

HD74HC564, HD74HC574

Octal D-type Flip-Flops (with 3-state outputs)

REJ03D0630-0200
 (Previous ADE-205-510)
 Rev.2.00
 Mar 30, 2006

Description

These devices are positive edge triggered flip-flops. The difference between HD74HC564 and HD74HC574 is only that the former has inverting outputs and the latter has noninverting outputs.

Data at the D inputs, meeting the set-up and hold time requirements, are transferred to the Q or \bar{Q} outputs on positive going transitions of the clock (CK) input. When a high logic level is applied to the output control (OC) input, all outputs go to a high impedance state, regardless of what signals are present at the other inputs and the state of the storage elements.



Features

- High Speed Operation: t_{pd} (Clock to Output) = 13 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 15 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)
- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|--------------------------------|--------------------|------------------------------|----------------------|--------------------------------|
| HD74HC564P HD74HC574P | DILP-20 pin | PRDP0020AC-B (DP-20NEV) | P | — |
| HD74HC564FPEL HD74HC574FPEL | SOP-20 pin (JEITA) | PRSP0020DD-B (FP-20DAV) | FP | EL (2,000 pcs/reel) |
| HD74HC564RPEL | SOP-20 pin (JEDEC) | PRSP0020DC-A (FP-20DBV) | RP | EL (1,000 pcs/reel) |

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

Function Table

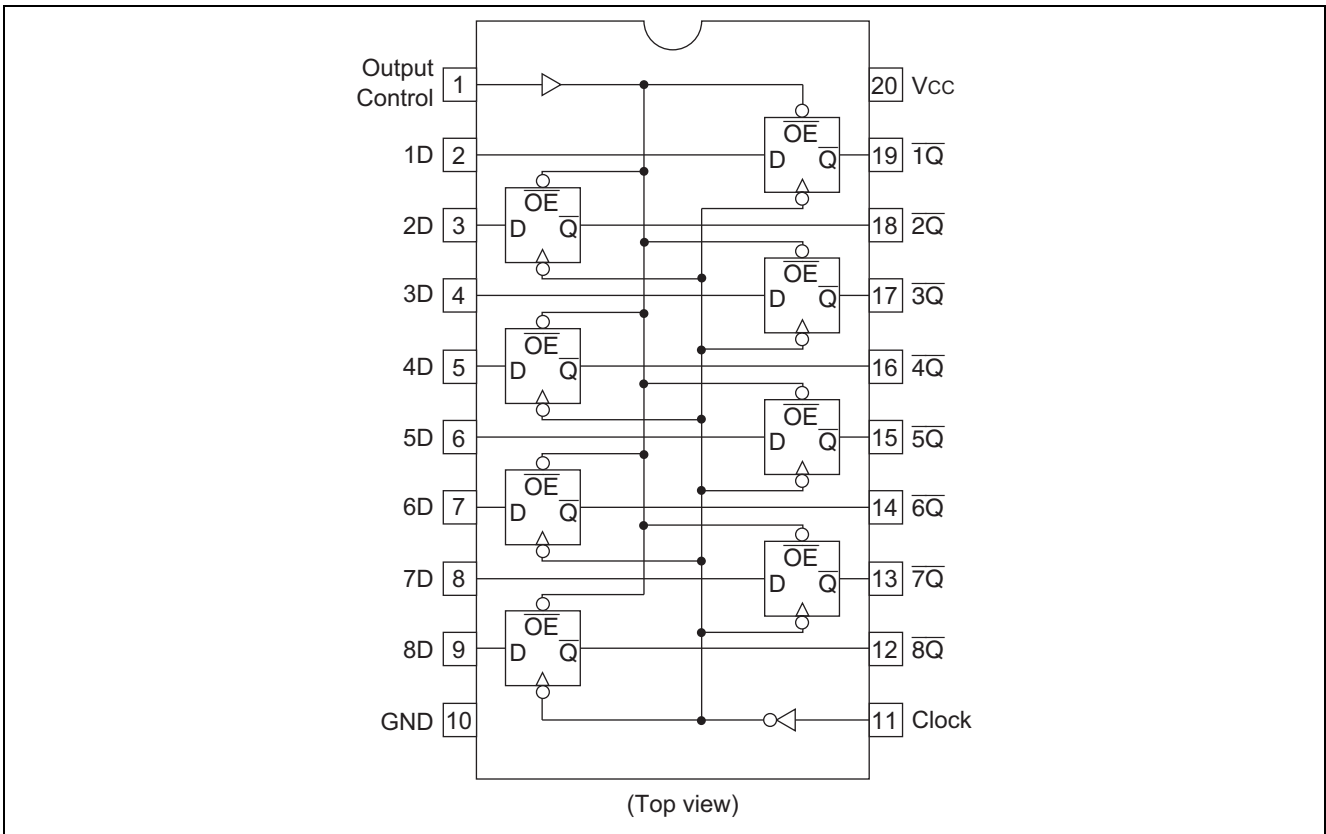
| Output Control | Inputs | | Outputs | |
|----------------|---|------|-----------|-----------|
| | Clock | Data | HD74HC564 | HD74HC574 |
| L |  | H | L | H |
| L |  | L | H | L |
| L | L | X | Q_0 | Q_0 |
| H | X | X | Z | Z |

