



THE DATASHEET OF STW30NF20





STP30NF20 - STB30NF20 STW30NF20

N-channel 200V - 0.065Ω - 30A - TO-220/TO-247/D²PAK
Low gate charge STripFET™ Power MOSFET

Features

| Type | V _{DSS} | R _{DS(on)} | I _D | P _{TOT} |
|-----------|------------------|---------------------|----------------|------------------|
| STP30NF20 | 200V | 0.075Ω | 30A | 125W |
| STW30NF20 | 200V | 0.075Ω | 30A | 125W |
| STB30NF20 | 200V | 0.075Ω | 30A | 125W |

- Gate charge minimized
- 100% avalanche tested
- Excellent figure of merit (R_{DS}*Q_g)
- Very good manufacturing repeability
- Very low intrinsic capacitances

Application

- Switching applications

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.

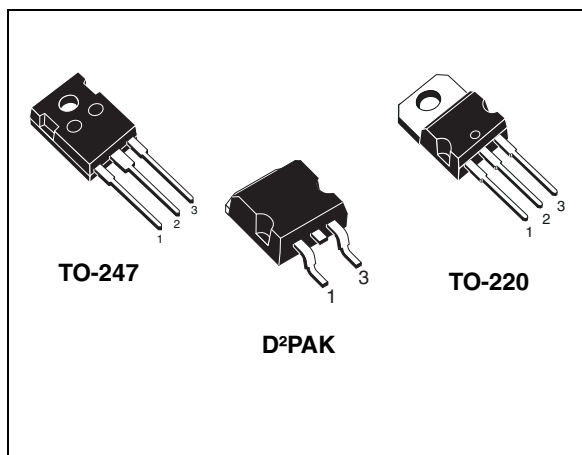


Figure 1. Internal schematic diagram

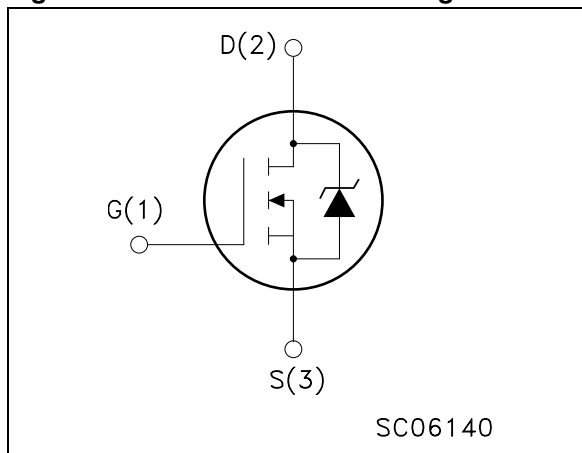


Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|--------------------|-------------|
| STP30NF20 | 30NF20 | TO-220 | Tube |
| STW30NF20 | 30NF20 | TO-247 | Tube |
| STB30NF20 | 30NF20 | D ² PAK | Tape & reel |

Contents

| | | |
|----------|---|-----------|
| 1 | Electrical ratings | 3 |
| 2 | Electrical characteristics | 4 |
| 2.1 | Electrical characteristics (curves) | 6 |
| 3 | Test circuit | 9 |
| 4 | Package mechanical data | 10 |
| 5 | Packaging mechanical data | 14 |
| 6 | Revision history | 15 |

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|--------------------|---|------------|---------------------|
| V_{DS} | Drain-source voltage ($V_{GS} = 0$) | 200 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| I_D | Drain current (continuous) at $T_C = 25^\circ\text{C}$ | 30 | A |
| I_D | Drain current (continuous) at $T_C = 100^\circ\text{C}$ | 19 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 120 | A |
| P_{TOT} | Total dissipation at $T_C = 25^\circ\text{C}$ | 125 | W |
| | Derating factor | 1 | W/ $^\circ\text{C}$ |
| $dv/dt^{(2)}$ | Peak diode recovery voltage slope | 10 | V/ns |
| T_J T_{stg} | Operating junction temperature Storage temperature | -55 to 150 | $^\circ\text{C}$ |
| T_l | Maximum lead temperature for soldering purpose | 300 | $^\circ\text{C}$ |

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 30\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} = 80\%V_{(BR)DSS}$

Table 3. Thermal data

| Symbol | Parameter | TO-220/ D ² PAK | TO-247 | Unit |
|------------|---|-------------------------------|--------|---------------------------|
| R_{thJC} | Thermal resistance junction-case max | 1 | | $^\circ\text{C}/\text{W}$ |
| R_{thJA} | Thermal resistance junction-ambient max | 62.5 | 50 | $^\circ\text{C}/\text{W}$ |

