

## N-channel 100 V, 0.0062 $\Omega$ typ., 19 A, STripFET™ VII DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

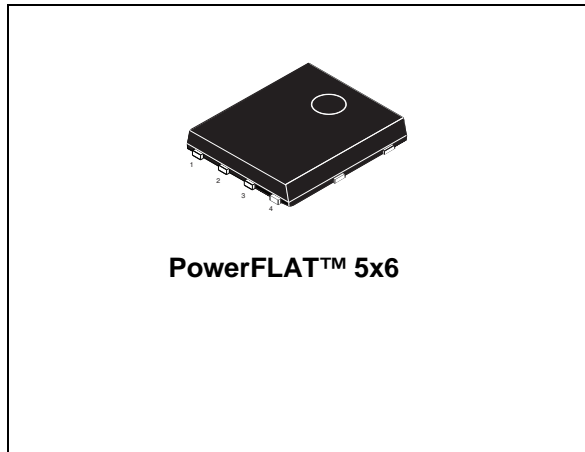
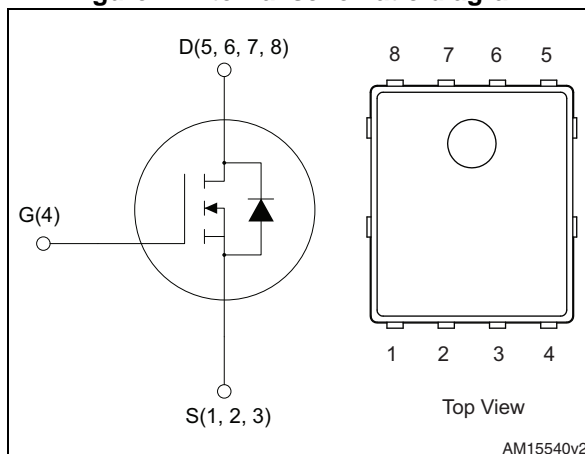


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>	P <sub>TOT</sub>
STL100N10F7	100 V	0.0073 $\Omega$	19 A	5 W

- Ultra low on-resistance
- 100% avalanche tested

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using the 7<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL100N10F7	100N10F7	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	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	70	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	19	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100\text{ }^\circ\text{C}$	13	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	76	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	100	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	5	W
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. This value is rated according to  $R_{thj-c}$ .
2. This 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	1.56	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31	$^\circ\text{C}/\text{W}$

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

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$E_{AS}$	Single pulse avalanche energy ( $T_J = 25\text{ }^\circ\text{C}$ , $L = 3.5\text{ mH}$ , $I_{AS} = 15\text{ A}$ , $V_{DD} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ )	400	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 ( $V_{GS}=0$ )	$I_D = 250\ \mu A$	100			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS}=0$ )	$V_{DS} = 100\text{ V}$ $V_{DS} = 100\text{ V}; T_C=125\text{ °C}$			1 100	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS}=0$ )	$V_{GS} = +20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D = 250\ \mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10\text{ V}, I_D=19\text{ A}$		0.0062	0.0073	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS}=50\text{ V}, f=1\text{ MHz},$ $V_{GS}=0$	-	4369	5680	pF
$C_{oss}$	Output capacitance		-	823	1070	pF
$C_{rss}$	Reverse transfer capacitance		-	36	47	pF
$Q_g$	Total gate charge	$V_{DD}=50\text{ V}, I_D = 19\text{ A}$	-	61	80	nC
$Q_{gs}$	Gate-source charge	$V_{GS}=10\text{ V}$	-	26		nC
$Q_{gd}$	Gate-drain charge	<a href="#">Figure 14</a>	-	13		nC

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=50\text{ V}, I_D=19\text{ A},$ $R_G=4.7\ \Omega, V_{GS}=10\text{ V}$ <a href="#">Figure 13</a>	-	27	-	ns
$t_r$	Rise time		-	40	-	ns
$t_{d(off)}$	Turn-off delay time		-	46	-	ns
$t_f$	Fall time		-	15	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		19	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		76	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 38 \text{ A}$ , $V_{GS} = 0$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 19 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 80 \text{ V}$ , $T_j = 150 \text{ }^\circ\text{C}$	-	77		ns
$Q_{rr}$	Reverse recovery charge		-	146		nC
$I_{RRM}$	Reverse recovery current		-	4		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

