

HD74HC4017

Decade Counter / Divider

REJ03D0644-0200
(Previous ADE-205-530)
Rev.2.00
Mar 30, 2006

Description

The HD74HC4017 is a 5-stage divide-by-10 Johnson counter with ten decoded outputs and a carry-out bit. High-speed operation and spike-free outputs are obtained by use of the Johnson decade counter configuration.

The ten decoded outputs are normally low and go high only at their respective decimal time periods. A high signal on Reset R asynchronously clears the decade counter and sets the carry output and Y_0 high. With $\overline{CE}$ low, the count is advanced on a low-to-high transition at C input. Alternatively, if C is high, the count is advanced on a high-to-low transition at $\overline{CE}$. Each decoded output remains high for one full clock cycle. The carry output is high while Q_0 , Q_1 , Q_2 , Q_3 or Q_4 is high, then is low while Q_5 , Q_6 , Q_7 , Q_8 or Q_9 is high.

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 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC4017P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC4017FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)
HD74HC4017RPEL	SOP-16 pin (JEDEC)	PRSP0016DG-A (FP-16DNV)	RP	EL (2,500 pcs/reel)

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

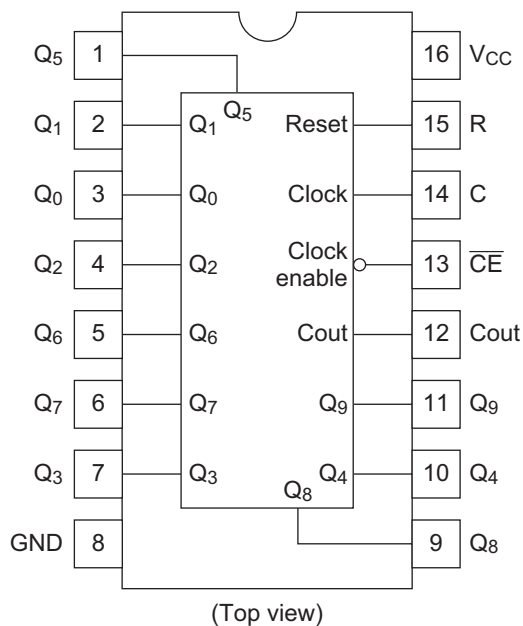
Function Table

C	$\overline{CE}$	R	Decode Output = n
L	X	L	n
X	H	L	n
X	X	H	Q_0
	L	L	n + 1
	X	L	n
X		L	n
H		L	n + 1

Notes: 1. X: Don't care

2. If $n < 5$ Carry = "H", Otherwise = "L"

Pin Arrangement



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}	± 20	mA
Output current	I_{OUT}	± 25	mA
V_{CC} , GND current	I_{CC} or I_{GND}	± 50	mA
Power dissipation	P_T	500	mW
Storage temperature	T_{stg}	-65 to +150	°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 ^{*1}	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		$V_{CC} = 6.0 \text{ V}$

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

Waveform: Refer to test circuit of switching characteristics.

