



THE DATASHEET OF STP36N55M5





STP36N55M5 STW36N55M5

N-channel 550 V, 0.06 Ω typ., 33 A MDmesh™ V Power MOSFET
in TO-220 and TO-247 packages

Datasheet — production data

Features

| Order codes | V_{DSS} @ T_{Jmax} | $R_{DS(on)}$ max | I_D |
|-------------|---------------------------|---------------------|-------|
| STP36N55M5 | 600 V | < 0.08 Ω | 33 A |
| STW36N55M5 | | | |

- Worldwide best $R_{DS(on)}$ * area
- Higher V_{DSS} rating and high dv/dt capability
- Excellent switching performance
- 100% avalanche tested

Applications

- Switching applications

Description

These devices are N-channel MDmesh™ V Power MOSFETs based on an innovative proprietary vertical process technology, which is combined with STMicroelectronics' well-known PowerMESH™ horizontal layout structure. The resulting product has extremely low on-resistance, which is unmatched among silicon-based Power MOSFETs, making it especially suitable for applications which require superior power density and outstanding efficiency.

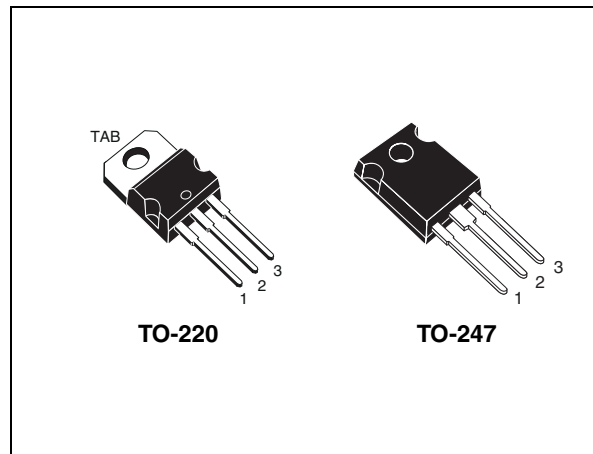
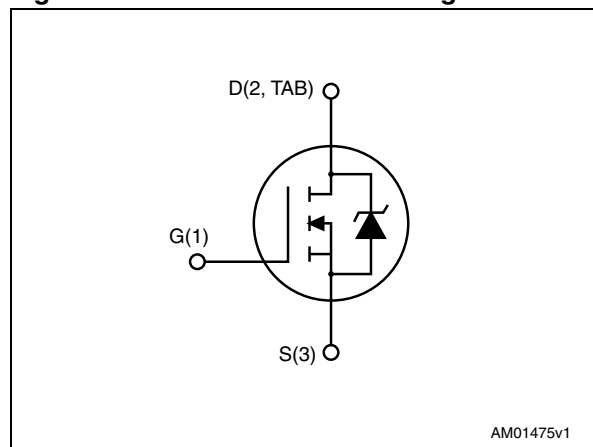


Figure 1. Internal schematic diagram



AM01475v1

Table 1. Device summary

| Order codes | Marking | Package | Packaging |
|-------------|---------|---------|-----------|
| STP36N55M5 | 36N55M5 | TO-220 | Tube |
| STW36N55M5 | | TO-247 | |

Contents

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

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|---|-------------|------------------|
| V_{GS} | Gate-source voltage | ± 25 | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$ | 33 | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 20.8 | A |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 132 | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$ | 190 | W |
| $dv/dt^{(1)}$ | Peak diode recovery voltage slope | 15 | V/ns |
| T_{stg} | Storage temperature | - 55 to 150 | $^\circ\text{C}$ |
| T_j | Max. operating junction temperature | 150 | $^\circ\text{C}$ |

1. $I_{SD} \leq 33\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$; $V_{DS(Peak)} < V_{(BR)DSS}$, $V_{DD} = 340\text{ V}$.

Table 3. Thermal data

| Symbol | Parameter | Value | | Unit |
|----------------|---|--------|--------|---------------------------|
| | | TO-220 | TO-247 | |
| $R_{thj-case}$ | Thermal resistance junction-case max | 0.66 | | $^\circ\text{C}/\text{W}$ |
| $R_{thj-amb}$ | Thermal resistance junction-ambient max | 62.5 | 50 | $^\circ\text{C}/\text{W}$ |

Table 4. Avalanche characteristics

| Symbol | Parameter | Value | Unit |
|----------|--|-------|------|
| I_{AR} | Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax}) | 7 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_J=25\text{ }^\circ\text{C}$, $I_D=I_{AR}$; $V_{DD}=50\text{ V}$) | 510 | mJ |

2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified)

