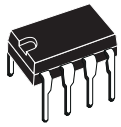
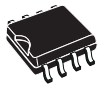
ST3485E

3.3V POWERED, 15KV ESD PROTECTED, TRASMIT AT UP TO 12MBPS TRUE RS-485/RS-422 TRANSCEIVER

- ESD PROTECTION:
  ±15KV HUMAN BODY MODEL
  ±8KV IEC 1000-4-2 CONTACT DISCHARGE
- OPERATE FROM A SINGLE 3.3V SUPPLY - NO CHARGE PUMP REQUIRED
- INTEROPERABLE WITH 5V LOGIC
- 1µA LOW CURRENT SHUTDOWN MODE MAX
- GUARANTEED 12 Mbps DATA RATE
- -7 TO 12 COMMON MODE INPUT VOLTAGE RANGE
- HALF DUPLEX VERSIONS AVAILABLE
- INDUSTRY STANDARD 75176 PINOUT
- CURRENT LIMITING AND THERMAL SHUTDOWN FOR DRIVER OVERLOAD PROTECTION
- GUARANTEED HIGH RECEIVER OUTPUT STATE FOR FLOATING INPUTS WITH NO SIGNAL PRESENT
- ALLOW UP TO 64 TRANSCEIVERS ON THE BUS



DIP



SOP

DESCRIPTION

The ST3485E is ±15kV ESD protected, 3.3V low power transceiver for RS-485 and RS-422 communications. The device contains one driver and one receiver in half duplex configuration. The ST3485E transmit and receive at guaranteed data rate at least to 12Mbps.

All transmitter outputs and receiver inputs are protected to ±15kV using Human Body Model.

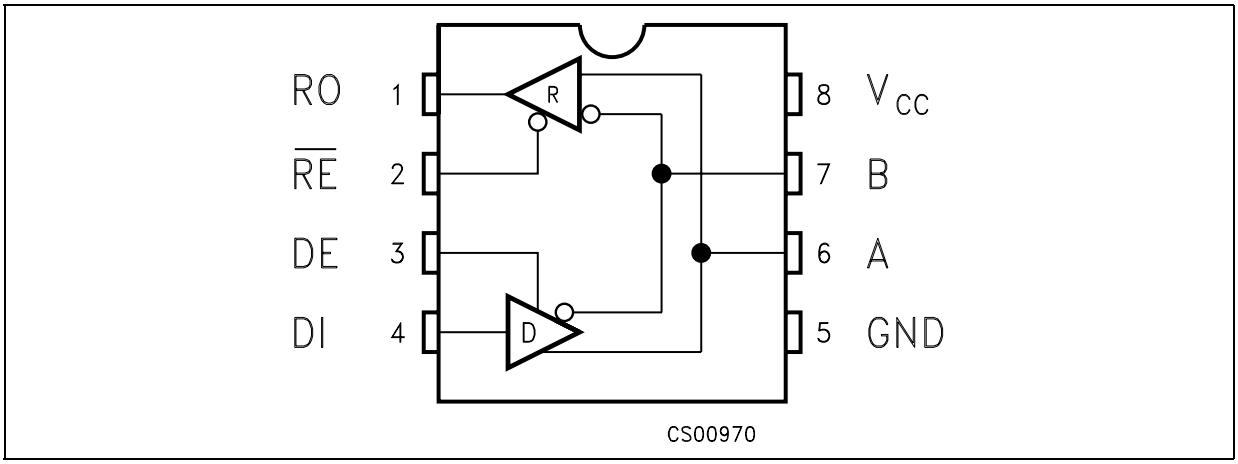
Driver is short-circuit current limited and is protected against excessive power dissipation by thermal shutdown circuitry that place the driver outputs into a high-impedance state.

The ST3485E input has a true fail-safe feature that guarantees a logic high output if both inputs are open circuit, shorted together or in presence of the termination with no signal on the bus.

ORDERING CODES

Type	Temperature Range	Package	Comments
ST3485ECN	0 to 70 °C	DIP-8	50parts per tube / 40tube per box
ST3485EBN	-40 to 85 °C	DIP-8	50parts per tube / 40tube per box
ST3485ECD	0 to 70 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST3485EBD	-40 to 85 °C	SO-8 (Tube)	100parts per tube / 20tube per box
ST3485ECDR	0 to 70 °C	SO-8 (Tape & Reel)	2500 parts per reel
ST3485EBDR	-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. 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}= 3V to 3.6V

TRUTH TABLE (DRIVER)

INPUTS			OUTPUTS		MODE
$\overline{RE}$	DE	DI	B	A	
X	H	H	L	H	Normal
X	H	L	H	L	Normal
L	L	X	Z	Z	Normal
H	L	X	Z	Z	Shutdown

X= Don't Care; Z=High Impedance

TRUTH TABLE (RECEIVER)

INPUTS			OUTPUT	MODE
$\overline{RE}$	DE	A-B	RO	
L	L	≥ -0.015V	H	Normal
L	L	≤ -0.2V	L	Normal
L	L	Inputs Open	H	Normal
L	L	Inputs Shorted	H	Normal
H	L	X	Z	Shutdown

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)	-0.3 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

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 Contact Disharge		± 8		KV

ELECTRICAL CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{SUPPLY}	V_{CC} Power Supply Current	No Load, DI=0V or V_{CC}	$\overline{DE}$=V_{CC}, $\overline{RE}$=0V or V_{CC}		1.3	2.2	mA
			DE=0V, $\overline{RE}$=0V		1.2	1.9	mA
I_{SHDN}	Shutdown Supply Current	DE=0V, RE=V_{CC}, DI=0V or V_{CC}			0.002	1	µA

LOGIC INPUT ELECTRICAL CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_{IL}	Input Logic Threshold Low	DE, DI, RE			1.3	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)	DE=0V, V_{CC}= 0 or 3.6V	V_{IN}=12V			1	mA
			V_{IN}=-7V			-0.8	mA

TRANSMITTER ELECTRICAL CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{OD}	Differential Drive Output	R_L= 100Ω (RS-422) (Figure 1)	2			V
		R_L= 54Ω (RS-485) (Figure 1)	1.5			V
		R_L= 60Ω (RS-485) (Figure 2)	1.5			V
ΔV_{OD}	Change in magnitude of Driver Differential Output Voltage for Complementary Output States (Note1)	R_L= 54Ω or 100Ω (Figure 1)			0.2	V
V_{OC}	Driver Common Mode Output Voltage	R_L= 54Ω or 100Ω (Figure 1)			3	V
ΔV_{OC}	Change in magnitude of Driver Common Mode Output Voltage (Note1)	R_L= 54Ω or 100Ω (Figure 1)			0.2	V
I_{OSD}	Driver Short Circuit Output Current				± 250	mA

RECEIVER ELECTRICAL CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TH}	Receiver Differential Threshold Voltage	V_{CM} = -7V to 12V, DE = 0	-0.2		-0.015	V
ΔV_{TH}	Receiver Input Hysteresis	V_{CM} = 0V		30		V
V_{OH}	Receiver Output High Voltage	I_{OUT} = -4mA, V_{ID} = 200mV, (Figures 8,9)	2			V
V_{OL}	Receiver Output Low Voltage	I_{OUT} = 4mA, V_{ID} = -200mV, (Figure 3)			0.4	V
I_{OZR}	3-State (High Impedance) Output Current at Receiver	V_{CC} = 3.6V V_O = 0V to V_{CC}			± 1	µA
R_{RIN}	Receiver Input Resistance	V_{CM} = -7V to 12V	24			KΩ
I_{OSR}	Receiver Short-Circuit Current	V_{RO} = 0V to V_{CC}	7		60	mA

