

HD75159

Dual Differential Line Drivers With 3 State Outputs

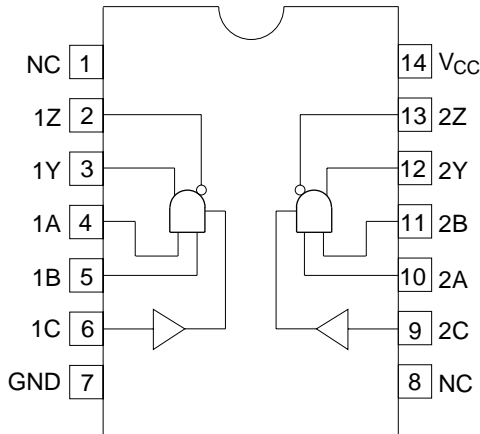
HITACHI

ADE-205-589 (Z)
1st. Edition
Dec. 2000

Description

The HD75159 features dual differential line drivers with three state outputs, which satisfy the requirements of EIA(standard) RS-422A. Each driver has an output control. When the 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.

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	7	V
Input Voltage	V_{IN}	5.5	V
Powre Dissipation ($T_a = 25^\circ\text{C}$)	P_T^{*1}	DP	1150
		FP	785
Operating Temperature Range	T_{opr}	0 to 70	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-60 to +150	$^\circ\text{C}$

- Note: 1. The above date were taken by the ΔV_{BE} method, mounting on a glass epoxy board ($40 \times 40 \times 1.6$ mm) of 10 % wiring density.
 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
Output Current	I_{OL}	—	—	40	mA
Operating Temperature	T_{opr}	0	70	$^\circ\text{C}$	

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

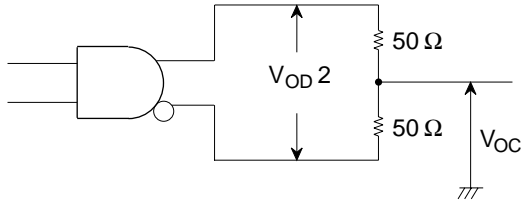
Item	Symbol	Min	Typ* ¹	Max	Unit	Conditions
Input Voltage	V_{IH}	2	—	—	V	
	V_{IL}	—	—	0.8		
Input Clamp Voltage	V_{IK}	—	-0.9	-1.5	V	$V_{CC} = 4.75$ V, $I_I = -12$ mA
Output Voltage	V_{OH}	2.5	3.0	—	V	$V_{CC} = 4.75$ V, $V_{IL} = 0.8$ V $V_{IH} = 2$ V, $I_{OH} = -40$ mA
	V_{OL}	—	-0.25	0.5		$V_{CC} = 4.75$ V, $V_{IL} = 0.8$ V $V_{IH} = 2$ V, $I_{OL} = 40$ mA
Output Clamp Voltage	V_{OK}	—	-1.1	-1.5	V	$V_{CC} = 5.25$ V, $I_O = -40$ mA
Differential Output Voltage	V_{OD1}	—	3.5	$2 V_{OD2}$	V	$V_{CC} = 5.25$ V, $I_O = 0$
	V_{OD2}	—	2	3.0		$V_{CC} = 4.75$ V, $R_L = 100 \Omega^{*1}$
Change In Magnitude Of Differential Output Voltage* ²	$\Delta V_{OD} $	—	0.02	0.4	V	$V_{CC} = 4.75$ V, $R_L = 100 \Omega^{*1}$
Common-mode Output Voltage* ³	V_{OC}	—	1.8	3	V	$V_{CC} = 5.25$ V, $R_L = 100 \Omega^{*1}$
		—	1.5	3		$V_{CC} = 4.75$ V, $R_L = 100 \Omega^{*1}$

