

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# HD74HC238

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

REJ03D0593-0200  
 (Previous ADE-205-470)  
 Rev.2.00  
 Jan 31, 2006

### Description

The HD74HC238 has 3 binary select inputs (A, B and C). If the device is enabled these inputs determine 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:  $t_{pd}$  (Data to Y) = 15 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  $\mu$ 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) |
|---------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74HC238P    | DILP-16 pin        | PRDP0016AE-B (DP-16FV)       | P                    | —                              |
| HD74HC238FPEL | SOP-16 pin (JEITA) | PRSP0016DH-B (FP-16DAV)      | FP                   | EL (2,000 pcs/reel)            |
| HD74HC238RPEL | SOP-16 pin (JEDEC) | PRSP0016DG-A (FP-16DNV)      | RP                   | EL (2,500 pcs/reel)            |

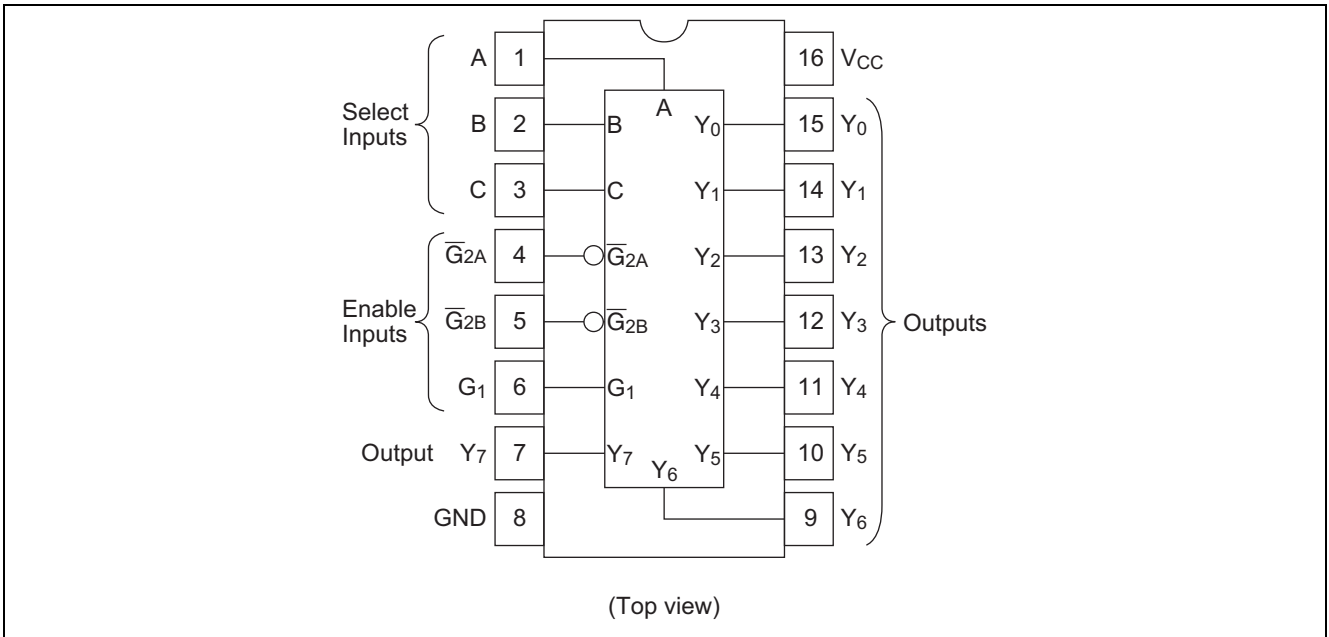
Note: Please consult the sales office for the above package availability.