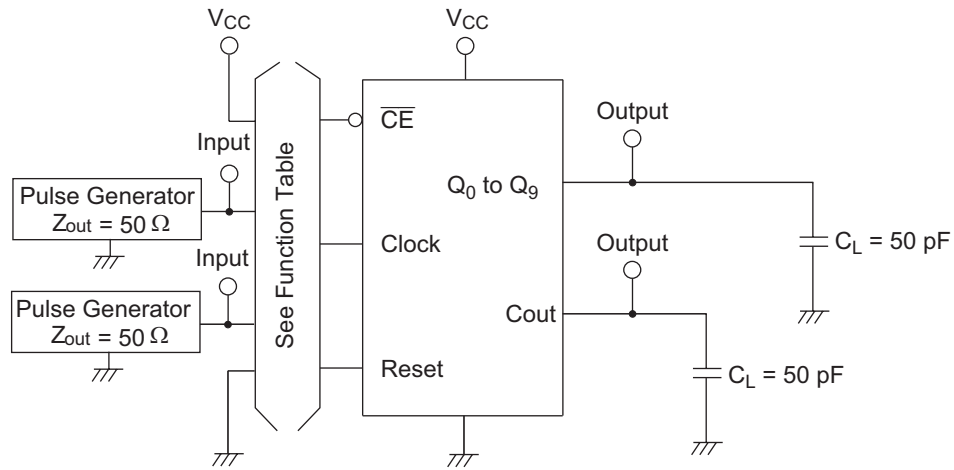
Electrical Characteristics

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°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	Vin = V _{IH} or V _{IL}	I _{OH} = -20 µA
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—		I _{OH} = -4 mA	
		6.0	5.68	—	—	5.63	—			I _{OH} = -5.2 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	Vin = V _{IH} or V _{IL}	I _{OL} = 20 µA
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	—	0.26	—	0.33		I _{OH} = 4 mA	
		6.0	—	—	0.26	—	0.33			I _{OH} = 5.2 mA
Input current	I _{in}	6.0	—	—	±0.1	—	±1.0	µA	Vin = V _{CC} or GND	
Quiescent supply current	I _{CC}	6.0	—	—	4.0	—	40	µA	Vin = V _{CC} or GND, I _{out} = 0 µA	

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

Item	Symbol	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	$f_{\max}$	2.0	—	—	6	—	5	MHz	
		4.5	—	—	31	—	27		
		6.0	—	—	36	—	31		
Propagation delay time	t_{PLH}	2.0	—	—	230	—	290	ns	C to Q
		4.5	—	20	46	—	58		
		6.0	—	—	39	—	49		
	t_{PHL}	2.0	—	—	230	—	290	ns	C to Cout
		4.5	—	19	46	—	58		
		6.0	—	—	39	—	49		
	t_{PLH}	2.0	—	—	250	—	315	ns	$\overline{CE}$ to Q
		4.5	—	21	50	—	63		
		6.0	—	—	43	—	54		
	t_{PHL}	2.0	—	—	250	—	315	ns	$\overline{CE}$ to Cout
		4.5	—	20	50	—	63		
		6.0	—	—	43	—	54		
	t_{PLH}	2.0	—	—	230	—	290	ns	R to Q
		4.5	—	18	46	—	58		
		6.0	—	—	39	—	49		
	t_{PHL}	2.0	—	—	230	—	290	ns	R to Cout
		4.5	—	13	46	—	58		
		6.0	—	—	39	—	49		
Pulse width	t_w	2.0	80	—	—	100	—	ns	
		4.5	16	5	—	20	—		
		6.0	14	—	—	17	—		
Setup time	t_{su}	2.0	75	—	—	95	—	ns	
		4.5	15	5	—	19	—		
		6.0	13	—	—	16	—		
Hold time	t_h	2.0	50	—	—	65	—	ns	
		4.5	10	4	—	13	—		
		6.0	9	—	—	11	—		
Removal time	t_{rem}	2.0	100	—	—	125	—	ns	
		4.5	20	−3	—	25	—		
		6.0	17	—	—	21	—		
Output rise/fall time	t_{TLH} t_{THL}	2.0	—	—	75	—	95	ns	
		4.5	—	6	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	C_{in}	—	—	5	10	—	10	pF	

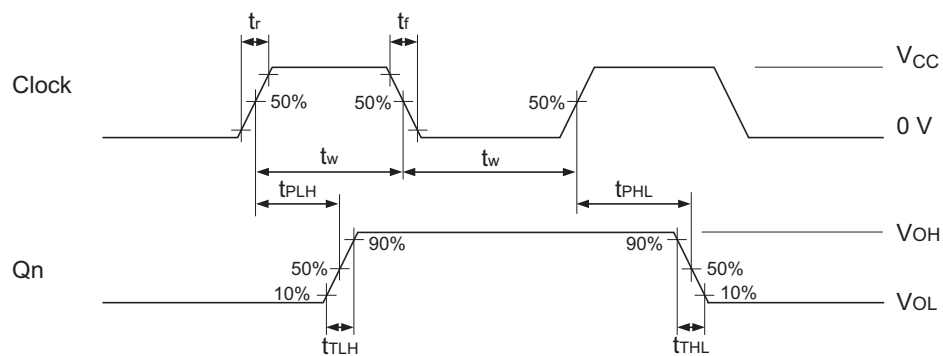
Test Circuit



Note : 1. C_L includes probe and jig capacitance.

