



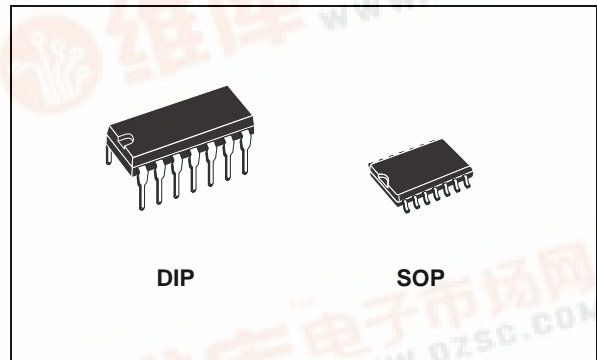
## ST491A

### LOW POWER HIGH SPEED RS-485/RS-422 TRANSCEIVER

- LOW SUPPLY CURRENT: 5mA MAX
- DESIGNED FOR RS485 INTERFACE APPLICATIONS
- -7 TO 12 COMMON MODE INPUT VOLTAGE RANGE
- 70mV TYPICAL INPUT HYSTERESIS
- DESIGNED FOR 25Mbps OPERATION
- OPERATE FROM SINGLE 5V SUPPLY
- $\pm 4$ kV ESD PROTECTION
- CURRENT LIMITING AND THERMAL SHUTDOWN FOR DRIVER OVERLOAD PROTECTION

#### DESCRIPTION

The ST491A is a low power transceiver for RS-485 and RS-422 communications. The device contains one driver and one receiver in full duplex configuration. The ST491A draws 5mA (typ.) of supply current when unloaded and operates from a single 5V supply.



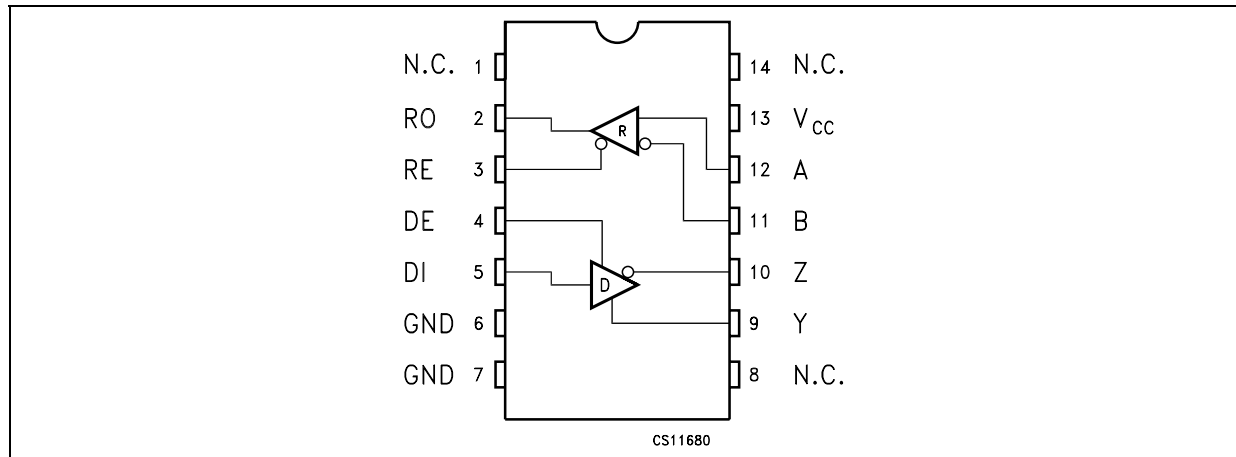
Driver is short-circuit current limited and is protected against excessive power dissipation by thermal shutdown circuitry that place the driver outputs into a high-impedance state. The receiver input has a fail-safe feature that guarantees a logic high output if both inputs are open circuit.

#### ORDERING CODES

Type	Temperature Range	Package	Comments
ST491ACN	0 to 70 °C	DIP-14	25parts per tube / 40tube per box
ST491ABN	-40 to 85 °C	DIP-14	25parts per tube / 40tube per box
ST491ACD	0 to 70 °C	SO-14 (Tube)	50parts per tube / 20tube per box
ST491ABD	-40 to 85 °C	SO-14 (Tube)	50parts per tube / 20tube per box
ST491ACDR	0 to 70 °C	SO-14 (Tape & Reel)	2500 parts per reel
ST491ABDR	-40 to 85 °C	SO-14 (Tape & Reel)	2500 parts per reel

## ST491A

### PIN CONFIGURATION



### PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	NC	Not Connected
2	RO	Receiver Output.
3	RE	Receiver Output Enable
4	DE	Driver Output Enable
5	DI	Inverting Driver Input.
6	GND	Ground
7	GND	Ground
8	NC	Not Connected
9	Y	Non-inverting Driver Output
10	Z	Inverting Driver Output
11	B	Inverting Receiver Input
12	A	Non-inverting Receiver Input
13	NC	Not Connected
14	V <sub>CC</sub>	Supply Voltage

