



# STL18N55M5

N-channel 550 V, 0.205  $\Omega$ , 13 A PowerFLAT™ 8x8 HV MDmesh™ V Power MOSFET

## Features

Type	V <sub>DSS</sub> @ T <sub>Jmax</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STL18N55M5	600 V	< 0.270 $\Omega$	13 A <sup>(1)</sup>

1. The value is rated according to R<sub>thj-case</sub>

- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

## Application

- Switching applications

## Description

This device is an 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.

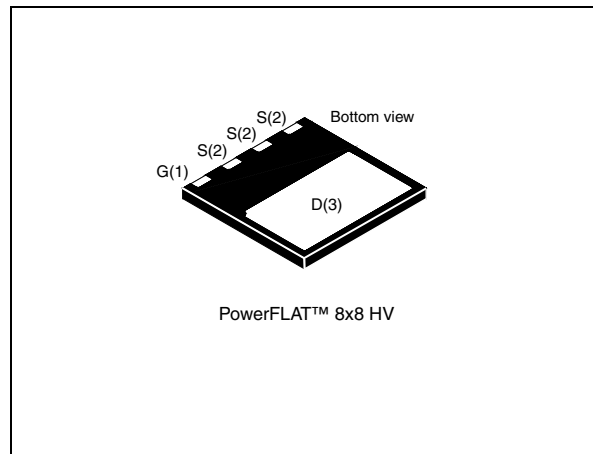


Figure 1. Internal schematic diagram

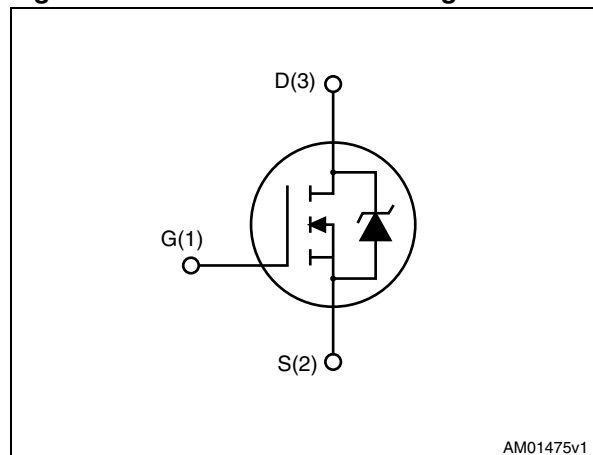


Table 1. Device summary

Order code	Marking	Package	Packaging
STL18N55M5	18N55M5	PowerFLAT™ 8x8 HV	Tape and reel

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	550	V
$V_{GS}$	Gate-source voltage	$\pm 25$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	13	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	8	A
$I_{DM}^{(1),(2)}$	Drain current (pulsed)	52	A
$I_D^{(3)}$	Drain current (continuous) at $T_{amb} = 25\text{ }^\circ\text{C}$	2.4	A
$I_D^{(3)}$	Drain current (continuous) at $T_{amb} = 100\text{ }^\circ\text{C}$	1.5	A
$I_{DM}^{(2),(3)}$	Drain current (pulsed)	9.6	A
$P_{TOT}^{(3)}$	Total dissipation at $T_{amb} = 25\text{ }^\circ\text{C}$	3	W
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	90	W
$I_{AR}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ max)	4	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	200	mJ
$dv/dt^{(4)}$	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. The value is rated according to  $R_{thj-case}$
2. Pulse width limited by safe operating area
3. When mounted on FR-4 board of  $1\text{ inch}^2$ , 2oz Cu
4.  $I_{SD} \leq 13\text{ A}$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ,  $V_{Peak} < V_{(BR)DSS}$ ,  $V_{DD}=400\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.38	$^\circ\text{C}/\text{W}$
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb max	45	$^\circ\text{C}/\text{W}$

