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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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HD74HC4020

14-stage Binary Counter

REJ03D0645-0200
 (Previous ADE-205-531)
 Rev.2.00
 Mar 30, 2006

Description

The HD74HC4020 is a 14 stage counter. This device is incremented on the falling edge (negative transition) of the input clock, and all its output is reset to a low level by applying a logical high on its reset input.



Features

- High Speed Operation: t_{pd} (Clock to Q_1) = 14 ns typ ($C_L = 50$ pF)
- 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)
HD74HC4020P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC4020FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)

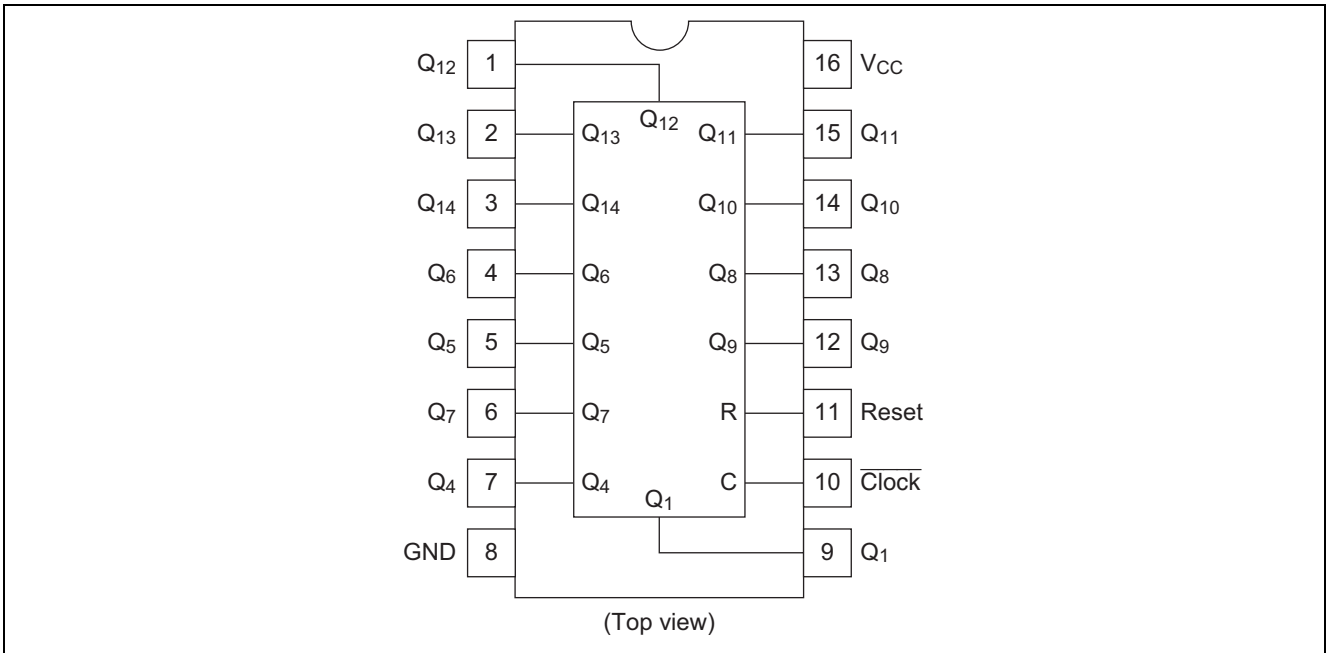
Note: Please consult the sales office for the above package availability.

