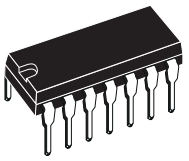
ST491A

Low power high speed RS-485/RS-422 transceiver

Features

- Low supply current: 5mA max
- Designed for RS485 interface applications
- -7V to 12V common mode input voltage range
- 70mV typical input hysteresis
- Designed for 25Mbps operation
- Operate from a single 5V supply
- ±4kV ESD protection
- Current limiting and thermal shutdown for driver overload protection



DIP-14

Description

The ST491A is a low power transceiver for RS-485 and RS-422 communications. The device contains one driver and one receiver in full duplex configuration. The ST491A draws 5mA (typ.) of supply current when unloaded and operates from a single 5V supply.

Driver is short-circuit current limited and is protected against excessive power dissipation by thermal shutdown circuitry that places the driver outputs into a high-impedance state. The receiver input has a fail-safe feature that guarantees a logic high output if both inputs are open circuit.

Order code

Part number	Temperature range	Package	Packaging
ST491ACN	0 to 70 °C	DIP-14	25parts per tube / 40tube per box

Contents

1 Pin configuration

Figure 1. Pin connections

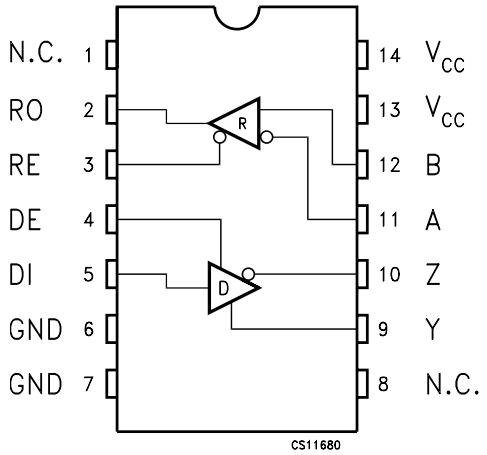


Table 1. Pin description

Pin n°	Symbol	Name and function
1	NC	Not connected
2	RO	Receiver output.
3	RE	Receiver output enable
4	DE	Driver output enable
5	DI	Inverting driver input
6	GND	Ground
7	GND	Ground
8	NC	Not connected
9	Y	Non-inverting driver output
10	Z	Inverting driver output
11	A	Inverting receiver input
12	B	Non-inverting receiver input
13	V_{CC}	Supply voltage
14	V_{CC}	Supply voltage

2 Truth tables

Table 2. Truth table (driver)

Inputs		Outputs	
DI	**DE**	**Y**	**Z**
L	H	L	H
H	H	H	L
X	L	Z	Z

Note: X = Don't care; Z = High impedance

Table 3. Truth table (receiver)

Inputs		Outputs
A-B	**RE**	**RO**
≥ -0.2V	L	H
between -0.2V to 0.2V	L	?
≤0.2V	L	L
OPEN	L	H
X	H	Z

Note: ?=Irrelevant; X = Don't care; Z = High impedance

3 Maximum ratings

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	7	V
V_{DI}	Driver input voltage	-0.5 to 7	V
V_Y, V_Z	Driver output voltage	-7.5 to 12.5	V
V_A, V_B	Receiver input voltage	-7.5 to 12.5	V
V_{RO}	Receiver output voltage	-0.3 to (V_{CC} + 0.3)	V
ESD	Human body model	3.5	KV

Note: Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

4 Electrical characteristics

Table 5. Electrical characteristics
(V_{CC} = 4.5V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A=25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{SUPPLY}	No load supply current		2	5	mA
C_{IN}	Input capacitance		1.8		pF
C_{YZ}	Driver output capacitance		1.2		pF
C_{OUT}	Output capacitance		2.3		pF