Table 5. On /off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|--|--|------|------|-----------|--------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $I_D = 1\text{ mA}$, $V_{GS} = 0$ | 550 | | | V |
| I_{DSS} | Zero gate voltage drain current ($V_{GS} = 0$) | $V_{DS} = 550\text{ V}$ $V_{DS} = 550\text{ V}$, $T_C = 125\text{ °C}$ | | | 1 100 | μA μA |
| I_{GSS} | Gate-body leakage current ($V_{DS} = 0$) | $V_{GS} = \pm 25\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 3 | 4 | 5 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 16.5\text{ A}$ | | 0.06 | 0.08 | Ω |

Table 6. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|---|------|-------------------|------|----------------|
| C_{iss} C_{oss} C_{rss} | Input capacitance Output capacitance Reverse transfer capacitance | $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$ | - | 2670 75 6.6 | - | pF pF pF |
| $C_{o(tr)}^{(1)}$ | Equivalent capacitance time related | $V_{DS} = 0\text{ to }440\text{ V}$, $V_{GS} = 0$ | - | 192 | - | pF |
| $C_{o(er)}^{(2)}$ | Equivalent capacitance energy related | | - | 71 | - | pF |
| R_G | Intrinsic gate resistance | $f = 1\text{ MHz}$ open drain | - | 1.85 | - | Ω |
| Q_g Q_{gs} Q_{gd} | Total gate charge Gate-source charge Gate-drain charge | $V_{DD} = 440\text{ V}$, $I_D = 16.5\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 18) | - | 62 15 27 | - | nC nC nC |

1. Time related is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}
2. Energy related is defined as a constant equivalent capacitance giving the same stored energy as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 7. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max | Unit |
|--------------|--------------------|---|------|------|-----|------|
| $t_{d(V)}$ | Voltage delay time | $V_{DD} = 400\text{ V}$, $I_D = 22\text{ A}$, | | 56 | | ns |
| $t_{r(V)}$ | Voltage rise time | $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ | - | 13 | - | ns |
| $t_{f(i)}$ | Current fall time | (see Figure 19 and | | 13 | | ns |
| $t_{c(off)}$ | Crossing time | Figure 22) | | 17 | | ns |

Table 8. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain current | | - | | 33 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 132 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 33\text{ A}$, $V_{GS} = 0$ | - | | 1.5 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 33\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | - | 334 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 100\text{ V}$ (see Figure 22) | | 5 | | μC |
| I_{RRM} | Reverse recovery current | | | 31 | | A |
| t_{rr} | Reverse recovery time | $I_{SD} = 33\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | - | 406 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 100\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ | | 7 | | μC |
| I_{RRM} | Reverse recovery current | (see Figure 22) | | 35 | | 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-220

