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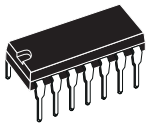
ST491A

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 5 SUPPLY
- ±4kV ESD PROTECTION
- CURRENT LIMITING AND THERMAL SHUTDOWN FOR DRIVER OVERLOAD PROTECTION



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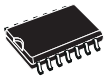

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DESCRIPTION

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

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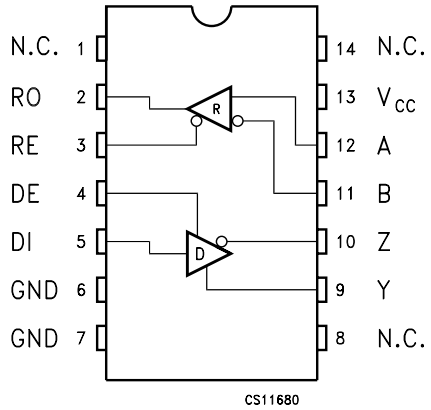
PIN CONFIGURATION



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_{CC}	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
≥ -0.2V	L	H
between -0.2V to 0.2V	L	?
≤ -0.2V	L	L
OPEN	L	H
X	H	Z

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

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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°C, unless otherwise specified. Typical values are referred to T_A = 25°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°C, unless otherwise specified. Typical values are referred to T_a = 25°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= 54Ω (RS-422) (Figure 1)	1.5	2.6	5	V
V_{OD3}	Differential Drive Output (With Load)	R_L= 100Ω (RS-422) (Figure 1)	2	3		V
ΔV_{OD}	Change in magnitude of Driver Differential Output Voltage for Complementary Output States (Note1)	R_L= 54Ω or 100Ω (Figure 1)		0	0.2	V
V_{OC}	Driver Common Mode Output Voltage	R_L= 54Ω (Figure 1)	1		3	V
ΔV_{OC}	Change in magnitude of Driver Common Mode Output Voltage (Note1)	R_L= 54Ω (Figure 1)		0	0.2	V
I_{OFF}	Power Off Output Current	V_{CC} = 0V V_O=-7V to 12V			± 100	µA
I_{OSD}	Driver Short Circuit Output Current	V_O=-7V to 12V	± 35		± 250	mA
V_{IL}	Input Logic Threshold Low				0.8	V
V_{IH}	Input Logic Threshold High		2			V

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RECEIVER ELECTRICAL CHARACTERISTICS

V_{CC} = 4.5V to 5.5V, 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_{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
ΔV_{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		KΩ

DRIVER SWITCHING CHARACTERISTICS

V_{CC} = 4.5V to 5.5V, 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	Jitter <5%	25	50		Mbps
t_{PLH} t_{PHL}	Propagation Delay Input to Output	R_L= 54Ω C_{L1}=C_{L2}=50pF, (Figure 1)		10	16	ns
t_{SKEW}	Differential Output Delay Skew	R_L= 54Ω C_{L1}=C_{L2}=50pF, (Figure 1)		1	3	ns
t_{TLH} t_{THL}	Rise or Fall Differential Time	R_L= 54Ω 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°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 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

