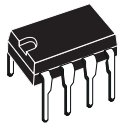
ST485E

±15KV ESD PROTECTED, 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
- ESD PROTECTION:
  ±15KV (H.B.M.)
  ±8KV (IEC-1000-4-2 CONTACT DISCHARGE)
- ALLOWS UP TO 64 TRANSCEIVERS ON THE BUS



DIP

SOP

DESCRIPTION

The ST485E is al low power transceiver for RS-485 and RS-422 communication. Each driver output and receiver input is protected against ±15KV electrostatic discharge (H.B.M.) (ESD) shocks, without latcup. These parts contain one driver and one receiver in half duplex configuration.

This transceiver draw 300µA (typ.) of supply current when unloaded or fully loaded with disabled drivers.

It operates from a single 5V supply.

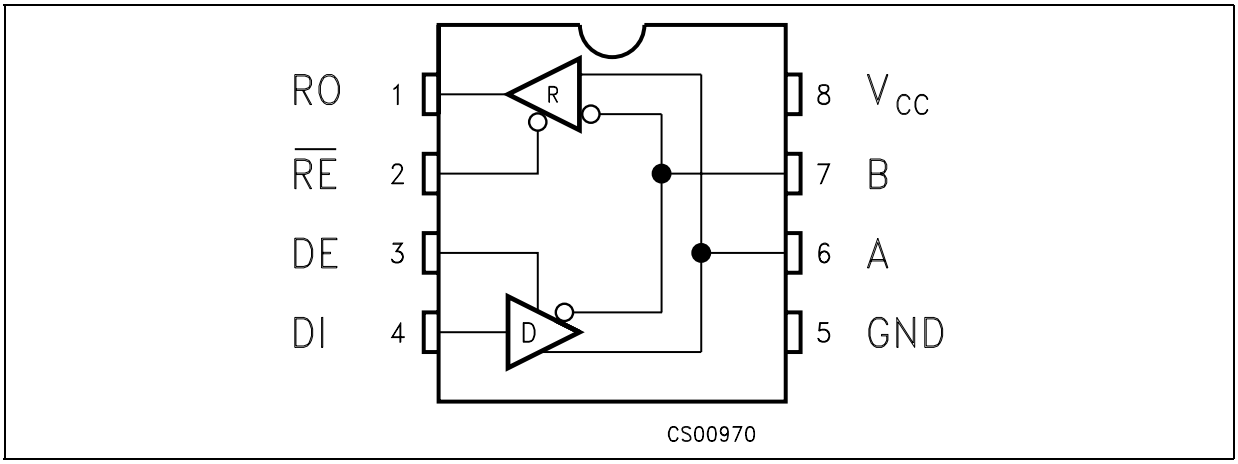
Driver is short-circuit current limited and is protected against excessive power dissipation by thermal shutdown circuitry that place the driver outputs into a high-impedance state.

The ST485E is designed for bi-directional data communications on multipoint bus transmission line (half-duplex applications).

ORDERING CODES

Type	Temperature Range	Package	Comments
ST485ECN	0 to 70 °C	DIP-8	50parts per tube / 40tube per box
ST485EBN	-40 to 85 °C	DIP-8	50parts per tube / 40tube per box
ST485EXN	-55 to 125 °C	DIP-8	50parts per tube / 40tube per box
ST485ECD	0 to 70 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485EBD	-40 to 85 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485EXD	-55 to 125 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST485ECDR	0 to 70 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST485EBDR	-40 to 85 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST485EXDR	-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.

ESD PERFORMANCE: TRANSMITTER OUTPUTS, RECEIVER INPUTS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD Protection Voltage	Human Body Model	±15			KV
ESD	ESD Protection Voltage	IEC-1000-4-2	±8			KV

