



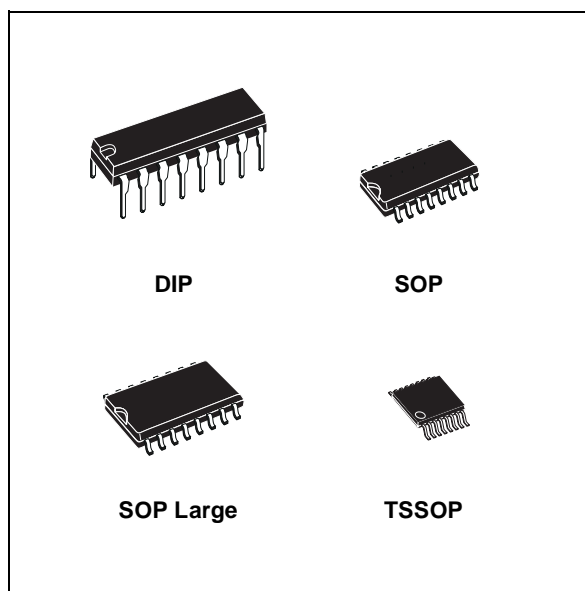
ST232

5V POWERED MULTI-CHANNEL RS-232 DRIVERS AND RECEIVERS

- SUPPLY VOLTAGE RANGE: 4.5 TO 5.5V
- SUPPLY CURRENT NO LOAD (TYP): 5mA
- TRANSMITTER OUTPUT VOLTAGE SWING (TYP): $\pm 7.8V$
- CONTROLLED OUTPUT SLEW RATE
- RECEIVER INPUT VOLTAGE RANGE: $\pm 30V$
- DATA RATE (TYP): 220Kbps
- OPERATING TEMPERATURE RANGE:
-40 TO 85°C, 0 TO 70°C
- COMPATIBLE WITH MAX232 AND MAX202

DESCRIPTION

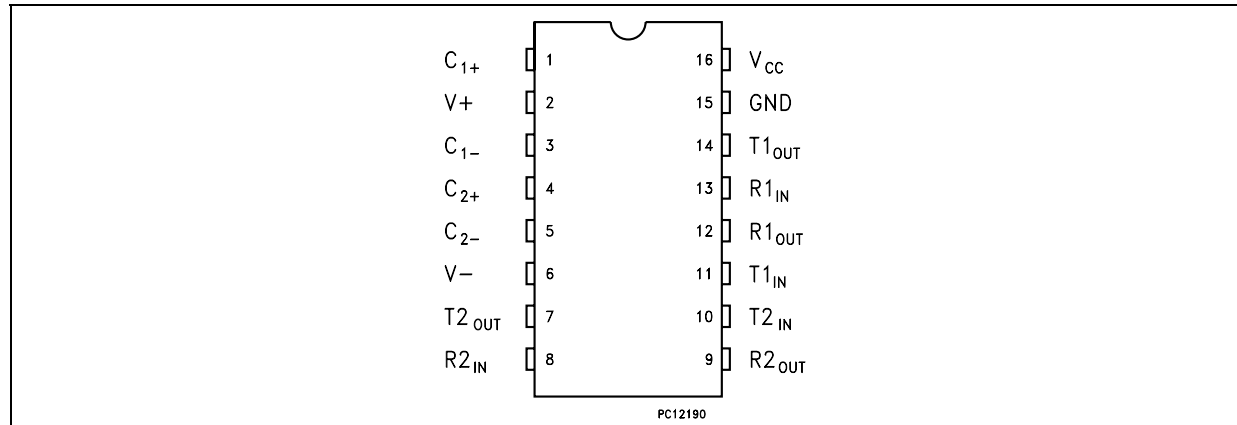
The ST232 is a 2 driver, 2 receiver device following EIA/TIA-232 and V.28 communication standard. It is particularly suitable for applications where $\pm 12V$ is not available. The ST232 uses a single 5V power supply and only four external capacitors (0.1 μF). Typical applications are in: Portable Computers, Low Power Modems, Interfaces Translation, Battery Powered RS-232 System, Multi-Drop RS-232 Networks.



ORDERING CODES

| Type | Temperature Range | Package | Comments |
|----------|-------------------|---------------------------|-------------------------------------|
| ST232CN | 0 to 70 °C | DIP-16 | 25parts per tube / 40tube per box |
| ST232BN | -40 to 85 °C | DIP-16 | 25parts per tube / 40tube per box |
| ST232CD | 0 to 70 °C | SO-16 (Tube) | 50parts per tube / 20tube per box |
| ST232BD | -40 to 85 °C | SO-16 (Tube) | 50parts per tube / 20tube per box |
| ST232CDR | 0 to 70 °C | SO-16 (Tape & Reel) | 2500 parts per reel |
| ST232BDR | -40 to 85 °C | SO-16 (Tape & Reel) | 2500 parts per reel |
| ST232CW | 0 to 70 °C | SO-16 Large (Tube) | 49 parts per tube / 25 tube per box |
| ST232BW | -40 to 85 °C | SO-16 Large (Tube) | 49 parts per tube / 25 tube per box |
| ST232CWR | 0 to 70 °C | SO-16 Large (Tape & Reel) | 1000 parts per reel |
| ST232BWR | -40 to 85 °C | SO-16 Large (Tape & Reel) | 1000 parts per reel |
| ST232CT | 0 to 70 °C | TSSOP16 (Tube) | only for samples |
| ST232BT | -40 to 85 °C | TSSOP16 (Tube) | only for samples |
| ST232CTR | 0 to 70 °C | TSSOP16 (Tape & Reel) | 2500 parts per reel |
| ST232BTR | -40 to 85 °C | TSSOP16 (Tape & Reel) | 2500 parts per reel |

