
HD29C3486

Quadruple Differential Line Receivers With 3 State Outputs

HITACHI

ADE-205-586 (Z)
1st. Edition
Dec. 2000

Description

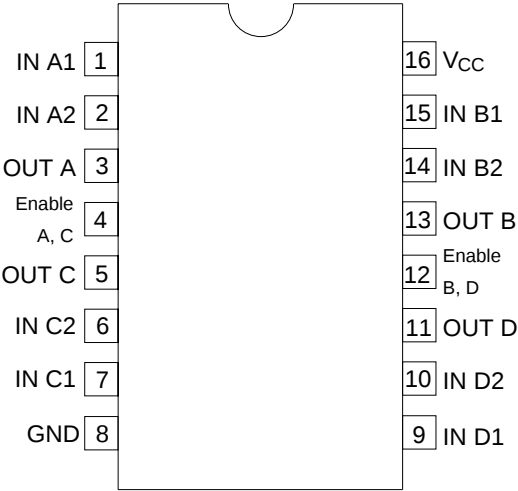
The HD29C3486 provides differential line receivers which realize low power dissipation by CMOS process. The device has four receivers which meet the requirements of EIA standard RS-422A and RS-423A in a 16 pin package.

The circuit provides two high enable terminals and each of the terminals can control two receivers. Fail safe design ensures that if the inputs are open the outputs will always be high.

Features

- Low power dissipation with CMOS process
- Meets EIA standard RS-422A/423A
- Input sensitivity: ± 0.2 V (In the range of ± 7 V of common mode input voltage)
- Propagation delay time: 19 ns typ
- Input hysteresis width: 60 mV typ
- Three state outputs
- Differential inputs are includes fail safe circuit
- Power up and power down protection
- Pin to pin compatible with HD293486

Pin Arrangement



(Top view)

Function Table

Differential Input	Enable	Output
$V_{ID} \geq V_{TH}$ or OPEN	H	H
$V_{TL} < V_{ID} < V_{TH}$	H	?
$V_{ID} \leq V_{TL}$	H	L
X	L	Z

- H : High level
- L : Low level
- Z : High impedance
- X : Irrelevant
- ? : Indeterminate

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

Item	Symbol	Ratings	Unit
Supply Voltage* ²	V_{CC}	7	V
In Phase Input Voltage	V_{CM}	± 14	V
Differential Input Voltage* ³	V_{DIFF}	± 14	V
Enable Input Voltage	V_{IN}	7	V
Output Current	I_O	± 25	mA
Storage Temperature	Tstg	-65 to +150	$^{\circ}\text{C}$

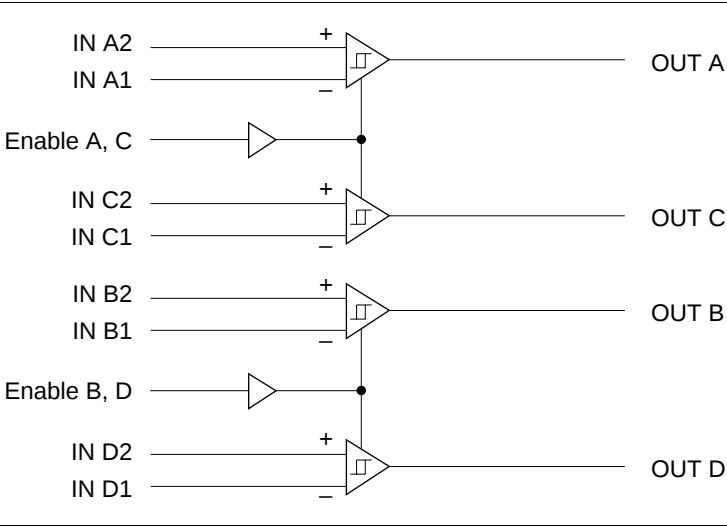
- Notes: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.
2. All voltage values except for differential input voltage are with respect to network ground terminal.
3. Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.