1. When mounted on  $1\text{ inch}^2$  FR-4 board, 2 oz Cu

## 2 Electrical characteristics

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

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$ , $V_{GS} = 0$	550			V
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 550\text{ V}$ $V_{DS} = 550\text{ V}$ , $T_C = 125\text{ °C}$ $V_{GS} = 0$			1 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{GS} = \pm 25\text{ V}$ , $V_{DS} = 0$			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	$V_{GS} = 10\text{ V}$ , $I_D = 6\text{ A}$		0.205	0.270	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 100\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	1352	-	pF
$C_{oss}$	Output capacitance			38		pF
$C_{rss}$	Reverse transfer capacitance			3.7		pF
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }440\text{ V}$ , $V_{GS} = 0$	-	98	-	pF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related			35		pF
$R_G$	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	1.7	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 440\text{ V}$ , $I_D = 6.5\text{ A}$ , $V_{GS} = 10\text{ V}$ (see <a href="#">Figure 15</a> )	-	31	-	nC
$Q_{gs}$	Gate-source charge			6.3		nC
$Q_{gd}$	Gate-drain charge			14		nC

- $C_{oss\text{ eq.}}$  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%  $V_{DSS}$
- $C_{oss\text{ eq.}}$  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 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(off)}$	Turn-off delay time	$V_{DD} = 400\text{ V}$ , $I_D = 9\text{ A}$ ,		29		ns
$t_{r(V)}$	Rise time	$R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$	-	9.5	-	ns
$t_{c(off)}$	Cross time	(see <a href="#">Figure 16</a> ),		23		ns
$t_{f(i)}$	Fall time	(see <a href="#">Figure 19</a> )		13		ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		13	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		52	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 13\text{ A}$ , $V_{GS} = 0$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 13\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	-	238		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ (see <a href="#">Figure 16</a> )		2.8		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current			23.5		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 13\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	-	278		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	3.3		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current	(see <a href="#">Figure 16</a> )		24		A

