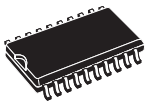
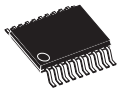
ST75185

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
- PINOUT COMPATIBLE WITH ST75C185



SOP



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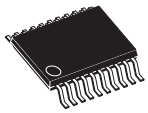

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DESCRIPTION

The ST75185 contains three drivers and five 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 ST75185 provides a rugged low-cost solution for this function at the expense of quiescent power and external passive components relative to the ST75C185.

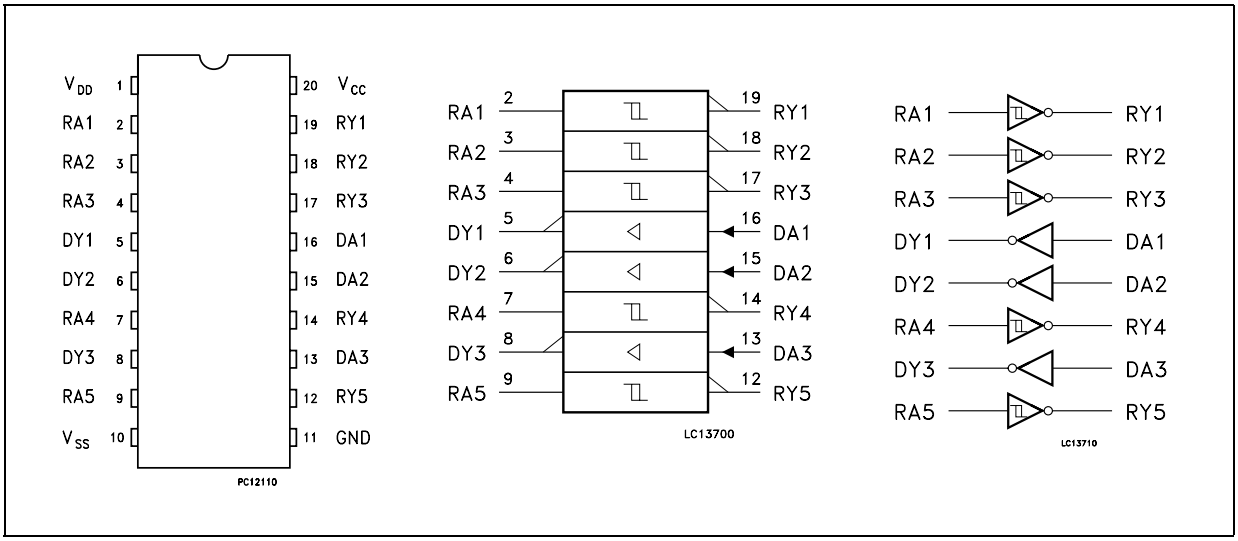
The ST75185 complies with the requirements of the EIA/TIA 232-E and ITU (formally CCITT) v.28 standards. These standards are for data interchange between a host computer and peripheral at signalling rates up to 20k-bits/s. The switching speeds of the ST75185 are fast enough to support rates up to 120K-bits/s 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.

The ST75185 is characterized for operation over the range of 0°C to 70°C.

ORDERING CODES

Type	Temperature Range	Package	Comments
ST75185CTR	0 to 70 °C	TSSOP20 (Tape & Reel)	2500 parts per reel
ST75185CD	0 to 70 °C	SO-20 (Tube)	40 parts per tube / 25 tubes per box
ST75185CDR	0 to 70 °C	SO-20 (Tape & Reel)	1000 parts per reel
ST75185CPR	0 to 70 °C	SSOP-20 (Tape & Reel)	1350 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 Ouput
13	DA3	Third Driver Intput
14	RY4	Fourth Receiver Ouput
15	DA2	Second Driver Input
16	DA1	First Driver Input
17	RY3	Third Receiver Ouput
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)	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_O	Receiver Low Level Output Current	20	mA
P_D	Continuous Total Power Dissipation	See dissipation Rating Table	
T_A	Operating Free-Air Tempereature Range	0 to 70	°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 voltage are with respect to the network ground terminal.

DISSIPATION RATING TABLE

Package	Power Rating at $T_A \leq 25°C$	Derating Factor above $T_A = 25°C$ (*)	Power Rating at $T_A \leq 70°C$
MICROPACKAGE (D)	1125 mW	9.0 mW/°C	720 mW

(*) This is the reverse of the traditional junction-case thermal resistance R_{tJ-C}

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{DD}	Supply Voltage		7.5	15	V
V_{SS}	Supply Voltage		-7.5	-15	V
V_{CC}	Supply Voltage		4.5	5.5	V
V_I	Driver Input Voltage		0	V_{CC}	V
I_{OH}	High Level Output Current	DRIVER		-6	mA
		RECEIVER		-0.5	
I_{OL}	Low Level Output Current	DRIVER		6	mA
		RECEIVER		16	
T_A	Operating Free-Air Tempereature Range		0	70	°C

SUPPLY CURRENTS

Symbol	Parameter	Test Conditions			Value			Unit
		V_{DD}	V_{SS}		Min.	Typ.	Max.	
I_{DD}	Supply Current from V_{DD}	9	-9	No load. All inputs at 1.9V			15	mA
		12	-12				19	
		15	-15				25	
		9	-9	No load. All inputs at 0.8V			4.5	mA
		12	-12				5.5	
		15	-15				9	
I_{SS}	Supply Current from V_{SS}	9	-9	No load. All inputs at 1.9V			-15	mA
		12	-12				-19	
		15	-15				-25	
		9	-9	No load. All inputs at 0.8V			-3.2	mA
		12	-12				-3.2	
		15	-15				-3.2	
I_{CC}	Supply Current from V_{CC}	No load. All inputs at 5V V_{CC} = 5V					30	mA

DRIVER ELECTRICAL CHARACTERISTICS OVER OPERATING FREE-AIR TEMPERATURE RANGE (V_{DD} = 9V, V_{SS} = -9V, V_{CC} = 5V, unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{OH}	High Level Output Voltage	V_{IL} = 0.8 V R_L = 3KΩ (See Figure 1)	6	7.5		V
V_{OL}	Low Level Output Voltage (Note 3)	V_{IH} = 1.9 V R_L = 3KΩ (See Figure 1)		-7.5	-6	V
I_{IH}	High Level Input Current	V_I = 5 V (See Figure 2)			10	µA
I_{IL}	Low Level Input Current	V_I = 0 V (See Figure 2)			–1.6	mA
$I_{OS(H)}$	High Level Short Circuit Output Current (Note 4)	V_{IL} = 0.8 V V_O = 0 V (See Figure 1)	-4.5	–12	–19.5	mA
$I_{OS(L)}$	Low Level Short Circuit Output Current	V_{IH} = 2 V V_O = 0 V (See Figure 1)	4.5	12	19.5	mA
R_O	Output Resistance	V_{DD} = V_{SS} = V_{CC} = 0 V V_O = -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 °C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t_{PLH}	Propagation Delay Time, Low to High Level Output	R_L = 3 to 7 KΩ C_L = 15 pF (See Figure 3, 4)		315	500	ns
t_{PHL}	Propagation Delay Time, High to Low Level Output	R_L = 3 to 7 KΩ C_L = 15 pF (See Figure 3, 4)		75	175	ns
t_{TLH}	Transition Time Low to High Level Output	R_L = 3 to 7 KΩ C_L = 15 pF (See Figure 3, 4)		60	100	ns
		R_L = 3 to 7 KΩ C_L = 2500 pF (Note 6, See Figure 3, 4)		1.7	2.5	µs
t_{THL}	Transition Time High to Low Level Output	R_L = 3 to 7 KΩ C_L = 15 pF (See Figure 3, 4)		40	7.5	ns
		R_L = 3 to 7 KΩ C_L = 2500 pF (Note 6, See Figure 3, 4)		1.5	2.5	µs

