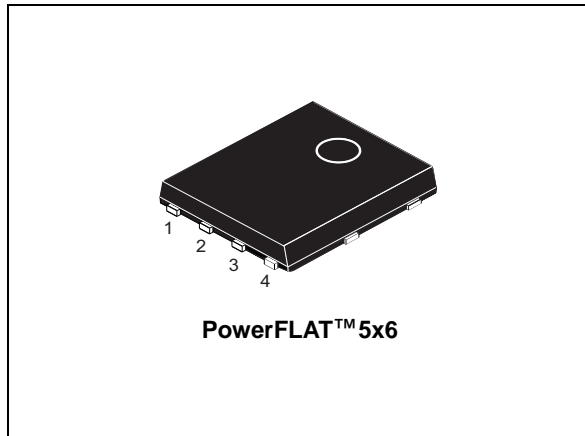


N-channel 30 V, 0.00081 Ω typ., 50 A STripFET™ VII DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL220N3LLH7	30 V	0.0011 Ω	50 A

- Very low on-resistance
- Very low Q_g
- High avalanche ruggedness

Applications

- Switching applications

Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

Figure 1. Internal schematic diagram

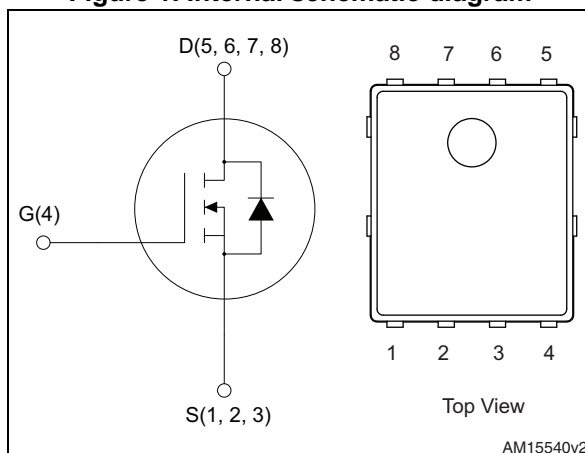


Table 1. Device summary

Order code	Marking	Package	Packaging
STL220N3LLH7	220N3LL7	PowerFLAT™ 5x6	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuits	8
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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	220	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	160	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	880	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	50	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	32	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	200	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	113	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
T_j	Max. operating junction temperature	-55 to 150	$^\circ\text{C}$

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

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	1.1	$^\circ\text{C}/\text{W}$

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

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\ \text{V}$ $V_{DS} = 24\ \text{V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1.2		2.2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$, $I_D = 25\ \text{A}$		0.00081	0.0011	Ω
		$V_{GS} = 4.5\ \text{V}$, $I_D = 25\ \text{A}$		0.00115	0.0015	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\ \text{V}$, $f = 1\ \text{MHz}$, $V_{GS} = 0$	-	8650	-	pF
C_{oss}	Output capacitance		-	2400	-	pF
C_{rss}	Reverse transfer capacitance		-	72	-	pF
Q_g	Total gate charge	$V_{DD} = 15\ \text{V}$, $I_D = 50\ \text{A}$, $V_{GS} = 4.5\ \text{V}$ (see Figure 14)	-	46	-	nC
Q_{gs}	Gate-source charge		-	26	-	nC
Q_{gd}	Gate-drain charge		-	10	-	nC
R_g	Intrinsic gate resistance	$f = 1\ \text{MHz}$	-	0.61	1.8	Ω

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\ \text{V}$, $I_D = 25\ \text{A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 4.5\ \text{V}$	-	55	-	ns
t_r	Rise time		-	115	-	ns
$t_{d(off)}$	Turn-off delay time		-	70	-	ns
t_f	Fall time		-	51	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		50	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		200	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 50 \text{ A}$, $V_{GS} = 0$	-		1	V
t_{rr}	Reverse recovery time	$I_D = 50 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 24 \text{ V}$	-	66		ns
Q_{rr}	Reverse recovery charge		-	101		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