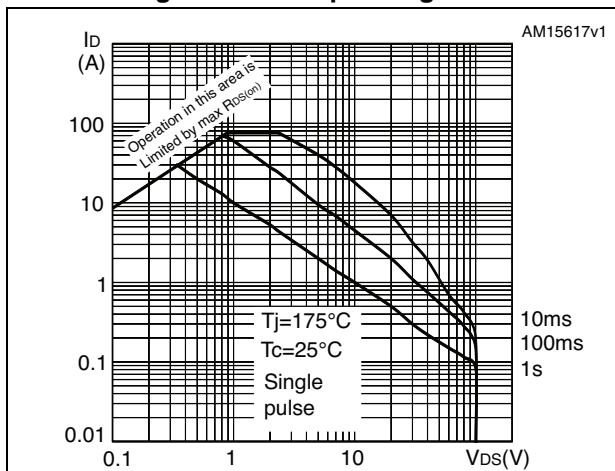


Figure 3. Thermal impedance

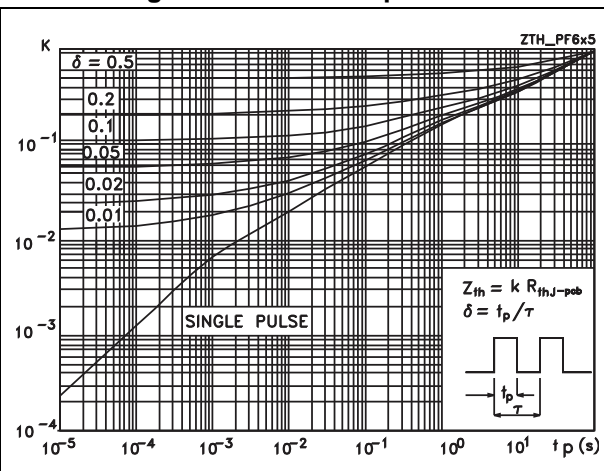


Figure 4. Output characteristics

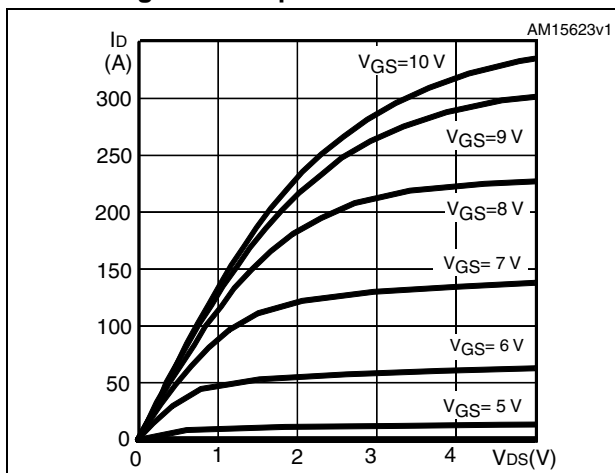


Figure 5. Transfer characteristics

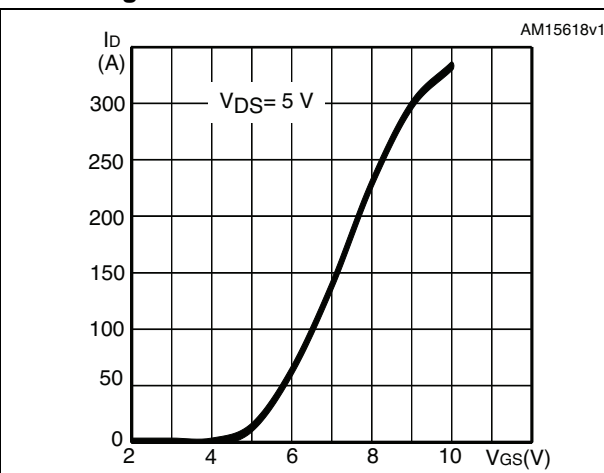


Figure 6. Gate charge vs gate-source voltage

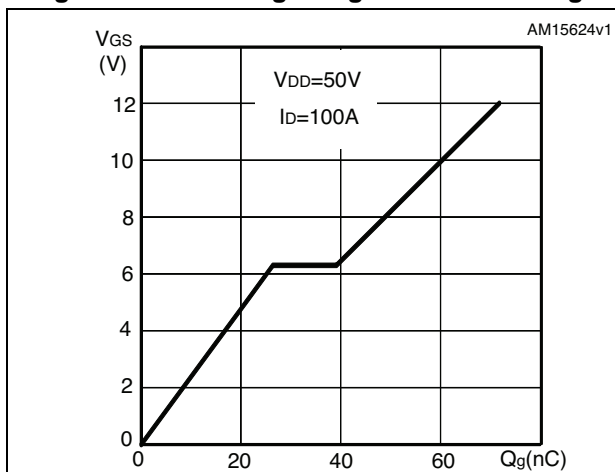


Figure 7. Static drain-source on-resistance

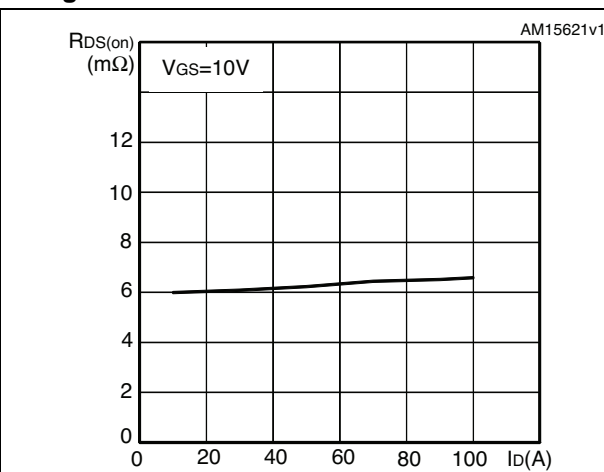


