STL220NS6F7

N-channel 60 V, 1.4 mΩ typ., 250 A STripFET™ F7 Power MOSFET plus monolithic Schottky in a PowerFLAT™ 5x6

Datasheet - preliminary data

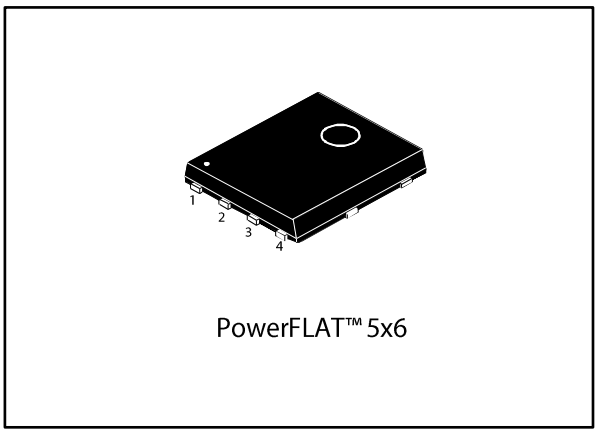
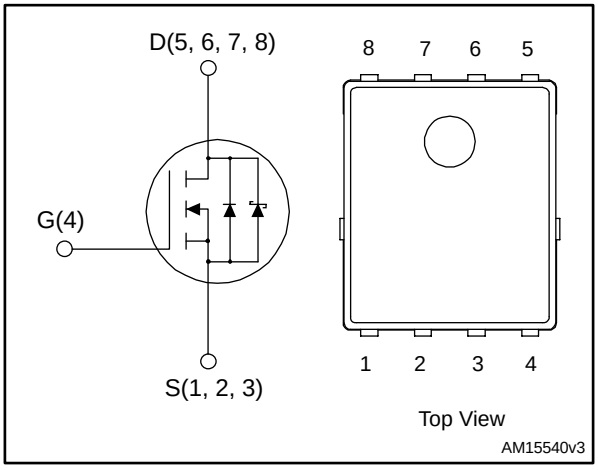


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL220NS6F7	60 V	1.6 mΩ	250 A

- Among the lowest $R_{DS(on)}$ on the market
- Excellent figure of merit (FoM)
- Embedded Schottky diode
- 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
STL220NS6F7	220NS6F7	PowerFLAT™ 5x6	Tape and reel

Contents

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 °C	250	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	177	A
I_{DM} (1)(2)	Drain current (pulsed)	1000	A
I_D (3)	Drain current (continuous) at T_{pcb} = 25 °C	40	A
I_D (3)	Drain current (continuous) at T_{pcb} = 100 °C	28.5	A
I_{DM} (2)(3)	Drain current (pulsed)	160	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	187	W
P_{TOT} (3)	Total dissipation at T_{pcb} = 25 °C	4.8	W
T_j	Max. operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		

Notes:

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

(2)Pulse width 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 max.	31.3	°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case max.	0.8	°C/W

Notes:

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

2 Electrical characteristics

(T_C = 25 °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 mA, V_{GS} = 0	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V V_{DS} = 60 V			500	µA
I_{GSS}	Gate-body leakage current	V_{GS} = 20 V, V_{DS} = 0			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 = 20 A		0.0014	0.0016	Ω

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	-	7200	-	pF
C_{oss}	Output capacitance		-	3580	-	pF
C_{rss}	Reverse transfer capacitance		-	130	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 40 A, V_{GS} = 10 V	-	100	-	nC
Q_{gs}	Gate-source charge		-	TBD	-	nC
Q_{gd}	Gate-drain charge		-	TBD	-	nC

Table 6: Switching times

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

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	I_{SD} = 20 A, V_{GS} = 0	-		0.7	V
t_{rr}	Reverse recovery time	I_D = 40 A, di/dt = 100 A/µs V_{DD} = 48 V	-	TBD		ns
Q_{rr}	Reverse recovery charge		-	TBD		nC
I_{RRM}	Reverse recovery current		-	TBD		A

