HD29412

Dual Differential Line Drivers With 3 State Output

HITACHI

ADE-205-581 (Z)
1st. Edition
Dec. 2000

Description

The HD29412 features dual differential line drivers with three state outputs designed to satisfy the requirements of EIA-422. Each driver has an output control is low, the associated outputs are in a high impedance state. This permits many deviced to be connected together on the same transmission line for party line applications.

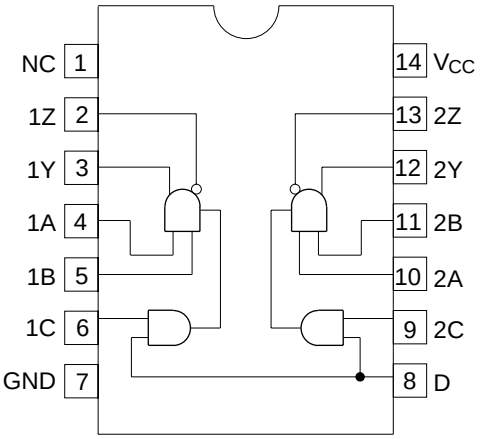
Function Table

Input				Output	
A	**B**	**C**	**D**	**Y**	**Z**
H	H	H	H	H	L
H	L	H	H	L	H
L	H	H	H	L	H
L	L	H	H	L	H
X	X	L	X	Z	Z
X	X	X	L	Z	Z

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

Hitachi semiconductor

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply Voltage	V_{CC}*1	7	V
Input Voltage	V_{IN}	5.5	V
Power Dissipation	P_T	1150	mW
Operating Temperature	Topr	0 to + 70	°C
Storage Temperature	Tstg	-65 to + 150	°C

Notes: 1. The values is defined as of ground terminal.
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}	—	—	–40	mA
	I_{OL}	—	—	40	mA
Operating Temperature	Topr	0	—	70	°C

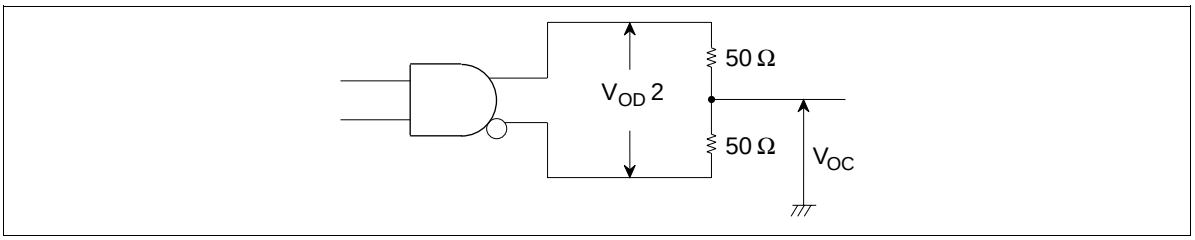
Electrical Characteristics (Ta = 0 to +70°C)

Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Input Voltage	V_{IH}	2	—		V	
	V_{IL}	—	—	0.8	V	
Input Clamp Voltage	V_{IK}	—	—	–1.5	V	V_{CC} = 4.75 V, I_I = –12 mA
Output Voltage	V_{OH}	2.5	—	—	V	V_{CC} = 4.75 V, V_{IL} = 0.8 V, V_{IH} = 2 V, I_{OH} = –40 mA
	V_{OL}	—	—	0.5	V	V_{CC} = 4.75 V, V_{IL} = 0.8 V, V_{IH} = 2 V, I_{OL} = 40 mA
Output Clamp Voltage	V_{OK}	—	—	–1.5	V	V_{CC} = 5.25 V, I_O = –40 mA
Differential Output Voltage	V_{OD1}	—	—	2 V_{OD2}	V	V_{CC} = 5.25 V, I_O = 0 mA
	V_{OD2}	2	—	—	V	V_{CC} = 4.75 V, R_L = 100 Ω
Change In Magunitude of Differential Output Voltage*[1]	V_{OD}	—	—	0.4	V	V_{CC} = 4.75 V
Common Mode Output Voltage*[3]	V_{OC}	—	—	3	V	V_{CC} = 5.25 V
		—	3	—	V	V_{CC} = 4.75 V
Magunitude of Common Mode Output Voltage*[2]	$\Delta \lvert V_{OC} \rvert$	—	—	0.4	V	V_{CC} = 4.75 V or 5.25 V
Output Current With Power Off	I_O	—	—	100	µA	V_{CC} = 0, V_O = 6 V
		—	—	–100		V_O = –0.25 V
		—	—	±100		V_O = –0.25 V to 6 V
Off State (HighImpedance) Output Current	I_{OZ}	—	—	±10	µA	V_{CC} = 5.25 V, Ta = 25°C, V_O = 0 to V_{CC}
		—	—	–20		Output Control = 0.8 V, Ta = 70°C, V_O = 0 V
		—	—	±20		V_O = 0.4 V
		—	—	±20		V_O = 2.4 V
		—	—	20		V_O = V_{CC}
Input Current (A, B, C Input)	I_I	—	—	1	mA	V_{CC} = 5.25 V, V_I = 5.5 V
	I_{IH}	—	—	40	µA	V_{CC} = 5.25 V, V_I = 2.4 V
	I_{IL}	—	—	–1.6	mA	V_{CC} = 5.25 V, V_I = 0.4 V
Input Current (D Input)	I_I	—	—	2	mA	V_{CC} = 5.25 V, V_I = 5.5 V
	I_{IH}	—	—	80	µA	V_{CC} = 5.25 V, V_I = 2.4 V
	I_{IL}	—	—	–1.8	mA	V_{CC} = 5.25 V, V_I = 0.4 V
Short Circuit Output*4	I_{OS}	–40	—	–150	mA	V_{CC} = 5.25 V
Supply Current (All Input GND)	I_{CC}	—	31	65	mA	V_{CC} = 5.25 V, Ta = 25°C

Notes: 1. All typical values are at V_{CC} = 5.0 V, Ta = 25°C

2. $\Delta \lvert V_{OD} \rvert$ and $\Delta \lvert V_{OC} \rvert$ denote the change of V_{OD} and V_{OC} in absolute values, respectively. Voltage generated when input level is changed from high to low.

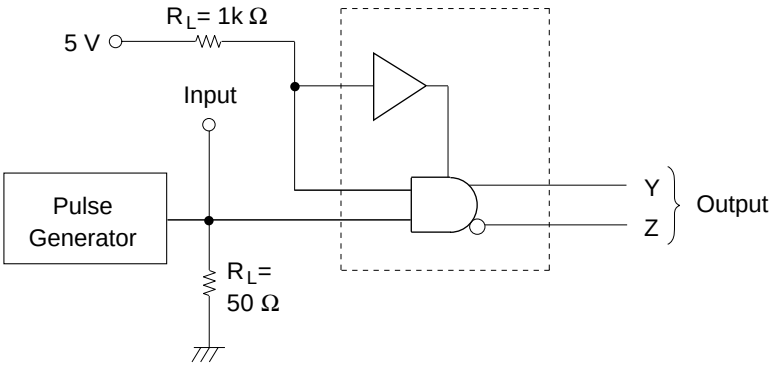
3. Voc is the average of two output voltages referenced to GND, and is indentical to output offset voltage (V_{OS}) in EIA standard RS-422.
4. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.



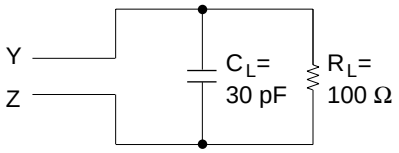
Switching Characteristics (V_{CC} = 5 V, Ta = 25°C)

Item	Symbol	Test Circuit	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}	1 Connection A	—	16	25	ns	C_L = 30 pF, R_L = 100 Ω
	t_{PHL}		11	—	20		
	t_{PLH}	1 Connection B	—	13	20		C_L = 15 pF
	t_{PHL}		9	—	15		
Transition Time	t_{TLH}	1 Connection A	—	4	20	ns	C_L = 30 pF, R_L = 100 Ω
	t_{THL}		4	—	20		
Output Enable Time	t_{ZH}	2	—	7	20	ns	C_L = 30 pF, R_L = 180 Ω
	t_{ZL}	3	—	14	40		C_L = 30 pF, R_L = 250 Ω
Output Disable Time	t_{HZ}	2	—	10	30	ns	C_L = 30 pF, R_L = 180 Ω
	t_{LZ}	3	—	17	35		C_L = 30 pF, R_L = 250 Ω
Over Shoot Coefficient		2, Connection C	—	—	10	%	R_L = 100 Ω

