

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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# HD151244

## Octal Buffers/Line Drivers With 3 State Outputs



ADE-205-596 (Z)

1st. Edition

Dec. 2000

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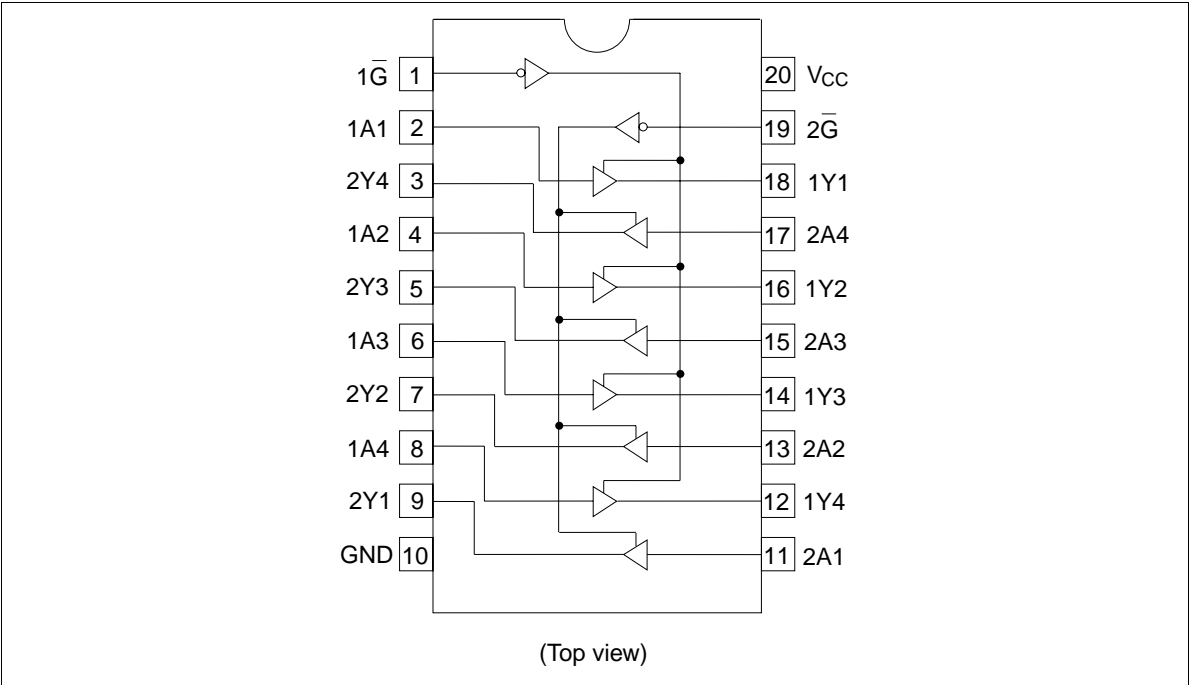
### Description

The HD151244 using CMOS process, provides high speed and high drivability equivalent to HD74LS240 with super low power dissipation. The device has eight inverter drivers (three state outputs) in 20 pin package. Each four drivers construct a group and the two groups are controlled separately by  $\overline{1G}$  and  $\overline{2G}$  which enable the output at low level. Power up down protection function keeps the output in high impedance state at low  $V_{CC}$  regardless of the state in enable inputs.

### Features

- High speed  $t_{pd} = 10 \text{ ns (Typ)}$
- High output current  $I_{OH} = -15 \text{ mA}$   
 $I_{OL} = 24 \text{ mA}$
- Both input and output is TTL level
- Wide operating temperature:  $T_a = -40 \text{ to } +85^\circ\text{C}$
- Both input and output is high impedance state at supply off
- The function provides power up down protection

Pin Arrangement



Function Table

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

H : High level  
L : Low level  
Z : High impedance  
X : Irrelevant

**Absolute Maximum Ratings** ( $T_a = 25^{\circ}\text{C}$ )

Item	Symbol	Rating	Unit
Supply Voltage	$V_{CC}$	-0.5 to +7.0	V
Input Voltage ( $\overline{G}$ , A)	$V_{IN}$	-0.5 to +7.0	V
Output Voltage	$V_{OUT}$	-0.5 to +5.5	V
Power Dissipation	$P_T$	500	mW
Storage Temperature	$T_{stg}$	-65 to +150	$^{\circ}\text{C}$

Note: 1. 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	Min	Typ	Max	Unit
Supply Voltage	$V_{CC}$	4.5	5.0	5.5	V
Output Current	$I_{OH}$	—	—	-15	mA
	$I_{OL}$	—	—	24	mA
Operating Temperature	$T_{opr}$	-40	25	85	$^{\circ}\text{C}$
Input Rise and Fall Time* <sup>1</sup>	$t_r, t_f$	0	—	250	ns/V

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

Waveform: Refer to test circuit of switching characteristics.

