



STL70N10F3

N-channel 100 V, 0.0078 Ω , 16 A STripFET™ III Power MOSFET in PowerFLAT™ 5x6 package

Datasheet — production data

Features

Order code	V _{DSS}	R _{DS(on)} max @ V _{GS} =10V	I _D	P _{TOT}
STL70N10F3	100 V	0.0084 Ω	16 A	136 W

- Improved die-to-footprint ratio
- Very low thermal resistance
- Low on-resistance

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.



Figure 1. Internal schematic diagram

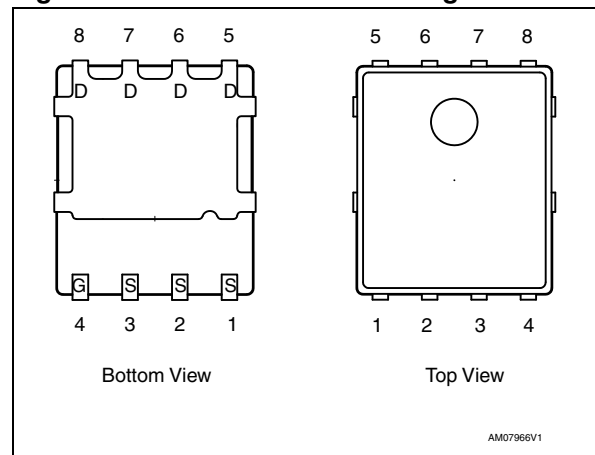


Table 1. Device summary

Order code	Marking	Package	Packaging
STL70N10F3	70N10F3	PowerFLAT™ 5x6	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	82	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	58	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	16	A
$I_{DM}^{(3),(2)}$	Drain current (pulsed)	64	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	136	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. The value is rated according to R_{thj-c} .
2. The value is rated according to $R_{thj-pcb}$.
3. Pulse width limited by safe operating area.

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.1	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10\text{ sec}$

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I_{AV}	Not-repetitive avalanche current, (pulse width limited by $T_J\text{ max}$)	16	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 50\text{ V}$)	770	mJ

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	100	-	-	V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 100\ \text{V}$, $V_{DS} = 100\ \text{V}$, $T_C = 125\text{ °C}$	-	-	10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\ \text{V}$	-	-	± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2	-	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 8\ \text{A}$	-	0.0078	0.0084	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$	-	3210	-	pF
C_{oss}	Output capacitance			450		
C_{rss}	Reverse transfer capacitance			16		
Q_g	Total gate charge	$V_{DD} = 50\ \text{V}$, $I_D = 16\ \text{A}$	-	56	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\ \text{V}$	-	17	-	nC
Q_{gd}	Gate-drain charge	(see Figure 15)	-	16	-	nC

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ \text{V}$, $I_D = 8\ \text{A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\ \text{V}$ (see Figure 14)	-	17	-	ns
t_r	Rise time			11		
$t_{d(off)}$	Turn-off delay time			43		
t_f	Fall time			5.7		

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	16	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	64	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16 \text{ A}, V_{GS} = 0$	-	-	1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 16 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V}$	-	56	-	ns
Q_{rr}	Reverse recovery charge			144		nC
I_{RRM}	Reverse recovery current			5		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