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

Item	Symbol	Min	Typ*1	Max	Unit	Conditions
Change In Magnitude Of Differential Output Voltage*2	$\Delta V_{oc} $	—	0.01	0.4	V	$V_{cc} = 4.75 \text{ V or } 5.25 \text{ V}$
Output Current With Power Off	I_o	—	0.1	100	μA	$V_{cc} = 0 \text{ V}, V_o = 6 \text{ V}$
		—	-0.1	-100		$V_{cc} = 0 \text{ V}, V_o = -0.25 \text{ V}$
		—	—	± 100		$V_{cc} = 0 \text{ V}, V_o = -0.25 \text{ V to } 6 \text{ V}$
Off State (High Impedance State) Output Current	I_{oz}	—	—	± 10	μA	$V_{cc} = 5.25 \text{ V}$ Output Control 0.8 V $T_a = 25^\circ\text{C}, V_o = 0 \text{ to } V_{cc}$
		—	—	-20		$V_{cc} = 5.25 \text{ V}$ Output Control 0.8 V, Input $T_a = 70^\circ\text{C}, V_o = 0 \text{ V}$
		—	—	± 20		$V_{cc} = 5.25 \text{ V}$ Output Control 0.8 V, Input $T_a = 70^\circ\text{C}, V_o = 0.4 \text{ V}$
		—	—	± 20		$V_{cc} = 5.25 \text{ V}$ Output Control 0.8 V, Input $T_a = 70^\circ\text{C}, V_o = 2.4 \text{ V}$
		—	—	20		$V_{cc} = 5.25 \text{ V}$ Output Control 0.8 V, Input $T_a = 70^\circ\text{C}, V_o = V_{cc}$
Input Current	I_i	—	—	1	mA	$V_{cc} = 5.25 \text{ V}, V_i = 5.5 \text{ V}$
	I_{iH}	—	—	40	μA	$V_{cc} = 5.25 \text{ V}, V_i = 2.4 \text{ V}$
	I_{iL}	—	-1	-1.6	mA	$V_{cc} = 5.25 \text{ V}, V_i = 0.4 \text{ V}$
Short Circuit Output Current*3,4	I_{os}	-40	-90	-150	mA	$V_{cc} = 5.25 \text{ V}$
Supply Current	I_{cc}	—	47	65	mA	$V_{cc} = 5.25 \text{ V}$ No Load, Inputs Grounded $T_a = 25^\circ\text{C}$

Notes: 1. All typical values are at $V_{cc} = 5 \text{ V}, T_a = 25^\circ\text{C}$.

- $\Delta |V_{od}|$ and $\Delta |V_{oc}|$ are the changes in magnitudes of V_{od} and V_{oc} , respectively, that occur when the input is changed from a high level to a low level.
- In EIA standard RS-422A, V_{oc} , which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{os} .
- Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.



Note: 1. Differential and common mode output voltages.

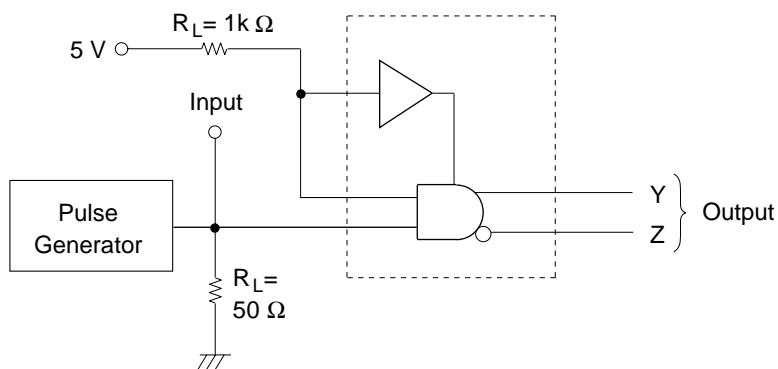
Switching Characteristics ($V_{CC} = 5.0 \text{ V}$, $T_a = 25^\circ\text{C}$)