DRIVER SWITCHING CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_R	Maximum Data Rate		12	15		Mbps
t_{DD}	Differential Output Delay	R_L= 60Ω C_L = 15pF, (Figures 4,5)		18	30	ns
t_{TD}	Differential Output Transition Time	R_L= 60Ω C_L = 15pF, (Figures 4,5)		12	20	ns
t_{PLH} t_{PHL}	Propagation Delay	R_L= 27Ω C_L = 15pF, (Figures 8,9)		18	30	ns
t_{PDS}	$\|t_{PLH} - t_{PHL}\|$ Propagation Delay Skew (Note2)	R_L= 27Ω C_L = 15pF, (Figures 8,9)		2	5	ns
t_{PZL}	Output Enable Time	R_L= 110Ω (Figures 10,11)		19	35	ns
t_{PZH}	Output Enable Time	R_L= 110Ω (Figures 6,7)		30	50	ns
t_{PHZ}	Output Disable Time	R_L= 110Ω (Figures 6,7)		19	35	ns
t_{PLZ}	Output Disable Time	R_L= 110Ω (Figures 10,11)		30	50	ns
t_{SKEW}	Differential Output Delay Skew			1	3	ns
$t_{ZH(SHDN)}$	Driver Enable from Shutdown to Output High			30	50	ns
$t_{ZL(SHDN)}$	Driver Enable from Shutdown to Output Low			19	35	ns

RECEIVER SWITCHING CHARACTERISTICS

V_{CC} = 3V to 3.6V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_a = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay	V_{ID} =0V to 3V C_{L1} = 15pF, (Figures 12,13)		30	50	ns
t_{RPDS}	$\|t_{PLH} - t_{PHL}\|$ Propagation Delay Skew	V_{ID} =0V to 3V C_{L1} = 15pF, (Figures 12,13)		1	3	ns
t_{PZL}	Output Enable Time	C_{RL} = 15pF (Figures 14-18)		10	20	ns
t_{PZH}	Output Enable Time	C_{RL} = 15pF (Figures 14-18)		10	20	ns
t_{PHZ}	Output Disable Time	C_{RL} = 15pF (Figures 14-18)		10	20	ns
t_{PLZ}	Output Disable Time	C_{RL} = 15pF (Figures 14-18)		10	20	ns
$t_{ZH(SHDN)}$	Receiver Enable from Shutdown to Output High	C_{RL} = 15pF (Figures 14-18)		10	20	ns
$t_{ZL(SHDN)}$	Receiver Enable from Shutdown to Output Low	C_{RL} = 15pF (Figures 14-18)		20	40	ns

Note 1: ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC}, respectively, when the DI input changes state.
Note 2: measured on $|t_{PLH}(A)-t_{PHL}(A)|$ and $|t_{PLH}(B)-t_{PHL}(B)|$
Note 3: The transceivers are put into shutdown by bring RE high and DE low. If the input are in state for less than 80ns, the part are guarenteed not to enter shutdown. If the inputs are in this state for at least 300ns, the parts are guarenteed to have entered shutdown.

