



STL35N6F3

N-channel 60 V, 0.019 Ω , 10 A STripFET™ III Power MOSFET in PowerFLAT™ 5x6 package

Datasheet — production data

Features

Order code	V _{DSS}	R _{DS(on) max}	I _D
STL35N6F3	60 V	< 0.022 Ω	10 A

- N-channel enhancement mode
- 100% avalanche rated
- Low gate charge
- Very 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.

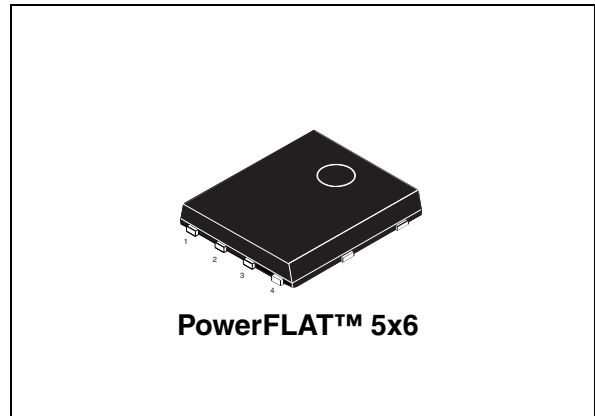


Figure 1. Internal schematic diagram

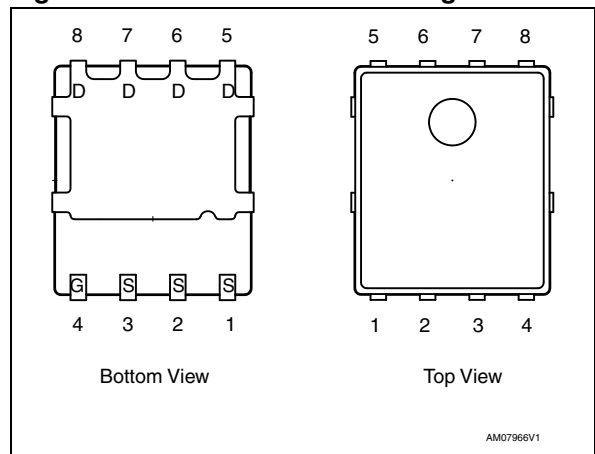


Table 1. Device summary

Order code	Marking	Package	Packaging
STL35N6F3	35N6F3	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	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	35	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	25	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	10	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100\text{ }^\circ\text{C}$	7	A
$I_{DM}^{(3)}$	Drain current (pulsed)	100	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	80	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	5	W
T_{stg}	Storage temperature	-55 to 175	$^\circ\text{C}$
T_j	Operating junction temperature		

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 data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	31.3	$^\circ\text{C}/\text{W}$
$R_{thj-case}$	Thermal resistance junction-case max.	1.9	$^\circ\text{C}/\text{W}$

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

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AV}	Not-repetitive avalanche current	5	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$, $V_{DD} = 50\text{ V}$)	409	mJ

2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60\ \text{V}$, $V_{DS} = 60\ \text{V}$, $T_C = 125\text{ °C}$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\ \text{V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 10\ \text{A}$		0.019	0.022	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$	-	762	-	pF
C_{oss}	Output capacitance			173		
C_{rss}	Reverse transfer capacitance			16		
Q_g	Total gate charge	$V_{DD} = 30\ \text{V}$, $I_D = 10\ \text{A}$	-	13.6	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\ \text{V}$		5.0		
Q_{gd}	Gate-drain charge	(see Figure 13)		3.7		
R_g	Gate input resistance	$f = 1\ \text{MHz}$ open drain	-	3.2	-	Ω

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}= 30\text{ V}$, $I_D= 5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (see Figure 12)	-	9.7	-	ns
t_r	Rise time			2.9		ns
$t_{d(off)}$	Turn-off delay time			19		ns
t_f	Fall time			4		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		10	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		40	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 10\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 10\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}= 48\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 14)	-	33		ns
Q_{rr}	Reverse recovery charge			51.2		nC
I_{RRM}	Reverse recovery current			3.1		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

