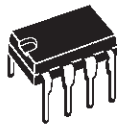
ST75C176

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 32 TRANSCEIVERS ON THE BUS
- BIC MOS TECHNOLOGY



DIP

SOP

DESCRIPTION

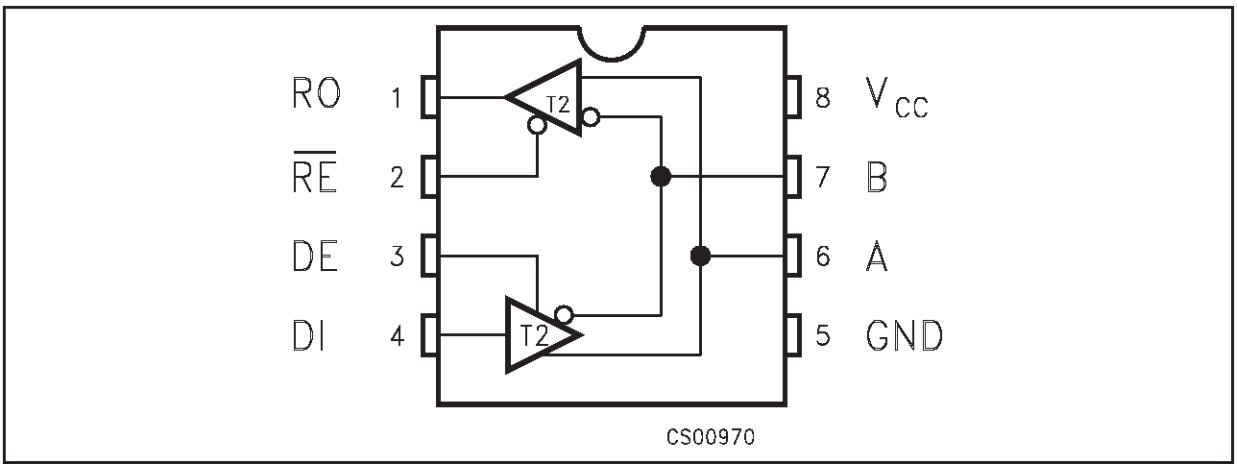
The ST75C176 is al low power transceiver for RS-485 and RS-422 communication. Each part contains one driver and one receiver.
This transceiver draw 300µA (typ.) of supply current when unloaded or fully loaded with disabled drivers.

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 receiver input has a fail safe feature that guarantees a logic-high output if the input is open circuit.
The ST75C176 is designed for bi-directional data communications on multipoint bus transmission line (half-duplex applciations).

ORDERING CODES

Type	Temperature Range	Package	Comments
ST75C176CN	0 to 70 °C	DIP-8	50parts per tube / 40tube per box
ST75C176BN	-40 to 85 °C	DIP-8	50parts per tube / 40tube per box
ST75C176CD	0 to 70 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST75C176BD	-40 to 85 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST75C176CDR	0 to 70 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST75C176BDR	-40 to 85 °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	12	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	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	12			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)	10	30	60	ns
t_{SK}	Output Skew to Output	R_{DIFF} = 54Ω C_{L1} = C_{L2} = 100pF (See Fig. 3 and 5)		5	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	ns
t_{PZH}	Output Enable Time	C_L = 100pF S2 = Closed (See Fig. 4 and 6)		40	70	ns
t_{PZL}	Output Enable Time	C_L = 100pF S1 = Closed (See Fig. 4 and 6)		40	70	ns
t_{PLZ}	Output Disable Time	C_L = 15pF S1 = Closed (See Fig. 4 and 6)		40	70	ns
t_{PHZ}	Output Disable Time	C_L = 15pF S2 = Closed (See Fig. 4 and 6)		40	70	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)	20	130	210	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	ns
t_{PZL}	Output Enable Time	C_{RL} = 15pF S2 = Closed (See Fig. 2 and 8)		20	50	ns
t_{PLZ}	Output Disable Time	C_{RL} = 15pF S1 = Closed (See Fig. 2 and 8)		20	50	ns
t_{PHZ}	Output Disable Time	C_{RL} = 15pF S2 = Closed (See Fig. 2 and 8)		20	50	ns
f_{MAX}	Maximum Data Rate		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