Table 6. Transmitter electrical characteristics
(V_{CC} = 4.5V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A=25°C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{OD1}	Differential drive output (no load)				V_{CC}	V
V_{OD2}	Differential drive output (with load)	R_L= 54Ω (RS-422) (*Figure 1.*)	1.5	2.6	5	V
V_{OD3}	Differential drive output (with load)	R_L= 100Ω (RS-422) (*Figure 1.*)	2	3		V
ΔV_{OD}	Change in magnitude of driver differential output voltage for complementary output states	R_L= 54Ω or 100Ω (*Figure 1.*)		0	0.2	V
V_{OC}	Driver common mode output voltage	R_L= 54Ω (*Figure 1.*)	1		3	V
ΔV_{OC}	Change in magnitude of driver common mode output voltage	R_L= 54Ω (*Figure 1.*)		0	0.2	V
I_{OFF}	Power off output current	V_{CC} = 0V, V_O=-7V to 12V			±100	µA
I_{OSD}	Driver short circuit output current	V_O=-7V to 12V	±35		±250	mA
V_{IL}	Input logic threshold low				0.8	V
V_{IH}	Input logic threshold high		2			V

Table 7. Receiver electrical characteristics

(V_{CC} = 4.5V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A=25°C)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_{IN}	Input current (A, B)	Other input = 0V V_{CC} = 0 or 5.25V	V_{IN}=12V		0.5	1	mA
			V_{IN}=-7V		-0.35	-0.8	
V_{TH}	Receiver differential threshold voltage	V_{CM} = -7V to 12V		-0.2		0.2	V
ΔV_{TH}	Receiver input hysteresis	V_{CM} = 0V			70		mV
V_{OH}	Receiver output high voltage	I_{OUT} = -8mA, V_{ID} = 200mV		3.5	4.7		V
V_{OL}	Receiver output low voltage	I_{OUT} = 8mA, V_{ID} = -200mV			0.3	0.5	V
R_{RIN}	Receiver input resistance	V_{CM} = -7V to 12V		12	24		KΩ

Table 8. Driver switching characteristics

(V_{CC} = 4.5V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A=25°C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
D_R	Maximum data rate	Jitter <5%	25	50		Mbps
t_{PLH} t_{PHL}	Propagation delay input to output	R_L= 54Ω, C_{L1}=C_{L2}=50pF, (*Figure 1.*)		10	16	ns
t_{SKEW}	Differential output delay skew	R_L= 54Ω, C_{L1}=C_{L2}=50pF, (*Figure 1.*)		1	3	ns
t_{TLH} t_{THL}	Rise or fall differential time	R_L= 54Ω, C_{L1}=C_{L2}=50pF, (*Figure 1.*)		8	12	ns
t_{PZL}	Output enable time	C_L= 50pF, S1 Closed		14	25	ns
t_{PZH}	Output enable time	C_L= 50pF, S2 Closed		14	25	ns
t_{PHZ}	Output disable time	C_L= 15pF, S2 Closed		10	25	ns
t_{PLZ}	Output disable time	C_L= 15pF, S1 Closed		16	25	ns

Table 9. Receiver switching characteristics
(V_{CC} = 4.5V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A=25°C)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Propagation delay input to output	C_L = 15pF, (*Figure 2.*, *Figure 4.*)		19	30	ns
t_{SKD}	$\lvert t_{PLH} - t_{PHL} \rvert$ Receiver output skew	C_L = 15pF, (*Figure 2.*, *Figure 4.*)		1	3	ns
t_{TLH} t_{THL}	Rise or fall time	C_L = 15pF, (*Figure 2.*, *Figure 4.*)		6		ns
t_{PZL}	Output enable time	C_{RL}= 15pF, S1 Closed		6	12	ns
t_{PZH}	Output enable time	C_{RL}= 15pF, S2 Closed		7	12	ns
t_{PHZ}	Output disable time	C_{RL}= 15pF, S2 Closed		6	12	ns
t_{PLZ}	Output disable time	C_{RL}= 15pF, S1 Closed		6	12	ns

