STL120N8F7

N-channel 80 V, 3.7 mΩ typ., 120 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

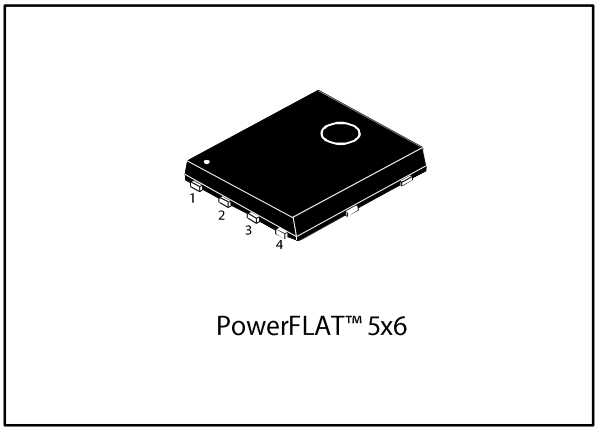
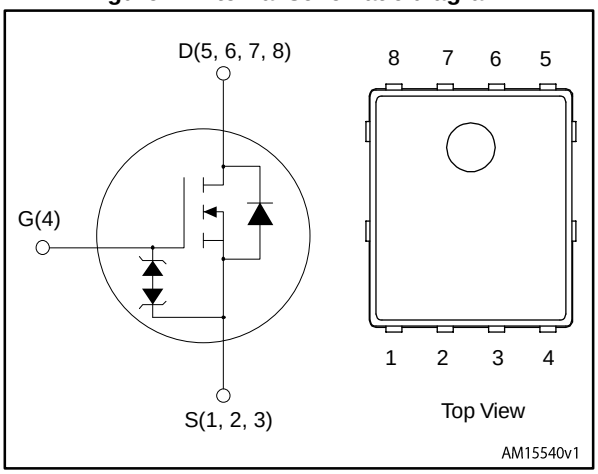


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STL120N8F7	80 V	4.4 mΩ	120 A	140 W

- 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	Packing
STL120N8F7	120N8F7	PowerFLAT™ 5x6	Tape and reel

This is information on a product in full production.

www.st.com

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	±20	V
I_D(1)	Drain current (continuous) at T_{case} = 25 °C	120	A
	Drain current (continuous) at T_{case} = 100 °C	90	
I_{DM}(1)(2)	Drain current (pulsed)	480	A
I_D(3)	Drain current (continuous) at T_{pcb} = 25 °C	23	A
	Drain current (continuous) at T_{pcb} = 100 °C	17	
I_{DM}(2)(3)	Drain current (pulsed)	92	A
P_{TOT}(1)	Total dissipation at T_{case} = 25 °C	140	W
P_{TOT}(3)	Total dissipation at T_{pcb} = 25 °C	4.8	W
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Operating junction temperature		

Notes:

(1) This value is rated according to $R_{thj\text{-}c}$.

(2) Pulse width is limited by safe operating area.

(3) This value is rated according to $R_{thj\text{-}pcb}$

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$(1)	Thermal resistance junction-pcb	31.3	°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case	1.05	

Notes:

(1) When mounted on a 1-inch² FR-4 board, 2oz Cu, t < 10 s

2 Electrical characteristics

(T_{case} = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 1 mA	80			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 80 V			1	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = 20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 11.5 A		3.7	4.4	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	4570	-	pF
C_{oss}	Output capacitance		-	800	-	
C_{rss}	Reverse transfer capacitance		-	64	-	
Q_g	Total gate charge	V_{DD} = 40 V, I_D = 23 A, V_{GS} = 10 V (see *Figure 14: "Gate charge test circuit"*)	-	60	-	nC
Q_{gs}	Gate-source charge		-	24.7	-	
Q_{gd}	Gate-drain charge		-	14.8	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 40 V, I_D = 11.5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13: "Switching times test circuit for resistive load"* and *Figure 18: "Switching time waveform"*)	-	34.5	-	ns
t_r	Rise time		-	16.8	-	
$t_{d(off)}$	Turn-off delay time		-	60	-	
t_f	Fall time		-	15.4	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 23 A	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 23 A, di/dt = 100 A/µs, V_{DD} = 64 V (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	48.6		ns
Q_{rr}	Reverse recovery charge		-	65.6		nC
I_{RRM}	Reverse recovery current		-	2.7		A

