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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# HD74LS393

## Dual 4-bit Binary Counters

REJ03D0486–0200
Rev.2.00
Feb.18.2005

This circuit contains eight master-slave flip-flops and additional gating to implement two individual four-bit counters. The HD74LS393 comprises two independent four-bit binary counters each having a clear and a clock input.

N-bit binary counter can be implemented with each package providing the capability of divide-by-258.

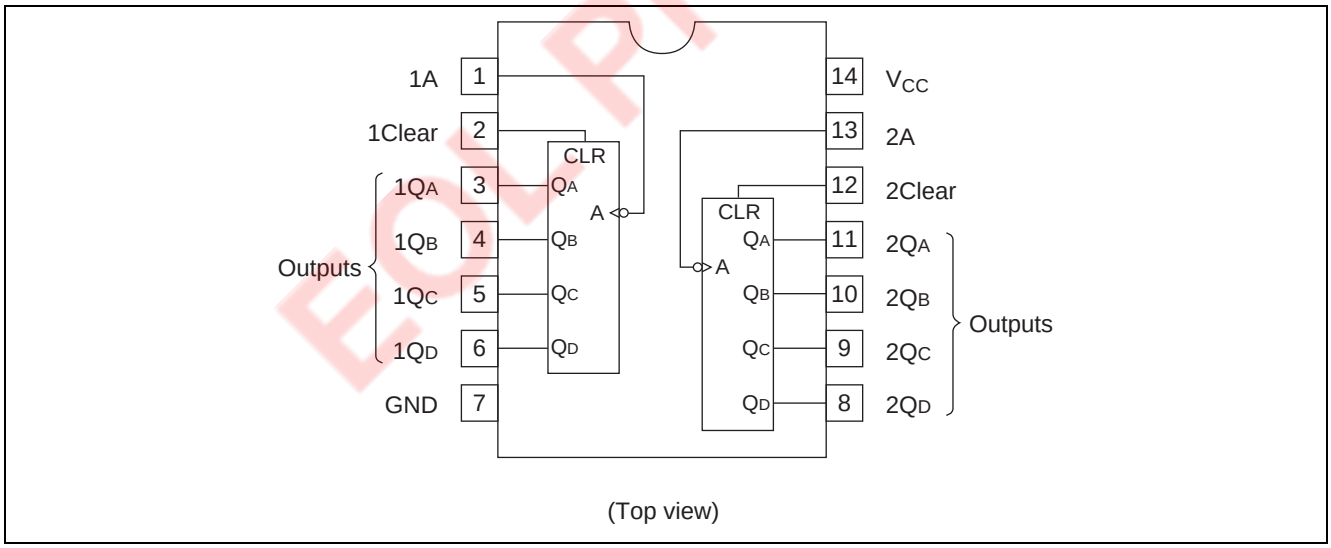
## Features

- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|---|---|---|---|---|
| HD74LS393P | DILP-14 pin | PRDP0014AB-B (DP-14AV) | P | — |
| HD74LS393FPEL | SOP-14 pin (JEITA) | PRSP0014DF-B (FP-14DAV) | FP | EL (2,000 pcs/reel) |
| HD74LS393RPEL | SOP-14 pin (JEDEC) | PRSP0014DE-A (FP-14DNV) | RP | EL (2,500 pcs/reel) |

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

## Pin Arrangement



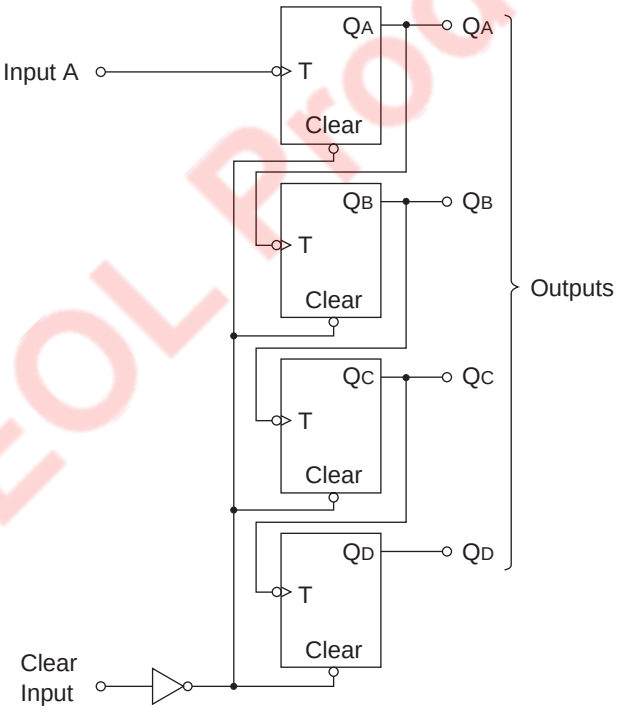

(Top view)

