



**THE DATASHEET OF
ST75C185BDR**





ST75C185

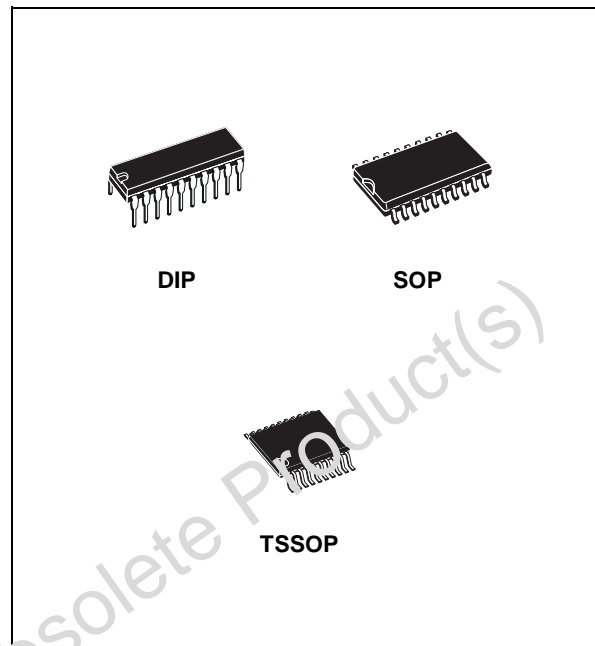
LOW POWER MULTIPLE RS-232 DRIVERS AND RECEIVERS

- 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 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/ 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 has a power sequence fault condition. It has been designed using low-power techniques in a BICMOS technology.

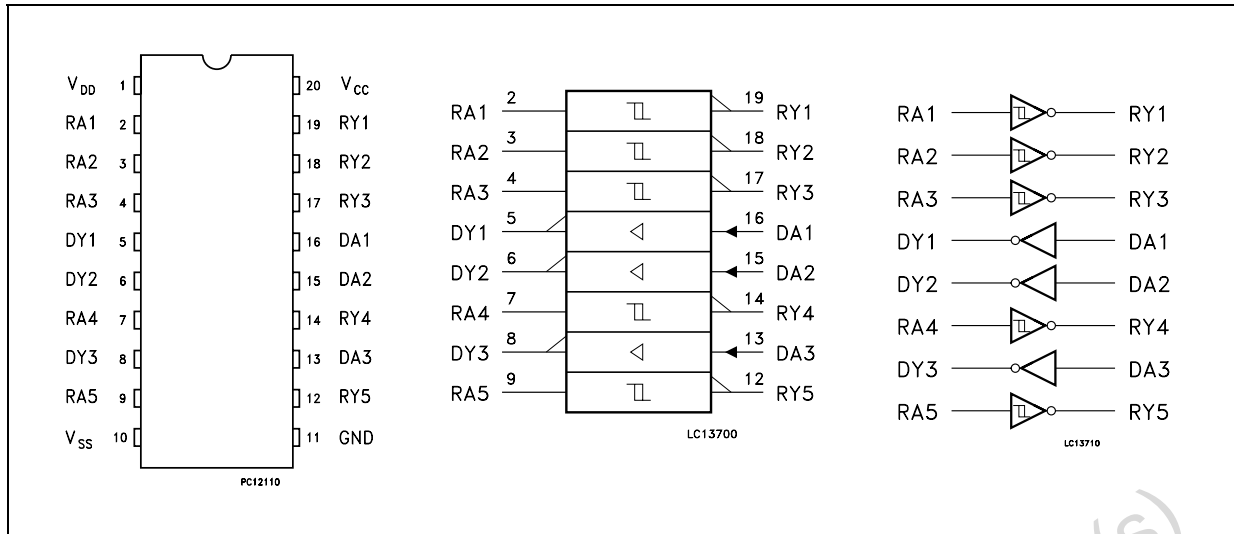


In most applications the receivers contained in this device will interface to single input peripheral devices such as ACEs, UARTs or microprocessors. By using sampling, such peripheral devices are usually insensitive to the transition times of the input signals. If this is not the case, or for other 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 | | | -1 | mA |
| I_{OL} | Low Level Output Current | | | 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 | μ A |
| I_{SS} | Supply Current from V_{SS} | No load. All inputs at 2 or 0.8V | | -115 | -500 | μ A |
| I_{CC} | Supply Current from V_{CC} | No load. All inputs at 2 or 5V | | 950 | 1500 | μ A |

DRIVER 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 _{OH} | High Level Output Voltage | V _{IL} = 0.8 V R _L = 3KΩ (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} = 1.9 V R _L = 3KΩ (See Figure 1) | V _{DD} = 7V, V _{SS} = -7V | | -6.3 | -5 | V |
| | | | V _{DD} = 12V, V _{SS} = -12V | | -10.8 | -10 | 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 = 5 V (See Figure 2) | | | | 1 | μA |
| I _{IL} | Low Level Input Current | V _I = 0 V (See Figure 2) | | | | -1 | μA |
| I _{OS(H)} | High Level Short Circuit Output Current (Note 4) | V _I = 0.8 V V _O = 0 V or V _{SS} (See Figure 1) | | -6 | -20 | -60 | mA |
| I _{OS(L)} | Low Level Short Circuit Output Current (Note 4) | V _I = 2 V V _O = 0 V or V _{SS} (See Figure 1) | | 6 | 35 | 60 | mA |
| R _O | Output Resistance | V _O = -2 to 2 V V _{SS} = V _{CC} = V _{DD} = 0 V | | 300 | 450 | | 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: 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 °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 = 1000 pF (See Figure 3) | | 1.9 | 4 | μs |
| t _{PHL} | Propagation Delay Time, High to Low Level Output | R _L = 3 to 7 KΩ C _L = 1000 pF (See Figure 3) | | 1.6 | 4 | μs |
| t _{TLH} | Transition Time Low to High Level Output | R _L = 3 to 7 KΩ C _L = 1000 pF (See Figure 3) | 0.53 | 2 | 3.2 | μs |
| t _{THL} | Transition Time High to Low Level Output | R _L = 3 to 7 KΩ C _L = 1000 pF (See Figure 3, 4) | 0.53 | 2 | 3.2 | μs |
| SR | Output Slew Rate (Note 5) | R _L = 3 to 7 KΩ C _L = 50 to 2500 pF (See Figure 3) | 4 | 11 | 30 | V/μs |

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_{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} = 0.75 mA or Input Open I _{OH} = -1 mA (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°CNOTE 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 (Note 8) | 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

