



## ST75C185

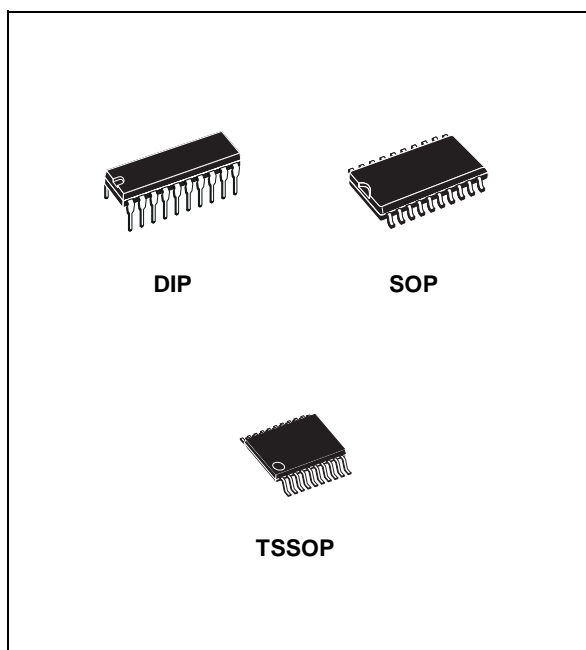
### LOW POWER MULTIPLE RS-232 DRIVERS AND RECEIVERS

- MEETS STANDARD EIA-232-E
- SINGLE CHIP WITH INTERFACE BETWEEN UART AND SERIAL PORT CONNECTOR
- LESS THAN 20mW QUIESCENT POWER CONSUMPTION
- WIDE DRIVER SUPPLY VOLTAGE: 7 TO 13.2V
- DRIVER OUTPUT SLEW RATE LIMITED TO 30V/ $\mu$ s MAX
- RECEIVER INPUT HYSTERESIS: 1.1 TYP
- PUSH-PULL RECEIVER OUTPUTS
- ON CHIP RECEIVER 1 $\mu$ s NOISE FILTER
- FUNCTIONALLY INTERCHANGEABLE WITH STM ST75185
- ESD PROTECTION:  $\pm$ 10KV HUMAN BODY MODEL

#### DESCRIPTION

The ST75C185 is a low power BICMOS device containing three independent drivers and five receivers that is used to interface data terminal equipment (DTE) with data circuit-terminating equipment (DCE). This device has been designed to conform to Standards ANSI/EIA-232-E. The drivers have a controlled output slew rate that is limited to a maximum of 30V/ $\mu$ s and the receivers have filters that reject input noise pulses that are shorter than 1 $\mu$ s. Both these features eliminate the need of external components.

The ST75C185 hasn't a power sequence fault condition. It has been designed using low-power techniques in a BICMOS technology.

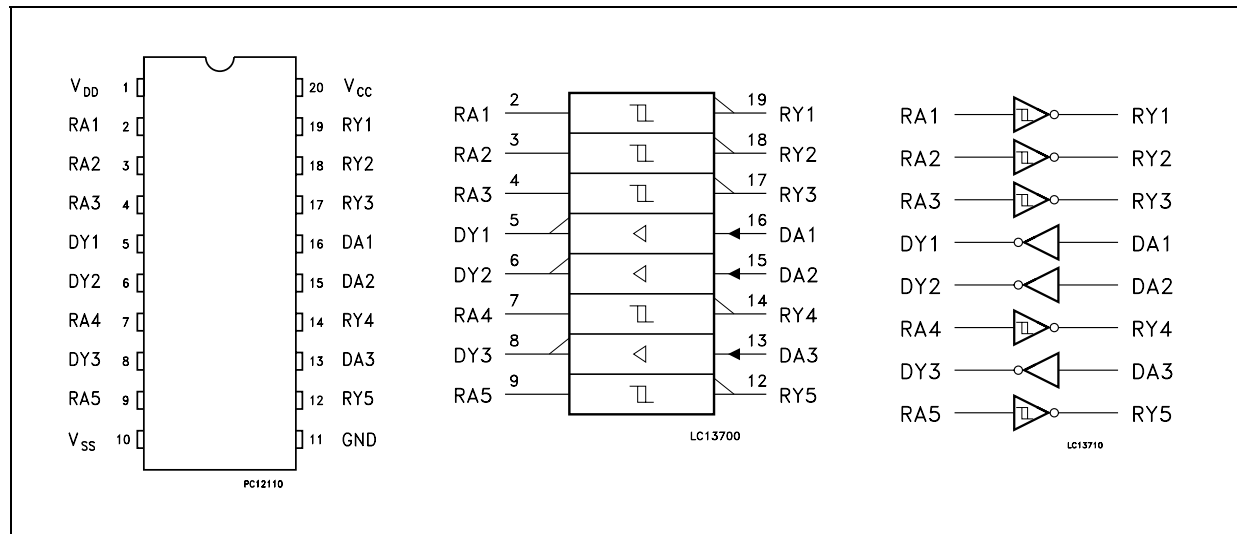


In most applications the receivers contained in this device will interface to single inputs peripheral devices such as ACEs, UARTs or microprocessors. By using sampling, such peripheral devices are usually insensitive to the transition times of the input signals. If this is not the case, or for other uses, it is recommended that the ST75C185 receiver outputs be buffered by single gates of the HCMOS, ALS or 74F logic families.

#### ORDERING CODES

Type	Temperature Range	Package	Comments
ST75C185CN	0 to 70 °C	DIP20	20 parts per tube / 50 tubes per box
ST75C185CD	0 to 70 °C	SO-20 (Tube)	40 parts per tube / 25 tubes per box
ST75C185CDR	0 to 70 °C	SO-20 (Tape & Reel)	1000 parts per reel
ST75C185CTR	0 to 70 °C	TSSOP20 (Tape & Reel)	2500 parts per reel
ST75C185BN	-40 to 85 °C	DIP20	20 parts per tube / 50 tubes per box
ST75C185BD	-40 to 85 °C	SO-20 (Tube)	40 parts per tube / 25 tubes per box
ST75C185BDR	-40 to 85 °C	SO-20 (Tape & Reel)	1000 parts per reel
ST75C185BTR	-40 to 85 °C	TSSOP-20 (Tape & Reel)	2500 parts per reel

## PIN CONNECTION IEC LOGIC SYMBOL AND LOGIC DIAGRAM



## PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	$V_{DD}$	Supply Voltage (+12V)
2	RA1	First Receiver Input
3	RA2	Second Receiver Input
4	RA3	Third Receiver Input
5	DY1	First Driver Output
6	DY2	Second Driver Output
7	RA4	Fourth Receiver Input
8	DY3	Third Driver Output
9	RA5	Fifth Receiver Input
10	$V_{SS}$	Supply Voltage (-12V)
11	GND	Ground
12	RY5	Fifth Receiver Output
13	DA3	Third Driver Input
14	RY4	Fourth Receiver Output
15	DA2	Second Driver Input
16	DA1	First Driver Input
17	RY3	Third Receiver Output
18	RY2	Second Receiver Output
19	RY1	First Receiver Output
20	$V_{CC}$	Supply Voltage (+5V)

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

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply Voltage (Note 1)	15	V
$V_{SS}$	Supply Voltage (Note 1)	-15	V
$V_{CC}$	Supply Voltage (Note 1)	7	V
$V_I$	Input Voltage Range (DRIVER)	-0.3 to ( $V_{CC} + 0.3$ )	V
$V_I$	Input Voltage Range (RECEIVER)	-30 to 30	V
$V_O$	Output Voltage Range (DRIVER)	( $V_{SS} - 6$ ) to ( $V_{DD} + 6$ )	V
$V_O$	Output Voltage Range (RECEIVER)	-0.3 to ( $V_{CC} + 0.3$ )	V
$I_O$	Receiver Low Level Output Current	20	mA
$T_A$	Operating Free-Air Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-65 to +150	°C
$T_L$	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 voltages are with respect to the network ground terminal.