PIN CONFIGURATION



PIN DESCRIPTION

| PIN N° | SYMBOL | NAME AND FUNCTION |
|--------|-------------------|--|
| 1 | C ₁₊ | Positive Terminal for the first Charge Pump Capacitor |
| 2 | V+ | Doubled Voltage Terminal |
| 3 | C ₁₋ | Negative Terminal for the first Charge Pump Capacitor |
| 4 | C ₂₊ | Positive Terminal for the second Charge Pump Capacitor |
| 5 | C ₂₋ | Negative Terminal for the second Charge Pump Capacitor |
| 6 | V- | Inverted Voltage Terminal |
| 7 | T _{2OUT} | Second Transmitter Output Voltage |
| 8 | R _{2IN} | Second Receiver Input Voltage |
| 9 | R _{2OUT} | Second Receiver Output Voltage |
| 10 | T _{2IN} | Second Transmitter Input Voltage |
| 11 | T _{1IN} | First Transmitter Input Voltage |
| 12 | R _{1OUT} | First Receiver Output Voltage |
| 13 | R _{1IN} | First Receiver Input Voltage |
| 14 | T _{1OUT} | First Transmitter Output Voltage |
| 15 | GND | Ground |
| 16 | V _{CC} | Supply Voltage |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|--|------|
| V _{CC} | Supply Voltage | -0.3 to 6 | V |
| T _{IN} | Transmitter Input Voltage Range | -0.3 to (V _{CC} + 0.3) | V |
| R _{IN} | Receiver Input Voltage Range | ± 30 | V |
| T _{OUT} | Transmitter Output Voltage Range | (V ₊ + 0.3) to (V ₋ - 0.3) | V |
| R _{OUT} | Receiver Output Voltage Range | -0.3 to (V _{CC} + 0.3) | V |
| T _{SCTOUT} | Short Circuit Duration on T _{OUT} | infinite | |
| T _{stg} | Storage Temperature Range | -65 to +150 | °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: No external supply can be applied to V+ terminal and V- terminal.

ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 5\text{V} \pm 10\%$, $T_A = -40$ to 85°C , unless otherwise specified.
Typical values are referred to $T_A = 25^\circ\text{C}$)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-------------------------------|-----------------------------------|------|------|------|------|
| I_{SUPPLY} | V_{CC} Power Supply Current | No Load, $T_A = 25^\circ\text{C}$ | | 5 | 10 | mA |

TRANSMITTER ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 5\text{V} \pm 10\%$, $T_A = -40$ to 85°C , unless otherwise specified.
Typical values are referred to $T_A = 25^\circ\text{C}$)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------|--|--|---------|-----------|----------|------------------|
| V_{TOUT} | Output Voltage Swing | All Transmitter outputs are loaded with $3\text{K}\Omega$ to GND | ± 5 | ± 7.8 | | V |
| I_{TIL} | Input Leakage Current | | | | ± 1 | μA |
| V_{TIL} | Input Logic Threshold Low | | 0.8 | | | V |
| V_{TIH} | Input Logic Threshold High | | | | 2 | V |
| SR_T | Transition Slew Rate | $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$ $R_L = 3$ to $7\text{K}\Omega$, $C_L = 50$ to 2500pF (Note1) | | 7 | 30 | V/ μs |
| D_R | Data Rate | (Note 2) | 120 | 220 | | Kbits/s |
| R_{TOUT} | Transmitter Output Resistance | $V_{CC} = V_+ = V_- = 0\text{V}$ $V_{\text{OUT}} = \pm 2\text{V}$ | 300 | | | Ω |
| I_{SC} | Transmitter Output Short Circuit Current | One T_{XOUT} to GND | | ± 10 | ± 60 | mA |

Note 1: Measured from 3V to -3V or from -3V to 3V.

Note2: One transmitter output is loaded with $R_L = 3\text{K}\Omega$ to $7\text{K}\Omega$, $C_L = 50$ to 1000pF