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

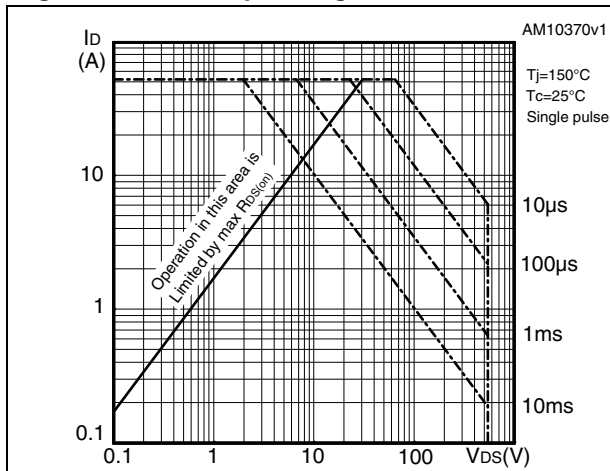


Figure 3. Thermal impedance

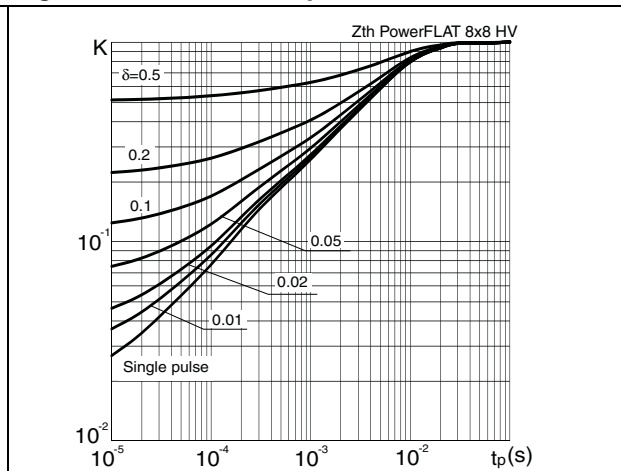


Figure 4. Output characteristics

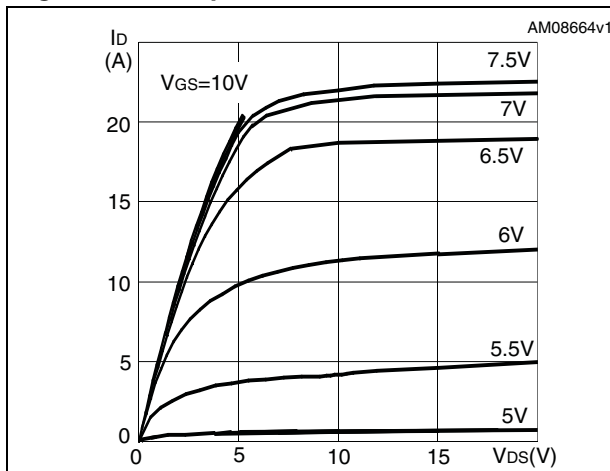


Figure 5. Transfer characteristics

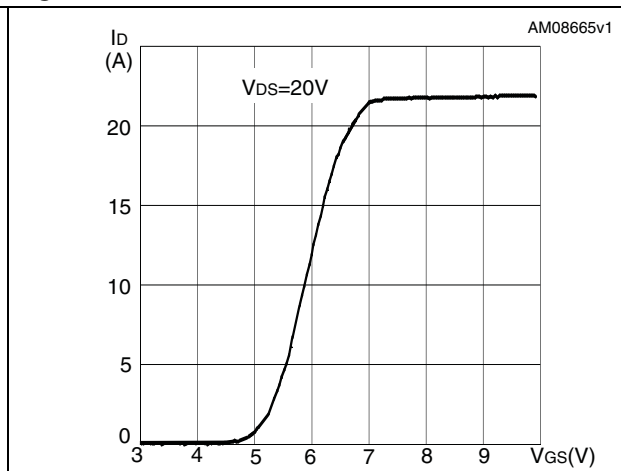


Figure 6. Gate charge vs gate-source voltage

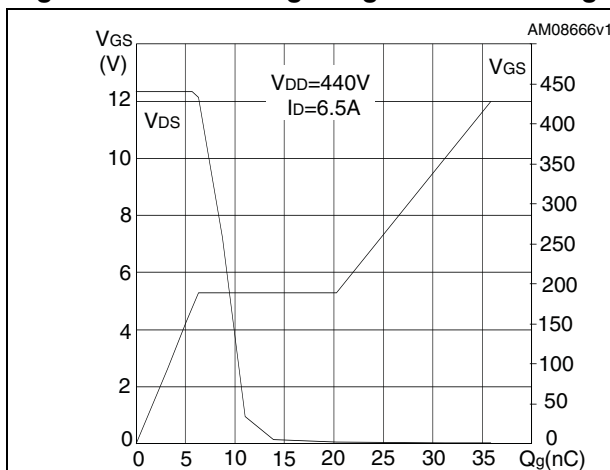


Figure 7. Static drain-source on resistance

