

To all our customers

Regarding the change of names mentioned in the document, such as Hitachi Electric and Hitachi XX, to Renesas Technology Corp.

The semiconductor operations of Mitsubishi Electric and Hitachi were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Hitachi, Hitachi, Ltd., Hitachi Semiconductors, and other Hitachi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Renesas Technology Home Page: <http://www.renesas.com>

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

Cautions

Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corporation product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corporation or a third party.
2. Renesas Technology Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.

3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor for the latest product information before purchasing a product listed herein.

The information described here may contain technical inaccuracies or typographical errors.

Renesas Technology Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.

Please also pay attention to information published by Renesas Technology Corporation by various means, including the Renesas Technology Corporation Semiconductor home page (<http://www.renesas.com>).

4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corporation is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corporation for further details on these materials or the products contained therein.

HD293487

Quadruple Differential Line Drivers With 3 State Outputs



ADE-205-585 (Z)

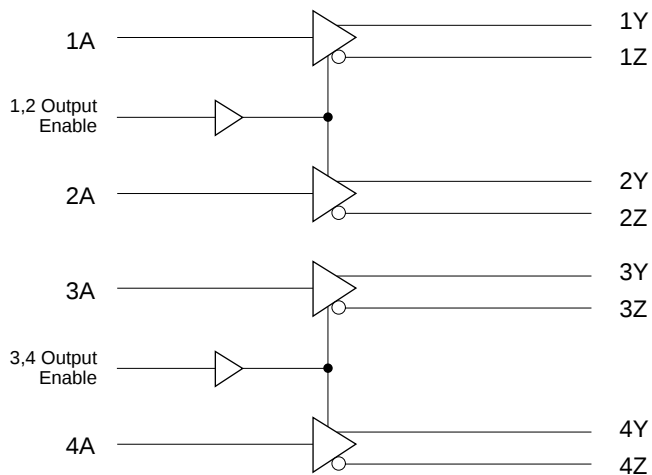
1st. Edition

Dec. 2000

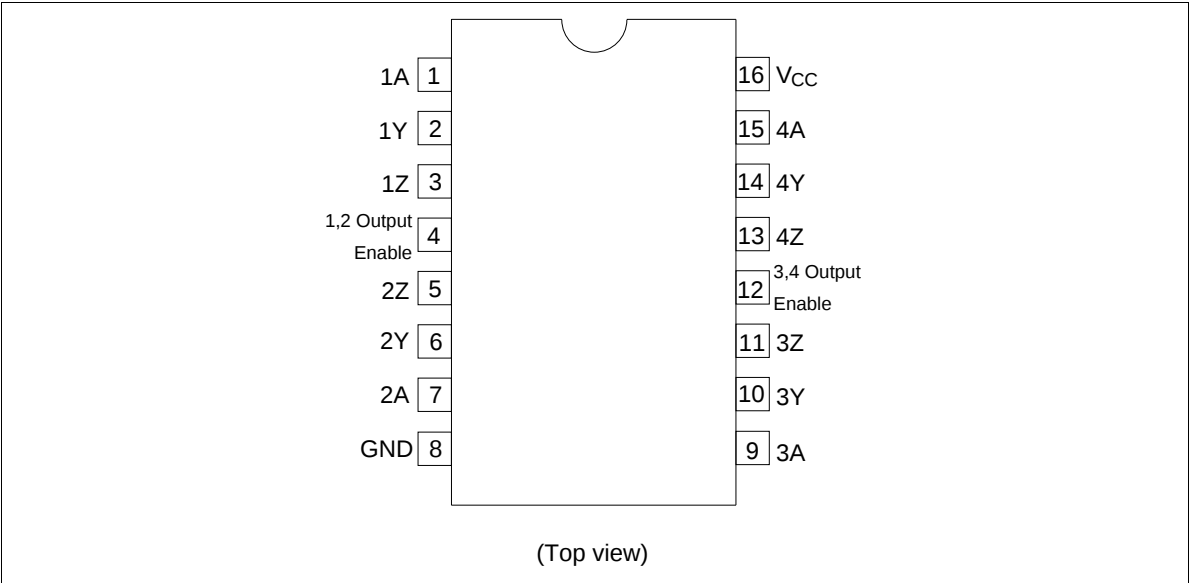
Description

The HD293487 features line drivers which satisfy the requirements of EIA RS-422 A. This device is designed to provide differential signals with high current capability on bus lines. When the enable input is low, the associated outputs are in a high impedance state. The output circuit has active pull up and pull down and is capable of sinking and sourcing 48 mA.

