



ST485

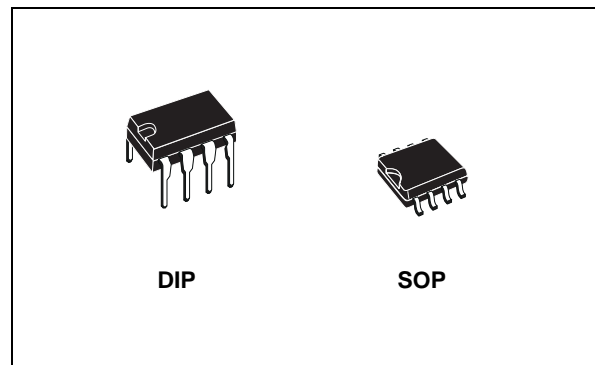
LOW POWER RS-485/RS-422 TRANSCEIVER

- LOW QUIESCENT CURRENT: 300 μ A
- DESIGNED FOR RS-485 INTERFACE APPLICATIONS
- -7V TO 12V COMMON MODE INPUT VOLTAGE RANGE
- DRIVER MAINTAINS HIGH IMPEDANCE IN 3-STATE OR WITH THE POWER OFF
- 70mV TYPICAL INPUT HYSTERESIS
- 30ns PROPAGATION DELAYS, 5ns SKEW
- OPERATE FROM A SINGLE 5V SUPPLY
- CURRENT LIMITING AND THERMAL SHUTDOWN FOR DRIVER OVERLOAD PROTECTION
- ALLOWS UP TO 64 TRANSCEIVERS ON THE BUS

DESCRIPTION

The ST485 is a low power transceiver for RS-485 and RS-422 communication. Each part contains one driver and one receiver.

This transceiver draws 300 μ A (typ.) of supply current when unloaded or fully loaded with disabled drivers.



It 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.

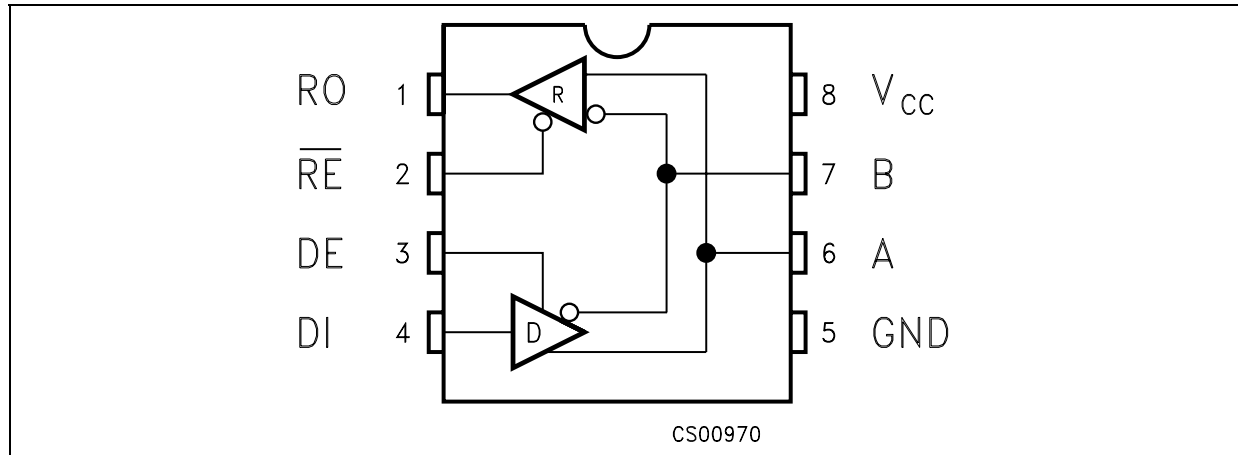
The ST485 is designed for bi-directional data communications on multipoint bus transmission line (half-duplex applications).

The ST485 is available in three temperature ranges: commercial (0°C to 70°C), industrial (-40°C to 85°C) and automotive (-55°C to 125°C)

ORDERING CODES

Type	Temperature Range	Package	Comments
ST485CN	0 to 70 °C	DIP-8	50parts per tube / 40tube per box
ST485BN	-40 to 85 °C	DIP-8	50parts per tube / 40tube per box
ST485XN	-55 to 125 °C	DIP-8	50parts per tube / 40tube per box
ST485CD	0 to 70 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485BD	-40 to 85 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485XD	-55 to 125 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485CDR	0 to 70 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST485BDR	-40 to 85 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST485XDR	-55 to 125 °C	SO-8 (Tape & Reel)	2500 parts per reel

PIN CONFIGURATION



PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	RO	Receiver Output
2	RE	Receiver Output Enable
3	DE	Driver Output Enable
4	DI	Driver Input
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

TRUTH TABLE (DRIVER)

INPUTS			OUTPUTS	
RE	DE	DI	B	A
X	H	H	L	H
X	H	L	H	L
X	L	X	Z	Z

X= Don't Care; Z=High Impedance

TRUTH TABLE (RECEIVER)

INPUTS			OUTPUT
RE	DE	A-B	RO
L	L	≥ +0.2V	H
L	L	≤ -0.2V	L
L	L	INPUTS OPEN	H
H	L	X	Z

X= Don't Care; Z=High Impedance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Supply Voltage	7	V
V _I	Control Input Voltage (RE, DE)	-0.5 to (V _{CC} + 0.5)	V
V _{DI}	Driver Input Voltage (DI)	-0.5 to (V _{CC} + 0.5)	V
V _{DO}	Driver Output Voltage (A, B)	± 14	V
V _{RI}	Receiver Input Voltage (A, B)	± 14	V
V _{RO}	Receiver Output Voltage (RO)	-0.5 to (V _{CC} + 0.5)	V