Notes:

(1) Pulse test: pulse duration = 300 µs, duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

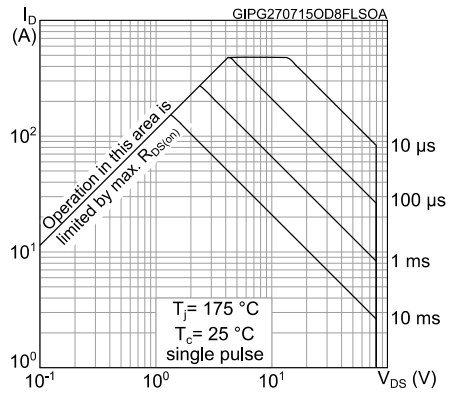


Figure 3: Thermal impedance

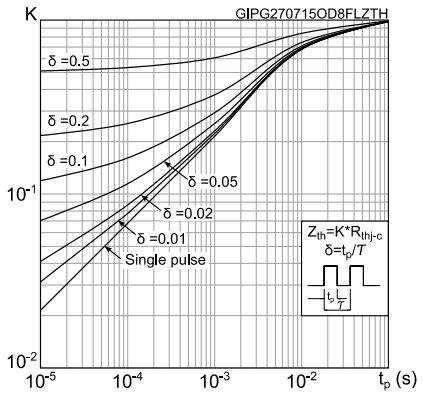


Figure 4: Output characteristics

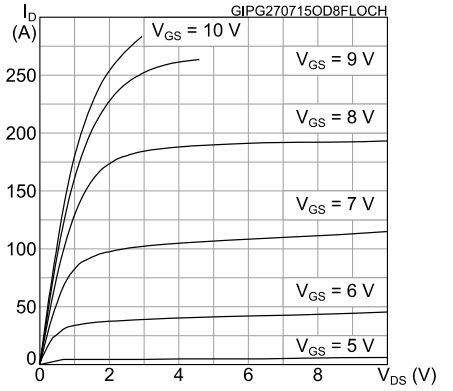


Figure 5: Transfer characteristics

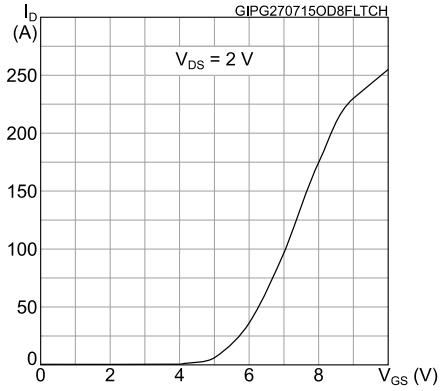


Figure 6: Gate charge vs gate-source voltage

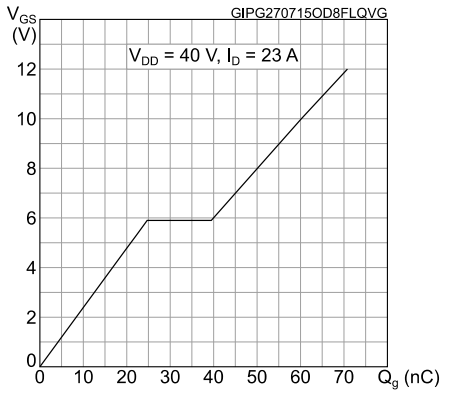