### Function Table

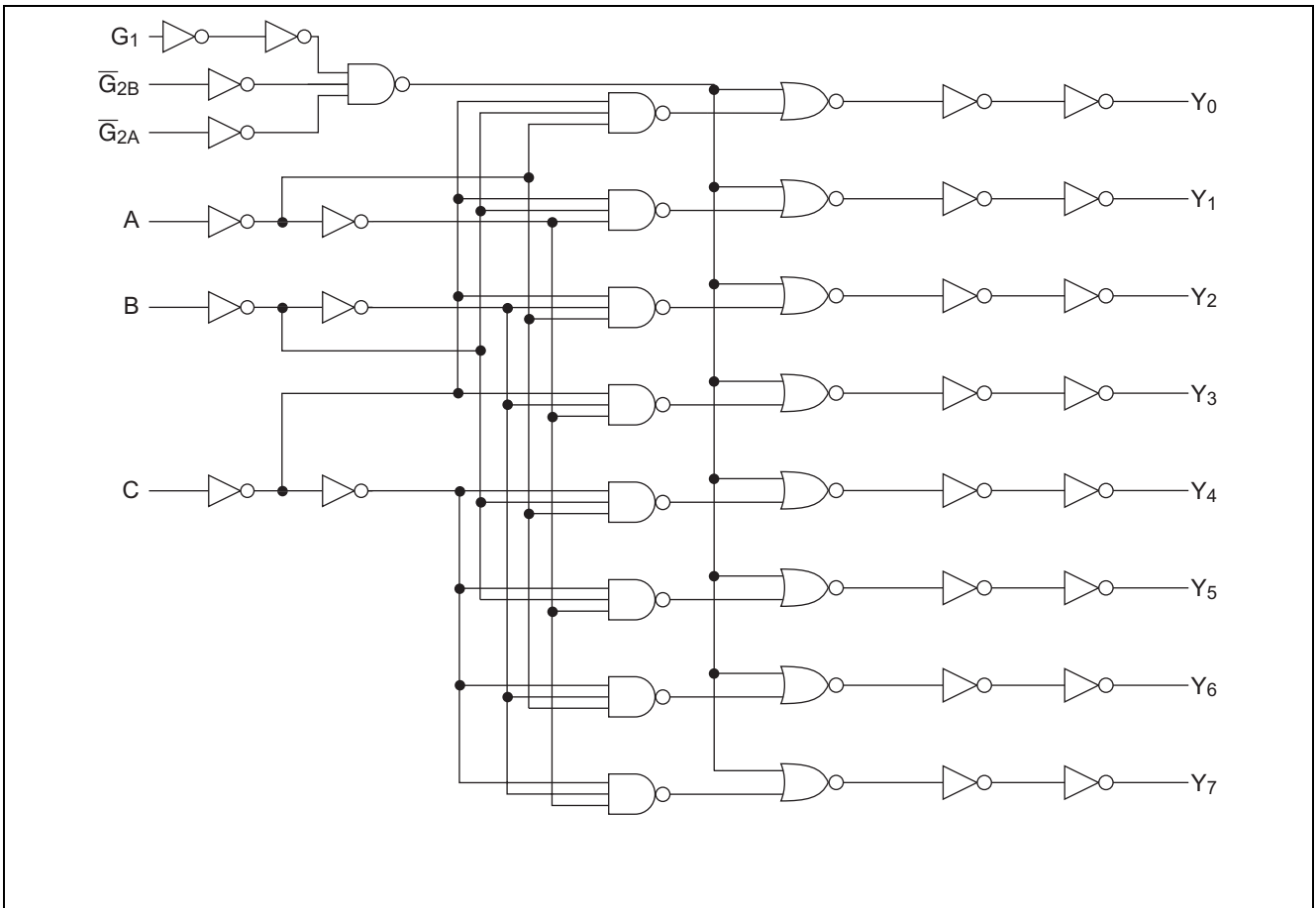
| Inputs |                     |                     |        |   |   | Outputs |       |       |       |       |       |       |       |
|--------|---------------------|---------------------|--------|---|---|---------|-------|-------|-------|-------|-------|-------|-------|
| Enable |                     |                     | Select |   |   |         |       |       |       |       |       |       |       |
| $G_1$  | $\overline{G}_{2A}$ | $\overline{G}_{2B}$ | 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                | 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 | $I_{IK}, I_{OK}$      | $\pm 20$               | mA   |
| Output current               | $I_O$                 | $\pm 35$               | mA   |
| $V_{CC}$ , GND current       | $I_{CC}$ or $I_{GND}$ | $\pm 75$               | 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 <sup>*1</sup> | $t_r, t_f$        | 0 to 1000     | ns   | $V_{CC} = 2.0\text{ V}$ |
|                                      |                   | 0 to 500      |      | $V_{CC} = 4.5\text{ V}$ |
|                                      |                   | 0 to 400      |      | $V_{CC} = 6.0\text{ V}$ |

