To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

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HD74HC292/HD74HC294

Programmable Frequency Divider/Digital Timer

REJ03D0608–0200
(Previous ADE-205-486)
Rev.2.00
Jan 31, 2006

Description

This device divides the incoming clock frequency by a number (a power of 2) that is preset by the Programming inputs. It has two Clock inputs, either of which may be used as a clock inhibit. The device also has an active-low Reset, which initializes the internal flip-flop states. Test Point outputs (TP1, TP2, TP3) are provided with HD74HC292 to facilitate incoming inspections.

Test Point output is provided with HD74HC294 to facilitate incoming inspections.

Features

- High Speed Operation: t_{pd} (Clock to Q) = 16 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 µA max
- Low Quiescent Supply Current: I_{CC} (static) = 4 µA max (Ta = 25°C)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC292P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC294FPEL	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

$\overline{CLR}$	CLK1	CLK2	Q Output Mode
L	X	X	Cleared to L
H	↓	L	Count
H	L	↓	Count
H	H	X	Inhibit
H	X	H	Inhibit

H : high level
L : low level

HD74HC292

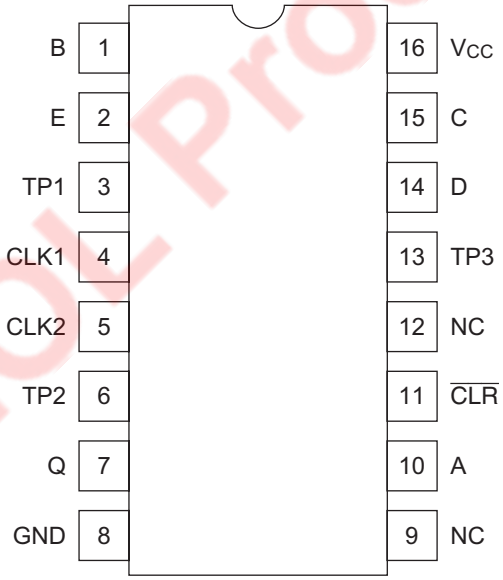
Programming Inputs					Frequency Division							
					Q Out		TP1		TP2		TP3	
E	D	C	B	A	Binary	Decimal	Binary	Decimal	Binary	Decimal	Binary	Decimal
L	L	L	L	L	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	L	H	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	H	L	2^2	4	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	L	H	H	2^3	8	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	L	L	2^4	16	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	L	H	2^5	32	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	H	L	2^6	64	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	L	H	H	H	2^7	128	2^9	512	2^{17}	131,072	2^{24}	16,777,216
L	H	L	L	L	2^8	256	2^9	512	2^{17}	131,072	2^2	4
L	H	L	L	H	2^9	512	2^9	512	2^{17}	131,072	2^2	4
L	H	L	H	L	2^{10}	1,024	2^9	512	2^{17}	131,072	2^4	16
L	H	L	H	H	2^{11}	2,048	2^9	512	2^{17}	131,072	2^4	16
L	H	H	L	L	2^{12}	4,096	2^9	512	2^{17}	131,072	2^6	64
L	H	H	L	H	2^{13}	8,192	2^9	512	2^{17}	131,072	2^6	64
L	H	H	H	L	2^{14}	16,384	2^9	512	Disabled LOW		2^8	256
L	H	H	H	H	2^{15}	32,768	2^9	512	Disabled LOW		2^8	256
H	L	L	L	L	2^{16}	65,536	2^9	512	2^3	8	2^{10}	1,024
H	L	L	L	H	2^{17}	131,072	2^9	512	2^3	8	2^{10}	1,024
H	L	L	H	L	2^{18}	262,144	2^9	512	2^5	32	2^{12}	4,096
H	L	L	H	H	2^{19}	524,288	2^9	512	2^5	32	2^{12}	4,096
H	L	H	L	L	2^{20}	1,048,576	2^9	512	2^7	128	2^{14}	16,384
H	L	H	L	H	2^{21}	2,097,152	2^9	512	2^7	128	2^{14}	16,384
H	L	H	H	L	2^{22}	4,194,304	Disabled LOW		2^9	512	2^{16}	65,536
H	L	H	H	H	2^{23}	8,388,608	Disabled LOW		2^9	512	2^{16}	65,536
H	H	L	L	L	2^{24}	16,777,216	2^3	8	2^{11}	2,048	2^{18}	262,144
H	H	L	L	H	2^{25}	33,554,432	2^3	8	2^{11}	2,048	2^{18}	262,144
H	H	L	H	L	2^{26}	67,108,864	2^5	32	2^{13}	8,192	2^{20}	1,048,576
H	H	L	H	H	2^{27}	134,217,728	2^5	32	2^{13}	8,192	2^{20}	1,048,576
H	H	H	L	L	2^{28}	268,435,456	2^7	128	2^{15}	32,768	2^{22}	4,194,304
H	H	H	L	H	2^{29}	536,870,912	2^7	128	2^{15}	32,768	2^{22}	4,194,304
H	H	H	H	L	2^{30}	1,073,741,824	2^9	512	2^{17}	131,072	2^{24}	16,777,216
H	H	H	H	H	2^{31}	2,147,483,648	2^9	512	2^{17}	131,072	2^{24}	16,777,216