Recommended Operating Conditions ($T_a = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$)

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
In Phase Input Voltage	V_{CM}	—	—	± 7	V
Differential Input Voltage	V_{DIFF}	—	—	± 7	V
Output Current	I_O	—	—	± 6	mA
Operating Temperature	Topr	-40	—	85	$^{\circ}\text{C}$
Enable Input Rise/Fall Time	tr, tf	—	—	500	ns

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

Logic Diagram



Electrical Characteristics (Ta = -40°C to +85°C, V_{CC} = 5 V ± 10%)

Item	Symbol	Min	Typ	Max	Unit	Conditions
Differential Input Threshold Voltage	V _{TH}	—	—	0.2	V	V _{CM} = -7 to 7 V, V _{OUT} ≥ 3.8 V
	V _{TL}	—	—	-0.2	V	V _{CM} = -7 to 7 V, V _{OUT} ≤ 0.3 V
Input Hysteresis	V _{HYST}	—	60	—	mV	V _{CM} = 0 V
Enable Input Voltage	V _{IH}	2.0	—	—	V	
	V _{IL}	—	—	0.8	V	
Output Voltage	V _{OH}	3.8	4.2	—	V	V _{CC} = 4.5 V, V _{DIEF} = 1 V, I _{OUT} = -6.0 mA
	V _{OL}	—	0.2	0.3	V	V _{CC} = 5.5 V, V _{DIEF} = -1 V, I _{OUT} = 6.0 mA
Off State Output Current	I _{OZ}	—	0.5	5.0	mA	Enable = 0.8 V, V _{OUT} = V _{CC}
		—	-0.5	-5.0	mA	Enable = 0.8 V, V _{OUT} = GND
Input Current	I _{IN}	—	1.1	1.5	mA	V _{IN} = 10 V, Other Input = GND
		-0.1* ¹	—	0.6	mA	V _{IN} = 3 V, Other Input = GND
		0	—	-1.1	A	V _{IN} = -3 V, Other Input = GND
		—	-2.0	-2.5	mA	V _{IN} = -10 V, Other Input = GND
Enable Input Current	I ^I	—	—	1.0	μA	V _{IN} = V _{CC}
		—	—	-1.0	μA	V _{IN} = GND
Input Resistance	R _{IN}	5.8	6.8	10	KΩ	V _{CM} = -7 to 7 V (One Input AC GND)
Supply Current	I _{CC}	—	16	23	mA	V _{CC} = 5.5 V, V _{DIEF} = 1 V

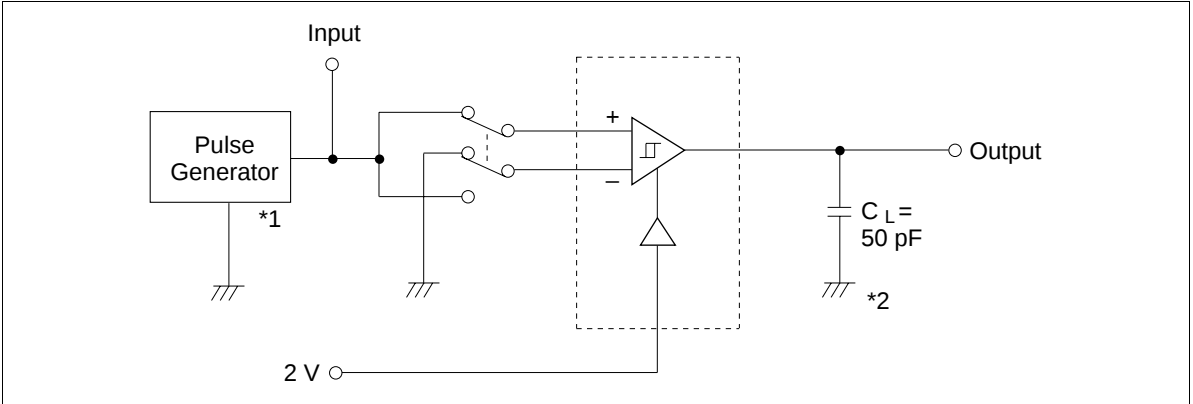
Note: 1. This specification is nonstandard of RS-422A.

