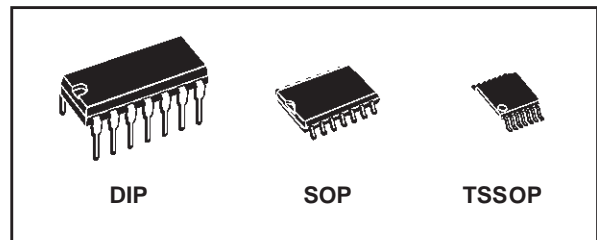




74ACT04

HEX INVERTER

- HIGH SPEED: $t_{PD} = 5.0ns$ (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 2\mu A$ (MAX.) at $T_A = 25^\circ C$
- COMPATIBLE WITH TTL OUTPUTS
 $V_{IH} = 2V$ (MIN.), $V_{IL} = 0.8V$ (MAX.)
- 50Ω TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 24mA$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
 V_{CC} (OPR) = 4.5V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 04
- IMPROVED LATCH-UP IMMUNITY



ORDER CODES

| PACKAGE | TUBE | T & R |
|---------|----------|------------|
| DIP | 74ACT04B | |
| SOP | 74ACT04M | 74ACT04MTR |
| TSSOP | | 74ACT04TTR |

DESCRIPTION

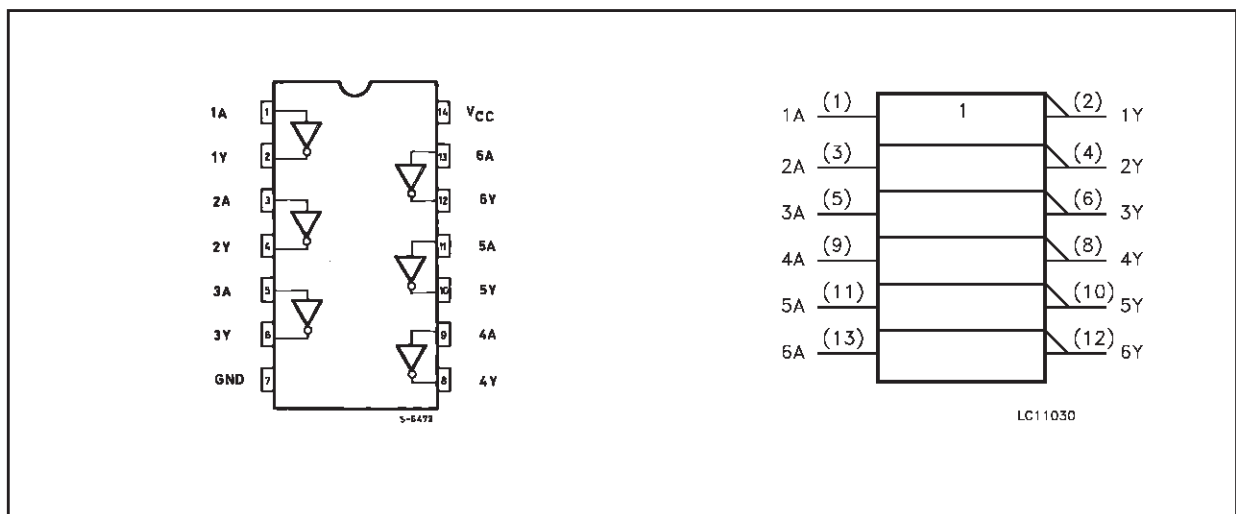
The 74ACT04 is an advanced high-speed CMOS HEX INVERTER fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology.

The internal circuit is composed of 3 stages including buffer output, which enables high noise immunity and stable output.