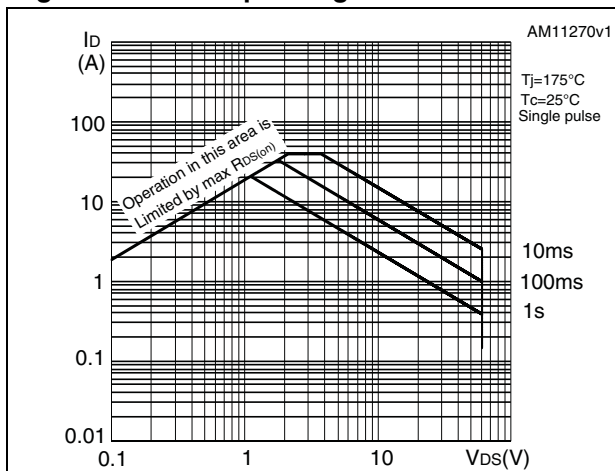


Figure 3. Thermal impedance

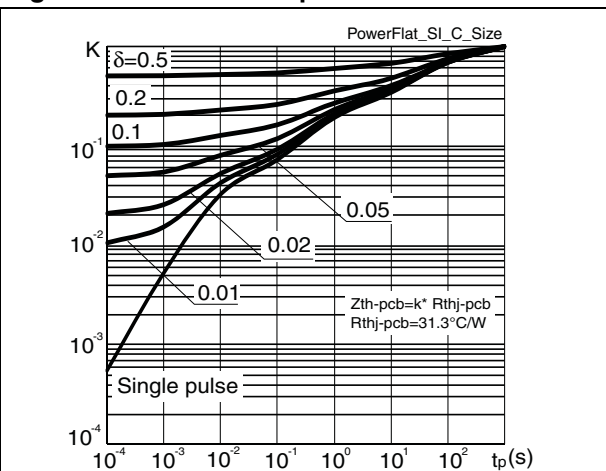


Figure 4. Output characteristics

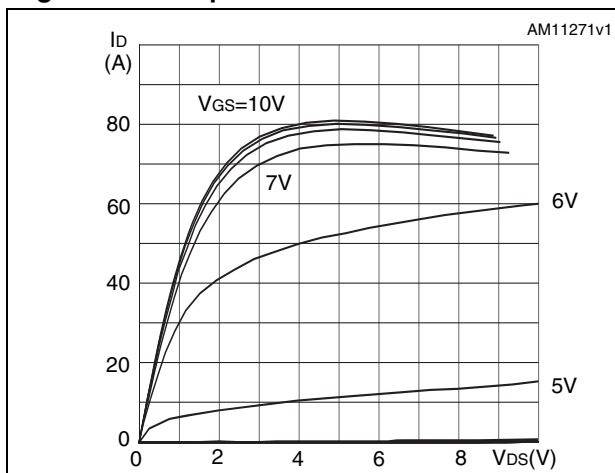


Figure 5. Transfer characteristics

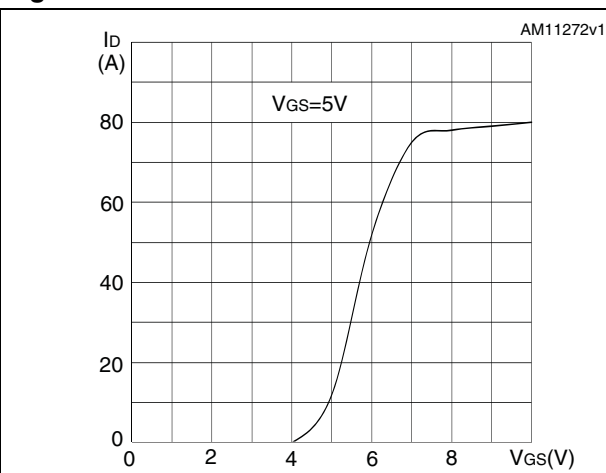


Figure 6. Normalized V_{DS} vs temperature

