

N-channel 60 V, 0.0012 Ω typ., 260 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

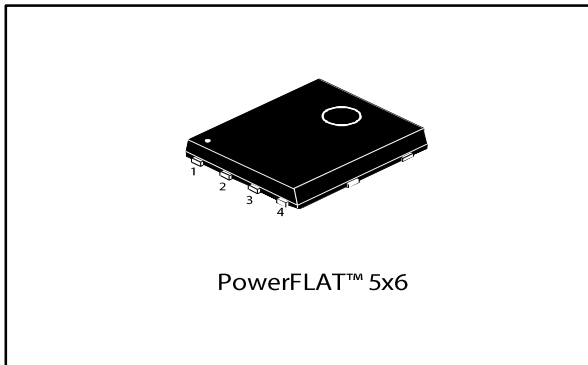
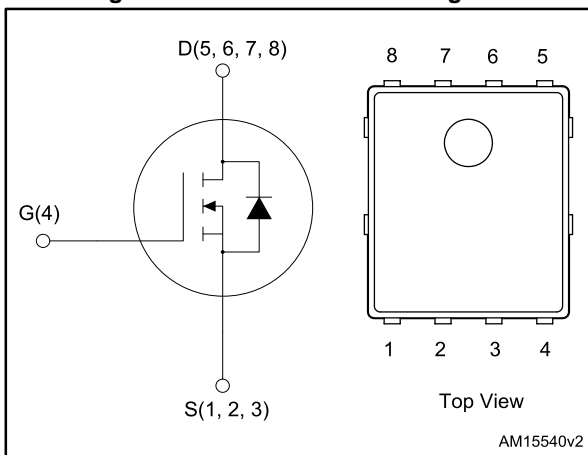


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL220N6F7	60 V	0.0014 Ω	260 A

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packaging
STL220N6F7	220N6F7	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 $T_C = 25\text{ }^\circ\text{C}$	260	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	185	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	1000	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	40	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	28.5	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	160	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	187	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
T_j	Max. operating junction temperature	-55 to 175	$^\circ\text{C}$

Notes:

⁽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	$^\circ\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case max.	0.8	$^\circ\text{C/W}$

Notes:

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

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	$I_D = 1\text{ mA}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20\text{ V}$, $V_{DS} = 0$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 20\text{ A}$		0.0012	0.0014	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	6600	-	pF
C_{oss}	Output capacitance		-	3100	-	pF
C_{rss}	Reverse transfer capacitance		-	250	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = 10\text{ V}$	-	100	-	nC
Q_{gs}	Gate-source charge		-	30	-	nC
Q_{gd}	Gate-drain charge		-	30	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 20\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	34	-	ns
t_r	Rise time		-	43	-	ns
$t_{d(off)}$	Turn-off delay time		-	66	-	ns
t_f	Fall time		-	38	-	ns

