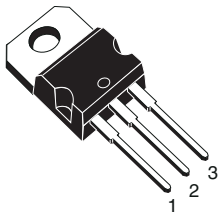
# STP40NF10L

## N-channel 100V - 0.028Ω - 40A TO-220
## Low gate charge STripFET™ Power MOSFET

## General features

| Type | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STP40NF10L | 100V | <0.033Ω | 40A |

- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

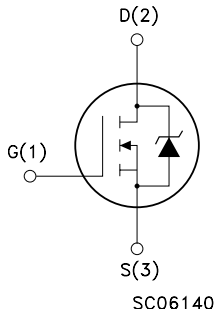



**TO-220**

## Description

This Power MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer application. It is also intended for any application with low gate charge drive requirements.

## Internal schematic diagram




## Applications

- Switching application

## Order codes

| Part number | Marking | Package | Packaging |
|---|---|---|---|
| STP40NF10L | P40NF10L | TO-220 | Tube |

# Contents

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source voltage ($v_{gs}$ = 0) | 100 | V |
| $V_{GS}$ | Gate- source voltage | ±17 | V |
| $I_D$ | Drain current (continuous) at $T_C$ = 25°C | 40 | A |
| $I_D$ | Drain current (continuous) at $T_C$ = 100°C | 25 | A |
| $I_{DM}$ (1) | Drain current (pulsed) | 160 | A |
| $P_{TOT}$ | Total dissipation at $T_C$ = 25°C | 150 | W |
| | Derating factor | 1 | W/°C |
| $E_{AS}$ (2) | Single pulse avalanche energy | 430 | mJ |
| $T_{stg}$ | Storage temperature | – 65 to 175 | °C |
| $T_j$ | Max. operating junction temperature | 175 | |

1. Pulse width limited by safe operating area
2. Starting $T_j$= 25°C, $I_D$ = 20A, $V_{DD}$=40V

**Table 2. Thermal data**

| | | | |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction-case Max | 1 | °C/W |
| $R_{thj\text{-}a}$ | Thermal resistance junction-ambient Max | 62.5 | °C/W |
| $T_l$ | Maximum lead temperature for soldering purpose | 300 | °C |

# 2 Electrical characteristics

($T_{CASE}$=25°C unless otherwise specified)

**Table 3. On/off states**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown voltage | $I_D$ = 250 µA, $V_{GS}$ = 0 | 100 | | | V |
| $I_{DSS}$ | Zero gate voltage Drain current ($V_{GS}$ = 0) | $V_{DS}$ = Max rating | | | 1 | µA |
| | | $V_{DS}$=Max rating, $T_C$=125°C | | | 10 | µA |
| $I_{GSS}$ | Gate-body leakage current ($V_{DS}$ = 0) | $V_{GS}$ = ±17V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250µA | 1 | 1.7 | 2.5 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS}$ = 10V, $I_D$ = 20A | | 0.028 | 0.033 | Ω |
| | | $V_{GS}$ = 5V, $I_D$ = 20A | | 0.030 | 0.036 | Ω |

**Table 4. Dynamic**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ (1) | Forward transconductance | $V_{DS}$ = 15V, $I_D$=20A | | 25 | | S |
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 25V, f = 1 MHz, $V_{GS}$ = 0 | | 2300 | | pF |
| $C_{oss}$ | Output capacitance | | | 290 | | pF |
| $C_{rss}$ | Reverse transfer capacitance | | | 125 | | pF |
| $Q_g$ | Total gate charge | $V_{DD}$ = 80V, $I_D$ = 40A, $V_{GS}$ = 5V | | 46 | 64 | nC |
| $Q_{gs}$ | Gate-source charge | | | 12 | | nC |
| $Q_{gd}$ | Gate-drain charge | | | 22 | | nC |

1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5.