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 °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} = -0.5mA	V_{IH} = 0.75 V	2.6	4	5	V
			Inputs Open	2.6			
V_{OL}	Low Level Output Voltage	V_I = 3 V I_{OL} = 10 mA			0.2	0.45	V
I_{IH}	High Level Input Current	V_I = 25 V (See Figure 6)		3.6		8.3	mA
		V_I = 3 V (See Figure 6)		0.43			
I_{IL}	Low Level Input Current	V_I = -25 V (See Figure 6)		-3.6		-8.3	mA
		V_I = -3 V (See Figure 6)		-0.43			
I_{OS}	Short-Circuit Output Current	V_I = 0 V V_O = 0 V (See Figure 5)			-3.4	-12	mA

All typical values are at TA = 25°C, VCC = 5V, VDD = 9V and VSS=-9V

RECEIVER SWITCHING CHARACTERISTICS (V_{DD} = 12V, V_{SS} = -12V, V_{CC} = 5V T_A = 25°C)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
t_{PLH}	Propagation Delay Time Low to High Level Output	R_L = 5 KΩ C_L = 50 pF (See Figure 6)		400	1000	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	R_L = 5 KΩ C_L = 50 pF (See Figure 6)		70	150	ns
t_{TLH}	Transition Time Low to High Level Output	R_L = 5 KΩ C_L = 50 pF (See Figure 6)		200	525	ns
t_{THL}	Transition Time High to Low Level Output	R_L = 5 KΩ C_L = 50 pF (See Figure 6)		20	60	ns

