

HD74LVC138

3-to-8-line Decoder / Demultiplexer

REJ03D0349-0300Z
 (Previous ADE-205-068B (Z))
 Rev.3.00
 Jul. 23, 2004

Description

The HD74LVC138 has three binary select inputs in a 16 pin package. 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 are provided to ease the cascading of decoders. Low voltage and high-speed operation is suitable at the battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 2.0\text{ V to }5.5\text{ V}$
- All inputs $V_{IH}(\text{Max.}) = 5.5\text{ V} (@V_{CC} = 0\text{ V to }5.5\text{ V})$
- Typical V_{OL} ground bounce $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V}, Ta = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V}, Ta = 25^\circ\text{C})$
- High output current $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$
- Ordering Information

| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|----------------|--------------------|--------------|----------------------|--------------------------------|
| HD74LVC138FPEL | SOP-16 pin (JEITA) | FP-16DAV | FP | EL (2,000 pcs/reel) |
| HD74LVC138TELL | TSSOP-16 pin | TTP-16DAV | T | ELL (2,000 pcs/reel) |

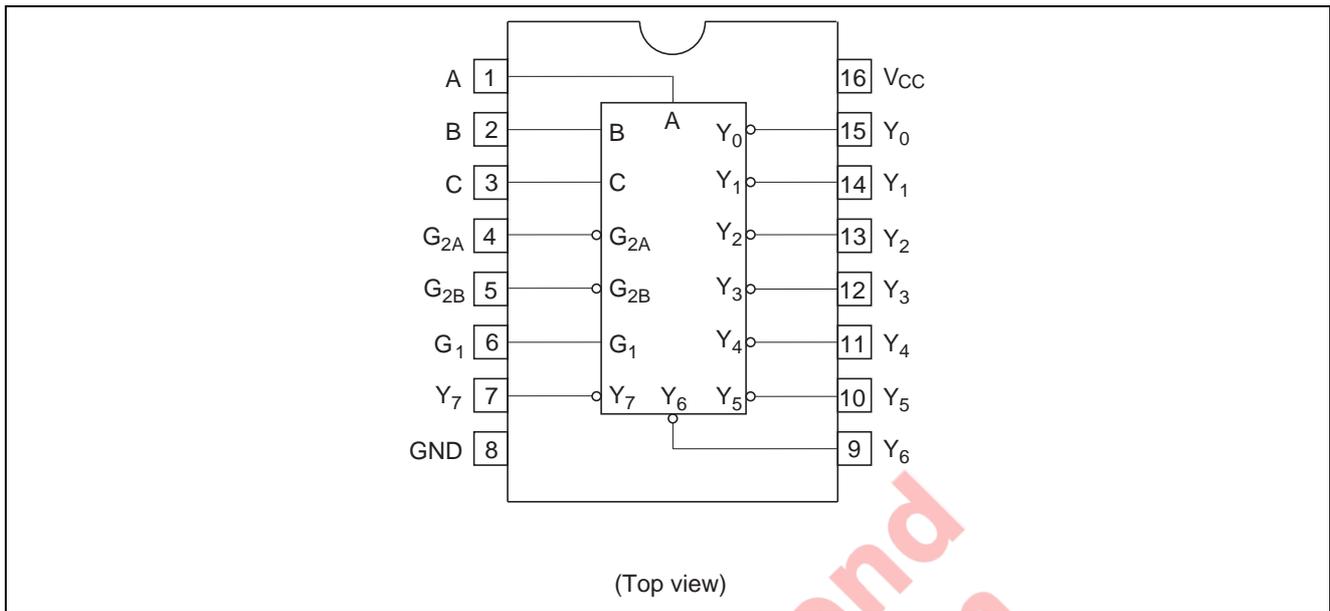
Note: Please consult the sales office for the above package availability.

