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April 1st, 2010
Renesas Electronics Corporation

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HD74LS293

4-bit Binary Counter

REJ03D0477-0300

Rev.3.00

Jul.15.2005

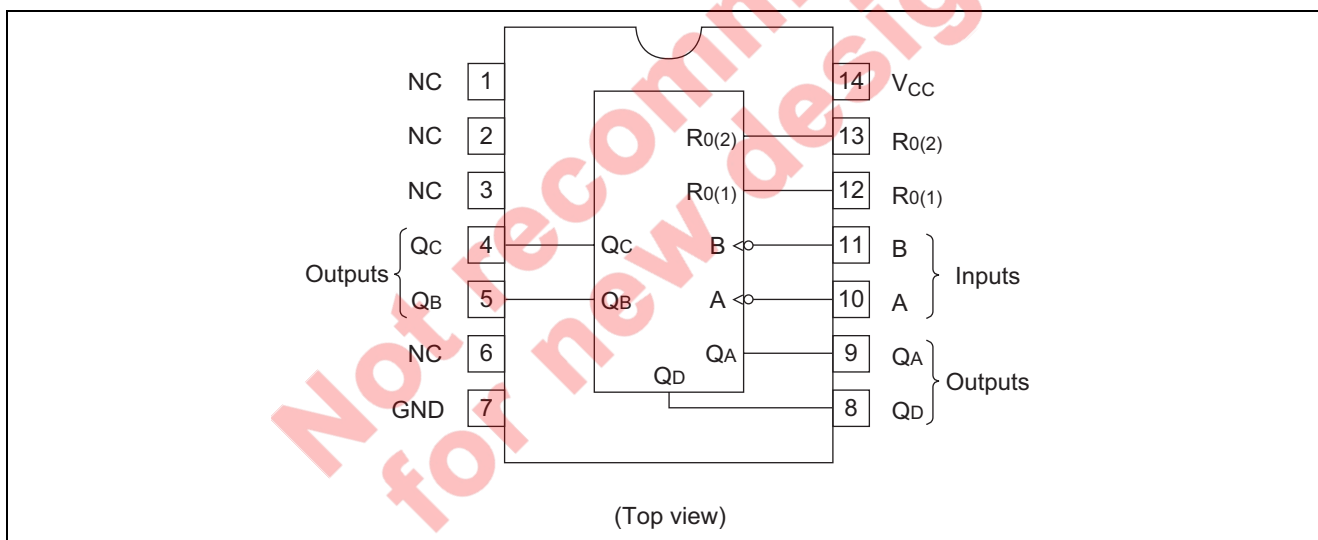
This counter contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and divide-by-eight counter. This counter has a gated zero reset. To use the maximum count length of this counter, the B input is connected to the Q_A output. The input count pulses are applied to input A and the outputs are as described in the appropriate function table.

Features

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LS293P	DILP-14 pin	PRDP0014AB-B (DP-14AV)	P	—

