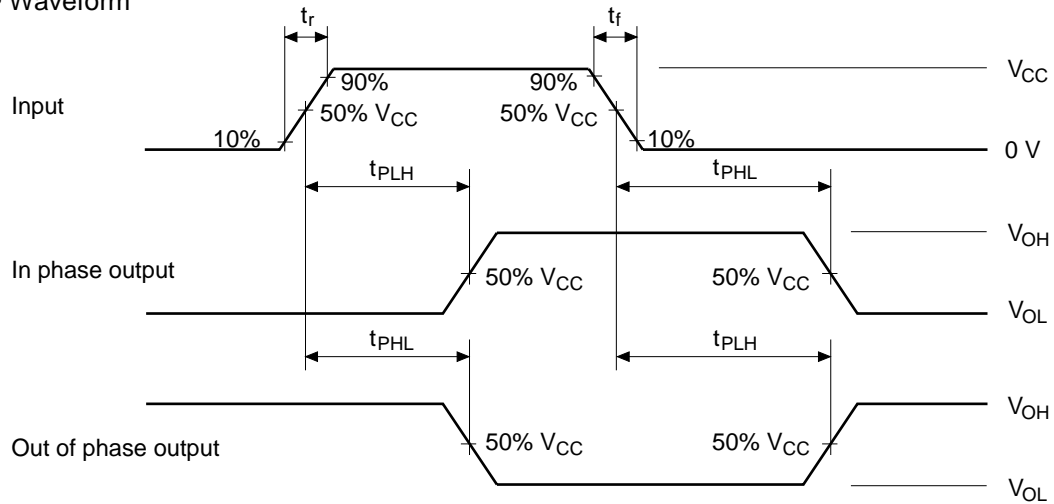
$T_a = 25^\circ\text{C}$

Item	Symbol	$V_{CC}$ (V)	Min	Typ	Max	Unit	Test Conditions
Power dissipation capacitance	$C_{PD}$	3.3	—	16.8	—	pF	f = 10 MHz
		5.0	—	19.1	—		

## Test Circuit

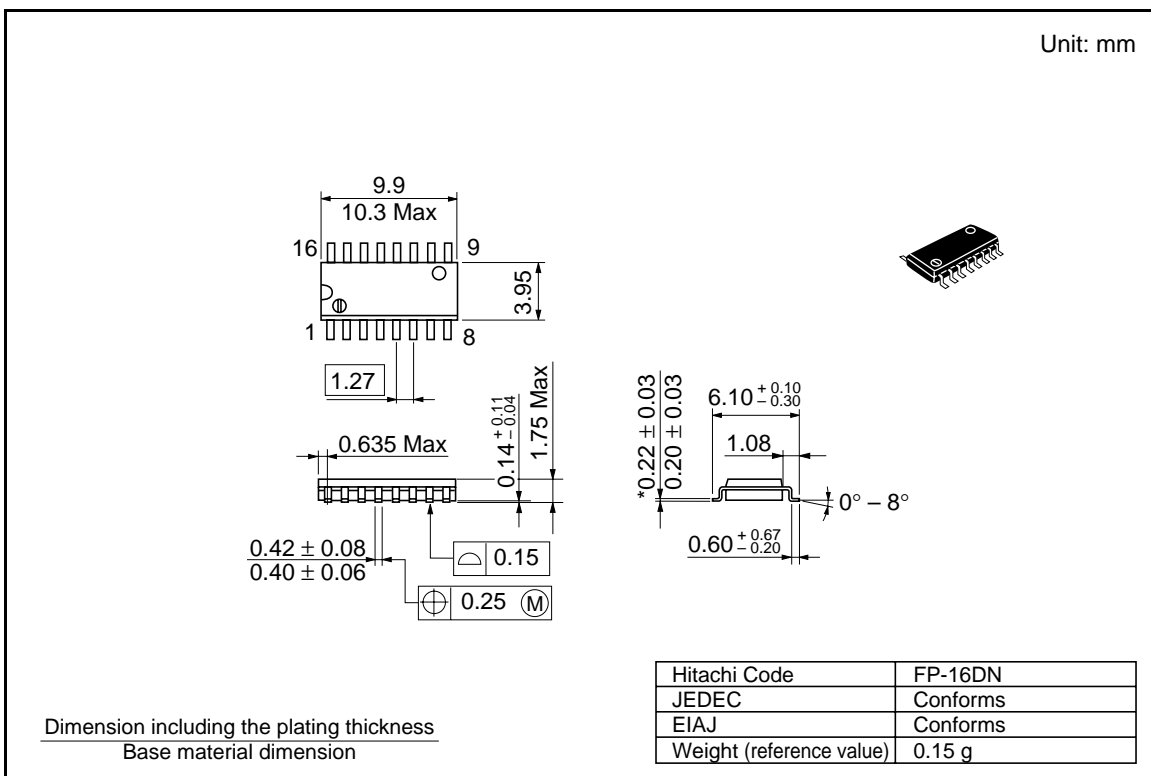
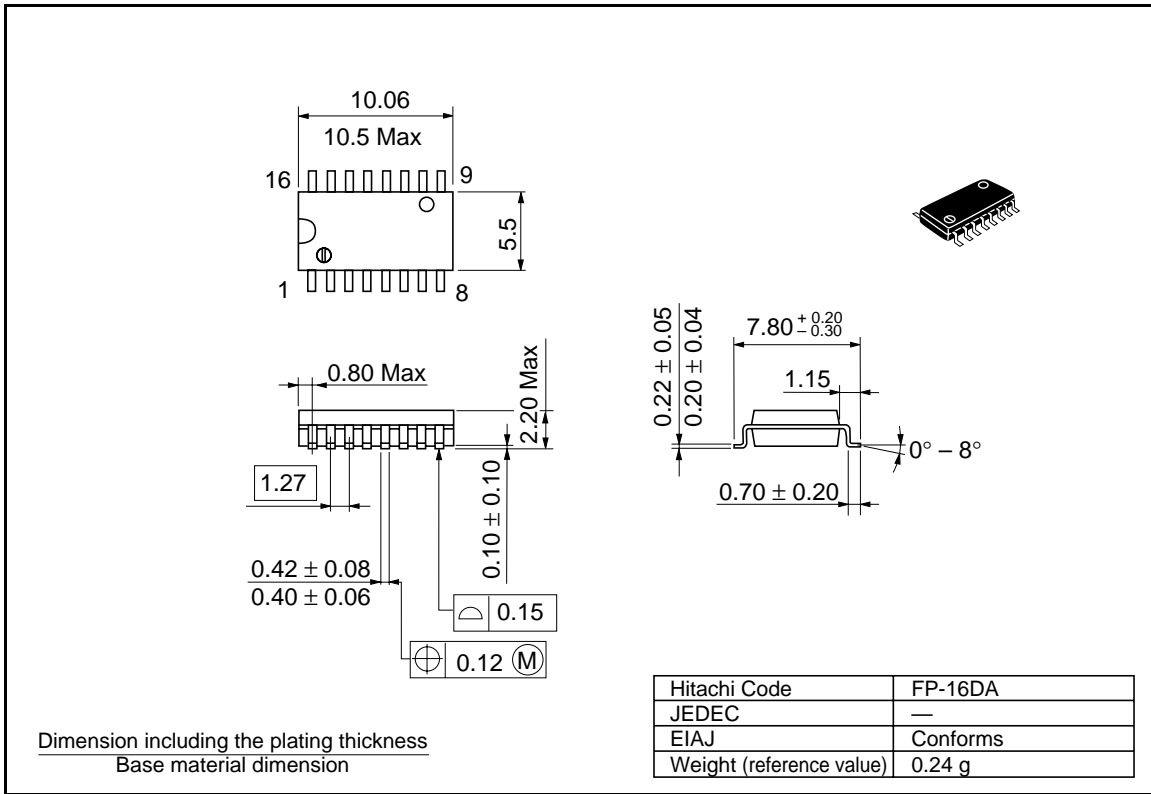


