

RD74LVC541B

Octal Buffers / Line Drivers with 3-state Outputs

REJ03D0114-0100Z

Rev.1.00

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Description

The RD74LVC541B has eight line drivers with three state outputs in a 20 pin package. When $\overline{G1}$ and $\overline{G2}$ is low level, this drivers set up output is enable. 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 $< 0.8\text{ V} (@V_{CC} = 3.3\text{ V, Ta} = 25^\circ\text{C})$
- Typical V_{OH} undershoot $> 2.0\text{ V} (@V_{CC} = 3.3\text{ V, Ta} = 25^\circ\text{C})$
- High output current
 - $\pm 4\text{ mA} (@V_{CC} = 1.65\text{ V})$
 - $\pm 8\text{ mA} (@V_{CC} = 2.3\text{ V})$
 - $\pm 12\text{ mA} (@V_{CC} = 2.7\text{ V})$
 - $\pm 24\text{ mA} (@V_{CC} = 3.0\text{ V to }5.5\text{ V})$
- Ordering Information

| Part Name | Package Type | Package Code | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------------|--------------------|--------------|----------------------|--------------------------------|
| RD74LVC541BFPEL | SOP-20 pin (JEITA) | FP-20DAV | FP | EL (2,000 pcs / Reel) |
| RD74LVC541BTELL | TSSOP-20 pin | TTP-20DAV | T | ELL (2,000 pcs / Reel) |

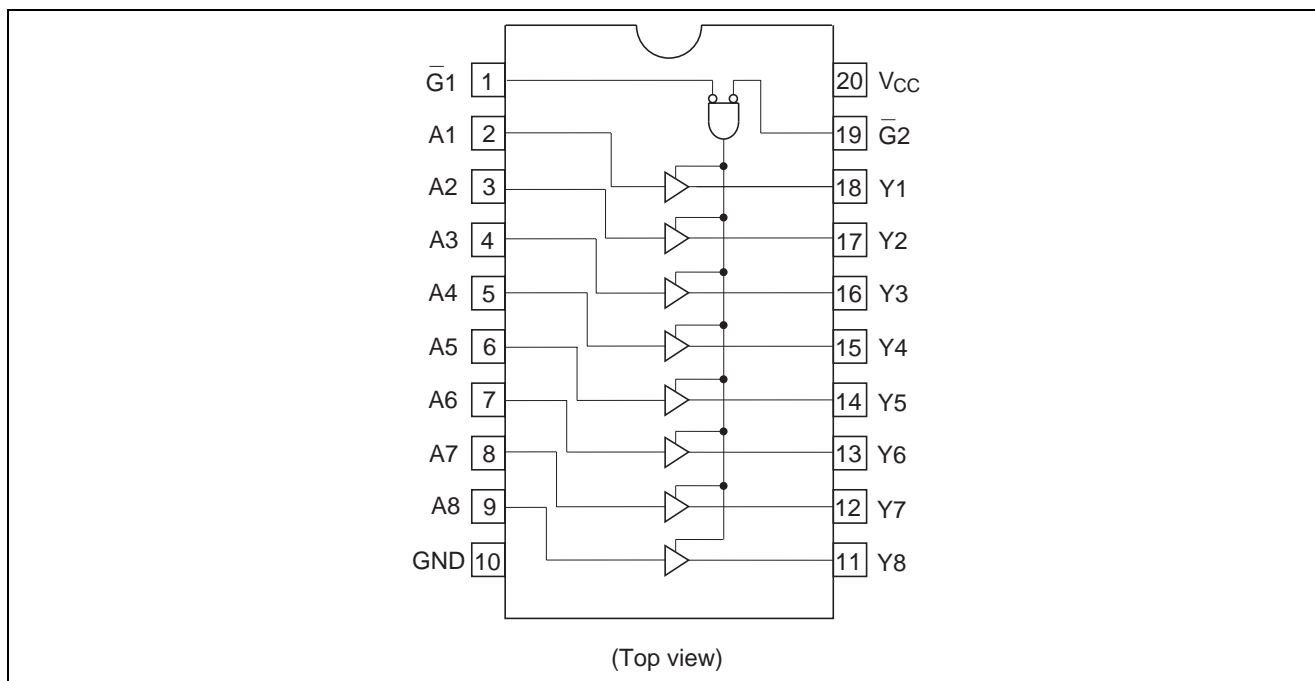
Function Table

Inputs

| $\overline{G1}$ | $\overline{G2}$ | A | Output Y |
|-----------------|-----------------|---|----------|
| L | L | L | L |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |