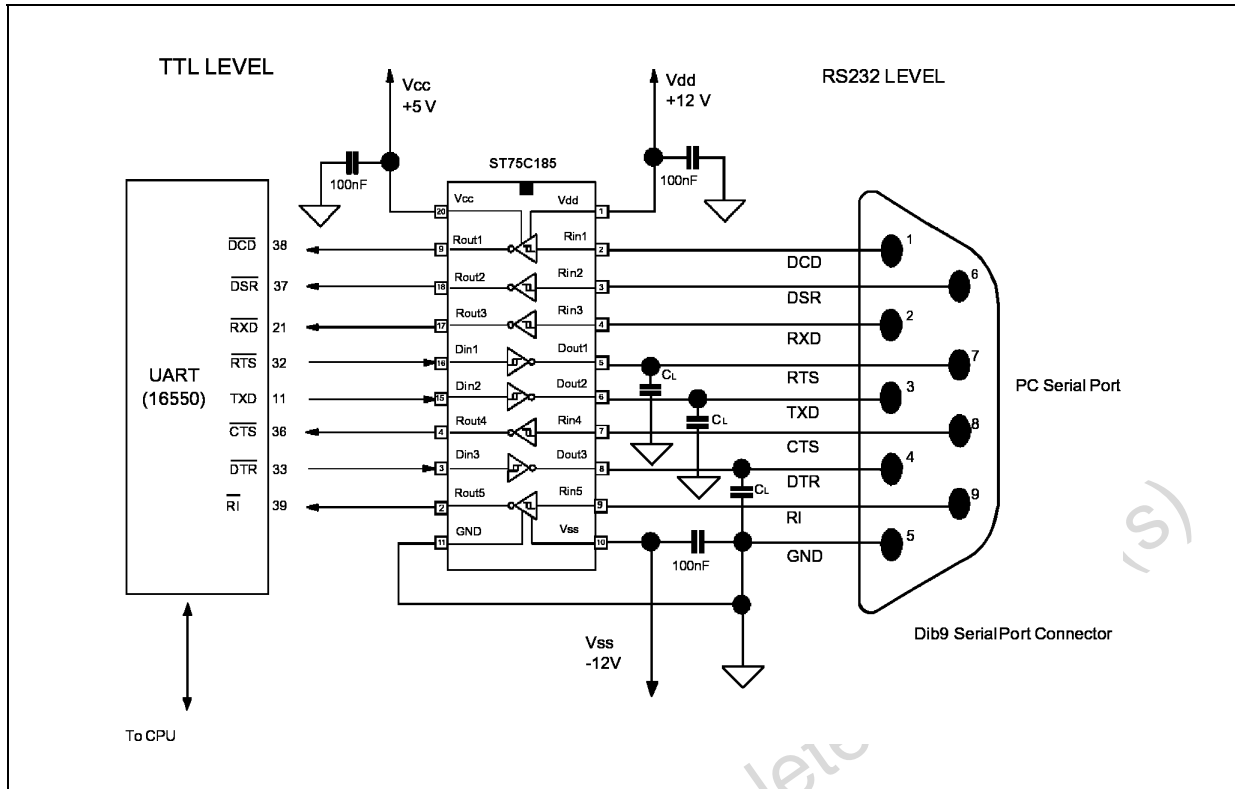


Figure 1 : Driver Test Circuit for V_{OH}, I_{SO(H)} and I_{SO(L)}

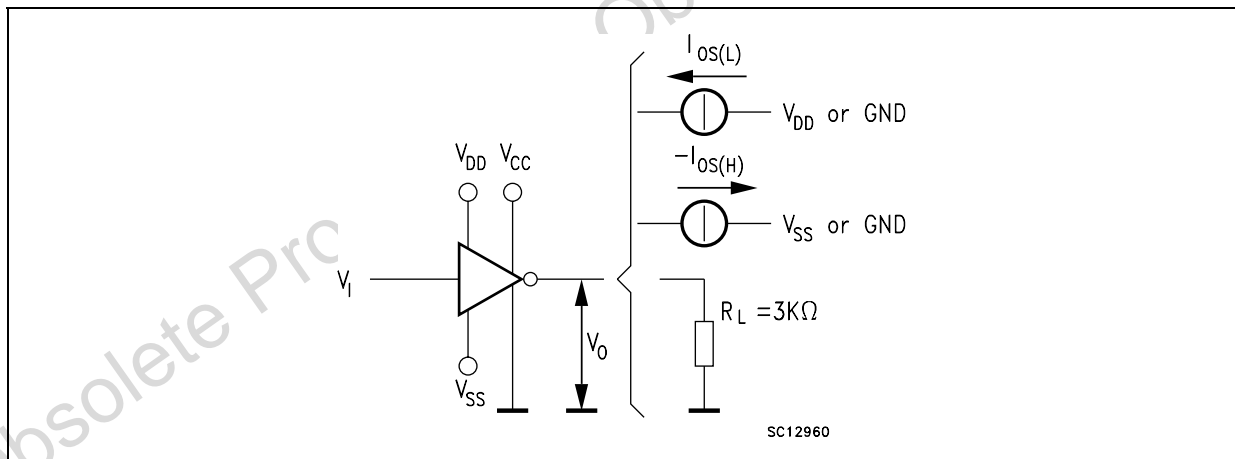


Figure 2 : Driver Test Circuit for I_{IH} and I_{IL}

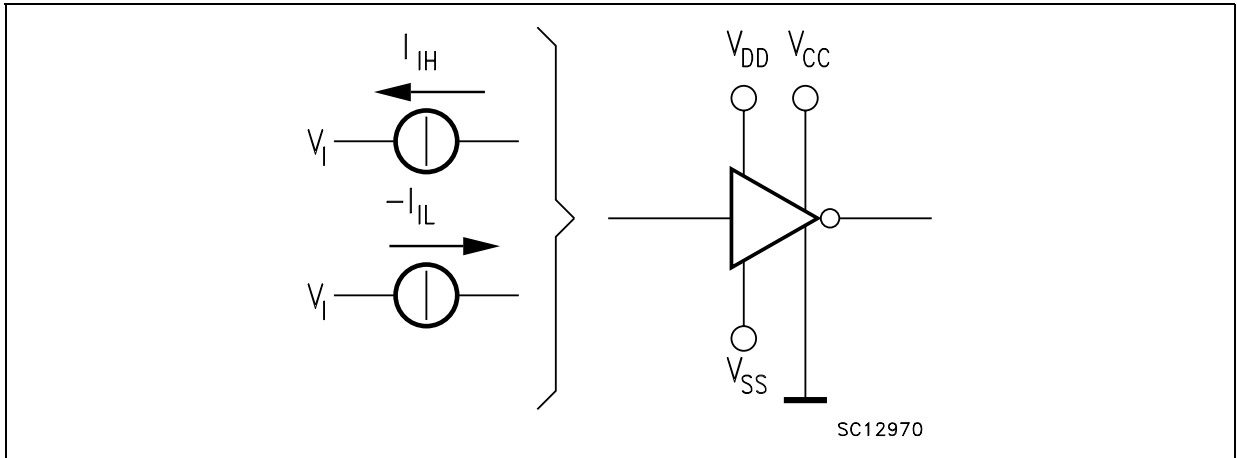


