

Automotive-grade dual N-channel 60 V, 35 mΩ typ., 6.5 A STripFET™ F3 Power MOSFET in PowerFLAT™ 5x6 double island

Datasheet - production data

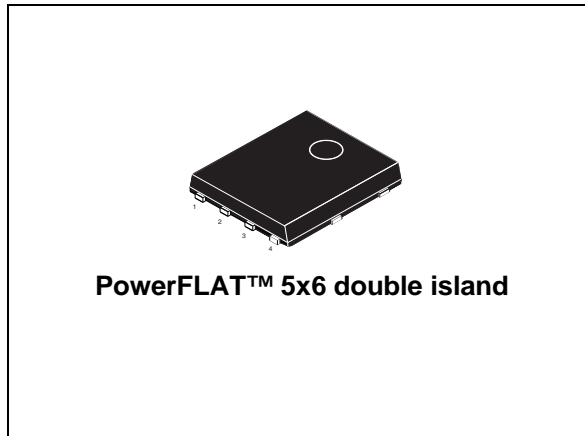
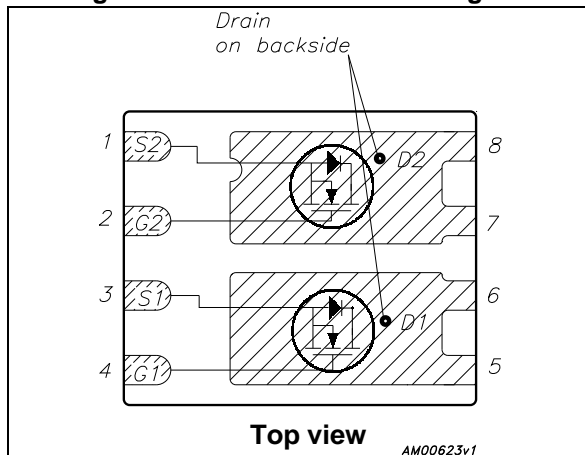


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL7DN6LF3	60 V	43 mΩ	6.5 A

- Designed for automotive application 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 a dual N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL7DN6LF3	7DN6LF3	PowerFLAT™ 5x6 double island ⁽¹⁾	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 information	9
5	Packaging information	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
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	16	A
$I_D^{(4)}$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	6.5	A
$I_D^{(4)}$	Drain current (continuous) at $T_{pcb}=100^\circ\text{C}$	4.6	A
$I_{DM}^{(3),(4)}$	Drain current (pulsed)	26	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	52	W
$P_{TOT}^{(4)}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4.3	W
I_{AV}	Not-repetitive avalanche current	6.5	A
$E_{AS}^{(5)}$	Single pulse avalanche energy	190	mJ
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Specified by design. Not subject to production test.
2. Current is limited by bonding, with an $R_{thJC} = 2.9^\circ\text{C/W}$ the chip is able to carry 22 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 $T_J = 25^\circ\text{C}$, $I_D = 8\text{ A}$, $V_{DD} = 25\text{ V}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.9	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	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

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ($V_{GS} = 0$)	$I_D = 250\ \mu\text{A}$	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	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 3\ \text{A}$ $V_{GS} = 5\ \text{V}$, $I_D = 3\ \text{A}$		35 48	43 60	$\text{m}\Omega$ $\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$	-	432	-	pF
C_{oss}	Output capacitance		-	93	-	pF
C_{rss}	Reverse transfer capacitance		-	10.5	-	pF
Q_g	Total gate charge	$V_{DD} = 30\ \text{V}$, $I_D = 6.5\ \text{A}$ $V_{GS} = 10\ \text{V}$, Figure 13	-	8.7	-	nC
Q_{gs}	Gate-source charge		-	1.9	-	nC
Q_{gd}	Gate-drain charge		-	1.9	-	nC
R_G	Intrinsic gate resistance	$f = 1\ \text{MHz}$ open drain	-	6.3	-	Ω

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\ \text{V}$, $I_D = 3\ \text{A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\ \text{V}$ Figure 12	-	6.7	-	ns
t_r	Rise time		-	10.4	-	ns
$t_{d(off)}$	Turn-off delay time		-	32.4	-	ns
t_f	Fall time		-	5.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current		-		6.5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		26	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 6.5 \text{ A}, V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 6.5 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 48 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	24	-	ns
Q_{rr}	Reverse recovery charge		-	23.3	-	nC
I_{RRM}	Reverse recovery current		-	1.94	-	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

