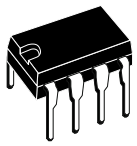
ST485A

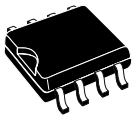
Very high speed low power RS-485/RS-422 transceiver

General features

- Low supply current: 5mA max
- High data rate > 30Mbps
- Designed for RS 485 interface applications
- -7 to 12 common mode input voltage range
- Driver maintains high impedance in 3-state or with the power off
- 70mV typical input hysteresis
- Operate from single 5 supply
- ±4kV ESD protection
- Current limiting and thermal shutdown for driver overload protection
- Latch-up free up to 500mA



DIP-8



SO-8

Driver is short-circuit current limited and is protected against excessive power dissipation by thermal shutdown circuitry that place 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.

The ST485A is designed for bi-directional data communications or multipoint bus transmission lines.

Description

The ST485A is a low power, high speed transceiver for RS-485 and RS-422 communications. The device contains one driver and one receiver in half duplex configuration. The ST485A draws 3mA (typ.) of supply current when unloaded or fully loaded with disabled drivers. It operates from a single 5V supply.

Order code

Part number	Temperature range	Package	Comments
ST485ACN	0 to 70 °C	DIP-8	50parts per tube / 40tube per box
ST485ABN	-40 to 85 °C	DIP-8	50parts per tube / 40tube per box
ST485ACDR	0 to 70 °C	SO-8 (Tape & reel)	2500 parts per reel
ST485ABDR	-40 to 85 °C	SO-8 (Tape & reel)	2500 parts per ree

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2 Truth tables 4

3 Maximum ratings 5

4 Electrical characteristics 6

4.1 Logic input 6

4.2 Transmitter 6

4.3 Receiver 7

4.4 Driver switching 7

4.5 Receiver switching 8

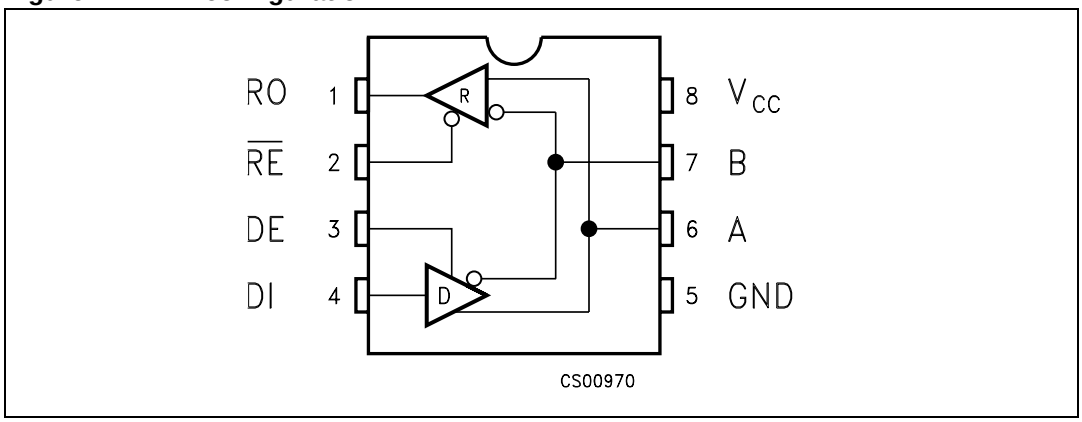
5 Test circuit and typical characteristics 9

6 Package mechanical data 14

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1 Pin configuration

Figure 1. Pin configuration



1.1 Pin description

Table 1. Pin description

Pin n°	Symbol	Name and function
1	RO	Receiver output. If A>B by 200mV, RO will be high; if A<B by 200mV, RO will be low
2	$\overline{RE}$	Receiver output enable. RO is enabled when RE is low; RO is high impedance when RE is high. If RE is high and DE is low, the device will enter a low power shutdown mode.
3	DE	Driver output enable. The driver outputs are enabled by bringing DE high. They are high impedance when DE is low. If RE is high DE is low, the device will enter a low-power shutdown mode. If the driver outputs are enabled, the part functions as line driver, while they are high impedance, it functions as line receivers if RE is low.
4	DI	Driver input. A low on DI forces output A low and output B high. Similarly, a high on DI forces output A high and output B low
5	GND	Ground
6	A	Non-inverting receiver input and non-inverting driver output
7	B	Inverting receiver input and inverting driver output
8	V_{CC}	Supply voltage: V_{CC}= 4.75V to 5.25V

2 Truth tables

Table 2. Truth table (driver)

Inputs			Outputs		Mode
$\overline{RE}$	DE	DI	B	A	A
X	H	H	L	H	Normal
X	H	L	H	L	Normal
L	L	X	Z	Z	Normal

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

Table 3. Truth table (receiver)

Inputs			Outputs	Mode
$\overline{RE}$	DE	A-B	RO	
L	L	≥ -0.2V	H	Normal
L	L	≤ -0.2V	L	Normal
L	L	INPUTS OPEN	H	Normal

Note: 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_I	Control input voltage ($\overline{RE}$, DE)	-0.3 to 7	V
V_{DI}	Driver input voltage (DI)	-0.3 to 7	V
V_{DO}	Driver output voltage (A, B)	-7.5 to 12.5	V
V_{RI}	Receiver input voltage (A, B)	-7.5 to 12.5	V
V_{RO}	Receiver output voltage (RO)	-0.3 to (V_{CC} + 0.3)	V