Function Table

| Inputs | | | Select | | Outputs | | | | | | | | | |
|----------------|-----------------|-----------------|--------|---|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--|
| Enable | | | C | B | A | Y ₀ | Y ₁ | Y ₂ | Y ₃ | Y ₄ | Y ₅ | Y ₆ | Y ₇ | |
| G ₁ | G _{2A} | G _{2B} | | | | | | | | | | | | |
| X | X | H | X | X | X | H | H | H | H | H | H | H | H | |
| X | H | X | X | X | X | H | H | H | H | H | H | H | H | |
| L | X | X | X | X | X | H | H | H | H | H | H | H | H | |
| H | L | L | L | L | L | L | H | H | H | H | H | H | H | |
| H | L | L | L | L | H | H | L | H | H | H | H | H | H | |
| H | L | L | L | H | L | H | H | L | H | H | H | H | H | |
| H | L | L | L | H | H | H | H | H | L | H | H | H | H | |
| H | L | L | H | L | L | H | H | H | H | L | H | H | H | |
| H | L | L | H | L | H | H | H | H | H | H | L | H | H | |
| H | L | L | H | H | L | H | H | H | H | H | H | L | H | |
| H | L | L | H | H | H | H | H | H | H | H | H | H | L | |

H: High level
 L: Low level
 X: Immaterial

Pin Arrangement



Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|------------------------------|-----------------------|------------------------|--------------------|-------------------------------|
| Supply voltage | V_{CC} | -0.5 to 6.0 | V | |
| Input diode current | I_{IK} | -50 | mA | $V_I = -0.5\text{ V}$ |
| Input voltage | V_I | -0.5 to 6.0 | V | |
| Output diode current | I_{OK} | -50 | mA | $V_O = -0.5\text{ V}$ |
| | | 50 | | $V_O = V_{CC} + 0.5\text{ V}$ |
| Output voltage | V_O | -0.5 to $V_{CC} + 0.5$ | V | |
| Output current | I_O | ± 50 | mA | |
| V_{CC} , GND current / pin | I_{CC} or I_{GND} | 100 | mA | |
| Storage temperature | T_{stg} | -65 to +150 | $^{\circ}\text{C}$ | |

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} | 1.5 to 5.5 | V | Data retention |
| | | 2.0 to 5.5 | | At operation |
| Input / output voltage | V _I | 0 to 5.5 | V | G, A, B, C |
| | V _O | 0 to V _{CC} | V | Y ₀ to Y ₇ |
| Operating temperature | T _a | -40 to 85 | °C | |
| Output current | I _{OH} | -12 | mA | V _{CC} = 2.7 V |
| | | -24 ^{*2} | | V _{CC} = 3.0 V to 5.5 V |
| | I _{OL} | 12 | mA | V _{CC} = 2.7 V |
| | | 24 ^{*2} | | V _{CC} = 3.0 V to 5.5 V |
| Input rise / fall time ^{*1} | t _r , t _f | 10 | ns/V | |

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

Waveform: Refer to test circuit of switching characteristics.

