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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD75153

Quadruple Differential Line Drivers With 3 State Outputs

ADE-205-588 (Z)
1st. Edition
Dec. 2000

Description

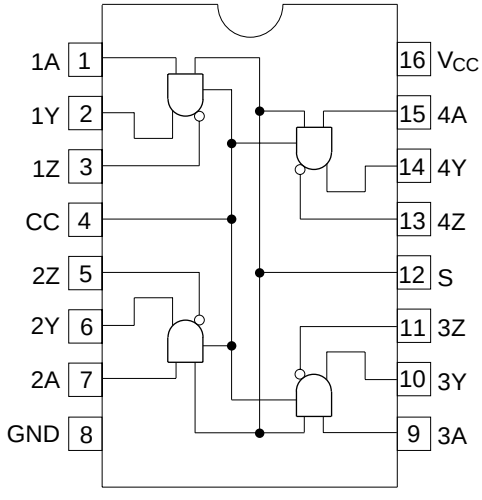
HD75153 features line drivers which satisfy the requirements of EIA RS 422 A and Federal Standard 1020. This device is designed to provide differential signals with high current capability on bus lines. The circuit provides strobe and enable inputs to control all four drivers. The output circuit has active pull up and pull down and is capable of sinking or sourcing 40 mA.

Function Table

Input			Output	
Enable CC	**Strobe S**	**Data A**	**Y**	**Z**
L	X	X	Z	Z
H	L	X	L	H
H	X	L	L	H
H	H	H	H	L

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

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol		Rating	Unit
Supply Voltage	V_{CC}		7	V
Input Voltage	V_{IN}		5.5	V
Power Dissipation (Ta = 25°C)	P_T	DP	1000	mW
		FP	785	
Operating Temperature Range	Topr		0 to +70	°C
Storage Temperature Range	Tstg		–60 to +150	°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	500	5.25	V
Common Mode Output Voltage	Vout C	–0.25		6	V
Output Current	I_{OH}	—	—	–40	mA
Output Current	I_{OL}	—	—	40	mA
Operating Temperature	Topr	0	—	70	°C

Electrical Characteristics (Ta = 0 to 70°C)

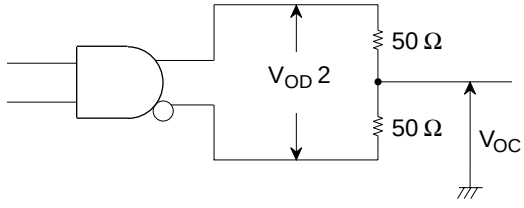
Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Input Voltage	V_{IH}	2	—	—	V	
	V_{IL}	—	—	0.8		
Input Clamp Voltage	V_{IK}	—	—	–2	V	V_{CC} = 4.75 V, I_I = –12 mA, CC, S
		–0.9	–1.5			V_{CC} = 4.75 V, I_I = –12 mA, All Others
Output Voltage	V_{OH}	2.5	—	—	V	V_{CC} = 4.75 V, V_{IL} = 0.8 V, V_{IH} = 2 V, I_{OH} = –20 mA
		2.4	—	—		V_{CC} = 4.75 V, V_{IL} = 0.8 V, V_{IH} = 2 V, I_{OH} = –40 mA
	V_{OL}	—	—	0.5		V_{CC} = 4.75 V, V_{IL} = 0.8 V, V_{IH} = 2 V, I_{OL} = 40 mA
Differential Output Voltage	V_{OD1}	—	3.4	2 V_{OD2}	V	V_{CC} = 5.25 V, I_O = 0
	V_{OD2}*[5]	2	2.8	—		V_{CC} = 4.75 V, R_L = 100 Ω
Change In Magnitude Of Differential Output Voltage	Δ $\|V_{OD}\|$*[2]	—	0.01	0.4	V	V_{CC} = 4.75 V, R_L = 100 Ω
Common Mode Output	V_{OC}*[3]	—	1.8	3	V	V_{CC} = 5.25 V, R_L = 100 Ω
Voltage		—	1.6	3		V_{CC} = 4.75 V, R_L = 100 Ω
Change In MagnitudeOf Common Mode Output Voltage	Δ $\|V_{OC}\|$*[2]	—	0.02	0.4	V	V_{CC} = 4.75 V or 5.25 V, R_L = 100 Ω
Off State (High Impedance State) Output Current	I_{OZ}	—	—	–20	μA	V_{CC} = 5.25 V, Enable = 0.8 V, V_O = 0.5 V
		—	—	20		V_{CC} = 5.25 V, Enable = 0.8 V, V_O = 2.5 V
		—	—	20		V_{CC} = 5.25 V, Enable = 0.8 V, V_O = V_{CC}
Output Current With Power	I_O	—	0.1	100	μA	V_{CC} = 0 V, V_O = 6 V
Off		—	–0.1	–100		V_{CC} = 0 V, V_O = –0.25 V
		—	—	±100		V_{CC} = 0 V, V_O = –0.25 V to 6 V