HD74HC294

Programming Inputs				Frequency Division			
				Q Output		TP Output	
D	C	B	A	Binary	Decimal	Binary	Decimal
L	L	L	L	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	H	Inhibit	Inhibit	Inhibit	Inhibit
L	L	H	L	2^2	4	2^9	512
L	L	H	H	2^3	8	2^9	512
L	H	L	L	2^4	16	2^9	512
L	H	L	H	2^5	32	2^9	512
L	H	H	L	2^6	64	2^9	512
L	H	H	H	2^7	128	Disabled LOW	
H	L	L	L	2^8	256	2^2	4
H	L	L	H	2^9	512	2^3	8
H	L	H	L	2^{10}	1,024	2^4	16
H	L	H	H	2^{11}	2,048	2^5	32
H	H	L	L	2^{12}	4,096	2^6	64
H	H	L	H	2^{13}	8,192	2^7	128
H	H	H	L	2^{14}	16,384	2^8	256
H	H	H	H	2^{15}	32,768	2^9	512

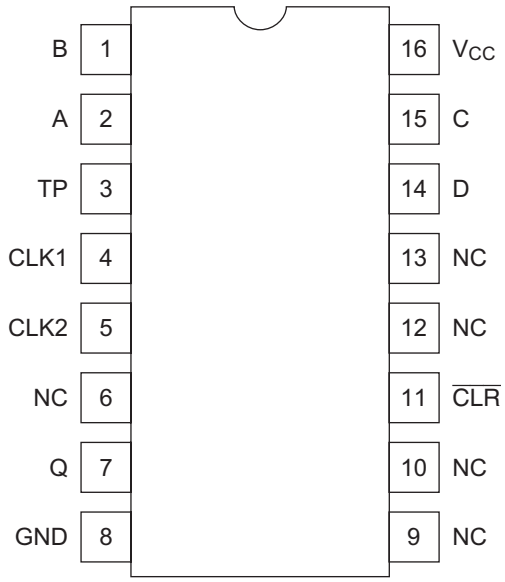
Pin Arrangement

- HD74HC292



(Top view)