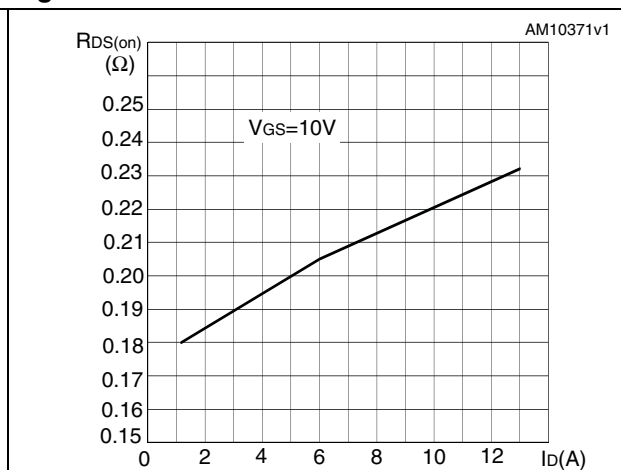


Figure 8. Capacitance variations

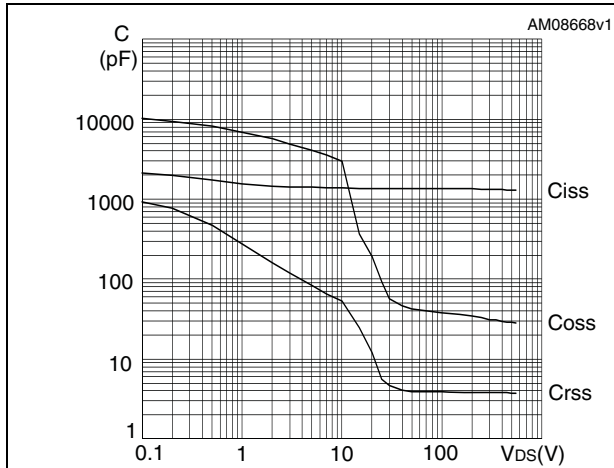


Figure 9. Output capacitance stored energy

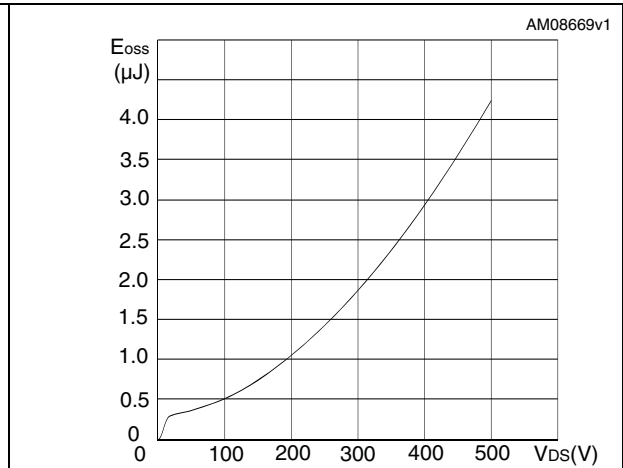


Figure 10. Normalized gate threshold voltage vs temperature

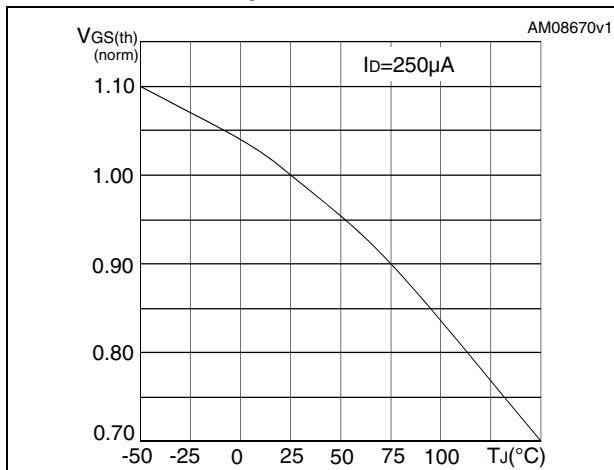


Figure 11. Normalized on resistance vs temperature

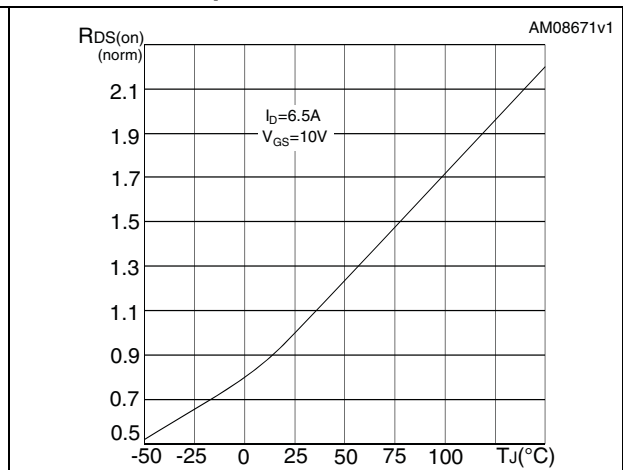


Figure 12. Switching losses vs gate resistance (1)

