



STP100NF04 STB100NF04-1

N-CHANNEL 40V - 0.0043Ω - 120A TO-220/I²PAK
STripFET™ II POWER MOSFET

PRELIMINARY DATA

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|--------------|------------------|---------------------|----------------|
| STP100NF04 | 40 V | < 0.0046 Ω | 120 A |
| STB100NF04-1 | 40 V | < 0.0046 Ω | 120 A |

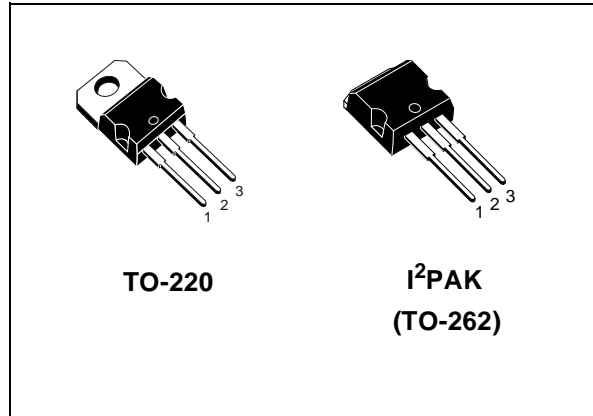
- TYPICAL R_{DS(on)} = 0.0043Ω
- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED

DESCRIPTION

This Power Mosfet is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

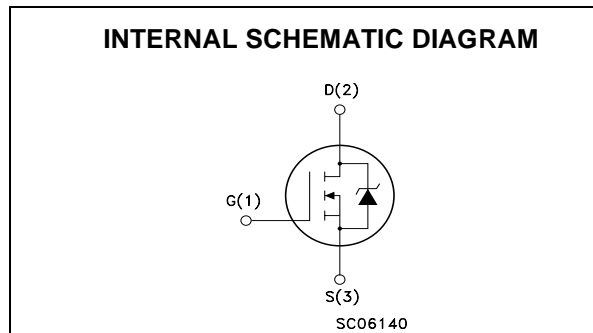
APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS
- SOLENOID AND RELAY DRIVERS



TO-220

I²PAK
(TO-262)



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|--|-------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 40 | V |
| V _{DGR} | Drain-gate Voltage (R _{GS} = 20 kΩ) | 40 | V |
| V _{GS} | Gate- source Voltage | ± 20 | V |
| I _D (#) | Drain Current (continuous) at T _C = 25°C | 120 | A |
| I _D | Drain Current (continuous) at T _C = 100°C | 120 | A |
| I _{DM} (●) | Drain Current (pulsed) | 480 | A |
| P _{TOT} | Total Dissipation at T _C = 25°C | 300 | W |
| | Derating Factor | 2 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 6 | V/ns |
| E _{AS} | Single Pulse Avalanche Energy | 1.2 | J |
| T _{stg} | Storage Temperature | - 55 to 175 | °C |
| T _j | Max. Operating Junction Temperature | | |

(●) Pulse width limited by safe operating area

(#) Current Limited by Package

(1) I_{SD} ≤ 120A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{jMAX}

(2) Starting T_j = 25°C, I_d = 60A, V_{DD} = 30 V

STP100NF04/STB100NF04-1

THERMAL DATA

| | | | |
|----------------|--|------|------|
| Rthj-case | Thermal Resistance Junction-case Max | 0.5 | °C/W |
| Rthj-amb | Thermal Resistance Junction-ambient Max | 62.5 | °C/W |
| T _l | Maximum Lead Temperature For Soldering Purpose | 300 | °C |

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------|---|---|------|------|---------|----------|
| V _{(BR)DSS} | Drain-source Breakdown Voltage | I _D = 250 μA, V _{GS} = 0 | 40 | | | V |
| I _{DSS} | Zero Gate Voltage Drain Current (V _{GS} = 0) | V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C | | | 1 10 | μA μA |
| I _{GSS} | Gate-body Leakage Current (V _{DS} = 0) | V _{GS} = ±20V | | | ±100 | nA |