Q_0 : level of Q before the indicated Steady-state input conditions were established.

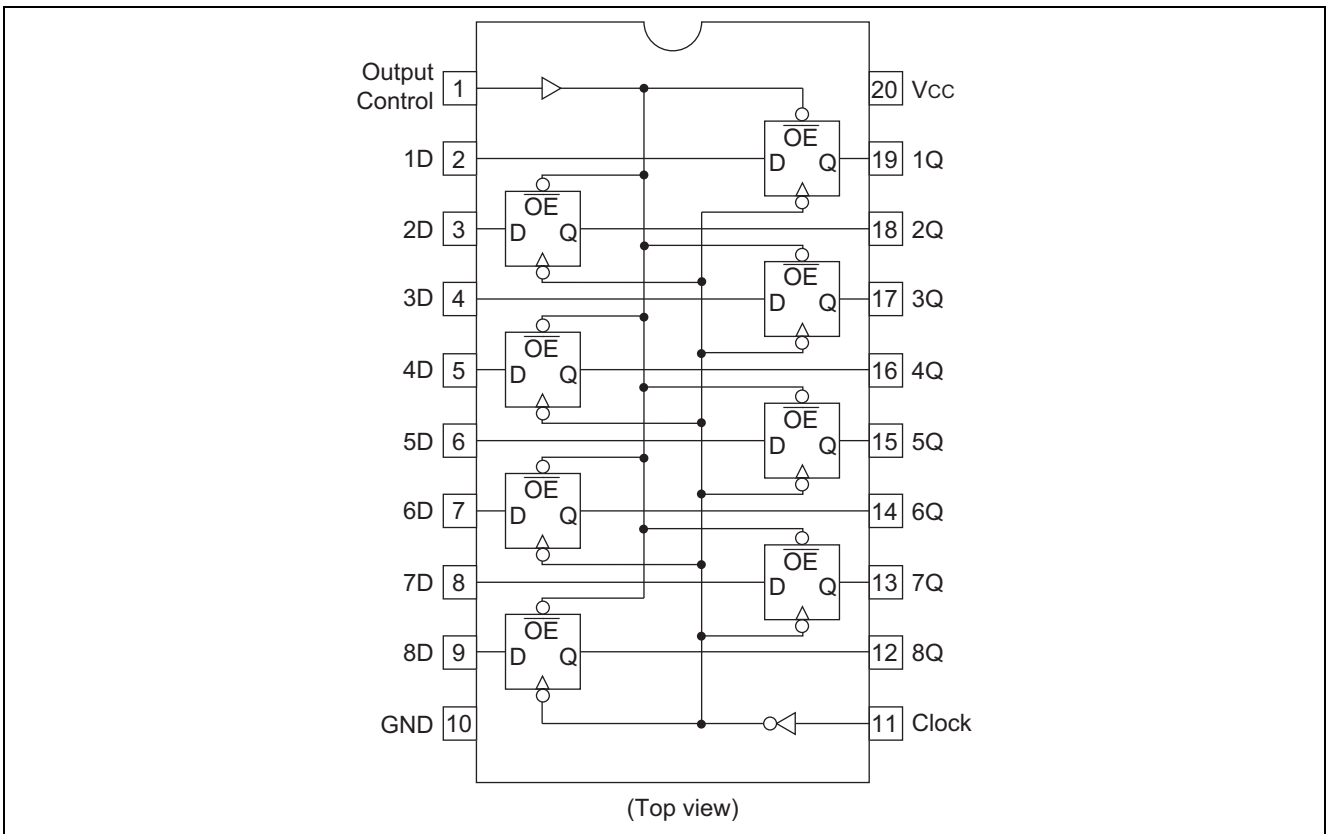
\bar{Q}_0 : complement of Q_0 or level of \bar{Q} before the indicated Steady-state input Conditions were established.

