

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

Datasheet - production data

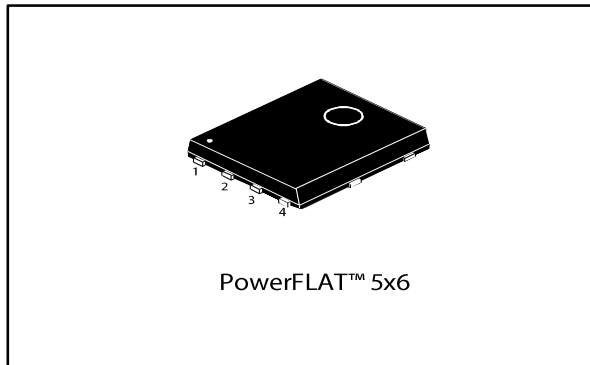
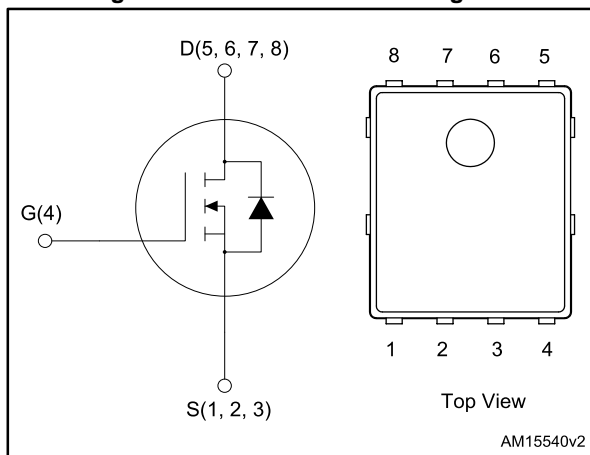


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STL220N6F7	60 V	0.0014 $\Omega$	260 A

- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent figure of merit (FoM)
- Low C<sub>rss</sub>/C<sub>iss</sub> 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	$\pm 20$	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 inch<sup>2</sup>, 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	$\mu\text{A}$
$I_{GSS}$	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	$\Omega$