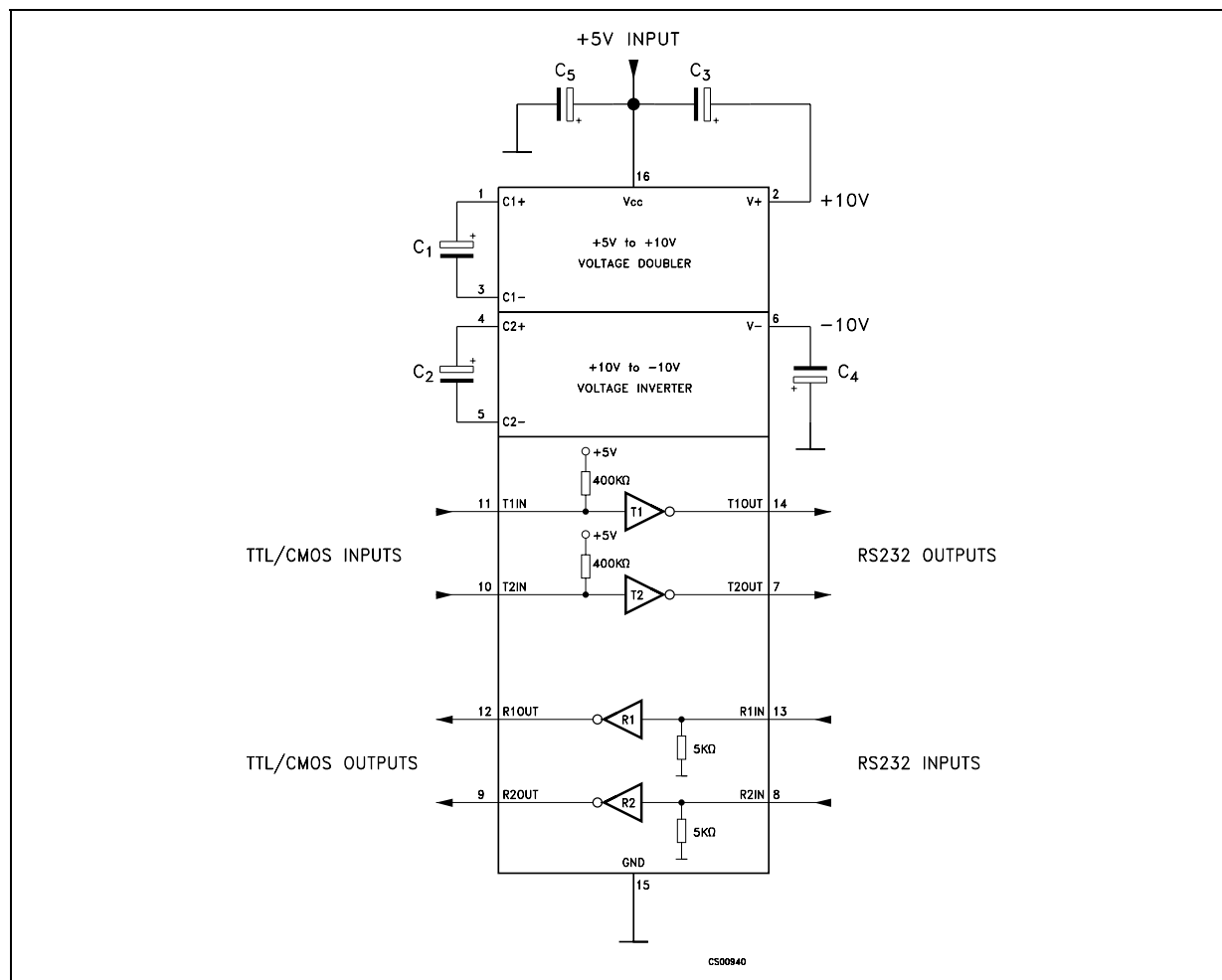
RECEIVER ELECTRICAL CHARACTERISTICS

($C_1 - C_4 = 0.1\mu\text{F}$, $V_{CC} = 5\text{V} \pm 10\%$, $T_A = -40$ to 85°C , unless otherwise specified.
Typical values are referred to $T_A = 25^\circ\text{C}$)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|--|--|------|--------------|------|------------------|
| V_{RIN} | Receiver Input Voltage Operating Range | | -30 | | 30 | V |
| R_{RIN} | RS-232 Input Resistance | $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $V_{\text{RIN}} = 5\text{V}$ | 3 | 5 | 7 | $\text{K}\Omega$ |
| V_{RIL} | RS-232 Input Logic Threshold Low | $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$ | 0.8 | 1.2 | | V |
| V_{RIH} | RS-232 Input Logic Threshold High | $T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$ | | 1.7 | 2.4 | V |
| V_{RIHYS} | RS-232 Input Hysteresis | $V_{CC} = 5\text{V}$ | 0.2 | 0.5 | 1 | V |
| V_{ROL} | TTL/CMOS Output Voltage Low | $I_{\text{OUT}} = 3.2\text{mA}$ (to V_{CC}) | | | 0.4 | V |
| V_{ROH} | TTL/CMOS Output Voltage High | $I_{\text{OUT}} = -1\text{mA}$ (to GND) | 3.5 | $V_{CC}-0.4$ | | V |
| t_{DR} | Receiver Propagation Delay | $C_L = 150\text{pF}$ (Note 1) | | 0.3 | 1 | μs |
| I_{SCR} | Receiver Output Short Circuit Current | | | ± 10 | | mA |

Note 1: RS-232 IN to TTL-CMOS OUT (from 50% to 50%)

APPLICATION CIRCUITS (note 1, note 2)



Note 1: C₁₋₄ capacitors can even be 1μF ones.

Note 2: C₁₋₄ can be common or biased capacitors.

CAPACITANCE VALUE (μF)

| C1 | C2. | C3 | C4 | C5 |
|-----|-----|-----|-----|-----|
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

TYPICAL PERFORMANCE CHARACTERISTICS (unless otherwise specified $T_j = 25^\circ\text{C}$)

