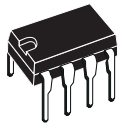
ST485

LOW POWER RS-485/RS-422 TRANSCEIVER

- LOW QUIESCENT CURRENT: 300µA
- 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



DIP

SOP

DESCRIPTION

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

This transceiver draw 300µA (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 placed the driver outputs into a high-impedance state. .

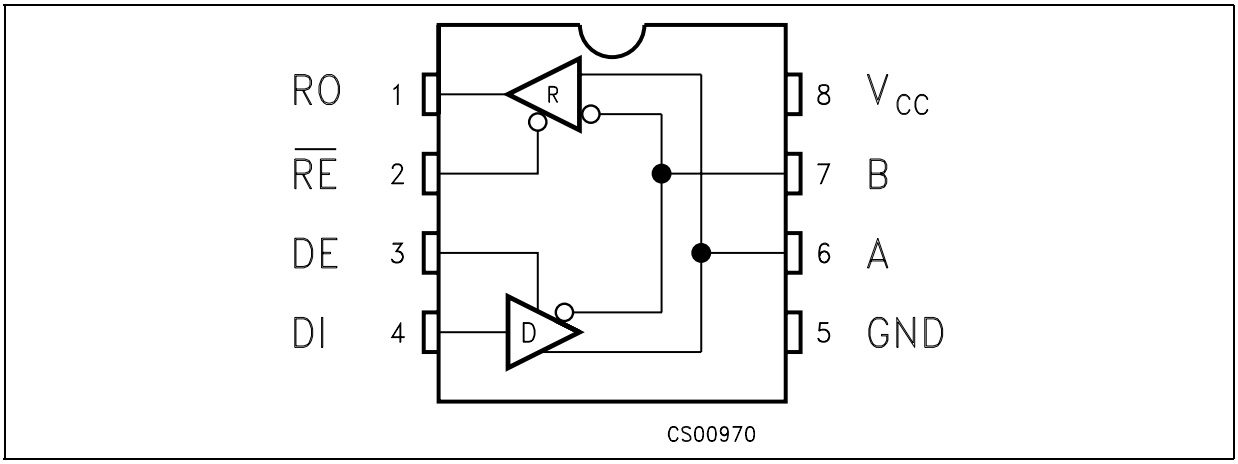
The ST485 is designed for bi-directional data communications on multipoint bus transmission line (half-duplex applciations).

The ST485 is available in three temperature range: commercial (0°C to 70°C), industrial (-40°C to 850°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	$\overline{RE}$	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	
$\overline{RE}$	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
$\overline{RE}$	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 ($\overline{RE}$, 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 ± 5%, T_A = T_{MIN} to T_{MAX} , unless otherwise specified. Typical values are referred to T_A = 25°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 = 27Ω (RS-485) (See Fig.1) R_L = 50Ω (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 = 27Ω or 50Ω (See Fig. 1)			0.2		0.2	V
V_{OC}	Driver Common-Mode Output Voltage	R_L = 27Ω 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 = 27Ω or 50Ω (See Fig. 1)			0.2		0.2	V
V_{IH}	Input High Voltage	$\overline{RE}$, DE, DI	2.0			2.0		V
V_{IL}	Input Low Voltage	$\overline{RE}$, DE, DI			0.8		0.8	V
I_{IN1}	Input Current	$\overline{RE}$, 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		KΩ
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 cuttents 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 ± 5%, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise specified. Typical values are referred to T_A = 25°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} = 54Ω $C_{L1} = C_{L2}$ = 100pF (See Fig. 3 and 5)	10	30	60		70	ns
t_{SK}	Output Skew to Output	R_{DIFF} = 54Ω $C_{L1} = C_{L2}$ = 100pF (See Fig. 3 and 5)		5	10		10	ns
t_{TLH} t_{THL}	Rise or Fall Time	R_{DIFF} = 54Ω $C_{L1} = C_{L2}$ = 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 cuttents out of device pins are negative; all voltages are referenced to device ground unless specified.