APPLICATION CIRCUITS

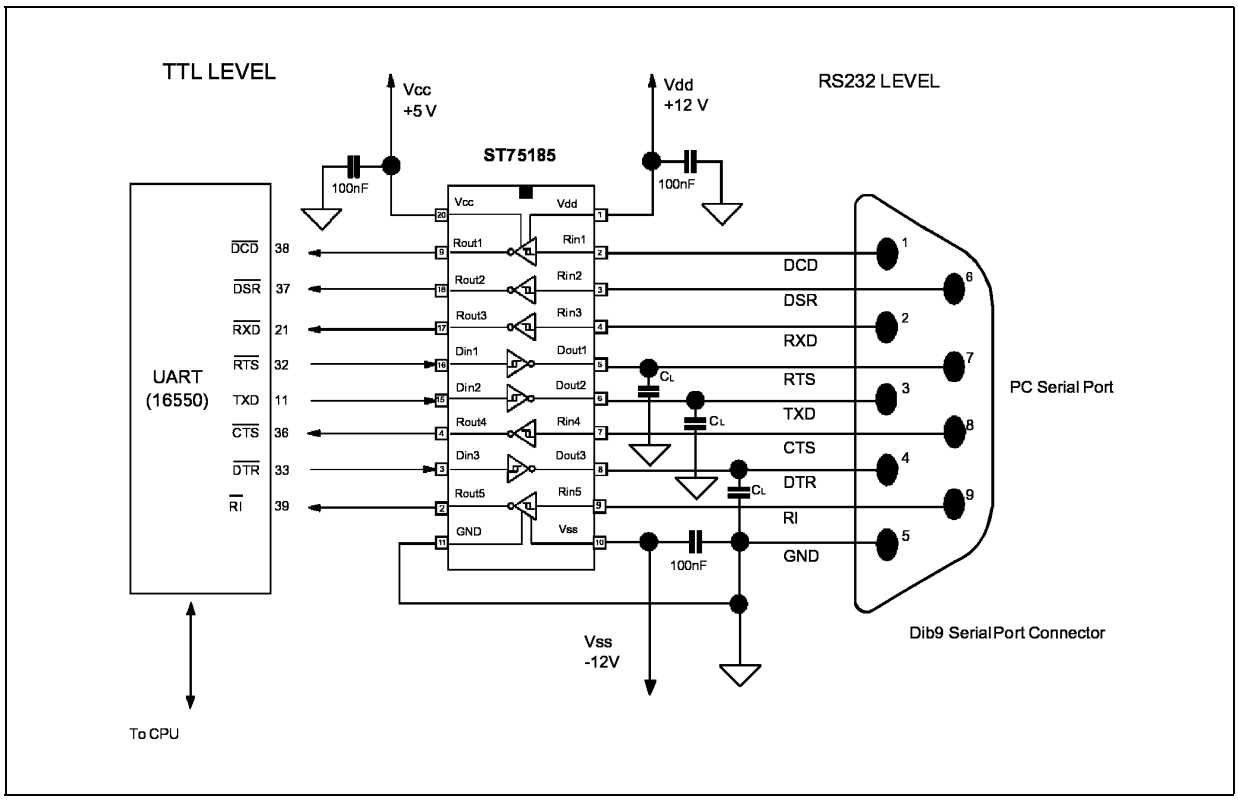


Figure 1 : Driver Test Circuit for V_{OH}, $I_{SO(H)}$ and $I_{SO(L)}$

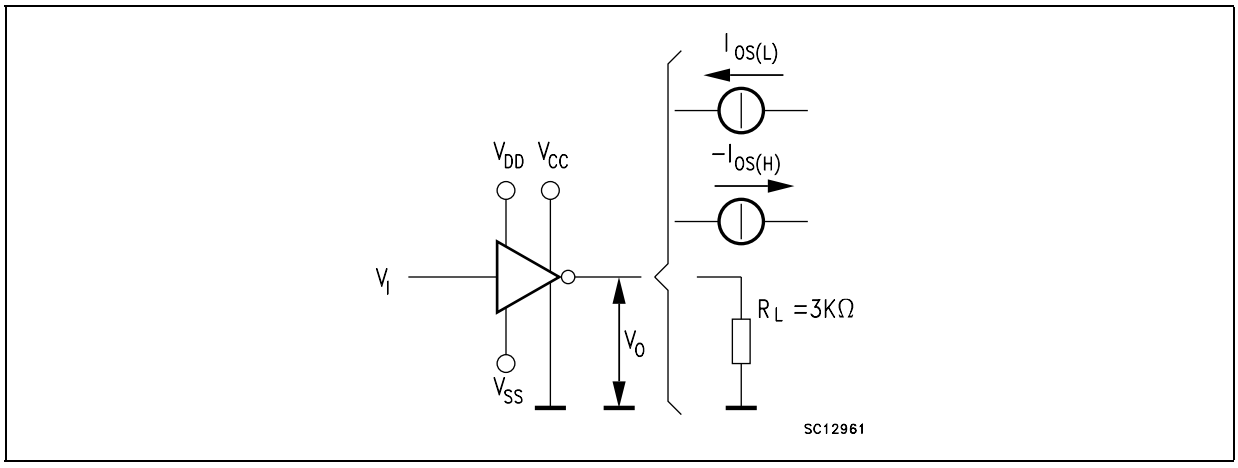


Figure 2 : Driver Test Circuit for I_{IH} and I_{IL}

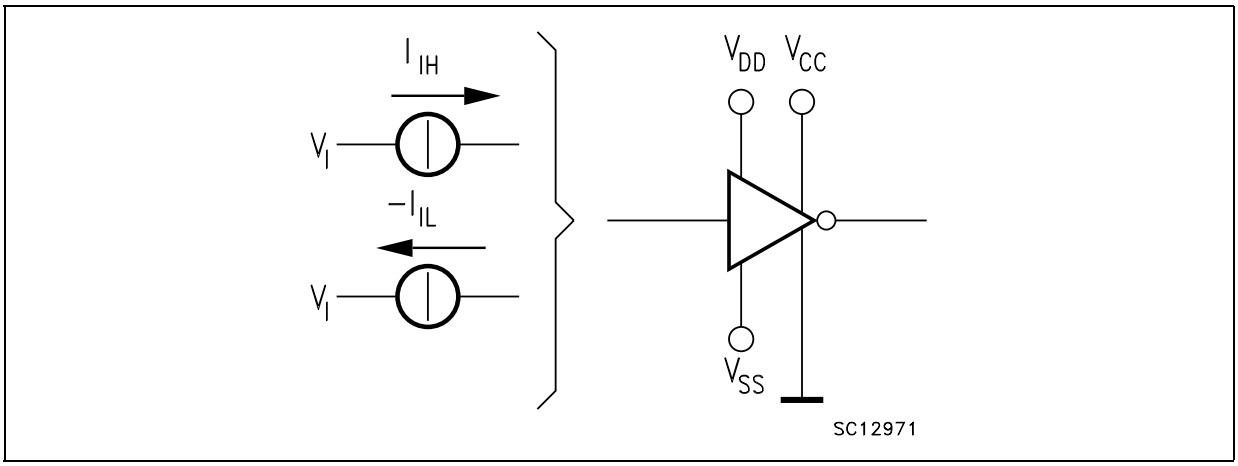


Figure 3 : Driver Test Circuit

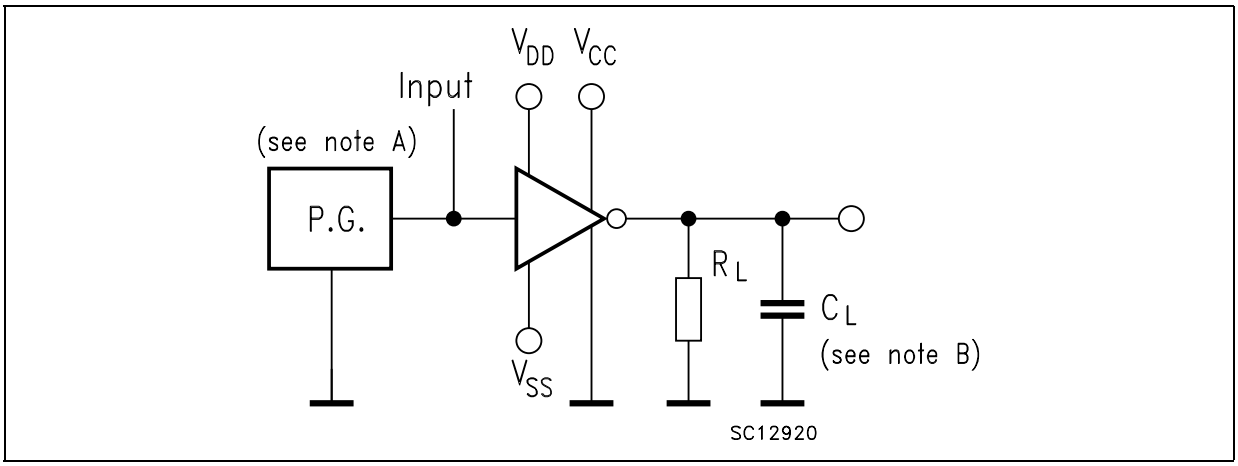