Logic Diagram



Pin Arrangement



Function Table

Input A	Output Enable	Output Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

- H : High level
- L : Low level
- X : Irrelevant
- Z : High inpedance (Off state)

Absolute Maximum Ratings

Item	Symbol	Ratings		Unit
Supply Voltage	V_{CC}	7.0		V
Input Voltage	V_{IN}	5.5		V
Power Dissipation	P_T^{*1}	DP	1000	mW
		FP	785	
Operating Temperature	T_{opr}	0 to + 70		°C
Storage Temperature	T_{stg}	−65 to + 150		°C

Notes: 1. The above data were taken by the ΔV_{EB} method mounting on a glass epoxy board (40 × 40 × 1.6 mm) of 10% wiring density.

2. 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.

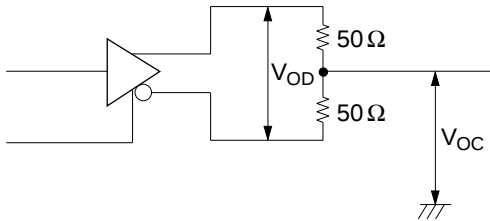
Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.75	5.00	5.25	V
Output Current	I_{OH}	—	—	−48	mA
	I_{OL}	—	—	48	
Operating Temperature	T_{opr}	0	25	70	°C

Electrical Characteristics (Ta = 0 to +70°C)

Item	Symbol	Min	Typ*1	Max	Unit	Conditions
Input Voltage	V_{IH}	2.0	—	—	V	
	V_{IL}	—	—	0.8		
Input Clamp Voltage	V_{IK}	—	—	−1.5	V	$V_{CC} = 4.75\text{ V}$, $I_I = -18\text{ mA}$
Output Voltage	V_{OH}	2.5	—	—	V	$V_{CC} = 4.75\text{ V}$, $V_{IH} = 2\text{ V}$, $V_{IL} = 0.8\text{ V}$, $I_{OH} = -20\text{ mA}$
		2.0	—	—		$V_{CC} = 4.75\text{ V}$, $V_{IH} = 2\text{ V}$, $V_{IL} = 0.8\text{ V}$, $I_{OH} = -48\text{ mA}$
	V_{OL}	—	—	0.5		$V_{CC} = 4.75\text{ V}$, $V_{IH} = 2\text{ V}$, $V_{IL} = 0.8\text{ V}$, $I_{OL} = 48\text{ mA}$
	$ V_{OD} $	2.0	—	—		$R_L = 100\text{ }\Omega^{*2}$
	$\Delta V_{OD} $	—	—	±0.4		
	V_{OC}	—	—	3.0		
	$\Delta V_{OC} $	—	—	±0.4		
Output Current	I_O	—	—	100	μA	$V_{CC} = 0\text{ V}$, $V_O = 6\text{ V}$
		—	—	−100		$V_{CC} = 0\text{ V}$, $V_O = -0.25\text{ V}$
	I_{OZ}	—	—	100		Output Enables = 0.8 V, $V_O = 2.7\text{ V}$
		—	—	−100		Output Enables = 0.8 V, $V_O = 0.5\text{ V}$
Input Current	I_I	—	—	100	μA	$V_I = 5.5\text{ V}$
	I_{IH}	—	—	50		$V_I = 2.7\text{ V}$
	I_{IL}	—	—	−400		$V_I = 0.5\text{ V}$
Short Circuit Output Current	I_{OS}	−40	—	−140	mA	$V_I = 2.0\text{ V}$
Supply Current	I_{CC}	—	—	105	mA	All Input GND without load
		—	—	85		Output Enable = 2 V

Notes: 1. All typical values are at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$.
2. $\Delta |V_{OD}|$ or $\Delta |V_{OC}|$ denote the difference of V_{OD} or V_{OC} when input voltage is changed from “H” to “L”.