Figure 3 : Driver Test Circuit

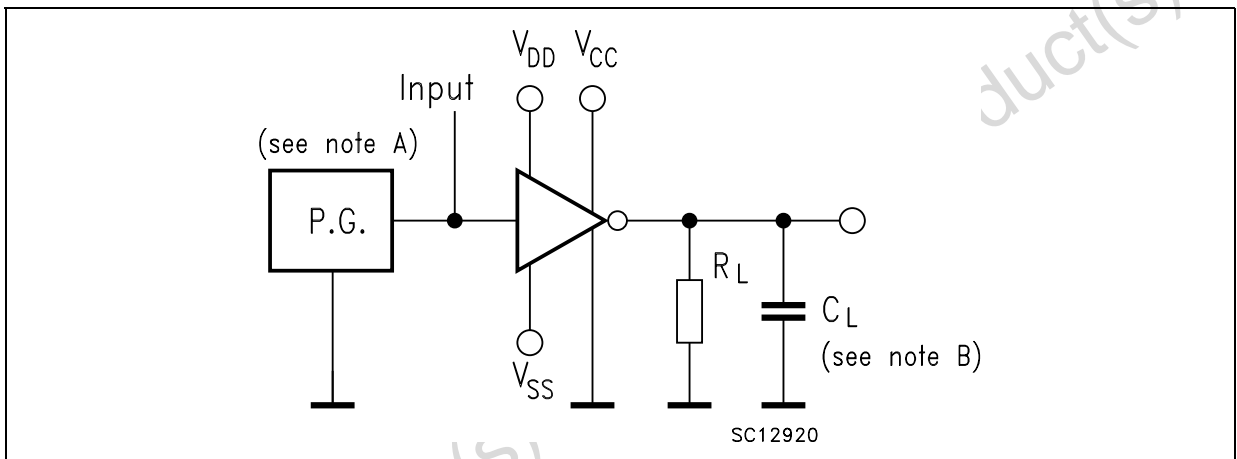


Figure 4 : Driver Voltage Waveforms

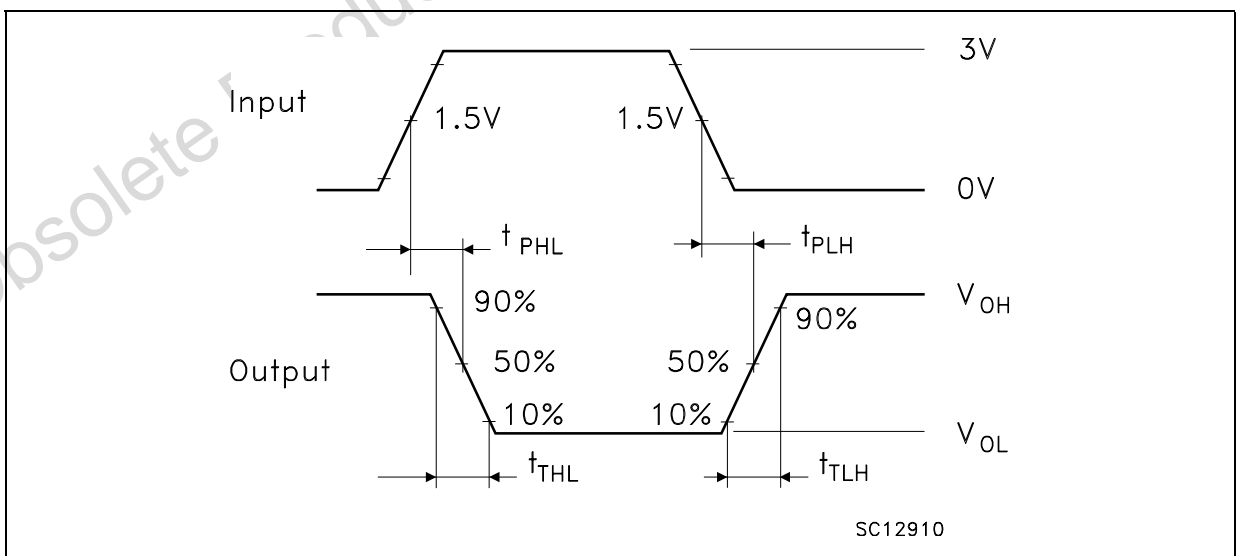


Figure 5 : Receiver Test Circuit for I_{OS}

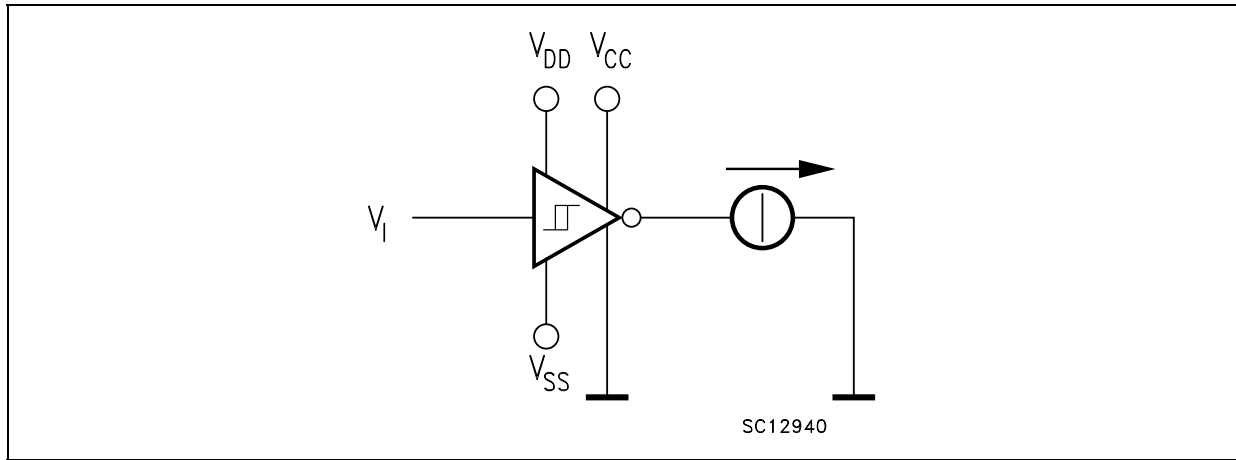


