



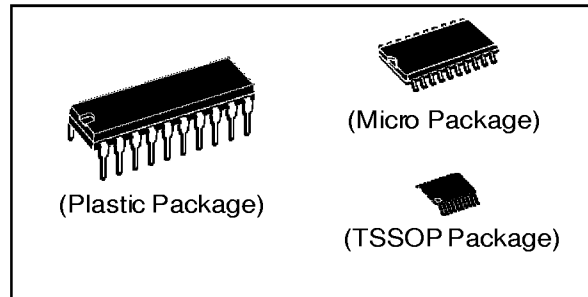
ST75C185

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/ μ s MAX
- RECEIVER INPUT HYSTERESIS: 1.1 TYP
- PUSH-PULL RECEIVER OUTPUTS
- ON CHIP RECEIVER 1 μ s NOISE FILTER
- FUNCTIONALLY INTERCHANGEABLE WITH STM ST75185
- ESD PROTECTION: $\pm$ 10KV HUMAN BODY MODEL

DESCRIPTION

The ST75C185 is 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/ μ s and the receivers have filters that reject input noise pulses that are shorter than 1 μ s. Both

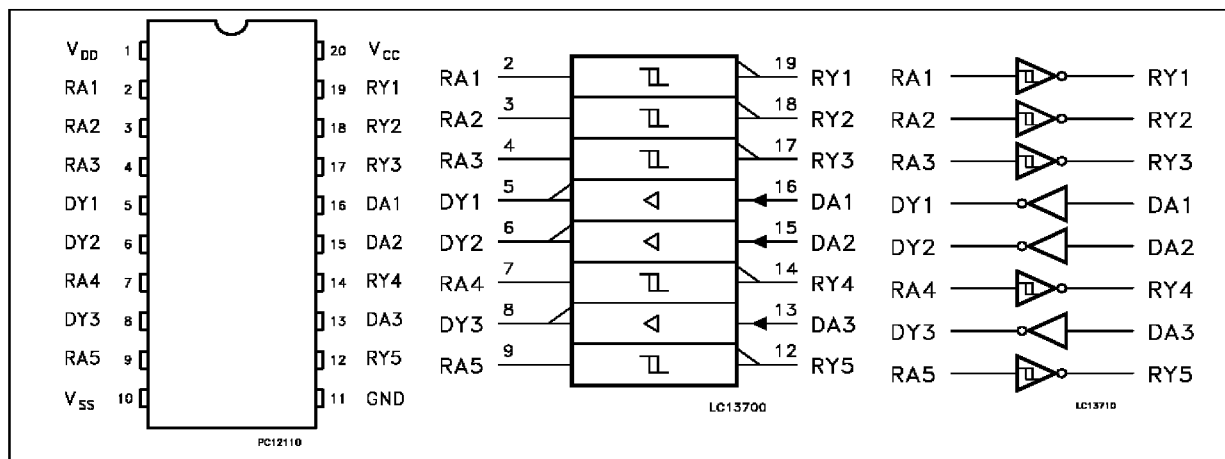


these features eliminate the need of external components.

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

In most application 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.

PIN CONNECTION IEC LOGIC SYMBOL AND LOGIC DIAGRAM



ST75C185

ORDER CODES

Type	Temperature Range	Package	Comments
ST75C185CN	0 to 70 °C	DIP-20	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	DIP-20	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	TSSOP20 (Tape & Reel)	2500 parts per reel

PIN DESCRIPTION

PIN No	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 (unless otherwise specified)

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.
NOTE1: 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_{IN}	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		-40	25	85	°C

NOTE 2: The algebraic convention, where the more positive (less negative) limit is 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 ($V_{DD} = 12V$, $V_{SS} = -12V$, $V_{CC} = 5V$, unless otherwise specified)

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 0 or 5V		950	1500	μA

DRIVER ELECTRICAL CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE($V_{DD} = 12V$, $V_{SS} = -12V$, $V_{CC} = 5V \pm 10\%$, unless otherwise specified)