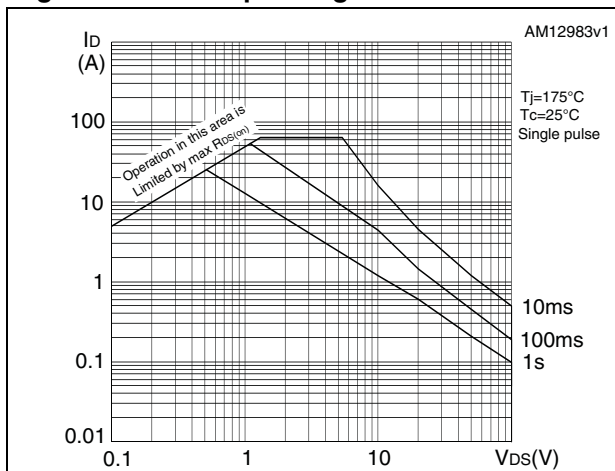


Figure 3. Thermal impedance

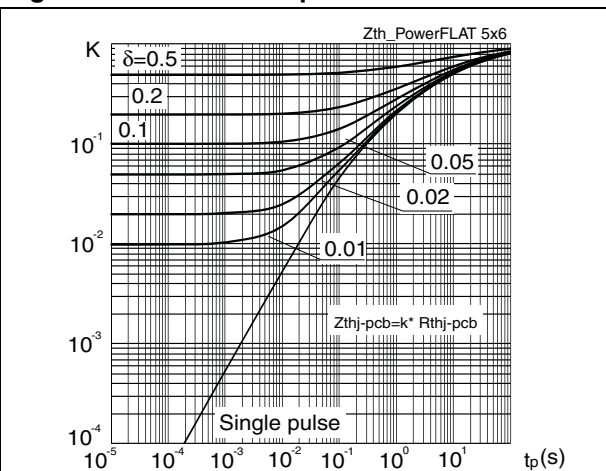


Figure 4. Output characteristics up to $V_{DS}=10\text{ V}$

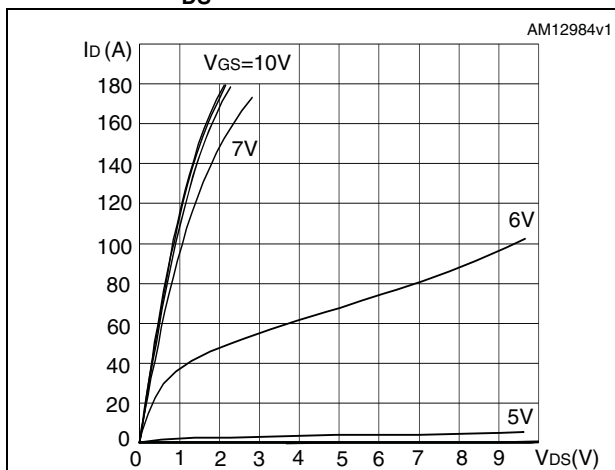


Figure 5. Output characteristics up to $V_{DS}=0.3\text{ V}$

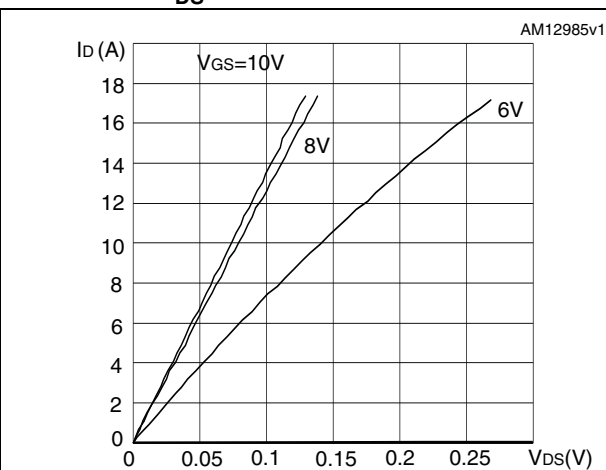


Figure 6. Transfer characteristics

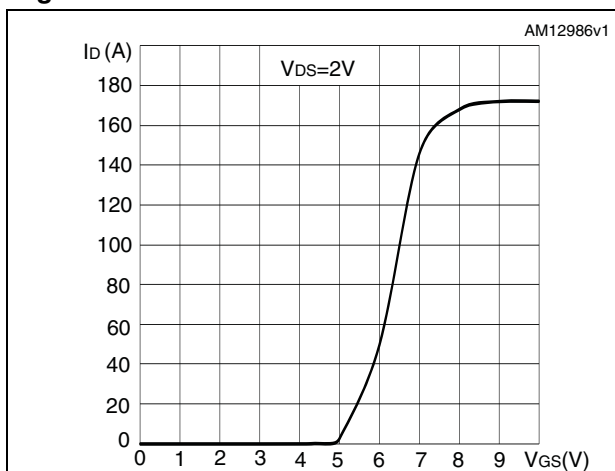


Figure 7. Static drain-source on-resistance

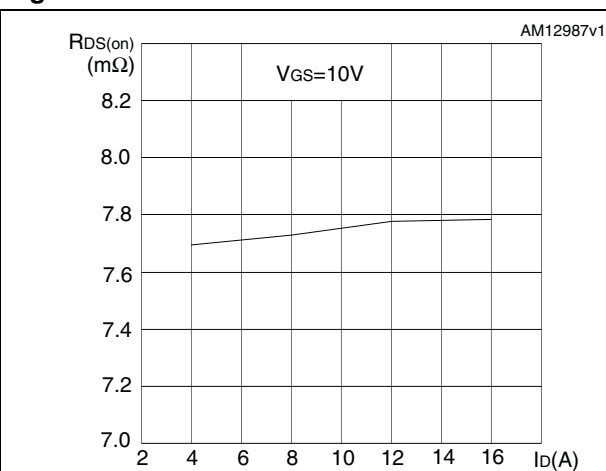