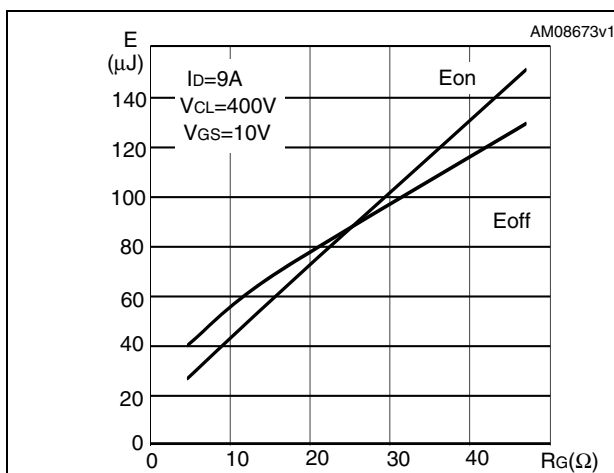
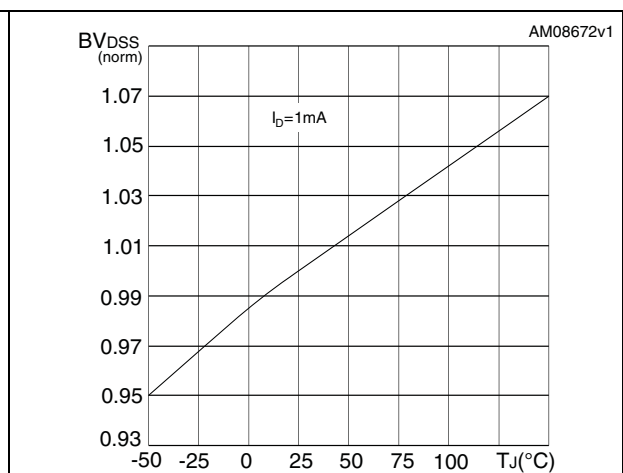


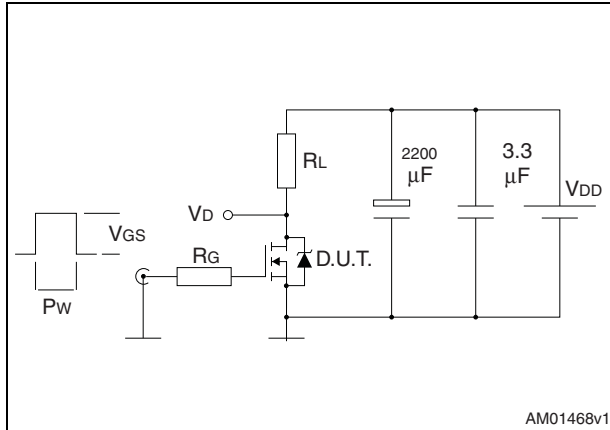
Figure 13. Normalized B<sub>VDS</sub> vs temperature



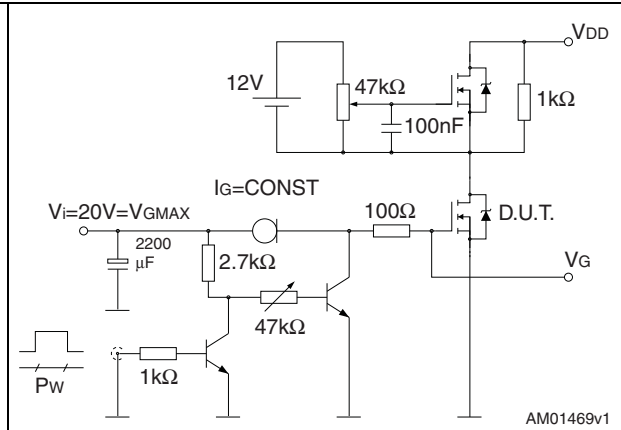
1. Eon including reverse recovery of a SiC diode