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TEST CIRCUITS AND TYPICAL CHARACTERISTICS

Figure 1 : Driver DC Test Load

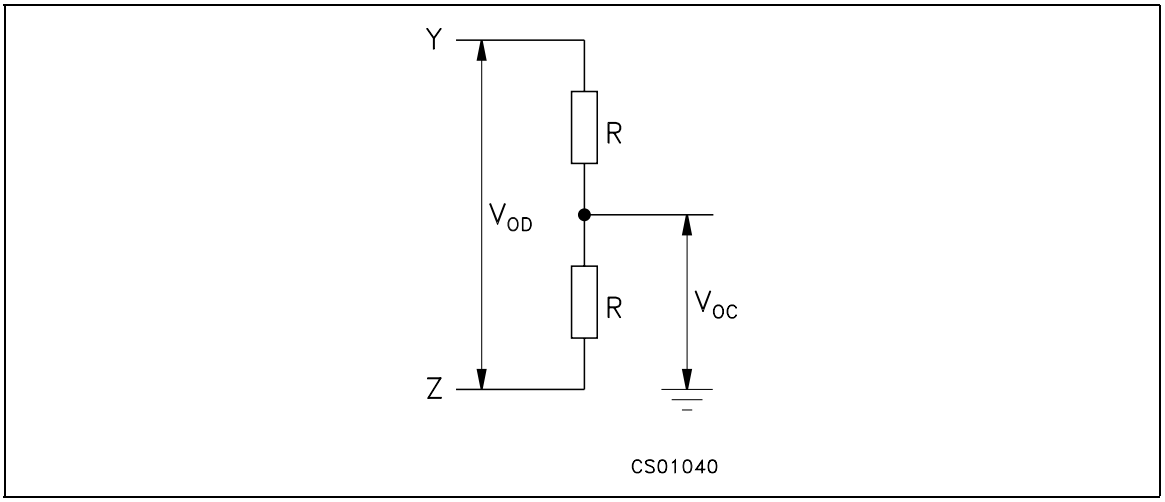

Figure 2 : Receiver Timing Test Load

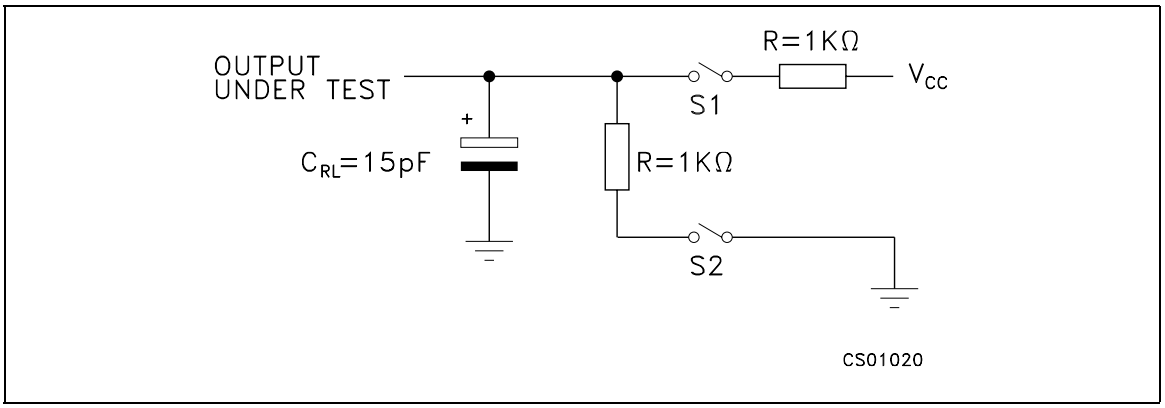

Figure 3 : Driver/Receiver Timing Test Circuit

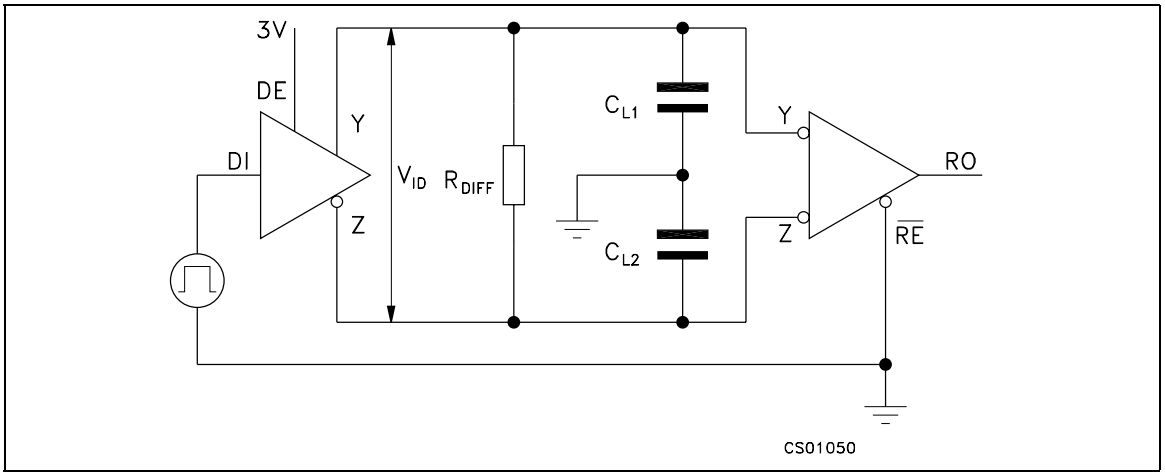

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Figure 4 : Driver Timing Test Load