## Function Table

| Count | Output | | | |
|---|---|---|---|---|
| | $Q_D$ | $Q_C$ | $Q_B$ | $Q_A$ |
| 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 |

H; high level, L; low level

## Block Diagram (1/2)



## Absolute Maximum Ratings

| Item | | Symbol | Ratings | Unit |
|---|---|---|---|---|
| Supply voltage | | $V_{CC}$ | 7 | V |
| Input voltage | Clear | $V_{IN}$ | 7 | V |
| | A | $V_{IN}$ | 5.5 | V |
| Power dissipation | | $P_T$ | 400 | mW |
| Storage temperature | | Tstg | –65 to +150 | °C |
| Operating temperature | | Topr | –20 to +75 | °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 | | Topr | –20 | — | 75 | °C |
| Count frequency | A input | $f_{count}$ | 0 | — | 25 | MHz |
| Pulse width | A input high or low | $t_w$ | 20 | — | — | ns |
| | Clear high | | 20 | — | — | |
| Clear setup time | | $t_{su}$ | 25↓ | — | — | ns |

## Electrical Characteristics

(Ta = –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 | $V_{CC}$ = 4.75 V, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V |
| | | | — | — | 0.5 | | $I_{OL}$ = 8 mA | |
| Input current | Clear | $I_{IH}$ | — | — | 20 | µA | $V_{CC}$ = 5.25 V, $V_I$ = 2.7 V | |
| | Input A | | — | — | 100 | | | |
| | Clear | $I_{IL}$ | — | — | –0.4 | mA | $V_{CC}$ = 5.25 V, $V_I$ = 0.4 V | |
| | Input A | | — | — | –1.6 | | | |
| | Clear | $I_I$ | — | — | 0.1 | mA | $V_I$ = 7 V | $V_{CC}$ = 5.25 V |
| | Input A | | — | — | 0.2 | | $V_I$ = 5.5 V | |
| Short-circuit output current | | $I_{OS}$ | –20 | — | –100 | mA | $V_{CC}$ = 5.25 V | |
| Supply current | | $I_{CC}$** | — | 15 | 26 | 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, Ta = 25°C

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

## Switching Characteristics

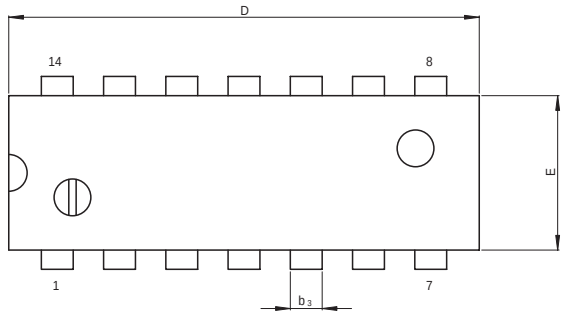
($V_{CC}$ = 5 V, Ta = 25°C)

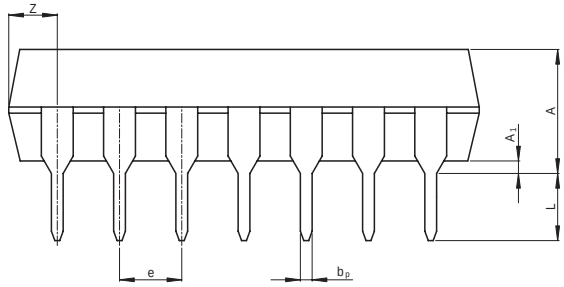
| Item | Symbol | Inputs | Outputs | min. | typ. | max. | Unit | Condition |
|---|---|---|---|---|---|---|---|---|
| Maximum count frequency | $f_{max}$ | A | $Q_A$ | 25 | 35 | — | MHz | $C_L$ = 15 pF, $R_L$ = 2 kΩ |
| Propagation delay time | $t_{PLH}$ | A | $Q_A$ | — | 12 | 20 | ns | |
| | $t_{PHL}$ | | | — | 13 | 20 | | |
| | $t_{PLH}$ | A | $Q_D$ | — | 40 | 60 | ns | |
| | $t_{PHL}$ | | | — | 40 | 60 | | |
| | $t_{PHL}$ | Clear | Any | — | 24 | 39 | ns | |

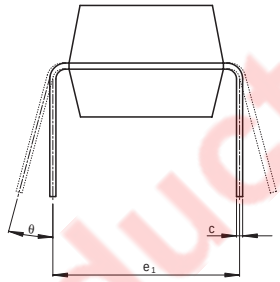
Note: Refer to Test Circuit and Waveform of the Common Item "TTL Common Matter (Document No.: REJ27D0005-0100)".