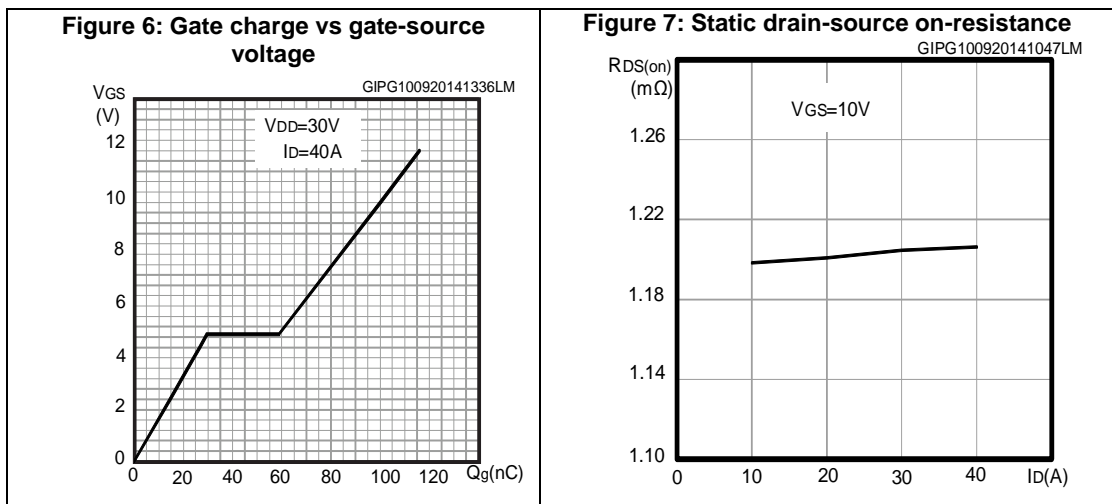
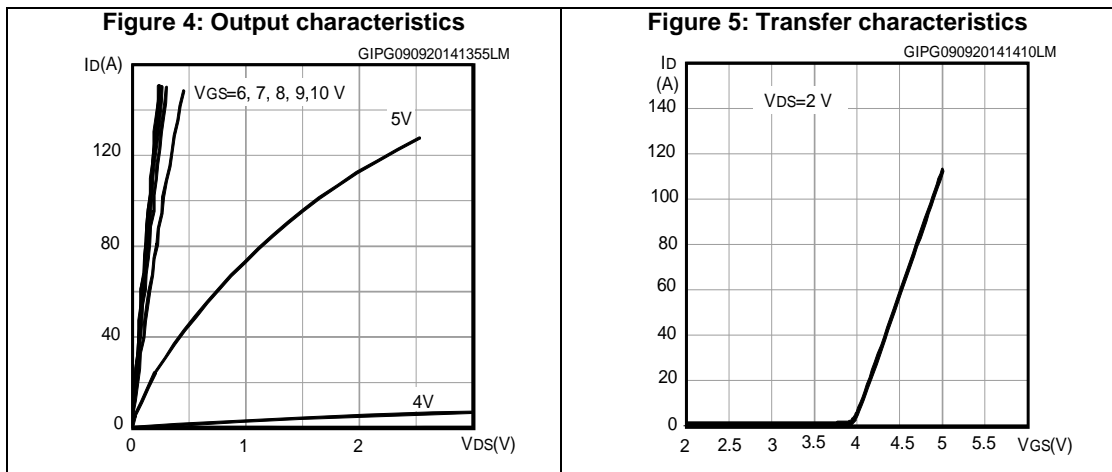
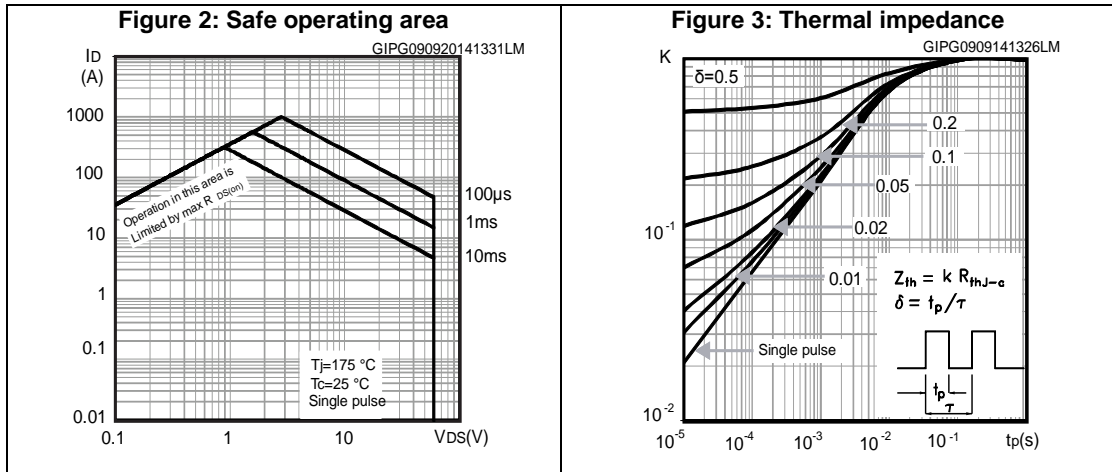
Table 7: Source-drain diode