Pin Arrangement

HD74HC564

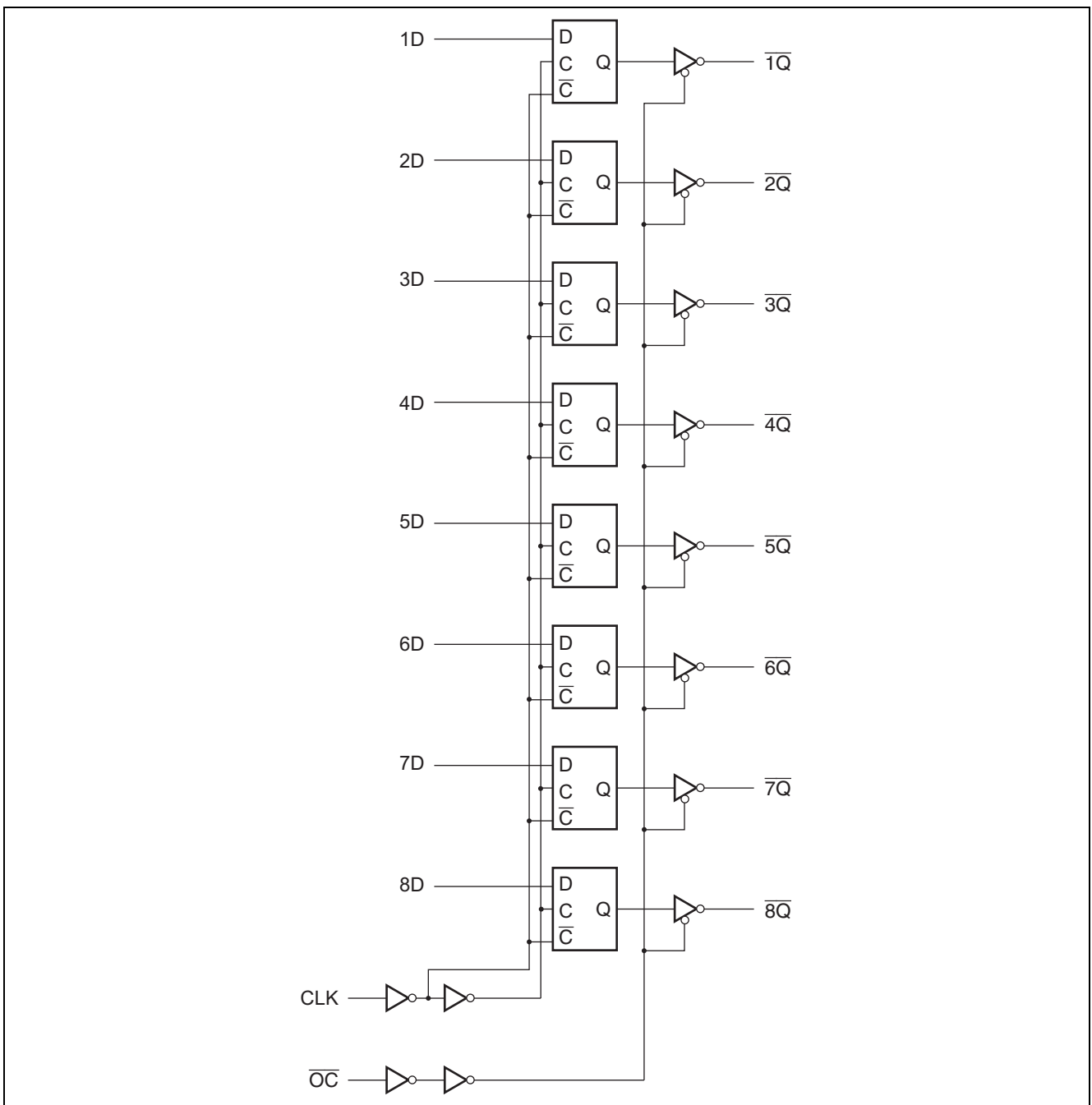


HD74HC574

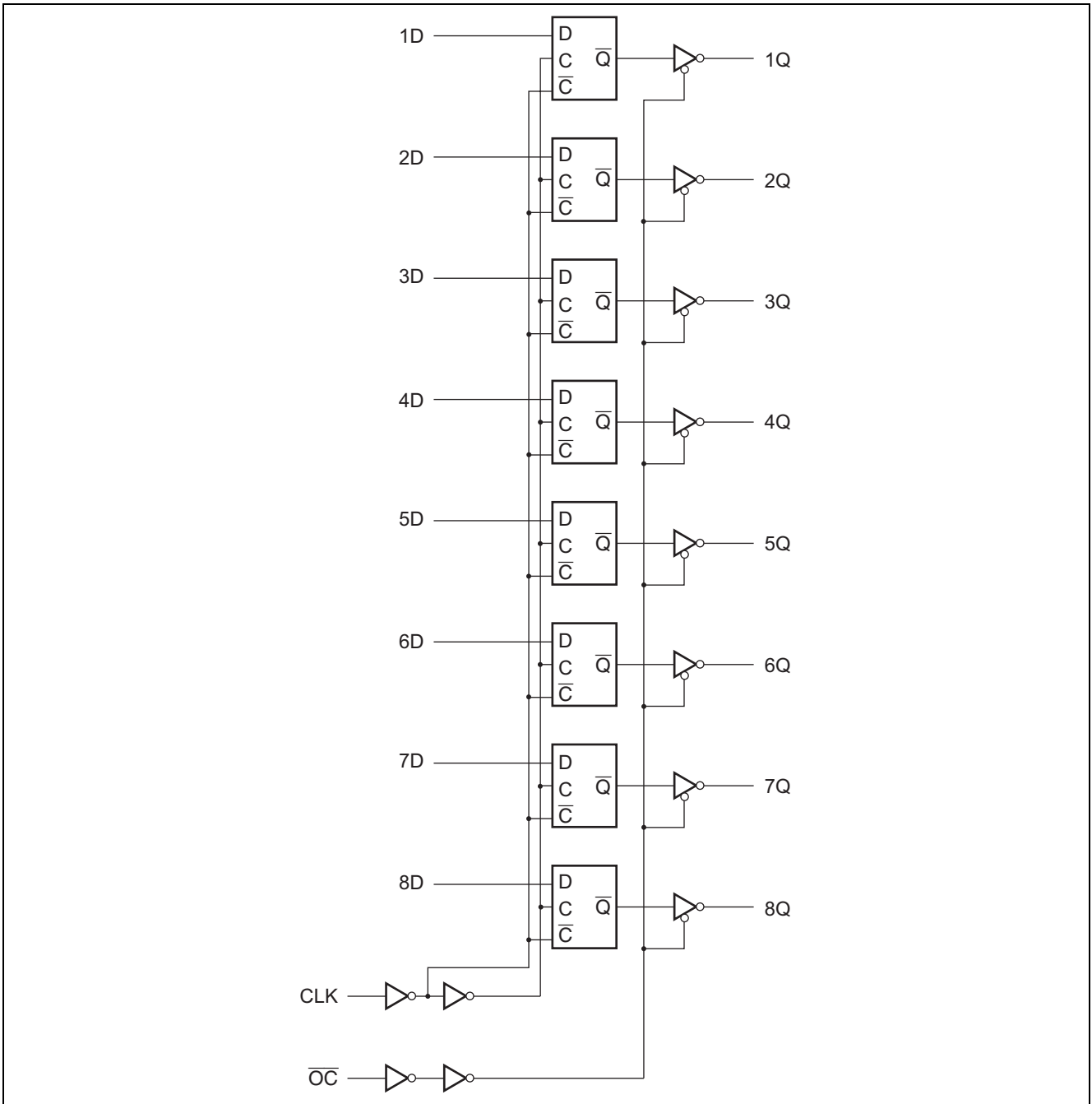


Logic Diagram

HD74HC564



HD74HC574



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} | ± 20 | mA |
| Output current | I_O | ± 35 | mA |
| V_{CC} , GND current | I_{CC} or I_{GND} | ± 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 ^{*1} | 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 | | $V_{CC} = 6.0\text{ V}$ |