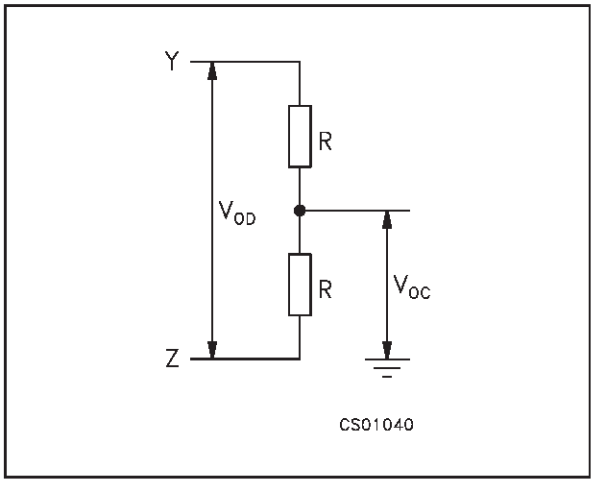


Figure 2 : Receiver Timing Test Load

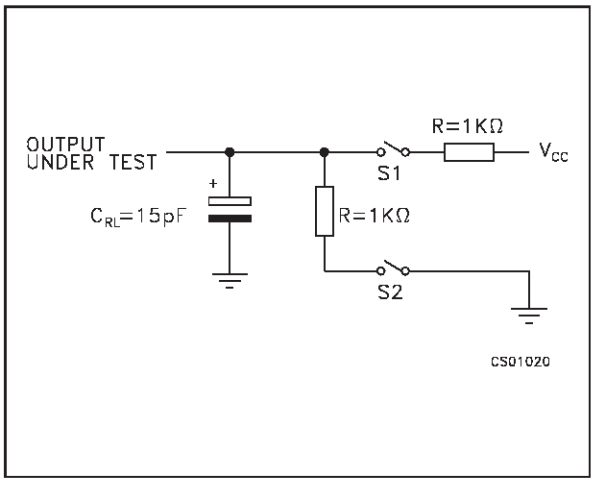


Figure 3 : Drive/Receiver Timing Test Circuit

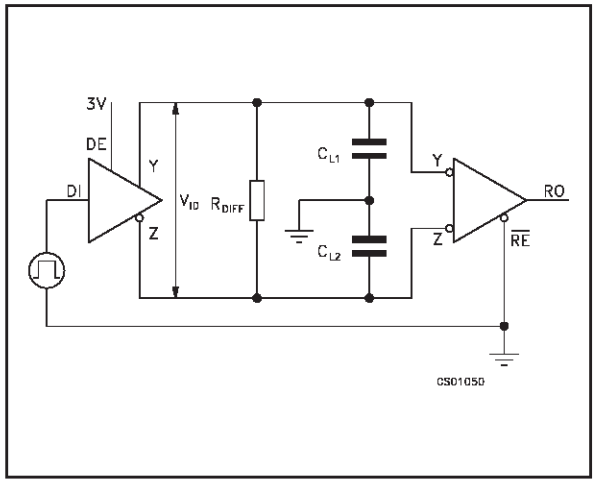


Figure 4 : Driver Timing Test Load