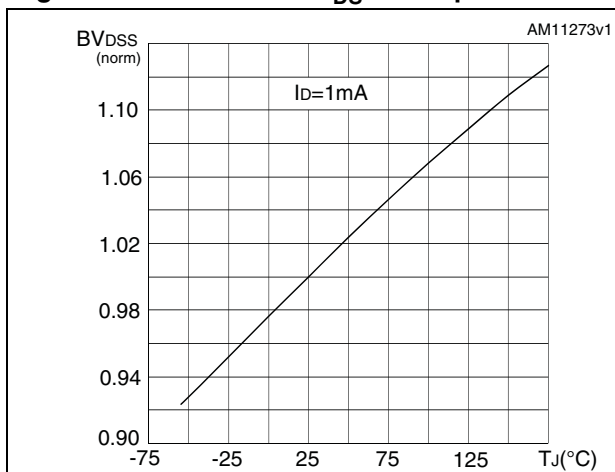


Figure 7. Static drain-source on-resistance

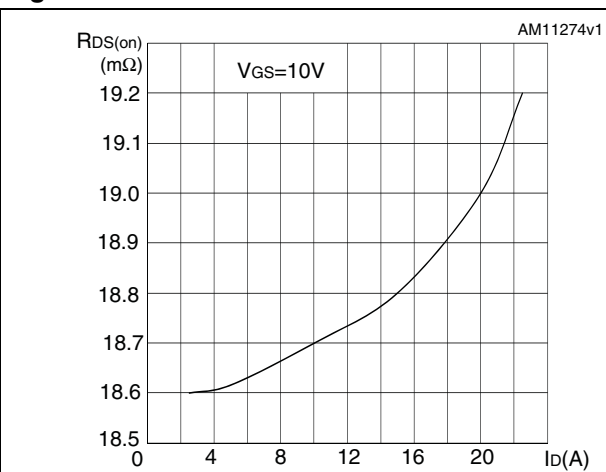


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

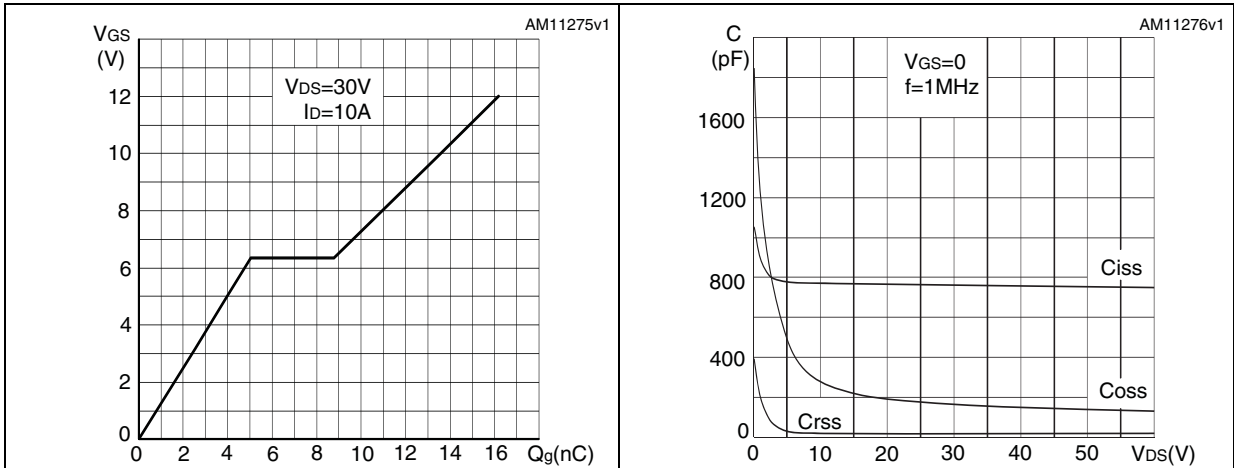
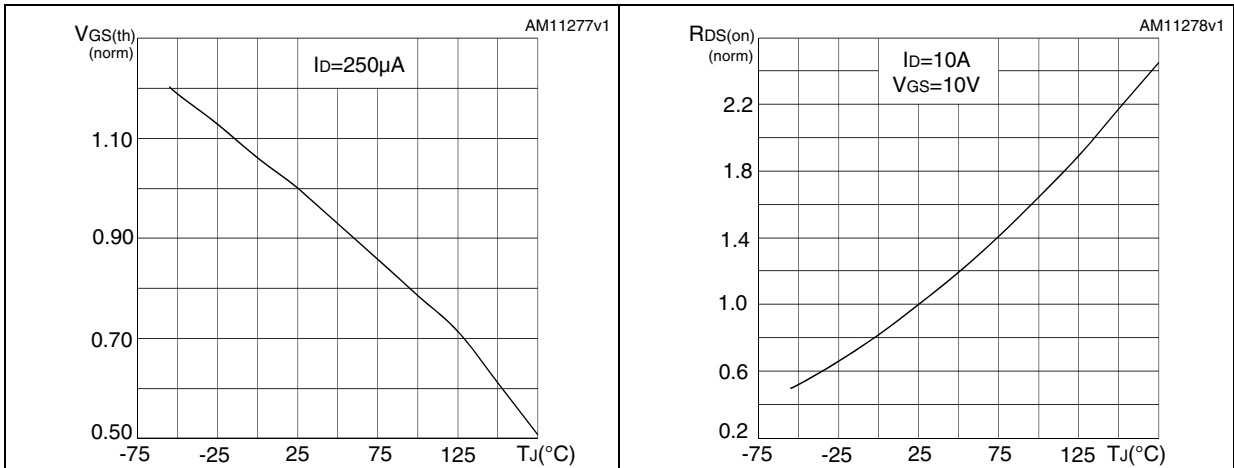


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on-resistance vs temperature



