



STL52N25M5

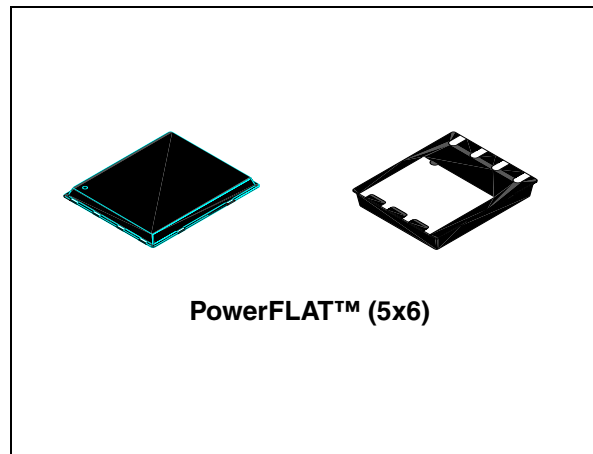
N-channel 250 V, 0.064 Ω , 28 A, PowerFLAT™ (5x6)
MDmesh™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max.	I _D ⁽¹⁾
STL52N25M5	250 V	< 0.076 Ω	28 A

1. This value is rated according R_{thj-case}.

- Amongst the best R_{DS(on)}* area
- Very low profile package (1 mm max.)
- Excellent switching performance
- High dv/dt capability
- 100% avalanche tested



Application

Switching applications

Description

This device is N-channel MDmesh™ V Power MOSFET 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

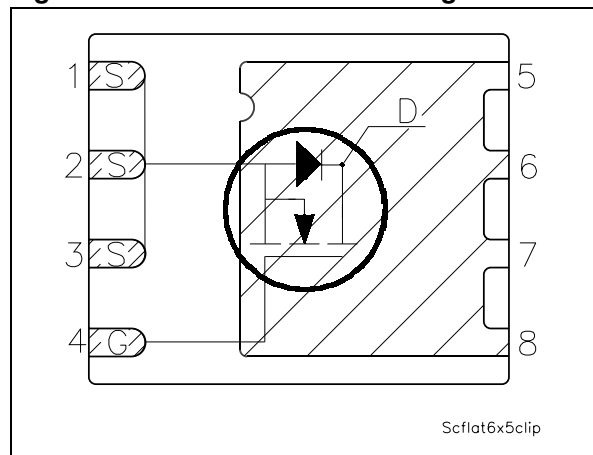


Table 1. Device summary

Order code	Marking	Package	Packaging
STL52N25M5	52N25M5	PowerFLAT™ (5x6)	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	6
3	Test circuits	8
4	Package mechanical data	9
5	Revision history	12

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate- source voltage	25	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ °C}$	28	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ °C}$	18	A
$I_{DM}^{(1),(2)}$	Drain current (pulsed)	112	A
$I_D^{(3)}$	Drain current (continuous) at $T_C = 25\text{ °C}$	4.2	A
$I_D^{(3)}$	Drain current (continuous) at $T_C = 100\text{ °C}$	2.6	A
$I_{DM}^{(2),(3)}$	Drain current (pulsed)	16.8	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ °C}$	110	W
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25\text{ °C}$	2.5	W
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max)	10	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	230	mJ
$dv/dt^{(4)}$	Peak diode recovery voltage slope	15	V/ns
T_J T_{stg}	Operating junction temperature Storage temperature	- 55 to 150	°C

1. This value is rated according $R_{thj-case}$.
2. Pulse width limited by safe operating area.
3. This value is rated according R_{thj-a} .
4. $I_{SD} \leq 28\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DD} = 150\text{ V}$, $V_{Peak} < V_{(BR)DSS}$.

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.14	°C/W
$R_{thj-a}^{(1)}$	Thermal resistance junction-amb max	50	°C/W
T_J	Maximum lead temperature for soldering purpose	300	°C/W

1. When mounted on FR-4 board of 1inch², 2oz Cu

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified).