Function Table

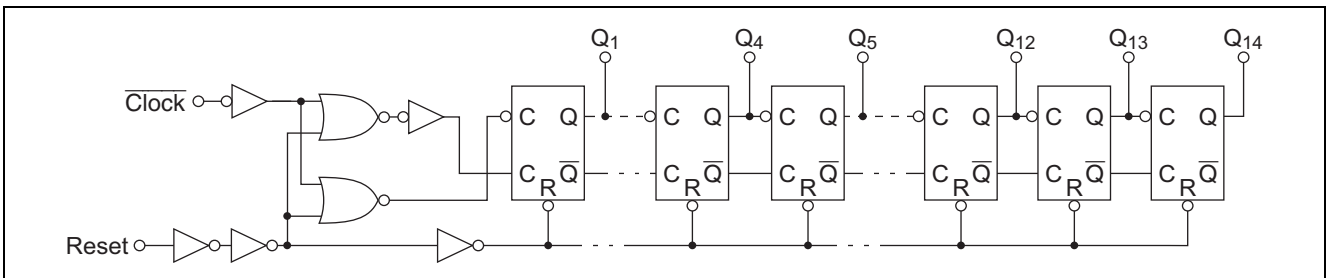
Clock	Reset	Outputs State
	L	No change
	L	Advance to next state
X	H	All output are low

Note: 1. X: Don't care

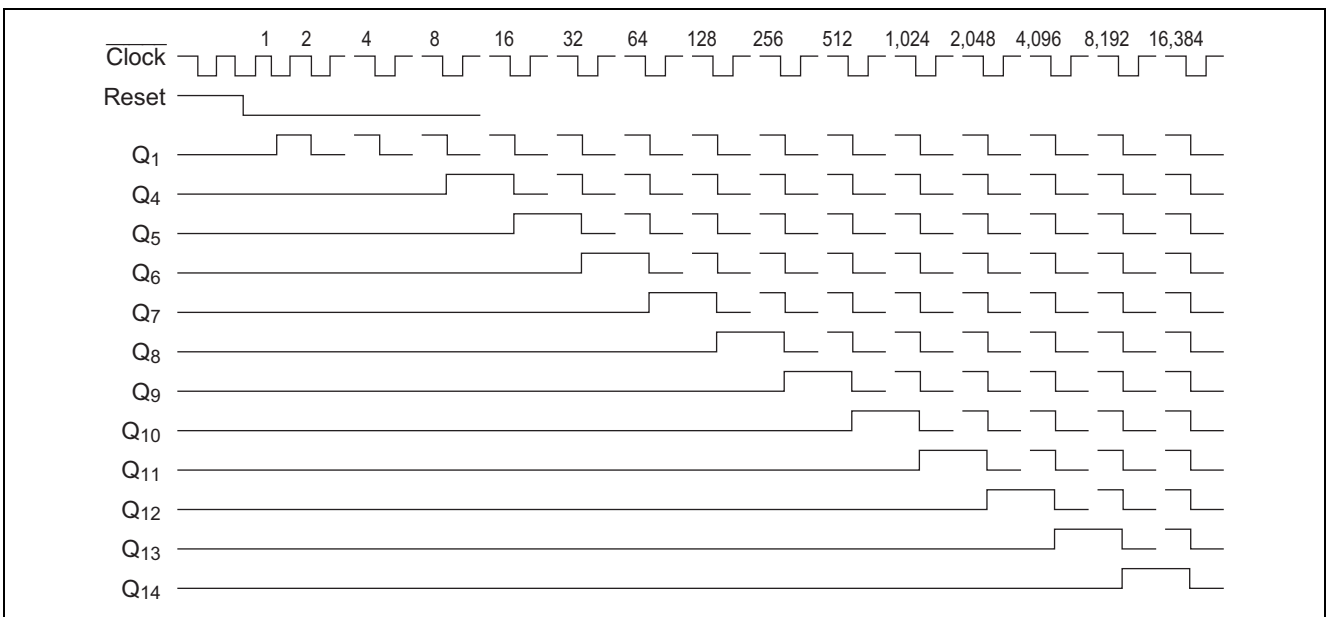
Pin Arrangement



Block Diagram



Timing 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}	± 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	$V_{CC} = 2.0$ V
		0 to 500		$V_{CC} = 4.5$ V
		0 to 400		$V_{CC} = 6.0$ V

Note: 1. This item guarantees maximum limit when one input switches.
Waveform: Refer to test circuit of switching characteristics.