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

DC ELECTRICAL CHARACTERISTICS

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise specified. Typical values are referred to $T_A = 25^\circ C$)
(See Note 1)

Symbol	Parameter	Test Conditions	Value					Unit
			-40 to 85 °C			-55 to 125 °C		
			Min.	Typ.	Max.	Min.	Max.	
V_{OD1}	Differential Driver Output (No Load)				5		5	V
V_{OD2}	Differential Driver Output (With Load)	$R_L = 27\Omega$ (RS-485) (See Fig.1) $R_L = 50\Omega$ (RS-422) (See Fig.1)	1.5		5 5	1.4	5 5	V V
ΔV_{OD}	Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	$R_L = 27\Omega$ or 50Ω (See Fig. 1)			0.2		0.2	V
V_{OC}	Driver Common-Mode Output Voltage	$R_L = 27\Omega$ or 50Ω (See Fig. 1)			3		3	V
ΔV_{OC}	Change in Magnitude of Driver Common-Mode Output Voltage for Complementary Output States	$R_L = 27\Omega$ or 50Ω (See Fig. 1)			0.2		0.2	V
V_{IH}	Input High Voltage	RE, DE, DI	2.0			2.0		V
V_{IL}	Input Low Voltage	RE, DE, DI			0.8		0.8	V
I_{IN1}	Input Current	RE, DE, DI			± 2		± 2	μA
I_{IN2}	Input Current (A, B)	$V_{CM} = 0V$ or $5.25V$ $V_{DE} = 0V$ $V_{IN} = 12V$ $V_{IN} = -7V$			1 -0.8		1 -0.8	mA mA
V_{TH}	Receiver Differential Threshold Voltage	$V_{CM} = -7$ to $12V$	-0.2		0.2	-0.2	0.2	V
ΔV_{TH}	Receiver Input Hysteresis	$V_{CM} = 0V$		70				mV
V_{OH}	Receiver Output High Voltage	$I_O = -4mA$ $V_{ID} = 200mV$	3.5			3.4		V
V_{OL}	Receiver Output Low Voltage	$I_O = 4mA$ $V_{ID} = -200mV$			0.4		0.55	V
I_{OZR}	3-State (High Impedance) Output Current at Receiver	$V_O = 0.4$ to $2.4V$			± 1		± 1	μA
R_{IN}	Receiver Input Resistance	$V_{CM} = -7$ to $12V$	24			24		K Ω
I_{CC}	No Load Supply Current (Note 2)	$V_{RE} = 0V$ or V_{CC} $V_{DE} = V_{CC}$ $V_{DE} = 0V$		400 300	900 500		900 500	μA μA
I_{OSD1}	Driver Short-Circuit Current, $V_O=High$	$V_O = -7$ to $12V$ (Note 3)	35		250	35	250	mA
I_{OSD2}	Driver Short-Circuit Current, $V_O=Low$	$V_O = -7$ to $12V$ (Note 3)	35		250	35	250	mA
I_{OSR}	Receiver Short-Circuit Current	$V_O = 0V$ to V_{CC}	7		95	7	95	mA

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.

Note 2: Supply current specification is valid for loaded transmitters when $V_{DE} = 0V$

Note 3: Applies to peak current. See typical Operating Characteristics.

DRIVER SWITCHING CHARACTERISTICS

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise specified. Typical values are referred to $T_A = 25^\circ C$)
(See Note 1)

Symbol	Parameter	Test Conditions	Value					Unit
			-40 to 85 °C			-55 to 125 °C		
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Input to Output	$R_{DIFF} = 54\Omega$ $C_{L1} = C_{L2} = 100pF$ (See Fig. 3 and 5)	10	30	60		70	ns
t_{SK}	Output Skew to Output	$R_{DIFF} = 54\Omega$ $C_{L1} = C_{L2} = 100pF$ (See Fig. 3 and 5)		5	10		10	ns
t_{TLH} t_{THL}	Rise or Fall Time	$R_{DIFF} = 54\Omega$ $C_{L1} = C_{L2} = 100pF$ (See Fig. 3 and 5)	3	15	40	3	45	ns
t_{PZH}	Output Enable Time	$C_L = 100pF$ $S2 = Closed$ (See Fig. 4 and 6)		70	90		90	ns
t_{PZL}	Output Enable Time	$C_L = 100pF$ $S1 = Closed$ (See Fig. 4 and 6)		70	90		90	ns
t_{PLZ}	Output Disable Time	$C_L = 15pF$ $S1 = Closed$ (See Fig. 4 and 6)		70	90		90	ns
t_{PHZ}	Output Disable Time	$C_L = 15pF$ $S2 = Closed$ (See Fig. 4 and 6)		70	90		90	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.