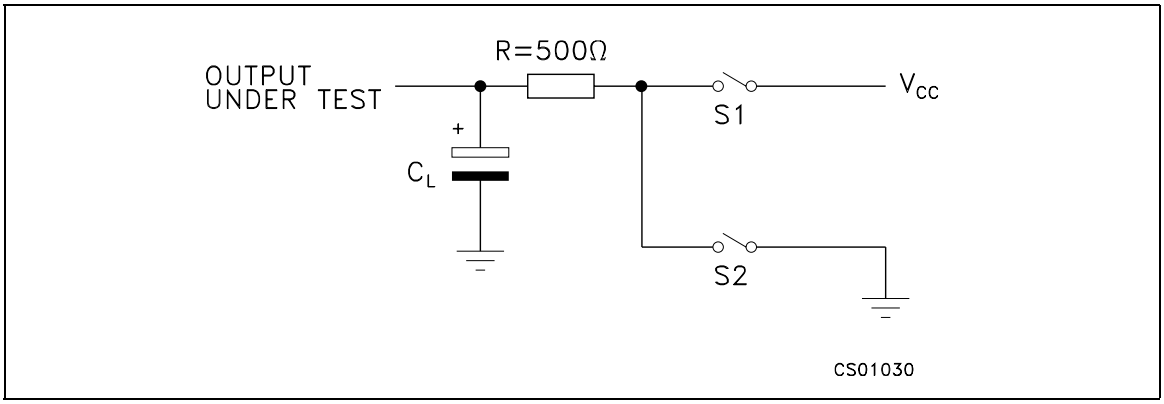

Figure 5 : Driver Propagation Delay

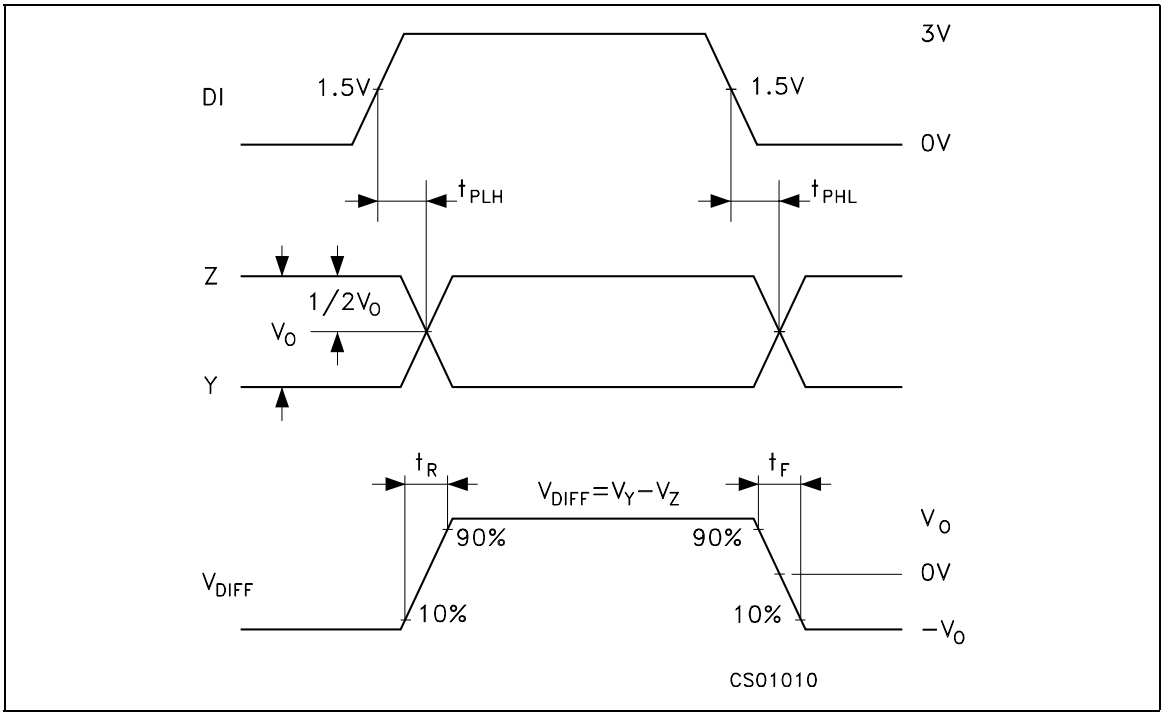

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Figure 6 : Receiver Propagation Delay

