

## N-channel 60 V, 9 mΩ typ., 60 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

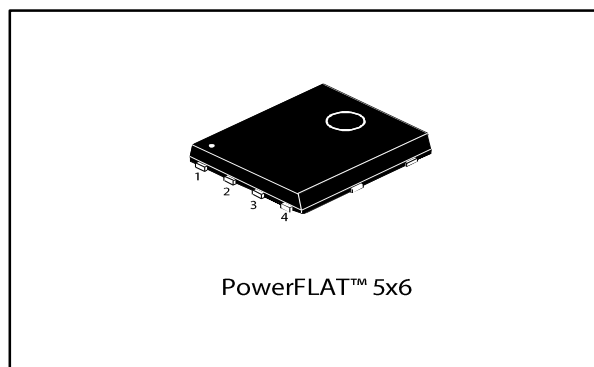


Figure 1: Internal schematic diagram

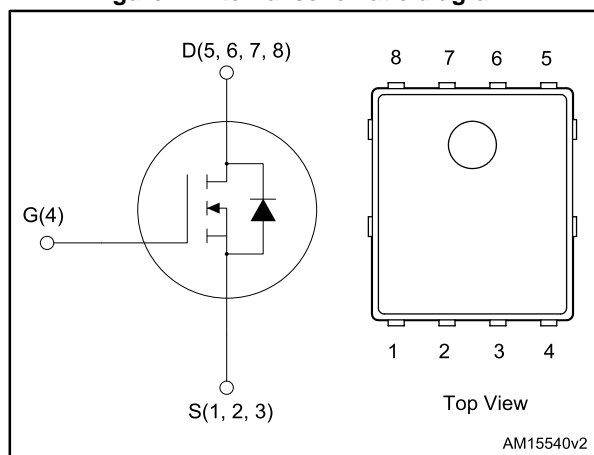


Table 1: Device summary

Order code	Marking	Package	Packaging
STL50N6F7	50N6F7	PowerFLAT™ 5x6	Tape and reel

### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STL50N6F7	60 V	11 mΩ	60 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.

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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 $T_C = 25\text{ }^\circ\text{C}$	60	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	43	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	240	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	15	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	11	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	60	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	71	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
$T_j$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

**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	$^\circ\text{C}/\text{W}$
$R_{thj-case}$	Thermal resistance junction-case max.	2.1	$^\circ\text{C}/\text{W}$

**Notes:**

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

## 2 Electrical characteristics

(T<sub>C</sub> = 25 °C unless otherwise specified)

**Table 4: On/Off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0 V	60			V
I <sub>DSS</sub>	Zero gate voltage drain current	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 60 V			1	μA
I <sub>GSS</sub>	Gate-body leakage current	V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V			100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 7.5 A		9	11	mΩ

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 30 V, f = 1 MHz, V <sub>GS</sub> = 0 V	-	1035	-	pF
C <sub>oss</sub>	Output capacitance		-	450	-	pF
C <sub>rss</sub>	Reverse transfer capacitance		-	53	-	pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 15 A, V <sub>GS</sub> = 10 V (see <a href="#">Figure 14: "Test circuit for gate charge behavior"</a> )	-	17	-	nC
Q <sub>gs</sub>	Gate-source charge		-	5.7	-	nC
Q <sub>gd</sub>	Gate-drain charge		-	5.7	-	nC

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 7.5 A, R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V (see <a href="#">Figure 13: "Test circuit for resistive load switching times"</a> )	-	14.5	-	ns
t <sub>r</sub>	Rise time		-	15.3	-	ns
t <sub>d(off)</sub>	Turn-off delay time		-	19.4	-	ns
t <sub>f</sub>	Fall time		-	8	-	ns