Notes:

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

3 Test circuits

Figure 2: Switching times test circuit for resistive load

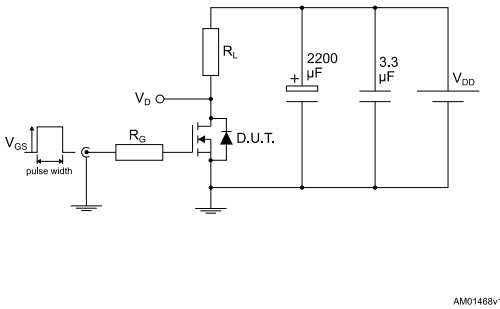


Figure 3: Gate charge test circuit

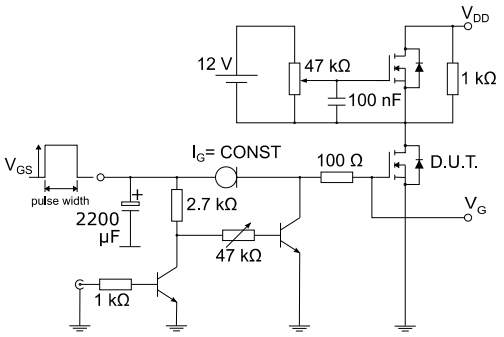


Figure 4: Test circuit for inductive load switching and diode recovery times

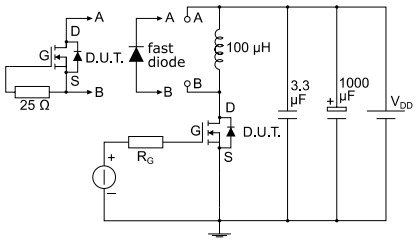


Figure 5: Unclamped inductive load test circuit

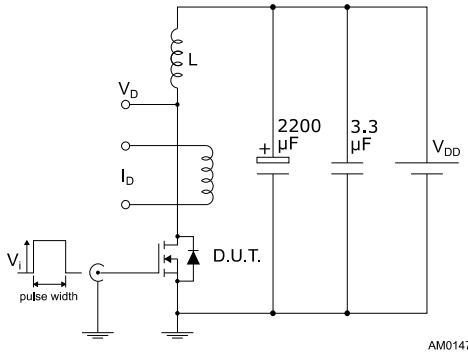


Figure 6: Unclamped inductive waveform

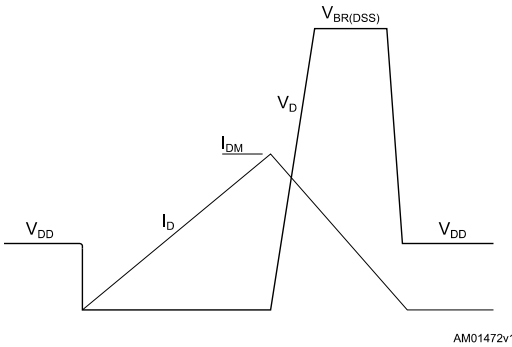
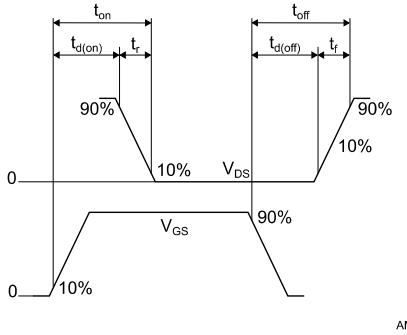