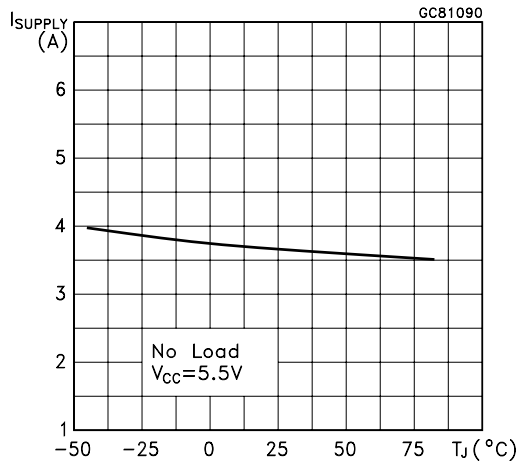
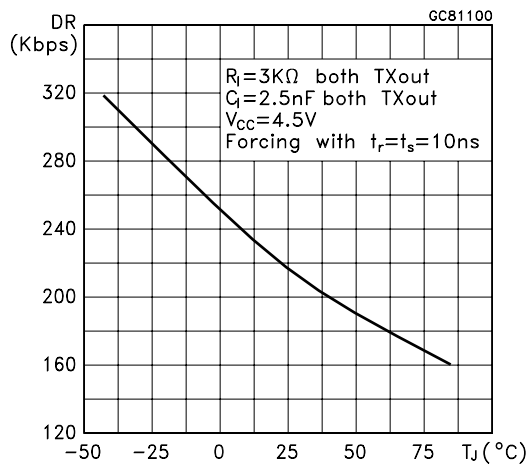
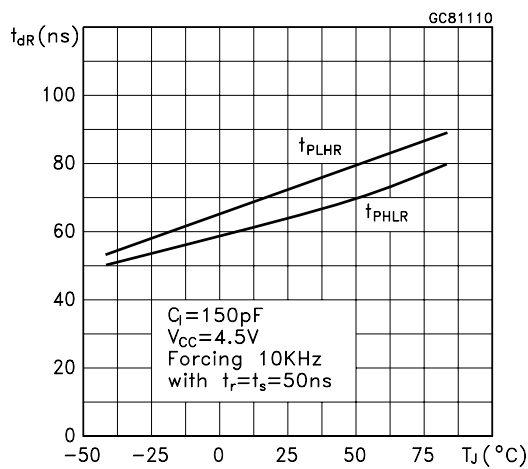
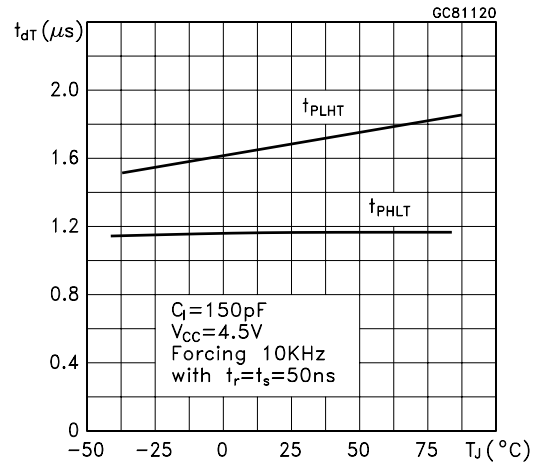
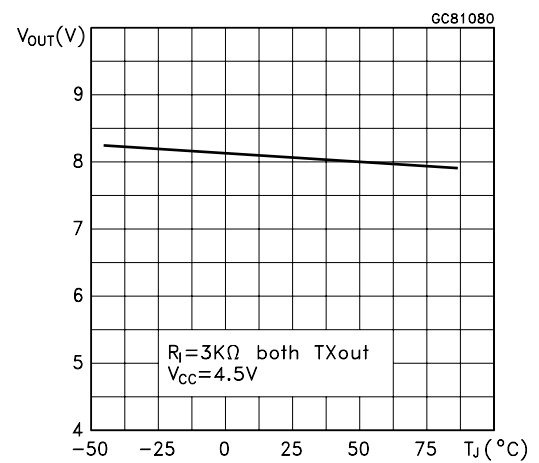
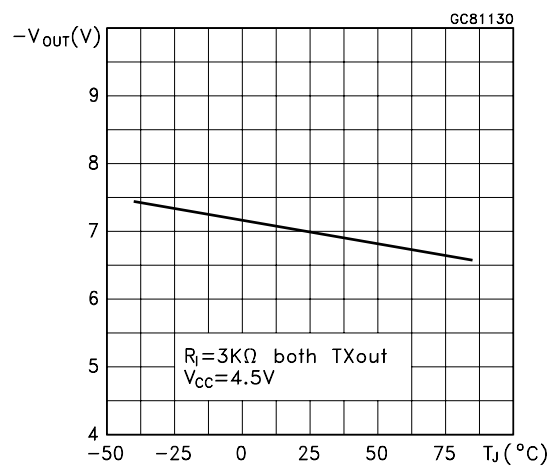