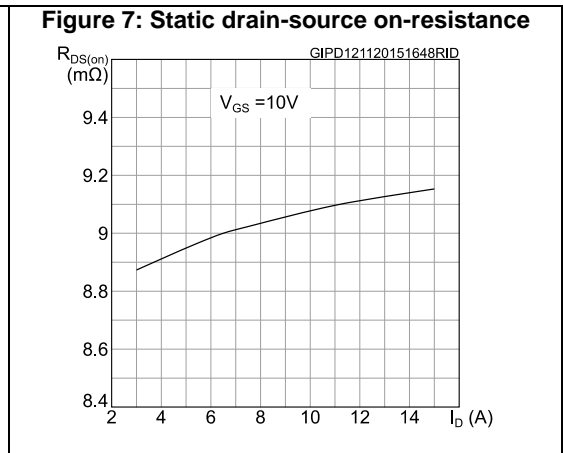
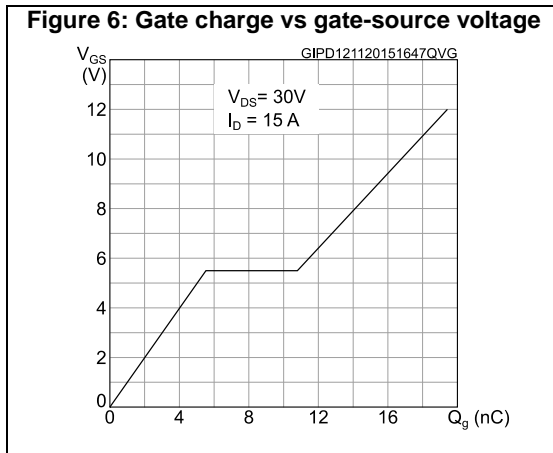
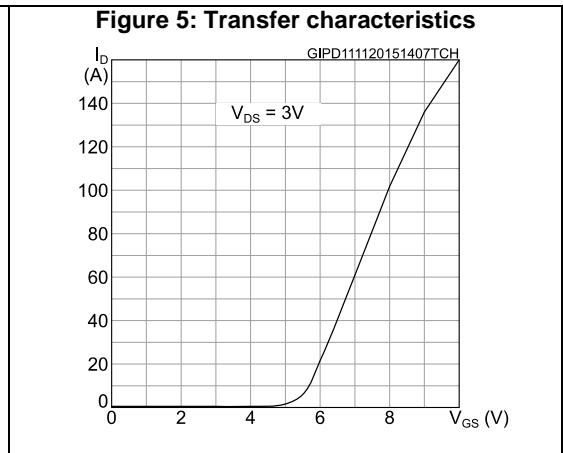
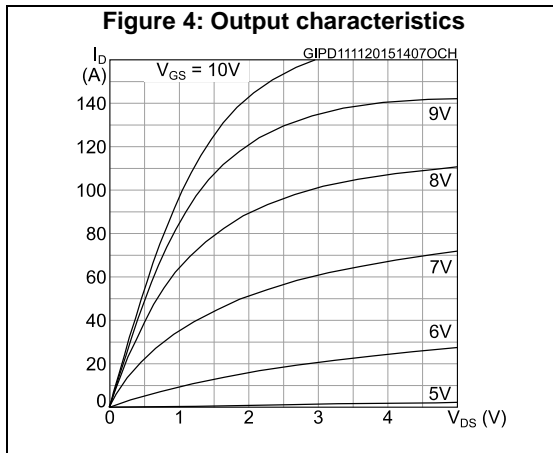
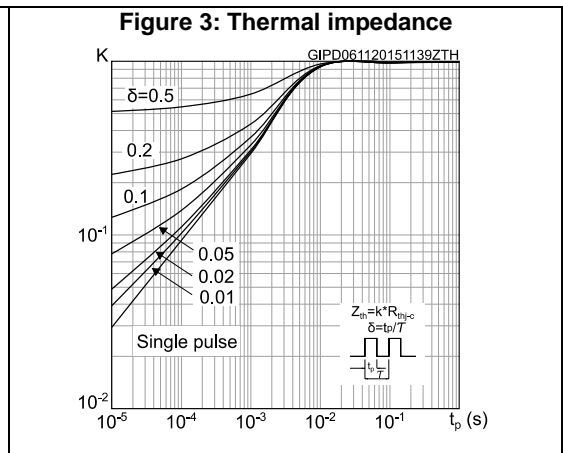
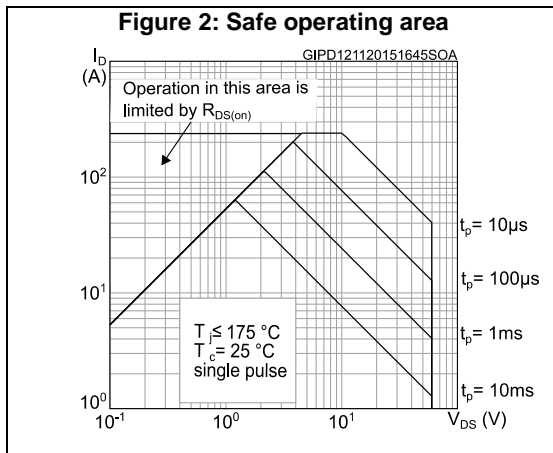
**Table 7: Source-drain diode**

