

# HD74HCT238

## 3-to-8-line Decoder/Demultiplexer

REJ03D0661-0200  
 (Previous ADE-205-549)  
 Rev.2.00  
 Mar 30, 2006

### Description

The HD74HCT238 has 3 binary select inputs (A, B, and C). If the device is enabled these inputs determined which one of the eight normally high outputs will go low. Two active low and one active high enables ( $\overline{G_1}$ ,  $\overline{G_{2A}}$  and  $\overline{G_{2B}}$ ) are provided to ease the cascading of decoders.

### Features

- High Speed Operation:  $t_{pd}$  (A, B, C to Y) = 16.5 ns typ ( $C_L = 50$  pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage:  $V_{CC} = 2$  V to 6 V
- Low Input Current: 1  $\mu$ A max
- Low Quiescent Supply Current:  $I_{CC}$  (static) = 4  $\mu$ A max ( $T_a = 25^\circ\text{C}$ )
- Ordering Information

| Part Name      | Package Type       | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|----------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74HCT238FPEL | SOP-16 pin (JEITA) | PRSP0016 DH-B (FP-16DAV)     | FP                   | EL (2,000 pcs/reel)            |
| HD74HCT238RPEL | SOP-16 pin (JEDEC) | PRSP0016 DG-A (FP-16DNV)     | RP                   | EL (2,500 pcs/reel)            |

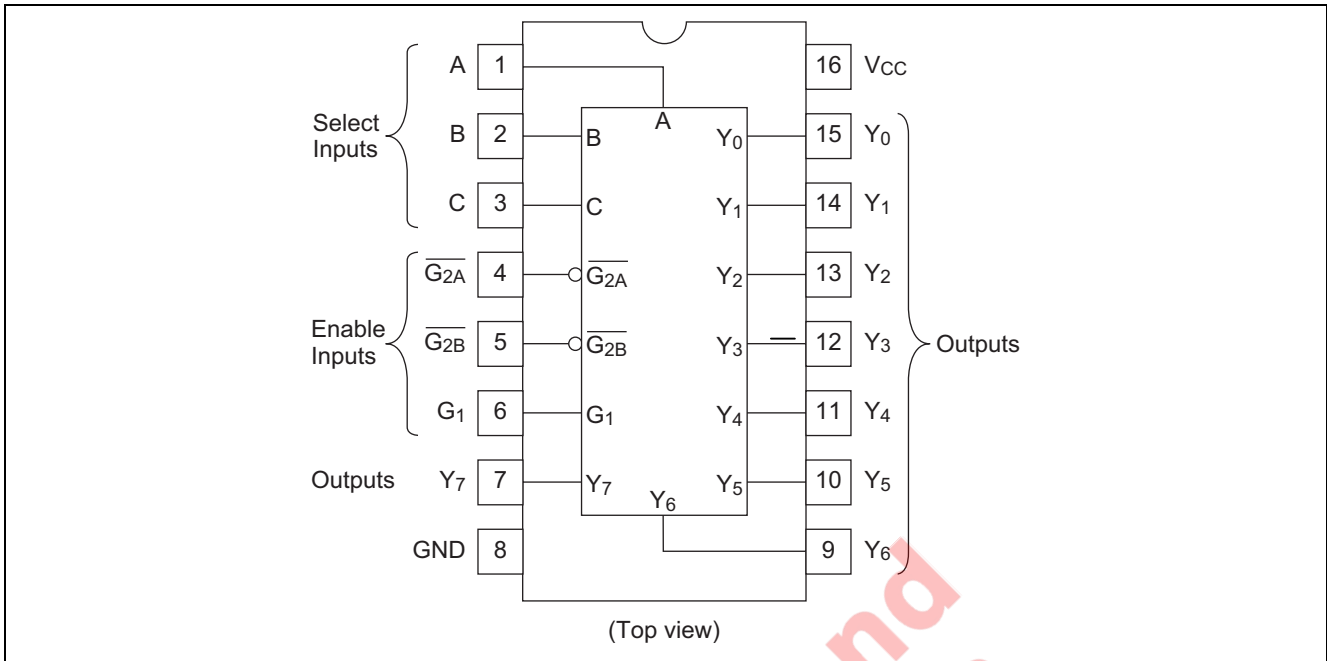
Note: Please consult the sales office for the above package availability.