Symbol	Parameter	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{OH}	High Level Output Voltage	$V_{IL} = 0.8V$ $R_L = 3K\Omega$ (See Figure 1)	$V_{DD} = 7V$, $V_{SS} = -7V$	5	6.3	V
			$V_{DD} = 12V$, $V_{SS} = -12V$	10	10.8	V
V_{OL}	Low Level Output Voltage (Note 3)	$V_{IH} = 1.9V$ $R_L = 3K\Omega$ (See Figure 1)	$V_{DD} = 7V$, $V_{SS} = -7V$		-6.3	V
			$V_{DD} = 12V$, $V_{SS} = -12V$		-10.8	V
V_{IH}	High Level Input Voltage		2	1.4		V
V_{IL}	Low Level Input Voltage			1.4	0.8	V
I_{IH}	High Level Input Current	$V_I = 5V$ (See Figure 2)			1	μA
I_{IL}	Low Level Input Current	$V_I = 0V$ (See Figure 2)			-1	μA
$I_{OS(H)}$	High Level Short Circuit Output Current (Note 4)	$V_I = 0.8V$ $V_O = 0V$ or V_{SS} (See Figure 1)	-6	-20	-60	mA
$I_{OS(L)}$	Low Level Short Circuit Output Current (Note 4)	$V_I = 2V$ $V_O = 0V$ or V_{SS} (See Figure 1)	6	35	60	mA
R_O	Output Resistance	$V_O = -2$ to $2V$ $V_{SS} = V_{CC} = V_{DD} = 0V$	300	450		Ω

NOTE3: The algebraic convention, where the more positive (less negative) limit is 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).

NOTE4: Not more than one outputs should be shorted at one time.

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	$R_L = 3$ to $7K\Omega$ $C_L = 1000pF$ (See Figures 3)		1.9	4	μs
t_{PHL}	Propagation Delay Time High to Low Level Output	$R_L = 3$ to $7K\Omega$ $C_L = 1000pF$ (See Figures 3)		1.6	4	μs
t_{TLH}	Transition Time Low to High Level Output	$R_L = 3$ to $7K\Omega$ $C_L = 1000pF$ (See Figures 3)	0.53	2	3.2	μs
t_{THL}	Transition Time High to Low Level Output	$R_L = 3$ to $7K\Omega$ $C_L = 1000pF$ (See Figure 3)	0.53	2	3.2	μs
SR	Output Slew Rate (Note 5)	$R_L = 3$ to $7K\Omega$ $C_L = 50$ to $2500pF$ (See Figure 3)	4	11	30	V/ μs

NOTE5: 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_{DD} = 12V, V_{SS} = -12V, V_{CC} = 5V±10%, unless otherwise specified)

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

All typical values are at T_A = 25 °C.**NOTE 6:** Hysteresis is the difference between the positive going input threshold voltage, V_{T+}, and the negative going input threshold voltage V_{T-}.**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_{DD} = 12V, V_{SS} = -12V, V_{CC} = 5V±10% 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)		3.2	4	μs
t _{PHL}	Propagation Delay Time High to Low Level Output	R _L = 5 KΩ C _L = 50 pF (See Figure 6)		2.6	4	μs
t _{TLH}	Transition Time Low to High Level Output	R _L = 5 KΩ C _L = 50 pF (See Figure 6)		30	100	ns
t _{THL}	Transition Time High to Low Level Output	R _L = 5 KΩ C _L = 50 pF (See Figure 6)		10	50	ns
t _{W(N)}	Pulse Duration of longest pulse rejection as noise (Note8)	R _L = 5 KΩ C _L = 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_{W(N)} and accepts any positive or negative going pulse greater than the maximum of t_{W(N)}.

