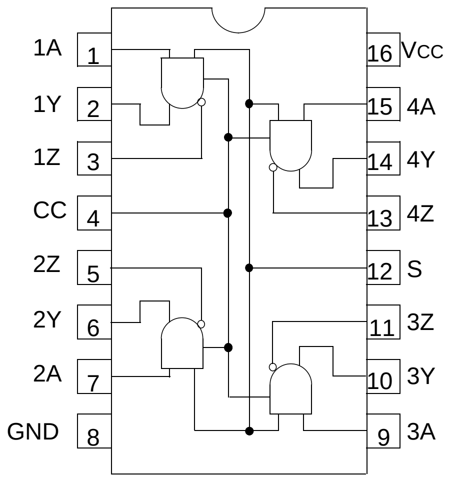
HD75153

Quadruple Differential Line Drivers With 3 State Outputs

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.

Pin Arrangement



(Top View)

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

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

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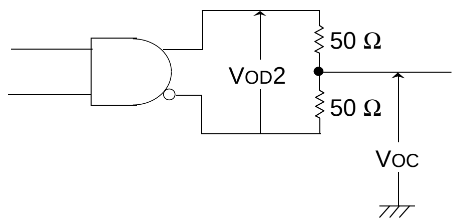
Item	Symbol	Conditions		Min	Typ [*1]	Max	Unit
Output Current With Power Off	I_O	V_{CC} = 0 V	V_O = 6 V	—	0.1	100	µA
			V_O = –0.25 V	—	–0.1	–100	
			V_O = –0.25 V to 6 V	—	—	±100	
Input Current	I_I	V_{CC} = 5.25 V, V_I = 5.5 V		—	—	0.1	mA
	I_{IH}	V_{CC} = 5.25 V, V_I = 2.4 V	A	—	—	20	µA
			CC, S	—	—	80	
	I_{IL}	V_{CC} = 5.25 V, V_I = 0.4 V	A	—	—	–0.36	mA
			CC,S	—	—	–1.6	
Short Circuit Output Current	I_{OS} [*4]	V_{CC} = 5.25 V		–50	–90	–150	mA
Supply Current	I_{CC}	V_{CC} = 5.25 V No Load	Outputs Disabled	—	30	60	mA
			Outputs Enabled	—	60	84	

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

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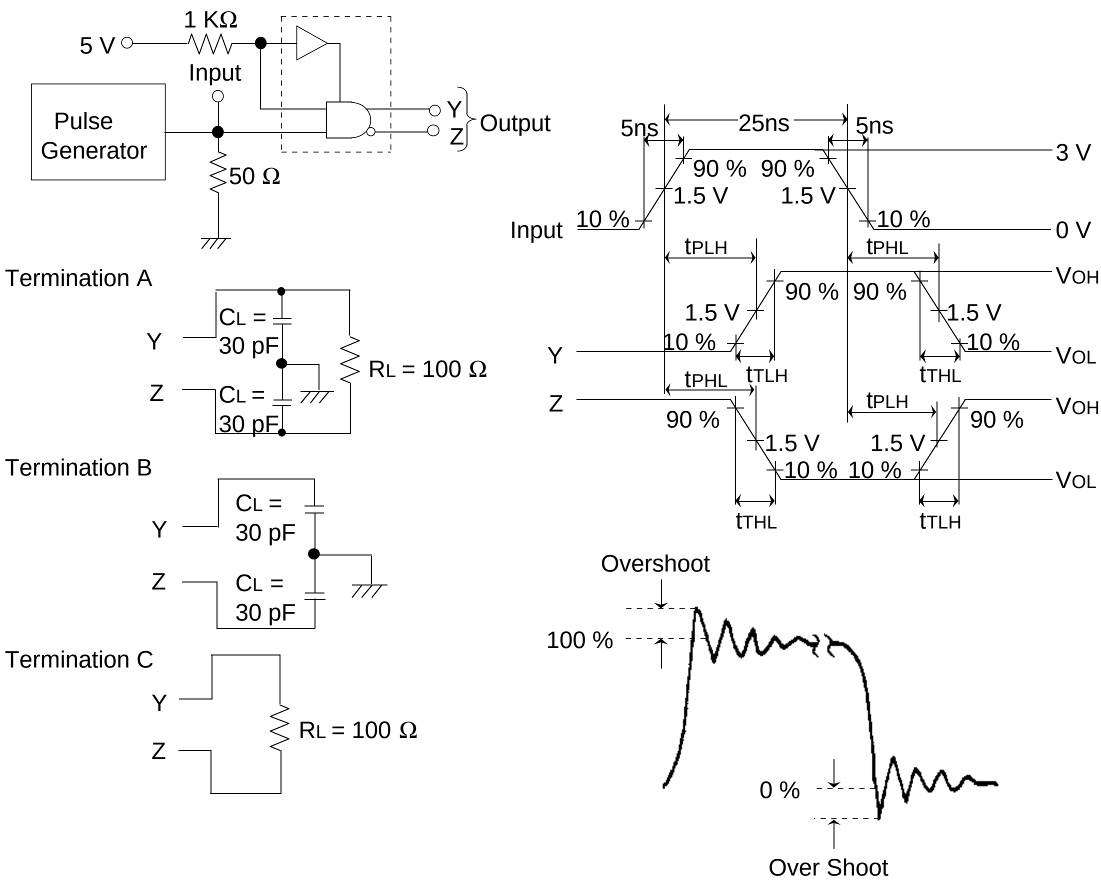
Switching Time Test Method