RECEIVER SWITCHING CHARACTERISTICS

(V_{CC} = 5V ± 5%, $T_A = T_{MIN}$ to T_{MAX} , unless otherwise specified. Typical values are referred to T_A = 25°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} = 54Ω $C_{L1} = C_{L2}$ = 100pF (See Fig. 3 and 7)	20	130	210		230	ns
t_{SKD}	Differential Receiver Skew	R_{DIFF} = 54Ω $C_{L1} = C_{L2}$ = 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 cuttents 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

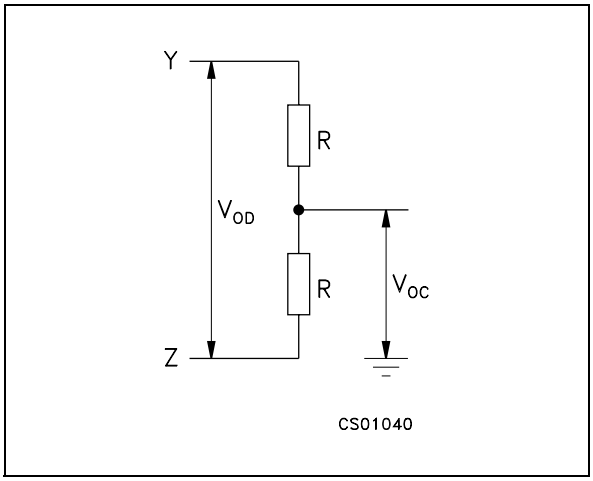


Figure 2 : Receiver Timing Test Load

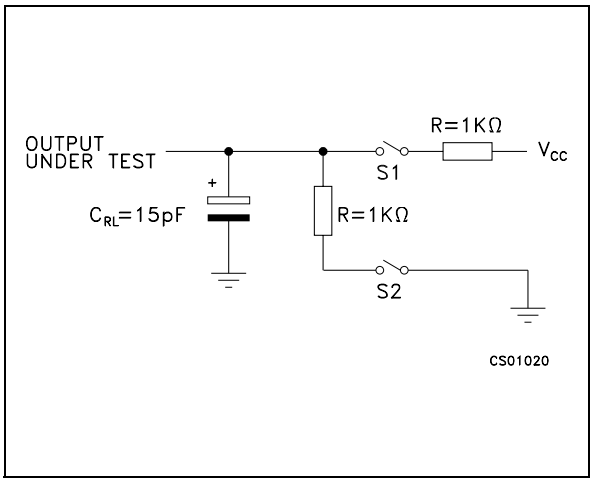


Figure 3 : Drive/Receiver Timing Test Circuit

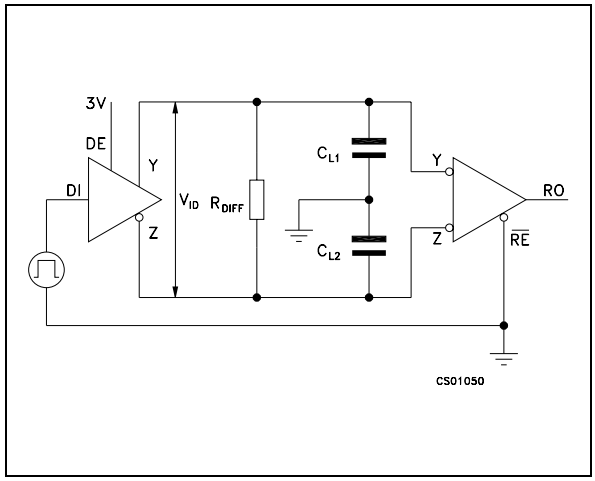


Figure 4 : Driver Timing Test Load