### TRUTH TABLE (DRIVER)

INPUT		OUTPUTS	
DI	DE	Y	Z
L	H	L	H
H	H	H	L
X	L	Z	Z

X= Don't Care; Z=High Impedance

### TRUTH TABLE (RECEIVER)

INPUT		OUTPUT
A-B	RE	RO
$\geq -0.2V$	L	H
between $-0.2V$ to $0.2V$	L	?
$\leq -0.2V$	L	L
OPEN	L	H
X	H	Z

?= Irrelevant; X= Don't Care; Z=High Impedance

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	7	V
$V_{DI}$	Driver Input Voltage	-0.5 to 7	V
$V_Y, V_Z$	Driver Output Voltage	-7.5 to 12.5	V
$V_A, V_B$	Receiver Input Voltage	-7.5 to 12.5	V
$V_{RO}$	Receiver Output Voltage	-0.3 to ( $V_{CC} + 0.3$ )	V
ESD	Human Body Model	3.5	KV

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

**ELECTRICAL CHARACTERISTICS**

$V_{CC} = 4.5V$  to  $5.5V$ ,  $T_A = -40$  to  $85^\circ C$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SUPPLY}$	No Load Supply Current			2	5	mA
$C_{IN}$	Input Capacitance			1.8		pF
$C_{YZ}$	Driver Output Capacitance			1.2		pF
$C_{OUT}$	Output Capacitance			2.3		pF

**TRANSMITTER ELECTRICAL CHARACTERISTICS**

$V_{CC} = 4.5V$  to  $5.5V$ ,  $T_A = -40$  to  $85^\circ C$ , unless otherwise specified. Typical values are referred to  $T_A = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{OD1}$	Differential Drive Output (No load)				$V_{CC}$	V
$V_{OD2}$	Differential Drive Output (With Load)	$R_L = 54\Omega$ (RS-422) (Figure 1)	1.5	2.6	5	V
$V_{OD3}$	Differential Drive Output (With Load)	$R_L = 100\Omega$ (RS-422) (Figure 1)	2	3		V
$\Delta V_{OD}$	Change in magnitude of Driver Differential Output Voltage for Complementary Output States (Note1)	$R_L = 54\Omega$ or $100\Omega$ (Figure 1)		0	0.2	V
$V_{OC}$	Driver Common Mode Output Voltage	$R_L = 54\Omega$ (Figure 1)	1		3	V
$\Delta V_{OC}$	Change in magnitude of Driver Common Mode Output Voltage (Note1)	$R_L = 54\Omega$ (Figure 1)		0	0.2	V
$I_{OFF}$	Power Off Output Current	$V_{CC} = 0V$ $V_O = -7V$ to $12V$			$\pm 100$	$\mu A$
$I_{OSD}$	Driver Short Circuit Output Current	$V_O = -7V$ to $12V$	$\pm 35$		$\pm 250$	mA
$V_{IL}$	Input Logic Threshold Low				0.8	V
$V_{IH}$	Input Logic Threshold High		2			V

## ST491A

### RECEIVER ELECTRICAL CHARACTERISTICS

$V_{CC} = 4.5V$  to  $5.5V$ ,  $T_A = -40$  to  $85^\circ C$ , unless otherwise specified. Typical values are referred to  $T_a = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{IN}$	Input Current (A, B)	other input=0V $V_{CC} = 0$ or $5.25V$	$V_{IN}=12V$	0.5	1	mA
			$V_{IN}=-7V$	-0.35	-0.8	mA
$V_{TH}$	Receiver Differential Threshold Voltage	$V_{CM} = -7V$ to $12V$	-0.2		0.2	V
$\Delta V_{TH}$	Receiver Input Hysteresis	$V_{CM} = 0V$		70		mV
$V_{OH}$	Receiver Output High Voltage	$I_{OUT} = -8mA$ , $V_{ID} = 200mV$	3.5	4.7		V
$V_{OL}$	Receiver Output Low Voltage	$I_{OUT} = 8mA$ , $V_{ID} = -200mV$		0.3	0.5	V
$R_{RIN}$	Receiver Input Resistance	$V_{CM} = -7V$ to $12V$	12	24		K $\Omega$

### DRIVER SWITCHING CHARACTERISTICS

$V_{CC} = 4.5V$  to  $5.5V$ ,  $T_A = -40$  to  $85^\circ C$ , unless otherwise specified. Typical values are referred to  $T_a = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$D_R$	Maximum Data Rate	Jitter <5%	25	50		Mbps
$t_{PLH}$ $t_{PHL}$	Propagation Delay Input to Output	$R_L = 54\Omega$ $C_{L1}=C_{L2}=50pF$ , (Figure 1)		10	16	ns
$t_{SKEW}$	Differential Output Delay Skew	$R_L = 54\Omega$ $C_{L1}=C_{L2}=50pF$ , (Figure 1)		1	3	ns
$t_{TLH}$ $t_{THL}$	Rise or Fall Differential Time	$R_L = 54\Omega$ $C_{L1}=C_{L2}=50pF$ , (Figure 1)		8	12	ns
$t_{PZL}$	Output Enable Time	$C_L = 50pF$ S1 Closed		14	25	ns
$t_{PZH}$	Output Enable Time	$C_L = 50pF$ S2 Closed		14	25	ns
$t_{PHZ}$	Output Disable Time	$C_L = 15pF$ S2 Closed		10	25	ns
$t_{PLZ}$	Output Disable Time	$C_L = 15pF$ S1 Closed		16	25	ns