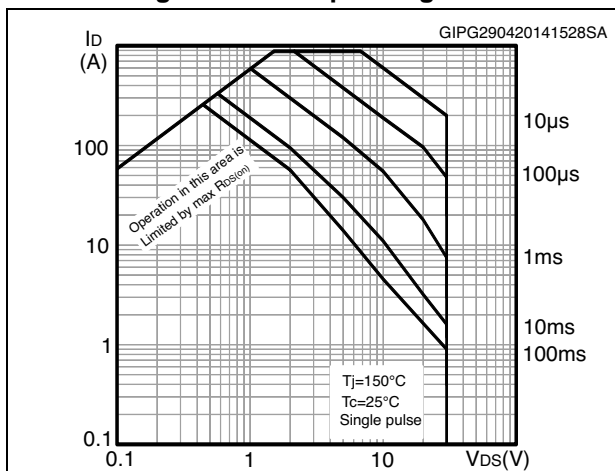


Figure 3. Thermal impedance

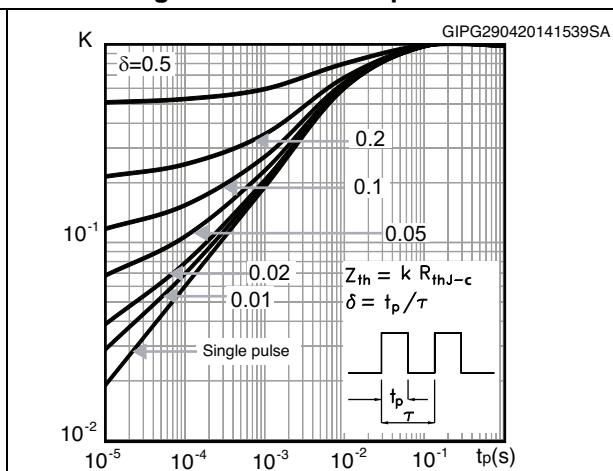


Figure 4. Output characteristics

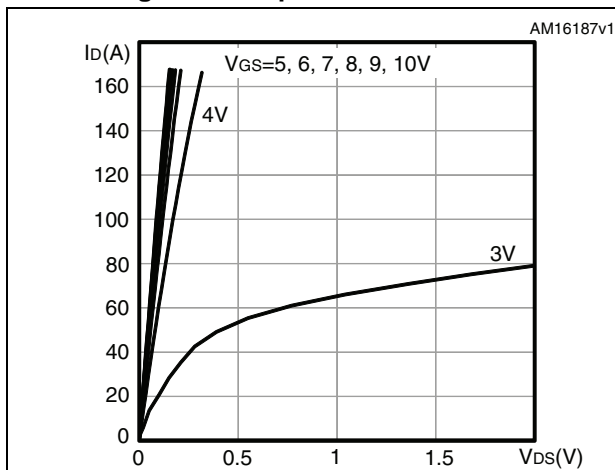


Figure 5. Transfer characteristics

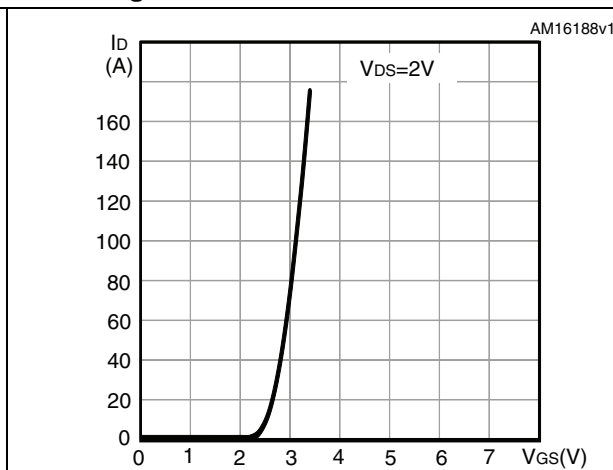