**Table 5. Switching times**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD}$ = 50V, $I_D$ = 20A $R_G$ = 4.7Ω $V_{GS}$ = 4.5V (see Figure 13) | | 25 | | ns |
| $t_r$ | Rise time | | | 82 | | ns |
| $t_{d(off)}$ | Turn-off-delay time | $V_{DD}$ = 50V, $I_D$ = 20A, $R_G$ = 4.7Ω, $V_{GS}$ = 4.5V (see Figure 13) | | 64 | | ns |
| $t_f$ | Fall time | | | 24 | | ns |
| $t_{d(off)}$ | Off-voltage Rise Time | Vclamp =80V, $I_D$ = 40 A $R_G$ = 4.7Ω, $V_{GS}$ = 4.5V (see Figure 15) | | 51 | | ns |
| $t_f$ | Fall Time | | | 29 | | ns |
| $t_c$ | Cross-over time | | | 53 | | ns |

**Table 6. Source drain diode**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$ | Source-drain current | | | | 40 | A |
| $I_{SDM}$ (1) | Source-drain current (pulsed) | | | | 160 | A |
| $V_{SD}$ (2) | Forward on voltage | $I_{SD}$ = 40A, $V_{GS}$ = 0 | | | 1.3 | V |
| $t_{rr}$ | Reverse recovery time | $I_{SD}$ = 40A, $V_{DD}$ = 30V | | 110 | | ns |
| $Q_{rr}$ | Reverse recovery charge | di/dt = 100A/µs, | | 467 | | nC |
| $I_{RRM}$ | Reverse recovery current | $T_j$ = 150°C (see Figure 15) | | 8 | | A |