Pin Arrangement



Function Table

Reset / Count

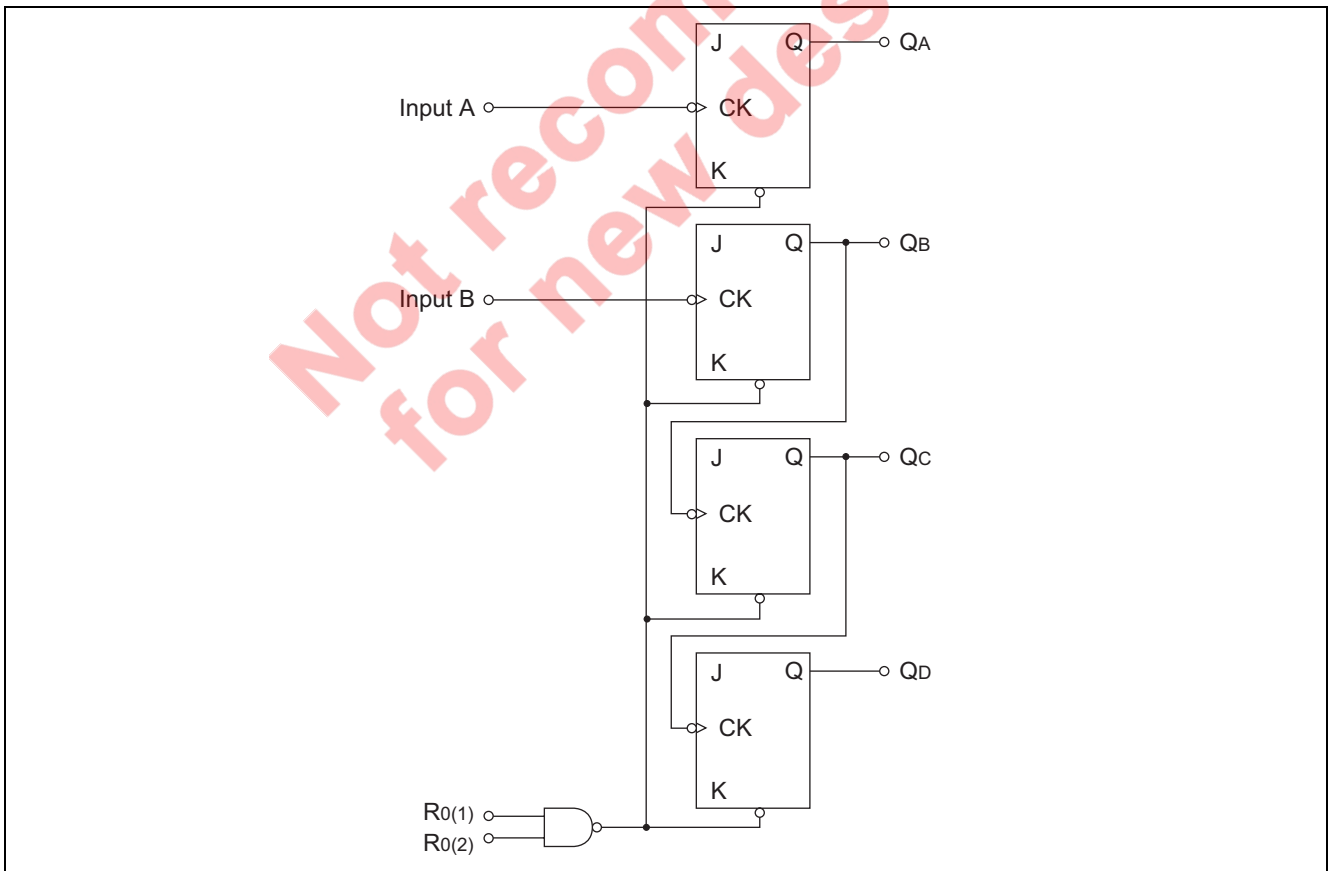
Reset Input		Outputs			
$R_0(1)$	$R_0(2)$	Q_D	Q_C	Q_B	Q_A
H	H	L	L	L	L
L	X	Count			
X	L	Count			

BCD Count Sequence

Count	Outputs			
	Q _D	Q _C	Q _B	Q _A
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H
10	H	L	H	L
11	H	L	H	H
12	H	H	L	L
13	H	H	L	H
14	H	H	H	L
15	H	H	H	H

- Notes: 1. H; high level, L; low level, X; irrelevant
 2. Output Q_A is connected to input B.

