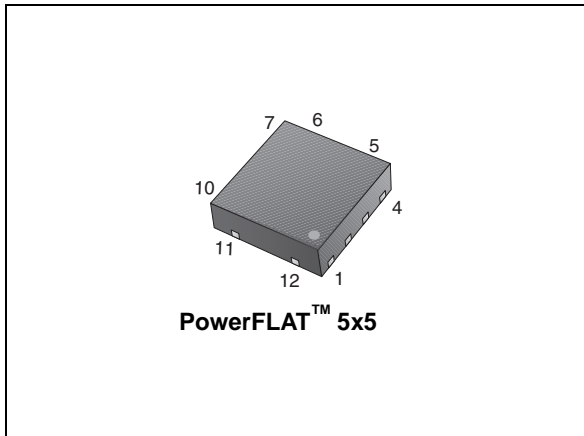


N-channel 650 V, 0.475 Ω typ., 8.5 A MDmesh™ M5 Power MOSFET in a PowerFLAT™ 5x5 package

Datasheet - production data



Features

Order code	$V_{DS} @ T_{j \max.}$	$R_{DS(on) \max}$	I_D
STL11N65M5	710 V	0.530 Ω	8.5 A

- Extremely low $R_{DS(on)}$
- Low gate charge and input capacitance
- Excellent switching performance
- 100% avalanche tested

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET based on MDmesh™ M5 innovative vertical process technology combined with the well-known PowerMESH™ horizontal layout. The resulting product offers extremely low on-resistance, making it particularly suitable for applications requiring high power and superior efficiency.

Figure 1. Internal schematic diagrams

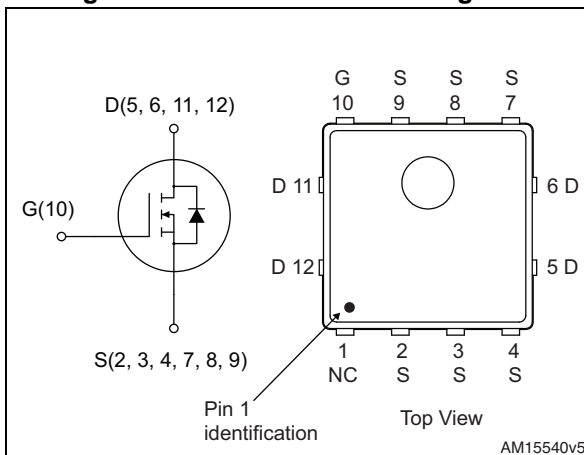


Table 1. Device summary

Order code	Marking	Package	Packaging
STL11N65M5	11N65M5	PowerFLAT™ 5x5	Tape and reel

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	13

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	650	V
V_{GS}	Gate-source voltage	± 25	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	8.5	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	4.9	A
$I_{DM}^{(1),(2)}$	Drain current (pulsed)	34	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb}=25^\circ\text{C}$	1.35	A
$I_{D(3)}$	Drain current (continuous) at $T_{pcb}=100^\circ\text{C}$	0.86	A
$I_{DM(2),(3)}$	Drain current (pulsed)	5.4	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	70	W
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	1.9	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	130	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		$^\circ\text{C}$

- Limited by maximum junction temperature
- Pulse width limited by safe operating area.
- When mounted on FR-4 Board of 1 inch², 2 oz Cu ($t < 100\text{ s}$)
- $I_{SD} \leq 8.5\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{Peak} \leq V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$.