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

(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, V_{CC} = 5V) (*Note: 1*)

Table 5. DC Electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
I_{SUPPLY}	V_{CC} Power supply current	No load, V_{RE}=0V or V_{CC}	V_{DE} = V_{CC}		2.3	5	mA
			V_{DE} = 0V		2.6	5	mA
$C_{I/O}$	Input/output capacitance				10		pF
C_{AB}	Driver output capacity				10		pF

4.1 Logic input

(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, V_{CC} = 5V) (*Note: 1*)

Table 6. Logic input electrical characteristics

Symbol	Parameter	Test conditions		Min	Typ	Max	Unit
V_{IL}	Input logic threshold low	DE, DI, RE				0.8	V
V_{IH}	Input logic threshold high	DE, DI, RE		2			V
I_{IN1}	Logic input current	DE, DI, RE				± 2.0	µA
I_{IN2}	Input current (A, B)	V_{DE}=0V, V_{CC}= 0 or 5.25V	V_{IN}=12V			1	mA
			V_{IN}=-7V			-0.8	mA

4.2 Transmitter

(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, V_{CC} = 5V) (*Note: 1*)

Table 7. Transmitter electrical characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
V_{OD1}	Differential driver output (No load)				5	V
V_{OD2}	Differential driver output (with load)	R_L= 54Ω (RS-422) V_{CM}= -7V to 12V	1.5	2.7	5	V
ΔV_{OD}	Change in magnitude of driver differential output voltage for complementary output states (*Note: 1*)	R_L= 27Ω or 50Ω		0	0.2	V
V_{OC}	Driver common mode output voltage	R_L= 27Ω or 50Ω	1		3	V
ΔV_{OC}	Change in magnitude of driver common mode output voltage (*Note: 1*)	R_L= 54Ω or 100Ω		0	0.2	V
I_{OSD}	Driver short circuit output current	V_O= -7V to 12V			± 250	mA

4.3 Receiver

(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, V_{CC} = 5V) (*Note: 1*)

Table 8. Receiver electrical characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
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} = -4mA, V_{ID} = 200mV	3.5	4.7		V
V_{OL}	Receiver Output Low Voltage	I_{OUT} = 4mA, V_{ID} = -200mV		0.2	0.4	V
I_{OZR}	3-State (High Impedance) Output Current at Receiver	V_O = 0.4V to 2.4V			± 1	µA
R_{RIN}	Receiver Input Resistance	V_{CM} = -7V to 12V	12	24		KΩ
I_{OSR}	Receiver Short-Circuit Current	V_O = 0V to V_{CC}	7		95	mA

4.4 Driver switching

(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, V_{CC} = 5V) (See *Note: 1*, *3*)

Table 9. Driver switching characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
D_R	Maximum data rate	Jitter < 5%	30	50		Mbps
t_{PLH} t_{PHL}	Propagation delay input to output	R_L= 54Ω, C_{L1}=C_{L2}=50pF, (Figure 1)		18	30	ns
t_{SKEW}	Differential output delay skew	R_L= 54Ω, C_{L1}=C_{L2}=50pF, (Figure 1)		0.5	2	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			30	ns
t_{PZH}	Output enable time	C_L= 50pF, S2 Closed			30	ns
t_{PHZ}	Output disable time	C_L= 15pF, S2 Closed			30	ns
t_{PLZ}	Output disable time	C_L= 15pF, S1 Closed			30	ns
$t_{SK(EN)}$	Synchronous driver operation a-b at enable				2	ns
$t_{SK(DS)}$	Synchronous driver operation A-B at disable			4	6	ns

4.5 Receiver switching

(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, V_{CC} = 5V) (See *Note: 1*, *3*)

Table 10. Driver switching characteristics

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t_{PLH} t_{PHL}	Propagation Delay	C_L = 15pF		18	30	ns
t_{RPDS}	$\|t_{PLH} - t_{PHL}\|$ Propagation delay skew	C_L = 15pF		0.5	2	ns
t_{PZL}	Output enable time	C_{RL} = 15pF, S1 Closed		7	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		7	12	ns
t_{PLZ}	Output disable time	C_{RL} = 15pF, S1 Closed		7	12	ns

Note: 1 All currents into device pins are positive; all currents out of device pins are negative; all voltages are referenced to device ground unless specified.

2 Applies to peak current. See typical Operating Characteristics.

3 t_r=t_f ≤ 6ms.