Figure 8. Gate charge vs. gate-source voltage

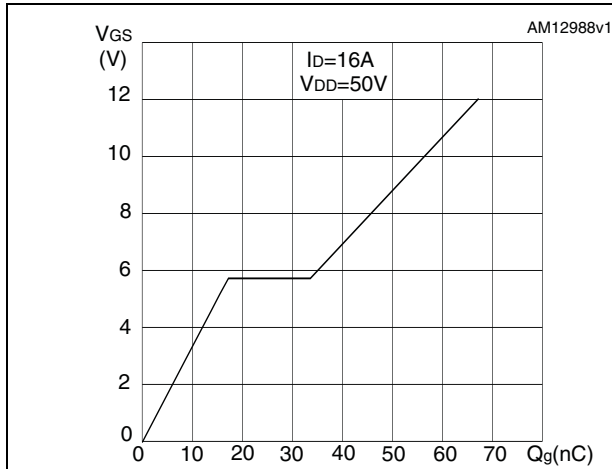


Figure 9. Capacitance variations

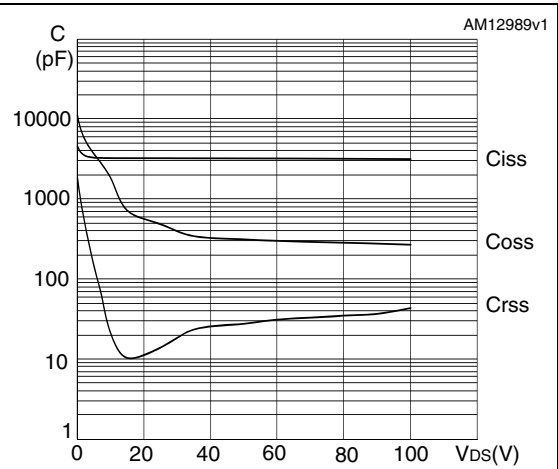


Figure 10. Normalized gate threshold voltage vs. temperature

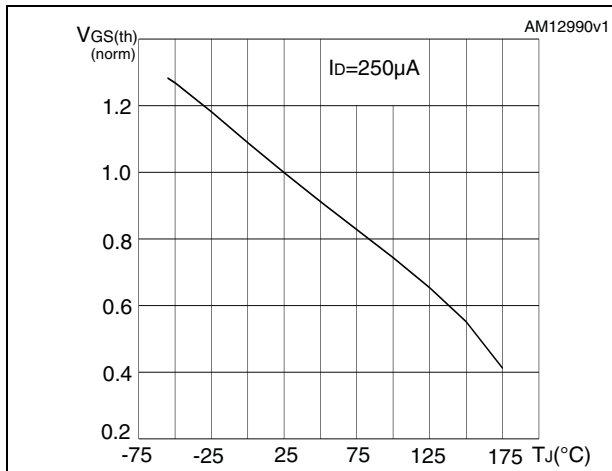


Figure 11. Normalized on-resistance vs. temperature

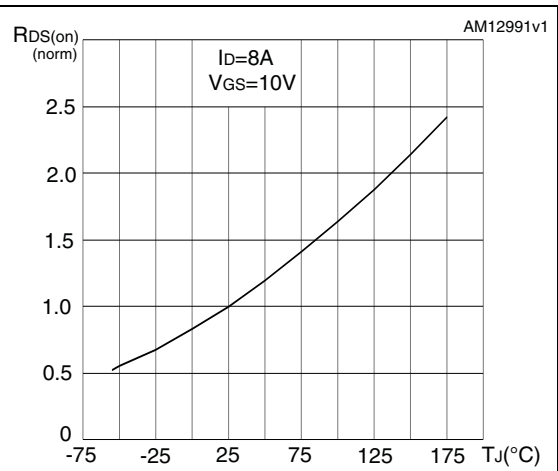


Figure 12. Normalized BV_{DSS} vs temperature

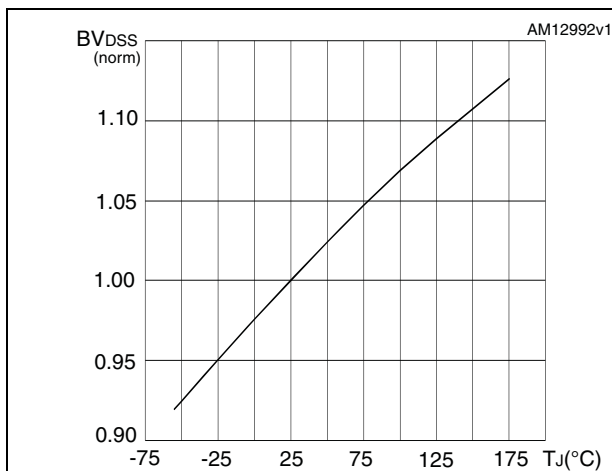
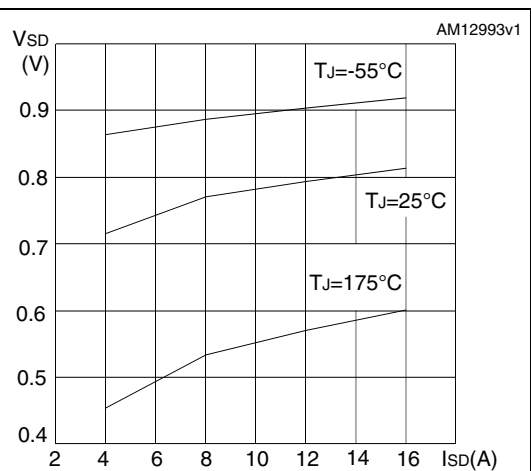