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter		Min	TYP	Max	Unit
$V_{DD}$	Supply Voltage		7	12	13.2	V
$V_{SS}$	Supply Voltage		-7	-12	-13.2	V
$V_{CC}$	Supply Voltage		4.5	5	5.5	V
$V_I$	Input Voltage (Note 2)	DRIVER	0		$V_{CC}$	V
		RECEIVER	-25		25	
$I_{OH}$	High Level Output Current	RECEIVER			-1	mA
$I_{OL}$	Low Level Output Current	RECEIVER			3.2	mA
$T_A$	Operating Free-Air Temperature Range		-40	25	85	°C

NOTE 2: The algebraic conversion, where the more positive (less negative) limits designed 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.

**SUPPLY CURRENTS**

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
$I_{DD}$	Supply Current from $V_{DD}$	No load. All inputs at 2 or 0.8V		115	500	μA
$I_{SS}$	Supply Current from $V_{SS}$	No load. All inputs at 2 or 0.8V		-115	-500	μA
$I_{CC}$	Supply Current from $V_{CC}$	No load. All inputs at 2 or 5V		950	1500	μA

**DRIVER ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE**(V<sub>DD</sub> = 12V, V<sub>SS</sub> = -12V, V<sub>CC</sub> = 5V ± 10%, 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> = 3K $\Omega$ (See Figure 1)	V <sub>DD</sub> = 7V, V <sub>SS</sub> = -7V	5	6.3	V
			V <sub>DD</sub> = 12V, V <sub>SS</sub> = -12V	10	10.8	V
V <sub>OL</sub>	Low Level Output Voltage (Note 3)	V <sub>IH</sub> = 1.9 V R <sub>L</sub> = 3K $\Omega$ (See Figure 1)	V <sub>DD</sub> = 7V, V <sub>SS</sub> = -7V		-6.3	V
			V <sub>DD</sub> = 12V, V <sub>SS</sub> = -12V		-10.8	V
V <sub>IH</sub>	High Level Input Voltage			2	1.4	V
V <sub>IL</sub>	Low Level Input Voltage			1.4	0.8	V
I <sub>IH</sub>	High Level Input Current	V <sub>I</sub> = 5 V (See Figure 2)			1	$\mu$ A
I <sub>IL</sub>	Low Level Input Current	V <sub>I</sub> = 0 V (See Figure 2)			-1	$\mu$ A
I <sub>OS(H)</sub>	High Level Short Circuit Output Current (Note 4)	V <sub>I</sub> = 0.8 V V <sub>O</sub> = 0 V or V <sub>SS</sub> (See Figure 1)		-6	-20	mA
I <sub>OS(L)</sub>	Low Level Short Circuit Output Current (Note 4)	V <sub>I</sub> = 2 V V <sub>O</sub> = 0 V or V <sub>SS</sub> (See Figure 1)		6	35	mA
R <sub>O</sub>	Output Resistance	V <sub>O</sub> = -2 to 2 V V <sub>SS</sub> = V <sub>CC</sub> = V <sub>DD</sub> = 0 V	300	450		$\Omega$

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: Not more than one outputs should be shorted at one time.

**DRIVER SWITCHING CHARACTERISTICS**(V<sub>DD</sub> = 12V, V<sub>SS</sub> = -12V, V<sub>CC</sub> = 5V, T<sub>A</sub> = 25 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t <sub>PLH</sub>	Propagation Delay Time, Low to High Level Output	R <sub>L</sub> = 3 to 7 K $\Omega$ C <sub>L</sub> = 1000 pF (See Figure 3)		1.9	4	$\mu$ s
t <sub>PHL</sub>	Propagation Delay Time, High to Low Level Output	R <sub>L</sub> = 3 to 7 K $\Omega$ C <sub>L</sub> = 1000 pF (See Figure 3)		1.6	4	$\mu$ s
t <sub>TLH</sub>	Transition Time Low to High Level Output	R <sub>L</sub> = 3 to 7 K $\Omega$ C <sub>L</sub> = 1000 pF (See Figure 3)	0.53	2	3.2	$\mu$ s
t <sub>THL</sub>	Transition Time High to Low Level Output	R <sub>L</sub> = 3 to 7 K $\Omega$ C <sub>L</sub> = 1000 pF (See Figure 3, 4)	0.53	2	3.2	$\mu$ s
SR	Output Slew Rate (Note 5)	R <sub>L</sub> = 3 to 7 K $\Omega$ C <sub>L</sub> = 50 to 2500 pF (See Figure 3)	4	11	30	V/ $\mu$ s

NOTE 5: Measured between -3V and 3V points of output waveform (EIA-232-E conditions), all unused inputs tied either high or low.

**RECEIVER ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE**(V<sub>DD</sub> = 12V, V<sub>SS</sub> = -12V, V<sub>CC</sub> = 5V ± 10%, unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V <sub>T+</sub>	Positive Going Threshold Voltage	(See Figure 6)	1.6	2.1	2.55	V
V <sub>T-</sub>	Negative Going Threshold Voltage	(See Figure 6)	0.65	1	1.25	V
V <sub>hys</sub>	Input Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> ) (Note 6)		0.6	1.1		V
V <sub>OH</sub>	High Level Output Voltage (Note 7)	I <sub>OH</sub> = 0.75 mA or Input Open I <sub>OH</sub> = -1 mA (See Figure 6)	3.5	4.8		V
V <sub>OL</sub>	Low Level Output Voltage	V <sub>I</sub> = 3 V I <sub>OL</sub> = 3.2 mA (See Figure 6)		0.2	0.4	V
I <sub>IH</sub>	High Level Input Current	V <sub>I</sub> = 25 V (See Figure 6)	3.6	4.5	8.3	mA
		V <sub>I</sub> = 3 V (See Figure 6)	0.43	0.55	1	
I <sub>IL</sub>	Low Level Input Current	V <sub>I</sub> = -25 V (See Figure 6)	-3.6	-4.4	-8.3	mA
		V <sub>I</sub> = -3 V (See Figure 6)	-0.4	-0.55	-1	
I <sub>OS(H)</sub>	Short-Circuit Output Current at High Level	V <sub>I</sub> = 0.75 V V <sub>O</sub> = 0 V (See Figure 5)		-13	-30	mA
I <sub>OS(L)</sub>	Short-Circuit Output Current at Low Level	V <sub>I</sub> = V <sub>CC</sub> V <sub>O</sub> = V <sub>CC</sub> (See Figure 5)		35	60	mA

All typical values are at T<sub>A</sub> = 25°CNOTE 6: Hysteresis is the difference between the positive going input threshold voltage, V<sub>T+</sub>, and the negative going input threshold voltage V<sub>T-</sub>.

