

# HD74HC373, HD74HC533

Octal D-type Transparent Latches (with 3-state outputs)

Octal D-type Transparent Latches (with inverted 3-state outputs)

REJ03D0619-0200  
 (Previous ADE-205-498)  
 Rev.2.00  
 Mar 30, 2006

## Description

When the latch enable input is high, the Q outputs of HD74HC373 will follow the D inputs and the Q outputs of HD74HC533 will follow the inversion of the D inputs. When the latch enable goes low, data at the D inputs will be retained at the outputs until latch enable returns high again. When a high logic level is applied to the output control 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:  $t_{pd}$  (D to Q) = 16 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  $\mu$ 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)
HD74HC373P HD74HC533P	DILP-20 pin	PRDP0020AC-B (DP-20NEV)	P	—
HD74HC373FPEL HD74HC533FPEL	SOP-20 pin (JEITA)	PRSP0020DD-B (FP-20DAV)	FP	EL (2,000 pcs/reel)
HD74HC533RPEL	SOP-20 pin (JEDEC)	PRSP0020DC-A (FP-20DBV)	RP	EL (1,000 pcs/reel)
HD74HC373TELL	TSSOP-20 pin	PTSP0020JB-A (TTP-20DAV)	T	ELL (2,000 pcs/reel)

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

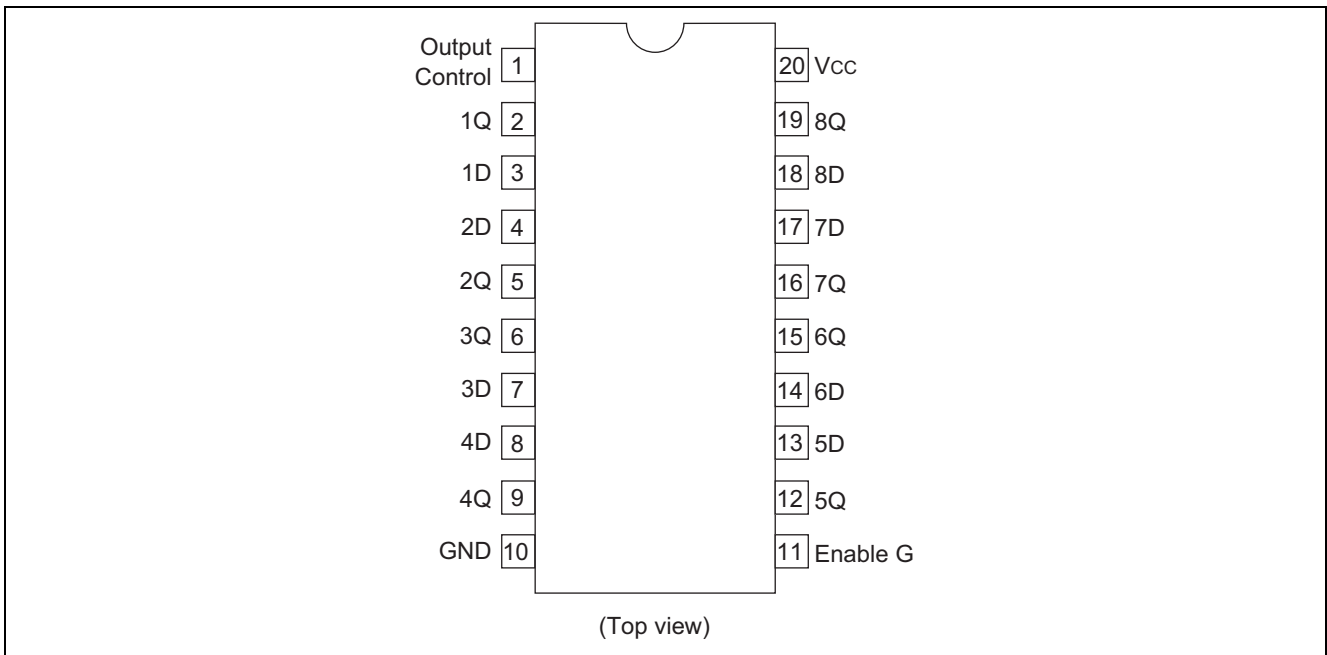
## Function Table

Output Control	Enable G	D	HD74HC373 Q	HD74HC533 $\bar{Q}$
L	H	H	H	L
L	H	L	L	H
L	L	X	No change	No change
H	X	X	Z	Z