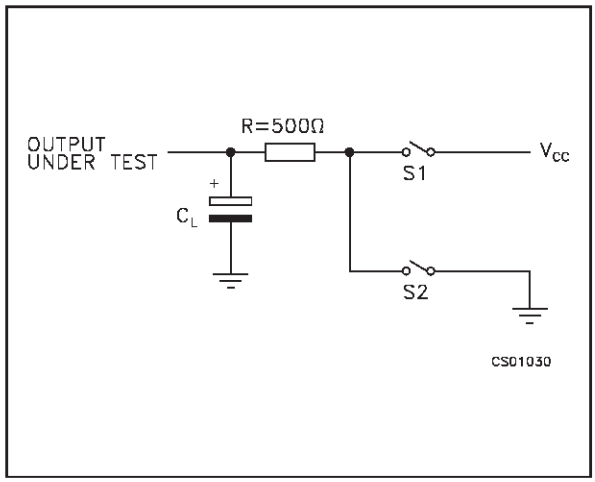


Figure 5 : Driver Propagation Delay

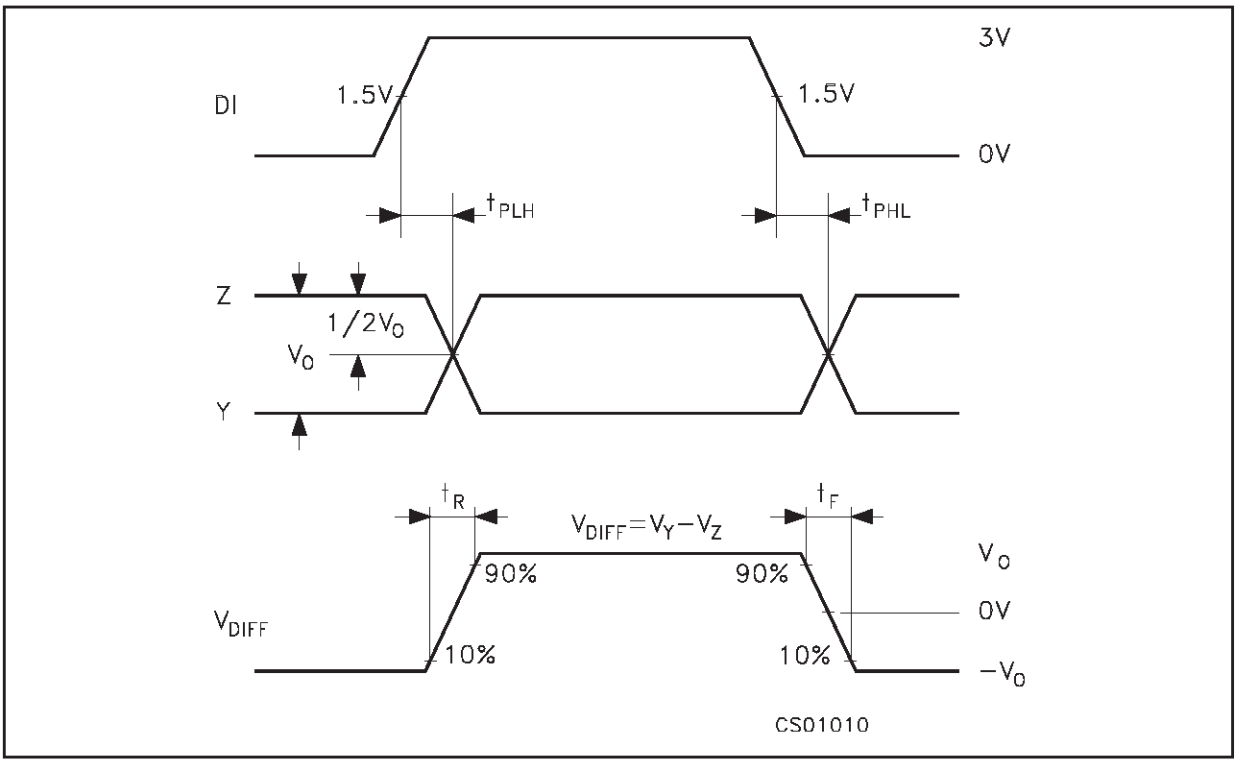


Figure 6 : Driver Enable and Disable Time

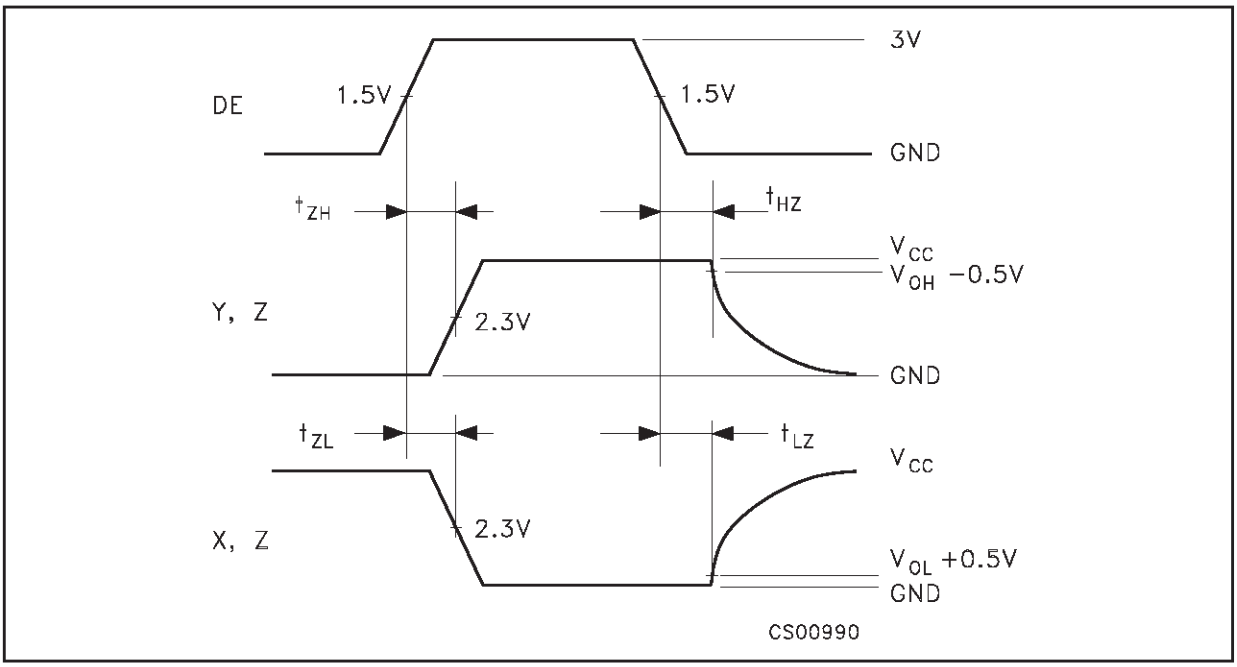