### Function Table

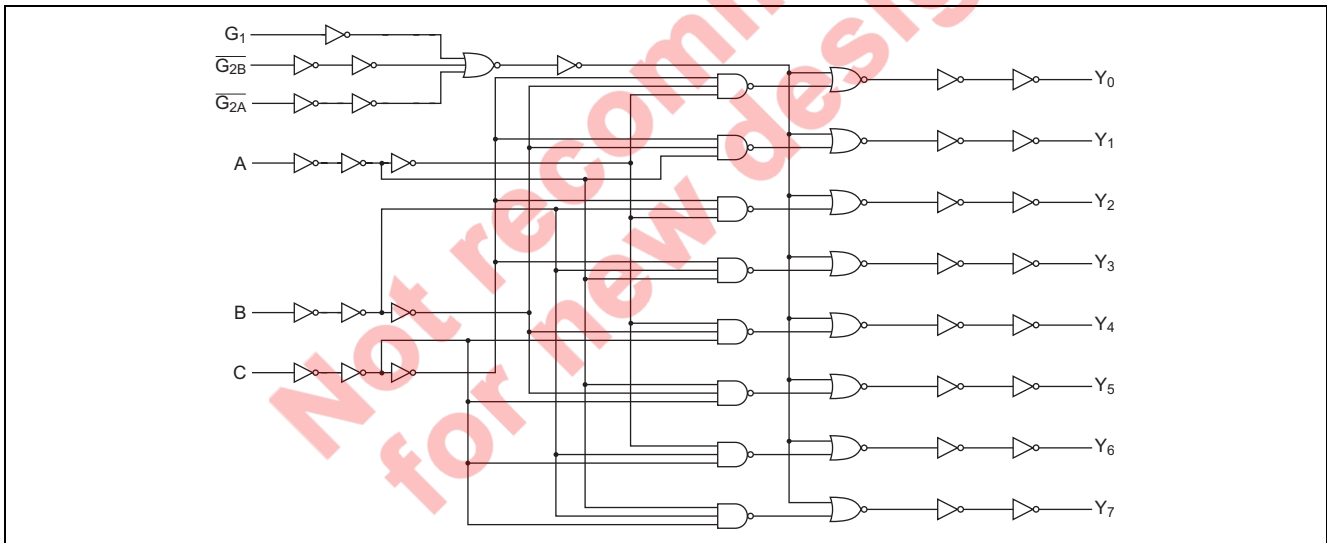
| Inputs           |                     |                     |        |   |   | Outputs |       |       |       |       |       |       |       |
|------------------|---------------------|---------------------|--------|---|---|---------|-------|-------|-------|-------|-------|-------|-------|
| Enable           |                     |                     | Select |   |   |         |       |       |       |       |       |       |       |
| $\overline{G_1}$ | $\overline{G_{2A}}$ | $\overline{G_{2B}}$ | C      | B | A | $Y_0$   | $Y_1$ | $Y_2$ | $Y_3$ | $Y_4$ | $Y_5$ | $Y_6$ | $Y_7$ |
| X                | X                   | H                   | X      | X | X | L       | L     | L     | L     | L     | L     | L     | L     |
| X                | H                   | X                   | X      | X | X | L       | L     | L     | L     | L     | L     | L     | L     |
| L                | X                   | X                   | X      | X | X | L       | L     | L     | L     | L     | L     | L     | L     |
| H                | L                   | L                   | L      | L | L | H       | L     | L     | L     | L     | L     | L     | L     |
| H                | L                   | L                   | L      | L | H | L       | H     | L     | L     | L     | L     | L     | L     |
| H                | L                   | L                   | L      | H | L | L       | L     | H     | L     | L     | L     | L     | L     |
| H                | L                   | L                   | L      | H | H | L       | L     | L     | H     | L     | L     | L     | L     |
| H                | L                   | L                   | H      | L | L | L       | L     | L     | L     | H     | L     | L     | L     |
| H                | L                   | L                   | H      | L | H | L       | L     | L     | L     | L     | H     | L     | L     |
| H                | L                   | L                   | H      | H | L | L       | L     | L     | L     | L     | L     | H     | L     |
| H                | L                   | L                   | H      | H | H | L       | L     | L     | L     | L     | L     | L     | H     |