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 | $V_I = -0.5$ V |
| Input voltage | V_I | -0.5 to 7.0 | V | |
| Output diode current | I_{OK} | -50 | mA | $V_O = -0.5$ V |
| | | 50 | | $V_O = V_{CC} + 0.5$ V |
| Output voltage | V_O | -0.5 to $V_{CC} + 0.5$ | V | Output "H" or "L" |
| | | -0.5 to 7.0 | | 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 | $^{\circ}$ 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 | $\overline{G}1, \overline{G}2, A$ |
| | 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 | | |
| | | 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 | — | | |
| | | 3.0 | 2.2 | — | | I _{OH} = -24 mA |
| | | 4.5 | 3.8 | — | | |
| | V _{OL} | 1.65 to 5.5 | — | 0.2 | | 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 | V _{IN} = 5.5 V or GND |
| 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 _{OUT} = 5.5 V or GND |
| Quiescent supply current | I _{CC} | 2.7 to 3.6 | — | ±5.0 | μA | V _{IN} = 3.6 to 5.5 V |
| | | 2.7 to 5.5 | — | 5.0 | μA | 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 | — | 15.7 | ns | A | Y |
| | t _{PHL} | 2.5±0.2 | 1.0 | — | 7.8 | | | |
| | | 2.7 | 1.0 | — | 5.6 | | | |
| | | 3.3±0.3 | 1.5 | — | 5.1 | | | |
| | | 5.0±0.5 | 1.0 | — | 4.1 | | | |
| Output enable time | t _{ZH} | 1.8±0.15 | 1.0 | — | 17.5 | ns | $\overline{G}1$ or $\overline{G}2$ | Y |
| | t _{ZL} | 2.5±0.2 | 1.0 | — | 10.5 | | | |
| | | 2.7 | 1.0 | — | 7.5 | | | |
| | | 3.3±0.3 | 1.5 | — | 7.0 | | | |
| | | 5.0±0.5 | 1.0 | — | 6.0 | | | |
| Output disable time | t _{HZ} | 1.8±0.15 | 1.0 | — | 16.5 | ns | $\overline{G}1$ or $\overline{G}2$ | Y |
| | t _{LZ} | 2.5±0.2 | 1.0 | — | 9.0 | | | |
| | | 2.7 | 1.0 | — | 7.7 | | | |
| | | 3.3±0.3 | 1.5 | — | 7.0 | | | |
| | | 5.0±0.5 | 1.0 | — | 6.0 | | | |
| Between output pins skew ^{*1} | t _{OSLH} | 1.8±0.15 | — | — | — | ns | | |
| | t _{OSSL} | 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 | | |

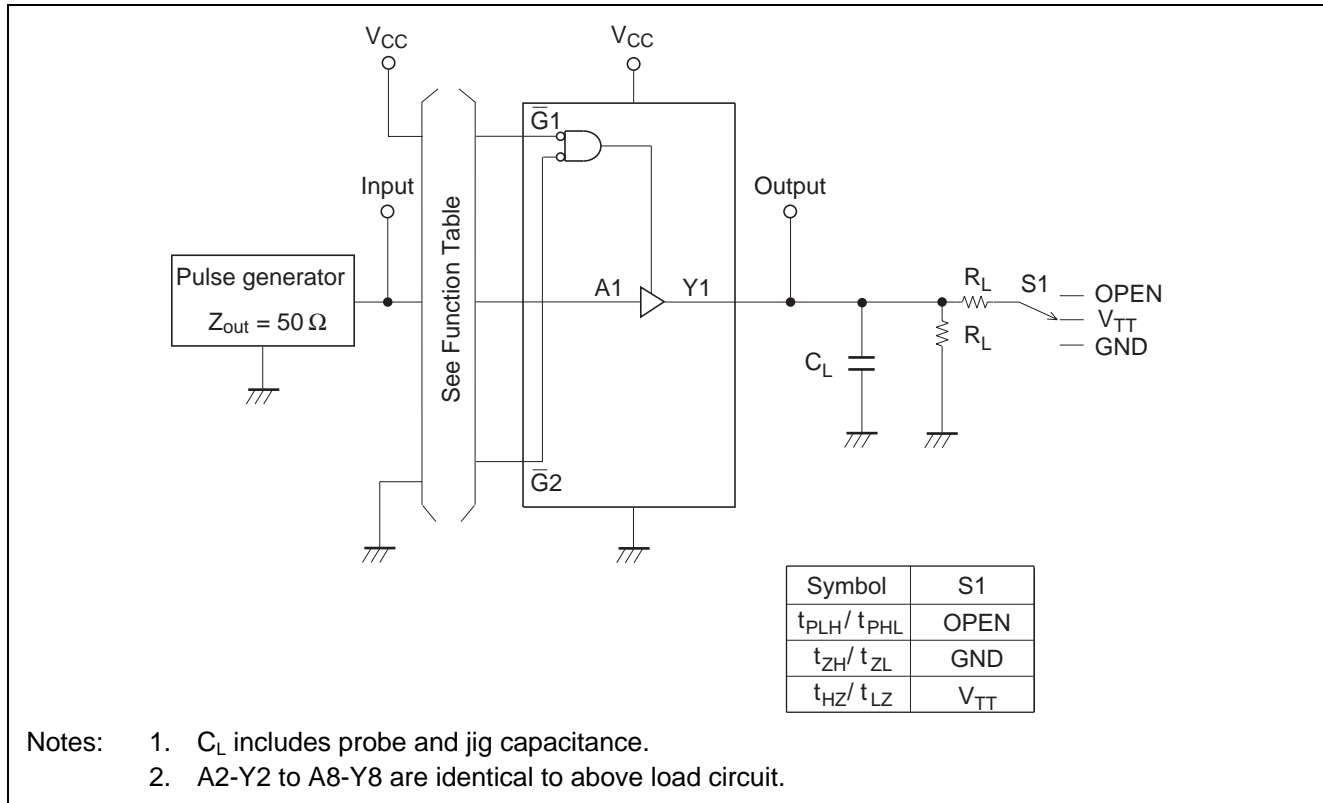
Note: 1. This parameter is characterized but not tested.