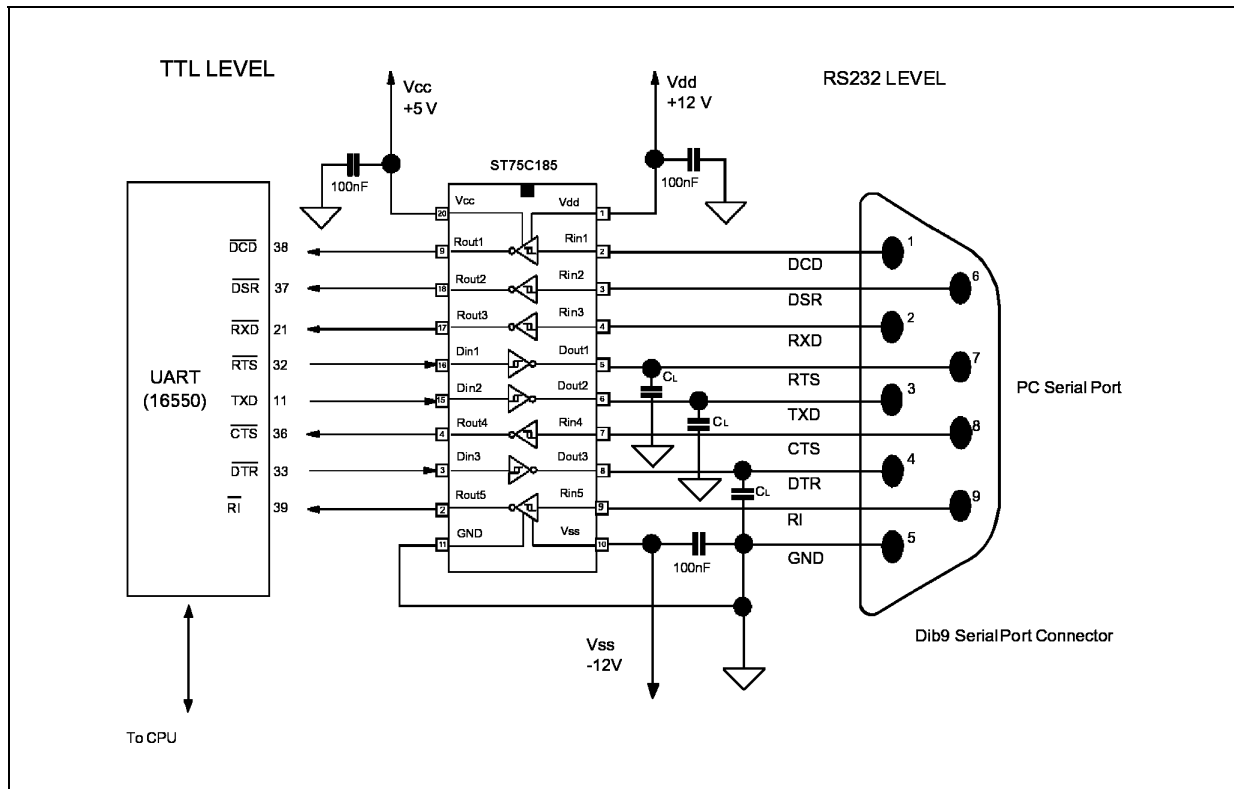
NOTE 7: If the inputs are left unconnected, the receiver interprets this as an input low, and the receiver outputs will remain in the high state.

**RECEIVER SWITCHING CHARACTERISTICS**(V<sub>DD</sub> = 12V, V<sub>SS</sub> = -12V, V<sub>CC</sub> = 5V ± 10% T<sub>A</sub> = 25°C)

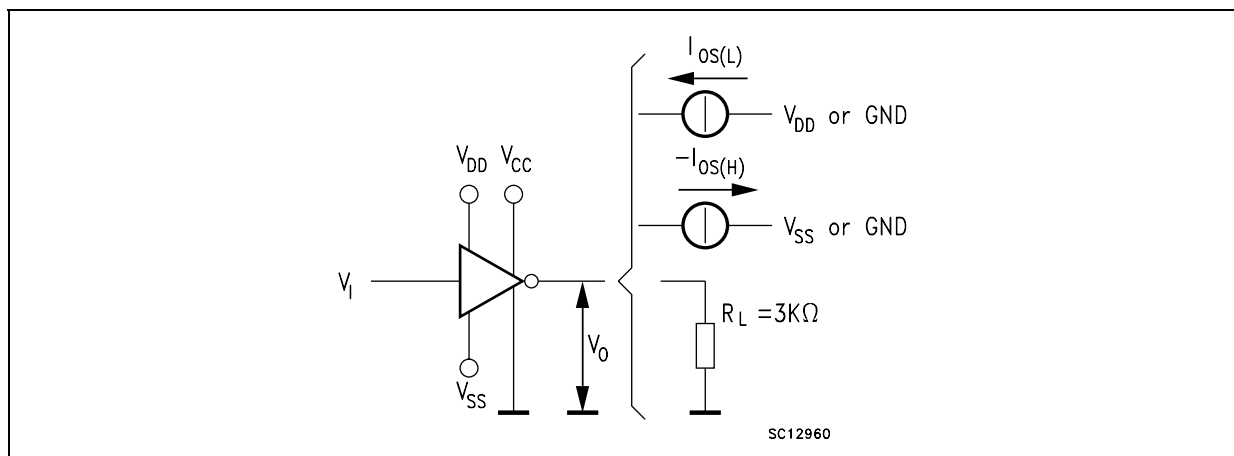
Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t <sub>PLH</sub>	Propagation Delay Time Low to High Level Output	R <sub>L</sub> = 5 KΩ C <sub>L</sub> = 50 pF (See Figure 6)		3.2	4	μs
t <sub>PHL</sub>	Propagation Delay Time High to Low Level Output	R <sub>L</sub> = 5 KΩ C <sub>L</sub> = 50 pF (See Figure 6)		2.6	4	μs
t <sub>TLH</sub>	Transition Time Low to High Level Output	R <sub>L</sub> = 5 KΩ C <sub>L</sub> = 50 pF (See Figure 6)		30	100	ns
t <sub>THL</sub>	Transition Time High to Low Level Output	R <sub>L</sub> = 5 KΩ C <sub>L</sub> = 50 pF (See Figure 6)		10	50	ns
t <sub>W(N)</sub>	Pulse Duration of longest pulse rejection as noise (Note 8)	R <sub>L</sub> = 5 KΩ C <sub>L</sub> = 50 pF (See Figure 6)	1	2.3	4	μs