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

## 2.1 Electrical characteristics (curves)

**Figure 1. Safe operating area**

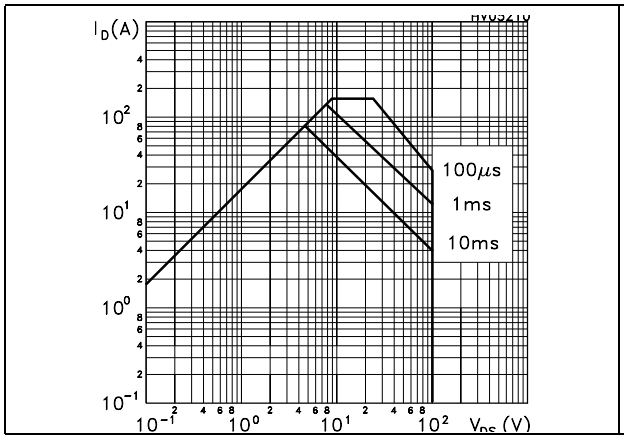



**Figure 2. Thermal impedance**

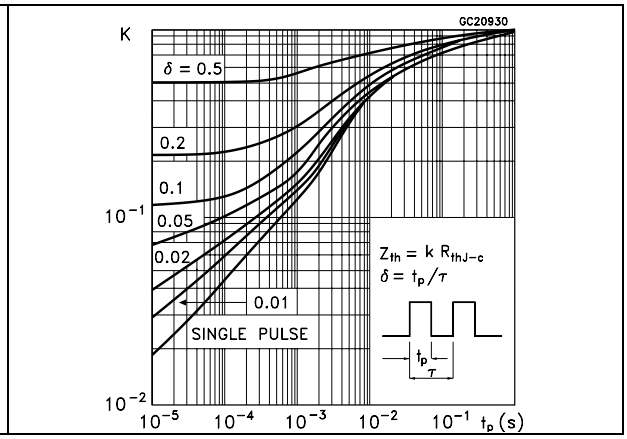



**Figure 3. Output characteristics**

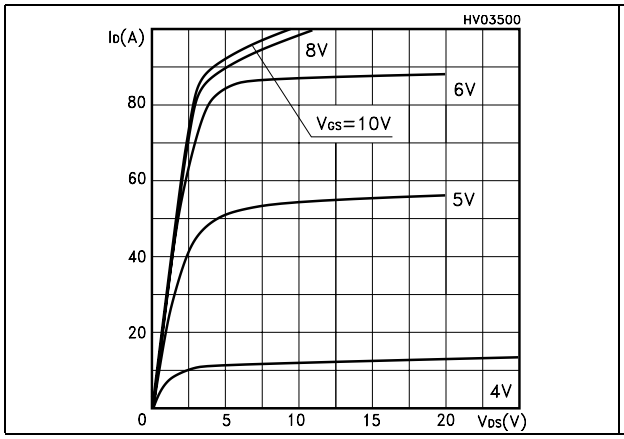



**Figure 4. Transfer characteristics**

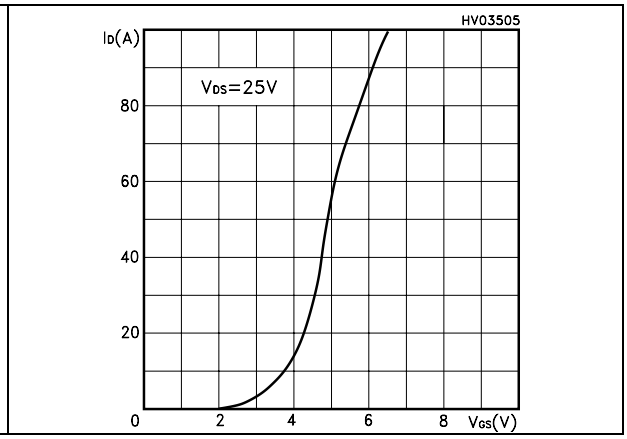



**Figure 5. Transconductance**

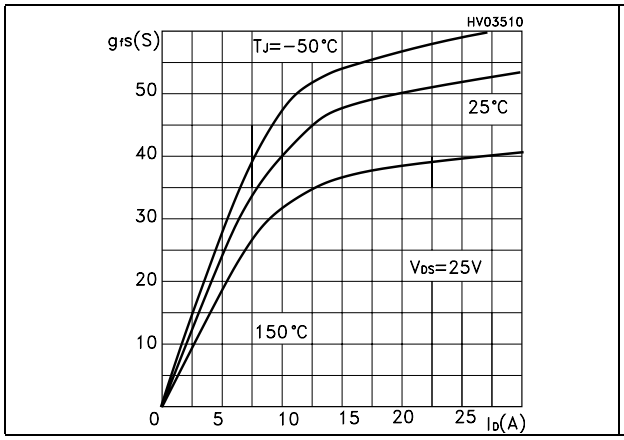



**Figure 6. Static drain-source on resistance**

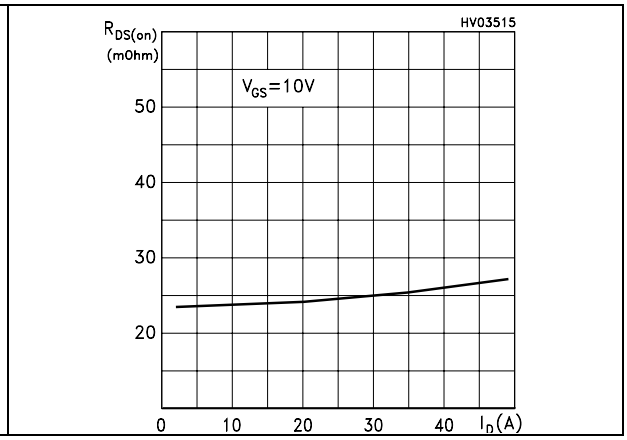