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

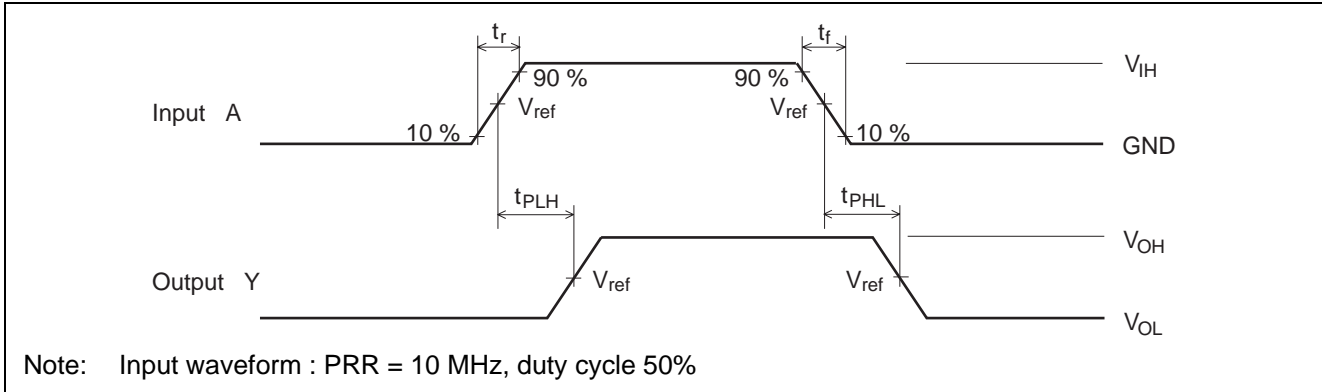
Operating Characteristics

| Item | Symbol | V _{CC} (V) | Ta = 25°C | | | Unit | Test conditions |
|-----------------------------------|-----------------|---------------------|-----------|-----|-----|------|-----------------|
| | | | Min | Typ | Max | | |
| Power dissipation C _{PD} | C _{PD} | 1.8 | — | 22 | — | pF | f = 10 MHz |
| Capacitance | | 2.5 | — | 25 | — | | |
| | | 3.3 | — | 25 | — | | |
| | | 5.0 | — | 30 | — | | |