APPLICATION CIRCUITS

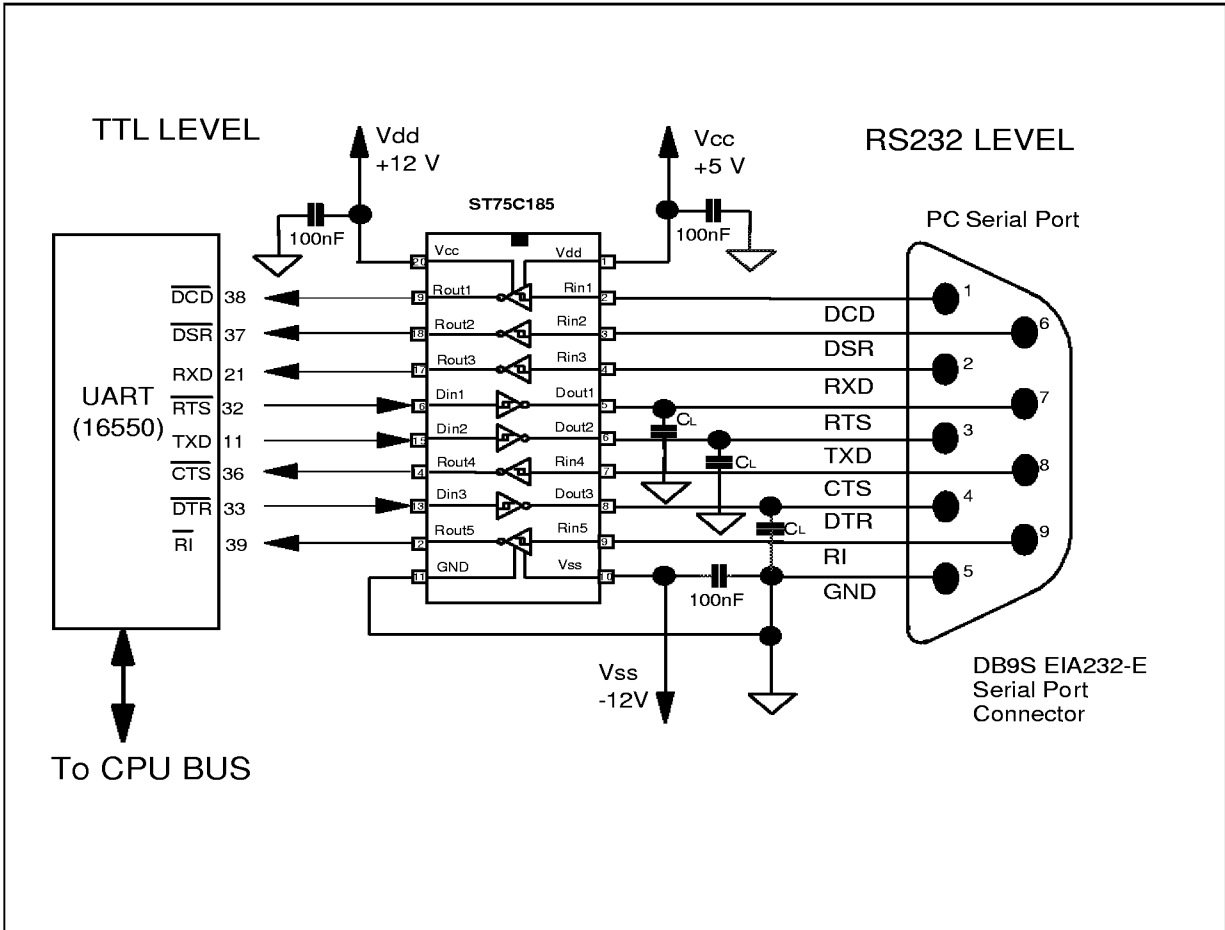


FIGURE 1: Driver Test Circuit for V_{OH} , V_{OL} , $I_{SO(H)}$ and $I_{SO(L)}$

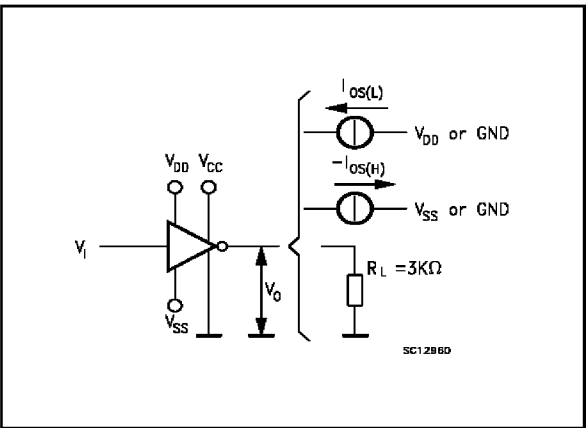


FIGURE 2: Driver Test Circuit for I_{IH} and I_{IL}

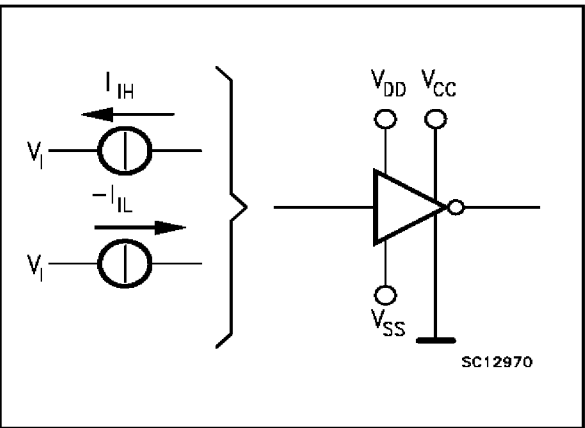


FIGURE 3: Driver Test Circuit