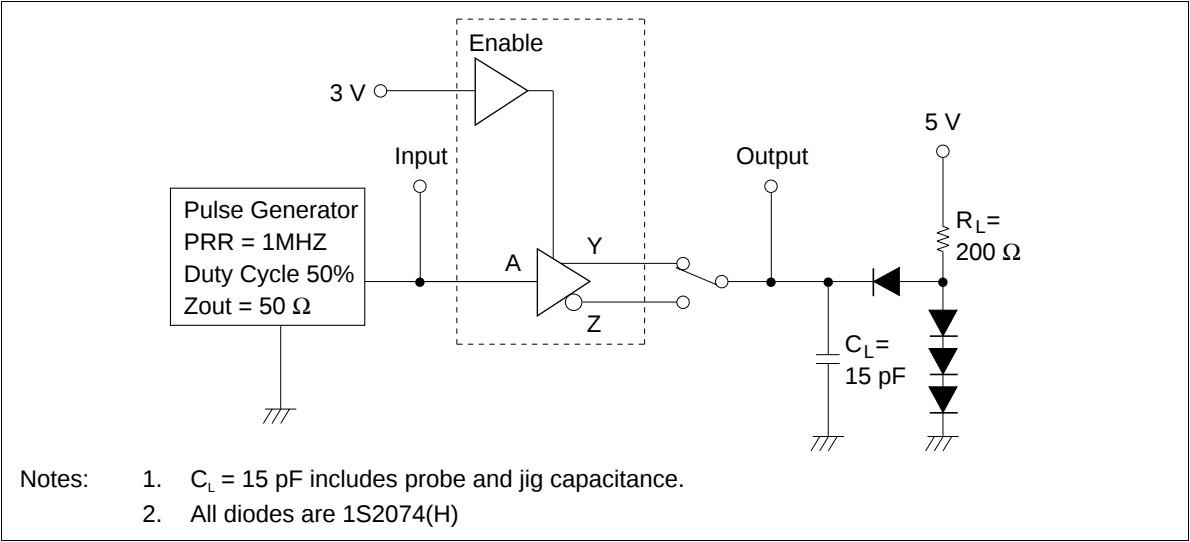


Switching Characteristics (V_{CC} = 5 V, Ta = 25°C)

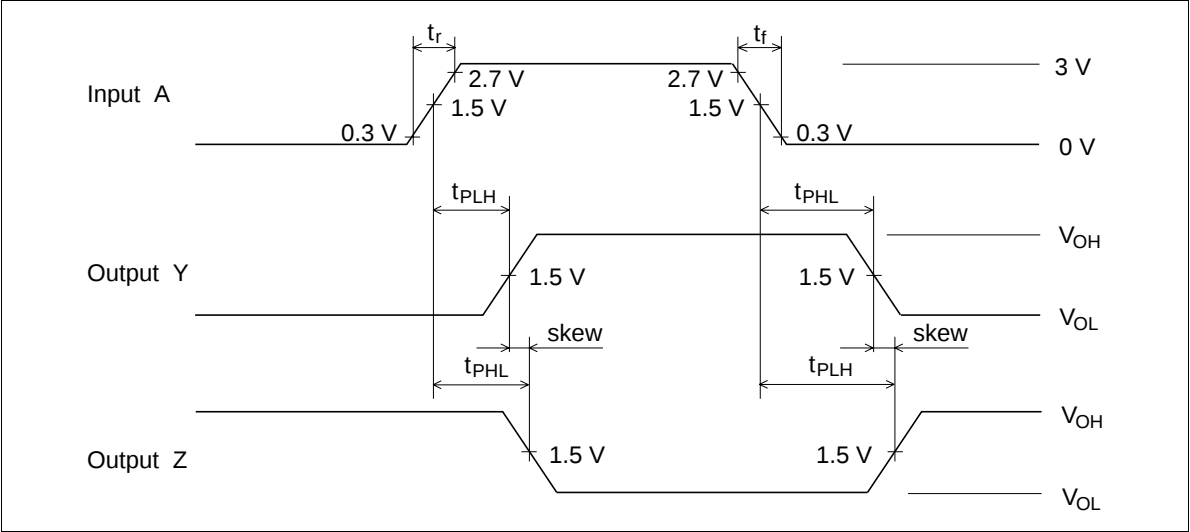
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t _{PLH}	—	—	20	ns	C _L = 15 pF
	t _{PHL}	—	—	20		
Output to Output Skew		—	—	6	ns	
Differential Output Transition Time	t _{TD}	—	—	20	ns	C _L = 15 pF, R _L = 100 Ω
Output Enable Time	t _{ZH}	—	—	30	ns	C _L = 50 pF
	t _{ZL}	—	—	30		
Output Disable Time	t _{HZ}	—	—	25	ns	
	t _{LZ}	—	—	25		

