STL19N60DM2

N-channel 600 V, 0.280 Ω typ., 11 A MDmesh™ DM2 with fast diode Power MOSFET in a PowerFLAT™ 8x8 HV package

Datasheet – preliminary data

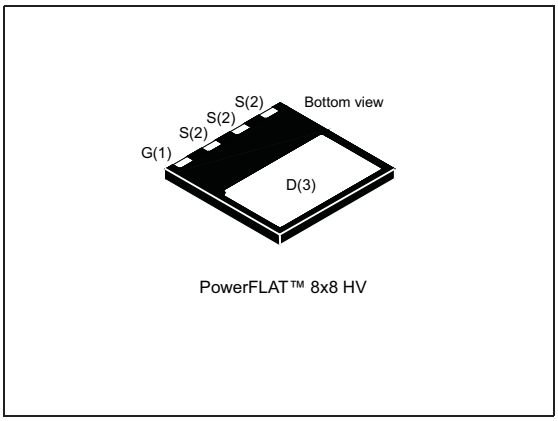
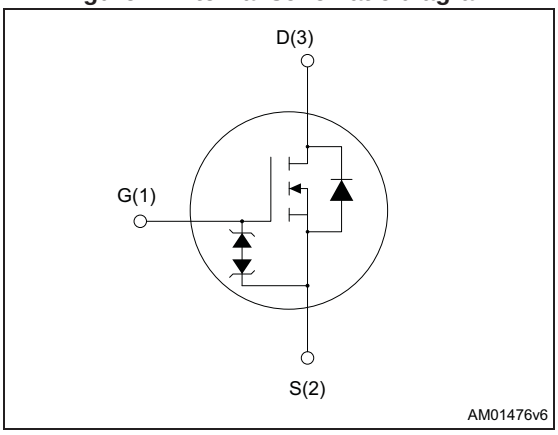


Figure 1. Internal schematic diagram



Features

Order code	V_{DS} @ T_{Jmax}	$R_{DS(on)max}$	I_D
STL19N60DM2	650 V	0.320 Ω	11 A

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance $R_{DS(on)}$
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

Applications

- Switching applications

Description

This high voltage N-channel Power MOSFET is part of the MDmesh DM2 fast recovery diode series. It offers very low recovery charge and time (Q_{rr}, t_{rr}) combined with low $R_{DS(on)}$, rendering it suitable for the most demanding high efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL19N60DM2	19N60DM2	PowerFLAT™ 8x8 HV	Tape and reel

Contents

1 Electrical ratings 3

2 Electrical characteristics 4

3 Test circuits 6

4 Package mechanical data 7

5 Packaging mechanical data 10

6 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 °C	11	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	6.8	A
I_{DM} (1),(2)	Drain current (pulsed)	44	A
P_{TOT}(1)	Total dissipation at TC = 25 °C	90	W
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	TBD	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	TBD	mJ
dv/dt (3)	Peak diode recovery voltage slope	40	V/ns
dv/dt (4)	MOSFET dv/dt ruggedness	50	V/ns
T_{stg}	Storage temperature	- 55 to 150	°C
T_j	Max. operating junction temperature	150	°C

1. The value is rated according to $R_{thj\text{-}case}$ and limited by package.
2. Pulse width limited by safe operating area.
3. $I_{SD} \leq 11$ A, di/dt $\leq$ 400 A/µs, $V_{DS(peak)} < V_{(BR)DSS}$, V_{DD}= 400 V
4. $V_{DS} \leq 480$ V

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.39	°C/W
$R_{thj\text{-}amb}$(1)	Thermal resistance junction-ambient max	45	°C/W

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

2 Electrical characteristics

(T_C = 25 °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 mA	600			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 600V			1	µA
		V_{GS} = 0, V_{DS} = 600 V, T_C=125 °C			100	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0, V_{GS} = ± 25 V			±10	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 5.5 A		0.280	0.320	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 100 V, f = 1 MHz, V_{GS} = 0	-	TBD	-	pF
C_{oss}	Output capacitance		-	TBD	-	pF
C_{rss}	Reverse transfer capacitance		-	TBD	-	pF
$C_{oss\ eq.}$ (1)	Equivalent output capacitance	V_{DS} = 0 to 480 V, V_{GS} = 0	-	TBD	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain		5.5	-	Ω
Q_g	Total gate charge	V_{DD} = 480 V, I_D = 11 A, V_{GS} = 10 V (see *Figure 3*)	-	21	-	nC
Q_{gs}	Gate-source charge		-	TBD	-	nC
Q_{gd}	Gate-drain charge		-	TBD	-	nC