Figure 6. Gate charge vs gate-source voltage

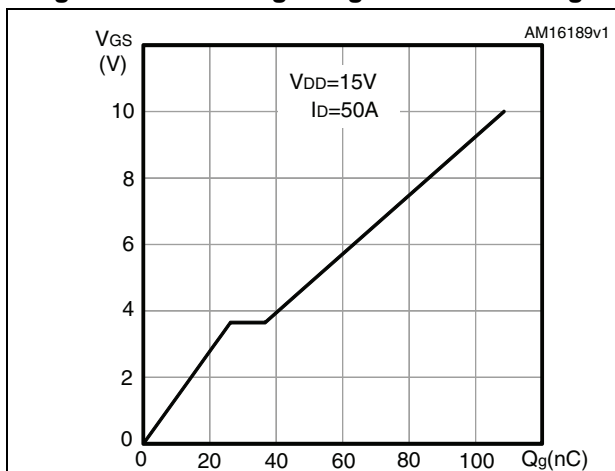


Figure 7. Static drain-source on-resistance

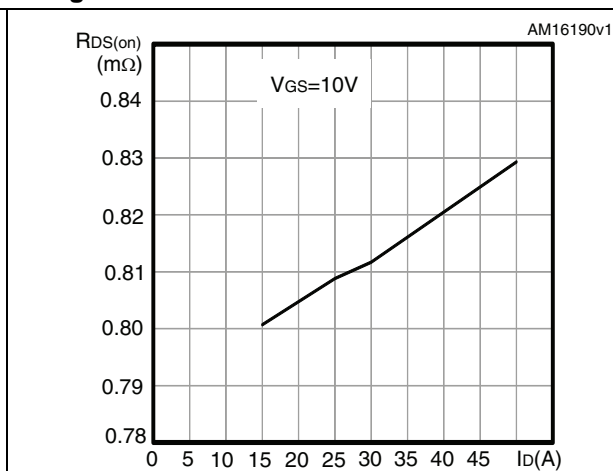


Figure 8. Capacitance variations

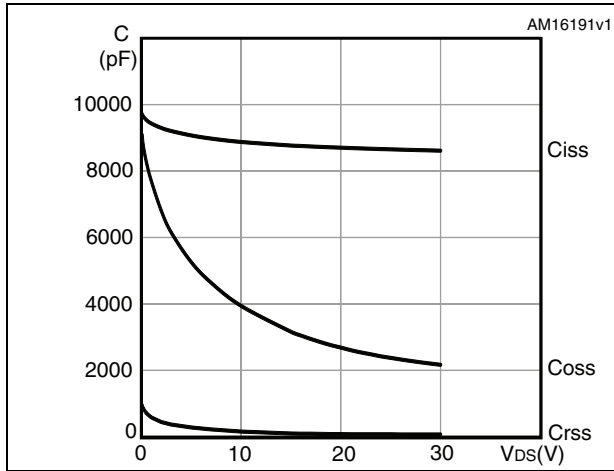


Figure 9. Normalized gate threshold voltage vs temperature