5 Test circuit and typical characteristics

Figure 2. Driver DC test load

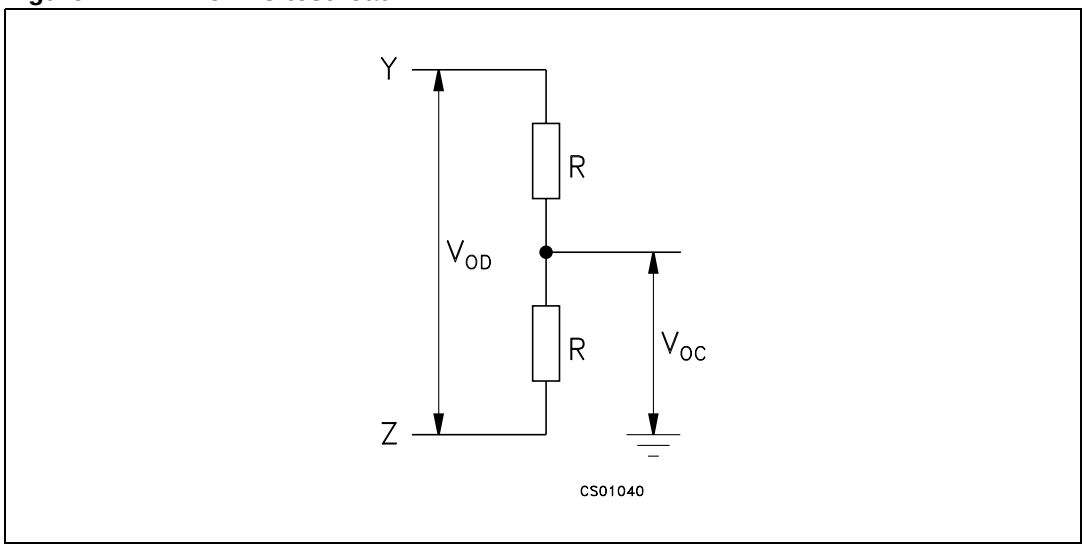


Figure 3. Receiver timing test load

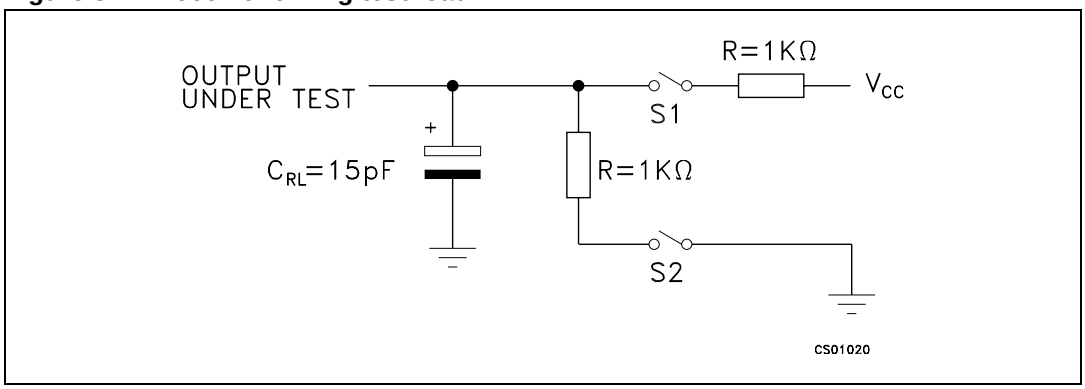


Figure 4. Driver/receiver timing test circuit

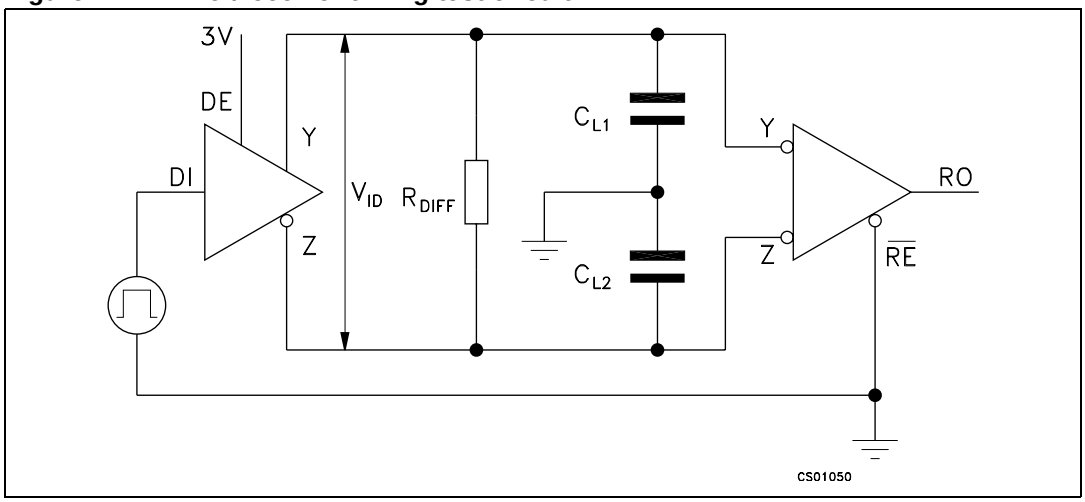