Figure 8. Capacitance variations

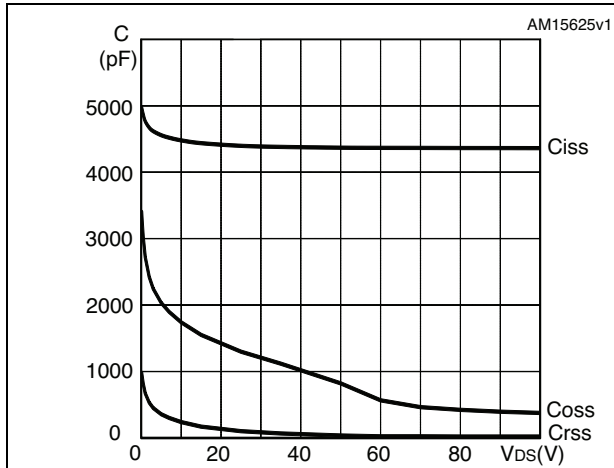


Figure 9. Normalized  $B_{VDSS}$  vs temperature

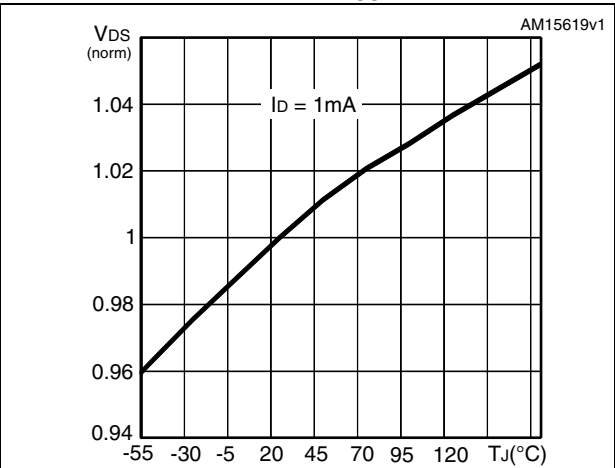


Figure 10. Normalized gate threshold voltage vs temperature

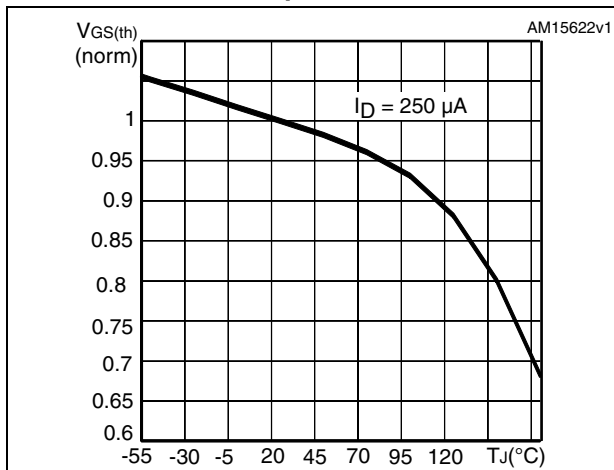


Figure 11. Normalized on-resistance vs temperature

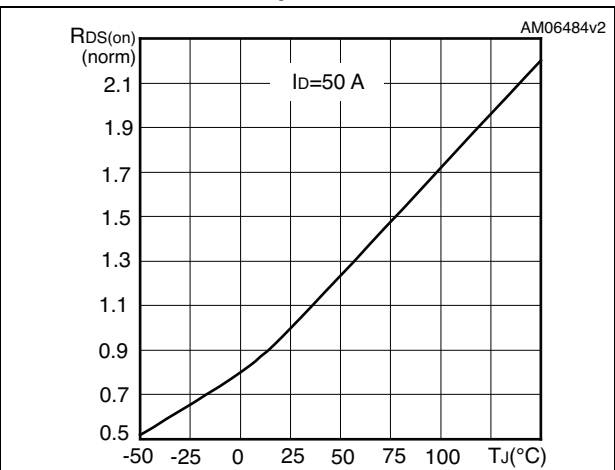
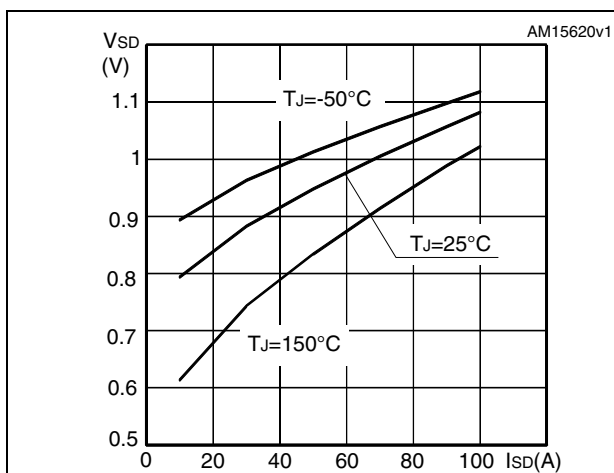