RECEIVER SWITCHING CHARACTERISTICS

($V_{CC} = 5V \pm 5\%$, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise specified. Typical values are referred to $T_A = 25^\circ C$)
(See Note 1)

Symbol	Parameter	Test Conditions	Value					Unit
			-40 to 85 °C			-55 to 125 °C		
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Input to Output	$R_{DIFF} = 54\Omega$ $C_{L1} = C_{L2} = 100pF$ (See Fig. 3 and 7)	20	130	210		230	ns
t_{SKD}	Differential Receiver Skew	$R_{DIFF} = 54\Omega$ $C_{L1} = C_{L2} = 100pF$ (See Fig. 3 and 7)		13				ns
t_{PZH}	Output Enable Time	$C_{RL} = 15pF$ $S1 = Closed$ (See Fig. 2 and 8)		20	50		56	ns
t_{PZL}	Output Enable Time	$C_{RL} = 15pF$ $S2 = Closed$ (See Fig. 2 and 8)		20	50		56	ns
t_{PLZ}	Output Disable Time	$C_{RL} = 15pF$ $S1 = Closed$ (See Fig. 2 and 8)		20	50		56	ns
t_{PHZ}	Output Disable Time	$C_{RL} = 15pF$ $S2 = Closed$ (See Fig. 2 and 8)		20	50		56	ns
f_{MAX}	Maximum Data Rate		2.5			2.5		Mbps

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.

