

Automotive-grade dual N-channel 60 V, 22.5 mΩ typ., 7.8 A STripFET™ III Power MOSFET in a PowerFLAT™ 5x6 double island package

Datasheet — production data

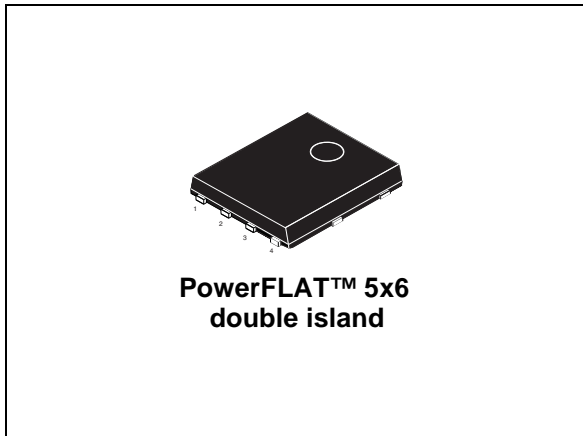
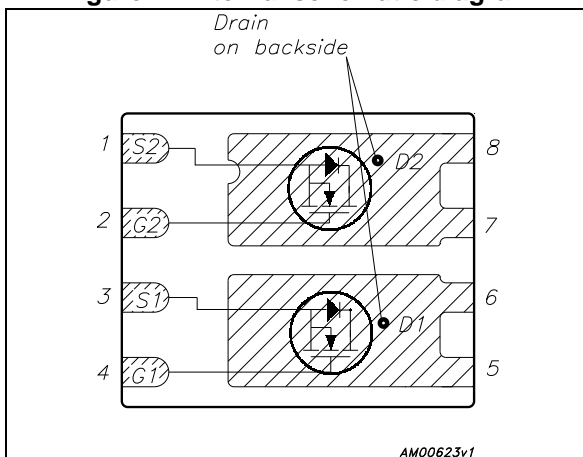


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL8DN6LF3	60 V	30 mΩ	7.8 A

- Designed for automotive applications and AEC-Q101 qualified
- Logic level V_{GS(th)}
- 175 °C junction temperature
- 100% avalanche rated
- Wettable flank package

Applications

- Switching applications

Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Packages ⁽¹⁾	Packaging
STL8DN6LF3	8DN6LF3	PowerFLAT™ 5x6 double island	Tape and reel

1. For wettable flank option, please contact ST sale offices

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	Packaging mechanical data	15
6	Revision history	17

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1),(2)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	20	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	20	A
$I_D^{(4)}$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	7.8	A
$I_D^{(4)}$	Drain current (continuous) at $T_{pcb}=100^\circ\text{C}$	5.5	A
$I_{DM}^{(3),(4)}$	Drain current (pulsed)	31.2	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	65	W
$P_{TOT}^{(4)}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4.3	W
I_{AV}	Not-repetitive avalanche current	7.8	A
$E_{AS}^{(5)}$	Single pulse avalanche energy	190	mJ
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature		$^\circ\text{C}$

1. Specified by design. Not subject to production test.
2. Current is limited by bonding, with an $R_{thJC} = 2.3^\circ\text{C/W}$ the chip is able to carry 30 A at 25°C .
3. Pulse width limited by safe operating area
4. When mounted on FR-4 board of 1inch^2 , 2oz Cu, $t < 10\text{ sec}$
5. Starting $T_J = 25^\circ\text{C}$, $I_D = 8\text{ A}$, $V_{DD} = 25\text{ V}$, per channel, 100% tested.

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.3	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	35	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1inch^2 , 2oz Cu, $t < 10\text{ sec}$

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ($V_{GS} = 0$)	$I_D = 250\text{ }\mu\text{A}$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60\text{ V}$			1	μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 10\text{ V}$, $I_D = 4\text{ A}$		22.5	30	$\text{m}\Omega$
		$V_{GS} = 5\text{ V}$, $I_D = 4\text{ A}$		30	44	$\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	668	-	pF
C_{oss}	Output capacitance		-	144	-	pF
C_{rss}	Reverse transfer capacitance		-	14	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 7.8\text{ A}$	-	13	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$	-	2.4	-	nC
Q_{gd}	Gate-drain charge	Figure 15	-	3	-	nC
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	4	-	Ω