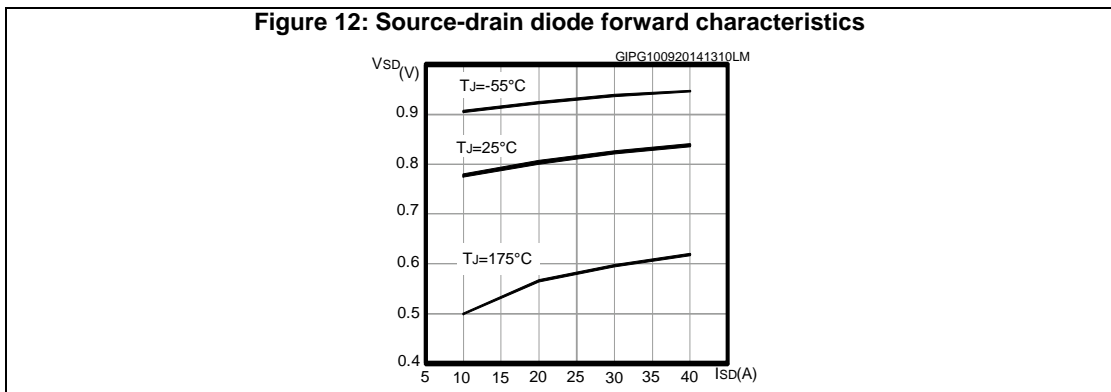
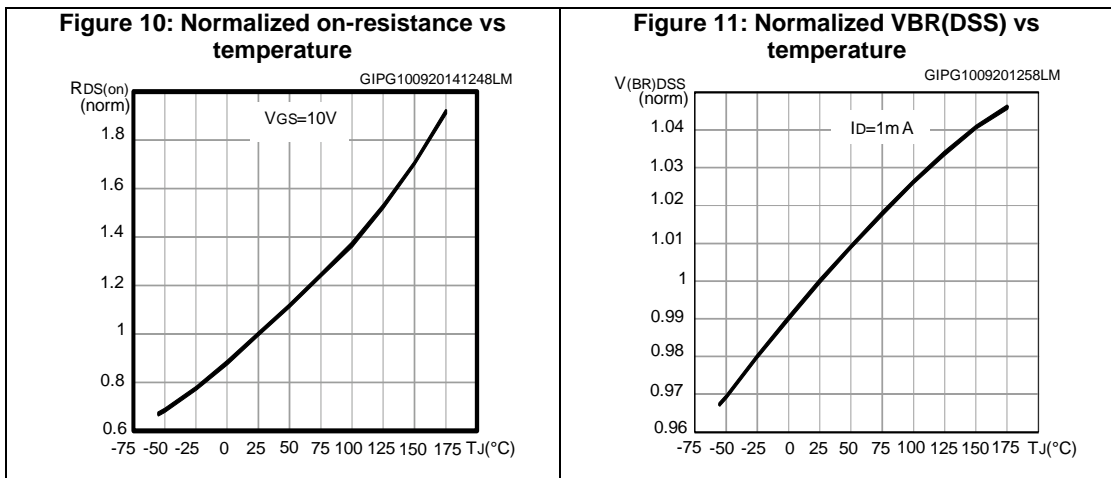
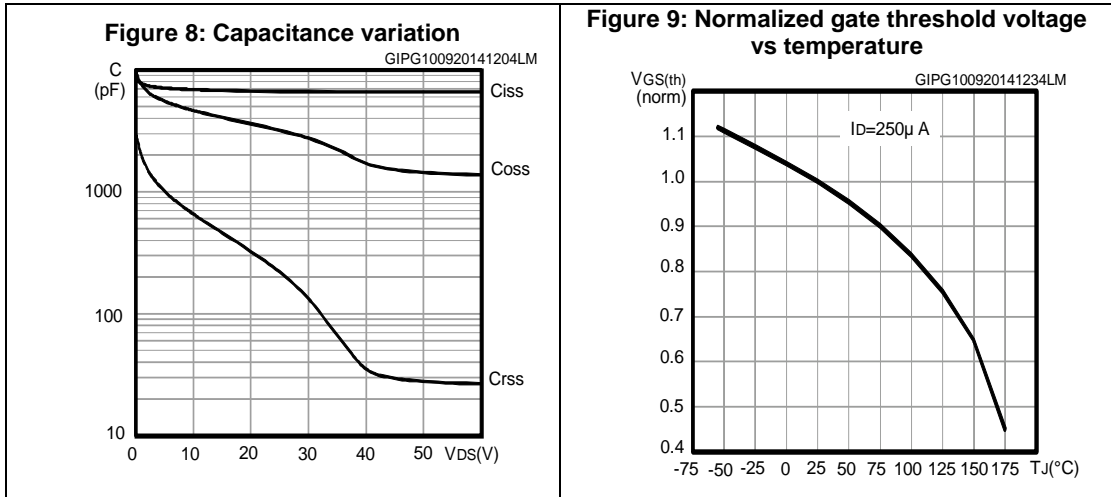
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 40\text{ A}$, $V_{GS} = 0$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 40\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$	-	55		ns
Q_{rr}	Reverse recovery charge		-	70		nC
I_{RRM}	Reverse recovery current		-	2		A