Block Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	V_{CC}	7	V
Input voltage	R_0 Inputs	7	V
	A, B Inputs	5.5	V
Power dissipation	P_T	400	mW
Operating temperature	T_{opr}	-20 to +75	°C
Storage temperature	T_{stg}	-65 to +150	°C

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	
Supply voltage	V_{CC}	4.75	5.00	5.25	V	
Output current	I_{OH}	—	—	-400	μA	
	I_{OL}	—	—	8	mA	
Operating temperature	T_{opr}	-20	25	75	°C	
Count frequency	A input	f_{count}	0	—	32	MHz
	B input		0	—	16	
Pulse width	A input	t_w	15	—	—	ns
	B input		30	—	—	
	Reset inputs		15	—	—	
Setup time	t_{su}	25	—	—	ns	

Electrical Characteristics

($T_a = -20$ to $+75$ °C)

Item	Symbol	min.	typ.*	max.	Unit	Condition
Input voltage	V_{IH}	2.0	—	—	V	
	V_{IL}	—	—	0.8	V	
Output voltage	V_{OH}	2.7	—	—	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = -400$ μA
	V_{OL}	—	—	0.4	V	$I_{OL} = 4$ mA**
		—	—	0.5	V	$I_{OL} = 8$ mA**
Input current	Any Reset	—	—	20	μA	$V_{CC} = 5.25$ V, $V_I = 2.7$ V
	A input	—	—	40		
	B input	—	—	40		
	Any Reset	—	—	-0.4	mA	$V_{CC} = 5.25$ V, $V_I = 0.4$ V
	A input	—	—	-2.4		
	B input	—	—	-1.6		
	Any Reset	—	—	0.1	mA	$V_I = 7$ V
A input	—	—	0.2			
B input	—	—	0.2			
Short-circuit output current	I_{OS}	-20	—	-100	mA	$V_{CC} = 5.25$ V
Supply current***	I_{CC}	—	9	15	mA	$V_{CC} = 5.25$ V
Input clamp voltage	V_{IK}	—	—	-1.5	V	$V_{CC} = 4.75$ V, $I_{IN} = -18$ mA

Notes: * $V_{CC} = 5$ V, $T_a = 25$ °C

** Q_A output is tested at specified I_{OL} plus the limit value of I_{IL} for the B input. This permits driving the B input while maintaining full fan-out capability.

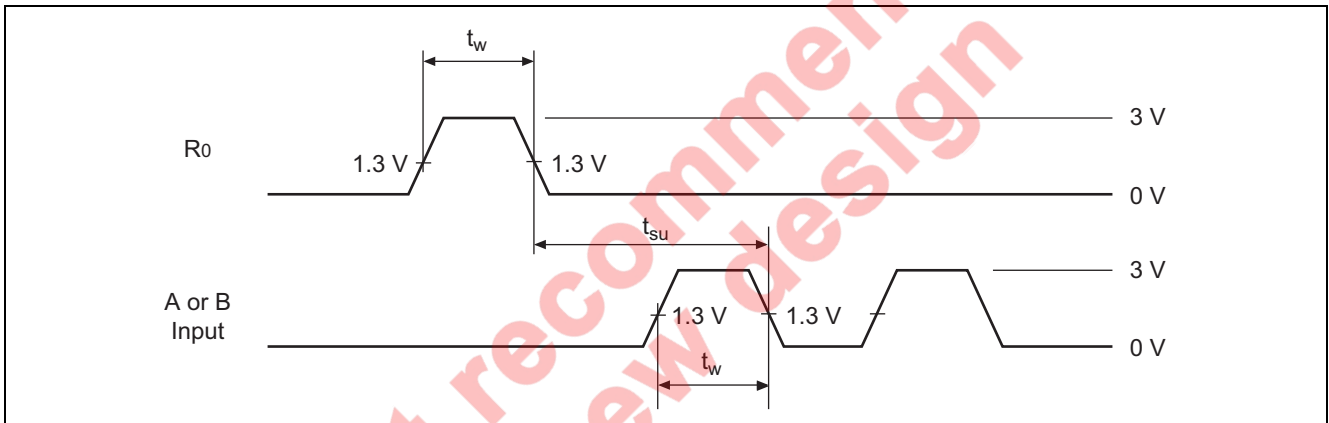
*** I_{CC} is measured with all outputs open, both R_0 inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.