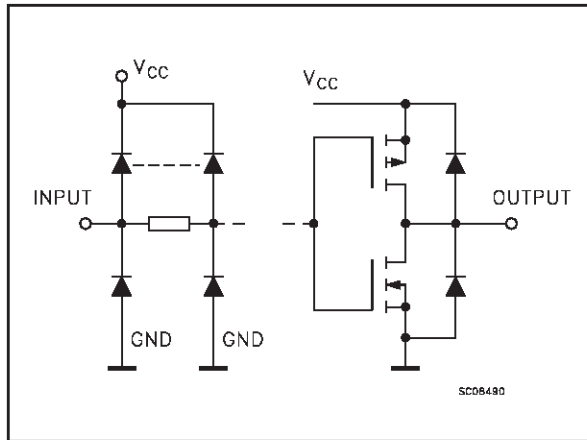
The device is designed to interface directly High Speed CMOS systems with TTL, NMOS and CMOS output voltage levels.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------------|-----------------|-------------------------|
| 1, 3, 5, 9, 11, 13 | 1A to 6A | Data Inputs |
| 2, 4, 6, 8, 10, 12 | 1Y to 6Y | Data Outputs |
| 7 | GND | Ground (0V) |
| 14 | V _{CC} | Positive Supply Voltage |

TRUTH TABLE

| A | Y |
|---|---|
| L | H |
| H | L |

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------------------------|--------------------------------------|-------------------------------|------|
| V _{CC} | Supply Voltage | -0.5 to +7 | V |
| V _I | DC Input Voltage | -0.5 to V _{CC} + 0.5 | V |
| V _O | DC Output Voltage | -0.5 to V _{CC} + 0.5 | V |
| I _{IK} | DC Input Diode Current | ± 20 | mA |
| I _{OK} | DC Output Diode Current | ± 20 | mA |
| I _O | DC Output Current | ± 50 | mA |
| I _{CC} or I _{GND} | DC V _{CC} or Ground Current | ± 200 | mA |
| T _{stg} | Storage Temperature | -65 to +150 | °C |
| T _L | Lead Temperature (10 sec) | 300 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit |
|-----------------|---|----------------------|------|
| V _{CC} | Supply Voltage | 4.5 to 5.5 | V |
| V _I | Input Voltage | 0 to V _{CC} | V |
| V _O | Output Voltage | 0 to V _{CC} | V |
| T _{op} | Operating Temperature | -55 to 125 | °C |
| dt/dv | Input Rise and Fall Time V _{CC} = 4.5 to 5.5V (note 1) | 8 | ns/V |

1) V_{IN} from 0.8V to 2.0V

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|--------------------|------------------------------------|------------------------|--|-----------------------|-------|-------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| V _{IH} | High Level Input Voltage | 4.5 | V _O = 0.1 V or V _{CC} -0.1V | 2.0 | 1.5 | | 2.0 | | 2.0 | | V |
| | | 5.5 | | 2.0 | 1.5 | | 2.0 | | 2.0 | | |
| V _{IL} | Low Level Input Voltage | 4.5 | V _O = 0.1 V or V _{CC} -0.1V | | 1.5 | 0.8 | | 0.8 | | 0.8 | V |
| | | 5.5 | | | 1.5 | 0.8 | | 0.8 | | 0.8 | |
| V _{OH} | High Level Output Voltage | 4.5 | I _O =-50 μA | 4.4 | 4.49 | | 4.4 | | 4.4 | | V |
| | | 5.5 | I _O =-50 μA | 5.4 | 5.49 | | 5.4 | | 5.4 | | |
| | | 4.5 | I _O =-24 mA | 3.86 | | | 3.76 | | 3.7 | | V |
| | | 5.5 | I _O =-24 mA | 4.86 | | | 4.76 | | 4.7 | | |
| V _{OL} | Low Level Output Voltage | 4.5 | I _O =50 μA | | 0.001 | 0.1 | | 0.1 | | 0.1 | V |
| | | 5.5 | I _O =50 μA | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 | I _O =24 mA | | | 0.36 | | 0.44 | | 0.5 | V |
| | | 5.5 | I _O =24 mA | | | 0.36 | | 0.44 | | 0.5 | |
| I _I | Input Leakage Current | 5.5 | V _I = V _{CC} or GND | | | ± 0.1 | | ± 1 | | ± 1 | μA |
| I _{CC(T)} | Max I _{CC} /Input | 5.5 | V _I = V _{CC} - 2.1V | | 0.6 | | | 1.5 | | 1.6 | mA |
| I _{CC} | Quiescent Supply Current | 5.5 | V _I = V _{CC} or GND | | | 2 | | 20 | | 40 | μA |
| I _{OLD} | Dynamic Output Current (note 1, 2) | 5.5 | V _{OLD} = 1.65 V max | | | | | 75 | | 50 | mA |
| I _{OHD} | | | V _{OHD} = 3.85 V min | | | | | -75 | | -50 | mA |