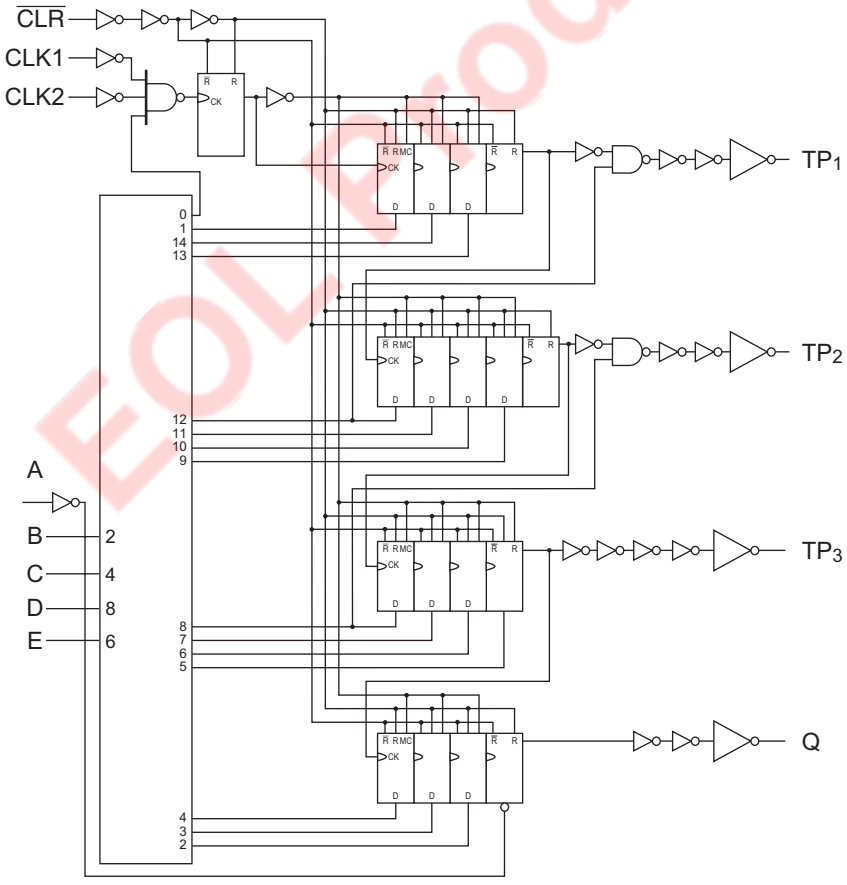
- HD74HC294



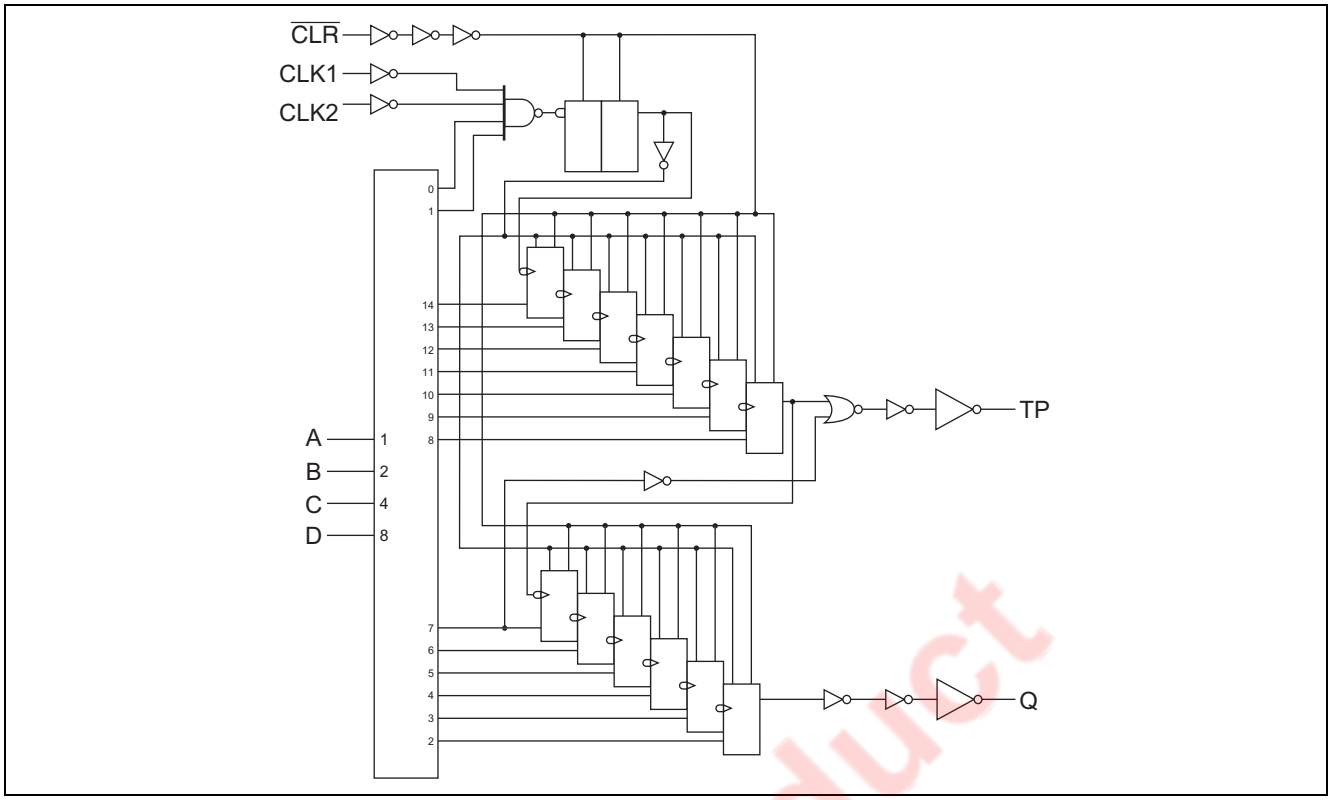
(Top view)