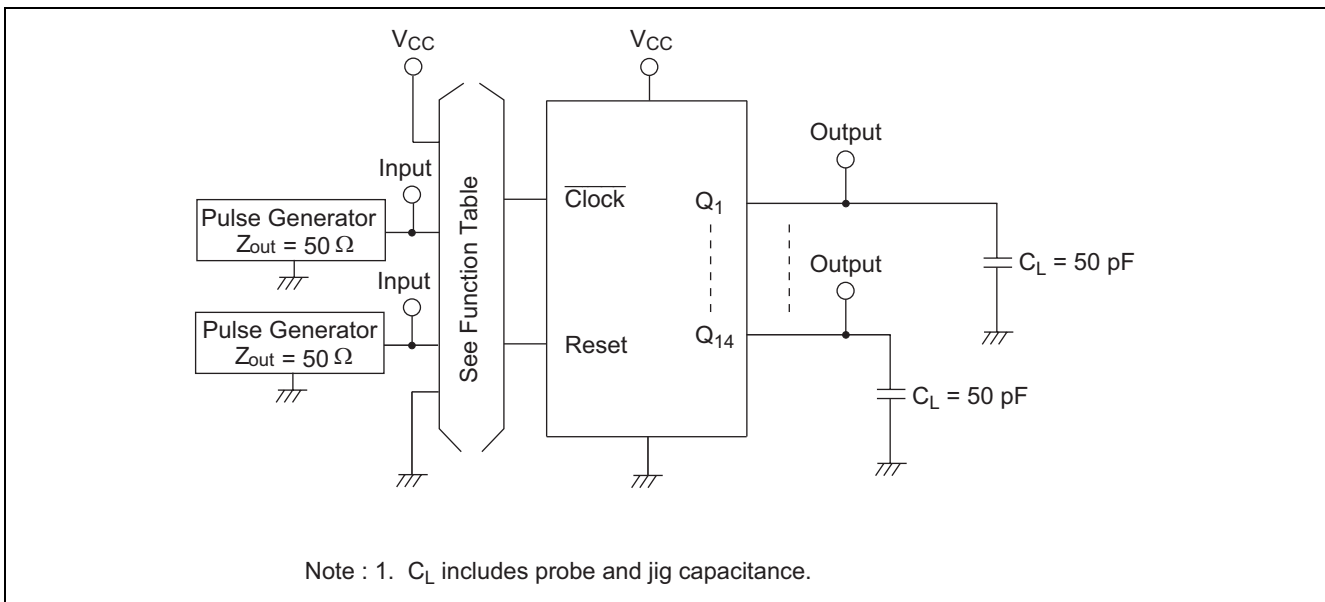
Electrical Characteristics

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		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				$I_{OH} = 4 \text{ mA}$
		6.0	—	—	0.26	—	0.33				$I_{OH} = 5.2 \text{ mA}$
Input current	I_{in}	6.0	—	—	± 0.1	—	± 1.0	μA	$V_{in} = V_{CC}$ or GND		
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	μA	$V_{in} = V_{CC}$ or GND, $I_{out} = 0 \mu\text{A}$		