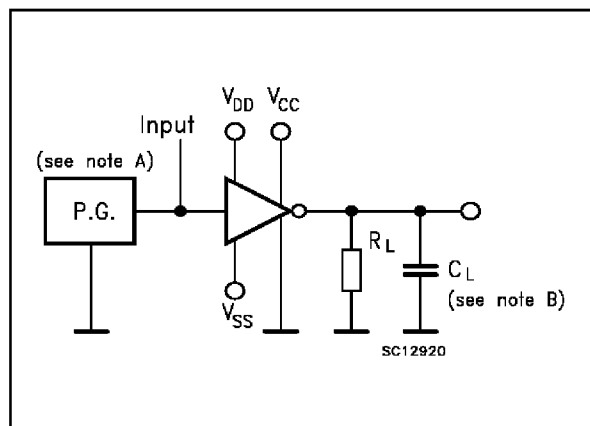


FIGURE 4: Driver Voltage Waveforms

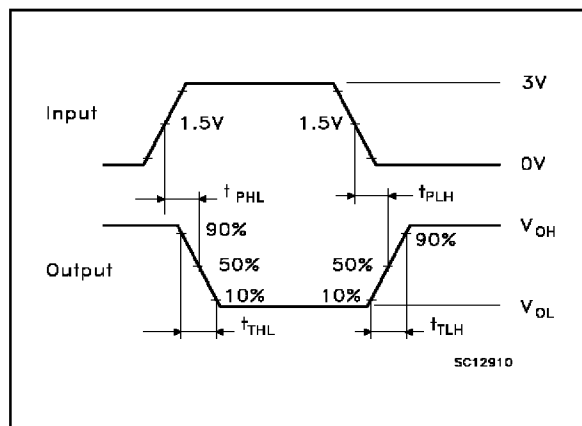
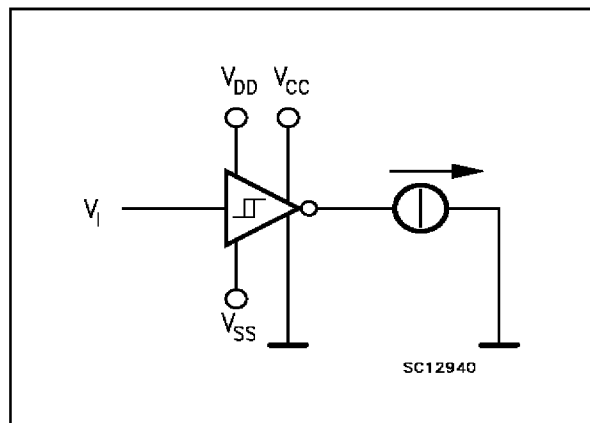
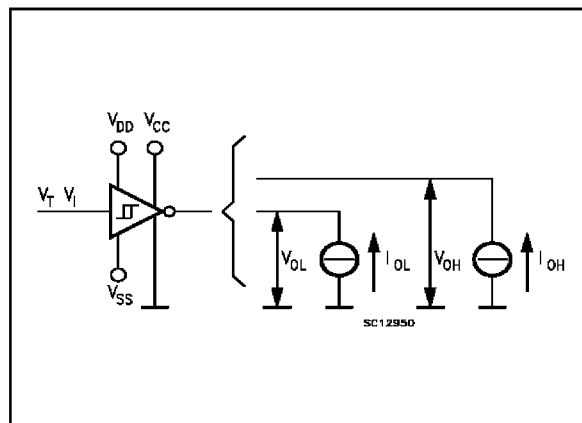
FIGURE 5: Receiver Test Circuit for I_{OS} FIGURE 6: Receiver Test Circuit for V_T , V_{OH} , V_{OL} 