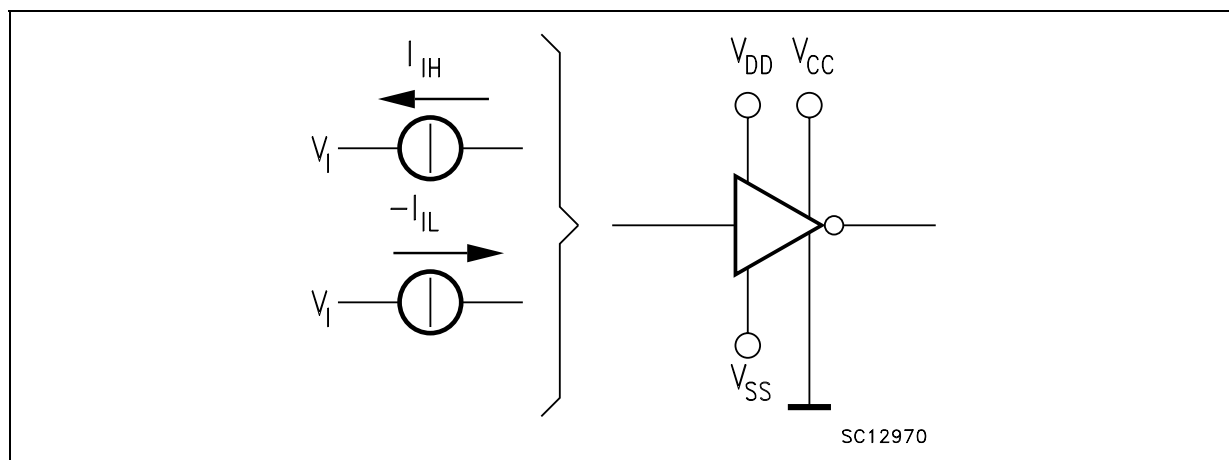
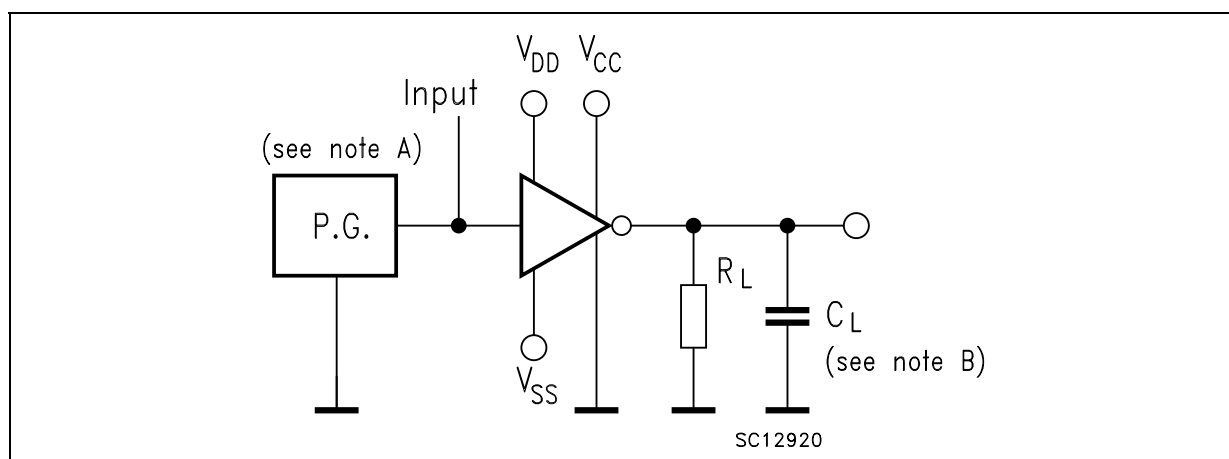
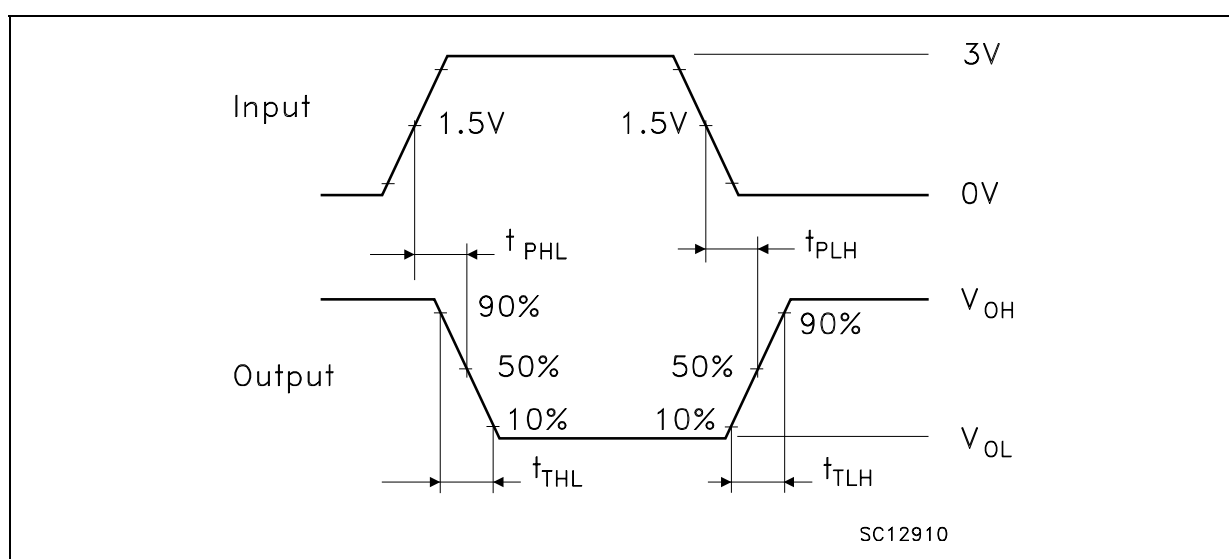
NOTE 8: The receiver ignores any positive or negative going pulse that is less than the minimum value of t<sub>W(N)</sub> and accepts any positive or negative going pulse greater than the maximum of t<sub>W(N)</sub>.