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

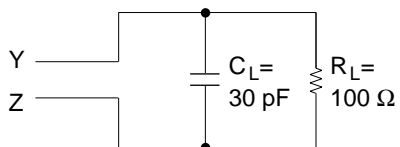
Switching Time Test Method

Test Circuit

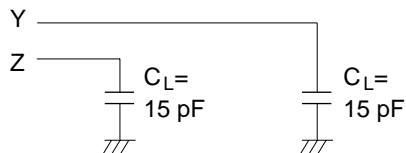
1. t_{PLH} , t_{PHL} , t_{TLB} , t_{THL} , and overshoot factor



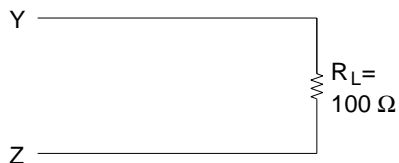
Termination A

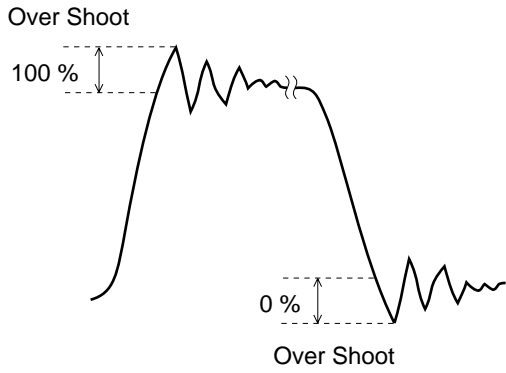
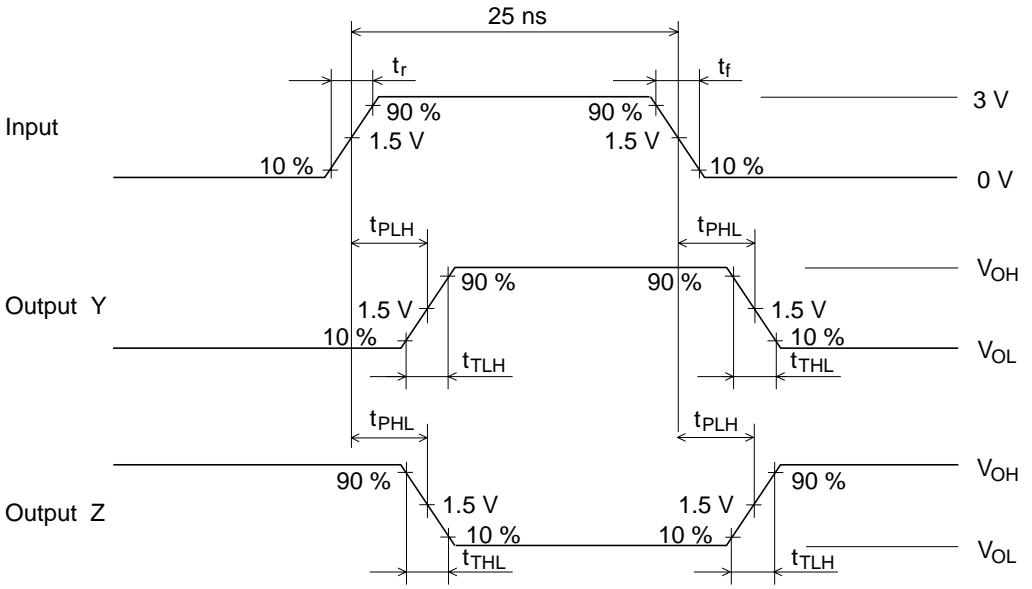