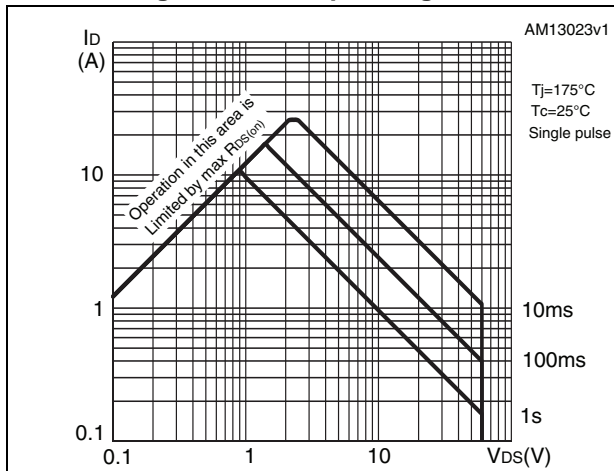


Figure 3. Thermal impedance

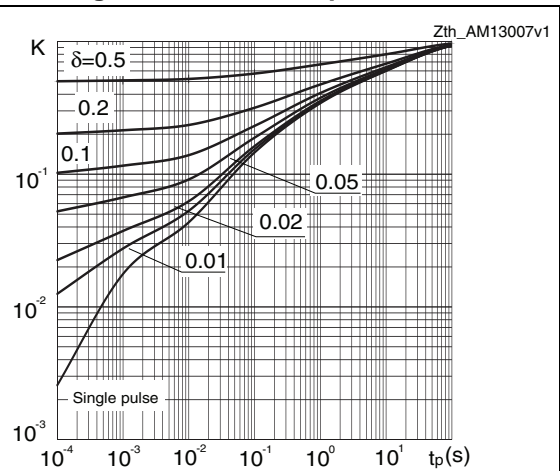


Figure 4. Output characteristics

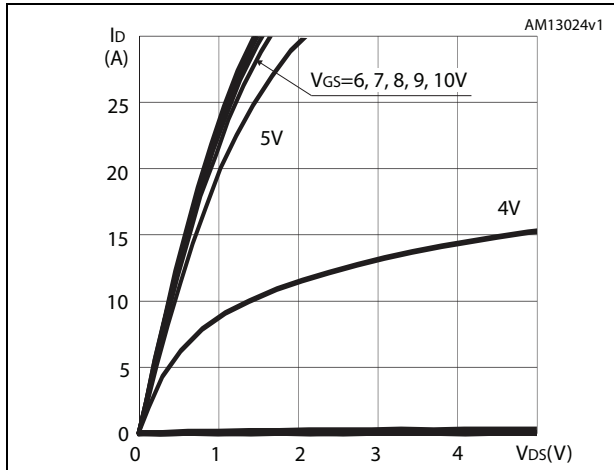


Figure 5. Transfer characteristics

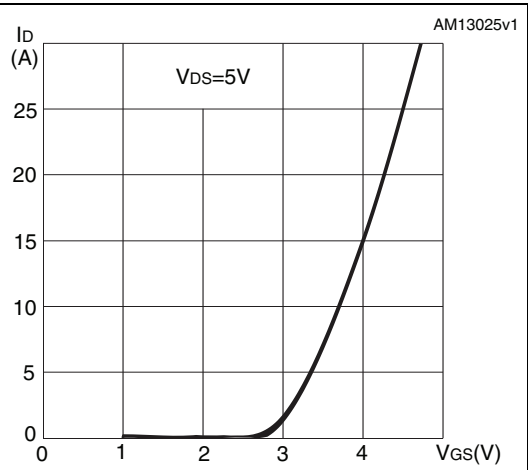


Figure 6. Normalized $V_{(BR)DSS}$ vs temperature

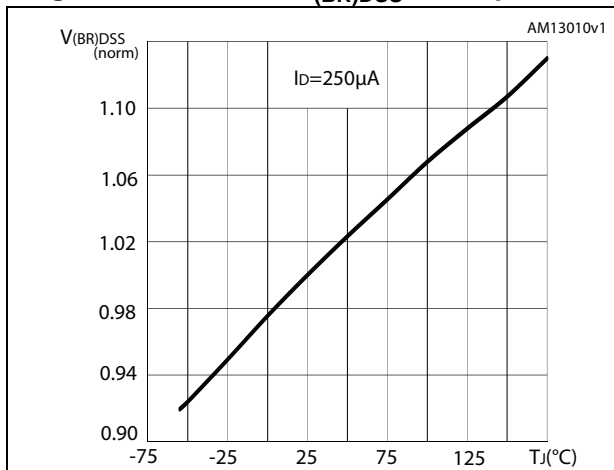


Figure 7. Static drain-source on-resistance

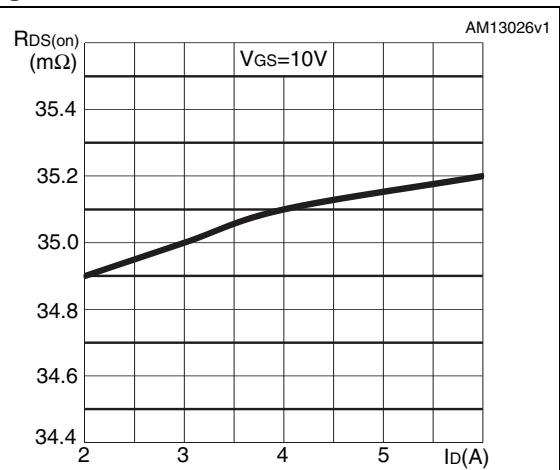


Figure 8. Gate charge vs gate-source voltage

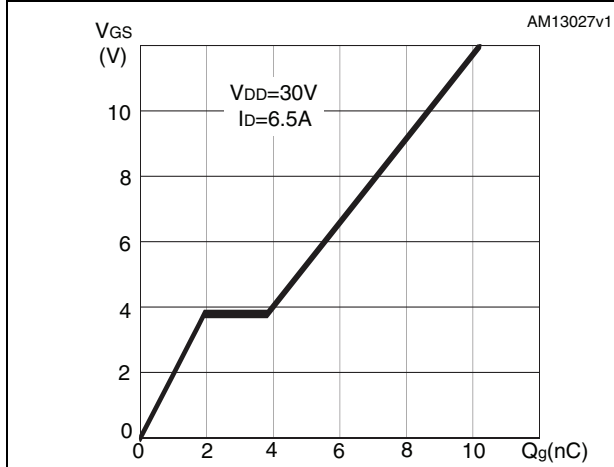