Figure 6 : Receiver Test Circuit for V_T, V_{OH}, V_{OL}

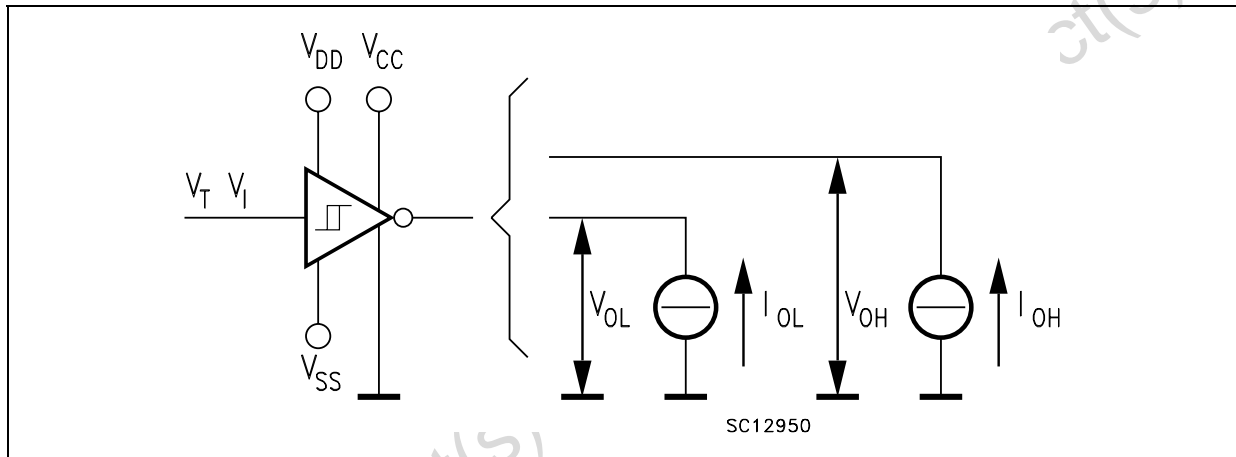


Figure 7 : Receiver Test Circuit

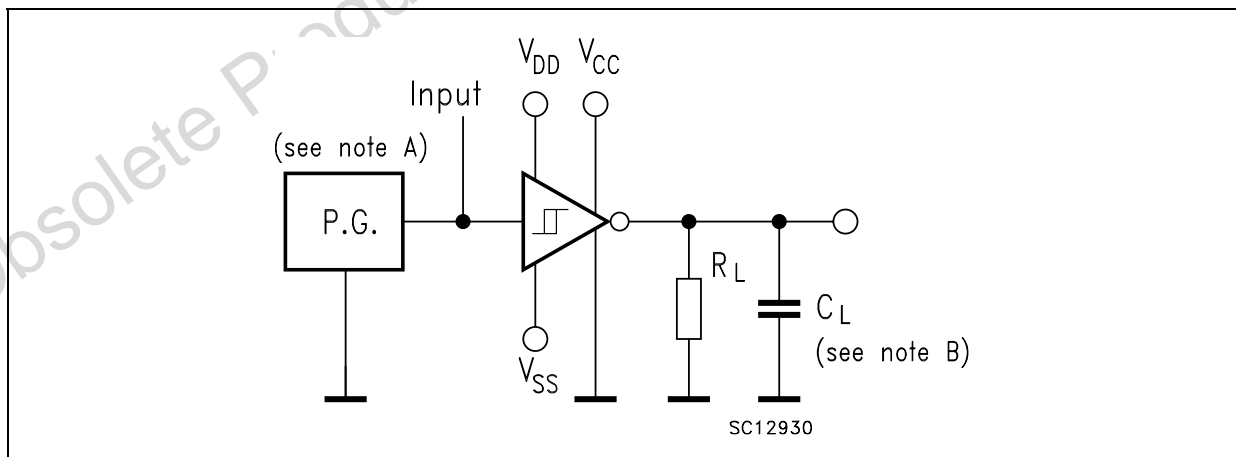
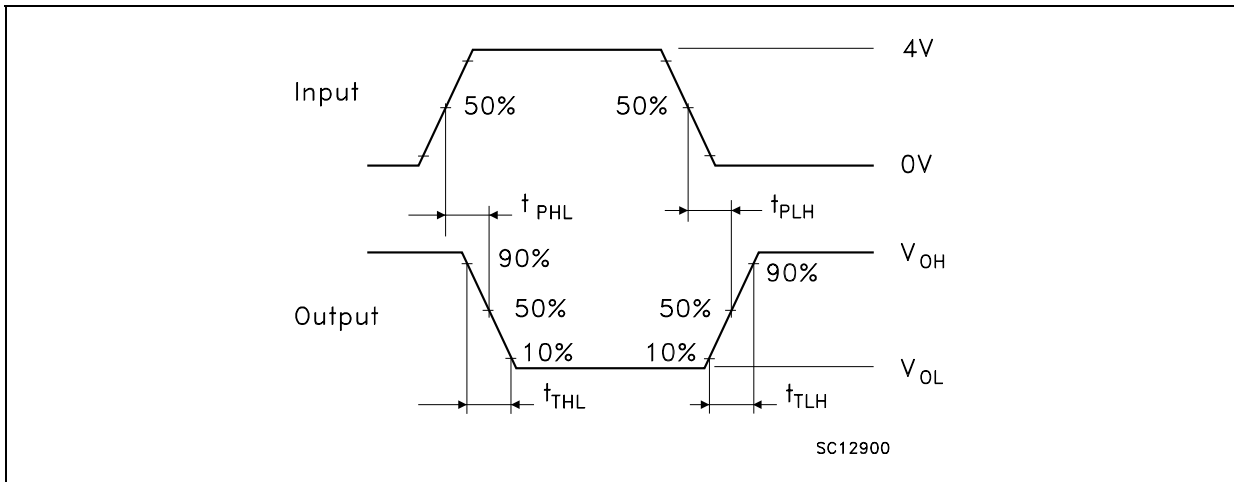