3 Test circuits

Figure 12. Switching times test circuit for resistive load

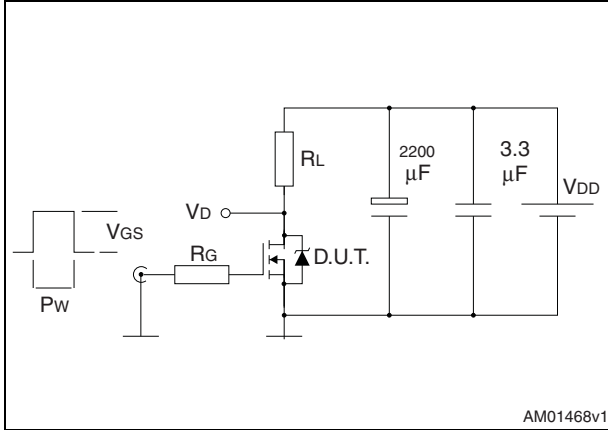


Figure 13. Gate charge test circuit

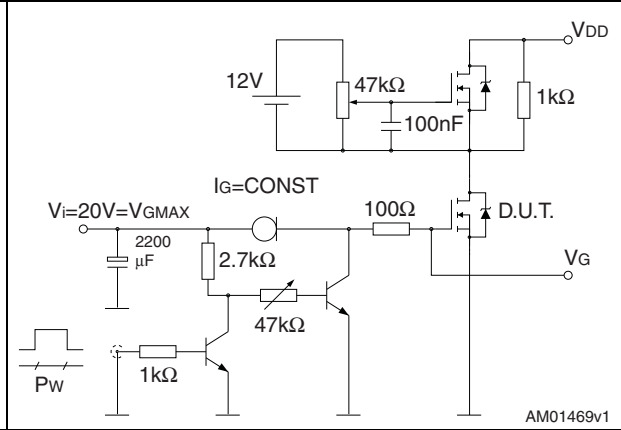


Figure 14. Test circuit for inductive load switching and diode recovery times

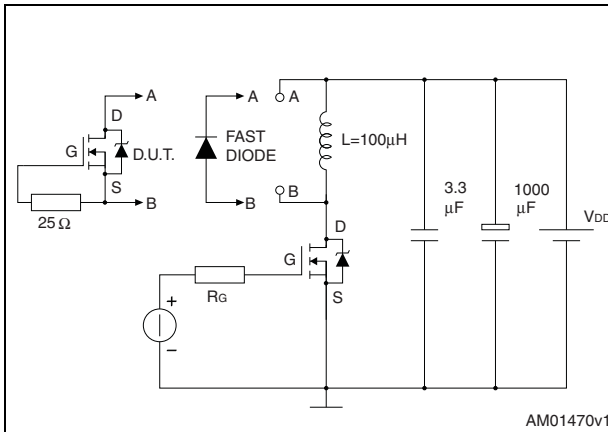


Figure 15. Unclamped inductive load test circuit

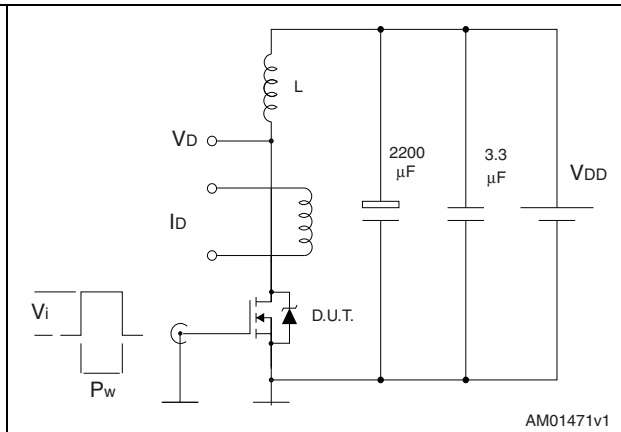