**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

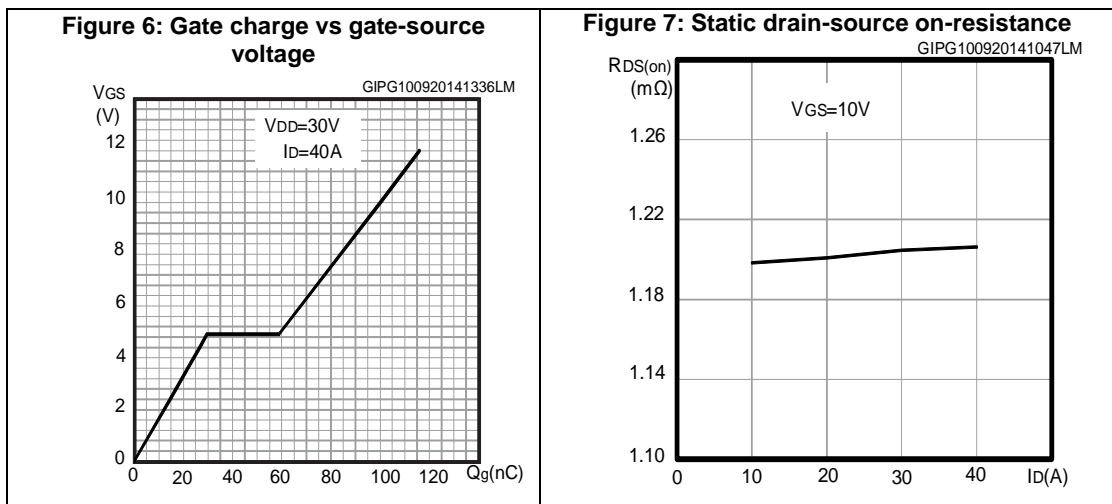
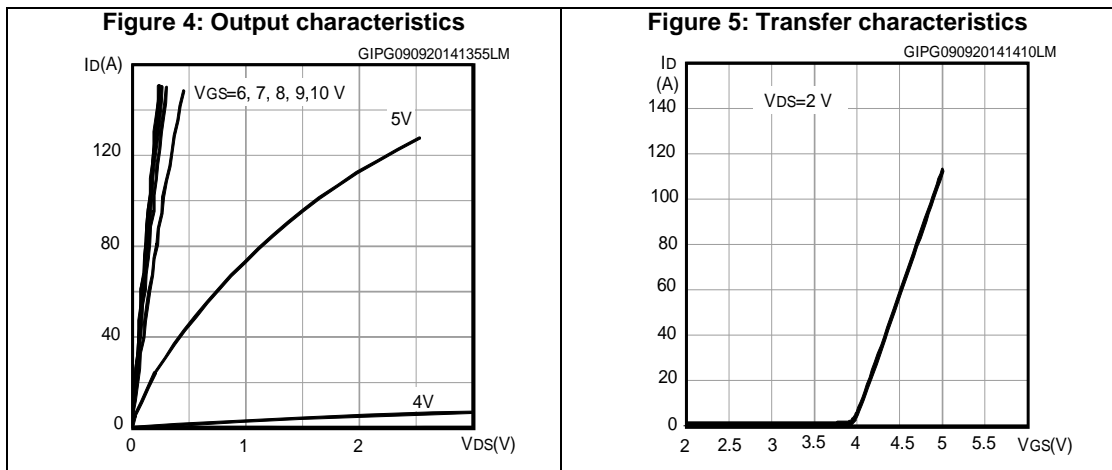
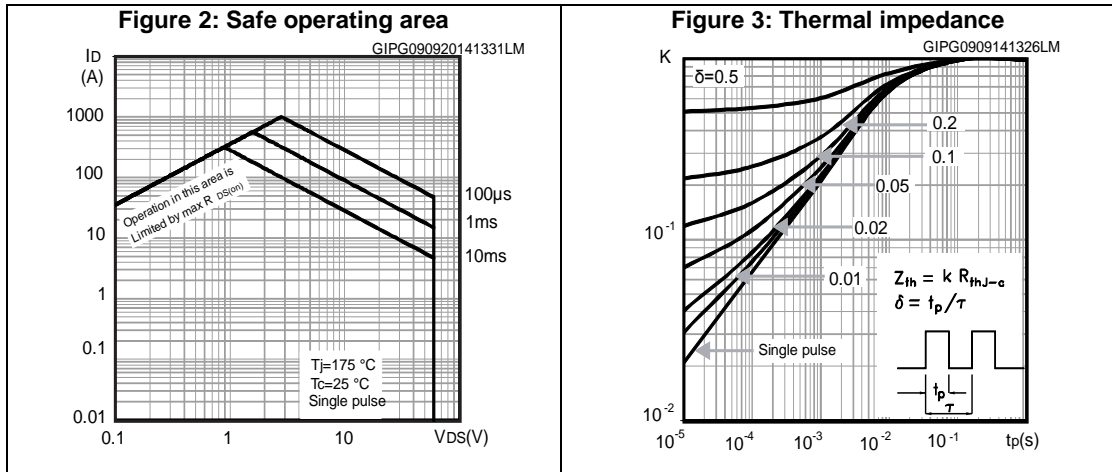
**Table 7: Source-drain diode**