TEST CIRCUITS AND TYPICAL CHARACTERISTICS

Figure 1 : Driver DC Test Load

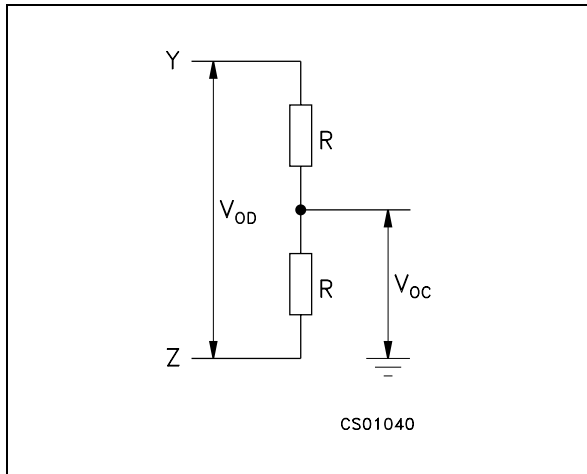


Figure 3 : Drive/Receiver Timing Test Circuit

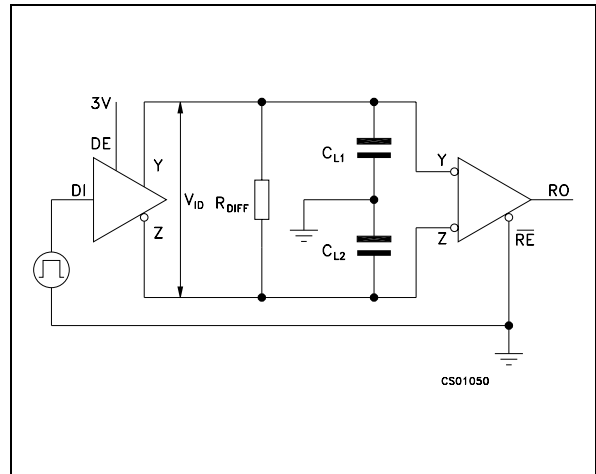


Figure 2 : Receiver Timing Test Load

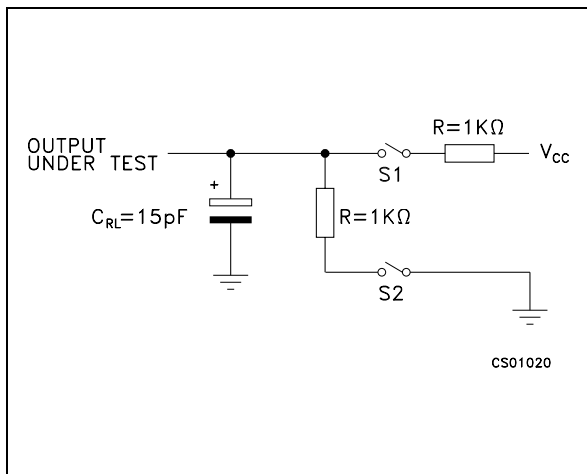


Figure 4 : Driver Timing Test Load

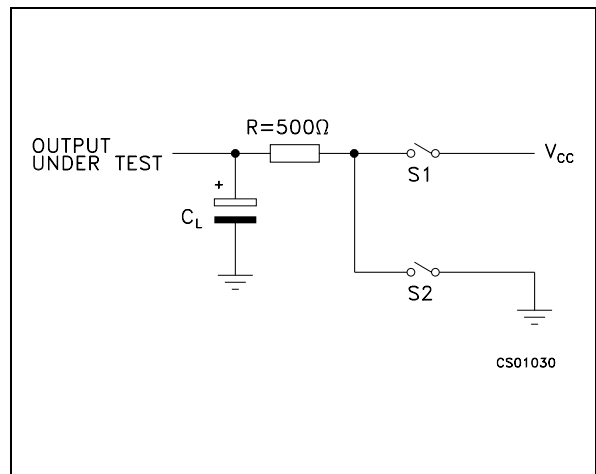