Figure 13. Source-drain diode forward characteristics



3 Test circuits

Figure 14. Switching times test circuit for resistive load

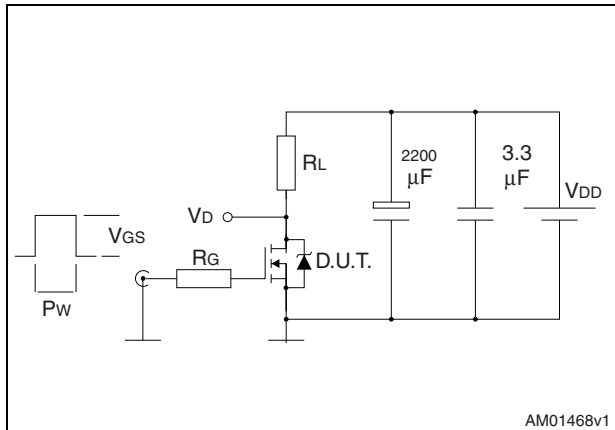


Figure 15. Gate charge test circuit

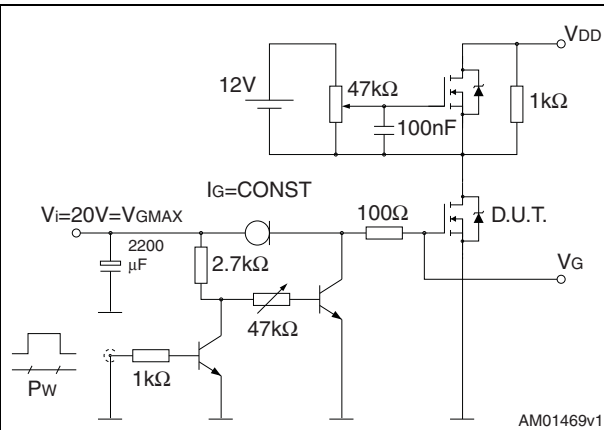


Figure 16. Test circuit for inductive load switching and diode recovery times

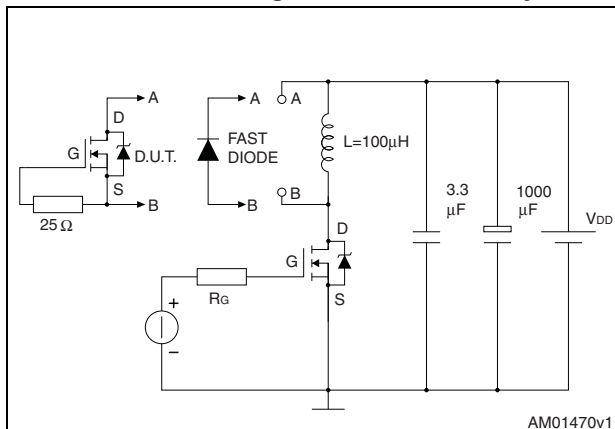