Table 6. Switching times

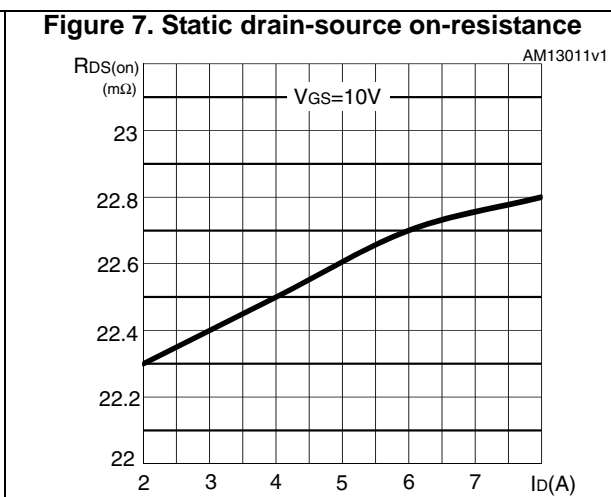
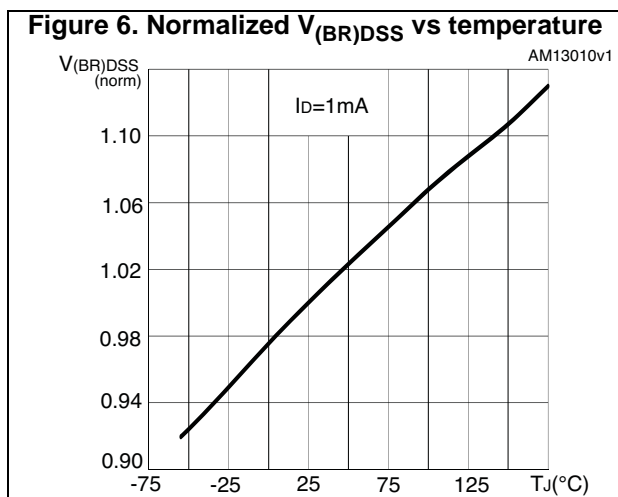
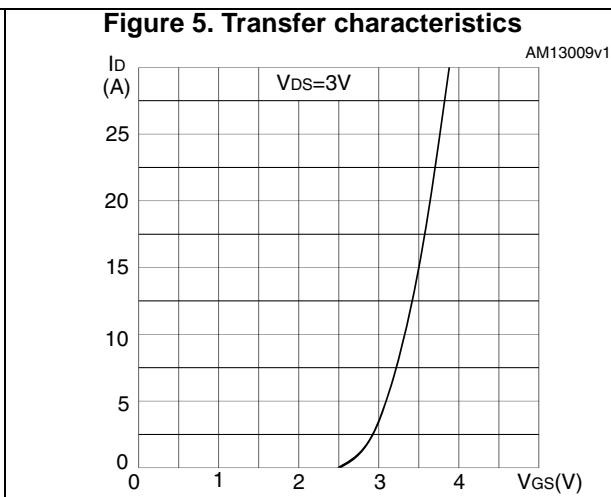
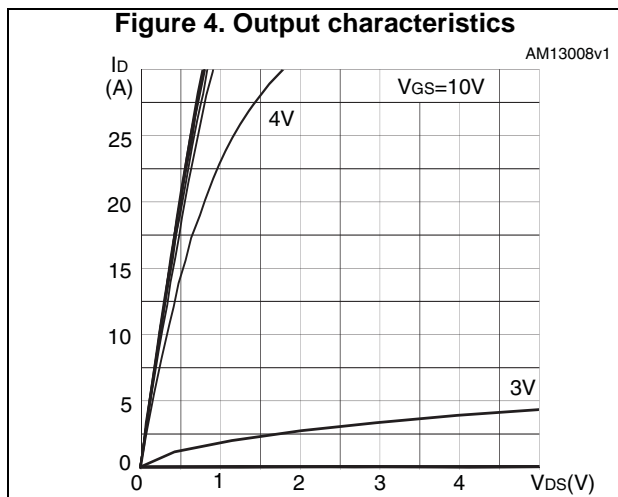
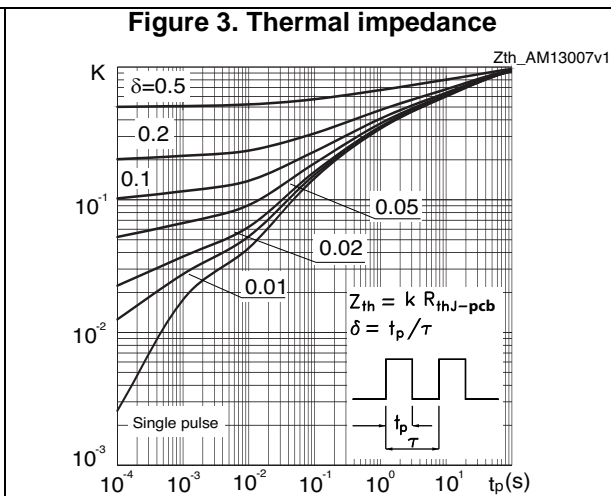
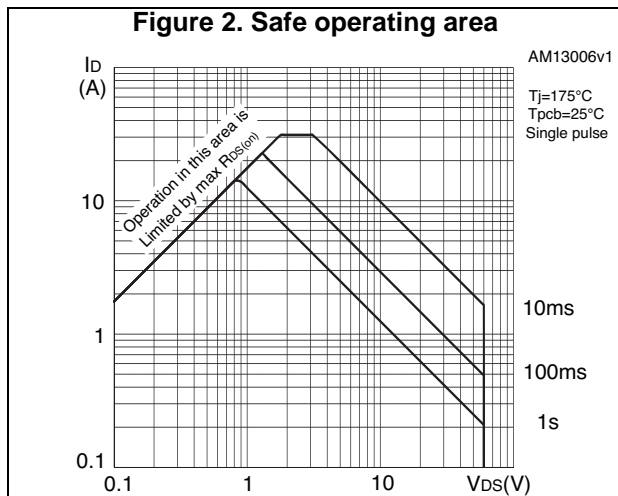
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 4\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ Figure 14	-	9	-	ns
t_r	Rise time		-	7.7	-	ns
$t_{d(off)}$	Turn-off delay time		-	32.5	-	ns
t_f	Fall time		-	5	-	ns

