



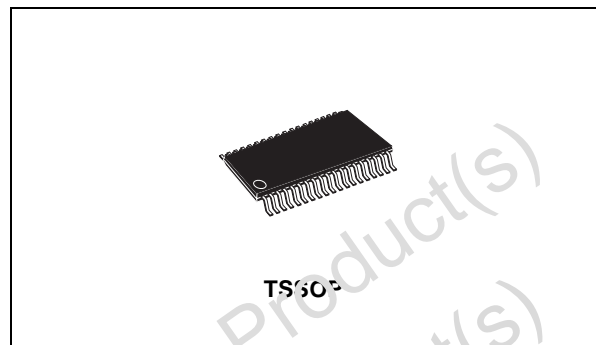
## MULTIPLE RS-232 DRIVERS AND RECEIVERS

- MEETS AND EXCEEDS THE REQUIREMENTS OF EIA/TIA-232-E AND ITUV.28 STANDARD
- SINGLE CHIP WITH EASY INTERFACE BETWEEN UART AND SERIAL PORT CONNECTOR OF IBM PC/AT™ AND COMPATIBLES
- DESIGNED TO SUPPORT DATA RATES UP TO 120 Kbps

### DESCRIPTION

The ST75285 contains six drivers and ten receivers. The pinout matches the DB9S connector design in order to decrease the part count, reduce the board space required and allow easy interconnection of the UART and serial port connector of IBM PC/AT™ and compatibles. The bipolar circuits and processing of the ST75285 provides a rugged low-cost solution for this function at the expense of quiescent power and external passive components relative to the ST75C185.

The ST75285 complies with the requirements of the EIA/TIA 232-E and ITU (formerly CCITT) v.28 standards. These standards are for data interchange between a host computer and



peripheral at signalling rates up to 20k-bits/s. The switching speeds of the ST75285 are fast enough to support rates up to 120K-bits/s with lower capacitive loads (shorter cables). Interoperability at the higher signalling rates cannot be assured unless the designer has design control of the cable and the interface circuits at the both ends. For interoperability at signalling rates to 120 K-bits/s, use of EIA/ITA-423-B (ITU v.10) and EIA/ITA-422-B (ITU v.11) standards are recommended. It allows space saving in applications where two ST75185 are needed.

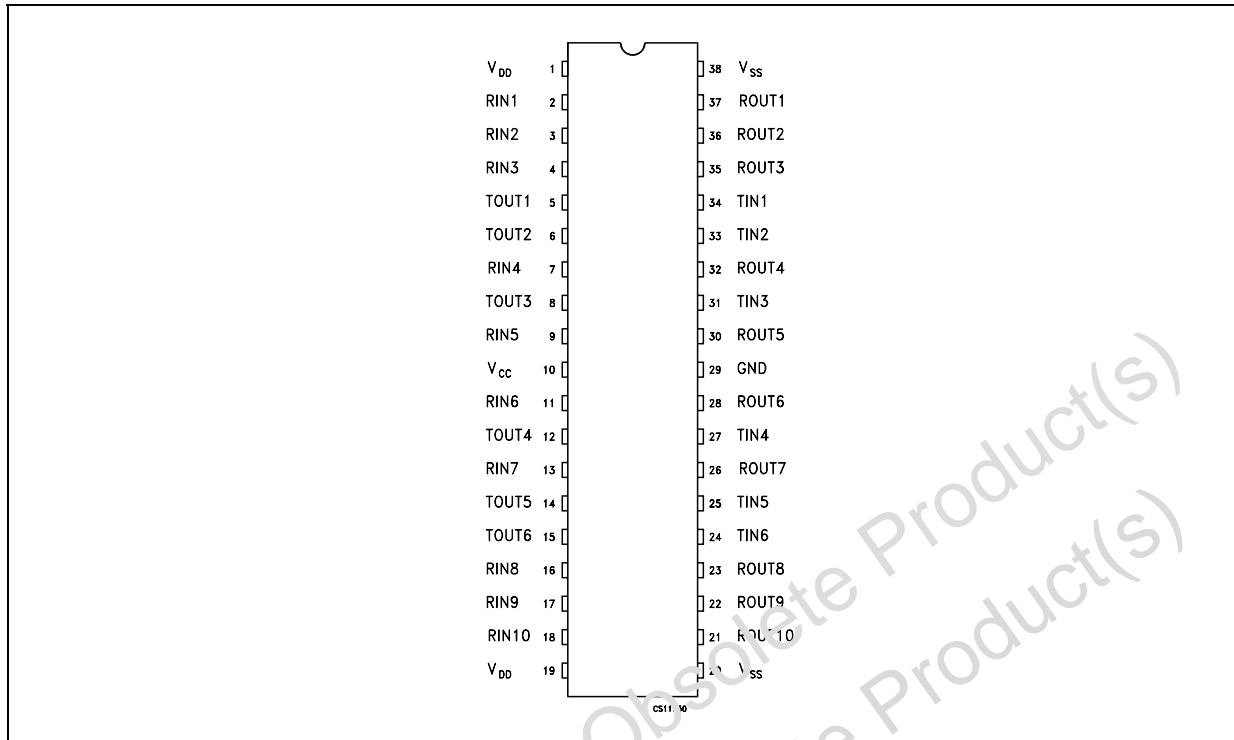
### ORDERING CODES

Type	Temperature Range	Package	Comments
ST75285CTR	0 to 70 °C	TSSOP38 (Tape & Reel)	2500 parts per reel

## PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	V <sub>DD</sub>	Supply Voltage (+12V)
2	RIN1	First Receiver Input
3	RIN2	Second Receiver Input
4	RIN3	Third Receiver Input
5	TOUT1	First Driver Output
6	TOUT2	Second Driver Output
7	RIN4	Fourth Receiver Input
8	TOUT3	Third Driver Output
9	RIN5	Fifth Receiver Input
10	V <sub>CC</sub>	Supply Voltage (-12V)
11	RIN6	Sixth Receiver Input
12	TOUT4	Fourth Driver Output
13	RIN7	Seventh Receiver Input
14	TOUT5	Fifth Driver Output
15	TOUT6	Sixth Driver Output
16	RIN8	Eighth Receiver Input
17	RIN9	Nineth Receiver Input
18	RIN10	Tenth Receiver Input
19	V <sub>DD</sub>	Supply Voltage (-12V)
20	V <sub>SS</sub>	Supply Voltage (+5V)
21	ROUT10	Tenth Receiver Output
22	ROUT9	Nineth Receiver Output
23	ROUT8	Eighth Receiver Output
24	TIN6	Sixth Driver Input
25	TIN5	Fifth Driver Input
26	ROUT7	Seventh Receiver Output
27	TIN4	Fourth Driver Input
28	ROUT6	Sixth Receiver Output
29	GND	Ground
30	ROUT5	Fifth Receiver Output
31	TIN3	Third Driver Input
32	ROUT4	Fourth Receiver Output
33	TIN2	Second Driver Input
34	TIN1	First Driver Input
35	ROUT3	Third Receiver Output
36	ROUT2	Second Receiver Output
37	ROUT1	First Receiver Output
38	V <sub>SS</sub>	Supply Voltage (+5V)

## PIN CONNECTION IEC LOGIC SYMBOL AND LOGIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS OVER OPERATING FREE-AIR TEMPERATURE RANGE

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage (Note 1)	-0.3 to 15	V
$V_{SS}$	Supply Voltage (Note 1)	0.3 to -15	V
$V_{CC}$	Supply Voltage (Note 1)	-0.3 to 10	V
$V_I$	Input Voltage Range (DRIVER)	-15 to 7	V
$V_I$	Input Voltage Range (RECEIVER)	-30 to 30	V
$V_O$	Output Voltage Range (DRIVER)	-15 to 15	V
$I_{OL}$	Receiver Low Level Output Current	20	mA
$P_D$	Continuous Total Power Dissipation	See dissipation Rating Table	
$T_A$	Operating Free-Air Temperature Range	0 to 70	°C
$T_{stg}$	Storage Temperature Range	-65 to + 150	°C
ESD	Human Body Model	>2	kV
$T_L$	Lead Temperature 1.6mm from case for 10 sec	260	°C

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

NOTE 1: All voltage are with respect to the network ground terminal.

## DISSIPATION RATING TABLE

Package	Power Rating at $T_A \leq 25^\circ\text{C}$	Derating Factor above $T_A = 25^\circ\text{C}$ (*)	Power Rating at $T_A \leq 85^\circ\text{C}$
TSSOP (T)	1277 mW	10.2 mW/°C	644 mW

(\*) This is the reverse of the traditional junction-case thermal resistance  $R_{j-c}$

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage	7.5	15	V
V <sub>SS</sub>	Supply Voltage	-7.5	-15	V
V <sub>CC</sub>	Supply Voltage	4.5	5.5	V
V <sub>I</sub>	Driver Input Voltage	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High Level Output Current	DRIVER	-6	mA
		RECEIVER	-0.5	
I <sub>OL</sub>	Low Level Output Current	DRIVER	6	mA
		RECEIVER	16	
T <sub>A</sub>	Operating Free-Air Temperature	0	70	°C

## SUPPLY CURRENTS

Symbol	Parameter	Test Conditions			Value			Unit		
		V <sub>DD</sub>	V <sub>SS</sub>		Min.	Typ.	Max.			
I <sub>DD</sub>	Supply Current from V <sub>DD</sub>	9	-9	No load. All inputs at 1.9V			22	mA		
		12	-12				28			
		15	-15				32			
		I <sub>SS</sub>	Supply Current from V <sub>SS</sub>	9	-9	No load. All inputs at 0.8V			9	mA
				12	-12				11	
				15	-15				12	
I <sub>SS</sub>	Supply Current from V <sub>SS</sub>	9	-9	No load. All inputs at 1.9V			-22	mA		
		12	-12				-28			
		15	-15				-32			
		I <sub>CC</sub>	Supply Current from V <sub>CC</sub>	9	-9	No load. All inputs at 0.8V			-6.4	mA
				12	-12				-6.4	
				15	-15				-6.4	
I <sub>CC</sub>	Supply Current from V <sub>CC</sub>	No load. All inputs at 5V V <sub>CC</sub> = 5V					60	mA		

DRIVER ELECTRICAL CHARACTERISTICS OVER OPERATING FREE-AIR TEMPERATURE RANGE (V<sub>DD</sub> = 9V, V<sub>SS</sub> = -9V, V<sub>CC</sub> = 5V, unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V <sub>OH</sub>	High Level Output Voltage	V <sub>IL</sub> = 0.8 V R <sub>L</sub> = 3KΩ (See Figure 1)	6	7.5		V
V <sub>OL</sub>	Low Level Output Voltage (Note 3)	V <sub>IH</sub> = 1.9 V R <sub>L</sub> = 3KΩ (See Figure 1)		-7.5	-6	V
I <sub>IH</sub>	High Level Input Current	V <sub>I</sub> = 5 V (See Figure 2)			10	μA
I <sub>IL</sub>	Low Level Input Current	V <sub>I</sub> = 0 V (See Figure 2)			-1.6	mA
I <sub>OS(H)</sub>	High Level Short Circuit Output Current (Note 4)	V <sub>IL</sub> = 0.8 V V <sub>O</sub> = 0 V (See Figure 1)	-4.5	-12	-19.5	mA
I <sub>OS(L)</sub>	Low Level Short Circuit Output Current	V <sub>IH</sub> = 2 V V <sub>O</sub> = 0 V (See Figure 1)	4.5	12	19.5	mA
R <sub>O</sub>	Output Resistance	V <sub>DD</sub> = V <sub>SS</sub> = V <sub>CC</sub> = 0 V V <sub>O</sub> = -2 to 2 V (Note 5)	300			Ω

NOTE 3: The algebraic convention, where the more positive (less negative) limits designated as maximum, is used in this datasheet for logic levels only (e.g. if -10V is a maximum, the typical value is a more negative voltage).

NOTE 4: Output short circuit conditions must maintain the total power dissipation below absolute maximum ratings.