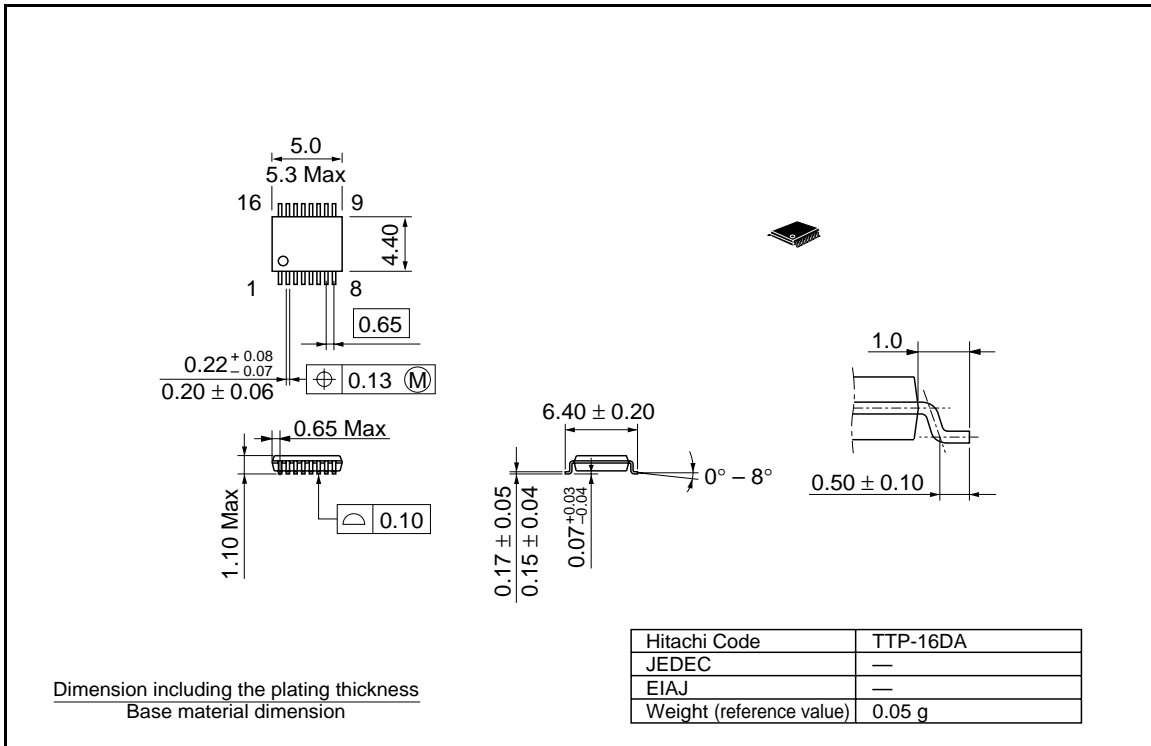
### • Waveform



- 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





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