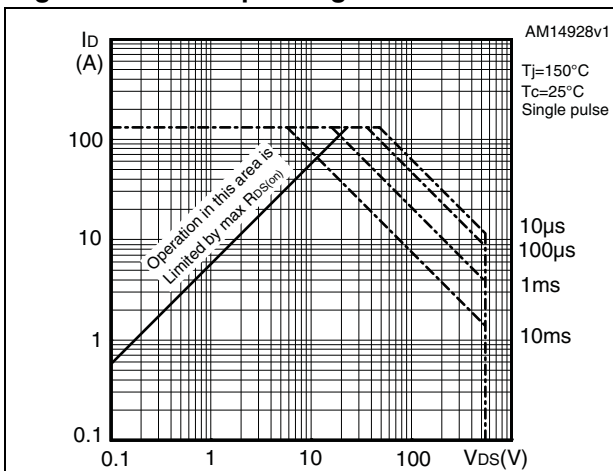


Figure 3. Thermal impedance for TO-220

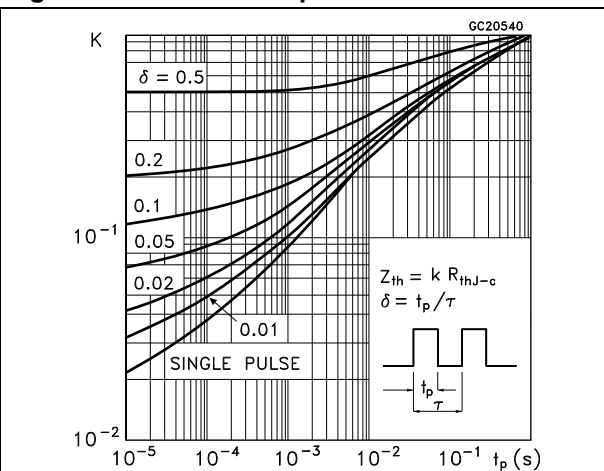


Figure 4. Safe operating area for TO-247

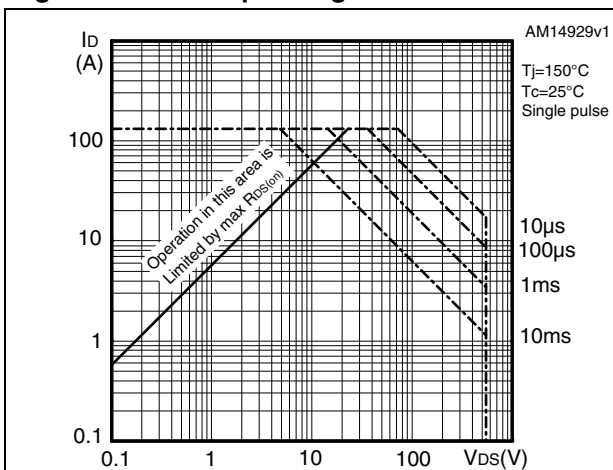


Figure 5. Thermal impedance for TO-247

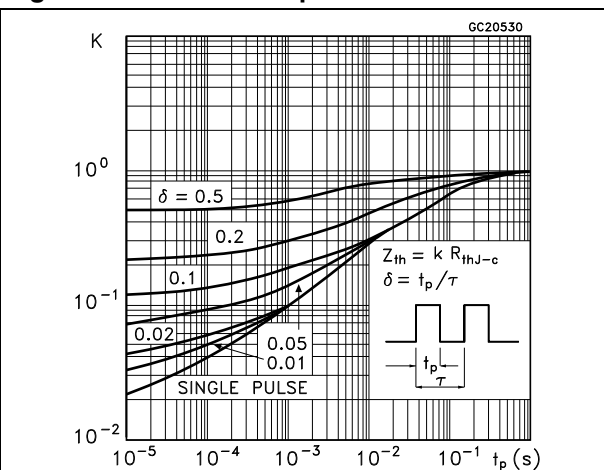


Figure 6. Output characteristics

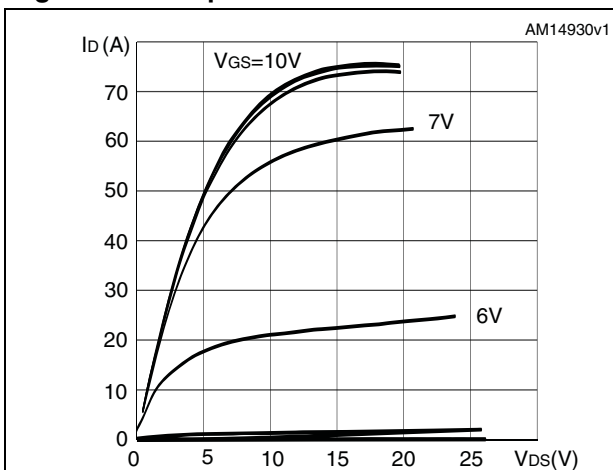


Figure 7. Transfer characteristics

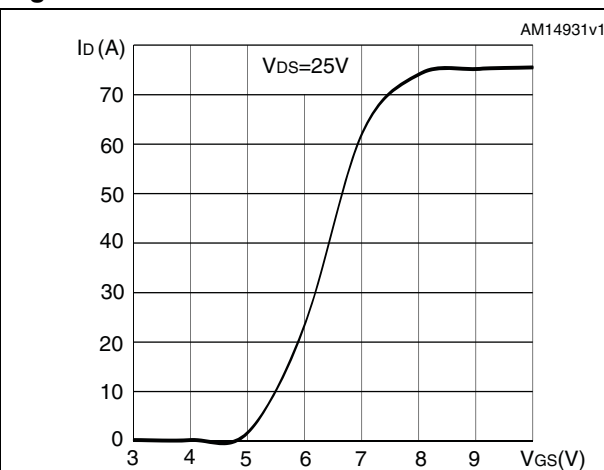


Figure 8. Gate charge vs gate-source voltage Figure 9. Static drain-source on-resistance