H : High level  
 L : Low level  
 X : Irrelevant

Pin Arrangement



Logic Diagram



Absolute Maximum Ratings

| Item                                | Symbol               | Rating                 | Unit        |
|-------------------------------------|----------------------|------------------------|-------------|
| Supply voltage range                | $V_{CC}$             | -0.5 to +7.0           | V           |
| Input voltage                       | $V_{IN}$             | -0.5 to $V_{CC} + 0.5$ | V           |
| Output voltage                      | $V_{OUT}$            | -0.5 to $V_{CC} + 0.5$ | V           |
| Output current                      | $I_{OUT}$            | $\pm 25$               | mA          |
| DC current drain per $V_{CC}$ , GND | $I_{CC}$ , $I_{GND}$ | $\pm 50$               | mA          |
| DC input diode current              | $I_{IK}$             | $\pm 20$               | mA          |
| DC output diode current             | $I_{OK}$             | $\pm 20$               | mA          |
| Power dissipation per package       | $P_T$                | 500                    | mW          |
| Storage temperature                 | $T_{stg}$            | -65 to +150            | $^{\circ}C$ |

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                       | $V_{CC}$          | 4.5 to 5.5    | 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 <sup>*1</sup> | $t_r, t_f$        | 0 to 500      | ns   | $V_{CC} = 4.5\text{ V}$ |

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

Waveform: Refer to test circuit of switching characteristics.

## Electrical Characteristics

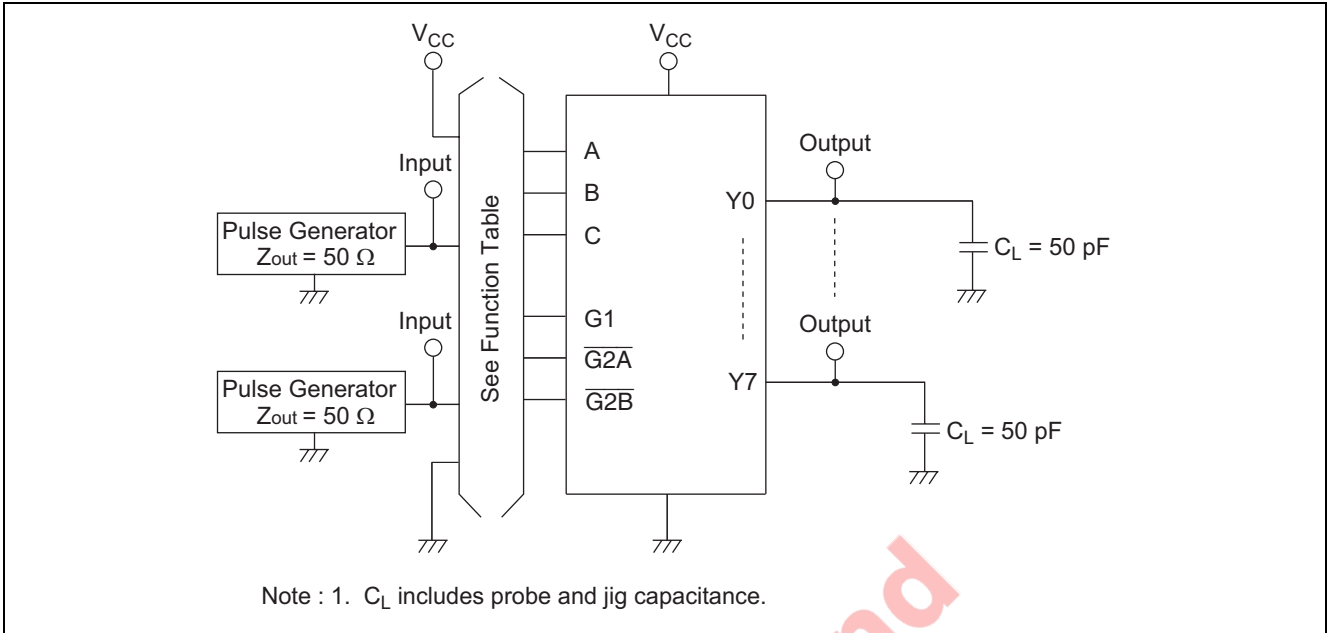
| Item                     | Symbol   | $V_{CC}$ (V) | $T_a = 25^\circ\text{C}$ |     |           | $T_a = -40\text{ to }+85^\circ\text{C}$ |           | Unit          | Test Conditions                                      |                             |
|--------------------------|----------|--------------|--------------------------|-----|-----------|---|-----------|---------------|--|-----------------------------|
|                          |          |              | Min                      | Typ | Max       | Min                                     | Max       |               |  |                             |
| Input voltage            | $V_{IH}$ | 4.5 to 5.5   | 2.0                      | —   | —         | 2.0                                     | —         | V             |  |                             |
|                          | $V_{IL}$ | 4.5 to 5.5   | —                        | —   | 0.8       | —                                       | 0.8       | V             |  |                             |
| Output voltage           | $V_{OH}$ | 4.5          | 4.4                      | —   | —         | 4.4                                     | —         | V             | $V_{in} = V_{IH}$ or $V_{IL}$                        | $I_{OH} = -20\ \mu\text{A}$ |
|                          |          | 4.5          | 4.18                     | —   | —         | 4.13                                    | —         | V             |  | $I_{OH} = -4\ \text{mA}$    |
|                          | $V_{OL}$ | 4.5          | —                        | —   | 0.1       | —                                       | 0.1       | V             | $V_{in} = V_{IH}$ or $V_{IL}$                        | $I_{OL} = 20\ \mu\text{A}$  |
|                          |          | 4.5          | —                        | —   | 0.26      | —                                       | 0.33      | V             |  | $I_{OL} = 4\ \text{mA}$     |
| Input current            | $I_{in}$ | 5.5          | —                        | —   | $\pm 0.1$ | —                                       | $\pm 1.0$ | $\mu\text{A}$ | $V_{in} = V_{CC}$ or GND                             |                             |
| Quiescent supply current | $I_{CC}$ | 5.5          | —                        | —   | 4.0       | —                                       | 40        | $\mu\text{A}$ | $V_{in} = V_{CC}$ or GND, $I_{out} = 0\ \mu\text{A}$ |                             |