Figure 12. Source-drain diode forward characteristics

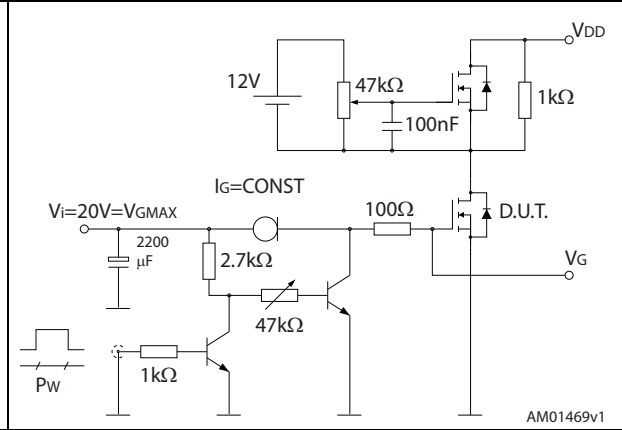


### 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**



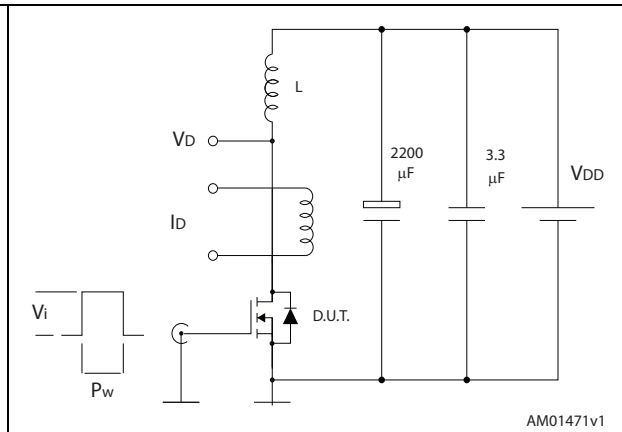
**Figure 14. Gate charge test circuit**



**Figure 15. Test circuit for inductive load switching and diode recovery times**



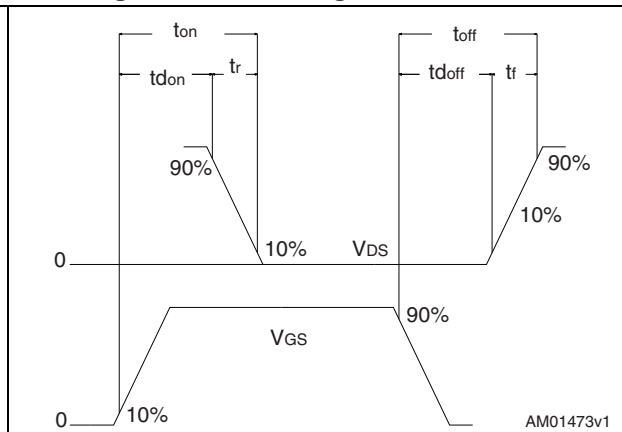
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**





## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Table 9. PowerFLAT 5x6 type S-R 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	5.00	5.20	5.40
E	5.95	6.15	6.35
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
L	0.60		0.80
K	1.275		1.575

