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April 1st, 2010
Renesas Electronics Corporation

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RD74LVC240B

Octal Buffers / Line Drivers with 3-state Outputs

REJ03D0219-0200

Rev.2.00

Feb. 17, 2005

Description

The RD74LVC240B has eight inverter drivers with three state outputs in a 20 pin package. This device is a inverting buffer and has two active low enables ($\overline{1G}$ and $\overline{2G}$). Each enable independently controls four buffers. 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

- $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$
- All inputs $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- All outputs $V_{OUT} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V or output off state})$
- Typical V_{OL} ground bounce $< 0.8 \text{ V} (@V_{CC} = 3.3 \text{ V, } T_a = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.0 \text{ V} (@V_{CC} = 3.3 \text{ V, } T_a = 25^\circ\text{C})$
- High output current
 - $\pm 4 \text{ mA} (@V_{CC} = 1.65 \text{ V})$
 - $\pm 8 \text{ mA} (@V_{CC} = 2.3 \text{ V})$
 - $\pm 12 \text{ mA} (@V_{CC} = 2.7 \text{ V})$
 - $\pm 24 \text{ mA} (@V_{CC} = 3.0 \text{ V to } 5.5 \text{ V})$
- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------------|--------------------|---------------------------------|-------------------------|-----------------------------------|
| RD74LVC240BFPEL | SOP-20 pin (JEITA) | PRSP0020DD-B (FP-20DAV) | FP | EL (2,000 pcs/reel) |
| RD74LVC240BTELL | TSSOP-20 pin | PTSP0020JB-A (TTP-20DAV) | T | ELL (2,000 pcs/reel) |

Function Table

| Inputs | | Output \overline{Y} |
|----------------|---|-----------------------|
| \overline{G} | A | |
| H | X | Z |
| L | H | L |
| L | L | H |