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	250			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}$, $T_C = 125\text{ }^\circ\text{C}$			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	$V_{DS} = V_{GS}$, $I_D = 100\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 13\text{ A}$		0.064	0.076	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	1770	-	pF
C_{oss}	Output capacitance			110		pF
C_{rss}	Reverse transfer capacitance			17		pF
$C_{o(er)}^{(1)}$	Equivalent output capacitance energy related	$V_{GS} = 0$, $V_{DS} = 0$ to 80% $V_{(BR)DSS}$	-	93	-	pF
$C_{o(tr)}^{(2)}$	Equivalent output capacitance time related	$V_{GS} = 0$, $V_{DS} = 0$ to 80% $V_{(BR)DSS}$	-	178	-	pF
R_g	Gate input resistance	$f = 1\text{ MHz}$ open drain	-	2.5	-	Ω
Q_g	Total gate charge	$V_{DD} = 200\text{ V}$, $I_D = 28\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 14)	-	47	-	nC
Q_{gs}	Gate-source charge			10		nC
Q_{gd}	Gate-drain charge			24		nC

- $C_{o(er)}$ is a constant capacitance value that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .
- $C_{o(tr)}$ is a constant capacitance value that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS} .

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(V)}$	Voltage delay time	$V_{DD} = 125\text{ V}$, $I_D = 14\text{ A}$,		40		ns
$t_{r(V)}$	Voltage rise time	$R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$	-	18	-	ns
$t_{f(i)}$	Current fall time	(see Figure 13)		64		ns
$t_{c(off)}$	Crossing time	(see Figure 18)		82		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		28	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				112	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 28\text{ A}$, $V_{GS} = 0$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 28\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		168		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$	-	1.2		μC
I_{RRM}	Reverse recovery current	(see Figure 15)		14.5		A
t_{rr}	Reverse recovery time	$I_{SD} = 28\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		196		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	1.7		μC
I_{RRM}	Reverse recovery current	(see Figure 15)		17		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