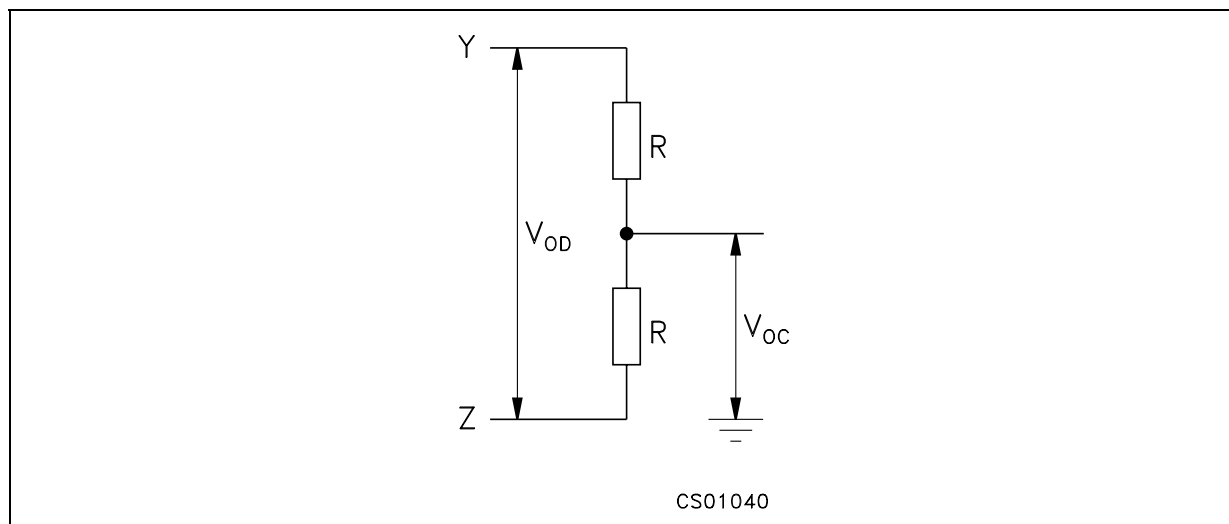
### RECEIVER SWITCHING CHARACTERISTICS

$V_{CC} = 4.5V$  to  $5.5V$ ,  $T_A = -40$  to  $85^\circ C$ , unless otherwise specified. Typical values are referred to  $T_a = 25^\circ C$ )

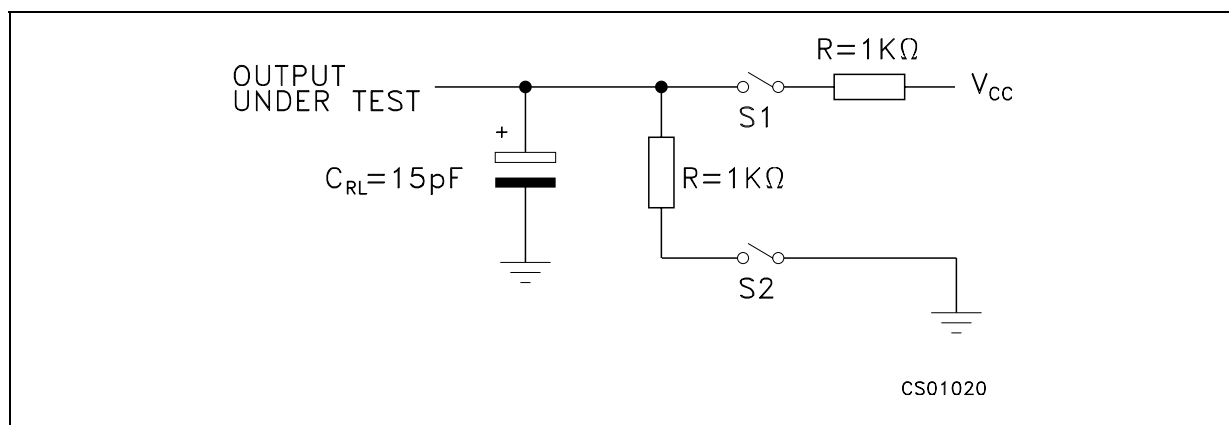
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{PLH}$ $t_{PHL}$	Propagation Delay Input to Output	$C_L = 15pF$ (Figures 2,4)		19	30	ns
$t_{SKD}$	$ t_{PLH} - t_{PHL} $ Receiver Output Skew	$C_L = 15pF$ (Figures 2,4)		1	3	ns
$t_{TLH}$ $t_{THL}$	Rise or Fall Time	$C_L = 15pF$ (Figures 2,4)		6		ns
$t_{PZL}$	Output Enable Time	$C_{RL} = 15pF$ S1 Closed		6	12	ns
$t_{PZH}$	Output Enable Time	$C_{RL} = 15pF$ S2 Closed		7	12	ns
$t_{PHZ}$	Output Disable Time	$C_{RL} = 15pF$ S2 Closed		6	12	ns
$t_{PLZ}$	Output Disable Time	$C_{RL} = 15pF$ S1 Closed		6	12	ns