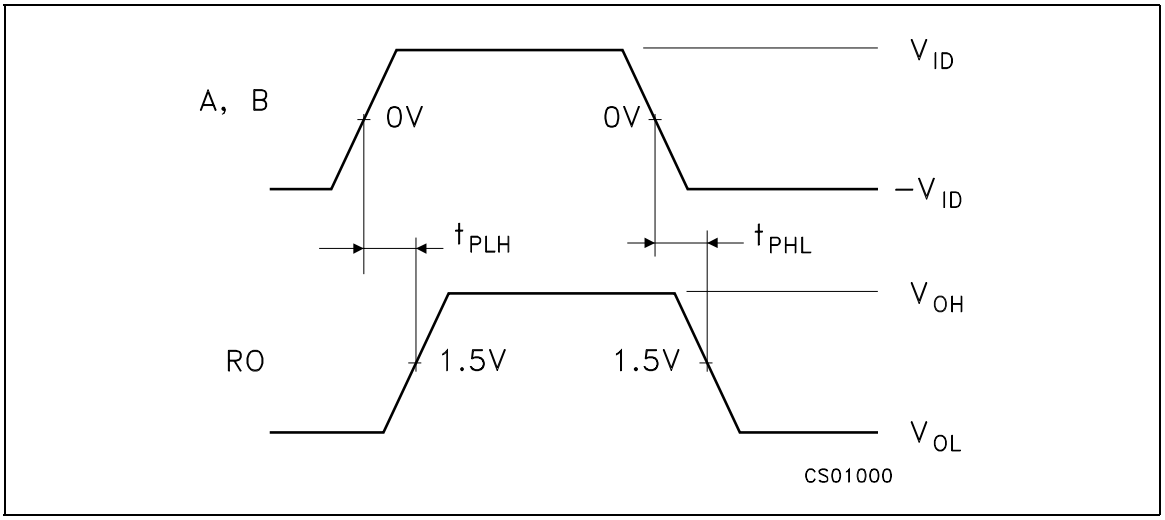

Figure 7 : Receiver Output Current vs Output Voltage (Output Low)

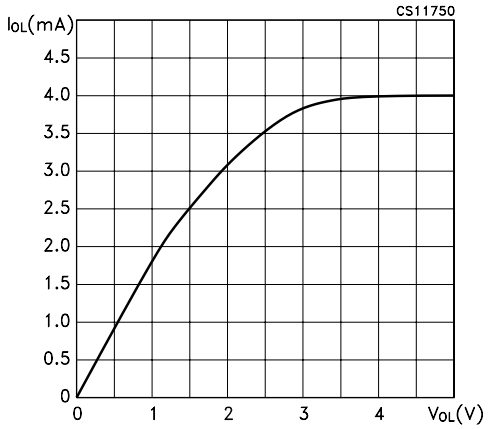

Figure 8 : Receiver Output Current vs Output Voltage (Output High)

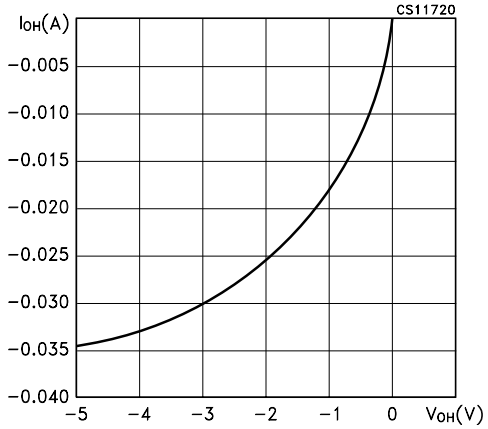

Figure 9 : Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output Low)