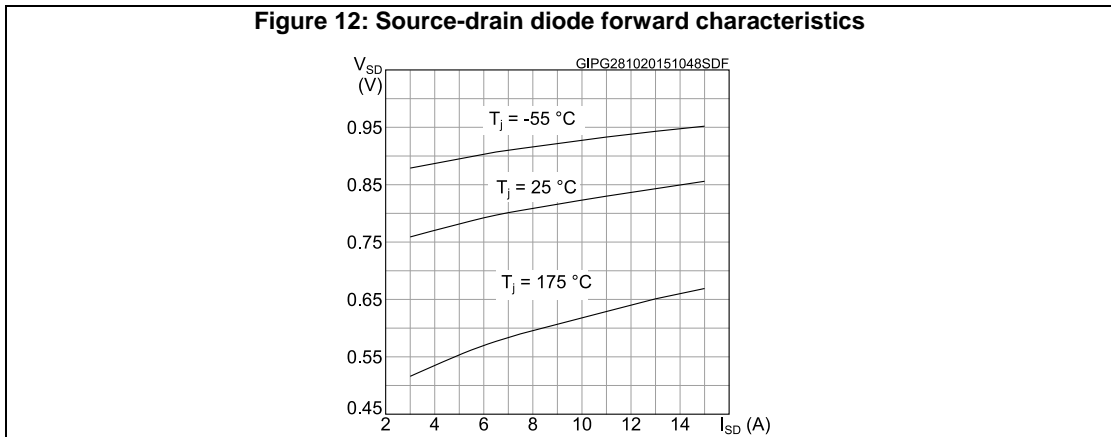
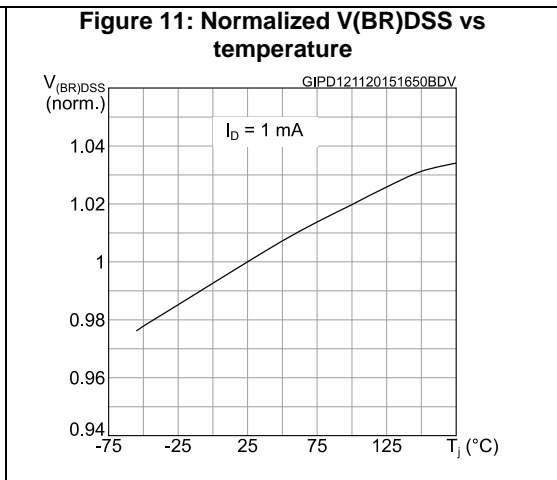
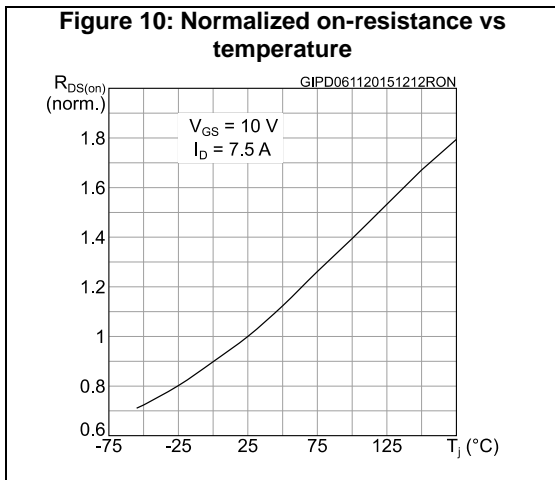
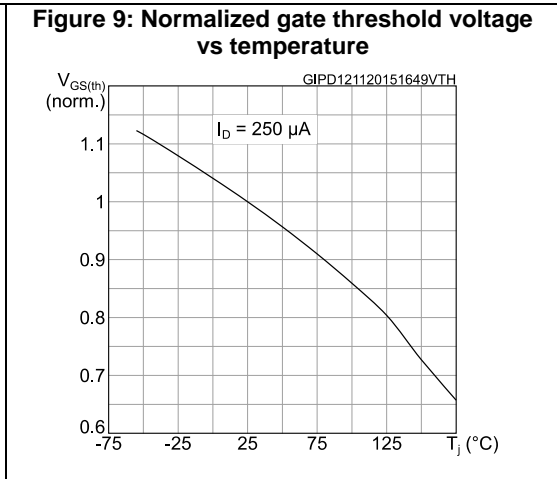
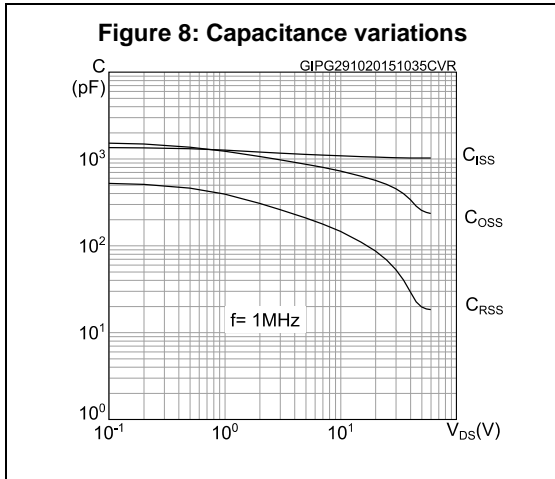
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>SD</sub> <sup>(1)</sup>	Forward on voltage	I <sub>SD</sub> = 15 A, V <sub>GS</sub> = 0 V	-		1.2	V
t <sub>rr</sub>	Reverse recovery time	I <sub>D</sub> = 15 A, di/dt = 100 A/μs V <sub>DD</sub> = 48 V (see <a href="#">Figure 15: "Test circuit for inductive load switching and diode recovery times"</a> )	-	26.8		ns
Q <sub>rr</sub>	Reverse recovery charge		-	14.2		nC
I <sub>RRM</sub>	Reverse recovery current		-	1.06		A