Table 4. Avalanche data

| Symbol | Parameter | Value | Unit |
|----------|---|-------|------|
| I_{AR} | Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax}) | 30 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_J = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{V}$) | 140 | mJ |

2 Electrical characteristics

($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Table 5. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|-------|-----------|--------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $I_D = 1mA, V_{GS} = 0$ | 200 | | | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating}, T_c = 125^{\circ}C$ | | | 1 10 | μA μA |
| I_{GSS} | Gate body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 20V$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS} = 10V, I_D = 15A$ | | 0.065 | 0.075 | Ω |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|------------------------------|--|------|------|------|------|
| $g_{fs}^{(1)}$ | Forward transconductance | $V_{DS} = 15V, I_D = 15A$ | | 20 | | S |
| C_{iss} | Input capacitance | $V_{DS} = 25V, f = 1\text{ MHz}, V_{GS} = 0$ | | 1597 | | pF |
| C_{oss} | Output capacitance | | | 320 | | pF |
| C_{rss} | Reverse transfer capacitance | | | 43 | | pF |
| Q_g | Total gate charge | $V_{DD} = 160V, I_D = 30A$ | | 38 | | nC |
| Q_{gs} | Gate-source charge | $V_{GS} = 10V$ | | 8 | | nC |
| Q_{gd} | Gate-drain charge | (see Figure 17) | | 18 | | nC |

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

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------------|--|------|------------|------|----------|
| $t_{d(on)}$ t_r | Turn-on delay time Rise time | $V_{DD}=100V$, $I_D=15A$, $R_G=4.7\Omega$, $V_{GS}=10V$ (see Figure 16) | | 35 15.7 | | ns ns |
| $t_{d(off)}$ t_f | Turn-off delay time Fall time | $V_{DD}=100V$, $I_D=15A$, $R_G=4.7\Omega$, $V_{GS}=10V$ (see Figure 16) | | 38 8.8 | | ns ns |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|--|--|------|---------------------|-----------|--------------------|
| I_{SD} $I_{SDM}^{(1)}$ | Source-drain current Source-drain current (pulsed) | | | | 30 120 | A A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD}=30A$, $V_{GS}=0$ | | | 1.5 | V |
| t_{rr} Q_{rr} I_{RRM} | Reverse recovery time Reverse recovery charge Reverse recovery current | $I_{SD}=30A$, $di/dt = 100A/\mu s$, $V_{DD}=100V$, $T_j=25^\circ C$ | | 155 0.96 12.4 | | ns μC A |
| t_{rr} Q_{rr} I_{RRM} | Reverse recovery time Reverse recovery charge Reverse recovery current | $I_{SD}=30A$, $di/dt = 100A/\mu s$, $V_{DD}=100V$, $T_j=150^\circ C$ | | 194 1.42 14.6 | | ns μC 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 2. Safe operating area for TO-247