Switching Characteristics (Ta = -40°C to +85°C, V_{CC} = 5 ± 10%)

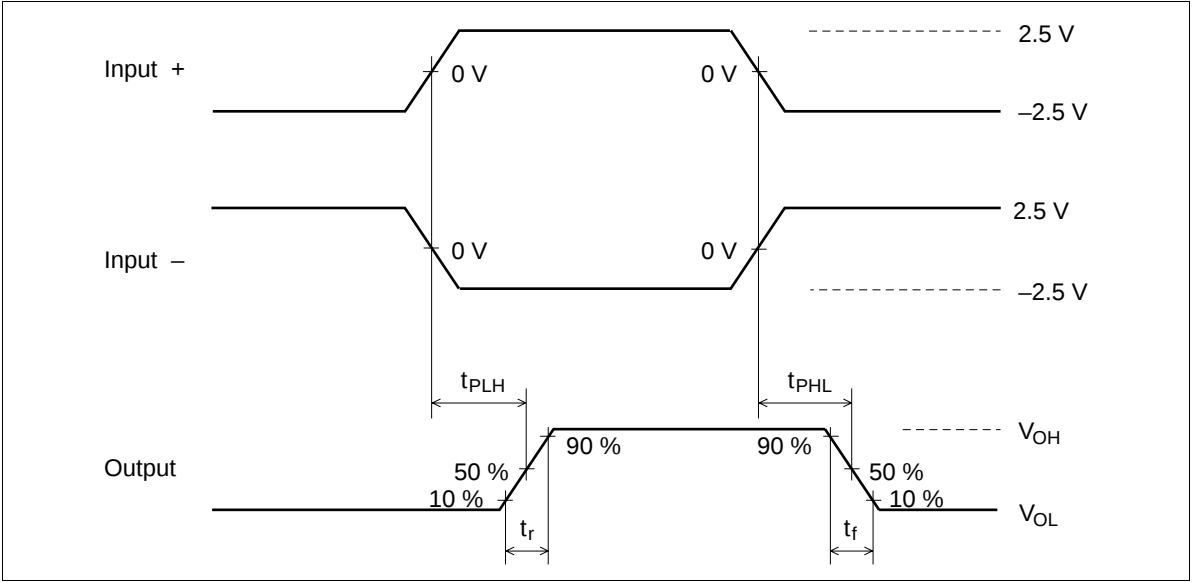
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t _{PLH}	7	16	25	ns	C _L = 50pF, V _{DIEF} = 2.5 V, V _{CM} = 0 V
	t _{PHL}	7	16	25	ns	
Output Rise/Fall Time	t _{RISE}	—	4	9	ns	C _L = 50pF, V _{DIEF} = 2.5 V, V _{CM} = 0 V
	t _{FALL}	—	4	9	ns	
Output Disable Time	t _{LZ}	—	13	22	ns	C _L = 50pF, R _L = 1000 Ω
	t _{HZ}	—	13	22	ns	V _{DIEF} = 2.5 V
Output Enable Time	t _{ZL}	—	13	22	ns	C _L = 50pF, R _L = 1000 Ω
	t _{ZH}	—	13	22	ns	V _{DIEF} = 2.5 V