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

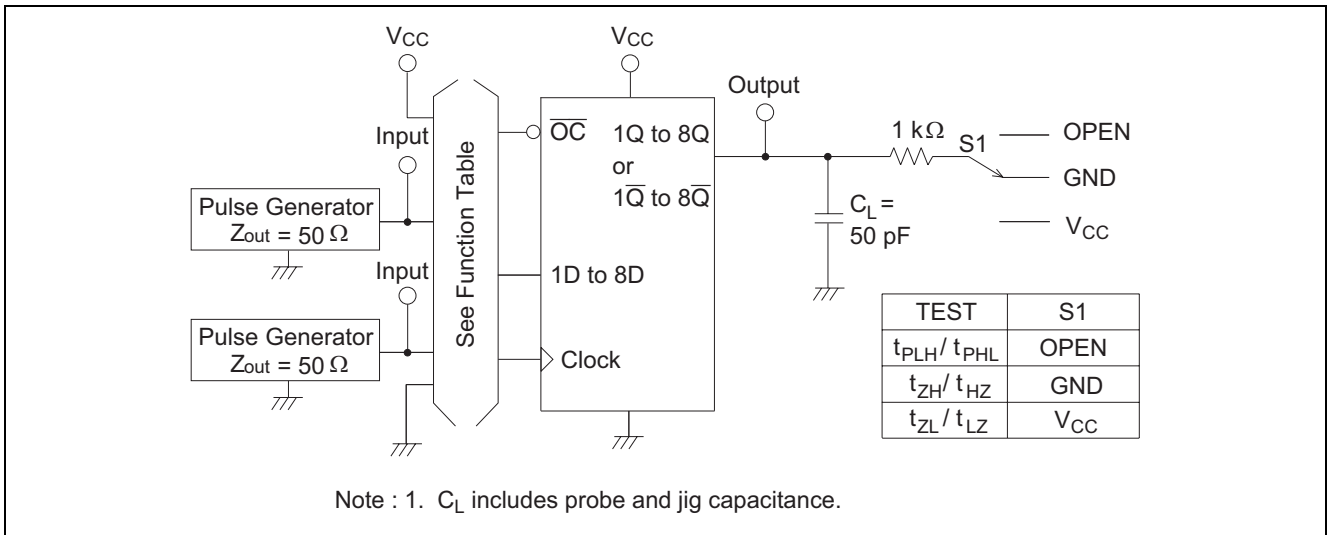
Electrical Characteristics

| 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 | — | | | $I_{OH} = -6\ \text{mA}$ |
| | | 6.0 | 5.9 | 6.0 | — | 5.9 | — | | | $I_{OH} = -7.8\ \text{mA}$ |
| | | 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 | | | $I_{OL} = 6\ \text{mA}$ |
| | | 6.0 | — | — | 0.26 | — | 0.33 | | | $I_{OL} = 7.8\ \text{mA}$ |
| Off-state output current | I_{OZ} | 6.0 | — | — | ± 0.5 | — | ± 5.0 | μA | $V_{in} = V_{IH}$ or V_{IL} , $V_{out} = V_{CC}$ or GND | |
| Input current | I_{in} | 6.0 | — | — | ± 0.1 | — | ± 1.0 | μA | $V_{in} = V_{CC}$ or GND | |
| Quiescent supply current | I_{CC} | 6.0 | — | — | 4.0 | — | 40 | μA | $V_{in} = V_{CC}$ or GND, $I_{out} = 0\ \mu\text{A}$ | |

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

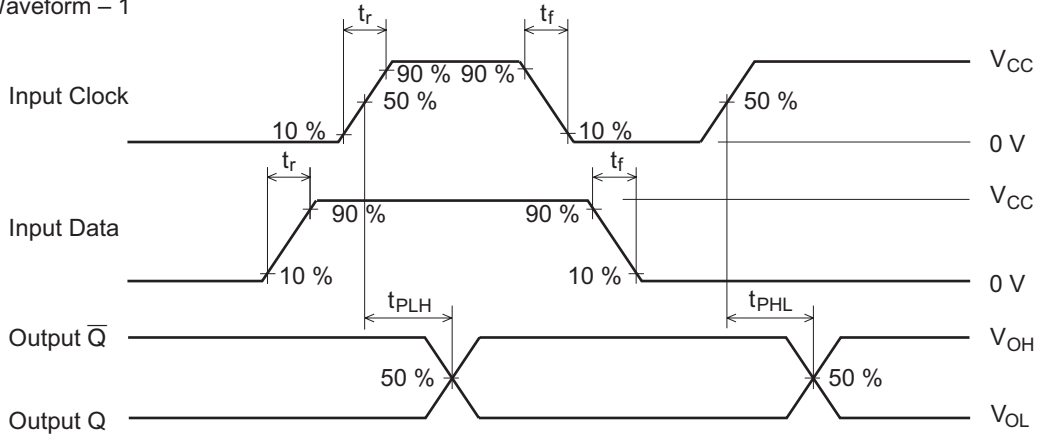
| Item | Symbol | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | | $T_a = -40 \text{ to } +85^\circ\text{C}$ | | Unit | Test Conditions |
|-------------------------|------------------------|--------------|--------------------------|-----|-----|---|-----|------|-----------------|
| | | | Min | Typ | Max | Min | Max | | |
| Maximum clock frequency | f_{max} | 2.0 | — | — | 6 | — | 5 | MHz | |
| | | 4.5 | — | — | 30 | — | 24 | | |
| | | 6.0 | — | — | 35 | — | 28 | | |
| Propagation delay time | t_{PLH} t_{PHL} | 2.0 | — | — | 155 | — | 195 | ns | Clock to output |
| | | 4.5 | — | 13 | 31 | — | 39 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Output enable time | t_{ZH} t_{ZL} | 2.0 | — | — | 150 | — | 190 | ns | |
| | | 4.5 | — | 13 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Output disable time | t_{HZ} t_{LZ} | 2.0 | — | — | 150 | — | 190 | ns | |
| | | 4.5 | — | 15 | 30 | — | 38 | | |
| | | 6.0 | — | — | 26 | — | 33 | | |
| Setup time | t_{su} | 2.0 | — | — | 100 | — | 125 | ns | |
| | | 4.5 | — | 1 | 20 | — | 25 | | |
| | | 6.0 | — | — | 17 | — | 21 | | |
| Hold time | t_h | 2.0 | 5 | — | — | 5 | — | ns | |
| | | 4.5 | 5 | 0 | — | 5 | — | | |
| | | 6.0 | 5 | — | — | 5 | — | | |
| Pulse width | t_w | 2.0 | 80 | — | — | 100 | — | ns | |
| | | 4.5 | 16 | 4 | — | 20 | — | | |
| | | 6.0 | 14 | — | — | 17 | — | | |
| Output rise/fall time | t_{TLH} t_{THL} | 2.0 | — | — | 60 | — | 75 | ns | |
| | | 4.5 | — | 4 | 12 | — | 15 | | |
| | | 6.0 | — | — | 10 | — | 13 | | |
| Input capacitance | C_{in} | — | — | 5 | 10 | — | 10 | pF | |