5 Test circuit and typical characteristics

Figure 2. Driver DC test load

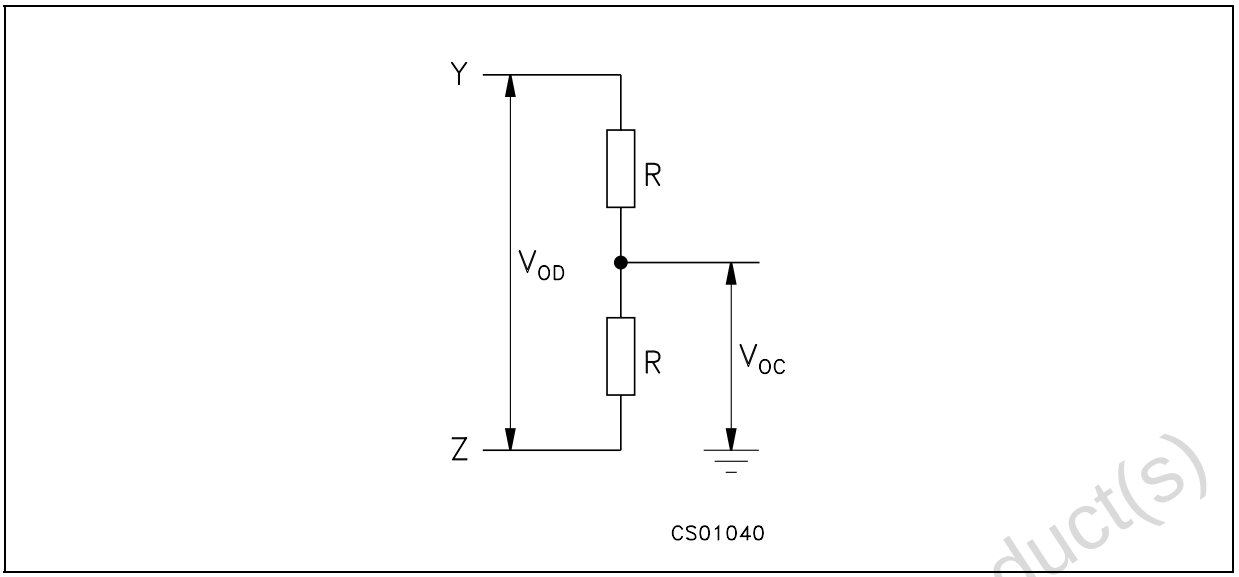


Figure 3. Receiver timing test load

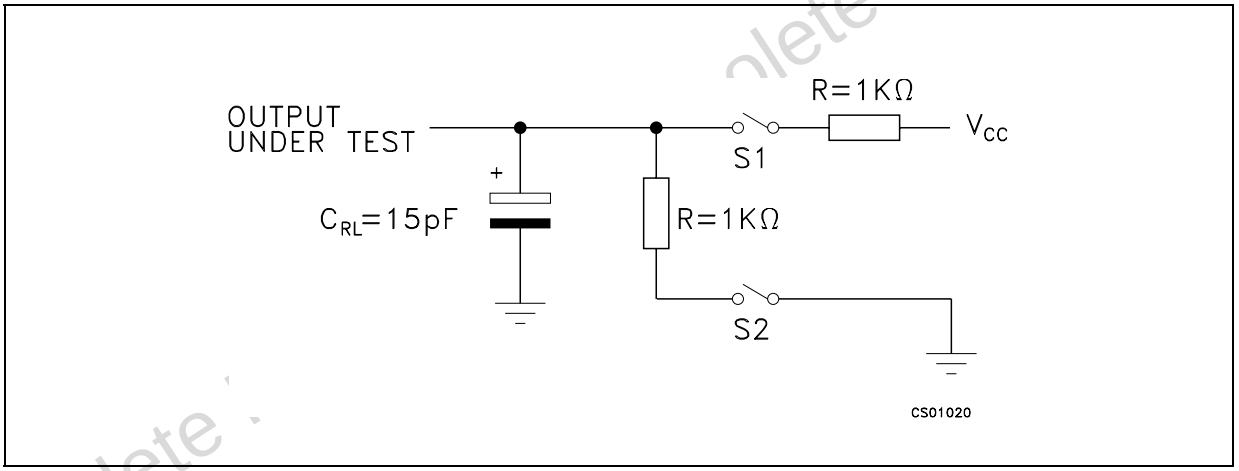