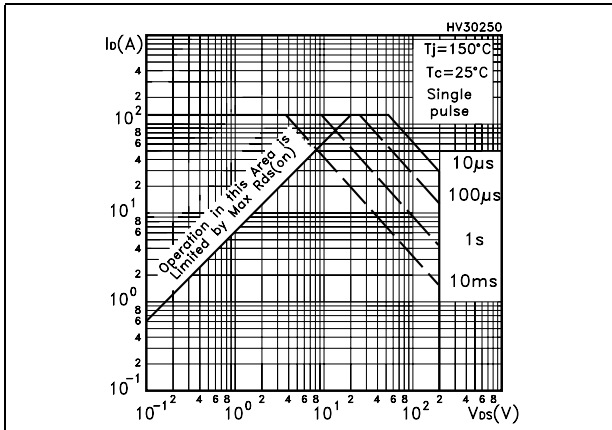


Figure 3. Thermal impedance for TO-247

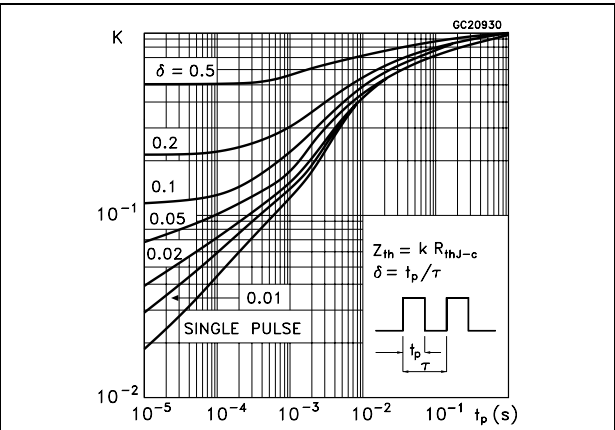


Figure 4. Safe operating area for TO-220/ D²PAK

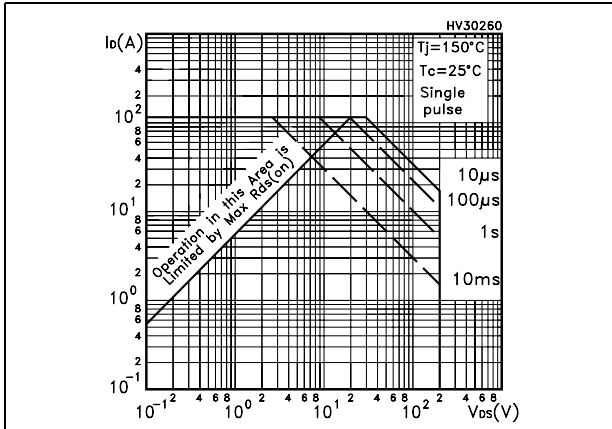


Figure 5. Thermal impedance for TO-220/ D²PAK

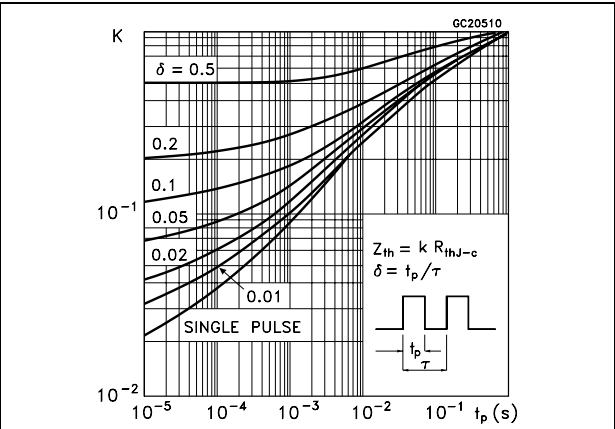


Figure 6. Output characteristics

