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Customer Support Dept.
April 1, 2003

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HD26C32A

Quadruple Differential Line Receivers With 3 State Outputs

ADE-205-575 (Z)
1st. Edition
Dec. 2000

Description

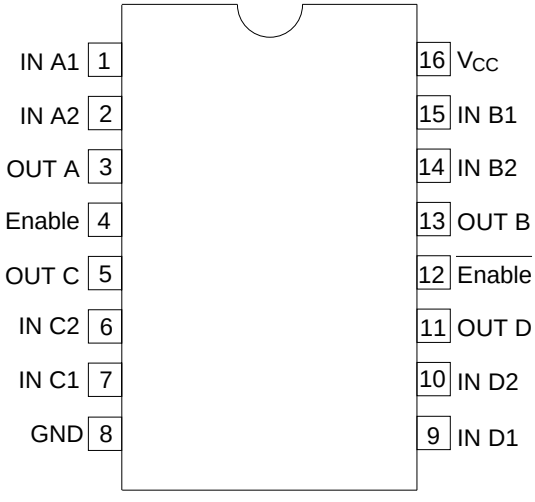
The HD26C32A provides differential line receivers which realize low power dissipation by CMOS process. The device has four receivers which meet the requirements of EIA standard RS-422A and RS-423A in a 16 pin package.

The enable function is common to all four receivers and offers a choise of active high or active low inputs. 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: ±0.2V (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 HD26LS32/32A

Pin Arrangement



(Top view)

Function Table

Differential Input	Enable	$\overline{\text{Enable}}$	Outputs
$V_{ID} \geq V_{TH}$ or OPEN	H	X	H
	X	L	
$V_{TL} < V_{ID} < V_{TH}$	H	X	?
	X	L	
$V_{ID} \geq V_{TH}$	H	X	L
	X	L	
X	L	H	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
Common Mode 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

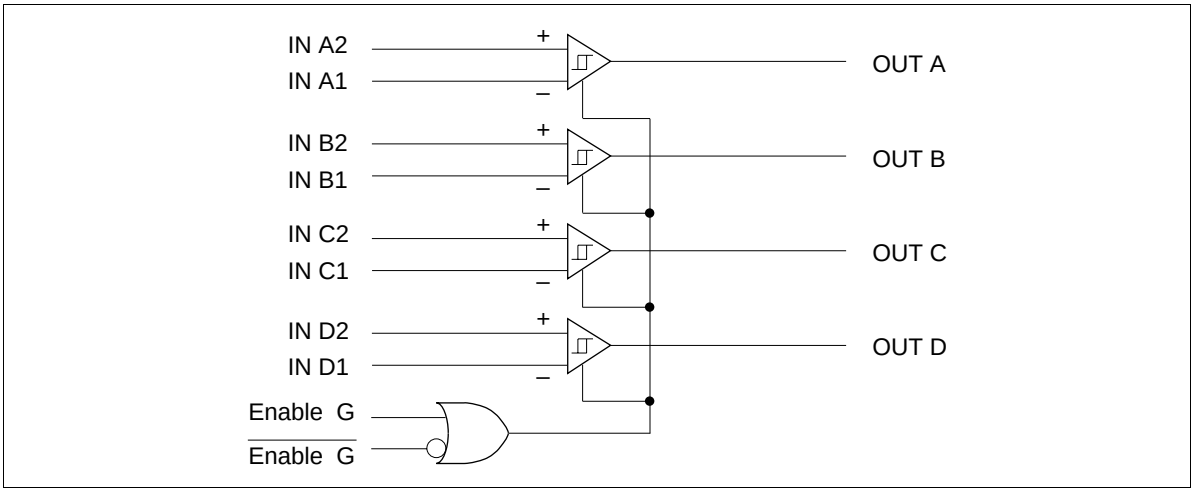
Notes: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.
2. All voltage values except for differential input voltage are with respect to network ground terminal.
3. Differential input voltage is measured 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
Common Mode 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	t_r, t_f	—	—	500	ns

Note: 1. This item guarantees maximum limit when one input switchies.
Waveform: Refer to test circuit of switching characteristics.

Logic Diagram



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

Item	Symbol	Min	Typ	Max	Unit	Conditions
Diffrential Input	V_{TH}	—	—	0.2	V	V_{CM} = –7 to 7 V, $V_{OUT} \geq$ 3.8 V
Threshold 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	V_{IH}	2.0	—	—	V	
Voltage	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
Output Leak	I_{OZ}	—	0.5	5.0	µA	Enable = 0.8 V, $\overline{\text{Enable}}$ = 2.0 V V_{OUT} = V_{CC}
CurrentI		—	–0.5	–5.0	µA	Enable = 0.8 V, $\overline{\text{Enable}}$ = 2.0 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	mA	V_{IN} = –3 V, Other Input = GND
		—	–2.0	-2.5	mA	V_{IN} = –10 V, Other Input = GND
Enable Input	I_I	—	—	1.0	µA	V_I = V_{CC}
Current		—	—	–1.0	µA	V_I = 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