Figure 17. Unclamped inductive load test circuit

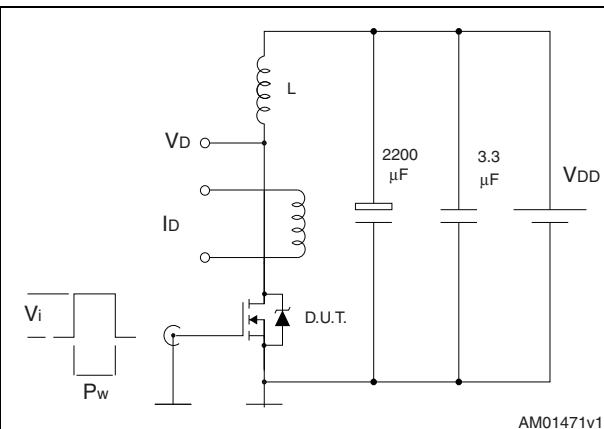


Figure 18. Unclamped inductive waveform

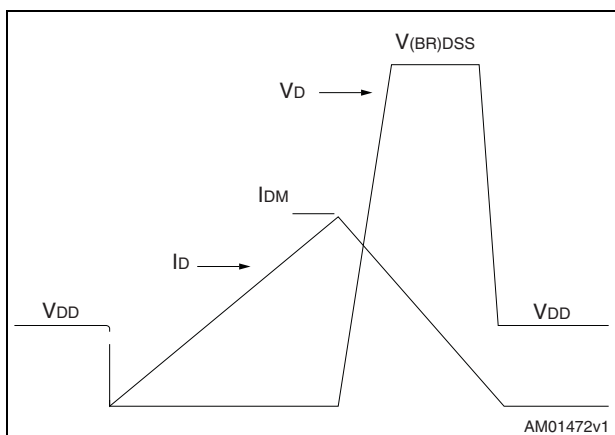
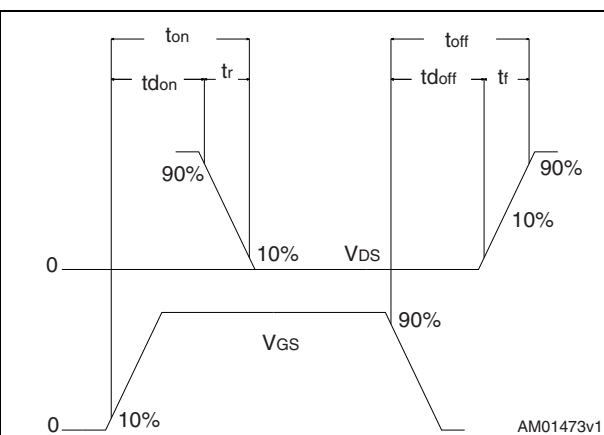


Figure 19. Switching time waveform



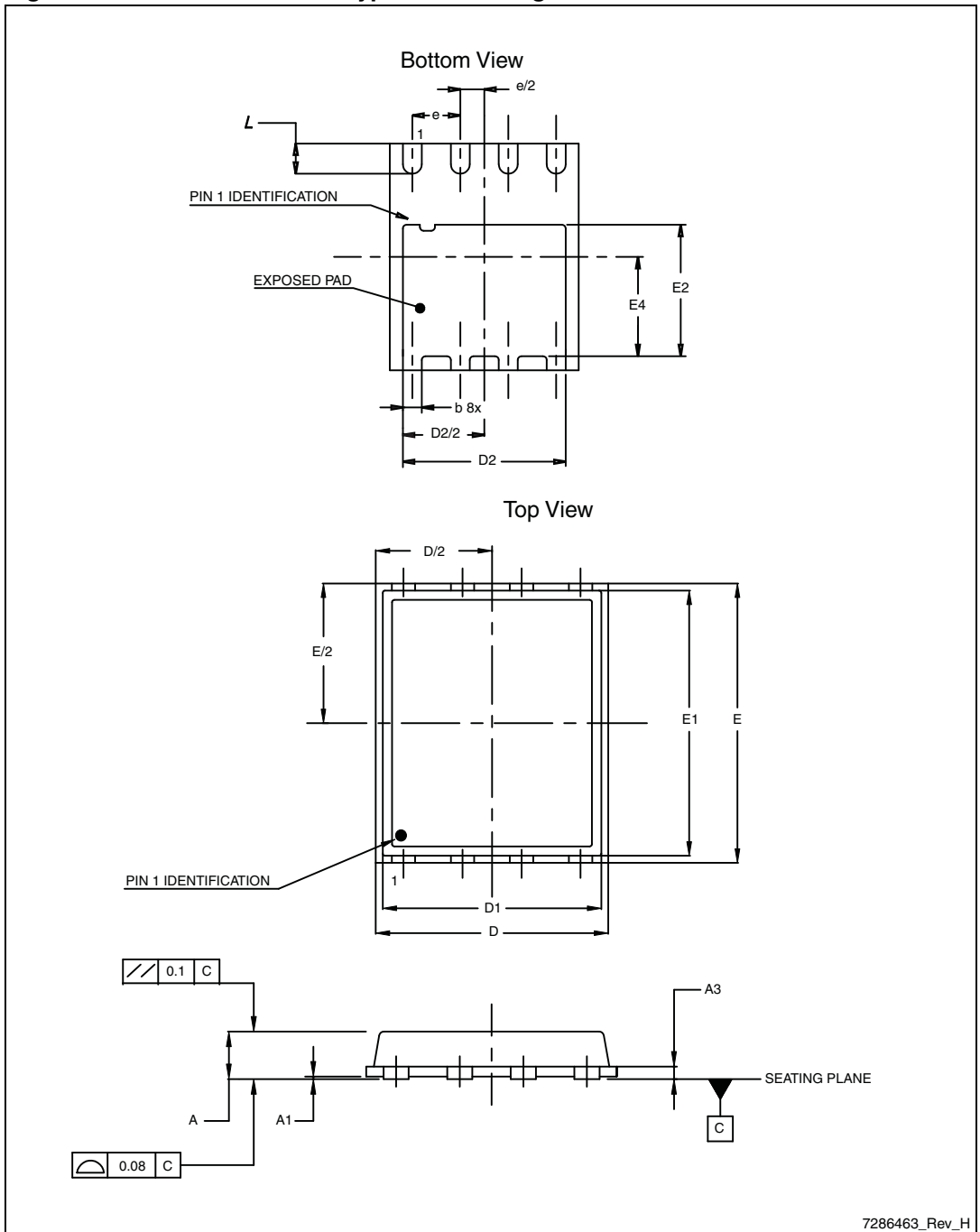
4 Package mechanical data

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. ECOPACK is an ST trademark.