Figure 9. Capacitance variations

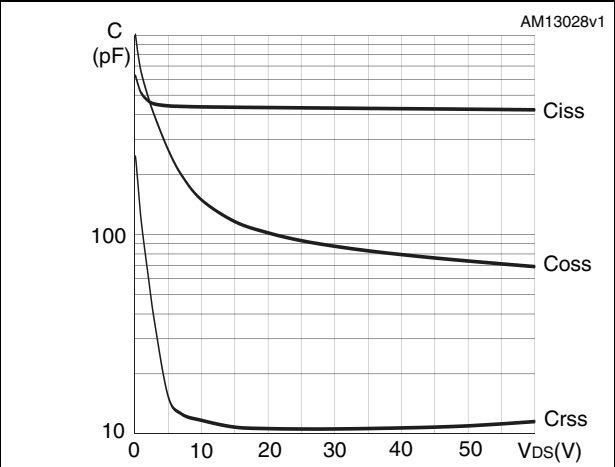


Figure 10. Normalized gate threshold voltage vs temperature

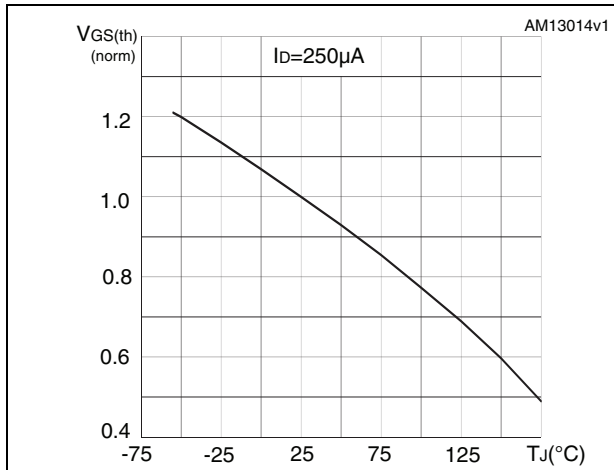
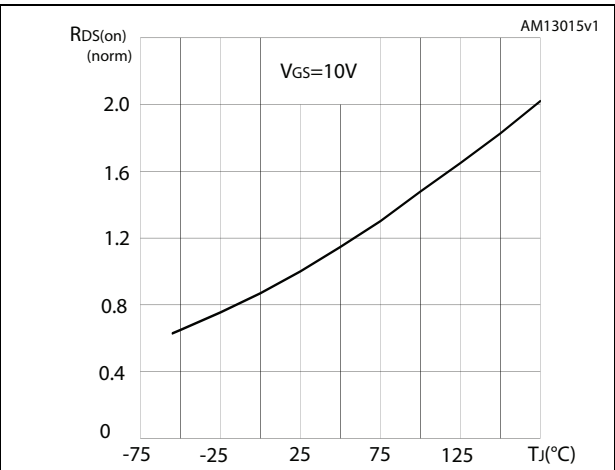


Figure 11. Normalized on-resistance vs temperature



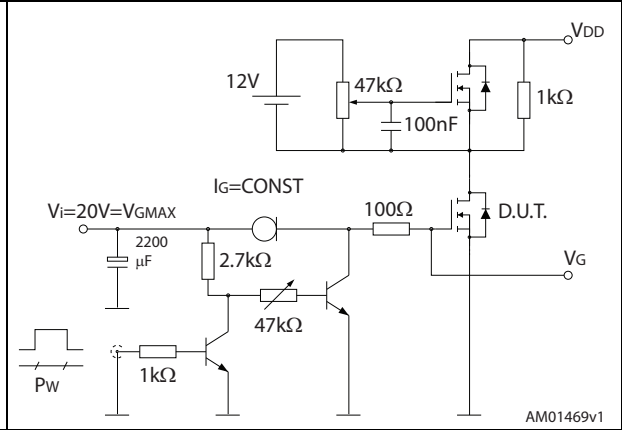
3 Test circuits

Figure 12. Switching times test circuit for resistive load



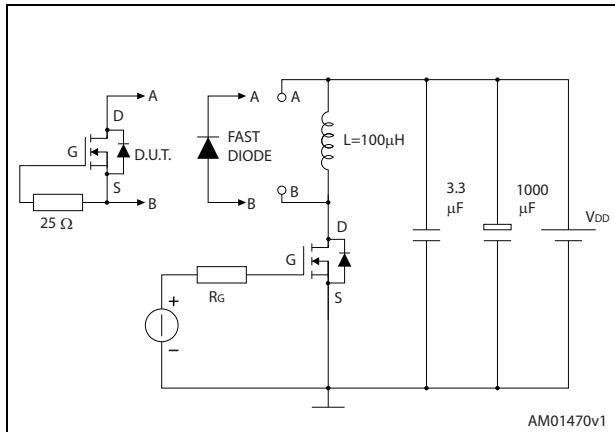
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Figure 13. Gate charge test circuit