Figure 8 : Receiver Voltage Waveforms



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

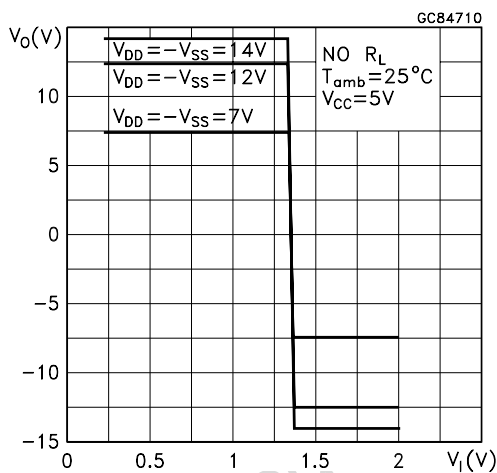


Figure 10 : Driver Output Current vs Output Voltage

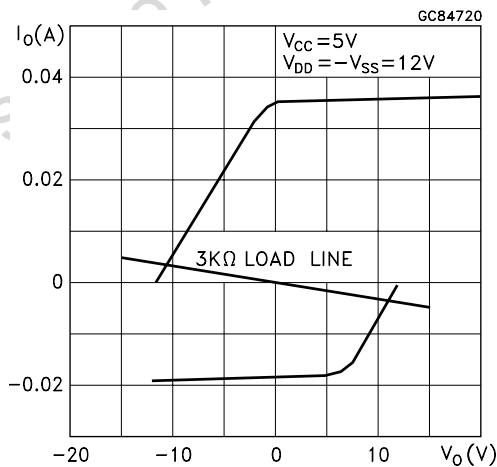


Figure 11 : Driver Short Circuit Output Current vs Free-Air Temperature

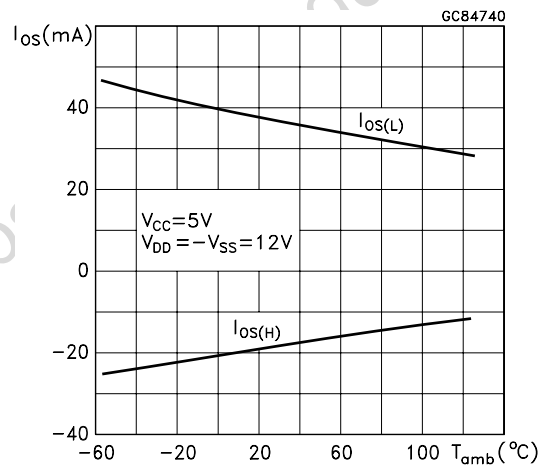


Figure 12 : Device Supply Current vs Temperature

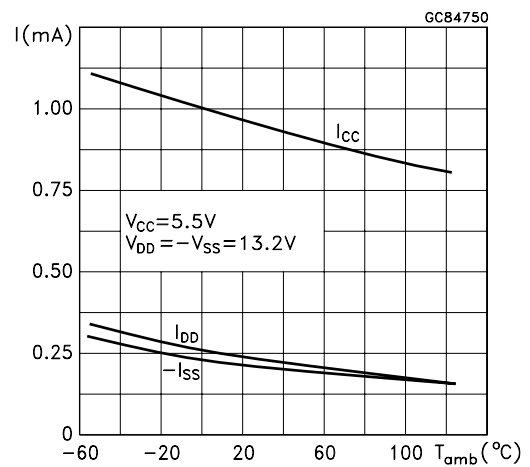


Figure 13 : Receiver Threshold vs Temperature

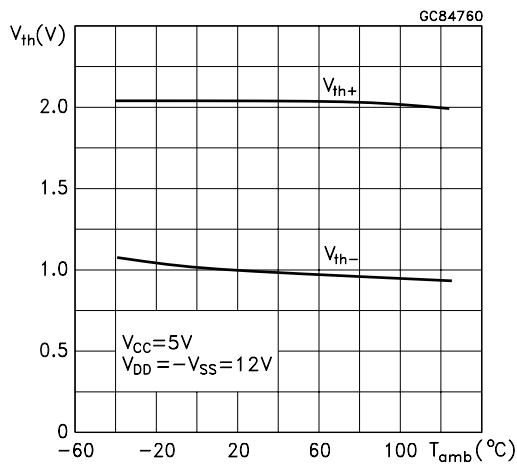
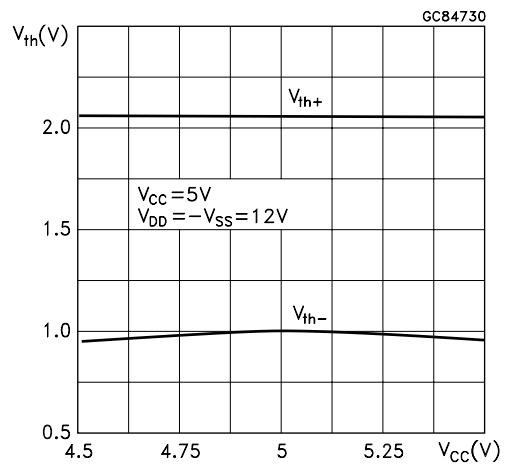
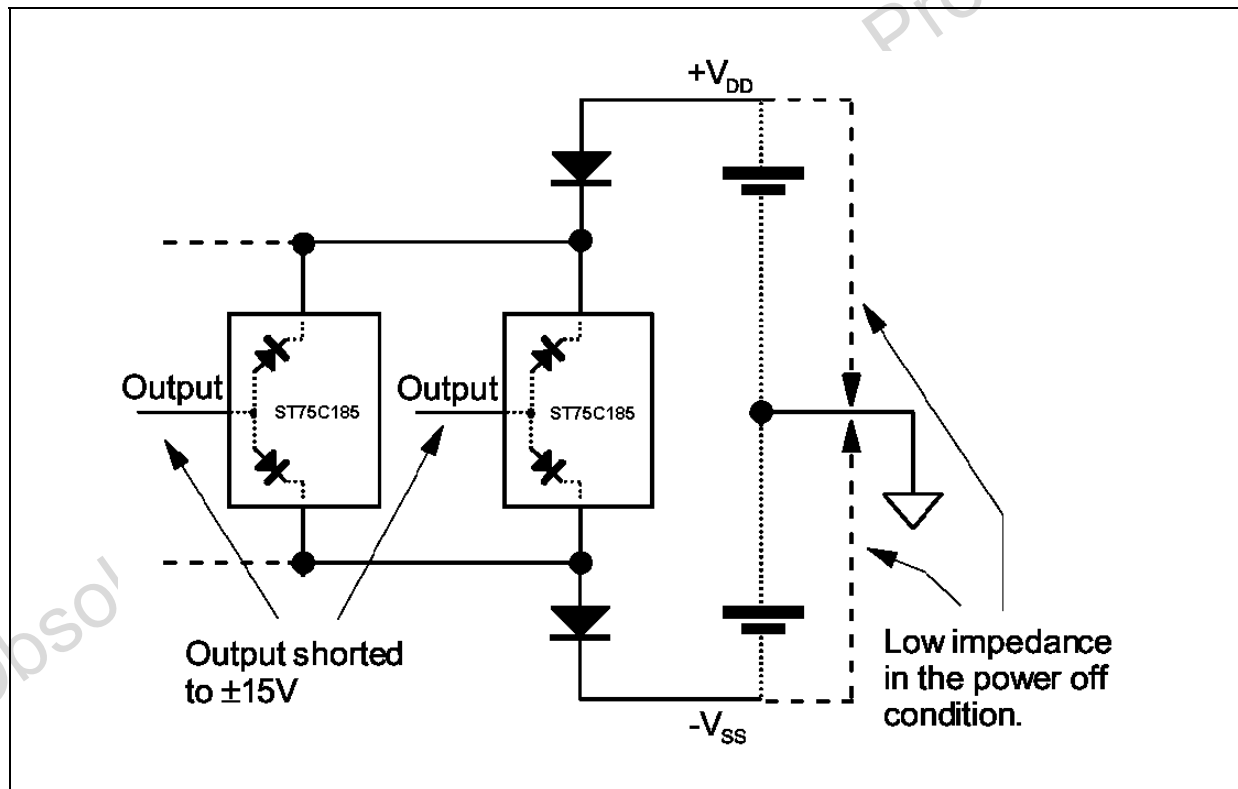