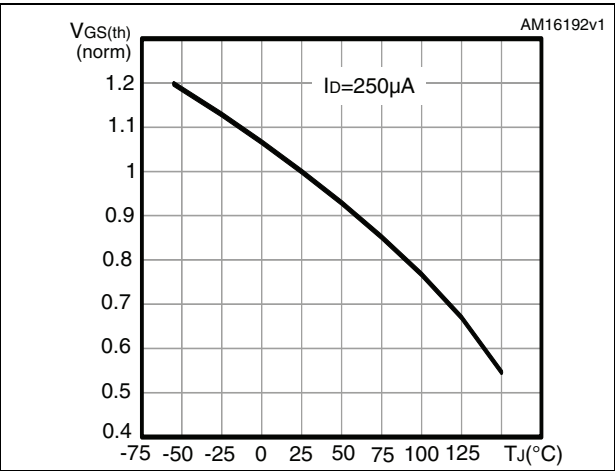


Figure 10. Normalized on-resistance vs temperature

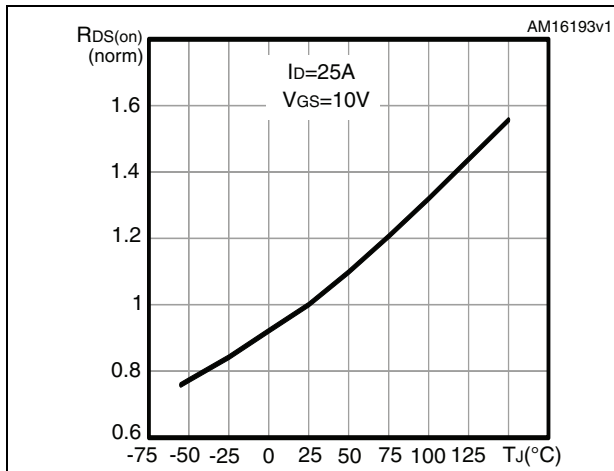


Figure 11. Normalized V(BR)DSS vs temperature

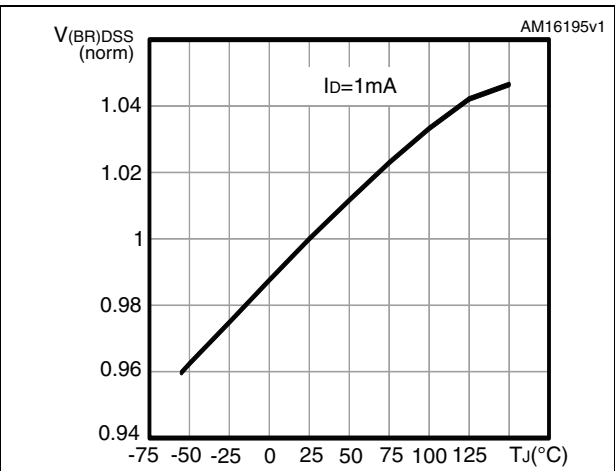
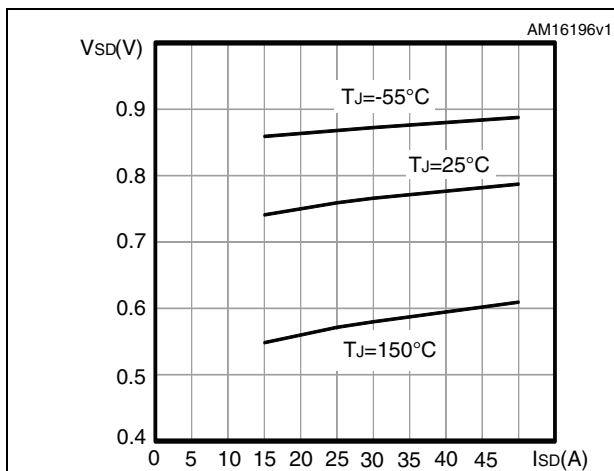