Figure 19. PowerFLAT 5x6 type S-R drawing

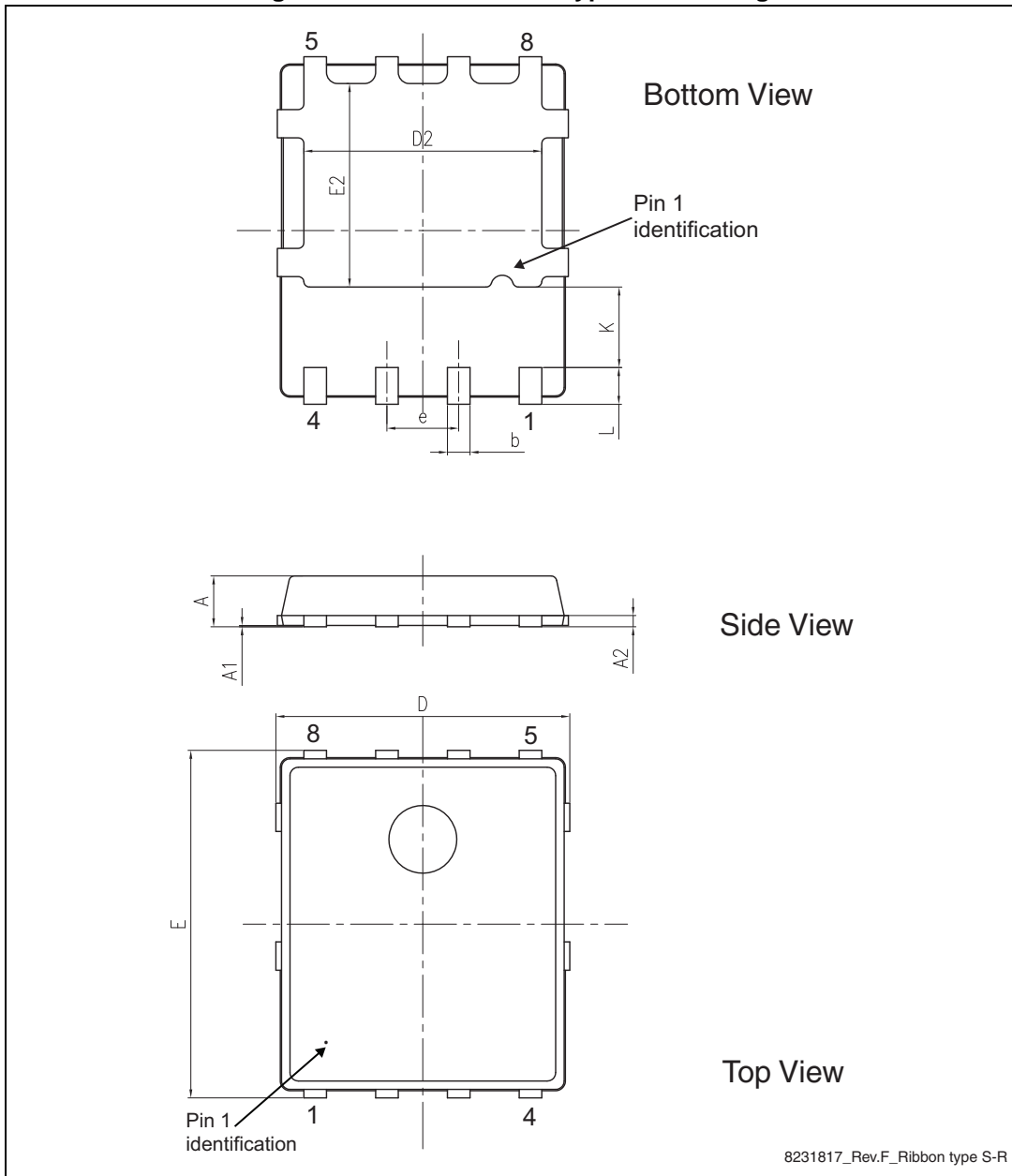