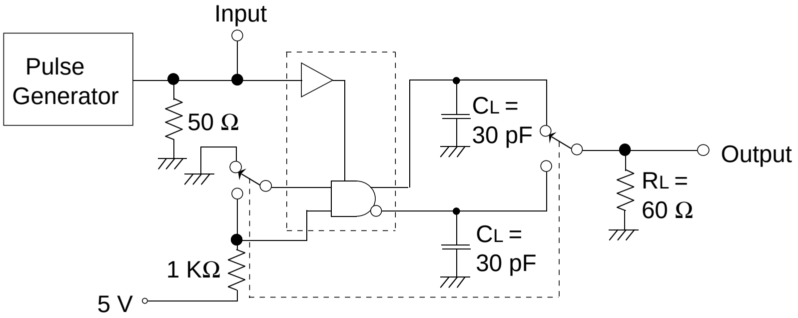
- **Test circuit**

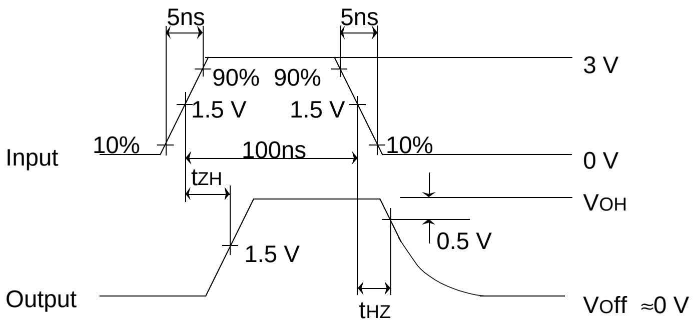
1. tPLH, tPHL, tTLH, tTHL, and overshoot factor



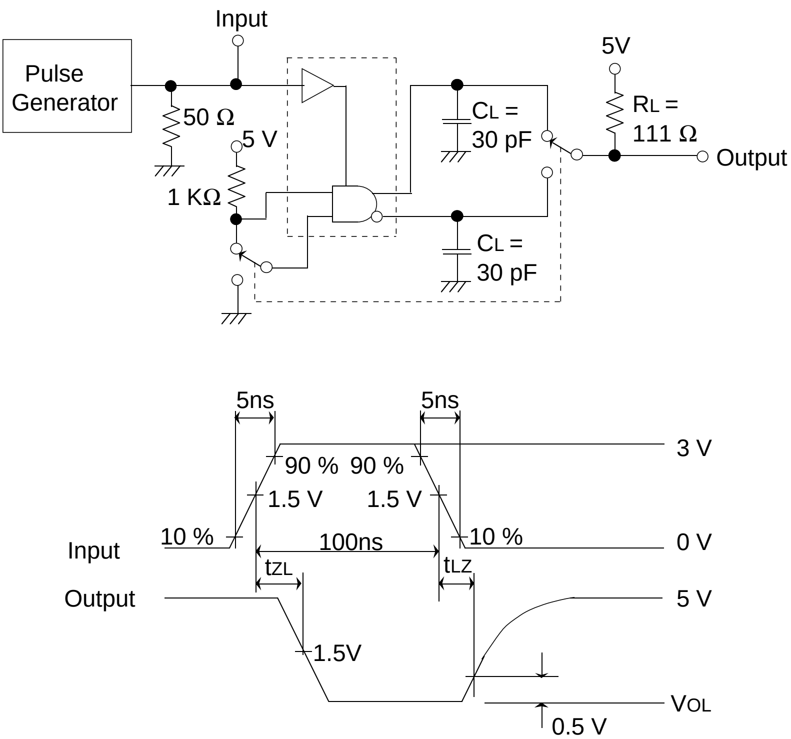
Notes: 1. The pulse generator has the following characteristics:
Zout = 50 Ω, PRR = 10 MHz
2. CL includes probe and jig capacitance.

2. t_{ZH}, t_{HZ}


Input
Pulse Generator
50 Ω
1 KΩ
5 V
CL = 30 pF
CL = 30 pF
Output
RL = 60 Ω


5ns
5ns
3 V
90%
90%
1.5 V
1.5 V
Input
10%
10%
100ns
0 V
tZH
VOH
0.5 V
1.5 V
Output
tHZ
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.