**Notes:**

<sup>(1)</sup>Pulsed: pulse duration = 300 μs, duty cycle 1.5%

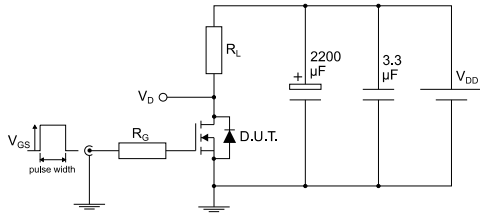
2.1 Electrical characteristics (curves)





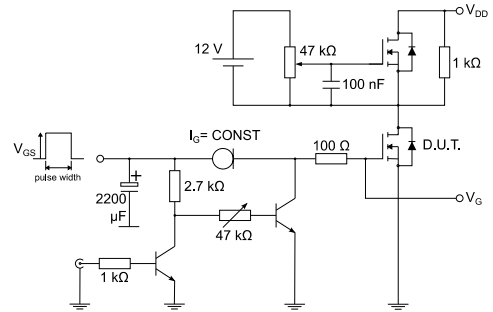
### 3 Test circuits

**Figure 13: Test circuit for resistive load switching times**



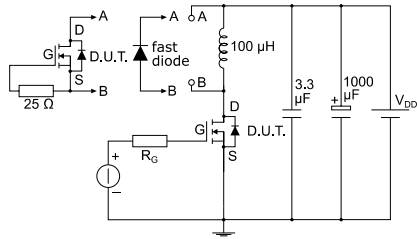
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**Figure 14: Test circuit for gate charge behavior**