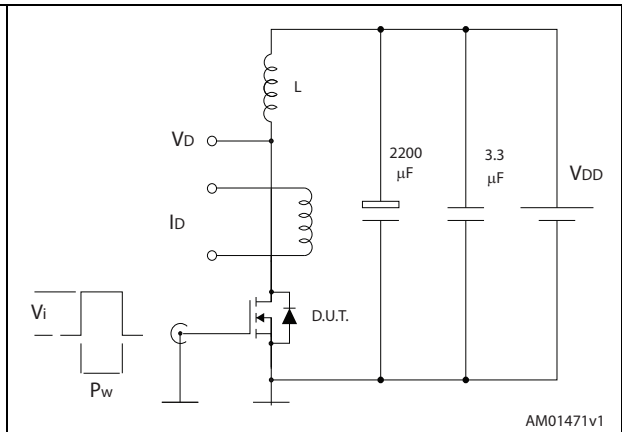
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Figure 14. Test circuit for inductive load switching and diode recovery times



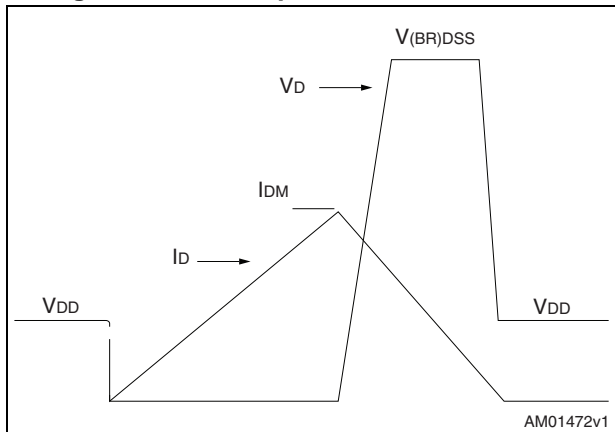
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Figure 15. Unclamped inductive load test circuit



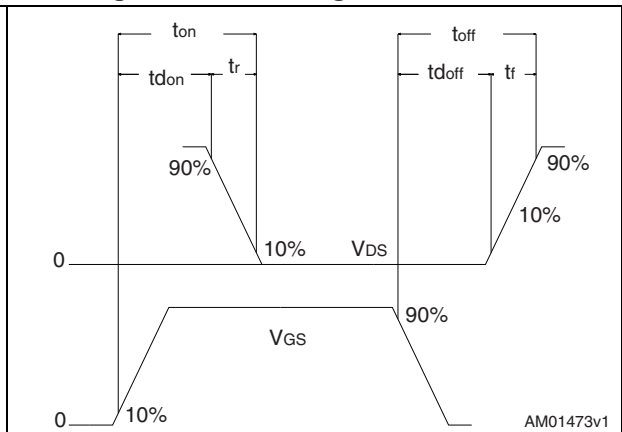
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Figure 16. Unclamped inductive waveform



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Figure 17. Switching time waveform