Notes:

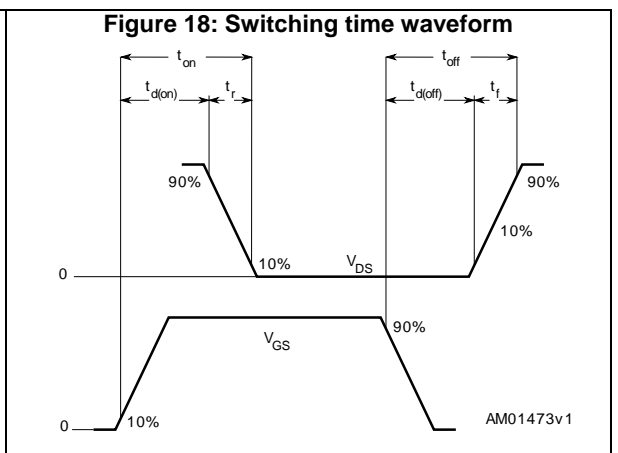
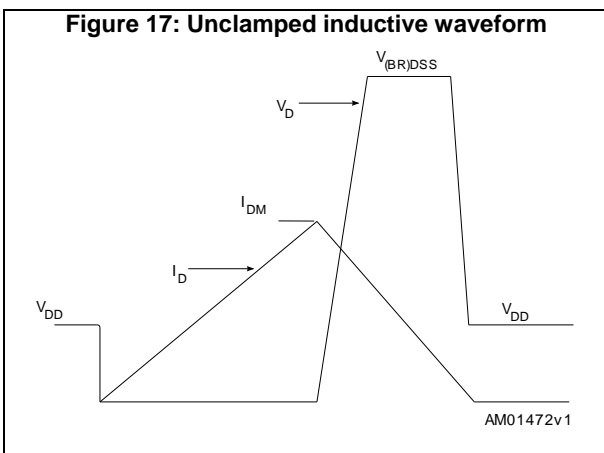
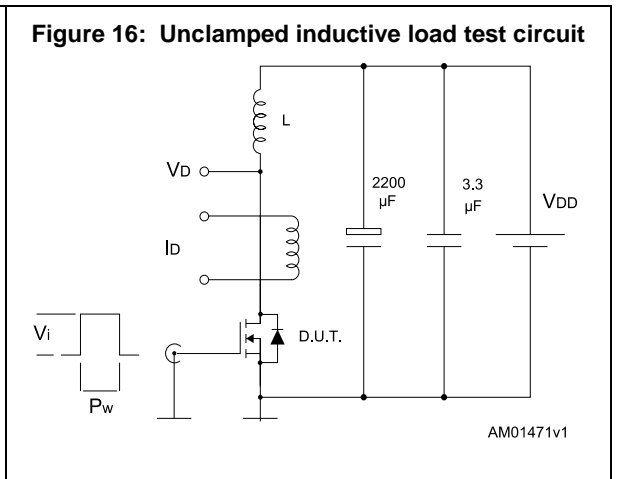
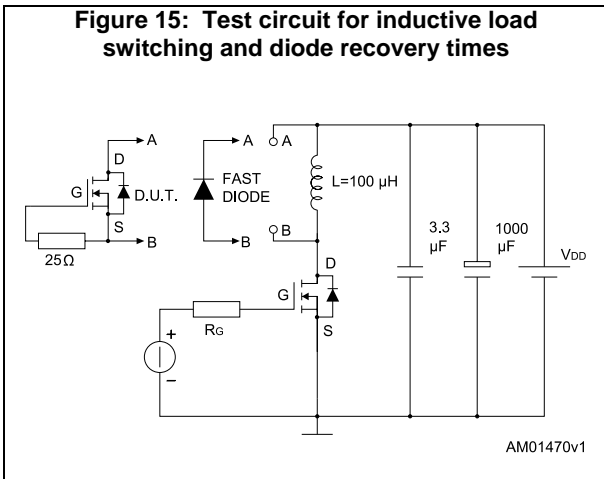
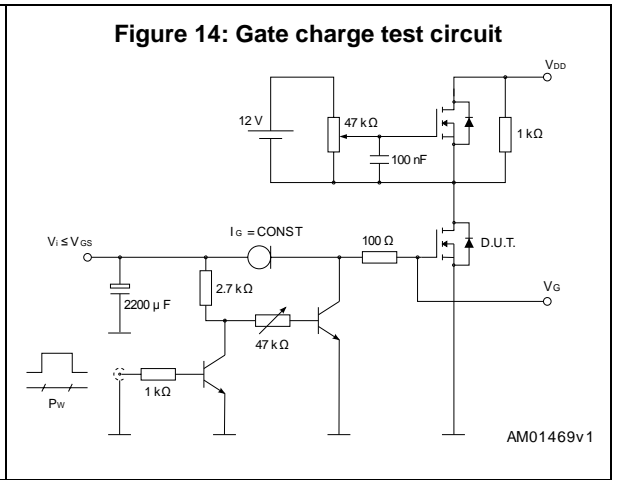
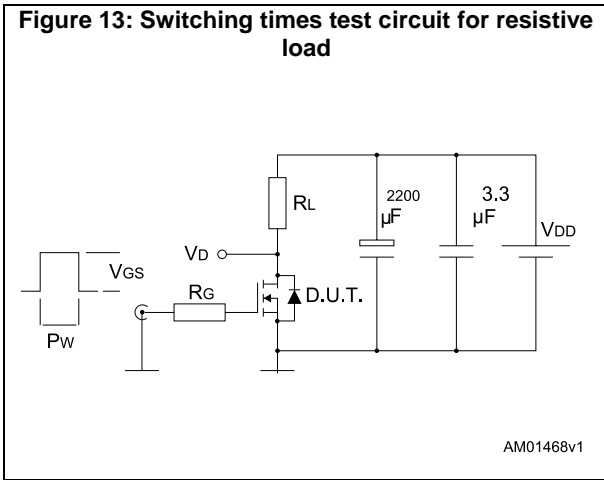
(1) Pulsed: pulse duration = 300 μs , duty cycle 1.5%