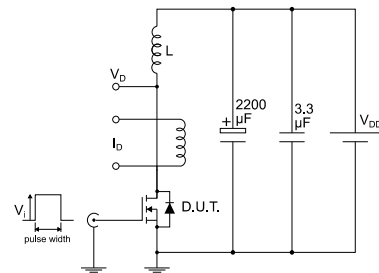
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**Figure 15: Test circuit for inductive load switching and diode recovery times**



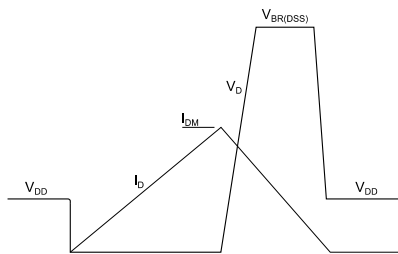
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**Figure 16: Unclamped inductive load test circuit**



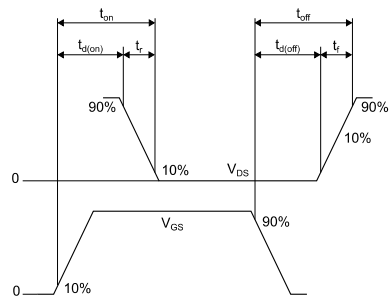
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**Figure 17: Unclamped inductive waveform**



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**Figure 18: Switching time waveform**



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## 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](http://www.st.com). ECOPACK® is an ST trademark.