Figure 16. Unclamped inductive waveform

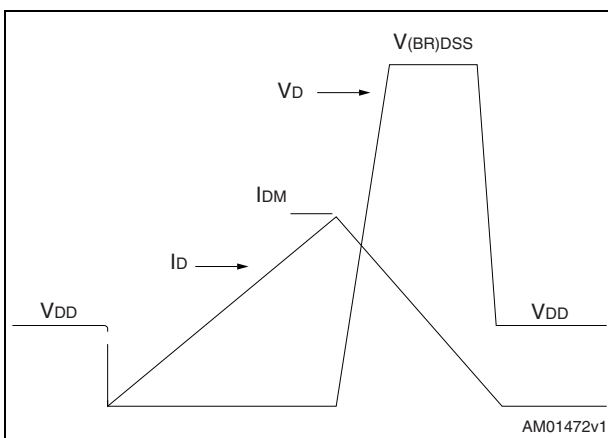
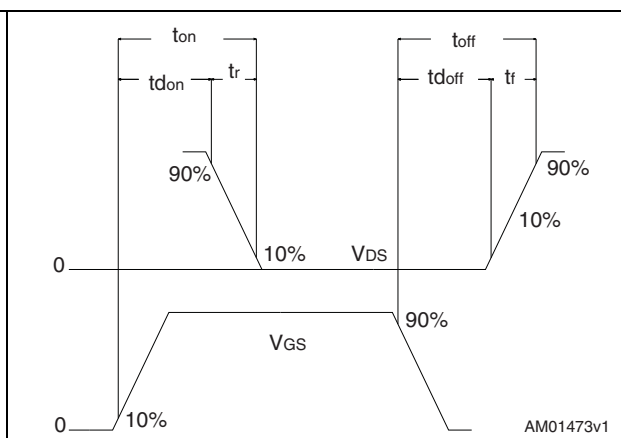


Figure 17. Switching time waveform



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 18. PowerFLAT™ 5x6 type C-B drawing

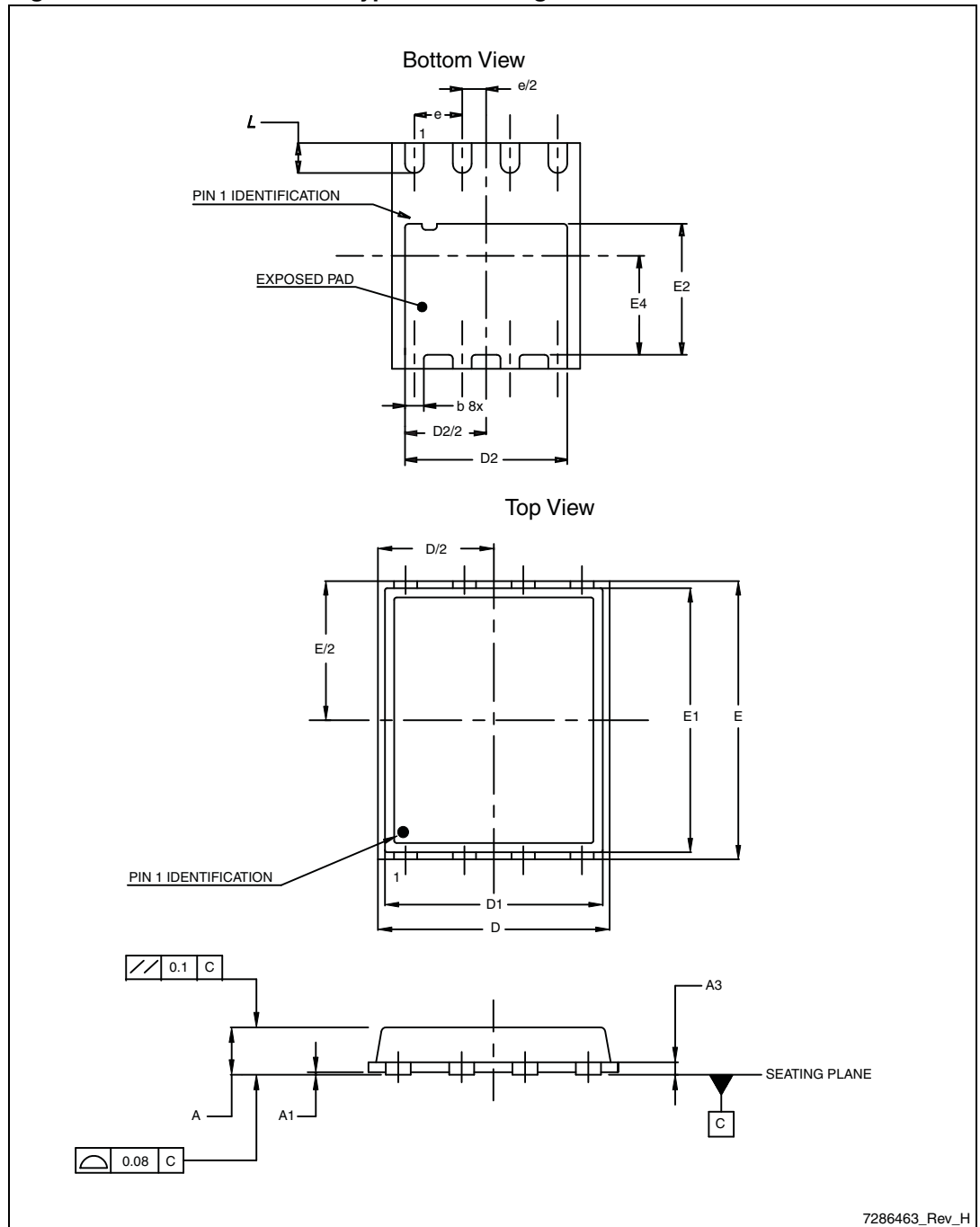


Table 10. PowerFLAT™ 5x6 type S-C mechanical data

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 19. PowerFLAT™ 5x6 type S-C mechanical data