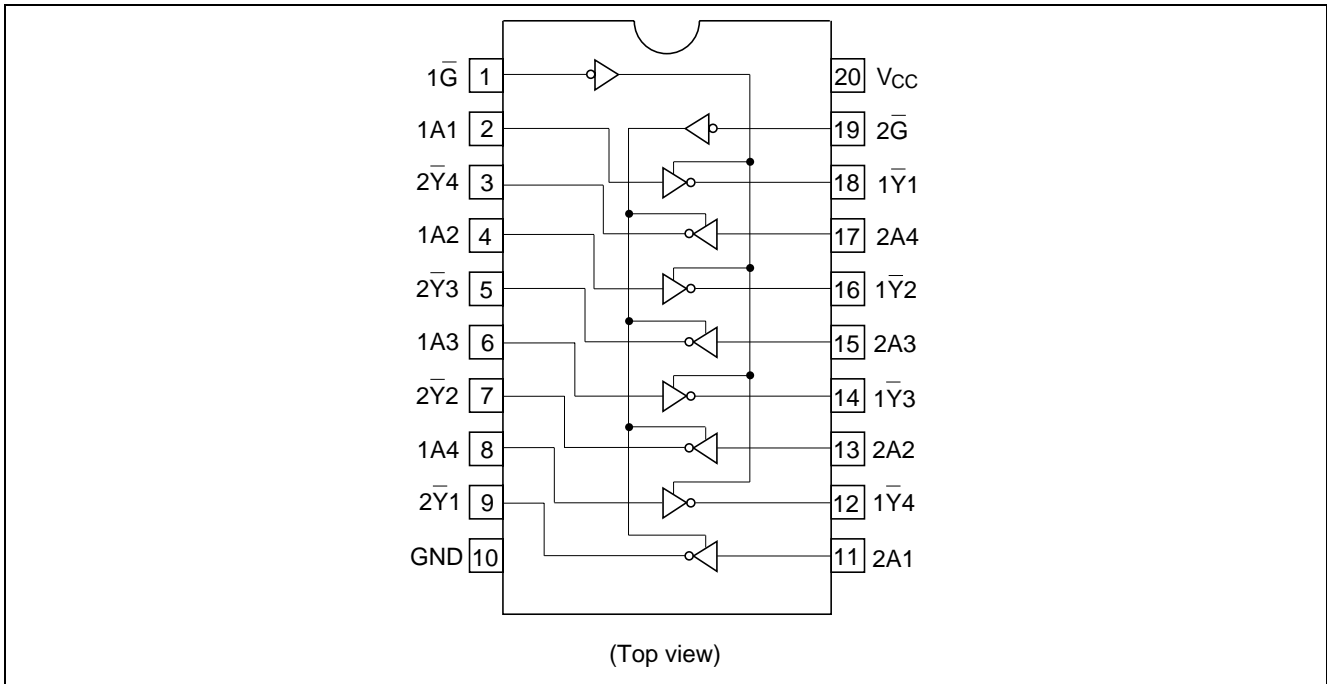
H: High level

L: Low level

X: Immaterial

Z: High impedance

Pin Arrangement



Absolute Maximum Ratings

| Item | Symbol | Ratings | Unit | Conditions |
|------------------------------|-----------------------|------------------------|--------------------|-------------------------------|
| Supply voltage | V_{CC} | -0.5 to 7.0 | V | |
| Input diode current | I_{IK} | -50 | mA | $V_I = -0.5\text{ V}$ |
| Input voltage | V_I | -0.5 to 7.0 | V | |
| Output diode current | I_{OK} | -50 | mA | $V_O = -0.5\text{ V}$ |
| | | 50 | mA | $V_O = V_{CC} + 0.5\text{ V}$ |
| Output voltage | V_O | -0.5 to $V_{CC} + 0.5$ | V | Output "H" or "L" |
| | | -0.5 to 6.0 | V | Output "Z" or V_{CC} :OFF |
| 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 hold |
| | | 1.65 to 5.5 | | At operation |
| Input / Output voltage | V_I | 0 to 5.5 | V | \bar{G} , A |
| | V_O | 0 to V_{CC} | | Output "H" or "L" |
| | | 0 to 5.5 | | Output "Z" or V_{CC} : OFF |
| Operating temperature | T_a | -40 to 85 | °C | |
| Output current | I_{OH} | -4 | mA | $V_{CC} = 1.65\text{ V}$ |
| | | -8 | | $V_{CC} = 2.3\text{ V}$ |
| | | -12 | | $V_{CC} = 2.7\text{ V}$ |
| | | -24 | | $V_{CC} = 3.0\text{ V to }5.5\text{ V}$ |
| | I_{OL} | 4 | mA | $V_{CC} = 1.65\text{ V}$ |
| | | 8 | | $V_{CC} = 2.3\text{ V}$ |
| | | 12 | | $V_{CC} = 2.7\text{ V}$ |
| | | 24 | | $V_{CC} = 3.0\text{ V to }5.5\text{ V}$ |
| Input rise / fall time ^{*1} | t_r, t_f | 20 | ns/V | $V_{CC} = 1.65\text{ V to }2.7\text{ V}$ |
| | | 10 | | $V_{CC} = 3.0\text{ V to }5.5\text{ V}$ |