NOTE 5: Test conditions are those specified by EIA-232-E and as listed above.

**DRIVER SWITCHING CHARACTERISTICS** ( $V_{DD} = 12V$ ,  $V_{SS} = -12V$ ,  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{PLH}$	Propagation Delay Time, Low to High Level Output	$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 15 \text{ pF}$ (See Figure 3, 4)		200	400	ns
$t_{PHL}$	Propagation Delay Time, High to Low Level Output	$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 15 \text{ pF}$ (See Figure 3, 4)		50	100	ns
$t_{TLH}$	Transition Time Low to High Level Output	$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 15 \text{ pF}$ (See Figure 3, 4)		60	100	ns
		$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 2500 \text{ pF}$ (Note 6, See Figure 3, 4)		1.7	2.5	$\mu s$
$t_{THL}$	Transition Time High to Low Level Output	$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 15 \text{ pF}$ (See Figure 3, 4)		50	100	ns
		$R_L = 3 \text{ to } 7 \text{ K}\Omega$ $C_L = 2500 \text{ pF}$ (Note 6, See Figure 3, 4)		1.5	2.5	$\mu s$

NOTE 6: Measured between -3V and 3V points of output waveform (EIA-232-E conditions), all unused inputs are tied.

**RECEIVER ELECTRICAL CHARACTERISTICS OVER OPERATING CONDITIONS**

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{T+}$	Positive Going Threshold Voltage	(See Figure 6)		2.2	2.4	V
$V_{T-}$	Negative Going Threshold Voltage	$T_A = 25^\circ C$ (See Figure 6)	0.75	0.97		V
$V_{hys}$	Input Hysteresis ( $V_{T+} - V_{T-}$ )		0.5			V
$V_{OH}$	High Level Output Voltage	$I_{OH} = -0.5 \text{ mA}$ $V_{IH} = 0.75 \text{ V}$	2.6	4	5	V
		Inputs Open	2.6			
$V_{OL}$	Low Level Output Voltage	$V_I = 3 \text{ V}$ $I_{OL} = 10 \text{ mA}$		0.2	0.45	V
$I_{IH}$	High Level Input Current	$V_I = 25 \text{ V}$ (See Figure 6)	3.6		8.3	mA
		$V_I = 3 \text{ V}$ (See Figure 6)	0.43			
$I_{IL}$	Low Level Input Current	$V_I = -25 \text{ V}$ (See Figure 6)	-3.6		-8.3	mA
		$V_I = -3 \text{ V}$ (See Figure 6)	-0.43			
$I_{OS}$	Short-Circuit Output Current	$V_I = 0 \text{ V}$ $V_O = 0 \text{ V}$ (See Figure 5)		-3.4	-12	mA

All typical values are at  $T_A = 25^\circ C$ ,  $V_{CC} = 5V$ ,  $V_{DD} = 9V$  and  $V_{SS} = -9V$

**RECEIVER SWITCHING CHARACTERISTICS** ( $V_{DD} = 12V$ ,  $V_{SS} = -12V$ ,  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ )

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{PLH}$	Propagation Delay Time Low to High Level Output	$R_L = 5 \text{ K}\Omega$ $C_L = 50 \text{ pF}$ (See Figure 6)		200	500	ns
$t_{PHL}$	Propagation Delay Time High to Low Level Output	$R_L = 5 \text{ K}\Omega$ $C_L = 50 \text{ pF}$ (See Figure 6)		60	120	ns
$t_{TLH}$	Transition Time Low to High Level Output	$R_L = 5 \text{ K}\Omega$ $C_L = 50 \text{ pF}$ (See Figure 6)		200	525	ns
$t_{THL}$	Transition Time High to Low Level Output	$R_L = 5 \text{ K}\Omega$ $C_L = 50 \text{ pF}$ (See Figure 6)		20	60	ns