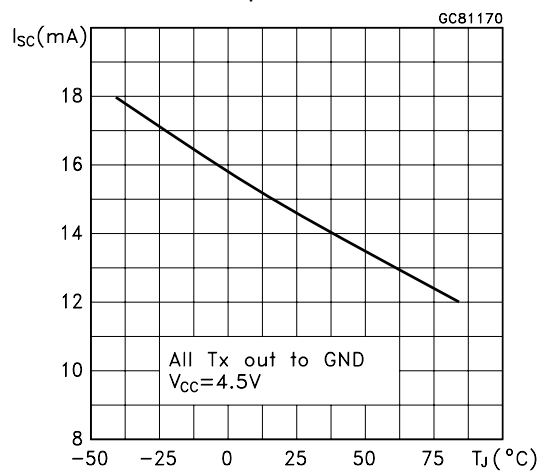
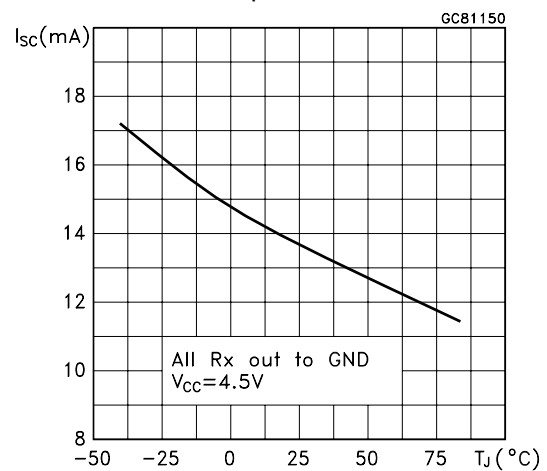
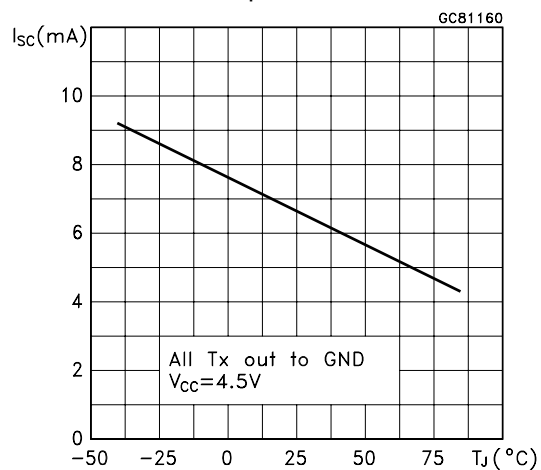
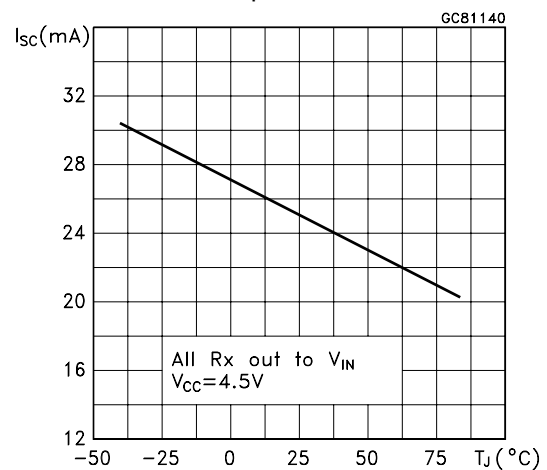
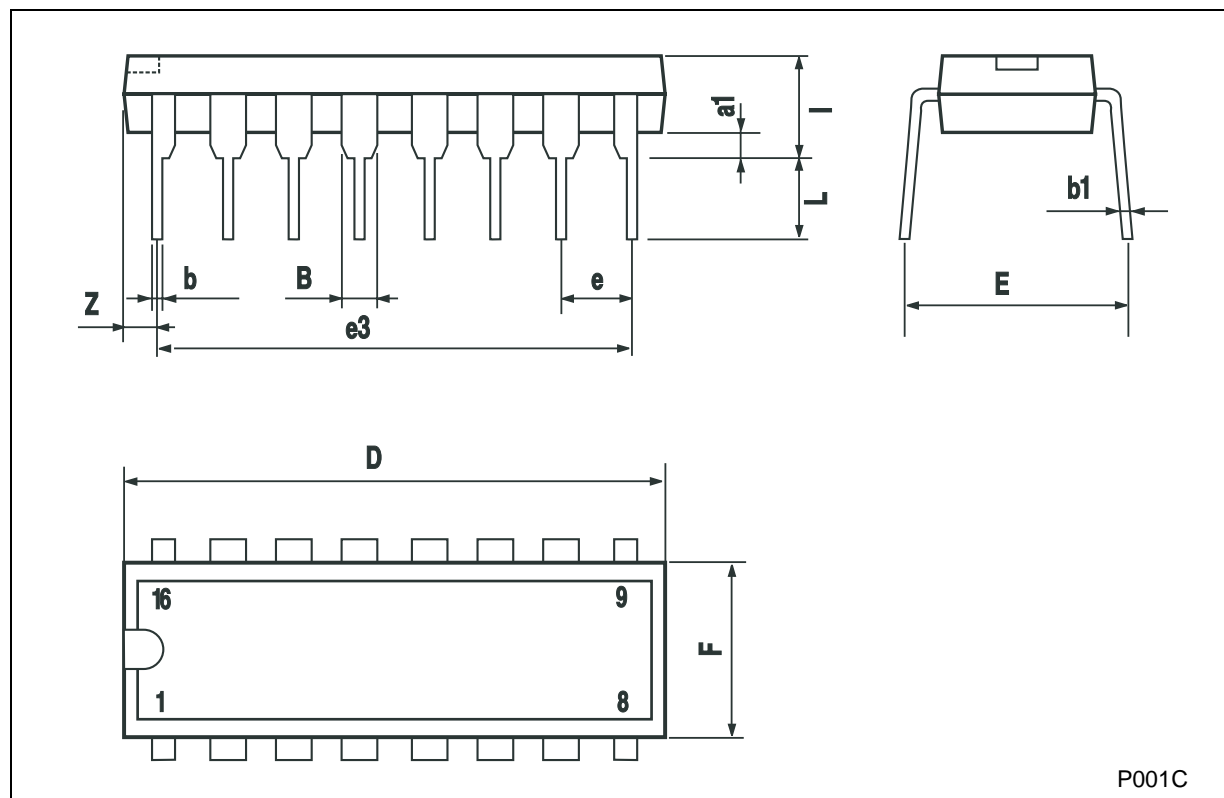
Figure 1 : Supply Current vs Temperature