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

### Electrical Characteristics

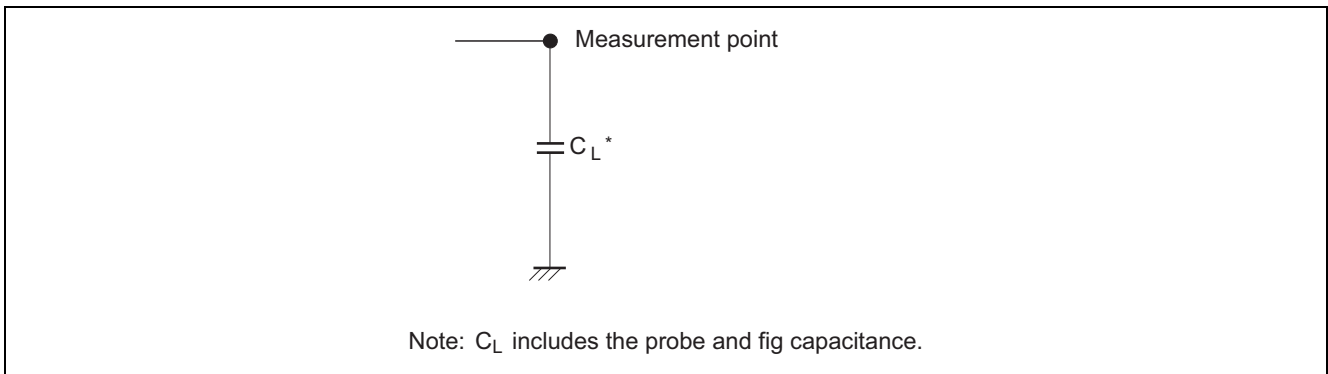
| Item                     | Symbol   | $V_{CC}$ (V) | $T_a = 25^\circ\text{C}$ |     |           | $T_a = -40\text{ to }+85^\circ\text{C}$ |           | Unit          | Test Conditions  |                             |                           |
|--------------------------|----------|--------------|--------------------------|-----|-----------|---|-----------|---------------|--|-----------------------------|---------------------------|
|                          |          |              | Min                      | Typ | Max       | Min                                     | Max       |               |  |                             |                           |
| Input voltage            | $V_{IH}$ | 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      |               |  |                             | $I_{OL} = 4\ \text{mA}$   |
|                          |          | 6.0          | —                        | —   | 0.26      | —                                       | 0.33      |               |  |                             | $I_{OL} = 5.2\ \text{mA}$ |
| Off-state output current | $I_{OZ}$ | 6.0          | —                        | —   | $\pm 0.5$ | —                                       | $\pm 5.0$ | $\mu\text{A}$ | $V_{in} = V_{IH}$ or $V_{IL}$ ,<br>$V_{out} = V_{CC}$ or GND |                             |                           |
| Input current            | $I_{in}$ | 6.0          | —                        | —   | $\pm 0.1$ | —                                       | $\pm 1.0$ | $\mu\text{A}$ | $V_{in} = V_{CC}$ or GND                                     |                             |                           |
| Quiescent supply current | $I_{CC}$ | 6.0          | —                        | —   | 4.0       | —                                       | 40        | $\mu\text{A}$ | $V_{in} = V_{CC}$ or GND, $I_{out} = 0\ \mu\text{A}$         |                             |                           |