### 3 Test circuits

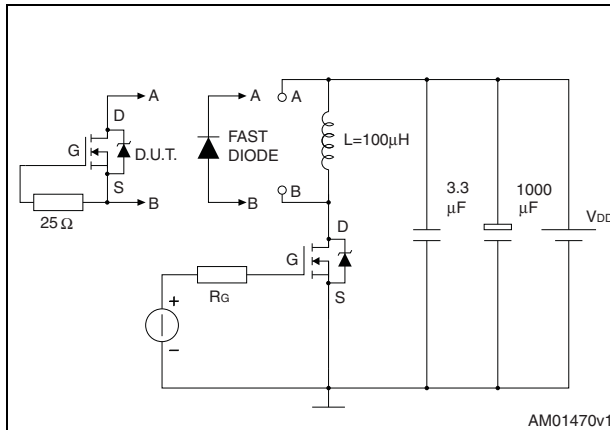
**Figure 14. Switching times test circuit for resistive load**



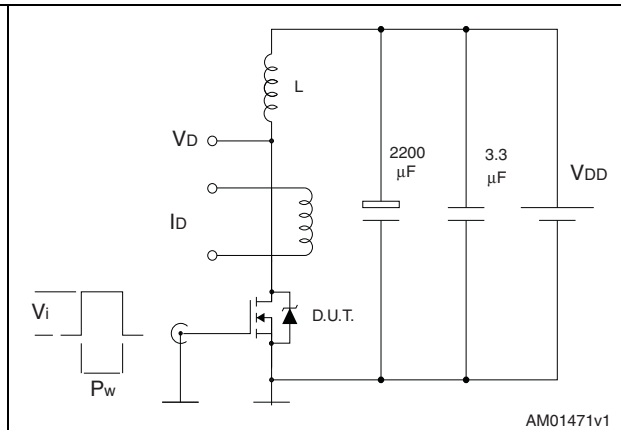
**Figure 15. Gate charge test circuit**



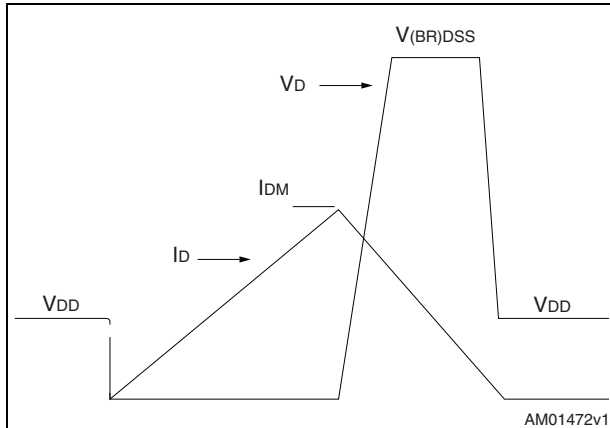
**Figure 16. Test circuit for inductive load switching and diode recovery times**



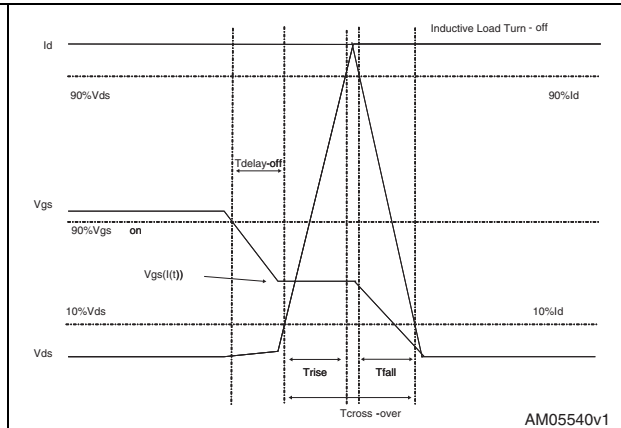
**Figure 17. Unclamped inductive load test circuit**