Figure 4. Driver/receiver timing test circuit

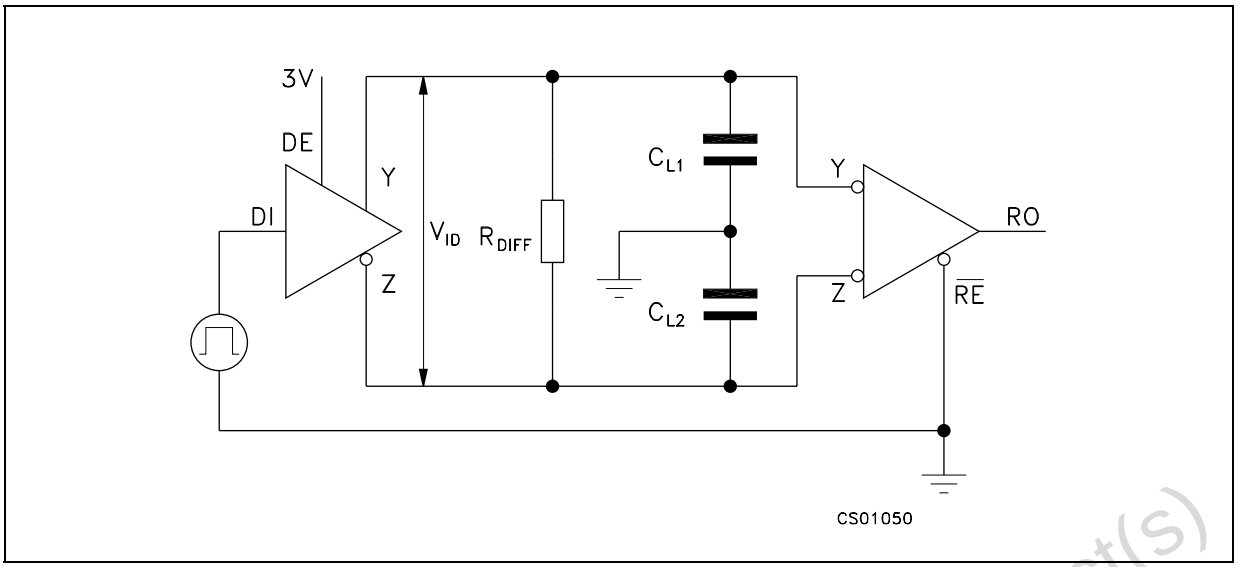


Figure 5. Driver timing test load

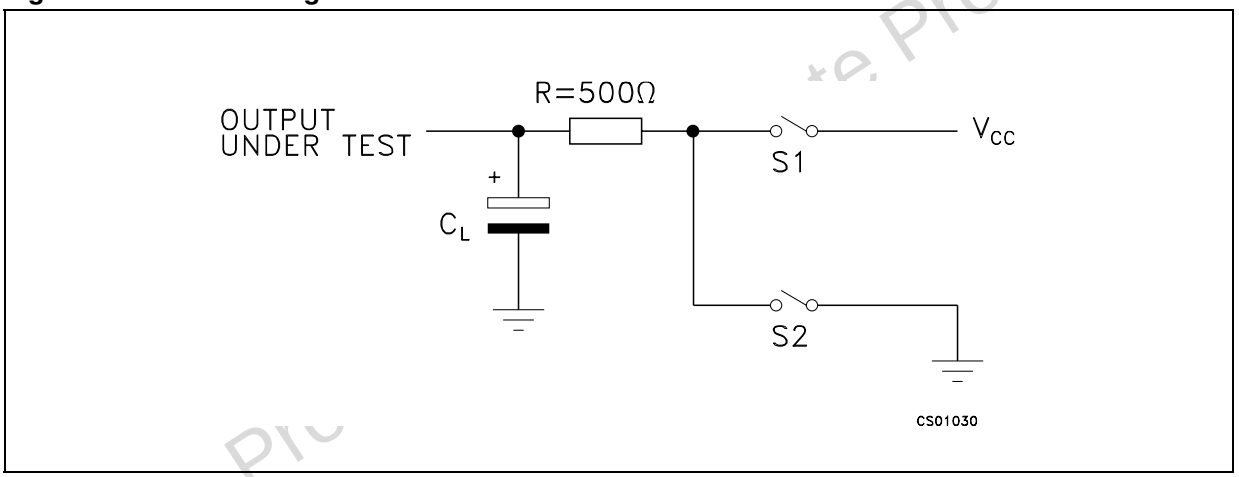


Figure 6. Driver propagation delay