Termination B

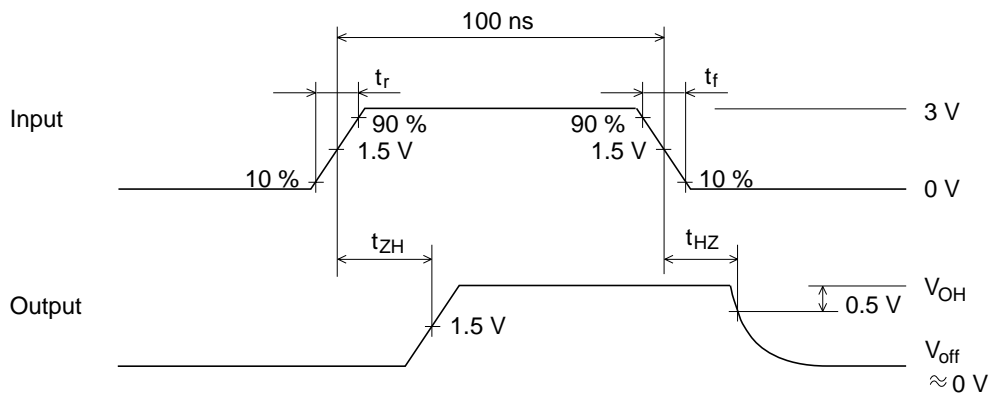
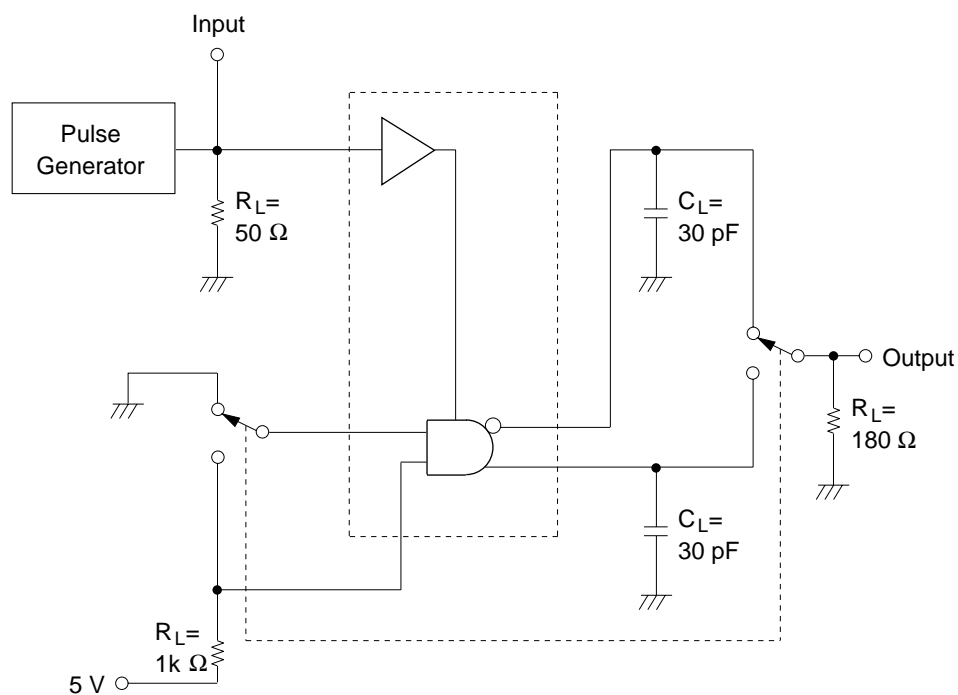