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

Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions	
Input Current	I_I	—	—	0.1	mA	V_{CC} = 5.25 V, V_I = 5.5 V	
	I_{IH}	—	—	20	µA	V_{CC} = 5.25 V, V_I = 2.4 V, A	
		—	—	80		V_{CC} = 5.25 V, V_I = 2.4 V, CC, S	
	I_{IL}	—	—	–0.36	mA	V_{CC} = 5.25 V, V_I = 0.4 V, A	
		—	—	–1.6		V_{CC} = 5.25 V, V_I = 0.4 V, CC, S	
Short Circuit Output Current	I_{OS}*[4]	–50	–90	–150	mA	V_{CC} = 5.25 V	
Supply Current	I_{CC}	30	—	60	mA	V_{CC} = 5.25 V	Outputs Disabled
		—	60	84		No Load	Outputs Enabled

Notes: 1. All typical values are at V_{CC} = 5 V, Ta = 25°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.

2. 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}.
3. Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.
4. Differential and common mode output voltages.



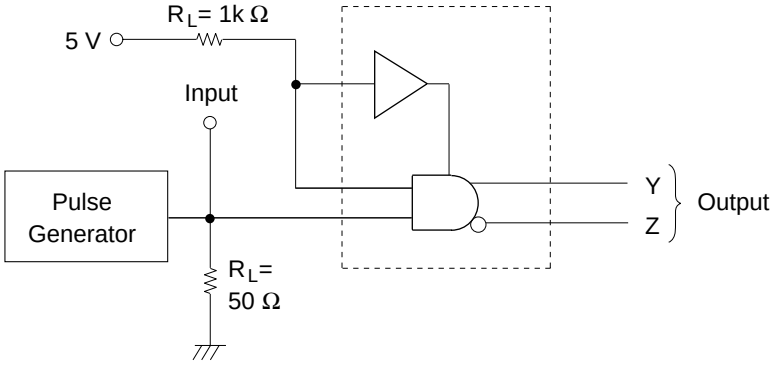
Switching Characteristics (V_{CC} = 5.0 V, Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}	—	15	30	ns	C_L = 30 pF, R_L = 100 Ω
	t_{PHL}	—	15	30		Termination A
	t_{PLH}	—	13	25		C_L = 30 pF Termination B
	t_{PHL}	—	13	25		
Transition Time	t_{TLH}	—	12	20	ns	C_L = 30 pF, R_L = 100 Ω
	t_{THL}	—	12	20		Termination A
Output Enable Time	t_{ZH}	—	18	35	ns	C_L = 30 pF, R_L = 60 Ω
	t_{ZL}	—	20	35		C_L = 30 pF, R_L = 111 Ω
Output Disable Time	t_{HZ}	—	19	30	ns	C_L = 30 pF, R_L = 60 Ω
	t_{LZ}	—	13	30		C_L = 30 pF, R_L = 111 Ω
Overshoot Factor		—	—	10	%	R_L = 100 Ω Termination C

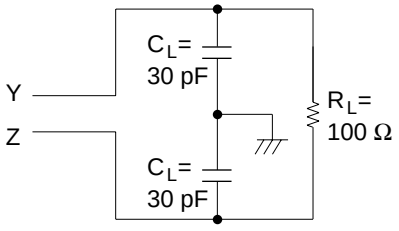
Switching Time Test Method

Test Circuit

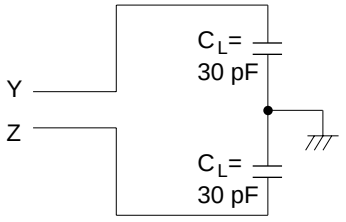
1. t_{PLH}, t_{PHL}, t_{TLH}, t_{THL}, and overshoot factor