Test Circuit

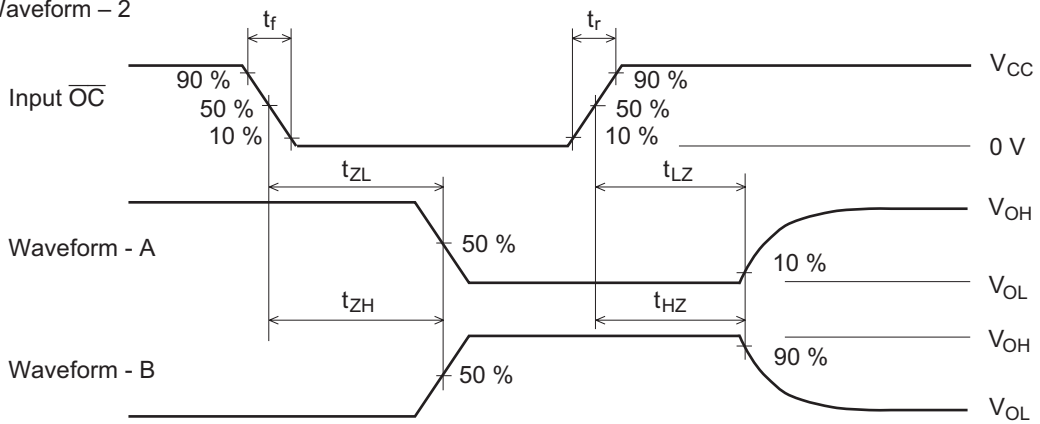


Waveforms

• Waveform – 1