Figure 4 : Driver Voltage Waveforms

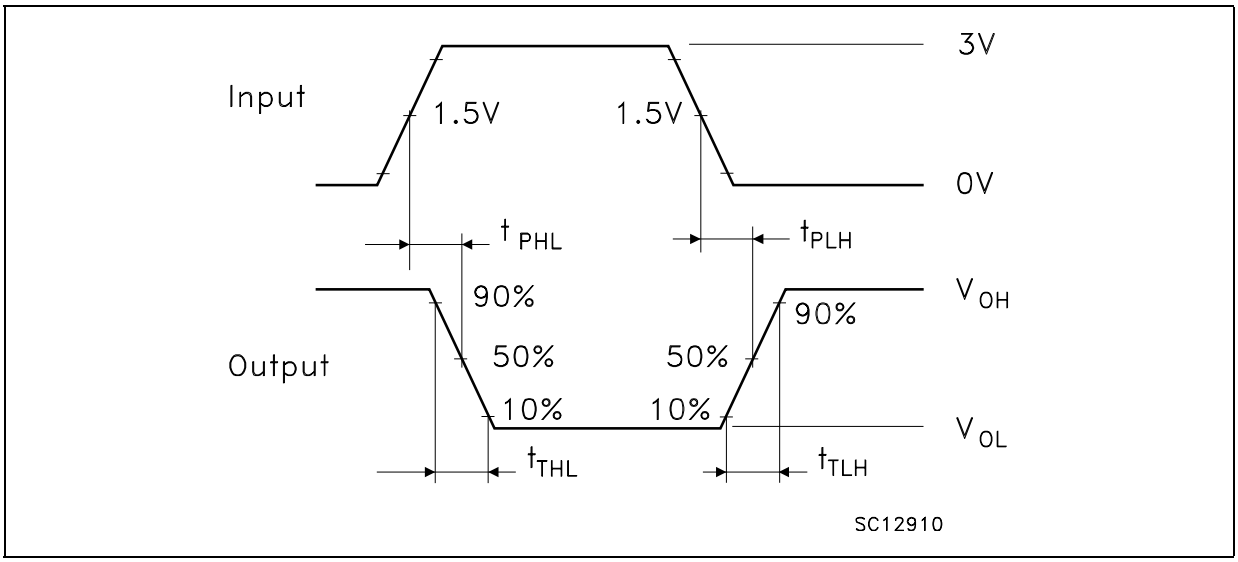


Figure 5 : Receiver Test Circuit for I_{OS}

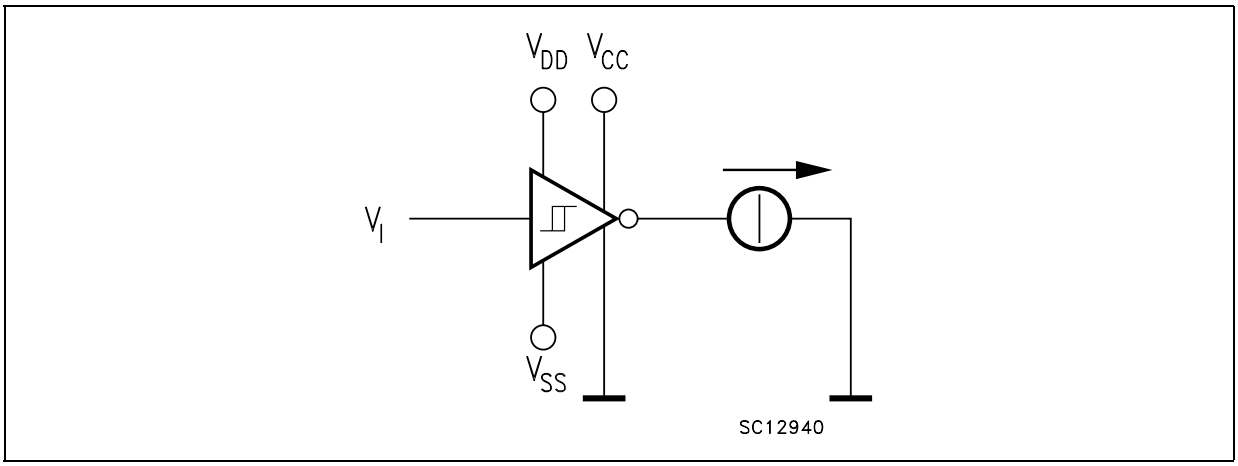


Figure 6 : Receiver Test Circuit for V_T, V_{OH}, V_{OL}

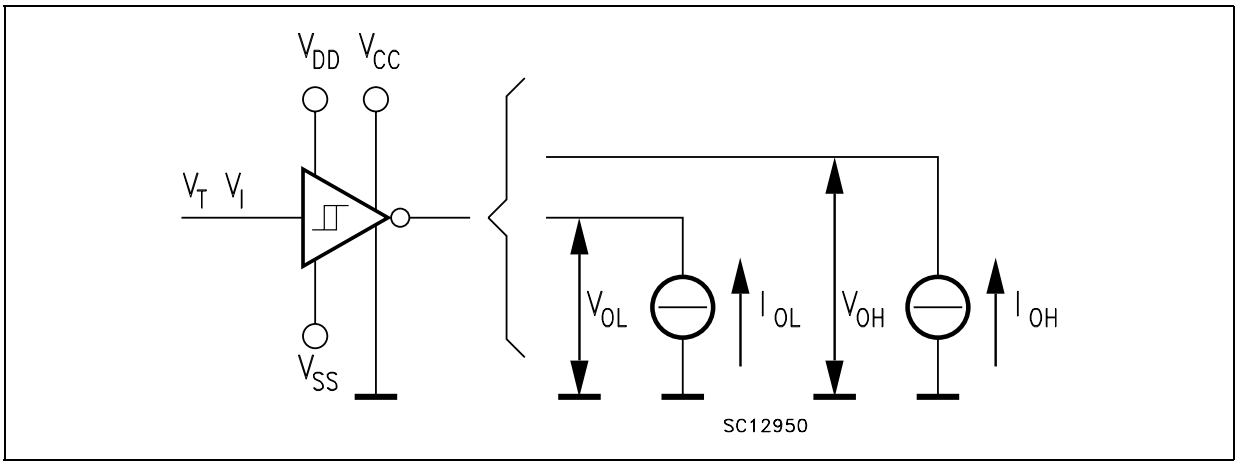


Figure 7 : Receiver Test Circuit

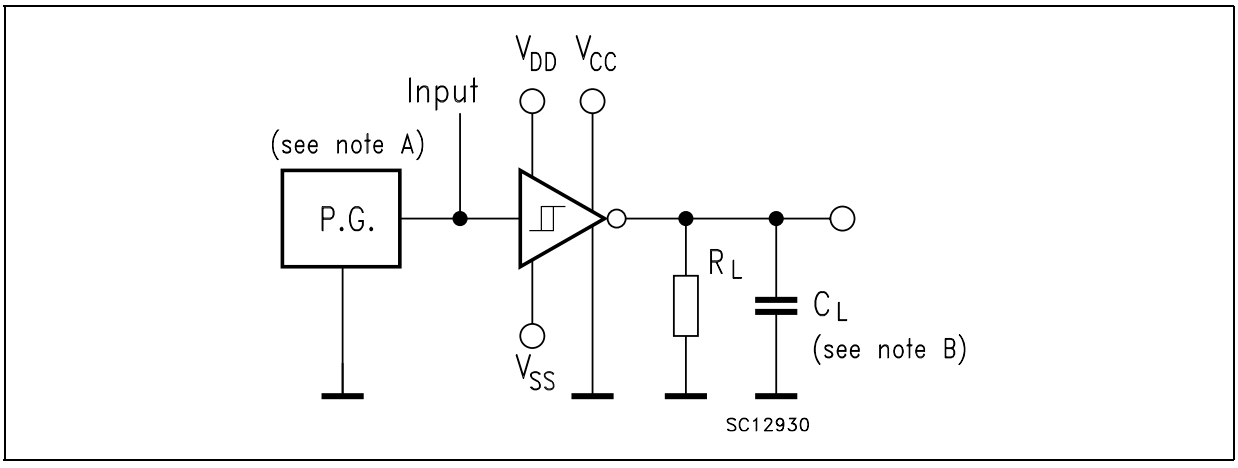
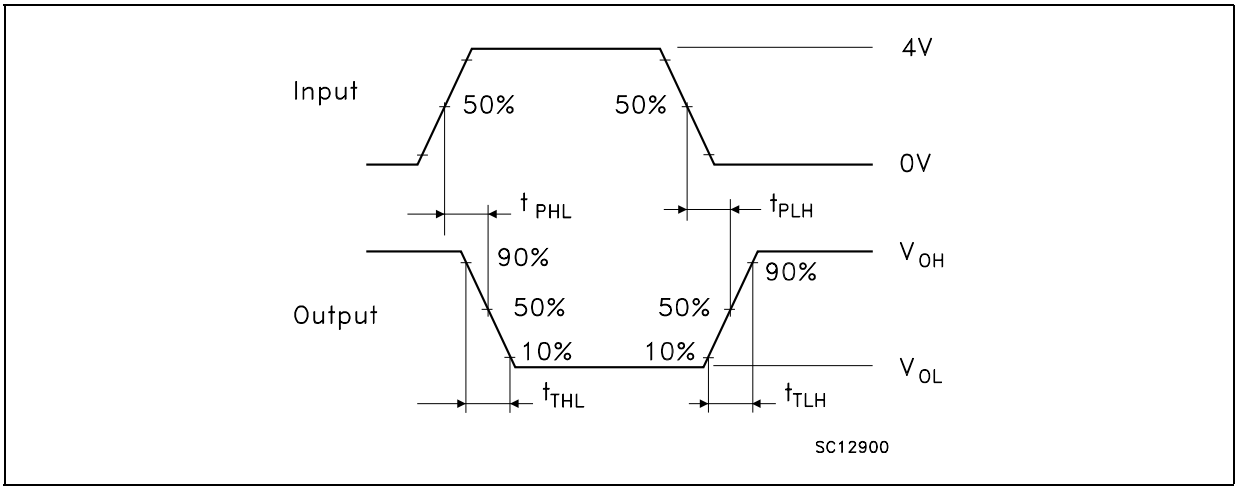