### Switching Characteristics

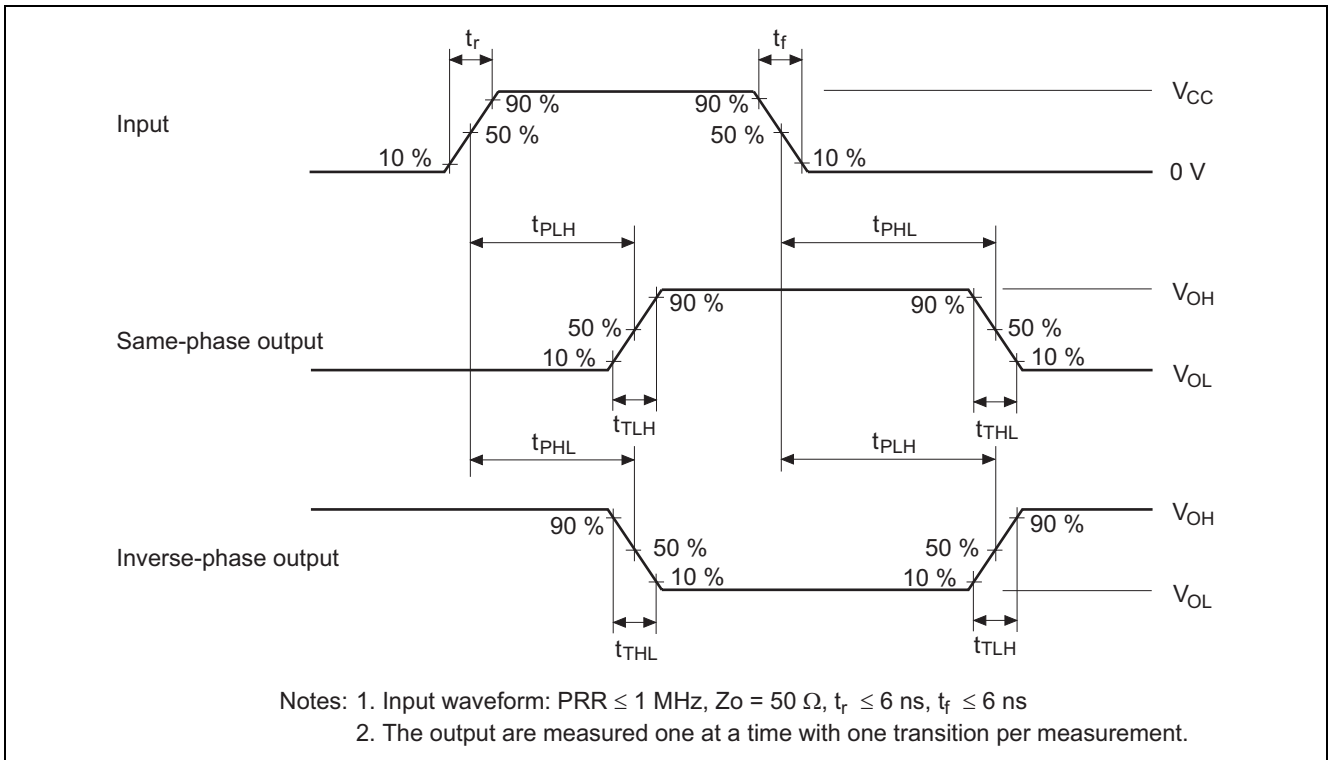
( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

| Item                   | Symbol    | $V_{CC}$ (V) | $T_a = 25^\circ\text{C}$ |     |     | $T_a = -40$ to $+85^\circ\text{C}$ |     | Unit | Test Conditions |
|------------------------|-----------|--------------|--------------------------|-----|-----|------------------------------------|-----|------|-----------------|
|                        |           |              | Min                      | Typ | Max | Min                                | Max |      |                 |
| Propagation delay time | $t_{PLH}$ | 2.0          | —                        | —   | 150 | —                                  | 190 | ns   | Select to Y     |
|                        |           | 4.5          | —                        | 15  | 30  | —                                  | 38  |      |                 |
|                        |           | 6.0          | —                        | —   | 26  | —                                  | 33  |      |                 |
|                        | $t_{PHL}$ | 2.0          | —                        | —   | 150 | —                                  | 190 | ns   | Enable to Y     |
|                        |           | 4.5          | —                        | 13  | 30  | —                                  | 38  |      |                 |
|                        |           | 6.0          | —                        | —   | 26  | —                                  | 33  |      |                 |
| Output rise/fall time  | $t_{TLH}$ | 2.0          | —                        | —   | 75  | —                                  | 95  | ns   |                 |
|                        | $t_{THL}$ | 4.5          | —                        | 5   | 15  | —                                  | 19  |      |                 |
|                        |           | 6.0          | —                        | —   | 13  | —                                  | 16  |      |                 |
| Input capacitance      | $C_{in}$  | —            | —                        | 5   | 10  | —                                  | 10  | pF   |                 |