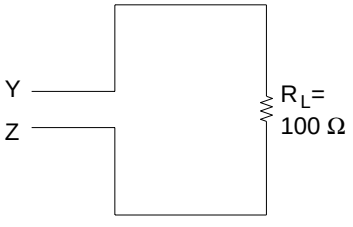
Termination A

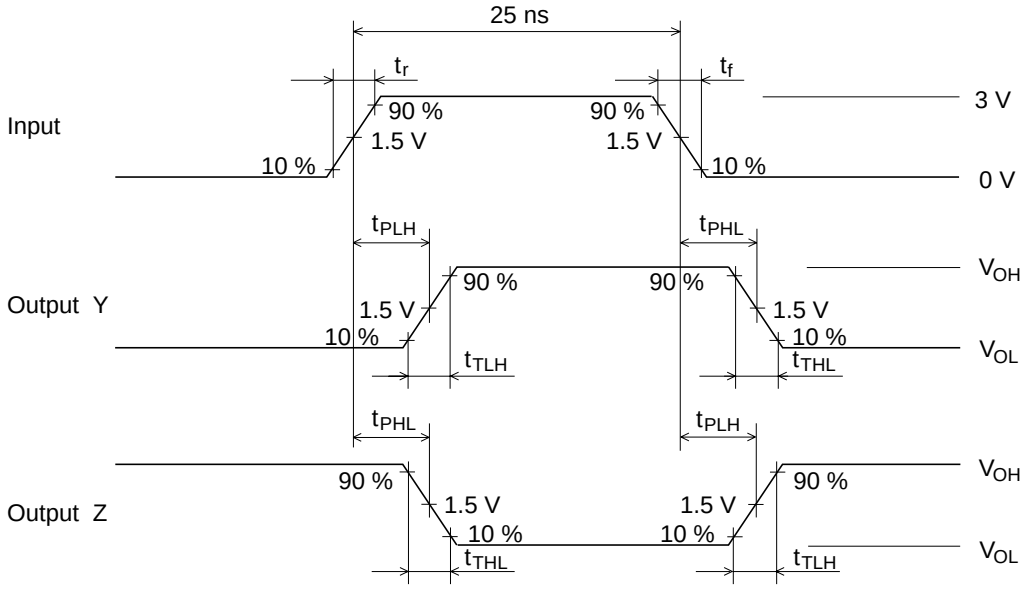


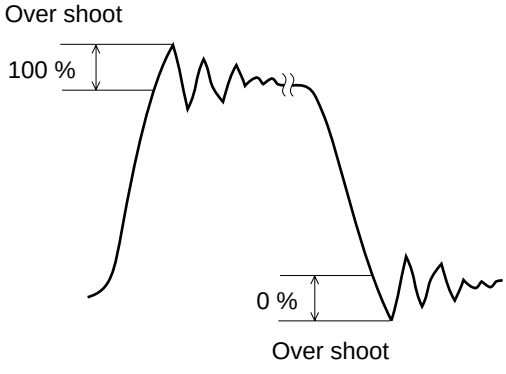
Termination B



Termination C