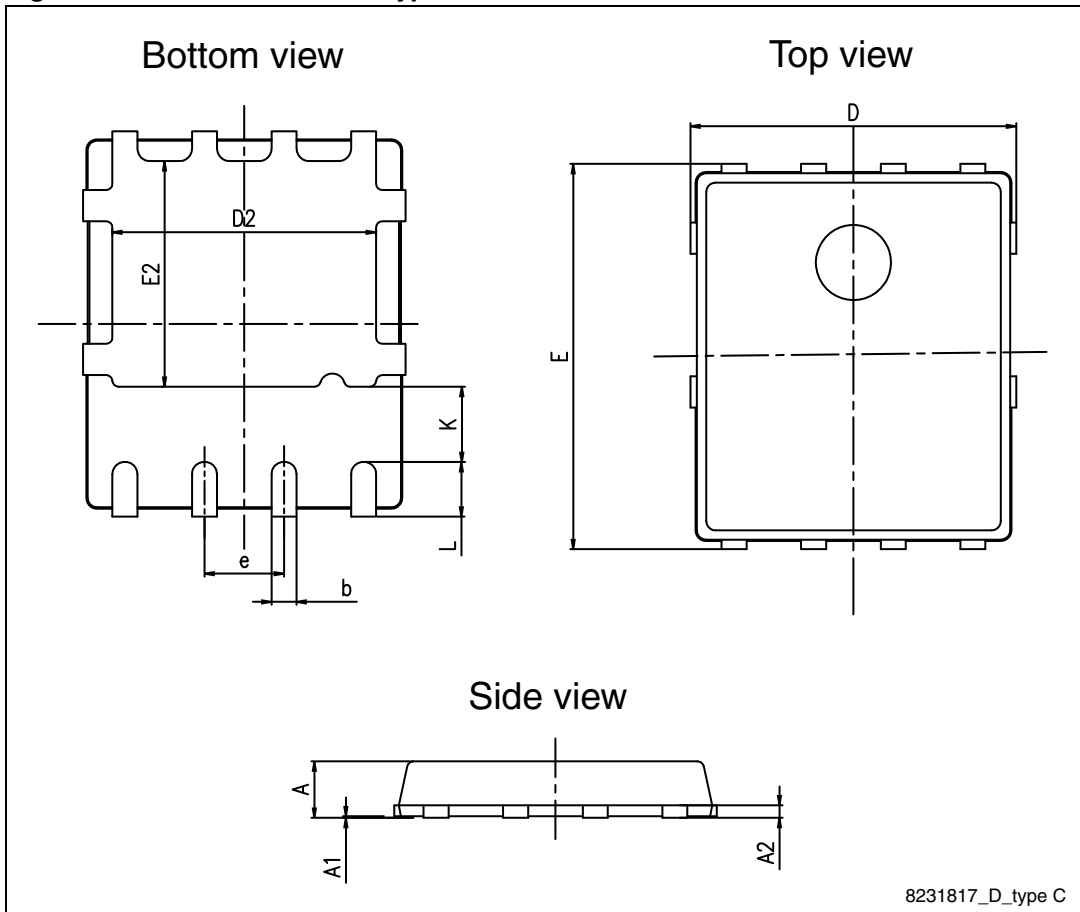
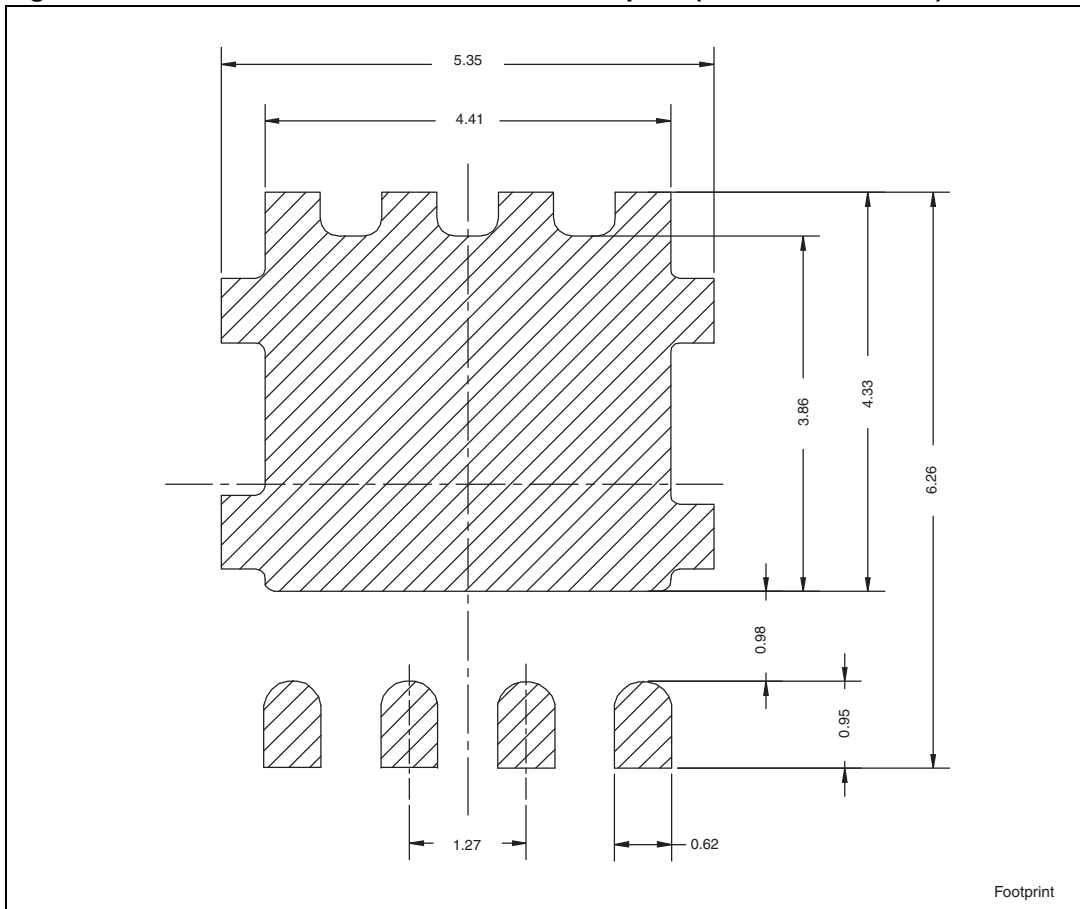