Logic Diagram

- HD74HC292



- HD74HC294



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_O	±25	mA
V_{CC}, GND current	I_{CC} or I_{GND}	±50	mA
Power dissipation	P_T	500	mW
Storage temperature	Tstg	–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	Ta	–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

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)	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		
	V_{IL}	4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
		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_{OL} = 4 mA
		6.0	—	—	0.26	—	0.33			I_{OL} = 5.2 mA
Input current	Iin	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, Iout = 0 µA	

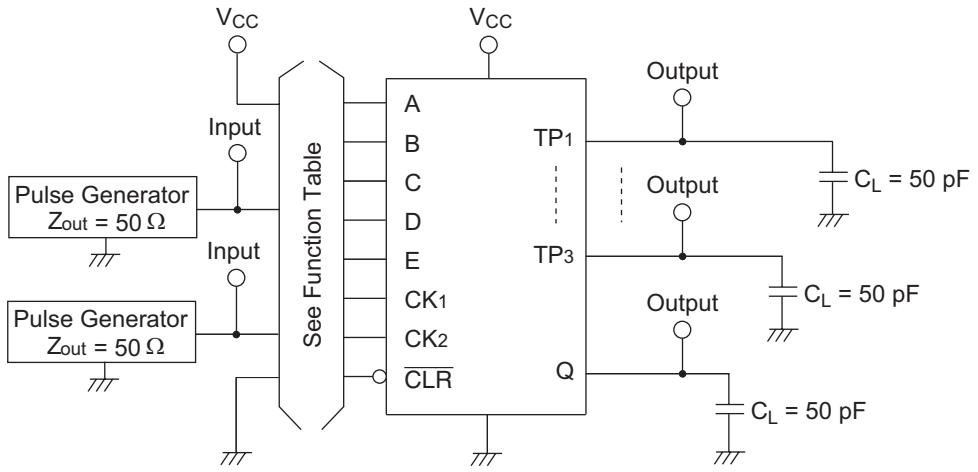
Switching Characteristics

(C_L = 50 pF, Input t_r = t_f = 6 ns)

Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Maximum clock frequency	f_{max}	2.0	—	—	5	—	4	MHz	
		4.5	—	—	27	—	21		
		6.0	—	—	31	—	24		
Propagation delay time	t_{PLH}	2.0	—	—	600	—	750	ns	Clock to output
		4.5	—	16	120	—	150		
		6.0	—	—	100	—	125		
Removal time	t_{rem}	2.0	100	—	—	125	—	ns	
		4.5	20	–4	—	25	—		
		6.0	17	—	—	21	—		
Pulse width	t_w	2.0	80	—	—	100	—	ns	
		4.5	16	14	—	20	—		
		6.0	14	–	—	17	—		
Output rise/fall time	t_{TLH}	2.0	—	—	75	—	95	ns	
	t_{THL}	4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	Cin	—	—	—	5	10	—	10	pF	