2. Duty cycle ≤ 50%

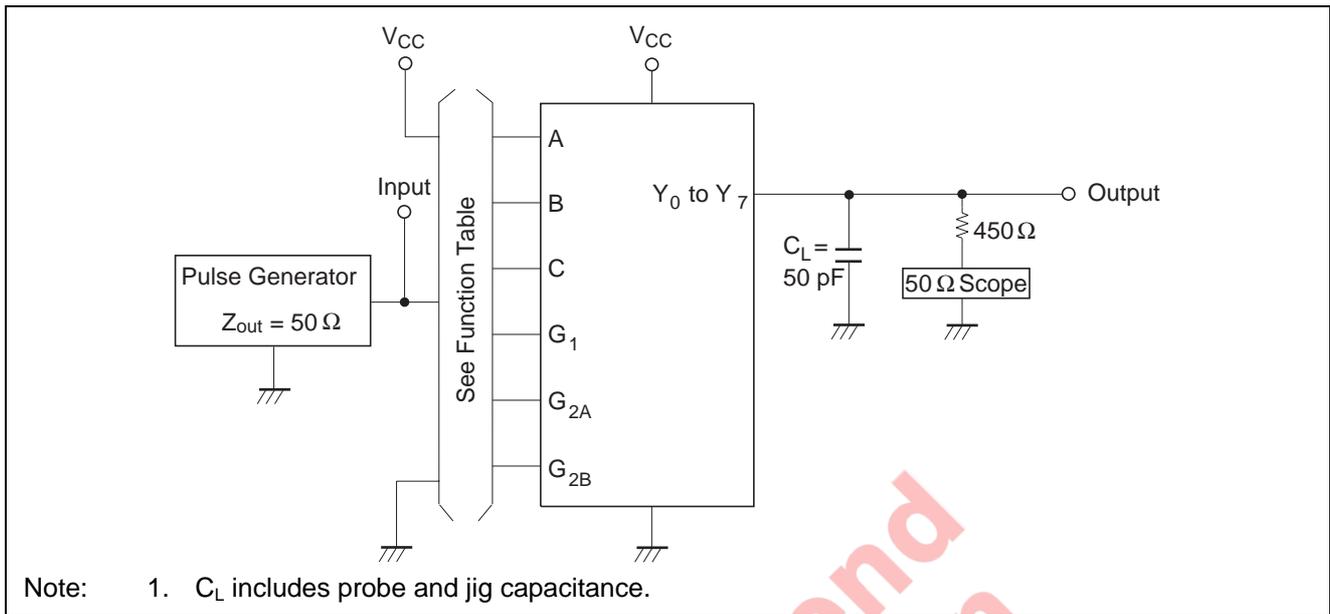
Electrical Characteristics

| Item | Symbol | V _{CC} (V) | Ta = -40 to 85°C | | Unit | Test Conditions |
|--------------------------|------------------|---------------------|-----------------------|----------------------|------|--|
| | | | Min | Max | | |
| Input voltage | V _{IH} | 2.7 to 3.6 | 2.0 | — | V | |
| | | 4.5 to 5.5 | V _{CC} ×0.7 | — | | |
| | V _{IL} | 2.7 to 3.6 | — | 0.8 | V | |
| | | 4.5 to 5.5 | — | V _{CC} ×0.3 | | |
| Output voltage | V _{OH} | 2.7 to 5.5 | V _{CC} - 0.2 | — | V | I _{OH} = -100 μA |
| | | 2.7 | 2.2 | — | | I _{OH} = -12 mA |
| | | 3.0 | 2.4 | — | | |
| | | 3.0 | 2.0 | — | | I _{OH} = -24 mA |
| | | 4.5 | 3.8 | — | | |
| | V _{OL} | 2.7 to 5.5 | — | 0.2 | V | I _{OL} = 100 μA |
| | | 2.7 | — | 0.4 | | I _{OL} = 12 mA |
| | | 3.0 | — | 0.55 | | I _{OL} = 24 mA |
| | | 3.0 | — | 0.55 | | |
| | | 4.5 | — | 0.55 | | |
| Input current | I _{IN} | 0 to 5.5 | — | ±5.0 | μA | V _{IN} = 5.5 V or GND |
| Quiescent supply current | I _{CC} | 5.5 | — | 20 | μA | V _{IN} = V _{CC} or GND |
| | ΔI _{CC} | 3.0 to 3.6 | — | 500 | μA | V _{IN} = one input at (V _{CC} -0.6)V, other inputs at V _{CC} or GND |

