

To our customers,

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## Old Company Name in Catalogs and Other Documents

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

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# HD74HC221

## Dual Monostable Multivibrators (with Schmitt Trigger Input)

REJ03D0591-0200  
 (Previous ADE-205-468)  
 Rev.2.00  
 Jan 31, 2006

### Description

Each multivibrator features both a negative, A, and a positive, B, transition triggered input, either of which can be used as an inhibit. Also included is a clear input that when taken low resets the one shot. The HD74HC221 can be triggered on the positive transition of the clear while A is held low and B is held high.

This device is a non-retriggerable, and therefore cannot be retriggered until the output pulse times out.

The output pulse equation is simply:

$$t_w = 0.7 \cdot (R_{ext}) \cdot (C_{ext})$$










### Features

- High Speed Operation
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC221P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC221FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)

Note: Please consult the sales office for the above package availability.

### Function Table

Inputs			Outputs	
Clear	A	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L			
H		H		
	L	H		

H : high level (steady state)

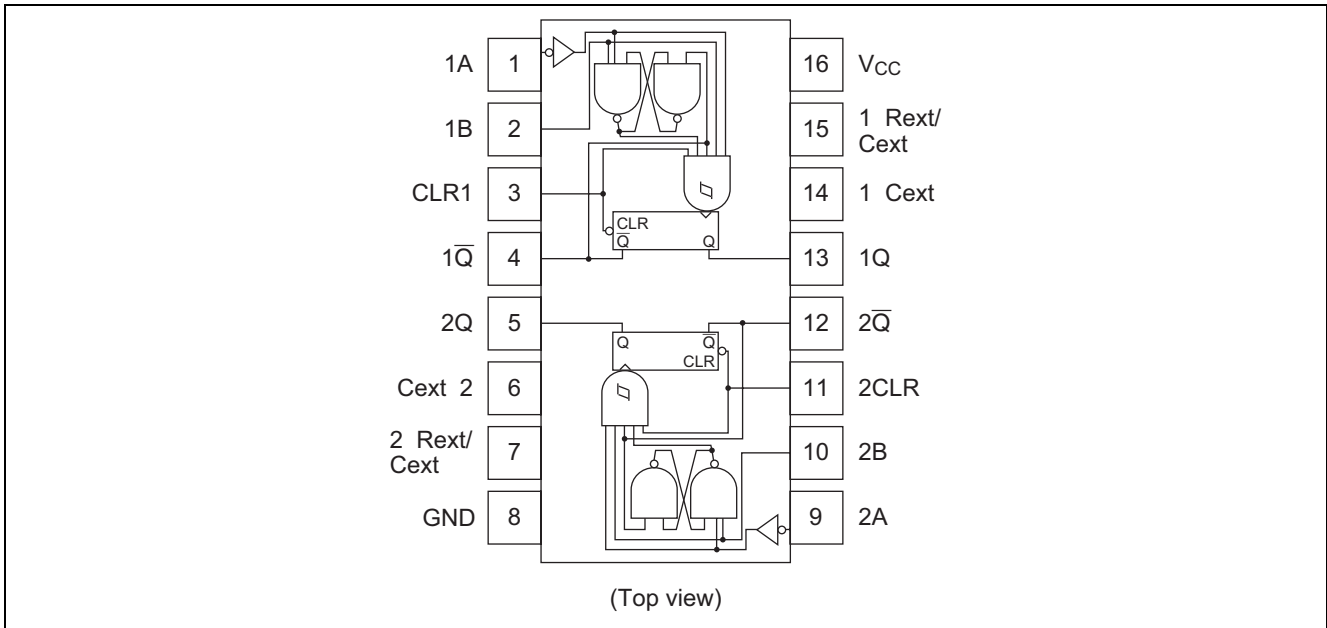
L : low level (steady state)