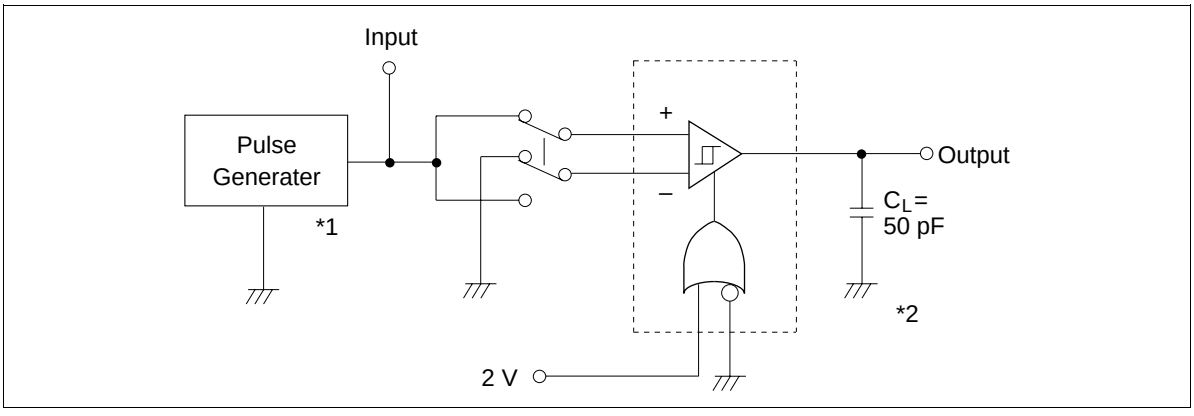
Note: 1. This specification is nonstandard of RS-422A.

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

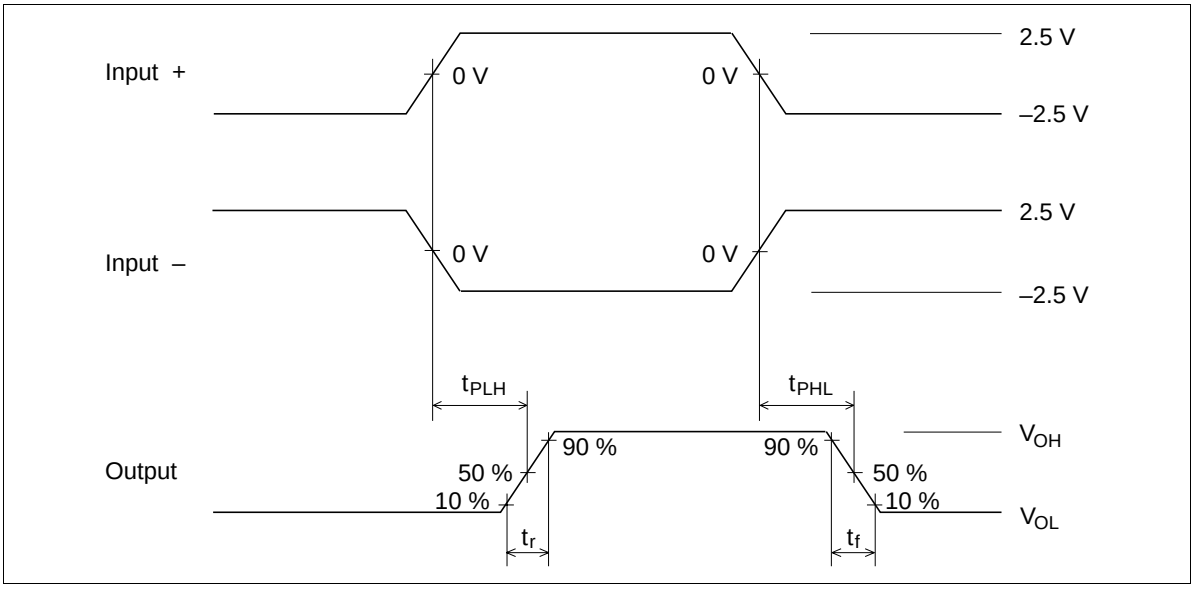
Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}	7	16	25	ns	C_L = 50 pF, V_{DIEF} = 2.5 V, V_{CM} = 0 V
	t_{PHL}	7	16	25	ns	
Output Rise / Fall Time	t_{RISE}	—	4	9	ns	C_L = 50 pF, V_{DIEF} = 2.5 V, V_{CM} = 0 V
	t_{FALL}		4	9	ns	
Output Disable Time	t_{LZ}	—	13	22	ns	C_L = 50 pF,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