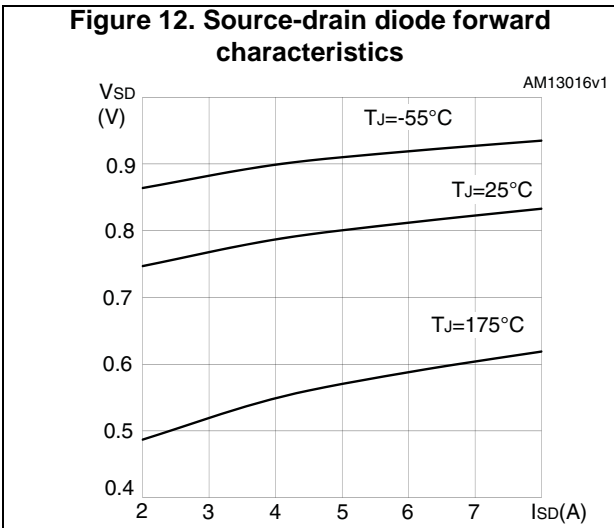
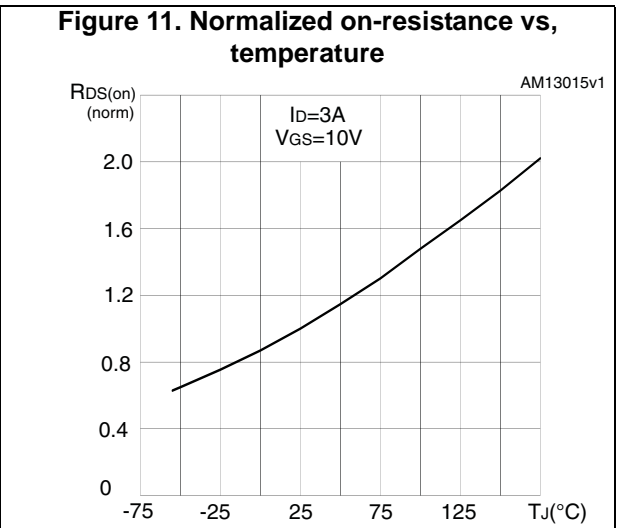
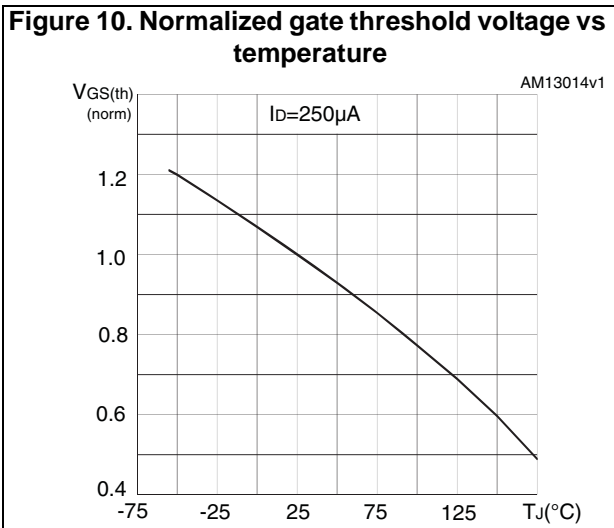
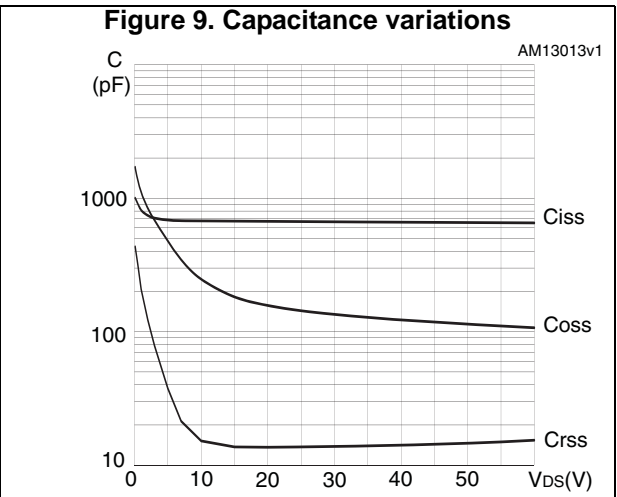
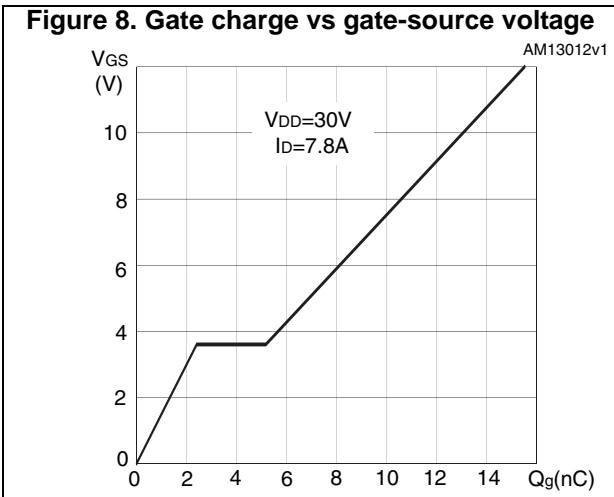
Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current		-		7.8	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		31.2	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 7.8 \text{ A}, V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 7.8 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 48 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	30		ns
Q_{rr}	Reverse recovery charge		-	35		nC
I_{RRM}	Reverse recovery current		-	2.35		A