3 Electrical characteristics (curves)





4 Test circuits

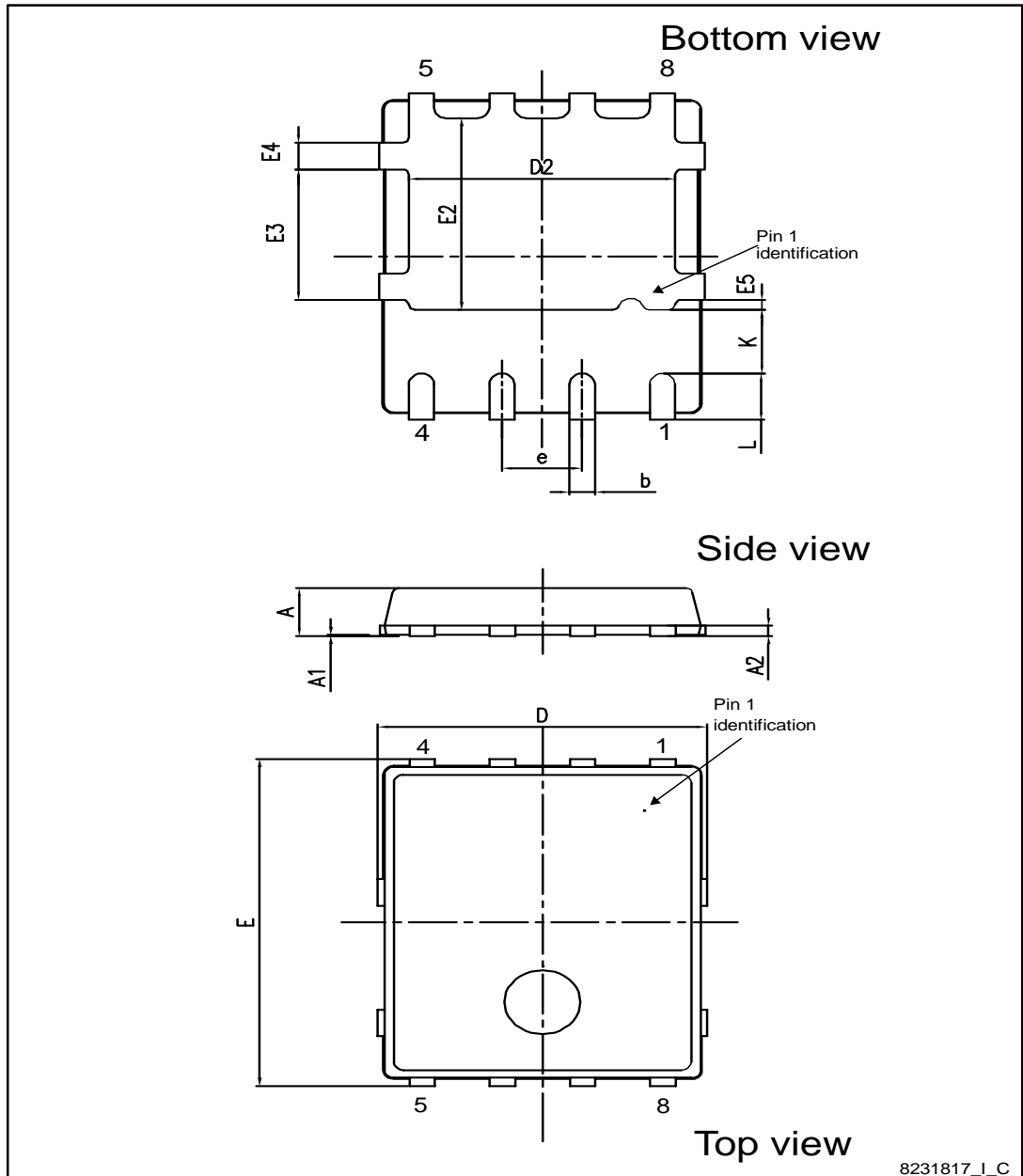


5 Package mechanical data

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.