Figure 5. Driver Timing Test Load

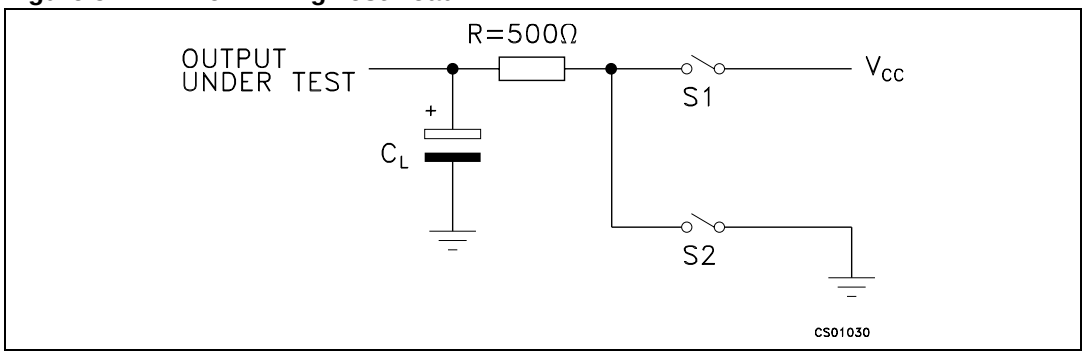


Figure 6. Driver timing test load

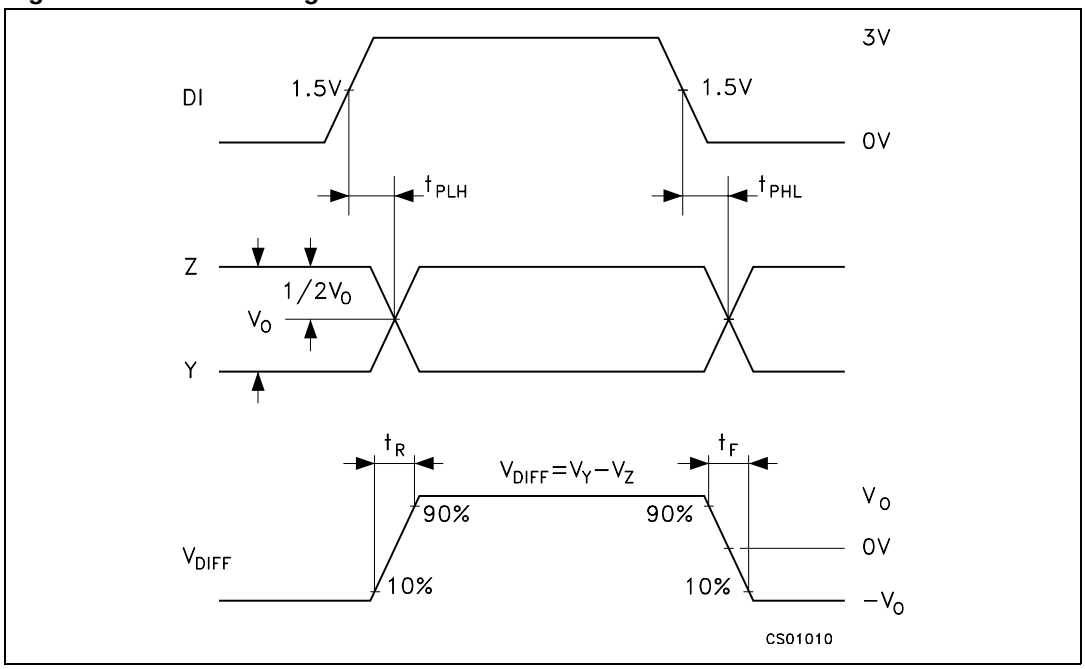


Figure 7. Driver enable and disable time

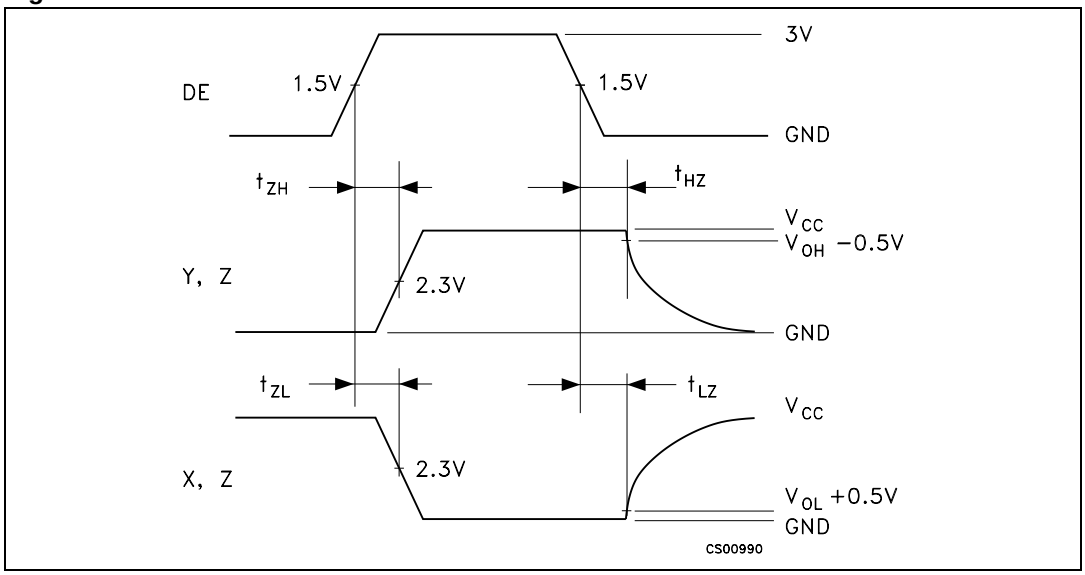


Figure 8. Receiver propagation delay