Figure 7: Switching time waveform



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 S-C package information

Figure 8: PowerFLAT™ 5x6 type C package outline

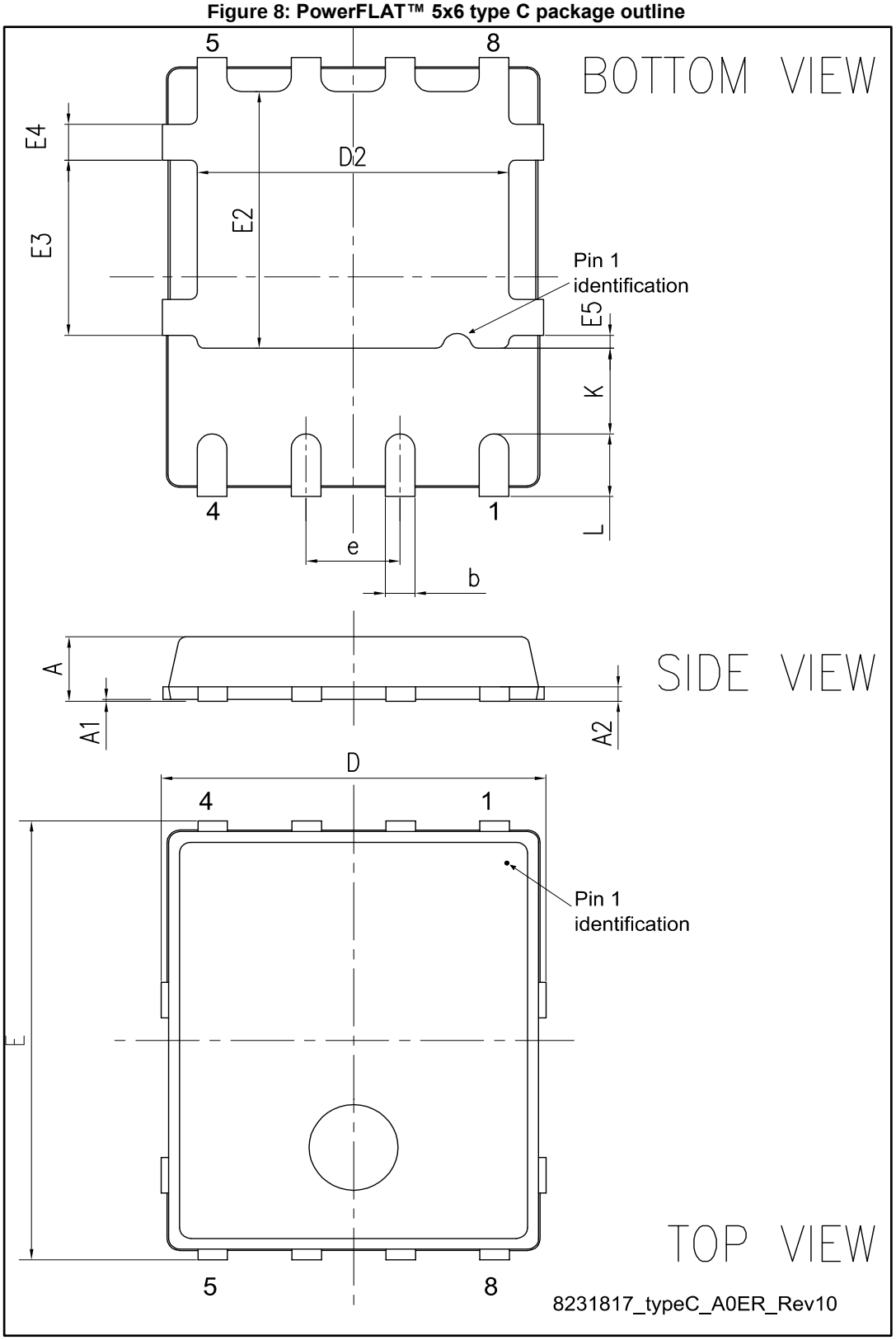
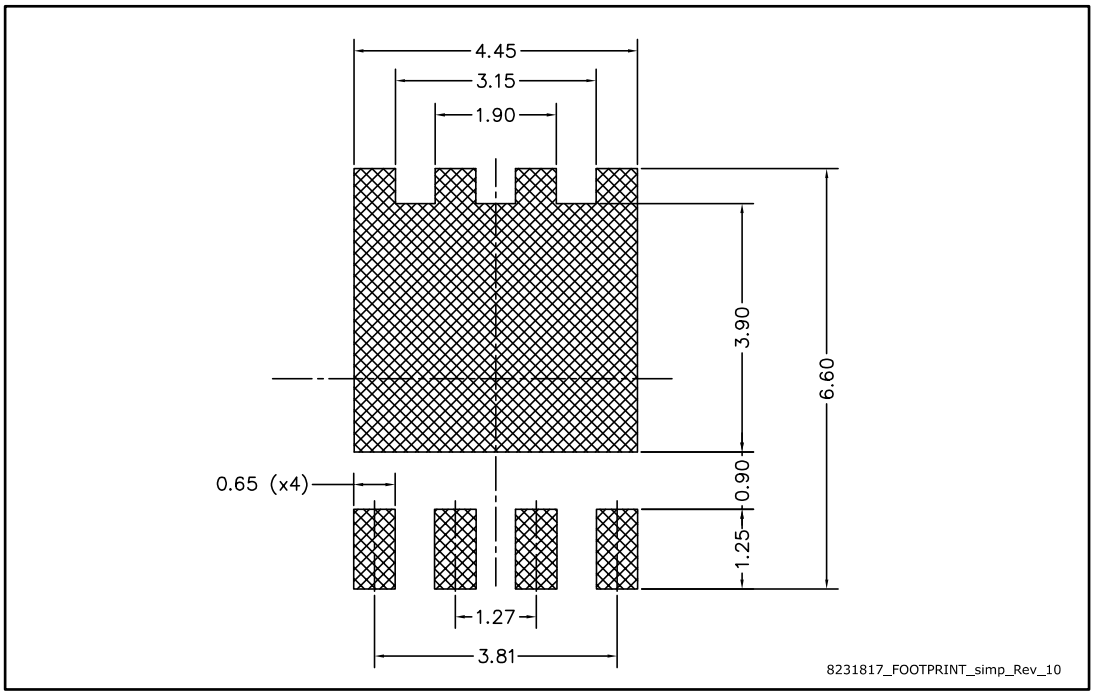