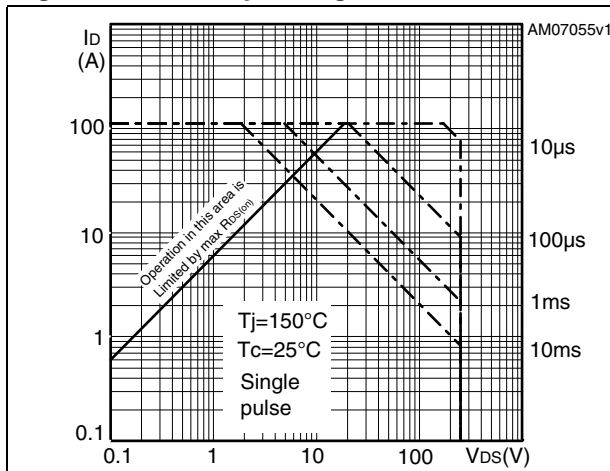


Figure 3. Thermal impedance

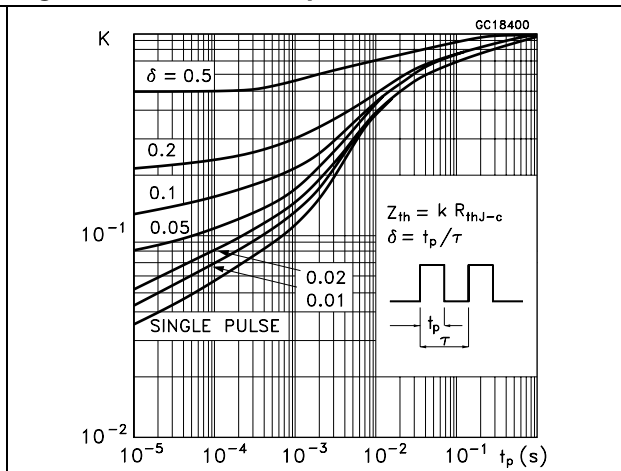


Figure 4. Output characteristics

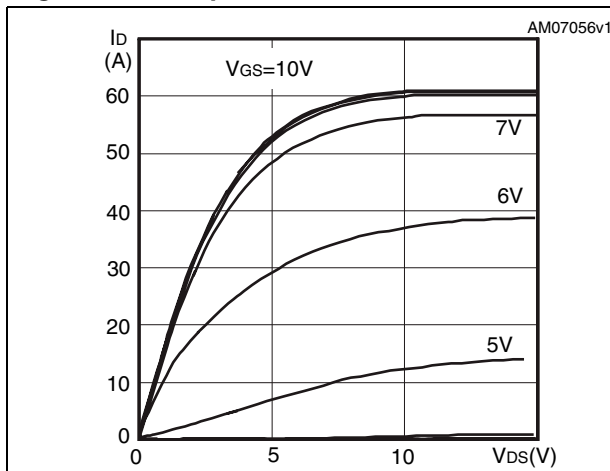


Figure 5. Transfer characteristics

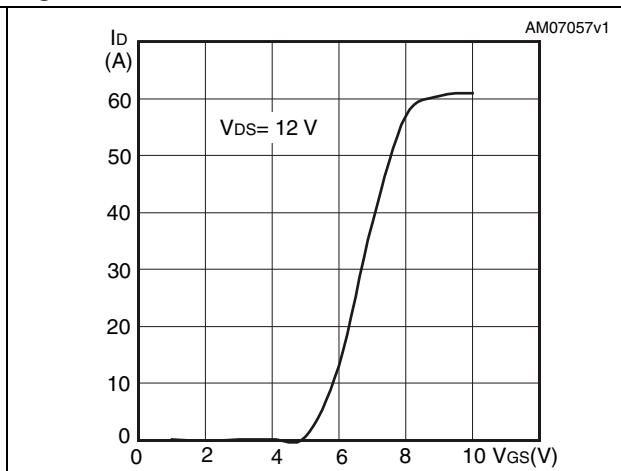


Figure 6. Gate charge vs gate-source voltage