TEST CIRCUITS AND TYPICAL CHARACTERISTICS

Figure 1 : Driver and V_{OC} Test Load

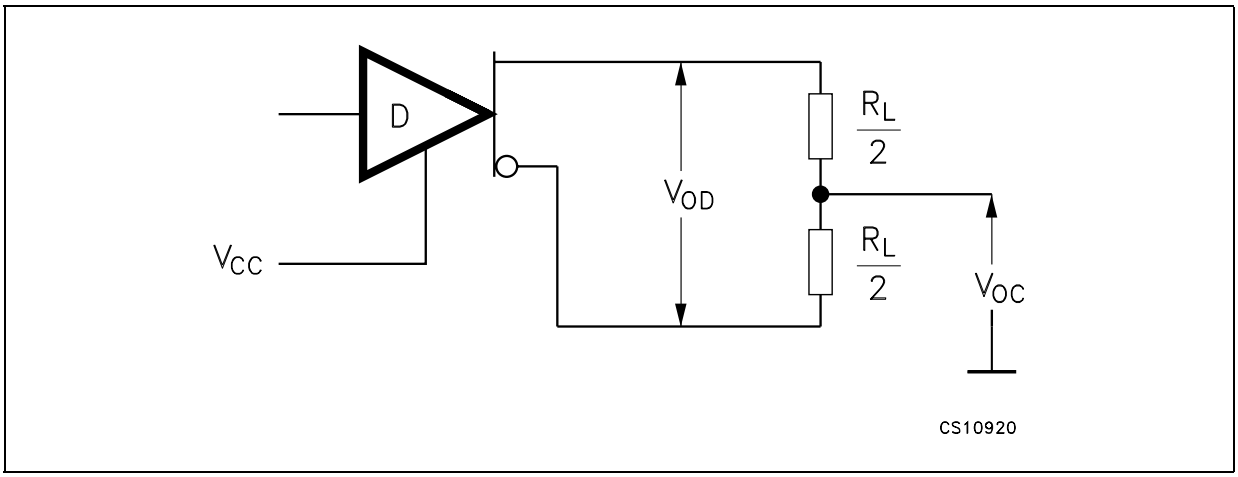


Figure 2 : Driver V_{OD} with Varying Common Mode Voltage Test Load

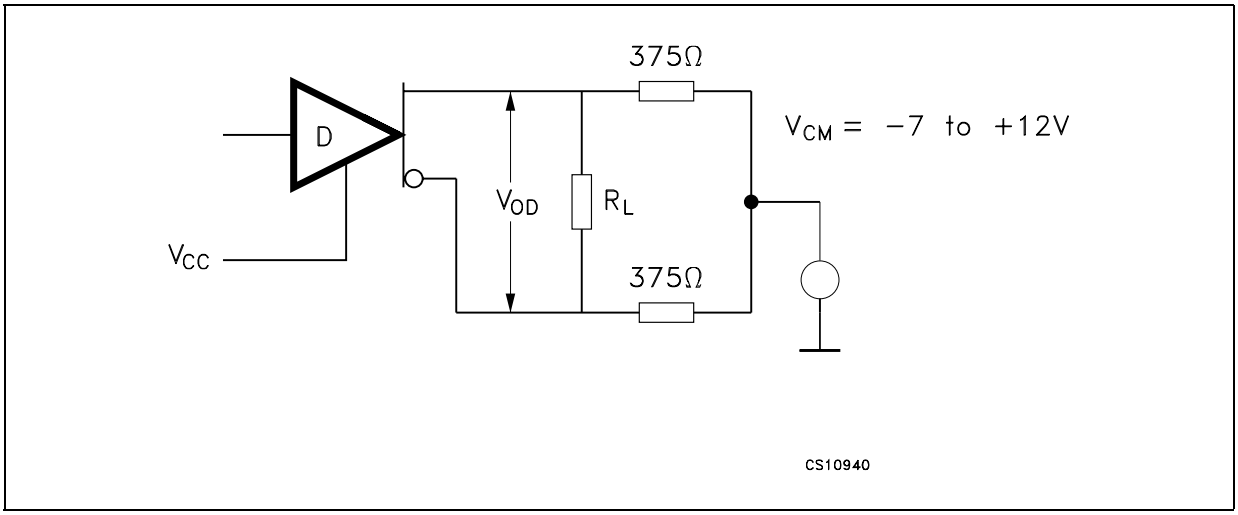


Figure 3 : Receiver V_{OH} and V_{OL} Test Circuit

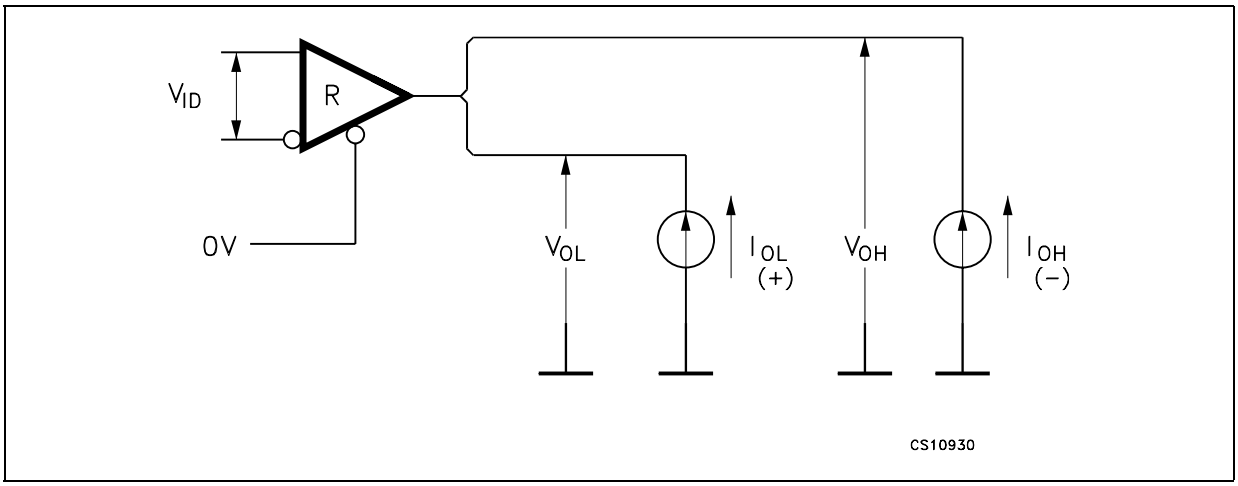


Figure 4 : Drive Differential Output Delay Transition Time Test Circuit

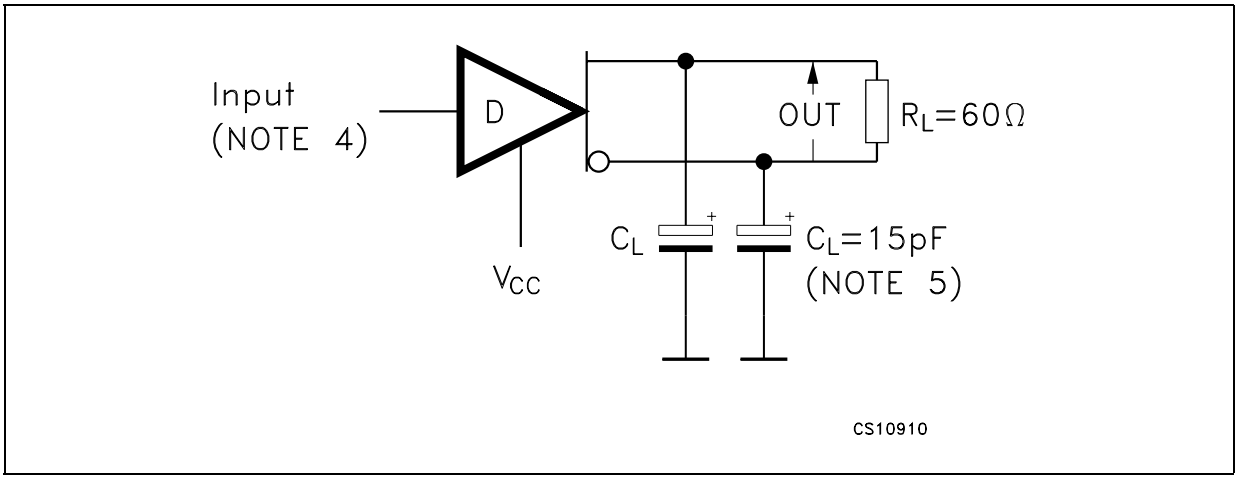