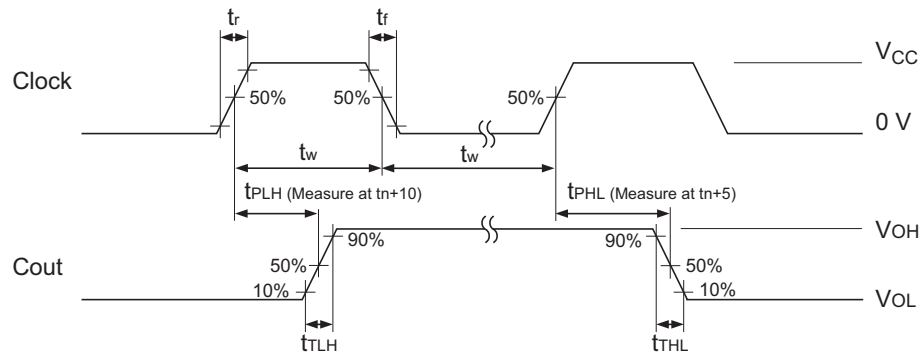
Waveforms

• Waveform – 1



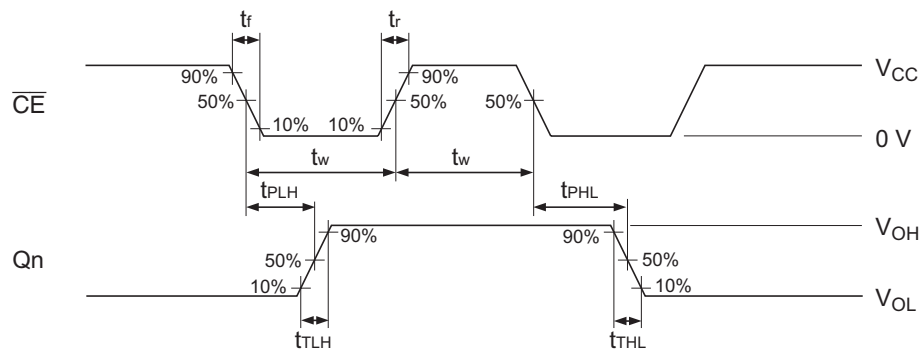
Notes : 1. Input waveform: $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$
 2. Other inputs : R = "L", $\overline{CE}$ = "L"

• Waveform – 2



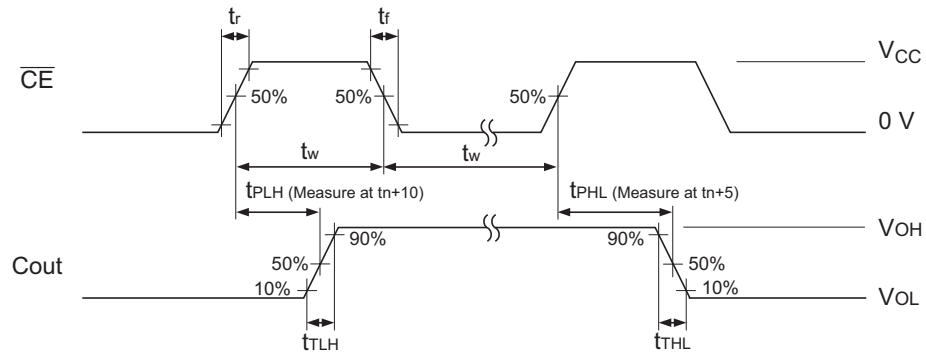
- Notes : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$
 2. Other inputs : $R = "L"$, $\overline{CE} = "L"$
 t_n is bit time with Q1 to Q9 at low.

• Waveform – 3



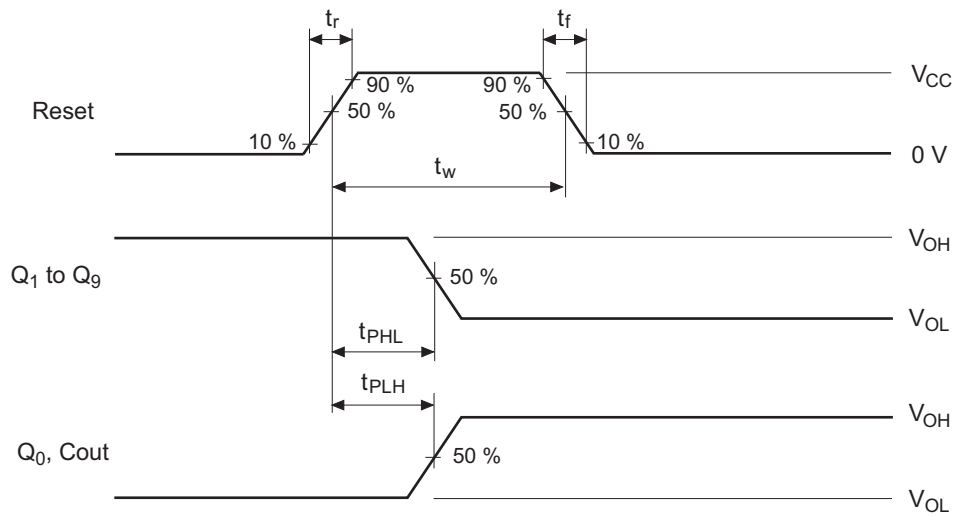
- Notes : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$
 2. Other inputs : $R = "L"$, $C = "H"$