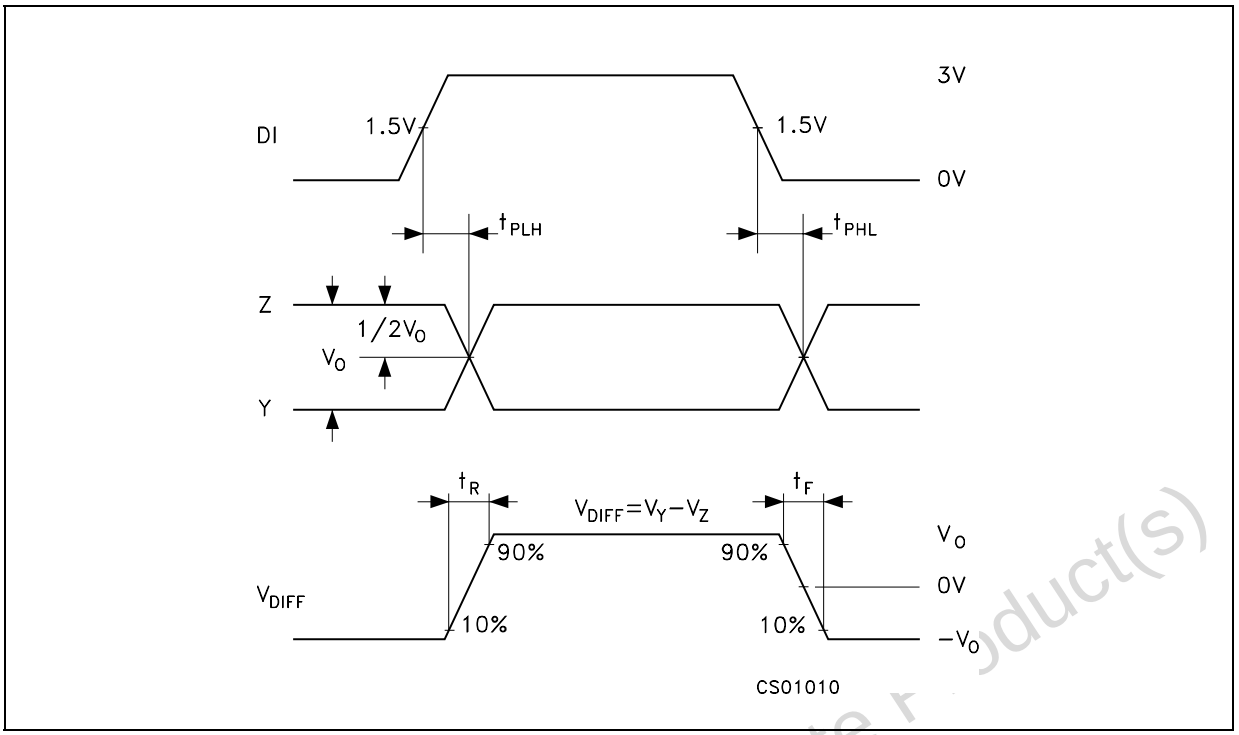


Figure 7. Receiver propagation delay

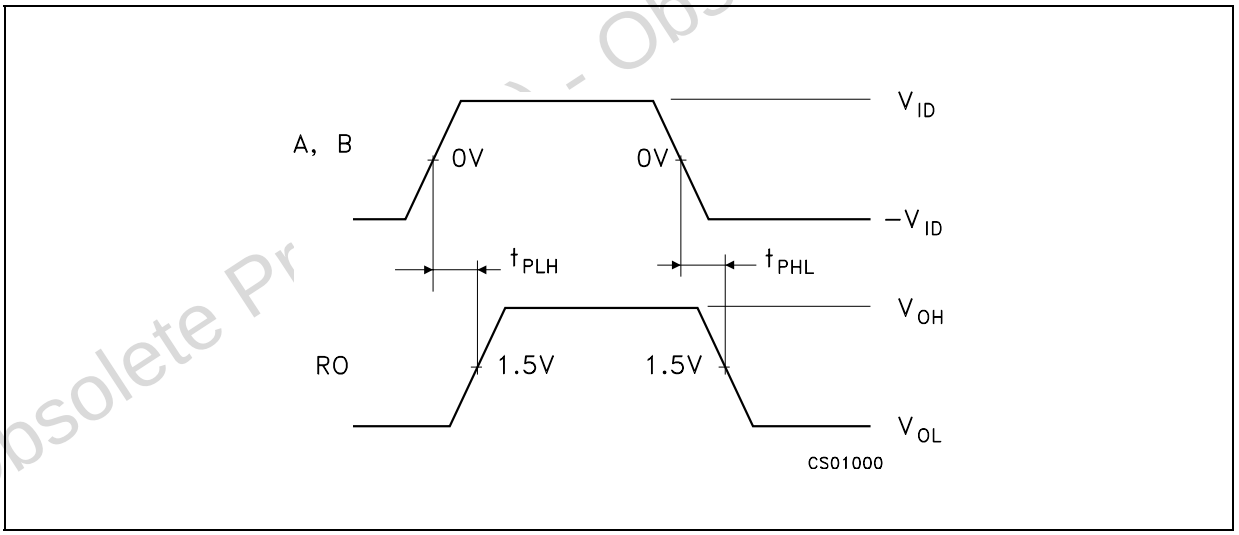


Figure 8. Receiver output current vs. output low voltage (output low)

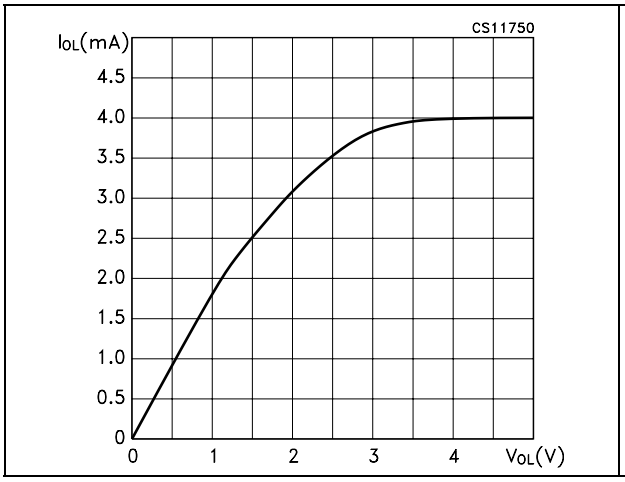


Figure 9. Receiver output current vs. output high voltage (output high)

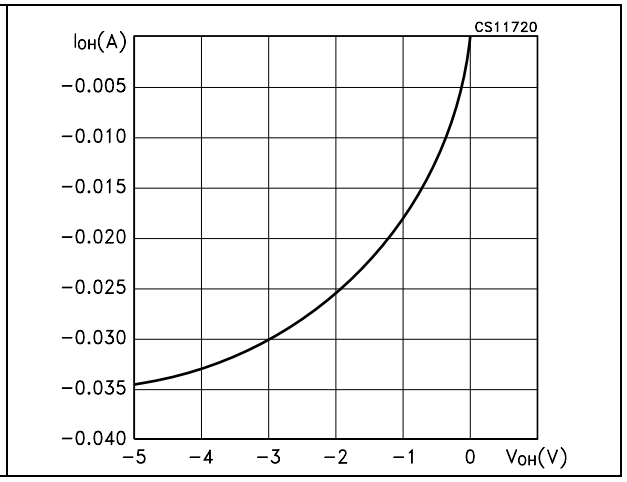


Figure 10. Driver diff. output voltage vs common mode voltage (diff. output low)