Table 9. PowerFLAT™ 5x6 type C-B mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.83	0.93
A1	0	0.02	0.05
A3		0.20	
b	0.35	0.40	0.47
D		5.00	
D1		4.75	
D2	4.15	4.20	4.25
E		6.00	
E1		5.75	
E2	3.43	3.48	3.53
E4	2.58	2.63	2.68
e		1.27	
L	0.70	0.80	0.90

Figure 20. PowerFLAT™ 5x6 type C-B drawing



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Table 10. PowerFLAT™ 5x6 type S-C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D		5.20	
E		6.15	
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
e1		0.65	
L	0.715		1.015
K	1.05		1.35

Figure 21. PowerFLAT™ 5x6 type S-C mechanical data

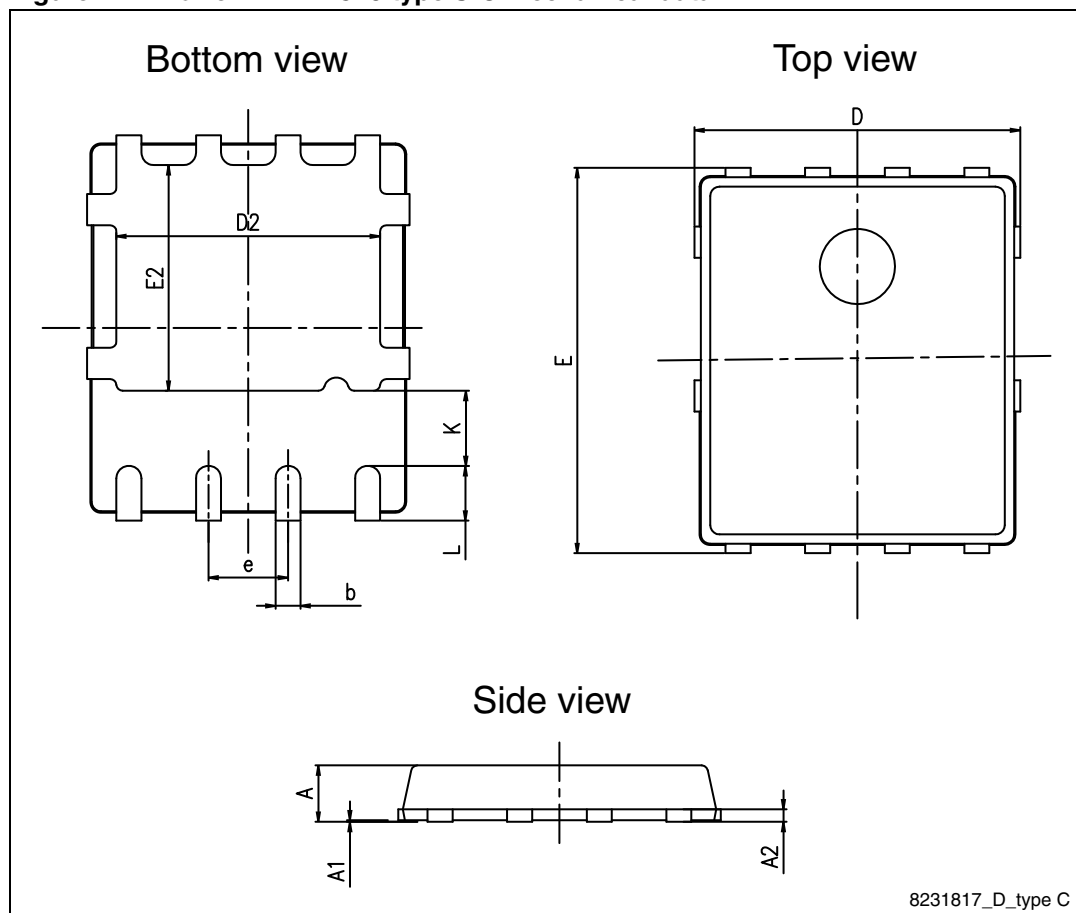
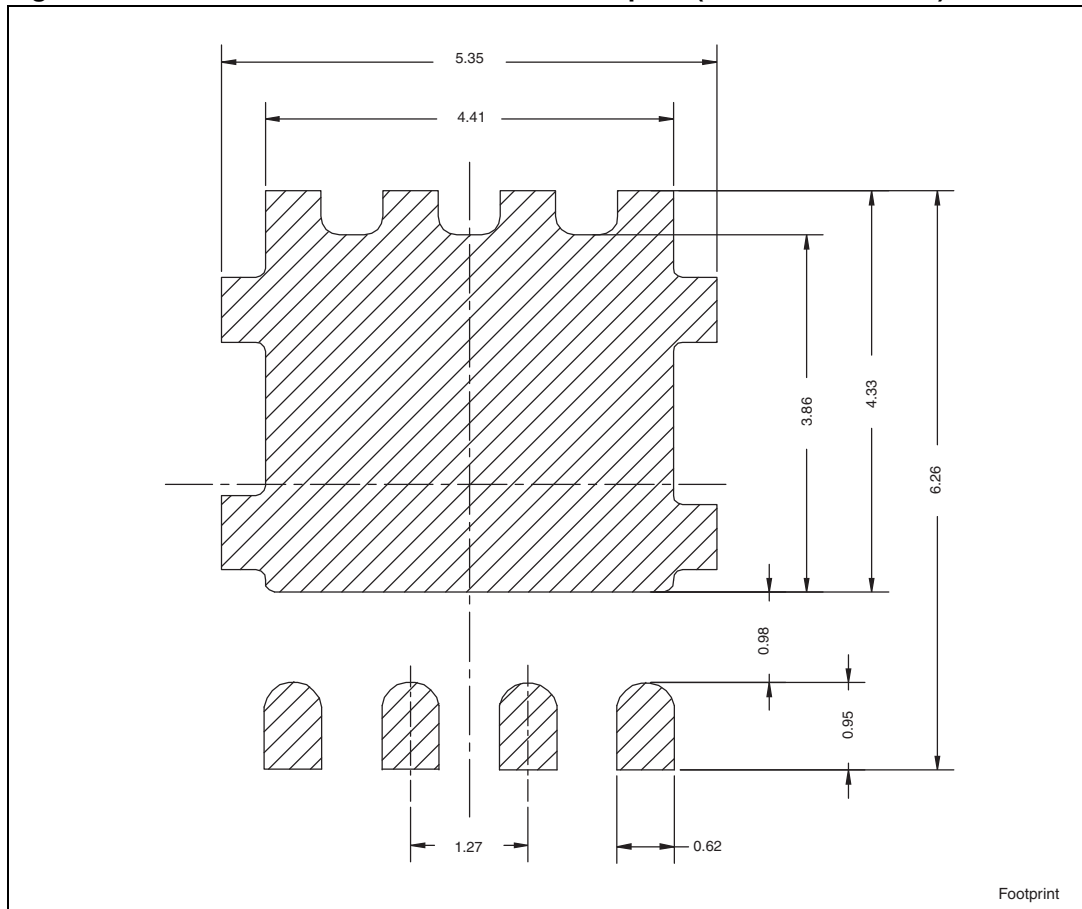