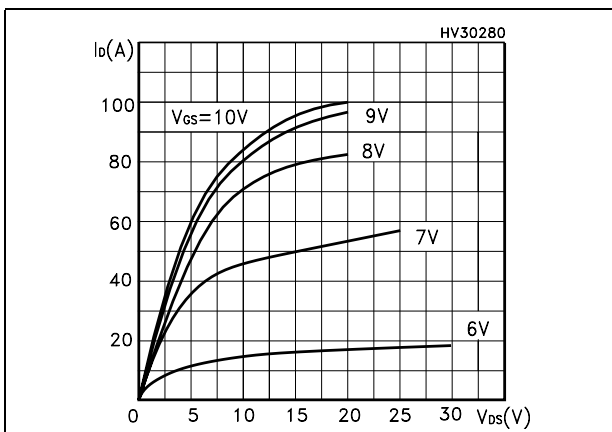


Figure 7. Transfer characteristics

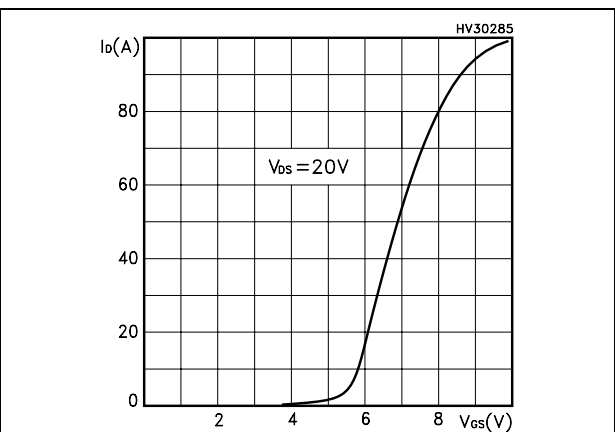


Figure 8. Normalized $B_{V_{DS}}$ vs temperature

Figure 9. Static drain-source on resistance

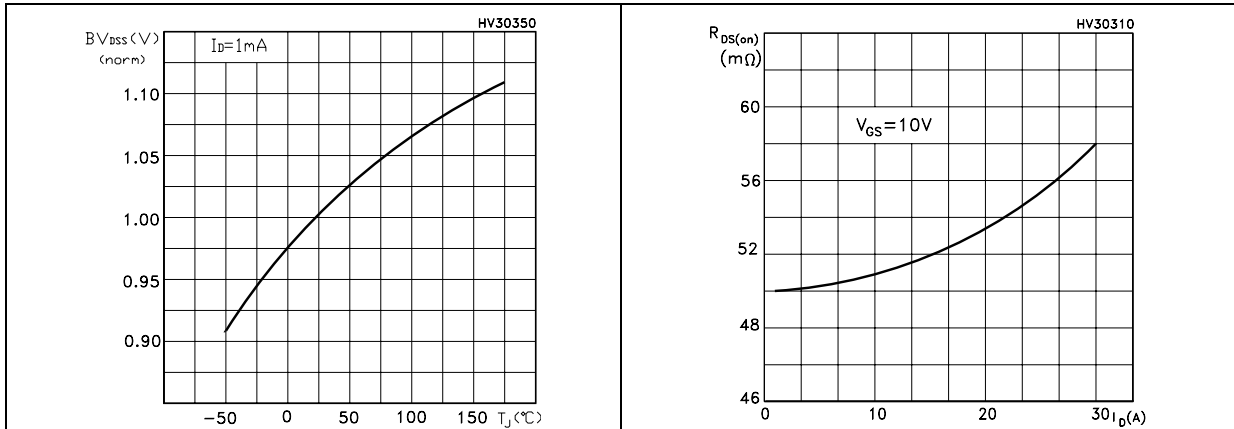


Figure 10. Gate charge vs gate-source voltage

Figure 11. Capacitance variations