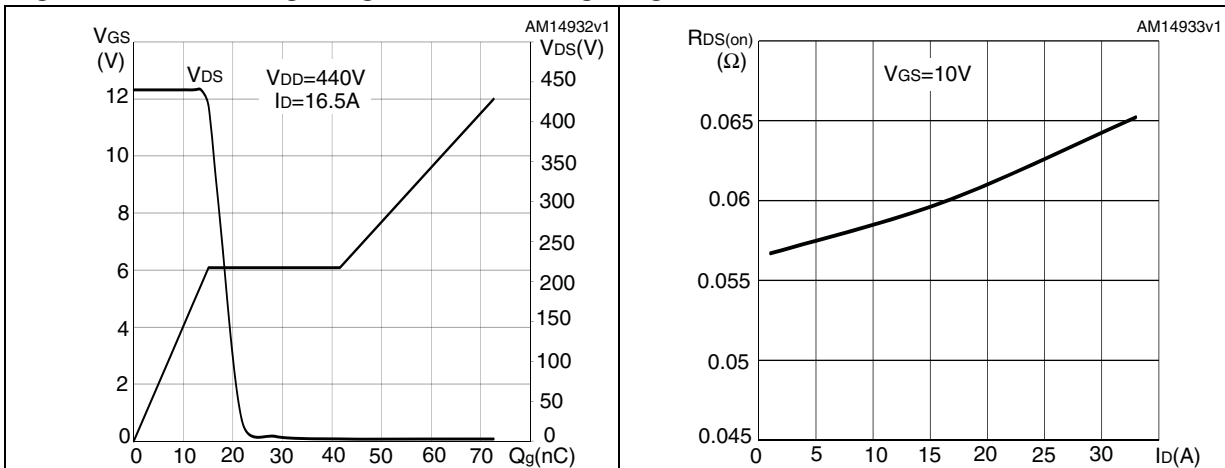


Figure 10. Capacitance variations Figure 11. Output capacitance stored energy

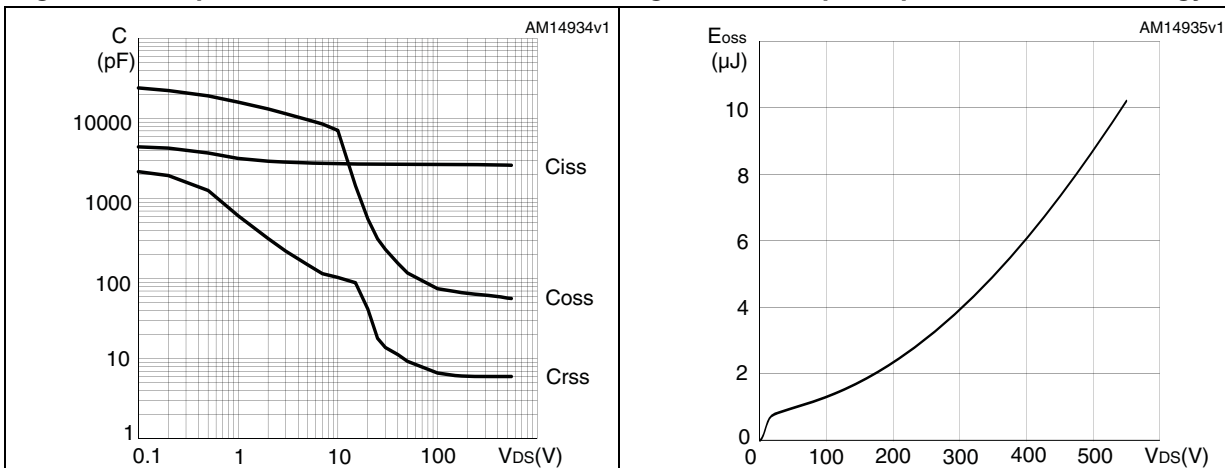


Figure 12. Normalized gate threshold voltage vs temperature Figure 13. Normalized on-resistance vs temperature