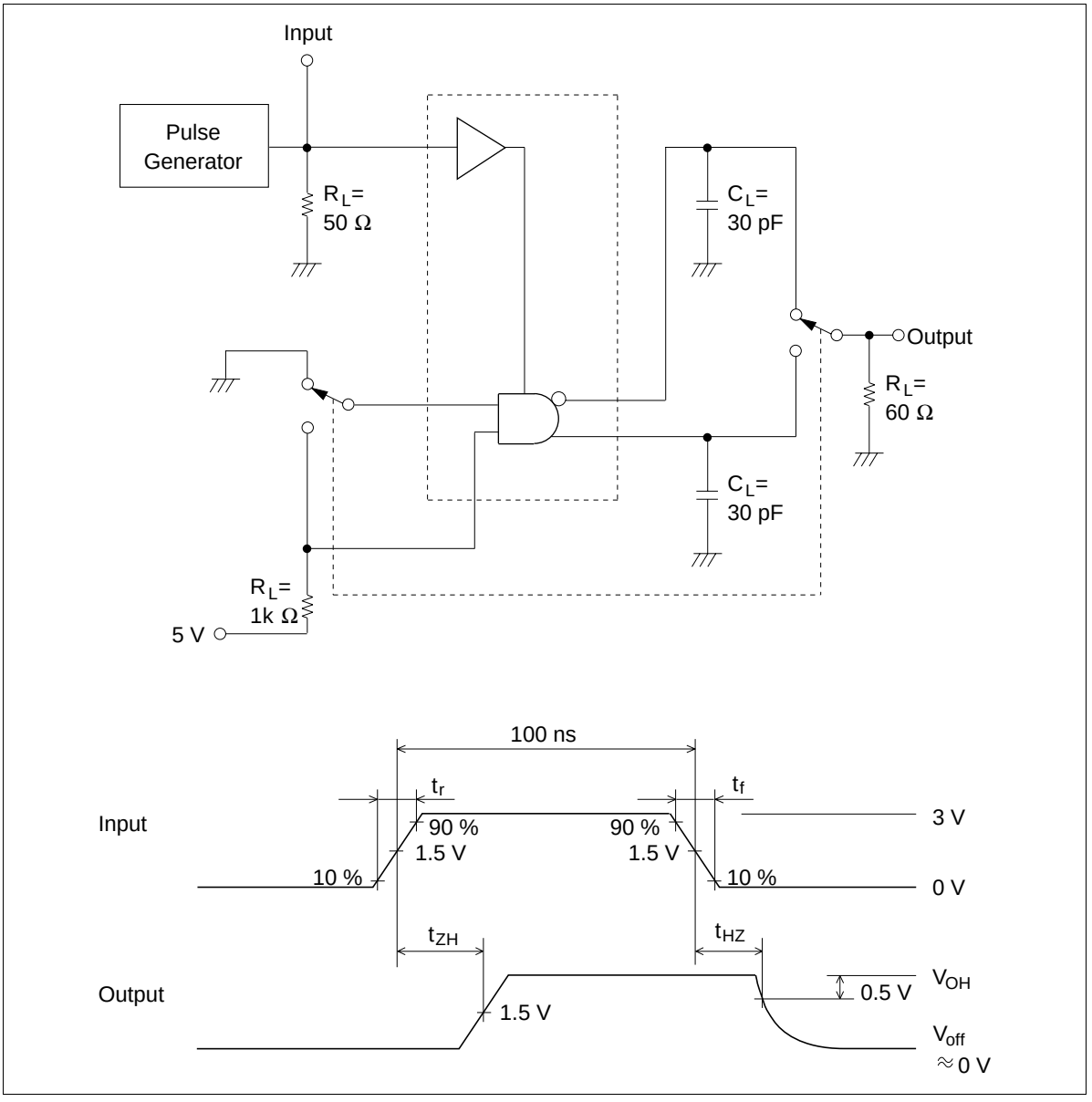




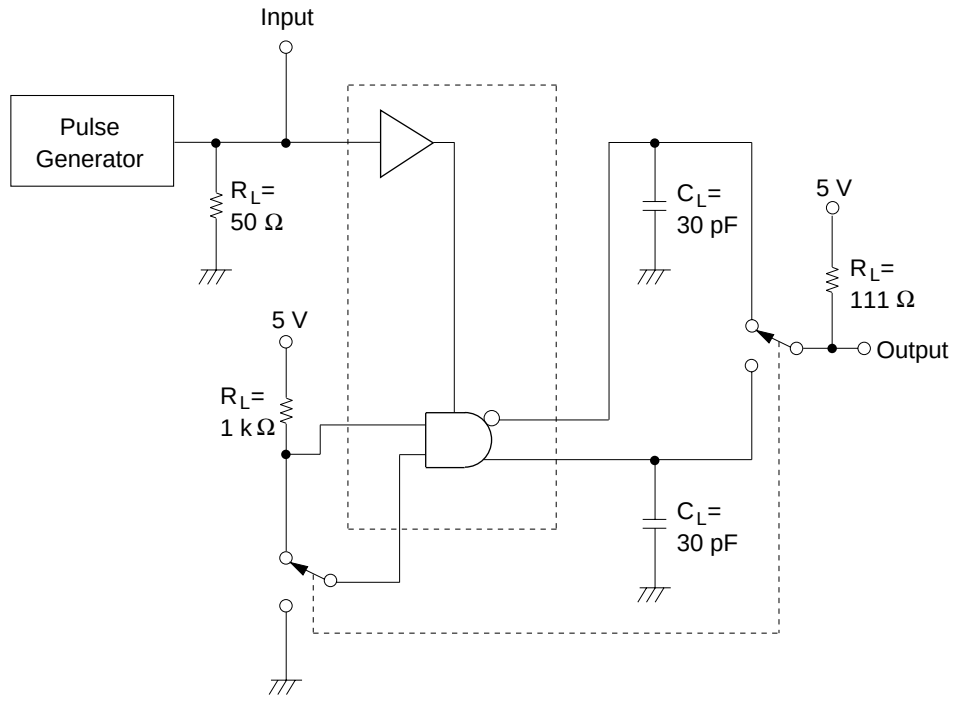
Notes: 1. The pulse generator has the following characteristics:
Zout = 50 Ω, PRR = 10 MHz