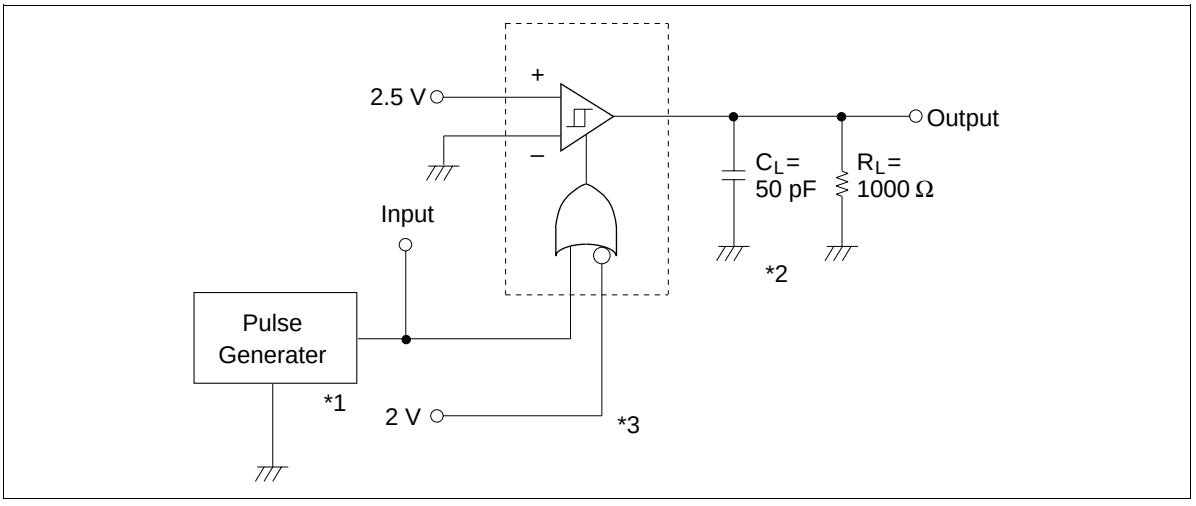


Wave forms

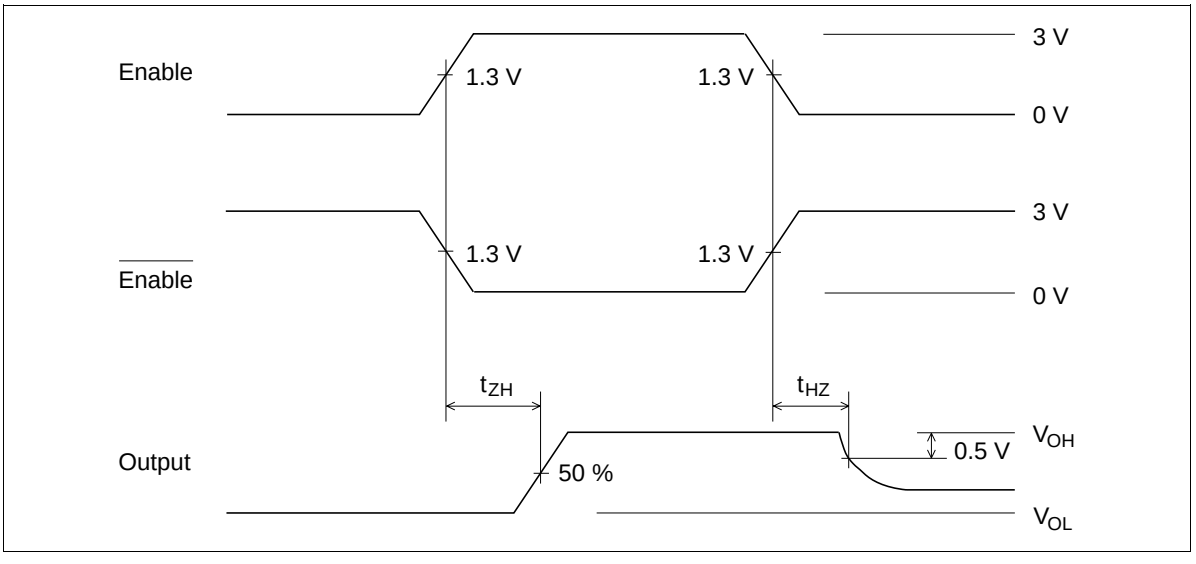


2. t_{HZ}, t_{ZH}

Test Circuit

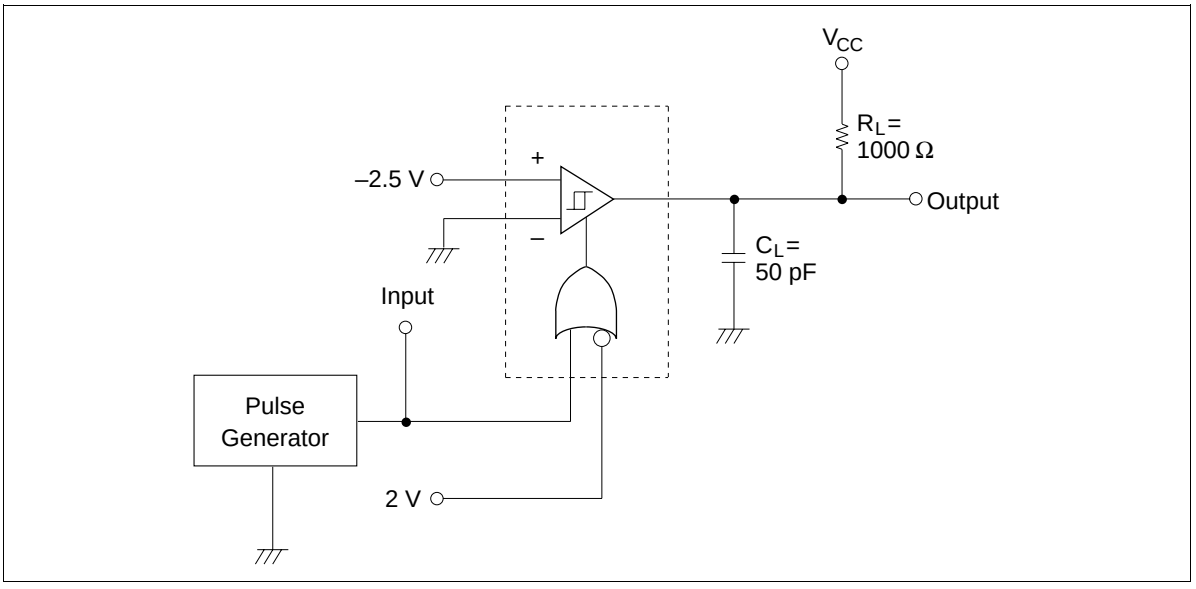


Wave forms

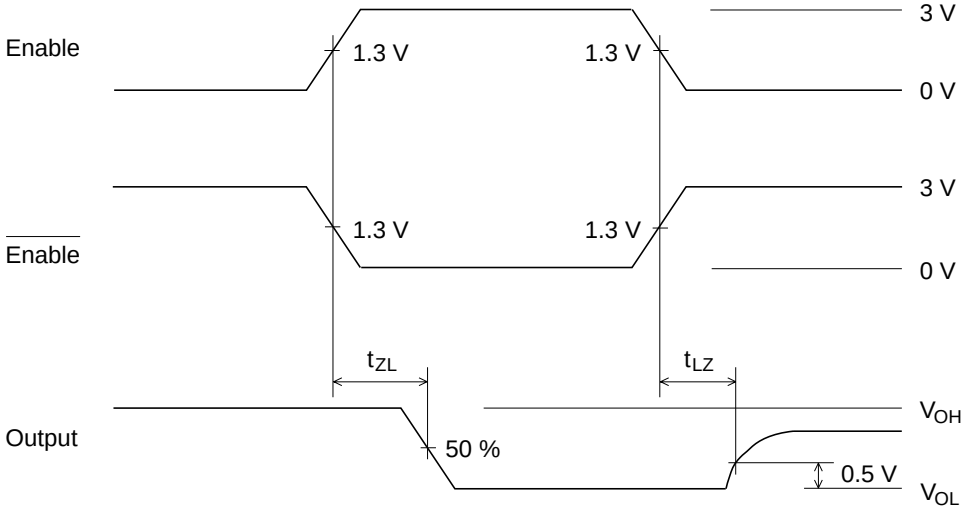


3. t_{LZ}, t_{ZL}

Test circuit



Wave forms



Notes:
1. The pulse generator has the following characteristics:
   PRR = 1 MHz, 50 % duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, Zout = 50 Ω
2. C_L includes probe and jig capacitance.
3. To test $\overline{\text{Enable}}$ input, ground Enable input and apply an inverted input waveform.

HD26C32A Line Receiver Applications

The HD26C32A is a line receiver that meets the EIA RS-422A and RS-423A conditions. It has a high in-phase input voltage range, both positive and negative, enabling highly reliable transmission to be performed even in noisy environments.

Its main features are listed below.

- Operates on a single 5 V power supply.
- ±0.2 V input sensitivity in in-phase input voltage ±7 V range
- Three-state output
- On-chip input fail-safe circuit
- On-chip power up/down protection circuit

As shown by the logic diagram, the enable function is common to all four drivers, and either active-high or active-low input can be selected.

When exchange is carried out using a party line system, it is better to keep the receiver input bias current constituting the driver load small, as this allows more receivers to be connected.