Figure 7 : Receiver Propagation Delay

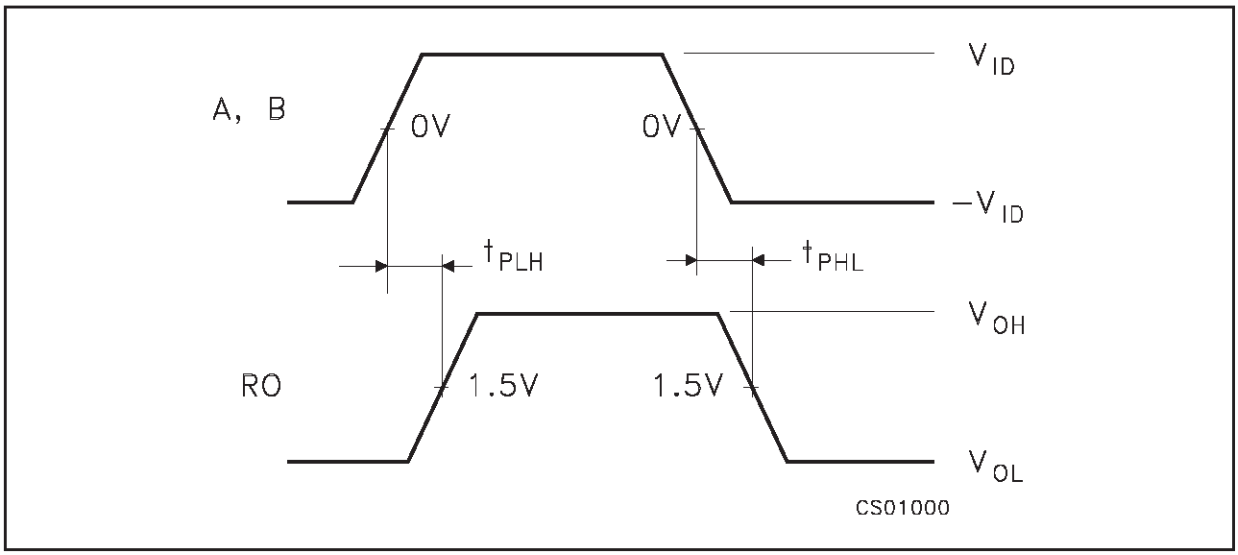


Figure 8 : Receiver Enable and Disable Time

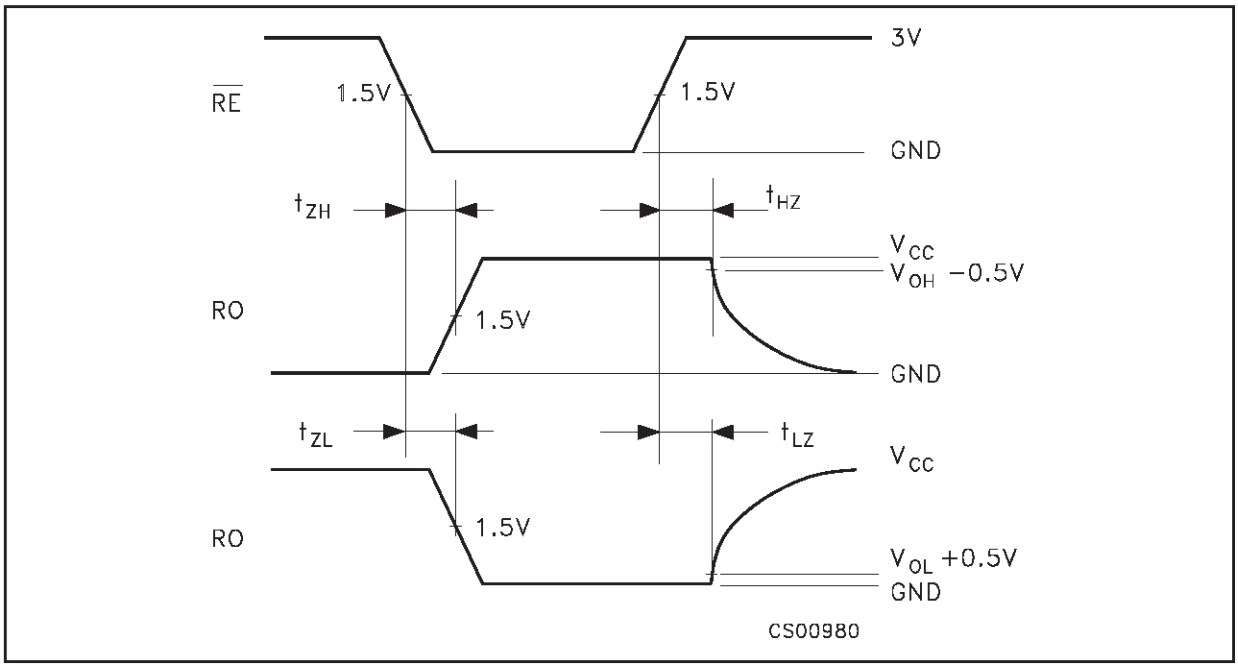


Figure 9 : Receiver Output Current vs Output Low Voltage