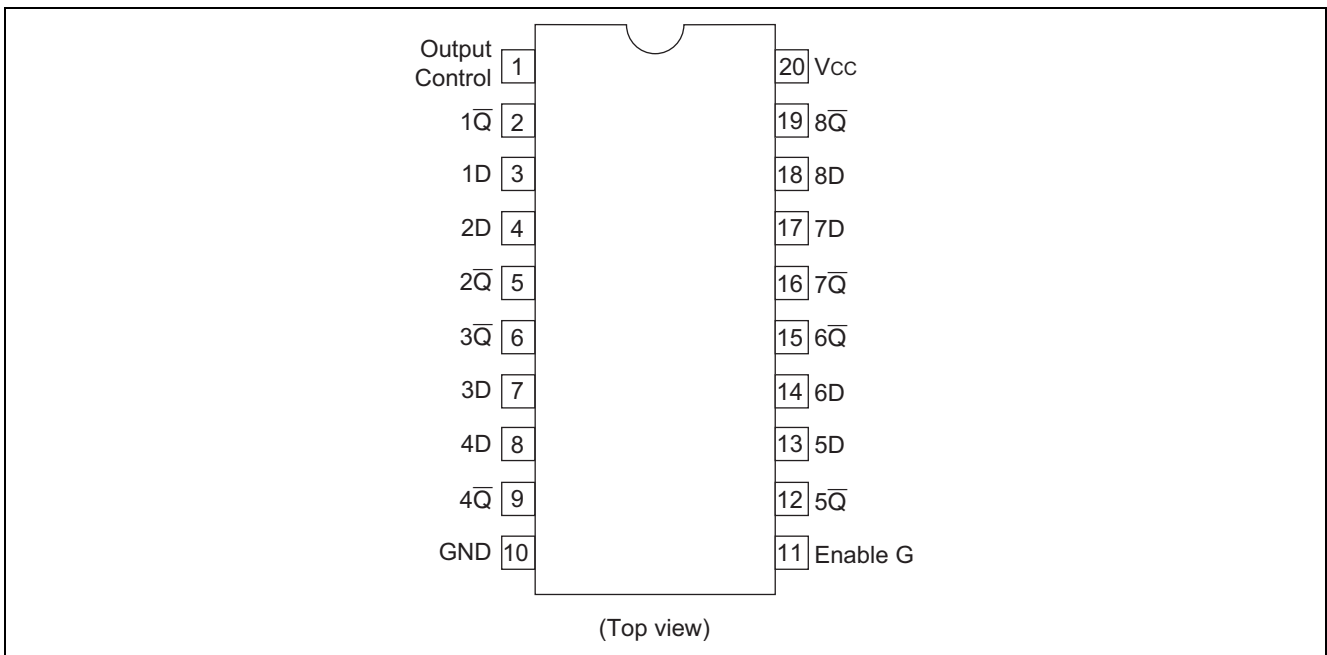
Note: 1. H; High level, L; Low level, X; Irrelevant, Z; High impedance