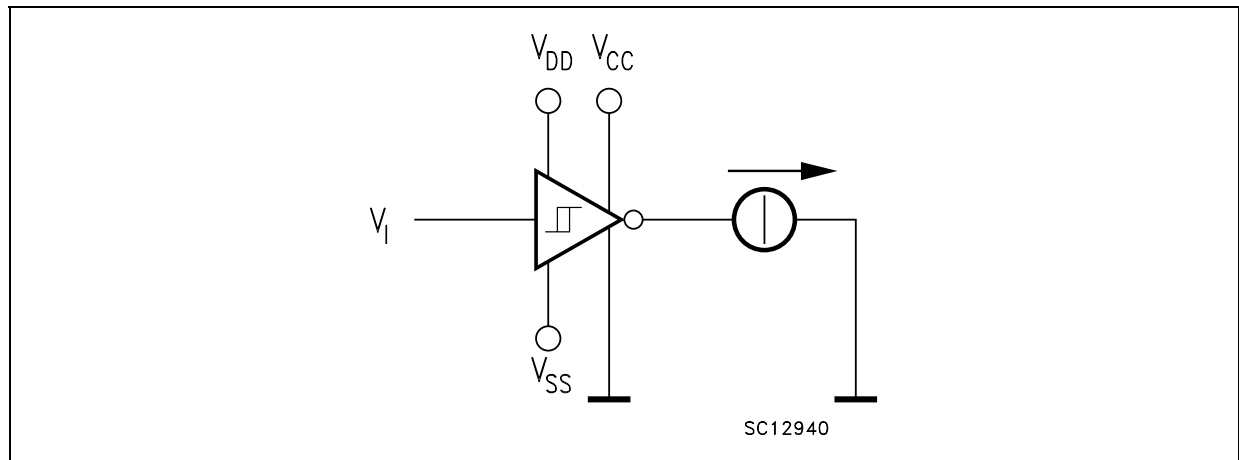
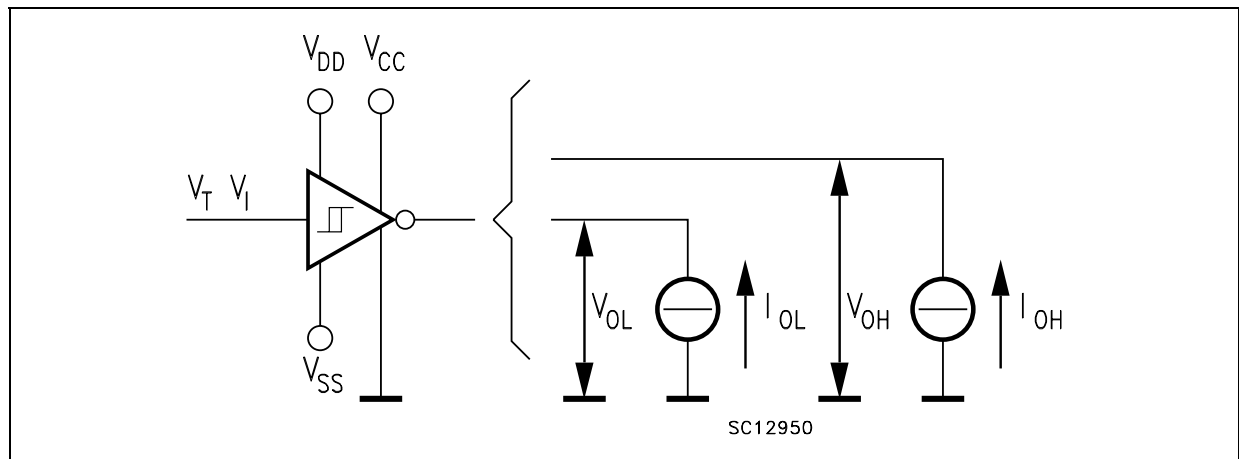
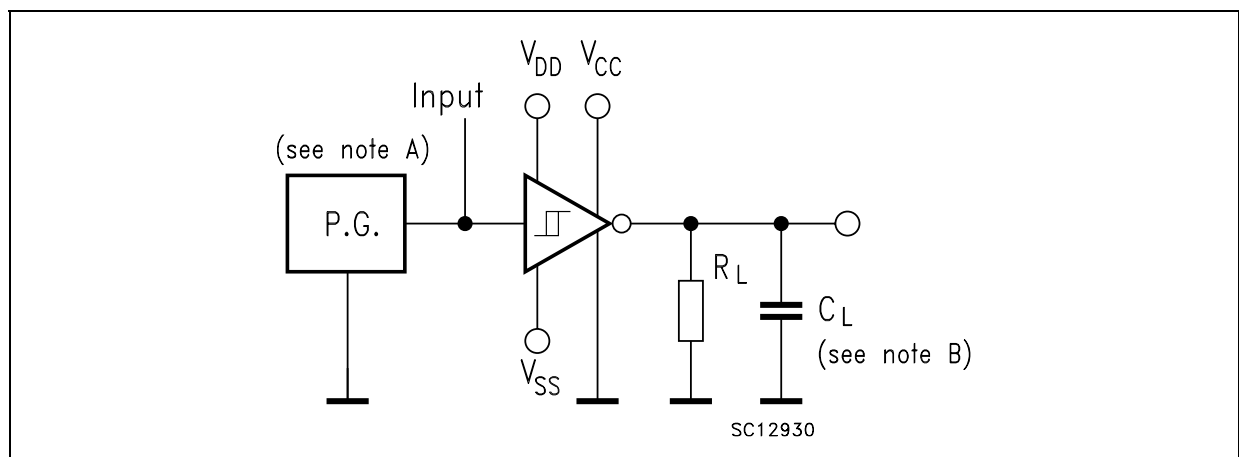
## APPLICATION CIRCUITS



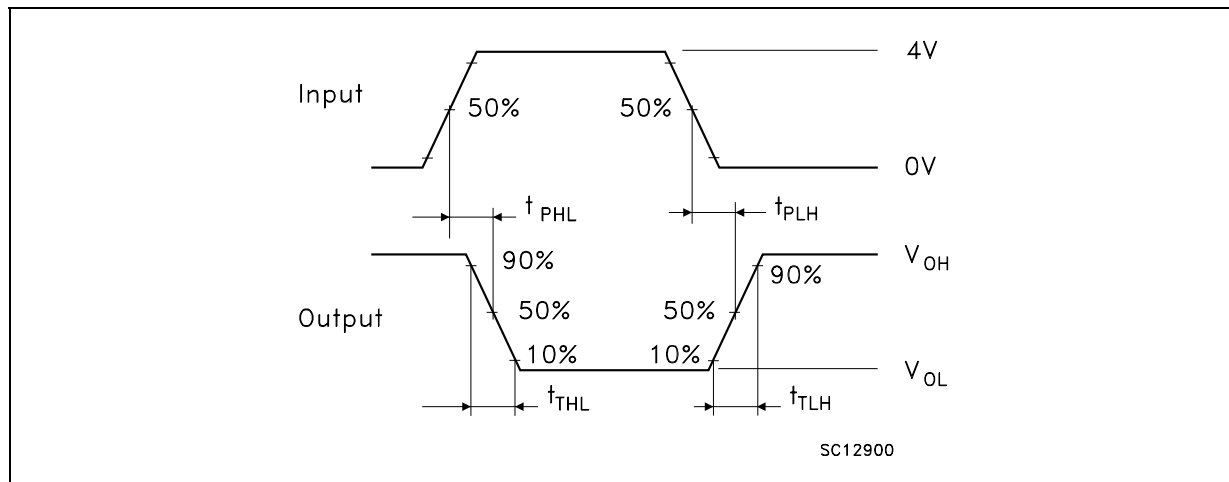
**Figure 1 :** Driver Test Circuit for  $V_{OH}$ ,  $I_{SO(H)}$  and  $I_{SO(L)}$



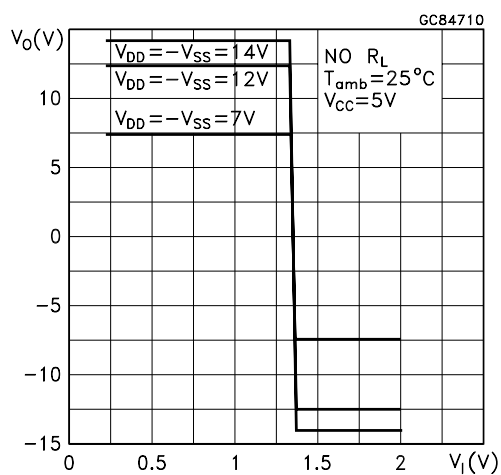
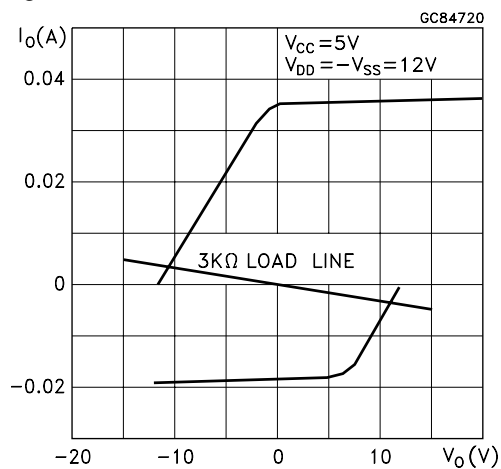
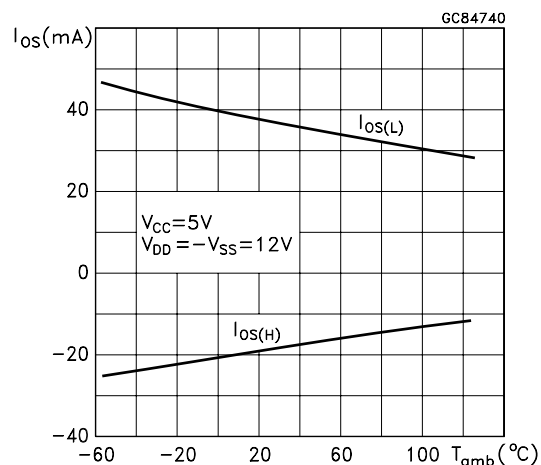
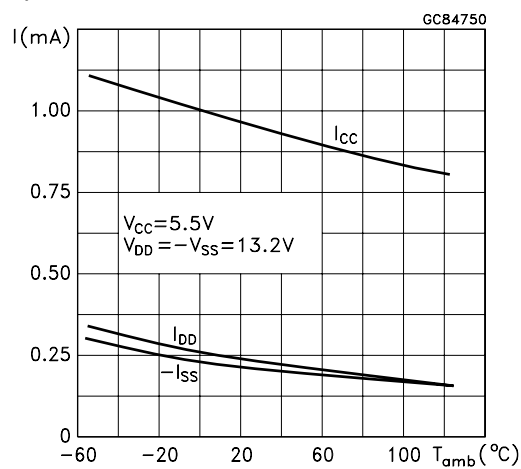
**Figure 2 : Driver Test Circuit for  $I_{IH}$  and  $I_{IL}$** **Figure 3 : Driver Test Circuit****Figure 4 : Driver Voltage Waveforms**