Figure 5 : Drive Differential Output Delay Transition Time Waveform

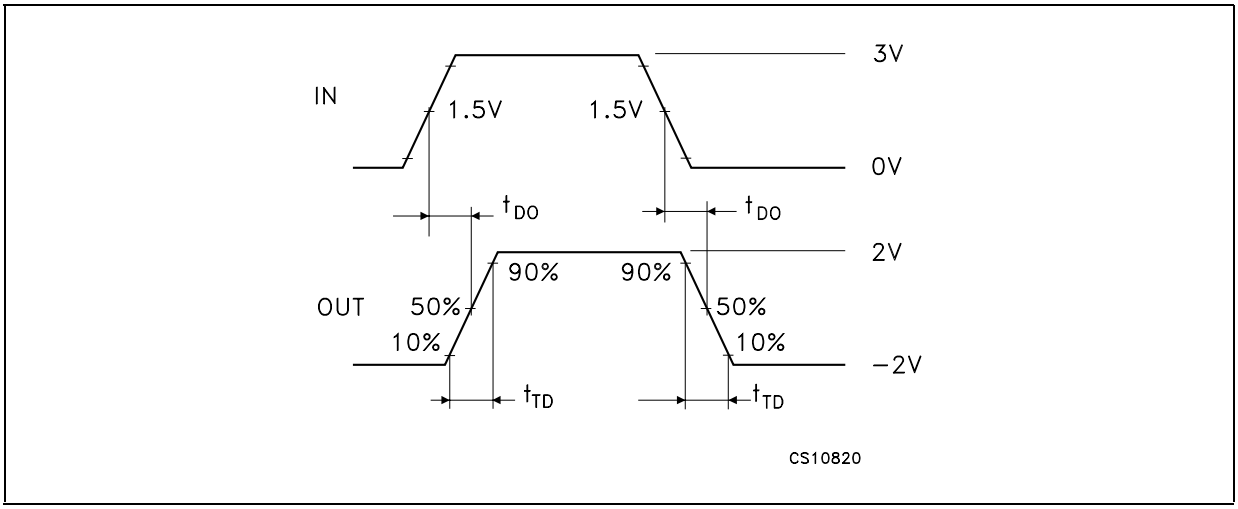


Figure 6 : Drive Enable and Disable Times Test Circuit

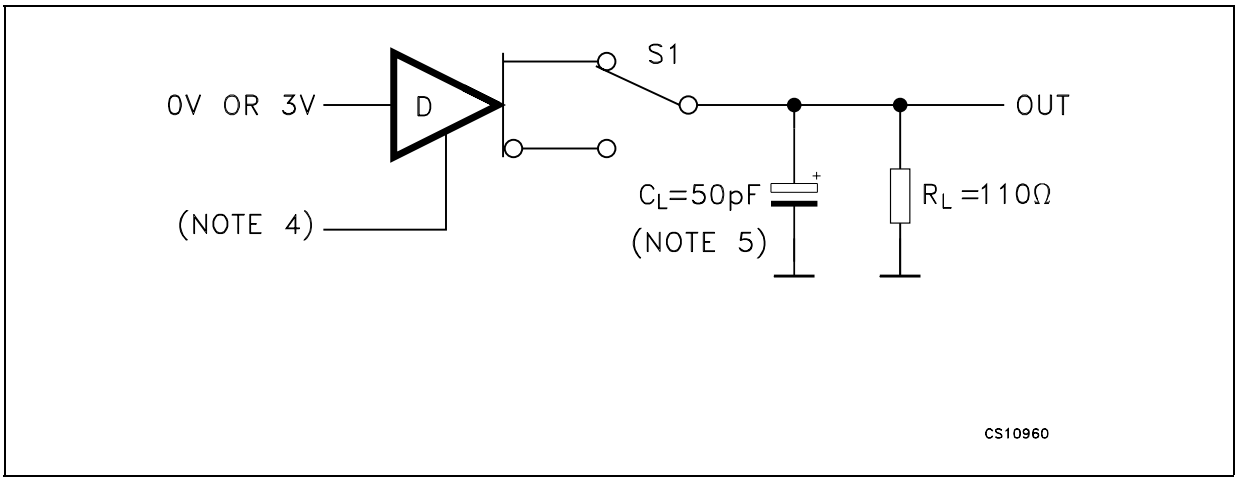


Figure 7 : Drive Enable and Disable Times Waveforms

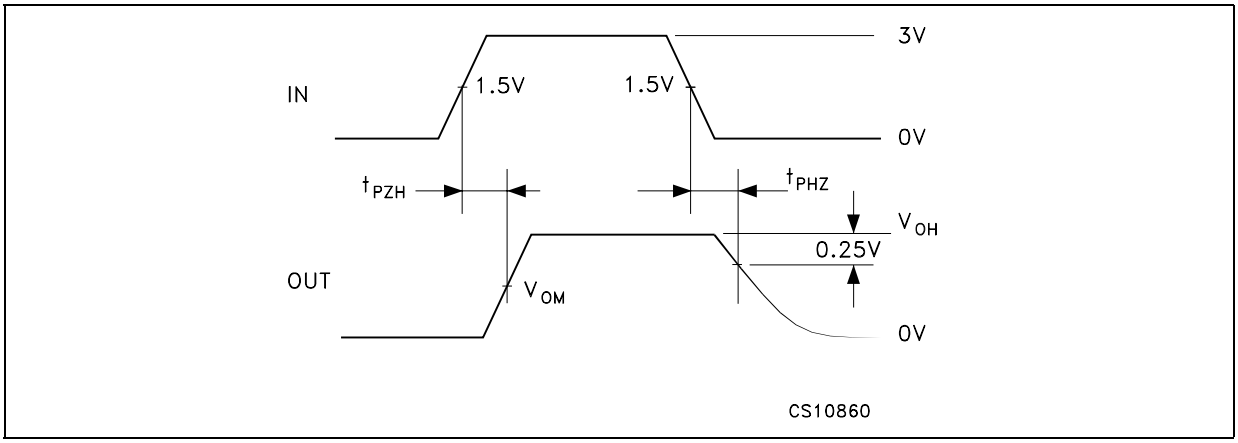


Figure 8 : Drive Propagation Time Test Circuit

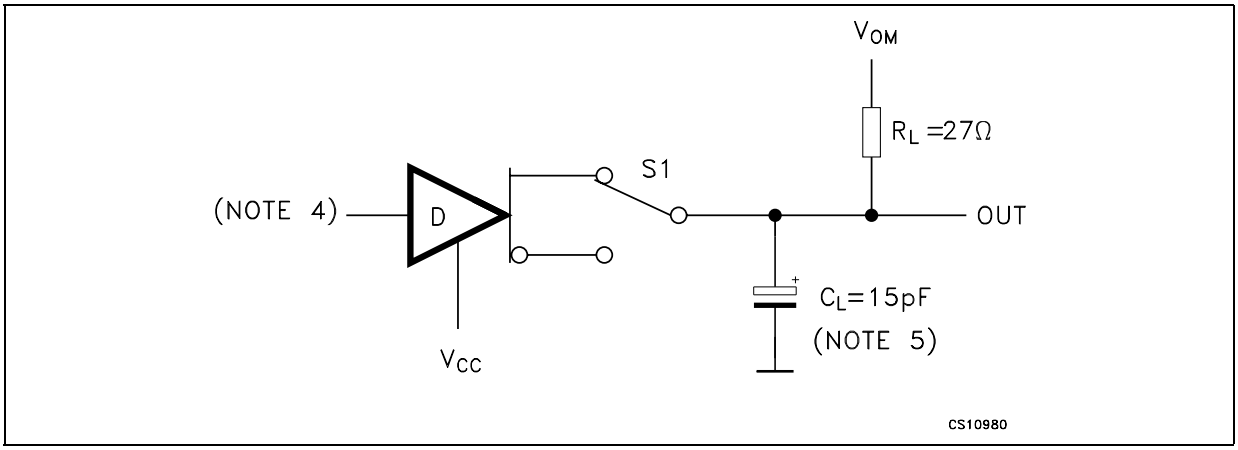


Figure 9 : Drive Propagation Time Waveform

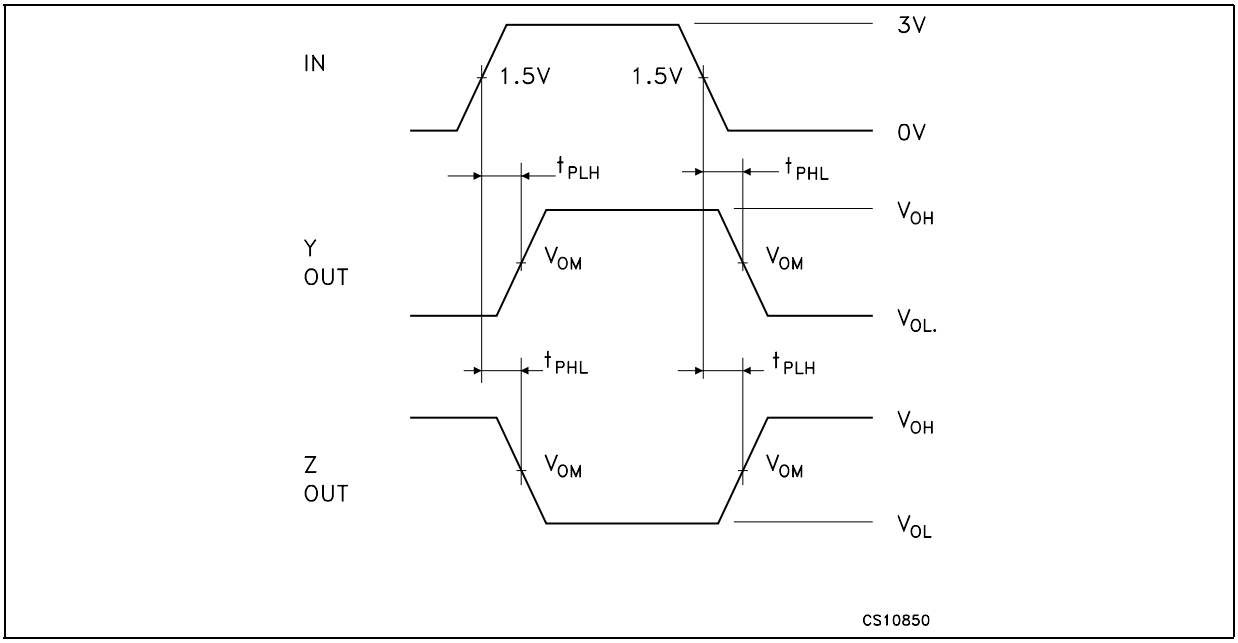