## Pin Arrangement

### HD74HC373

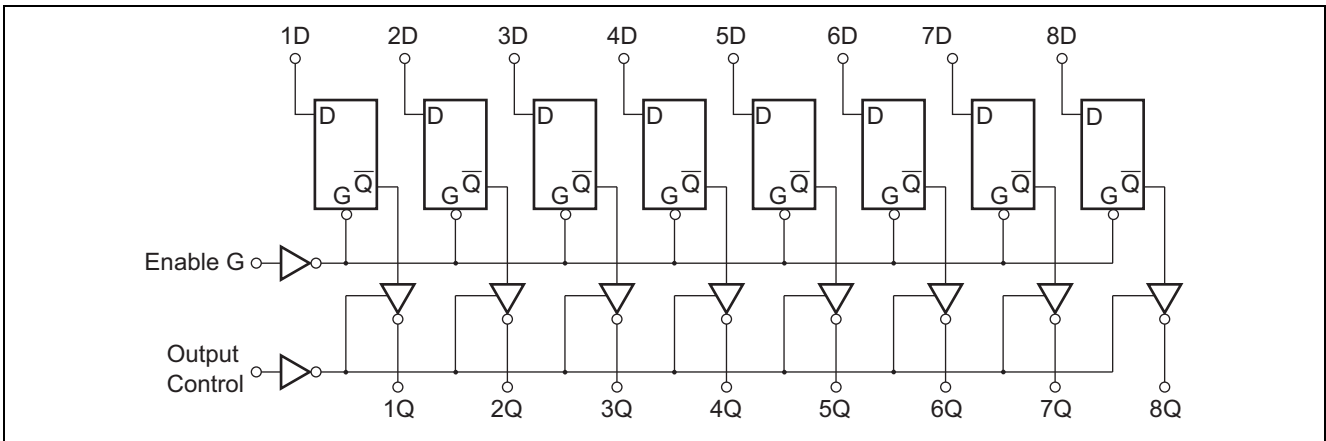


### HD74HC533

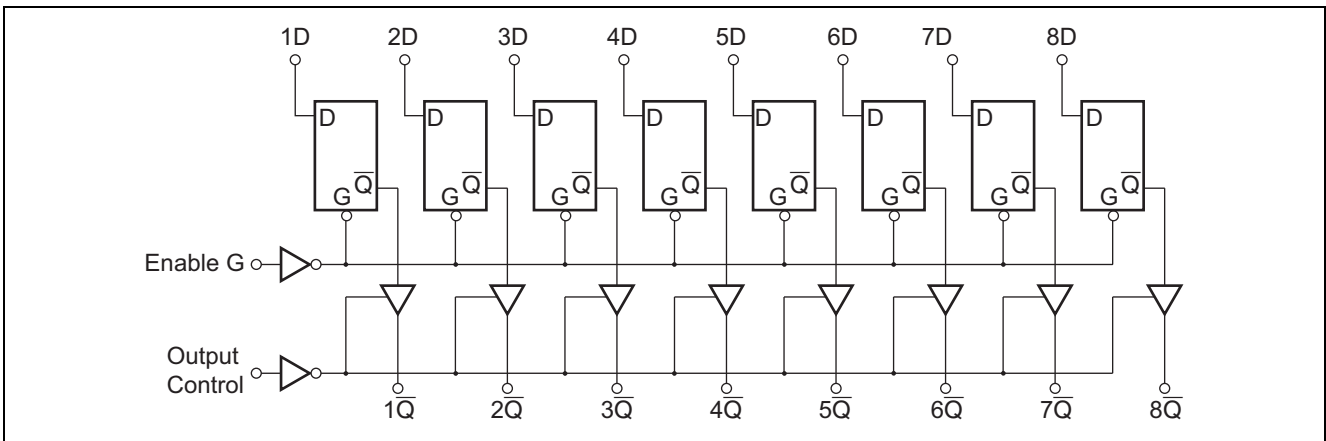


Logic Diagram

HD74HC373



HD74HC533



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	$I_{OUT}$	$\pm 35$	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	$^{\circ}C$

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	$V_{CC}$	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	$V_{CC} = 2.0$ V
		0 to 500		$V_{CC} = 4.5$ V
		0 to 400		$V_{CC} = 6.0$ V

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

Waveform: Refer to test circuit of switching characteristics.