**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

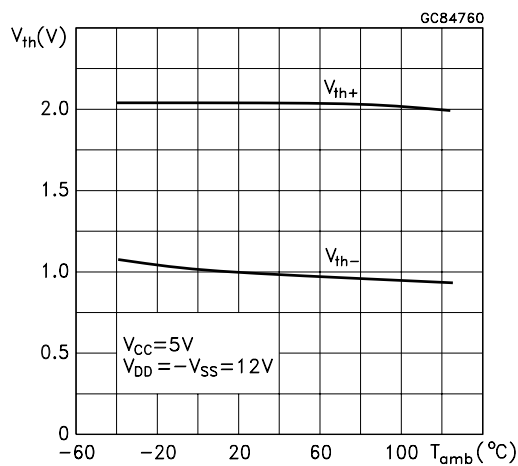


**Figure 8 : Receiver Voltage Waveforms**

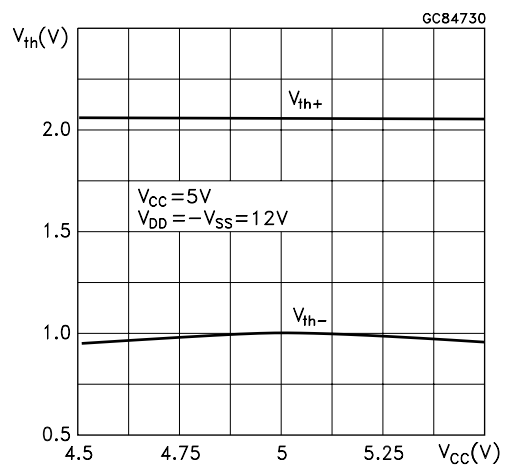
NOTE A: The pulse generator has the following characteristics:  $t_W = 25\mu s$ ,  $PRR = 20KHz$ ,  $Z_O = 50\Omega$ ,  $t_r = t_f < 50ns$   
 NOTE B:  $C_L$  includes probe and jig capacitance.

**Figure 9 : Driver Voltage Transfer Characteristics****Figure 10 : Driver Output Current vs Output Voltage****Figure 11 : Driver Short Circuit Output Current vs Free-Air Temperature****Figure 12 : Device Supply Current vs Temperature**

