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.

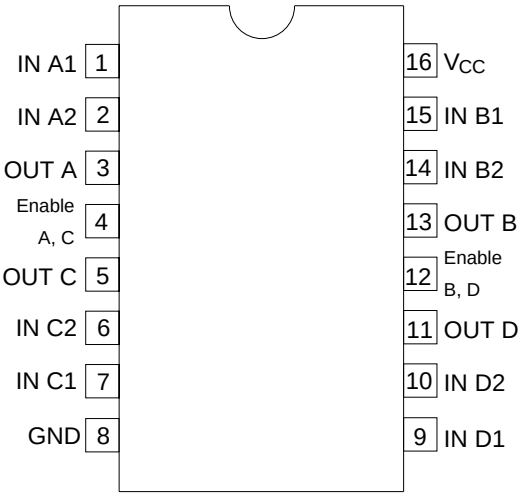
The circuit provides two high enable terminals and each of the terminals can control two receivers. Fail safe design ensures that if the inputs are open the outputs will always be high.

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

Hitachi semiconductor

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 (Ta = 25°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	°C

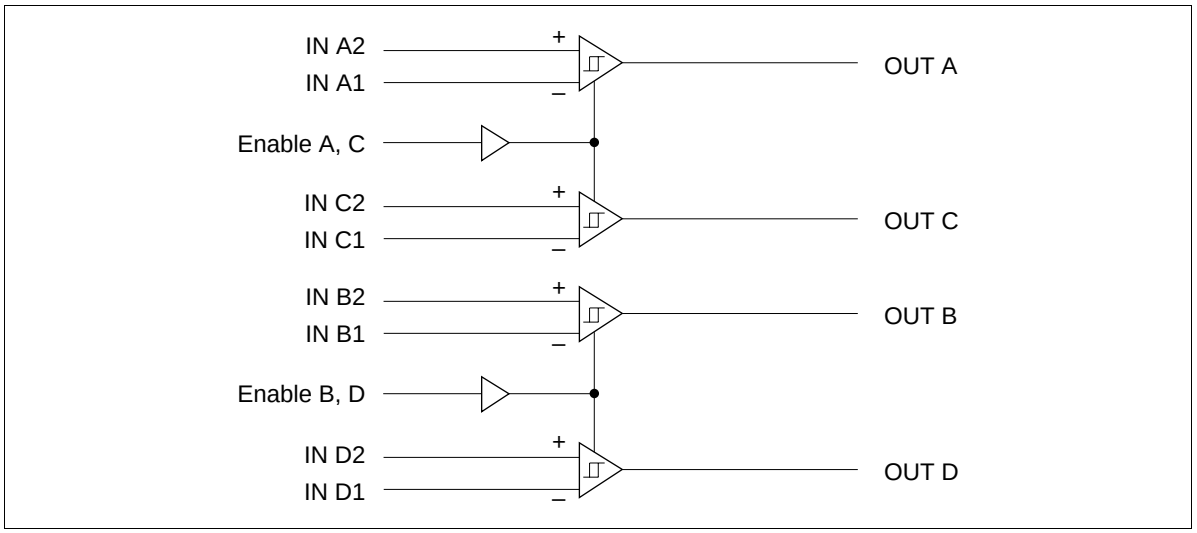
Notes: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.
2. All voltage values except for differential input voltage are with respect to network ground terminal.
3. Differential input voltage is measured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

Recommended Operating Conditions (Ta = –40°C to +85°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	°C
Enable Input Rise/Fall Time	tr, tf	—	—	500	ns

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

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	V_{TH}	—	—	0.2	V	V_{CM} = –7 to 7 V, $V_{OUT} \geq$ 3.8 V
Voltage	V_{TL}	—	—	–0.2	V	V_{CM} = –7 to 7 V, $V_{OUT} \leq$ 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