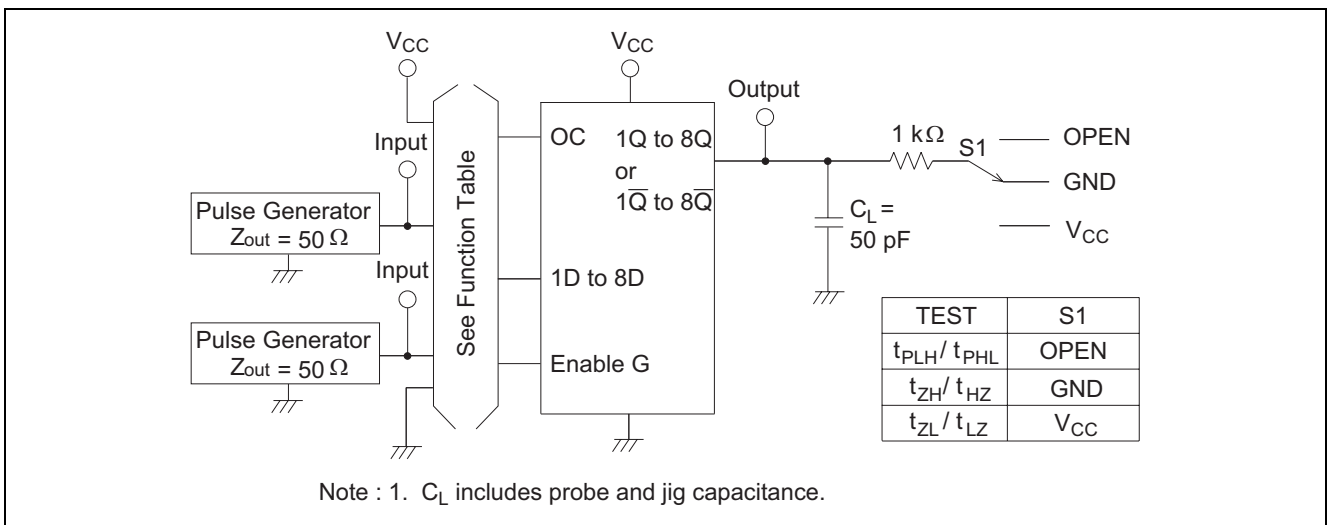
## Electrical Characteristics

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	$V_{in} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -20 \mu\text{A}$
		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	$V_{in} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 20 \mu\text{A}$
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	—	0.26	—	0.33			$I_{OH} = 6 \text{ mA}$
		6.0	—	—	0.26	—	0.33			$I_{OH} = 7.8 \text{ mA}$
Off-state output current	$I_{OZ}$	6.0	—	—	$\pm 0.5$	—	$\pm 5.0$	$\mu\text{A}$	$V_{in} = V_{IH} \text{ or } V_{IL}$ , $V_{out} = V_{CC} \text{ or } \text{GND}$	
Input current	$I_{in}$	6.0	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	$V_{in} = V_{CC} \text{ or } \text{GND}$	
Quiescent supply current	$I_{CC}$	6.0	—	—	4.0	—	40	$\mu\text{A}$	$V_{in} = V_{CC} \text{ or } \text{GND}$ , $I_{out} = 0 \mu\text{A}$	

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

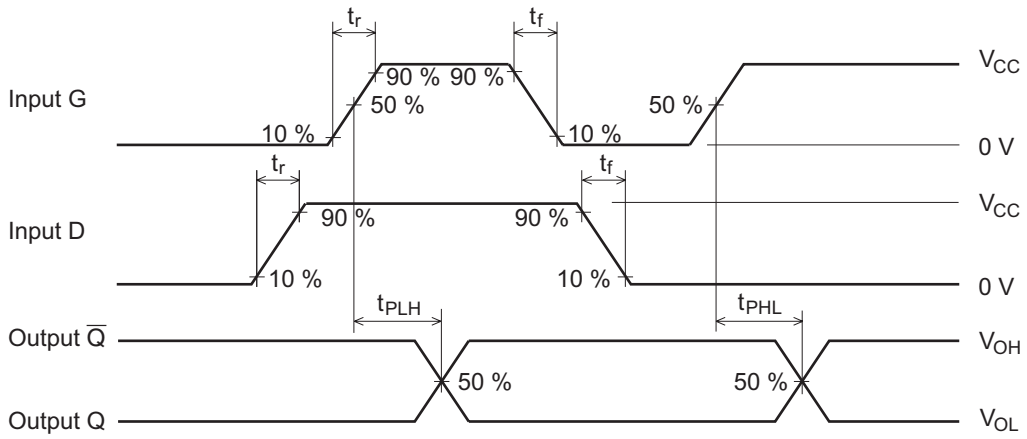
Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ			Max		
Propagation delay time	$t_{PLH}$	2.0	—	—	150	—	190	ns	G to Q
		4.5	—	18	30	—	38		
		6.0	—	—	26	—	33		
	$t_{PHL}$	2.0	—	—	125	—	155	ns	
		4.5	—	16	25	—	31		
		6.0	—	—	21	—	26		
Output enable time	$t_{ZL}$	2.0	—	—	150	—	190	ns	
		4.5	—	12	30	—	38		
		6.0	—	—	26	—	33		
	$t_{ZH}$	2.0	—	—	150	—	190	ns	
		4.5	—	15	30	—	38		
		6.0	—	—	26	—	33		
Output disable time	$t_{LZ}$	2.0	—	—	150	—	190	ns	
		4.5	—	13	30	—	38		
		6.0	—	—	26	—	33		
	$t_{HZ}$	2.0	—	—	150	—	190	ns	
		4.5	—	16	30	—	38		
		6.0	—	—	26	—	33		
Setup time	$t_{su}$	2.0	100	—	—	125	—	ns	
		4.5	20	1	—	25	—		
		6.0	17	—	—	21	—		
Hold time	$t_h$	2.0	50	—	—	65	—	ns	
		4.5	10	1	—	13	—		
		6.0	9	—	—	11	—		
Pulse width	$t_w$	2.0	80	—	—	100	—	ns	
		4.5	16	6	—	20	—		
		6.0	14	—	—	17	—		
Output rise/fall time	$t_{TLH}$	2.0	—	—	60	—	75	ns	
	$t_{THL}$	4.5	—	4	12	—	15		
	$t_{THL}$	6.0	—	—	10	—	13		
Input capacitance	$C_{in}$	—	—	5	10	—	10	pF	