FIGURE 7: Receiver Test Circuit

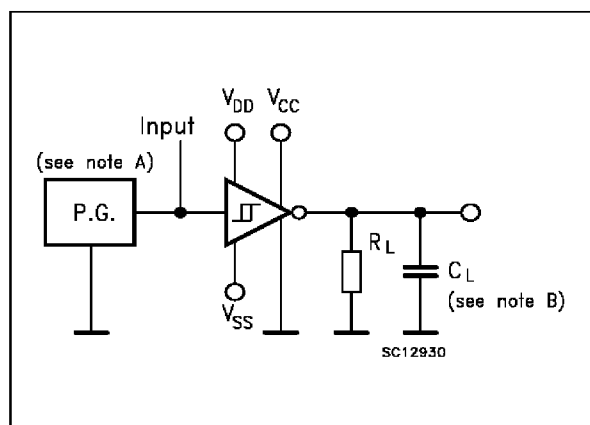
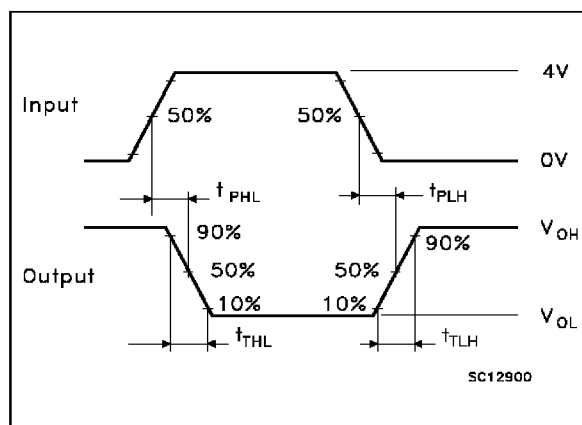


FIGURE 8: Receiver Voltage Waveforms

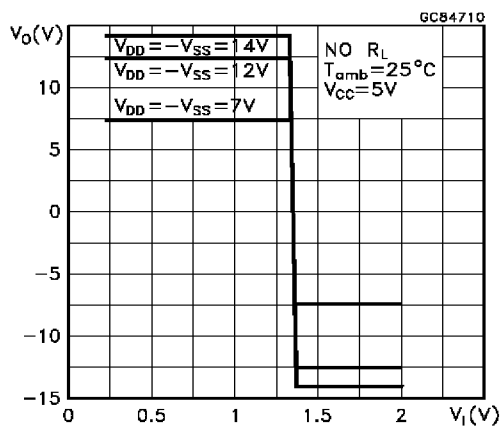


NOTE A: The pulse generator has the following characteristics: $t_w = 25 \mu s$, $PRR = 20 KHz$, $Z_o = 50 \Omega$, $t_r = t_f < 50 ns$.