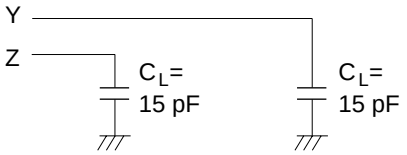
1. Switching Time Test Circuit



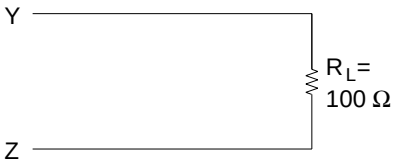
Connection A

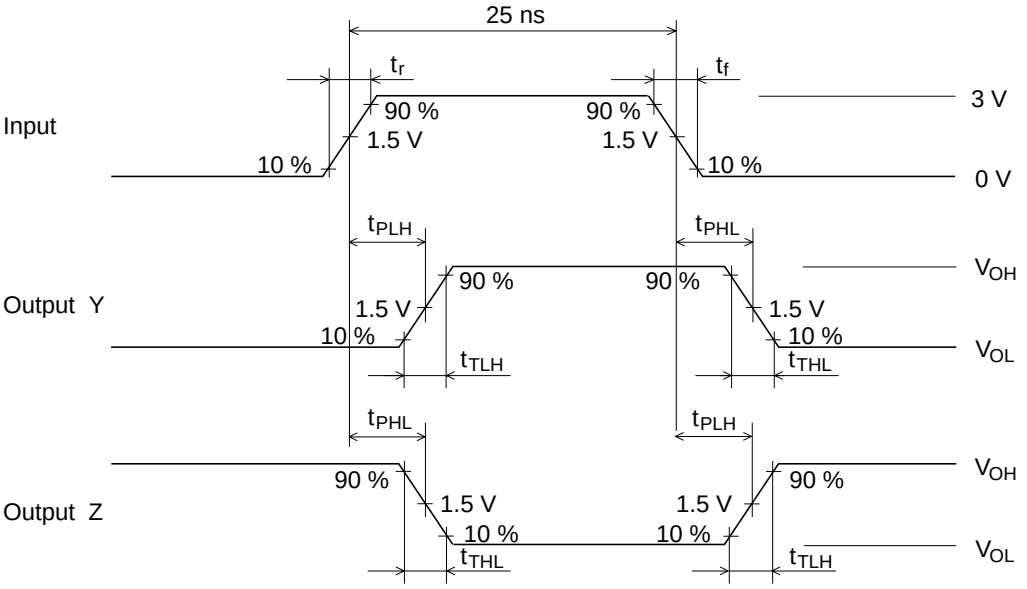


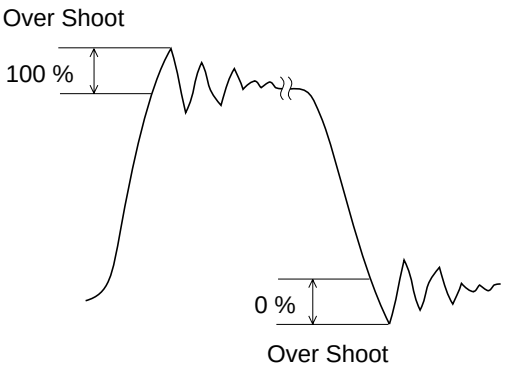