Figure 8 : Receiver Voltage Waveforms



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

Figure 9 : Driver Voltage Transfer Characteristics

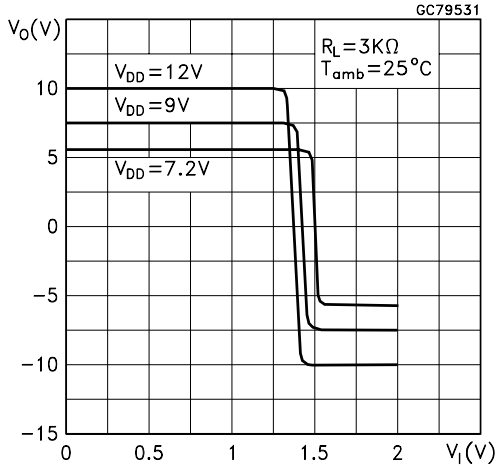


Figure 10 : Driver Short Circuit Output Current vs Free-Air Temperature

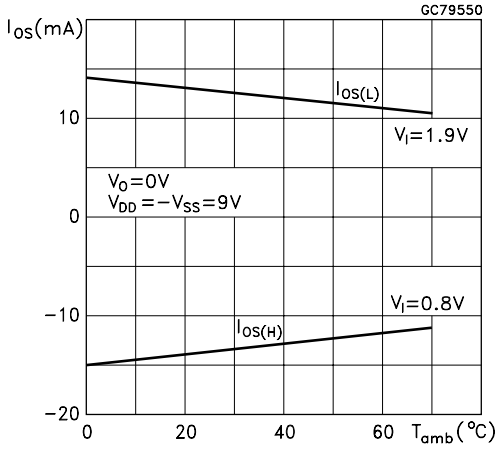


Figure 11 : Device Supply Current vs Temperature

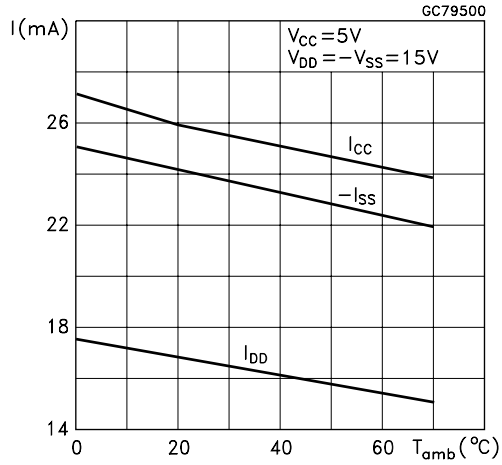


Figure 12 : Driver Output Current vs Output Voltage

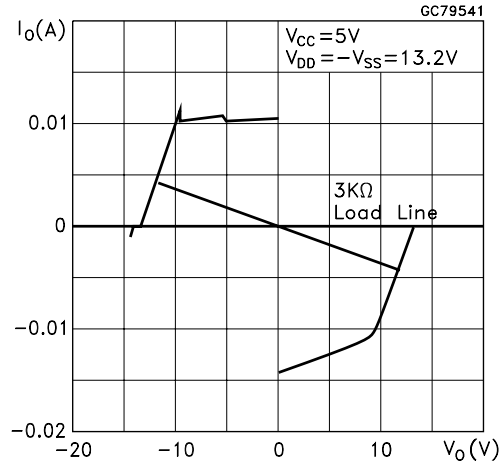


Figure 13 : Driver Output Slew Rate vs Load Capacitance