Figure 10 : Drive Enable and Disable Times Test Circuit

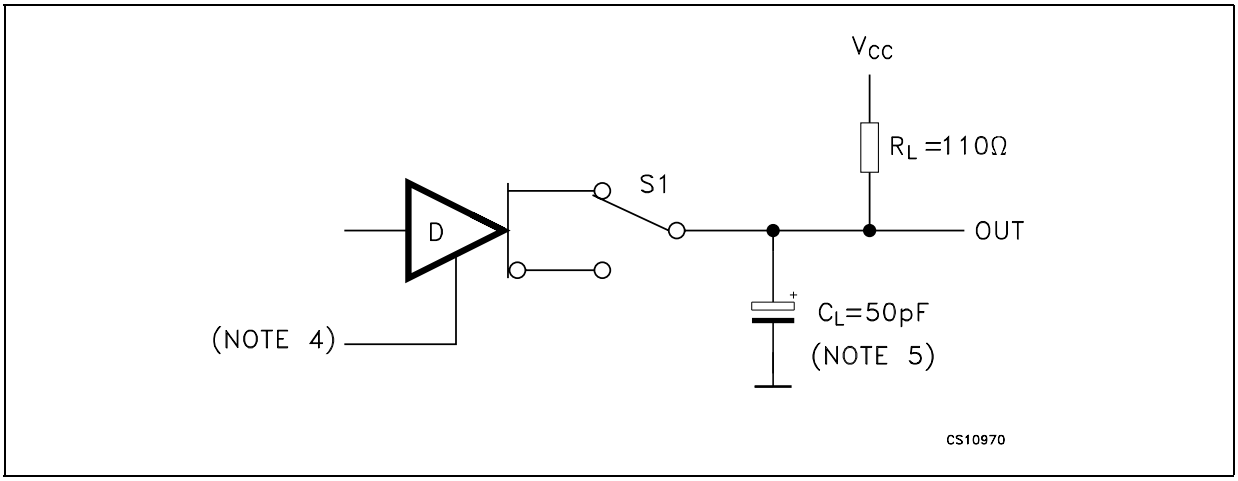


Figure 11 : Drive Enable and Disable Times Waveforms

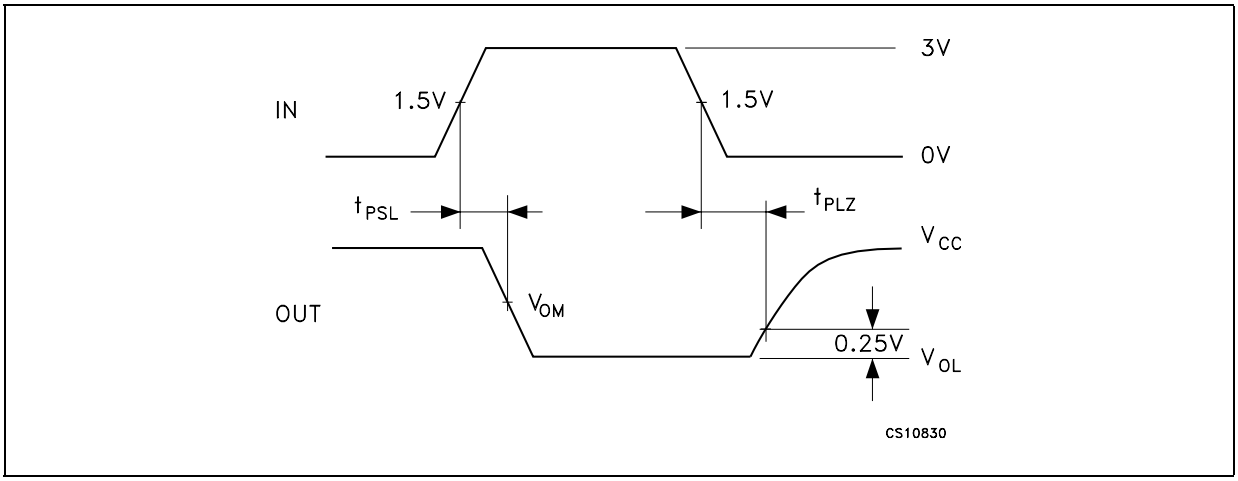


Figure 12 : Receiver Propagation Delay Time Test Circuit

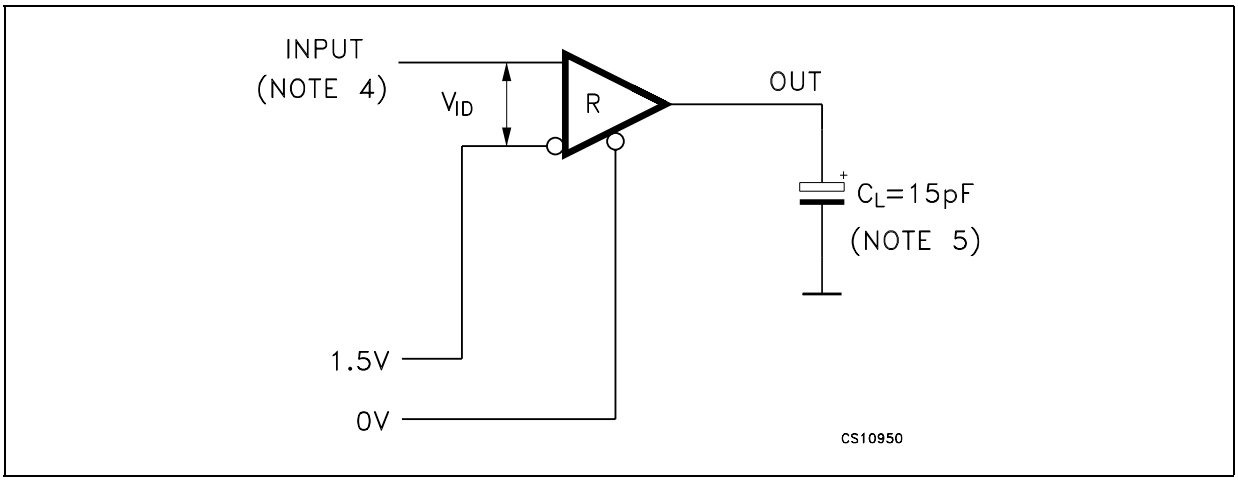


Figure 13 : Receiver Propagation Delay Time Waveforms

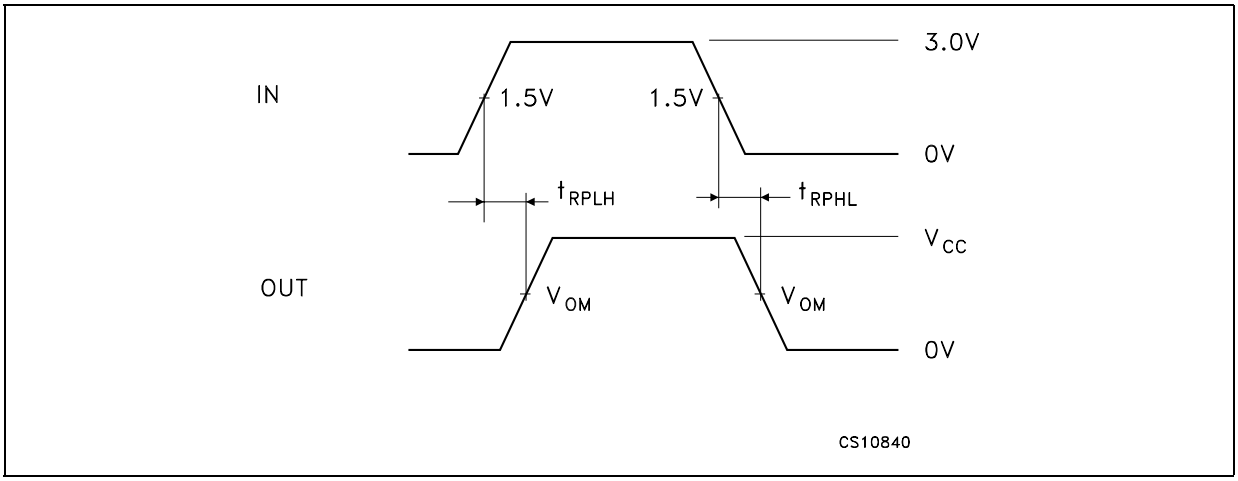


Figure 14 : Receiver Enable and Disable Times Test Circuit