Figure 7: Static drain-source on-resistance

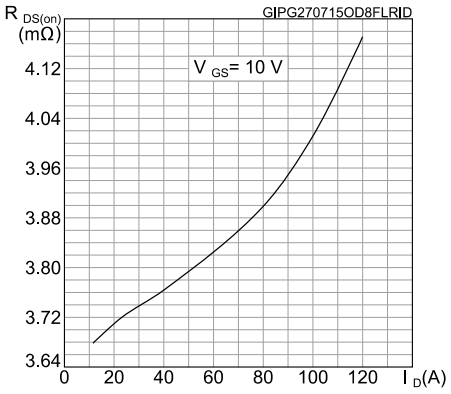


Figure 8: Capacitance variations

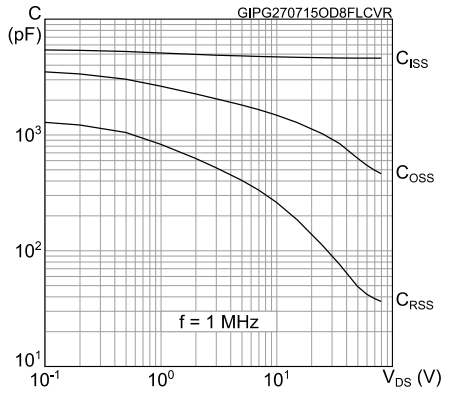


Figure 9: Normalized gate threshold voltage vs temperature

Figure 10: Normalized on-resistance vs temperature

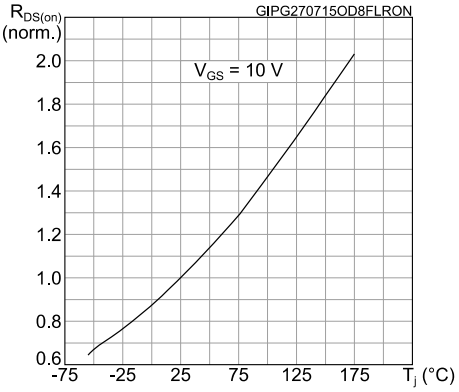


Figure 11: Normalized V(BR)DSS vs temperature

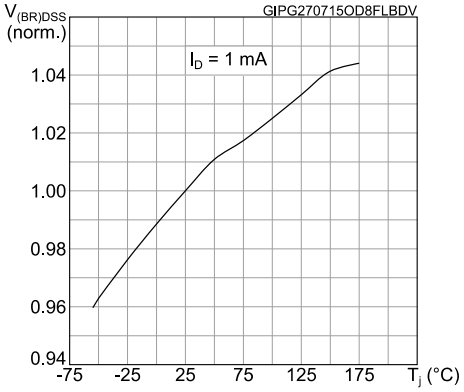
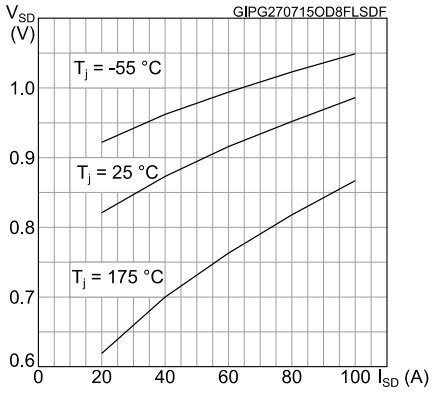