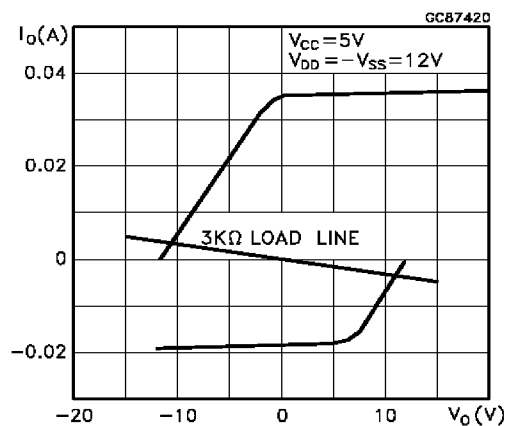
NOTE B: C_L includes probe and jig capacitance.



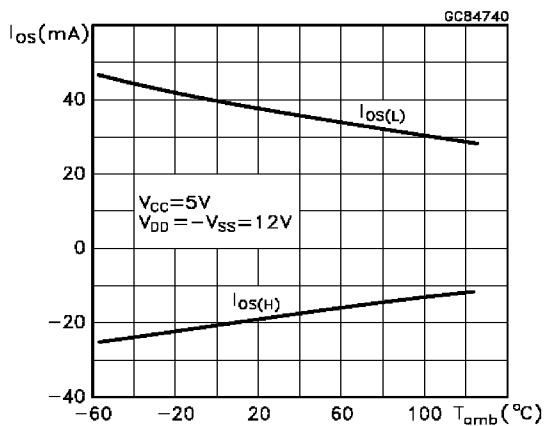
Driver Voltage Transfer Characteristics



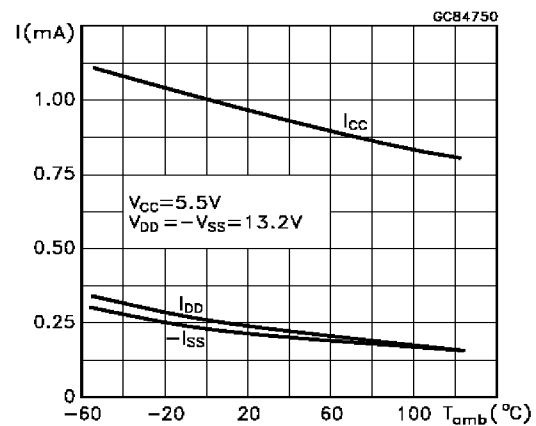
Driver Output Current vs Output Voltage



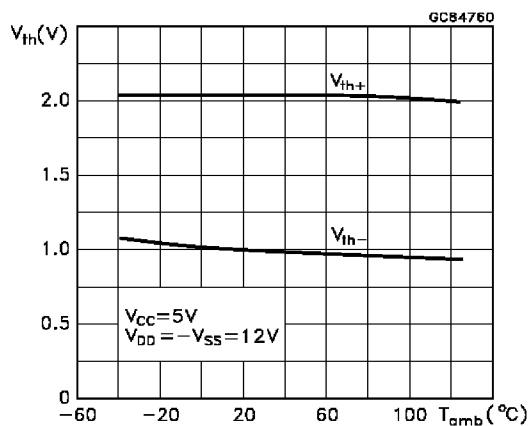
Driver Short Circuit Output Current vs Free-Air Temperature



