

N-channel 60 V, 3.3 mΩ typ., 25 A STripFET™ VI DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet – production data

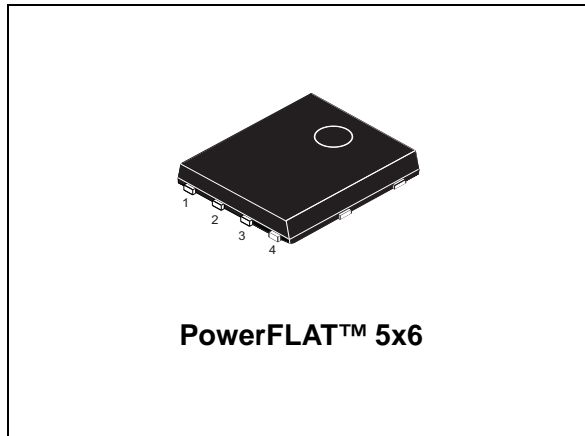
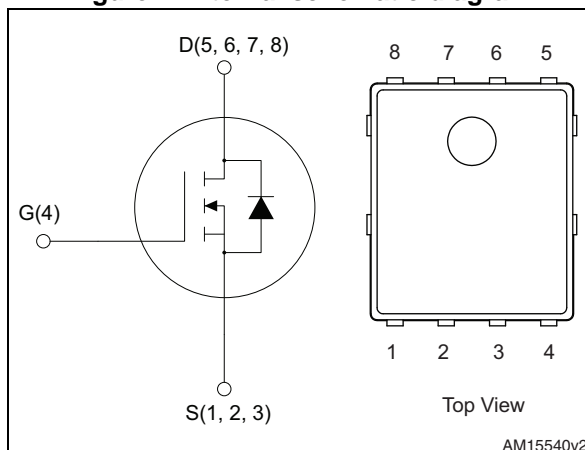


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL100N6LF6	60 V	4.4 mΩ	25 A

- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL100N6LF6	100N6LF6	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 $T_C = 25\text{ }^\circ\text{C}$	130	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	25	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100\text{ }^\circ\text{C}$	18	A
$I_{DM}^{(3)}$	Drain current (pulsed)	100	A
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	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	1.13	$^\circ\text{C}/\text{W}$

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

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	10	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AS}$, $V_{DD} = 52\text{ V}$)	1370	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	$I_D = 1\text{ mA}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}$, $T_C = 125\text{ °C}$			10	μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 11\text{ A}$		3.3	4.4	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}$, $I_D = 11\text{ A}$		4.3	5.5	$\text{m}\Omega$

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	6600	-	pF
C_{oss}	Output capacitance		-	670	-	pF
C_{rss}	Reverse transfer capacitance		-	315	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 20\text{ A}$	-	121	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10\text{ V}$	-	17	-	nC
Q_{gd}	Gate-drain charge	(see Figure 14)	-	22	-	nC
R_g	Gate input resistance	$f = 1\text{ MHz}$ Gate DC Bias=0 test signal level=20 mV $I_D = 0$	-	1.2	-	Ω

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13)	-	20	-	ns
t_r	Rise time		-	13	-	ns
$t_{d(off)}$	Turn-off delay time		-	108	-	ns
t_f	Fall time		-	22	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		22	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		84	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 22 \text{ A}, V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 20 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 48\text{V}, T_J = 150 \text{ }^\circ\text{C}$ (see Figure 15)	-	34		ns
Q_{rr}	Reverse recovery charge		-	44		nC
I_{RRM}	Reverse recovery current		-	2.6		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