• Waveform – 4



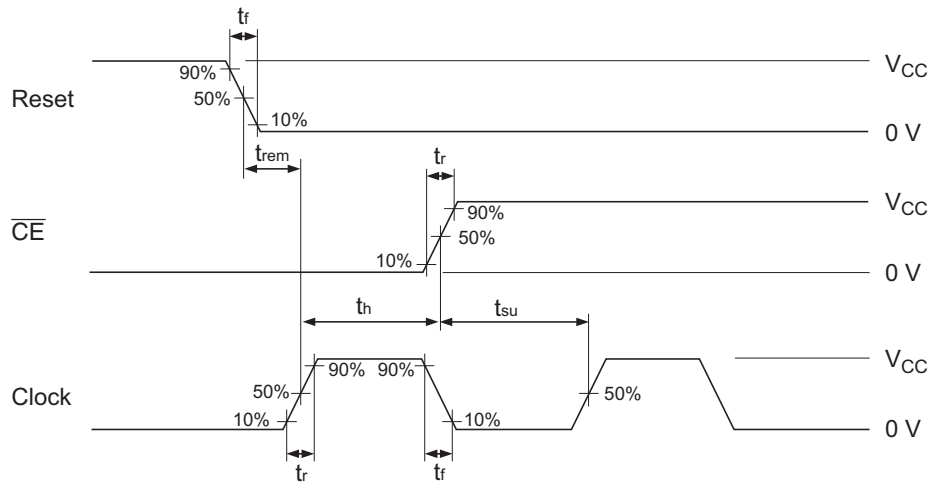
Notes : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$
 2. Other inputs : R = "L", C = "H"
 t_n is bit time with Q_1 to Q_9 at low.

• Waveform – 5



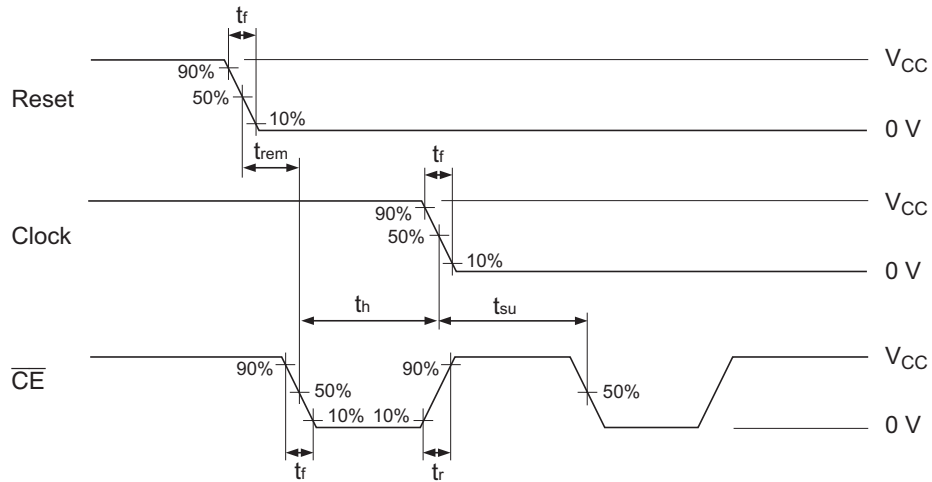
Note : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$