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.78	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	58.5	$^\circ\text{C}/\text{W}$

- When mounted on 1inch² FR-4 board, 2 oz Cu, $t < 100\text{ sec}$

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 ($V_{GS} = 0$)	$I_D = 1\text{ mA}$	650			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 650\text{ V}$			1	μA
		$V_{DS} = 650\text{ V}, T_C = 125\text{ °C}$			100	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	$V_{GS} = 10\text{ V}, I_D = 4.25\text{ A}$		0.475	0.530	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	644	-	pF
C_{oss}	Output capacitance		-	18	-	pF
C_{rss}	Reverse transfer capacitance		-	2.5	-	pF
$C_{o(tr)}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }520\text{ V}, V_{GS} = 0$	-	55	-	pF
$C_{o(er)}^{(2)}$	Equivalent capacitance energy related		-	17	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz open drain}$	-	5	-	Ω
Q_g	Total gate charge	$V_{DD} = 520\text{ V}, I_D = 4.5\text{ A}, V_{GS} = 10\text{ V}$ (see Figure 16)	-	17	-	nC
Q_{gs}	Gate-source charge		-	4.6	-	nC
Q_{gd}	Gate-drain charge		-	8.5	-	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
$t_{d(v)}$	Voltage delay time	$V_{DD} = 400\text{ V}$, $I_D = 6\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 17), (see Figure 20)	-	23	-	ns
$t_{r(v)}$	Voltage rise time		-	10	-	ns
$t_{f(i)}$	Current fall time		-	13.5	-	ns
$t_{c(off)}$	Crossing time		-	13	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}^{(1)}$	Source-drain current		-		8.5	A
$I_{SDM}^{(1)(2)}$	Source-drain current (pulsed)		-		34	A
$V_{SD}^{(3)}$	Forward on voltage	$I_{SD} = 8.5\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 8.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 60\text{ V}$ (see Figure 17)	-	232		ns
Q_{rr}	Reverse recovery charge		-	2		μC
I_{RRM}	Reverse recovery current		-	17.5		A
t_{rr}	Reverse recovery time	$I_{SD} = 8.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 17)	-	328		ns
Q_{rr}	Reverse recovery charge		-	2.8		μC
I_{RRM}	Reverse recovery current		-	17		A

1. Limited by maximum junction temperature
2. Pulse width limited by safe operating area
3. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