1) Maximum test duration 2ms, one output loaded at time

2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50Ω

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, R_L = 500 Ω, Input t_r = t_f = 3ns)

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|-----------------------------------|------------------------|------------------------|--|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| t _{PLH} t _{PHL} | Propagation Delay Time | 5.0(*) | | 1.5 | 5.0 | 9.0 | 1.0 | 9.5 | 1.0 | 9.5 | ns |

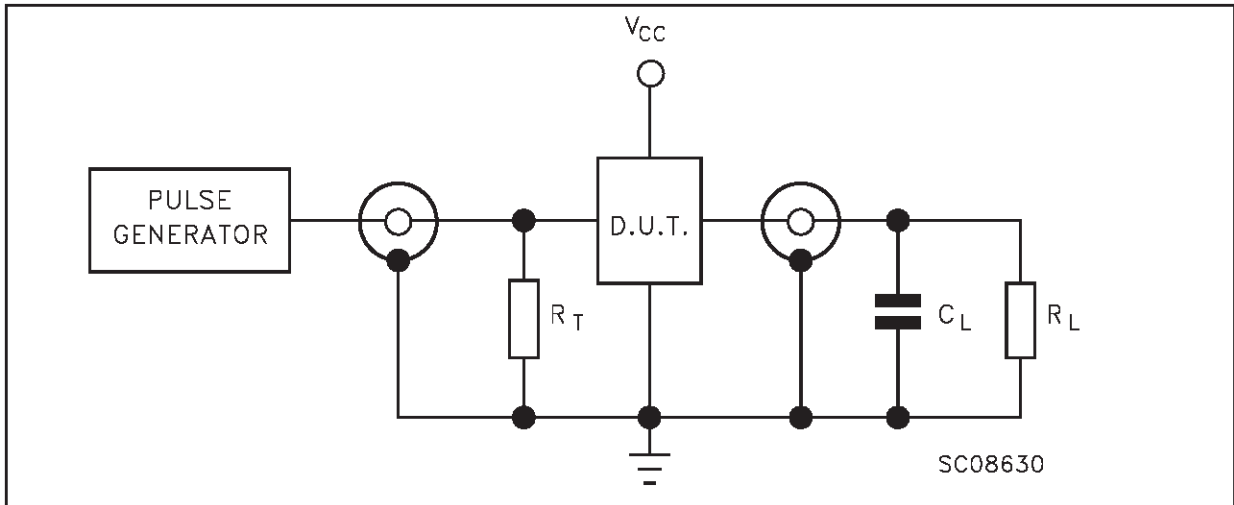
(*) Voltage range is 5.0V ± 0.5V

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|-----------------|--|------------------------|-------------------------|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| C _{IN} | Input Capacitance | 5.0 | | | 4 | | | | | | pF |
| C _{PD} | Power Dissipation Capacitance (note 1) | 5.0 | f _{IN} = 10MHz | | 37 | | | | | | pF |