**Test Circuit**

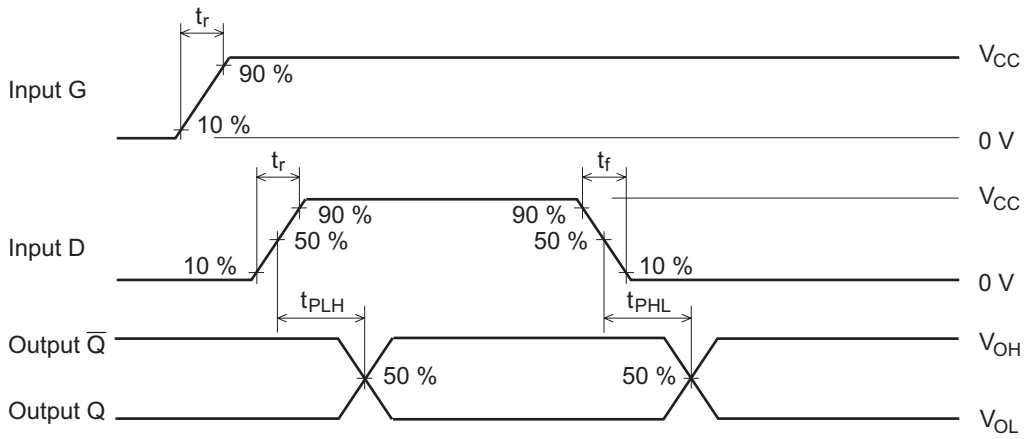


Waveforms

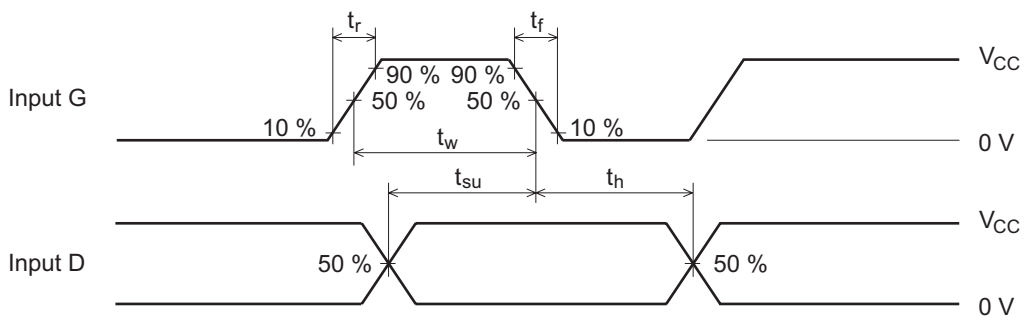
• Waveform – 1



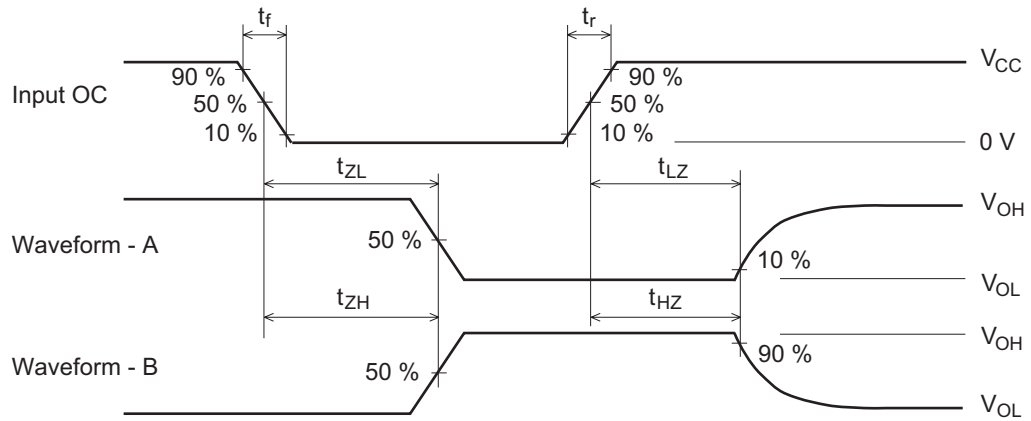