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	Min.	Typ.	Max.	Unit
V_{OD1}	Differential Driver Output (No Load)				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	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	V
V_{OC}	Driver Common-Mode Output Voltage	R_L = 27Ω or 50Ω (See Fig. 1)			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	V
V_{IH}	Input High Voltage	$\overline{RE}$, DE, DI	2.0			V
V_{IL}	Input Low Voltage	$\overline{RE}$, DE, DI			0.8	V
I_{IN1}	Input Current	$\overline{RE}$, DE, DI			± 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	mA mA
V_{TH}	Receiver Differential Threshold Voltage	V_{CM} = -7 to 12V	-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			V
V_{OL}	Receiver Output Low Voltage	I_O = 4mA V_{ID} = -200mV			0.4	V
I_{OZR}	3-State (High Impedance) Output Current at Receiver	V_O = 0.4 to 2.4V			± 1	µA
R_{IN}	Receiver Input Resistance	V_{CM} = -7 to 12V	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	µA µA
I_{OSD1}	Driver Short-Circuit Current, V_O=High	V_O = -7 to 12V (Note 3)	35		250	mA
I_{OSD2}	Driver Short-Circuit Current, V_O=Low	V_O = -7 to 12V (Note 3)	35		250	mA
I_{OSR}	Receiver Short-Circuit Current	V_O = 0V to V_{CC}	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	Min.	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay Input to Output	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 5)		25	45	ns
t_{SK}	Output Skew to Output	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 5)		2	5	ns
t_{TLH} t_{THL}	Rise or Fall Time	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 5)		15	40	ns
t_{PZH}	Output Enable Time	C_L = 100pF S2 = Closed (See Fig. 4 and 6)		35	50	ns
t_{PZL}	Output Enable Time	C_L = 100pF S1 = Closed (See Fig. 4 and 6)		25	40	ns
t_{PLZ}	Output Disable Time	C_L = 15pF S1 = Closed (See Fig. 4 and 6)		25	40	ns
t_{PHZ}	Output Disable Time	C_L = 15pF S2 = Closed (See Fig. 4 and 6)		35	50	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	Min.	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay Input to Output	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 7)		110	130	ns
t_{SKD}	Differential Receiver Skew	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 7)		5	10	ns
t_{PZH}	Output Enable Time	C_{RL} = 15pF S2 = Closed (See Fig. 2 and 8)		11	35	ns
t_{PZL}	Output Enable Time	C_{RL} = 15pF S1 = Closed (See Fig. 2 and 8)		13	35	ns
t_{PLZ}	Output Disable Time	C_{RL} = 15pF S1 = Closed (See Fig. 2 and 8)		13	35	ns
t_{PHZ}	Output Disable Time	C_{RL} = 15pF S2 = Closed (See Fig. 2 and 8)		11	35	ns
f_{MAX}	Maximum Data Rate		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