Connection B



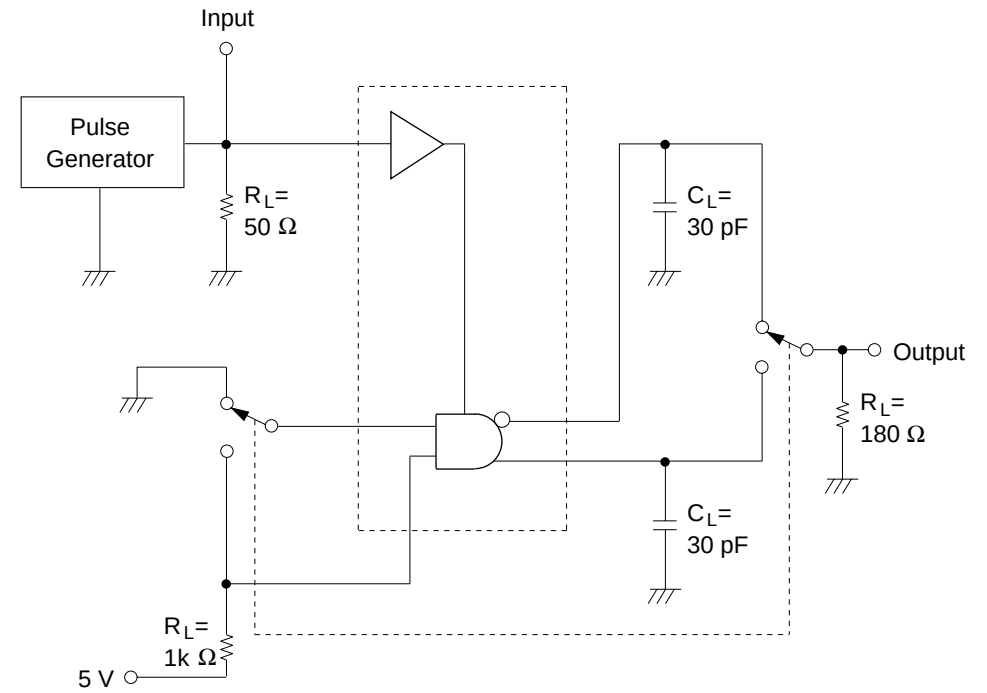
Connection C

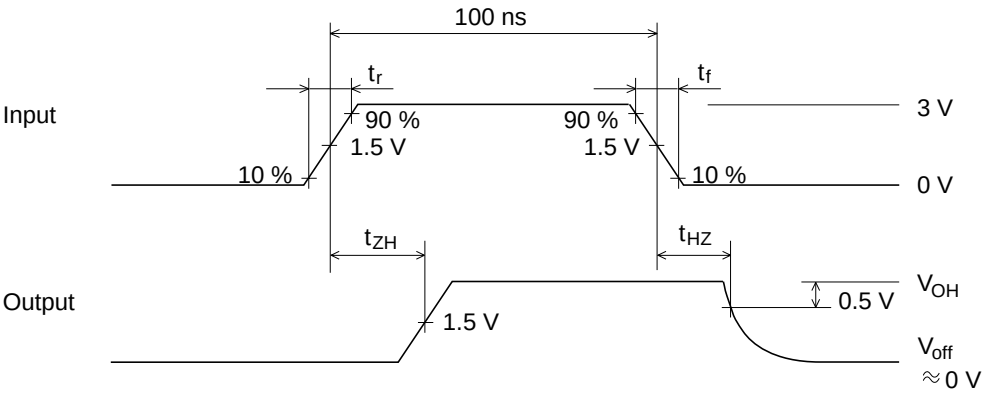



25 ns
t_r
t_f
Input
90 %
1.5 V
10 %
3 V
0 V
t_{PLH}
t_{PHL}
Output Y
V_{OH}
V_{OL}
t_{TLH}
t_{THL}
Output Z