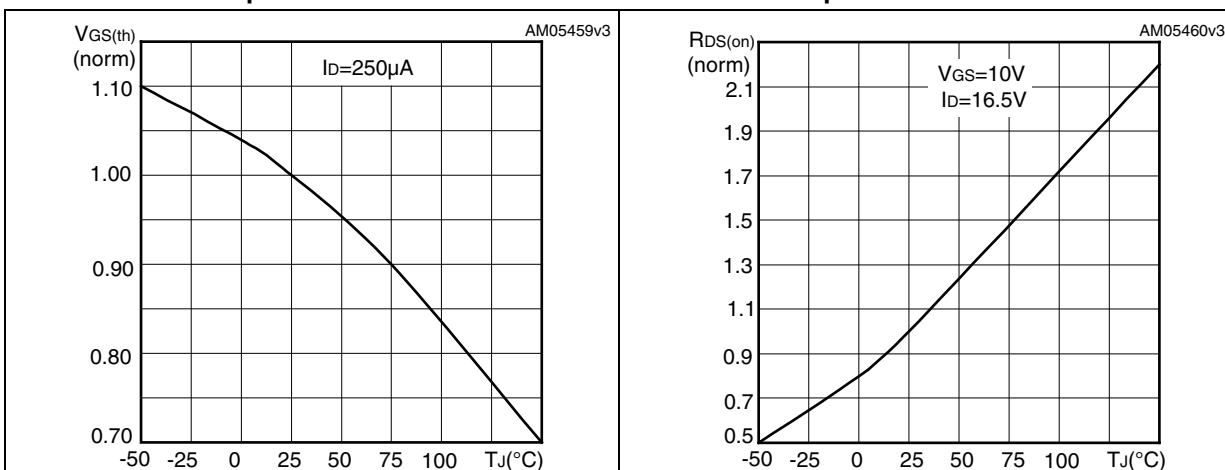


Figure 14. Source-drain diode forward characteristics

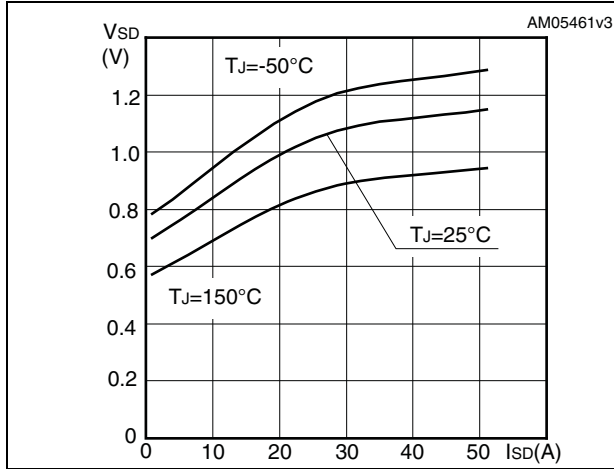


Figure 15. Normalized B_{VDSS} vs temperature

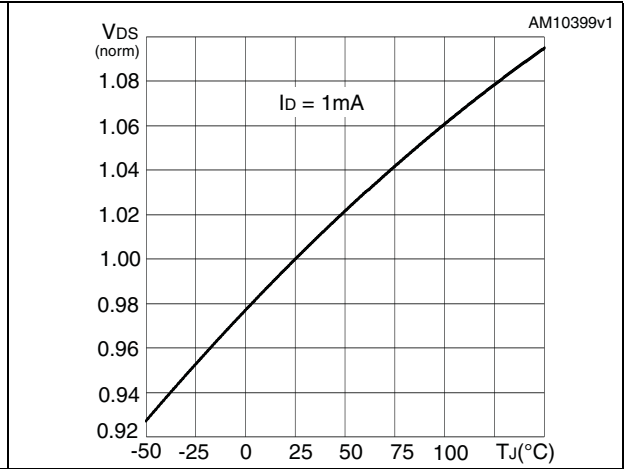
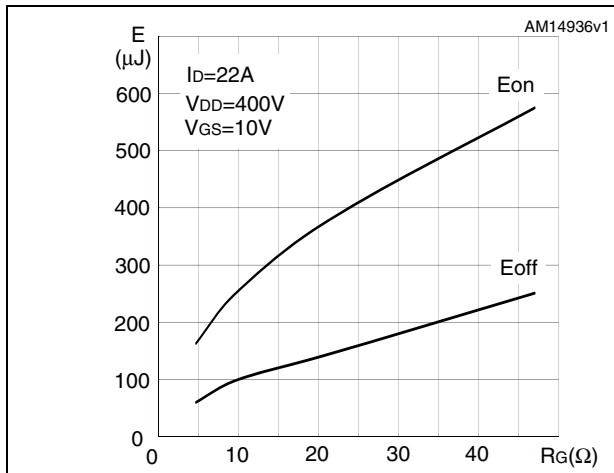


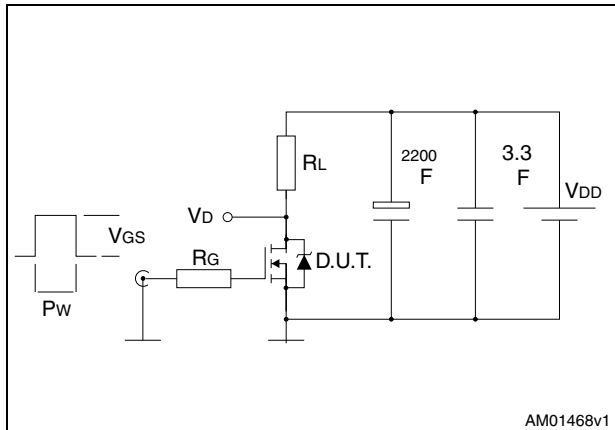
Figure 16. Switching losses vs gate resistance (1)