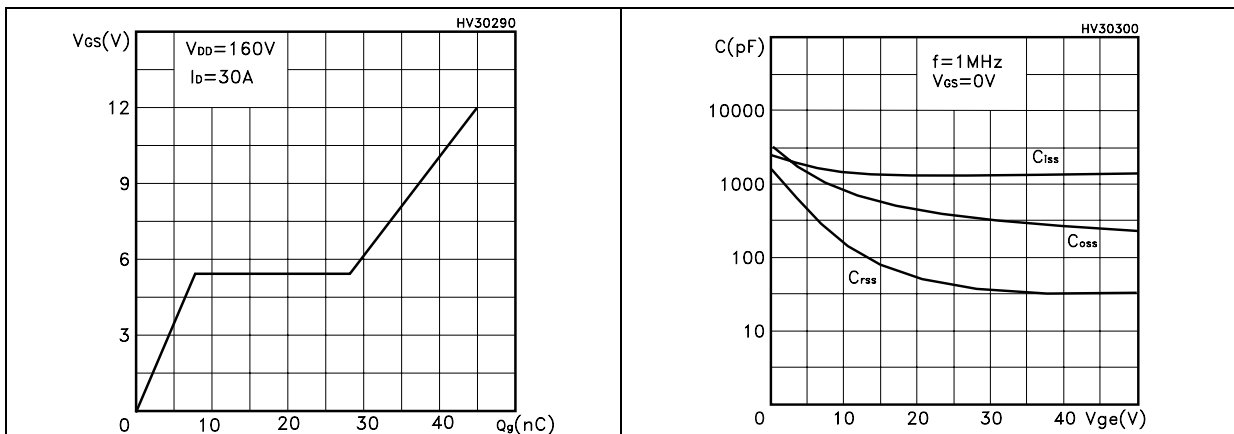


Figure 12. Normalized gate threshold voltage vs temperature

Figure 13. Normalized on resistance vs temperature

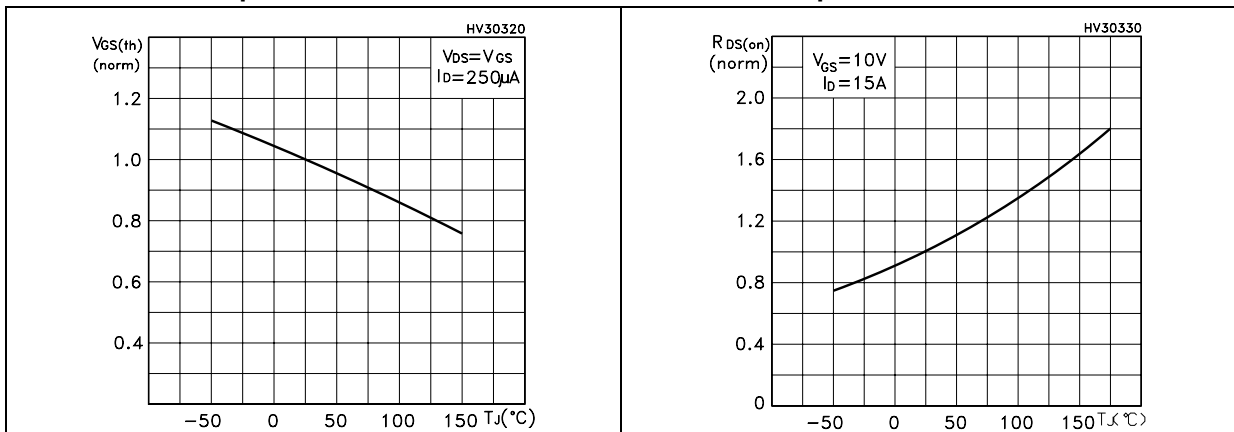


Figure 14. Source-drain diode forward characteristics

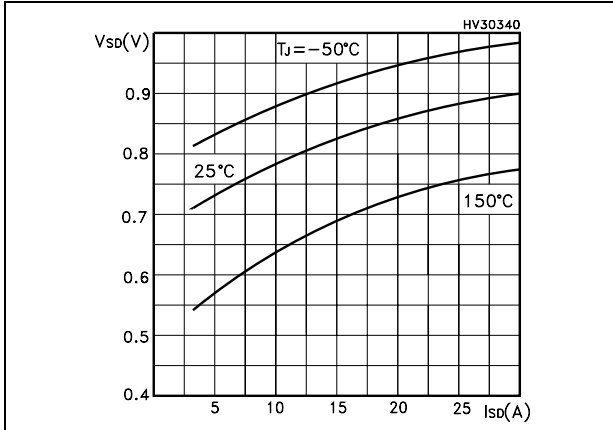
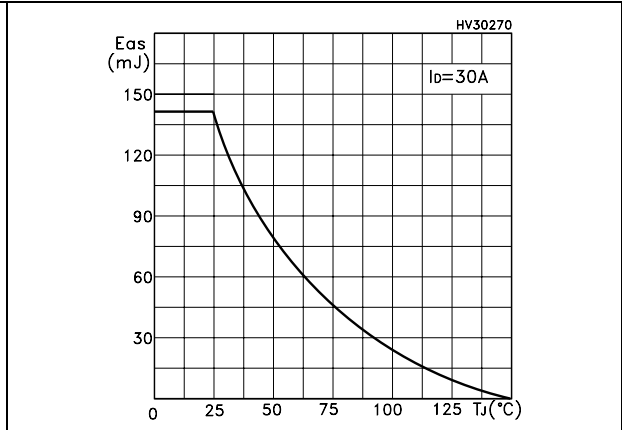