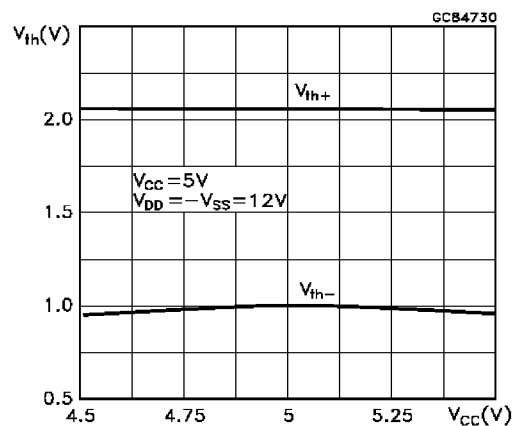
Device Supply Current vs Temperature



Receiver Threshold vs Temperature

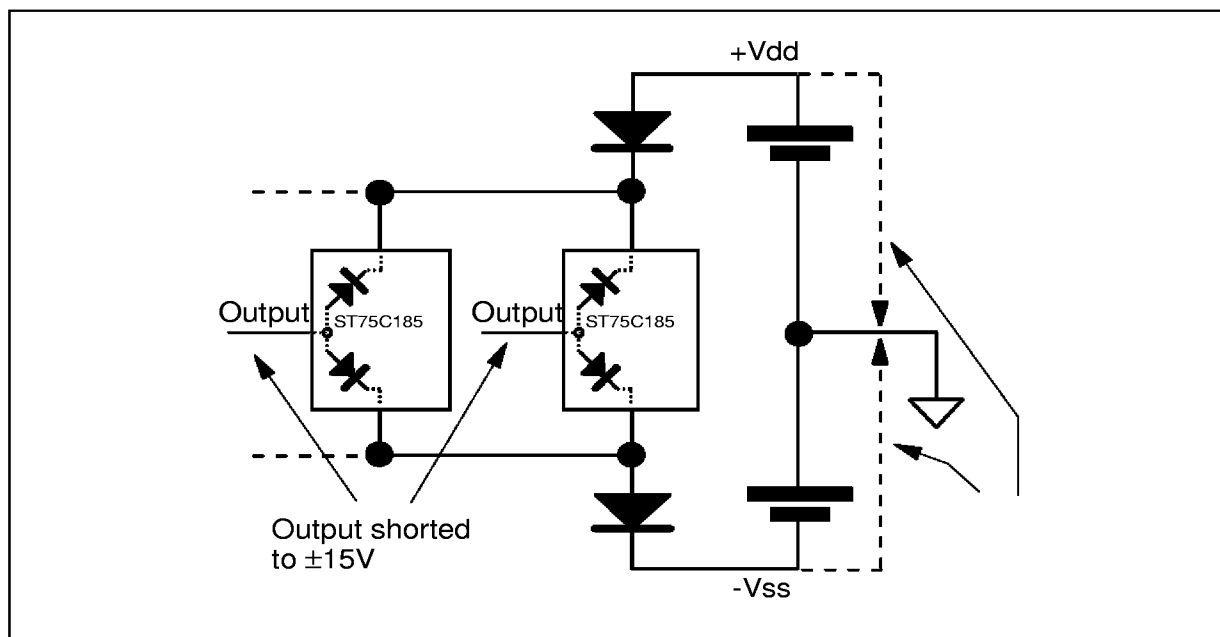


Receiver Threshold vs Supply Voltage



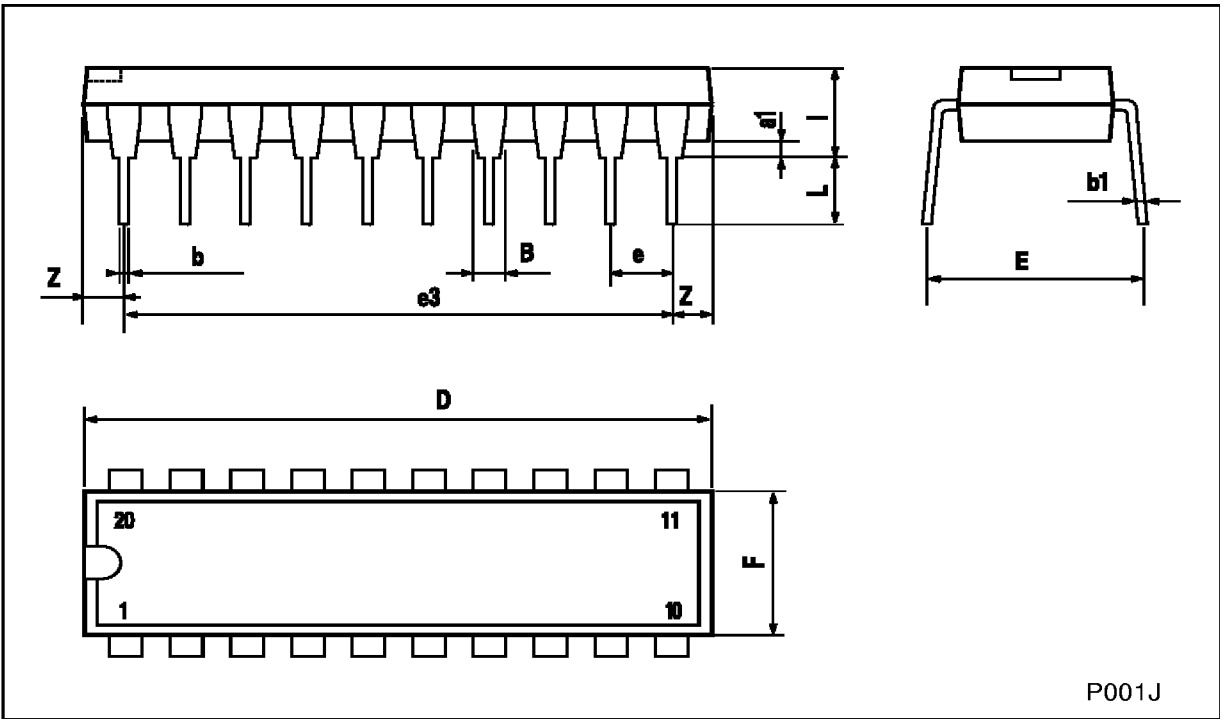
APPLICATION INFORMATION: DIODES ON POWER SUPPLY

Diodes placed in series with the V_{DD} and V_{SS} leads protect the ST75C185 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). Any idle transmitter input must be connected to GND or V_{CC} . This device is not sensitive to power supply sequence.