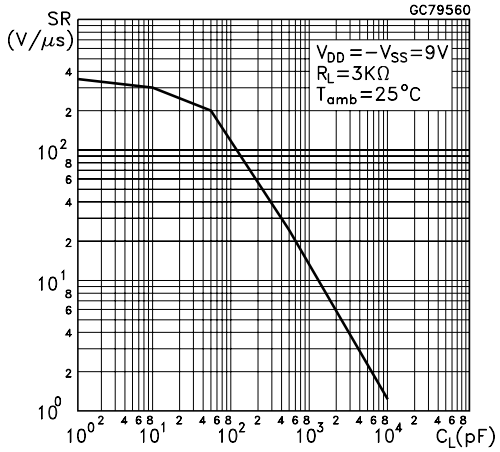


Figure 14 : Receiver Threshold vs Temperature

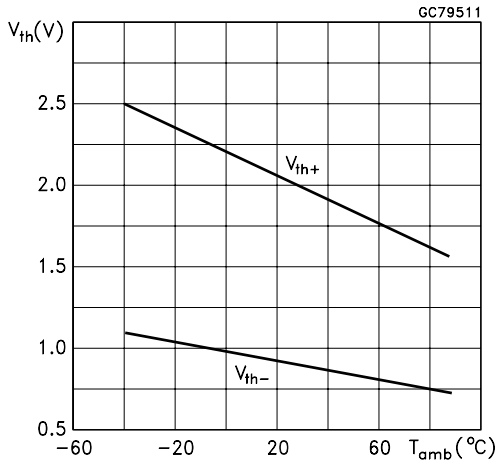
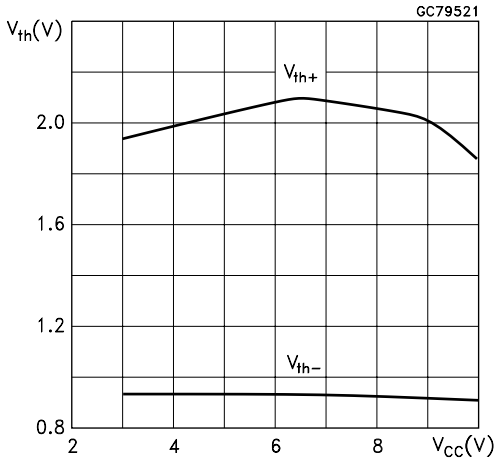
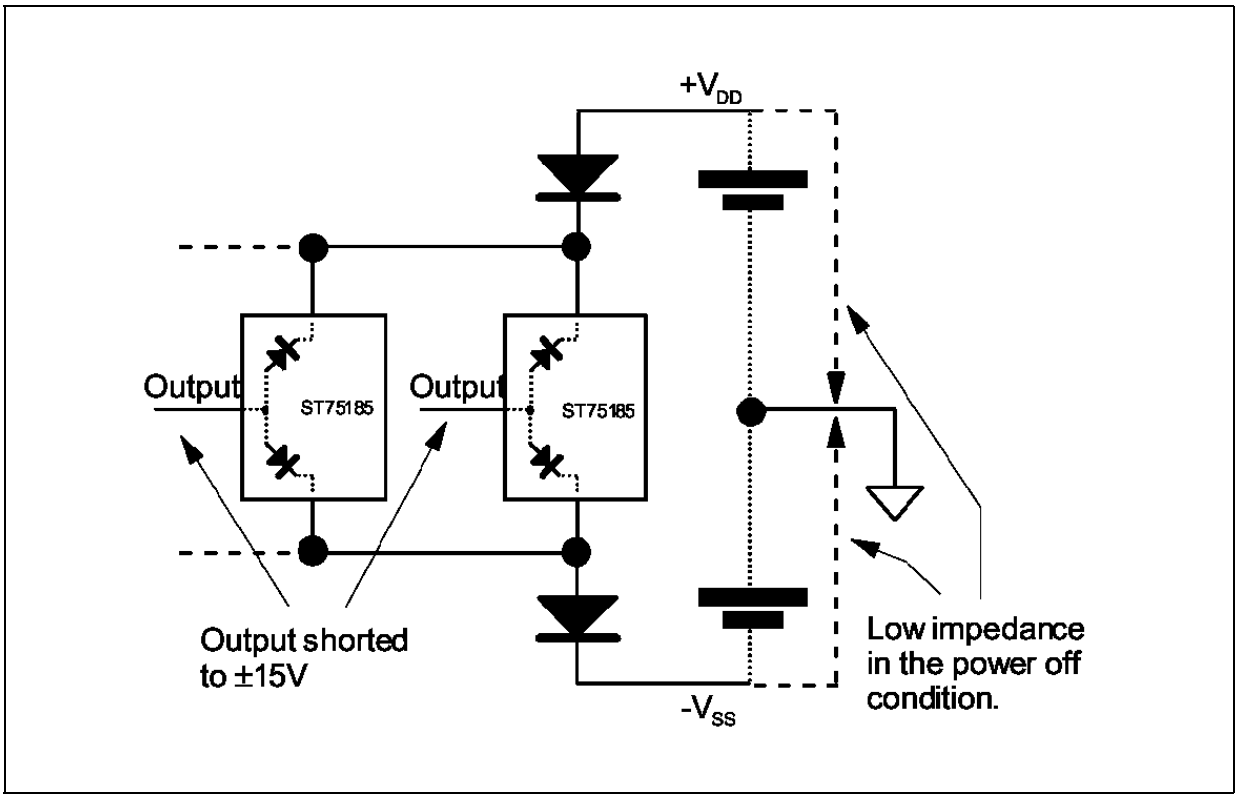


Figure 15 : Receiver Threshold vs Supply Voltage



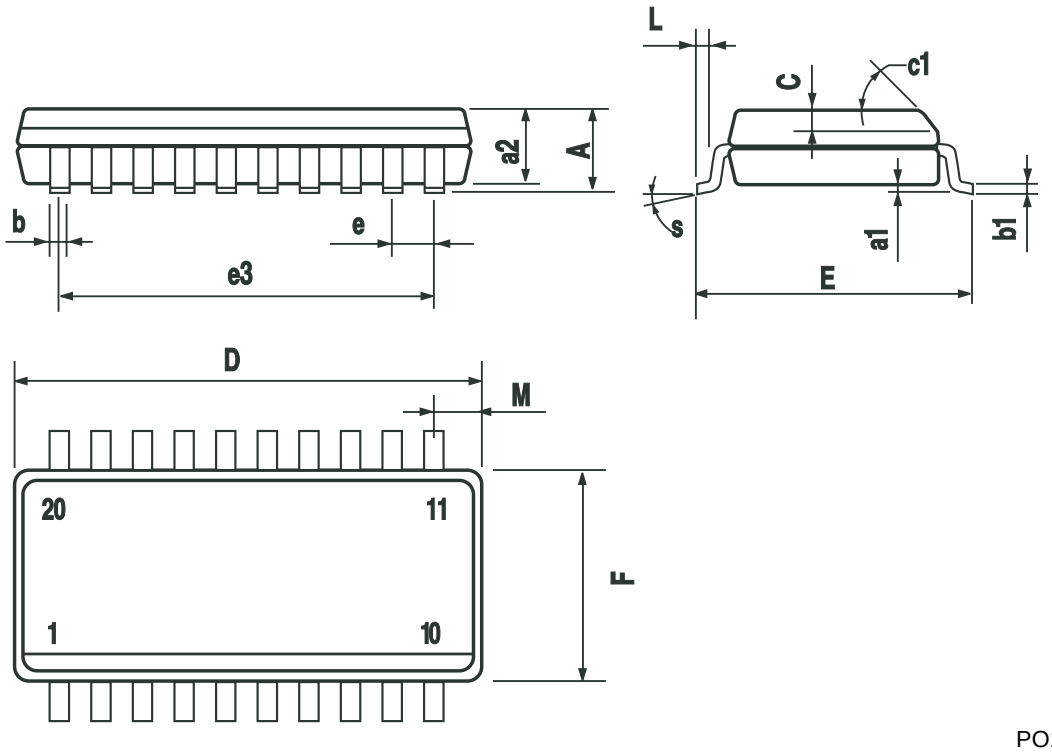
APPLICATION INFORMATION: DIODES ON POWER SUPPLY

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



SO-20 MECHANICAL DATA

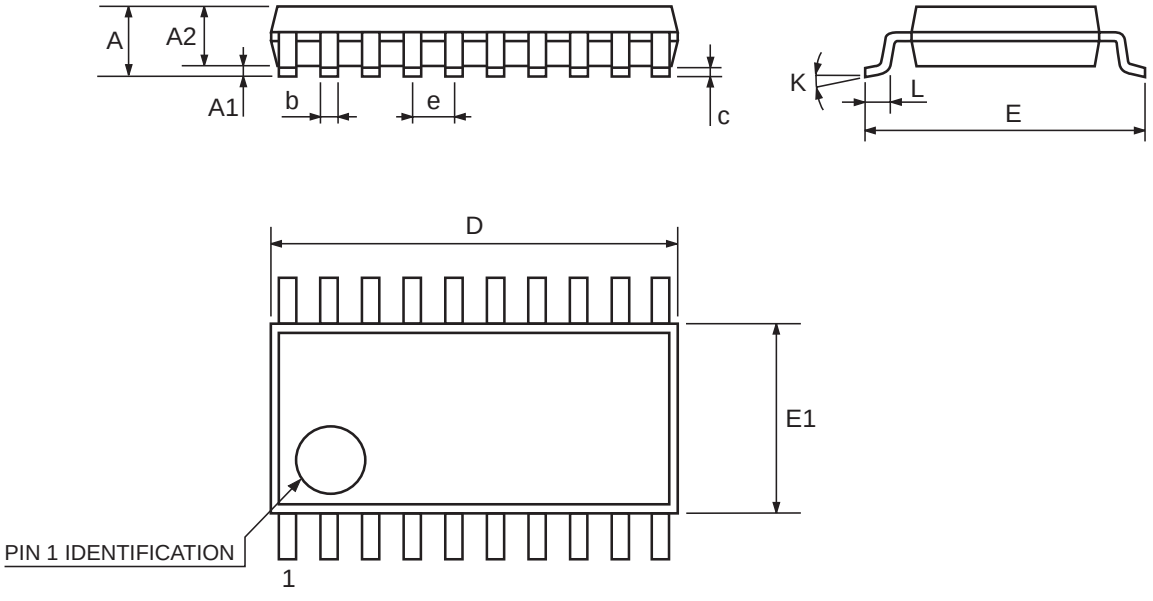
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60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