Figure 2 : Data Rate vs Temperature

Figure 3 : Receiver Propagation Delay

Figure 4 : Driver Propagation Delay

Figure 5 : High Level Output Voltage Swing vs Temperature

Figure 6 : Low Level Output Voltage Swing vs Temperature


Figure 7 : High Level Transmitter Output Short Circuit Current vs Temperature**Figure 9 : High Level Receiver Output Short Circuit Current vs Temperature****Figure 8 : Low Level Transmitter Output Short Circuit Current vs Temperature****Figure 10 : Low Level Receiver Output Short Circuit Current vs Temperature**

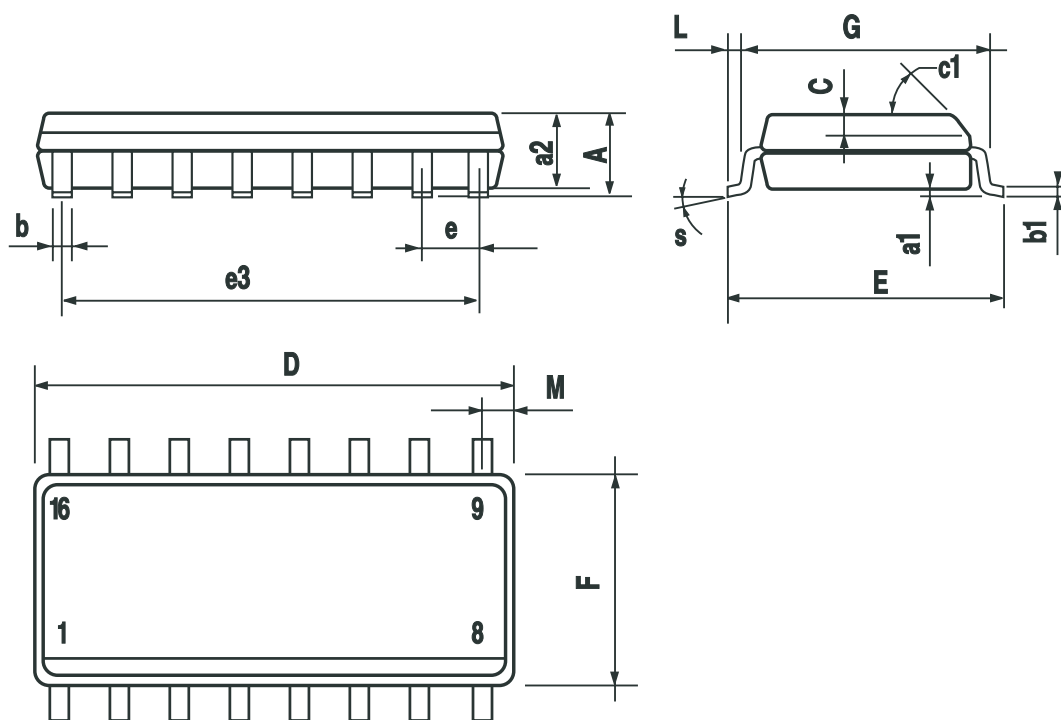
Plastic DIP-16 (0.25) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



SO-16 MECHANICAL DATA

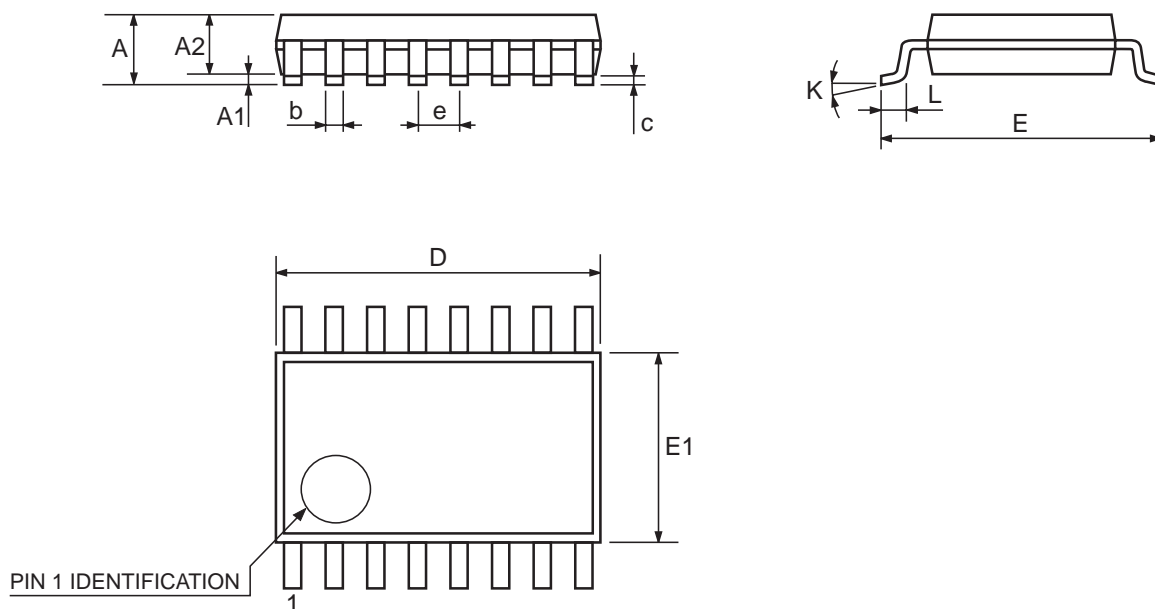
| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 9.8 | | 10 | 0.385 | | 0.393 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 8.89 | | | 0.350 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.62 | | | 0.024 |
| S | 8° (max.) | | | | | |