5.1 PowerFLAT 5x6 type S-C package mechanical data

Figure 19: PowerFLAT™ 5x6 type S-C drawings



6 Packaging mechanical data

6.1 PowerFLAT™ 5x6 packaging mechanical data

Figure 21: PowerFLAT™ 5x6 tape

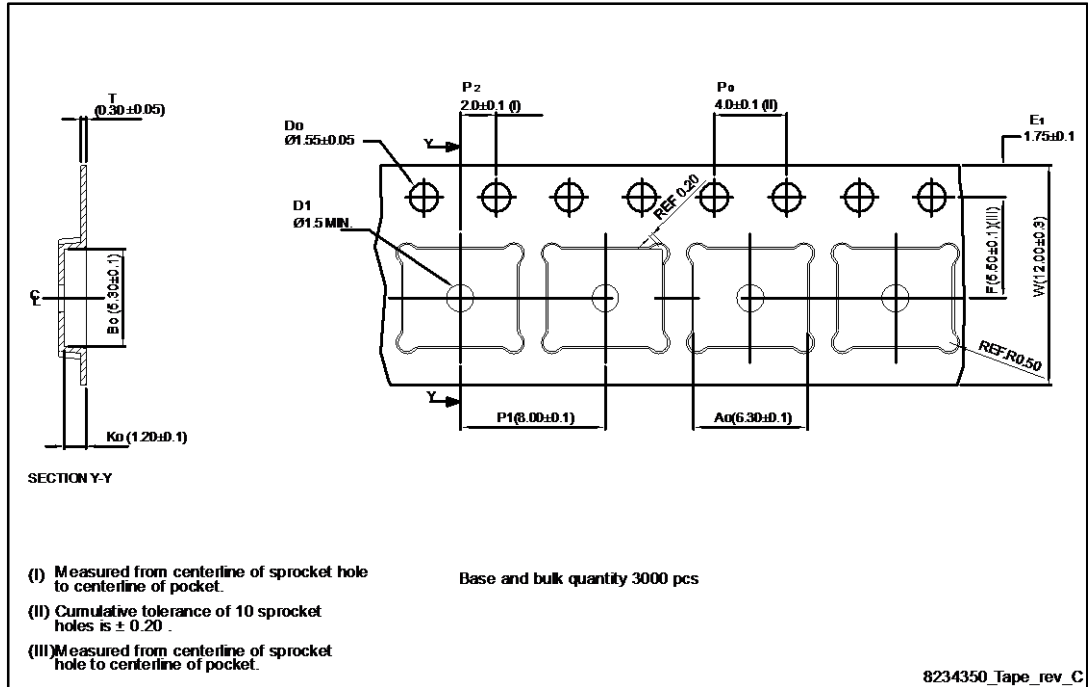


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

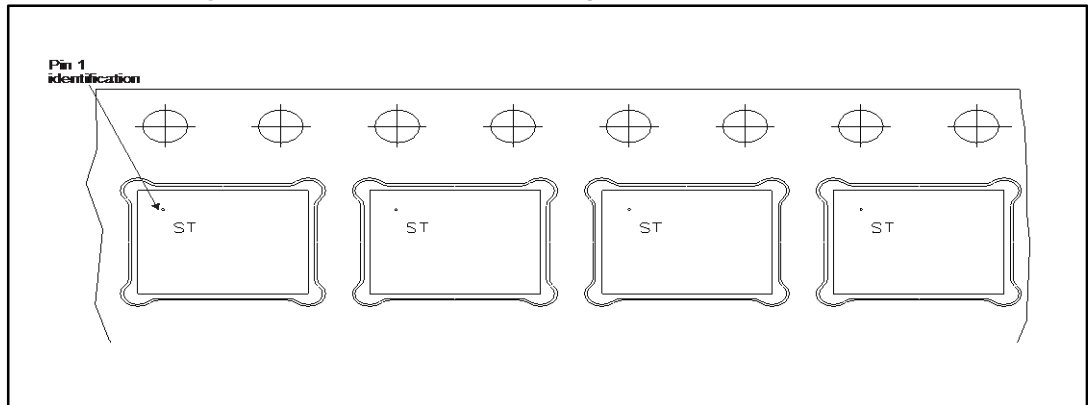
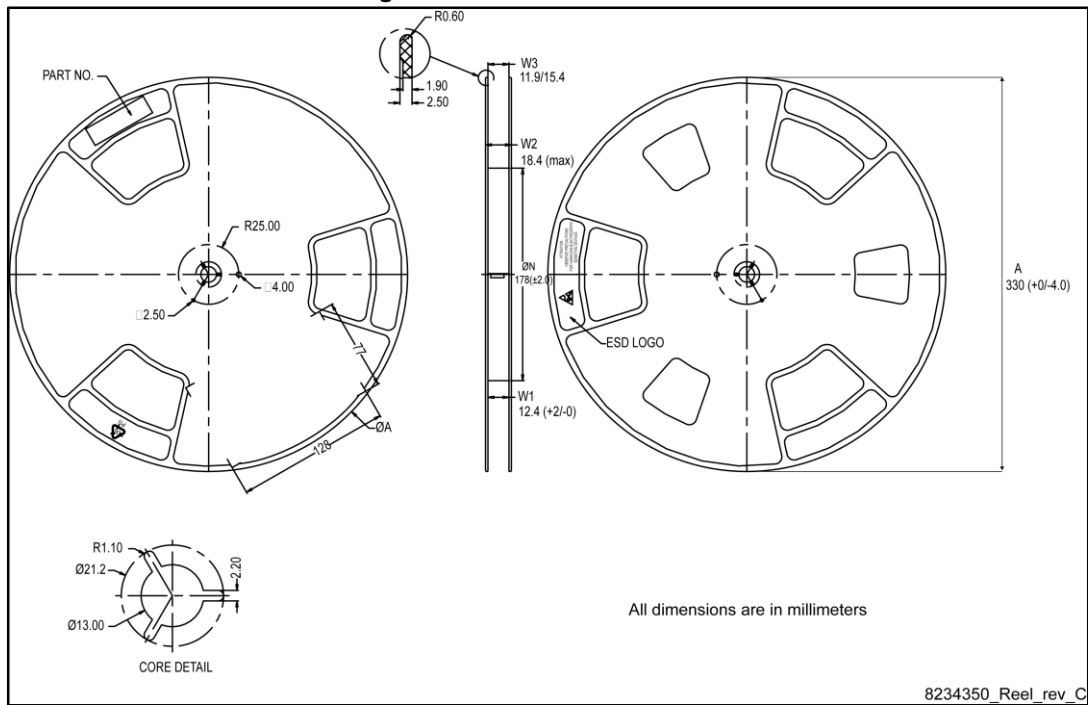


Figure 23: PowerFLAT™ 5x6 reel



7 Revision history

Table 9: Document revision history

Date	Revision	Changes
13-Jun-2014	1	First release.
22-Sep-2014	2	Updated title, features and description in cover page. Updated <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 4: "On /off states"</i> , <i>Table 5: "Dynamic"</i> , <i>Table 6: "Switching times"</i> and <i>Table 7: "Source-drain diode"</i> . Added <i>Section 3: "Electrical characteristics (curves)"</i> .
14-Jan-2014	3	Document status promoted from preliminary to production data.

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