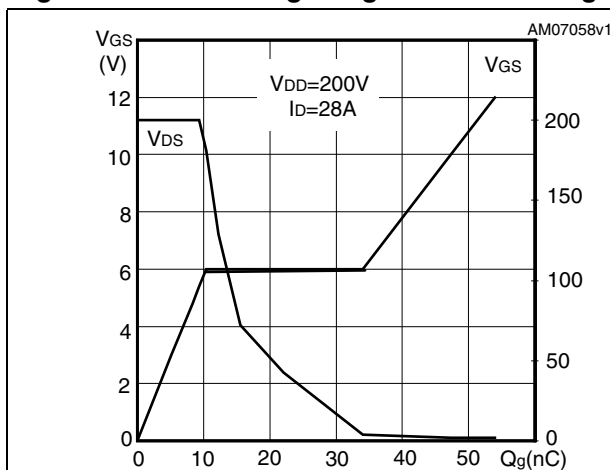


Figure 7. Static drain-source on resistance

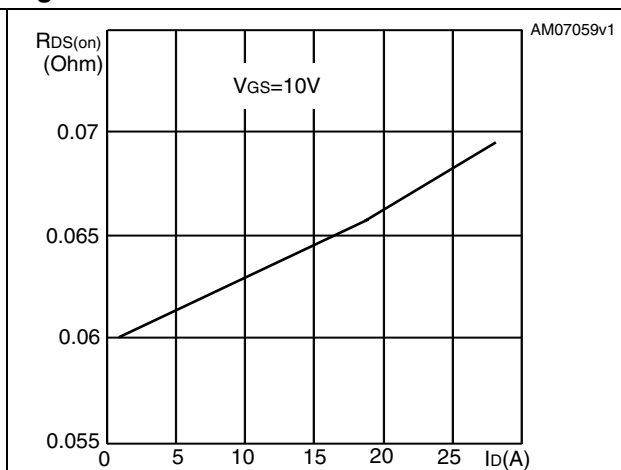


Figure 8. Capacitance variations

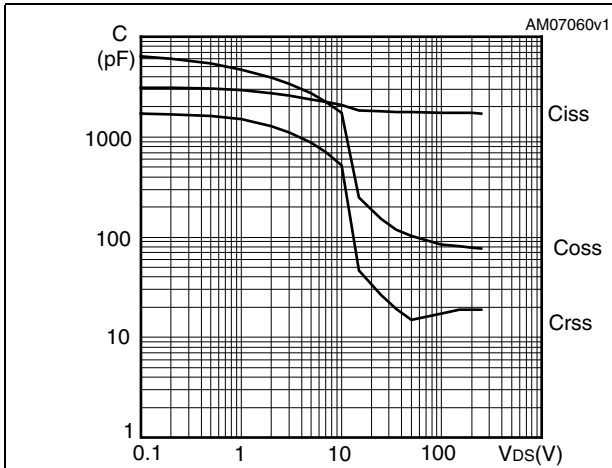


Figure 9. Output capacitance stored energy

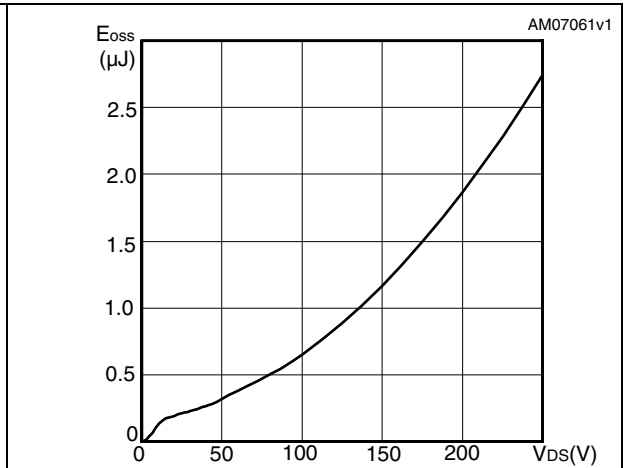