Figure 20. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape

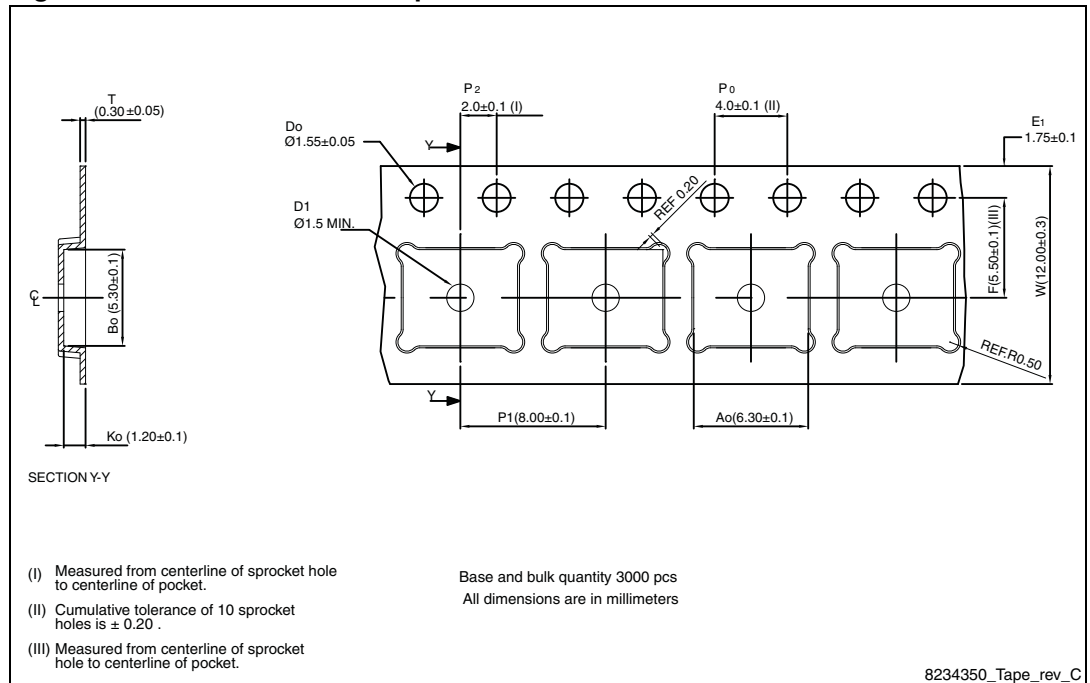


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.