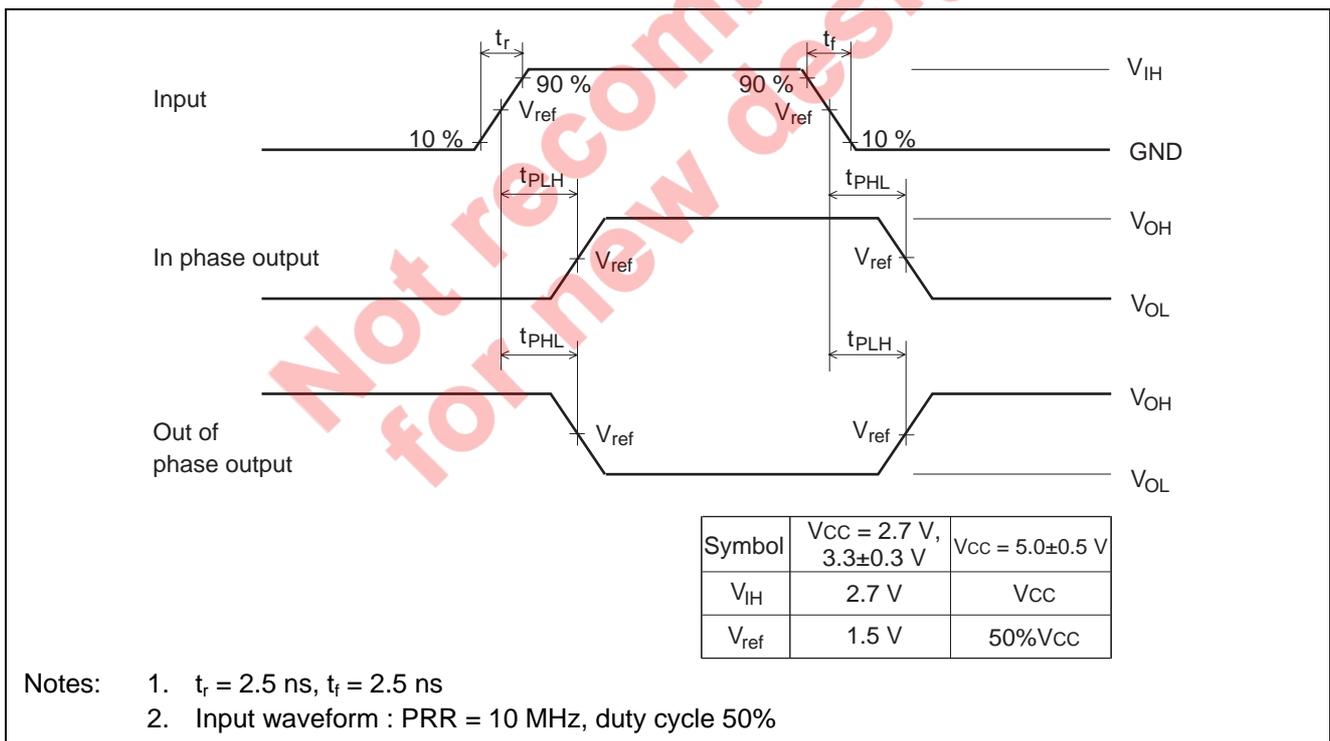
Switching Characteristics

| Item | Symbol | V _{CC} (V) | Ta = -40 to 85°C | | | Unit | From (Input) | To (Output) |
|------------------------|------------------|---------------------|------------------|------|------|------|--------------|----------------------------------|
| | | | Min | Typ | Max | | | |
| Propagation delay time | t _{PLH} | 2.7 | — | 7.0 | 10.0 | ns | G, A, B, C | Y ₀ to Y ₇ |
| | t _{PHL} | 3.3±0.3 | 1.5 | 5.0 | 9.0 | | | |
| | | 5.0±0.5 | — | 3.5 | 7.5 | | | |
| Input capacitance | C _{IN} | 2.7 | — | 3.0 | — | pF | | |
| Output capacitance | C _O | 2.7 | — | 15.0 | — | pF | | |