Figure 5 : Driver Propagation Delay

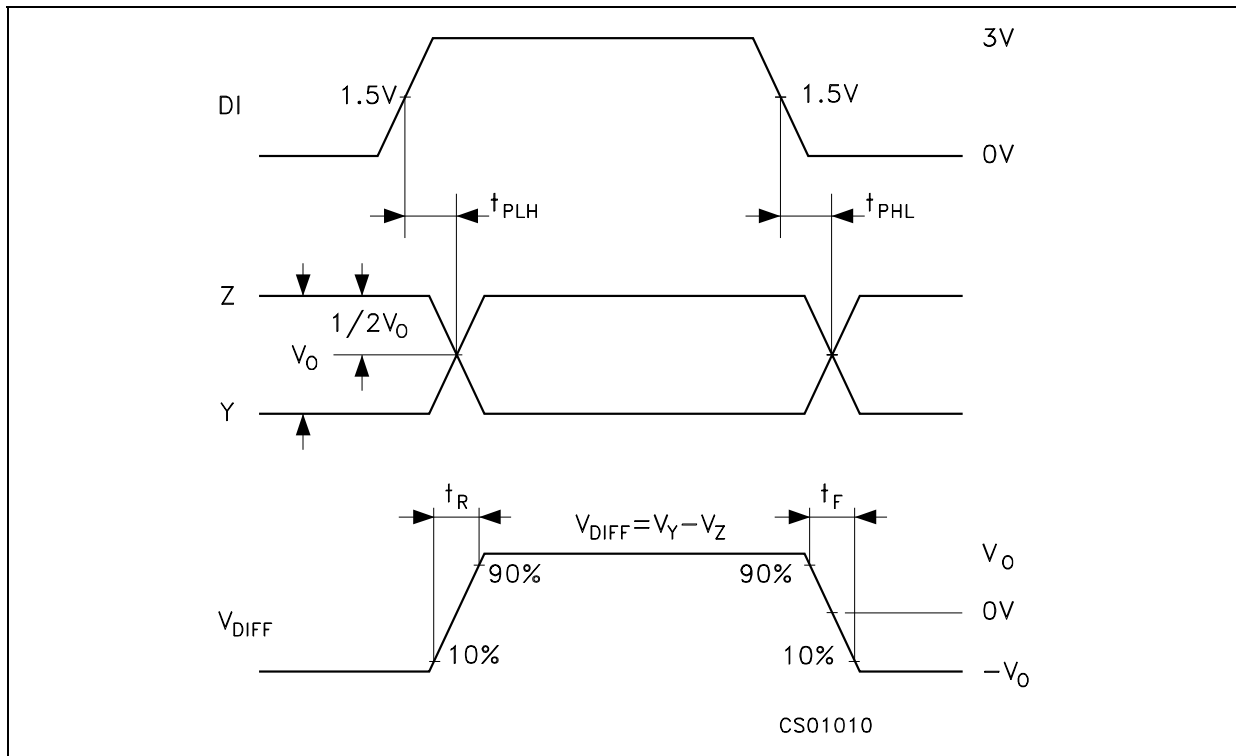


Figure 6 : Driver Enable and Disable Time

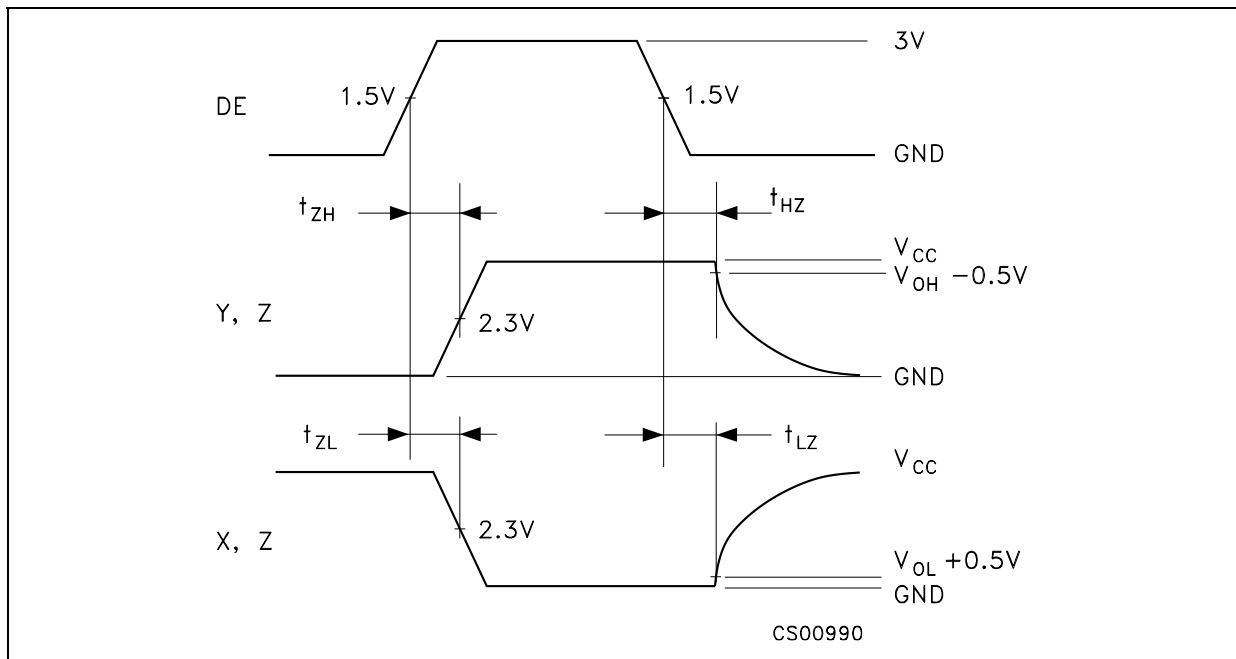


Figure 7 : Receiver Propagation Delay

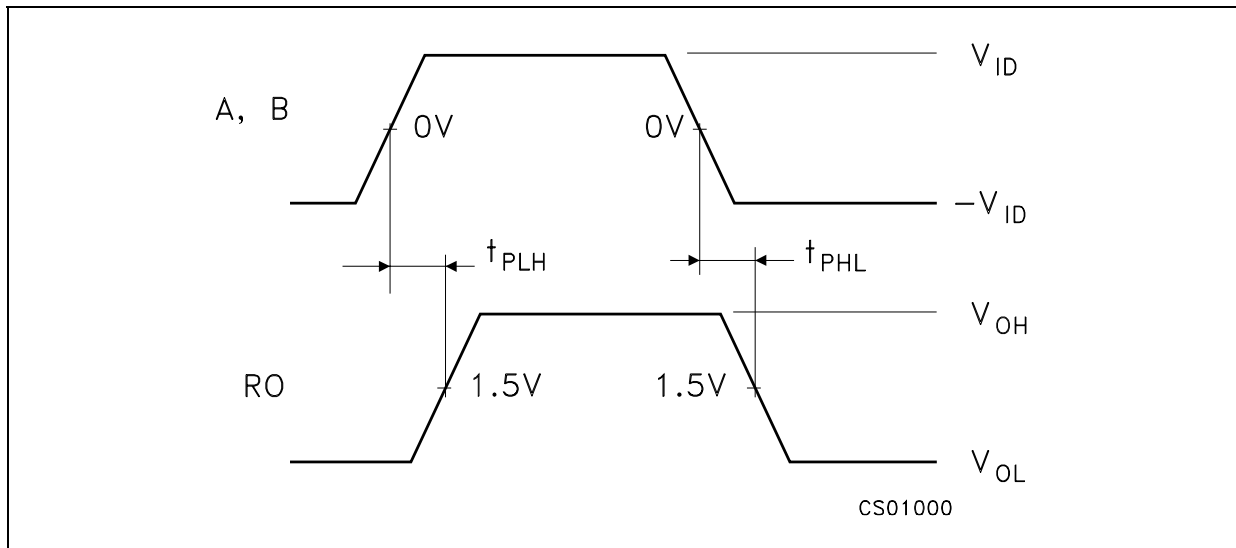


Figure 8 : Receiver Enable and Disable Time

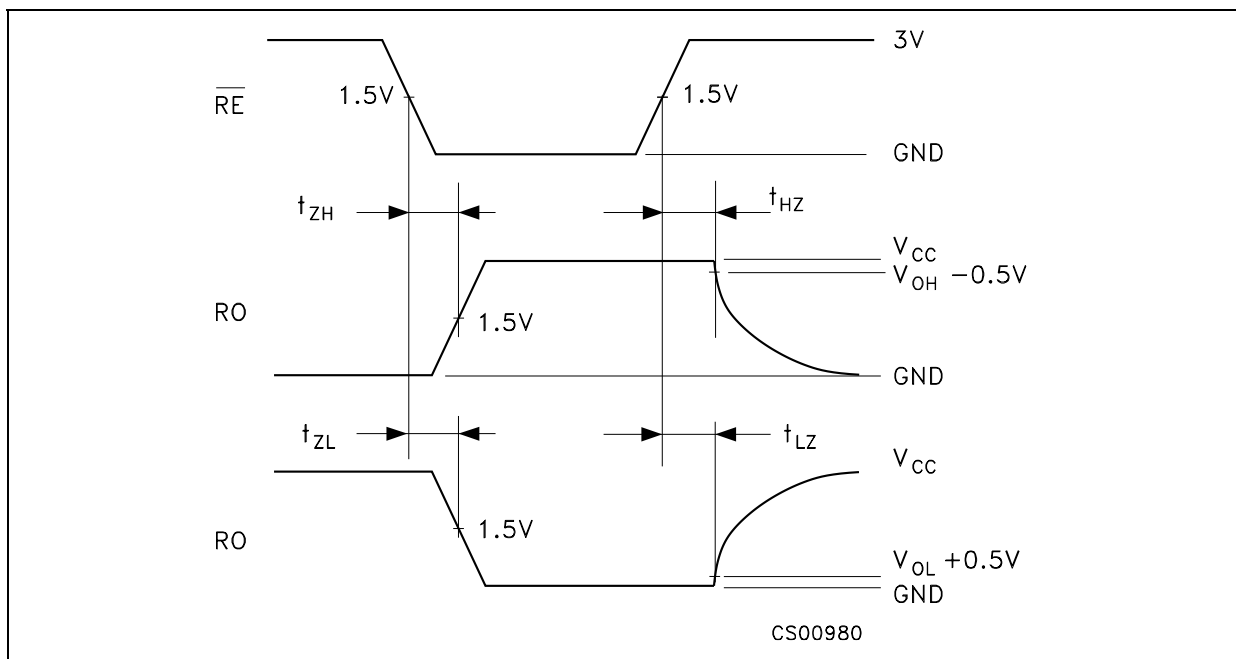


Figure 9 : Receiver Output Current vs Output Low Voltage