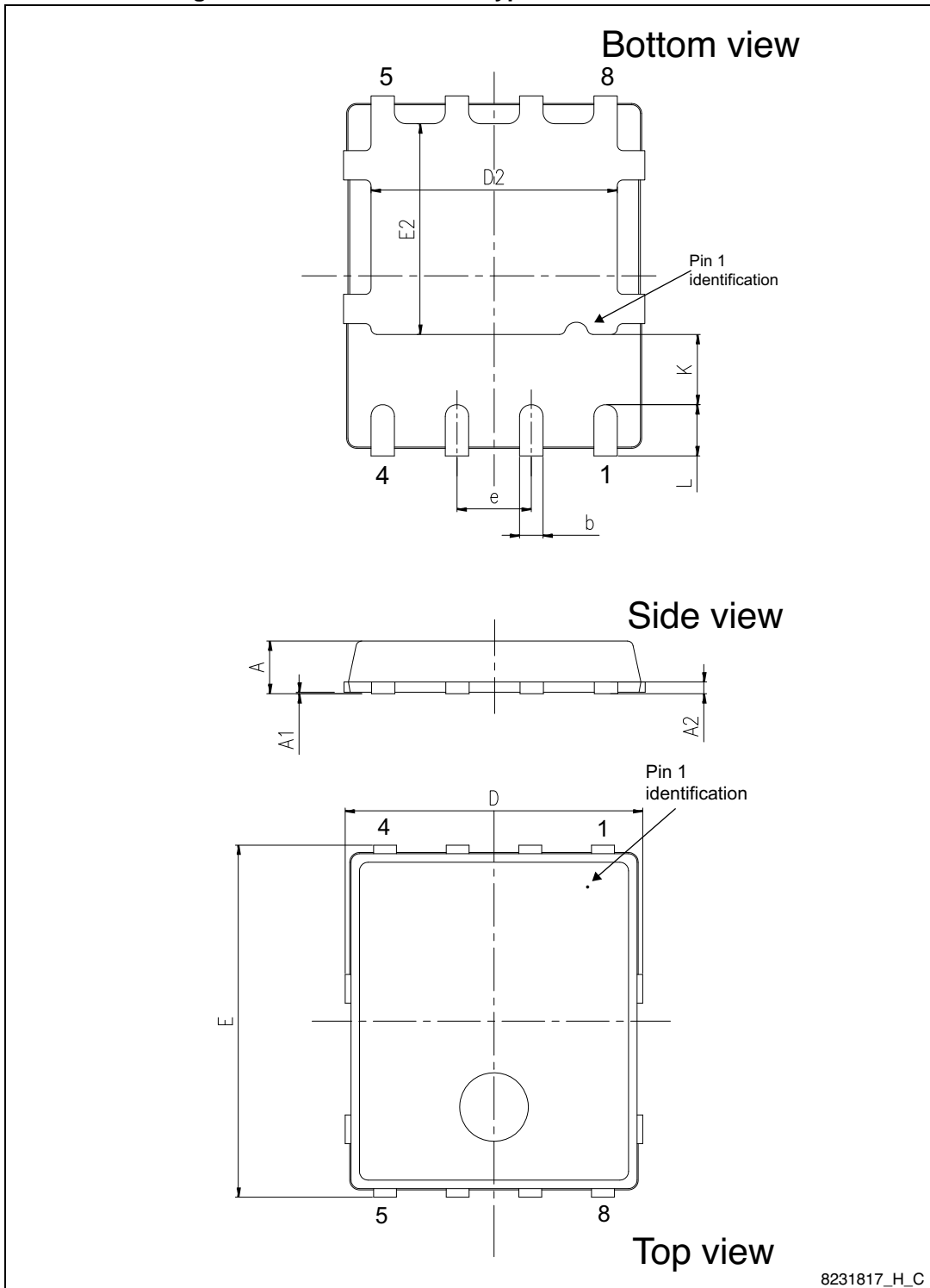
Figure 12. Source-drain diode forward characteristics