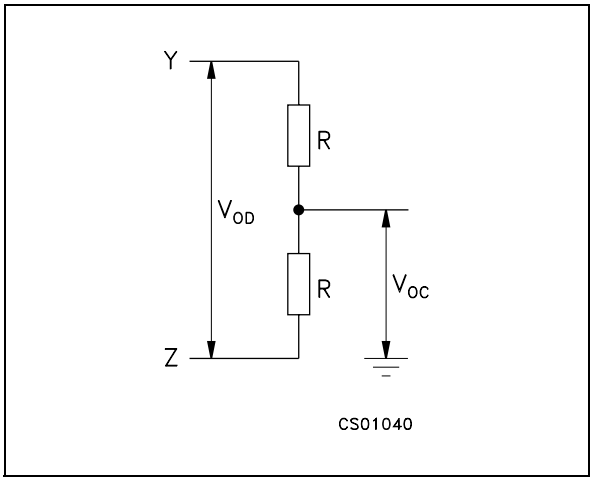


Figure 2 : Receiver Timing Test Load

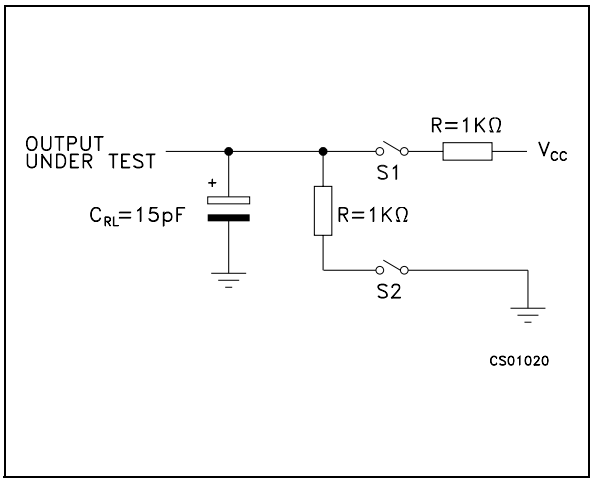


Figure 3 : Drive/Receiver Timing Test Circuit

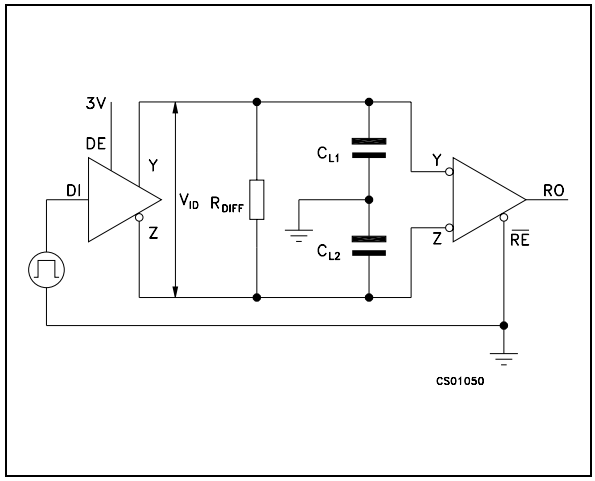


Figure 4 : Driver Timing Test Load

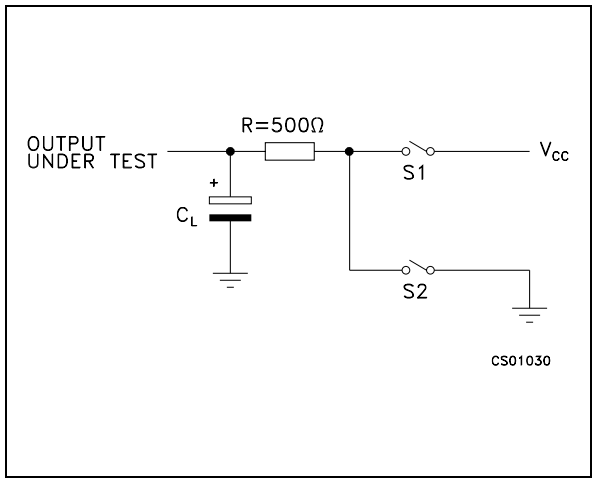