**Figure 7. Gate charge vs. gate-source voltage**

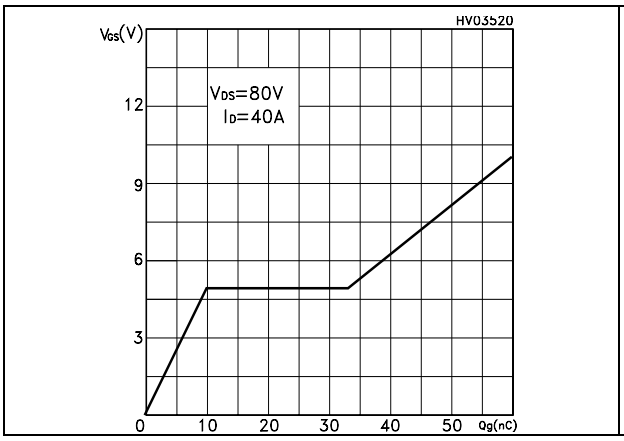



**Figure 8. Capacitance variations**

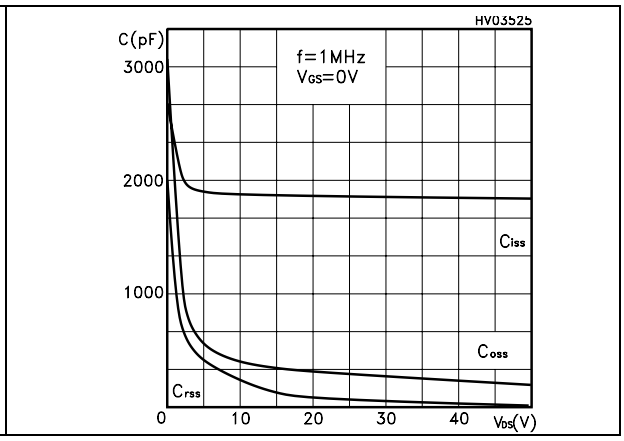



**Figure 9. Normalized gate threshold voltage vs. temperature**

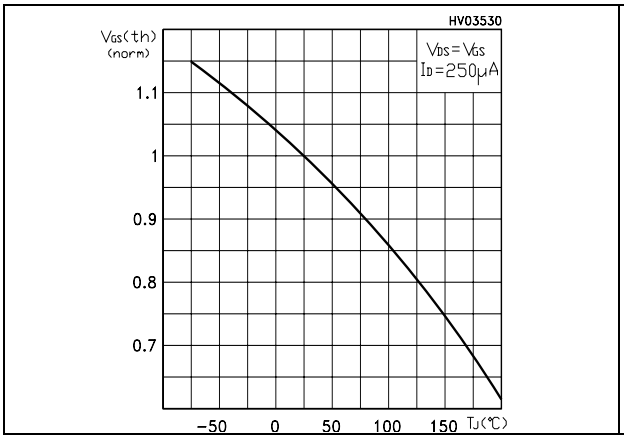



**Figure 10. Normalized on resistance vs. temperature**

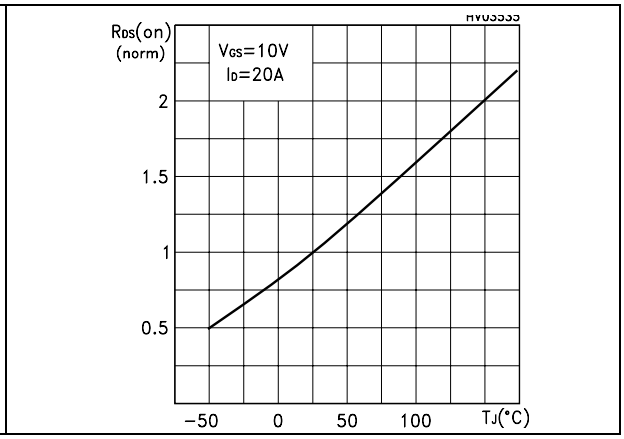



**Figure 11. Source-drain diode forward characteristics**

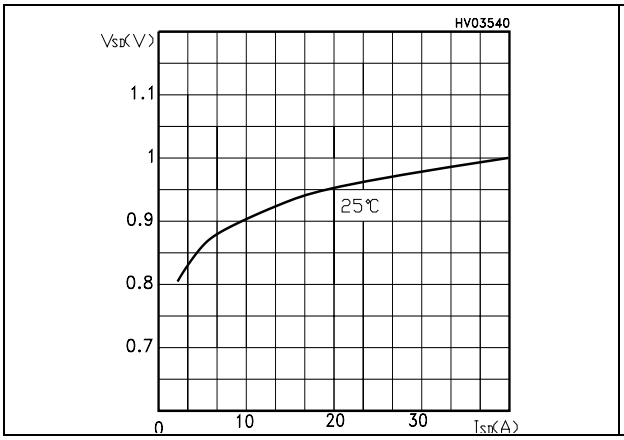
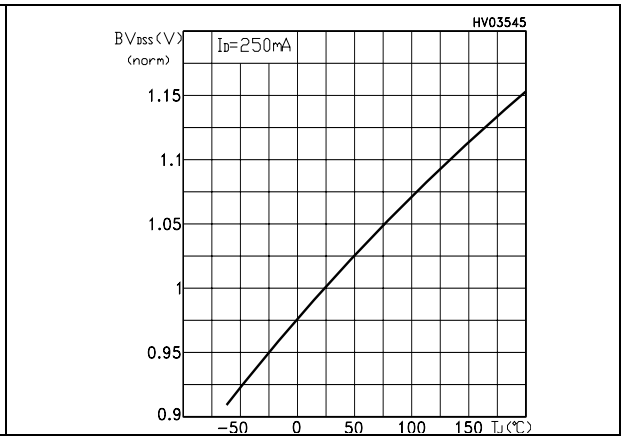