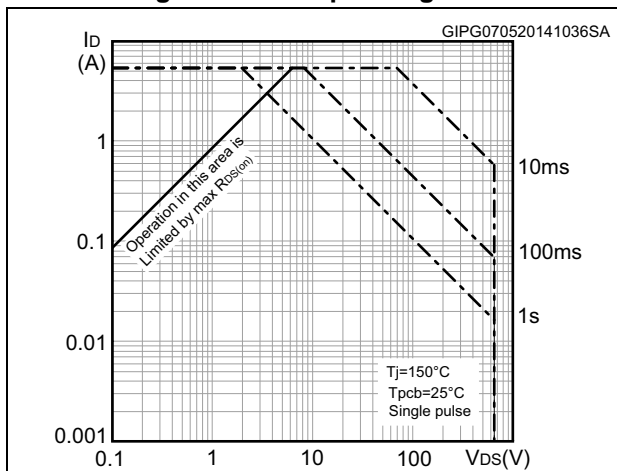


Figure 3. Thermal impedance

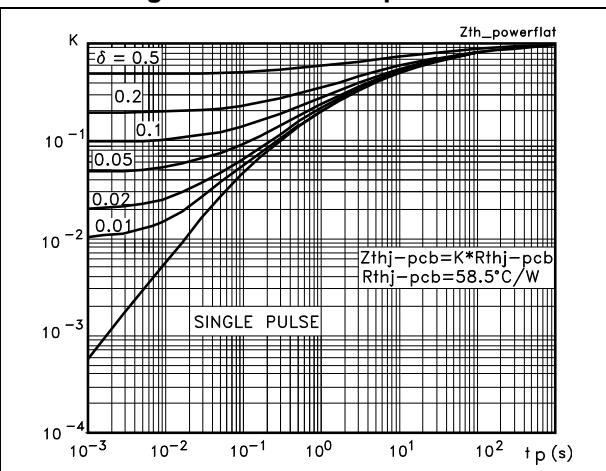


Figure 4. Output characteristics

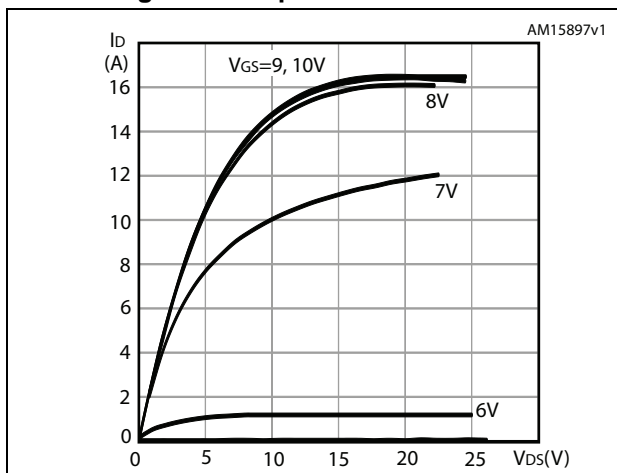


Figure 5. Transfer characteristics

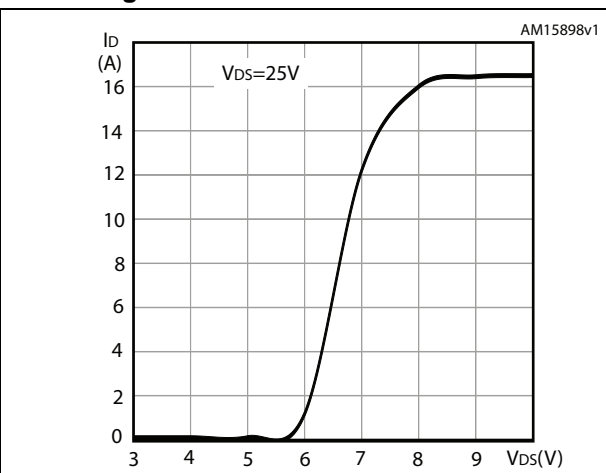


Figure 6. Static drain-source on-resistance

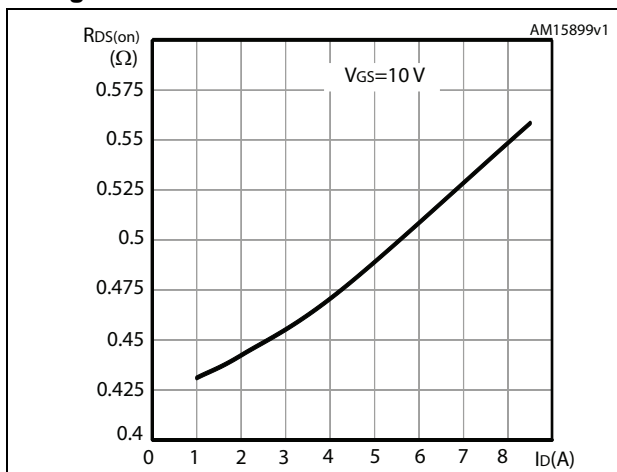