### 4.1 PowerFLAT 5x6 type R package information

Figure 19: PowerFLAT™ 5x6 type R package outline

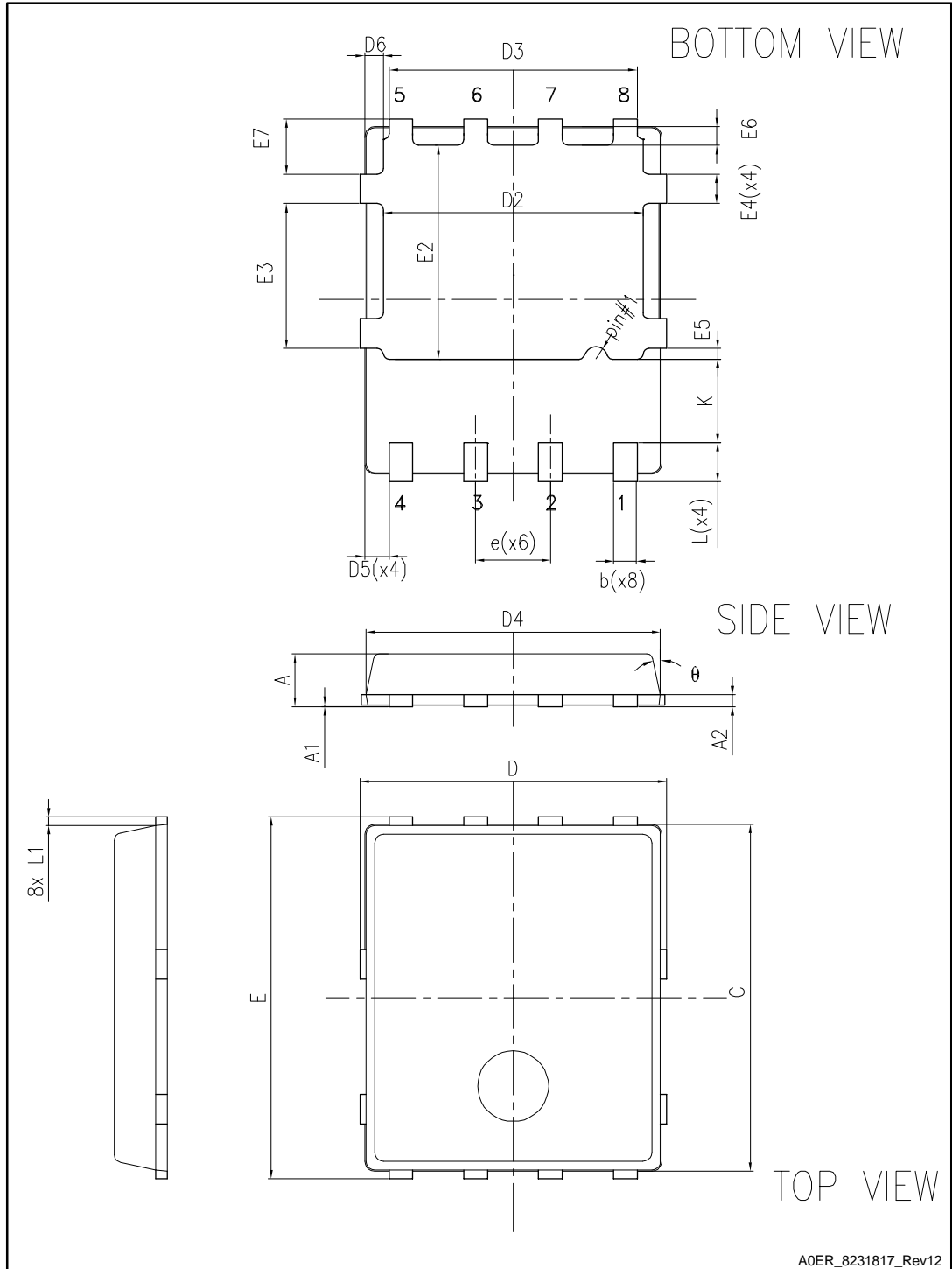
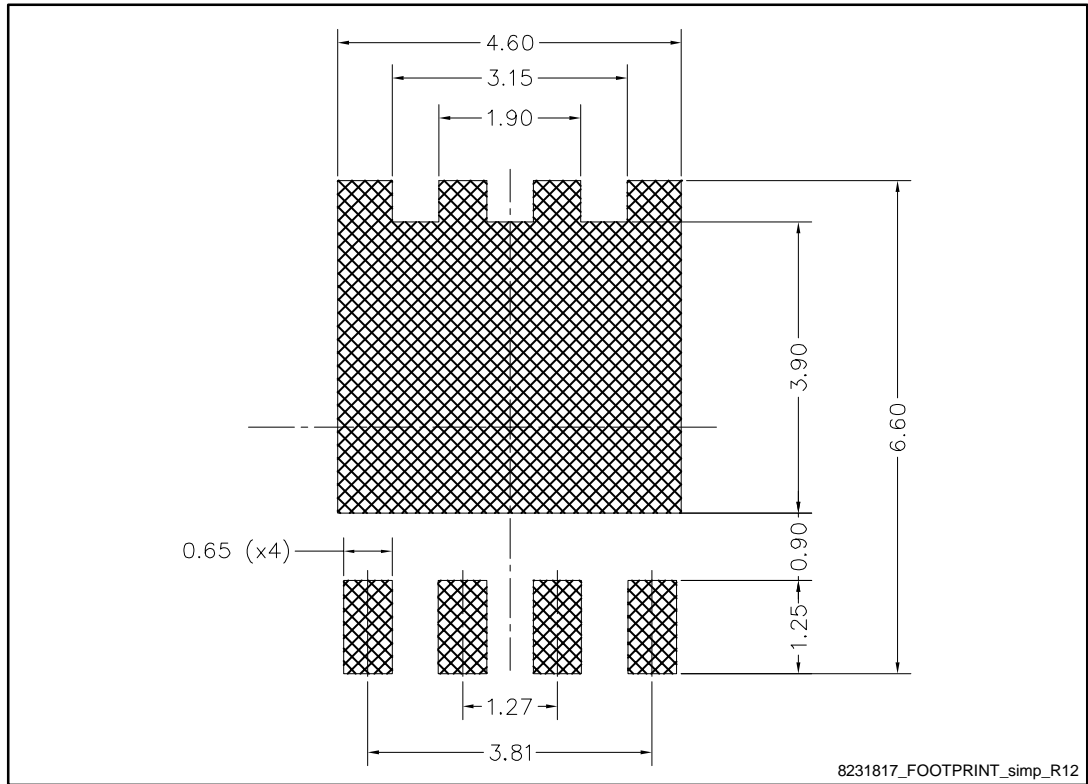