Figure 22. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 23. PowerFLAT™ 5x6 tape

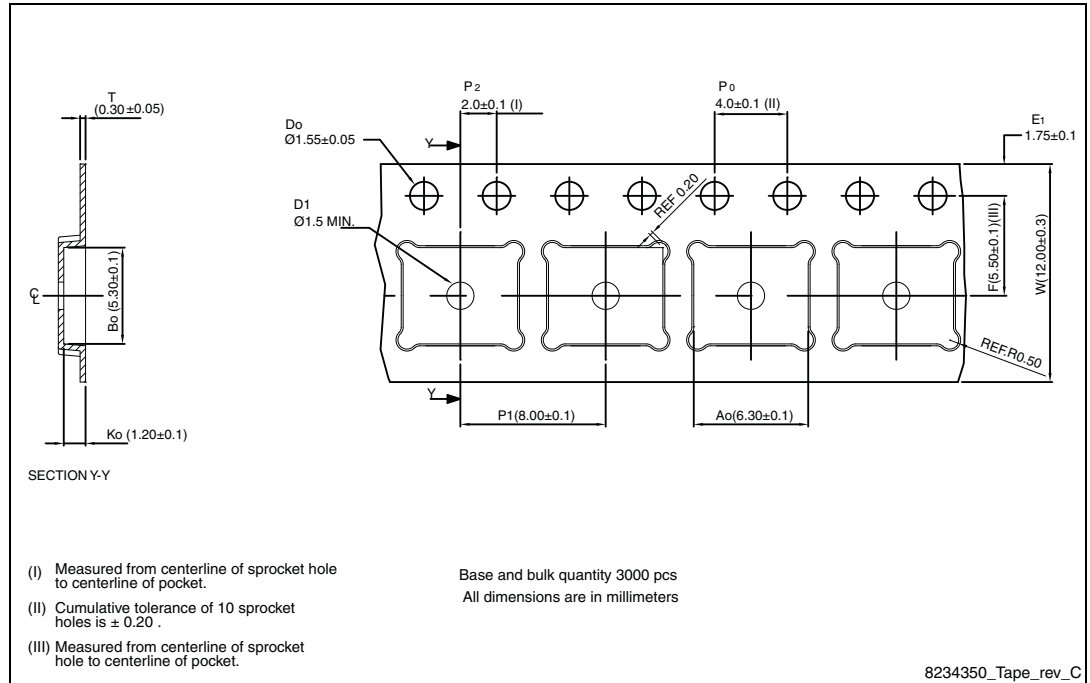


Figure 24. PowerFLAT™ 5x6 package orientation in carrier tape.