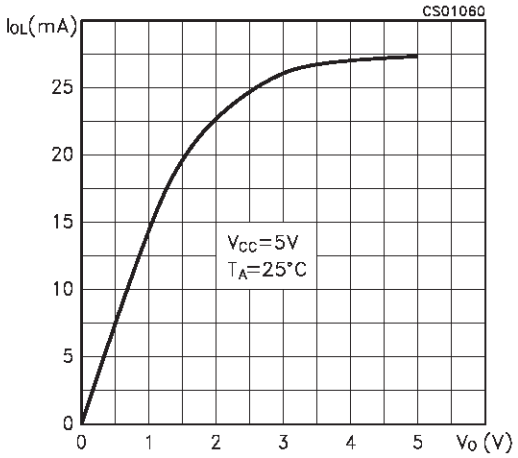


Figure 10 : Receiver Output Current vs Output High Voltage

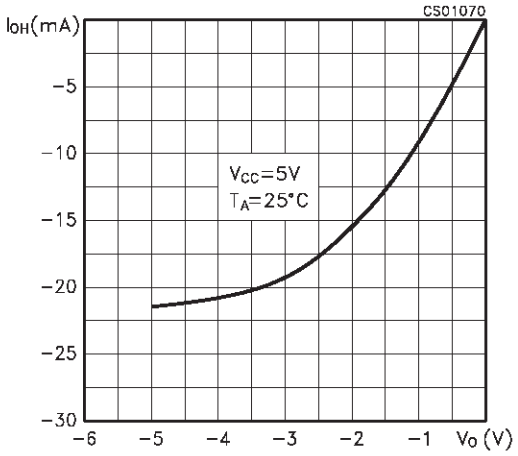


Figure 11 : Driver Output Current vs Output Low Voltage

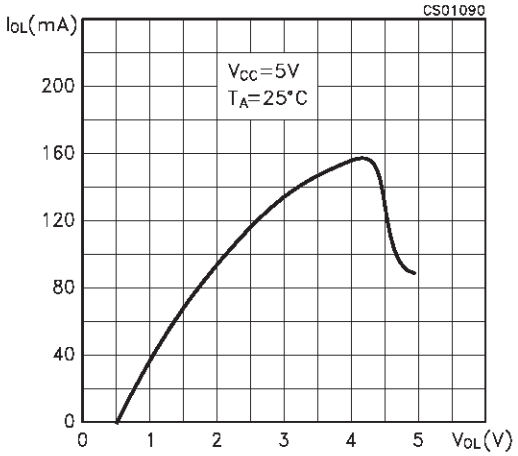