1. E_{on} including reverse recovery of a SiC diode

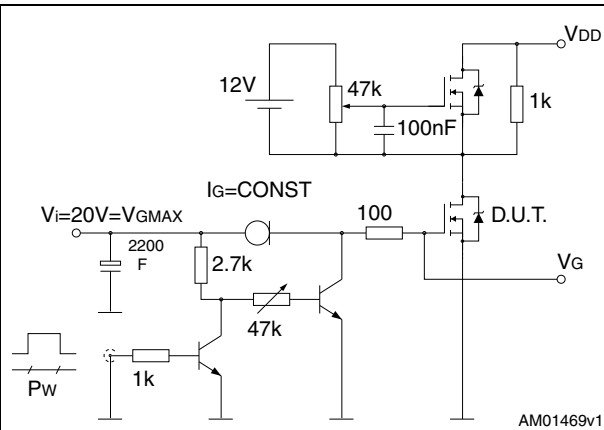
3 Test circuits

Figure 17. Switching times test circuit for resistive load



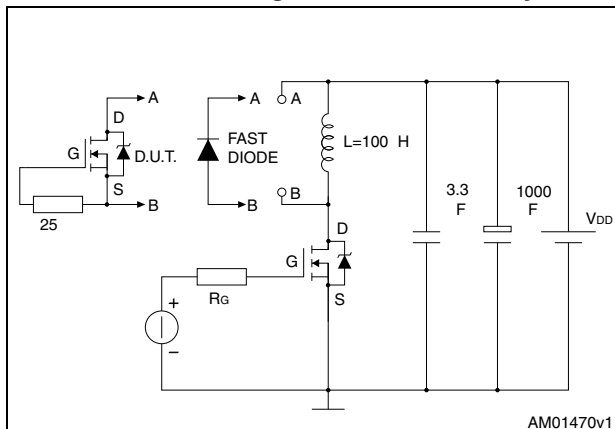
AM01468v1

Figure 18. Gate charge test circuit



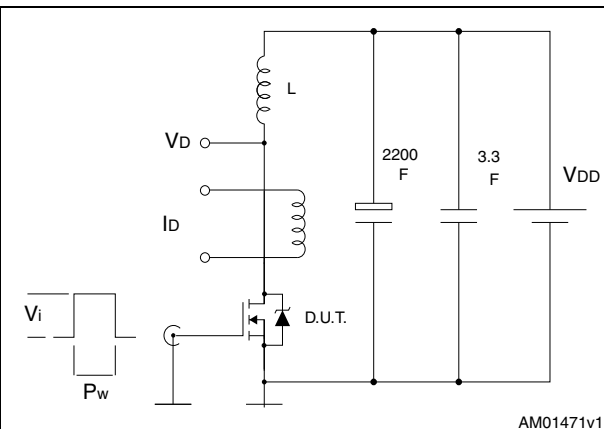
AM01469v1

Figure 19. Test circuit for inductive load switching and diode recovery times



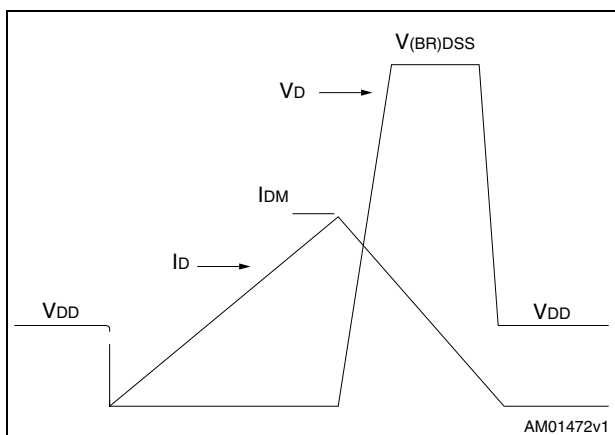
AM01470v1

Figure 20. Unclamped inductive load test circuit



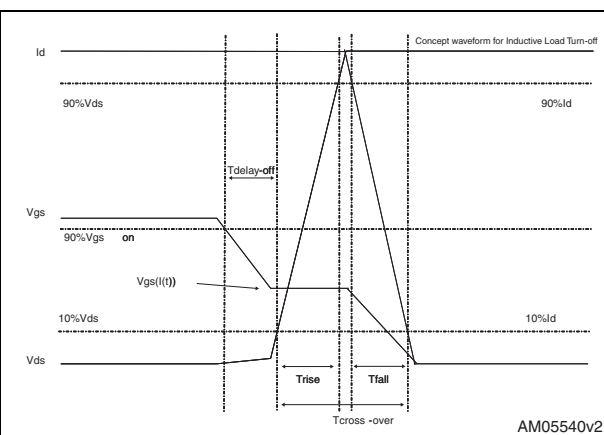
AM01471v1

Figure 21. Unclamped inductive waveform



AM01472v1

Figure 22. Switching time waveform



AM05540v2

4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

Table 9. TO-220 type A mechanical data