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) | Ta = -40 to 85°C | | Unit | Test Conditions |
|--------------------------|------------------|---------------------|-----------------------|-----------------------|------|---|
| | | | Min | Max | | |
| Input voltage | V _{IH} | 1.65 to 1.95 | V _{CC} ×0.65 | — | V | |
| | | 2.3 to 2.7 | 1.7 | — | | |
| | | 2.7 to 3.6 | 2.0 | — | | |
| | | 4.5 to 5.5 | V _{CC} ×0.7 | — | | |
| | V _{IL} | 1.65 to 1.95 | — | V _{CC} ×0.35 | V | |
| | | 2.3 to 2.7 | — | 0.7 | | |
| | | 2.7 to 3.6 | — | 0.8 | | |
| | | 4.5 to 5.5 | — | V _{CC} ×0.3 | | |
| Output voltage | V _{OH} | 1.65 to 5.5 | V _{CC} -0.2 | — | V | I _{OH} = -100 μA |
| | | 1.65 | 1.2 | — | | I _{OH} = -4 mA |
| | | 2.3 | 1.7 | — | | I _{OH} = -8 mA |
| | | 2.7 | 2.2 | — | | I _{OH} = -12 mA |
| | | 3.0 | 2.4 | — | | I _{OH} = -24 mA |
| | | 3.0 | 2.2 | — | | |
| | | 4.5 | 3.8 | — | | |
| | V _{OL} | 1.65 to 5.5 | — | 0.2 | V | I _{OL} = 100 μA |
| | | 1.65 | — | 0.45 | | I _{OL} = 4 mA |
| | | 2.3 | — | 0.7 | | I _{OL} = 8 mA |
| | | 2.7 | — | 0.4 | | I _{OL} = 12 mA |
| | | 3.0 | — | 0.55 | | I _{OL} = 24 mA |
| | | 4.5 | — | 0.55 | | |
| | Input current | I _{IN} | 0 to 5.5 | — | ±5.0 | μA |
| Output leak current | I _{OFF} | 0 | — | ±5.0 | μA | V _{IN} /V _{OUT} = 5.5 V |
| Off state output current | I _{OZ} | 2.7 to 5.5 | — | ±5.0 | μA | V _{IN} = V _{CC} or GND V _O = 5.5 V or GND |
| Quiescent supply current | I _{CC} | 2.7 to 3.6 | — | ±5.0 | μA | V _{IN} = 3.6 V to 5.5 V |
| | | 2.7 to 5.5 | — | 5.0 | | V _{IN} = V _{CC} or GND |
| | ΔI _{CC} | 2.7 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} | 1.8±0.15 | 1.0 | — | 10.9 | ns | A | Y |
| | t _{PHL} | 2.5±0.2 | 1.0 | — | 7.9 | | | |
| | | 2.7 | 1.0 | — | 6.9 | | | |
| | | 3.3±0.3 | 1.5 | — | 5.9 | | | |
| | | 5.0±0.5 | 1.0 | — | 4.4 | | | |
| Output enable time | t _{ZH} | 1.8±0.15 | 1.0 | — | 12.6 | ns | G | Y |
| | t _{ZL} | 2.5±0.2 | 1.0 | — | 9.6 | | | |
| | | 2.7 | 1.0 | — | 8.6 | | | |
| | | 3.3±0.3 | 1.5 | — | 7.6 | | | |
| | | 5.0±0.5 | 1.0 | — | 6.1 | | | |
| Output disable time | t _{HZ} | 1.8±0.15 | 1.0 | — | 12.1 | ns | G | Y |
| | t _{LZ} | 2.5±0.2 | 1.0 | — | 7.8 | | | |
| | | 2.7 | 1.0 | — | 6.8 | | | |
| | | 3.3±0.3 | 1.5 | — | 6.5 | | | |
| | | 5.0±0.5 | 1.0 | — | 5.5 | | | |
| Between output pins skew*1 | t _{OSLH} | 1.8±0.15 | — | — | — | ns | | |
| | t _{OSHL} | 2.5±0.2 | — | — | — | | | |
| | | 2.7 | — | — | — | | | |
| | | 3.3±0.3 | — | — | 1.0 | | | |
| | | 5.0±0.5 | — | — | 1.0 | | | |
| Input capacitance | C _{IN} | 3.3 | — | 4.0 | — | pF | | |
| Output capacitance | C _O | 3.3 | — | 8.0 | — | pF | | |