Figure 12 : Driver Output Current vs Output High Voltage

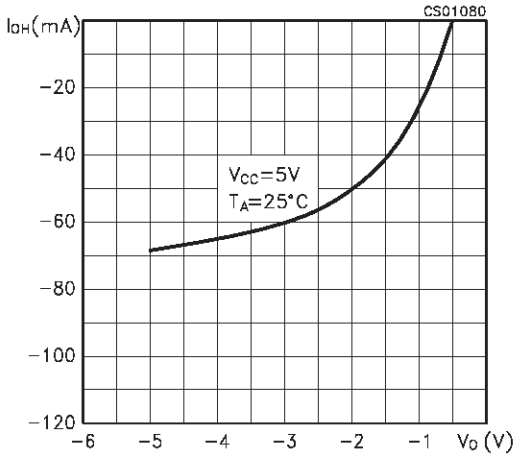


Figure 13 : Supply Current vs Temperature

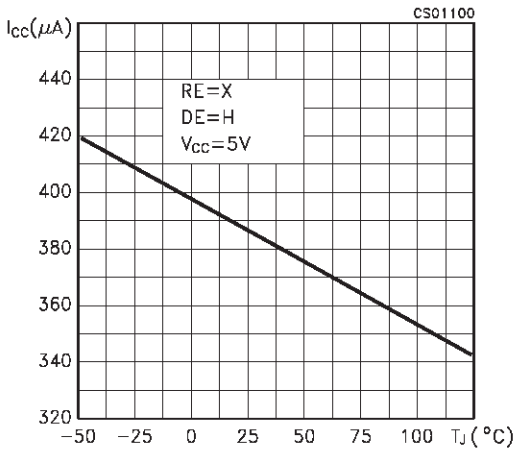


Figure 14 : Receiver High Level Output Voltage vs Temperature