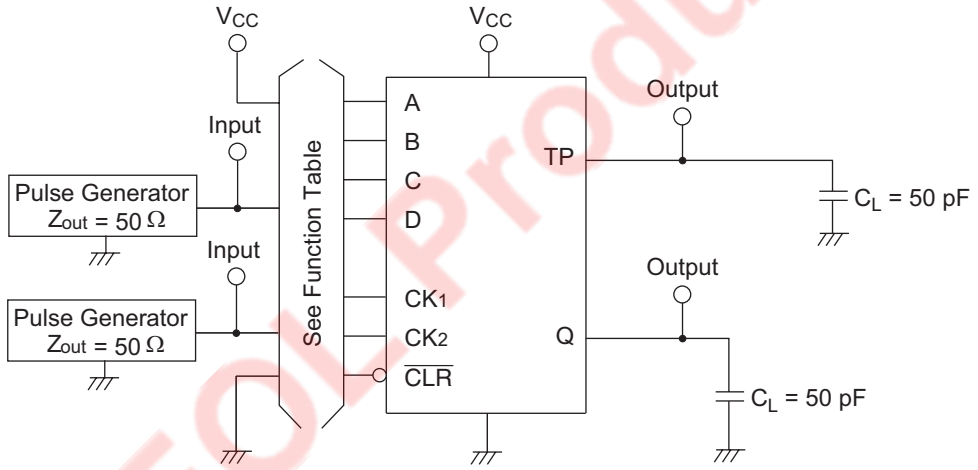
Test Circuit

- HD74HC292



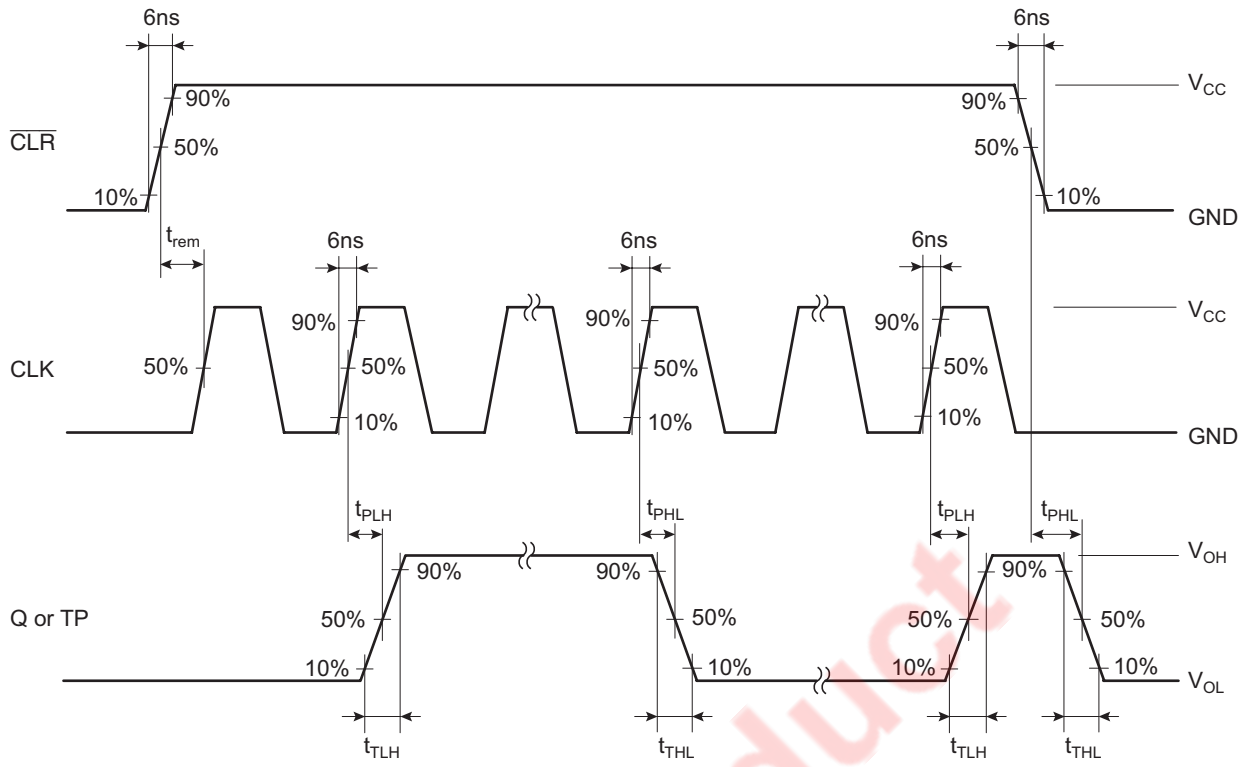
Note : 1. C_L includes probe and jig capacitance.

- HD74HC294



Note : 1. C_L includes probe and jig capacitance.