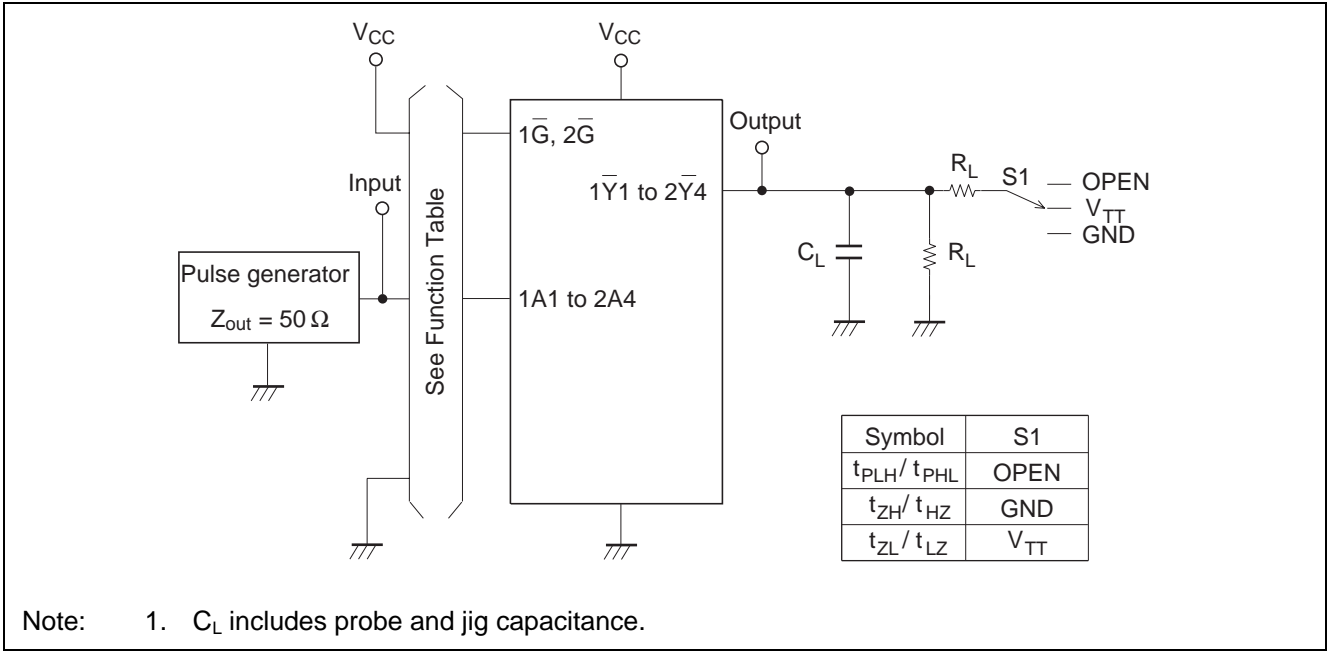
Note: 1. This parameter is characterized but not tested.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSHL} = |t_{PHLm} - t_{PHLn}|$$