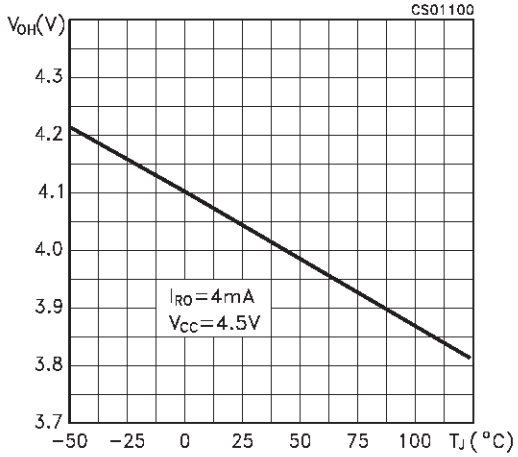


Figure 15 : Receiver Low Level Output Voltage vs Temperature

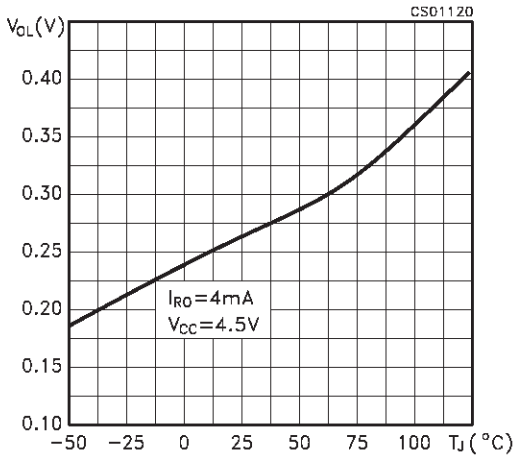
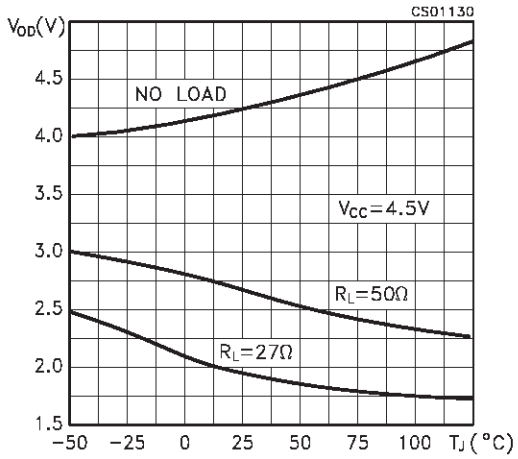
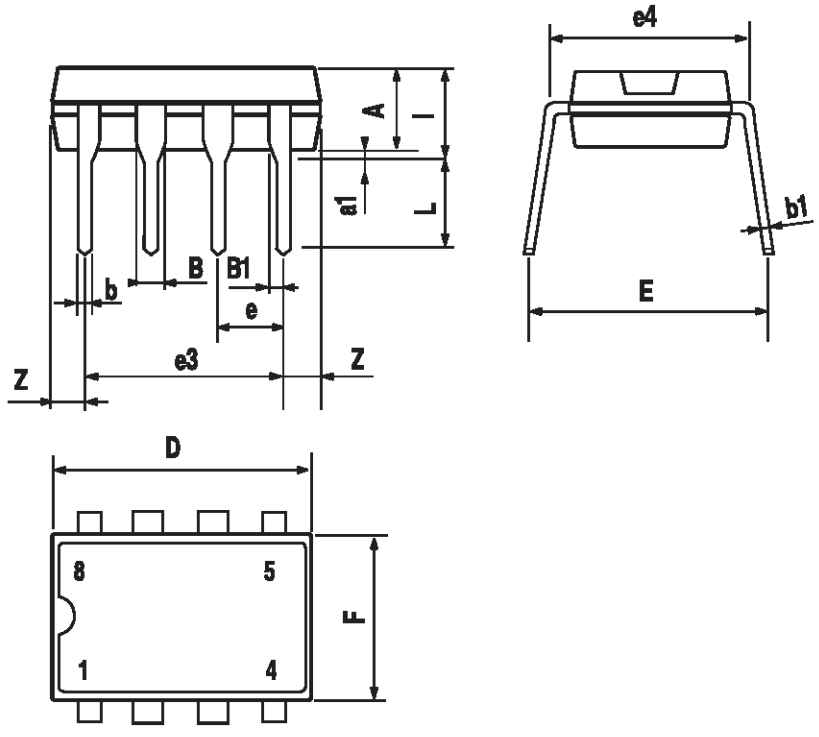