Figure 14 : Receiver Threshold vs Supply Voltage



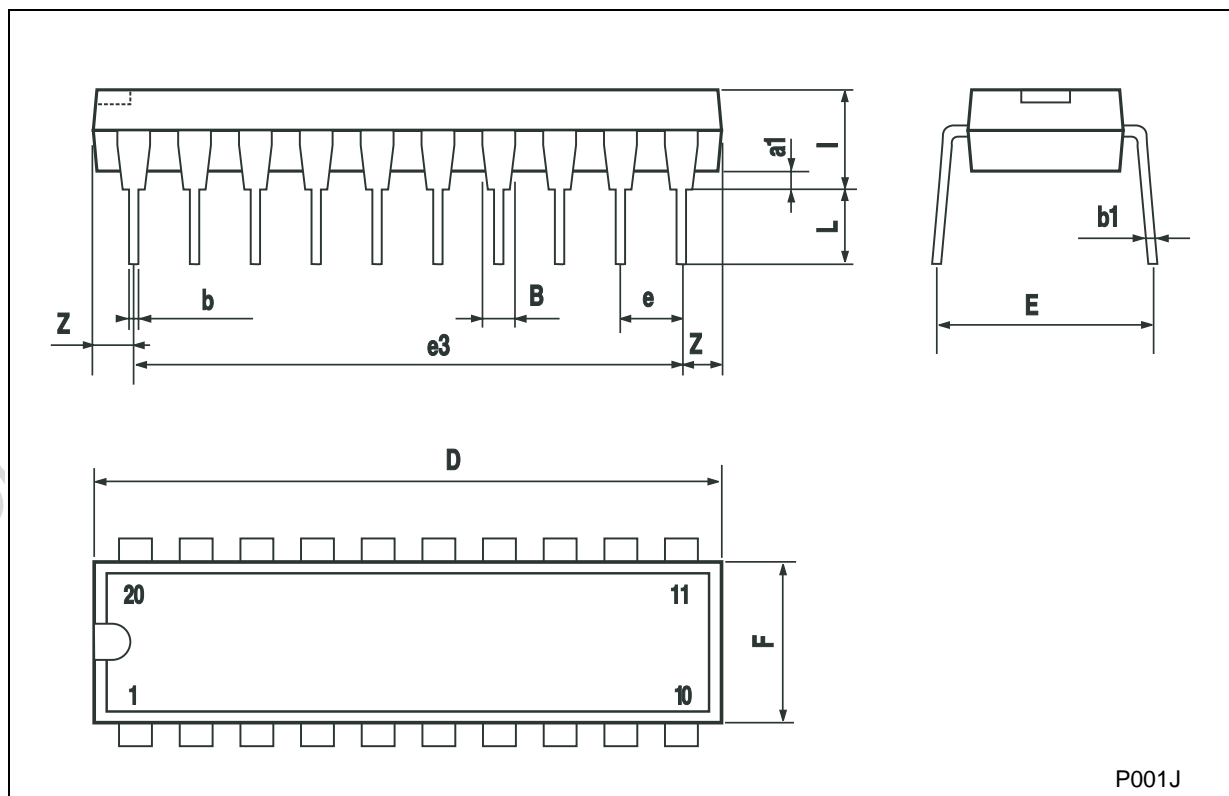
APPLICATION INFORMATION: DIODES ON POWER SUPPLY

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 ±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