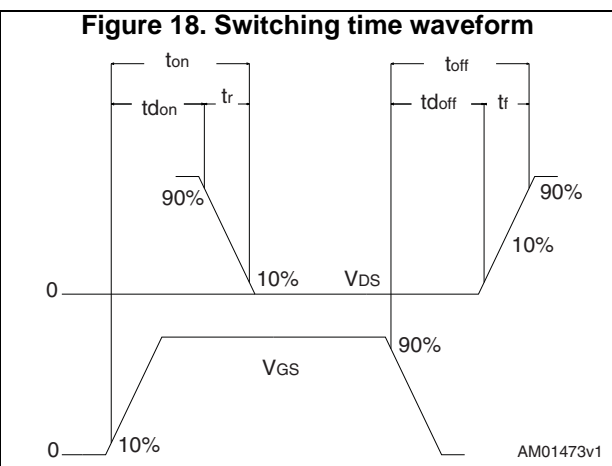
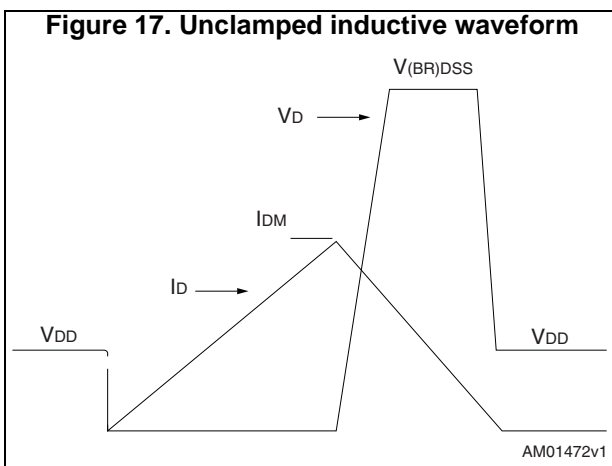
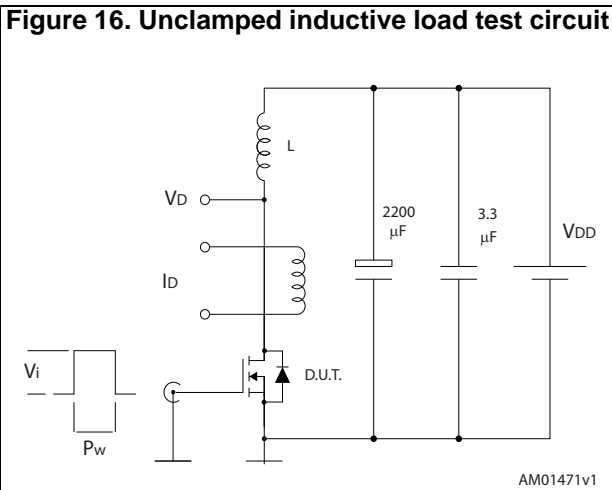
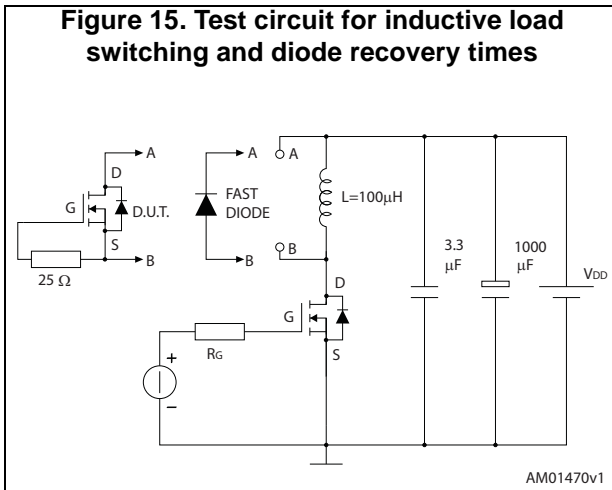
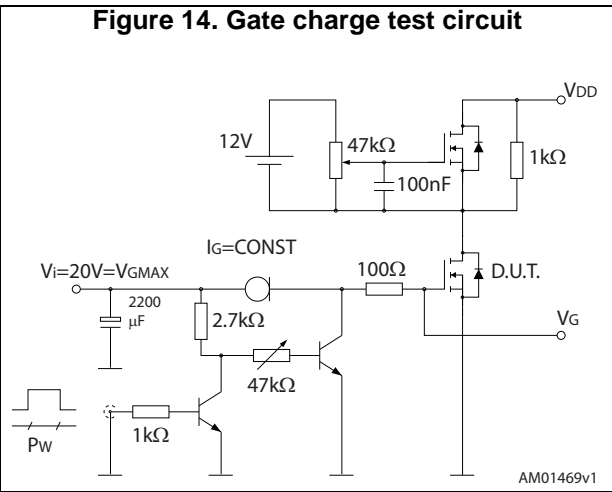
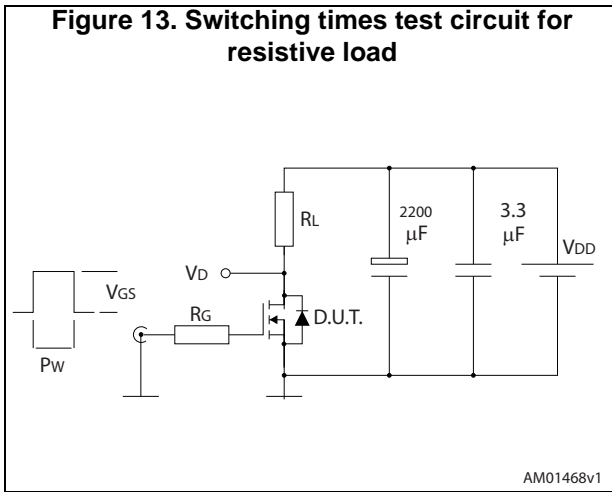
1. Pulse width limited by safe operating area
2. Pulsed: pulse duration= 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)