Figure 7. Gate charge vs gate-source voltage

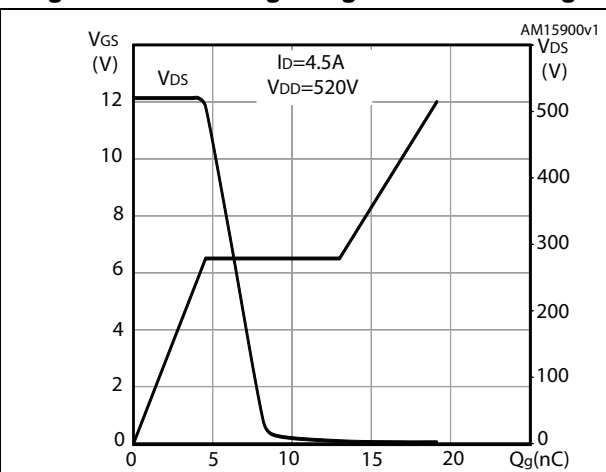


Figure 8. Capacitance variations

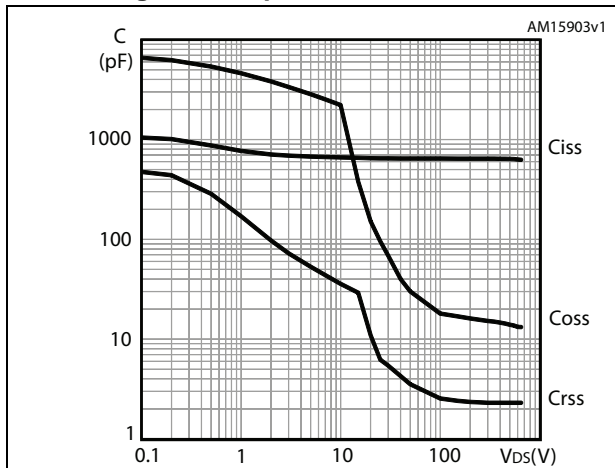


Figure 9. Output capacitance stored energy

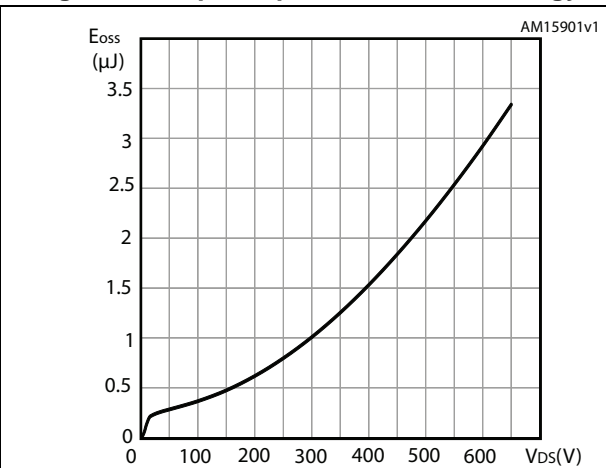


Figure 10. Normalized gate threshold voltage vs temperature

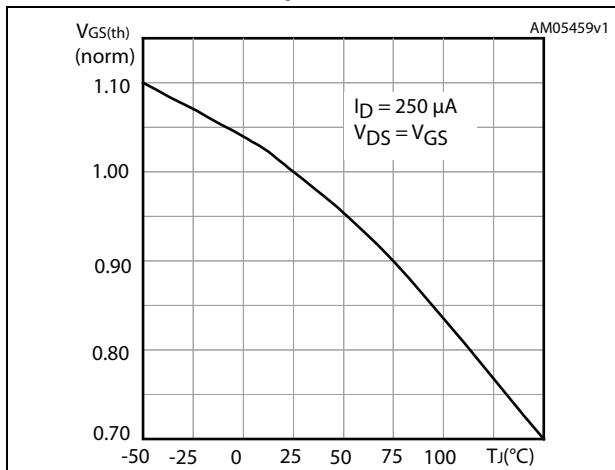