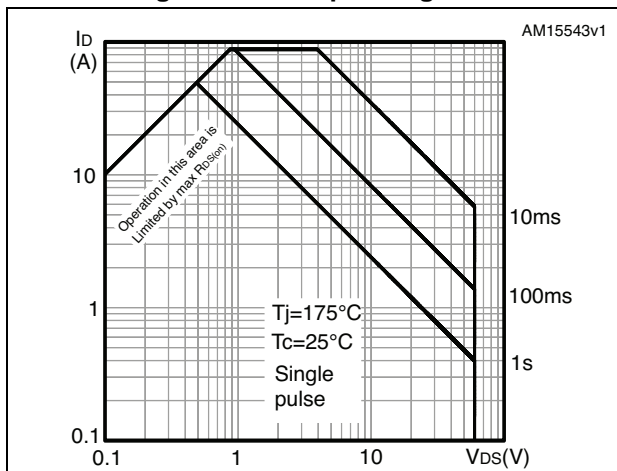


Figure 3. Thermal impedance

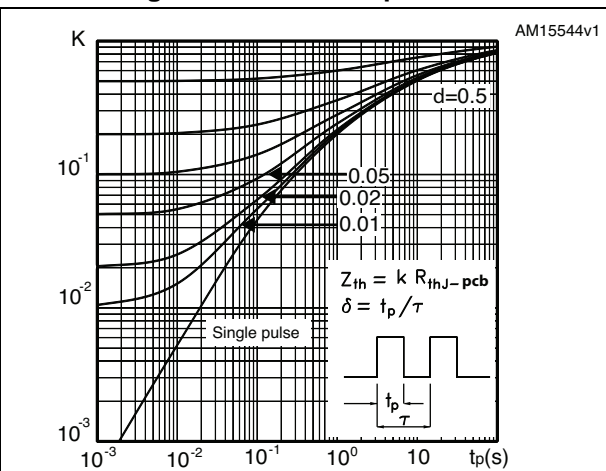


Figure 4. Output characteristics

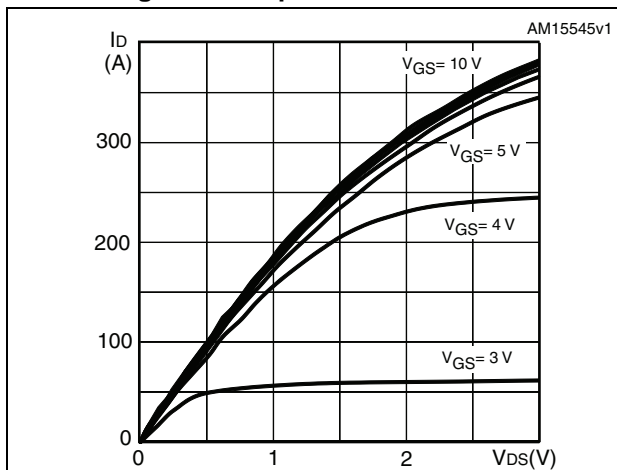


Figure 5. Transfer characteristics

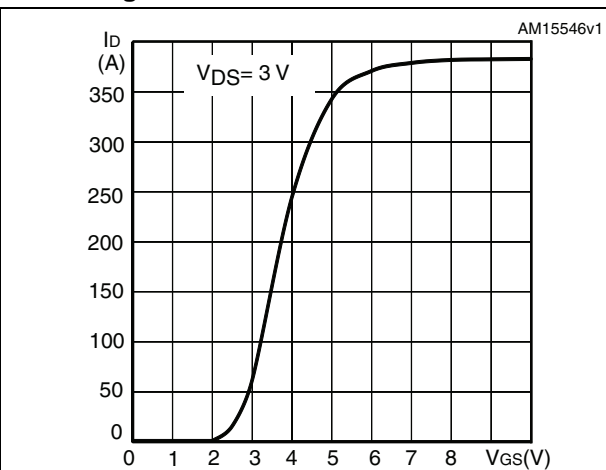


Figure 6. Gate charge vs gate-source voltage

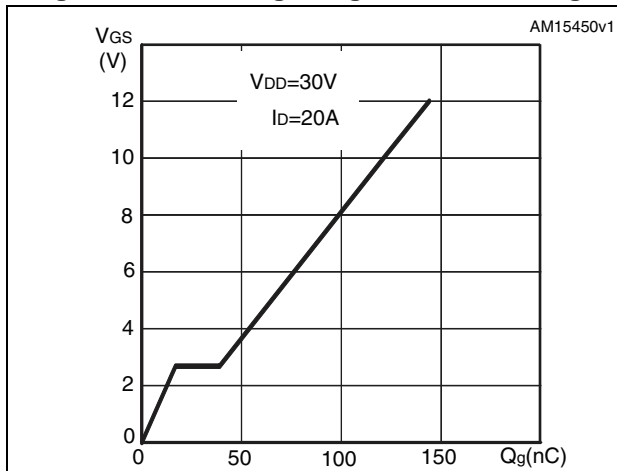


Figure 7. Static drain-source on-resistance