Table 8: PowerFLAT™ 5x6 type C mechanical data

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



5 Packing information

Figure 10: PowerFLAT™ 5x6 tape (dimensions are in mm)

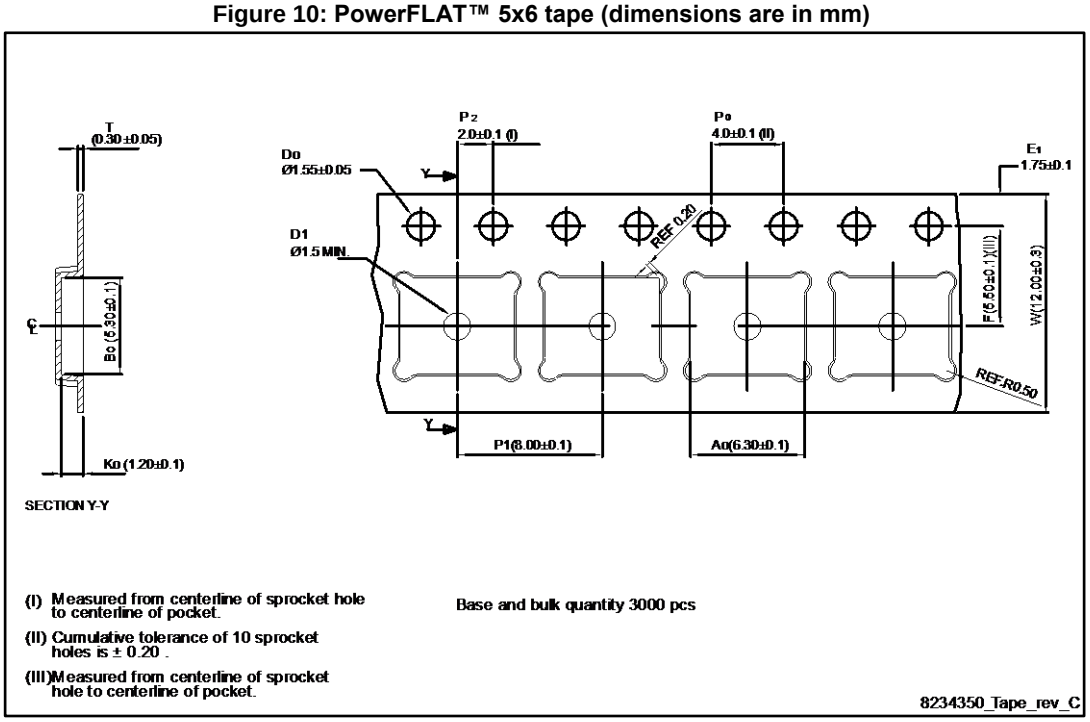


Figure 11: PowerFLAT™ 5x6 package orientation in carrier tape

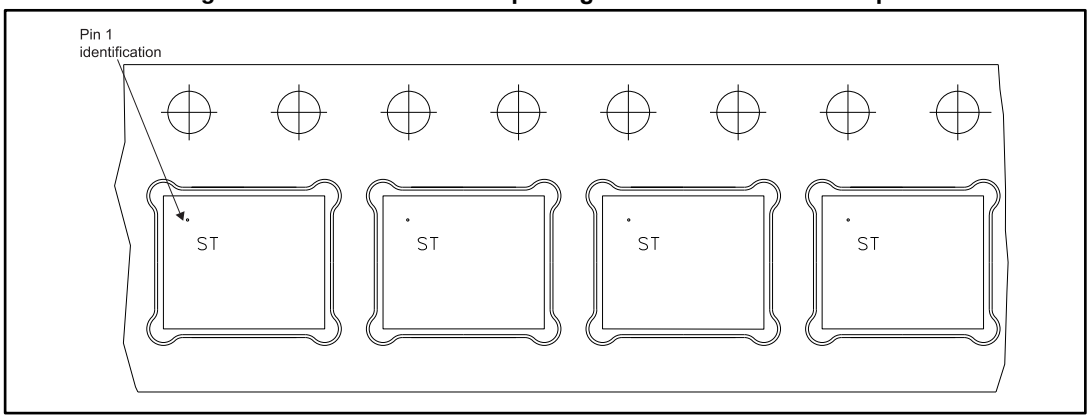
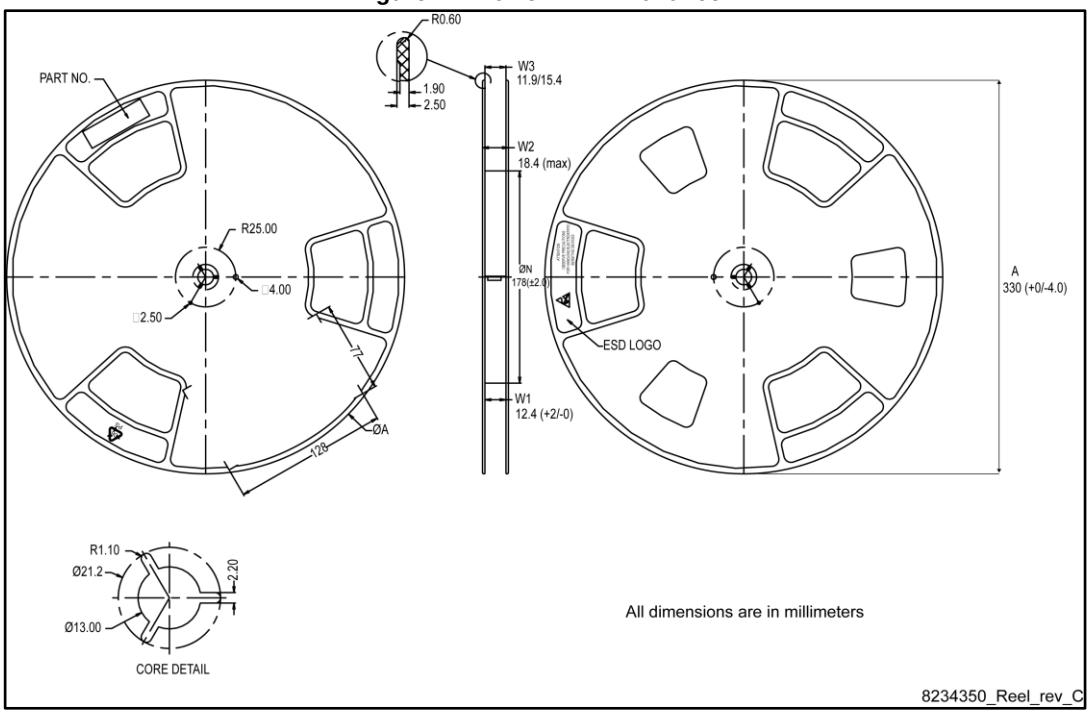