Figure 11. Normalized on-resistance vs temperature

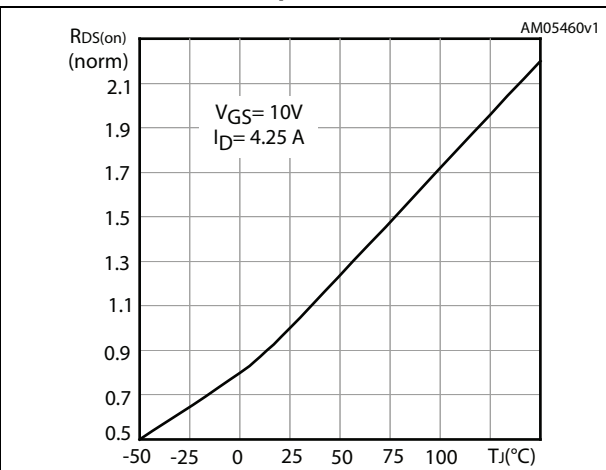


Figure 12. Source-drain diode forward characteristics

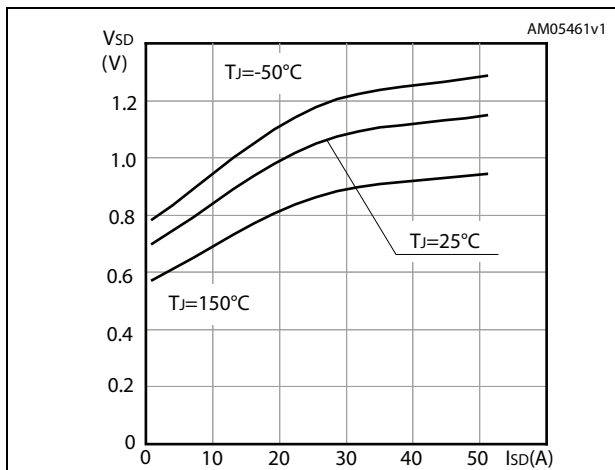


Figure 13. Normalized V(BR)DSS vs temperature

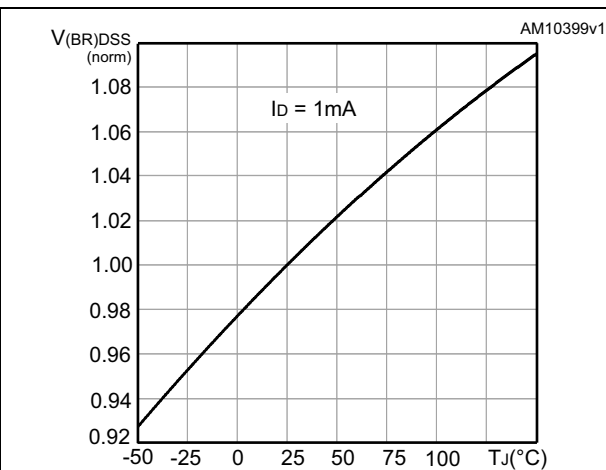
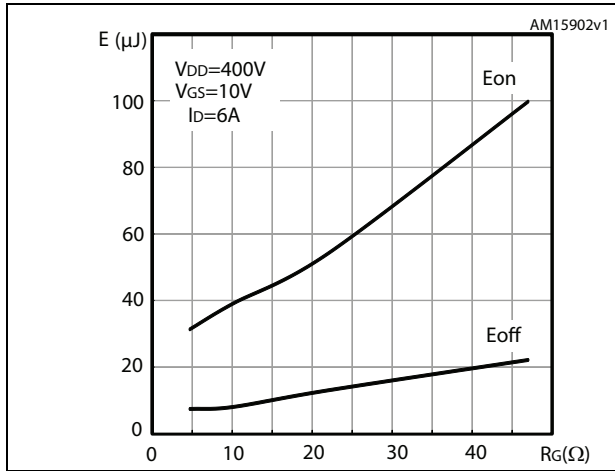


Figure 14. Switching losses vs gate resistance (1)