**Figure 12. Normalized breakdown voltage vs. tj**



# 3 Test circuit

**Figure 13. Switching times test circuit for resistive load**

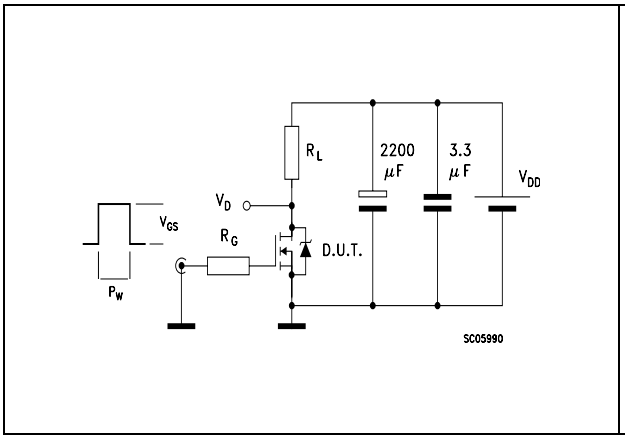



**Figure 14. Gate charge test circuit**

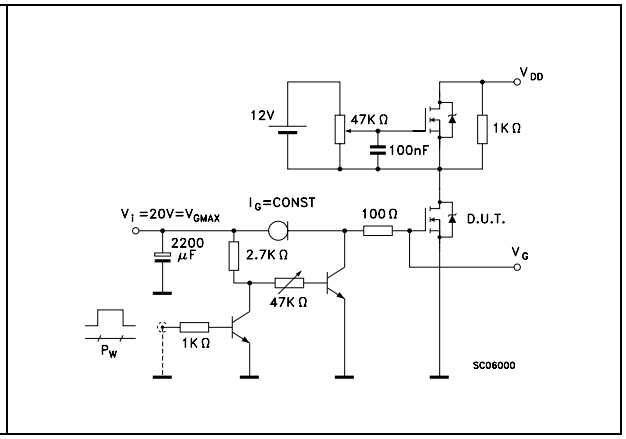



**Figure 15. Test circuit for inductive load switching and diode recovery times**

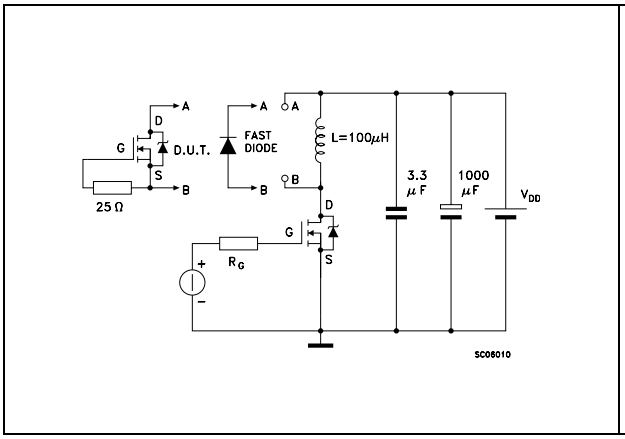



**Figure 16. Unclamped Inductive load test circuit**

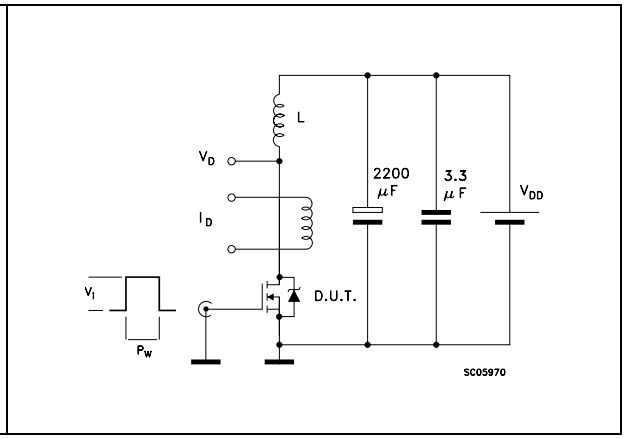



**Figure 17. Unclamped inductive waveform**

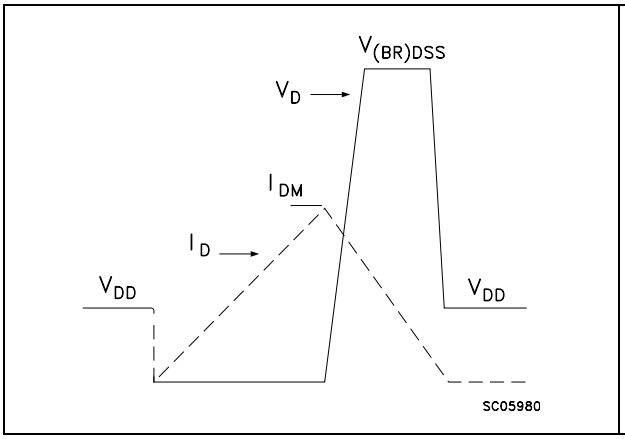
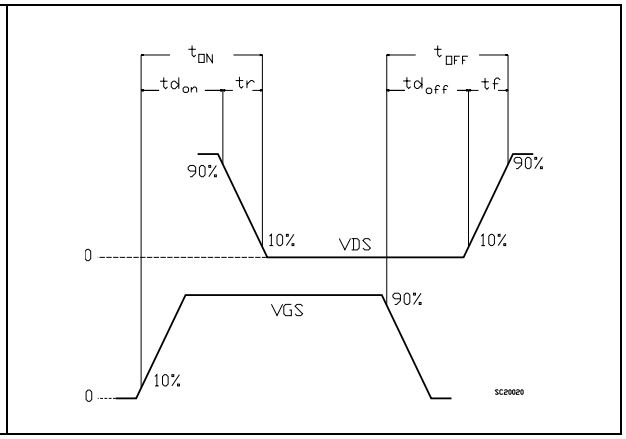



**Figure 18. Switching time waveform**

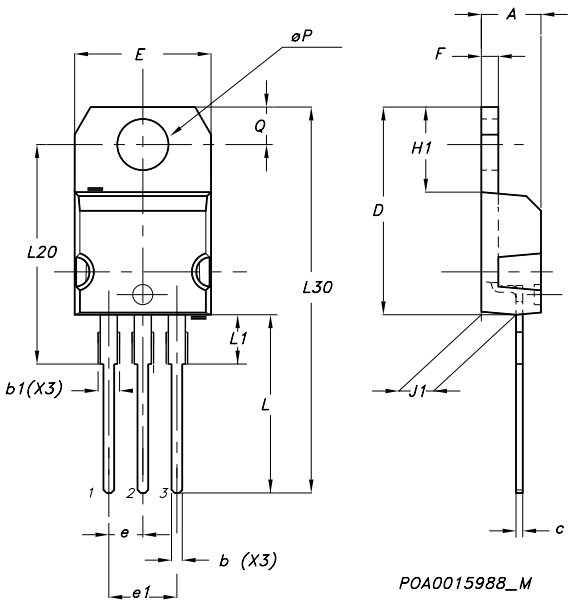


# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at : *www.st.com*

## 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 |



# 5 Revision history

**Table 7. Revision history**

| Date | Revision | Changes |
|---|---|---|
| 09-Sep-2004 | 1 | First version. |