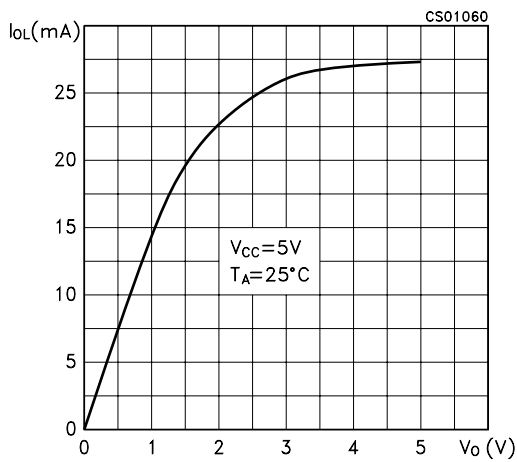


Figure 12 : Driver Output Current vs Output High Voltage

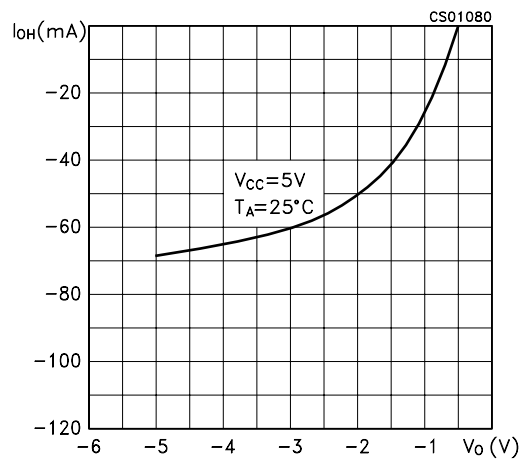


Figure 10 : Receiver Output Current vs Output High Voltage

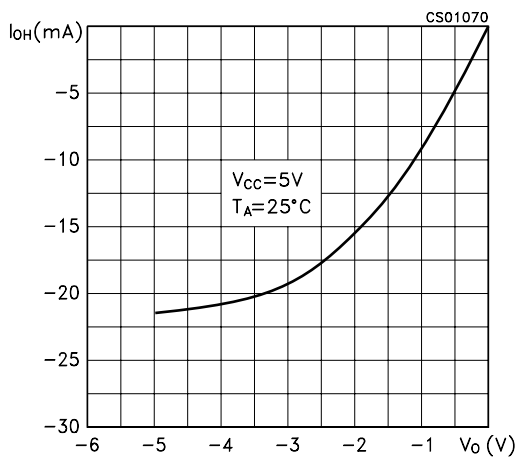


Figure 13 : Supply Current vs Temperature

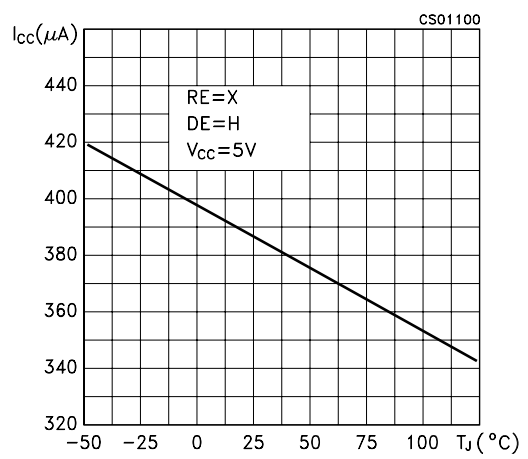