## TEST CIRCUITS AND TYPICAL CHARACTERISTICS

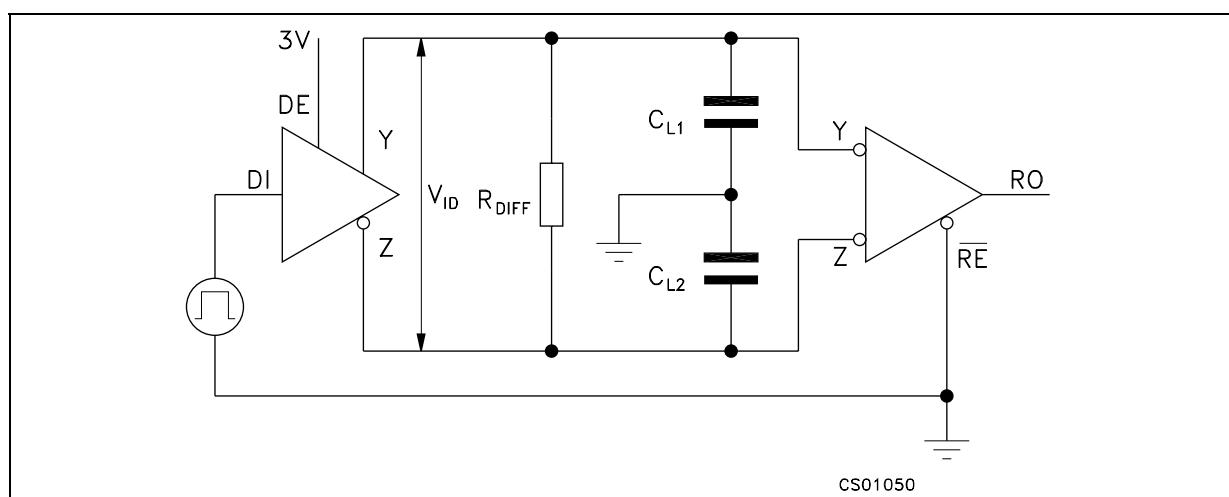
**Figure 1 :** Driver DC Test Load



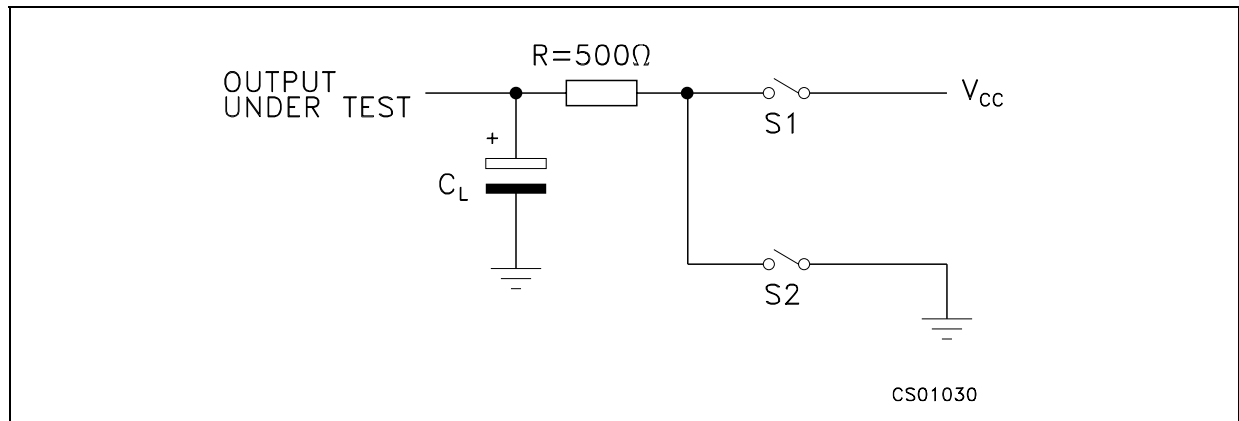
**Figure 2 :** Receiver Timing Test Load