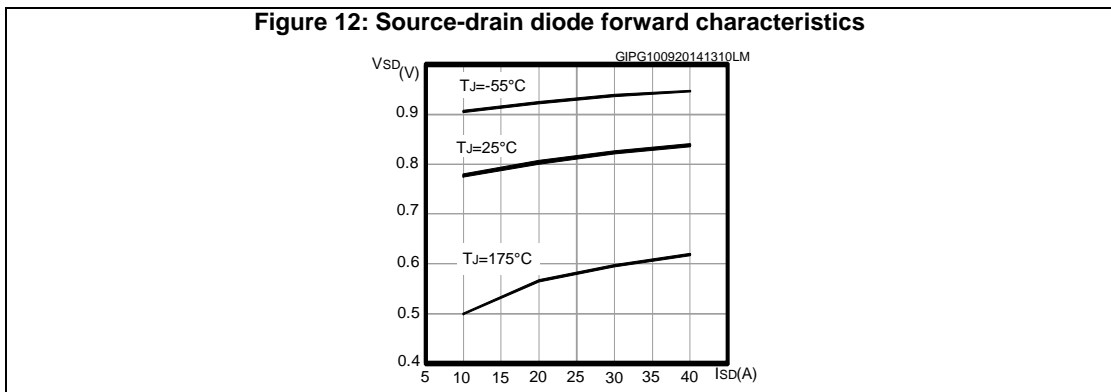
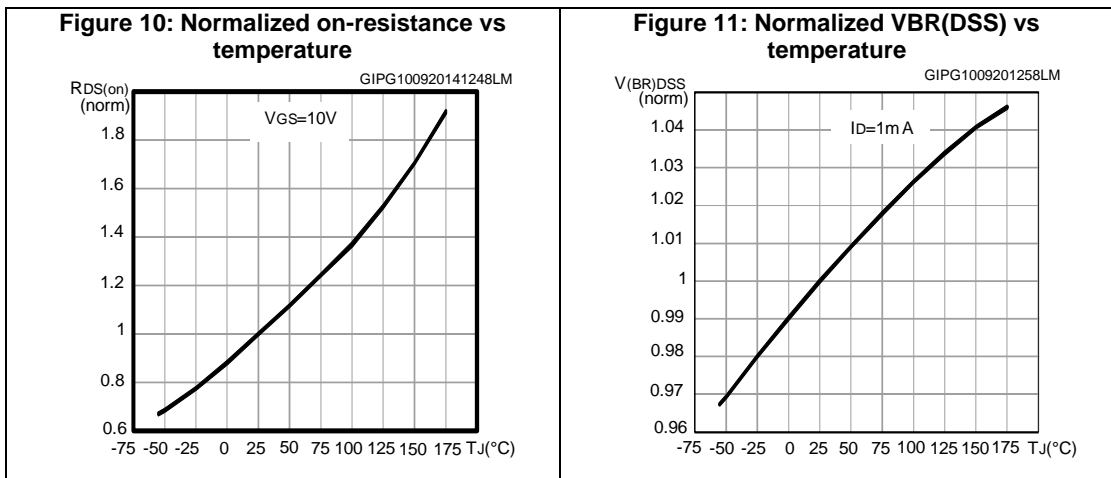
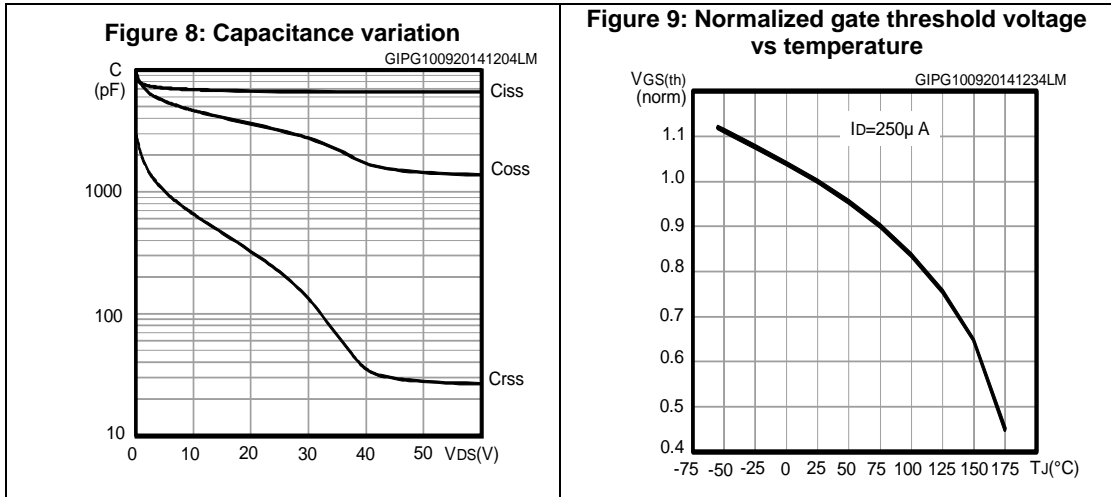
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 40\text{ A}$ , $V_{GS} = 0$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_D = 40\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$	-	55		ns
$Q_{rr}$	Reverse recovery charge		-	70		nC
$I_{RRM}$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