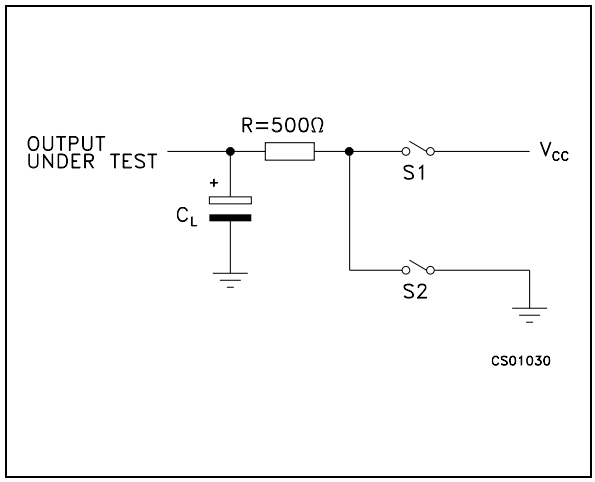


Figure 5 : Driver Propagation Delay

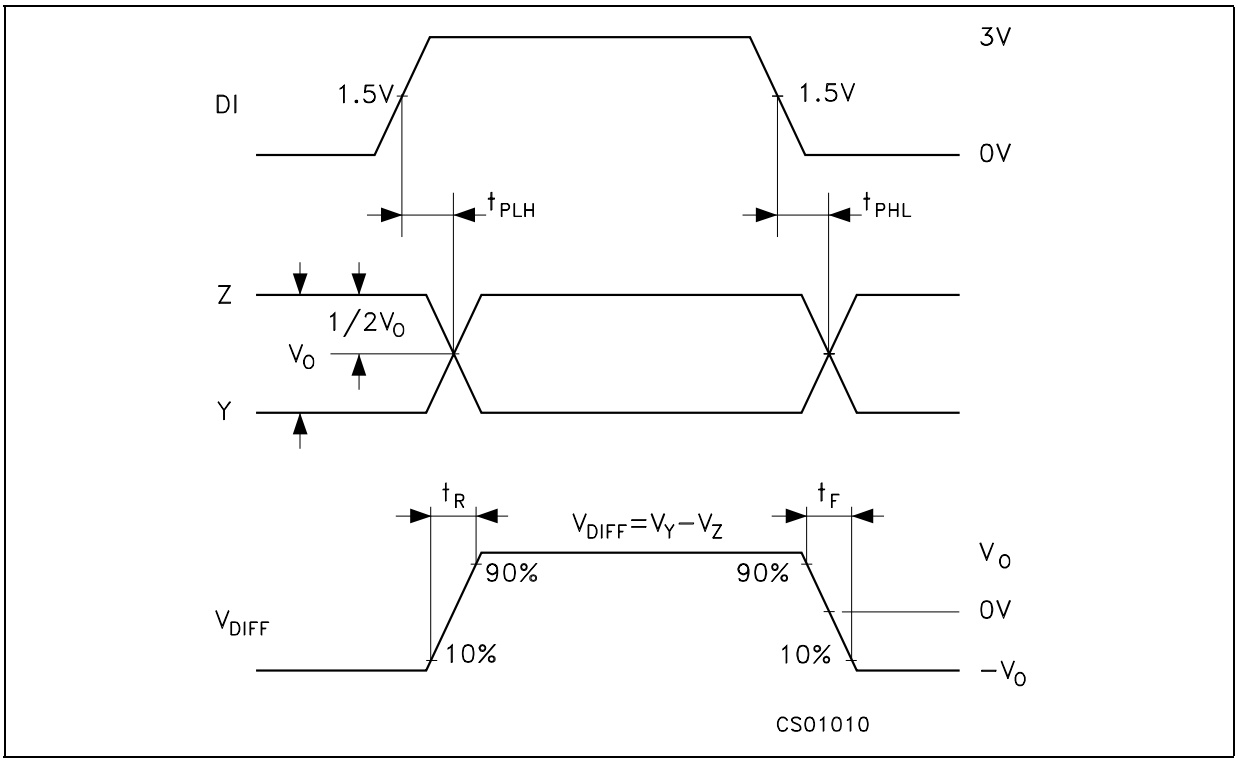


Figure 6 : Driver Enable and Disable Time

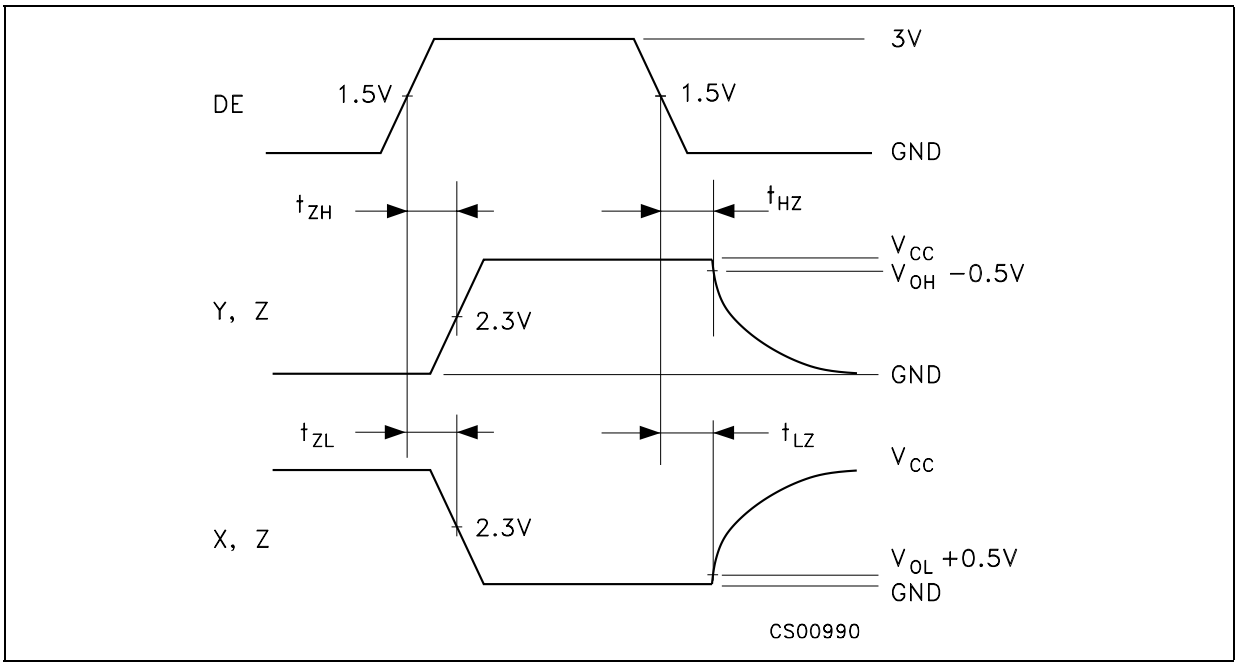


Figure 7 : Receiver Propagation Delay

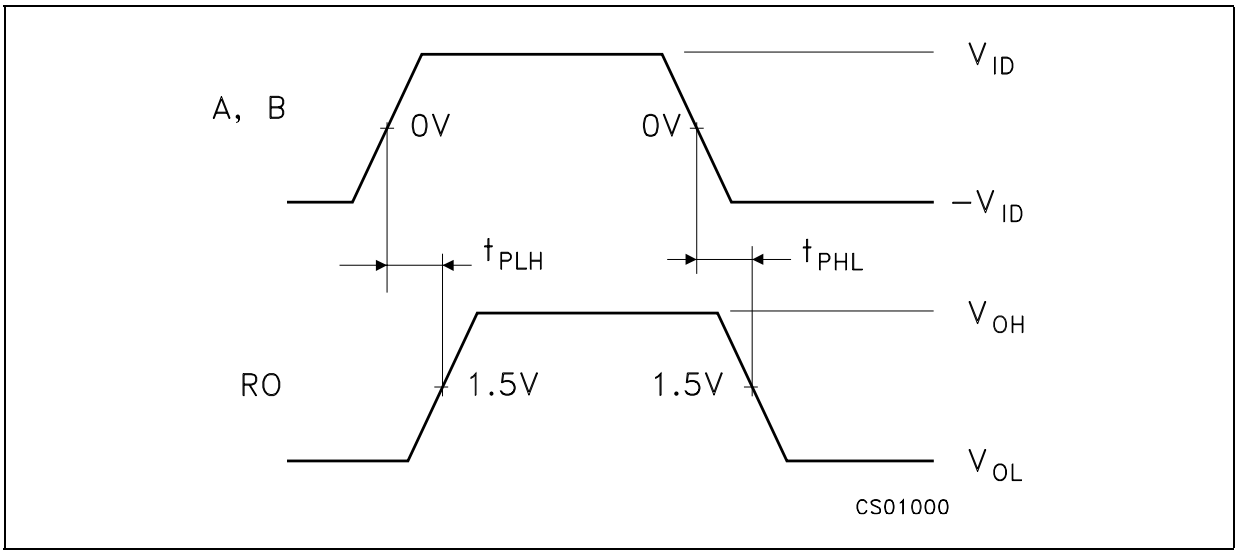


Figure 8 : Receiver Enable and Disable Time