X : don't care

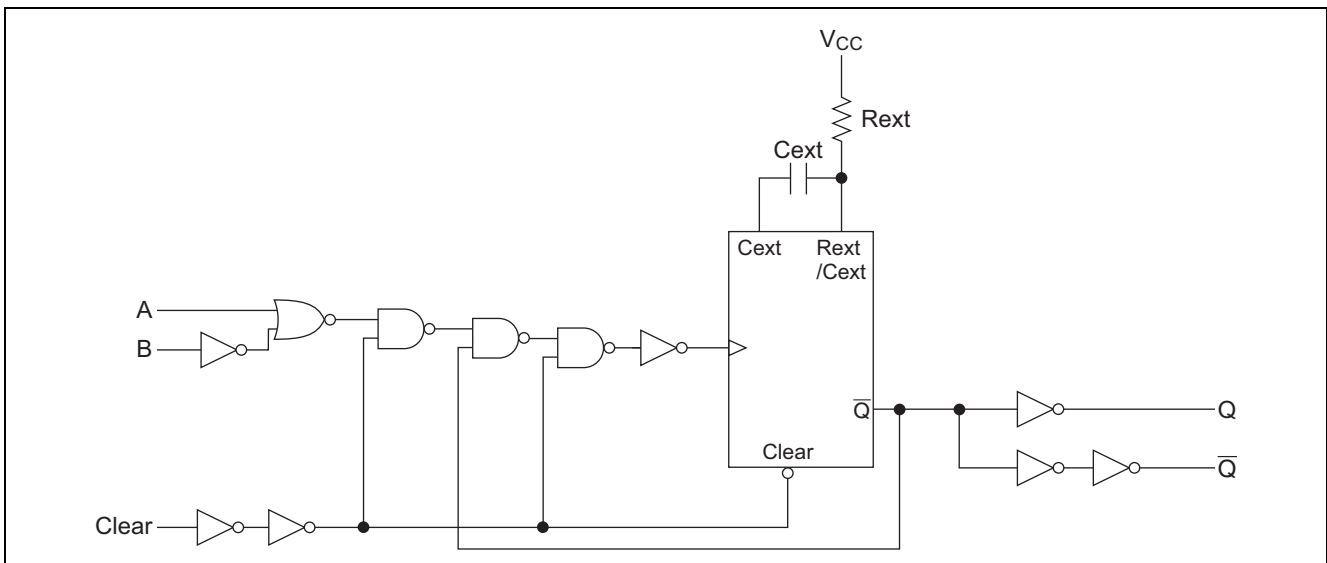
 : transition from low to high level.

 : transition from high to low level.

### Pin Arrangement



### Logic Diagram



### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V
Input / Output voltage	$V_{IN}, V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Input / Output diode current	$I_{IK}, I_{OK}$	$\pm 20$	mA
Output current	$I_O$	$\pm 25$	mA
$V_{CC}$ , GND current	$I_{CC}$ or $I_{GND}$	$\pm 50$	mA
Power dissipation	$P_T$	500	mW
Storage temperature	$T_{stg}$	-65 to +150	$^{\circ}C$

Note: 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.

## Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	$V_{CC}$	2 to 6	V	
Input / Output voltage	$V_{IN}, V_{OUT}$	0 to $V_{CC}$	V	
Operating temperature	$T_a$	-40 to 85	°C	
Input rise / fall time <sup>*1</sup>	$t_r, t_f$	0 to 1000	ns	$V_{CC} = 2.0\text{ V}$
		0 to 500		$V_{CC} = 4.5\text{ V}$
		0 to 400		$V_{CC} = 6.0\text{ V}$

Notes: 1. This item guarantees maximum limit when one input switches.

Waveform: Refer to test circuit of switching characteristics.