**Notes:**

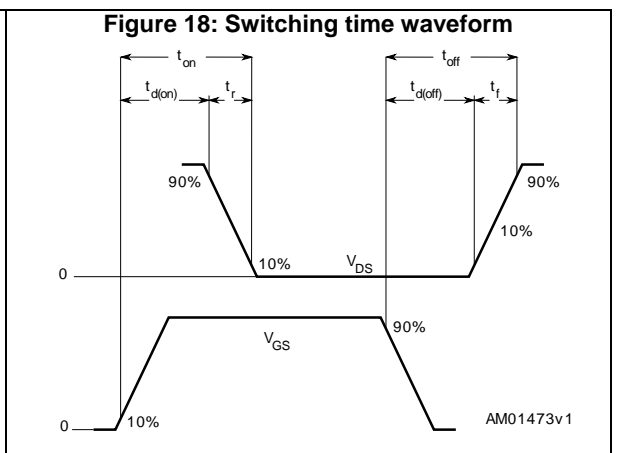
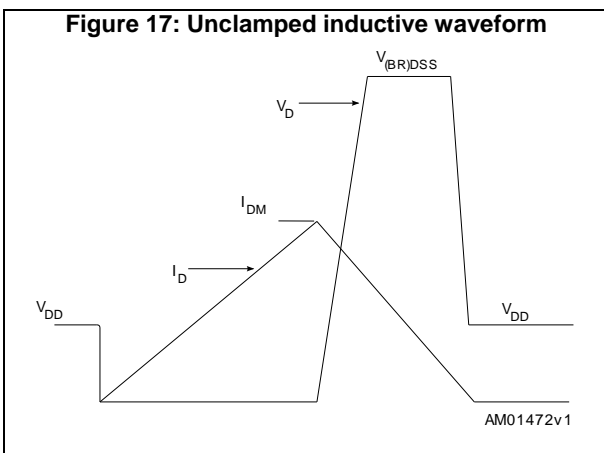
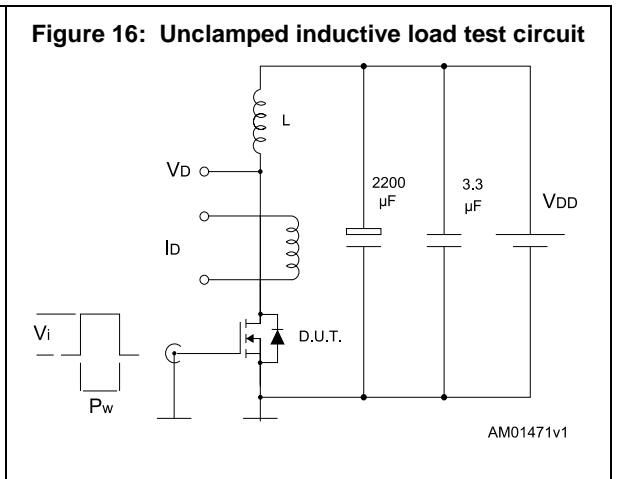
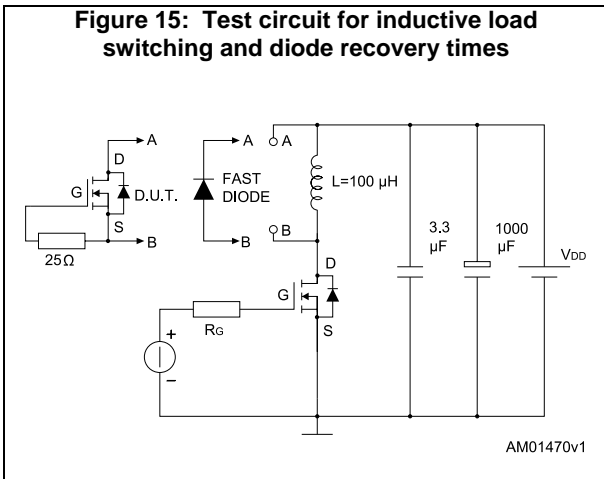
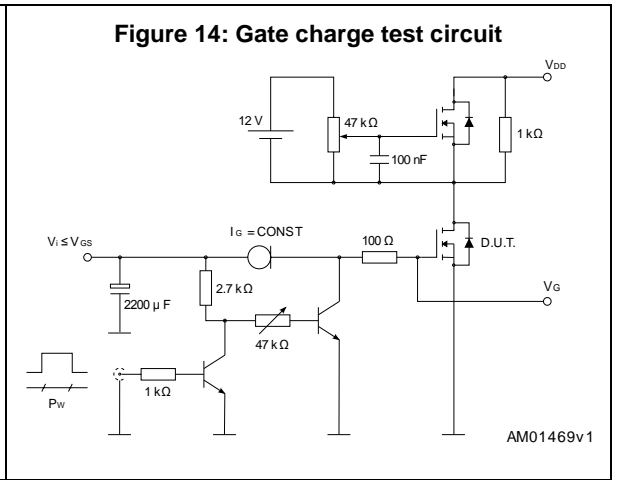
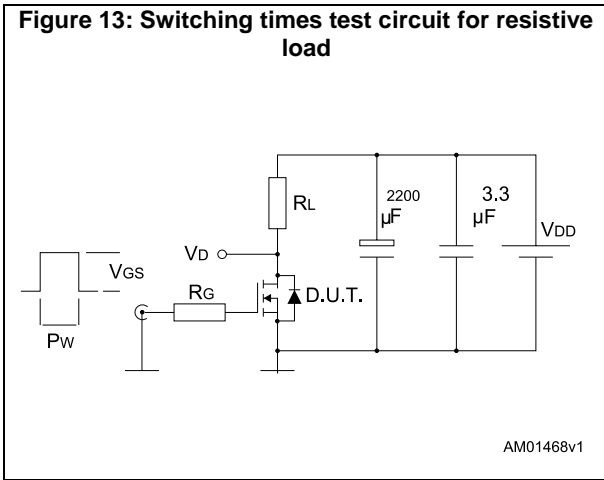
(1) Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