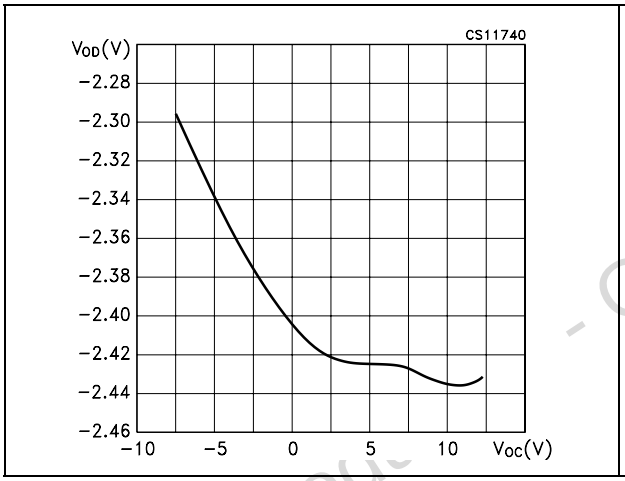


Figure 11. Driver diff. output voltage vs common mode voltage (diff. output high)

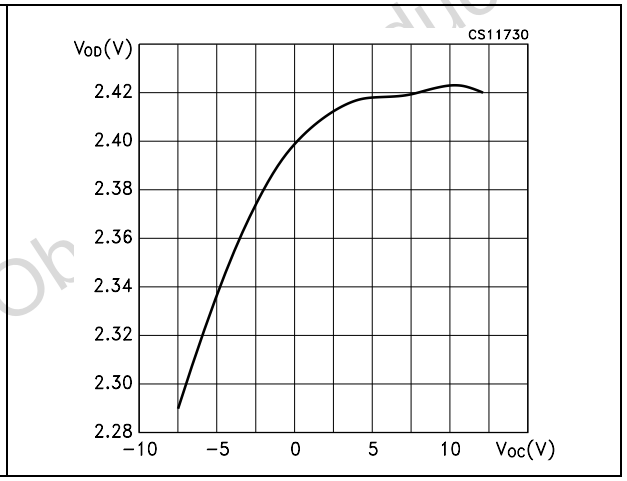


Figure 12. Driver short circuit current vs line voltage (output high)