Figure 1 : Driver Test Circuit for  $V_{OH}$ ,  $I_{SO(H)}$  and  $I_{SO(L)}$

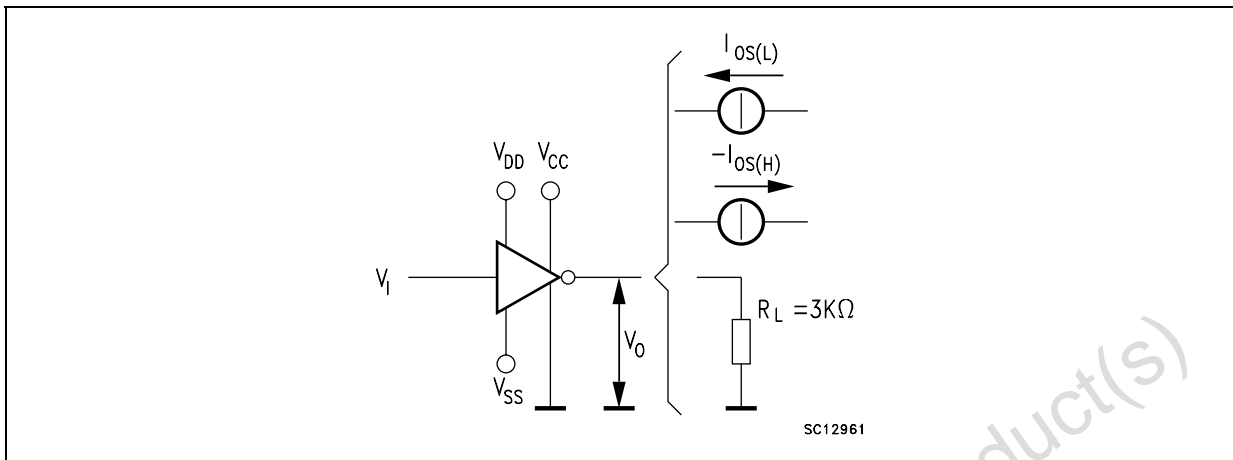


Figure 2 : Driver Test Circuit for  $I_{IH}$  and  $I_{IL}$

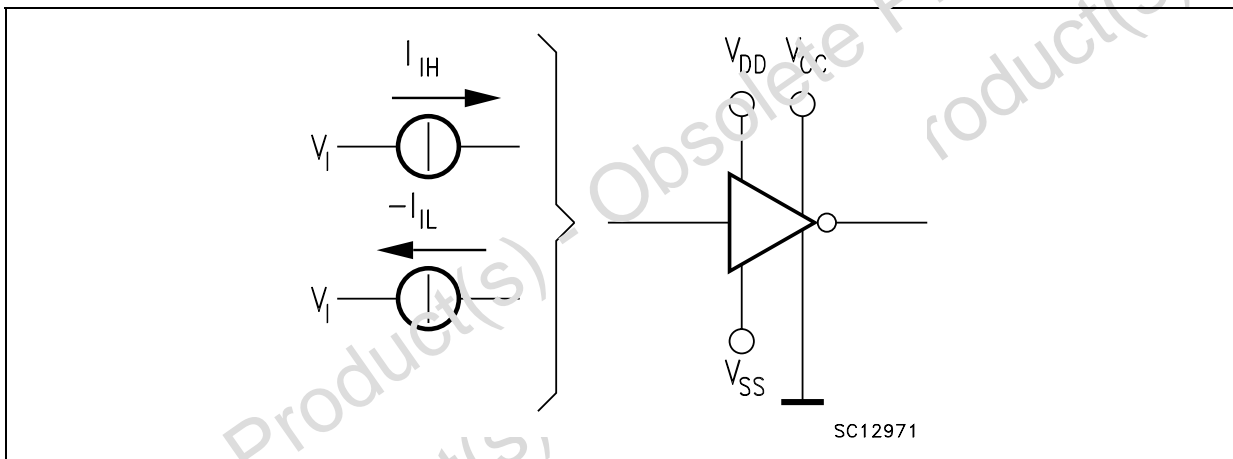