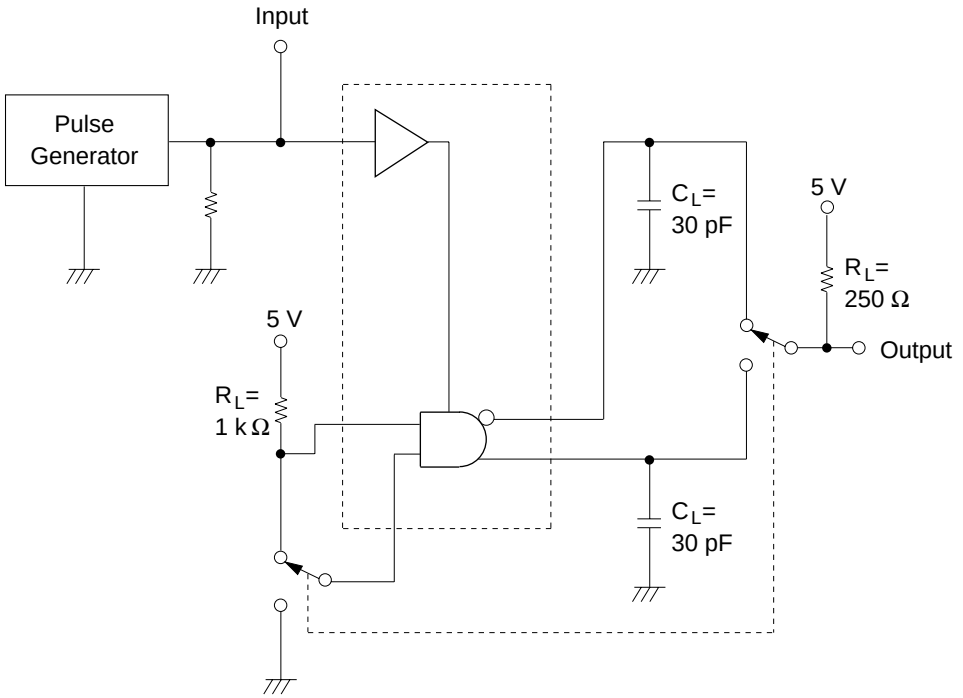

Over Shoot
100 %
0 %
Over Shoot

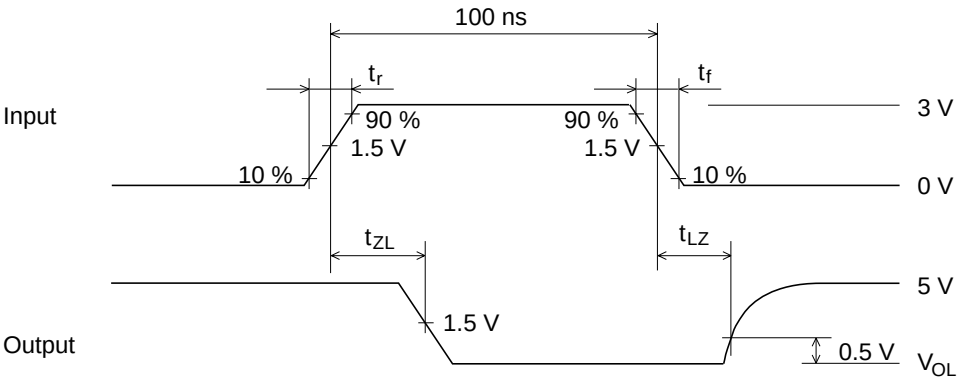
2. t_{ZH}, t_{HZ}


Input
Pulse Generator
R_L= 50 Ω
C_L= 30 pF
Output
R_L= 180 Ω
C_L= 30 pF
R_L= 1k Ω
5 V


100 ns
t_r
t_f
Input
90 %
1.5 V
90 %
1.5 V
10 %
10 %
3 V
0 V
t_{ZH}
t_{HZ}
Output
1.5 V
0.5 V
V_{OH}
V_{off}
≈ 0 V

3. t_{ZL}, t_{LZ}

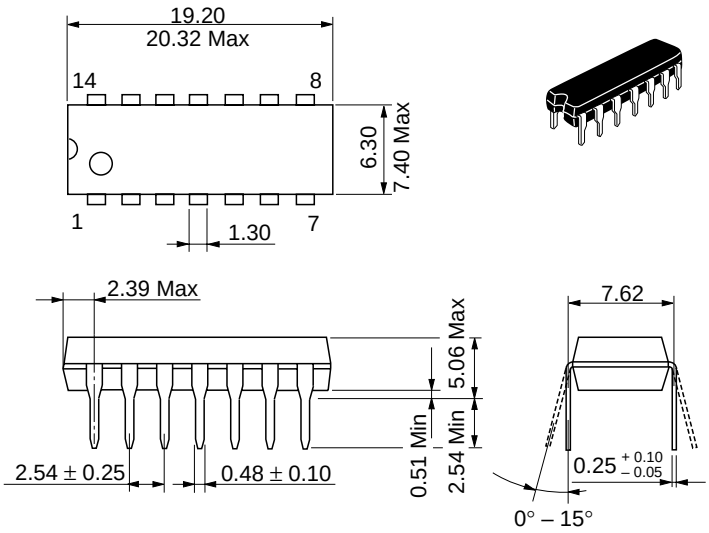




Notes: 1. The pulse generator has the following characteristics: PRR = 500 KHz, Z_{OUT} = 50 Ω.
2. C_L includes probe and jig capacitance.

Package Dimensions

Unit: mm



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.97 g

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