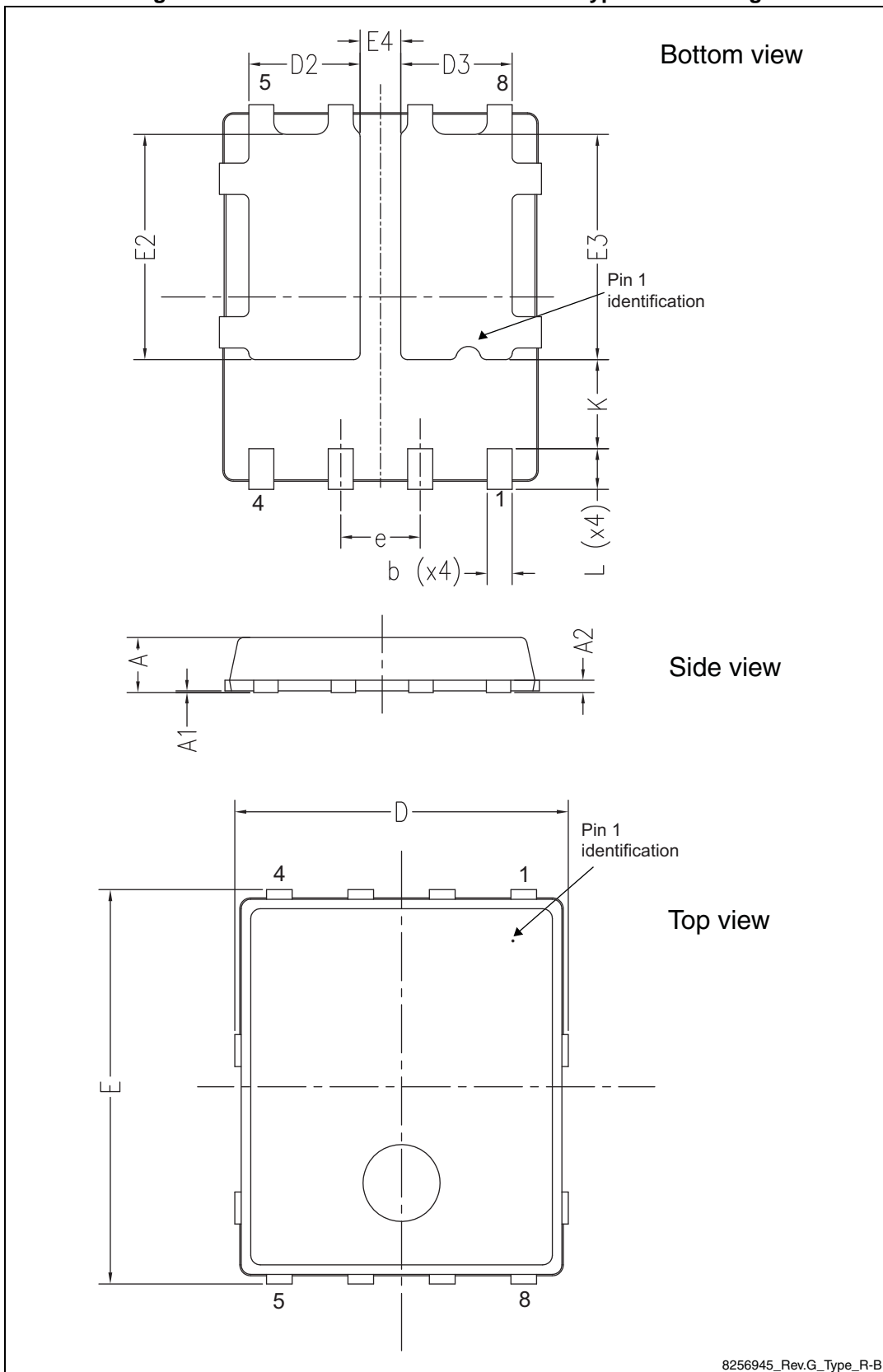
3 Test circuits



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 19. PowerFLAT™ 5x6 double island type R-B drawing



8256945_Rev.G_Type_R-B

Table 8. PowerFLAT™ 5x6 double island type R-B mechanical data

Ref.	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D	5.00	5.20	5.40
E	5.95	6.15	6.35
D2	1.68		1.88
E2	3.50		3.70
D3	1.68		1.88
E3	3.50		3.70
E4	0.55		0.75
e		1.27	
L	0.60		0.80
K	1.275		1.575