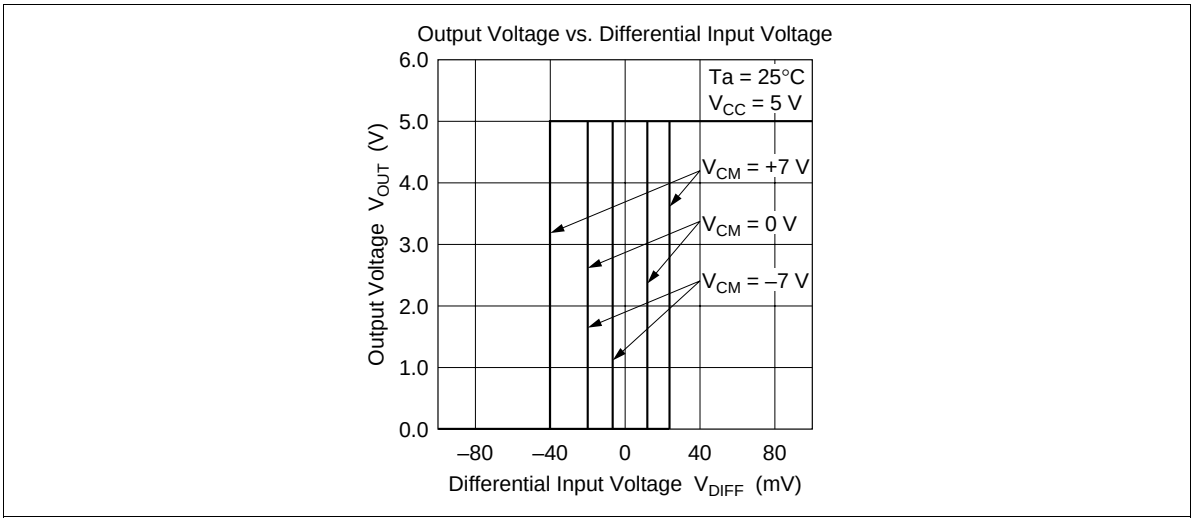


Figure 1 Differential Input Voltage vs. Output Voltage Characteristics

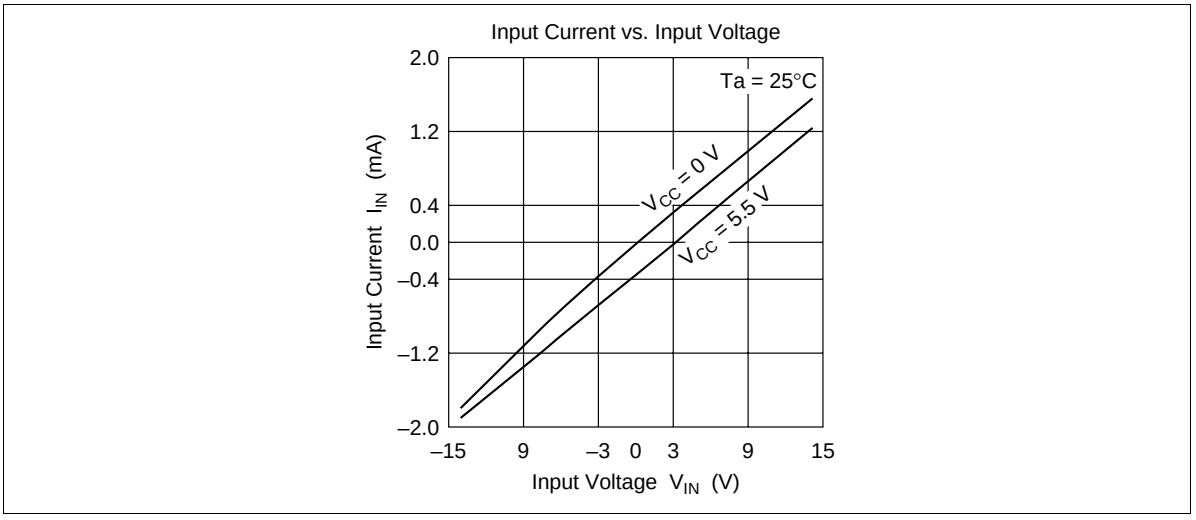


Figure 2 Input Voltage vs. Input Current Characteristics

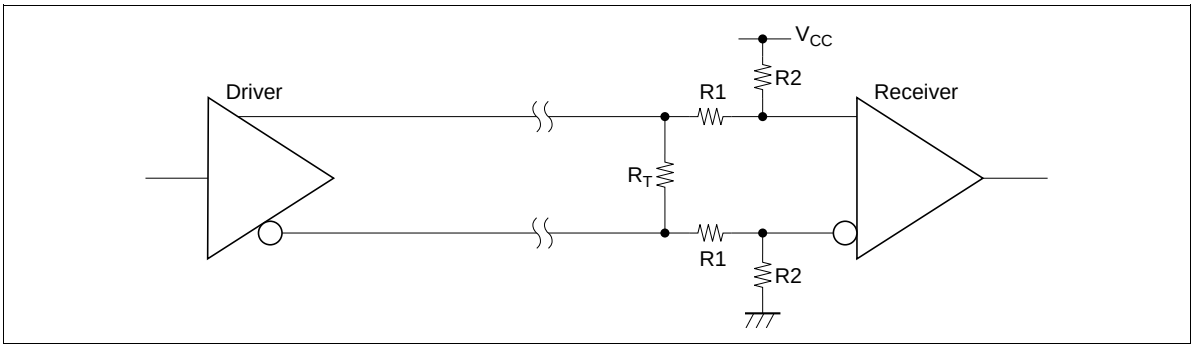


Figure 3 Method of Enhancing Fail-Safe Function

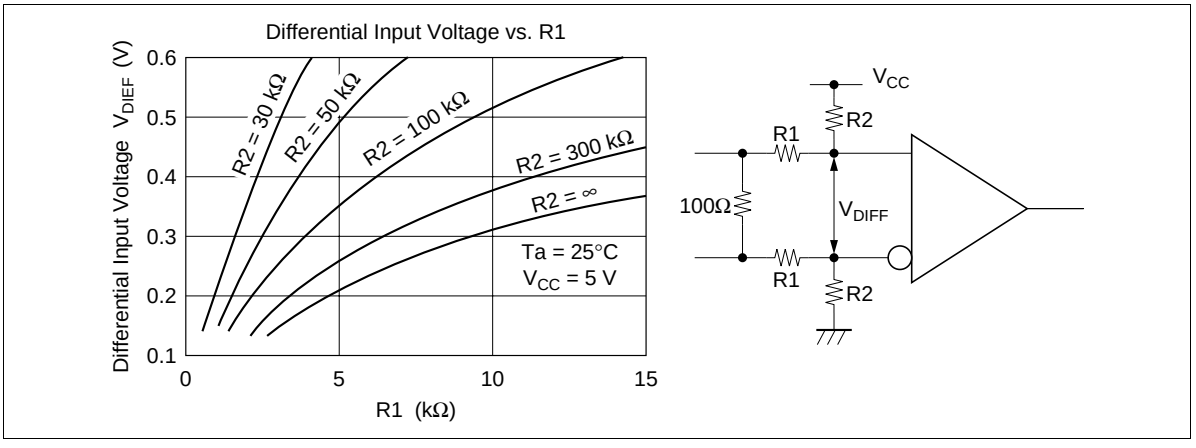