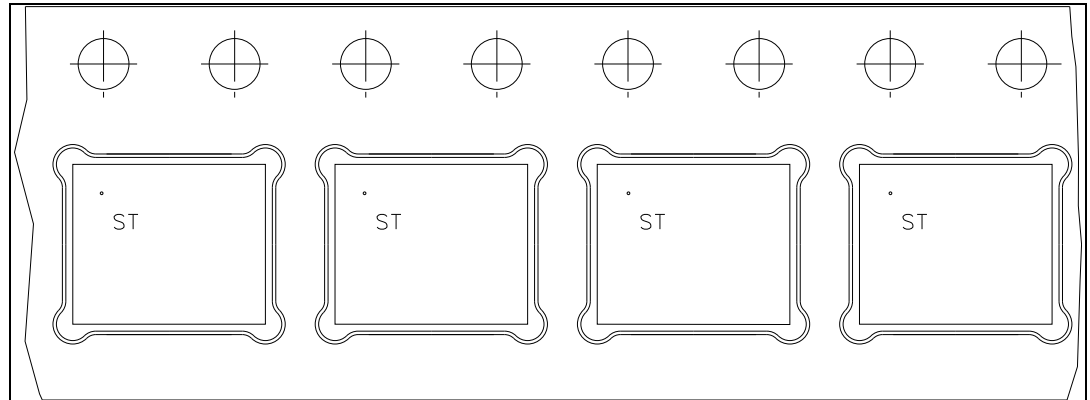
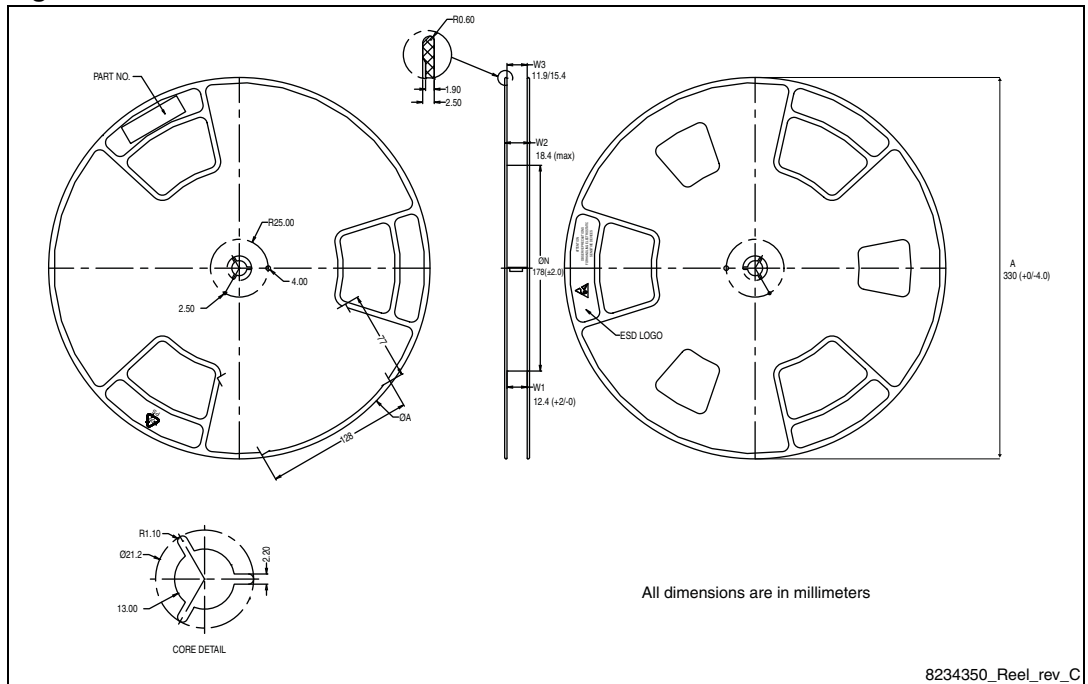


Figure 25. PowerFLAT™ 5x6 reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
02-Dec-2011	1	First release.
13-Jan-2012	2	$R_{DS(on)}$ values have been changed (see Table 5: On/off states).
29-May-2012	3	Document status promoted from preliminary data to production data.

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