1. Eon including reverse recovery of a SiC diode

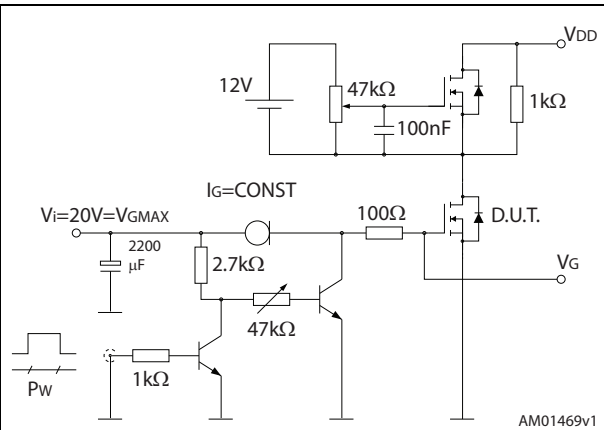
3 Test circuits

Figure 15. Switching times test circuit for resistive load



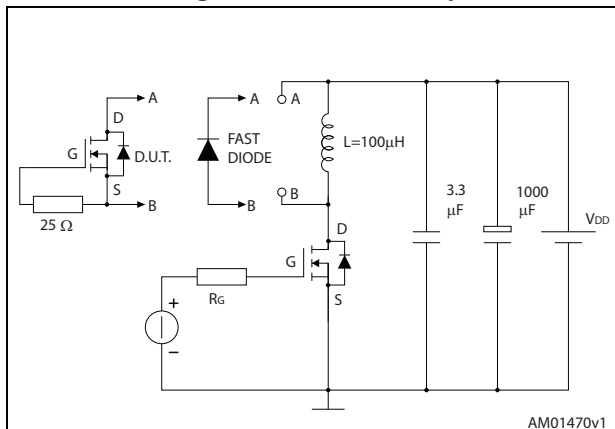
AM01468v1

Figure 16. Gate charge test circuit



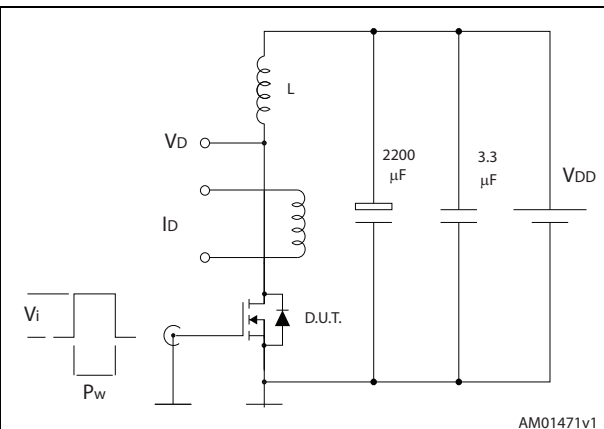
AM01469v1

Figure 17. Test circuit for inductive load switching and diode recovery times



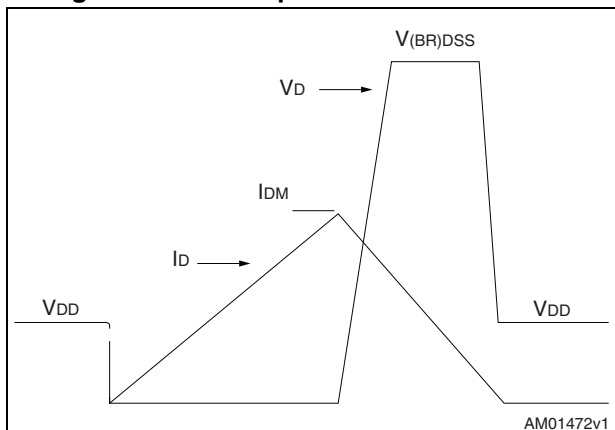
AM01470v1

Figure 18. Unclamped inductive load test circuit



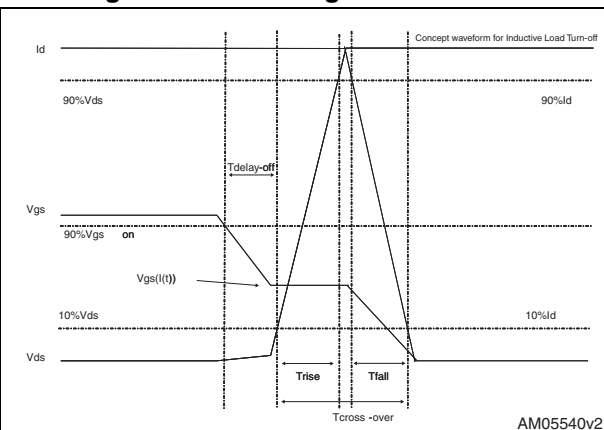
AM01471v1

Figure 19. Unclamped inductive waveform



AM01472v1

Figure 20. 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.