Switching Characteristics

($V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

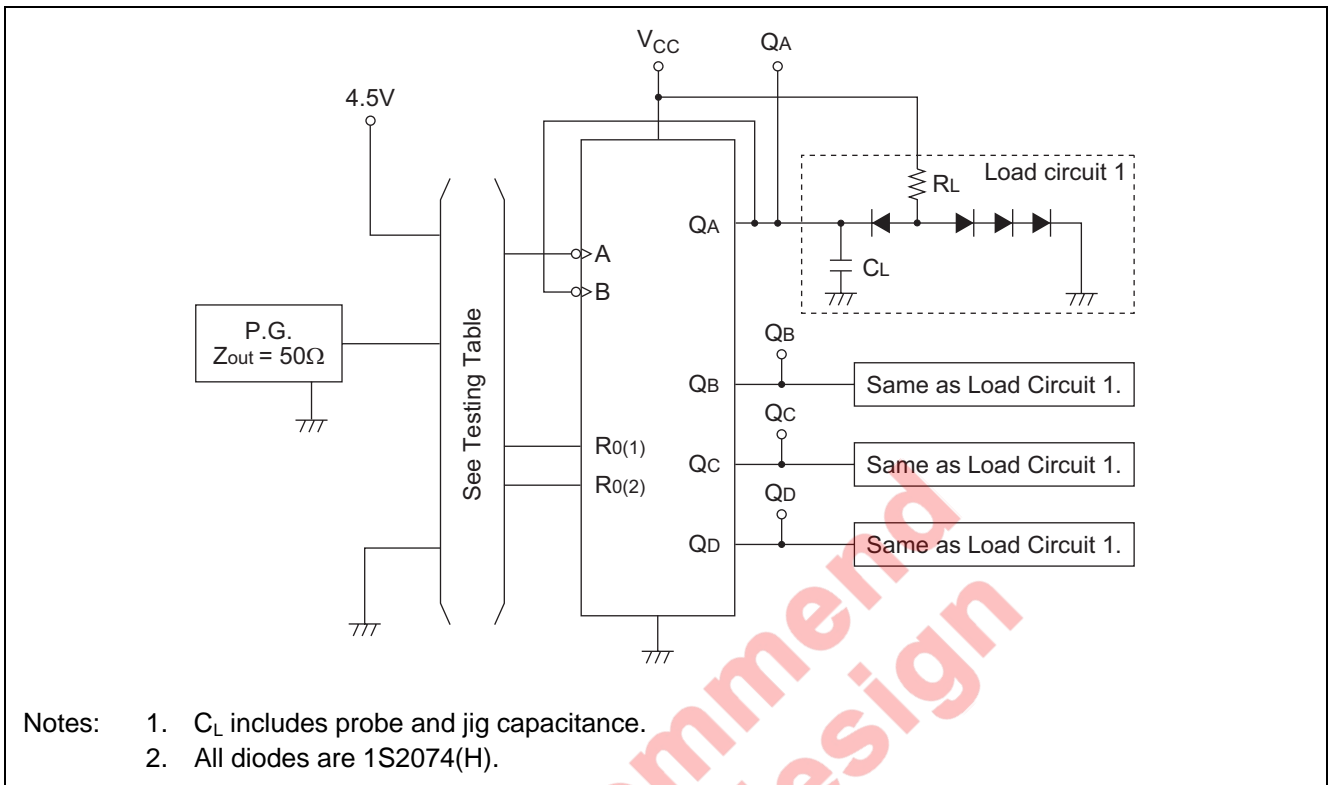
Item	Symbol	Inputs	Outputs	min.	typ.	max.	Unit	Condition
Maximum count frequency	f_{max}	A	Q_A	32	42	—	MHz	$C_L = 15\text{ pF}$, $R_L = 2\text{ k}\Omega$
		B	Q_B	16	—	—		
Propagation delay time	t_{PLH}	A	Q_A	—	10	16	ns	
	t_{PHL}			—	12	18		
	t_{PLH}	A	Q_D	—	46	70	ns	
	t_{PHL}			—	46	70		
	t_{PLH}	B	Q_B	—	10	16	ns	
	t_{PHL}			—	14	21		
	t_{PLH}	B	Q_C	—	21	32	ns	
	t_{PHL}			—	23	35		
	t_{PLH}	B	Q_D	—	34	51	ns	
	t_{PHL}			—	34	51		
	t_{PHL}	Set-to-0	Q_A to Q_D	—	26	40	ns	