| 17-Aug-2006 | 2 | The document has been reformatted. |
| 31-Jan-2007 | 3 | Typo mistake on *Table 1*. |

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.



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 of America

**www.st.com**

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** MOSFET ***category:***

***Click to view products by*** STMicroelectronics ***manufacturer:***

Other Similar products are found below :

614233C 648584F IRFD120 JANTX2N5237 FCA20N60_F109 FDZ595PZ 2SK2545(Q,T) 405094E 423220D TPCC8103,L1Q(CM MIC4420CM-TR VN1206L SBVS138LT1G 614234A 715780A NTNS3166NZT5G SSM6J414TU,LF(T 751625C BUK954R8-60E NTE6400 SQJ402EP-T1-GE3 2SK2614(TE16L1,Q) 2N7002KW-FAI DMN1017UCP3-7 EFC2J004NUZTDG ECH8691-TL-W FCAB21350L1 P85W28HP2F-7071 DMN1053UCP4-7 NTE221 NTE2384 NTE2903 NTE2941 NTE2945 NTE2946 NTE2960 NTE2967 NTE2969 NTE2976 NTE455 NTE6400A NTE2910 NTE2916 NTE2956 NTE2911 DMN2080UCB4-7 TK10A80W,S4X(S SSM6P69NU,LF DMP22D4UFO-7B DMN1006UCA6-7