Figure 4 R_1, R_2 vs. Differential Input Voltage

1. Unidirectional Transmission (1 : 1 Configuration)

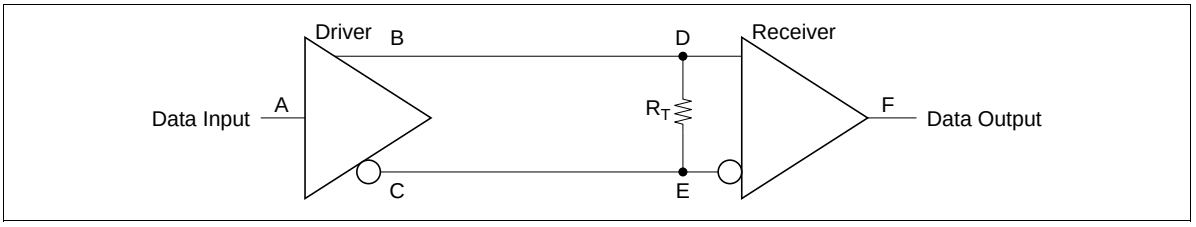


Figure 5 1 : 1 Unidirectional Transmission

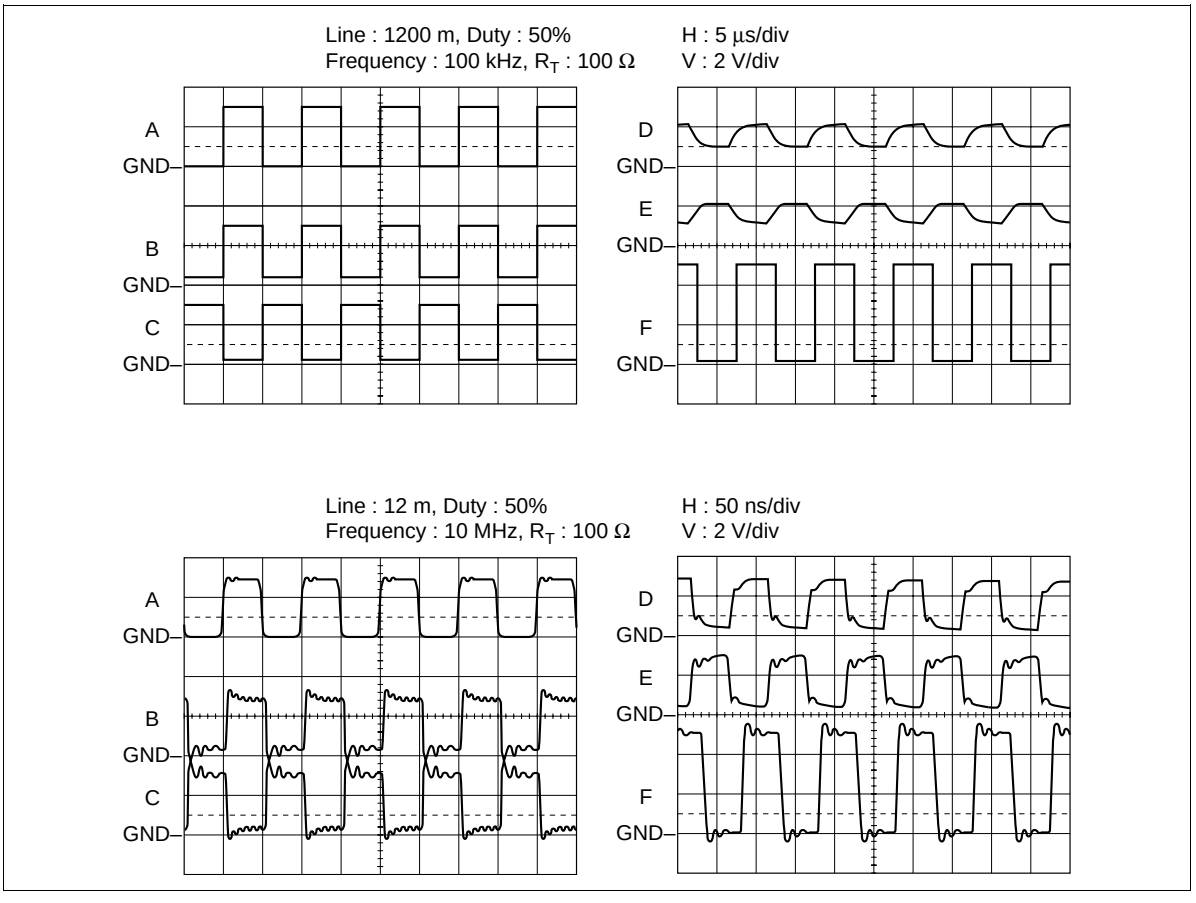


Figure 6 Sample Transmission Waveforms

2. Unidirectional Transmission (1 : n Configuration)