Figure 3 : Driver Test Circuit

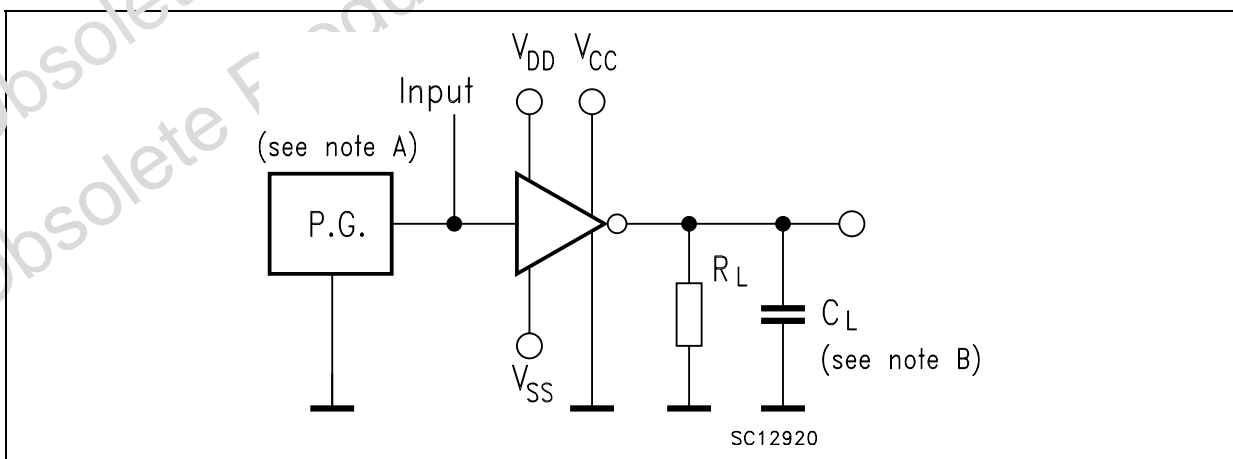


Figure 4 : Driver Voltage Waveforms

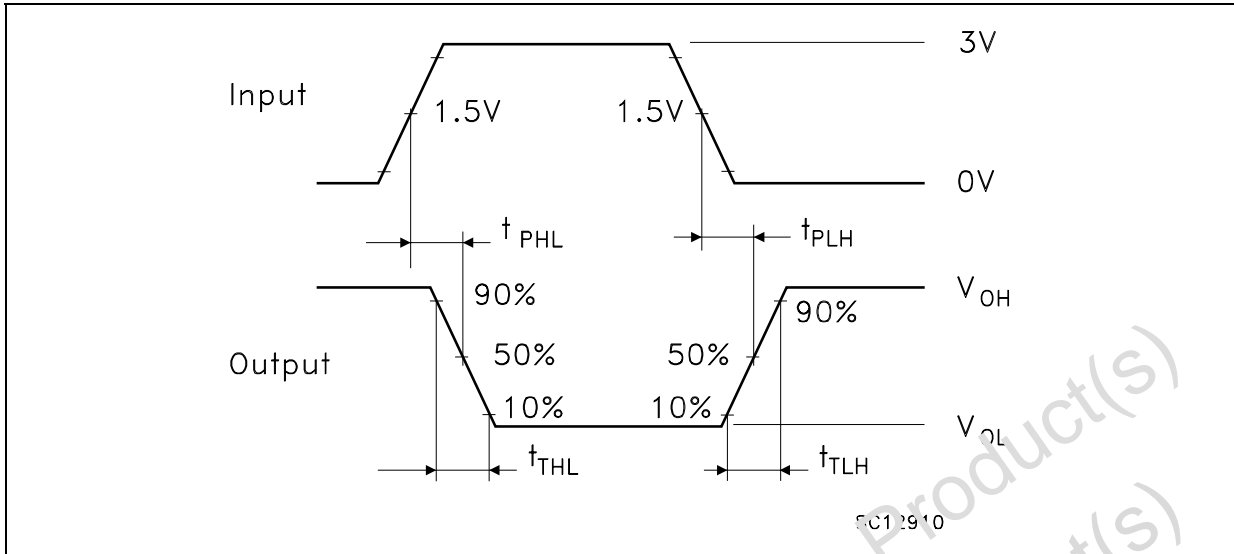


Figure 5 : Receiver Test Circuit for  $I_{OS}$

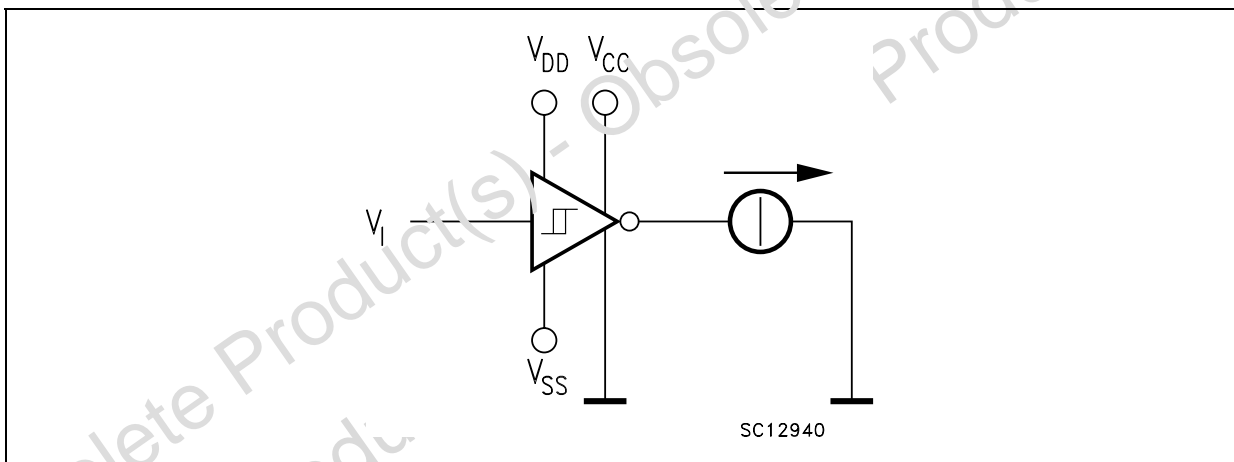