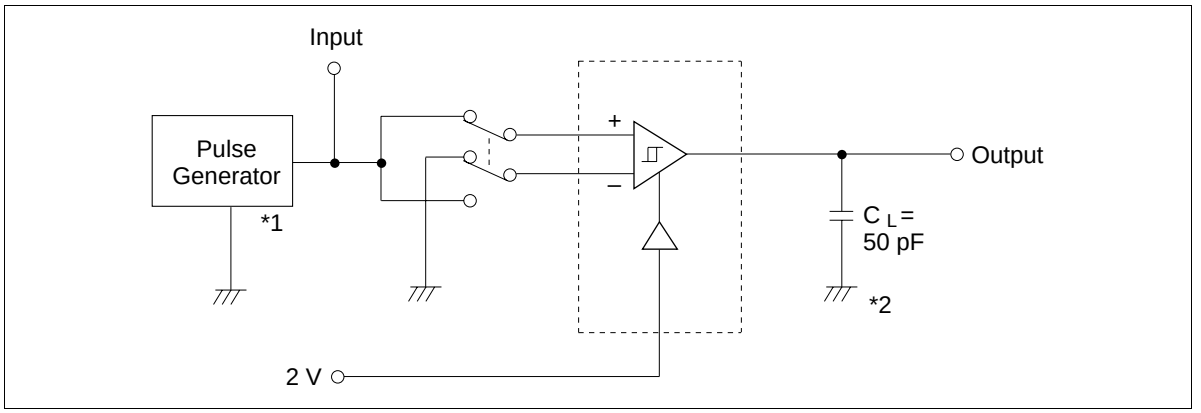
Note: 1. This specification is nonstandard of RS-422A.

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

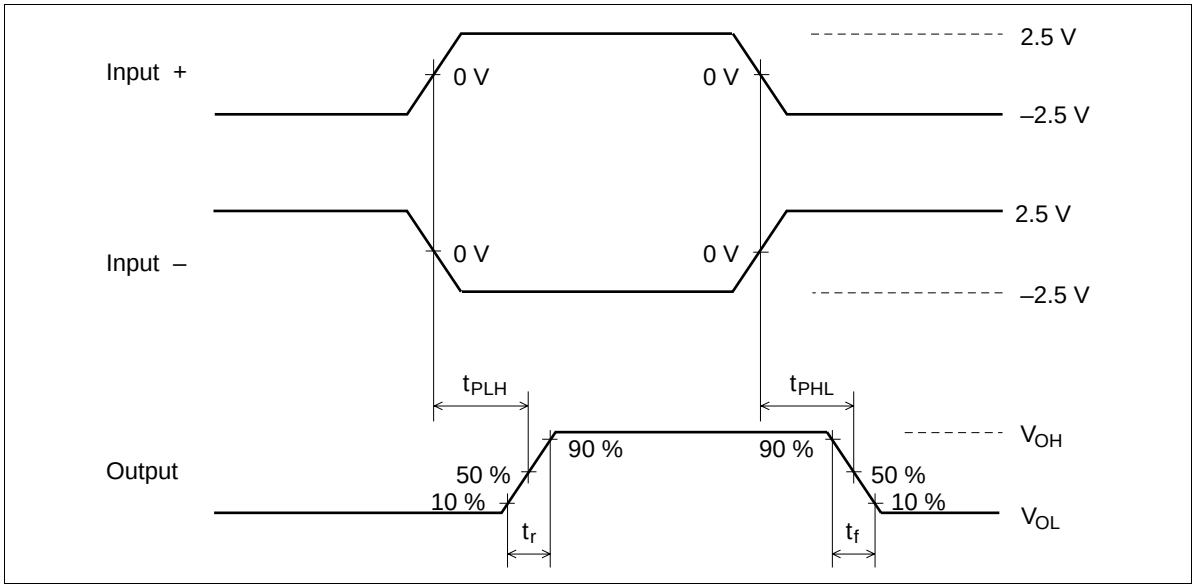
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}	7	16	25	ns	C_L = 50pF, V_{DIEF} = 2.5 V, V_{CM} = 0 V
	t_{PHL}	7	16	25	ns	
Output Rise/Fall Time	t_{RISE}	—	4	9	ns	C_L = 50pF, V_{DIEF} = 2.5 V, V_{CM} = 0 V
	t_{FALL}	—	4	9	ns	
Output Disable Time	t_{LZ}	—	13	22	ns	C_L = 50pF, R_L = 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