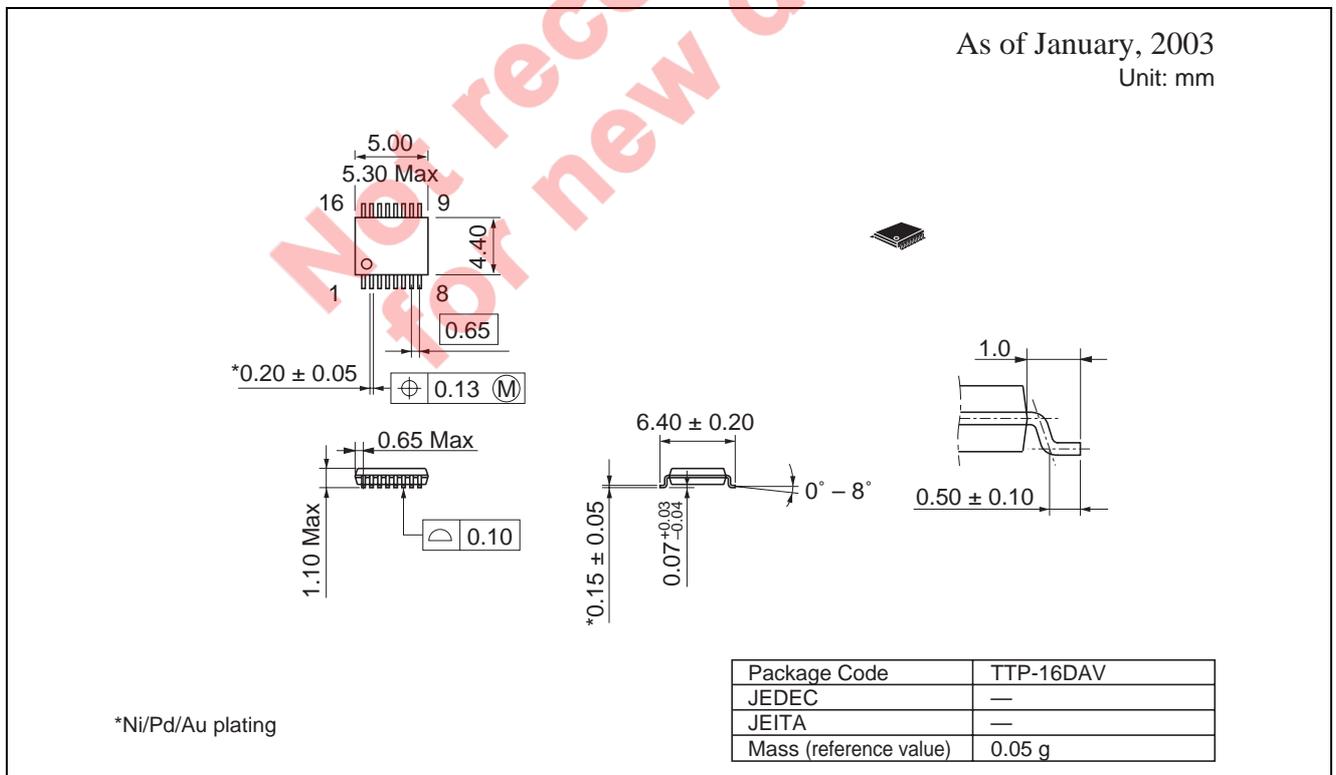
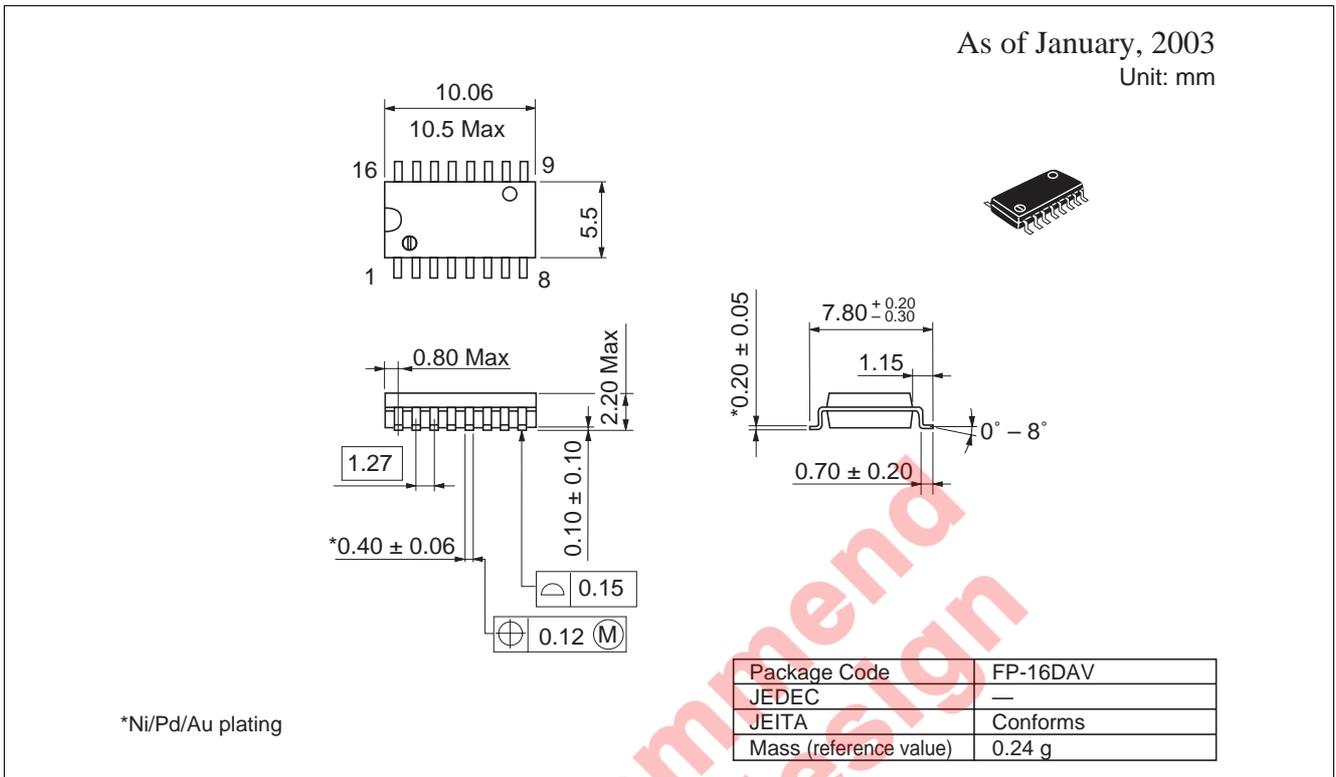
Test Circuit



Waveforms



Package Dimensions



Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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