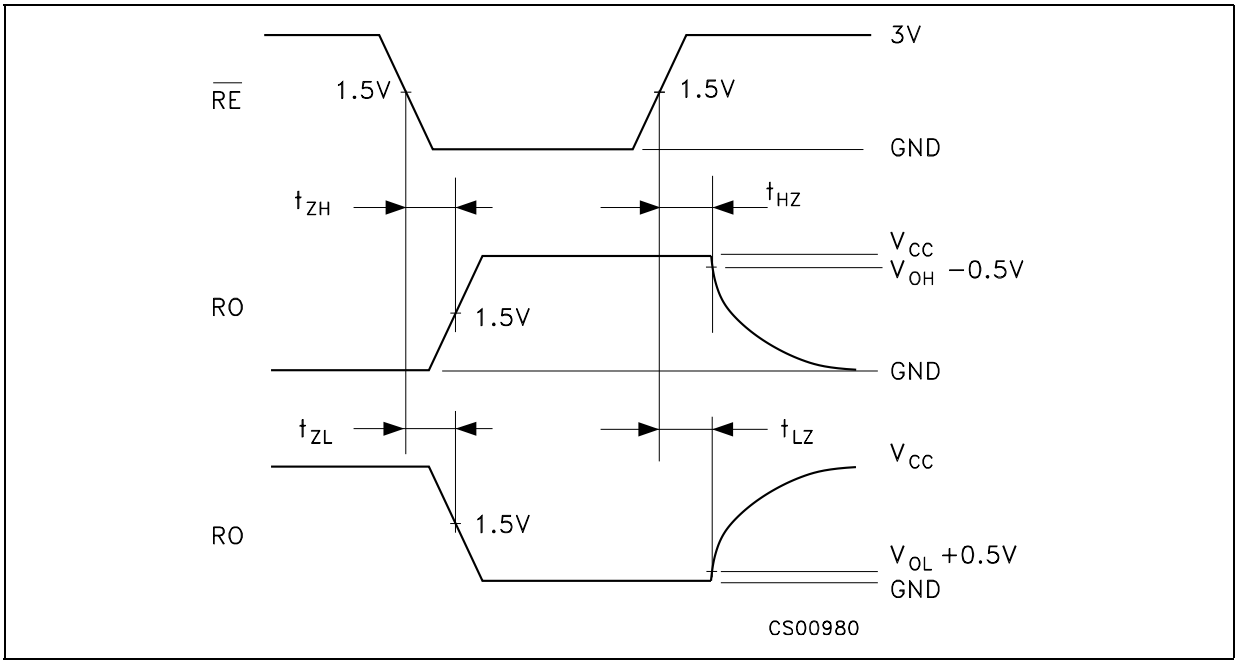


Figure 9 : Receiver Output Current vs Output Low Voltage

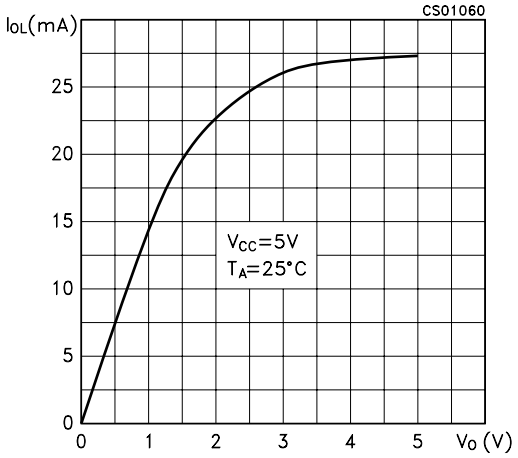


Figure 10 : Receiver Output Current vs Output High Voltage

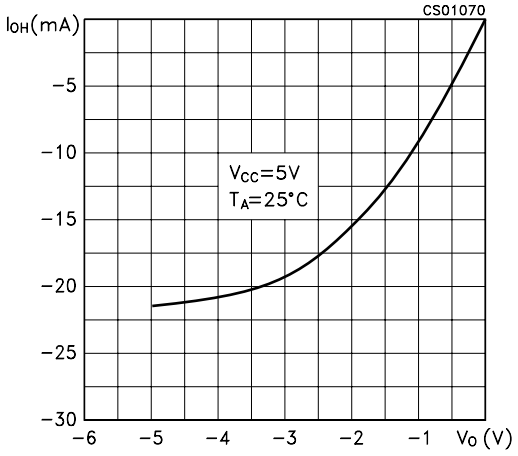


Figure 11 : Driver Output Current vs Output Low Voltage

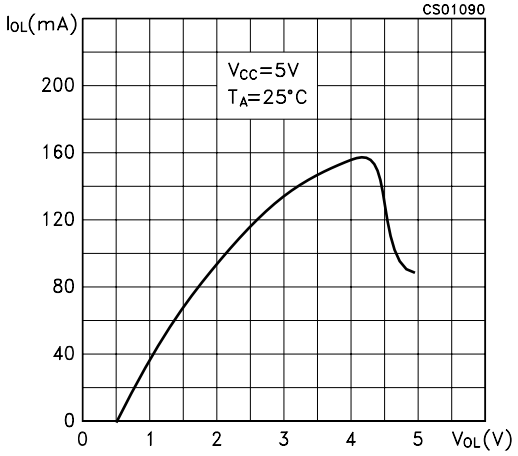