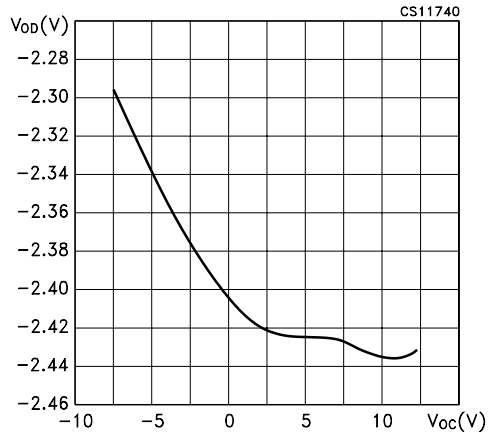

Figure 10 : Driver Diff. Output Voltage vs Common Mode Voltage (Diff. Output High)

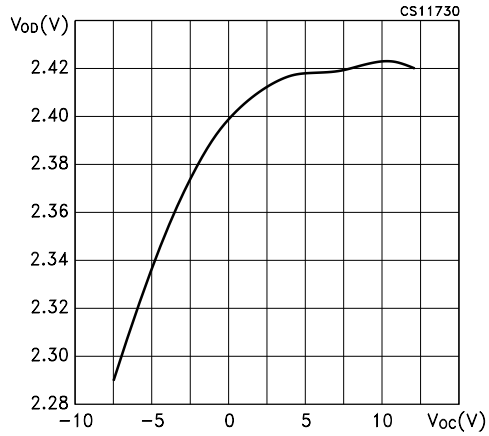

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Figure 11 : Driver Short Circuit Current vs Line Voltage (Output High)

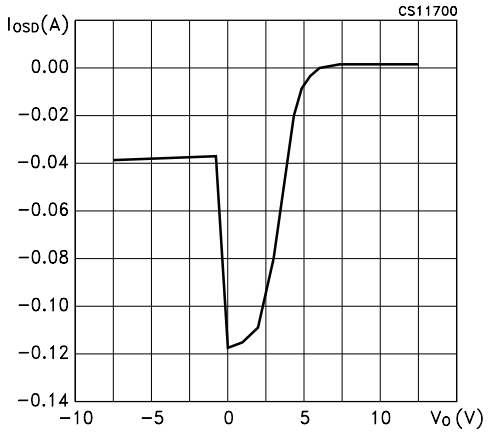


Figure 12 : Driver Short Circuit Current vs. Line Voltage (Output Low)

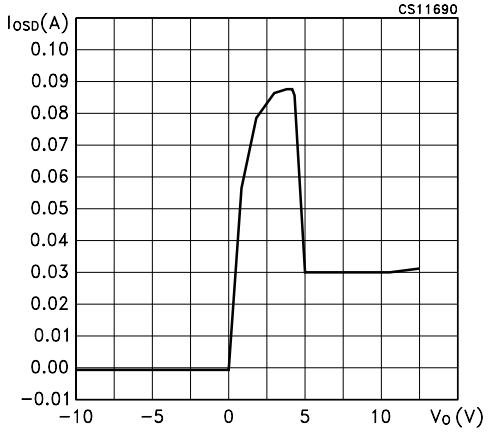
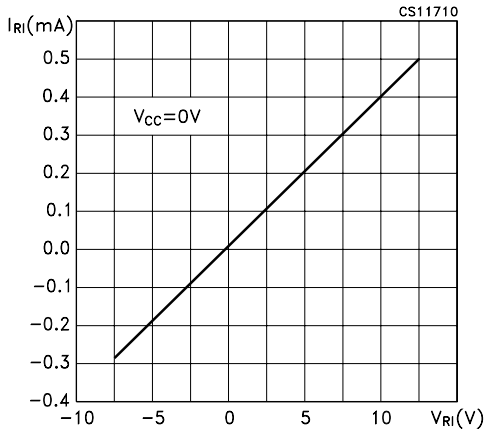