**Figure 18. Unclamped inductive waveform**



**Figure 19. Switching time waveform**





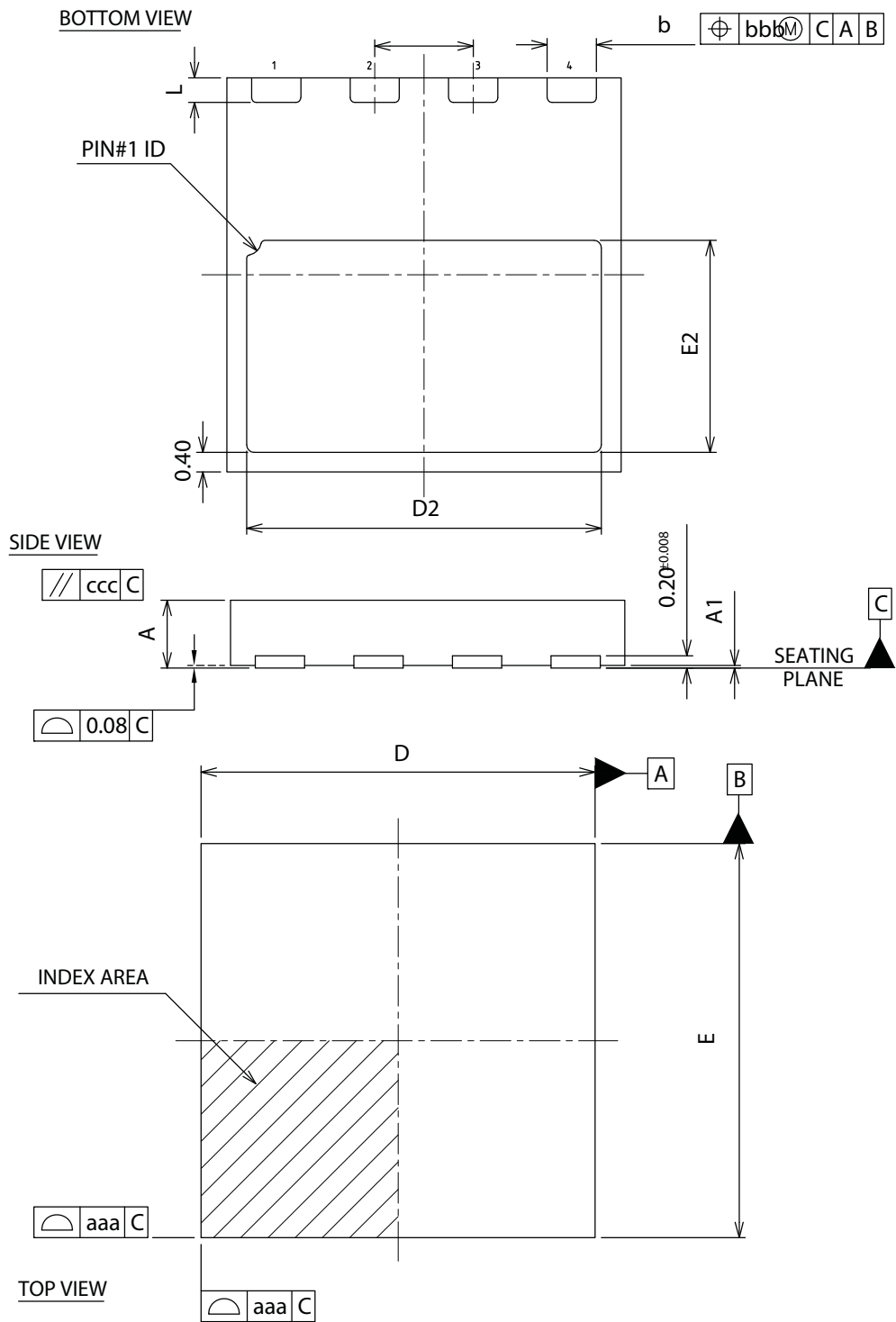
## 4 Package mechanical data

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](http://www.st.com). ECOPACK is an ST trademark.