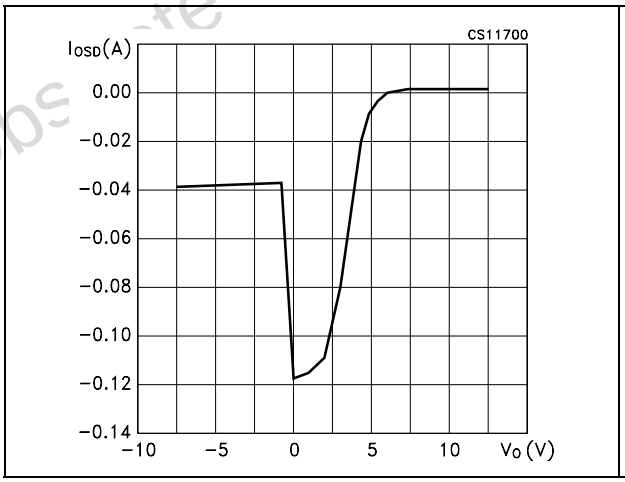


Figure 13. Receiver high level output voltage vs. temperature

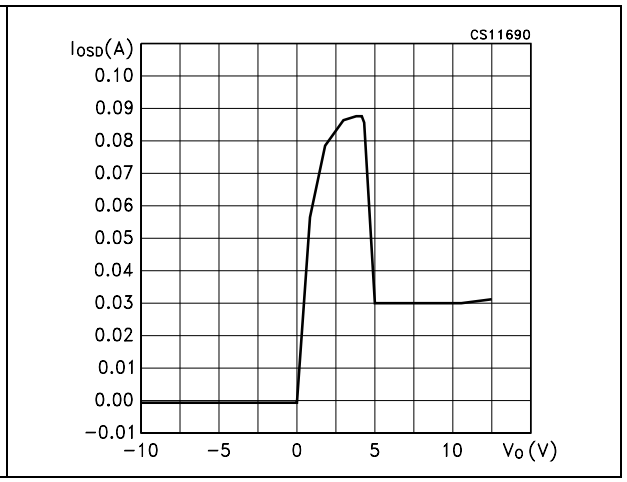
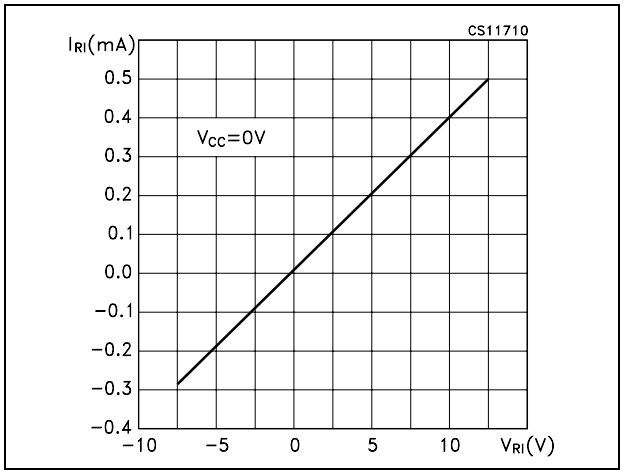


Figure 14. Receiver input current vs input voltage

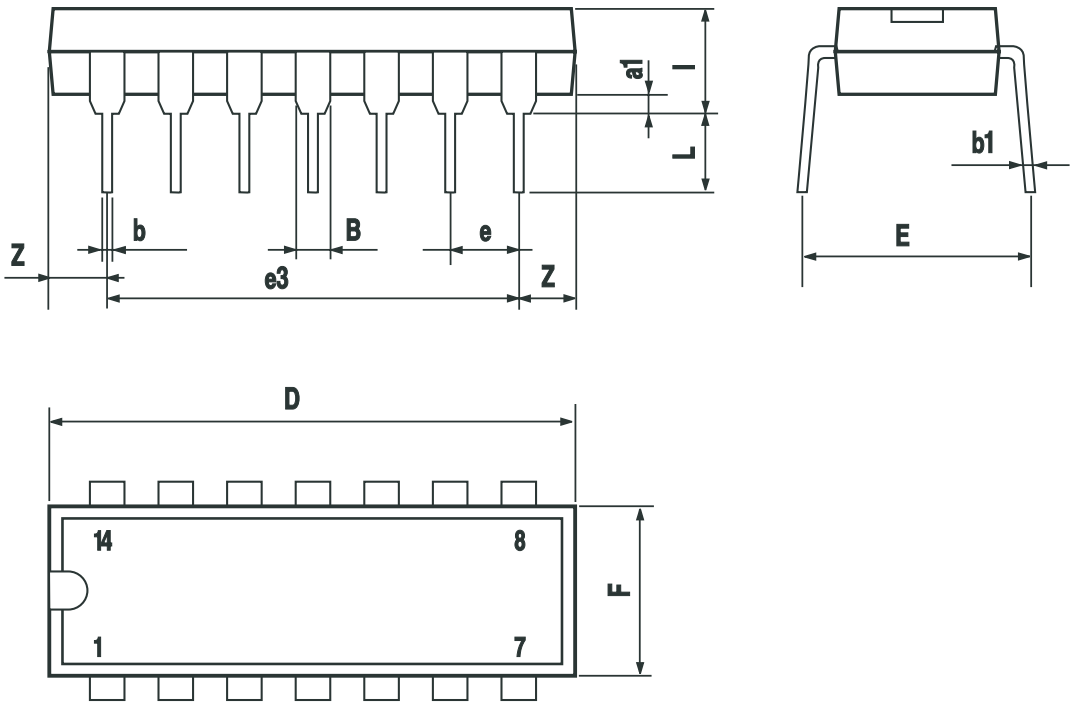


6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

Plastic DIP-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

7 Revision history

Table 10. Revision history

Date	Revision	Changes
10-May-2005	3	Mistake on Figure 1.
04-Jul-2005	4	Mistake on Figure 1 and Table 1 (Pin 13).
28-Apr-2006	5	Order codes has been updated and new template.
28-May-2007	6	Order codes has been updated.

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