• Waveform – 6



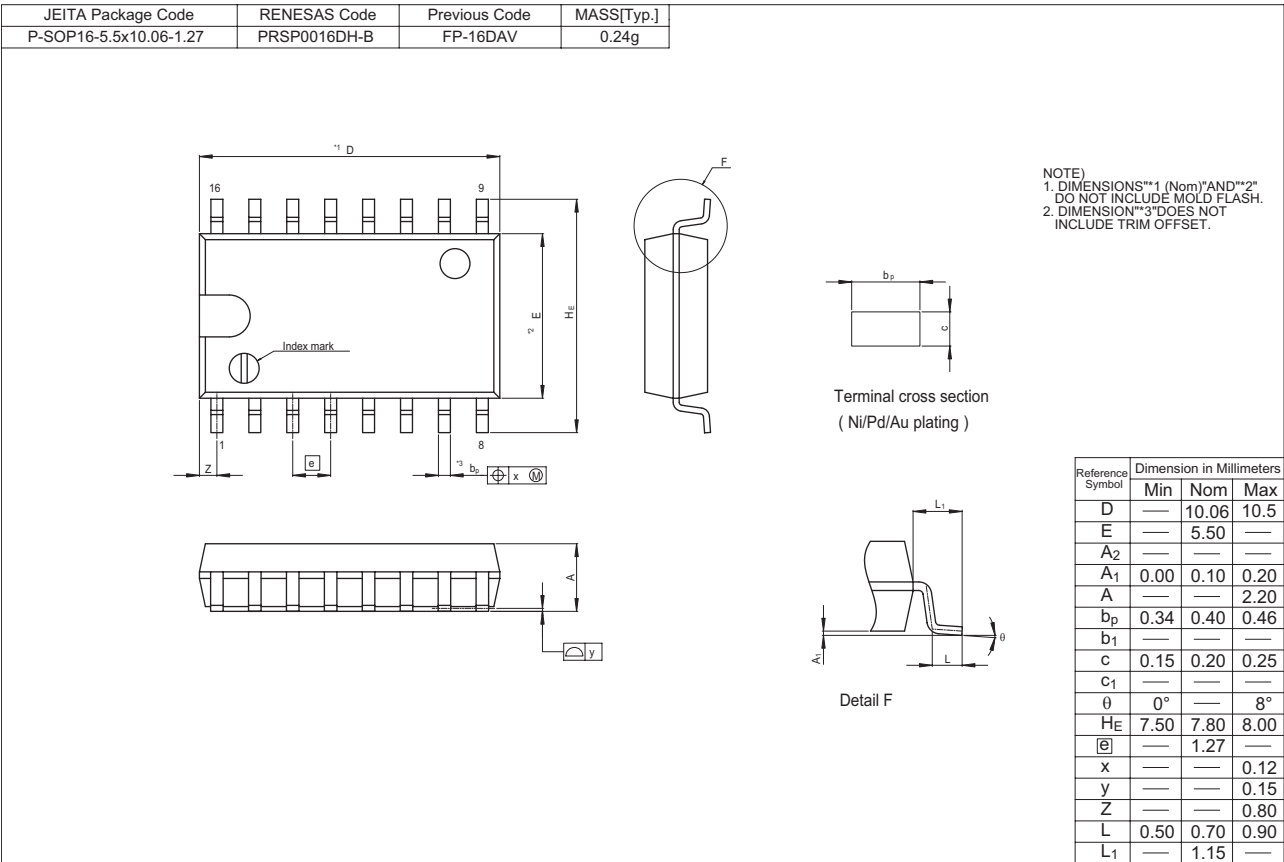
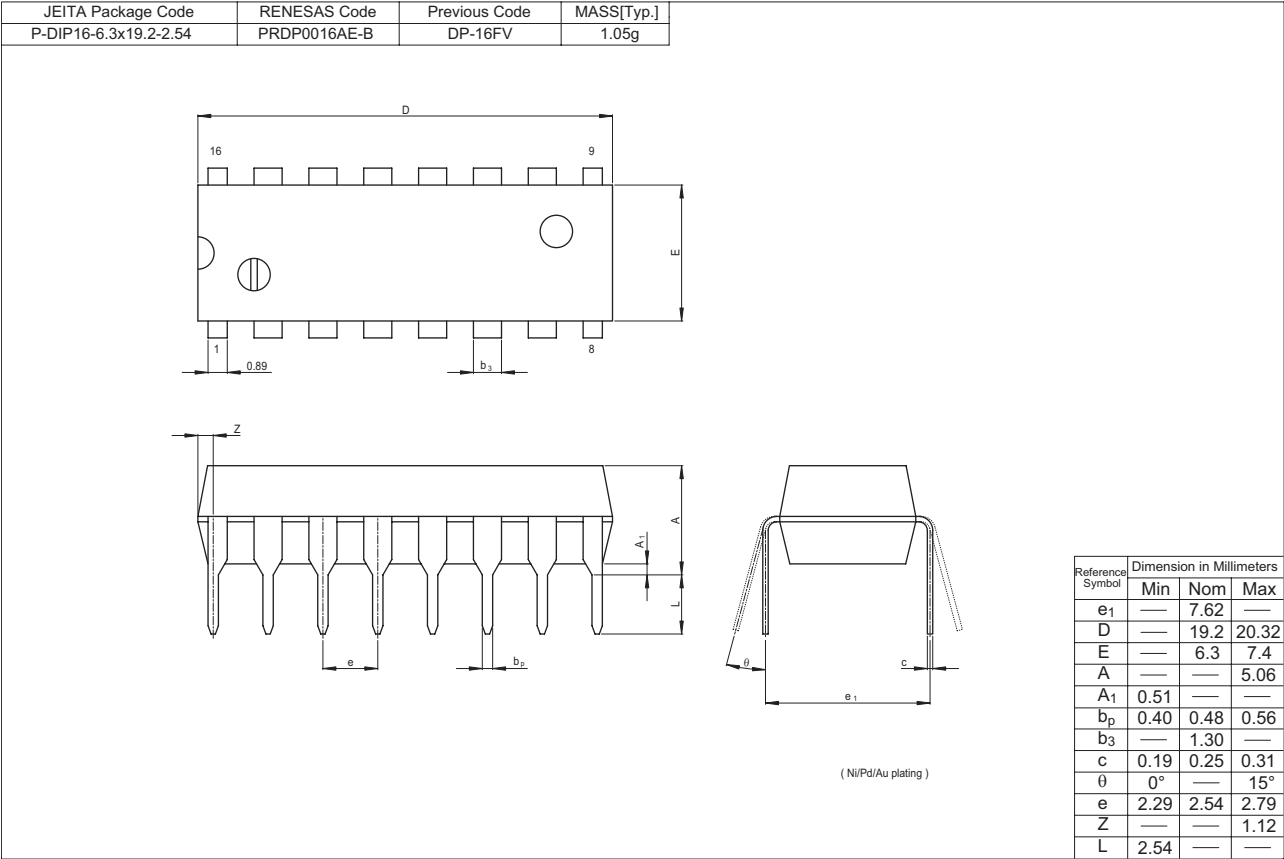
Note : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$