Figure 5 : Driver Propagation Delay

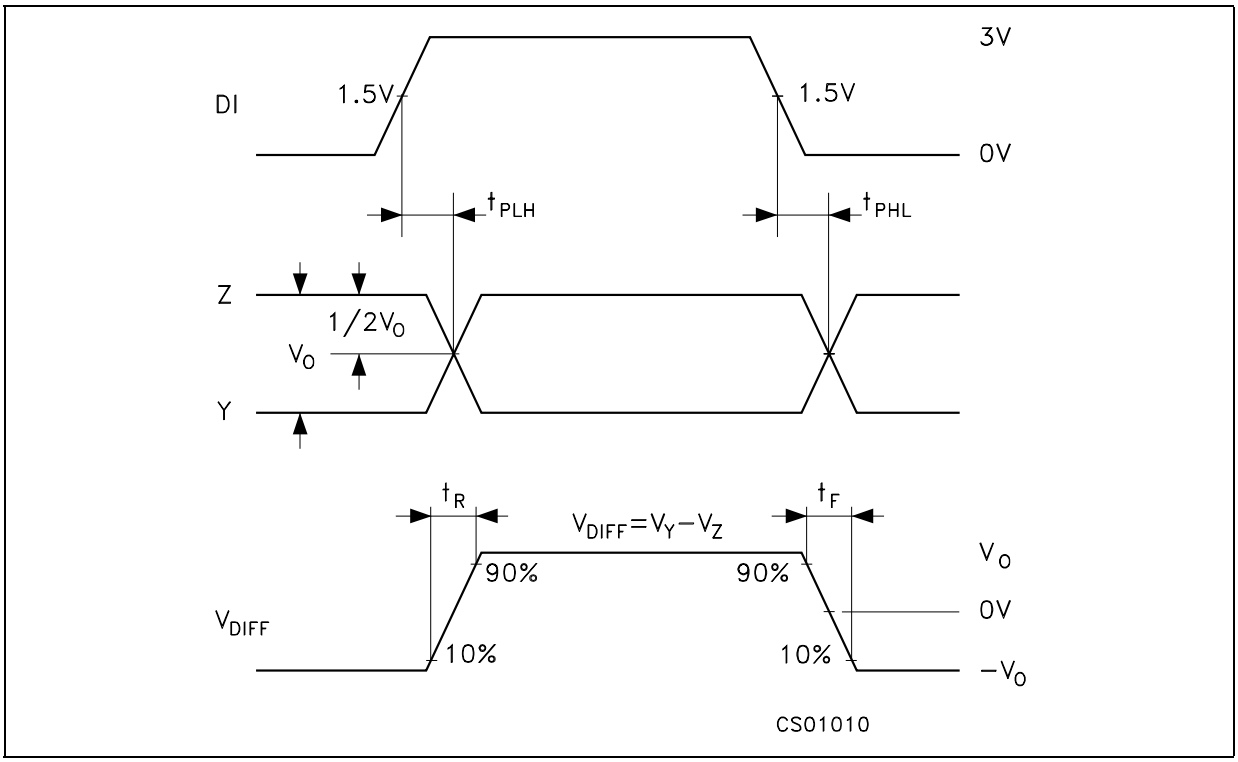


Figure 6 : Driver Enable and Disable Time

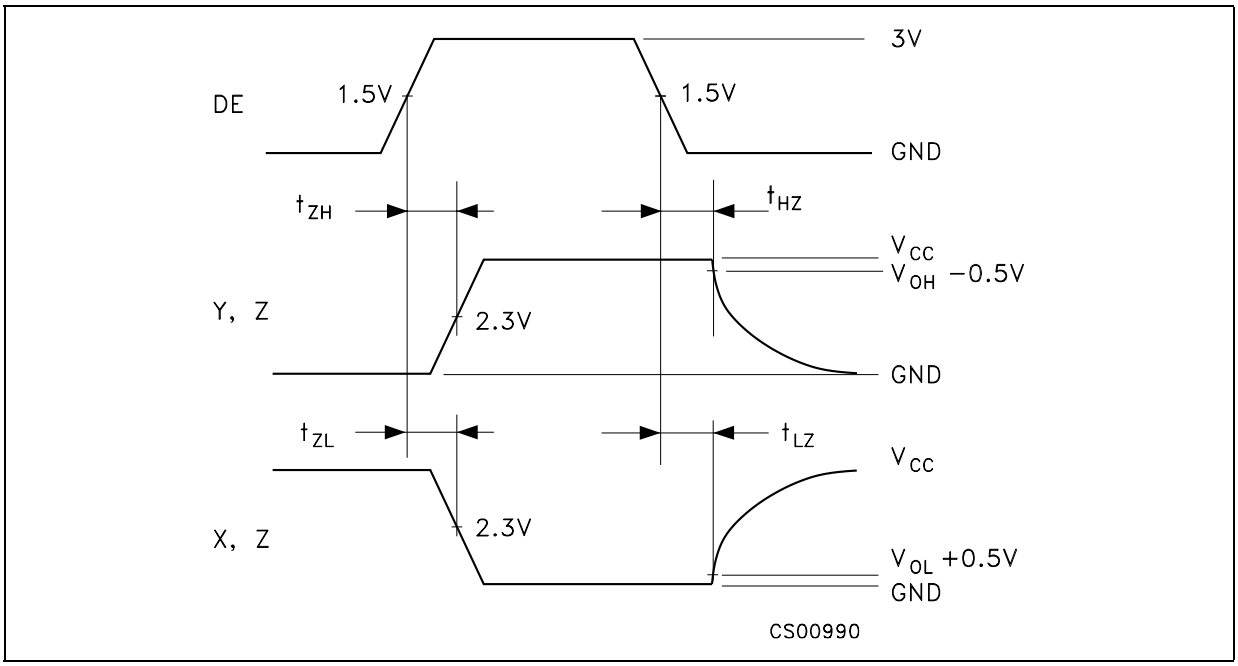


Figure 7 : Receiver Propagation Delay

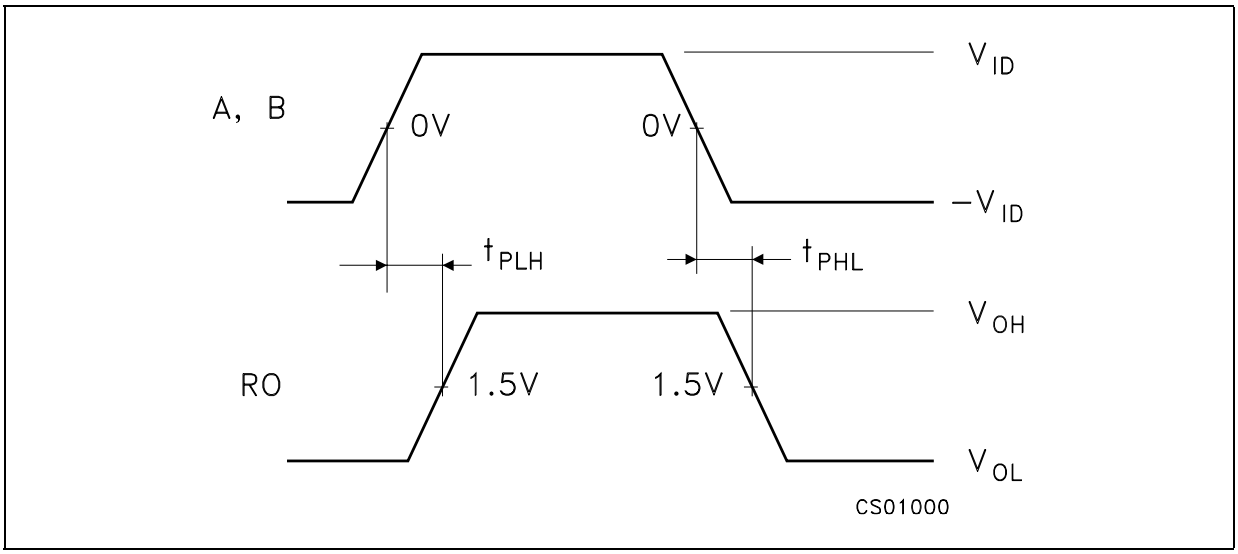


Figure 8 : Receiver Enable and Disable Time