• Waveform – 2



• Waveform – 3

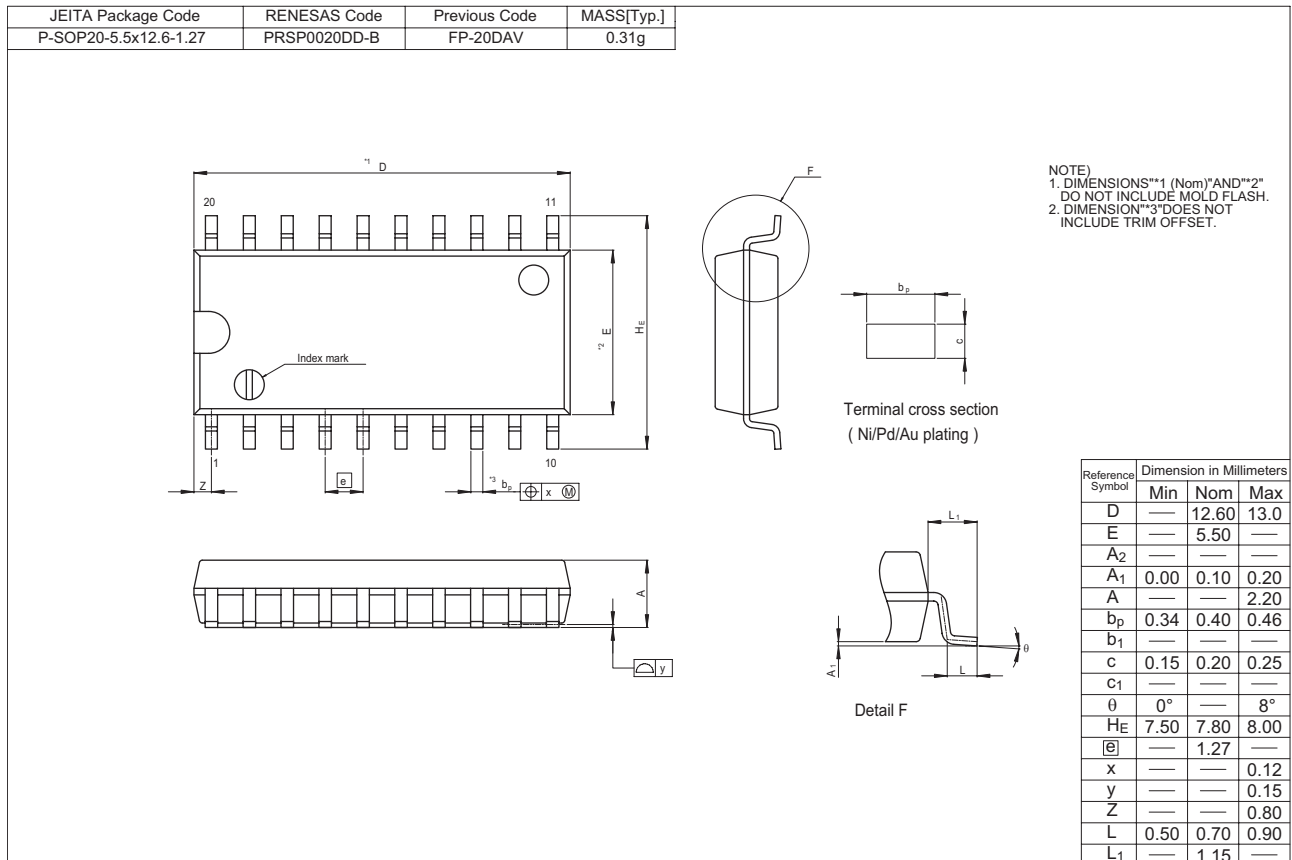
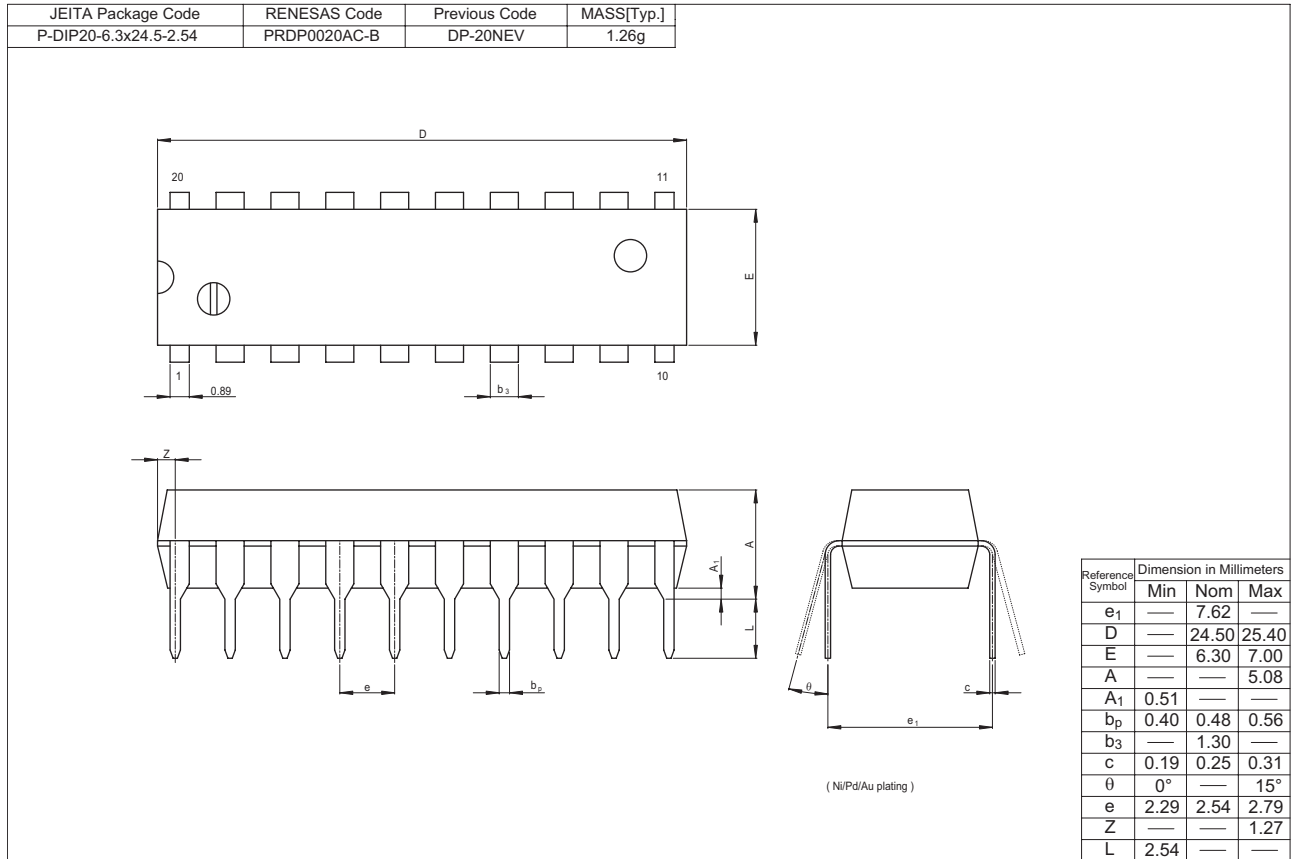


• Waveform – 4



- Notes :
1. Input waveform :  $PRR \leq 1\text{ MHz}$ , duty cycle 50%,  $t_r \leq 6\text{ ns}$ ,  $t_f \leq 6\text{ ns}$
  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.