Figure 11 : Driver Output Current vs Output Low Voltage

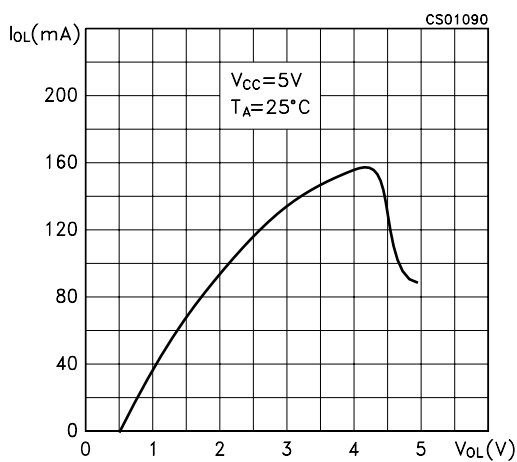


Figure 14 : Receiver High Level Output Voltage vs Temperature

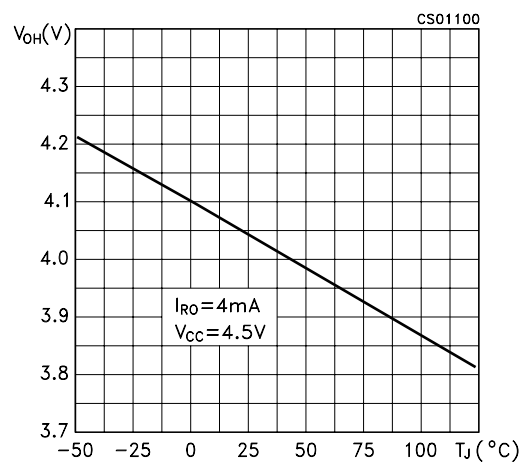


Figure 15 : Receiver Low Level Output Voltage vs Temperature

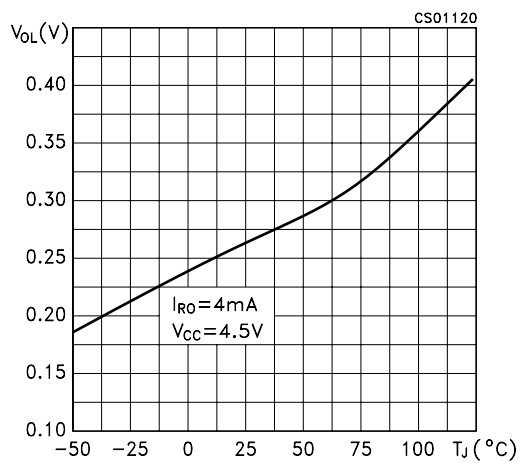
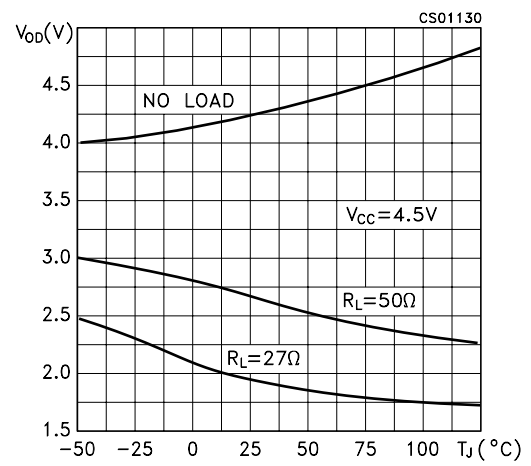
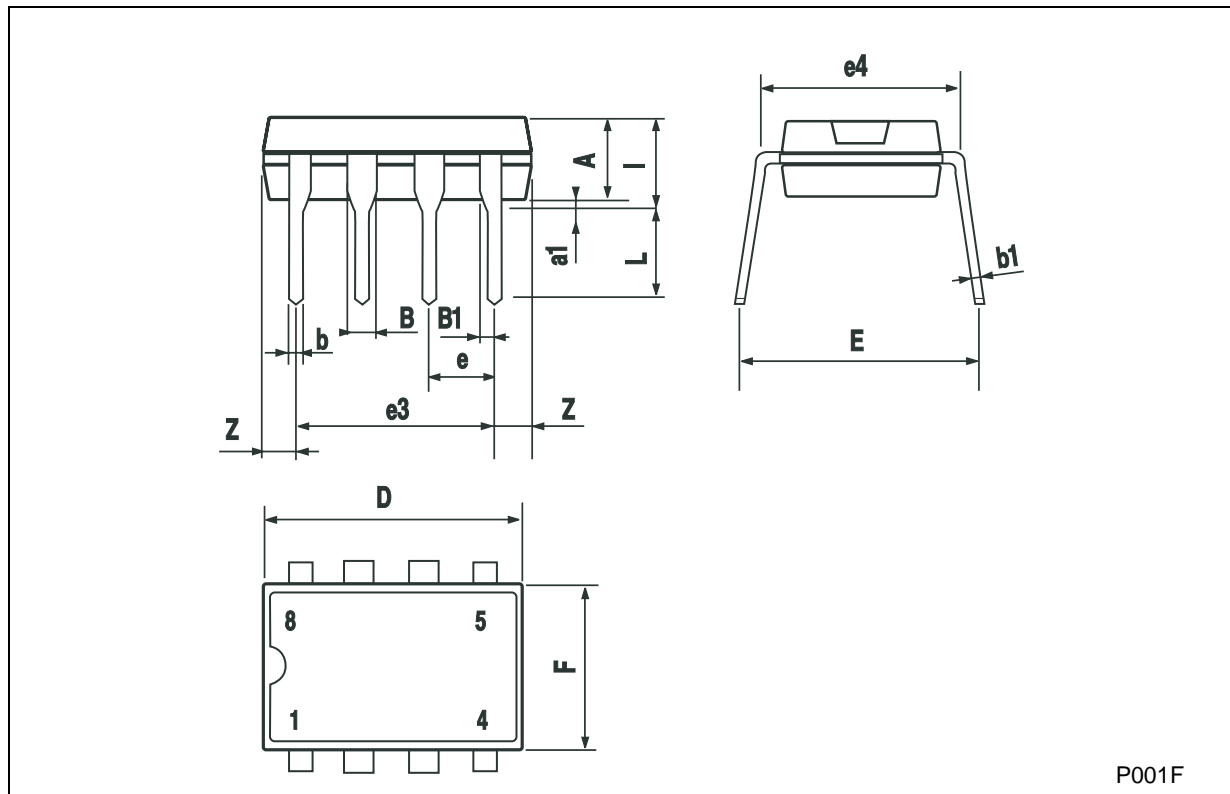