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

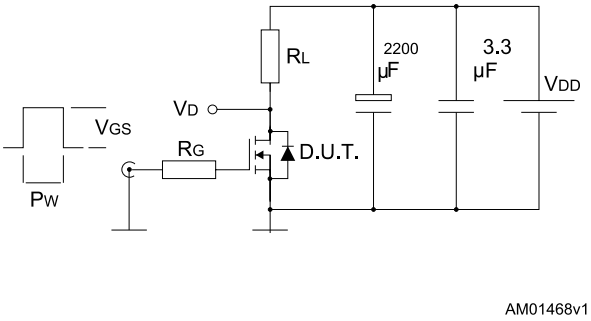


Figure 14: Gate charge test circuit

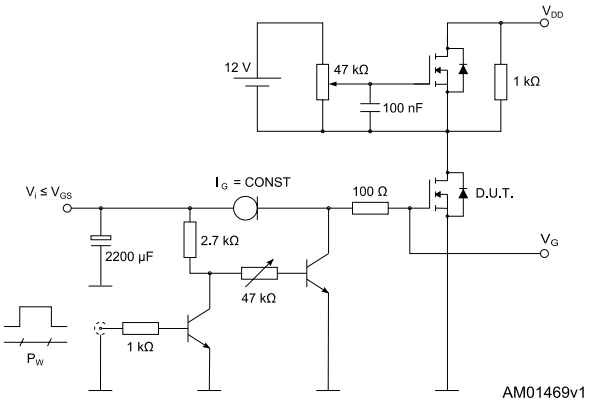


Figure 15: Test circuit for inductive load switching and diode recovery times

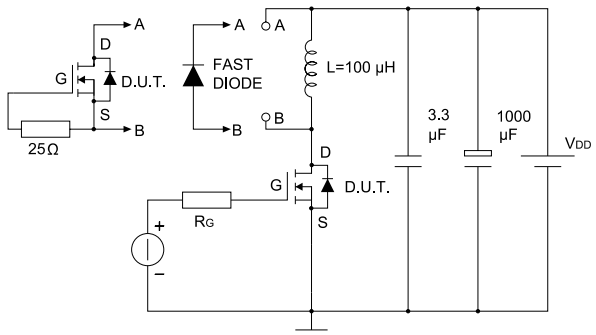


Figure 16: Unclamped inductive load test circuit

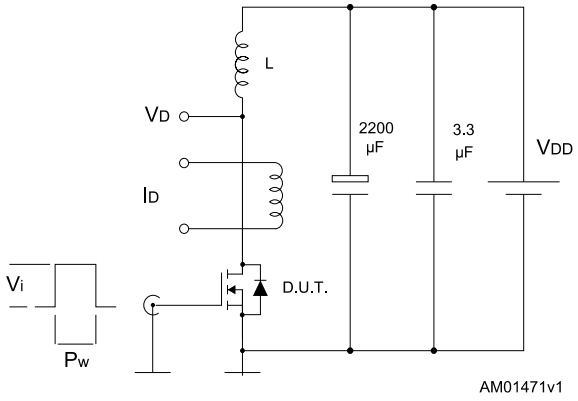


Figure 17: Unclamped inductive waveform

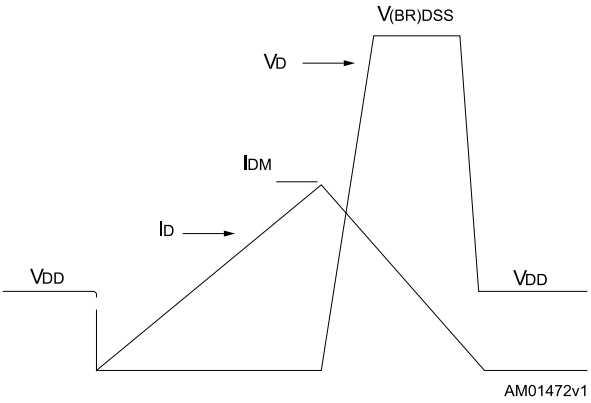
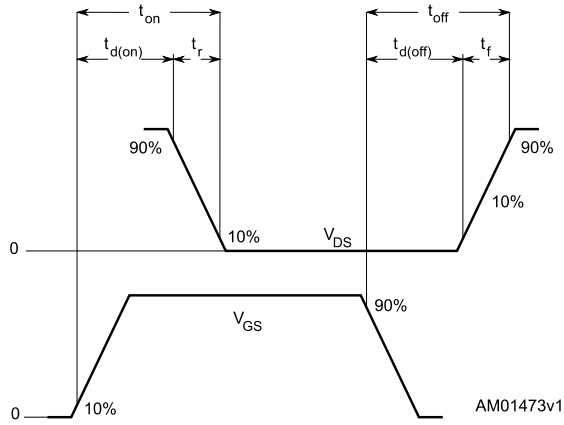


Figure 18: Switching time waveform



4 Package information

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.