Timing Method



Testing Method

Test Circuit



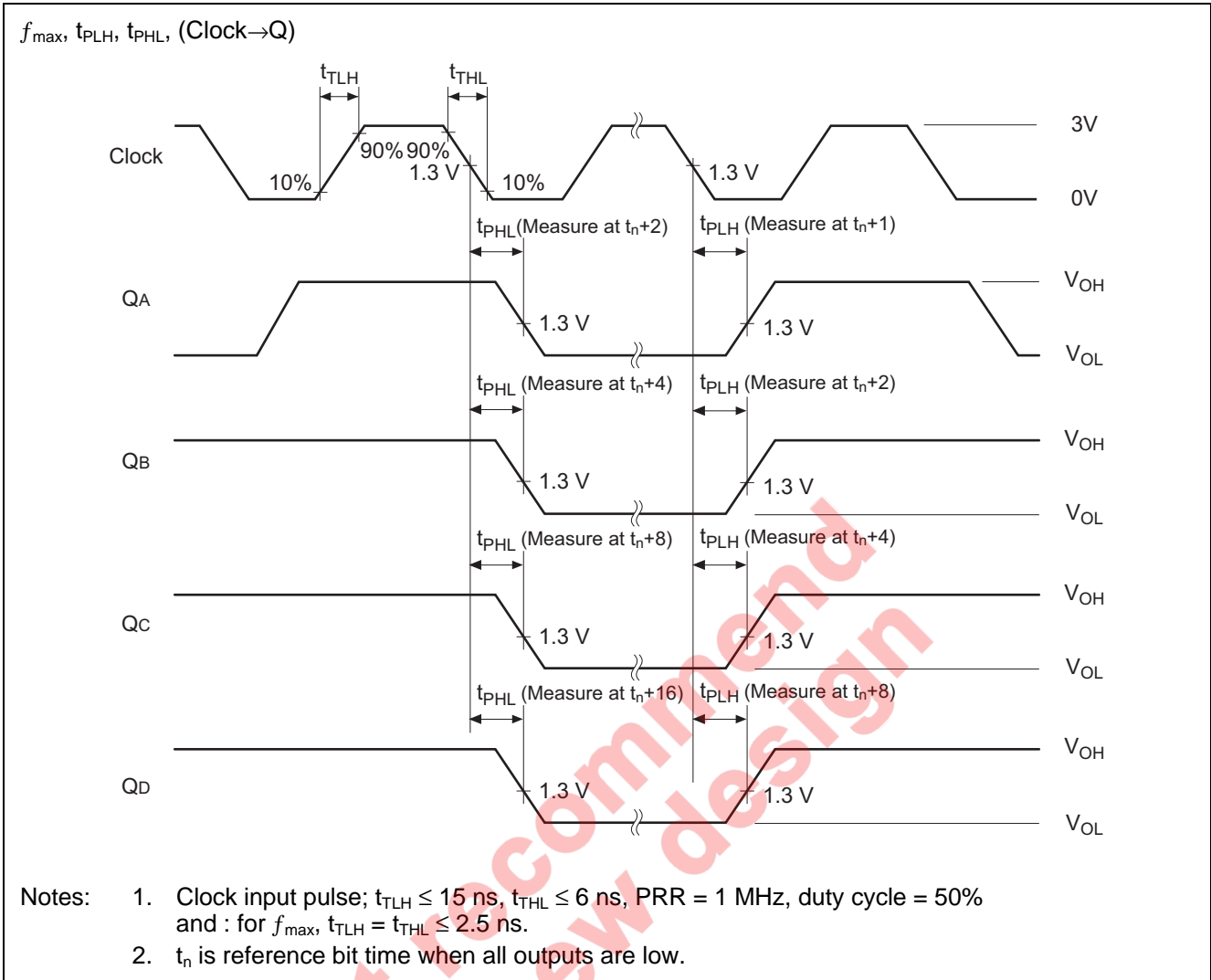
Testing Table

Item	From input to output	Inputs			Outputs			
		A	B	R_0	Q_A	Q_B	Q_C	Q_D
f_{max}	A→Q	IN	to Q_A	GND	OUT	OUT	OUT	OUT
	B→Q	4.5V	IN	GND	—	OUT	OUT	OUT