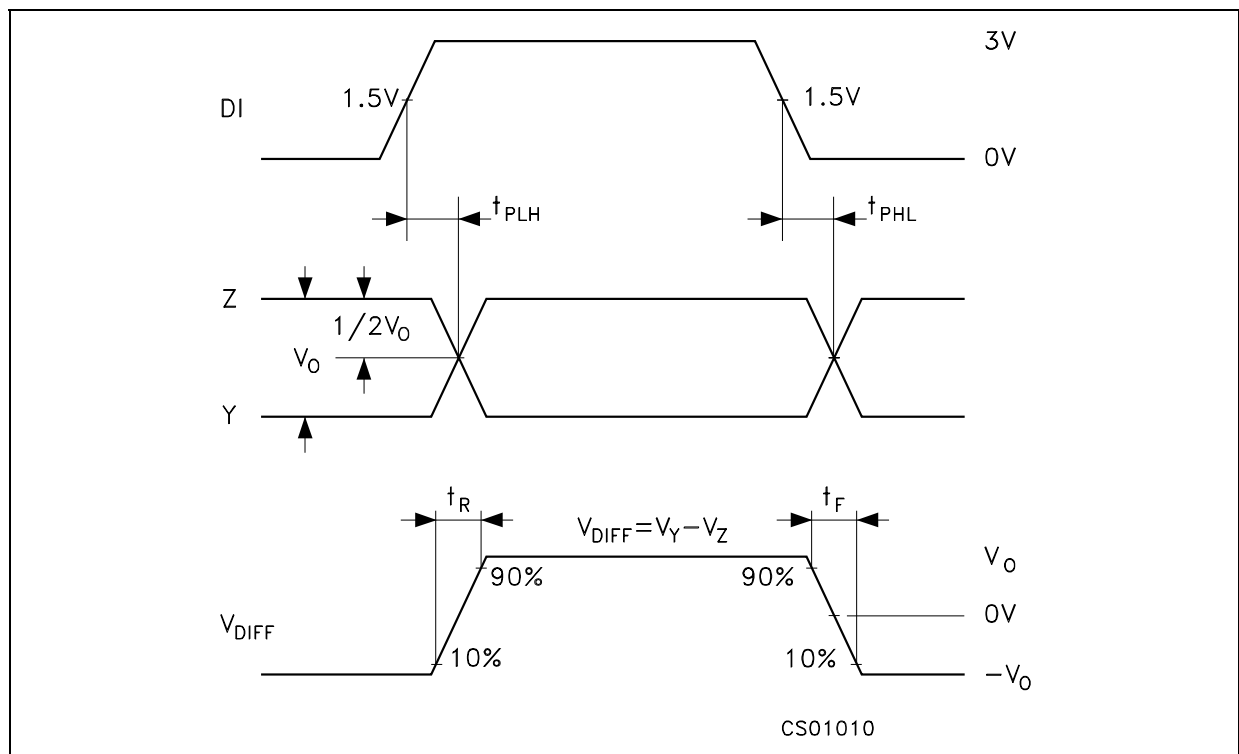
**Figure 3 :** Driver/Receiver Timing Test Circuit

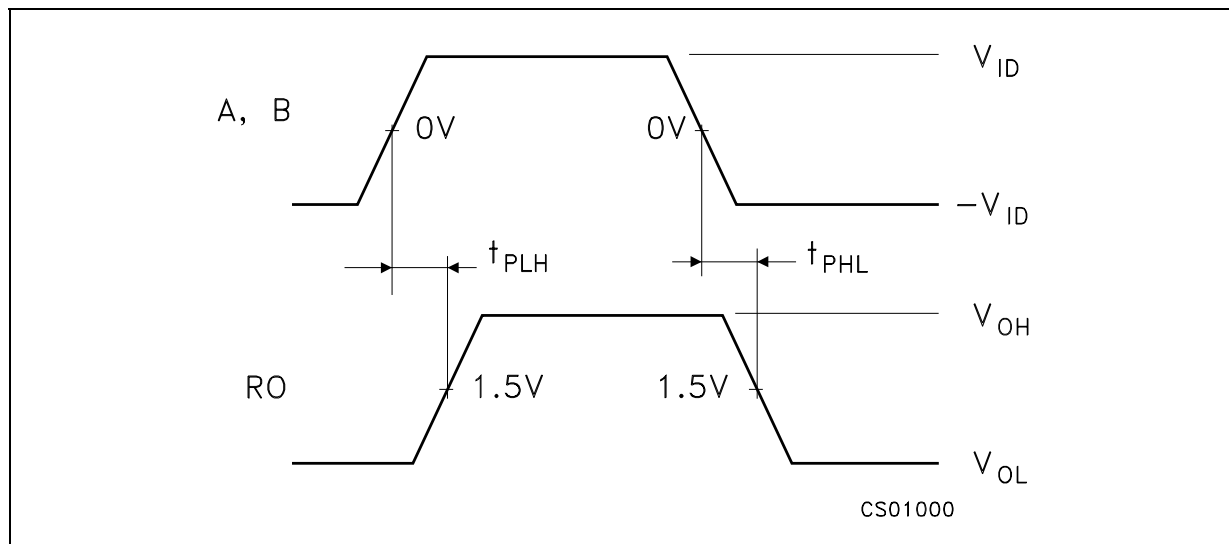
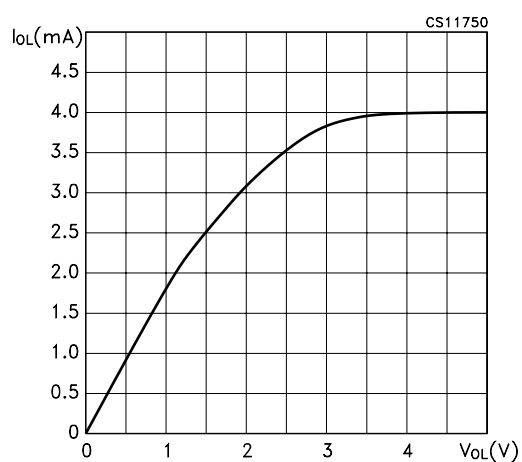
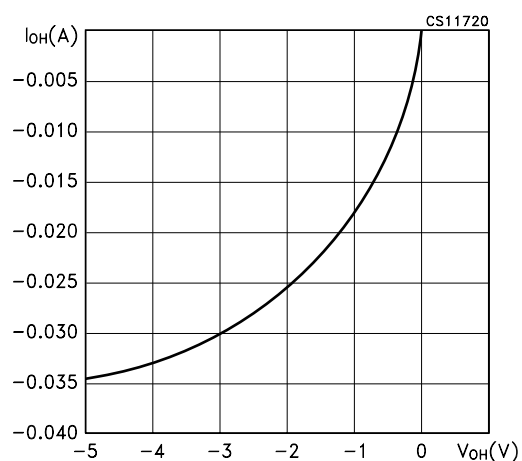
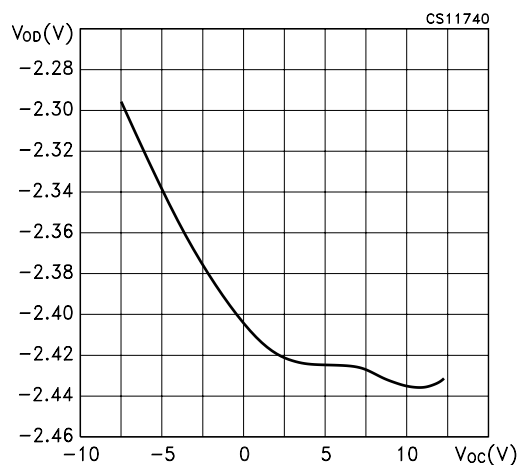
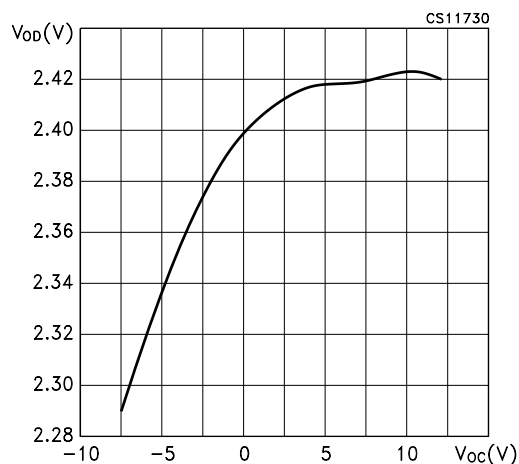