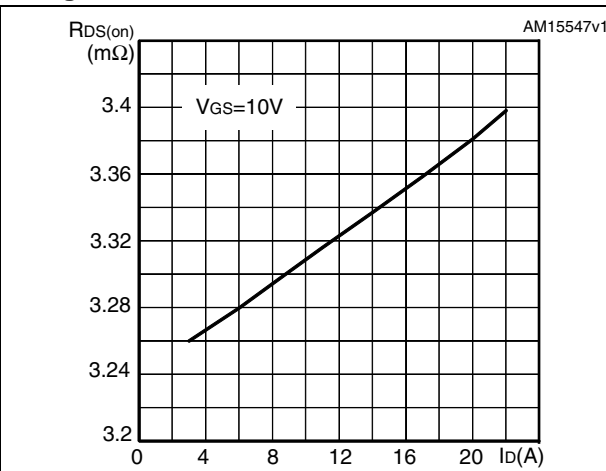


Figure 8. Capacitance variations

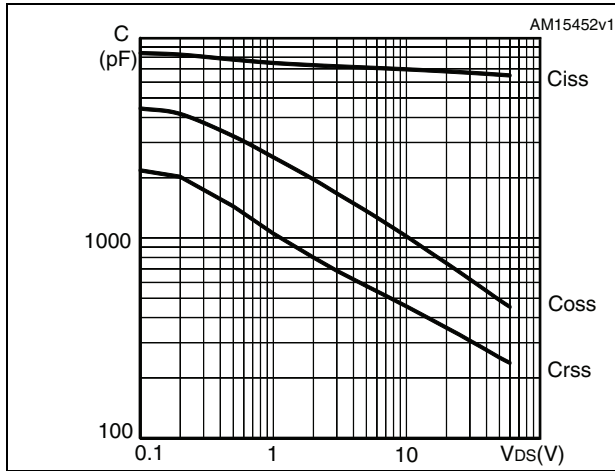


Figure 9. Source-drain diode forward characteristics

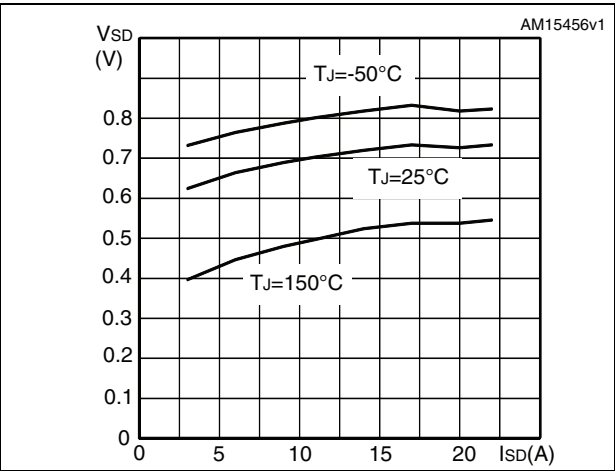


Figure 10. Normalized gate threshold voltage vs temperature

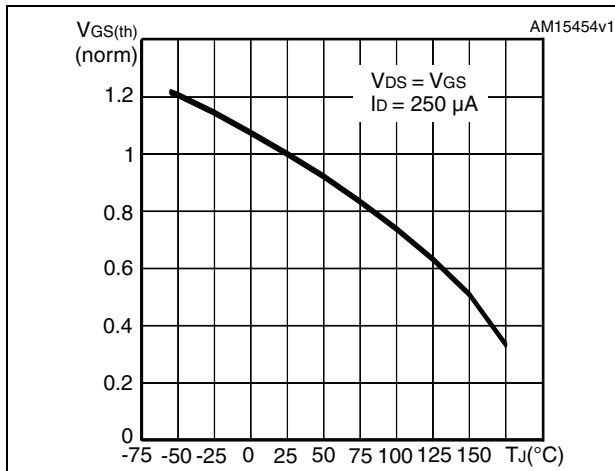


Figure 11. Normalized on-resistance vs temperature

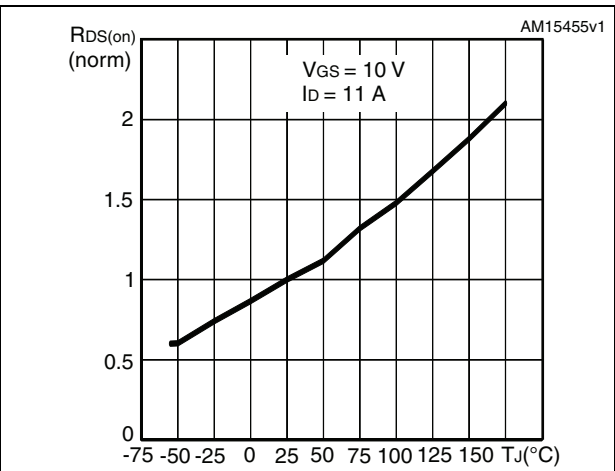