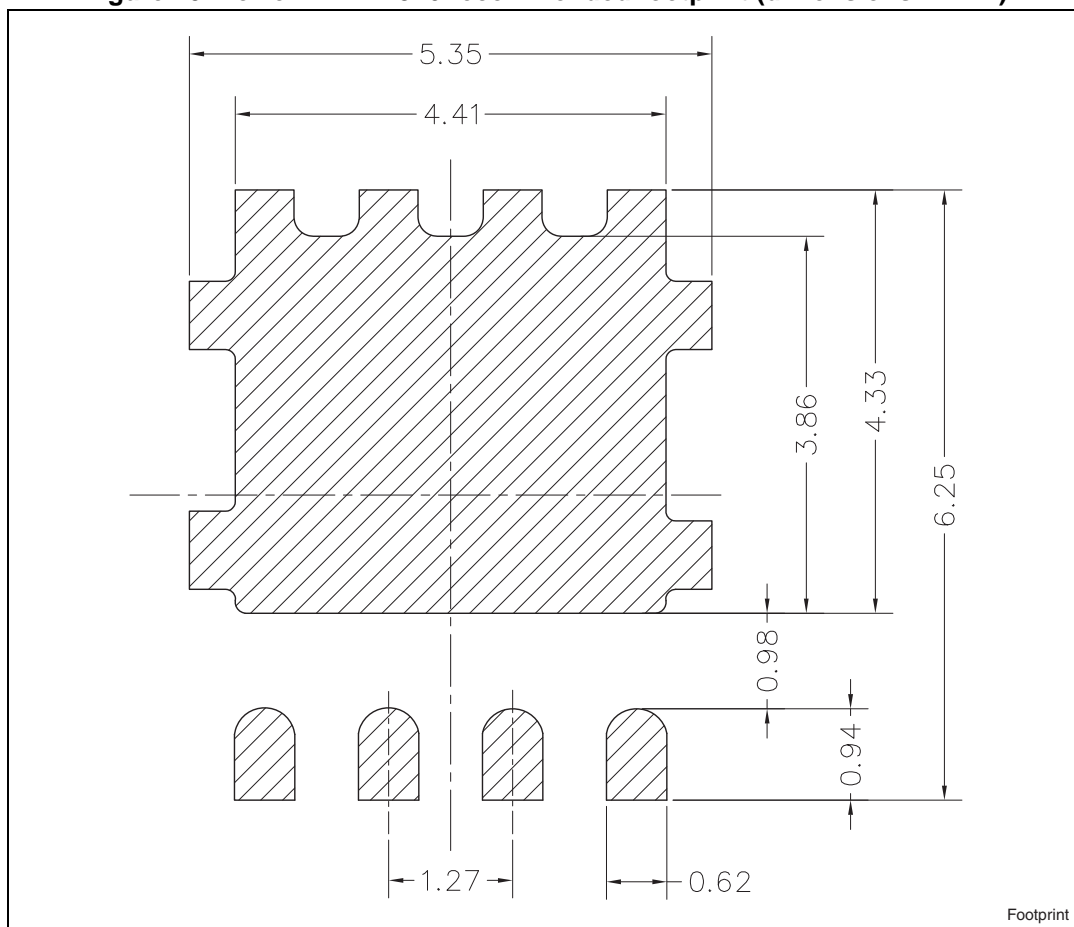