## Electrical Characteristics (Ta = -40°C to +85°C)

Item	Symbol	V <sub>CC</sub> (V)	Min	Max	Unit	Conditions
Input Voltage	V <sub>IH</sub>	—	2.0	—	V	
	V <sub>IL</sub>	—	—	0.8	V	
Output Voltage	V <sub>OH</sub>	4.5	2.4	—	V	I <sub>OH</sub> = -3 mA, V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V or 0.5 V
		4.5	2.0	—		I <sub>OH</sub> = -15 mA, V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V or 0.5 V
	V <sub>OL</sub>	4.5	—	0.4	V	I <sub>OL</sub> = 12 mA, V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V or 0.5 V
		4.5	—	0.5		I <sub>OL</sub> = 24 mA, V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V or 0.5 V
Off State Output Current	I <sub>OZ</sub>	5.5	—	±5.0	μA	V <sub>OUT</sub> = V <sub>CC</sub> or GND
	I <sub>OZ(off)</sub>	0	—	±5.0		V <sub>OUT</sub> = 5.5 V
Input Current	I <sub>IN</sub>	5.5	—	±1.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
	I <sub>IN(off)</sub>	0	—	±1.0		V <sub>IN</sub> = 5.5 V
Output Short current*1	I <sub>OS</sub>	5.5	-40	-225	mA	
Power Supply Current	I <sub>CC</sub>	5.5	—	0.5	mA	I <sub>OUT</sub> = 0 μA, V <sub>IN</sub> = V <sub>CC</sub> or 0.5 V
	I <sub>CCT</sub> *2	5.5	—	1.5		V <sub>IN</sub> = V <sub>CC</sub> - 2.1 V or 0.5 V

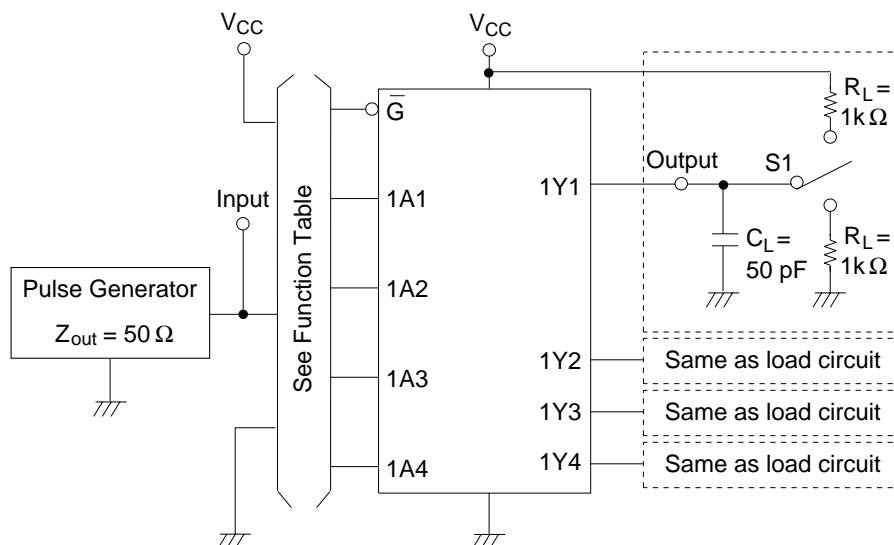
Notes: 1. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