Figure 20. PowerFLAT 5x6 double island type WF drawing

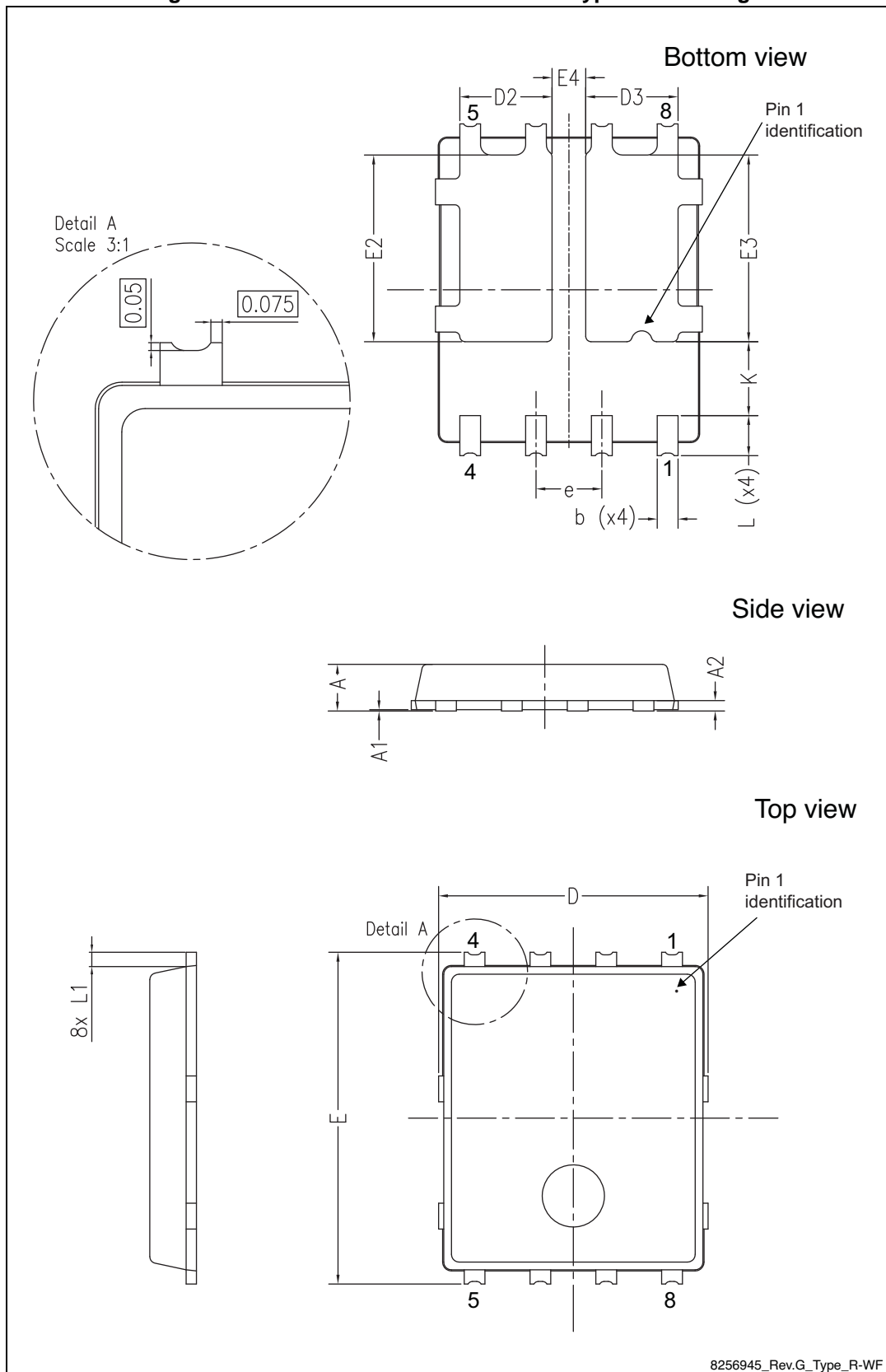
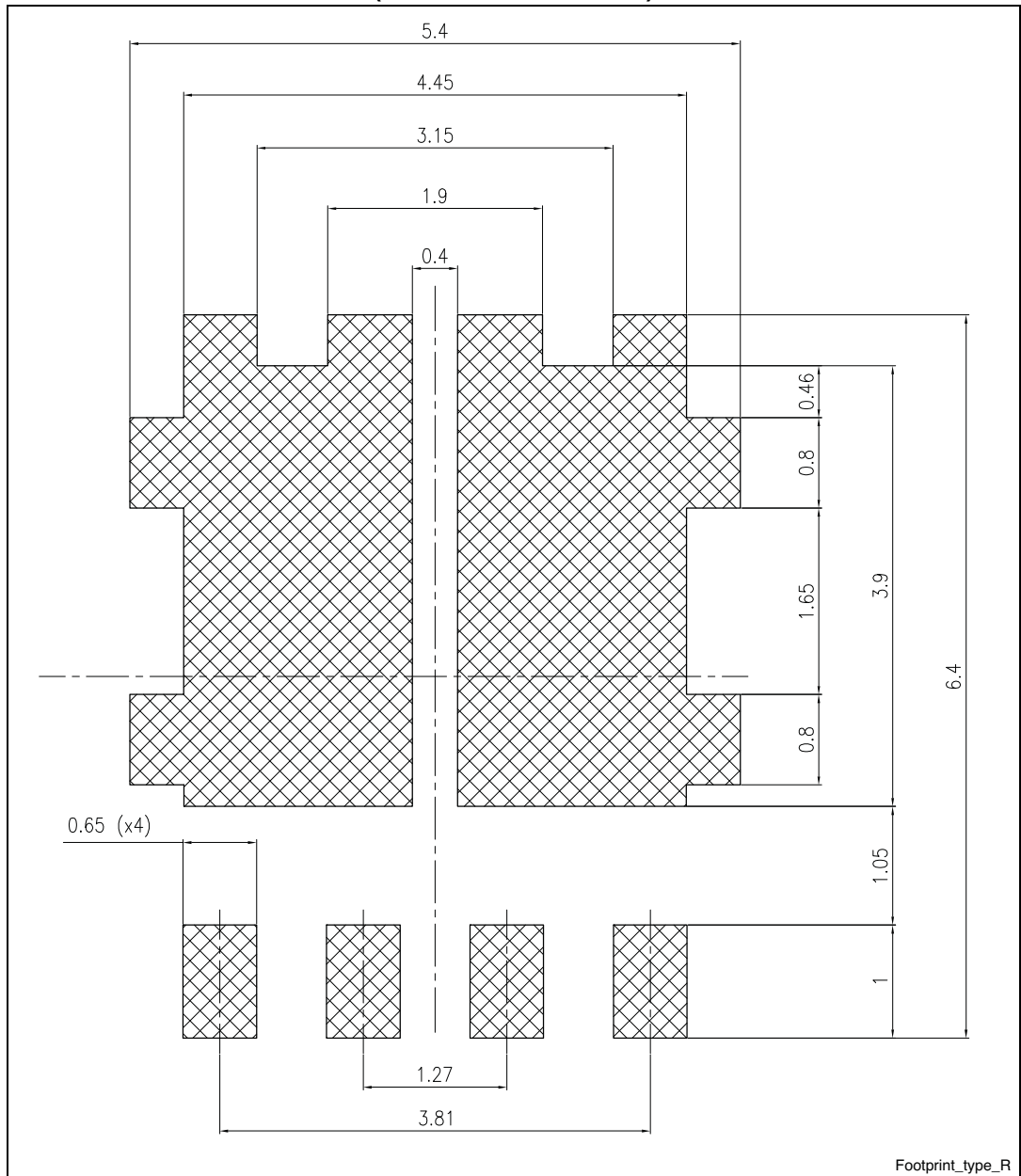