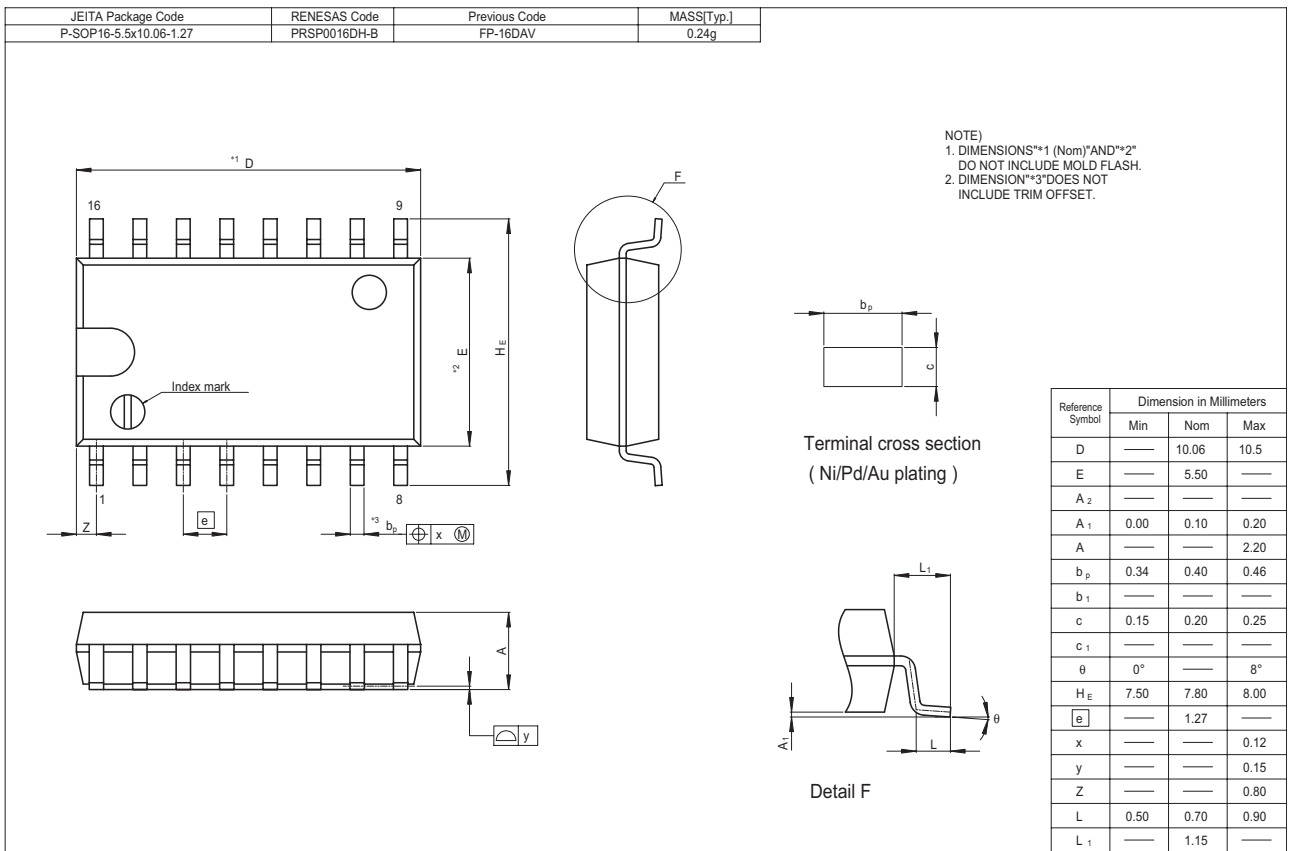
