

HD29412

Dual Differential Line Drivers With 3 State Outputs

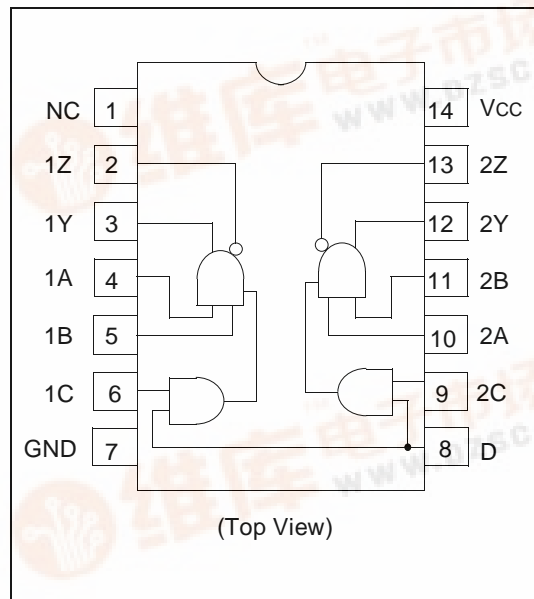
The HD29412 features dual differential line drivers with three state outputs designed to satisfy the requirements of EIA-422. Each driver has an output control is low, the associated outputs are in a high impedance state. This permits many devices to be connected together on the same transmission line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

Pin Arrangement



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	T _{opr}	0 to + 70	°C
Storage Temperature	T _{stg}	-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

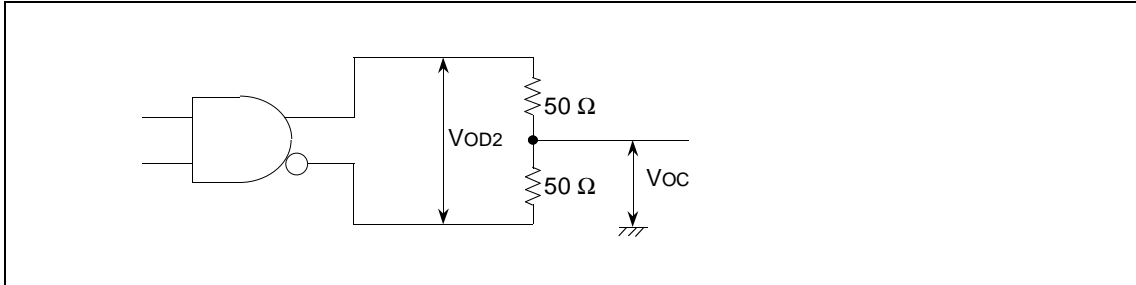
Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{CC}	4.75	5.00	5.25	V
Output Current	I _{OH}	—	—	-40	mA
	I _{OL}	—	—	40	mA
Operating Temperature	T _{opr}	0	—	70	°C

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

Item	Symbol	Conditions	Min	Typ ^{*1}	Max	Unit
Input Voltage	V _{IH}		2	—	—	V
	V _{IL}		—	—	0.8	V
Input Clamp Voltage	V _{IK}	V _{CC} = 4.75 V, I _I = -12 mA	—	—	-1.5	V
Output Voltage	V _{OH}	V _{CC} = 4.75 V, V _{IL} = 0.8 V V _{IH} = 2 V, I _{OH} = -40 mA	2.5	—	—	V
	V _{OL}	V _{CC} = 4.75 V, V _{IL} = 0.8 V V _{IH} = 2 V, I _{OL} = 40 mA	—	—	0.5	V
Output Clamp Voltage	V _{OK}	V _{CC} = 5.25 V, I _O = -40 mA	—	—	-1.5	V