Figure 10. Normalized gate threshold voltage vs temperature

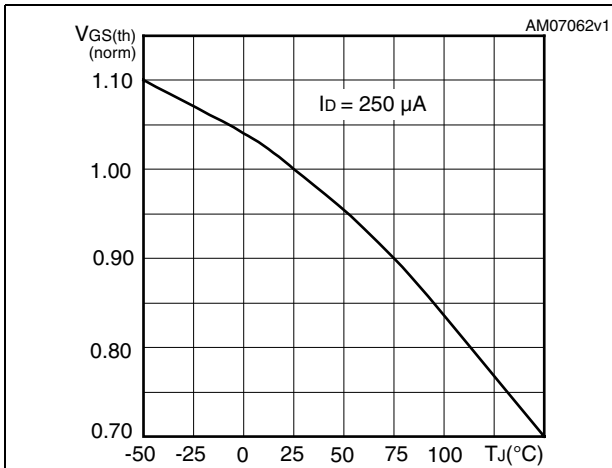


Figure 11. Normalized on resistance vs temperature

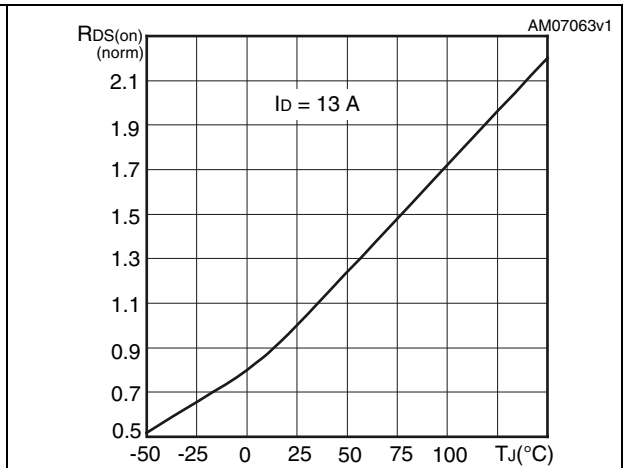
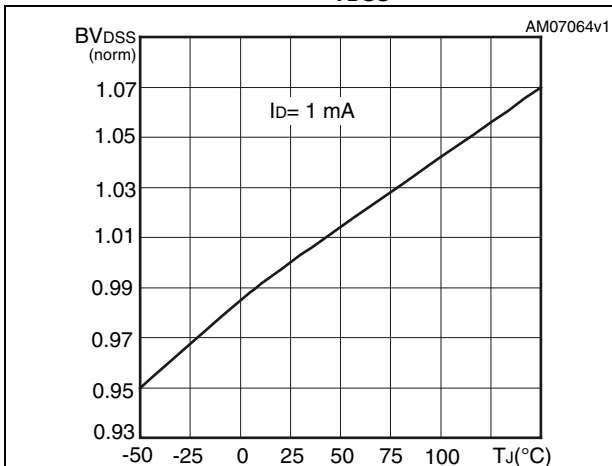


Figure 12. Normalized BV_{DSS} vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