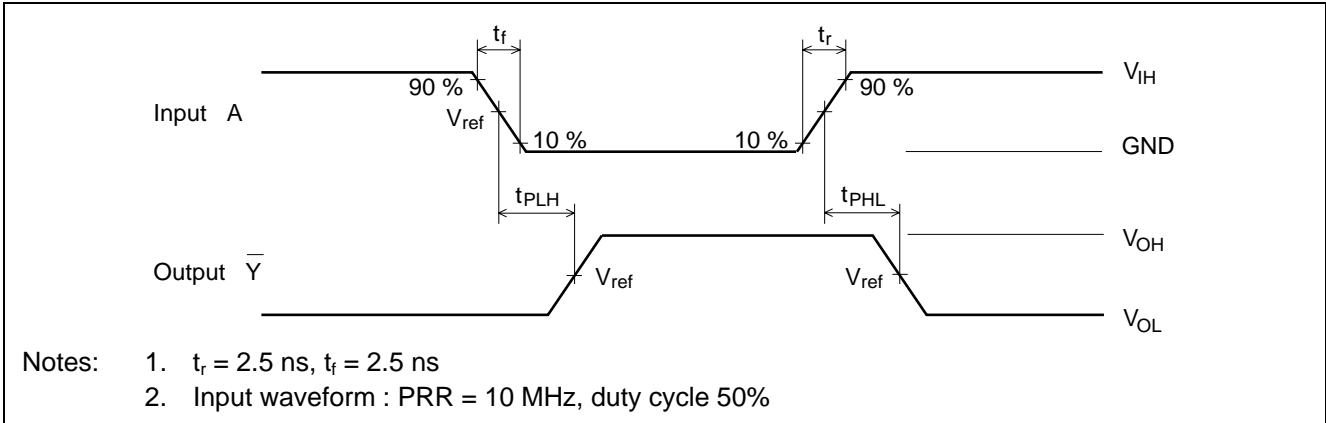
Operating Characteristics

| Item | Symbol | V _{CC} (V) | Ta = 25°C | | | Unit | Test conditions |
|-------------------------------|-----------------|---------------------|-----------|-----|-----|------|-----------------|
| | | | Min | Typ | Max | | |
| Power dissipation Capacitance | C _{PD} | 1.8 | — | 25 | — | pF | f = 10 MHz |
| | | 2.5 | — | 25 | — | | |
| | | 3.3 | — | 27 | — | | |
| | | 5.0 | — | 32 | — | | |