Table 9. PowerFLAT 5x6 double island type WF mechanical data

Ref.	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D	5.00	5.20	5.40
E	6.20	6.40	6.60
D2	1.68		1.88
E2	3.50		3.70
D3	1.68		1.88
E3	3.50		3.70
E4	0.55		0.75
e		1.27	
L	0.70		0.90
L1		0.275	
K	1.275		1.575

Figure 21. PowerFLAT™ 5x6 double island type R drawing recommended footprint (dimensions are in mm)



5 Packaging mechanical data

Figure 22. PowerFLAT™ 5x6 double island type R-B tape^(a)

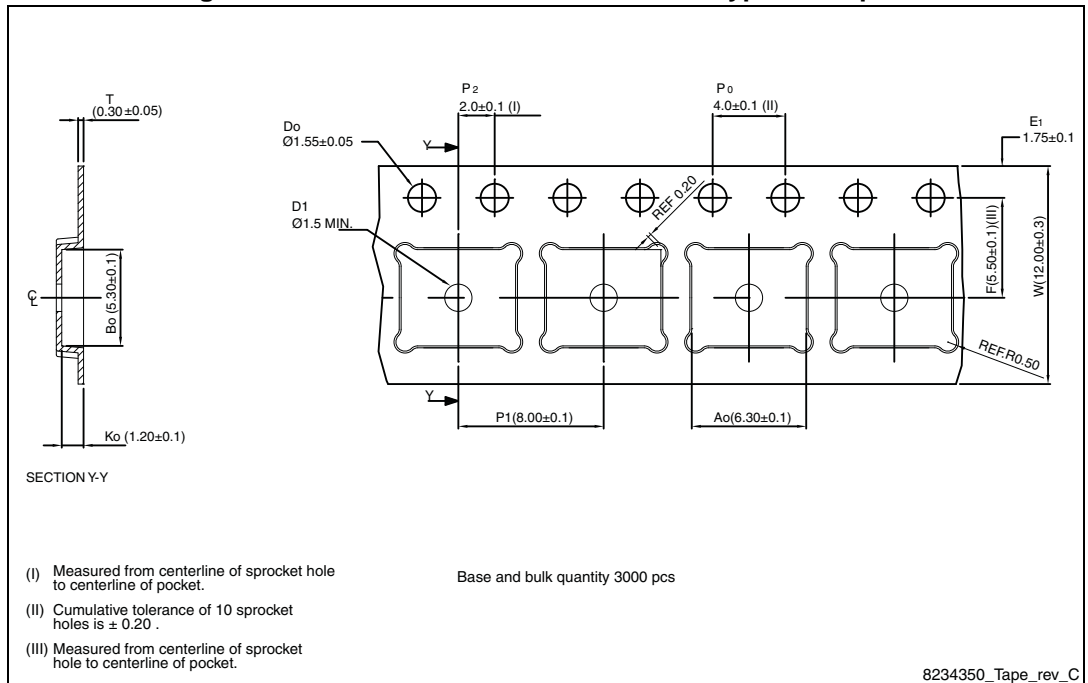
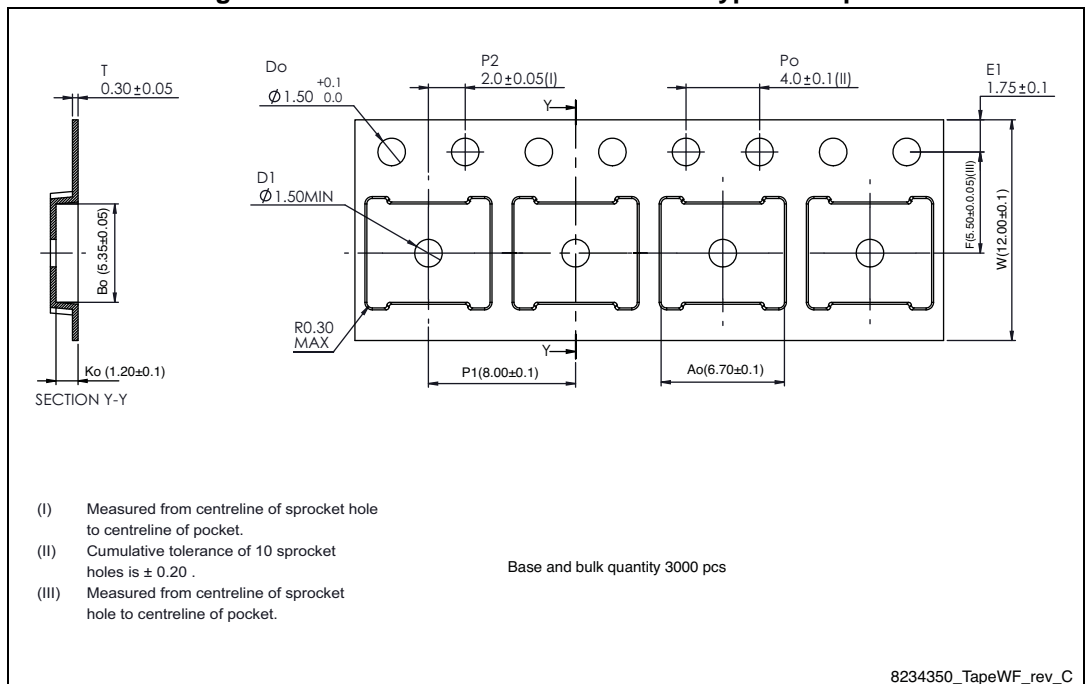


Figure 23. PowerFLAT 5x6 double island type WF tape^(a)



a. All dimensions are in millimeters.