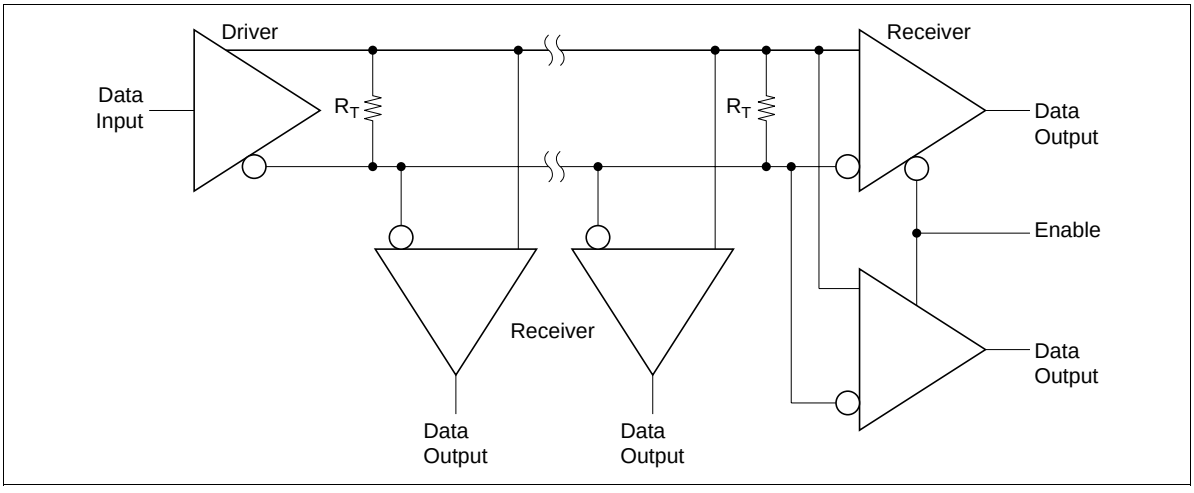


Figure 7 1:n Unidirectional Transmission

With this connection method, n receivers are connected for one driver. In the RS-422A standard, ten receivers can be connected simultaneously for one driver.

Conversely, it is also possible to connect one receiver for n drivers.