**Figure 13 : Receiver Threshold vs Temperature**

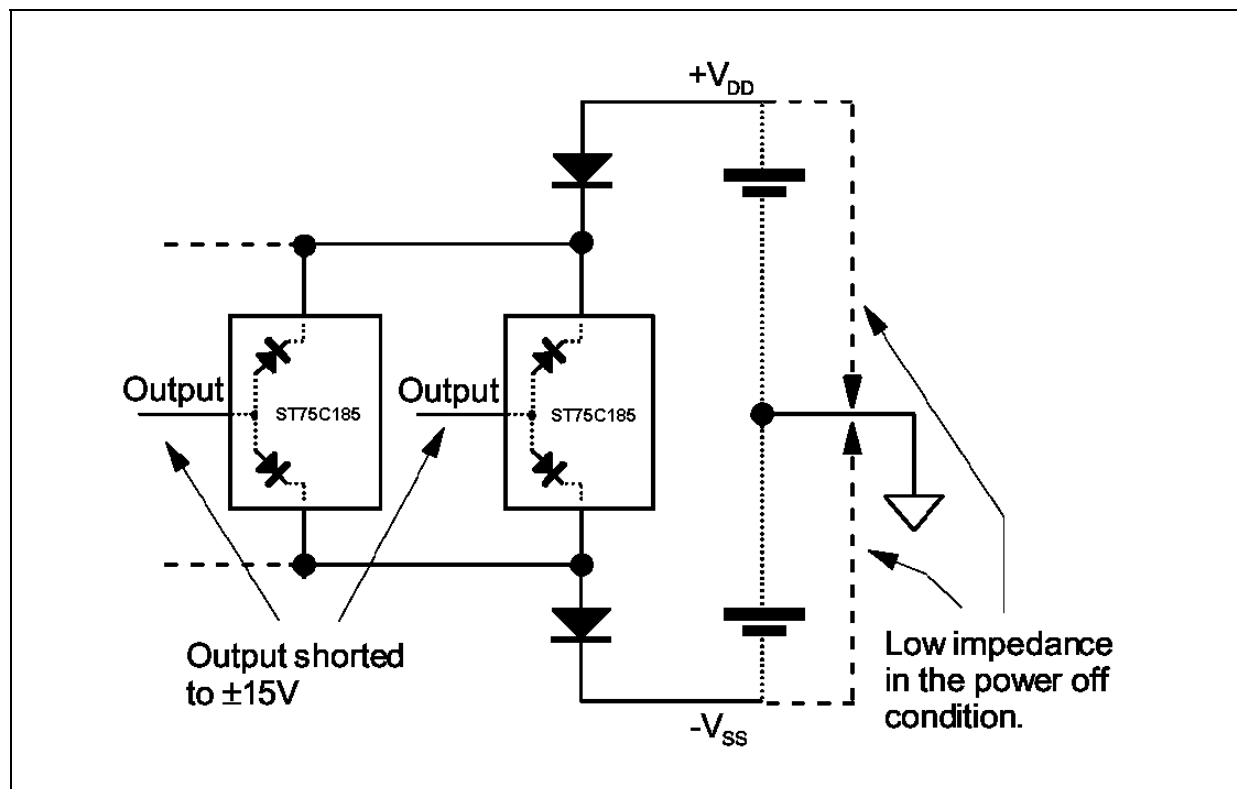


**Figure 14 : Receiver Threshold vs Supply Voltage**



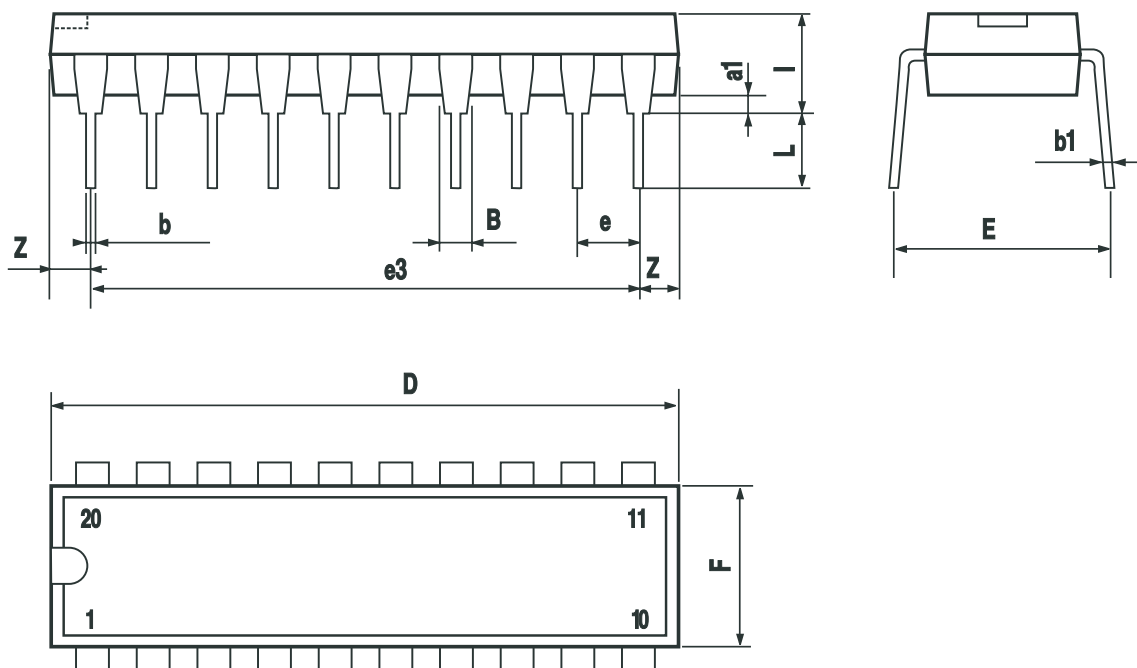
#### APPLICATION INFORMATION: DIODES ON POWER SUPPLY

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  $\pm 15V$  and the power supplies are at low state and provide low-impedance path to ground (see Figure below).



### Plastic DIP-20 (0.25) MECHANICAL DATA

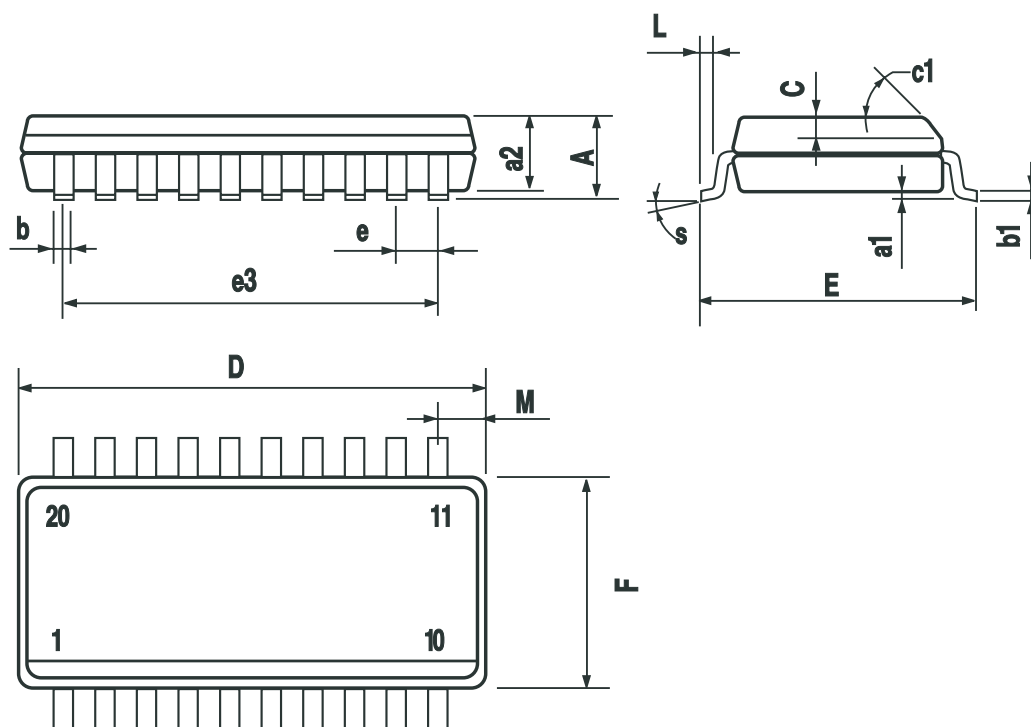
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



P001J

## SO-20 MECHANICAL DATA

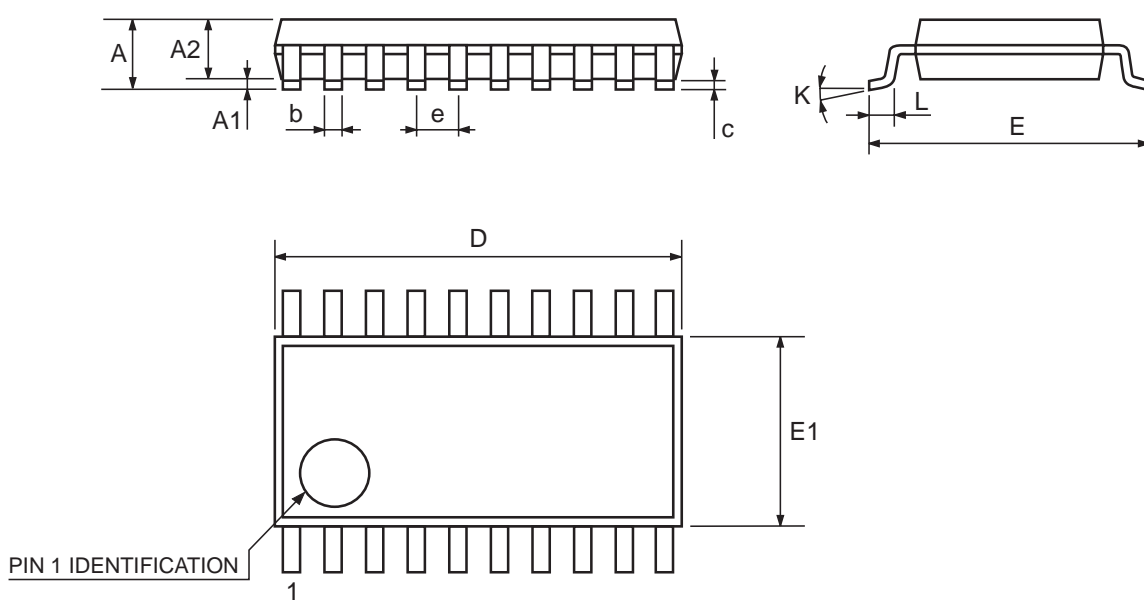
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
M			0.75			0.029
S	8° (max.)					