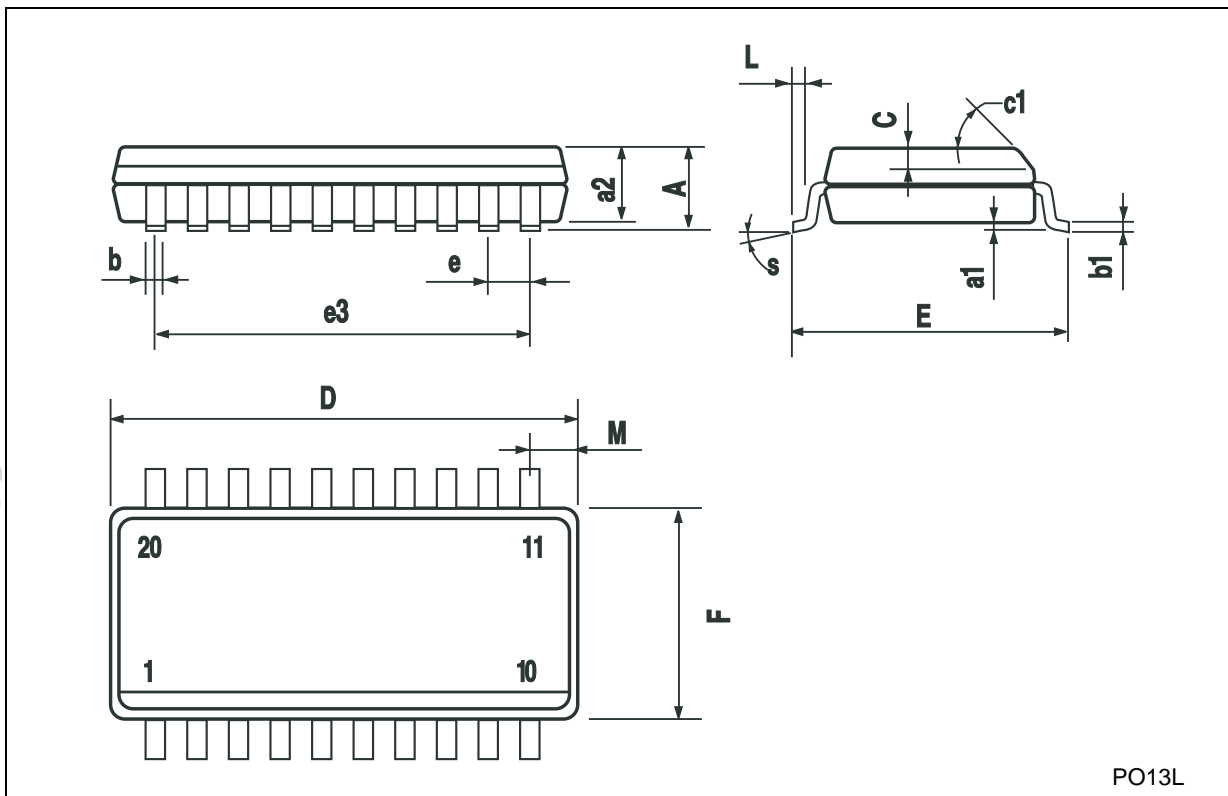
| DIM. | mm. | | | inch | | |
|------|-------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.254 | | | 0.010 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.45 | | | 0.018 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 25.4 | | | 1.000 |
| E | | 8.5 | | | 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

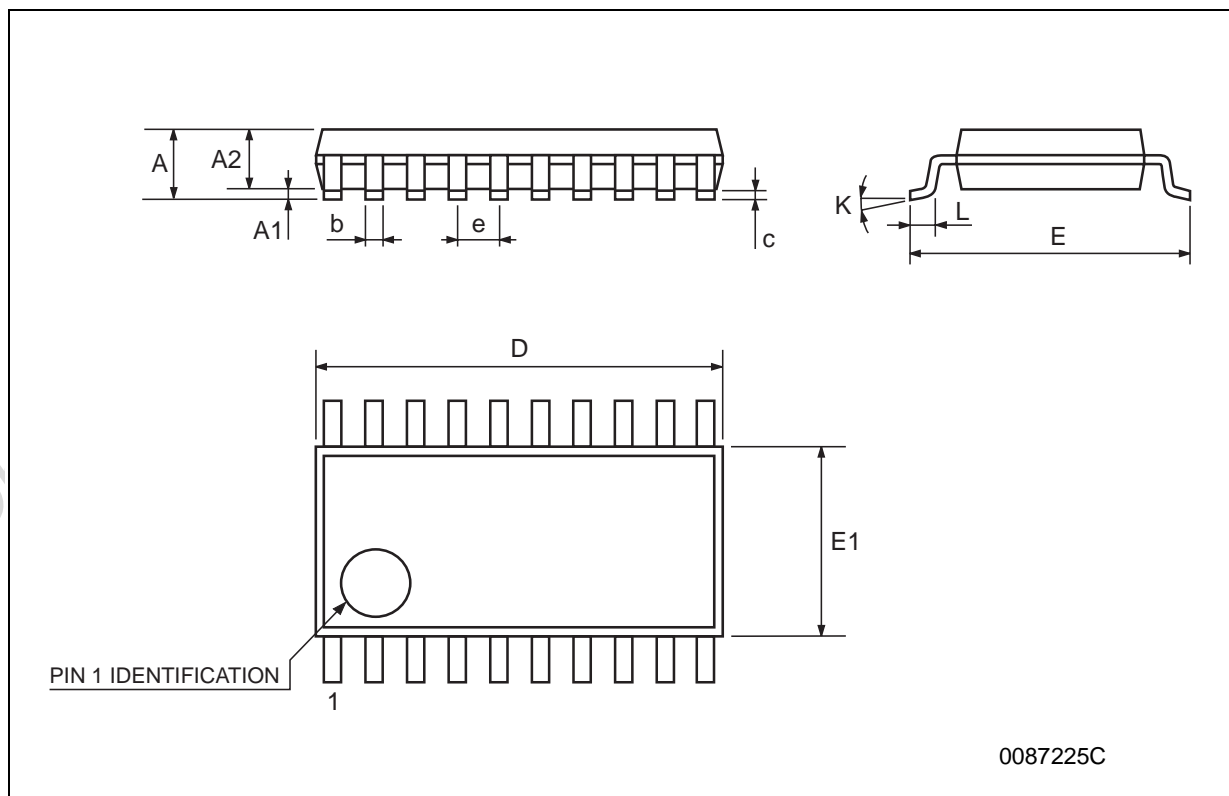
| DIM. | mm. | | | inch | | |
|------|------------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.014 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 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