PO13H

TSSOP16 MECHANICAL DATA

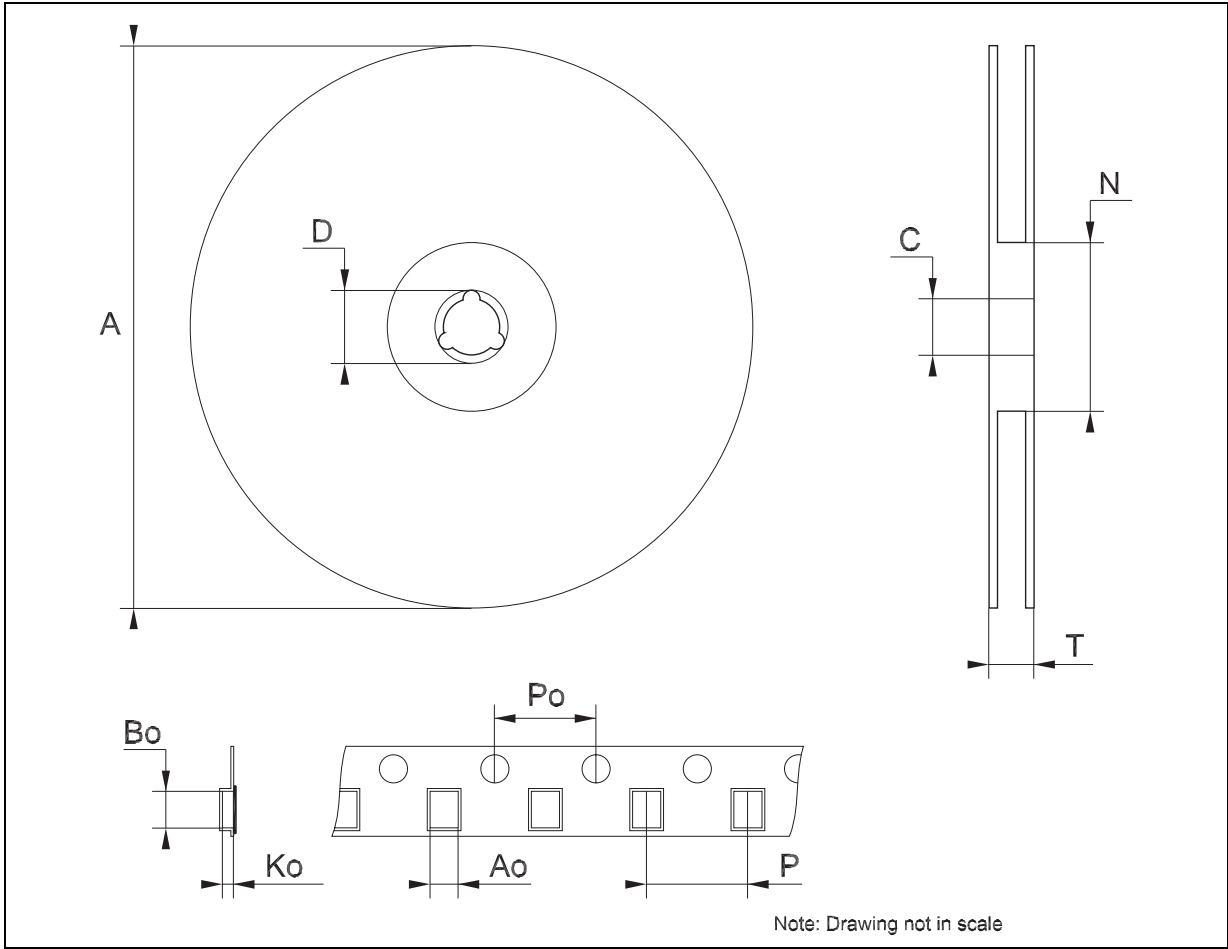
| DIM. | mm. | | | inch | | |
|------|------|----------|------|-------|------------|--------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | 0.8 | 1 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.0079 |
| D | 4.9 | 5 | 5.1 | 0.193 | 0.197 | 0.201 |
| 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 |