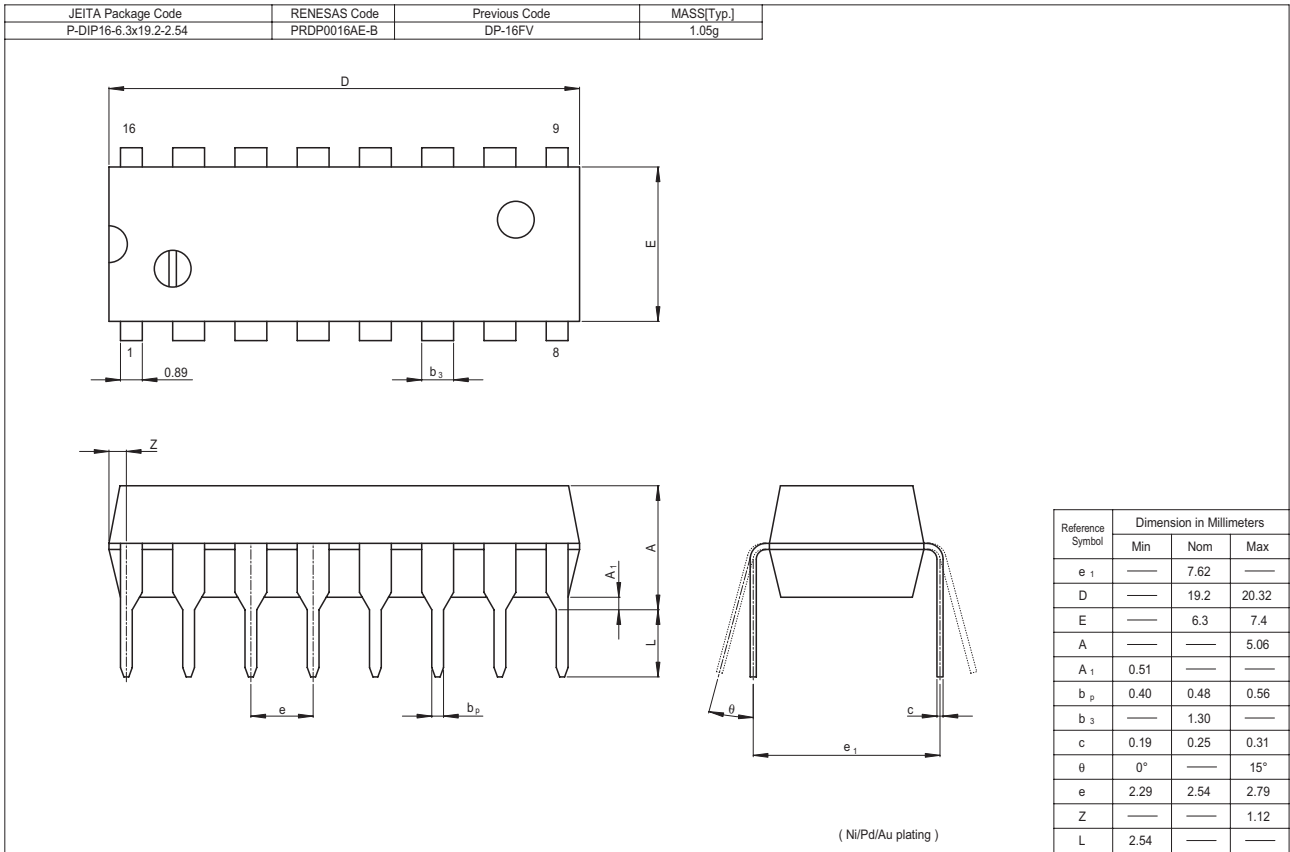
### Test Circuit