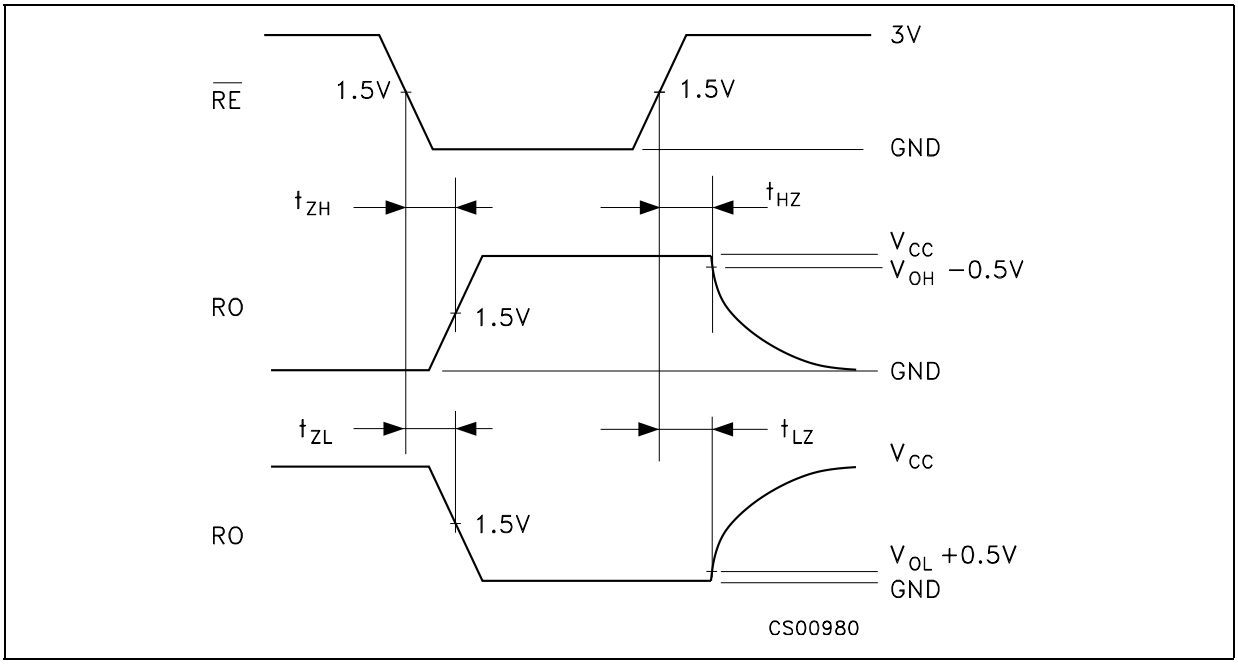


Figure 9 : Receiver Output Current vs Output Low Voltage

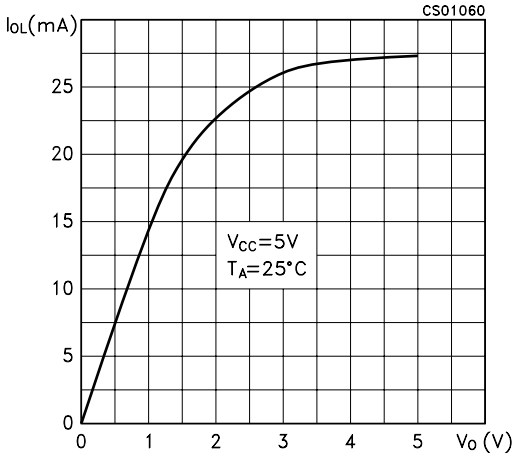


Figure 10 : Receiver Output Current vs Output High Voltage

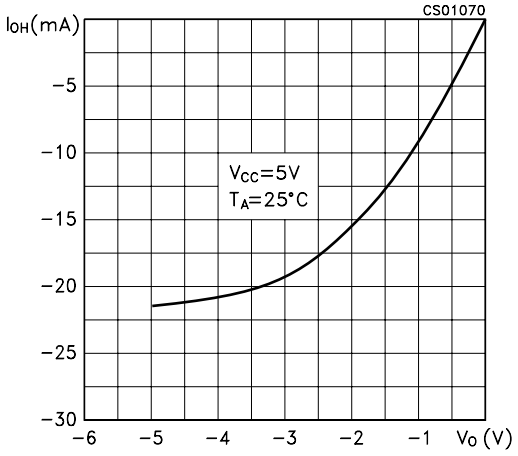