Figure 15. Maximum avalanche energy vs temperature



3 Test circuit

Figure 16. Switching times test circuit for resistive load



Figure 17. Gate charge test circuit

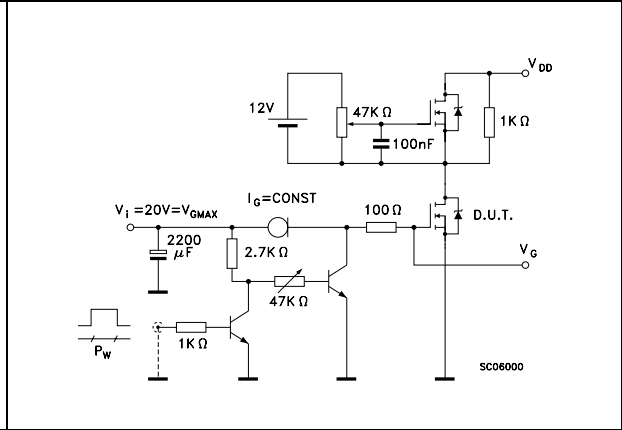


Figure 18. Test circuit for inductive load switching and diode recovery times

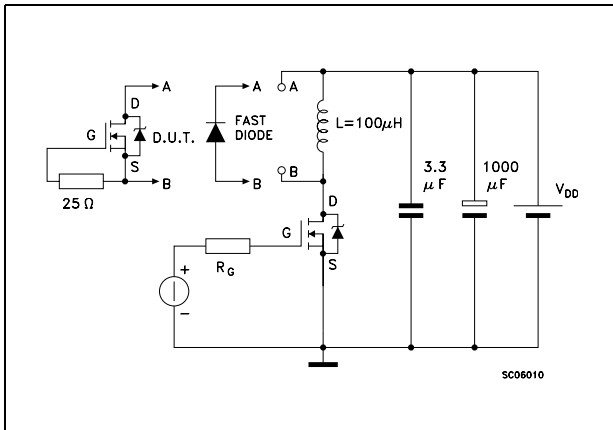


Figure 19. Unclamped inductive load test circuit

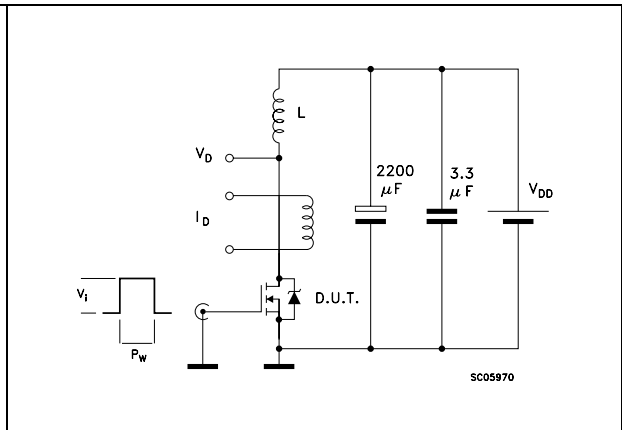


Figure 20. Unclamped inductive waveform

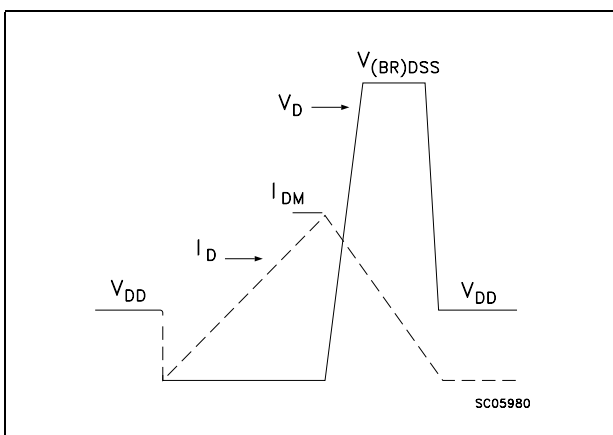
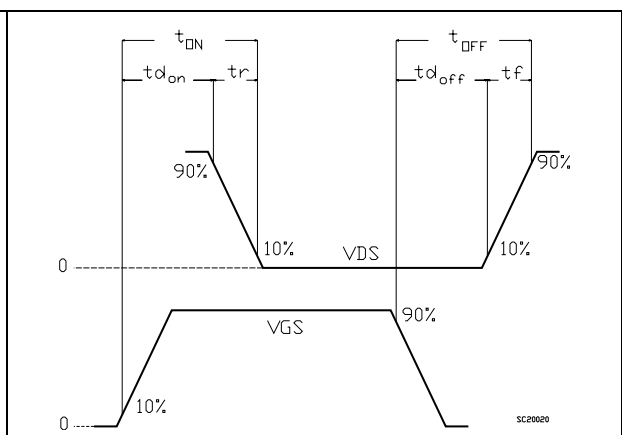