Figure 12 : Driver Output Current vs Output High Voltage

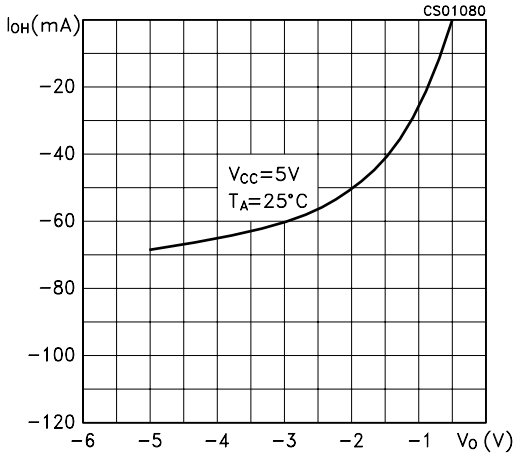


Figure 13 : Supply Current vs Temperature

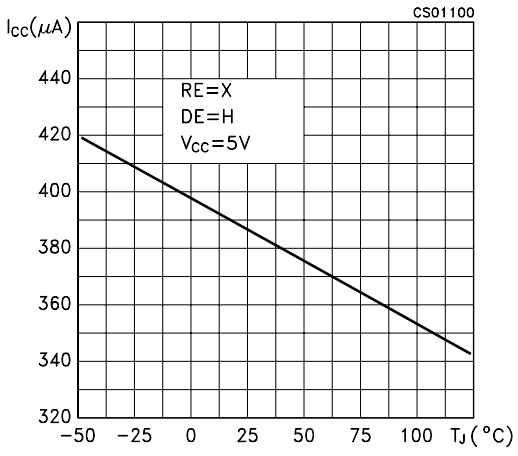


Figure 14 : Receiver High Level Output Voltage vs Temperature

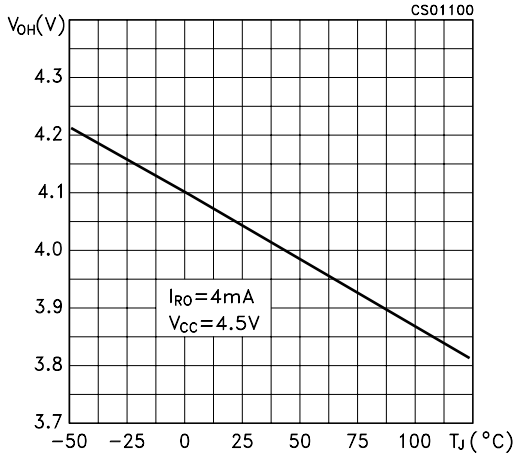


Figure 15 : Receiver Low Level Output Voltage vs Temperature