3. Bidirectional Transmission

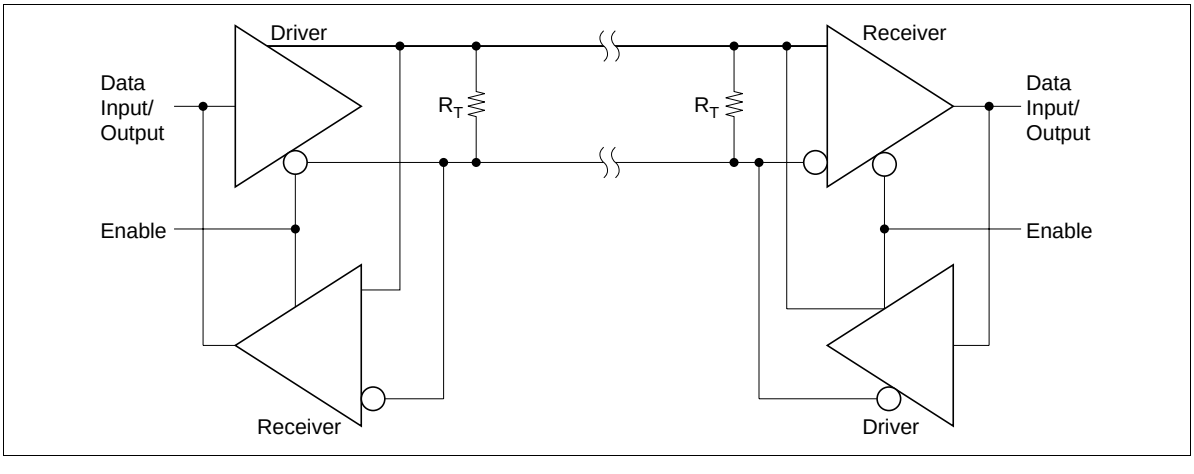


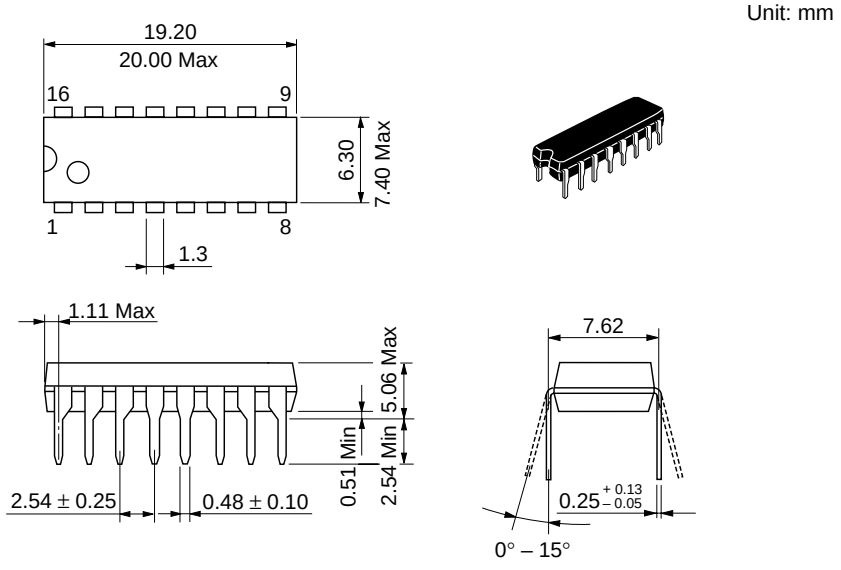
Figure 8 Bidirectional Transmission

When bidirectional data exchange is performed using a combination of the HD26C31 and HD26C32A, since either high or low output control is possible, using complementary enable inputs for the driver and receiver makes it easy to configure the kind of combination illustrated in figure 8.

Extending this combination makes it possible to exchange n-bit data simultaneously, and handle a party line system.

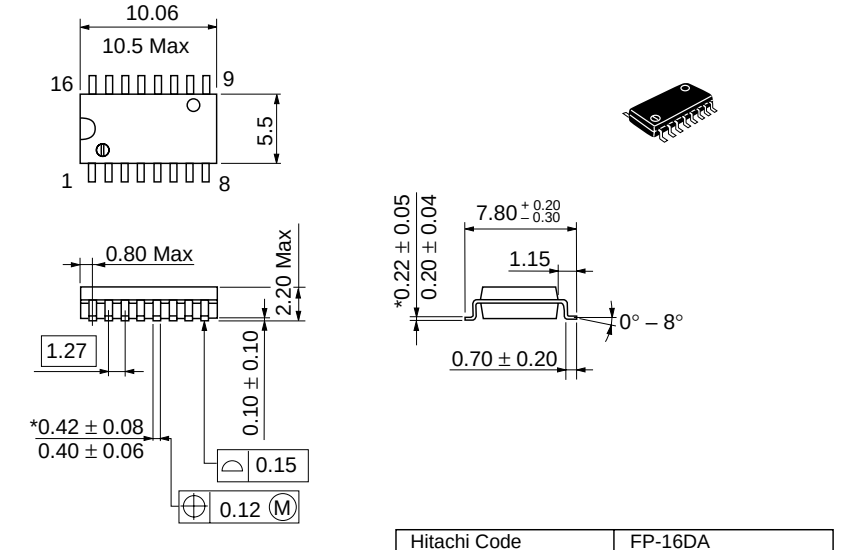
Package Dimensions

Unit: mm



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

Unit: mm



*Dimension including the plating thickness
Base material dimension

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

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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

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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
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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
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Telex : 23222 HAS-TP
URL : http://www.hitachi.com.tw

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