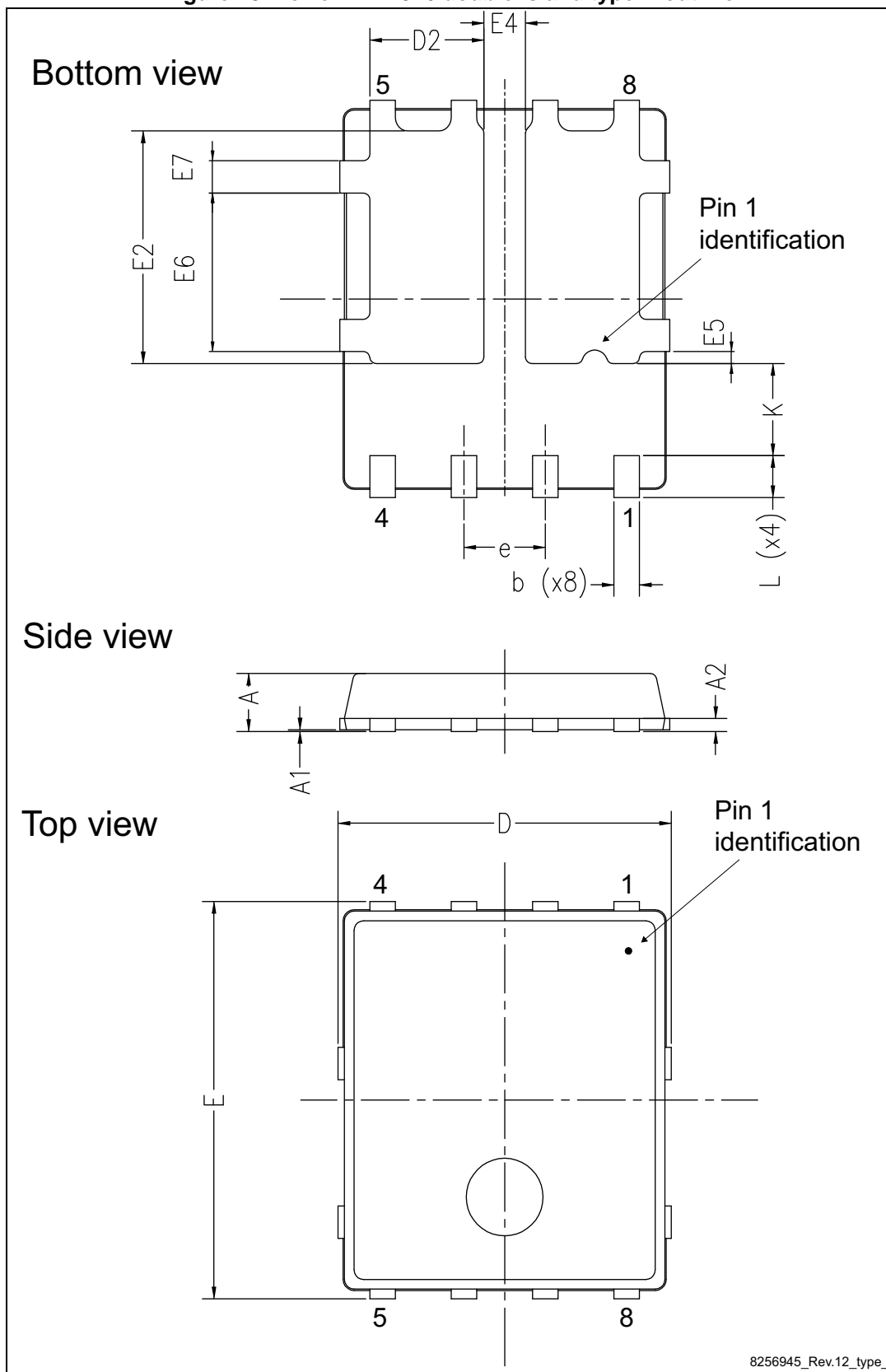


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4 Package information

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 18. PowerFLAT 5x6 double island type R outline



8256945_Rev.12_type_I

Table 8. PowerFLAT 5x6 double island type R 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
D2	1.68		1.88
E	5.95	6.15	6.35
E2	3.50		3.70
E4	0.55		0.75
E5	0.08		0.28
E6	2.35		2.55
E7	0.40		0.60
e		1.27	
L	0.60		0.80
K	1.275		1.575