## Electrical Characteristics

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40\text{ to }+85^\circ\text{C}$		Unit	Test Conditions		
			Min	Typ	Max	Min	Max				
Input voltage	$V_{IH}$	2.0	1.5	—	—	1.5	—	V			
		4.5	3.15	—	—	3.15	—				
		6.0	4.2	—	—	4.2	—				
	$V_{IL}$	2.0	—	—	0.5	—	0.5	V			
		4.5	—	—	1.35	—	1.35				
		6.0	—	—	1.8	—	1.8				
Output voltage	$V_{OH}$	2.0	1.9	2.0	—	1.9	—	V	$V_{in} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\ \mu\text{A}$	
		4.5	4.4	4.5	—	4.4	—			$I_{OH} = -4\ \text{mA}$	
		6.0	5.9	6.0	—	5.9	—			$I_{OH} = -5.2\ \text{mA}$	
		4.5	4.18	—	—	4.13	—				
		6.0	5.68	—	—	5.63	—				
	$V_{OL}$	2.0	—	0.0	0.1	—	0.1	V	$V_{in} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\ \mu\text{A}$	
		4.5	—	0.0	0.1	—	0.1				
		6.0	—	0.0	0.1	—	0.1				
		4.5	—	—	0.26	—	0.33			$I_{OL} = 4\ \text{mA}$	
		6.0	—	—	0.26	—	0.33			$I_{OL} = 5.2\ \text{mA}$	
Input current	$I_{in}$	6.0	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	$V_{in} = V_{CC}$ or GND		
Quiescent supply current	$I_{CC}$	6.0	—	—	130	—	220	$\mu\text{A}$	$V_{in} = V_{CC}$ or GND	$I_{out} = 0\ \mu\text{A}$	
		6.0	—	—	130	—	220			$R_{ext}/C_{ext} = 0.5V_{CC}$	