t_{PLH} t_{PHL}	A→ Q_A	IN	to Q_A	GND	OUT	—	—	—
	A→ Q_D	IN	to Q_A	GND	—	—	—	OUT
	B→ Q_B	4.5V	IN	GND	—	OUT	—	—
	B→ Q_C	4.5V	IN	GND	—	—	OUT	—
	B→ Q_D	4.5V	IN	GND	—	—	—	OUT
	R_0 → Q^{**}	IN*	to Q_A	IN	OUT	OUT	OUT	OUT

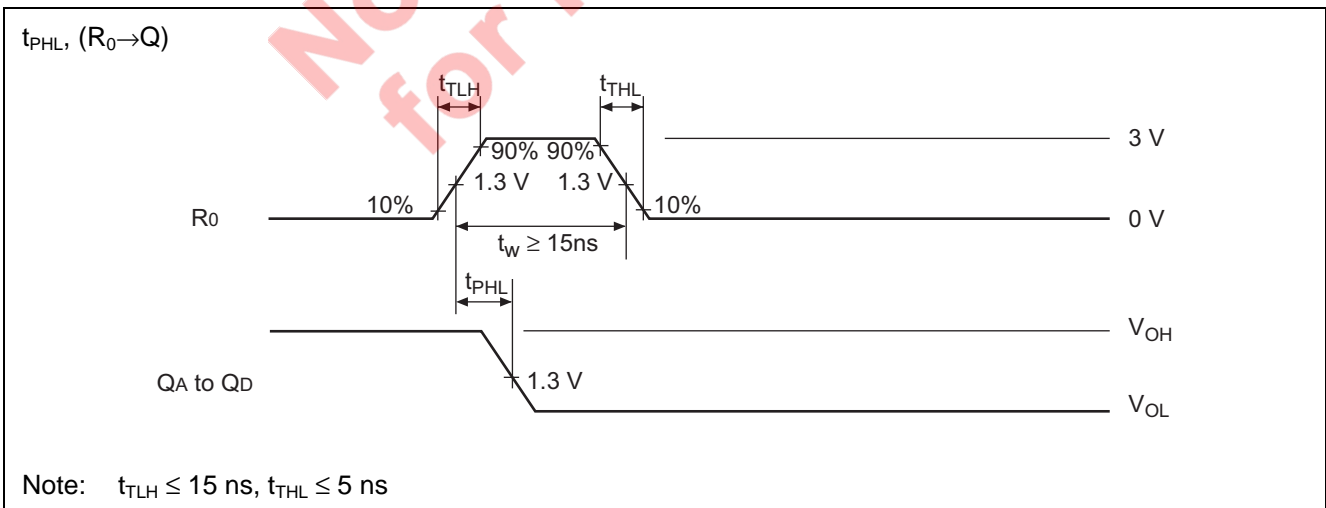
Notes: * For initialized.