1. t_{PLH} , t_{PHL} , t_{RISE} , t_{FALL}

Test Circuit

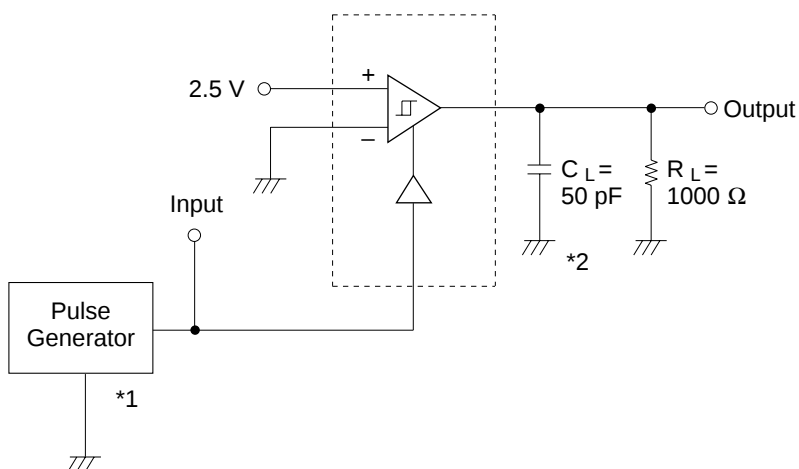


Waveforms

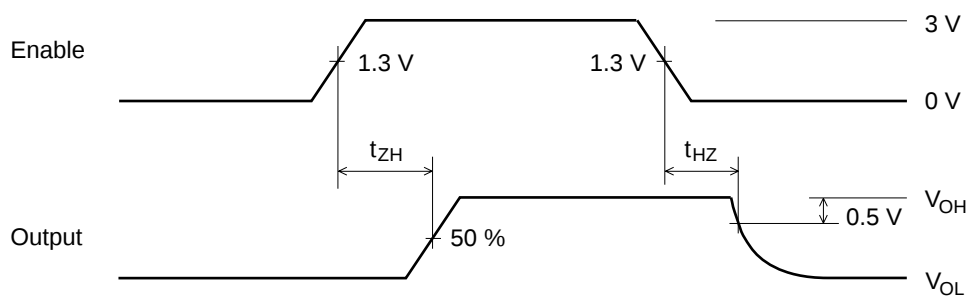


2. t_{HZ} , t_{ZH}

Test Circuit

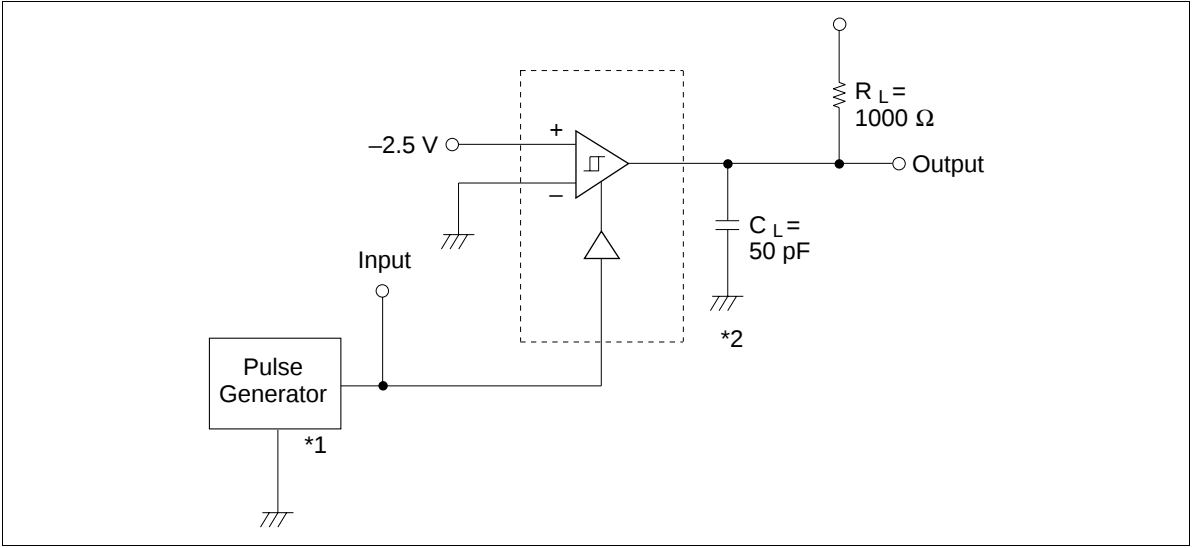


Waveforms

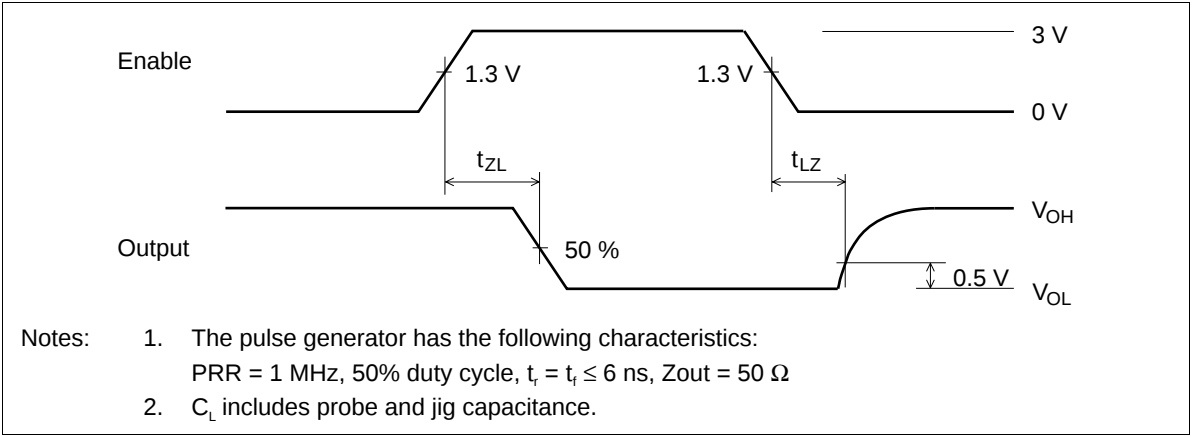


3. t_{LZ} , t_{ZL}

Test Circuit

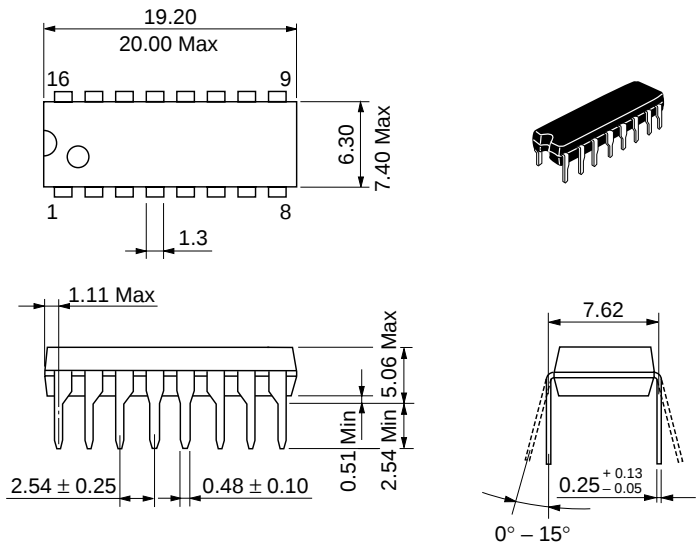


Waveforms



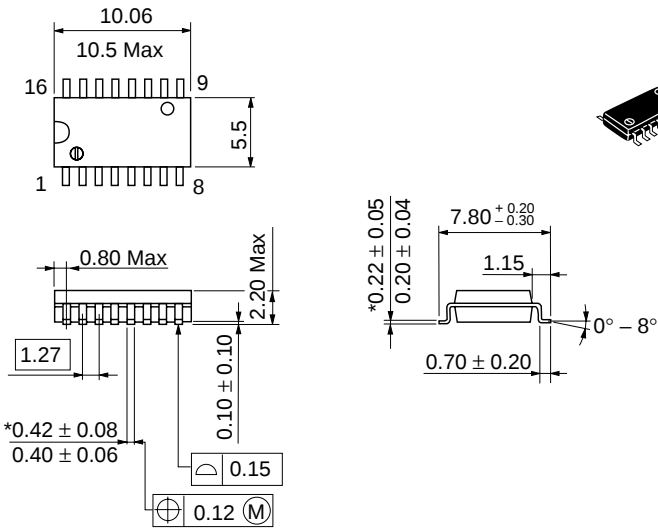
Package Dimensions

Unit: mm



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

Unit: mm



Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.24 g

*Dimension including the plating thickness
Base material dimension

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 StraÙe 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
--	---	--	---

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.
Colophon 2.0