Figure 11 : Driver Output Current vs Output Low Voltage

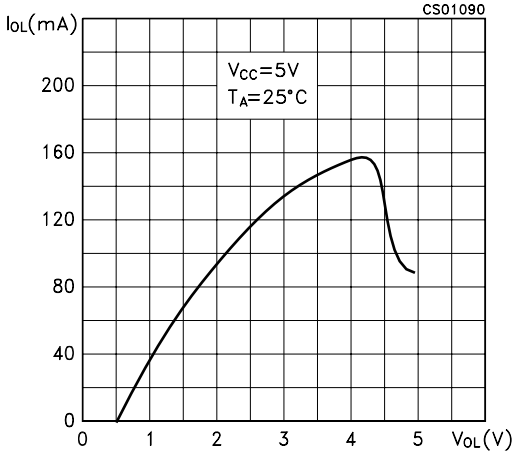


Figure 12 : Driver Output Current vs Output High Voltage

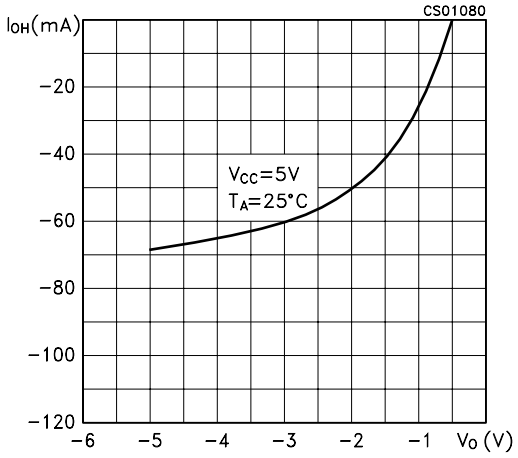


Figure 13 : Supply Current vs Temperature

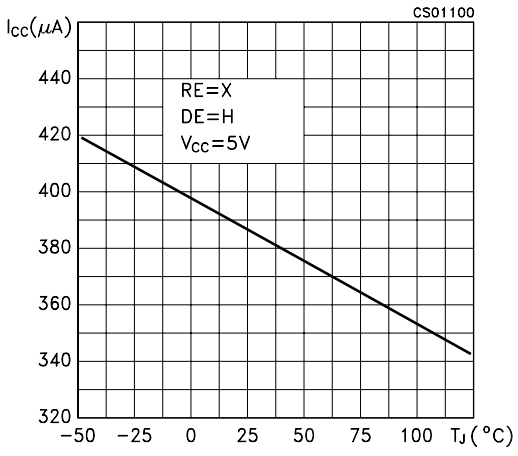