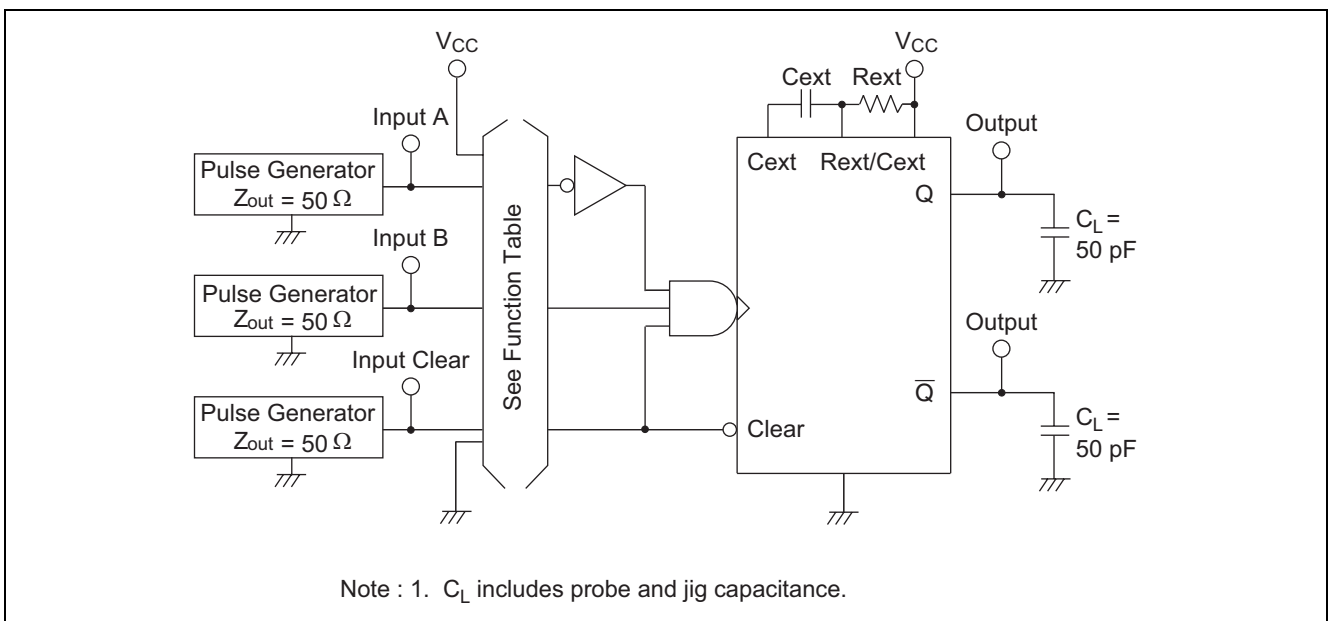
Switching Characteristics

( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

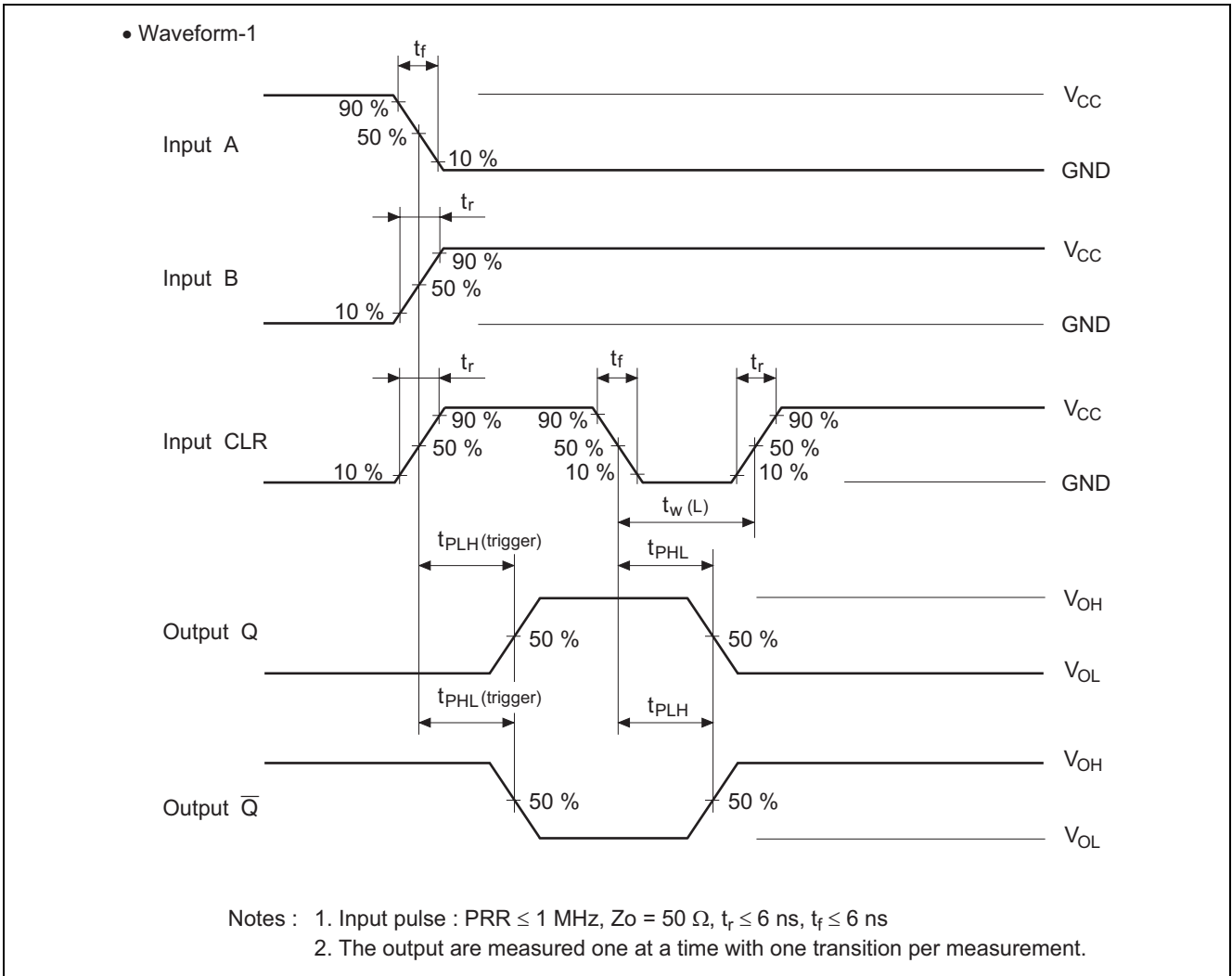
Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Trigger propagation delay time	$t_{PLH}$	2.0	—	—	210	—	265	ns	A, B or Clear to Q	
		4.5	—	—	42	—	53			
		6.0	—	—	36	—	45			
	$t_{PHL}$	2.0	—	—	240	—	300	ns	A, B or Clear to $\bar{Q}$	
		4.5	—	—	48	—	60			
		6.0	—	—	41	—	51			
Propagation delay time	$t_{PHL}$	2.0	—	—	170	—	215	ns	Clear to Q	
		4.5	—	—	34	—	43			
		6.0	—	—	29	—	37			
	$t_{PLH}$	2.0	—	—	180	—	225	ns	Clear to $\bar{Q}$	
		4.5	—	—	36	—	45			
		6.0	—	—	31	—	38			
Pulse width	$t_w$	2.0	80	—	—	100	—	ns	A, B, Clear	
		4.5	16	—	—	20	—			
		6.0	14	—	—	17	—			
Minimum output pulse width	$t_{WQ}(\text{min})$	2.0	—	1.5	—	—	—	$\mu\text{s}$	Cext = 28 pF	Rext = 6 k $\Omega$
		4.5	—	450	—	—	—			ns
		6.0	—	380	—	—	—			
Output pulse width	$t_{WQ}$	4.5	0.63	0.7	0.77	—	—	ms	Cext = 0.1 $\mu\text{F}$ Rext = 10 k $\Omega$	
Output rise/fall time	$t_{TLH}$	2.0	—	—	75	—	95	ns		
	$t_{THL}$	4.5	—	—	15	—	19			
		6.0	—	—	13	—	16			
Input capacitance	Cin	—	—	5	10	—	10	pF		

