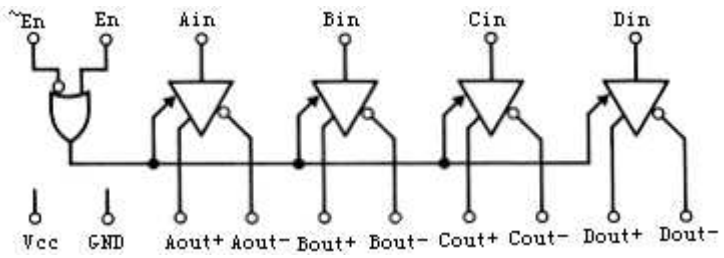
BL1501
CMOS 4-CH. 3-STATE Differential Line Driver

General Description

The BL1501 is a 4-channel differential line driver designed for digital data transmission over balanced lines. It is designed to meet all the requirements of EIA standard RS-422 while retaining the low power characteristics of CMOS. This enables the construction of serial and terminal interfaces while maintaining minimal power consumption. The BL1501 accepts TTL or CMOS input levels and translates these to RS-422 output levels. This device uses special output circuitry that enables the drivers to power down without loading down the bus. This device has enable and disable circuitry common to all four drivers. The BL1501 is pin compatible to the DS26C31(NS) and the AM26C31(TI) . All inputs are protected against damage due to electrostatic discharge by diodes to VCC and ground.

Function

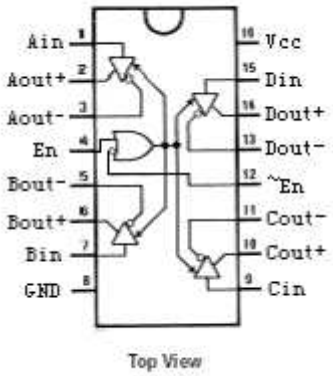
Block



Features

- TTL input compatible
- Typical propagation delays: 6 ns
- Typical output skew: 0.5 ns
- Outputs will not load line when VCC = 0V
- BL1501 meets the requirements of EIA standard RS-422
- Operation from single 5V supply
- TRI-STATE outputs for connection to system buses
- Low quiescent current
- Available in surface mount

Connection Diagrams



Top View

Pin description

NO.	Name	Description
1, 7, 9, 15	Ain, Bin, Cin, Din	Non-balance Input
2, 6, 10, 14	Aout+, Bout+, Cout+, Dout+	Balance Positive Output
3, 5, 11, 13	Aout-, Bout-, Cout-, Dout-	Balance Negative Output
4	En	Positive Enable Input
12	～En	Negative Enable Input
16	Vcc	＋5V power Supply
8	GND	Gnd

Truth table:

En	～En	Input	Positive Output	Negative Output
L	H	X	Z	Z
All other combinations of enable inputs		L	L	H
		H	H	L

Absolute Maximum Ratings

Supply Voltage (VCC)	-0.5V to 7.0V
DC Input Voltage (VIN)	-1.5V to VCC +1.5V
DC Output Voltage (VOUT)	-0.5V to 7V
Clamp Diode Current (IIK, IOK)	±20 mA
DC Output Current, per pin (IOUT)	±150 mA
DC VCC or GND Current, per pin (ICC)	±150 mA
Storage Temperature Range (TSTG)	-65° C to +150° C

This device exceeds 2000V ESD Rating.

Operating Conditions

	Min	Max	Units
Supply Voltage (VCC)	4.50	5.50	V
DC Input or Output Voltage(VIN, VOUT)	0	VCC	V
Operating Temperature Range (TA)	-40	+85	° C
Input Rise or Fall Times (tr, tf)		500	ns

DC Electrical Characteristics

VCC = 5V ± 10% (unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IH}	High Level Input Voltage		2.0			V
V_{IL}	Low Level Input Voltage				0.8	V
V_{OH}	High Level	$V_{IN}=V_{IH}$ or V_{IL}	2.5	3.4		V

	Output Voltage	I_{OUT}=－20mA				
V_{OL}	Low Level Output Voltage	V_{IN}=V_{IH} or V_{IL} I_{OUT}=20mA		0.3	0.5	V
V_T	Differential Output Voltage	R_L=100Ω	2.0	3.1		V
$\lvert V_T \rvert - \lvert \overline{V_T} \rvert$	Difference In Differential Output	R_L=100Ω			0.4	V
V_{OS}	Common Mode Output Voltage	R_L=100Ω		1.8	3.0	V
$\lvert V_{OS} - \overline{V_{OS}} \rvert$	Difference In Common Mode Output	R_L=100Ω			0.4	V
I_{IN}	Input Current	V_{IN}=Vcc, GND, V_{IH} or V_{IL}			±1.0	uA
I_{CC}	Quiescent Supply Current	I_{OUT} = 0 uA	V_{IN}=Vcc or GND		200	500	uA
			V_{IN} = 2.4V or 0.5V (Note 1)		0.8	2.0	mA
I_{OZ}	TRI-STATE Output Leakage Current	V_{OUT}=Vcc or GND ENABLE=V_{IL} $\overline{\text{ENABLE}}$=V_{IH}			±0.5	±5.0	uA
I_{SC}	Output Short Circuit Current	V_{IN}=Vcc or GND (Note 2)		－30		－150	mA
I_{OFF}	Output Leakage Current Power Off	Vcc = 0 V	V_{OUT}=6 V			100	uA
			V_{OUT}= -0.25 V			－100	uA

Note 1: Measured per input. All other inputs at VCC or GND.
Note 2: Short one output each time.