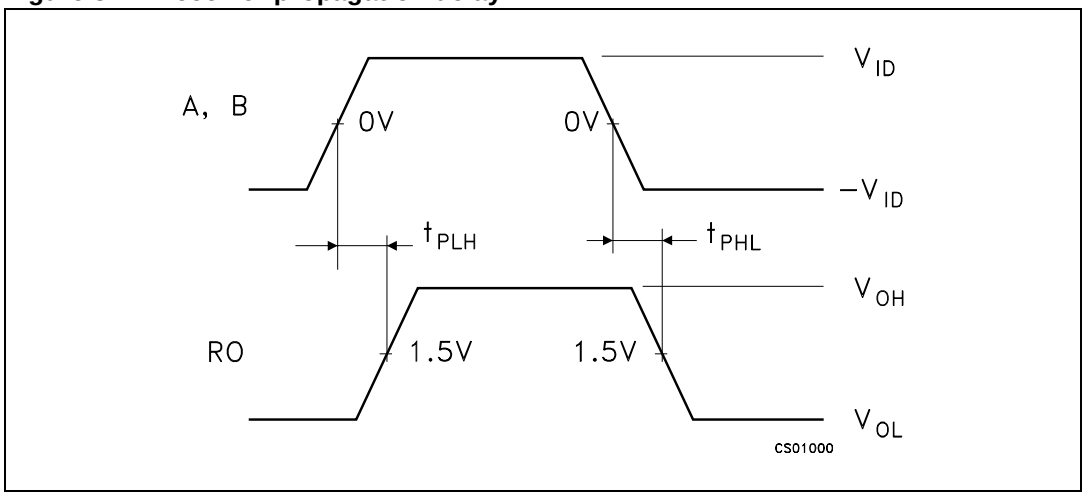


Figure 9. Receiver enable and disable time

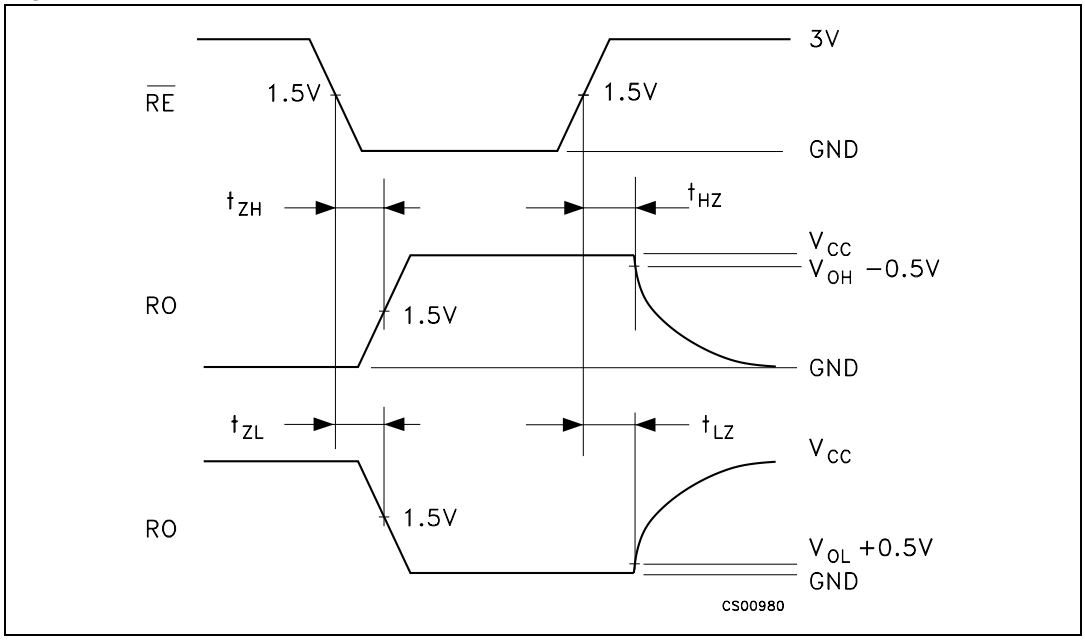


Figure 10. Receiver output current vs. output voltage (output low)

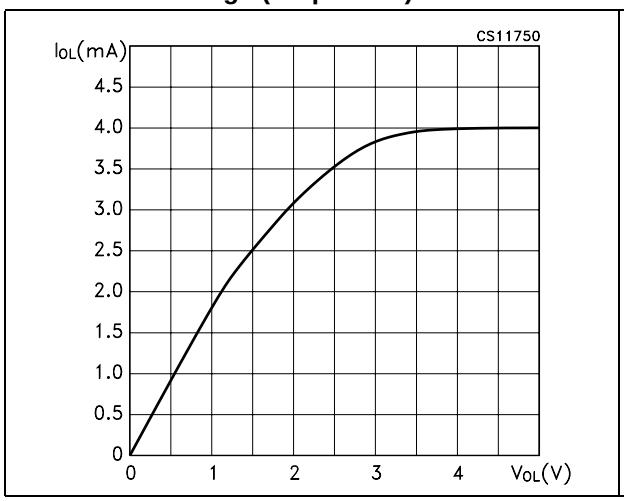


Figure 11. Receiver output current vs. output voltage (output high)