** Measured with each input and unused inputs at 4.5 V.

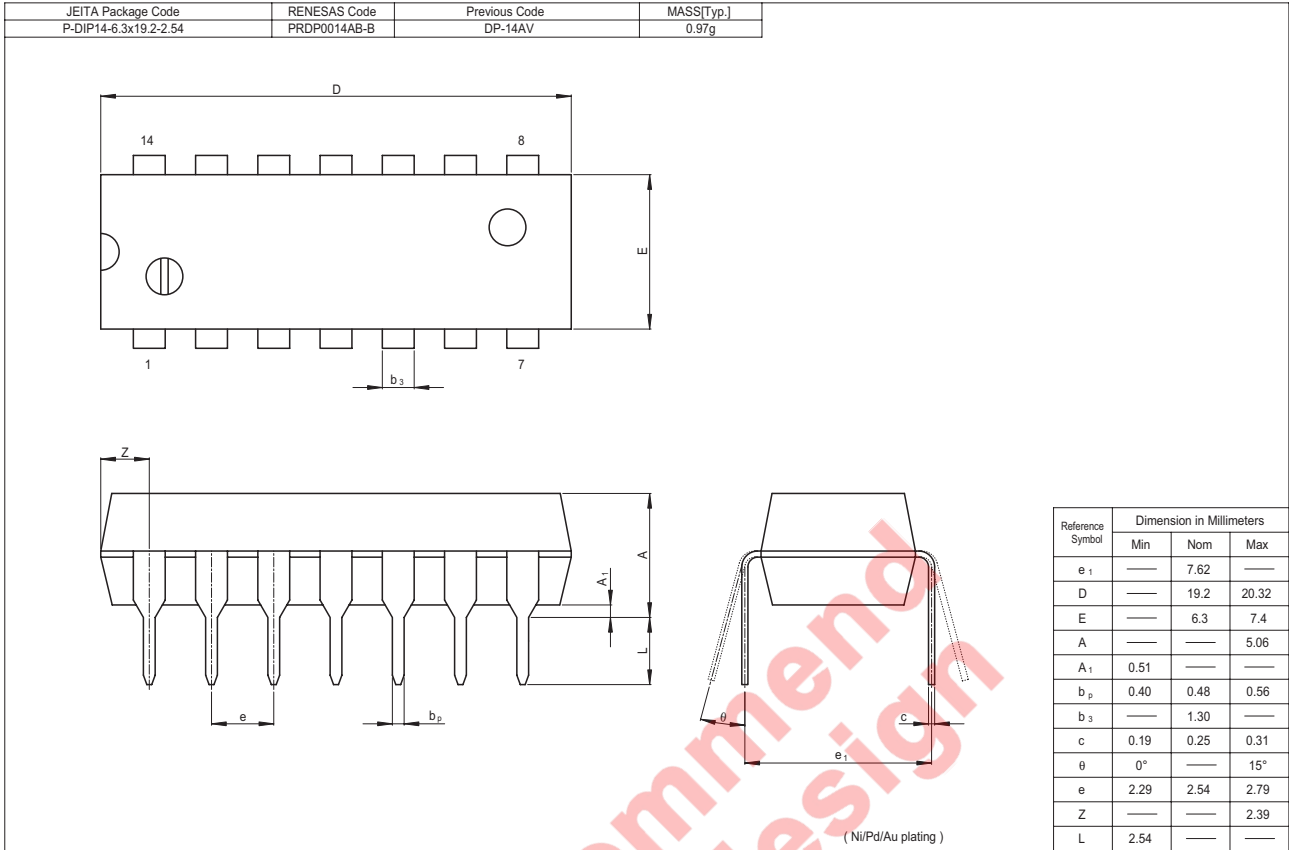
Waveforms 1



Waveforms 2



Package Dimensions



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