Figure 16 : Differential Driver Output Voltage vs Temperature



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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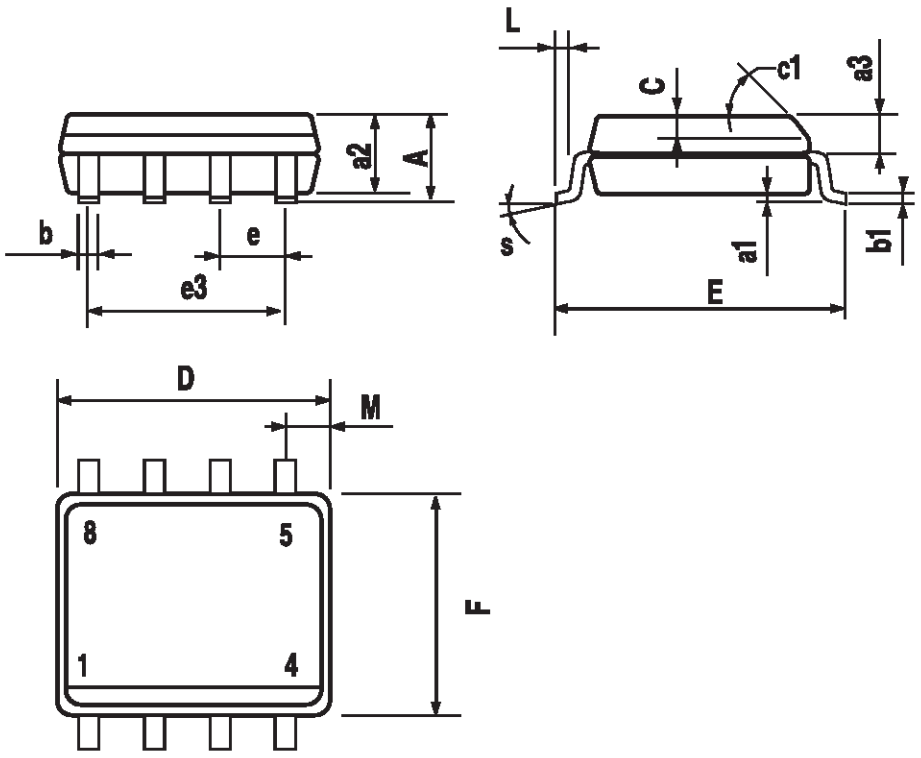
SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.189		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.149		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



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