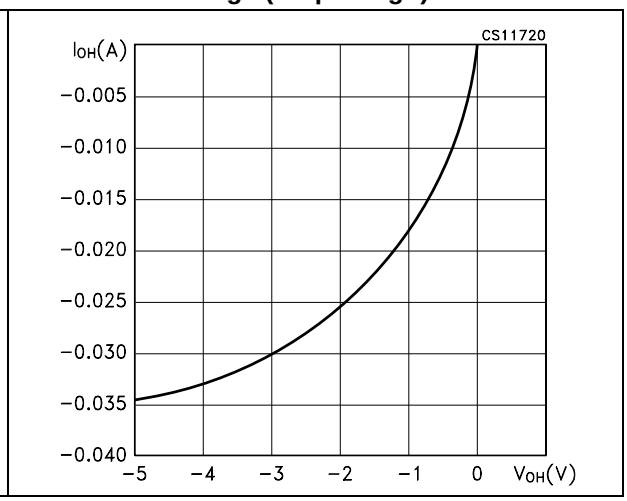


Figure 12. Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output Low)

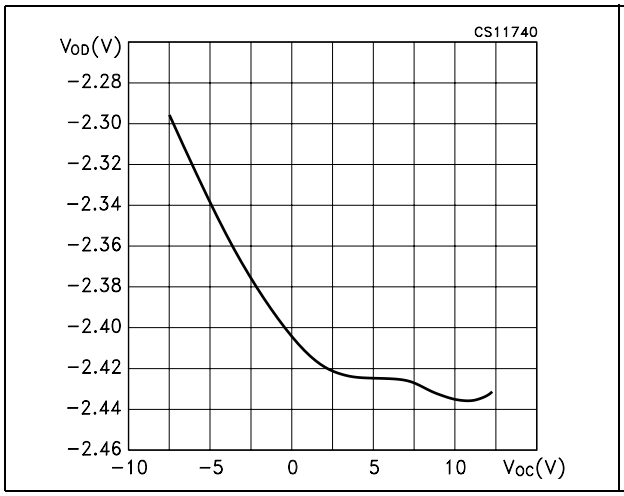


Figure 13. Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output Low)

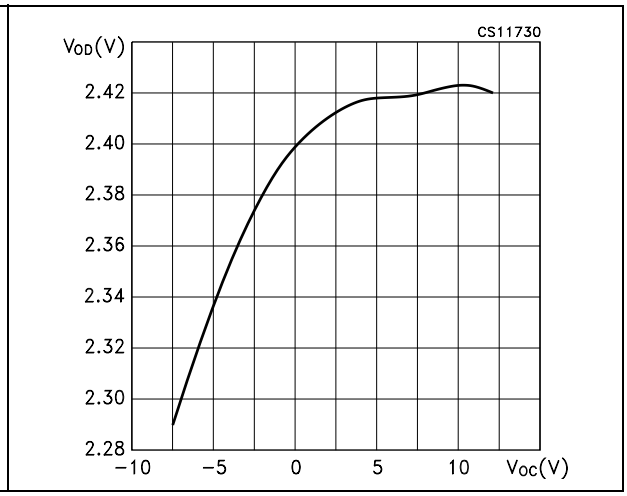


Figure 14. Driver Short Circuit Current vs Line Voltage (Output High)

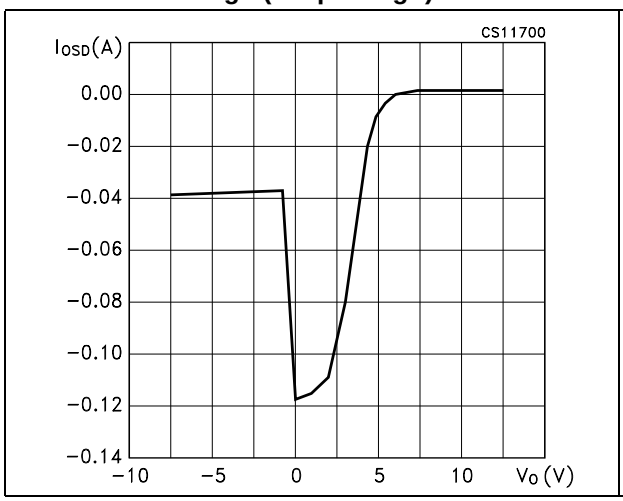


Figure 15. Driver Short Circuit Current vs. Line Voltage (Output Low)

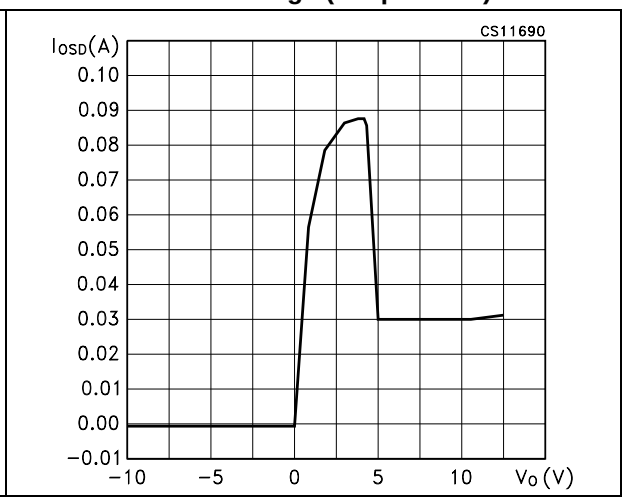
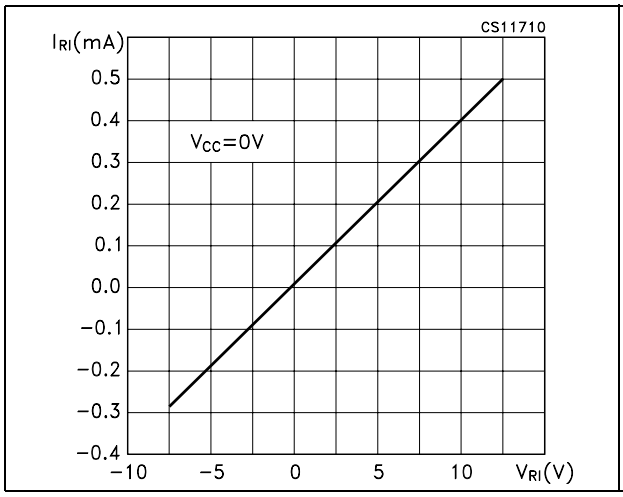