Item	Symbol	Conditions	Min	Typ ^{*1}	Max	Unit	
Differential Output Voltage	V _{OD1}	V _{CC} = 5.25 V, I _o = 0 mA	—	—	2 V _{OD2}	V	
	V _{OD2}	V _{CC} = 4.75 V R _L = 100 Ω	2	—	—		
Change In Magnitude Of Differential Output Voltage ^{*1}	Δ V _{OD}	V _{CC} = 4.75 V	—	—	0.4	V	
Common Mode Output Voltage ^{*3}	V _{OC}	V _{CC} = 5.25 V	—	—	3	V	
		V _{CC} = 4.75 V	—	—	3		
Magnitude of Common Mode Output Voltage ^{*2}	Δ V _{OC}	V _{CC} = 4.75 V or 5.25 V	—	—	0.4	V	
Output Current With Power Off	I _O	V _{CC} = 0	V _O = 6 V	—	—	100	μA
			V _O = -0.25 V	—	—	-100	
			V _O = -0.25 V to 6 V	—	—	±100	
Off State (High Impedance) Output Current	I _{OZ}	V _{CC} = 5.25 V Output Control = 0.8 V	T _a = 25°C, V _O = 0 to V _{CC}	—	—	±10	μA
			T _a = 70°C, V _O = 0 V	—	—	-20	
			V _O = 0.4 V	—	—	±20	
			V _O = 2.4 V	—	—	±20	
			V _O = V _{CC}	—	—	20	
Input Current (A, B, C Input)	I _I	V _{CC} = 5.25 V, V _I = 5.5 V	—	—	1	mA	
	I _{IH}	V _{CC} = 5.25 V, V _I = 2.4 V	—	—	40	μA	
	I _{IL}	V _{CC} = 5.25 V, V _I = 0.4 V	—	—	-1.6	mA	
Input Current (D Input)	I _I	V _{CC} = 5.25 V, V _I = 5.5 V	—	—	2	mA	
	I _{IH}	V _{CC} = 5.25 V, V _I = 2.4 V	—	—	80	μA	
	I _{IL}	V _{CC} = 5.25 V, V _I = 0.4 V	—	—	-1.8	mA	
Short Circuit Output ^{*4}	I _{OS}	V _{CC} = 5.25 V	-40	—	-150	mA	
Supply Current (All Input GND)	I _{CC}	V _{CC} = 5.25 V, T _a = 25°C	—	31	65	mA	

- Notes: 1. All typical values are at V_{CC} = 5.0 V, T_a = 25°C
2. Δ|V_{OD}| and Δ|V_{OC}| 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. V_{OC} is the average of two output voltages referenced to GND, and is identical 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.

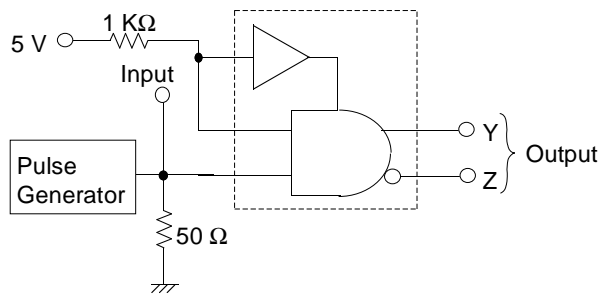


Switching Characteristics ($V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

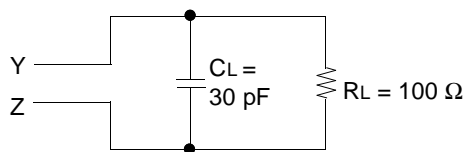
Item	Symbol	Test Circuit	Conditions	Min	Typ	Max	Unit
Propagation Delay Time	t_{PLH}	1 Connection A	$C_L = 30\text{ pF}$, $R_L = 100\ \Omega$	—	16	25	ns
	t_{PHL}			—	11	20	
	t_{PLH}	1 Connection B	$C_L = 15\text{ pF}$	—	13	20	
	t_{PHL}			—	9	15	
Transition Time	t_{TLH}	1 Connection A	$C_L = 30\text{ pF}$,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

Switching Time Test Circuit

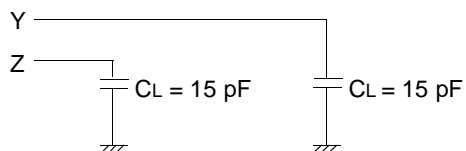
1.