1. $C_{oss\ eq.}$ 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}

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 5.5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 2* and *7*)	-	TBD	-	ns
t_r	Voltage rise time		-	TBD	-	ns
$t_{d(off)}$	Turn-off delay time		-	TBD	-	ns
t_f	Current fall time		-	TBD	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} (1)	Source-drain current		-		11	A
I_{SDM} (1),(2)	Source-drain current (pulsed)		-		44	A
V_{SD} (3)	Forward on voltage	I_{SD} = 11A, V_{GS} = 0	-		1.5	V
t_{rr} (4)	Reverse recovery time	I_{SD} = 11A, di/dt = 100A/µs V_{DD} = 100 V (see *Figure 4*)	-	120		ns
Q_{rr} (4)	Reverse recovery charge		-	TBD		µC
I_{RRM} (4)	Reverse recovery current		-	TBD		A
t_{rr} (4)	Reverse recovery time	I_{SD} = 11 A, di/dt = 100A/µs V_{DD} = 100 V, T_j = 150 °C (see *Figure 4*)	-	TBD		ns
Q_{rr} (4)	Reverse recovery charge		-	TBD		µC
I_{RRM} (4)	Reverse recovery current		-	TBD		A

1. The value is rated according to $R_{thj\text{-}case}$ and limited by package.
2. Pulse width limited by safe operating area
3. Pulsed: pulse duration = 300 µs, duty cycle 1.5%
4. Typical values are referring to the test conditions of the same die housed in through hole package.

The built-in back-to-back Zener diodes have been specifically designed to enhance the ESD capability of the device. The Zener voltage is appropriate for efficient and cost-effective intervention to protect the device integrity. These integrated Zener diodes thus eliminate the need for external components.