Figure 6 : Receiver Test Circuit for  $V_T, V_{OH}, V_{OL}$

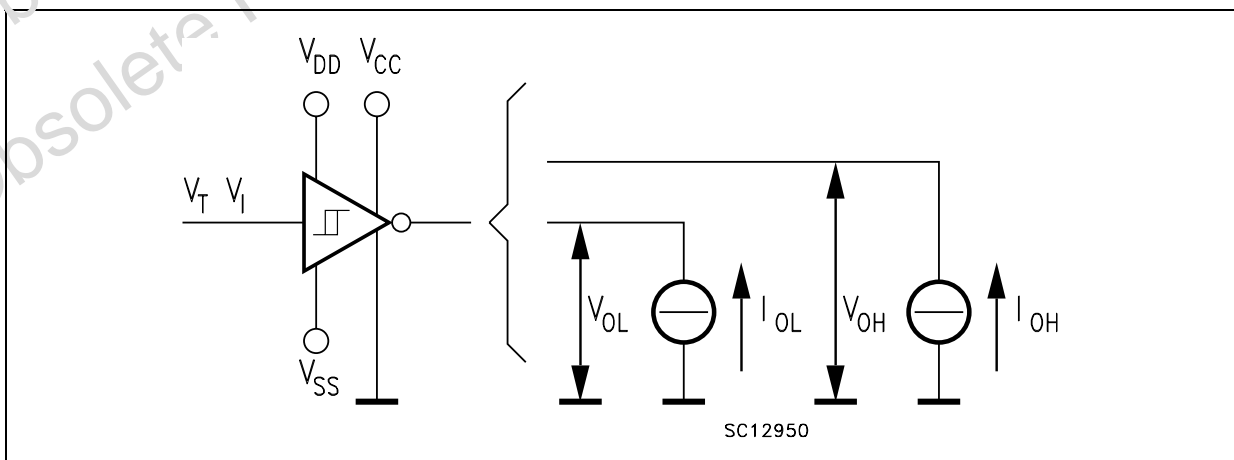


Figure 7 : Receiver Test Circuit

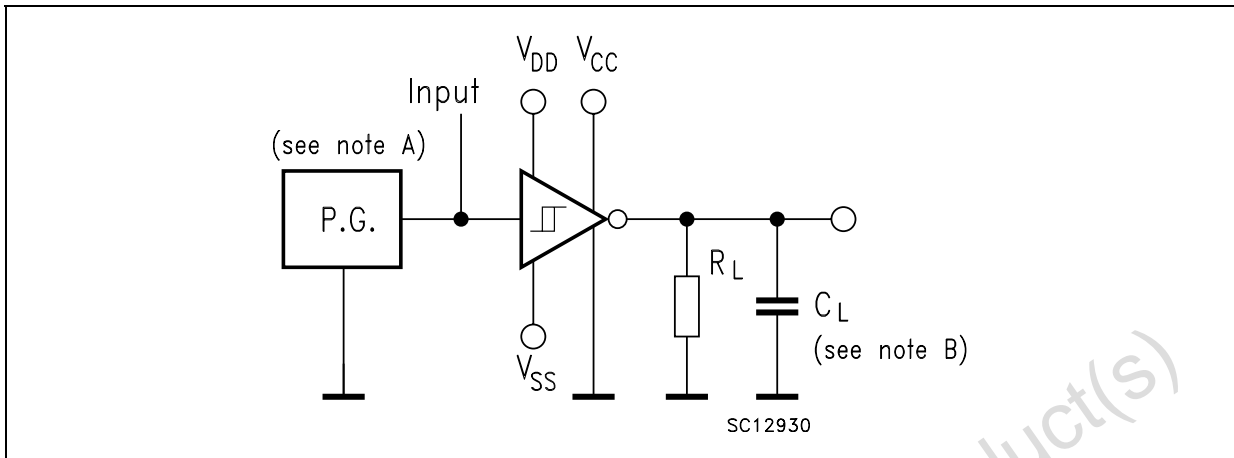
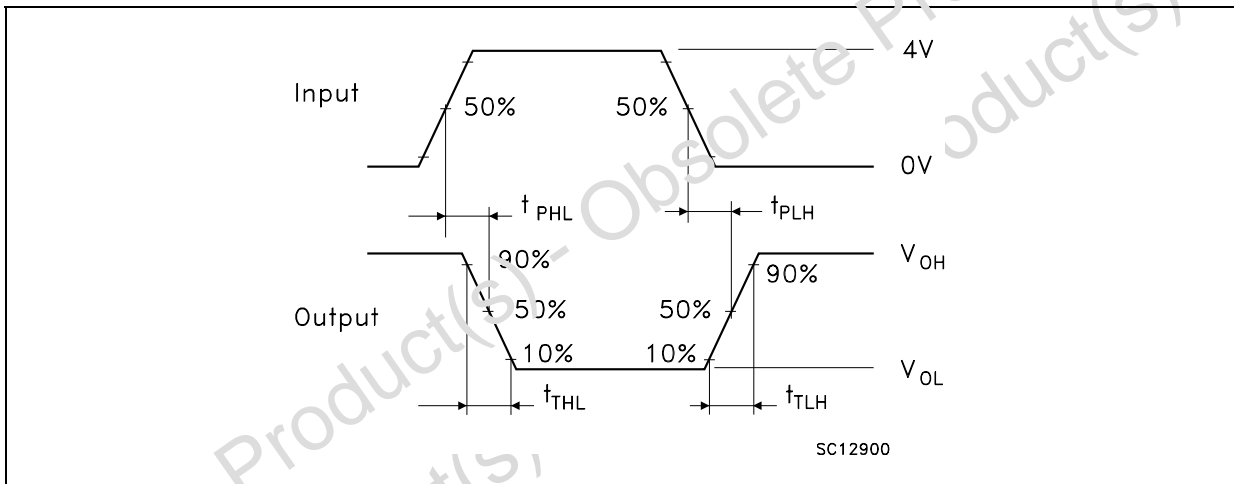