Table 8: PowerFLAT™ 5x6 type R mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.20
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.0	5.20
D5	0.25	0.4	0.55
D6	0.15	0.3	0.45
e		1.27	
E	5.95	6.15	6.35
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.2	0.325	0.450
E7	0.75	0.90	1.25
K	1.275		1.575
L	0.60		0.80
L1	0.05	0.15	0.25
θ	0°		12°

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



## 4.2 Packing information

Figure 21: PowerFLAT™ 5x6 tape (dimensions are in mm)

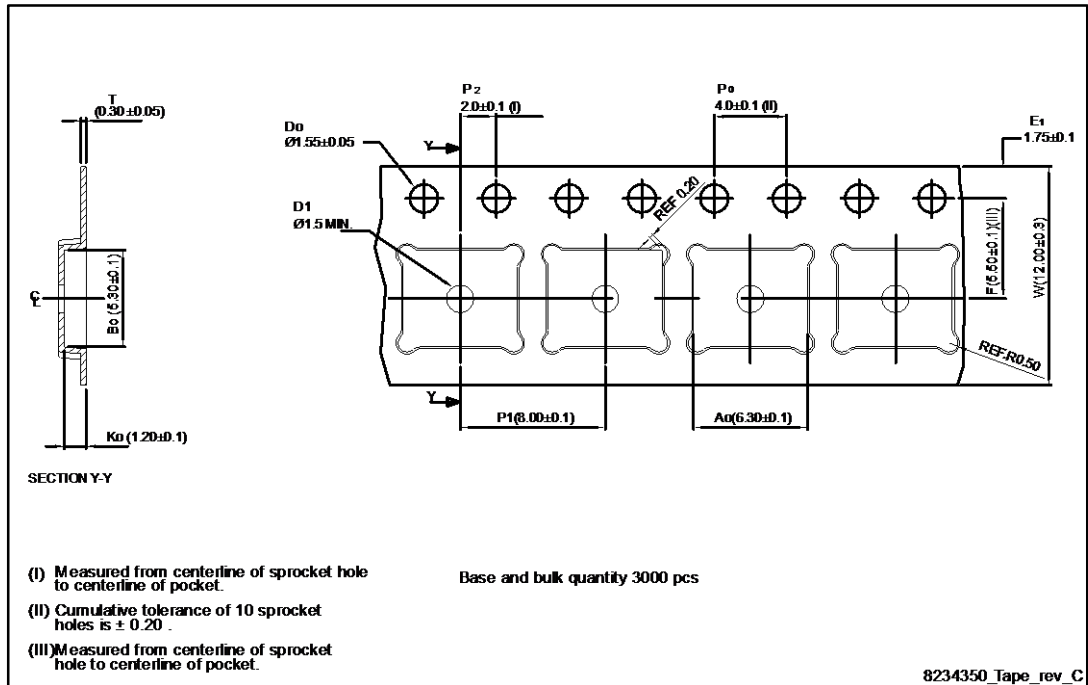


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

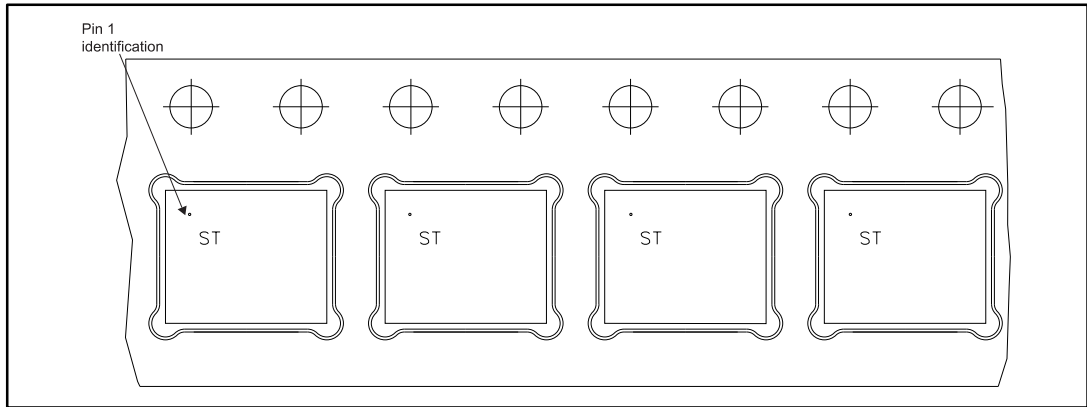