**Figure 4 : Driver Timing Test Load**

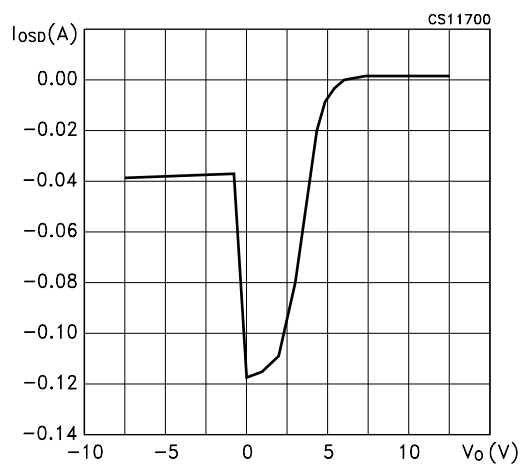


**Figure 5 : Driver Propagation Delay**

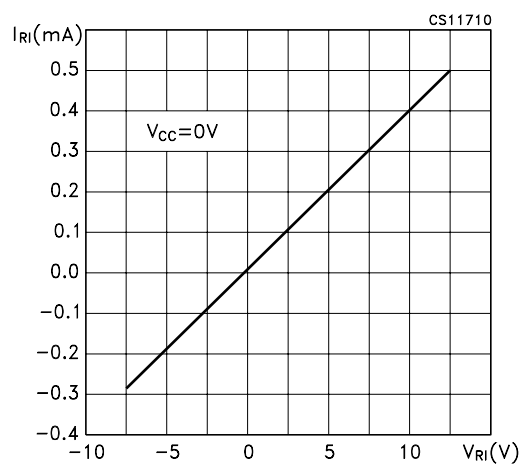


**Figure 6 : Receiver Propagation Delay****Figure 7 : Receiver Output Current vs Output Voltage (Output Low)****Figure 8 : Receiver Output Current vs Output Voltage (Output High)****Figure 9 : Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output Low)****Figure 10 : Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output High)**

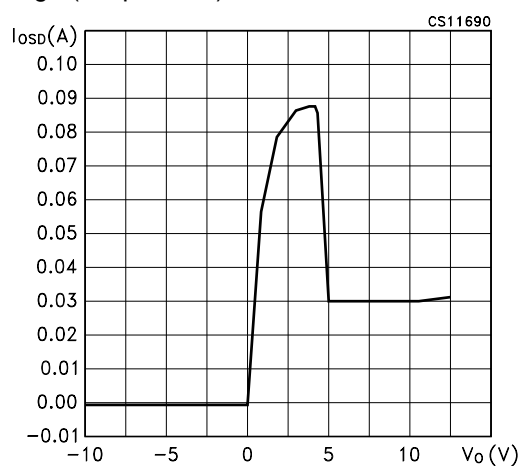
**Figure 11 : Driver Short Circuit Current vs Line Voltage (Output High)**