PO13L

## TSSOP20 MECHANICAL DATA

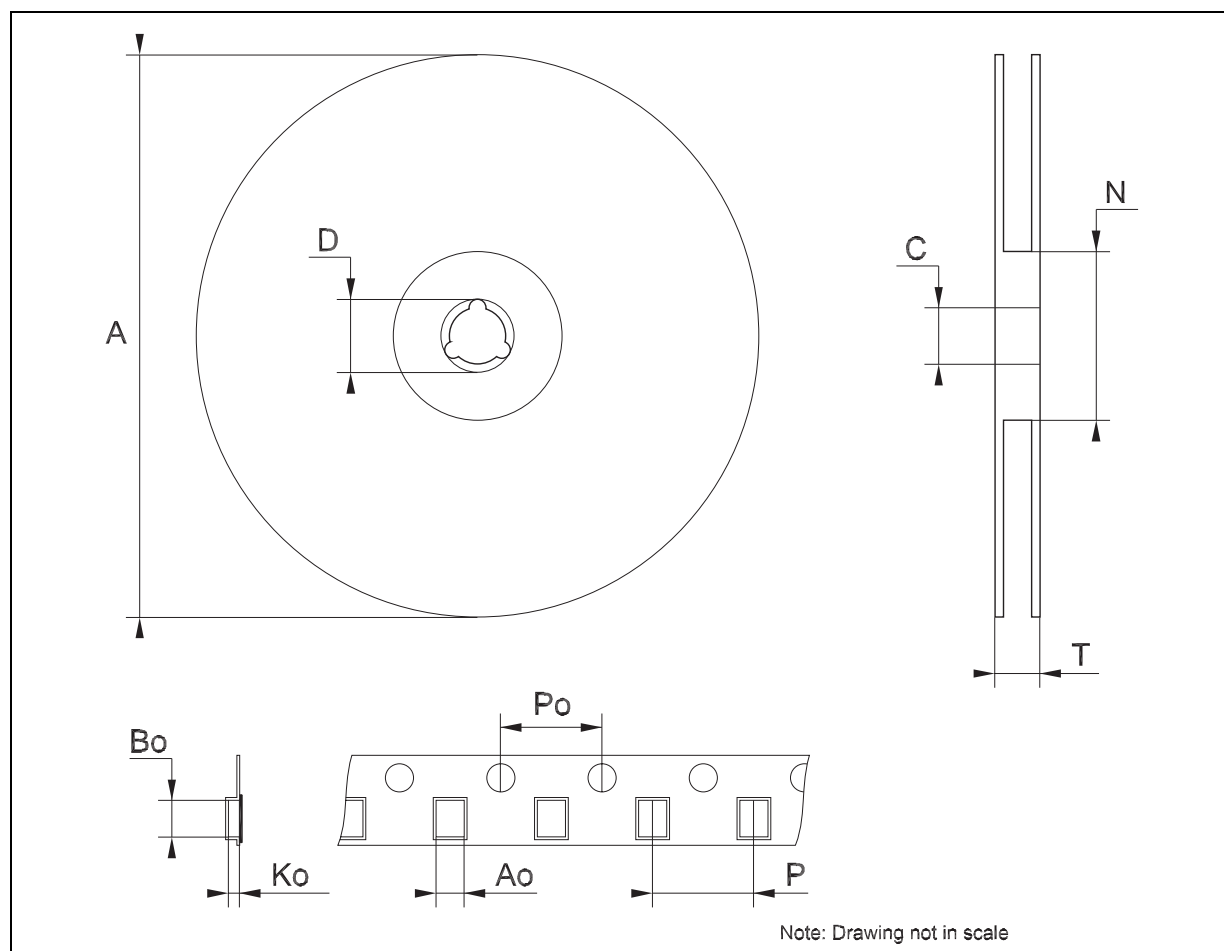
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



0087225C

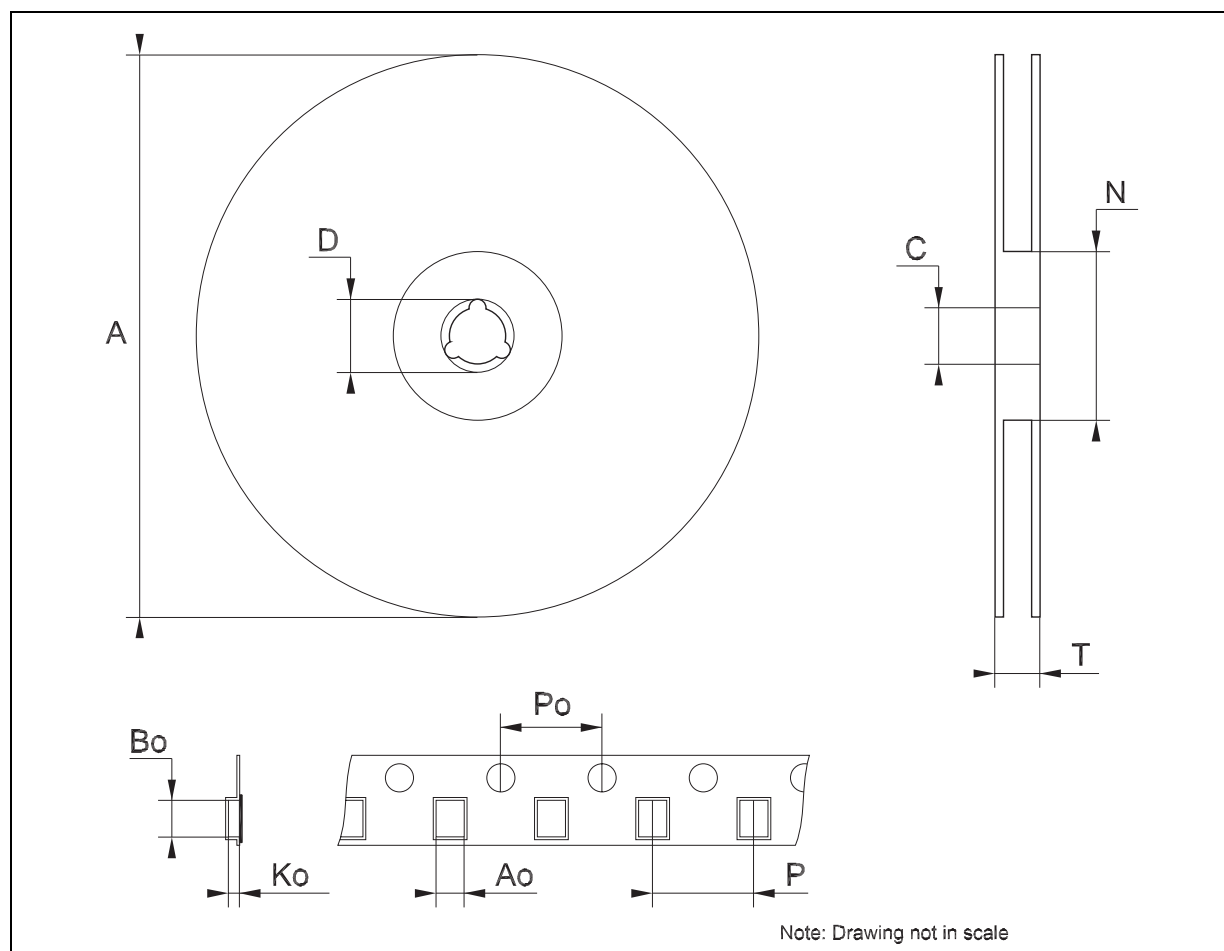
## Tape &amp; Reel SO-20 MECHANICAL DATA

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			30.4			1.197
Ao	10.8		11	0.425		0.433
Bo	13.2		13.4	0.520		0.528
Ko	3.1		3.3	0.122		0.130
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



### Tape & Reel TSSOP20 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	6.9		7.1	0.272		0.280
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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