2. When input by the TTL level, it shows I<sub>CC</sub> increase at per 1 pin.

## Switching Characteristics (C<sub>L</sub> = 50 pF)

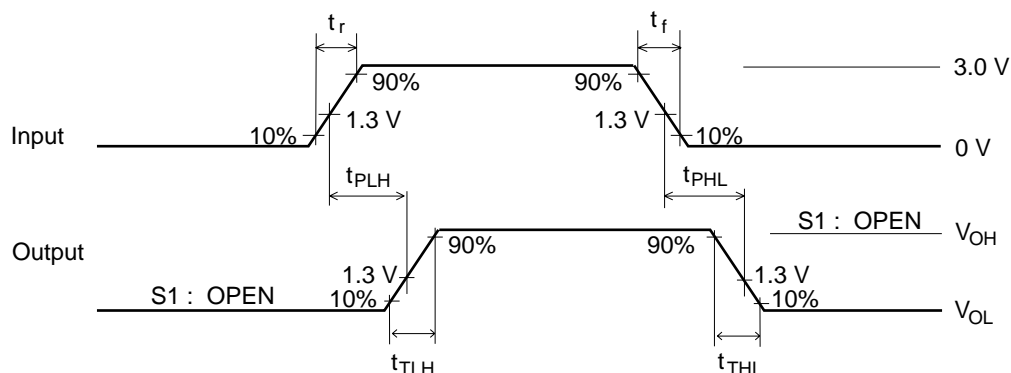
Item	Symbol	Ta = 25°C V <sub>CC</sub> = 5 V		Ta = -40°C to 85°C V <sub>CC</sub> = 5 V ±10%		Unit	Conditions
		Min	Max	Min	Max		
Propagation Delay Time	t <sub>PLH</sub>	3.0	15.0	3.0	18.0	ns	See Next Page
	t <sub>PHL</sub>	3.0	15.0	3.0	18.0		
Output Rise Time	t <sub>TLH</sub>	0.0	10.0	0.0	10.0	ns	
Output Fall Time	t <sub>THL</sub>	0.0	10.0	0.0	10.0		
Output Enable Time	t <sub>ZH</sub>	3.0	25.0	3.0	30.0	ns	
	t <sub>ZL</sub>	3.0	25.0	3.0	30.0		
Output Disable Time	t <sub>HZ</sub>	3.0	25.0	3.0	30.0	ns	
	t <sub>LZ</sub>	3.0	25.0	3.0	30.0		
Input Capacitance	C <sub>IN</sub>	—	5 (Typ)	—	—	pF	V <sub>IN</sub> = V <sub>CC</sub> or GND
Output Capacitance	C <sub>O</sub>	—	12 (Typ)	—	—	pF	V <sub>O</sub> = V <sub>CC</sub> or GND

# Test Circuit 1



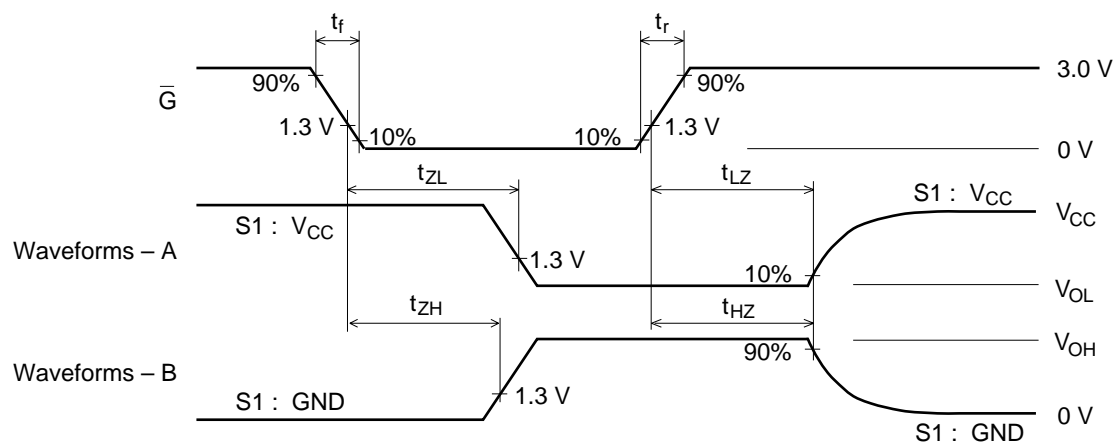
- Notes:
1.  $C_L$  includes probe and jig capacitance.
  2. 2G, 2A1-2A4 to 2Y1-2Y4 are identical to above load circuit.
  3. S1 is a input/output switch.