Figure 16. Receiver Input Current vs Input Voltage

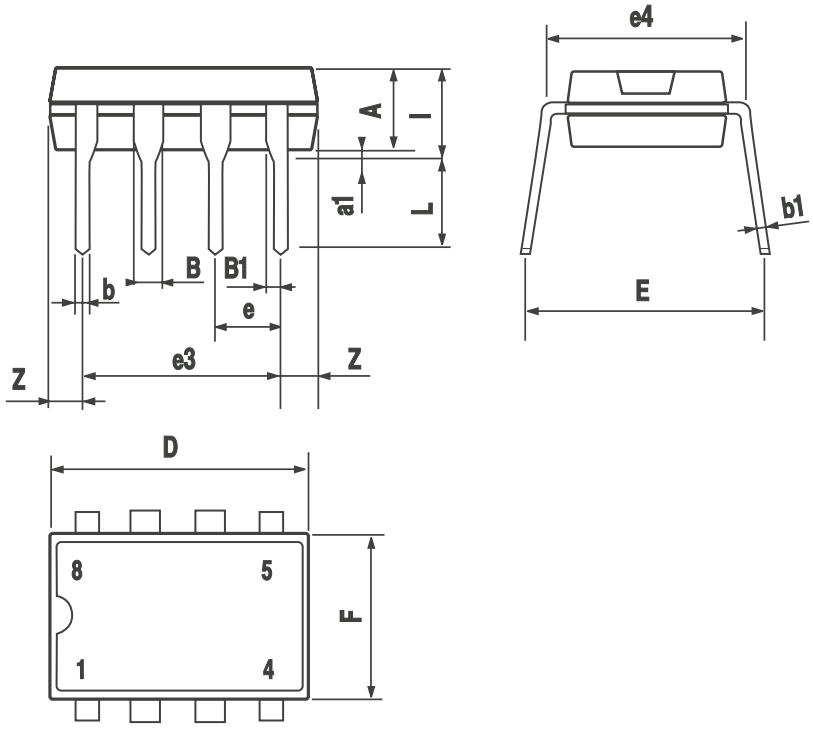


6 Package mechanical data

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-8 MECHANICAL DATA

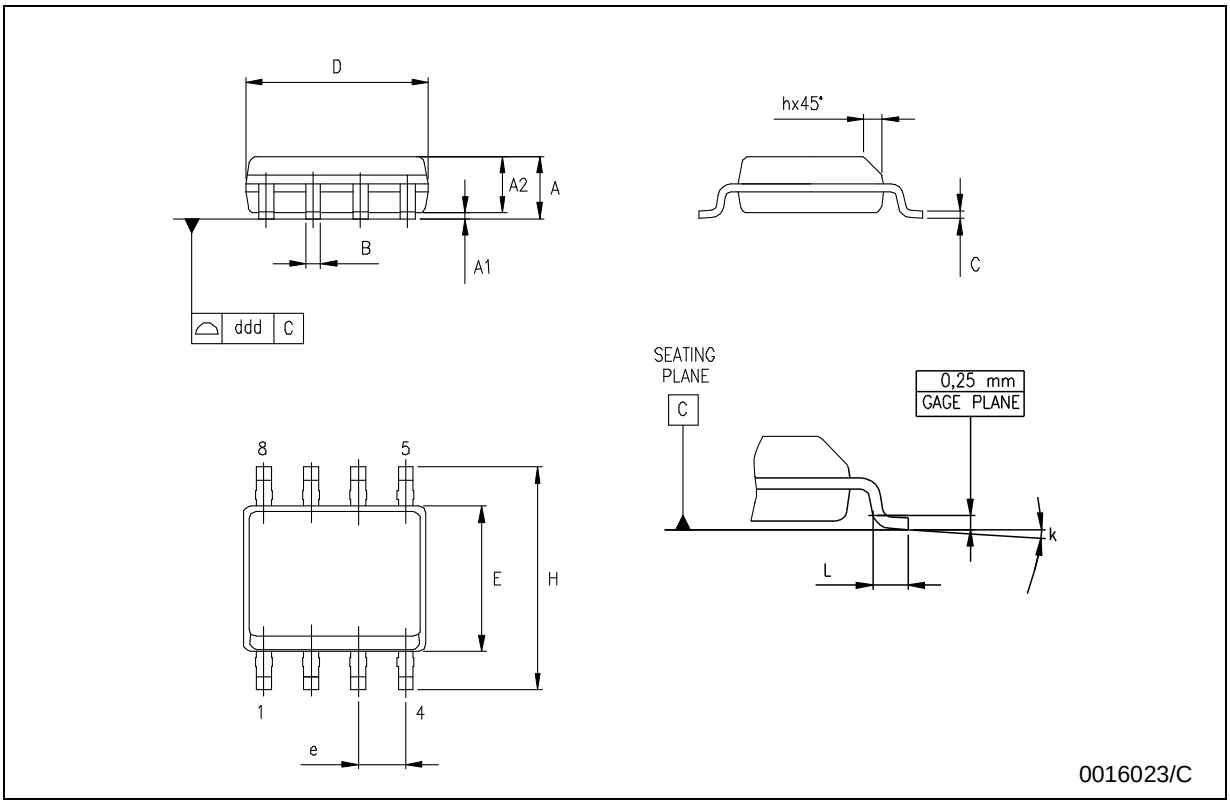
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063