Figure 16 : Differential Driver Output Voltage vs Temperature



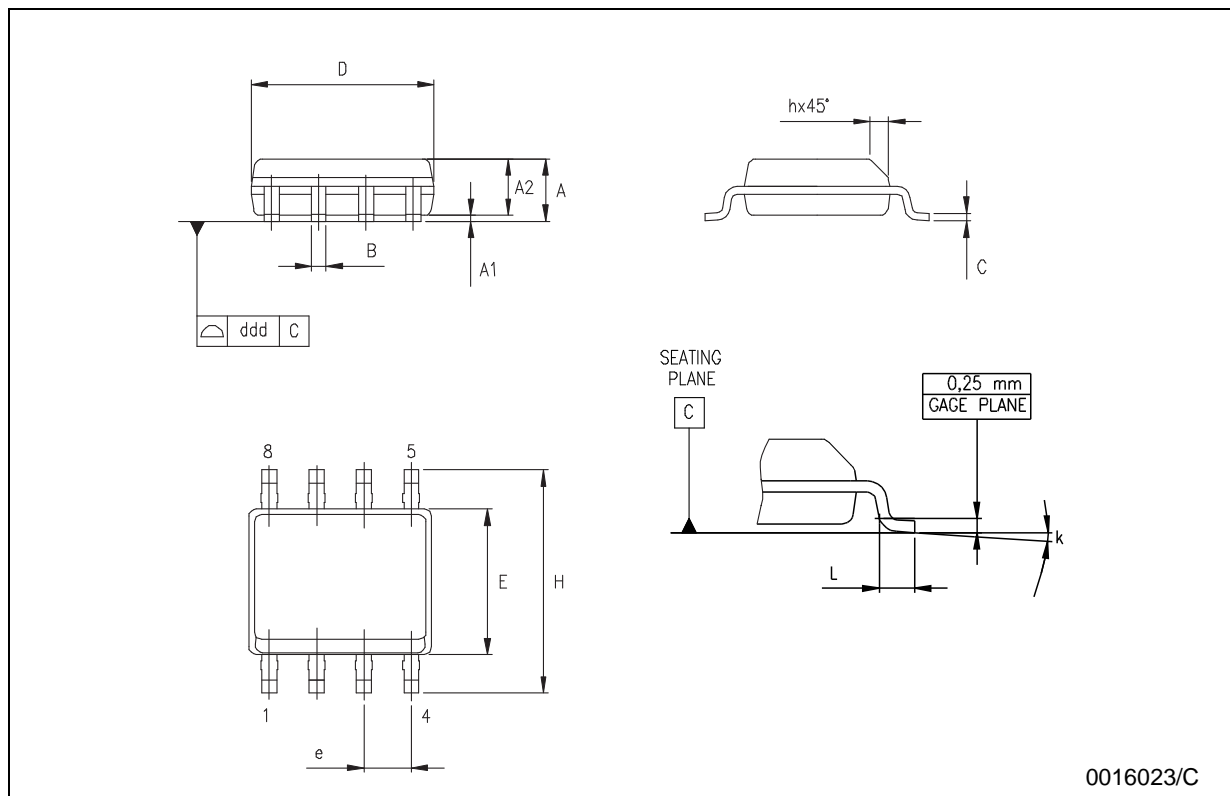
Plastic DIP-8 MECHANICAL DATA

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



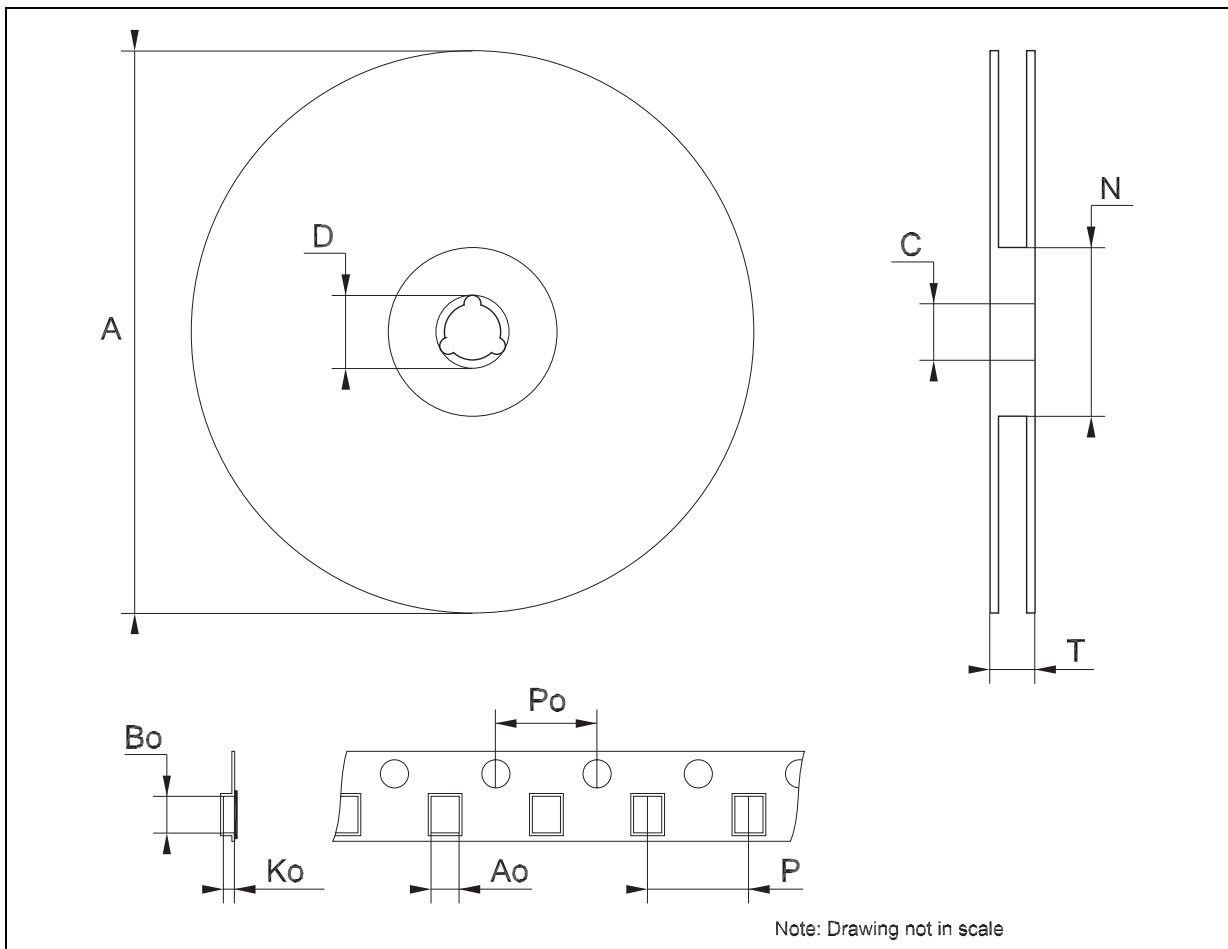
SO-8 MECHANICAL DATA

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



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



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>