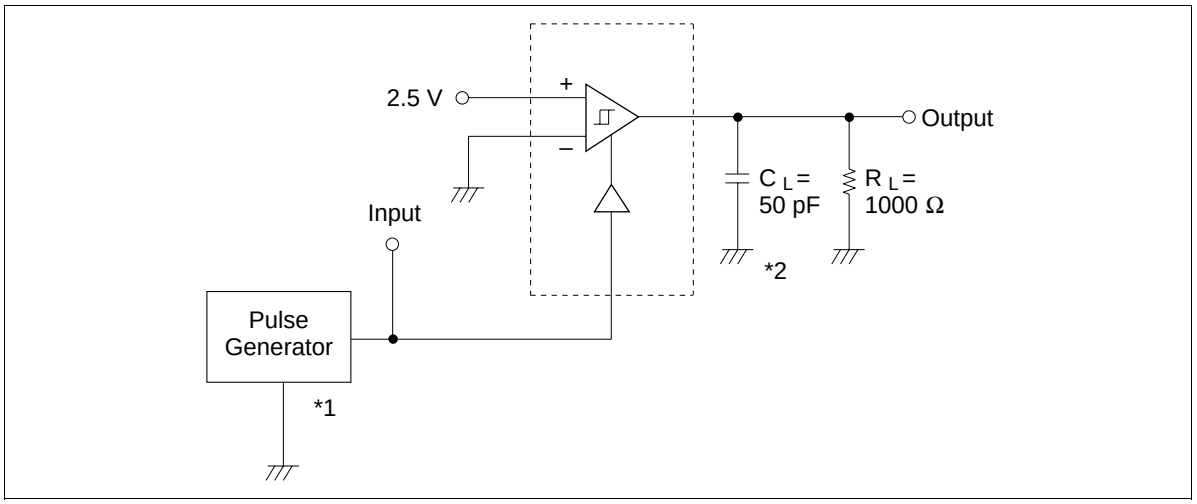


Waveforms

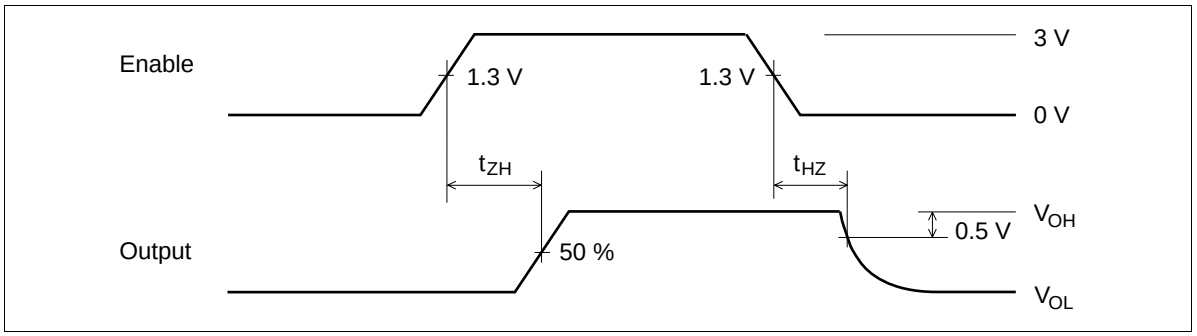


2. t_{HZ}, t_{ZH}

Test Circuit

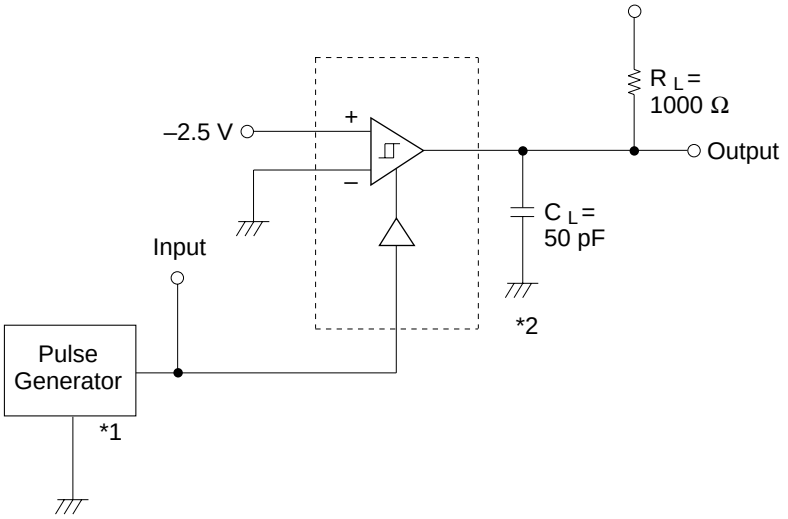


Waveforms

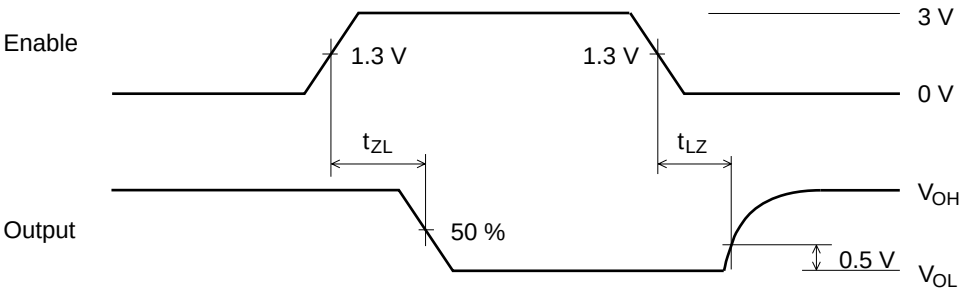


3. t_{LZ}, t_{ZL}

Test Circuit



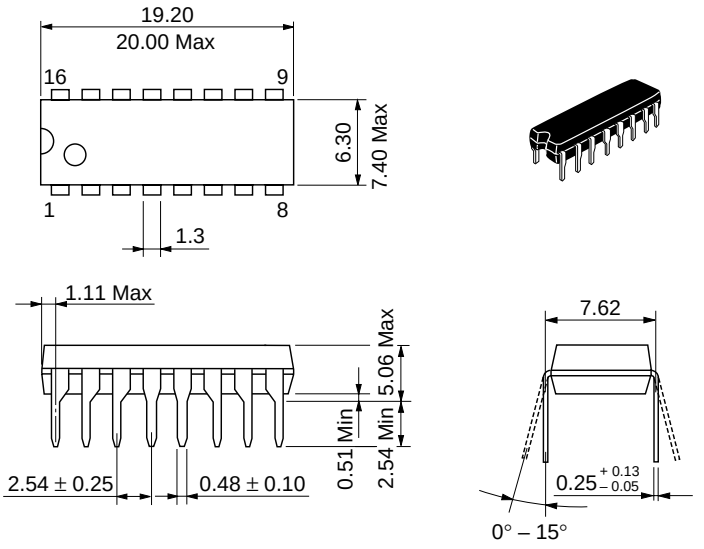
Waveforms



Notes:
1. The pulse generator has the following characteristics:
   PRR = 1 MHz, 50% duty cycle, $t_r = t_f \leq 6$ ns, Zout = 50 Ω