### 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](http://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

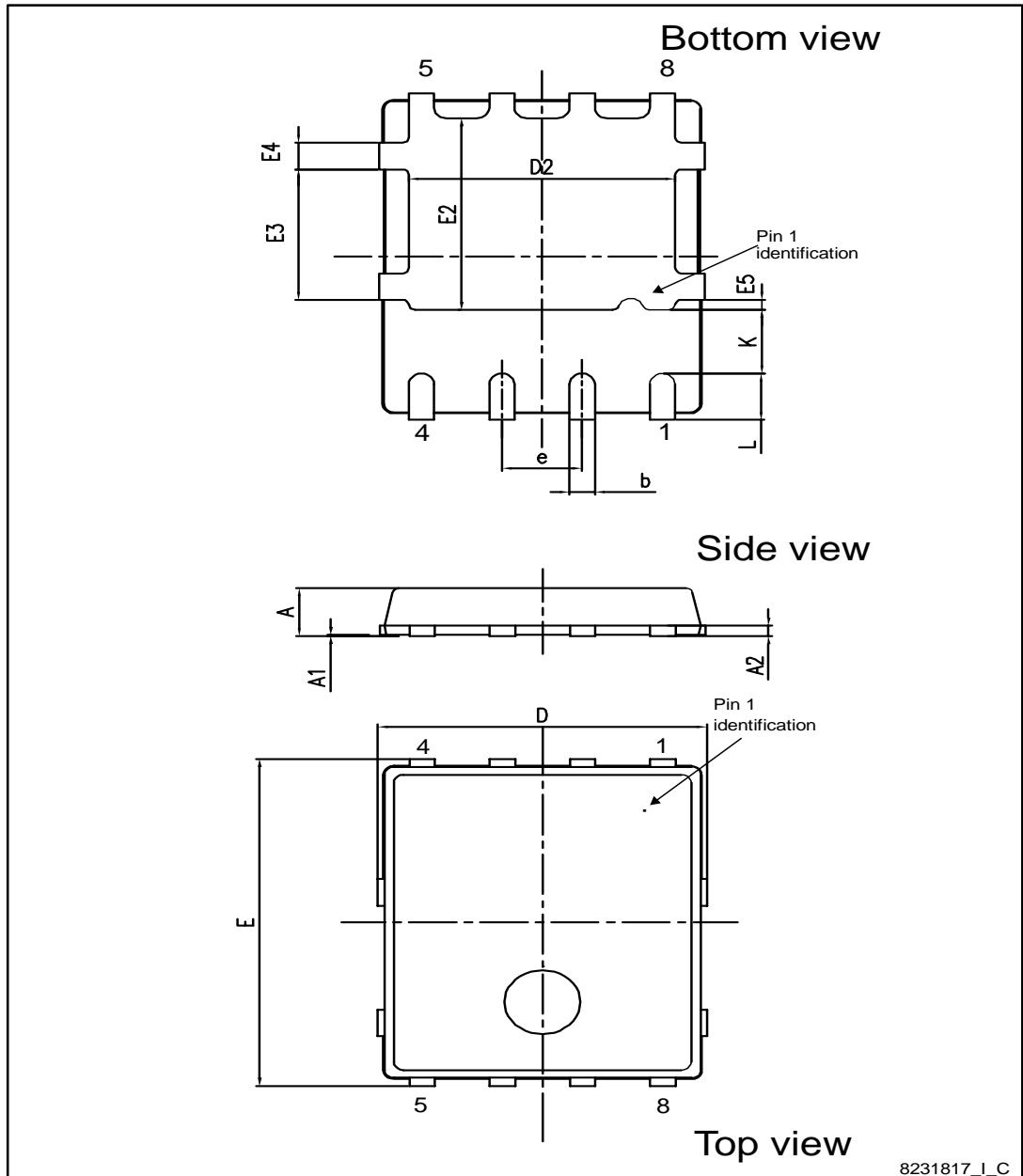
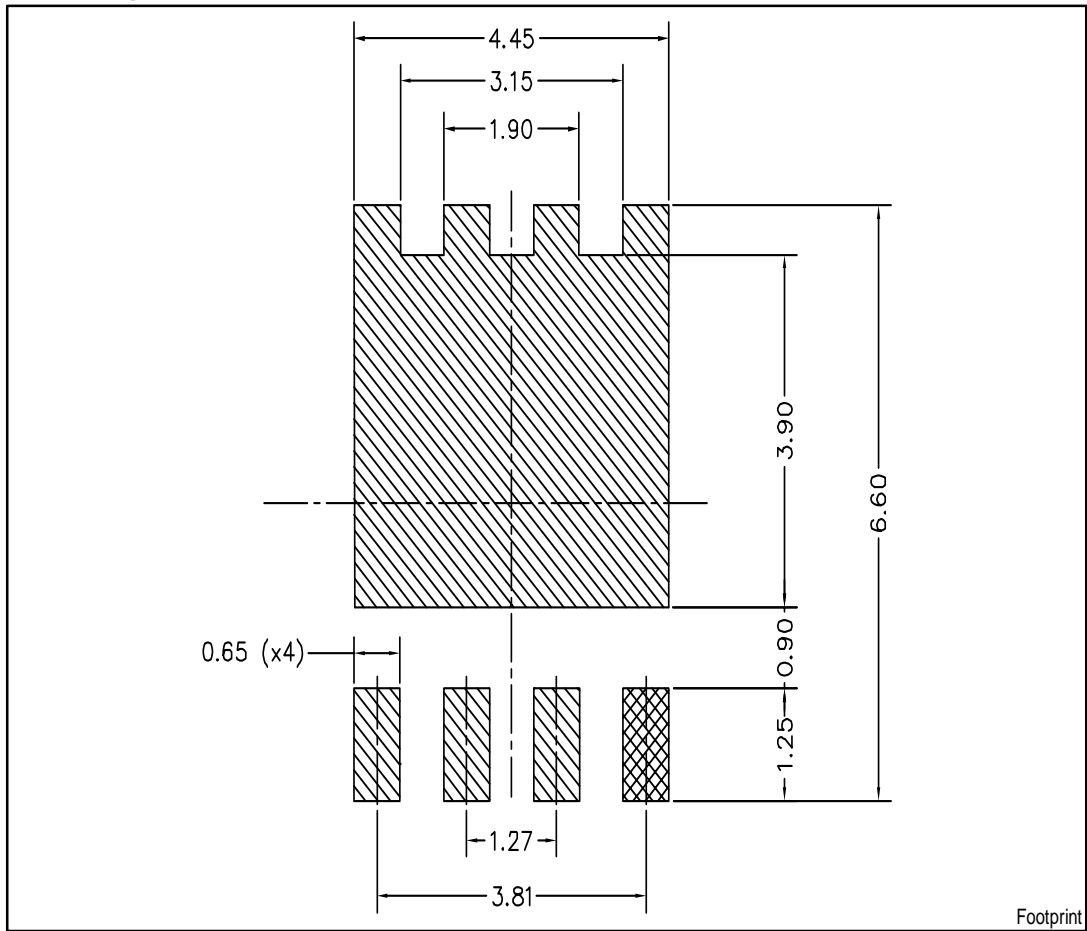