Figure 21. Switching time waveform

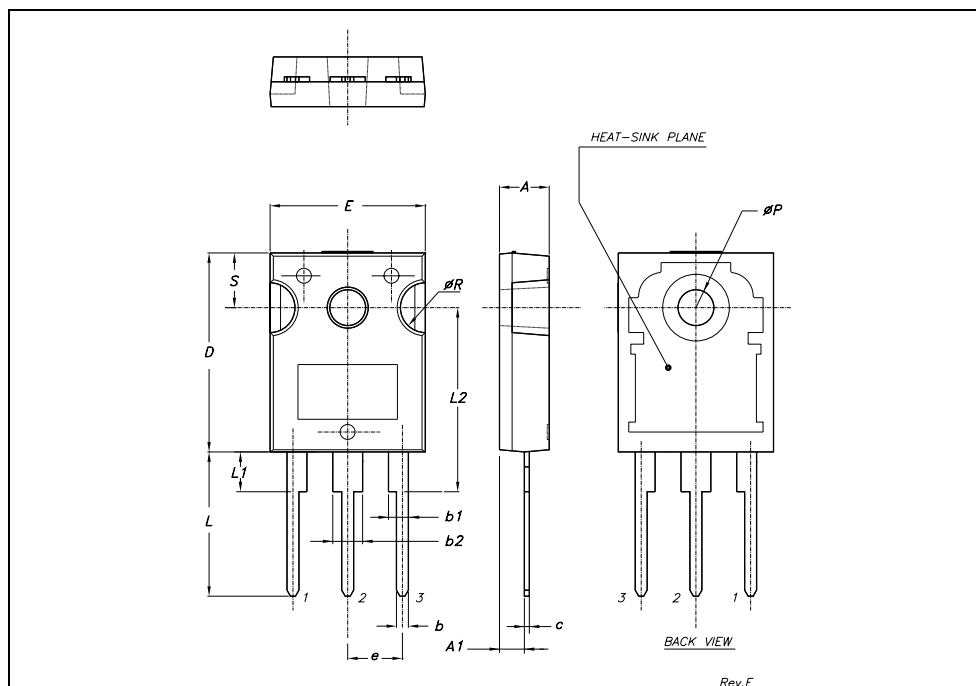


4 Package mechanical data

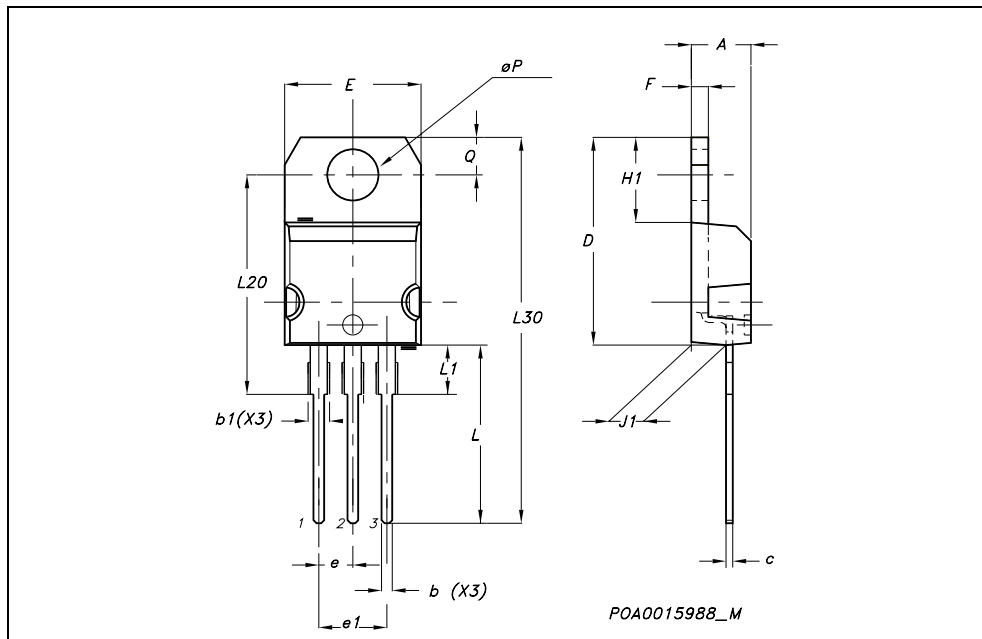
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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-247 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.85 | | 5.15 | 0.19 | | 0.20 |
| A1 | 2.20 | | 2.60 | 0.086 | | 0.102 |
| b | 1.0 | | 1.40 | 0.039 | | 0.055 |
| b1 | 2.0 | | 2.40 | 0.079 | | 0.094 |
| b2 | 3.0 | | 3.40 | 0.118 | | 0.134 |
| c | 0.40 | | 0.80 | 0.015 | | 0.03 |
| D | 19.85 | | 20.15 | 0.781 | | 0.793 |
| E | 15.45 | | 15.75 | 0.608 | | 0.620 |
| e | | 5.45 | | | 0.214 | |
| L | 14.20 | | 14.80 | 0.560 | | 0.582 |
| L1 | 3.70 | | 4.30 | 0.14 | | 0.17 |
| L2 | | 18.50 | | | 0.728 | |
| øP | 3.55 | | 3.65 | 0.140 | | 0.143 |
| øR | 4.50 | | 5.50 | 0.177 | | 0.216 |
| S | | 5.50 | | | 0.216 | |