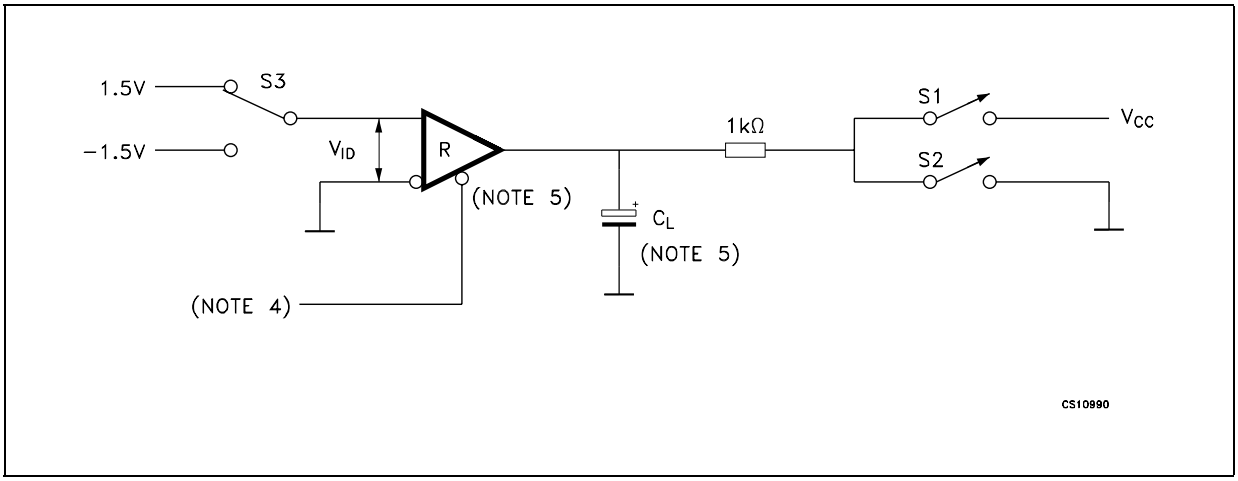


Figure 15 : Receiver Enable and Disable Times Waveform

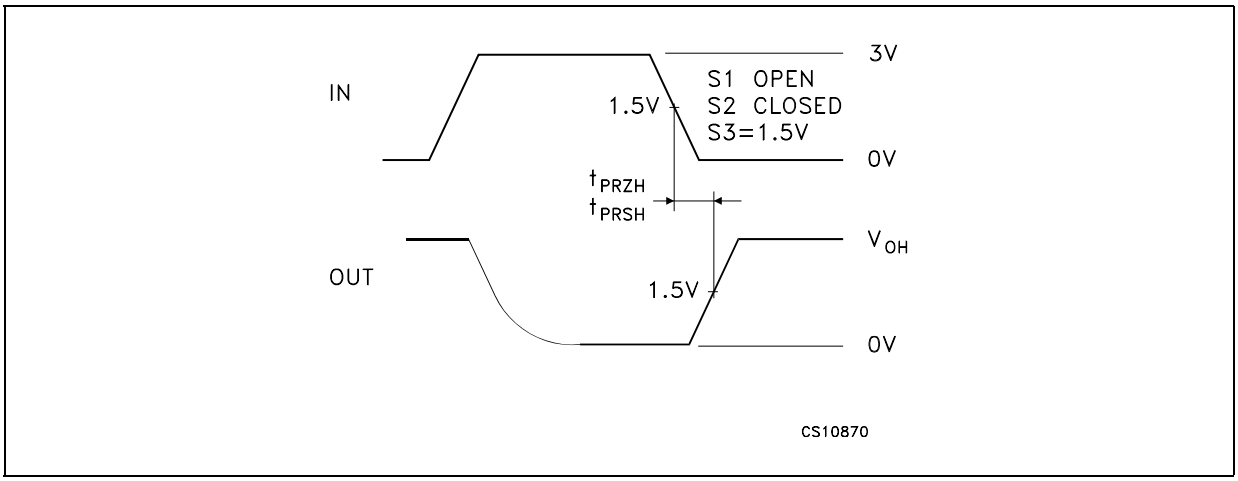


Figure 16 : Receiver Enable and Disable Times Waveform

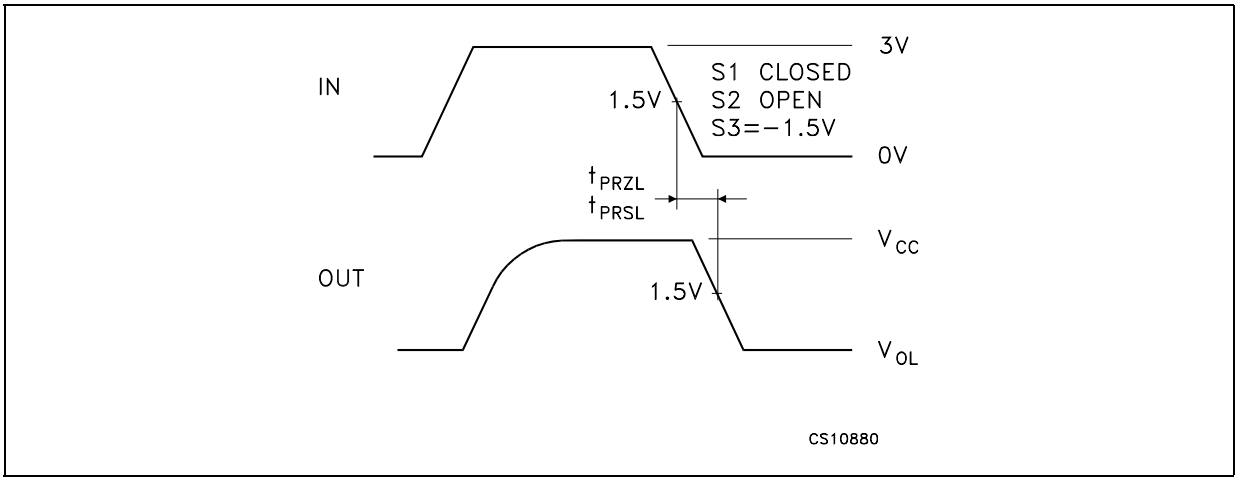


Figure 17 : Receiver Enable and Disable Times Waveform

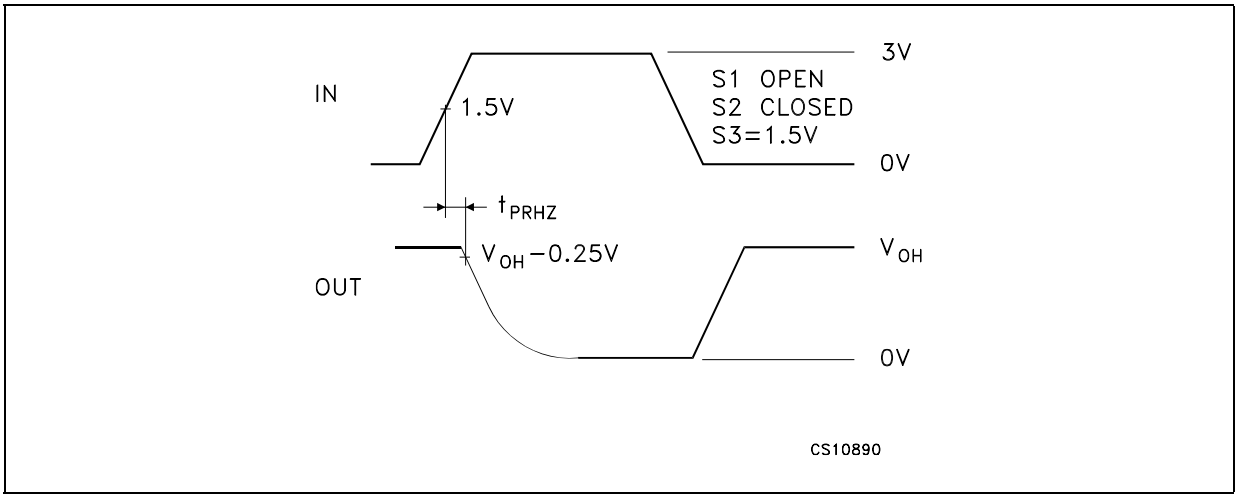


Figure 18 : Receiver Enable and Disable Times Waveform

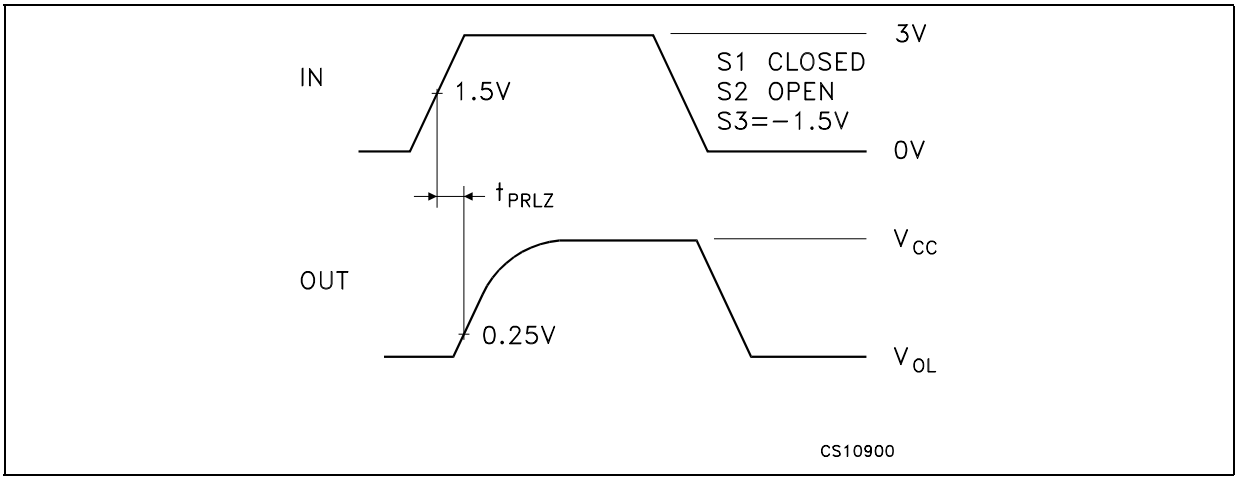


Figure 19 : Receiver Output Current vs Output Low Voltage