## Switching Characteristics

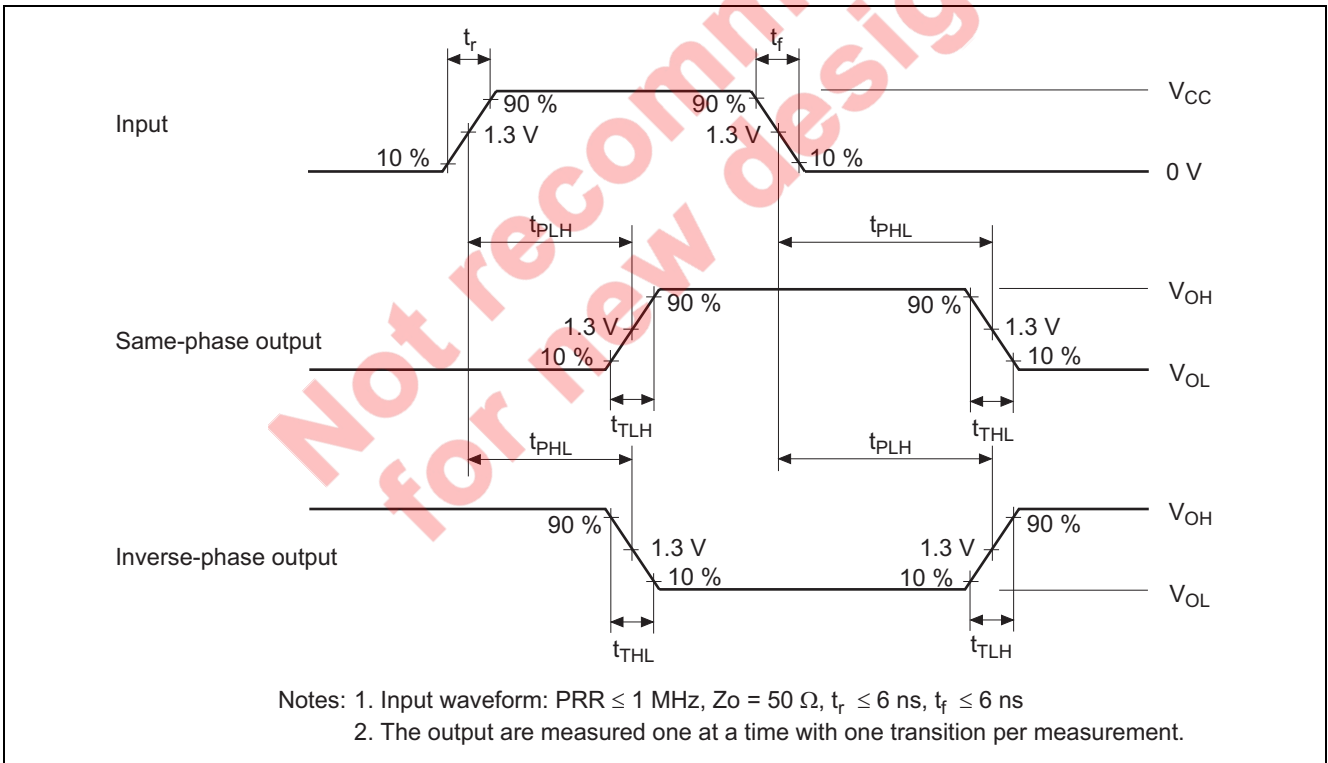
( $C_L = 50\ \text{pF}$ , Input  $t_r = t_f = 6\ \text{ns}$ )