| Dim. | mm | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| b | 0.61 | | 0.88 |
| b1 | 1.14 | | 1.70 |
| c | 0.48 | | 0.70 |
| D | 15.25 | | 15.75 |
| D1 | | 1.27 | |
| E | 10 | | 10.40 |
| e | 2.40 | | 2.70 |
| e1 | 4.95 | | 5.15 |
| F | 1.23 | | 1.32 |
| H1 | 6.20 | | 6.60 |
| J1 | 2.40 | | 2.72 |
| L | 13 | | 14 |
| L1 | 3.50 | | 3.93 |
| L20 | | 16.40 | |
| L30 | | 28.90 | |
| ØP | 3.75 | | 3.85 |
| Q | 2.65 | | 2.95 |

Figure 23. TO-220 type A drawing

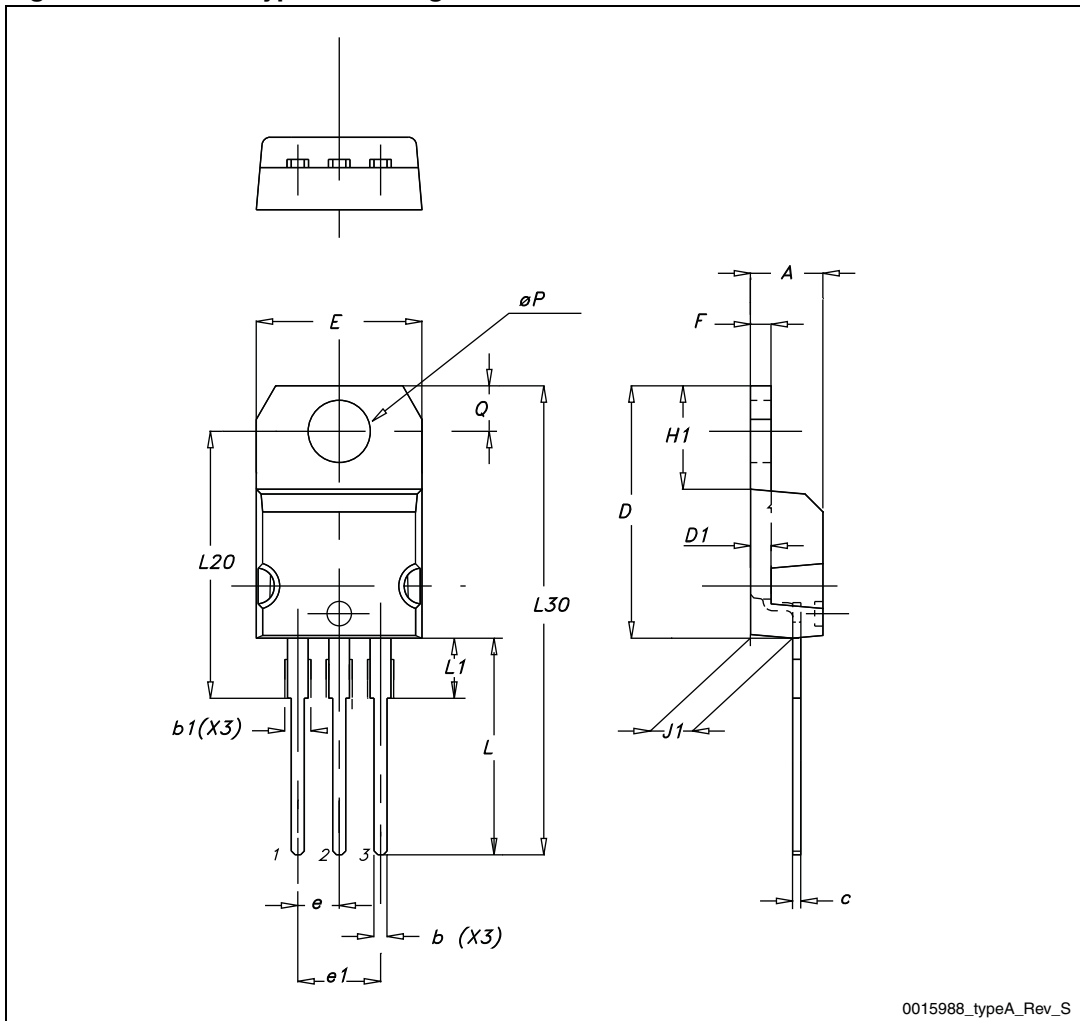
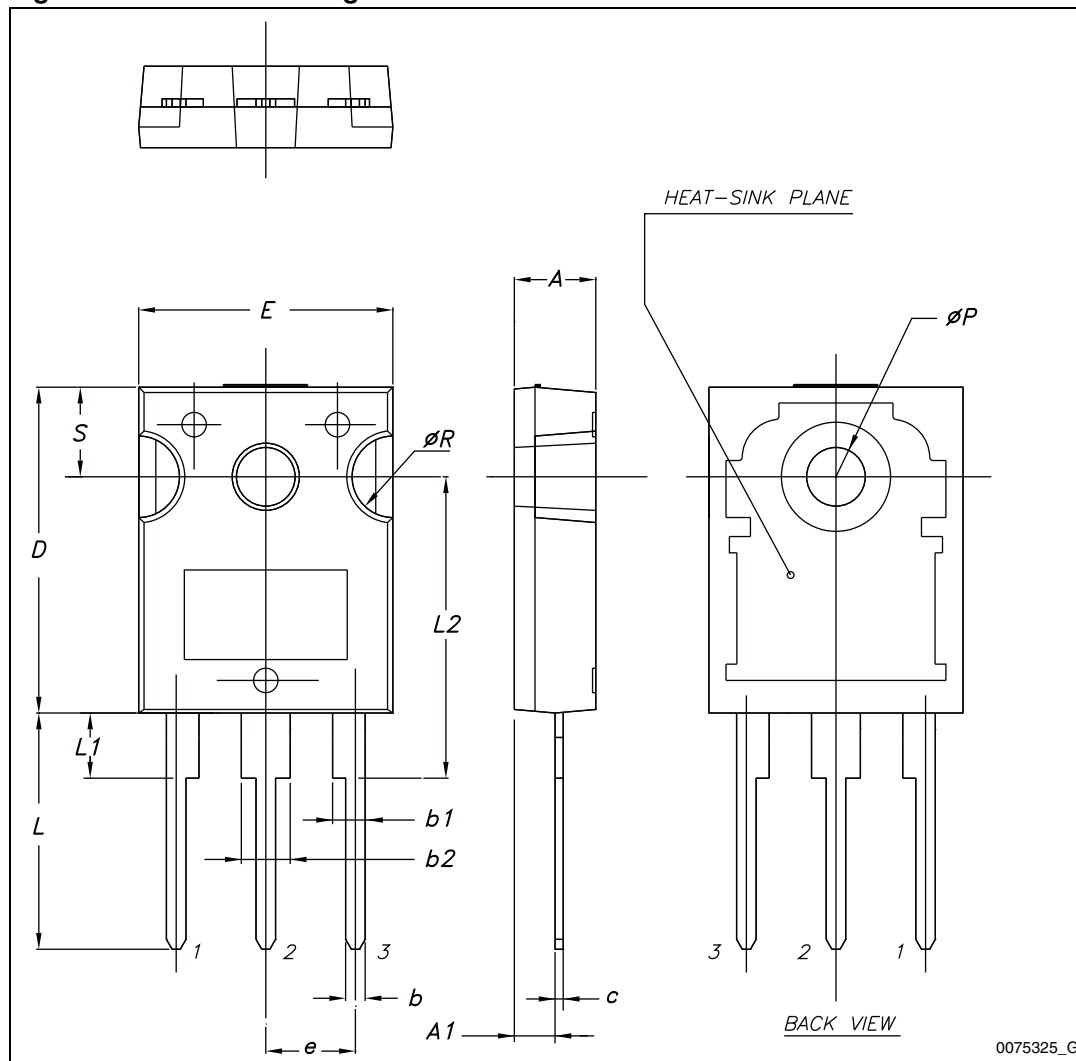


Table 10. TO-247 mechanical data

| Dim. | mm. | | |
|------|-------|-------|-------|
| | Min. | Typ. | Max. |
| A | 4.85 | | 5.15 |
| A1 | 2.20 | | 2.60 |
| b | 1.0 | | 1.40 |
| b1 | 2.0 | | 2.40 |
| b2 | 3.0 | | 3.40 |
| c | 0.40 | | 0.80 |
| D | 19.85 | | 20.15 |
| E | 15.45 | | 15.75 |
| e | 5.30 | 5.45 | 5.60 |
| L | 14.20 | | 14.80 |
| L1 | 3.70 | | 4.30 |
| L2 | | 18.50 | |
| ØP | 3.55 | | 3.65 |
| ØR | 4.50 | | 5.50 |
| S | 5.30 | 5.50 | 5.70 |

Figure 24. TO-247 drawing



0075325_G

5 Revision history

Table 11. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 07-Mar-2012 | 1 | First release. |
| 23-Oct-2012 | 2 | Document status promoted from preliminary data to production data. |

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 TWO AUTHORIZED ST REPRESENTATIVES, 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.

© 2012 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 - Philippines - 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 STP36N55M5 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