Figure 20. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



# 5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape<sup>(a)</sup>

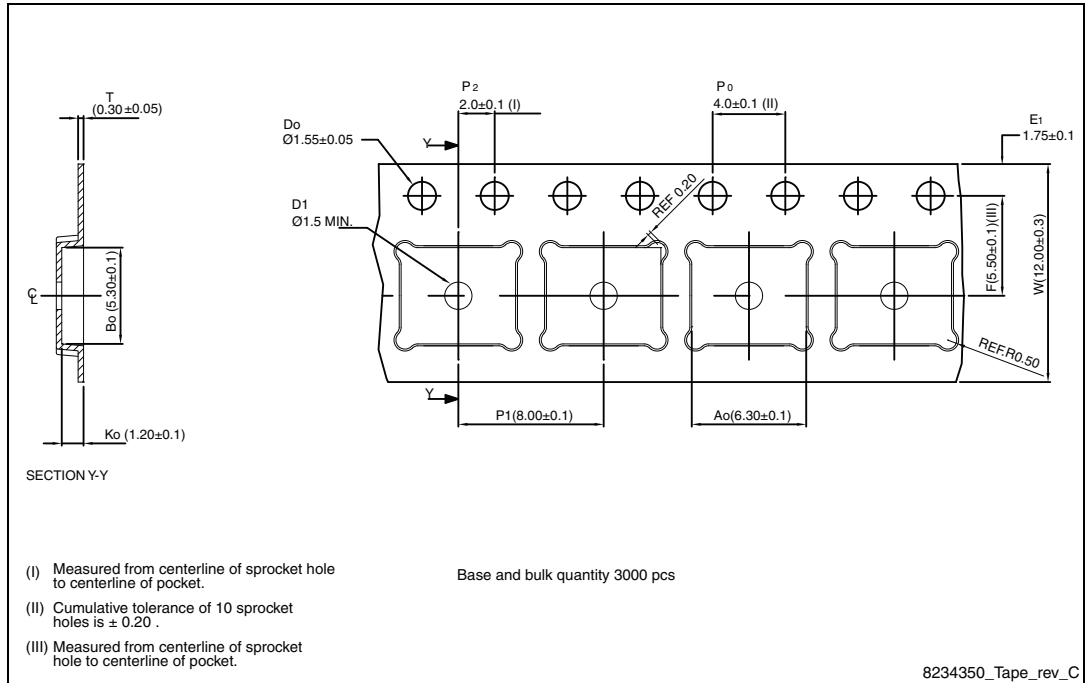
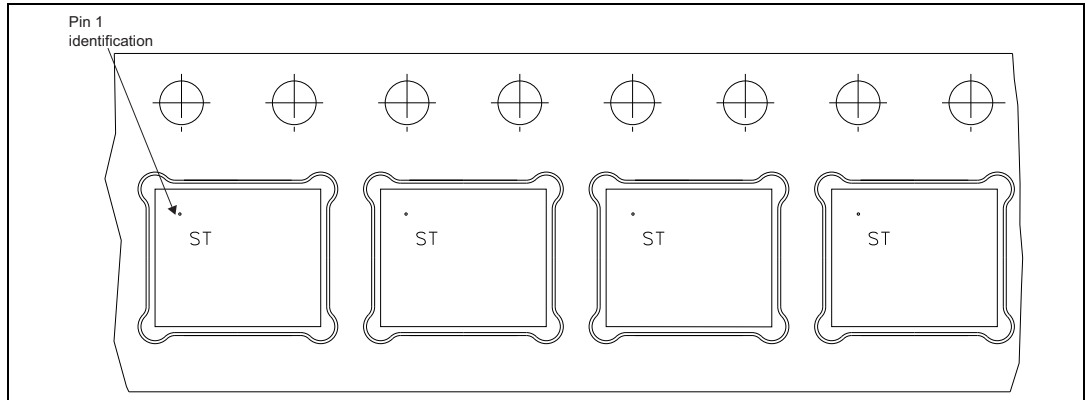
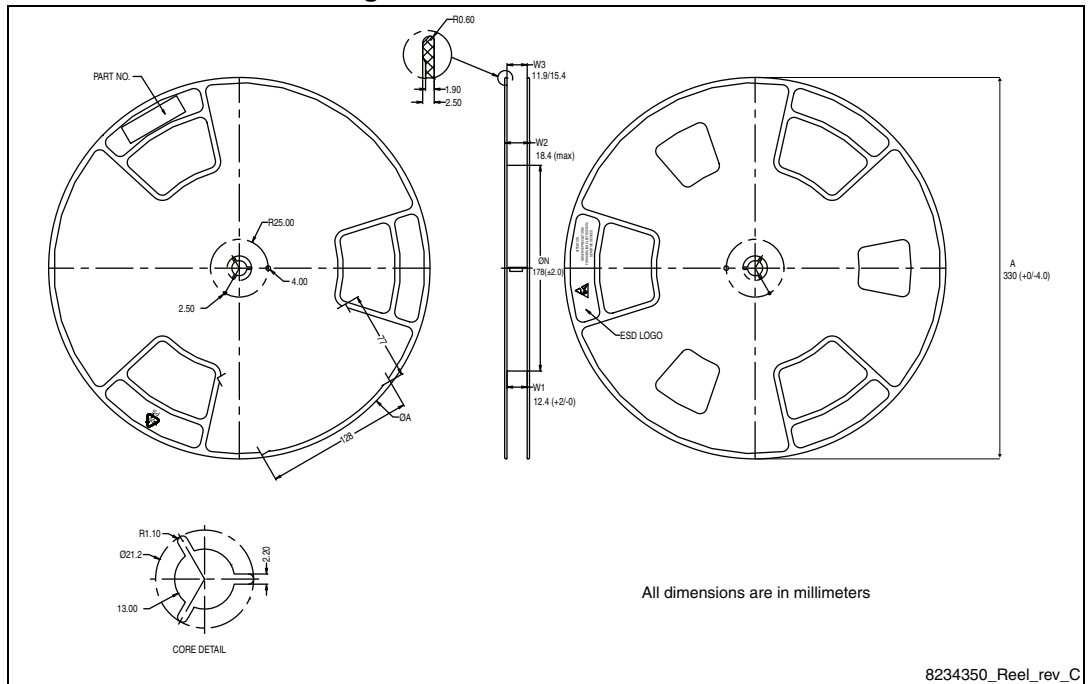


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.



a. All dimensions are in millimeters.

Figure 23. PowerFLAT™ 5x6 reel



## 6 Revision history

Table 10. Document revision history

Date	Revision	Changes
05-Oct-2012	1	First release.
19-Feb-2013	2	<ul style="list-style-type: none"><li>– Document status changed from preliminary to production data</li><li>– Inserted: <a href="#">Section 2.1: Electrical characteristics (curves)</a></li><li>– Updated: <a href="#">Section 4: Package mechanical data</a></li><li>– Added: <a href="#">Section 5: Packaging mechanical data</a></li><li>– Minor text changes</li></ul>
21-Feb-2013	3	<ul style="list-style-type: none"><li>– Updated <a href="#">Table 8: Source drain diode</a> and <a href="#">Figure 5: Transfer characteristics</a>.</li></ul>
31-Jul-2013	4	<ul style="list-style-type: none"><li>– Updated <math>I_D</math> values in test conditions respectively in <a href="#">Table 6: Dynamic</a> and <a href="#">Table 7: Switching times</a>.</li><li>– Modified: <a href="#">Figure 13, 14, 15 and 16</a></li><li>– Minor text changes</li></ul>

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