3 Test circuits

Figure 2. Switching times test circuit for resistive load

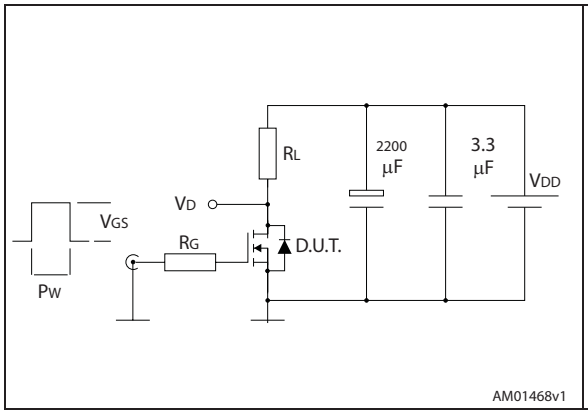


Figure 3. Gate charge test circuit

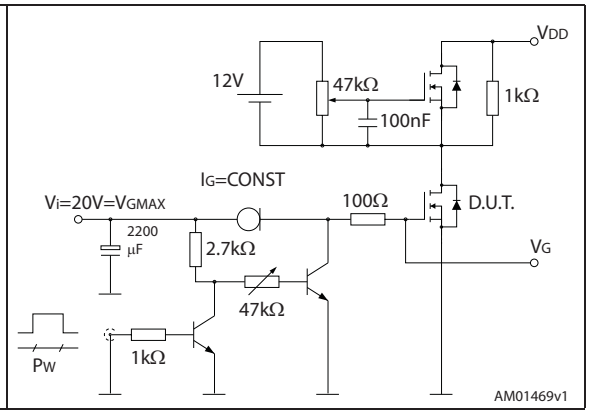


Figure 4. Test circuit for inductive load switching and diode recovery times

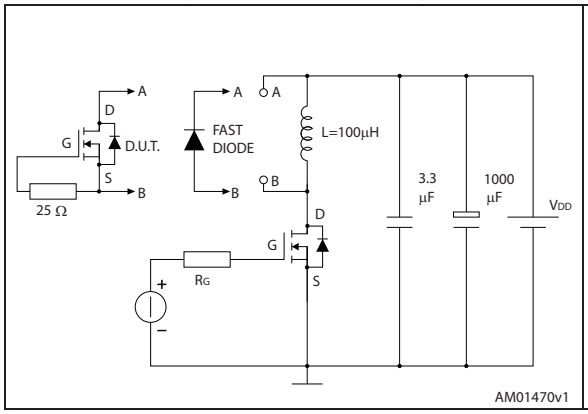


Figure 5. Unclamped inductive load test circuit

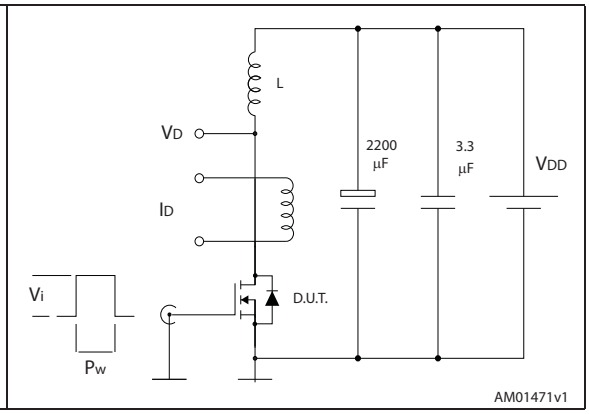


Figure 6. Unclamped inductive waveform

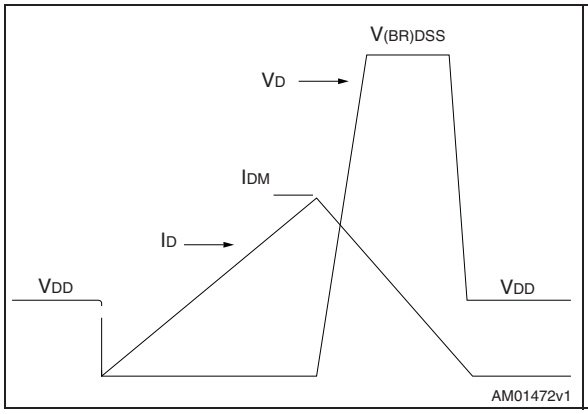
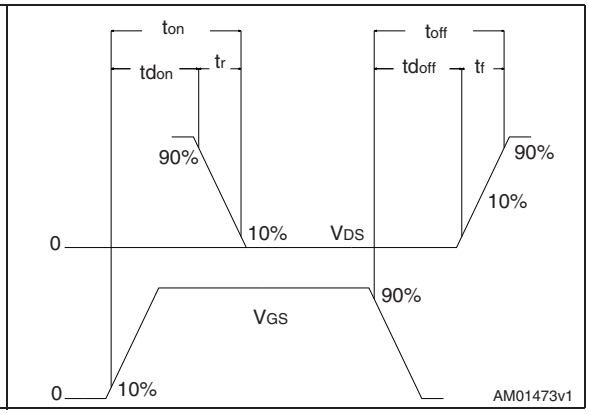


Figure 7. Switching time waveform



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.