Figure 8 : Receiver Voltage Waveforms



NOTE A: The pulse generator has the following characteristics:  $t_w = 25\mu s$ ,  $PRR = 20KHz$ ,  $Z_o = 50 \Omega$ ,  $t_r = t_f < 50ns$   
 NOTE B:  $C_L$  includes probe and jig capacitance.



Figure 9 : Driver Voltage Transfer Characteristics

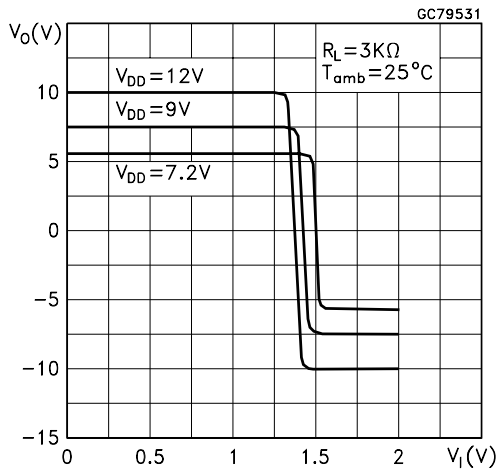


Figure 12 : Driver Output Current vs Output Voltage

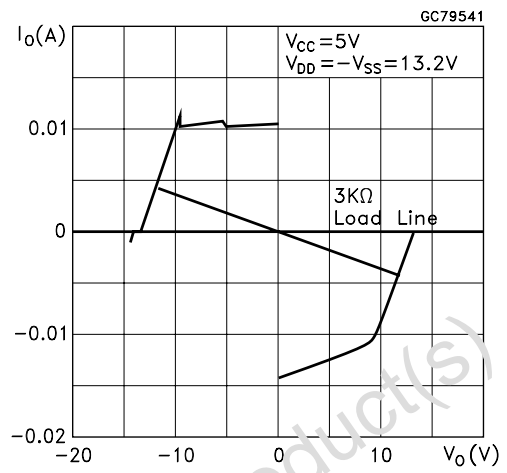


Figure 10 : Driver Short Circuit Output Current vs Free-Air Temperature

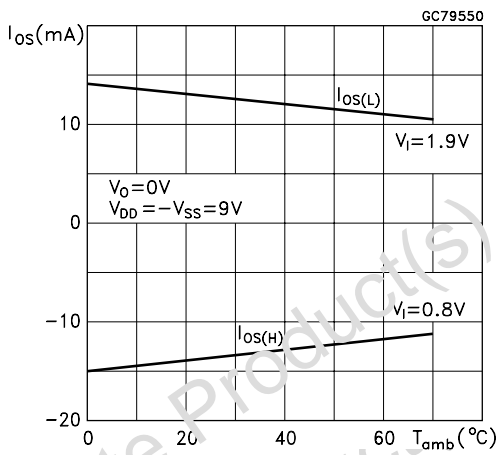


Figure 13 : Driver Output Slew Rate vs Load Capacitance

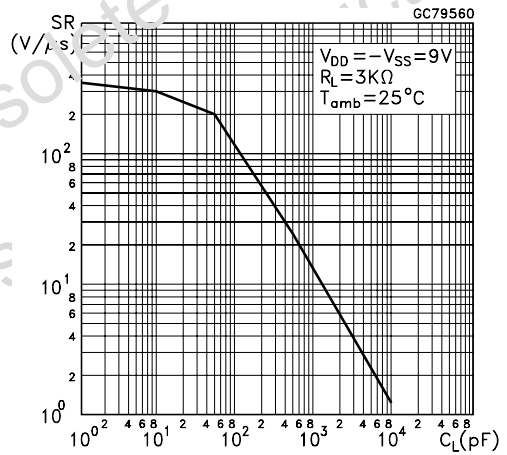


Figure 11 : Receiver Threshold vs Supply Voltage

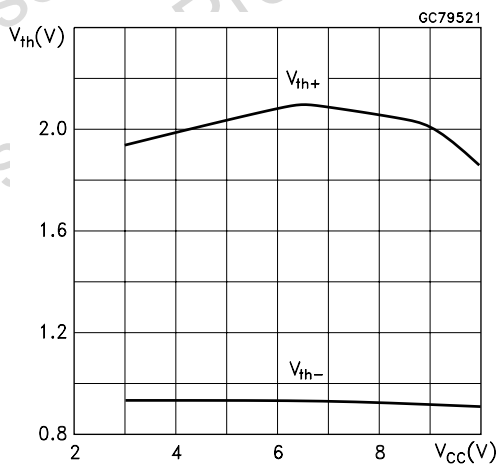
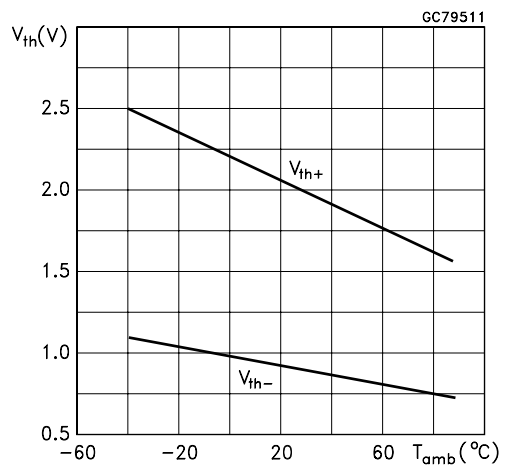
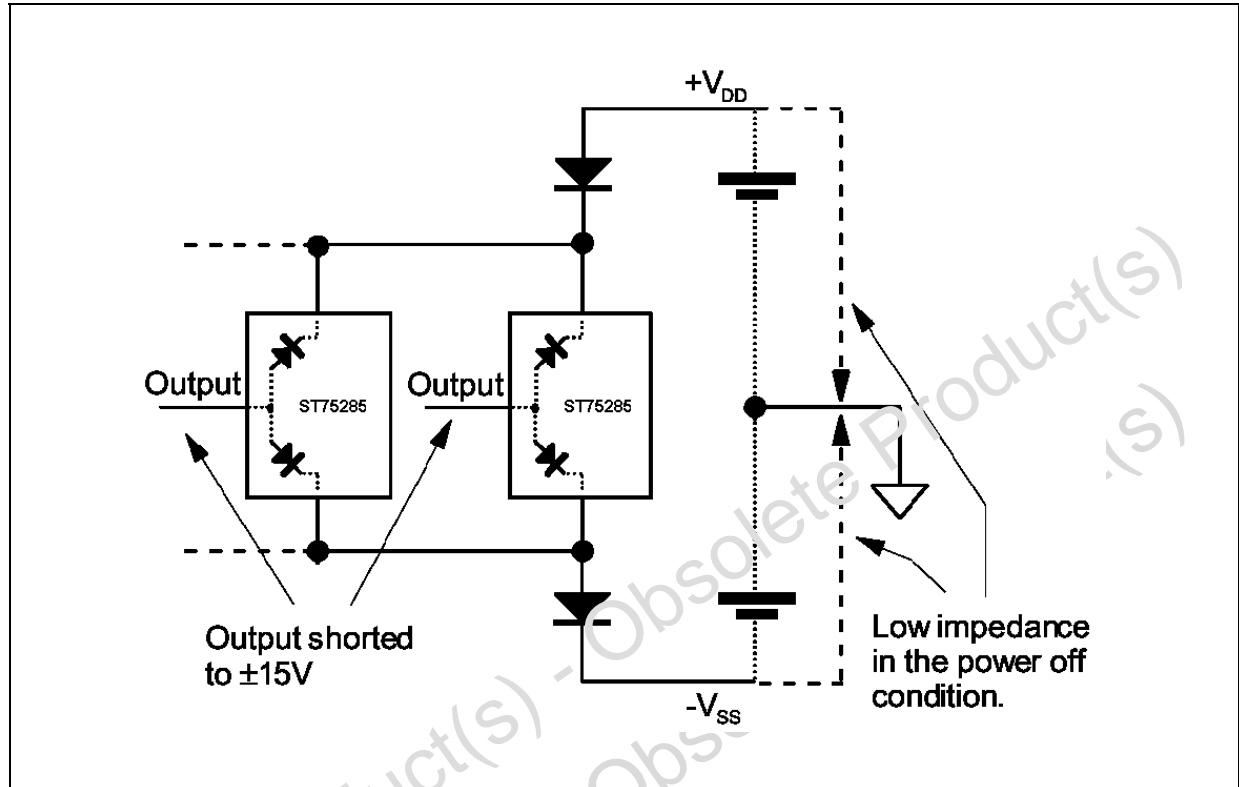