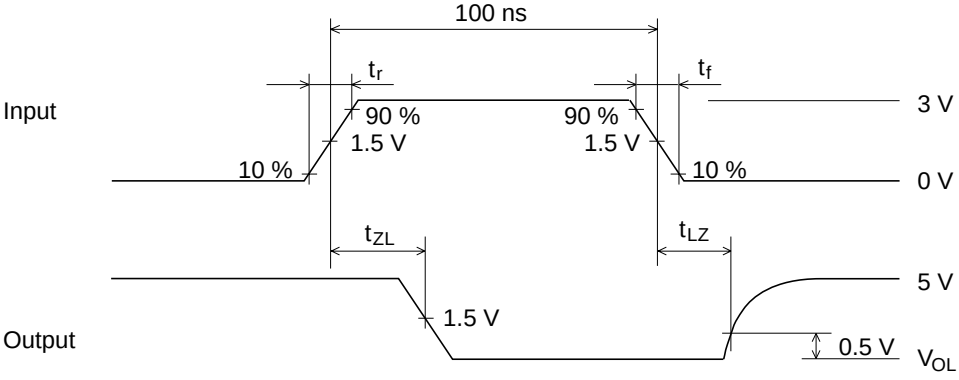
2. C_L includes probe and jig capacitance.

2. t_{ZH}, t_{HZ}


Input
Pulse Generator
RL= 50 Ω
CL= 30 pF
Output
RL= 60 Ω
CL= 30 pF
RL= 1k Ω
5 V
100 ns
tr
tf
Input
90 %
1.5 V
90 %
1.5 V
10 %
10 %
3 V
0 V
tZH
tHZ
Output
1.5 V
0.5 V
VOH
Voff
≈0 V

3. t_{ZL}, t_{LZ}

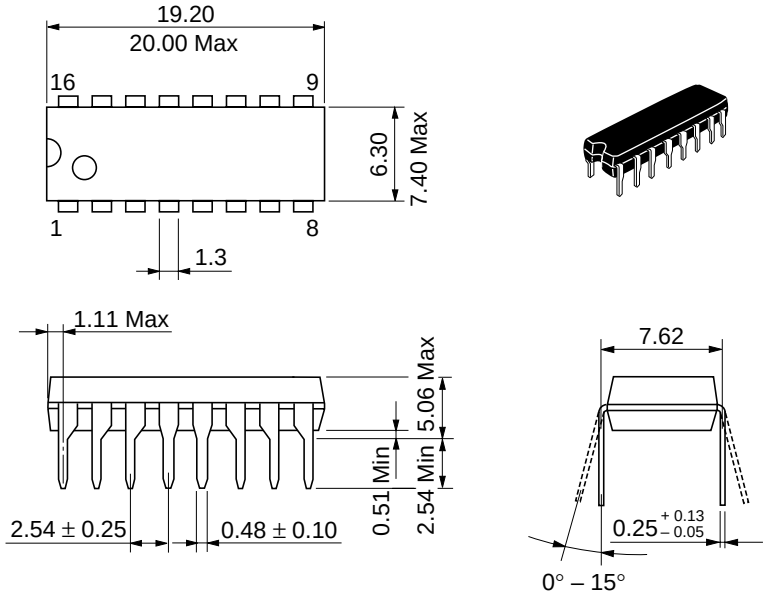




Notes: 1. The pulse generator has the following characteristics:
Zout = 50 Ω, PRR = 500 kHz
2. C_L includes probe and jig capacitance.

Package Dimensions

Unit: mm



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

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