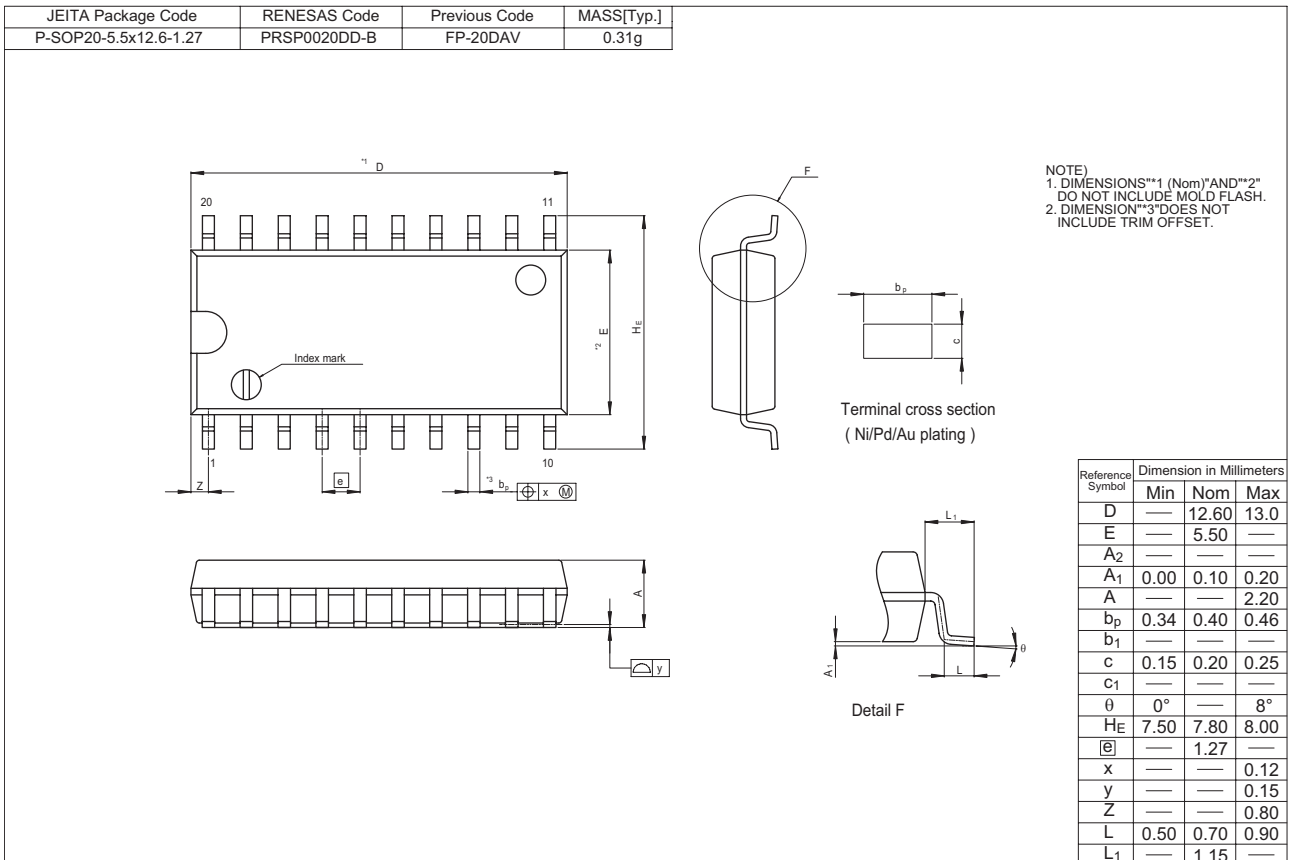
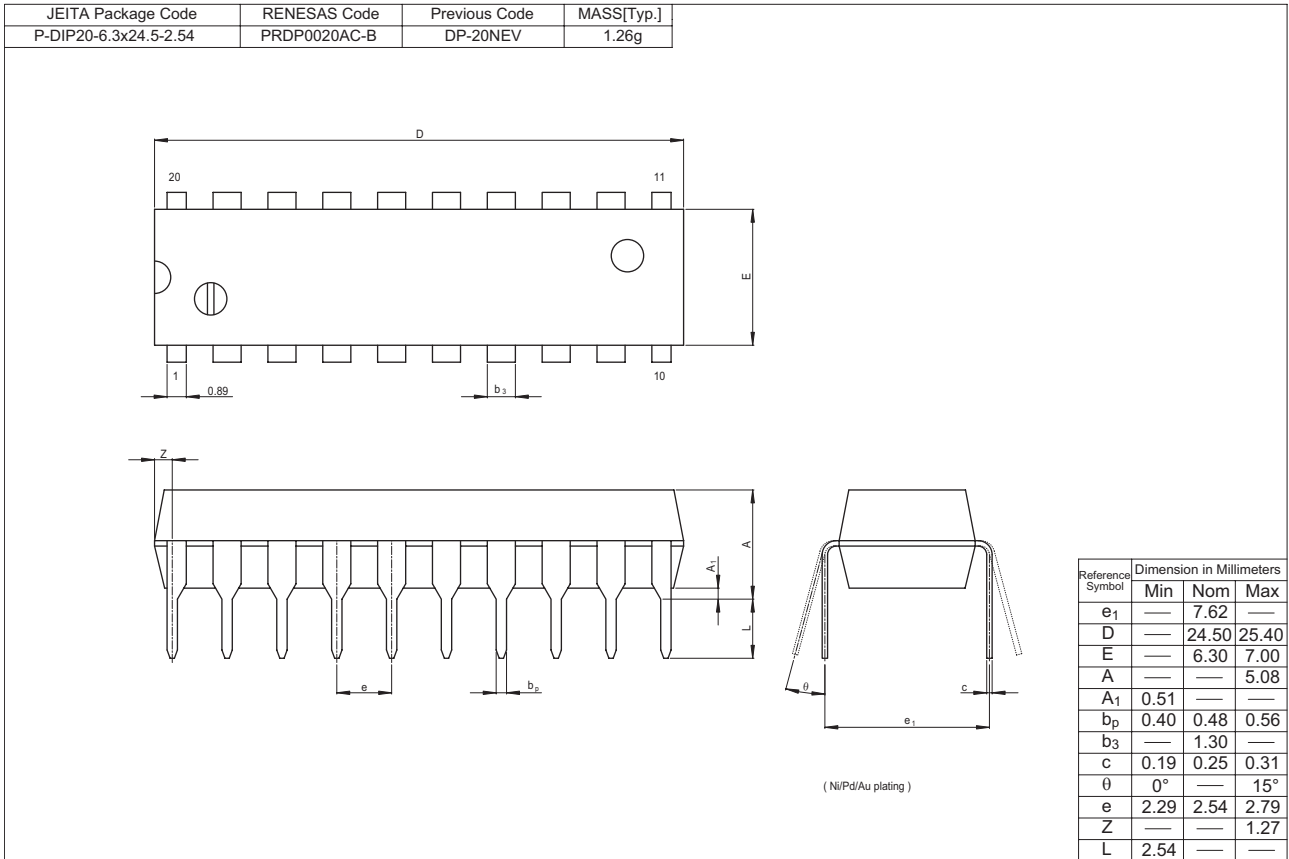