### Waveforms

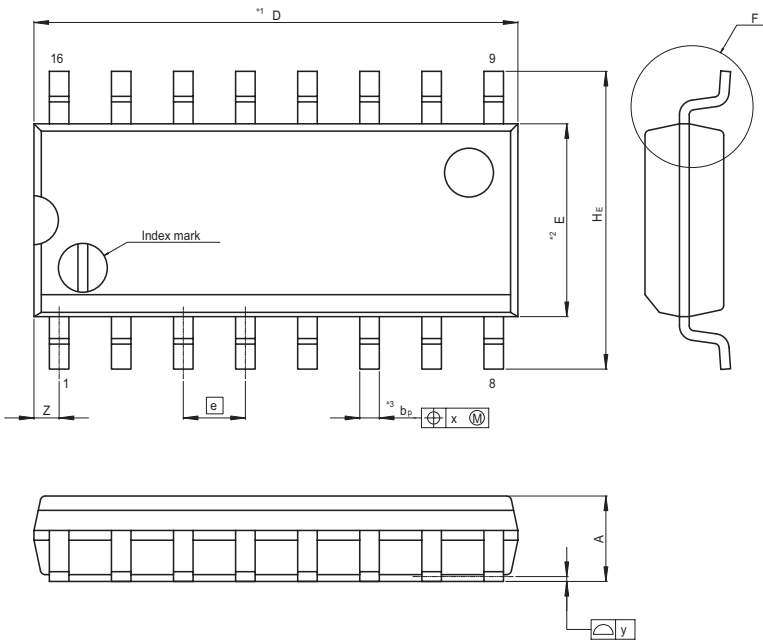


Package Dimensions

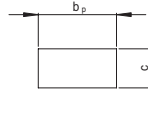


# HD74HC238

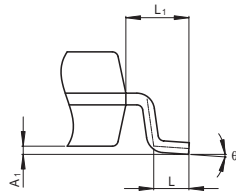
|   |                              |                           |                     |
|---|------------------------------|---------------------------|---------------------|
| JEITA Package Code<br>P-SOP16-3.95x9.9-1.27 | RENESAS Code<br>PRSP0016DG-A | Previous Code<br>FP-16DNV | MASS[Typ.]<br>0.15g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



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



Terminal cross section  
( Ni/Pd/Au plating )



| Reference Symbol | Dimension in Millimeters |      |       |
|------------------|--------------------------|------|-------|
|                  | Min                      | Nom  | Max   |
| D                | —                        | 9.90 | 10.30 |
| E                | —                        | 3.95 | —     |
| A <sub>z</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  |
| e                | —                        | 1.27 | —     |
| x                | —                        | —    | 0.25  |
| y                | —                        | —    | 0.15  |
| Z                | —                        | —    | 0.635 |
| L                | 0.40                     | 0.60 | 1.27  |
| L <sub>1</sub>   | —                        | 1.08 | —     |



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Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

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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 205, AZIA Center, No.133 Yincheng Rd (n), Pudong District, Shanghai 200120, China  
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  
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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**

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[HMC855LC5TR](#) [NLV14028BDR2G](#) [NLV14051BDR2G](#) [NLV74HC238ADTR2G](#) [715428X](#) [COMX-CAR-210](#) [5962-8607001EA](#) [5962-8756601EA](#) [MAX3783UCM+D](#) [PI5C3253QEX](#) [8CA3052APGGI8](#) [TC74HC4051AF\(EL,F\)](#) [TC74VHC138F\(EL,K,F\)](#) [PI3B3251LE](#)  
[PI5C3309UEX](#) [PI5C3251QEX](#) [PI3B3251QE](#) [74VHC4052AFT\(BJ\)](#) [PI3PCIE3415AZHEX](#) [NLV74HC4851AMNTWG](#) [MC74LVX257DG](#)  
[M74HC151YRM13TR](#) [M74HC151YTTR](#) [PI5USB31213XEAEX](#) [M74HCT4851ADWR2G](#) [XD74LS154](#) [AP4373AW5-7-01](#) [QS3VH251QG8](#)  
[QS4A201QG](#) [HCS301T-ISN](#) [HCS500-I/SM](#) [MC74HC151ADTG](#) [TC4066BP\(N,F\)](#) [74ACT11139PWR](#) [HMC728LC3CTR](#) [74VHC238FT\(BJ\)](#)  
[74VHC4066AFT\(BJ\)](#) [74VHCT138AFT\(BJ\)](#)