Caution in use: In order to prevent any malfunctions due to noise, connect a high-frequency performance capacitor between  $V_{CC}$  and GND, and keep the wiring between the external components and Cext, Rext/Cext pins as short as possible.

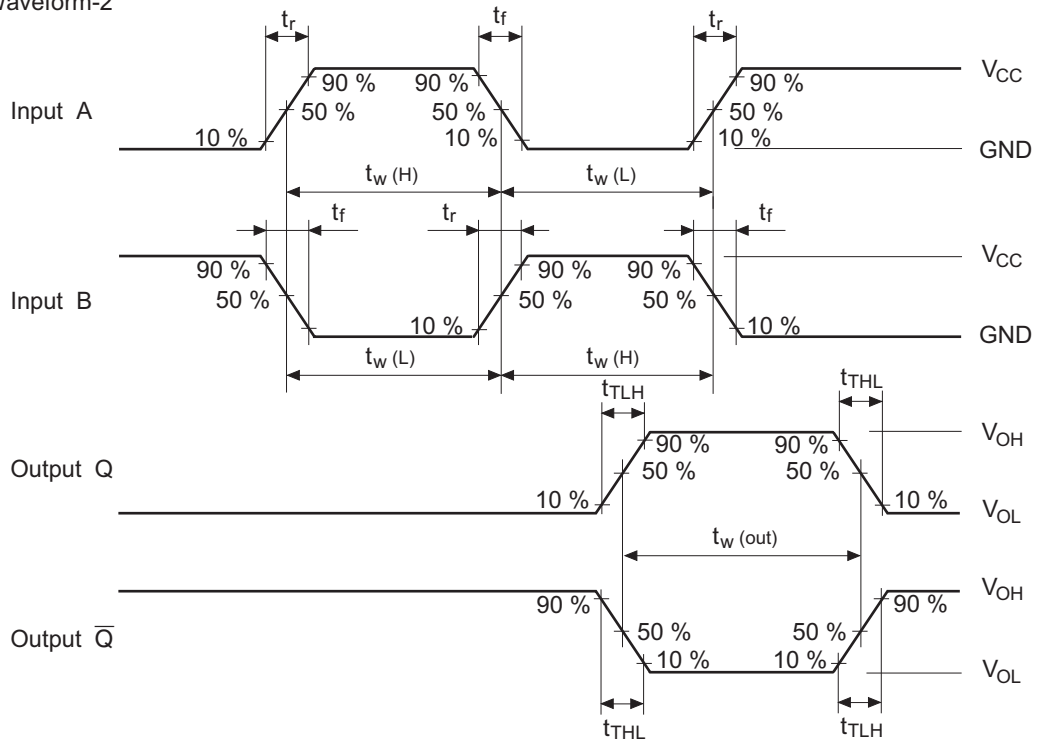
Test Circuit



Waveforms