Figure 14 : Receiver High Level Output Voltage vs Temperature

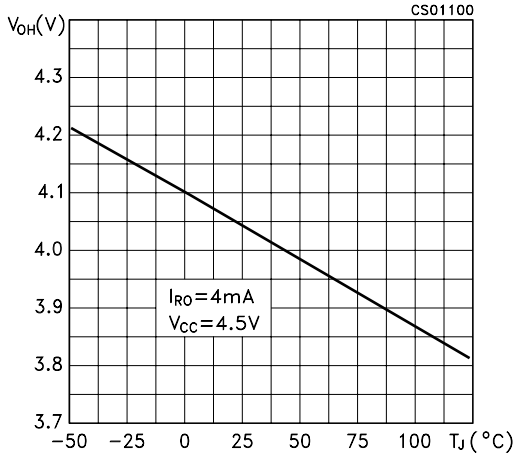


Figure 15 : Receiver Low Level Output Voltage vs Temperature

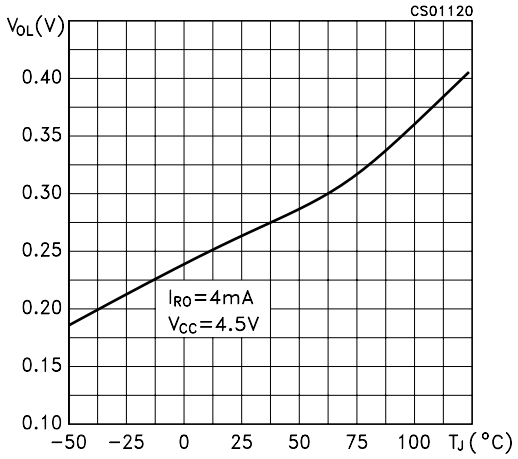
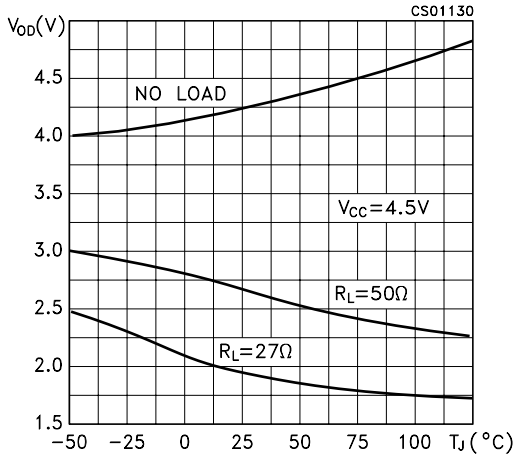
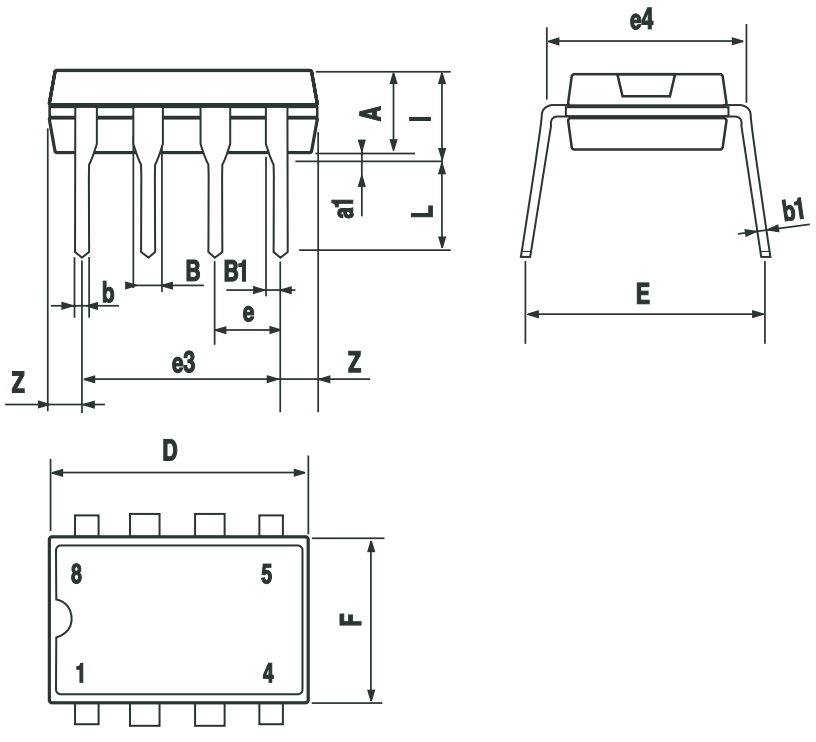