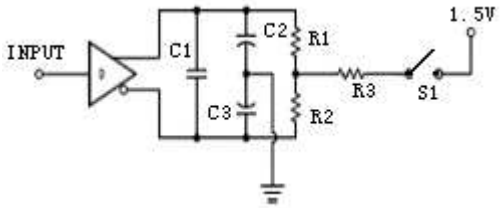
Switching Characteristics

VCC = 5V ±10%, tr = 6 ns, tf = 6 ns

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{PLH}, T_{PHL}	Propagation Delays Input to Output	S1 Open	2	6	11	ns
Skew	Skew is defined as the difference in propagation delays between complementary outputs at the 50% point.	S1 Open		0.5	2.0	ns
T_{TLH}, T_{THL}	Differential Output Rise And Fall Times	S1 Open		6	10	ns
T_{PZH}	Output Enable Time	S1 Close		11	19	ns
T_{PZL}	Output Enable Time	S1 Close		13	21	ns
T_{PHZ}	Output Disable Time	S1 Close		5	9	ns
T_{PLZ}	Output Disable Time	S1 Close		7	11	ns
C_{PD}	Power Dissipation Capacitance			50		pF

CIN	Input Capacitance			6		pF

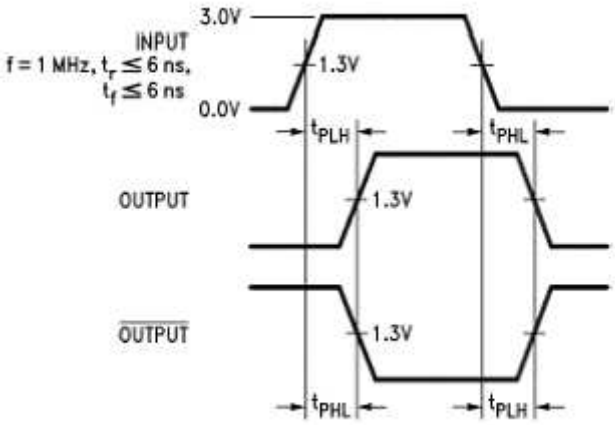
AC Test Circuit:



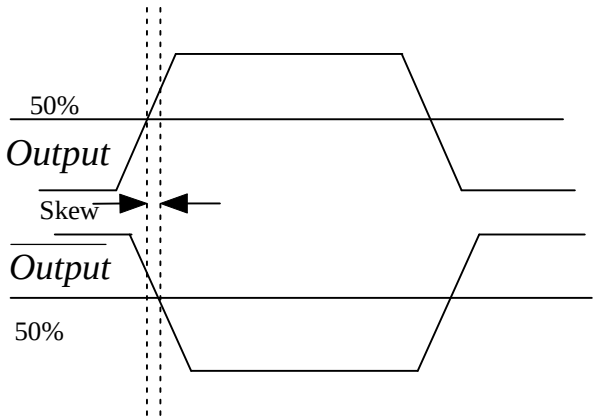
AC Test Circuit

Note: C1 = C2 = C3 = 40 pF (Including Probe and Jig Capacitance), R1 = R2 = 50 Ω, R3 = 500Ω.