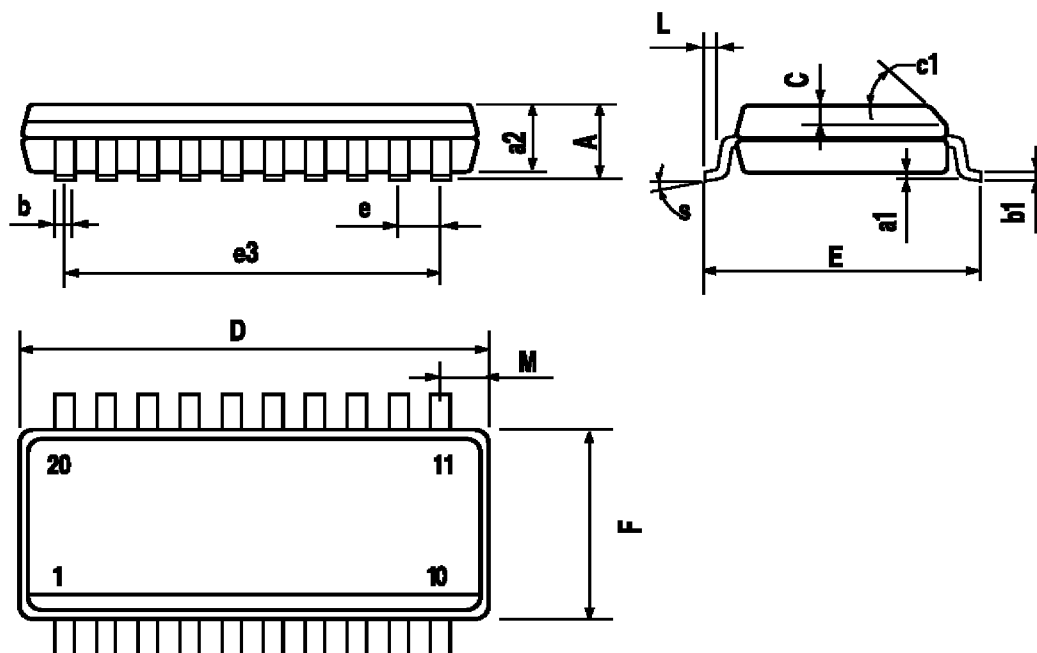
Plastic DIP-20 (0.25) MECHANICAL DATA

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



SO-20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			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		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8 (max.)					



P013L

TSSOP20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.2	0.0035		0.0079
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028