# Package Dimensions

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-DIP14-6.3x19.2-2.54 | PRDP0014AB-B | DP-14AV | 0.97g |



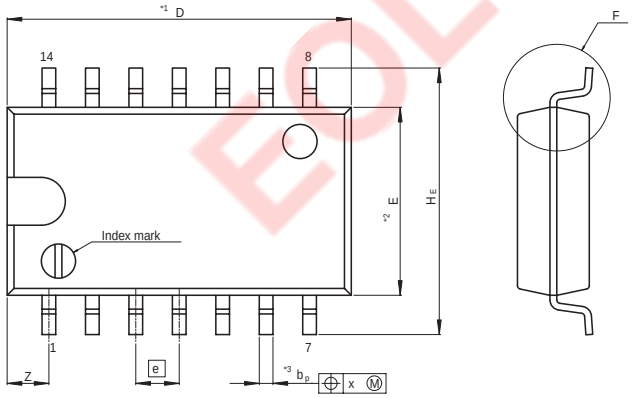



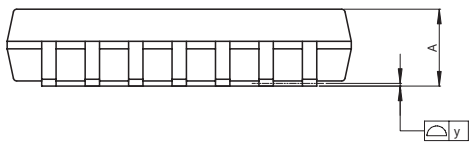




( Ni/Pd/Au plating )

| 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 | —— | —— | 2.39 |
| L | 2.54 | —— | —— |

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP14-5.5x10.06-1.27 | PRSP0014DF-B | FP-14DAV | 0.23g |

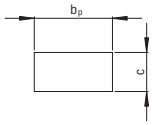


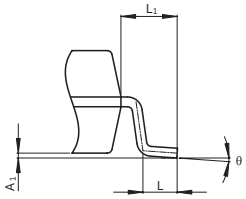




NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.



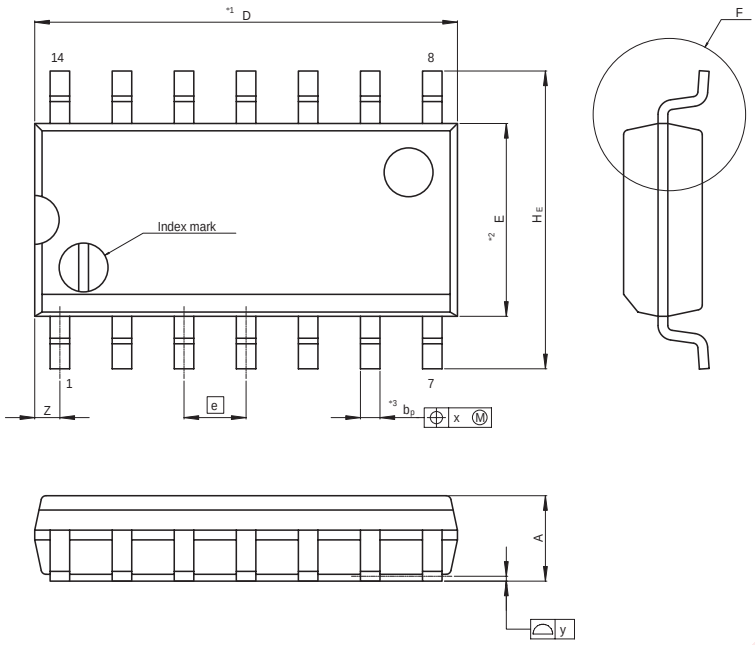

Terminal cross section
( Ni/Pd/Au plating )



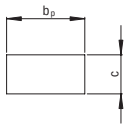

Detail F

| 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 | —— | —— | 1.42 |
| L | 0.50 | 0.70 | 0.90 |
| $L_1$ | —— | 1.15 | —— |

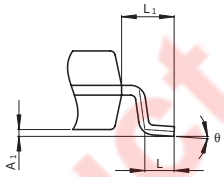
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP14-3.95x8.65-1.27 | PRSP0014DE-A | FP-14DNV | 0.13g |




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 | —— | 8.65 | 9.05 |
| 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 |
| e | —— | 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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