## Waveforms 1



- Notes:
1.  $t_r = 6.0 \text{ ns}$ ,  $t_f = 6.0 \text{ ns}$
  2. Input waveforms: PRR = 1 MHz, duty cycle 50%

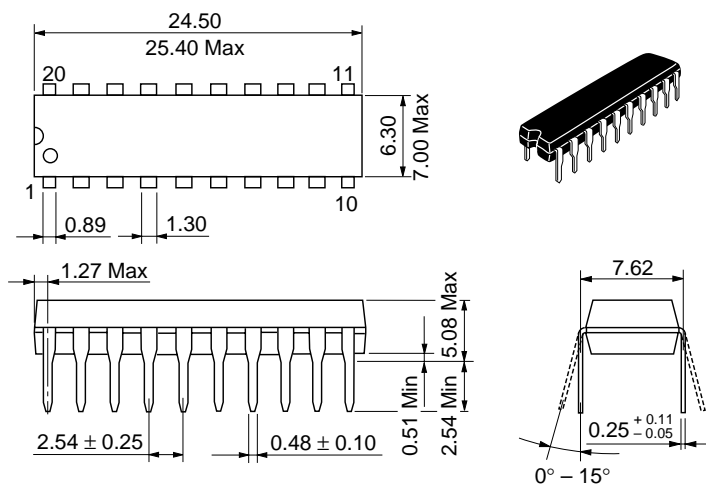
## Waveforms 2



- Notes:
1.  $t_r = 6.0$  ns,  $t_f = 6.0$  ns
  2. Input waveforms: PRR = 1 MHz, duty cycle 50%
  3. Waveform – A shows input conditions such that the output is low level when enable by the output control.
  4. Waveform – B shows input conditions such that the output is high level when enable by the output control.

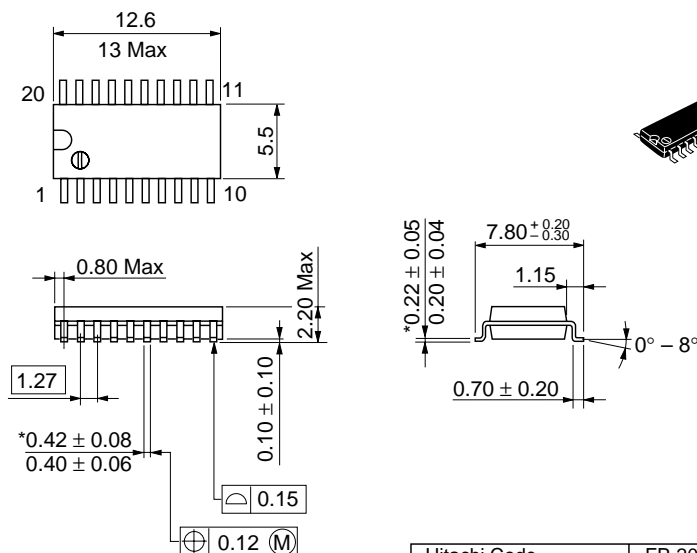
# Package Dimensions

Unit: mm



Hitachi Code	DP-20N
JEDEC	—
EIAJ	Conforms
Mass (reference value)	1.26 g

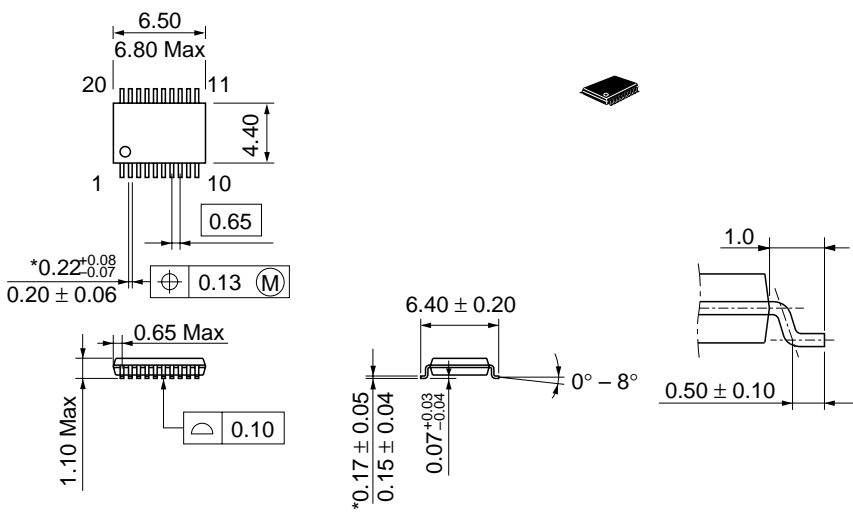
Unit: mm



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	FP-20DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.31 g

Unit: mm



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	TTP-20DA
JEDEC	—
EIAJ	—
Mass (reference value)	0.07 g

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