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

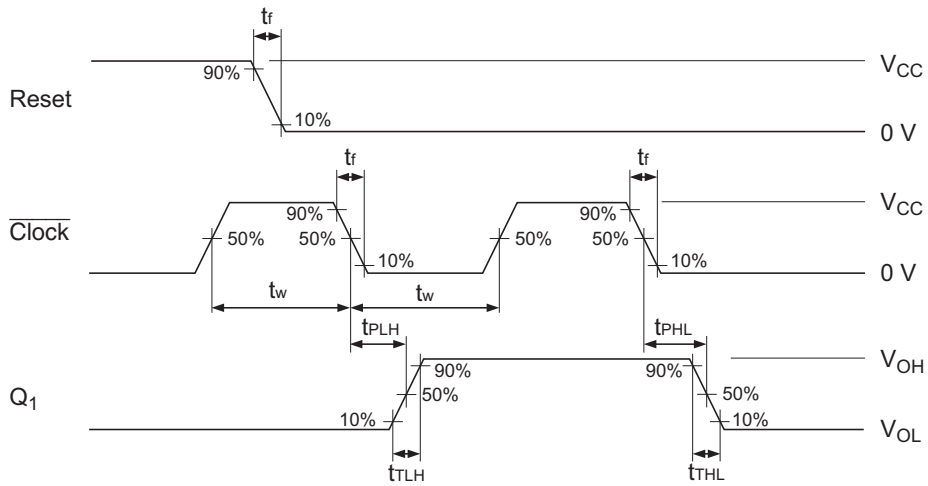
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Maximum clock frequency	f_{max}	2.0	—	—	5	—	4	MHz		
		4.5	—	—	25	—	20			
		6.0	—	—	29	—	24			
Propagation delay time	t_{PLH}	2.0	—	—	175	—	220	ns	Clock to Q_1	
		4.5	—	14	35	—	44			
		6.0	—	—	30	—	37			
	t_{PHL}	2.0	—	—	175	—	220	ns	Clock to Q_1	
		4.5	—	14	35	—	44			
		6.0	—	—	30	—	37			
	t_{PLH}	t_{PHL}	2.0	—	—	200	—	250	ns	Reset to output
			4.5	—	18	40	—	50		
			6.0	—	—	34	—	43		
	t_{PLH}	t_{PHL}	2.0	—	—	100	—	125	ns	Q_n to Q_{n-1}
			4.5	—	—	20	—	25		
			6.0	—	—	17	—	21		
Removal time	t_{rem}	2.0	100	—	—	125	—	ns		
		4.5	20	6	—	25	—			
		6.0	17	—	—	21	—			
Pulse width	t_w	2.0	80	—	—	100	—	ns		
		4.5	16	4	—	20	—			
		6.0	14	—	—	17	—			
Output rise/fall time	t_{TLH} t_{THL}	2.0	—	—	75	—	95	ns		
		4.5	—	5	15	—	19			
		6.0	—	—	13	—	16			
Input capacitance	C_{in}	—	—	5	10	—	10	pF		