ON (1)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|--|------|--------|--------|------|
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} = V _{GS} , I _D = 250μA | 2 | | 4 | V |
| R _{DS(on)} | Static Drain-source On Resistance | V _{GS} = 10 V, I _D = 50 A | | 0.0043 | 0.0046 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|---|------|------|------|------|
| g _{fs} (1) | Forward Transconductance | V _{DS} = 15 V ; I _D = 50 A | | 150 | | S |
| C _{iss} | Input Capacitance | V _{DS} = 25V, f = 1 MHz, V _{GS} = 0 | | 5100 | | pF |
| C _{oss} | Output Capacitance | | | 1300 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 160 | | pF |

ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING ON**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|--|---|------|-------------------|------|----------------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 20V, I_D = 60 A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | 35 | | ns |
| t_r | Rise Time | | | 220 | | ns |
| Q_g Q_{gs} Q_{gd} | Total Gate Charge Gate-Source Charge Gate-Drain Charge | $V_{DD} = 32 V, I_D = 120A,$ $V_{GS} = 10V$ | | 108 33.5 68 | 151 | nC nC nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------------|---|------|----------|------|----------|
| $t_{d(off)}$ t_f | Turn-off-Delay Time Fall Time | $V_{DD} = 20V, I_D = 60A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see test circuit, Figure 3) | | 80 50 | | ns ns |

SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|---|------|------------------|------|---------------|
| I_{SD} | Source-drain Current | | | | 120 | A |
| $I_{SDM} (2)$ | Source-drain Current (pulsed) | | | | 480 | A |
| $V_{SD} (1)$ | Forward On Voltage | $I_{SD} = 120A, V_{GS} = 0$ | | | 1.3 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current | $I_{SD} = 120A, di/dt = 100A/\mu s,$ $V_{DD} = 20V, T_j = 150^\circ C$ (see test circuit, Figure 5) | | 75 185 4.9 | | ns nC A |

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

SPICE THERMAL MODEL

| Parameter | Node | Value |
|-----------|-------|--------|
| CTHERM1 | 5 - 4 | 0.011 |
| CTHERM2 | 4 - 3 | 0.0012 |
| CTHERM3 | 3 - 2 | 0.05 |
| CTHERM4 | 2 - 1 | 0.1 |
| | | |
| R THERM1 | 5 - 4 | 0.09 |
| R THERM2 | 4 - 3 | 0.02 |
| R THERM3 | 3 - 2 | 0.11 |
| R THERM4 | 2 - 1 | 0.017 |