Figure 8. PowerFLAT™ 8x8 HV drawing mechanical data

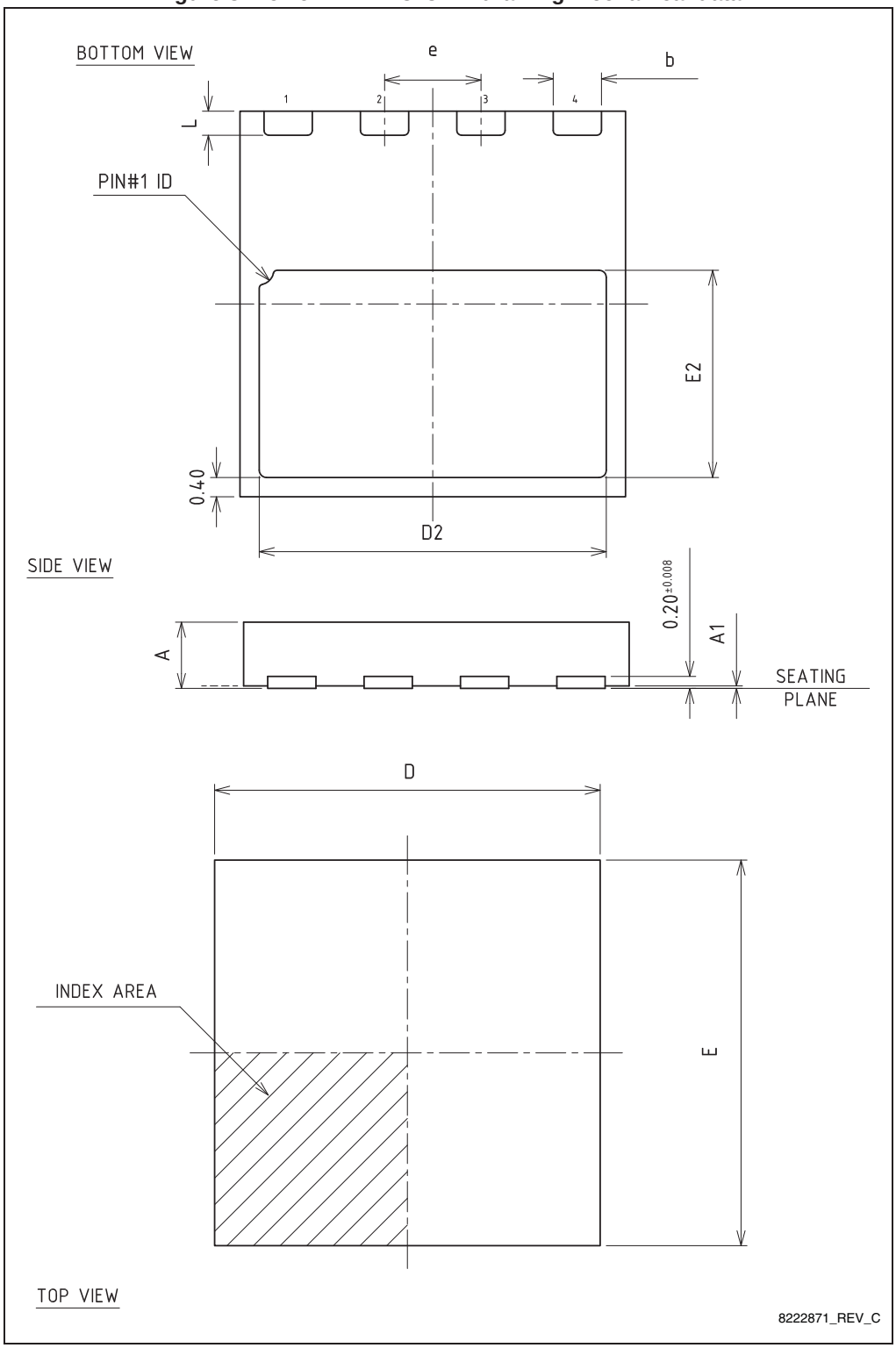
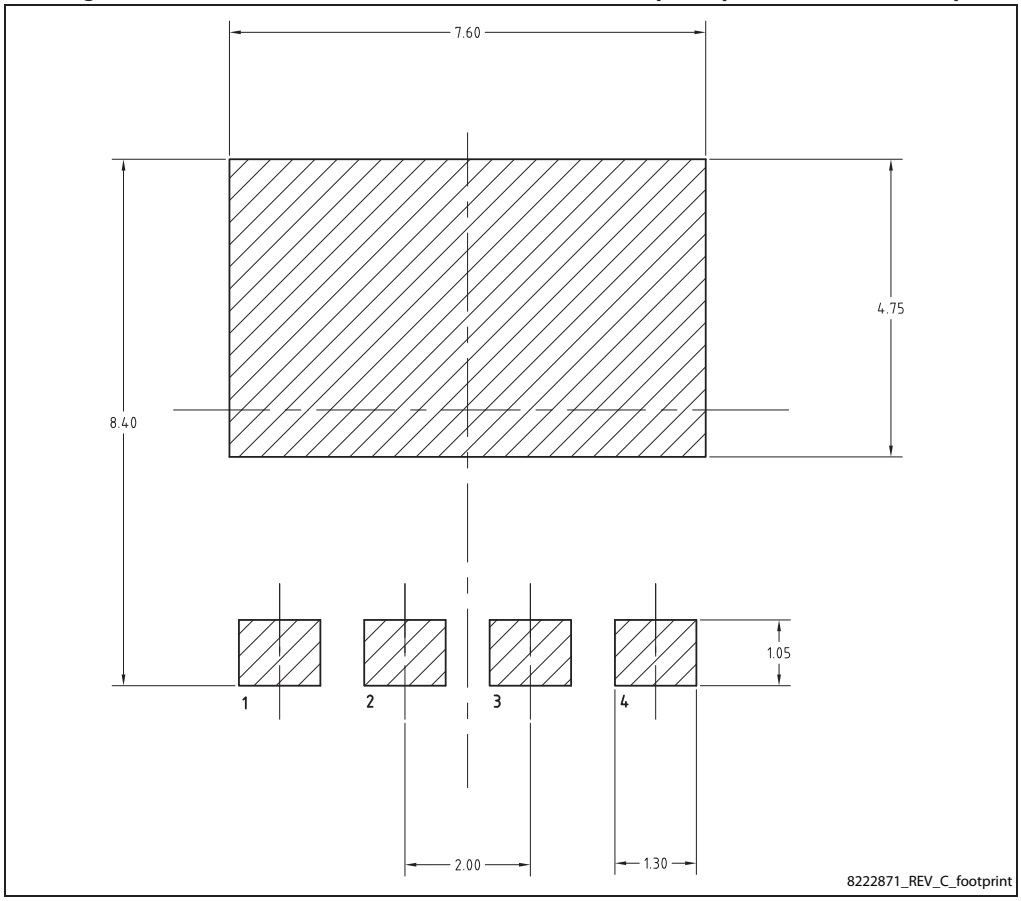