Termination C

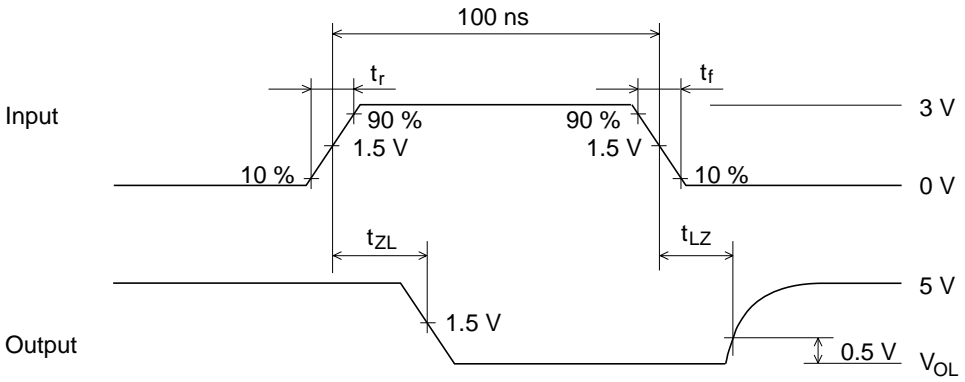
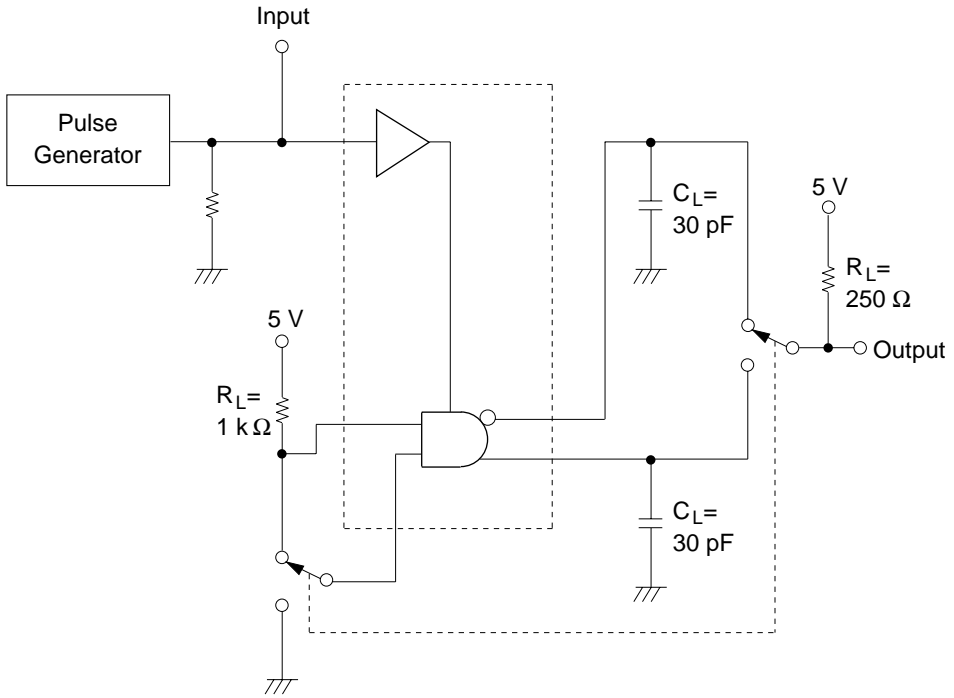




2. t_{ZH} , t_{HZ}



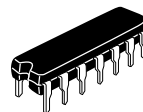
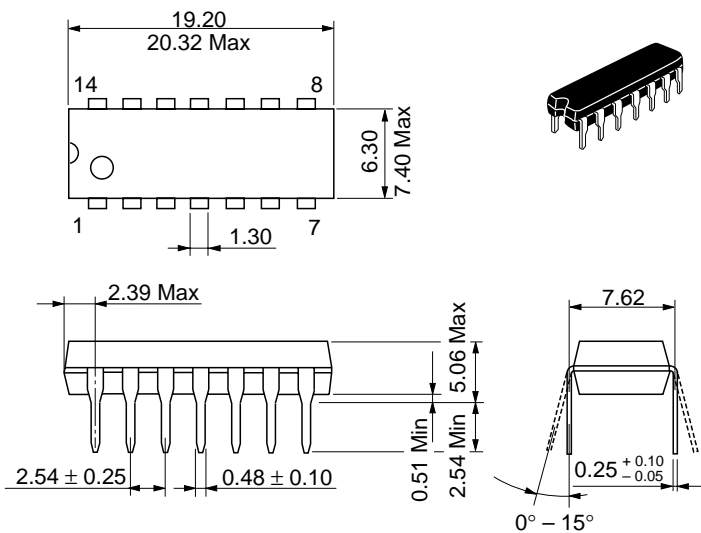
3. t_{zL} , t_{zZ}



- Notes:
1. The pulse generator has the following characteristics:
 $Z_{out} = 50 \Omega$, PRR = 500 kHz
 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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