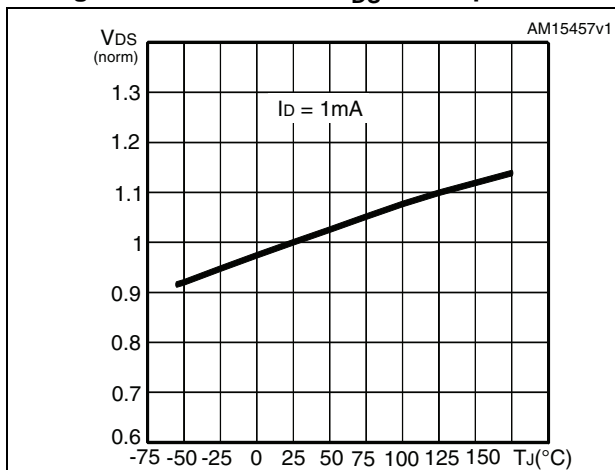
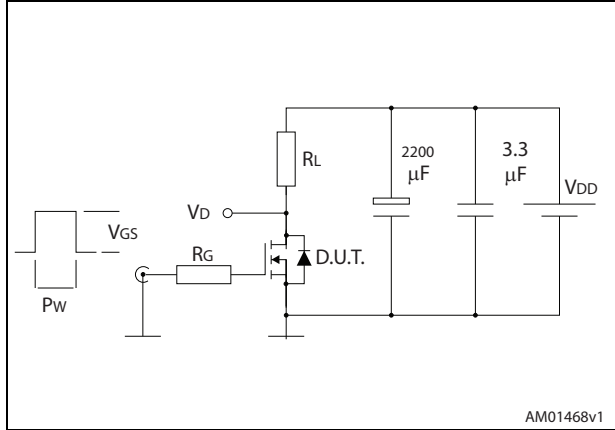


Figure 12. Normalized V_{DS} vs temperature



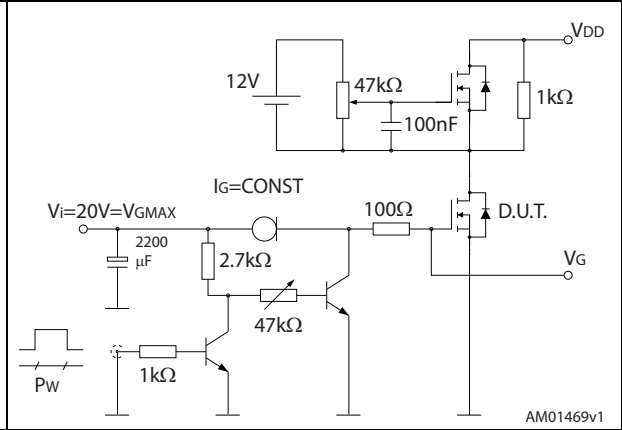
3 Test circuits

Figure 13. Switching times test circuit for resistive load



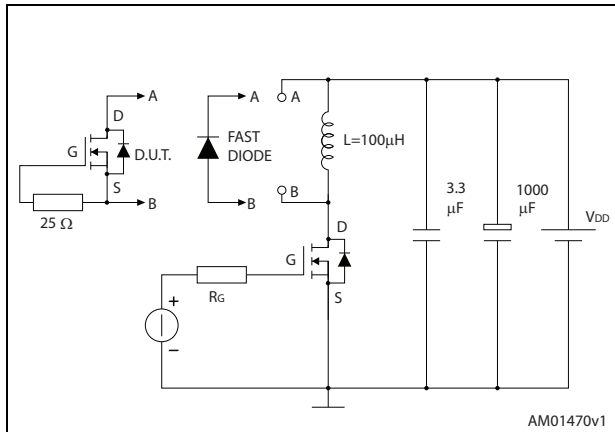
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Figure 14. Gate charge test circuit