4.1 PowerFLAT™ 5x6 type C package

Figure 19: PowerFLAT™ 5x6 type C package outline

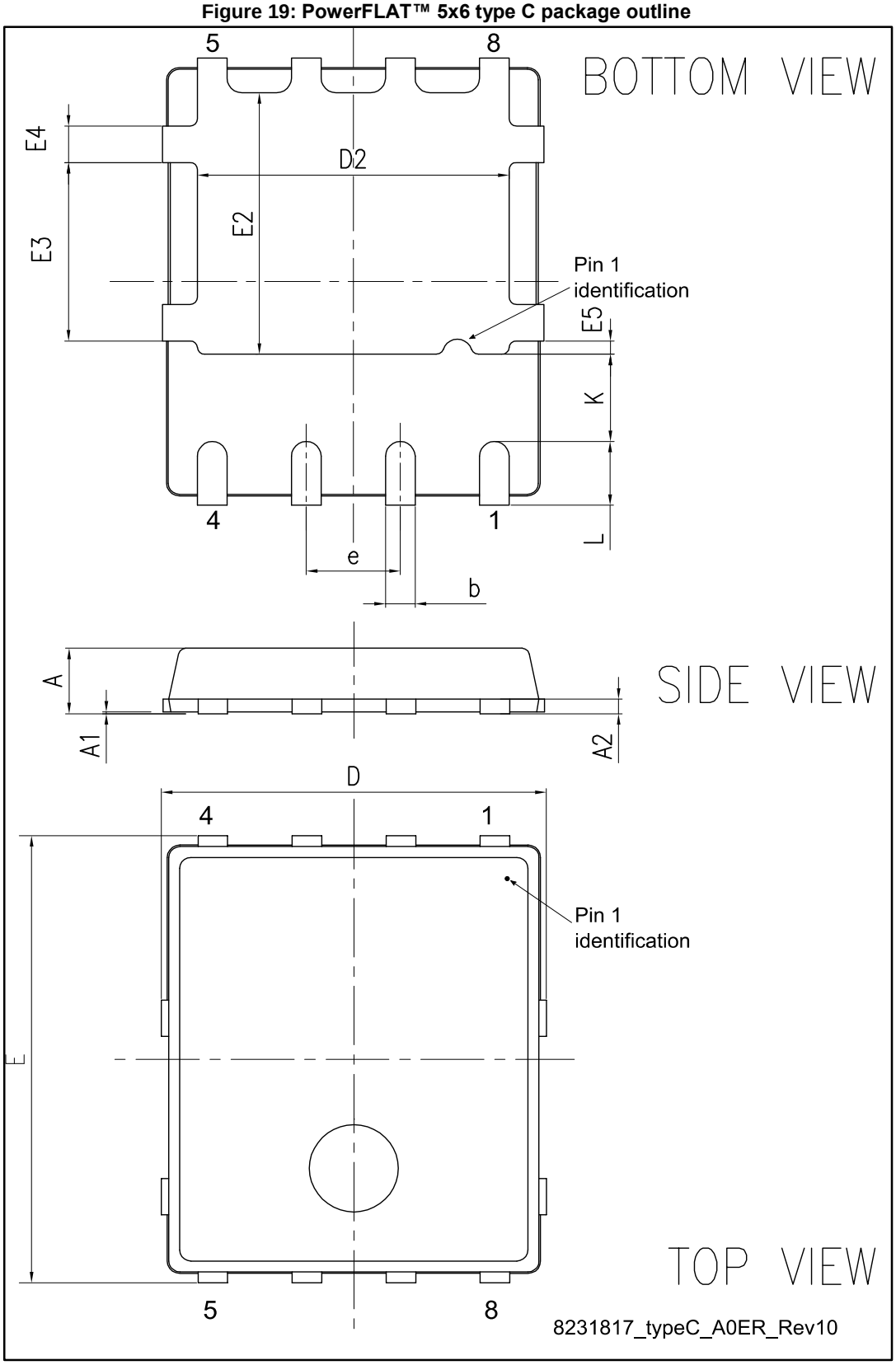
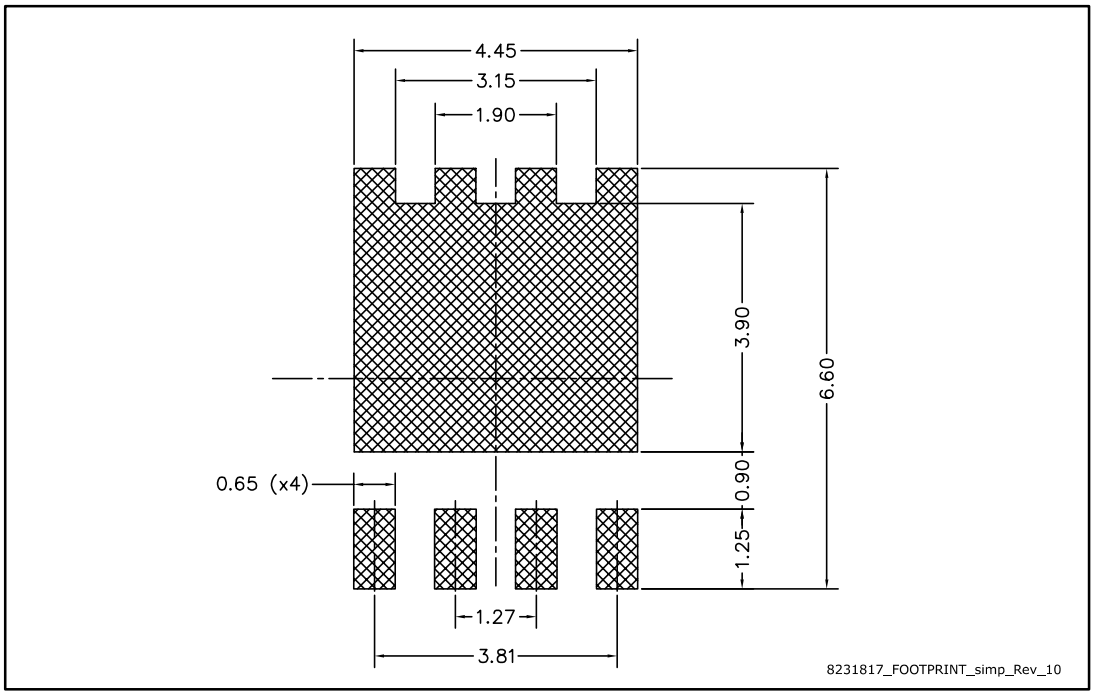