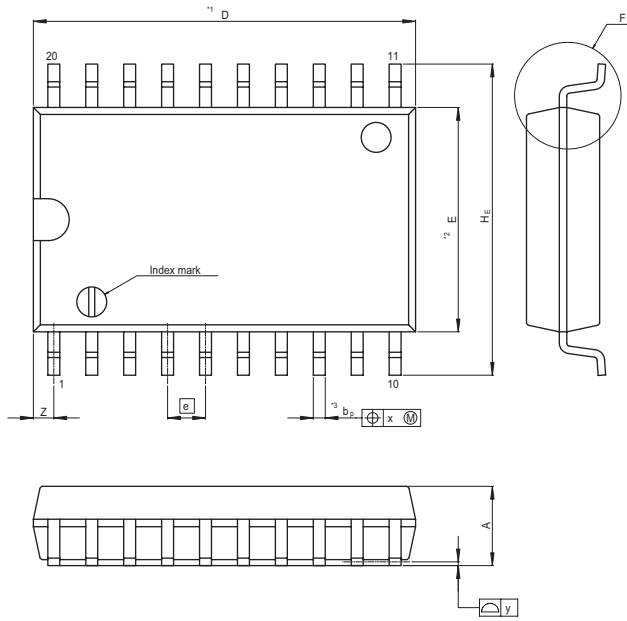
Package Dimensions



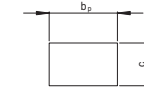


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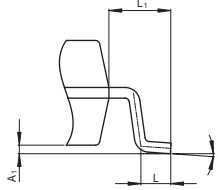
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP20-7.5x12.8-1.27	PRSP0020DC-A	FP-20DBV	0.52g



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



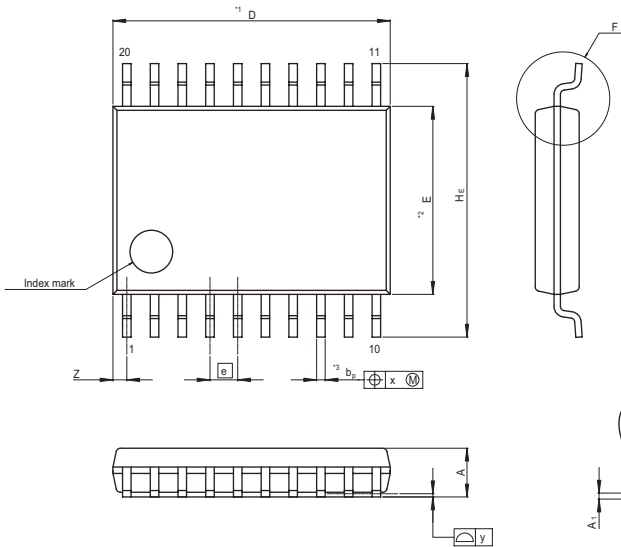
Terminal cross section  
( Ni/Pd/Au plating )



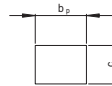
Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	12.80	13.2
E	—	7.50	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.10	0.20	0.30
A	—	—	2.65
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.20	0.25	0.30
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	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 <sub>1</sub>	—	1.45	—

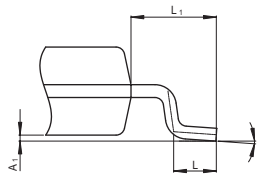
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP20-4.4x6.5-0.65	PTSP0020JB-A	TTP-20DAV	0.07g



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	—	6.50	6.80
E	—	4.40	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.03	0.07	0.10
A	—	—	1.10
b <sub>p</sub>	0.15	0.20	0.25
b <sub>1</sub>	—	—	—
c	0.10	0.15	0.20
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	6.20	6.40	6.60
@	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z	—	—	0.65
L	0.4	0.5	0.6
L <sub>1</sub>	—	1.0	—

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