Figure 21. PowerFLAT™ 5x5 type S mechanical drawing

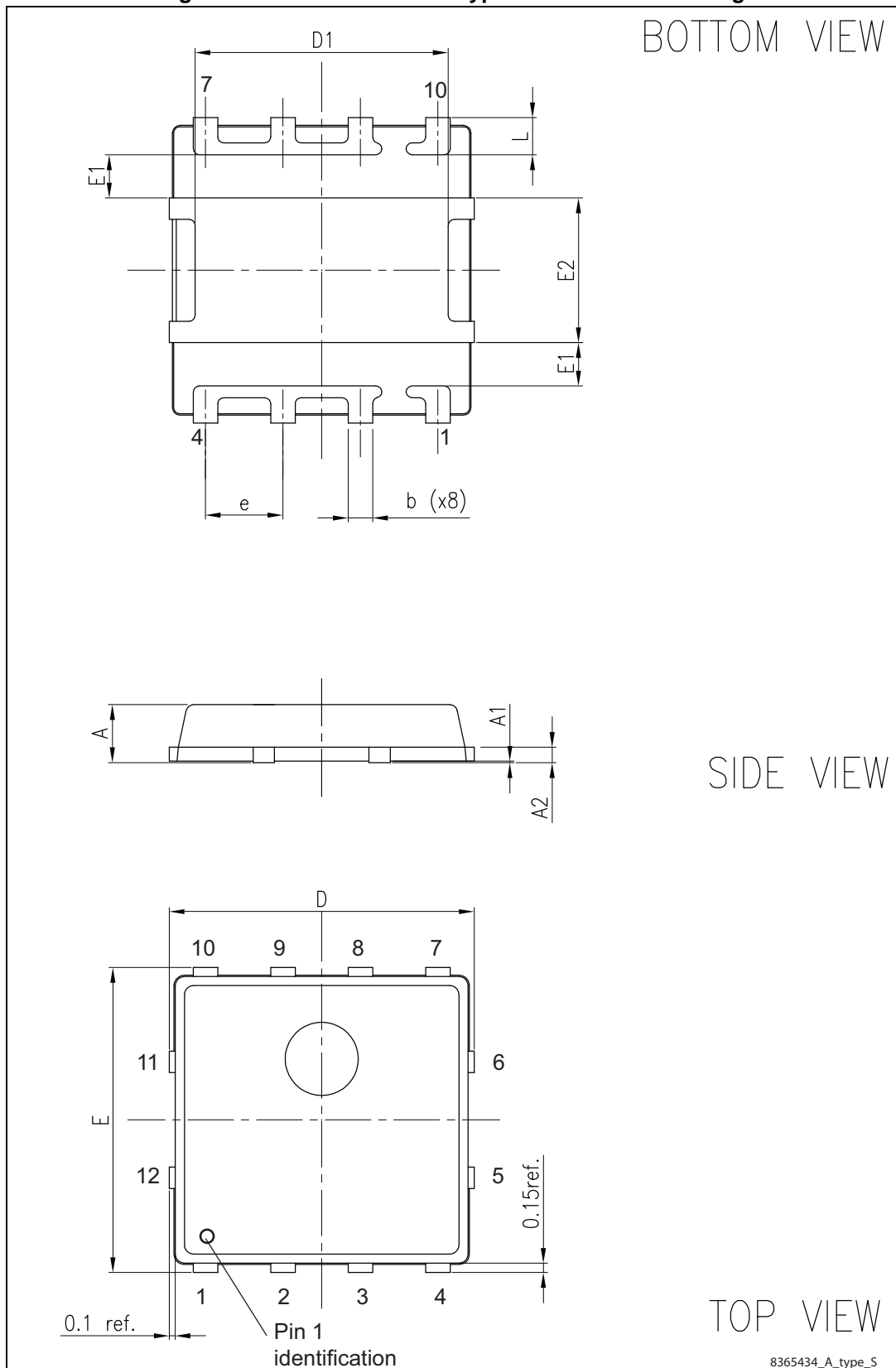
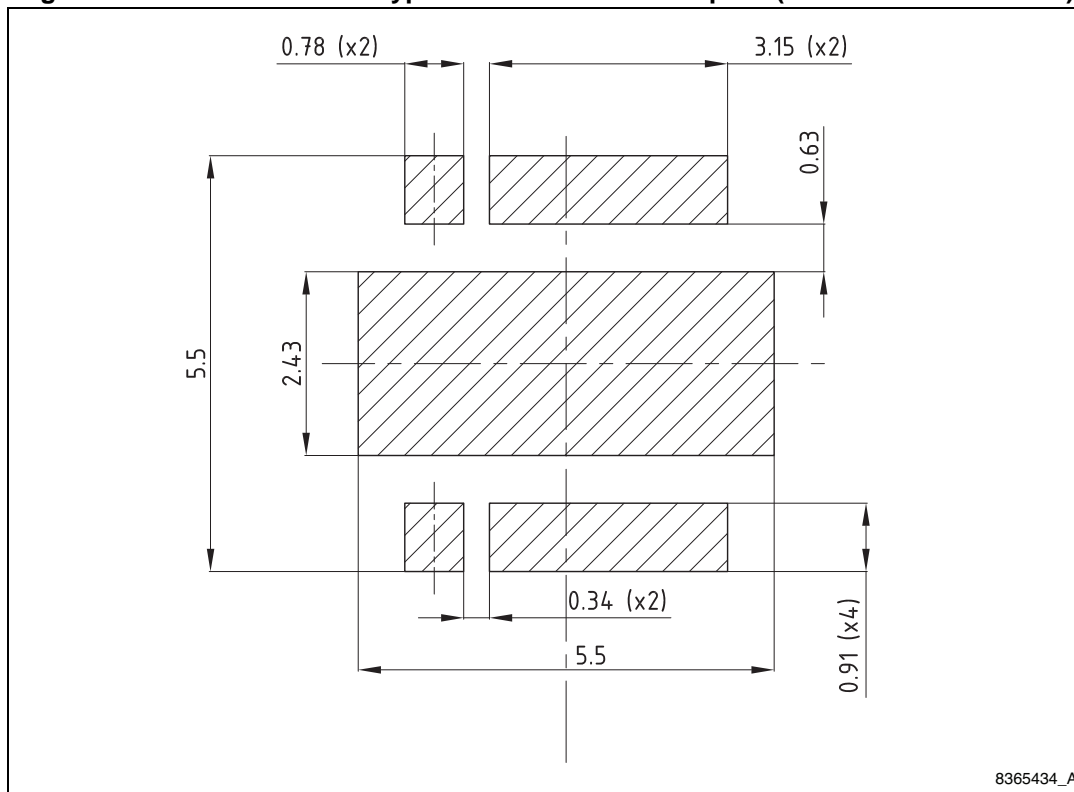


Table 8. PowerFLAT™ 5x5 type S mechanical dimensions

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.0
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D		5.00	
D1	4.05		4.25
E		5.00	
E1	0.64		0.79
E2	2.25		2.45
e		1.27	
L	0.45		0.75

Figure 22. PowerFLAT™ 5x5 type S recommended footprint (dimensions are in mm)



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
09-May-2014	1	First release
29-Sep-2014	2	Updated title, features and description in cover page. Document status promoted from preliminary to production data.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2014 STMicroelectronics – All rights reserved



Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331