Figure 14 : Receiver Threshold vs Temperature



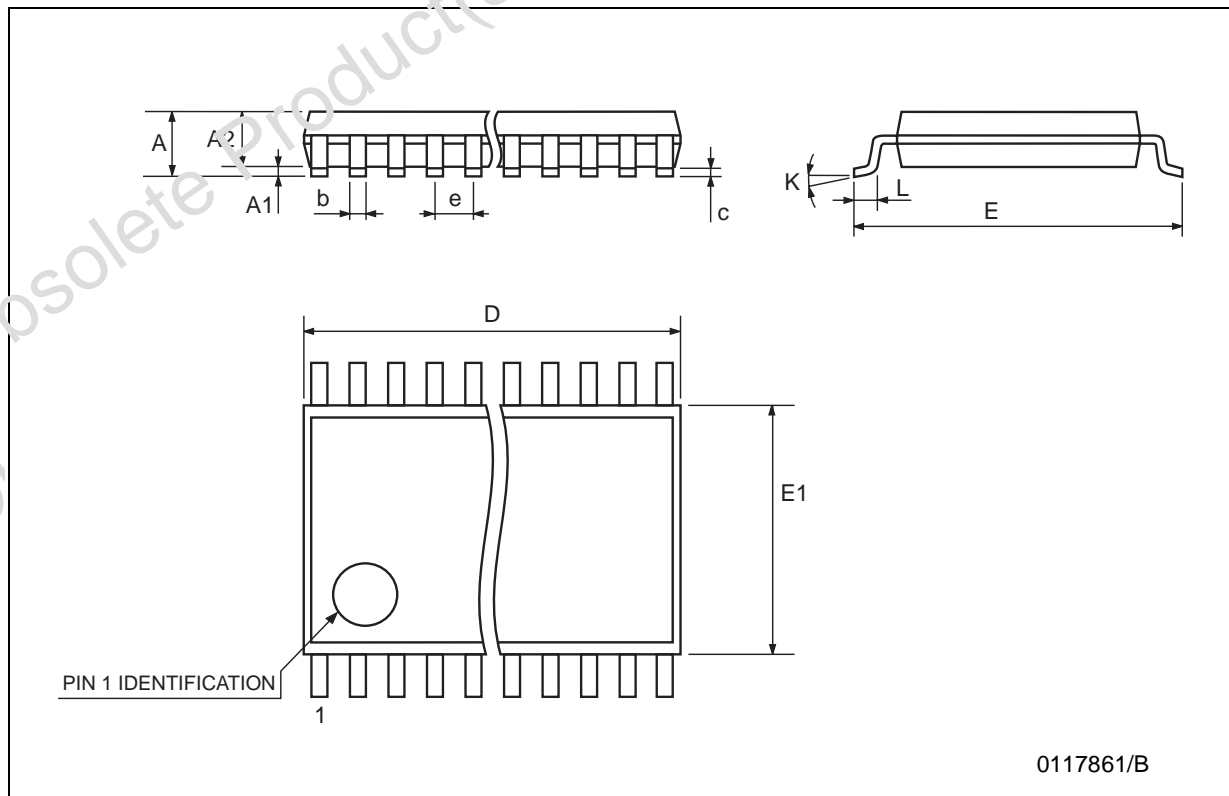
**APPLICATION INFORMATION: DIODES ON POWER SUPPLY**

Diodes placed in series with the VDD and VSS leads protect the ST75185 in the fault condition in which the devices output are shorted to  $\pm 15\text{V}$  and the power supplies are at low state and provide low-impedance path to ground (see Figure below).



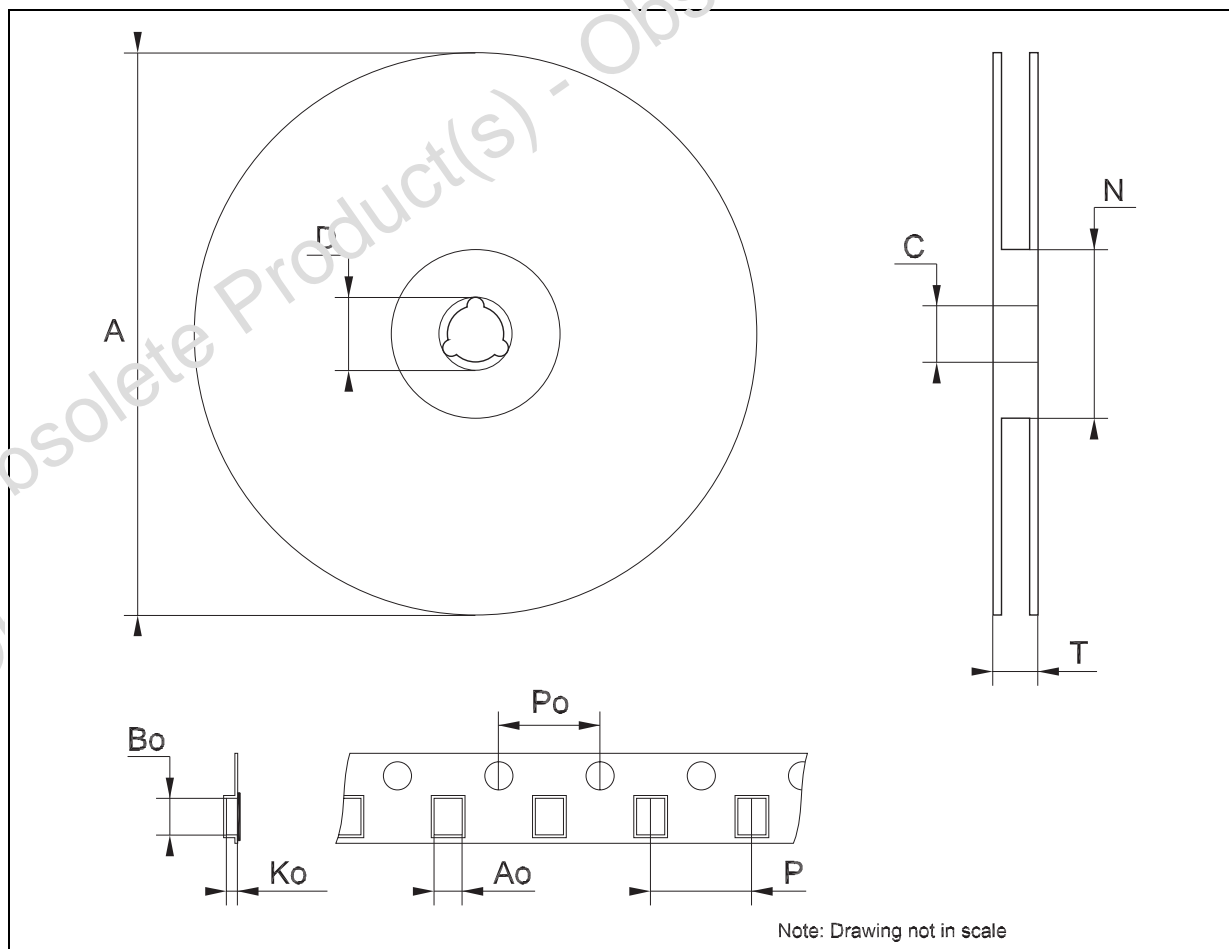
## TSSOP38 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002		0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.17		0.27	0.0067		0.011
c	0.09		0.20	0.0035		0.0079
D	9.6	9.7	9.8	0.378	0.381	0.385
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.5	0.169	0.173	0.177
e		0.5			0.0197	
K	0°		8°	0°		8°
L	0.50	0.6	0.75	0.020	0.023	0.030



**Tape & Reel TSSOP38 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	6.8		7	0.268		0.276
Bo	10.1		10.3	0.398		0.406
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



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