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

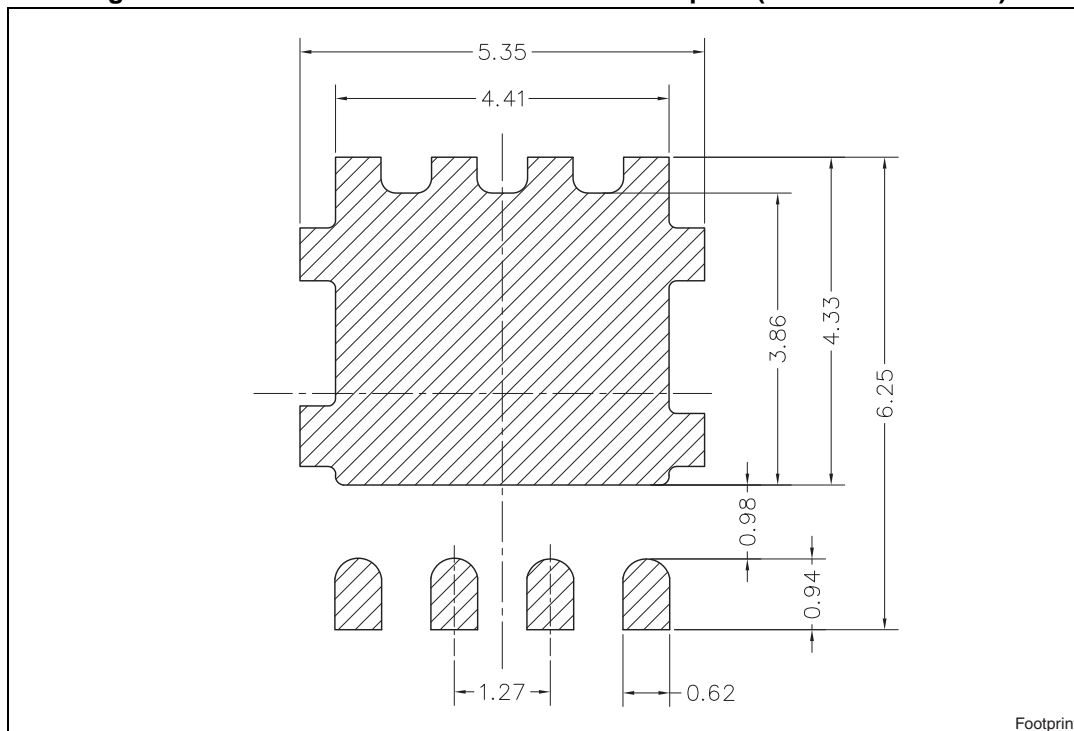


8231817_H_C

Table 8. 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)

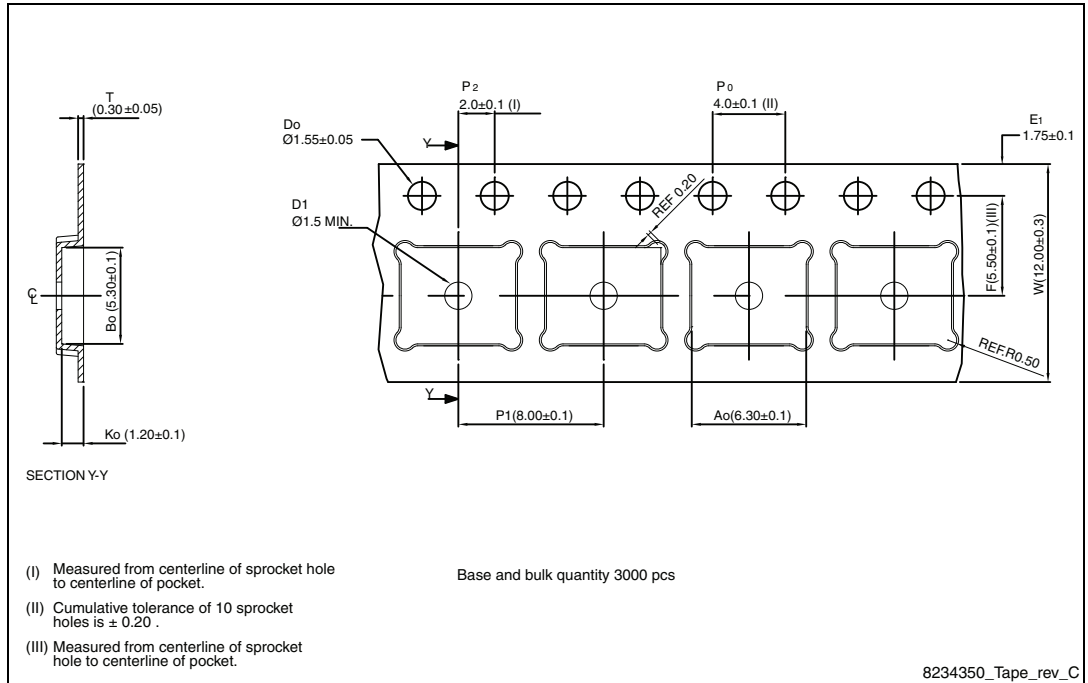
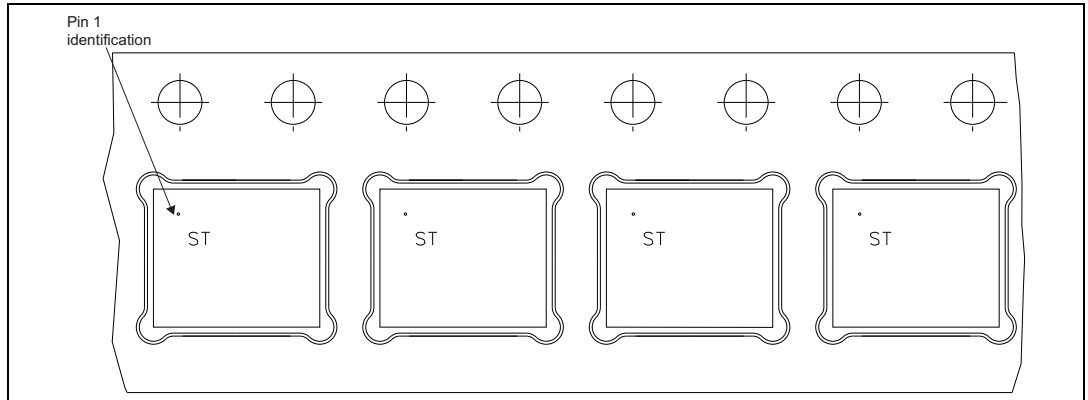
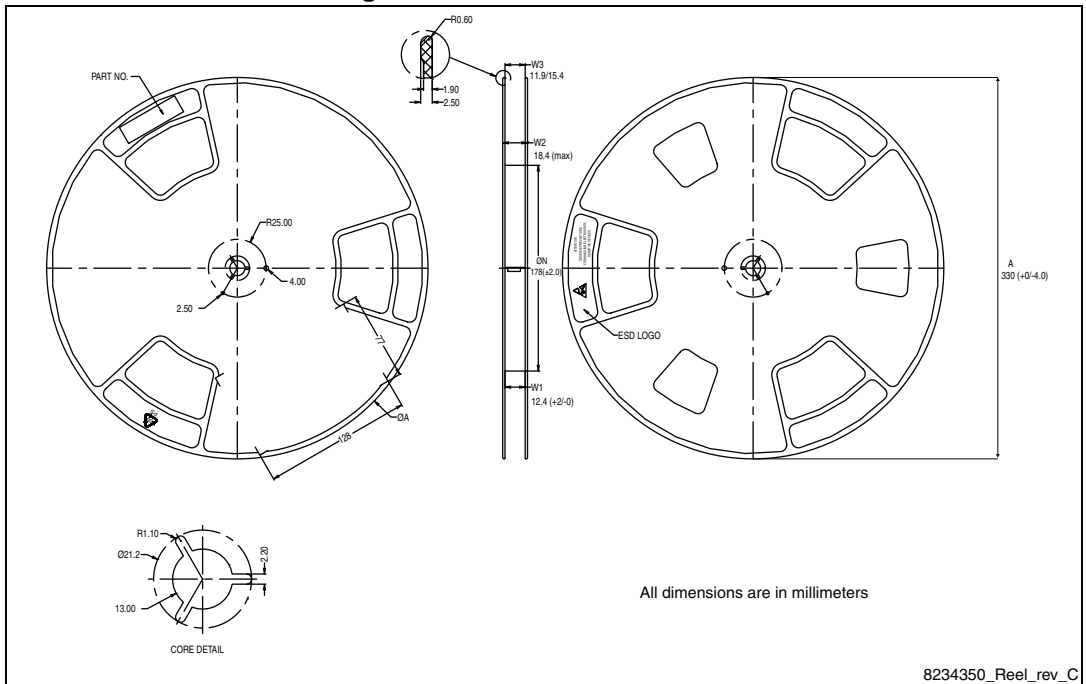


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape



a. All dimensions are in millimeters.

Figure 23. PowerFLAT™ 5x6 reel



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
04-Jun-2013	1	First release.
11-Jun-2013	2	<ul style="list-style-type: none"> – Changed: <i>Description</i> – Minor text changes
08-Nov-2013	3	<ul style="list-style-type: none"> – Modified: title, I_D (Drain current (continuous) at $T_{pcb} = 100\text{ °C}$), P_{TOT} (Total dissipation at T_C and $T_{pcb} = 25\text{ °C}$) and T_J values in Table 2, $R_{thj-case}$ value in Table 3, $V_{(BR)DSS}$ and $V_{GS(th)}$ test conditions, $R_{DS(on)}$ typical values, the entire typical values in Table 5, 6, R_G value in Table 6, V_{dd} and typical values in Table 7 – Updated: Section 4: Package mechanical data and Section 5: Packaging mechanical data
08-May-2014	4	<ul style="list-style-type: none"> – Inserted: R_g parameter in Table 5 – Minor text changes

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