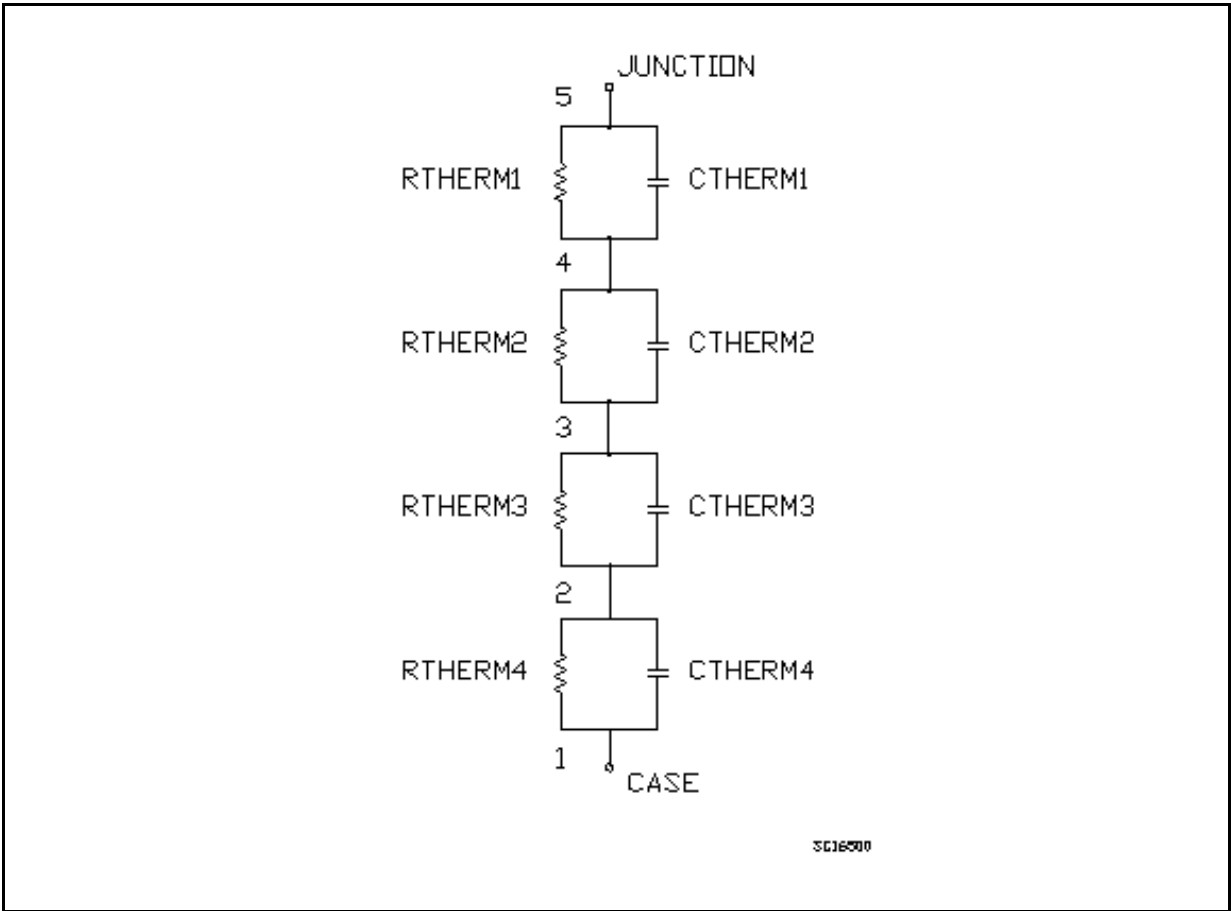


Fig. 1: Unclamped Inductive Load Test Circuit

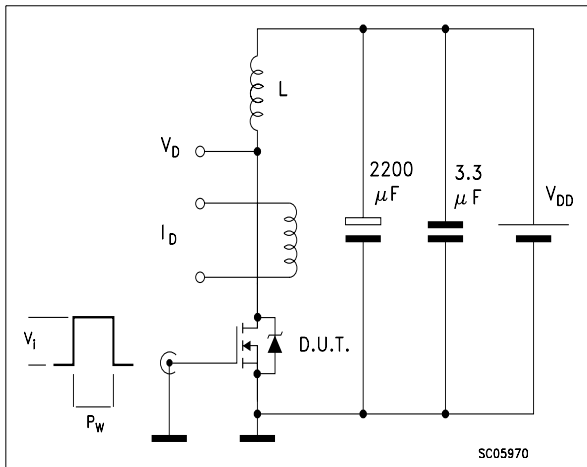


Fig. 2: Unclamped Inductive Waveform

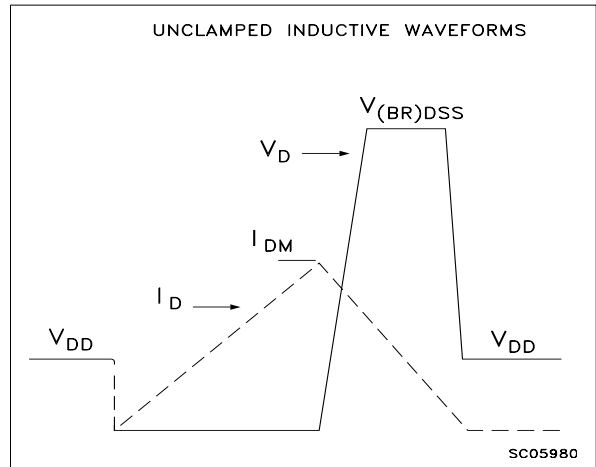