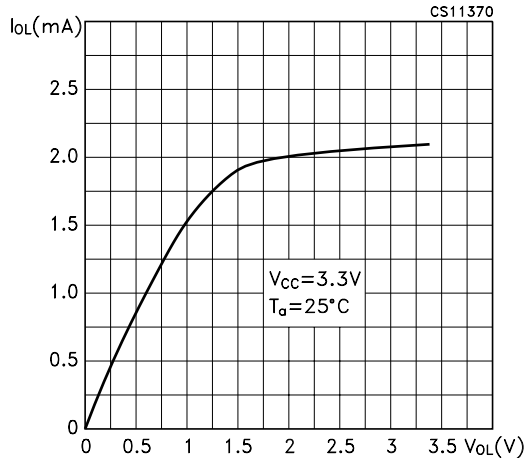


Figure 20 : Receiver Output Current vs Output High Voltage

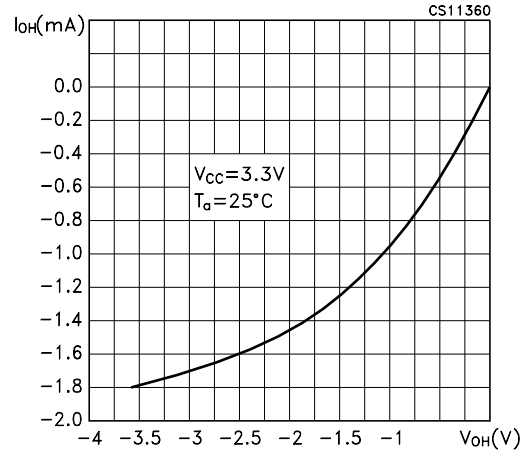


Figure 21 : Low Level Driver Output Capability

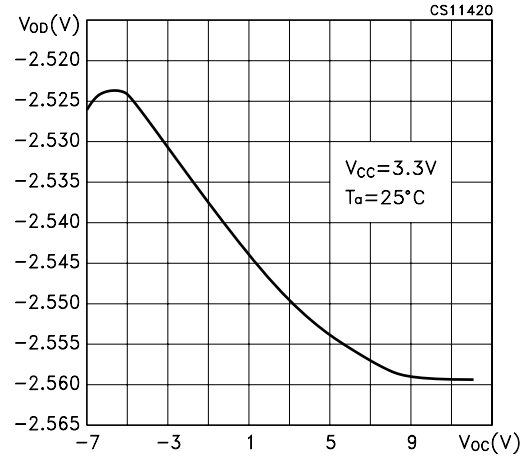


Figure 22 : High Level Driver Output Capability

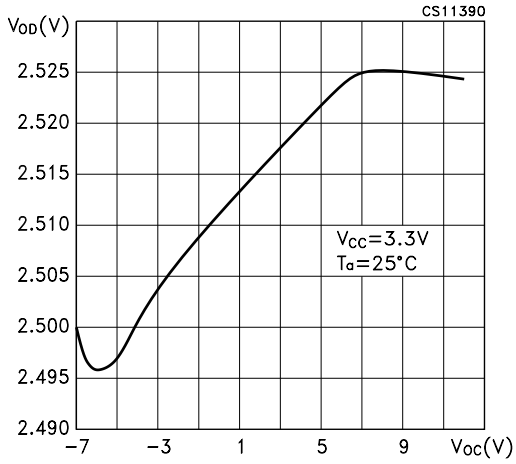


Figure 23 : Receiver Input Characteristics

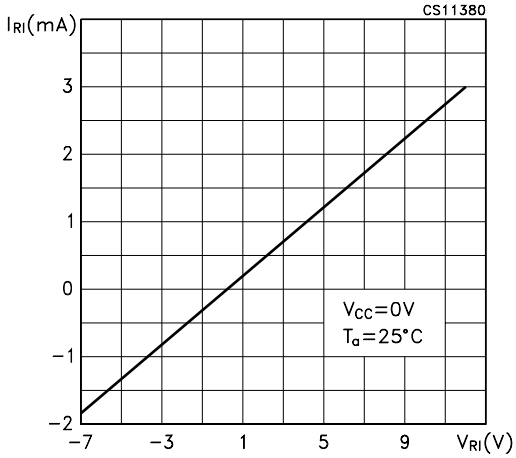


Figure 24 : Driver Short Circuit Current