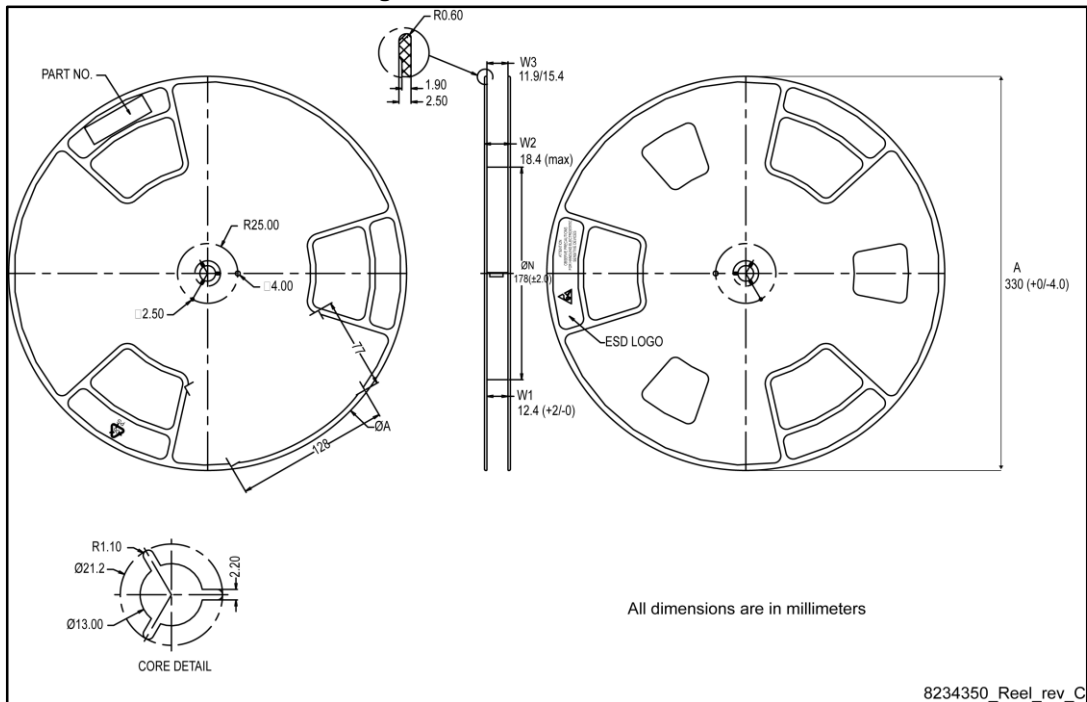


Figure 23: PowerFLAT™ 5x6 reel



## 5 Revision history

Table 9: Document revision history

Date	Revision	Changes
22-Jul-2015	1	First release.
12-Nov-2015	2	Document status promoted from preliminary to production data. Updated title and features in cover page. Updated <a href="#">Table 2: "Absolute maximum ratings"</a> and <a href="#">Section 3: "Electrical characteristics"</a> . Added <a href="#">Section 3.1: "Electrical characteristics (curves)"</a> Updated <a href="#">Section 5.1: "PowerFLAT 5x6 type R package information"</a> . Minor text changes.

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