| 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 |      |                      |  |
| Propagation delay time | $t_{PLH}$ | 4.5          | —                        | 18  | 30  | —                                       | 38  | ns   | A, B or C to Y       |  |
|                        | $t_{PHL}$ | 4.5          | —                        | 19  | 30  | —                                       | 38  | ns   |                      |  |
|                        | $t_{PLH}$ | 4.5          | —                        | 17  | 30  | —                                       | 38  | ns   | G <sub>2A</sub> to Y |  |
|                        | $t_{PHL}$ | 4.5          | —                        | 17  | 30  | —                                       | 39  | ns   |                      |  |
|                        | $t_{PLH}$ | 4.5          | —                        | 17  | 30  | —                                       | 38  | ns   | G <sub>2B</sub> to Y |  |
|                        | $t_{PHL}$ | 4.5          | —                        | 17  | 30  | —                                       | 38  | ns   |                      |  |
|                        | $t_{PLH}$ | 4.5          | —                        | 17  | 30  | —                                       | 38  | ns   | G <sub>1</sub> to Y  |  |
|                        | $t_{PHL}$ | 4.5          | —                        | 17  | 30  | —                                       | 38  | ns   |                      |  |
| Output rise/fall time  | $t_{TLH}$ | 4.5          | —                        | 5   | 15  | —                                       | 19  | ns   |                      |  |
|                        | $t_{THL}$ | 4.5          | —                        | 5   | 15  | —                                       | 19  | ns   |                      |  |
| Input capacitance      | $C_{in}$  | —            | —                        | 5   | 10  | —                                       | 10  | pF   |                      |  |