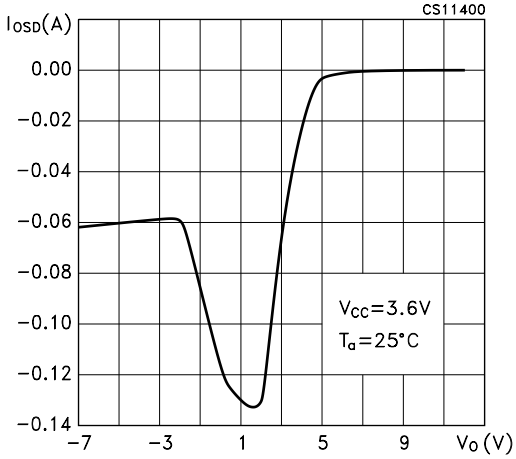
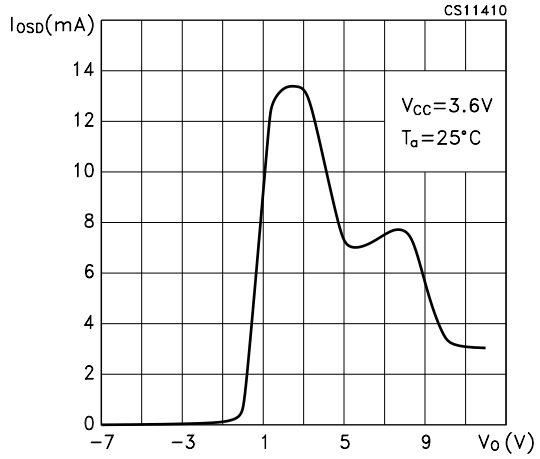
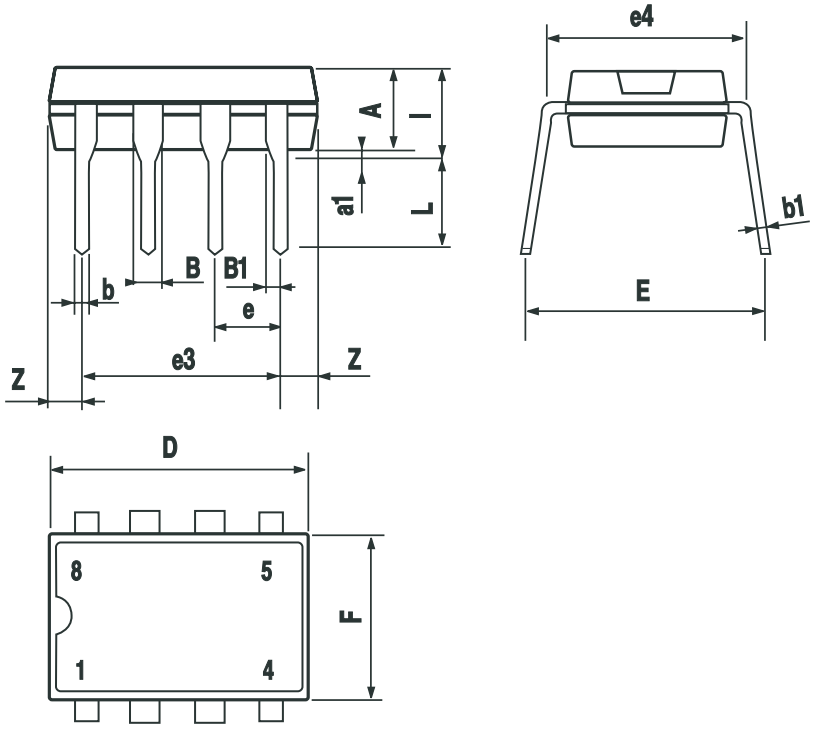


Figure 25 : Driver Short Circuit Current



Plastic DIP-8 MECHANICAL DATA

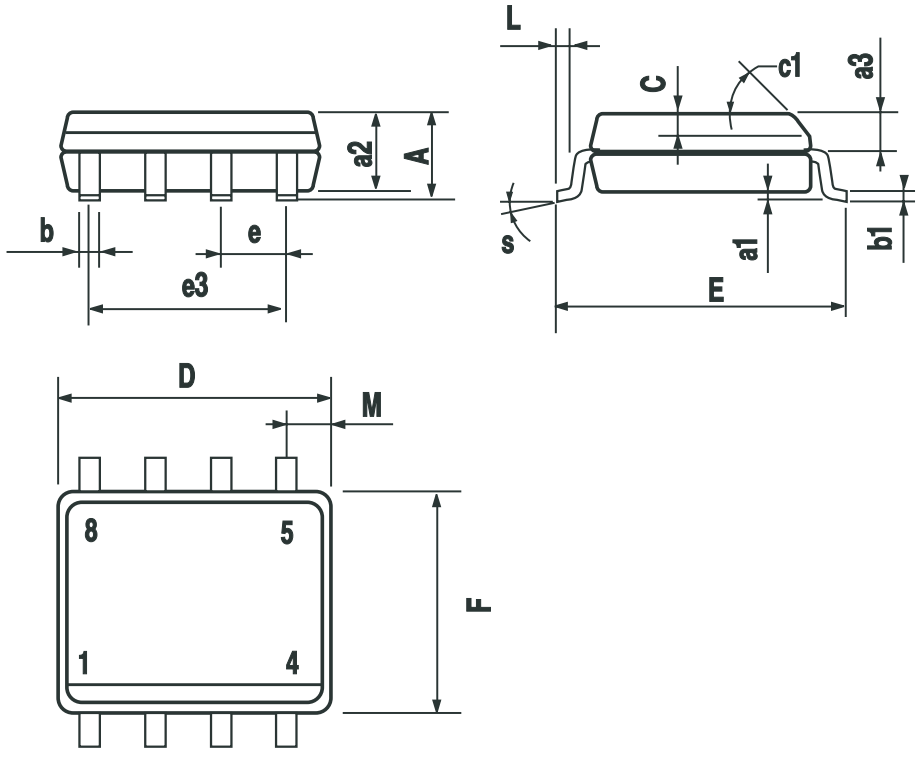
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			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			1.75			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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