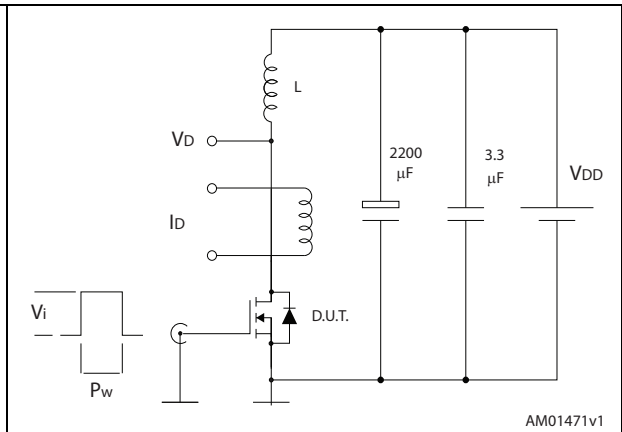
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Figure 15. Test circuit for inductive load switching and diode recovery times



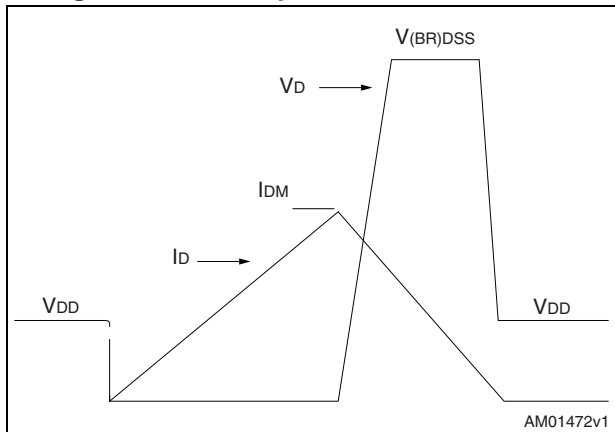
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Figure 16. Unclamped inductive load test circuit



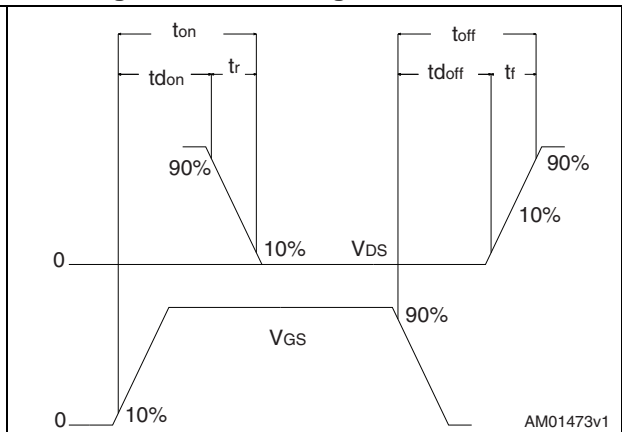
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Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