Fig. 3: Switching Times Test Circuit For Resistive Load

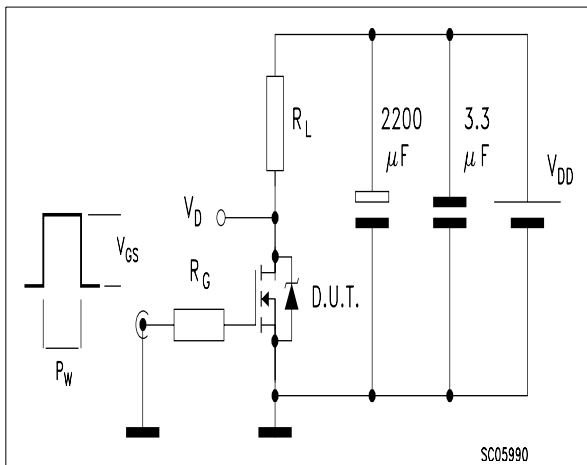


Fig. 4: Gate Charge test Circuit

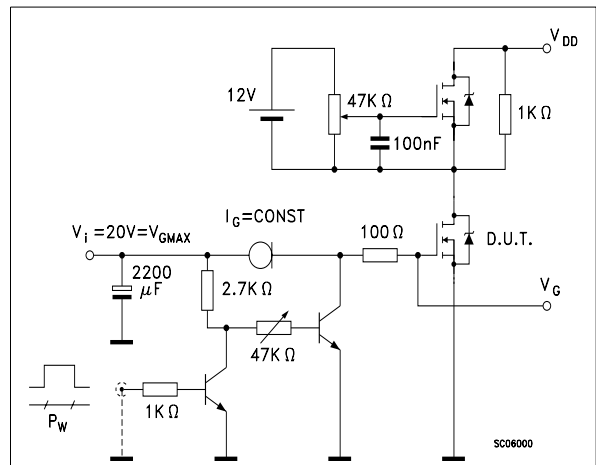
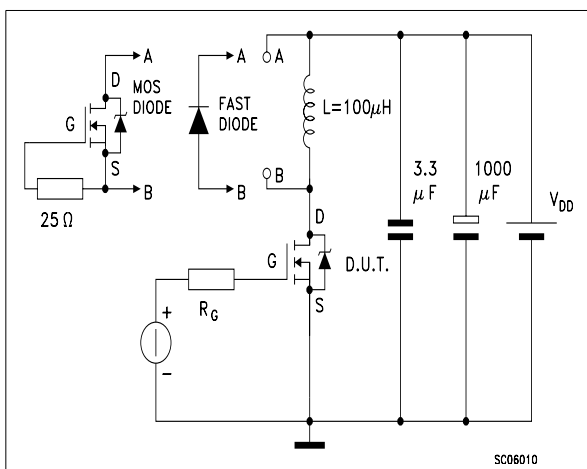
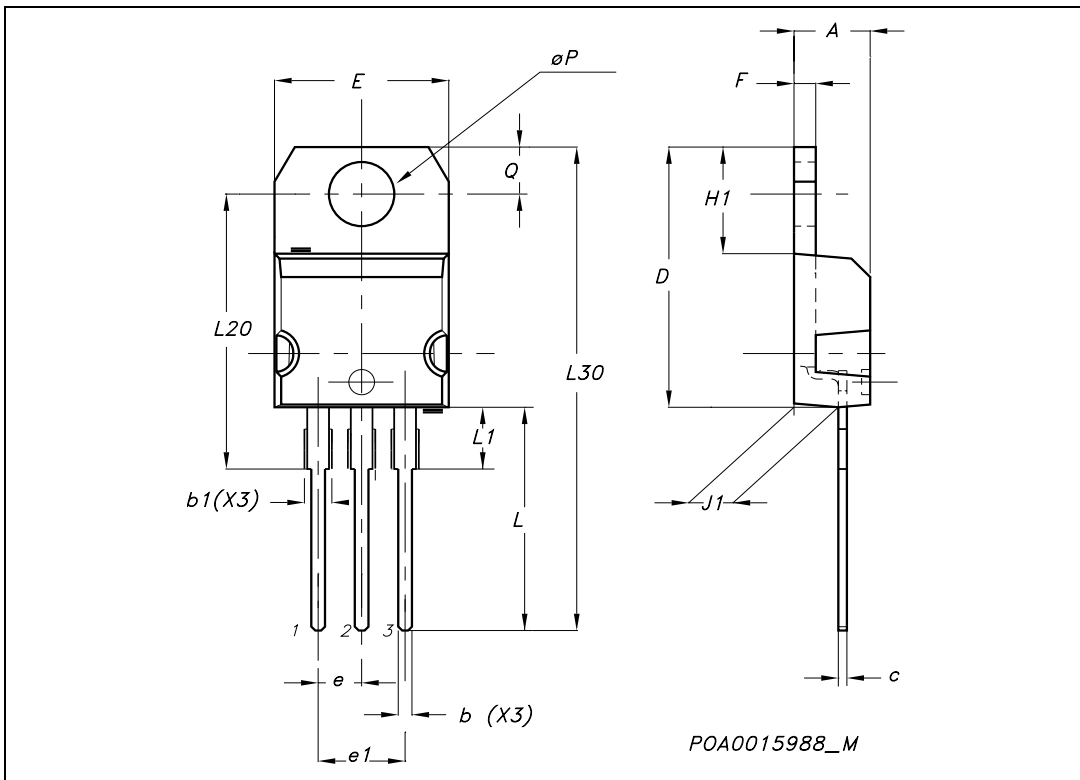