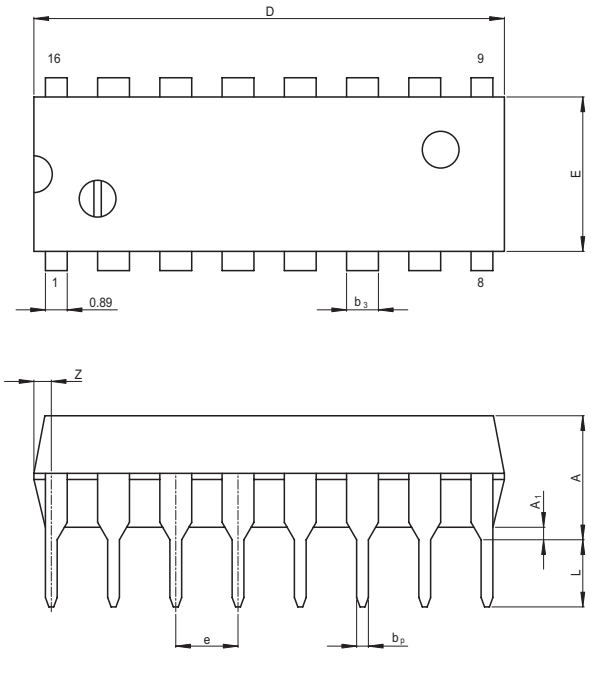
Waveforms



Note : 1. Input pulse : PRR≤1MHz, duty cycle 50%, $t_r \leq 6ns$, $t_f \leq 6ns$

Package Dimensions

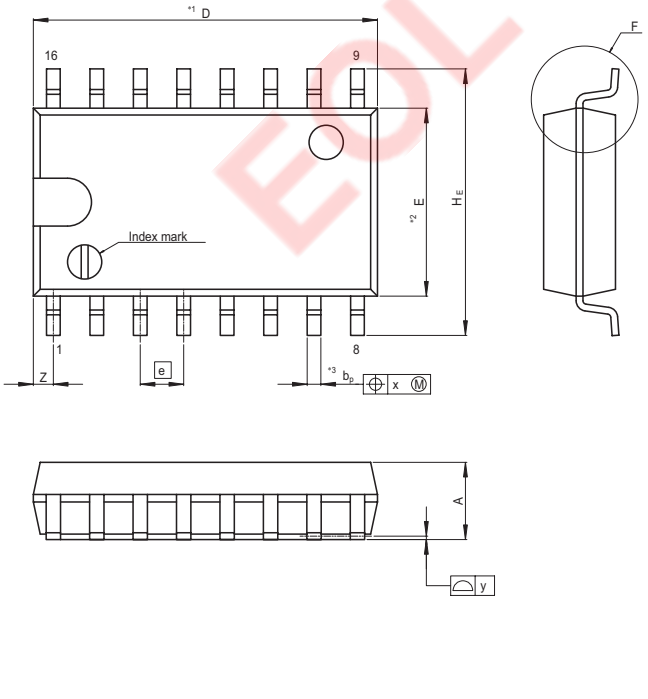
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP16-6.3x19.2-2.54	PRDP0016AE-B	DP-16FV	1.05g

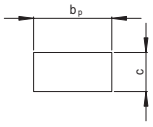


Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e 1	——	7.62	——
D	——	19.2	20.32
E	——	6.3	7.4
A	——	——	5.06
A 1	0.51	——	——
b p	0.40	0.48	0.56
b 3	——	1.30	——
c	0.19	0.25	0.31
θ	0°	——	15°
e	2.29	2.54	2.79
Z	——	——	1.12
L	2.54	——	——

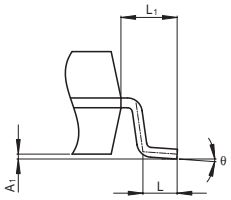
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g

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





Terminal cross section
(Ni/Pd/Au plating)



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	——	10.06	10.5
E	——	5.50	——
A 2	——	——	——
A 1	0.00	0.10	0.20
A	——	——	2.20
b p	0.34	0.40	0.46
b 1	——	——	——
c	0.15	0.20	0.25
c 1	——	——	——
θ	0°	——	8°
H E	7.50	7.80	8.00
e	——	1.27	——
x	——	——	0.12
y	——	——	0.15
Z	——	——	0.80
L	0.50	0.70	0.90
L 1	——	1.15	——

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