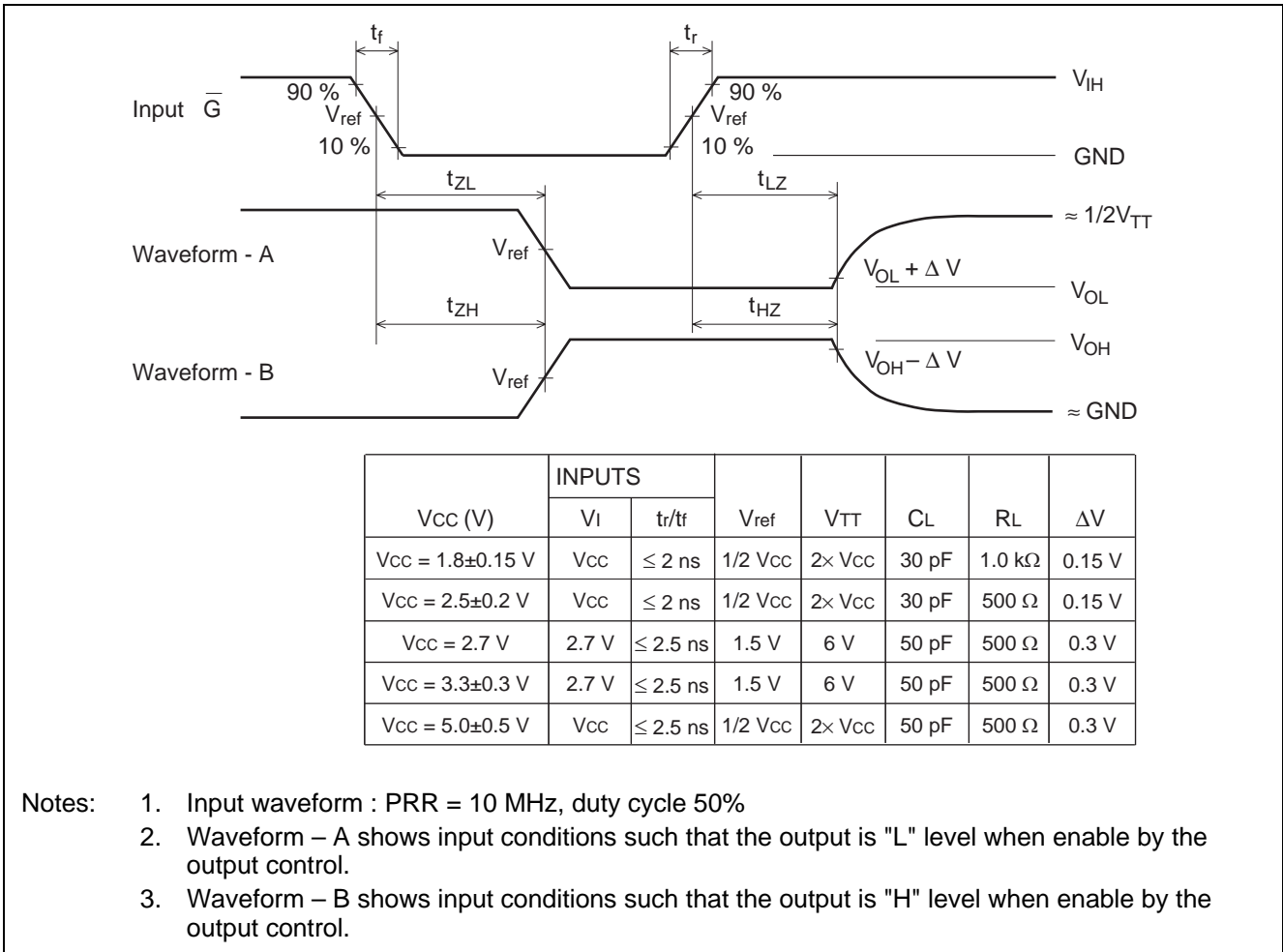
Test Circuit



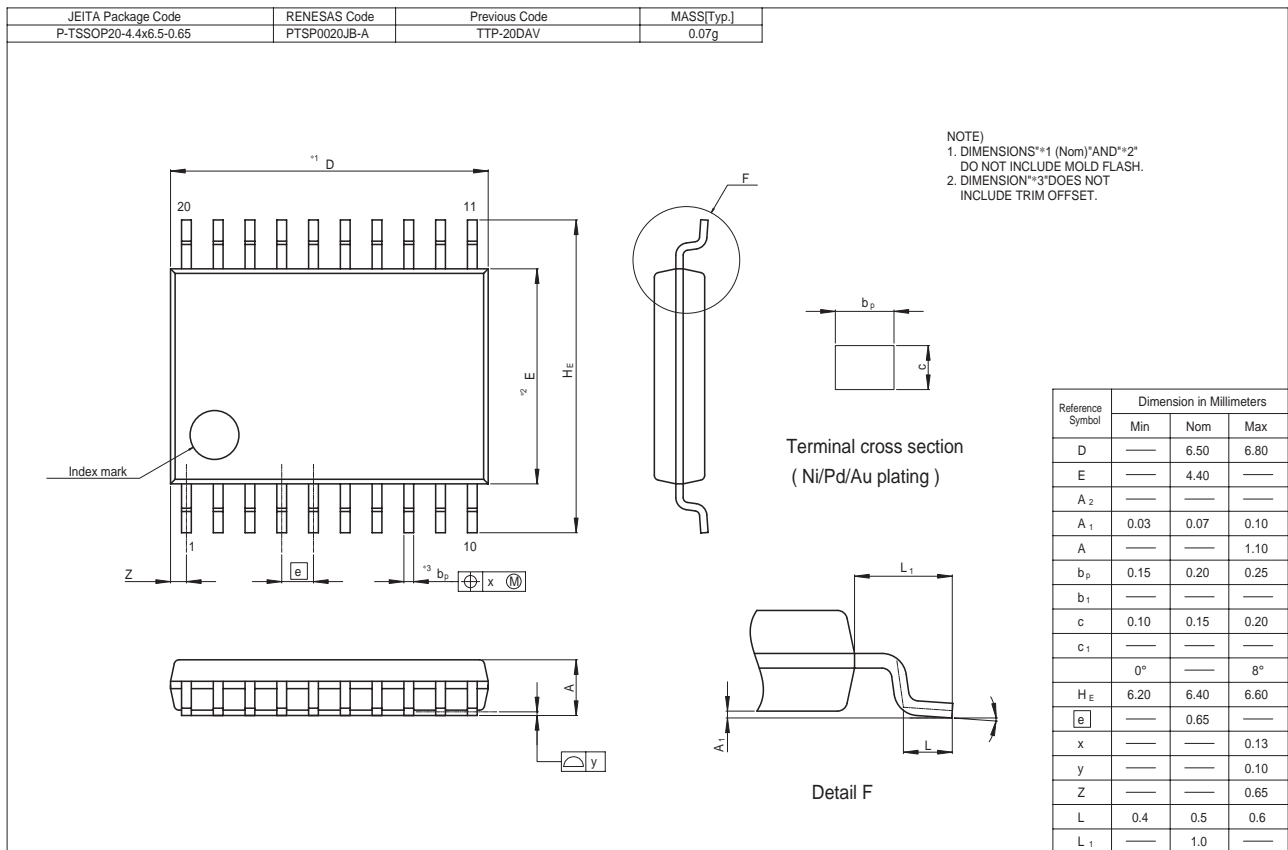
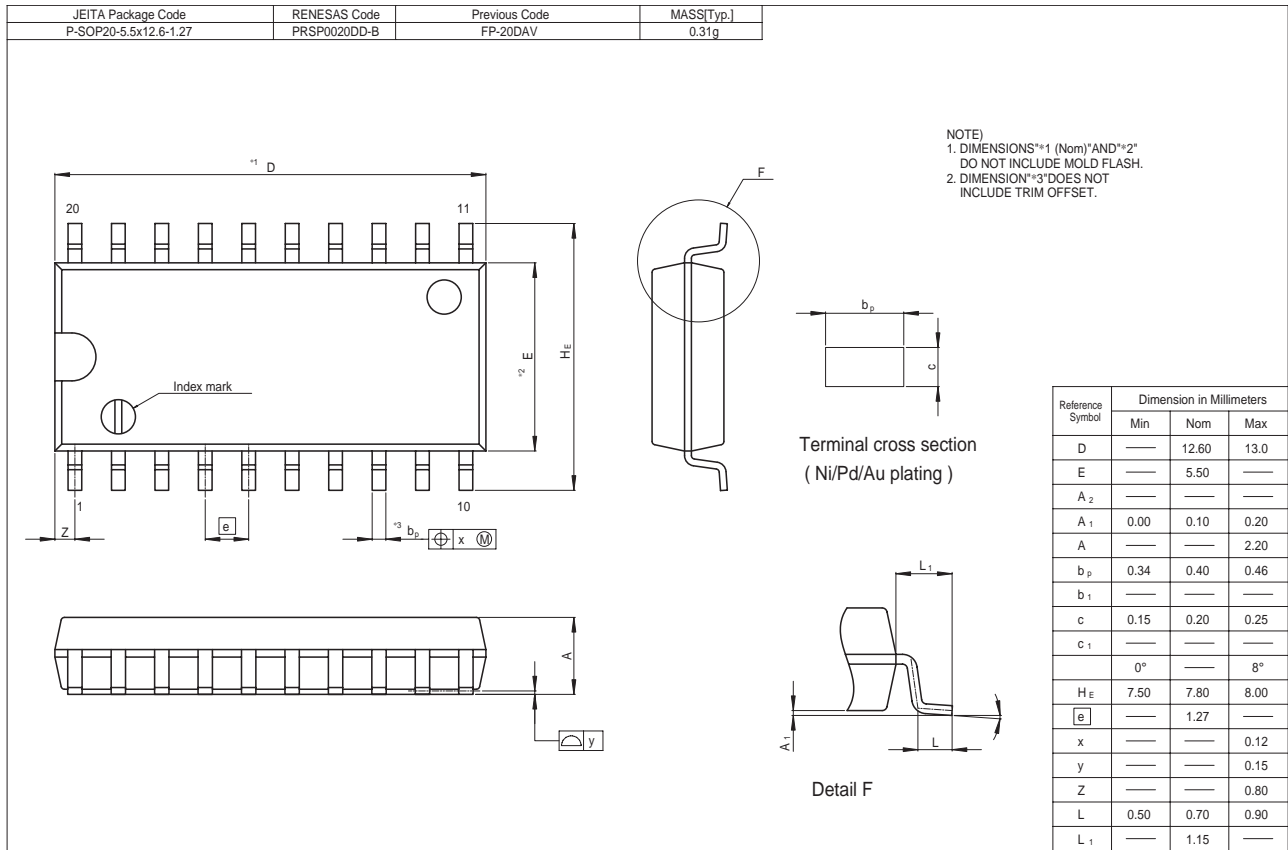
Waveforms – 1



Waveforms – 2



Package Dimensions



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