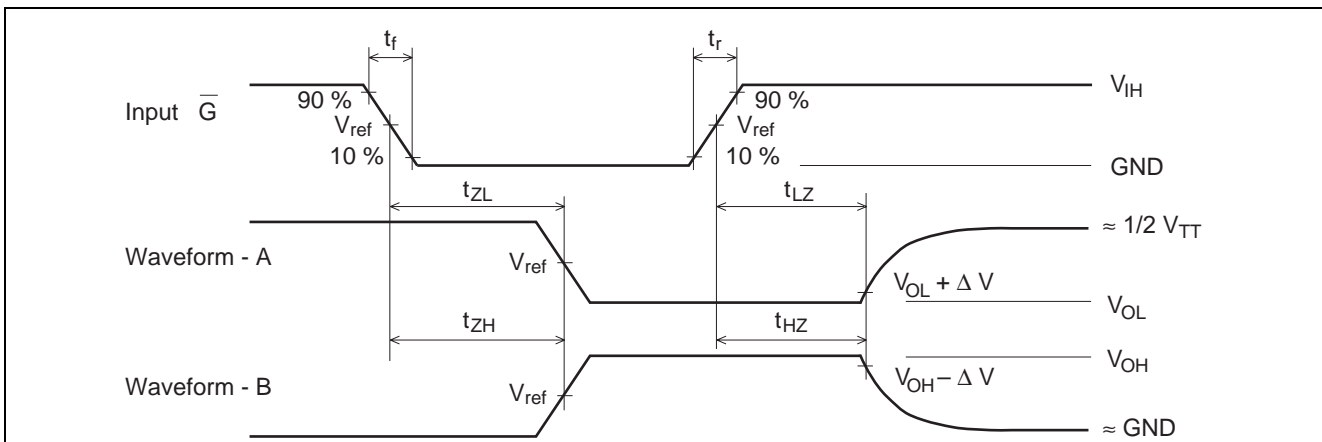
Test Circuit



Waveforms – 1



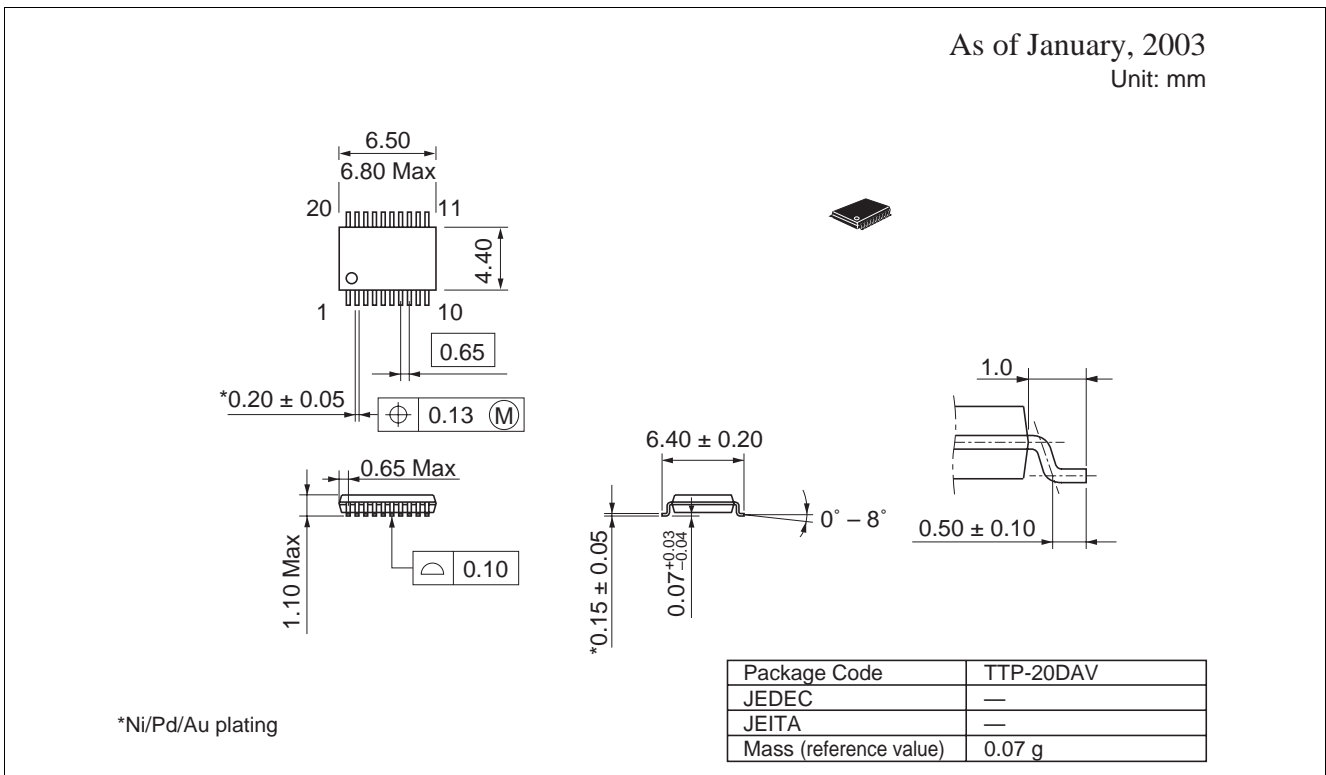
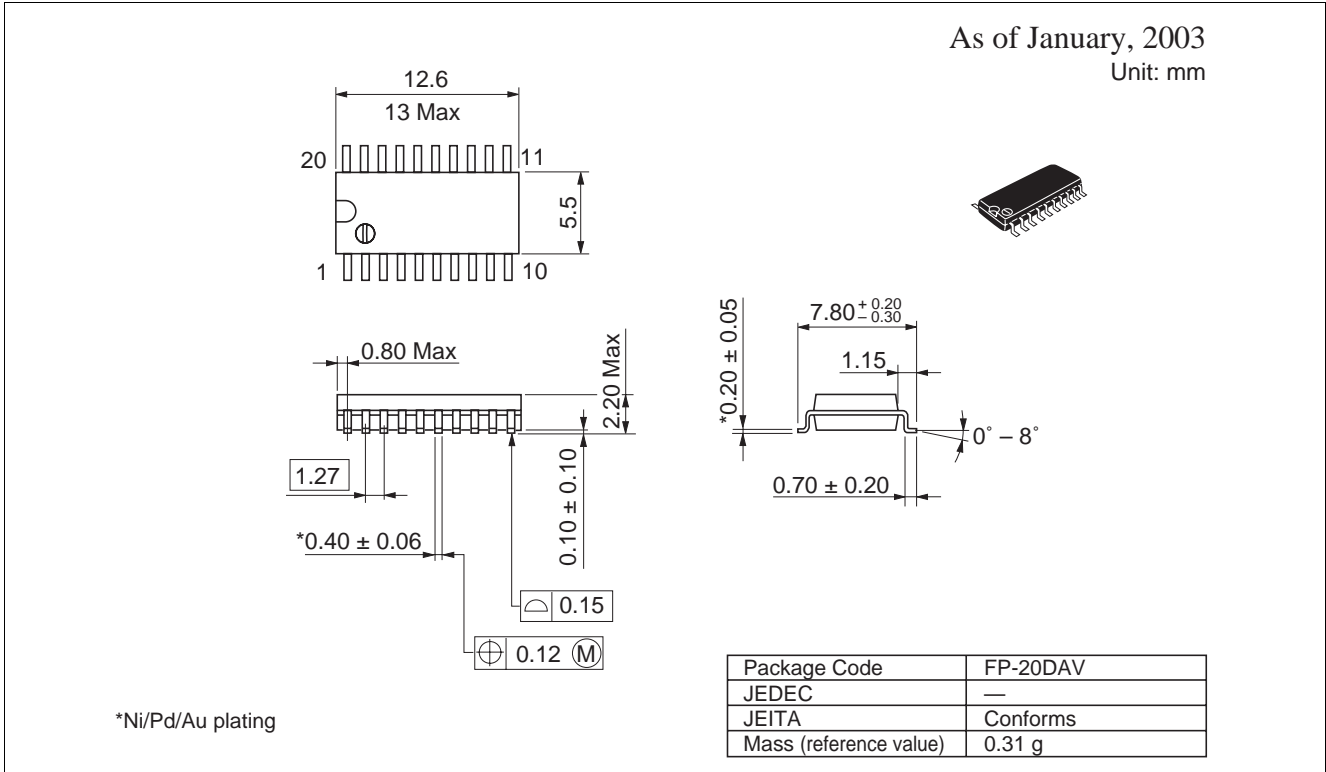
Waveforms – 2



| V _{CC} (V) | INPUTS | | V _{ref} | V _{TT} | C _L | R _L | ΔV |
|------------------------------|-----------------|---------------------------------|---------------------|---------------------|----------------|----------------|--------|
| | V _I | t _r / t _f | | | | | |
| V _{CC} = 1.8±0.15 V | V _{CC} | ≤ 2 ns | 1/2 V _{CC} | 2 × V _{CC} | 30 pF | 1.0 kΩ | 0.15 V |
| V _{CC} = 2.5±0.2 V | V _{CC} | ≤ 2 ns | 1/2 V _{CC} | 2 × V _{CC} | 30 pF | 500 Ω | 0.15 V |
| V _{CC} = 2.7 V | 2.7 V | ≤ 2.5 ns | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |
| V _{CC} = 3.3±0.3 V | 2.7 V | ≤ 2.5 ns | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |
| V _{CC} = 5.0±0.5 V | V _{CC} | ≤ 2.5 ns | 1/2 V _{CC} | 2 × V _{CC} | 50 pF | 500 Ω | 0.3 V |

- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%
 2. Waveform – A shows input conditions such that the output is "L" level when enable by the output control.
 3. Waveform – B shows input conditions such that the output is "H" level when enable by the output control.

Package Dimensions



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