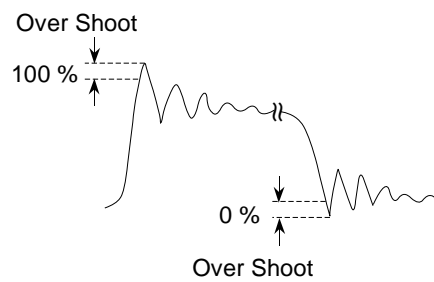
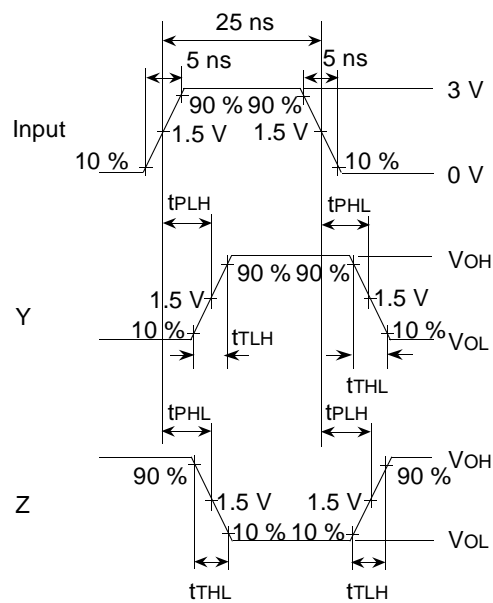
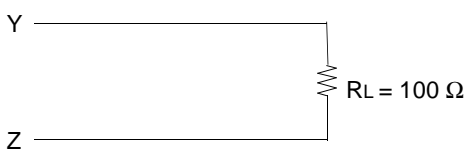
Connection A



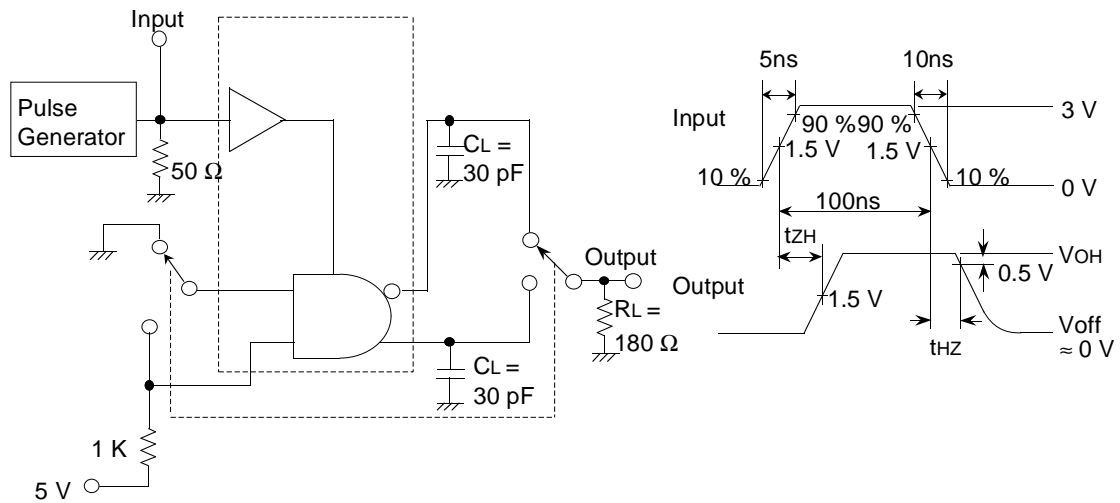
Connection B



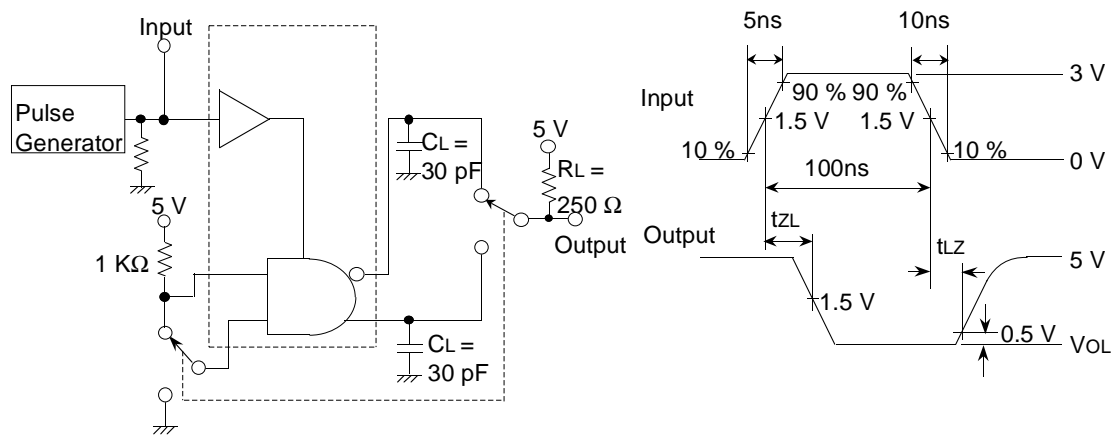
Connection C



2. t_{ZH}, t_{HZ}



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.