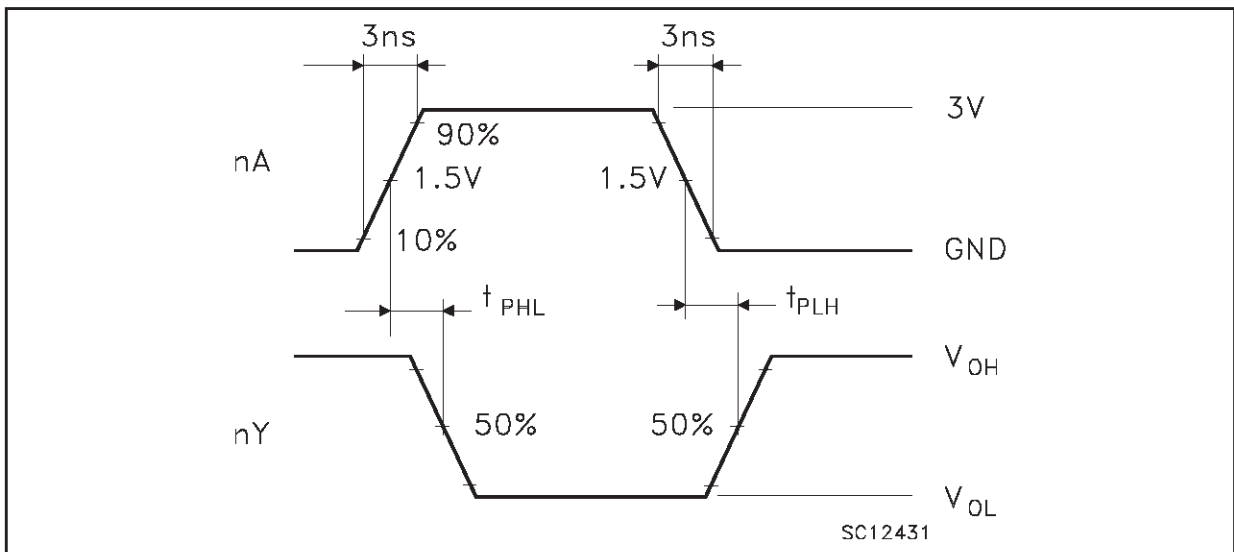
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. I_{CC(opr)} = C_{PD} × V_{CC} × f_{IN} + I_{CC}/6 (per gate)

TEST CIRCUIT



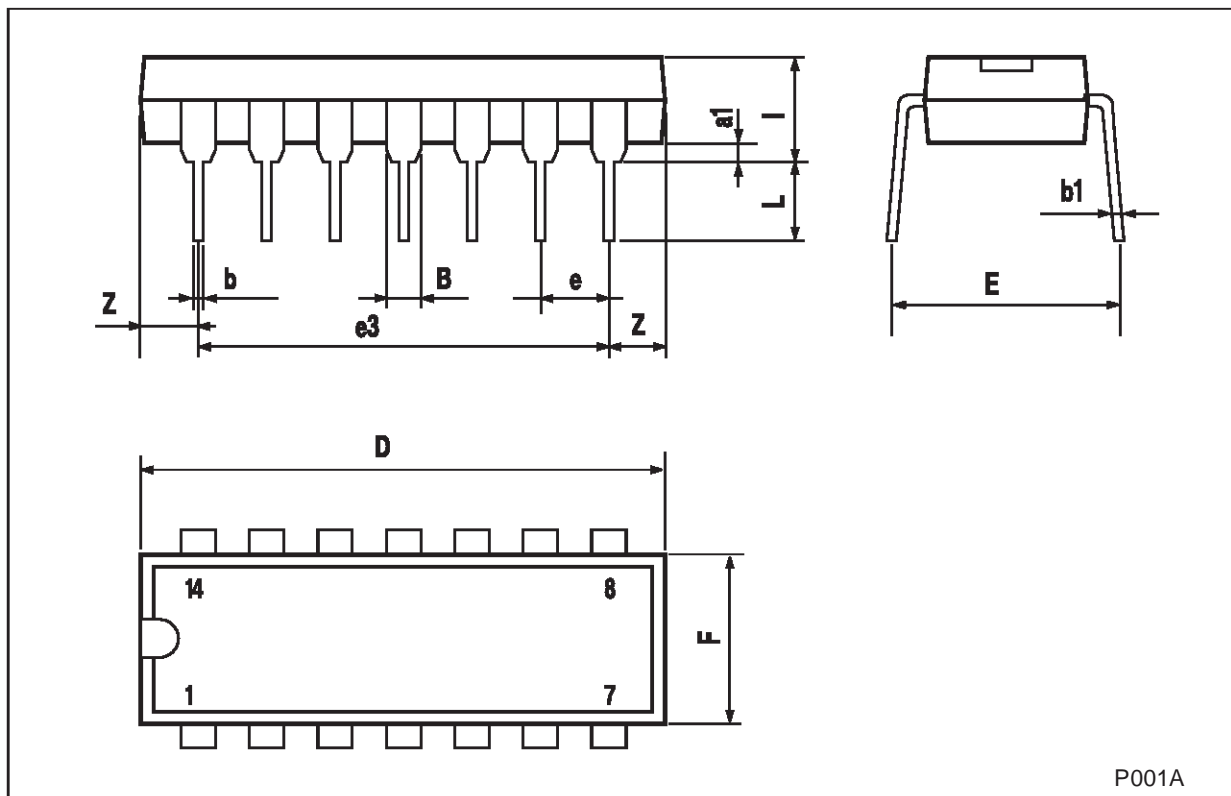
$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = R_1 = 500\Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