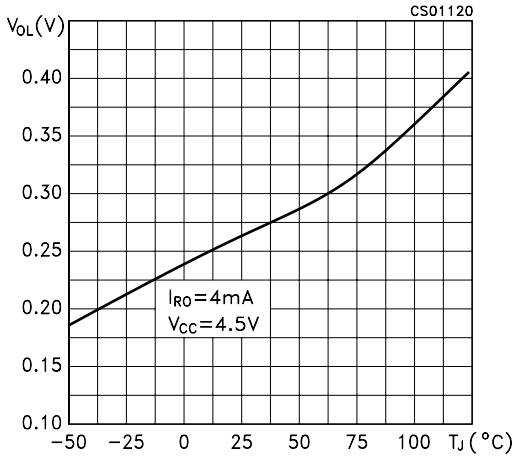
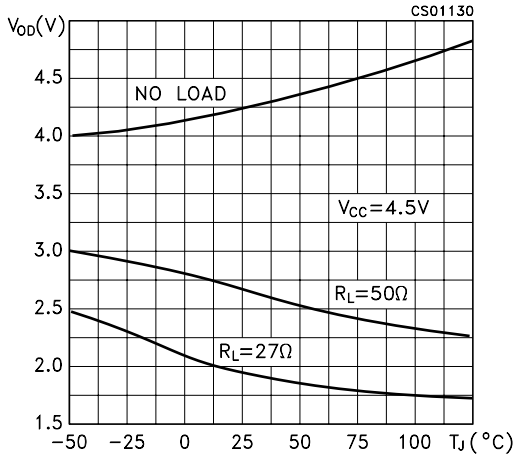
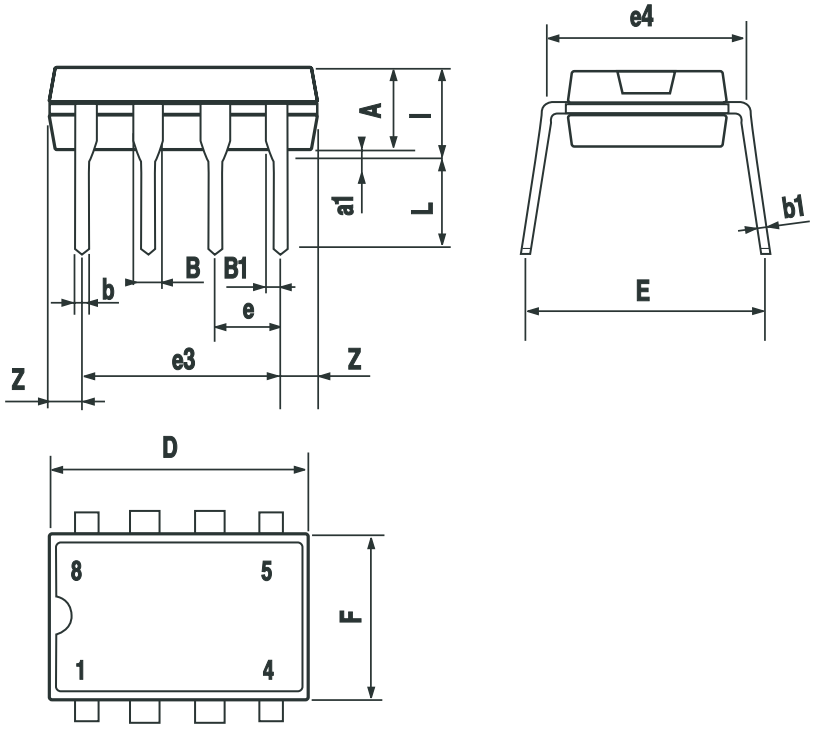


Figure 16 : Differential Driver Output Voltage vs Temperature



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



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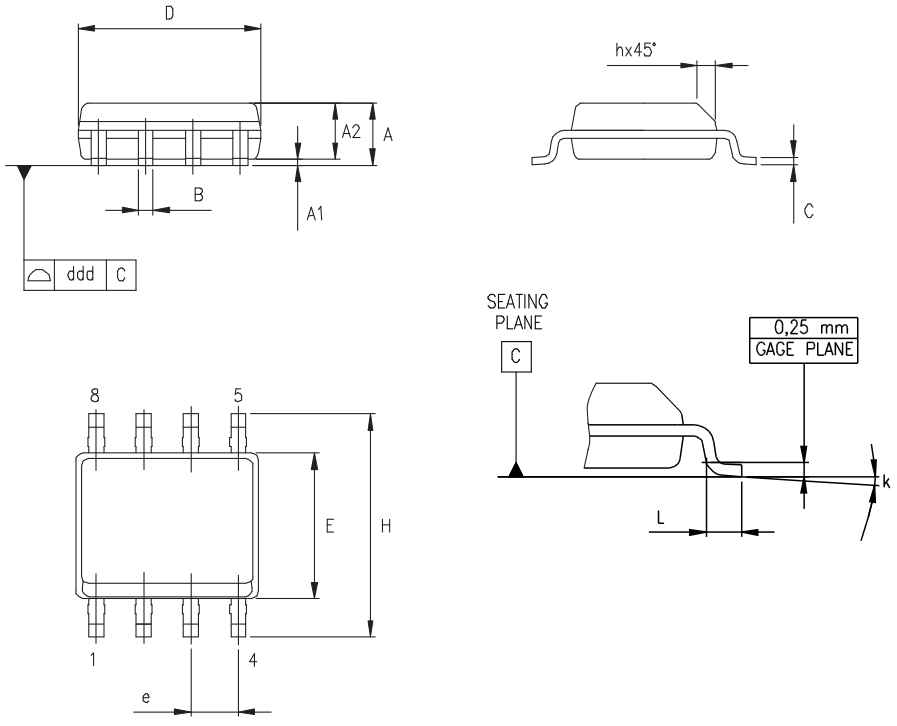
SO-8 MECHANICAL DATA