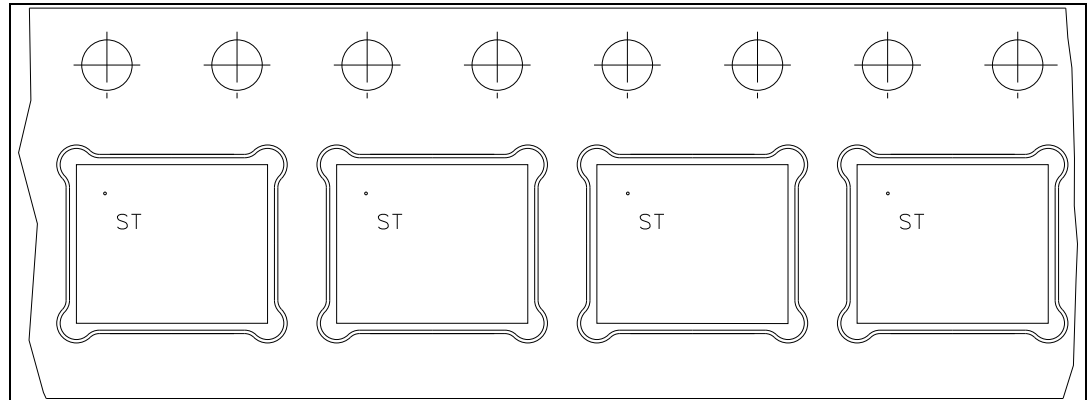
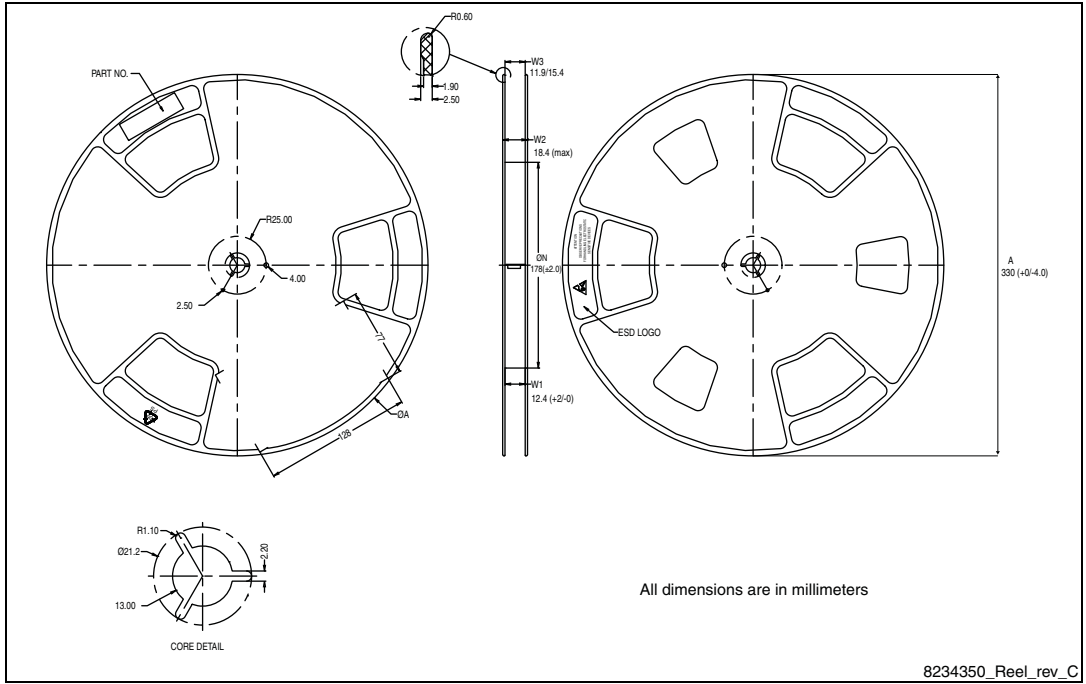


Figure 23. PowerFLAT™ 5x6 reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
29-Oct-2009	1	First release.
15-Nov-2011	2	<i>Section 4: Package mechanical data</i> has been updated. Minor text changes. Document status promoted from preliminary data to datasheet.
27-Mar-2012	3	<i>Section 2.1: Electrical characteristics (curves)</i> has been inserted.
11-May-2012	4	<i>Figure 2: Safe operating area</i> and <i>Figure 3: Thermal impedance</i> have been changed.

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