2. C_L includes probe and jig capacitance.

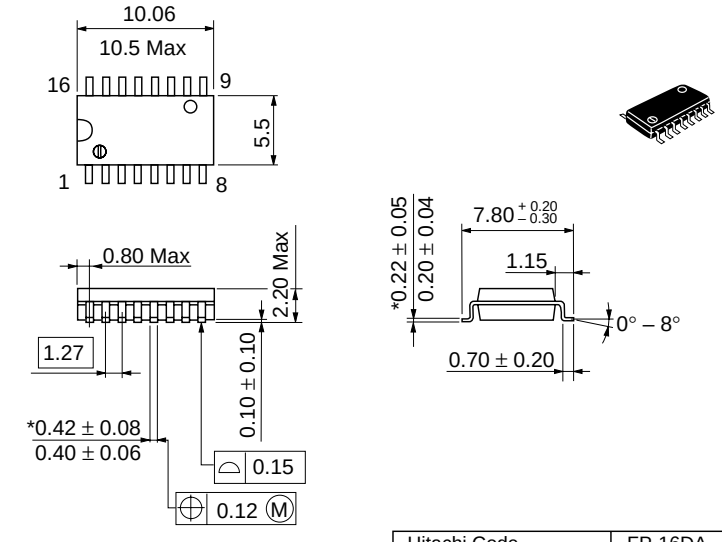
Package Dimensions

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

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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
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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 Straβe 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
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