• Waveform – 2



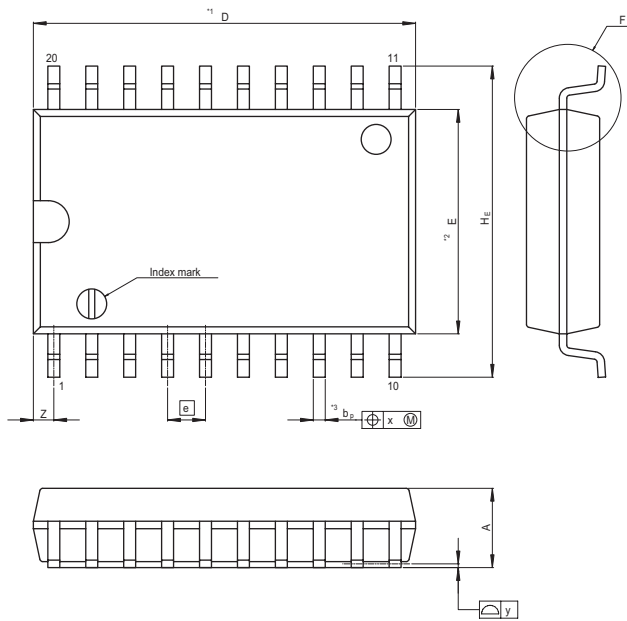
- Notes :
1. Input waveform : PRR \leq 1 MHz, duty cycle 50%, $t_r \leq$ 6 ns, $t_f \leq$ 6 ns
 2. Waveform - A is for an output with internal conditions such that the output is low except when disabled by the output control.
 3. Waveform - B is for an output with internal conditions such that the output is high except when disabled by the output control.
 4. The output are measured one at a time with one transition per measurement.

Package Dimensions

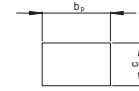


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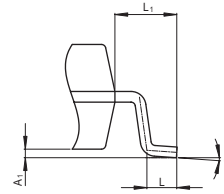
| | | | |
|-----------------------|--------------|---------------|------------|
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
| P-SOP20-7.5x12.8-1.27 | PRSP0020DC-A | FP-20DBV | 0.52g |



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



Terminal cross section
(Ni/Pd/Au plating)



Detail F

| Reference Symbol | Dimension in Millimeters | | |
|------------------|--------------------------|-------|-------|
| | Min | Nom | Max |
| D | — | 12.80 | 13.2 |
| E | — | 7.50 | — |
| A ₂ | — | — | — |
| A ₁ | 0.10 | 0.20 | 0.30 |
| A | — | — | 2.65 |
| b _p | 0.34 | 0.40 | 0.46 |
| b ₁ | — | — | — |
| c | 0.20 | 0.25 | 0.30 |
| c ₁ | — | — | — |
| θ | 0° | — | 8° |
| H _E | 10.00 | 10.40 | 10.65 |
| @ | — | 1.27 | — |
| x | — | — | 0.12 |
| y | — | — | 0.15 |
| Z | — | — | 0.935 |
| L | 0.40 | 0.70 | 1.27 |
| L ₁ | — | 1.45 | — |

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