• Waveform – 7

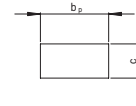
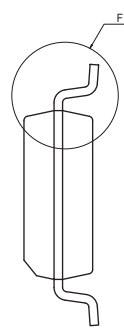
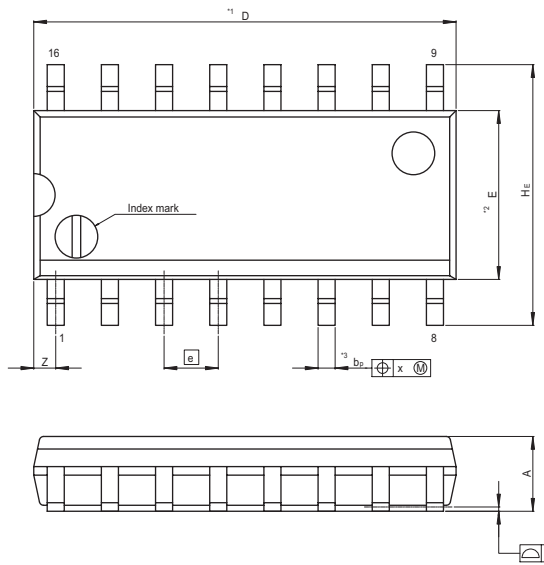


Note : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$

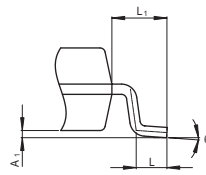
Package Dimensions



JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-3.95x9.9-1.27	PRSP0016DG-A	FP-16DNV	0.15g



Terminal cross section
(Ni/Pd/Au plating)



NOTE)
1. DIMENSIONS**1 (Nom)**AND**2*
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION**3*DOES NOT
INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	9.90	10.30
E	—	3.95	—
A ₂	—	—	—
A ₁	0.10	0.14	0.25
A	—	—	1.75
b _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	5.80	6.10	6.20
⓪	—	1.27	—
x	—	—	0.25
y	—	—	0.15
z	—	—	0.635
L	0.40	0.60	1.27
L ₁	—	1.08	—

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