**Figure 13 : Receiver Input Current vs Input Voltage**



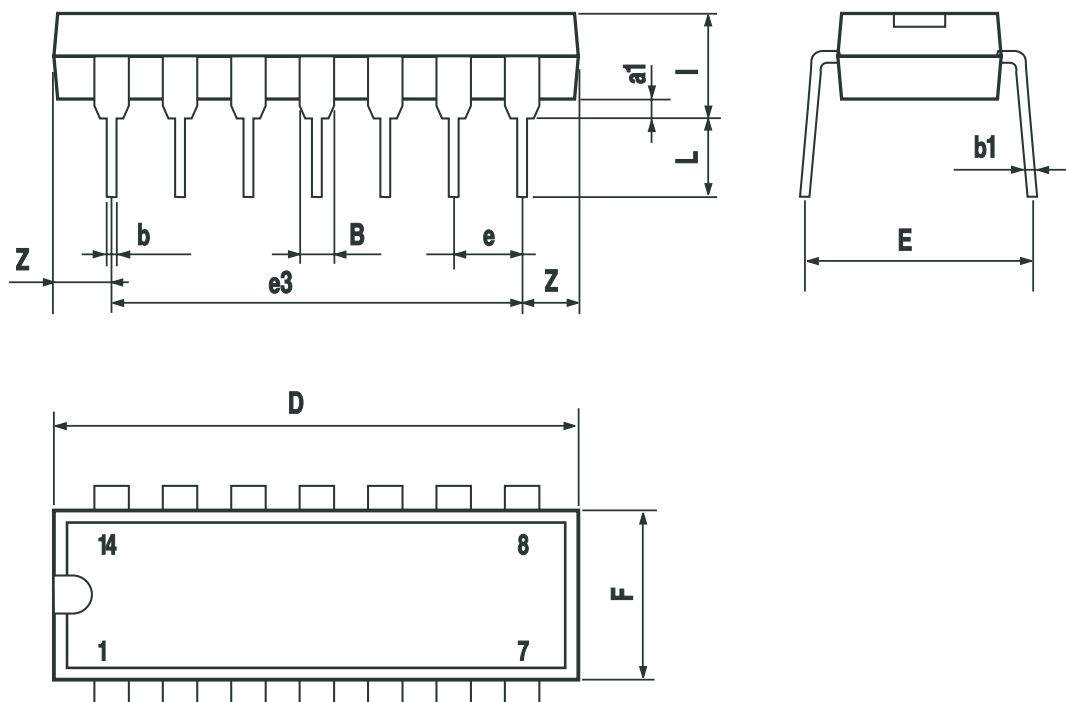
**Figure 12 : Driver Short Circuit Current vs. Line Voltage (Output Low)**





### Plastic DIP-14 MECHANICAL DATA

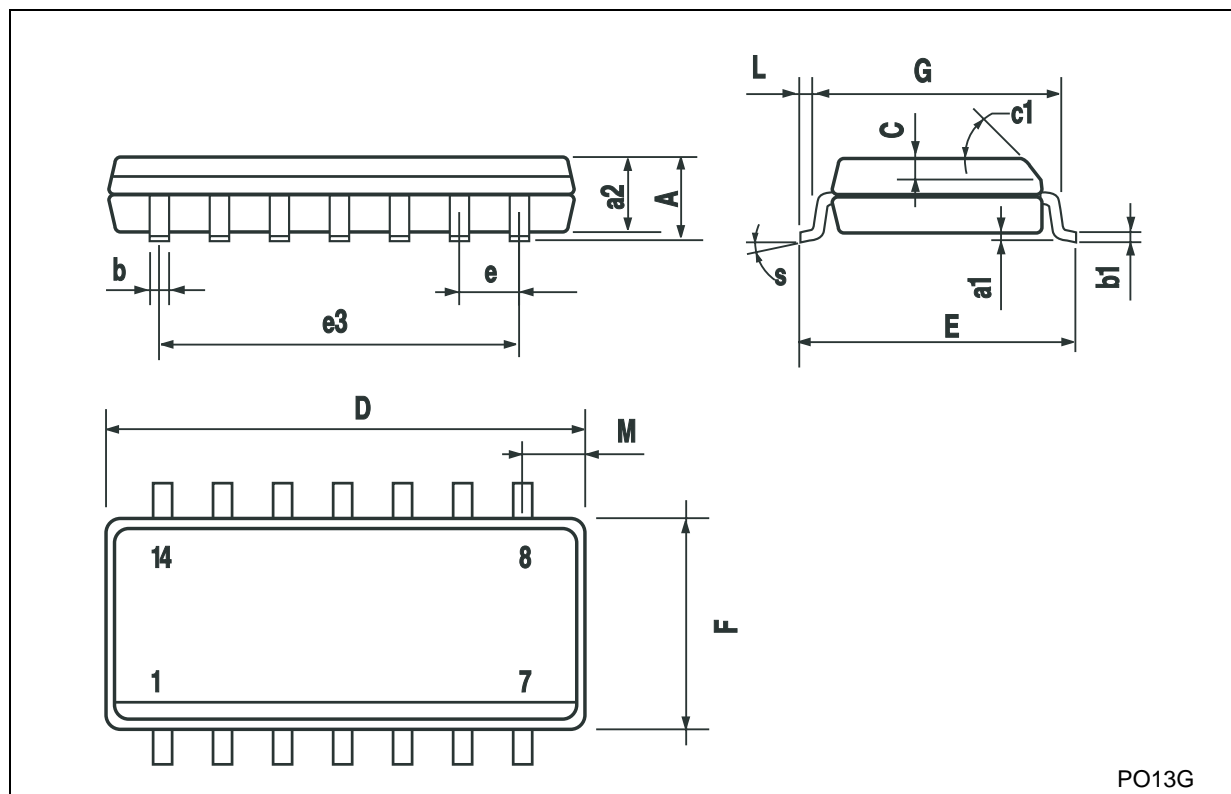
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