Figure 24. PowerFLAT™ 5x6 package orientation in carrier tape

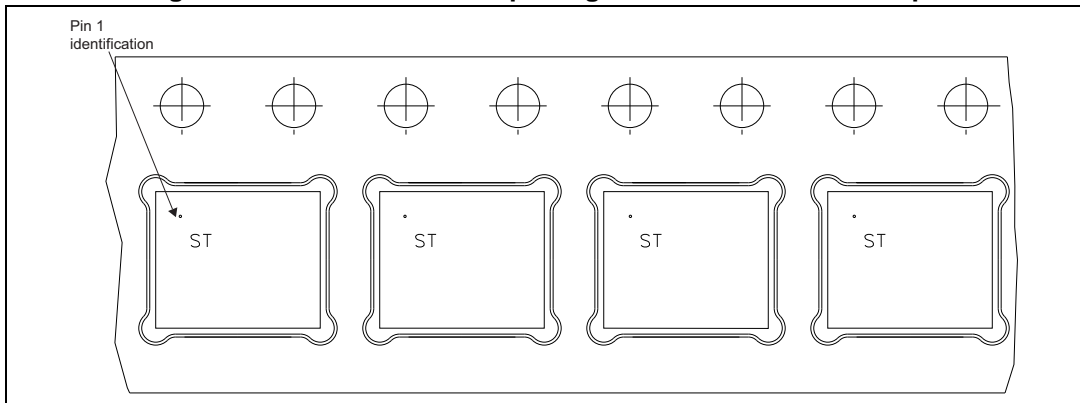
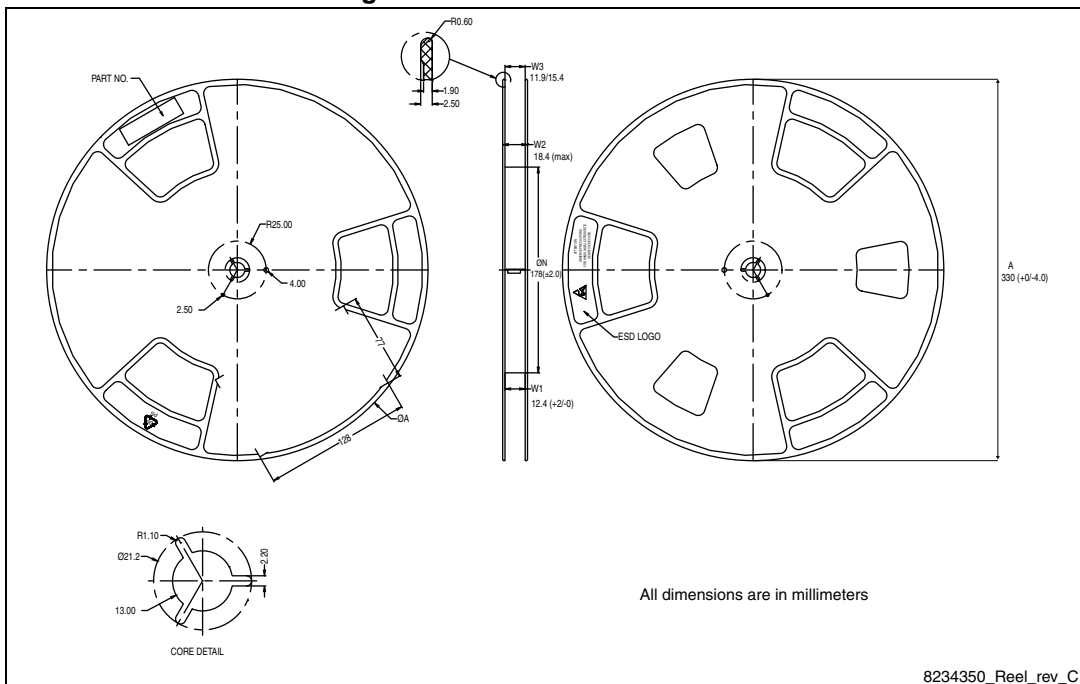


Figure 25. PowerFLAT™ 5x6 reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
11-Oct-2011	1	First release.
19-Jun-2012	2	Added Section 2.1: Electrical characteristics (curves) . Updated Section 4: Package mechanical data and title on the cover page.
26-Jun-2012	3	Document status promoted from preliminary to production data.
24-Oct-2013	4	<ul style="list-style-type: none"> – Updated title and features in cover page – Modified: $V_{GS(th)}$ value in Table 4 – Updated: Section 4: Package mechanical data and Section 5: Packaging mechanical data – Minor text changes
20-Feb-2014	5	<ul style="list-style-type: none"> – Added: Features in cover page – Added: note 1 in Table 1 – Added: Table 20 and Table 9 – Added: Figure 23 – Minor text changes

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.

ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER'S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR "AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL" INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.

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.

© 2014 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