Test Circuit

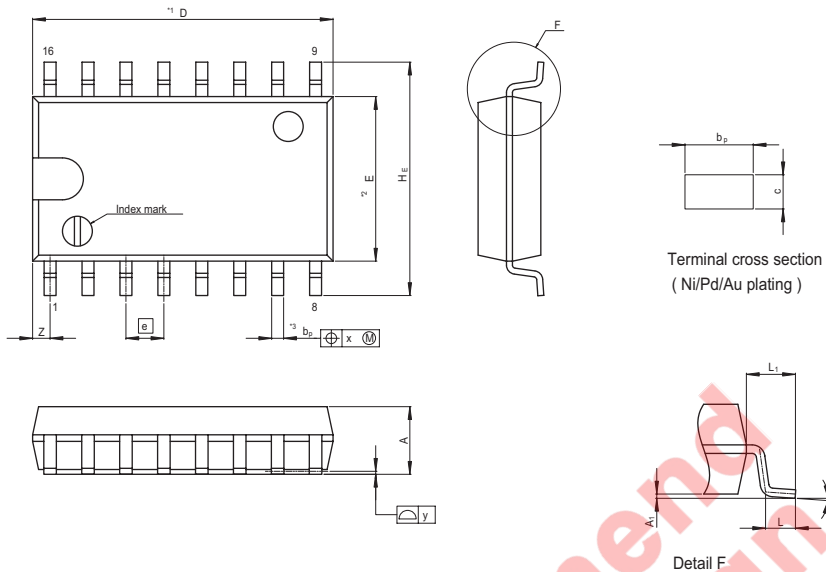


Waveforms



Package Dimensions

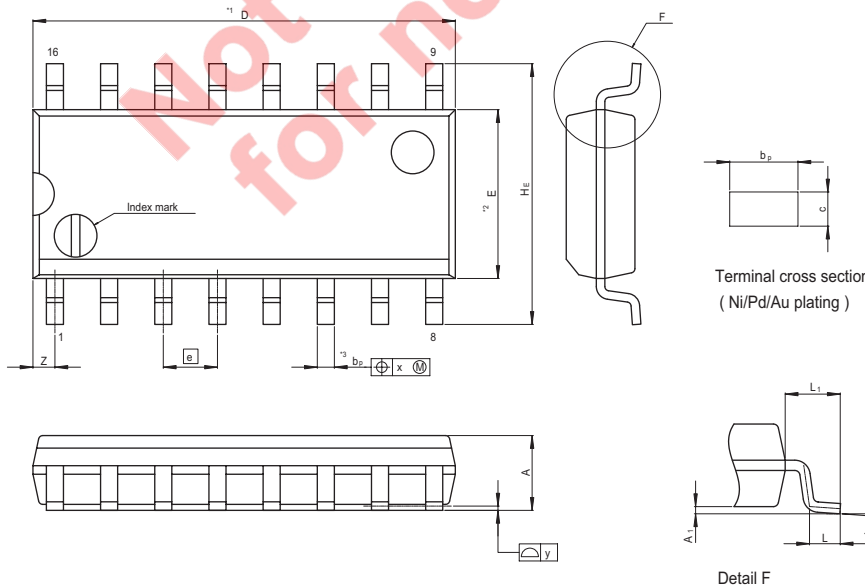
|                        |              |               |            |
|------------------------|--------------|---------------|------------|
| JEITA Package Code     | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP16-5.5x10.06-1.27 | PRSP0016DH-B | FP-16DAV      | 0.24g      |



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

| Reference Symbol | Dimension in Millimeters |       |      |
|------------------|--------------------------|-------|------|
|                  | Min                      | Nom   | Max  |
| D                | —                        | 10.06 | 10.5 |
| E                | —                        | 5.50  | —    |
| A <sub>2</sub>   | —                        | —     | —    |
| A <sub>1</sub>   | 0.00                     | 0.10  | 0.20 |
| A                | —                        | —     | 2.20 |
| b <sub>p</sub>   | 0.34                     | 0.40  | 0.46 |
| b <sub>1</sub>   | —                        | —     | —    |
| c                | 0.15                     | 0.20  | 0.25 |
| c <sub>1</sub>   | —                        | —     | —    |
| $\theta$         | 0°                       | —     | 8°   |
| H <sub>E</sub>   | 7.50                     | 7.80  | 8.00 |
| $\text{Ⓢ}$       | —                        | 1.27  | —    |
| x                | —                        | —     | 0.12 |
| y                | —                        | —     | 0.15 |
| Z                | —                        | —     | 0.80 |
| L                | 0.50                     | 0.70  | 0.90 |
| L <sub>1</sub>   | —                        | 1.15  | —    |

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



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 <sub>2</sub>   | —                        | —    | —     |
| A <sub>1</sub>   | 0.10                     | 0.14 | 0.25  |
| A                | —                        | —    | 1.75  |
| b <sub>p</sub>   | 0.34                     | 0.40 | 0.46  |
| b <sub>1</sub>   | —                        | —    | —     |
| c                | 0.15                     | 0.20 | 0.25  |
| c <sub>1</sub>   | —                        | —    | —     |
| $\theta$         | 0°                       | —    | 8°    |
| H <sub>E</sub>   | 5.80                     | 6.10 | 6.20  |
| $\text{Ⓢ}$       | —                        | 1.27 | —     |
| x                | —                        | —    | 0.25  |
| y                | —                        | —    | 0.15  |
| Z                | —                        | —    | 0.635 |
| L                | 0.40                     | 0.60 | 1.27  |
| L <sub>1</sub>   | —                        | 1.08 | —     |

Keep safety first in your circuit designs!

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