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

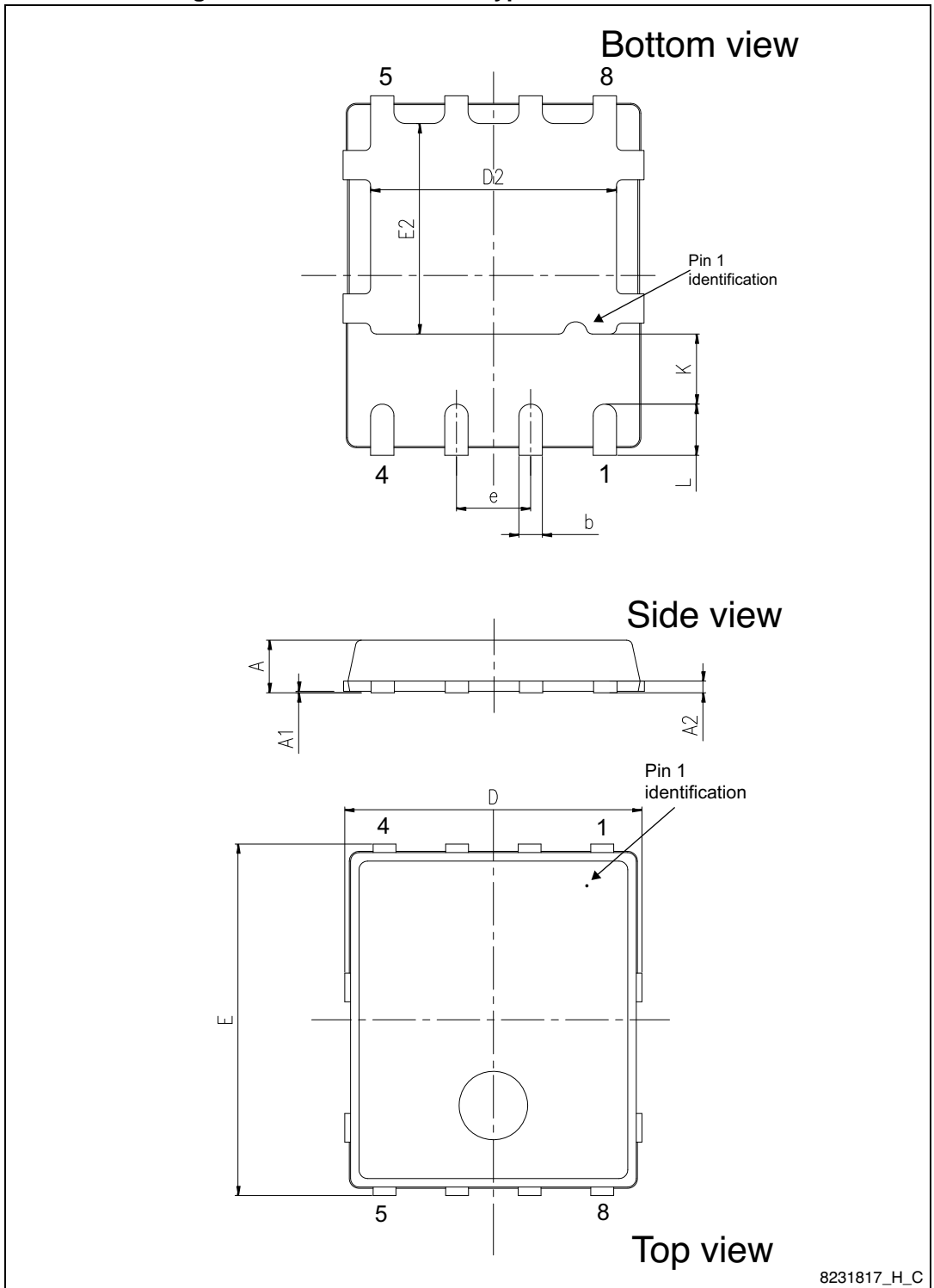
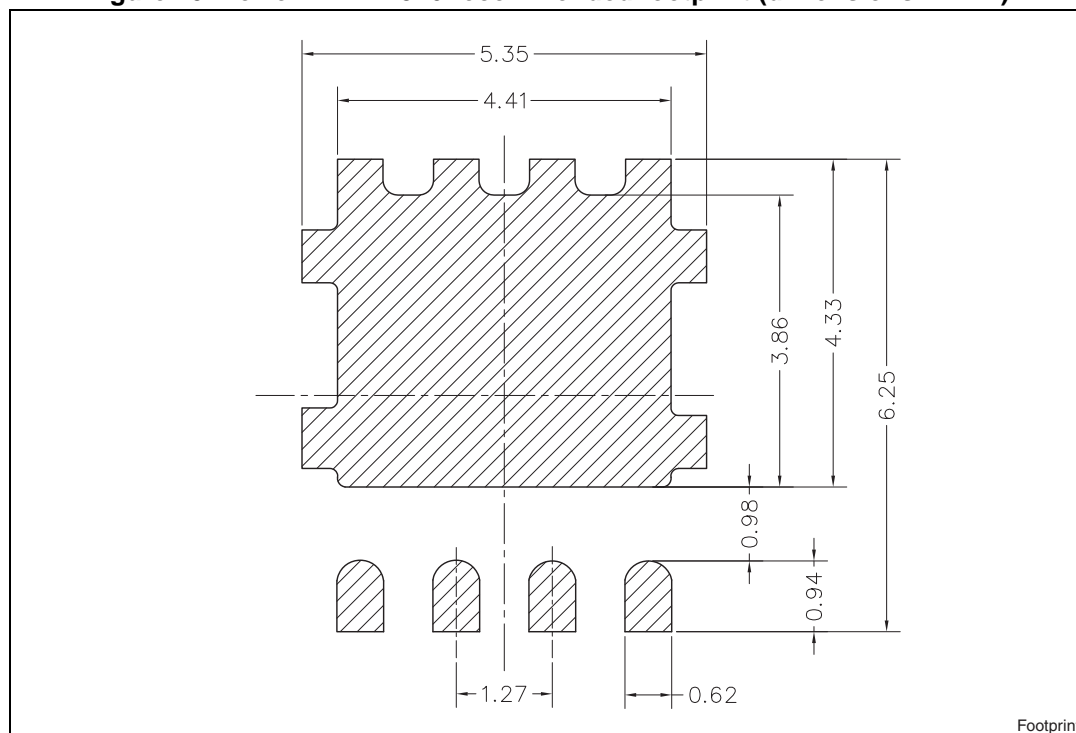