Figure 19. PowerFLAT 5x6 double island WF type R outline

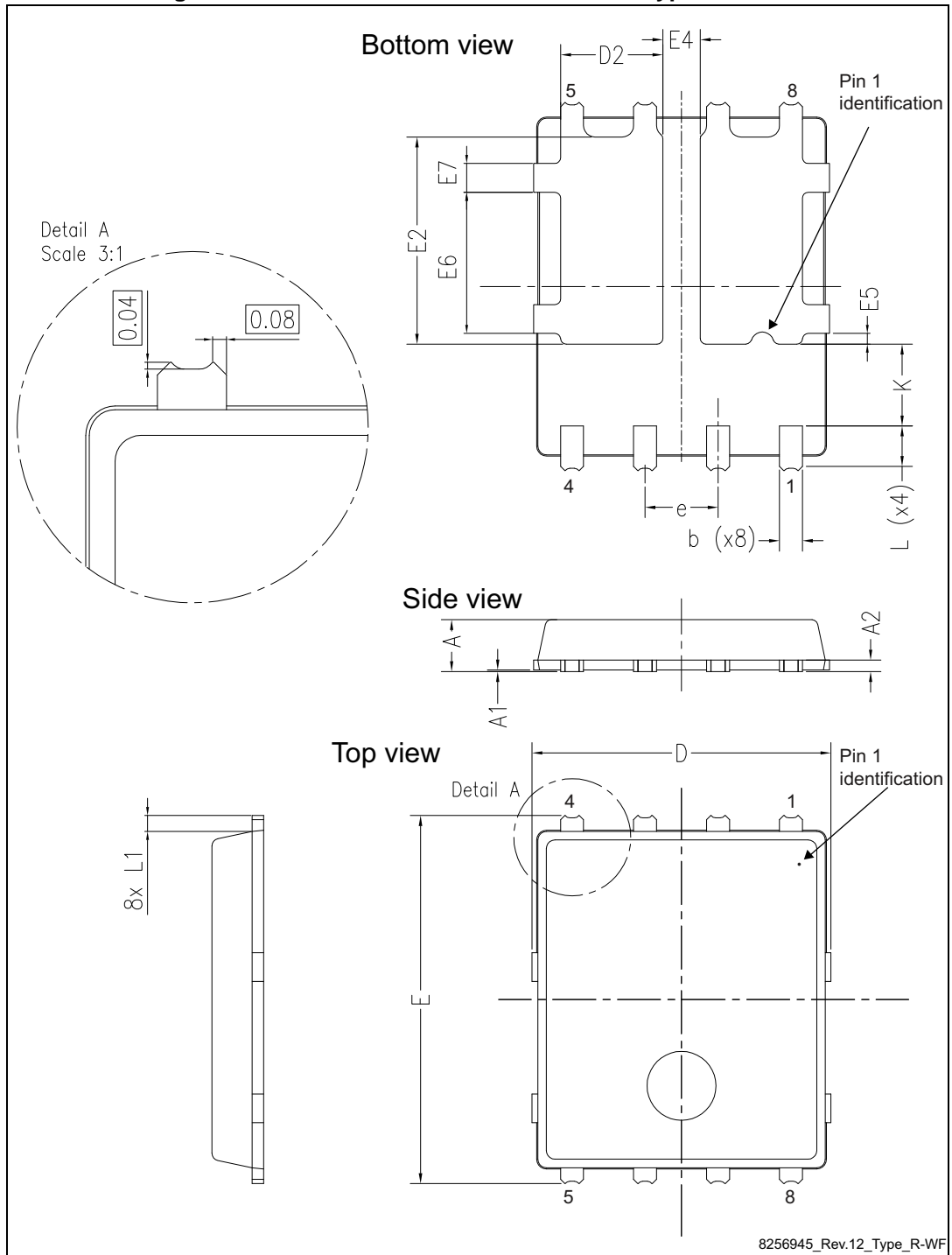
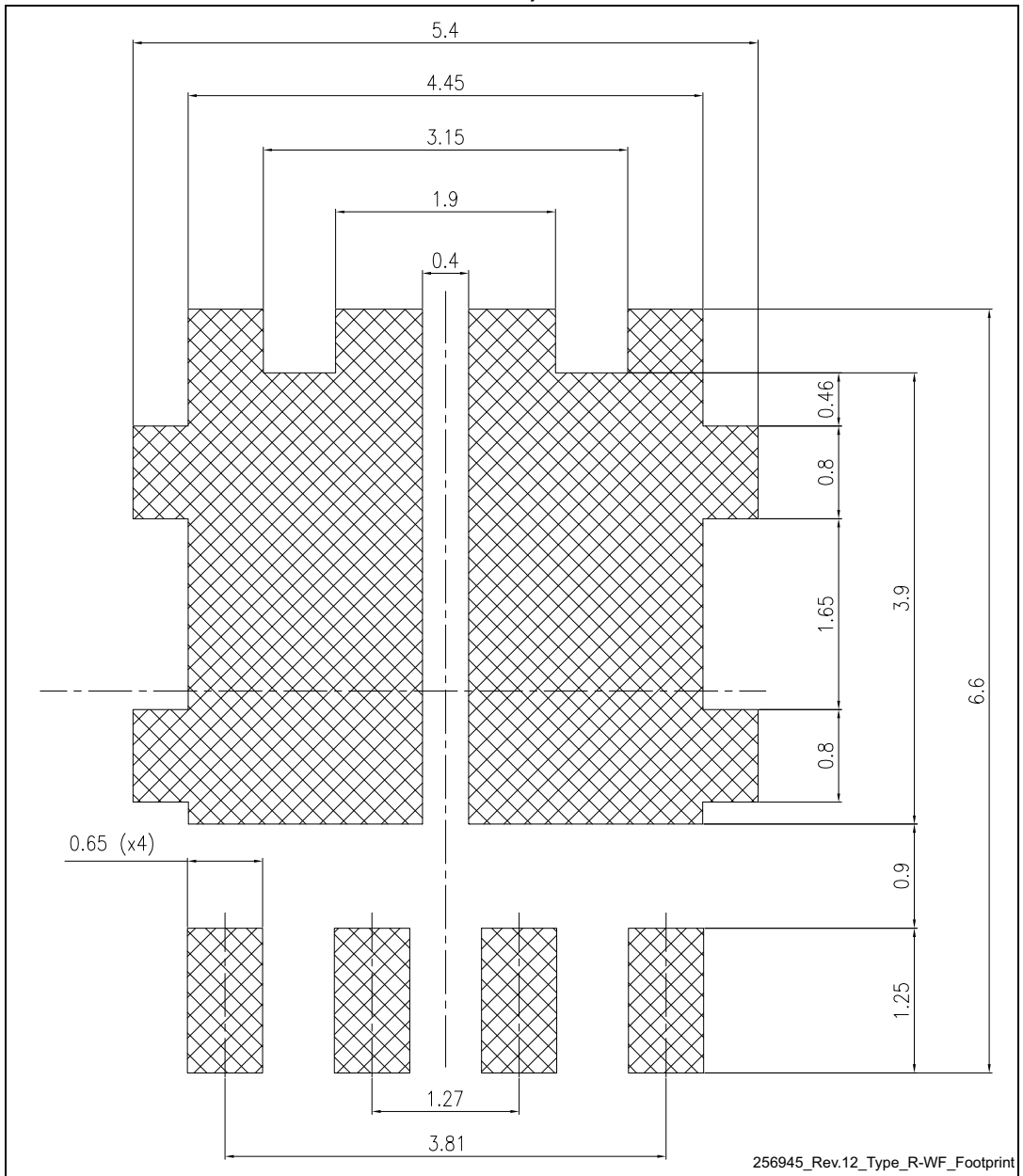