PO13L

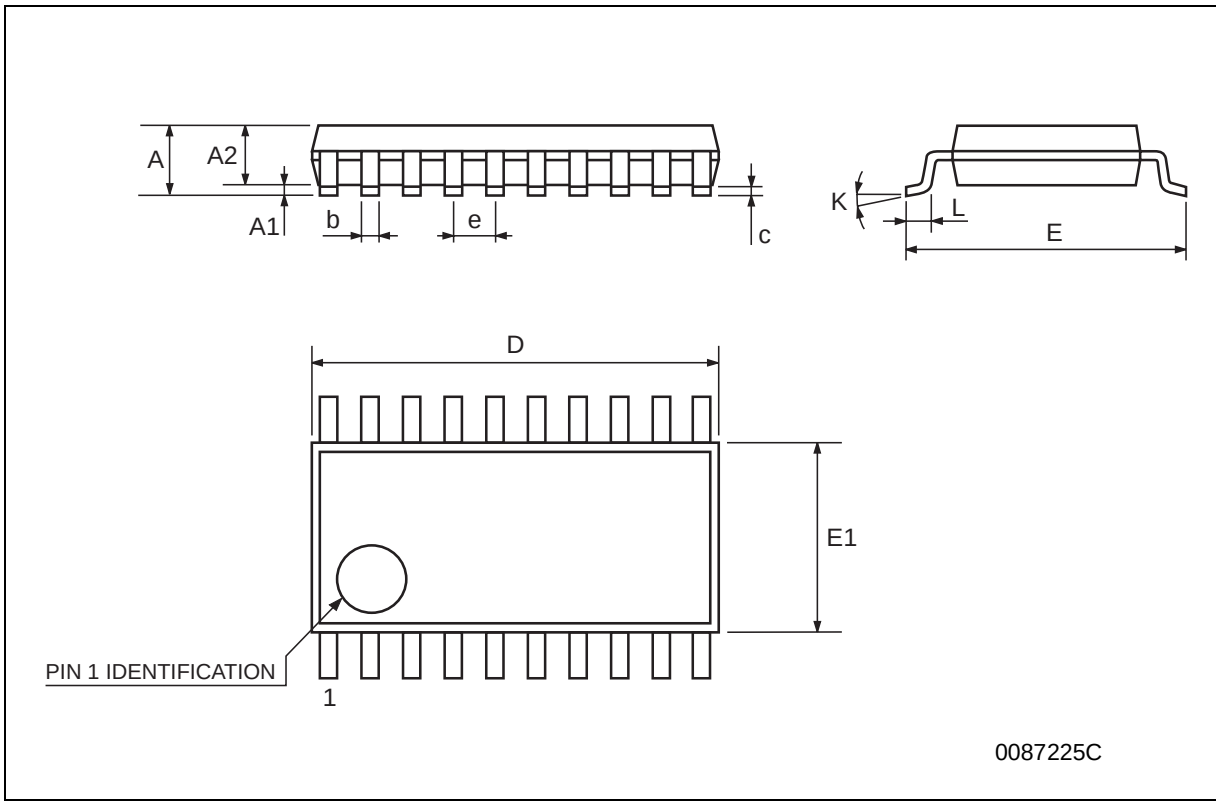
SSOP20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2			0.079
A1	0.05			0.002		
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.22		0.38	0.009		0.015
c	0.09		0.25	0.004		0.010
D	6.9	7.2	7.5	0.272	0.283	0.295
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.55	0.75	0.95	0.022	0.030	0.037