Test Circuit



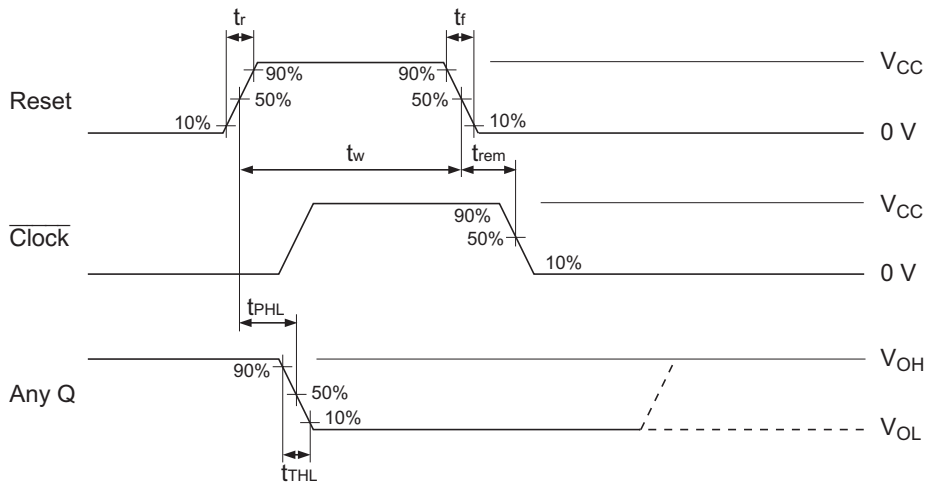
Waveforms

• Waveform – 1



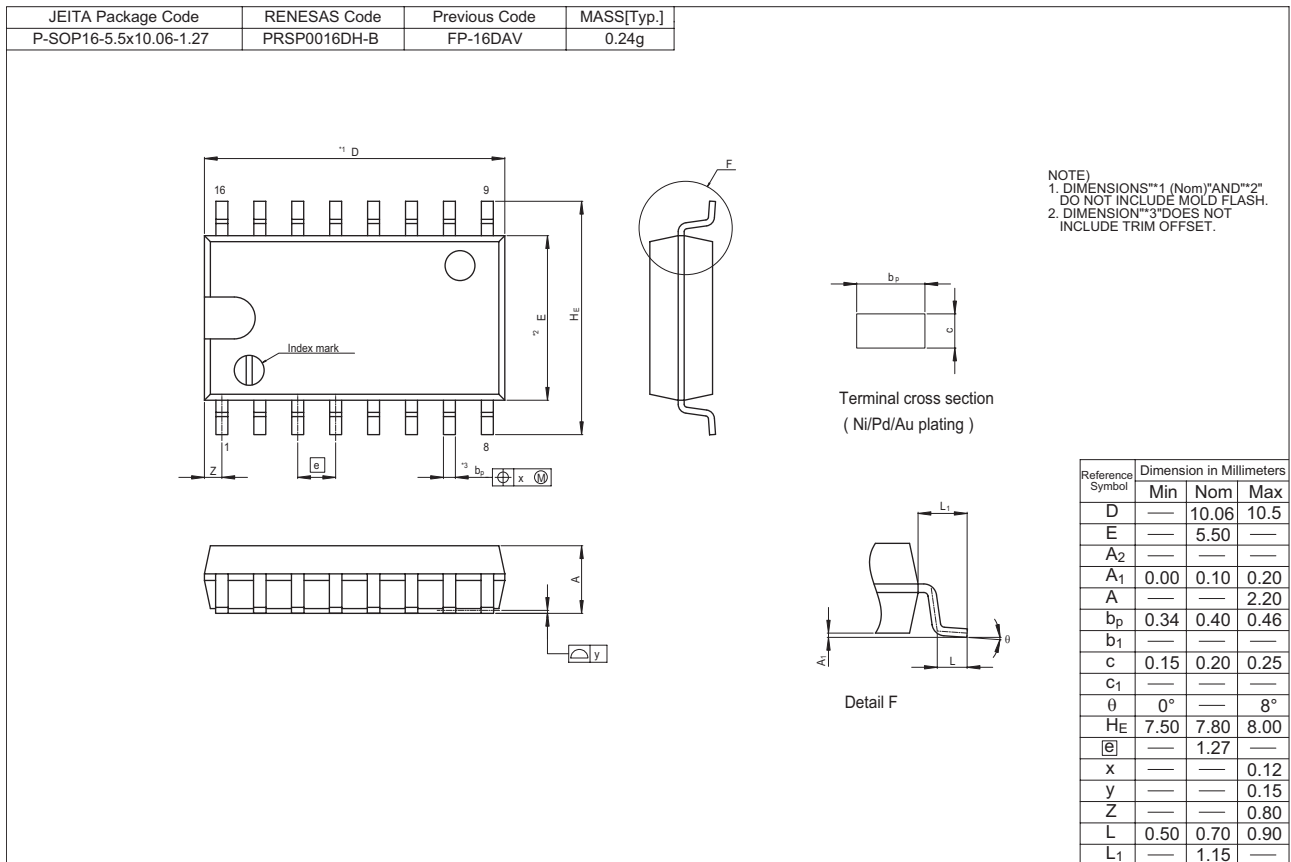
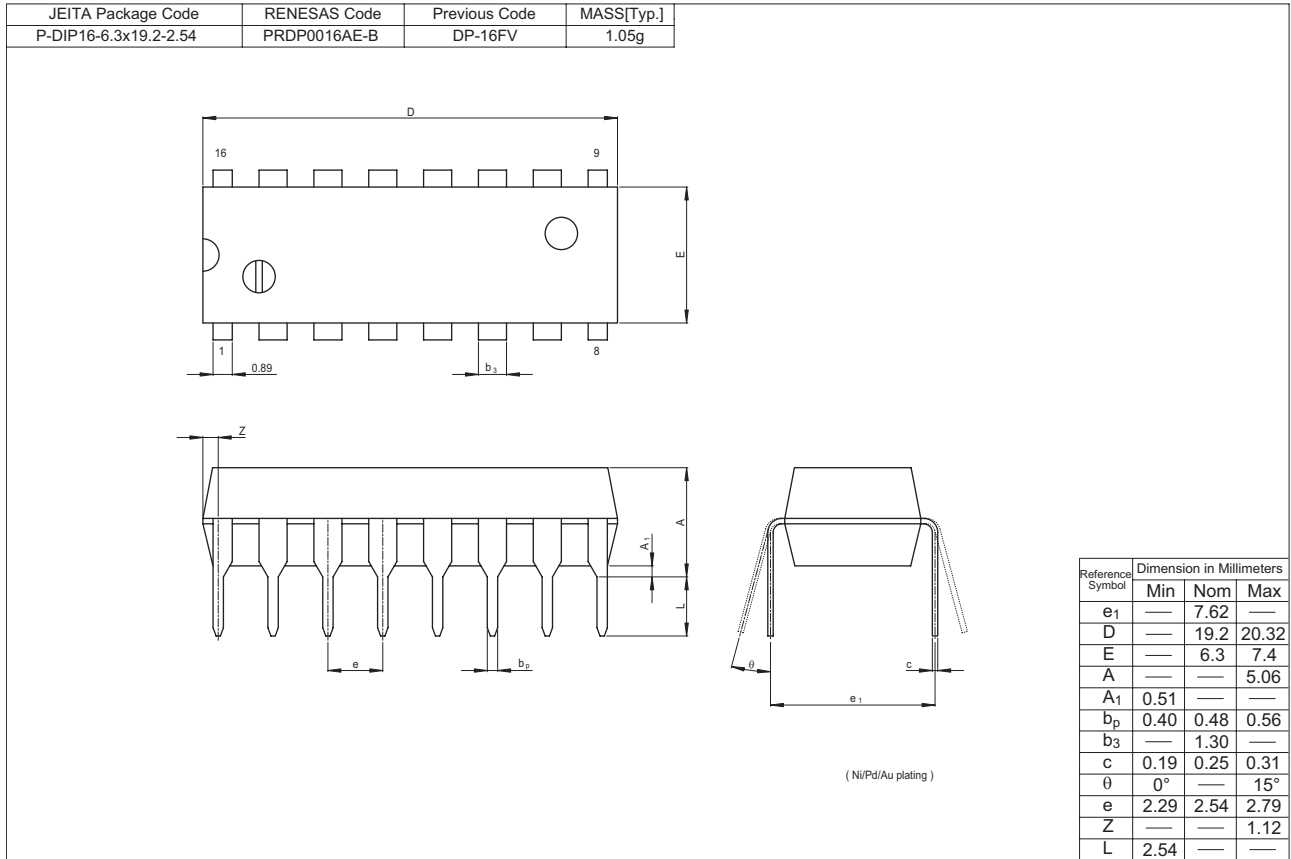
Note : 1. Waveform : $PRR \leq 1 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 6 \text{ ns}$, $t_f \leq 6 \text{ ns}$

• Waveform – 2



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

Package Dimensions



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Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology (Shanghai) Co., Ltd.

Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

Renesas Technology Hong Kong Ltd.

7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.

10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology Singapore Pte. Ltd.

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.

Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510