Table 8. PowerFLAT™ 8x8 HV mechanical data

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

Figure 9. PowerFLAT™ 8x8 HV recommended footprint (dimensions in mm.)



5 Packaging mechanical data

Figure 10. PowerFLAT™ 8x8 HV tape

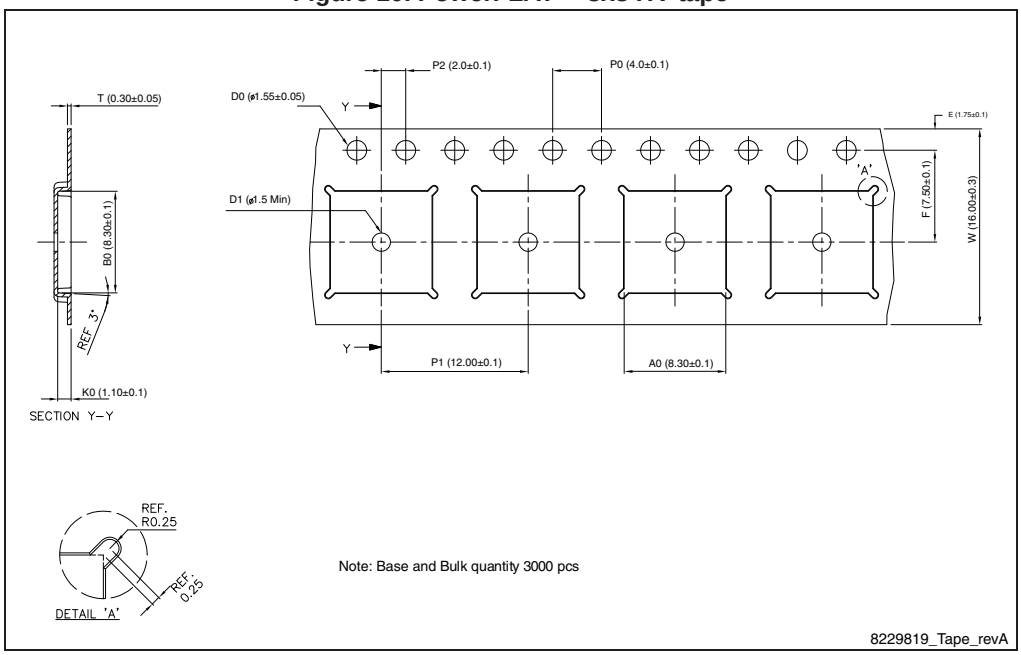


Figure 11. PowerFLAT™ 8x8 HV package orientation in carrier tape

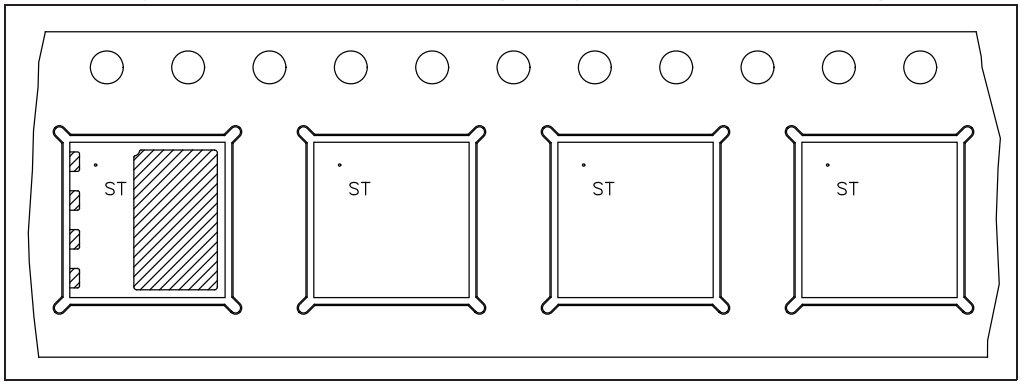
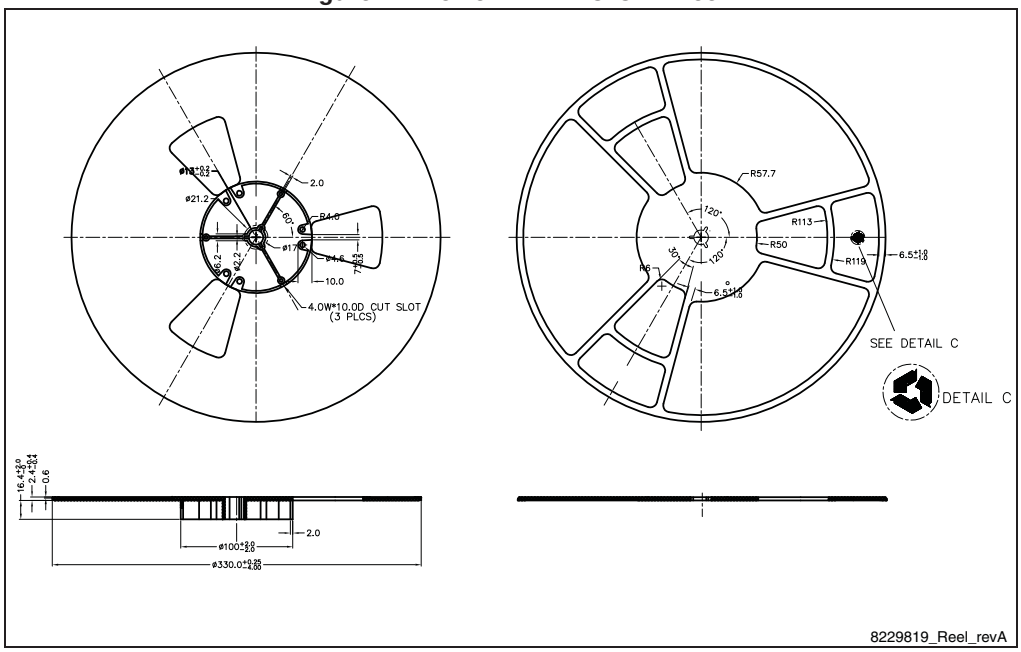


Figure 12. PowerFLAT™ 8x8 HV reel



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
08-Aug-2014	1	First release.

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