Table 9. PowerFLAT 5x6 double island WF type R mechanical data

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
D2	1.68		1.88
E	6.20	6.40	6.60
E2	3.50		3.70
E4	0.55		0.75
E5	0.08		0.28
E6	2.35		2.55
E7	0.40		0.60
e		1.27	
L	0.70		0.90
L1		0.275	
K	1.275		1.575

Figure 20. PowerFLAT 5x6 double island recommended footprint (dimensions are in mm)



5 Packaging information

Figure 21. PowerFLAT™ 5x6 tape^(a)

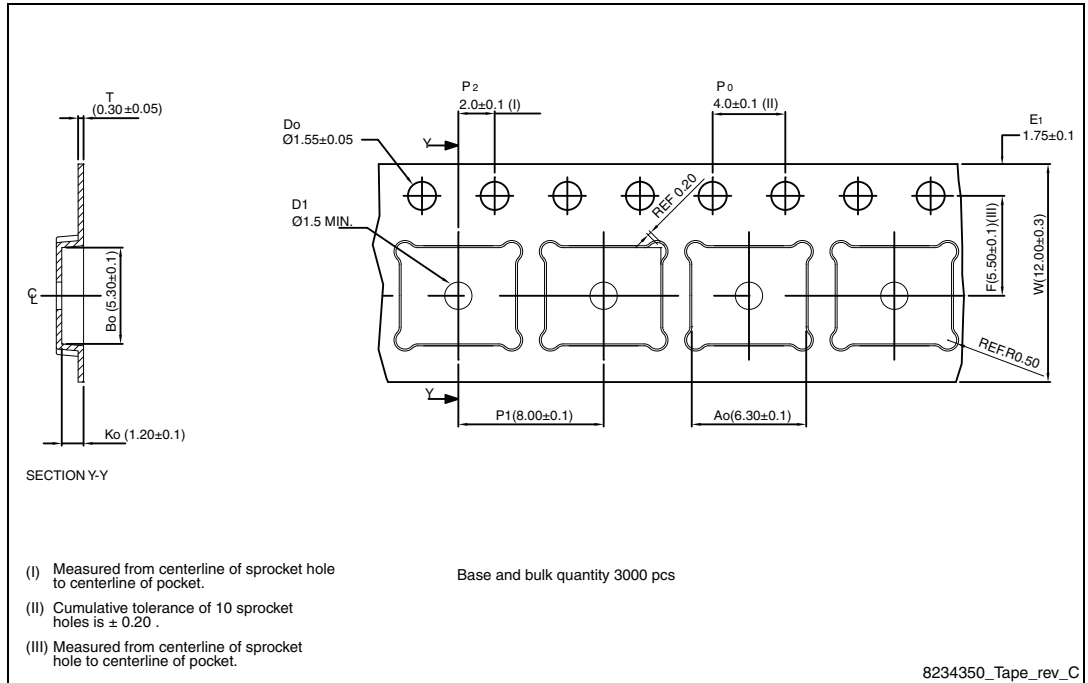
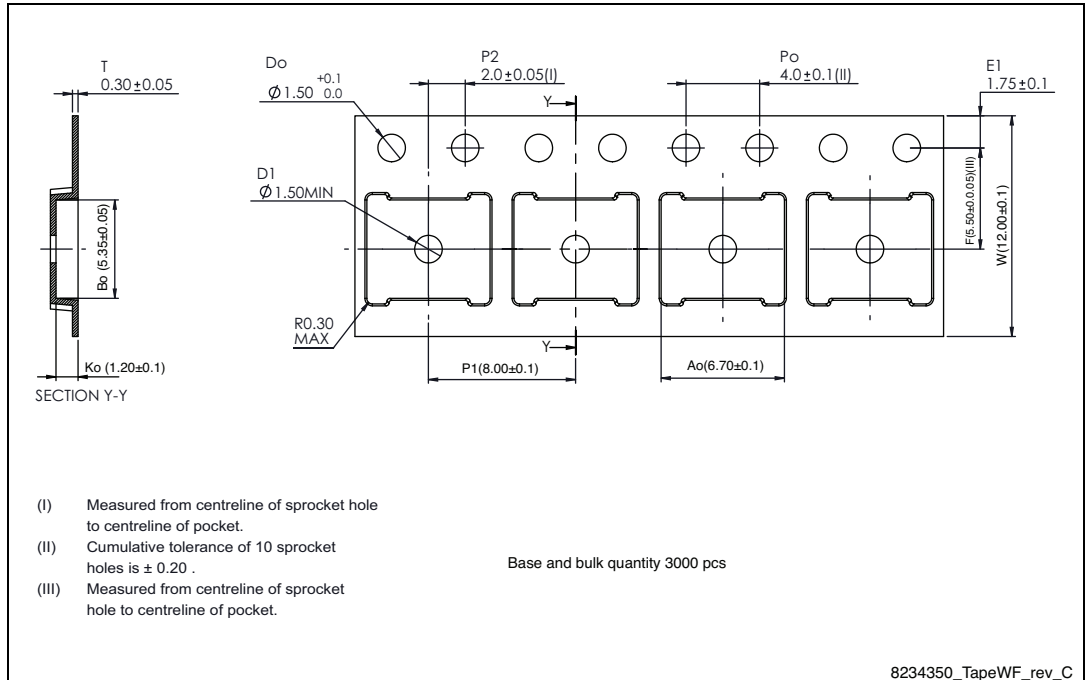


Figure 22. PowerFLAT 5x6 WF tape^(a)



a. All dimensions are in millimeters.