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



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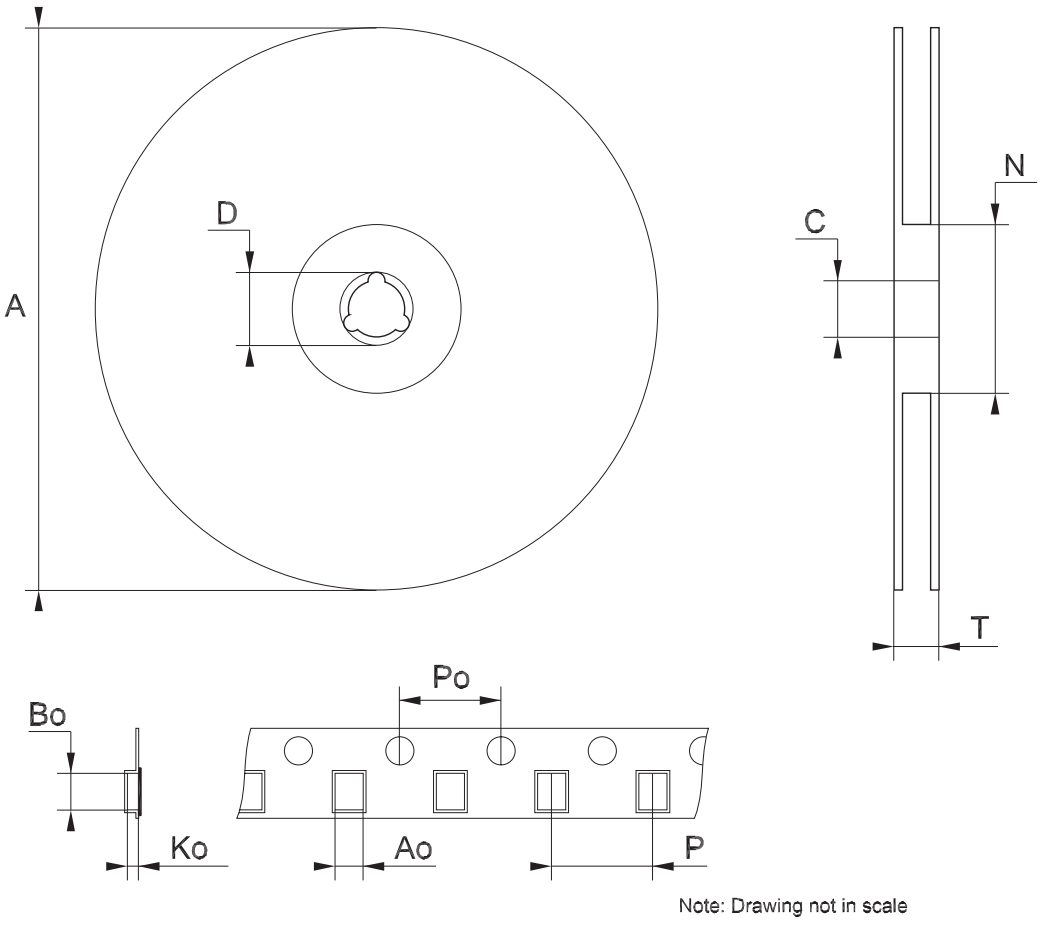
Tape & Reel SO-8 MECHANICAL DATA

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