Table 8: PowerFLAT 5x6 type S-C mechanical data

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
E3	2.35		2.55
E4	0.40		0.60
e		1.27	
e1		0.65	
L	0.715		1.015
K	1.05		1.35

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



## 6 Packaging mechanical data

### 6.1 PowerFLAT™ 5x6 packaging mechanical data

Figure 21: PowerFLAT™ 5x6 tape

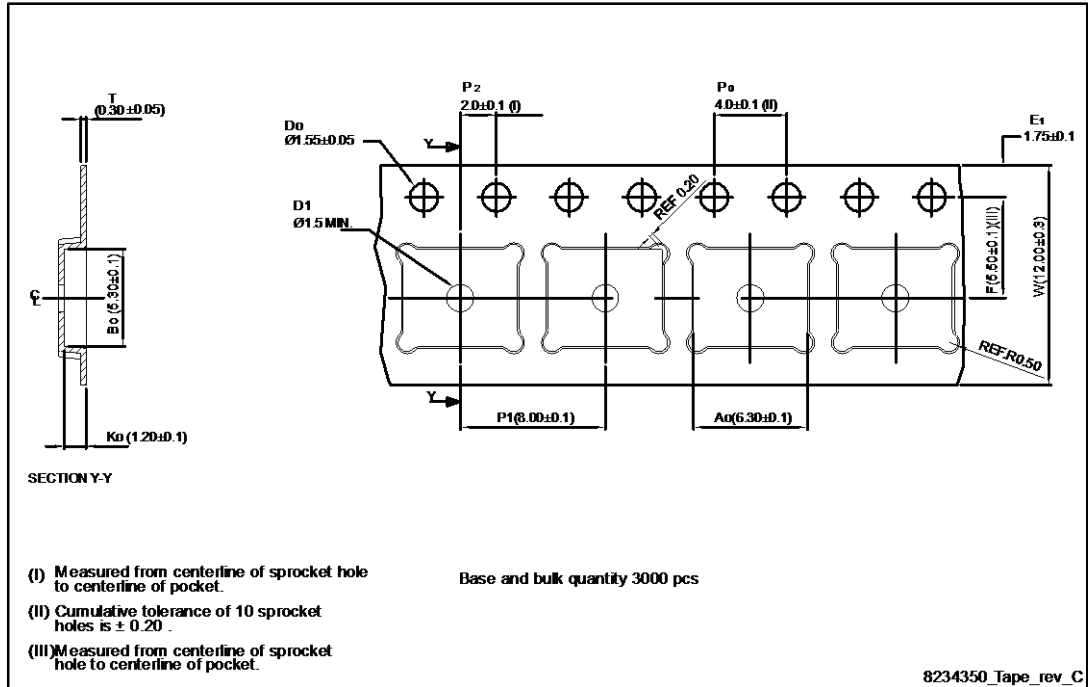


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

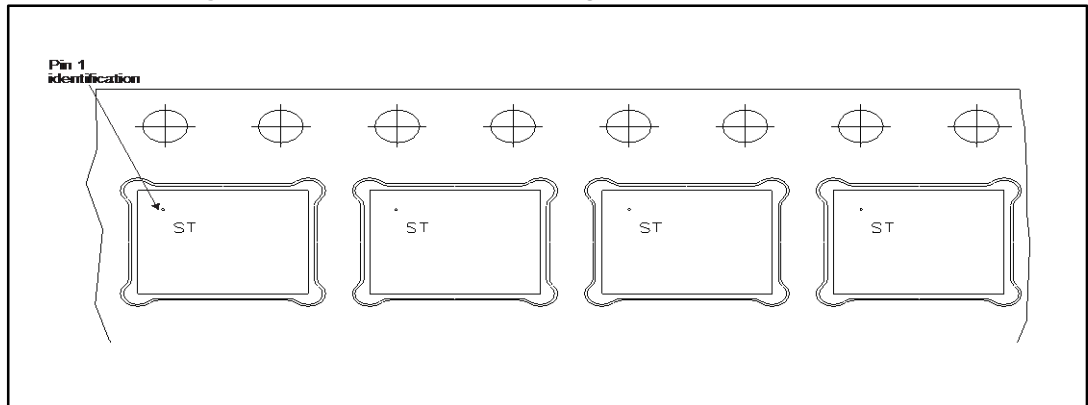
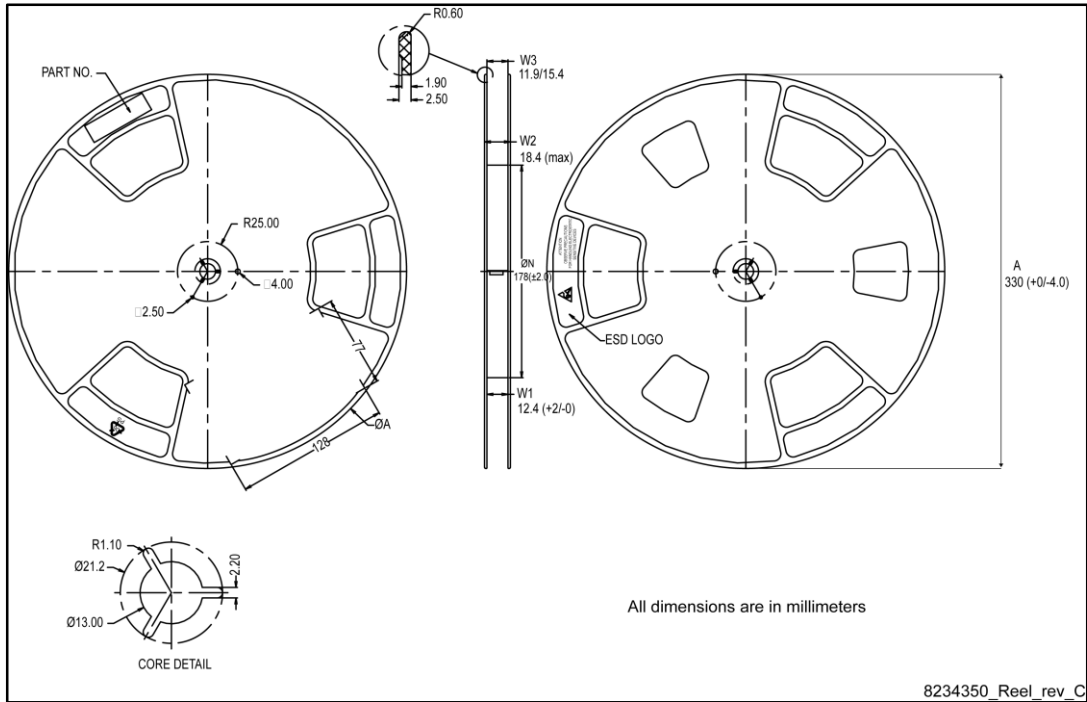


Figure 23: PowerFLAT™ 5x6 reel



## 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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