P001F

SO-8 MECHANICAL DATA

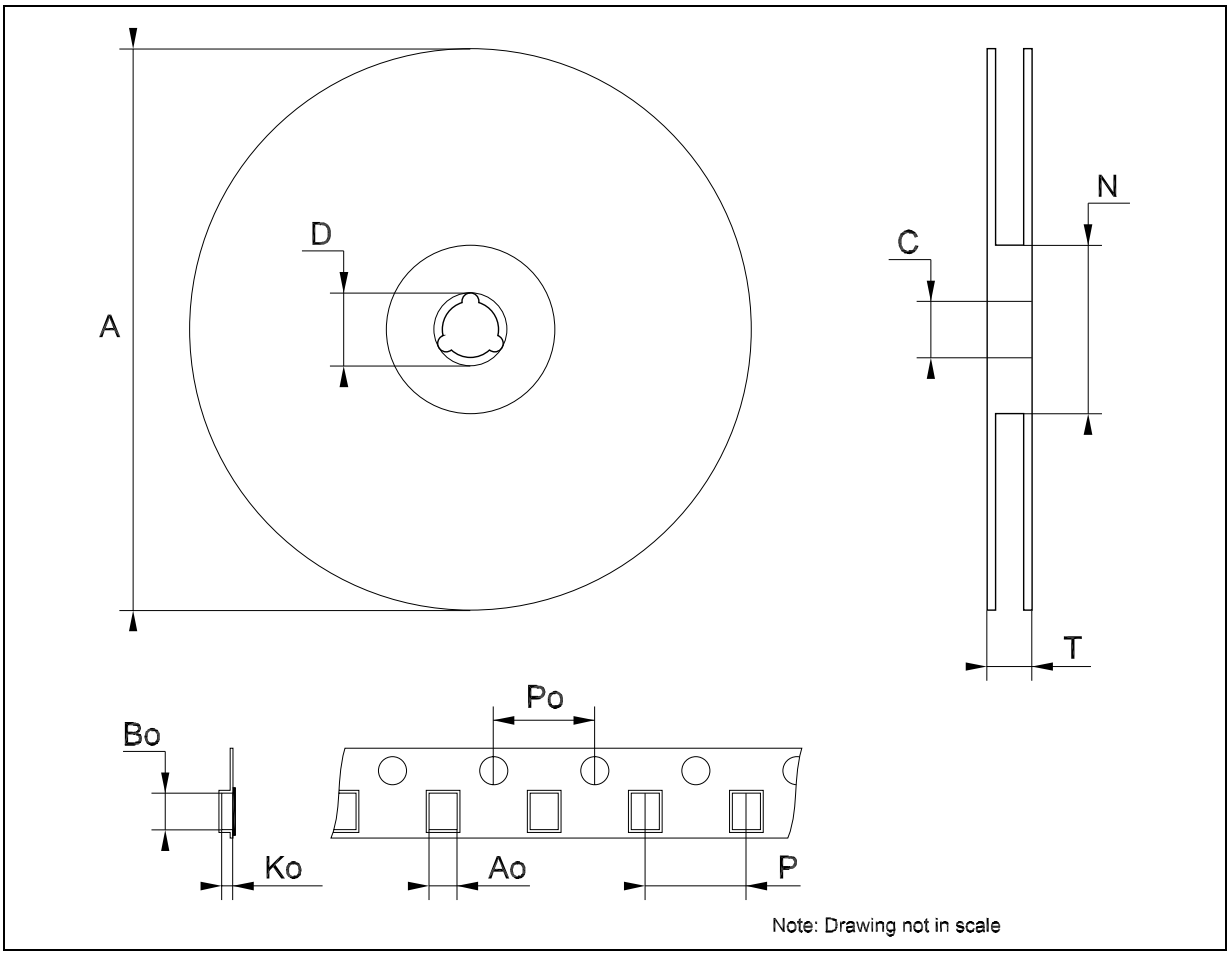
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
k	8° (max.)					
ddd			0.1			0.04



0016023/C

Tape & Reel SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.1		8.5	0.319		0.335
Bo	5.5		5.9	0.216		0.232
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Note: Drawing not in scale

7 Revision history

Table 11. Revision history

Date	Revision	Changes
28-Mar-2006	2	Order codes has been updated and new template.

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