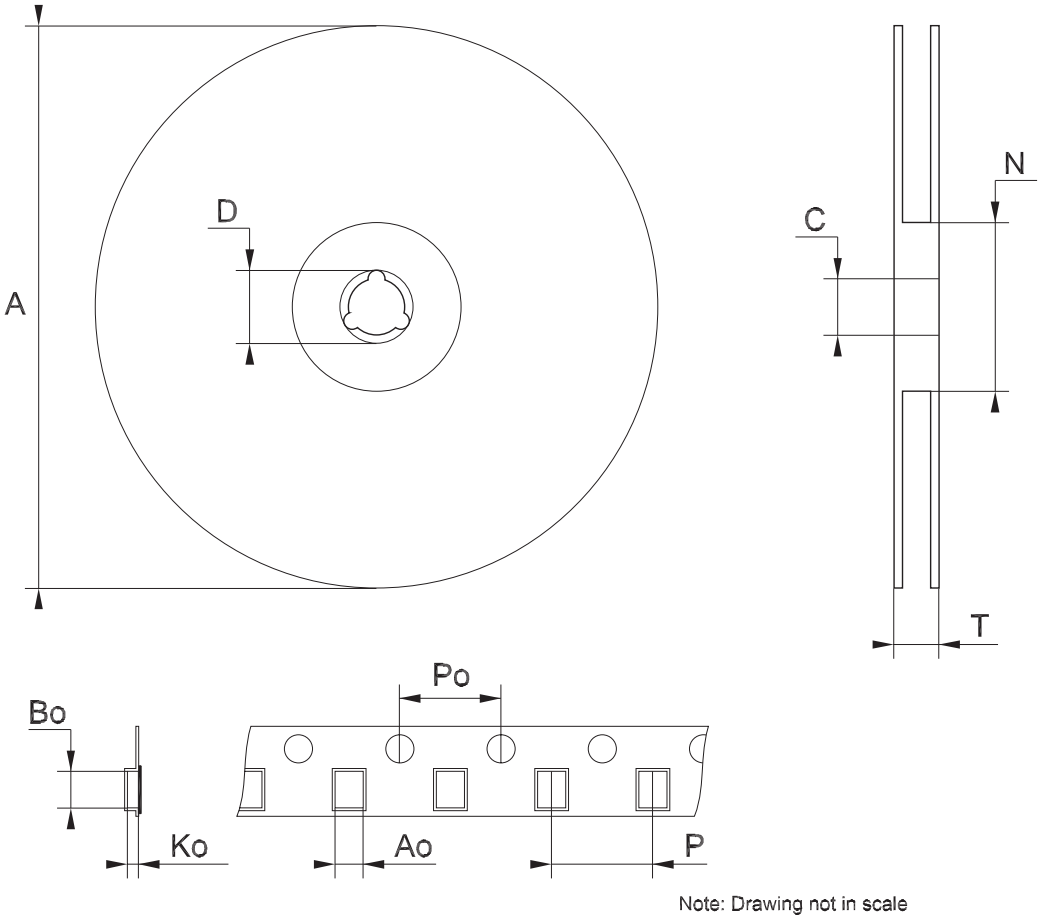
TSSOP20 MECHANICAL DATA

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



Tape & Reel SO-20 MECHANICAL DATA

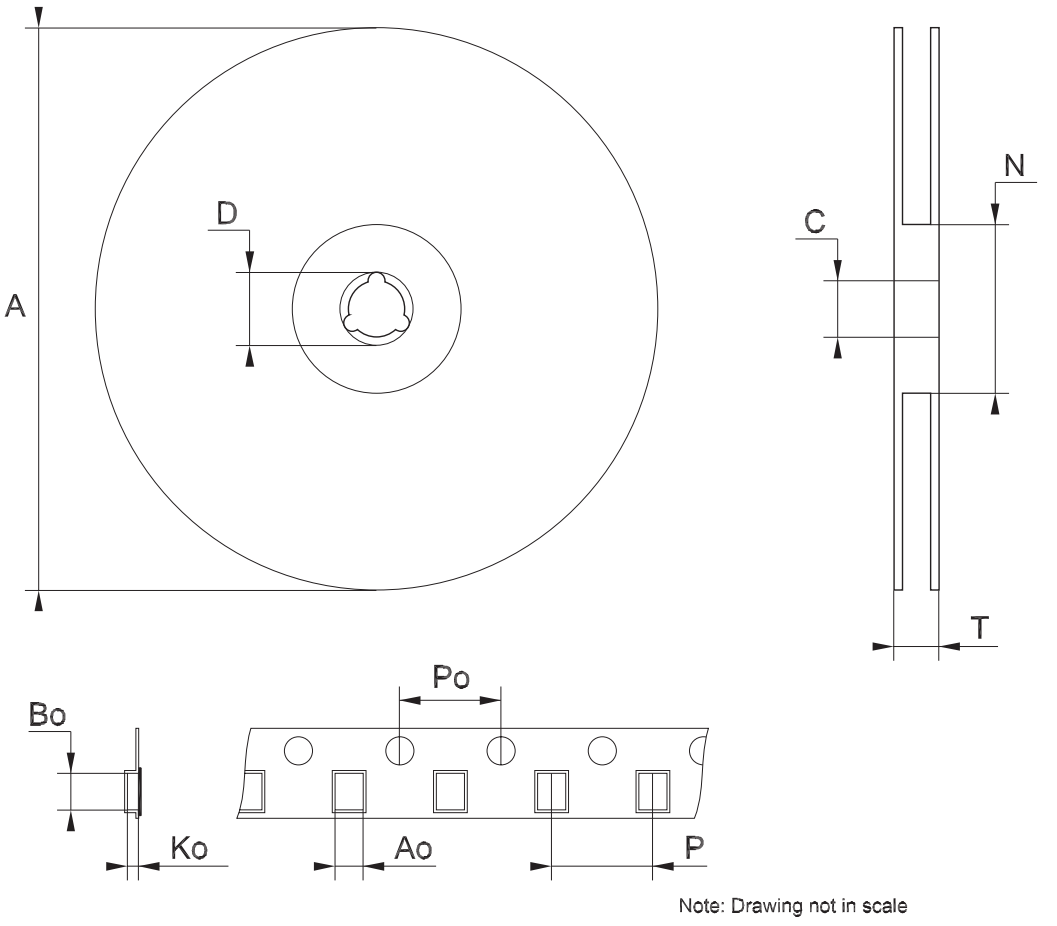
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			30.4			1.197
Ao	10.8		11	0.425		0.433
Bo	13.2		13.4	0.520		0.528
Ko	3.1		3.3	0.122		0.130
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Note: Drawing not in scale

Tape & Reel SSOP20 MECHANICAL DATA

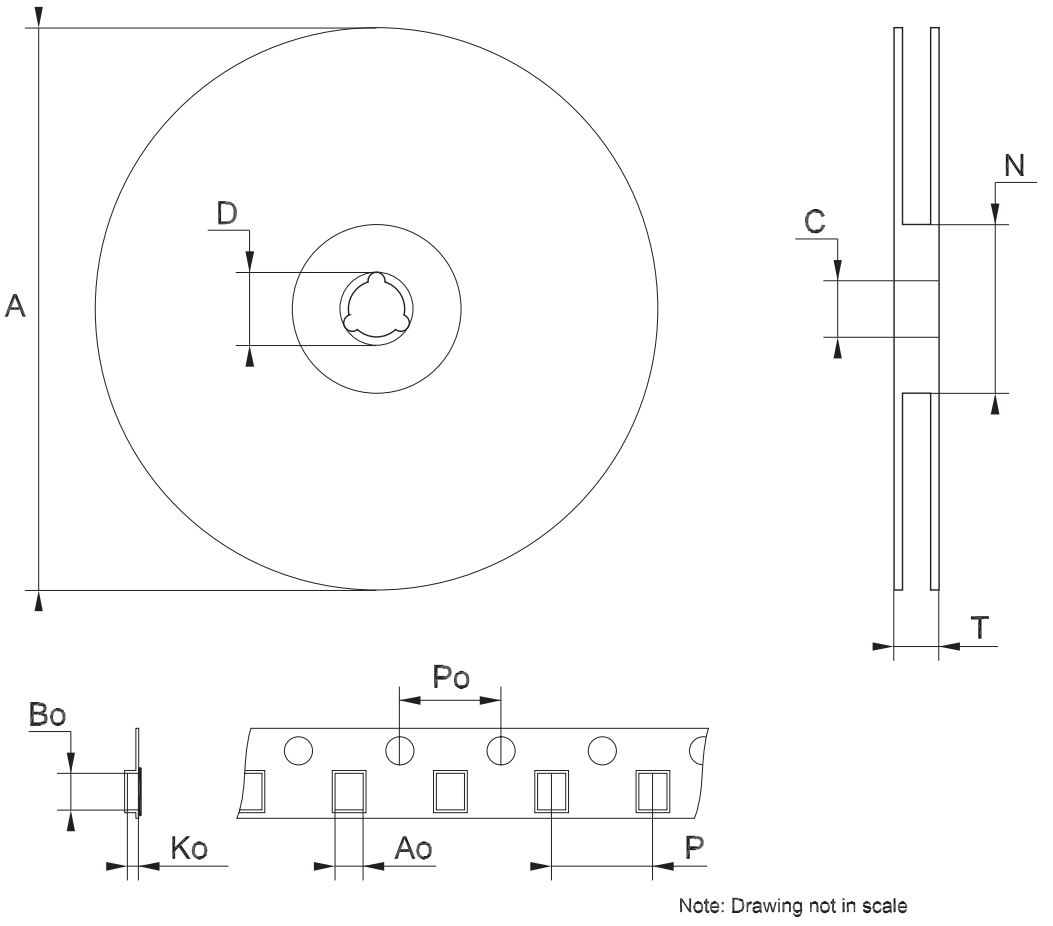
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	8.4		8.6	0.331		0.339
Bo	7.7		7.9	0.303		0.311
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Note: Drawing not in scale

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



Note: Drawing not in scale