Figure 23. PowerFLAT™ 5x6 package orientation in carrier tape

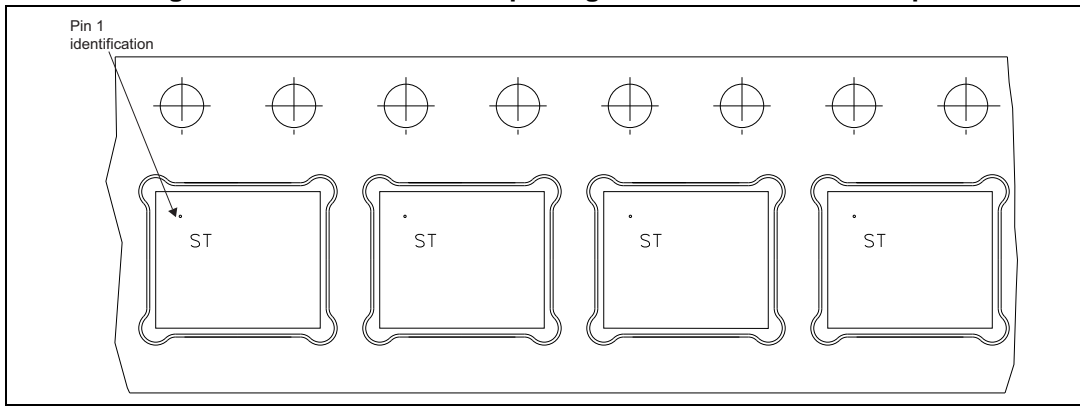
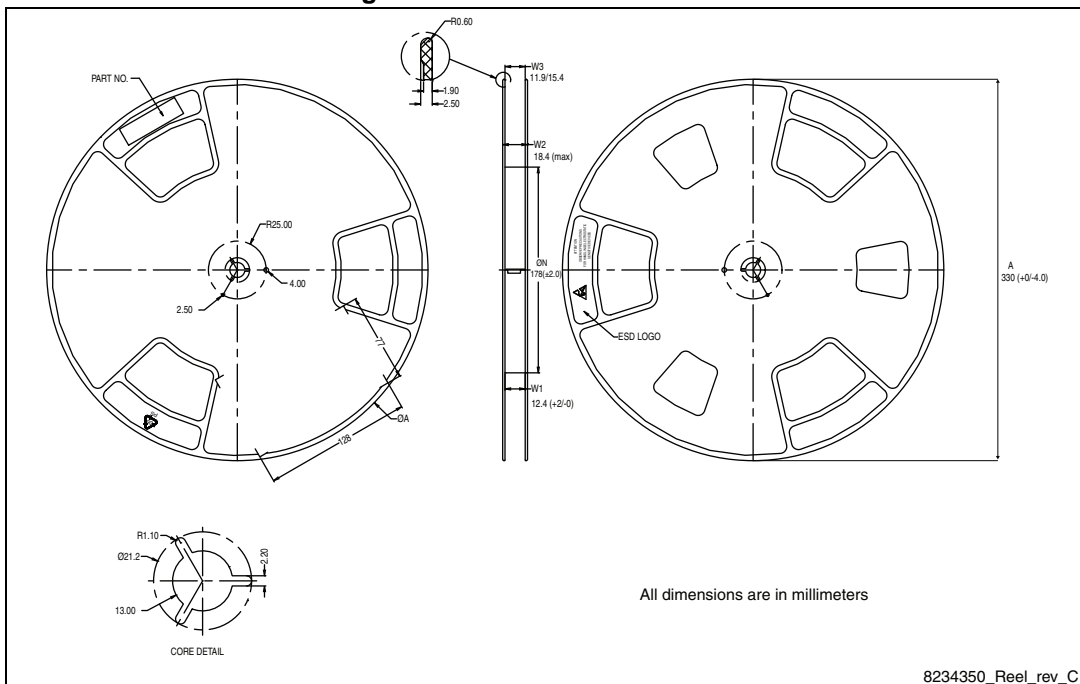


Figure 24. PowerFLAT™ 5x6 reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
28-Mar-2012	1	First release.
19-Jun-2012	2	Section 2.1: Electrical characteristics (curves) has been added. Updated Section 4: Package information and tile on the coverpage.
26-Jun-2012	3	Document status promoted from preliminary to production data.
23-Feb-2015	4	Updated title, features and description in cover page. Updated Table 5: Dynamic , Table 6: Switching times and Section 2.1: Electrical characteristics (curves) . Updated Section 4: Package information . Added Section 5: Packaging information . Minor text changes.

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