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



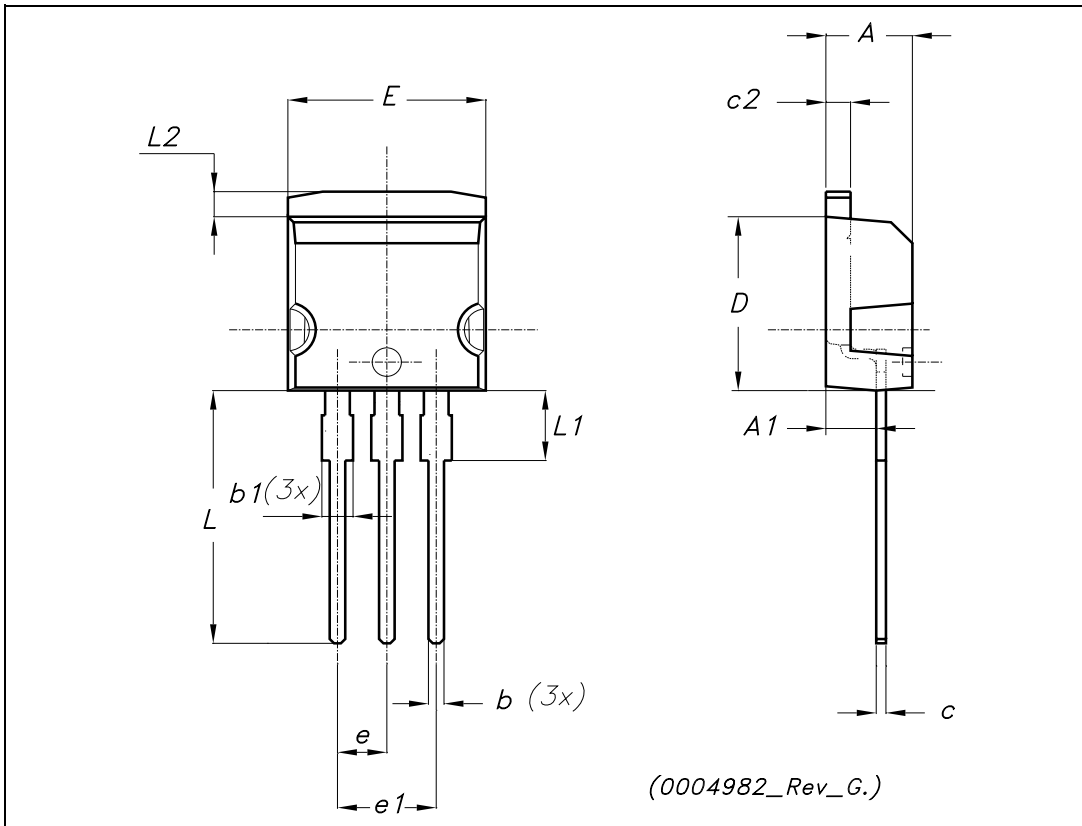
TO-220 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.15 | | 1.70 | 0.045 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.60 | | 0.620 |
| E | 10 | | 10.40 | 0.393 | | 0.409 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| F | 1.23 | | 1.32 | 0.048 | | 0.052 |
| H1 | 6.20 | | 6.60 | 0.244 | | 0.256 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.40 | | | 0.645 | |
| L30 | | 28.90 | | | 1.137 | |
| øP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |



TO-262 (I²PAK) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|------|-------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| A1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| c2 | 1.23 | | 1.32 | 0.048 | | 0.052 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| E | 10 | | 10.40 | 0.393 | | 0.410 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L2 | 1.27 | | 1.40 | 0.050 | | 0.055 |



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
All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.
<http://www.st.com>