0080338D

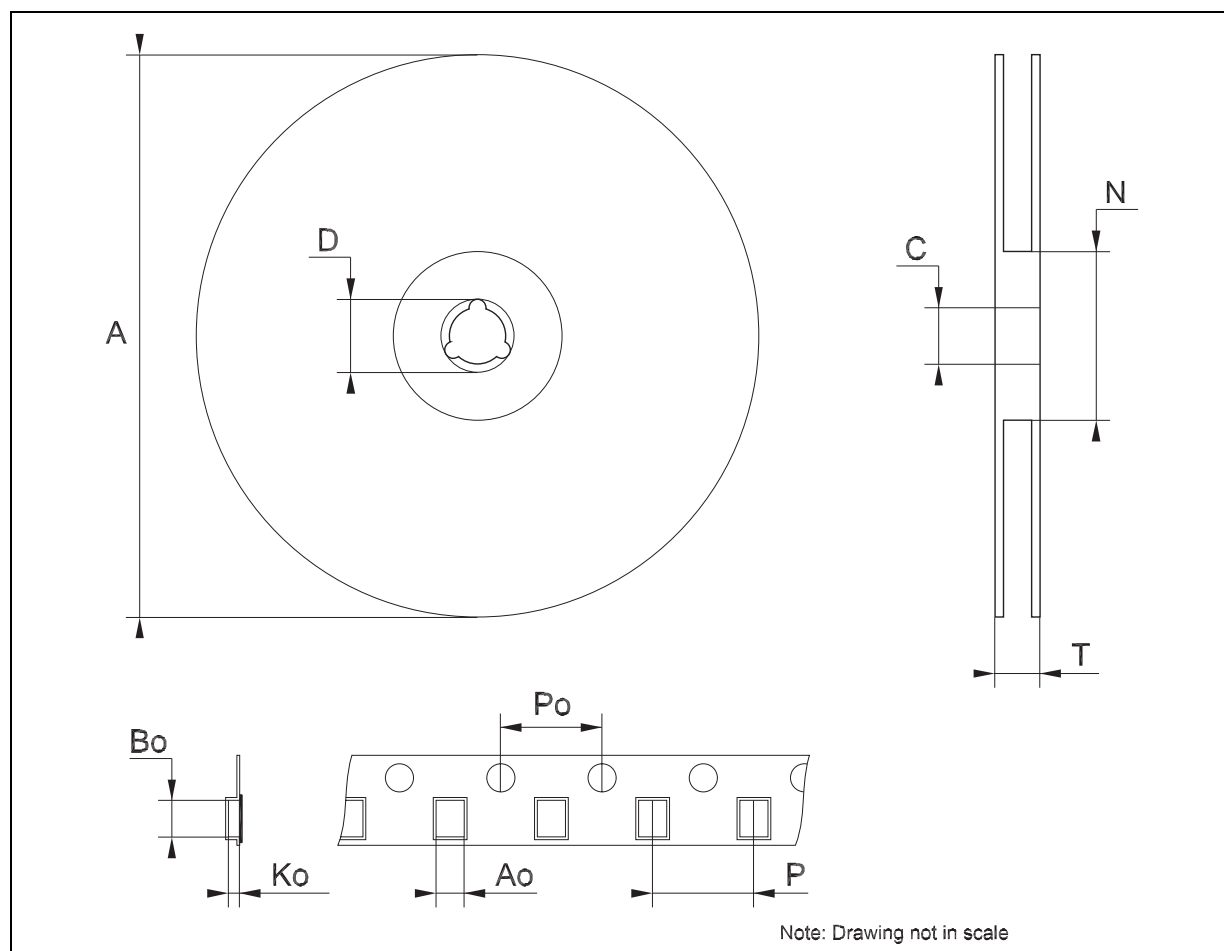
Tape & Reel SO-16 MECHANICAL DATA

| 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 | 6.45 | | 6.65 | 0.254 | | 0.262 |
| Bo | 10.3 | | 10.5 | 0.406 | | 0.414 |
| Ko | 2.1 | | 2.3 | 0.082 | | 0.090 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 7.9 | | 8.1 | 0.311 | | 0.319 |



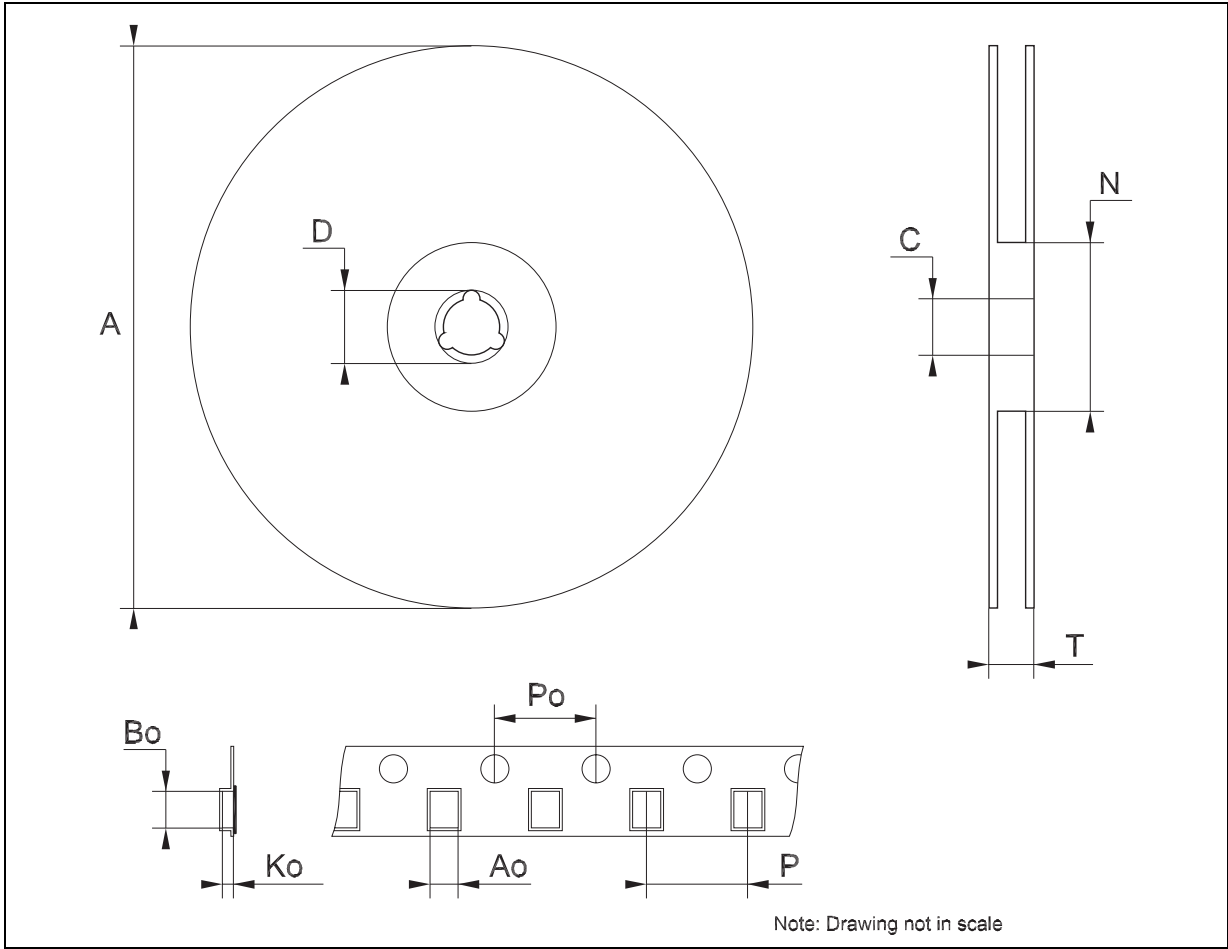
Tape & Reel SO-16L MECHANICAL DATA

| 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 | 10.8 | | 11.0 | 0.425 | | 0.433 |
| Bo | 10.7 | | 10.9 | 0.421 | | 0.429 |
| 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 |



Tape & Reel TSSOP16 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 | 6.7 | | 6.9 | 0.264 | | 0.272 |
| Bo | 5.3 | | 5.5 | 0.209 | | 0.217 |
| Ko | 1.6 | | 1.8 | 0.063 | | 0.071 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 7.9 | | 8.1 | 0.311 | | 0.319 |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>

This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.