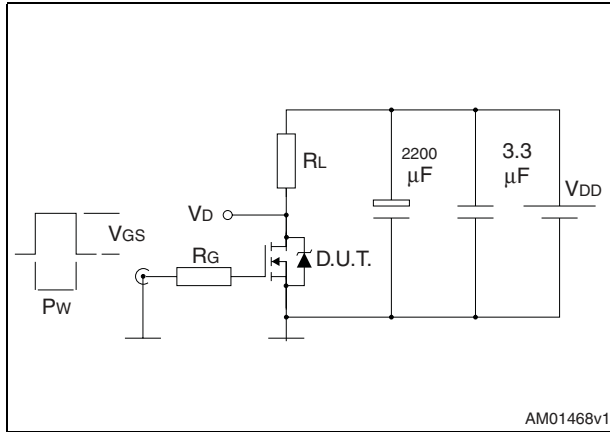


Figure 14. Gate charge test circuit

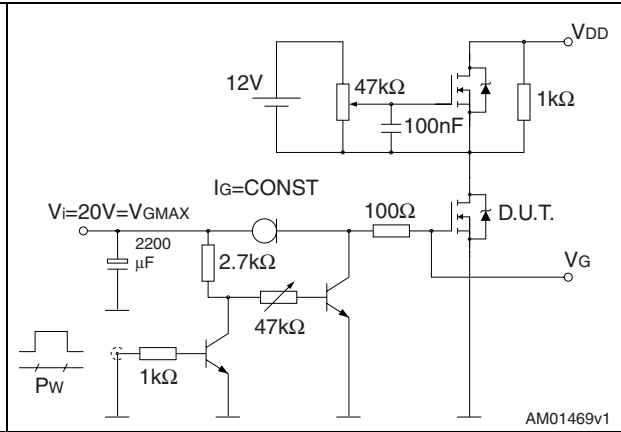


Figure 15. Test circuit for inductive load switching and diode recovery times

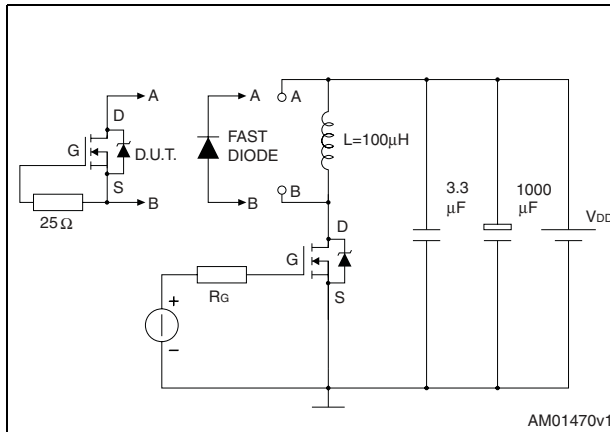


Figure 16. Unclamped inductive load test circuit

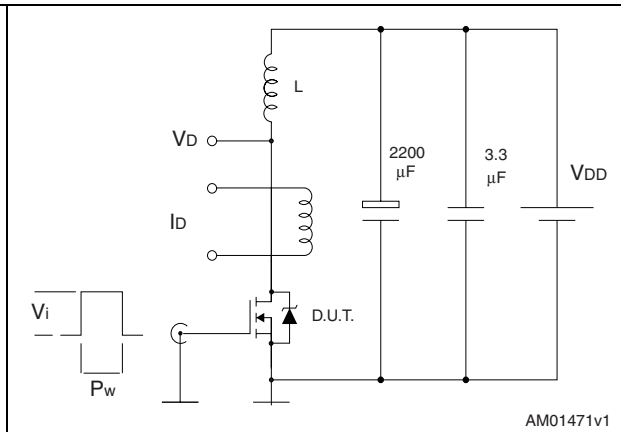


Figure 17. Unclamped inductive waveform

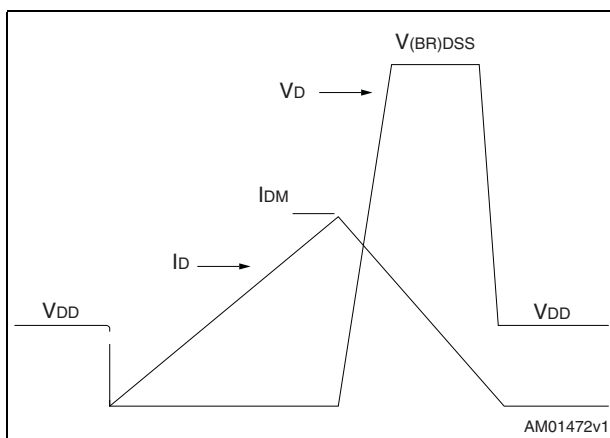
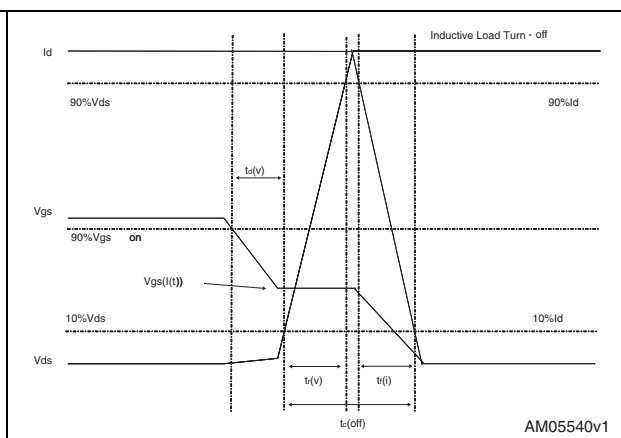


Figure 18. Switching time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in 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 8. PowerFLAT™ (5x6) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.83	0.93
A1		0.02	0.05
A3		0.20	
b	0.35	0.40	0.47
D		5.00	
D1		4.75	
D2	4.15	4.20	4.25
E		6.00	
E1		5.75	
E2	3.43	3.48	3.53
E4	2.58	2.63	2.68
e		1.27	
L	0.70	0.80	0.90