Table 8. PowerFLAT™ 8x8 HV mechanical data

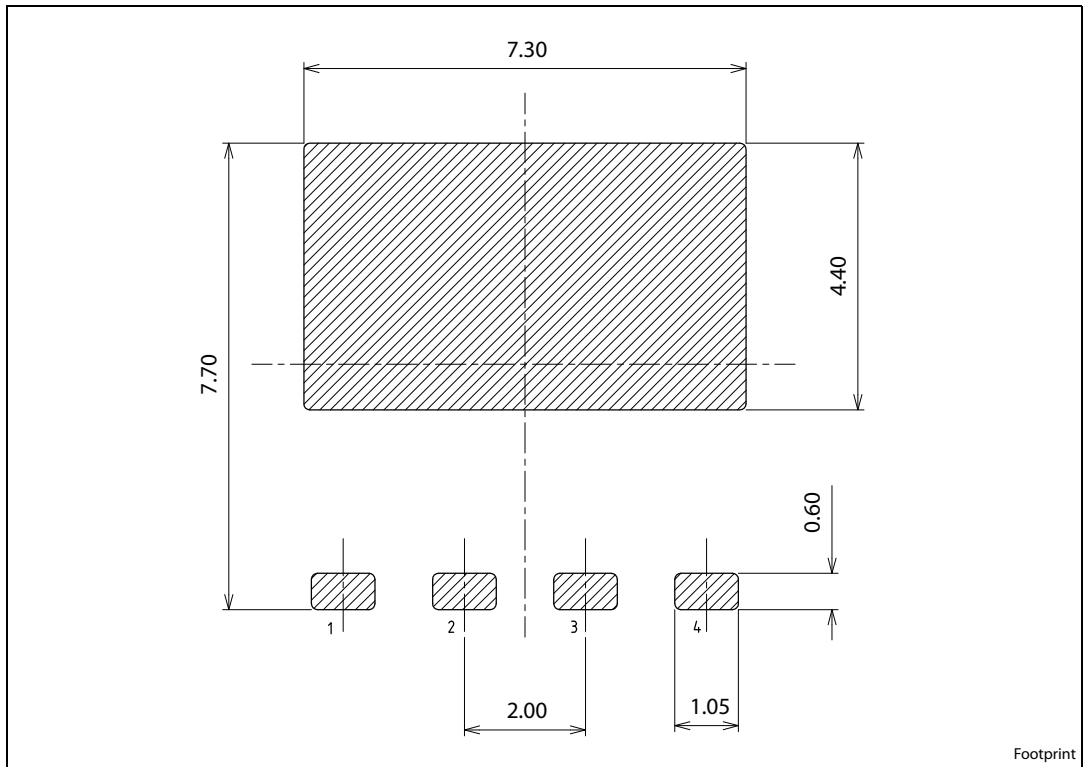
Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.90	1.00
A1	0.00	0.02	0.05
b	0.95	1.00	1.05
D		8.00	
E		8.00	
D2	7.05	7.20	7.30
E2	4.15	4.30	4.40
e		2.00	
L	0.40	0.50	0.60
aaa		0.10	
bbb		0.10	
ccc		0.10	

Figure 20. PowerFLAT™ 8x8 HV drawing mechanical data



8222871\_Rev\_B

Figure 21. PowerFLAT™ 8x8 HV recommended footprint



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
03-May-2010	1	First release
04-Oct-2011	2	<i>Section 4: Package mechanical data</i> has been updated Document status promoted from preliminary data to datasheet Inserted new section: <i>Electrical characteristics (curves)</i> Minor text changes.

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