P001A

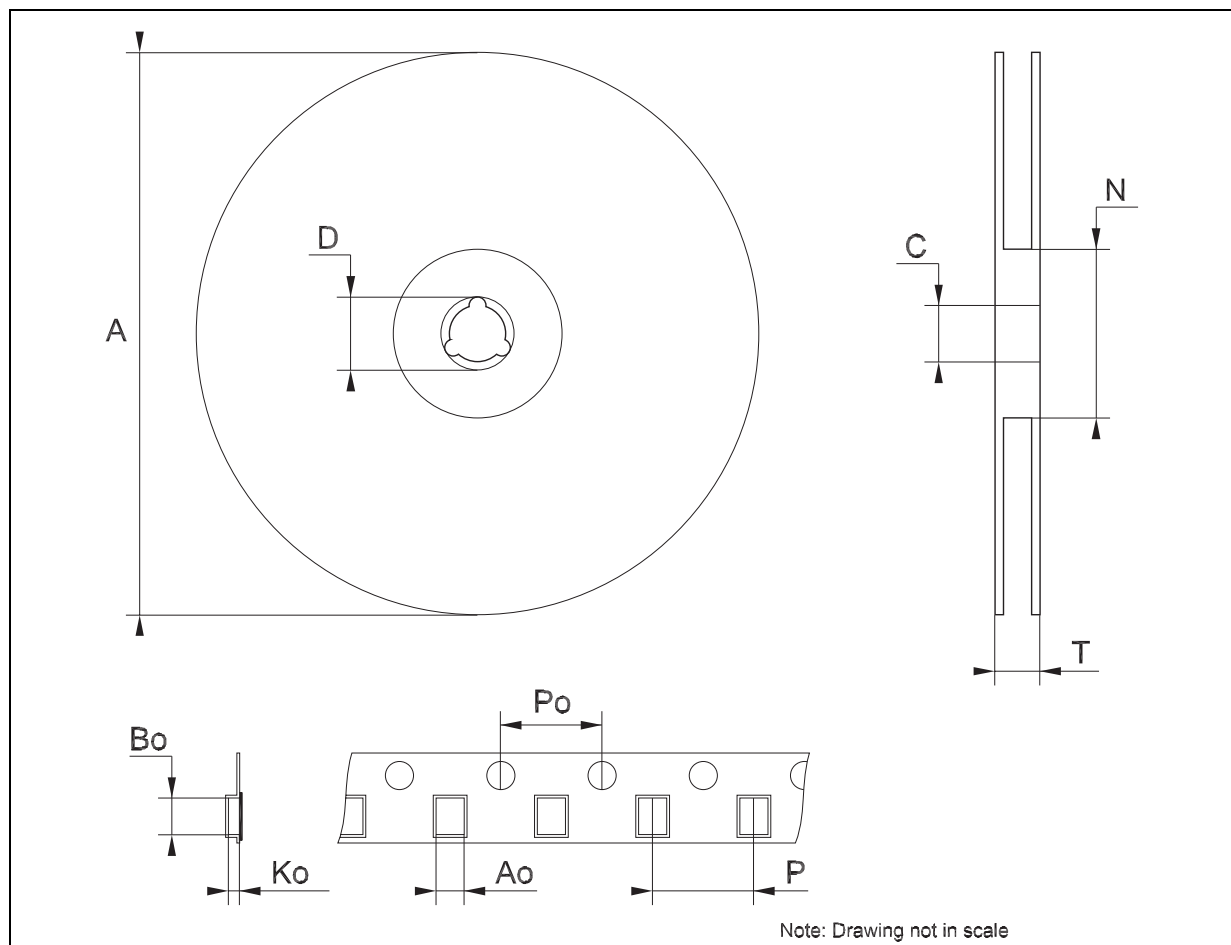
## SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



## Tape &amp; Reel SO-14 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	6.4		6.6	0.252		0.260
Bo	9		9.2	0.354		0.362
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



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