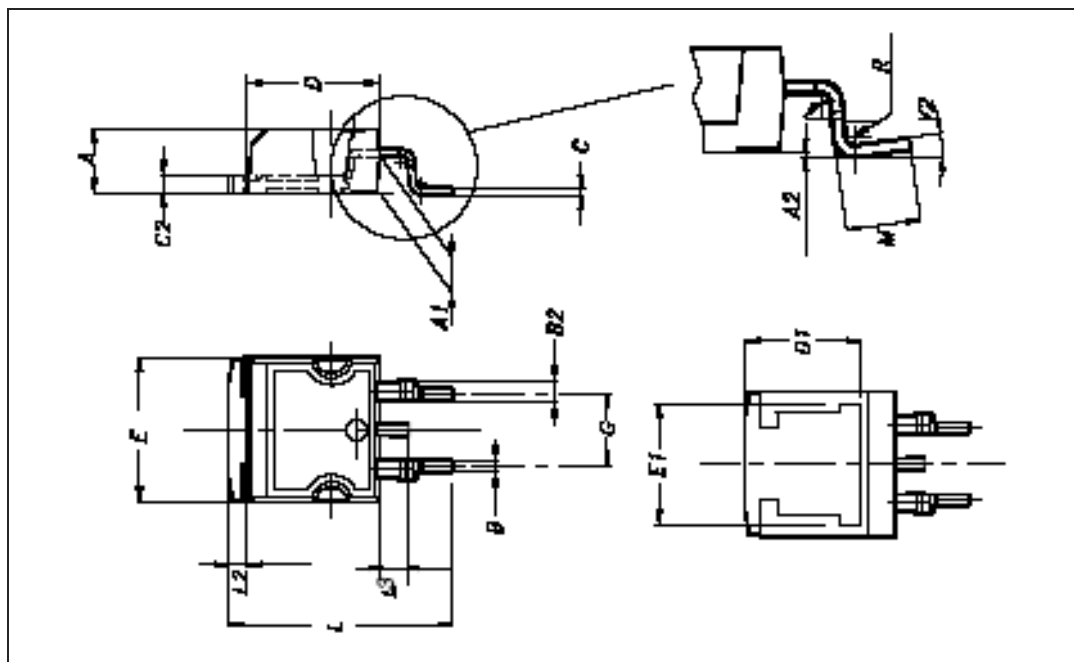


| TO-220 MECHANICAL DATA | | | | | | |
|------------------------|-------|-------|-------|-------|-------|-------|
| DIM. | mm. | | | inch | | |
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.15 | | 1.70 | 0.045 | | 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 |



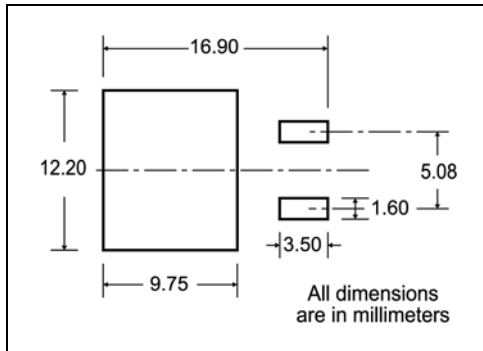
D²PAK mechanical data

| Dim | mm | | | inch | | |
|-----|------|-----|-------|-------|-------|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 4.4 | | 4.6 | 0.173 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.7 | | 0.93 | 0.027 | | 0.036 |
| B2 | 1.14 | | 1.7 | 0.044 | | 0.067 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 1.23 | | 1.36 | 0.048 | | 0.053 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| D1 | | 8 | | | 0.315 | |
| E | 10 | | 10.4 | 0.393 | | 0.409 |
| E1 | | 8.5 | | | 0.334 | |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15 | | 15.85 | 0.590 | | 0.625 |
| L2 | 1.27 | | 1.4 | 0.50 | | 0.55 |
| L3 | 1.4 | | 1.75 | 0.055 | | 0.68 |
| M | 2.4 | | 3.2 | 0.094 | | 0.126 |
| R | | 0.4 | | | 0.015 | |
| V2 | 0° | | 4° | | | |



5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

TAPE MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|--------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A0 | 10.5 | 10.7 | 0.413 | 0.421 |
| B0 | 15.7 | 15.9 | 0.618 | 0.626 |
| D | 1.5 | 1.6 | 0.059 | 0.063 |
| D1 | 1.59 | 1.61 | 0.062 | 0.063 |
| E | 1.65 | 1.85 | 0.065 | 0.073 |
| F | 11.4 | 11.6 | 0.449 | 0.456 |
| K0 | 4.8 | 5.0 | 0.189 | 0.197 |
| P0 | 3.9 | 4.1 | 0.153 | 0.161 |
| P1 | 11.9 | 12.1 | 0.468 | 0.476 |
| P2 | 1.9 | 2.1 | 0.075 | 0.082 |
| R | 50 | | 1.574 | |
| T | 0.25 | 0.35 | 0.0098 | 0.0137 |
| W | 23.7 | 24.3 | 0.933 | 0.956 |

REEL MECHANICAL DATA

| DIM. | mm | | inch | |
|------|------|------|-------|--------|
| | MIN. | MAX. | MIN. | MAX. |
| A | | 330 | | 12.992 |
| B | 1.5 | | 0.059 | |
| C | 12.8 | 13.2 | 0.504 | 0.520 |
| D | 20.2 | | 0.795 | |
| G | 24.4 | 26.4 | 0.960 | 1.039 |
| N | 100 | | 3.937 | |
| T | | 30.4 | | 1.197 |

| BASE QTY | BULK QTY |
|----------|----------|
| 1000 | 1000 |

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

TRL

Bending radius R min.

* on sales type

6 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|-------------|----------|--------------------------|
| 25-Jan-2007 | 1 | First Release |
| 18-Oct-2007 | 2 | Added D ² PAK |

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.

© 2007 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 of America

www.st.com

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View STW30NF20](#) on WIN SOURCE
-  [STMicroelectronics](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management