Figure 13 : Receiver Input Current vs Input Voltage



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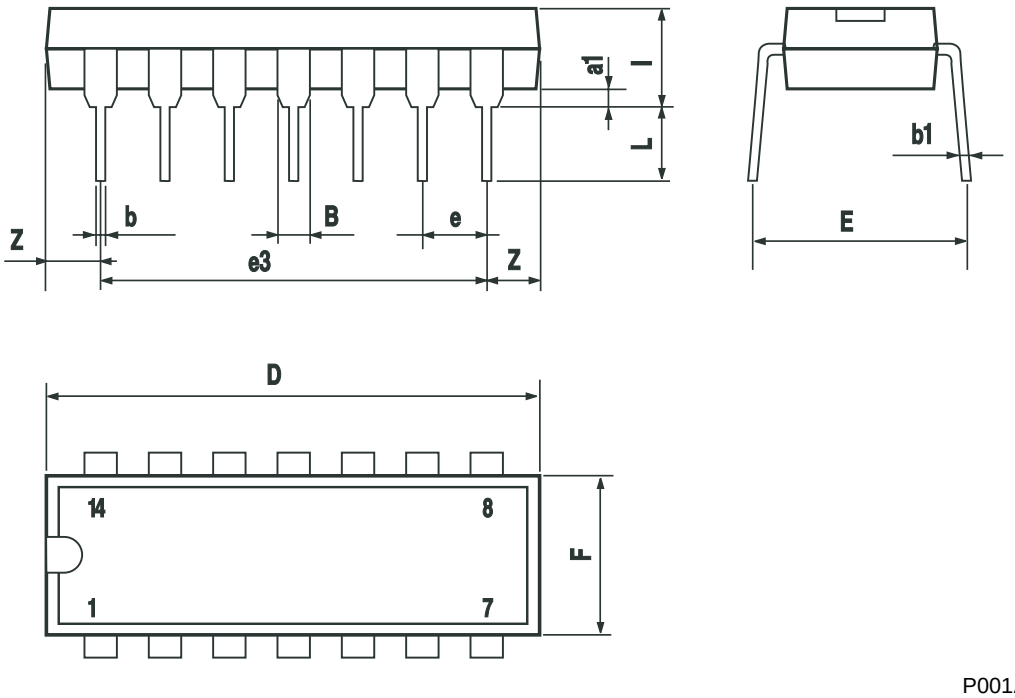
Plastic DIP-14 MECHANICAL DATA

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



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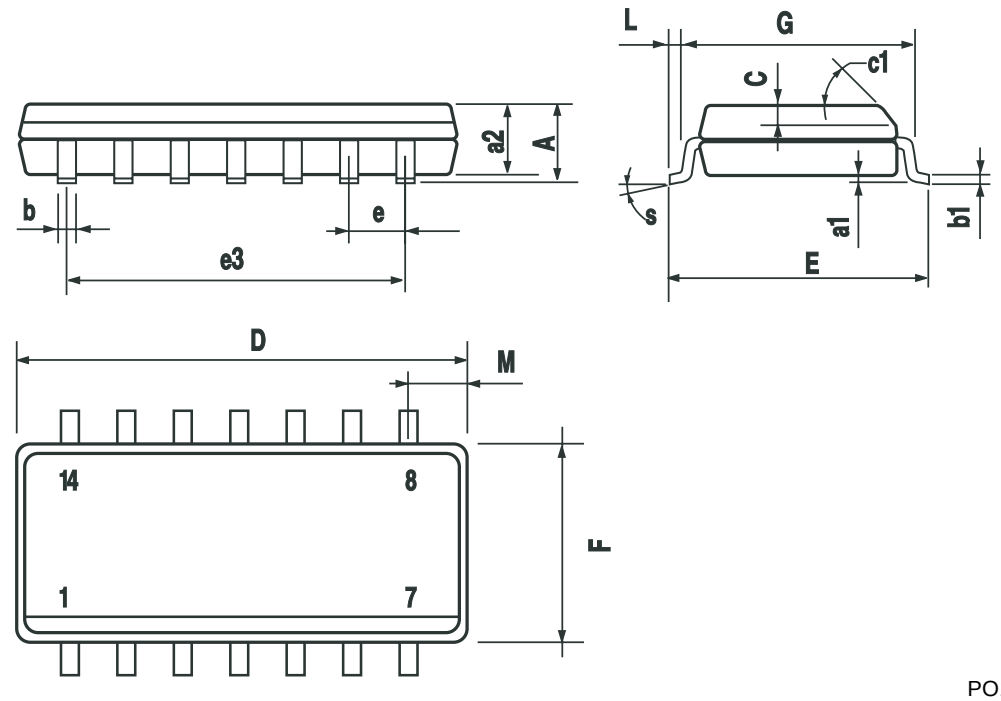
SO-14 MECHANICAL DATA

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.)					