Table 8: PowerFLAT™ 5x6 type C mechanical data

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
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28

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



4.2 PowerFLAT™ 5x6 packing information

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

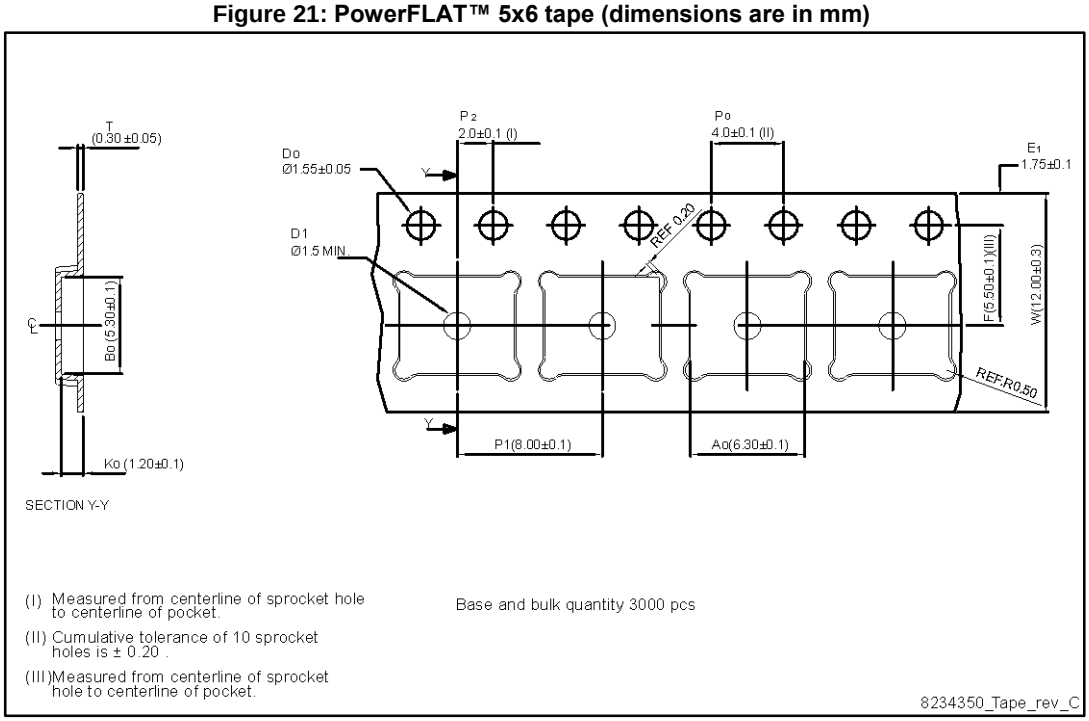


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

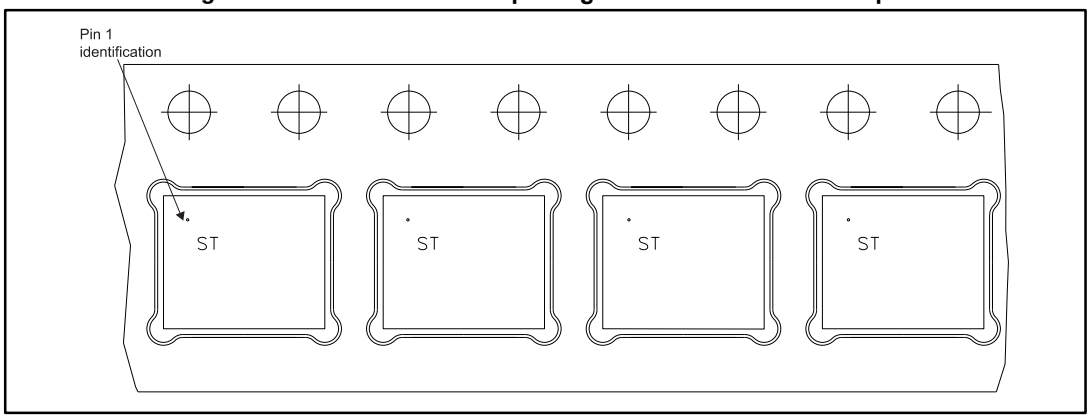
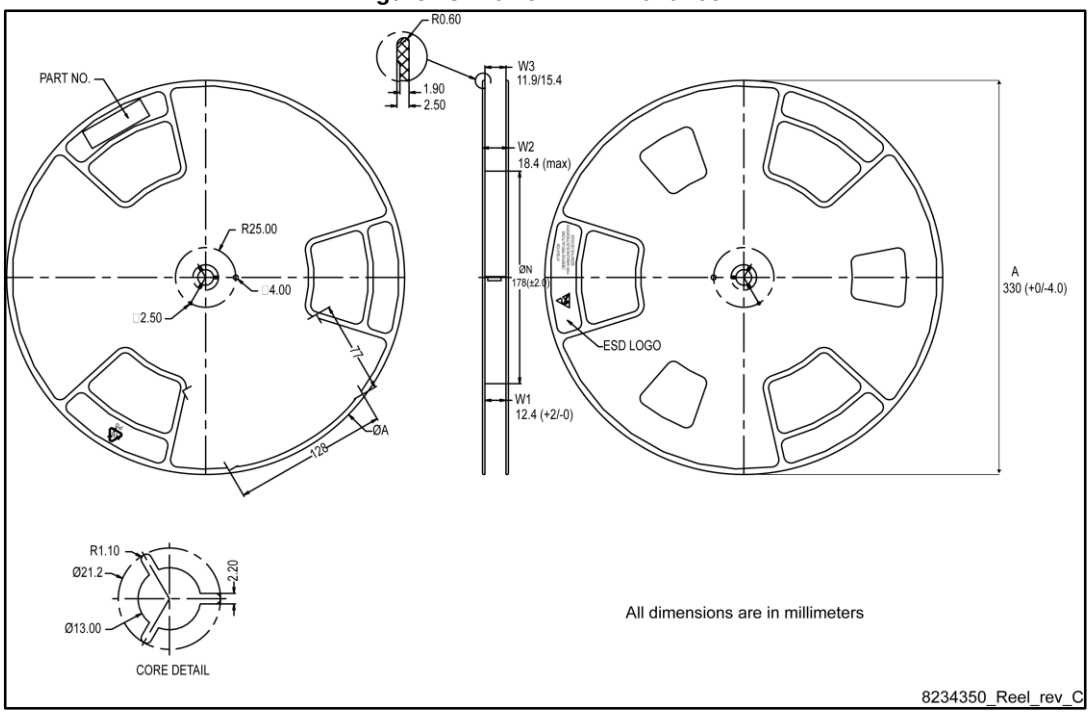


Figure 23: PowerFLAT™ 5x6 reel



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
09-Dec-2014	1	First release.
27-Jul-2015	2	Text and formatting changes throughout document. Datasheet status promoted from preliminary data to production data. In section *Electrical characteristics*: - updated tables *Dynamic*, *Switching times* and *Source-drain diode* - added section *Electrical characteristics (curves)*

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