Switching Time Test Method

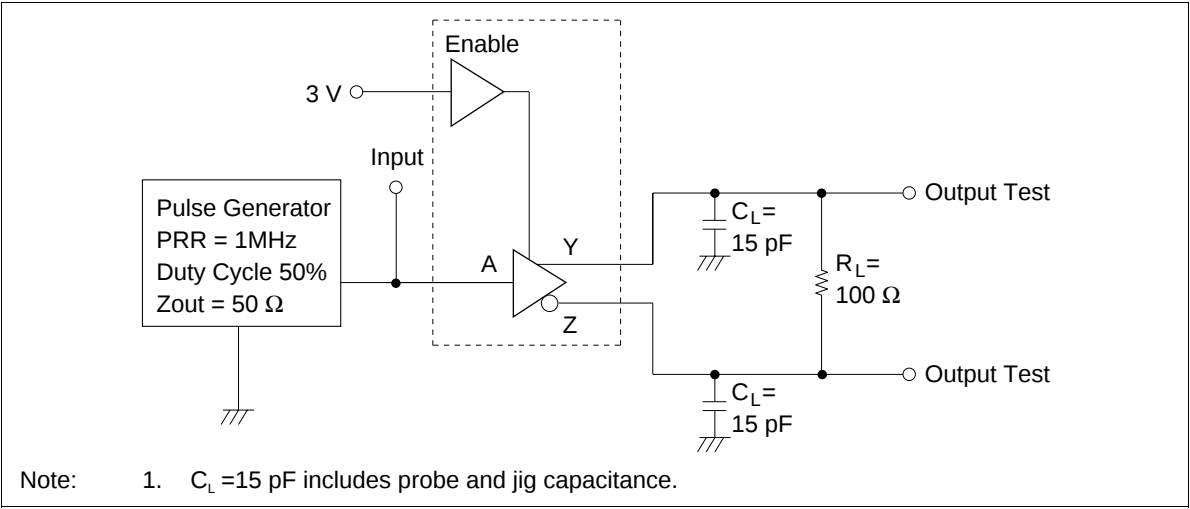
Test Circuit 1



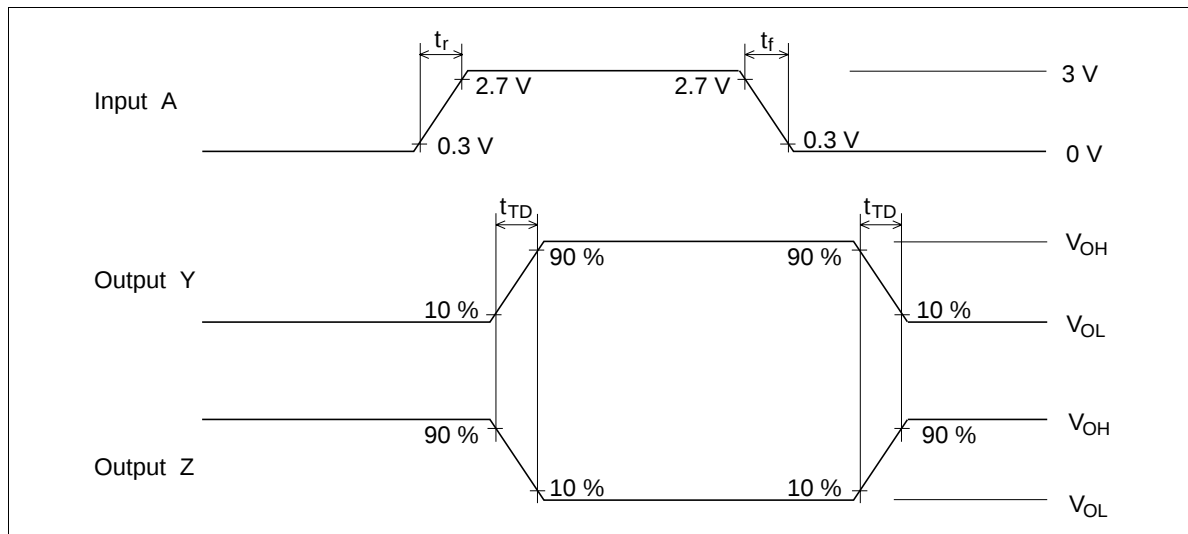
Waveforms



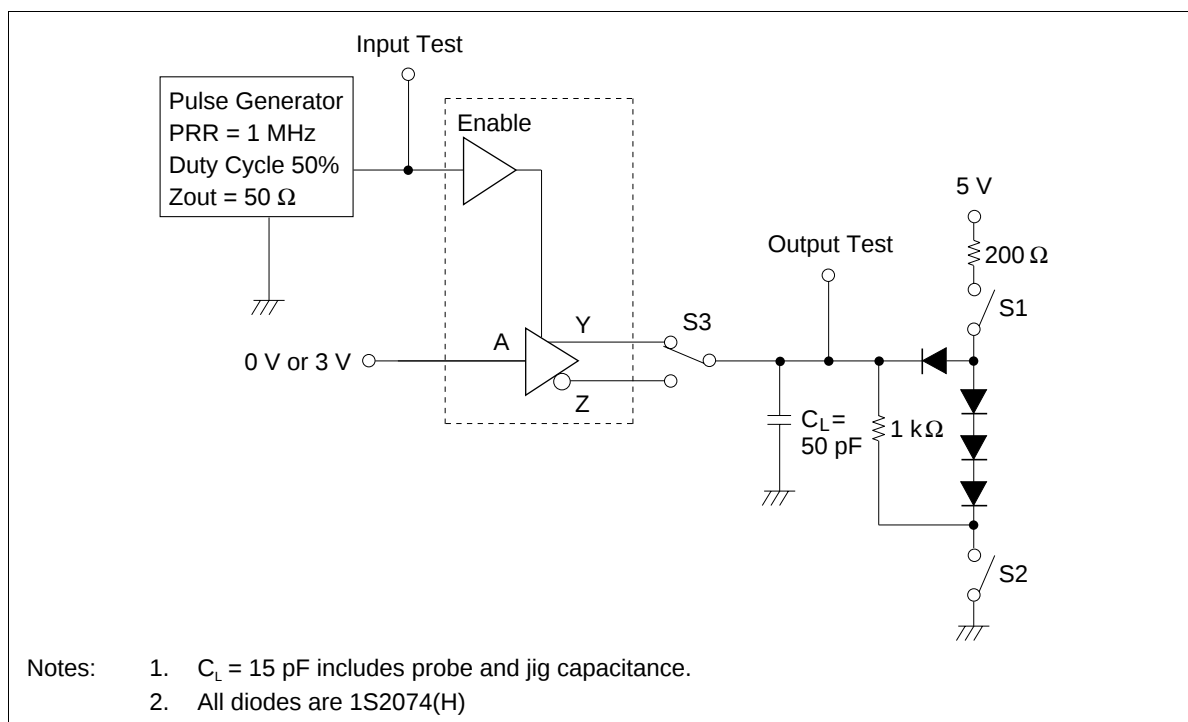
Test Circuit 2



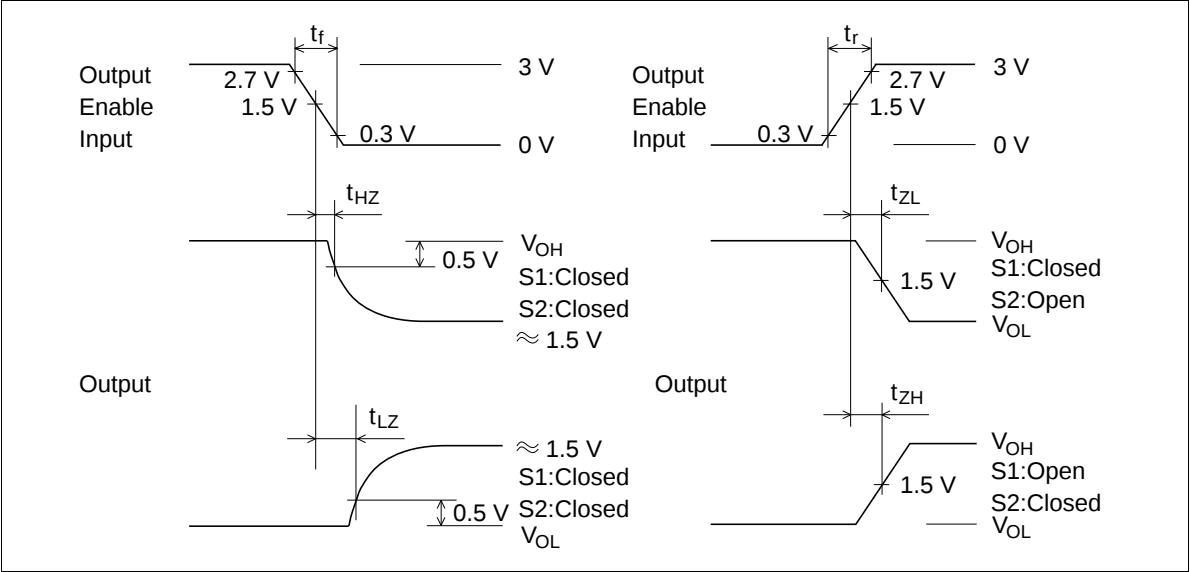
Waveforms



Test Circuit 3

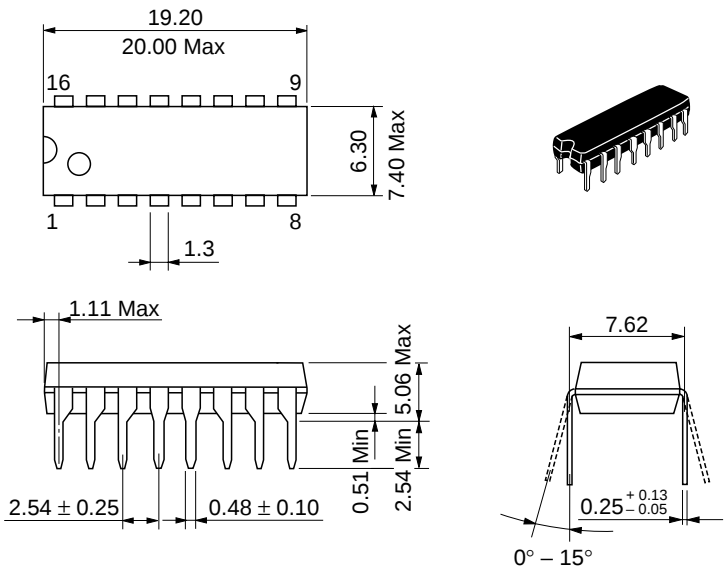


Waveforms



Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.

Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL	NorthAmerica	: http://semiconductor.hitachi.com/
	Europe	: http://www.hitachi-eu.com/hel/ecg
	Asia	: http://sicapac.hitachi-asia.com
	Japan	: http://www.hitachi.co.jp/Sicd/indx.htm