Figure 19. PowerFLAT™ (5x6) drawing

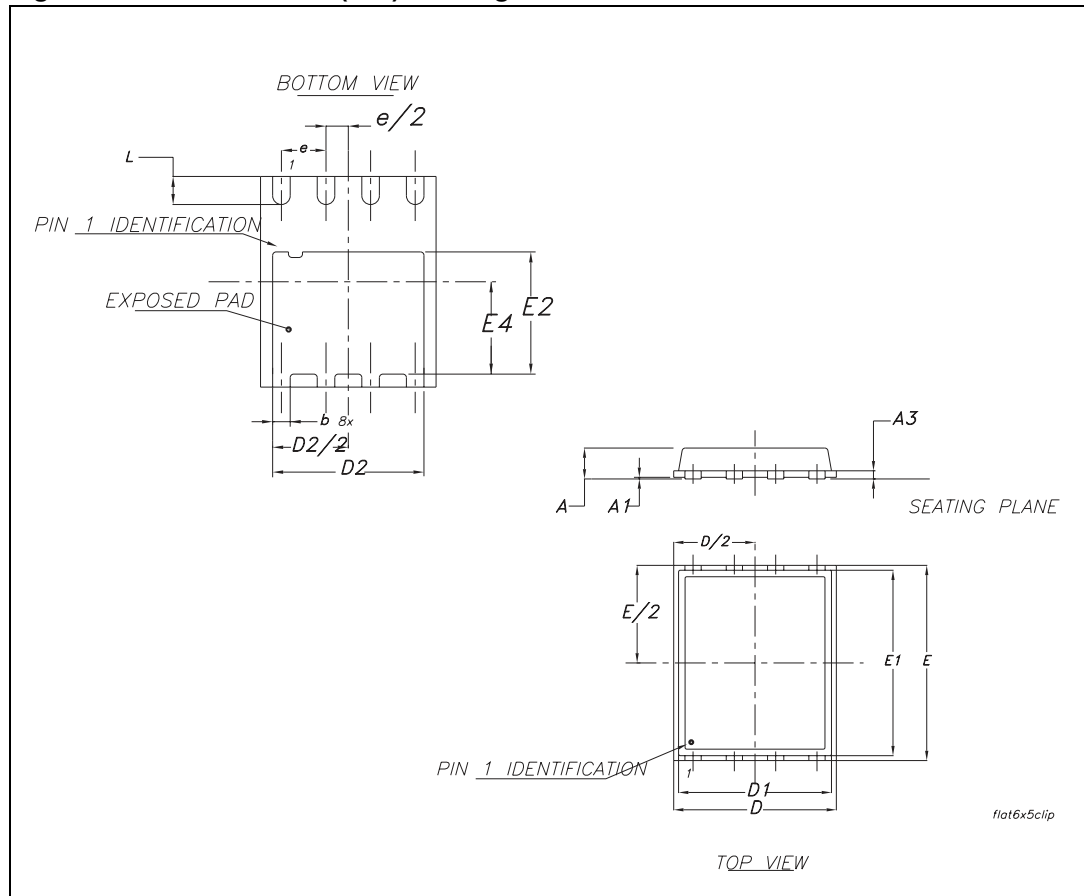
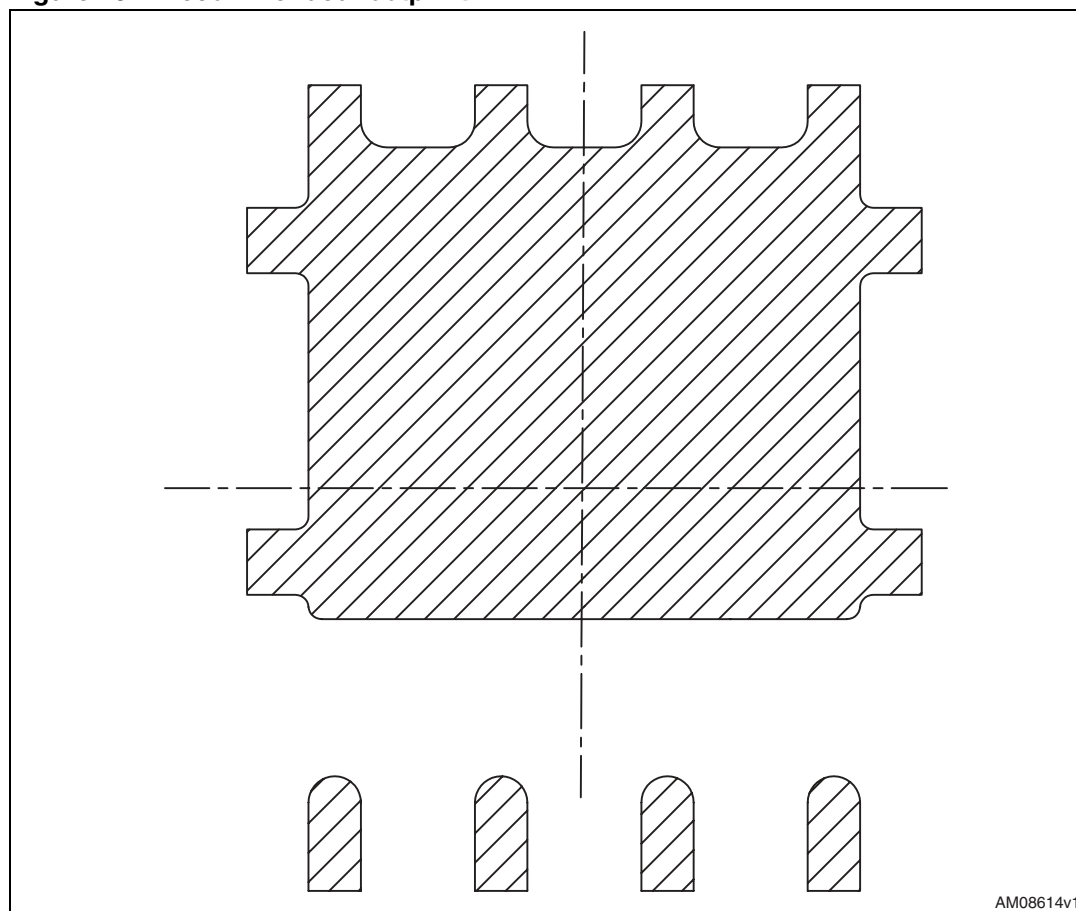


Figure 20. Recommended footprint



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
02-Aug-2010	1	First release.
26-Apr-2011	2	Updated $R_{DS(on)}$ value, and figures 2 , 5 , 7 , 10 , 11 and 12 . Updated Section 4 .

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.

© 2011 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