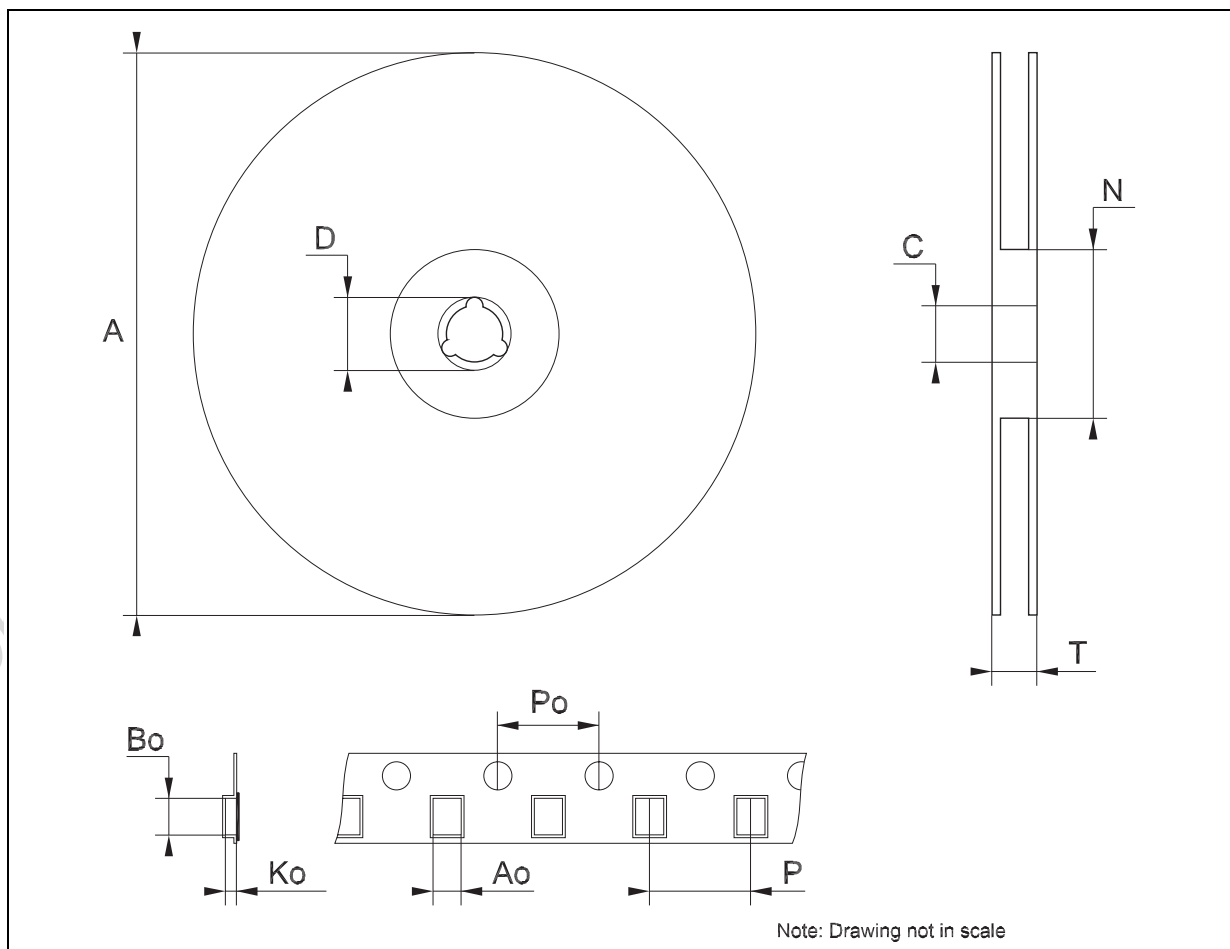
TSSOP20 MECHANICAL DATA

| 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 |



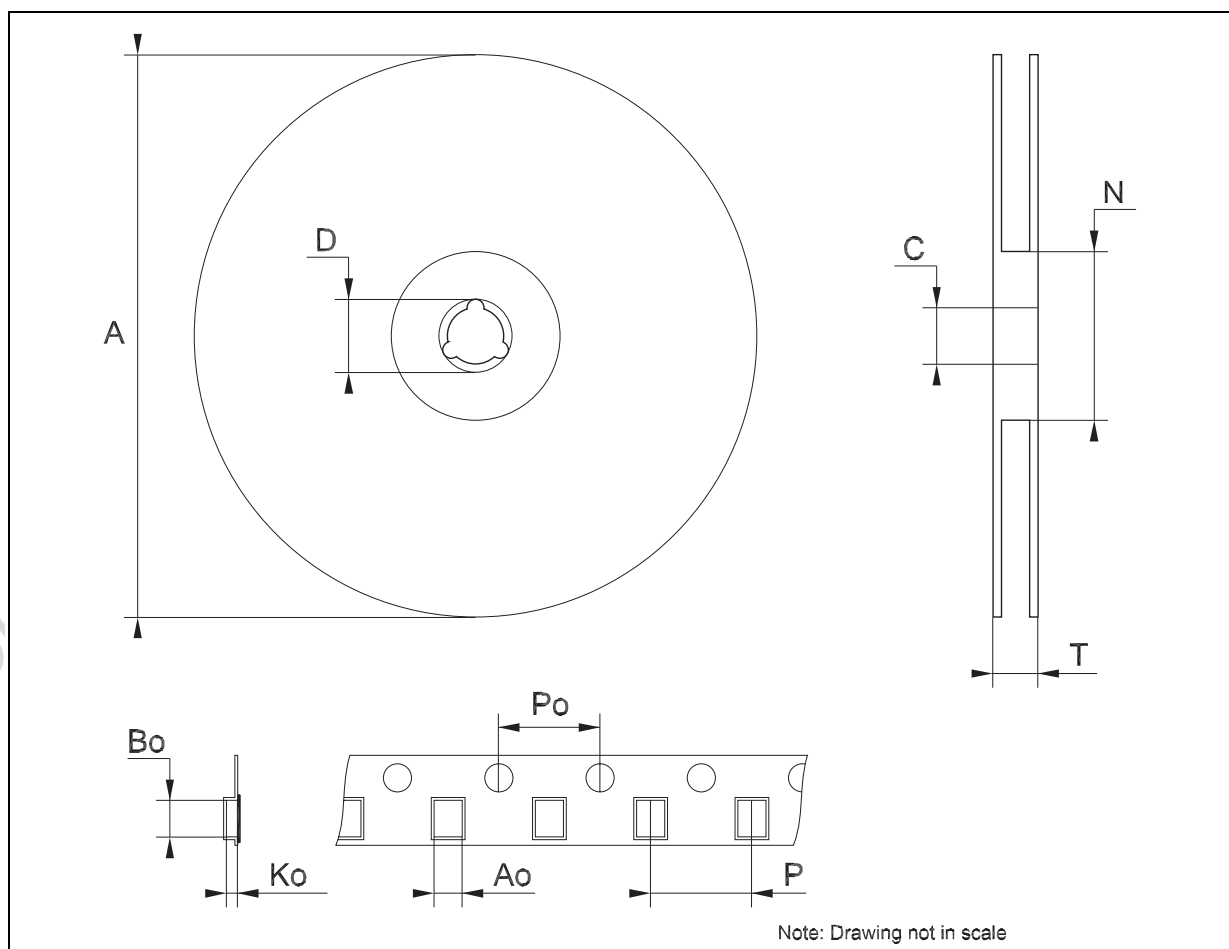
Tape & Reel SO-20 MECHANICAL DATA

| 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 |



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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-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management