WAVEFORM: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)



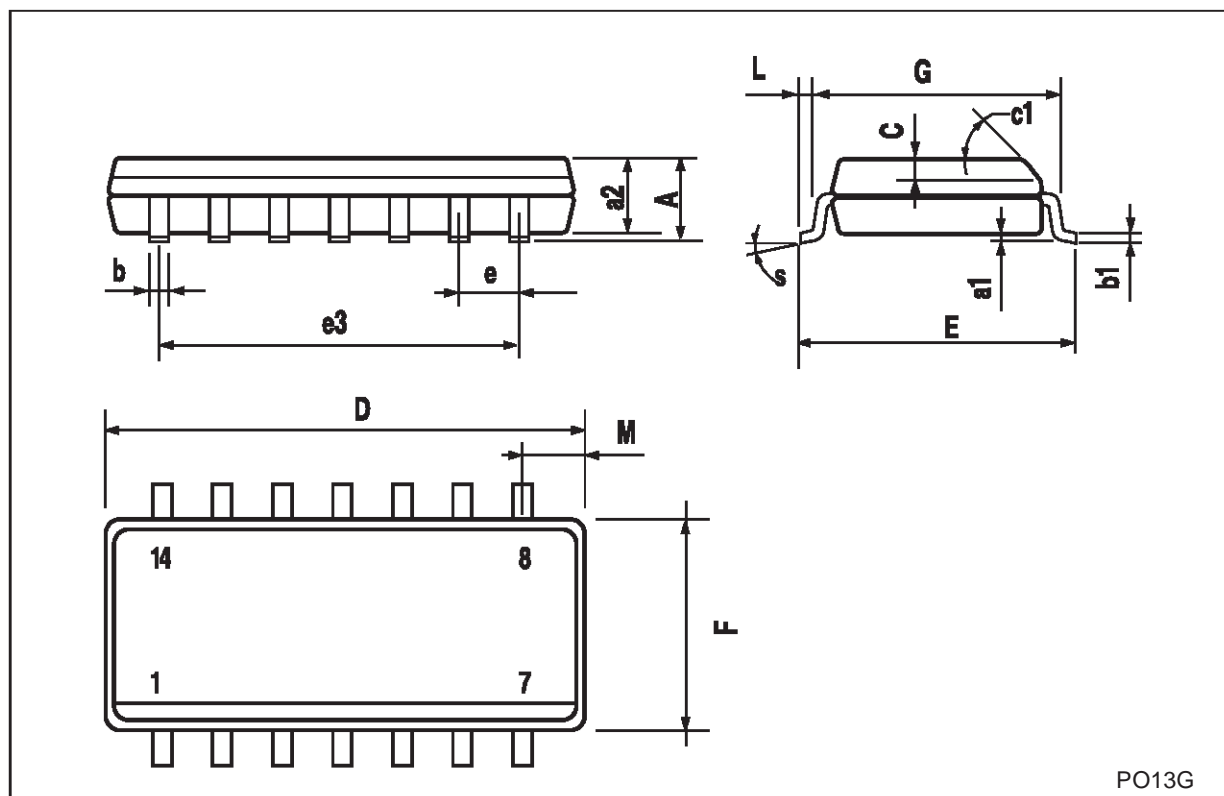
Plastic DIP-14 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.39 | | 1.65 | 0.055 | | 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 | | 15.24 | | | 0.600 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | 1.27 | | 2.54 | 0.050 | | 0.100 |



SO-14 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| 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 | 8.55 | | 8.75 | 0.336 | | 0.344 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 7.62 | | | 0.300 | |
| 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 | | | 0.68 | | | 0.026 |
| S | 8° (max.) | | | | | |



PO13G

TSSOP14 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 | | 0.0089 |
| 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 |



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 its 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

© 2001 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

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

© <http://www.st.com>



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.