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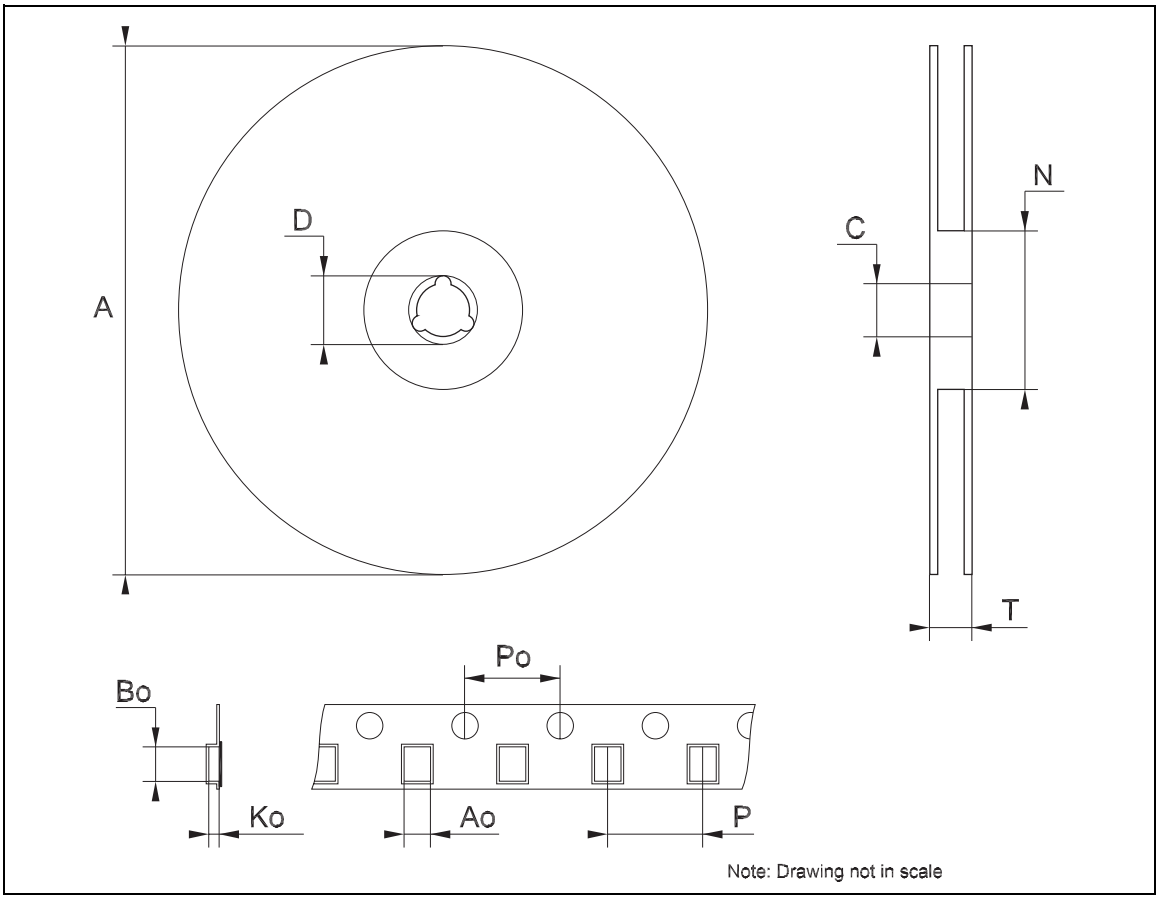
Tape & Reel SO-14 MECHANICAL DATA

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



Note: Drawing not in scale

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