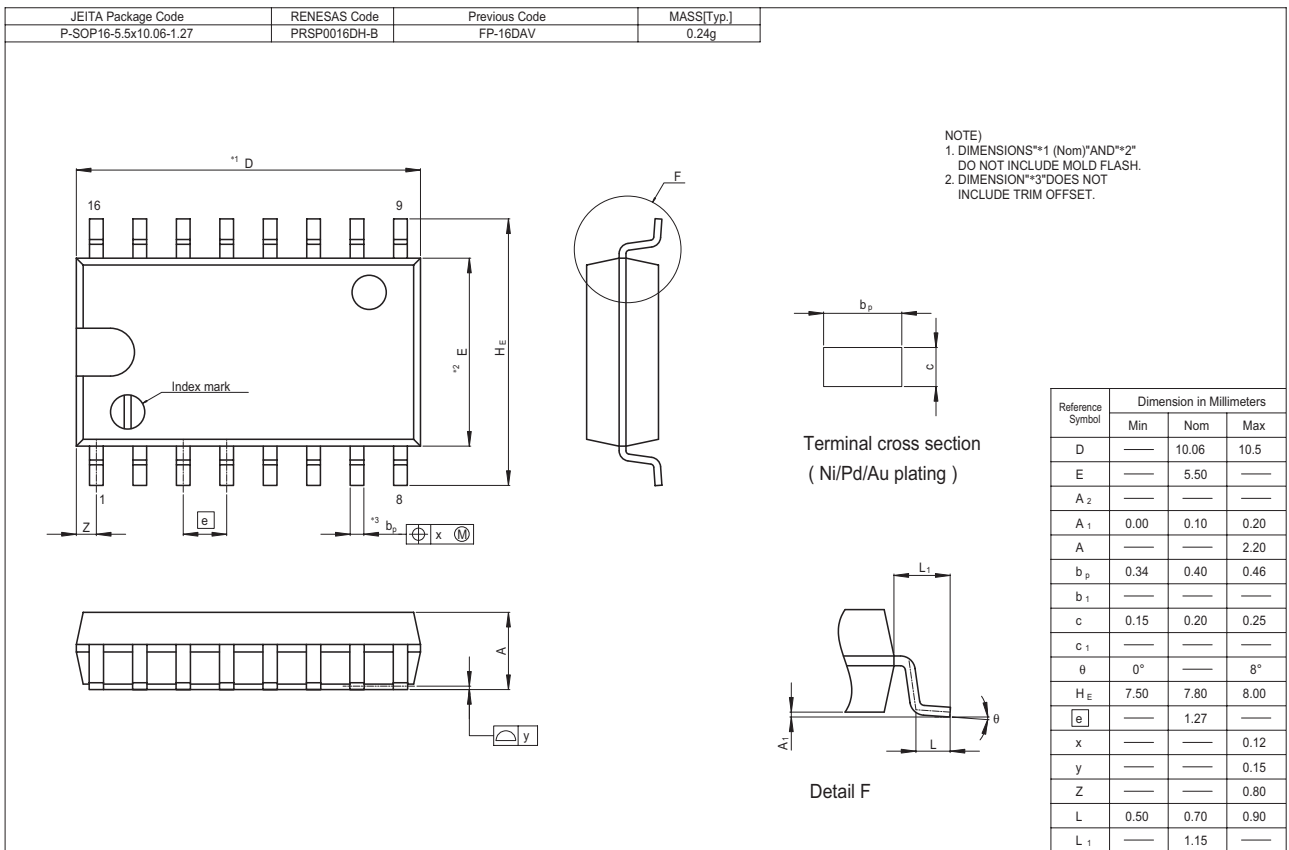
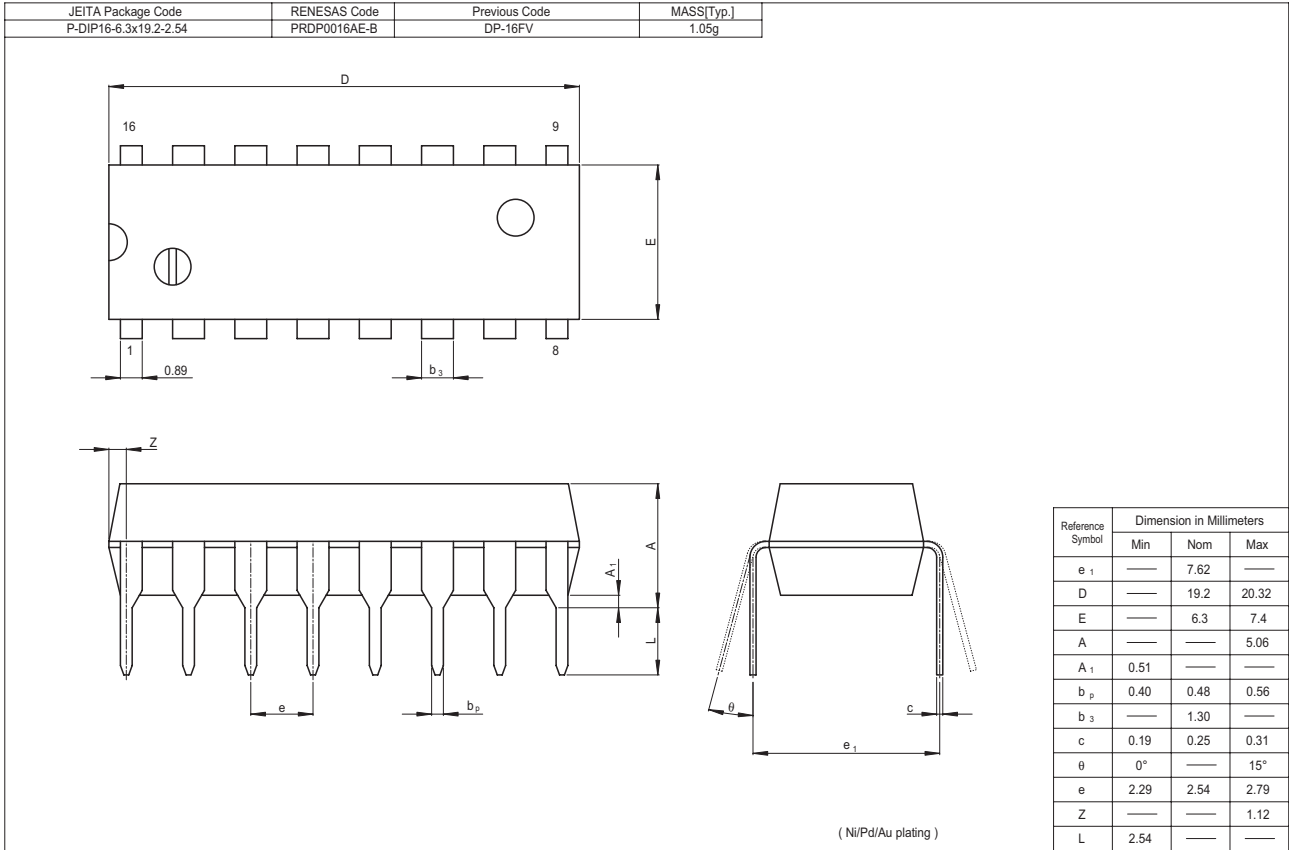


• Waveform-2



- Notes : 1. Input pulse :  $PRR \leq 1 \text{ MHz}$ ,  $Z_o = 50 \Omega$ ,  $t_r \leq 6 \text{ ns}$ ,  $t_f \leq 6 \text{ ns}$   
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions



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