Table 9. PowerFLAT™ 5x6 type S-C mechanical data

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



5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape^(a)

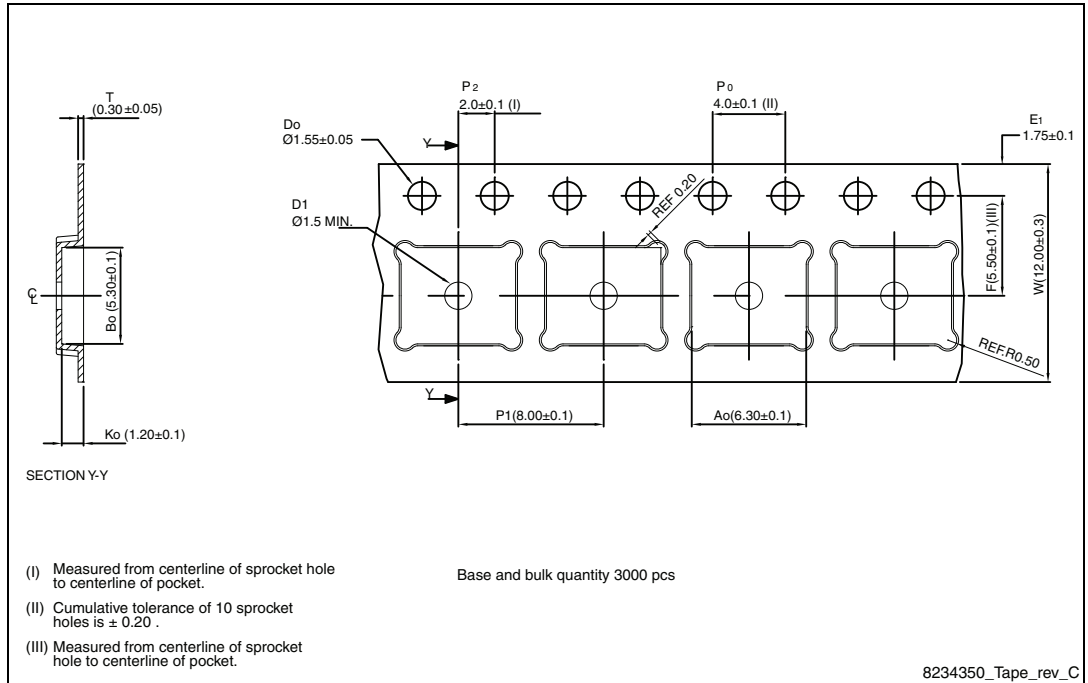
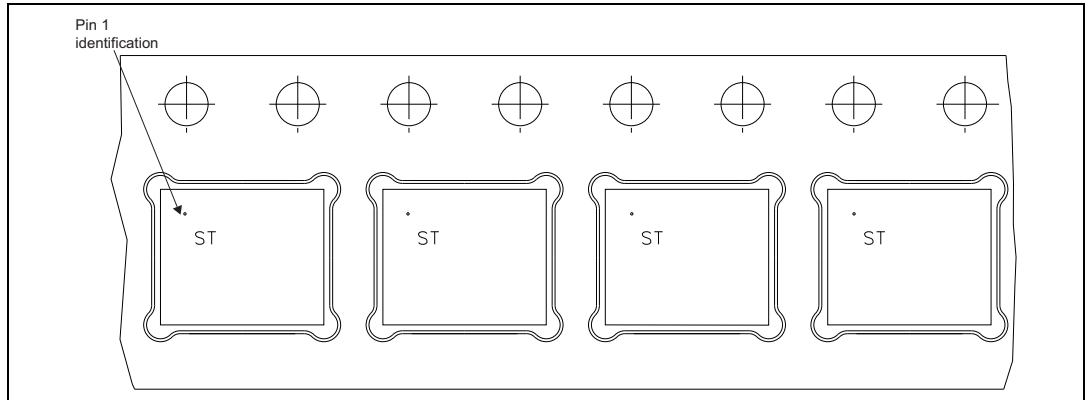
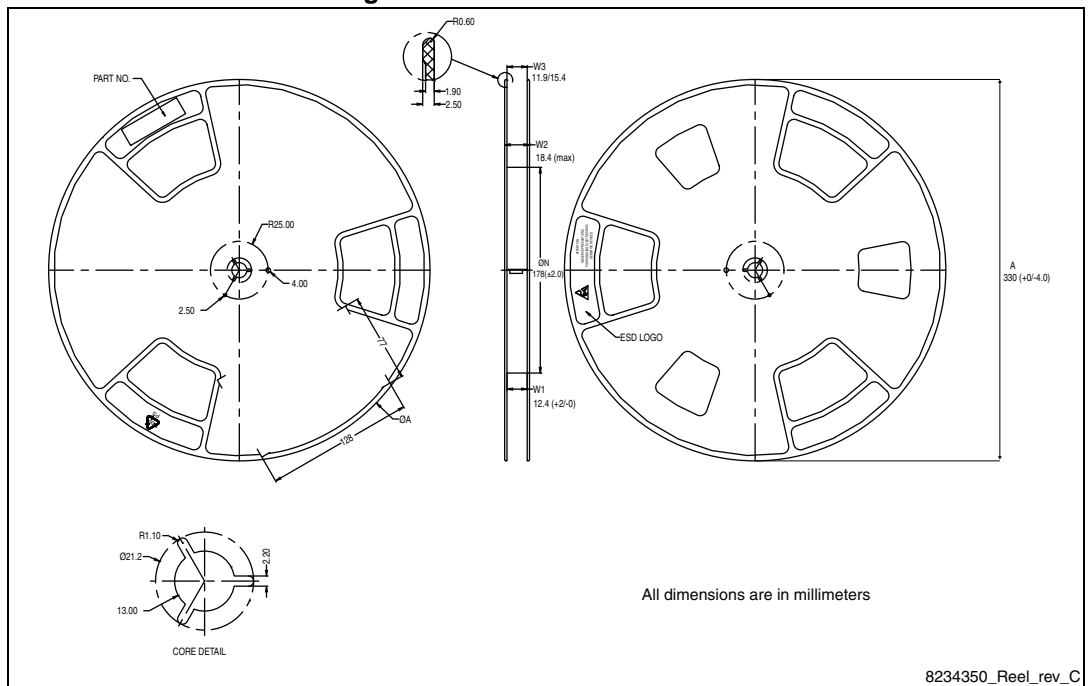


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.



a. All dimensions are in millimeters.

Figure 23. PowerFLAT™ 5x6 reel



6 Revision history

Table 10. Document revision history

Date	Revision	Changes
24-Feb-2011	1	First release
10-Nov-2011	2	Section 4: Package mechanical data has been updated. Minor text changes.
10-Mar-2014	3	<ul style="list-style-type: none"> – Updated: title on the cover page. – Modified: $R_{DS(on)}$ and I_D values on cover page – Modified: drain current (continuous) at $T_C = 25\text{ °C}$, drain current (continuous) at $T_{pcb} = 25\text{ °C}$, drain current (continuous) at $T_{pcb}=100\text{ °C}$, I_{DM}, total dissipation at $T_{pcb} = 25\text{ °C}$, T_{stg} and T_j values on table 2, $R_{thj-case}$ value on Table 3, max values on Table 4, $R_{DS(on)}$ typ and max. values, typical values on Table 6, 7 and 8 – Inserted: Section 2.1: Electrical characteristics (curves) – Updated: Section 4: Package mechanical data – Added: Section 5: Packaging mechanical data – Minor text changes

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