For further information write to:

Hitachi Semiconductor
(America) Inc.

179 East Tasman Drive,
San Jose, CA 95134

Tel: <1> (408) 433-1990

Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic Components Group

Dornacher Straße 3
D-85622 Feldkirchen, Munich

Germany

Tel: <49> (89) 9 9180-0

Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.

Electronic Components Group.

Whitebrook Park

Lower Cookham Road

Maidenhead

Berkshire SL6 8YA, United Kingdom

Tel: <44> (1628) 585000

Fax: <44> (1628) 585160

Hitachi Asia Ltd.

Hitachi Tower

16 Collyer Quay #20-00,

Singapore 049318

Tel: <65>-538-6533/538-8577

Fax: <65>-538-6933/538-3877

URL: <http://www.hitachi.com.sg>

Hitachi Asia Ltd.

(Taipei Branch Office)

4/F, No. 167, Tun Hwa North Road,

Hung-Kuo Building,

Taipei (105), Taiwan

Tel: <886>-(2)-2718-3666

Fax: <886>-(2)-2718-8180

Telex: 23222 HAS-TP

URL: <http://www.hitachi.com.tw>

Hitachi Asia (Hong Kong) Ltd.

Group III (Electronic Components)

7/F., North Tower,

World Finance Centre,

Harbour City, Canton Road

Tsim Sha Tsui, Kowloon,

Hong Kong

Tel: <852>-(2)-735-9218

Fax: <852>-(2)-730-0281

URL: <http://www.hitachi.com.hk>