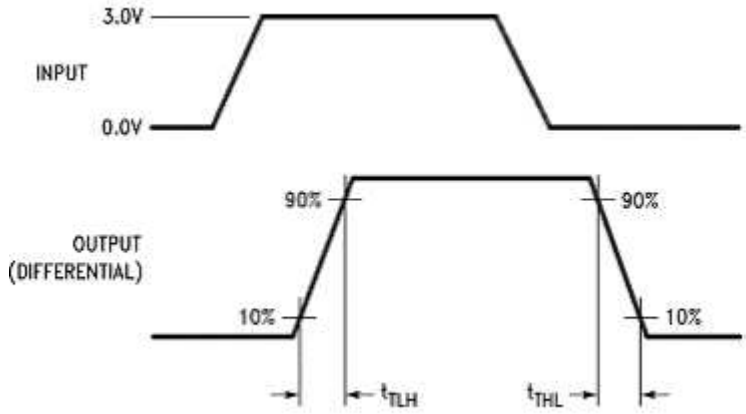
Wave Form



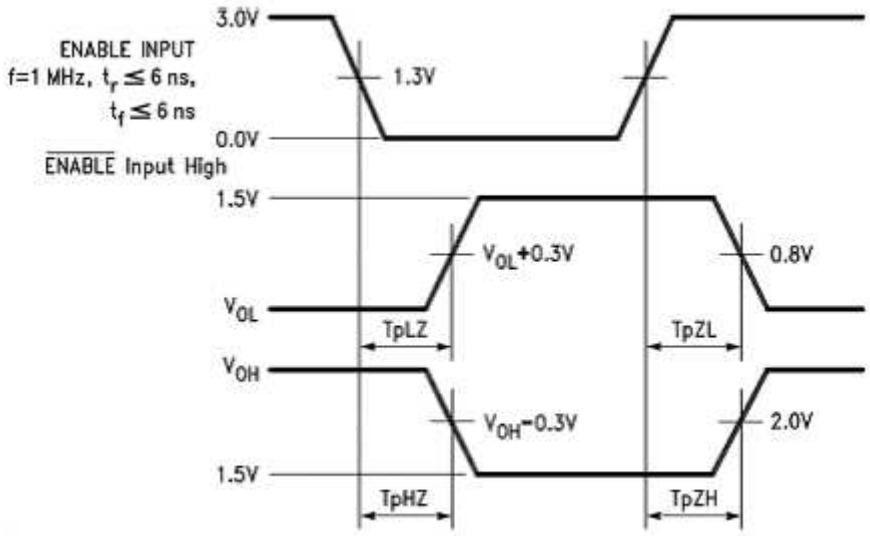
Propagation Delays



Skew

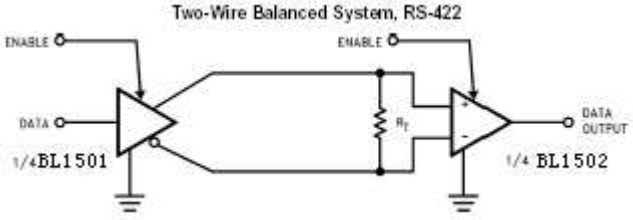


Differential Rise and Fall Times



Enable and Disable Times

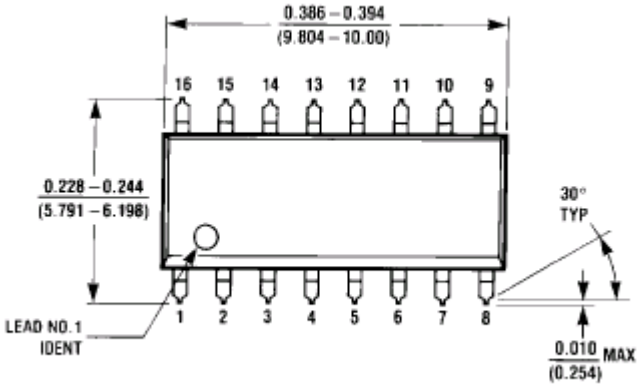
• Typical Applications:

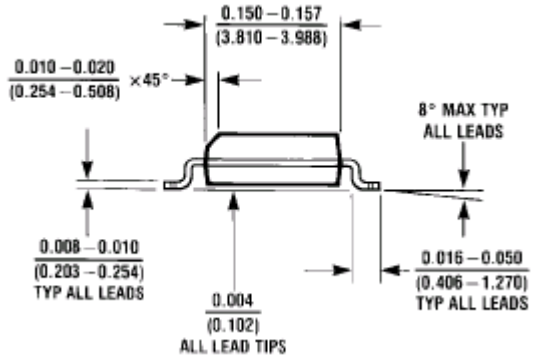


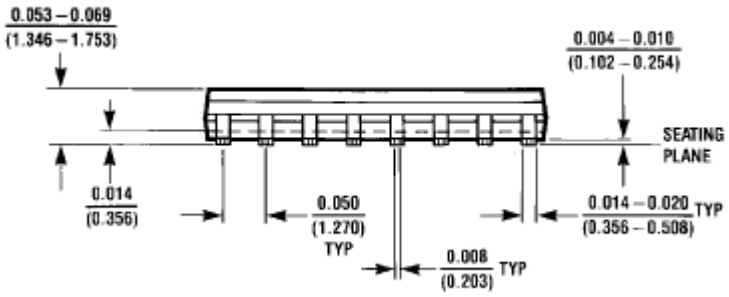
Rt=100 Ω (When the transmission line is short, Rt could be omitted.)

• Package dimension: inches (millimeters)

Narrow SOP Pin16 package


0.386 – 0.394
(9.804 – 10.00)
16 15 14 13 12 11 10 9
0.228 – 0.244
(5.791 – 6.198)
30°
TYP
LEAD NO.1
IDENT
1 2 3 4 5 6 7 8
0.010 MAX
(0.254)


0.150 – 0.157
(3.810 – 3.988)
0.010 – 0.020
(0.254 – 0.508)
×45°
8° MAX TYP
ALL LEADS
0.008 – 0.010
(0.203 – 0.254)
TYP ALL LEADS
0.004
(0.102)
ALL LEAD TIPS
0.016 – 0.050
(0.406 – 1.270)
TYP ALL LEADS


0.053 – 0.069
(1.346 – 1.753)
0.004 – 0.010
(0.102 – 0.254)
SEATING
PLANE
0.014
(0.356)
0.050
(1.270)
TYP
0.014 – 0.020 TYP
(0.356 – 0.508)
0.008 TYP
(0.203)