Figure 16 : Differential Driver Output Voltage vs Temperature



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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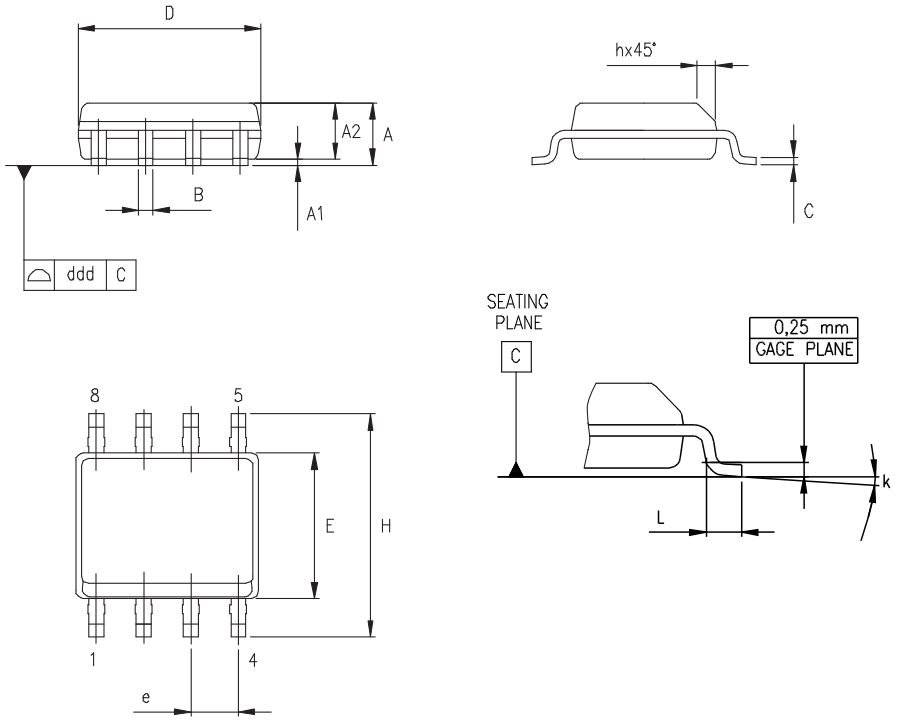
SO-8 MECHANICAL DATA

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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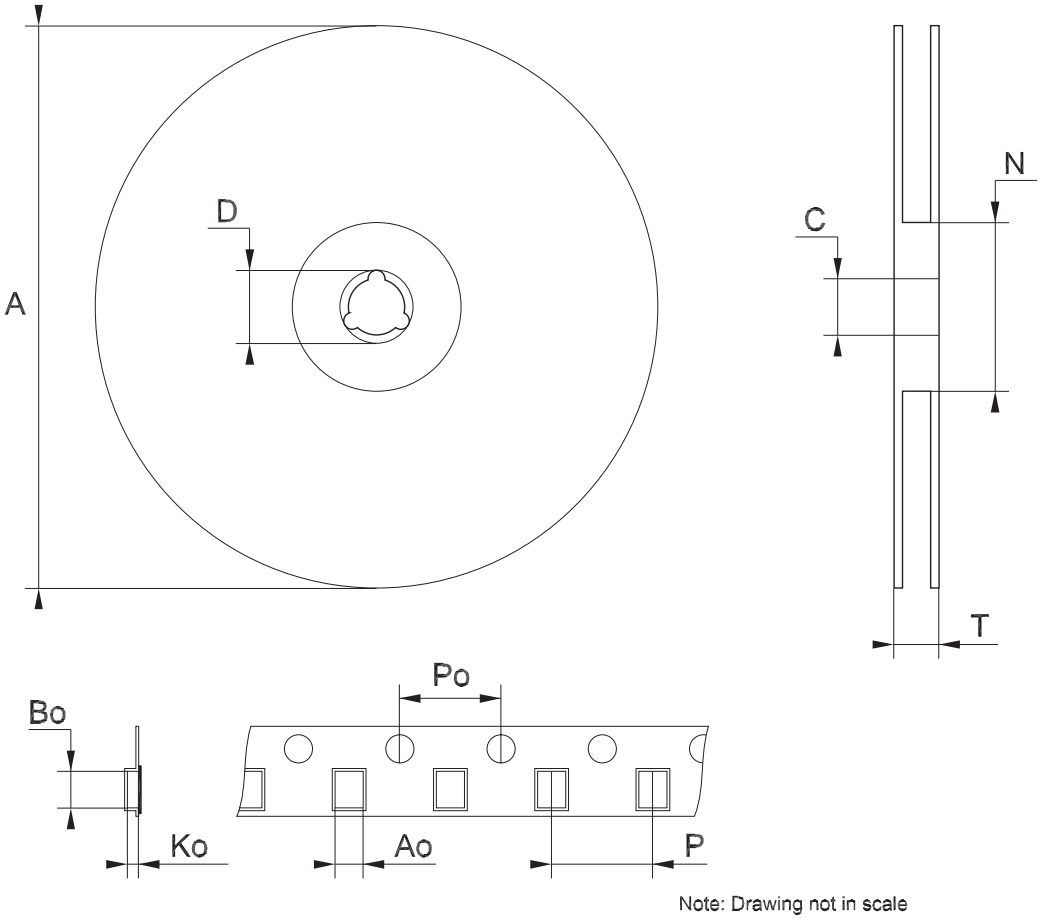
Tape & Reel SO-8 MECHANICAL DATA

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

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