Figure 12: PowerFLAT™ 5x6 reel



5.1 PowerFLAT™ 5x6 packing information

Figure 13: PowerFLAT™ 5x6 tape

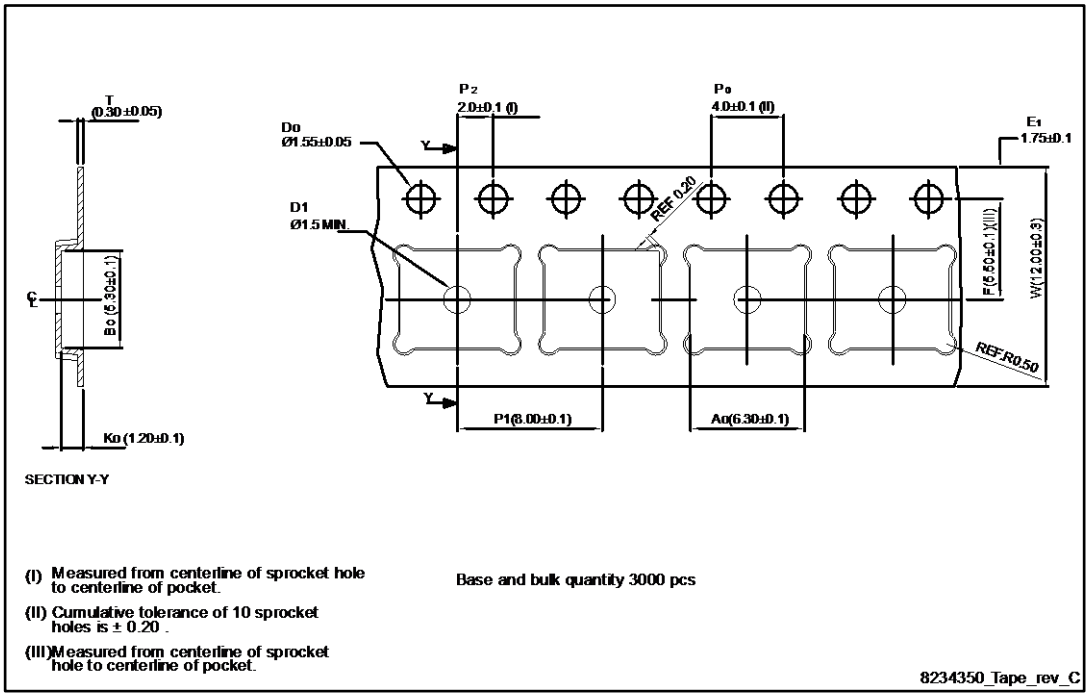


Figure 14: PowerFLAT™ 5x6 package orientation in carrier tape

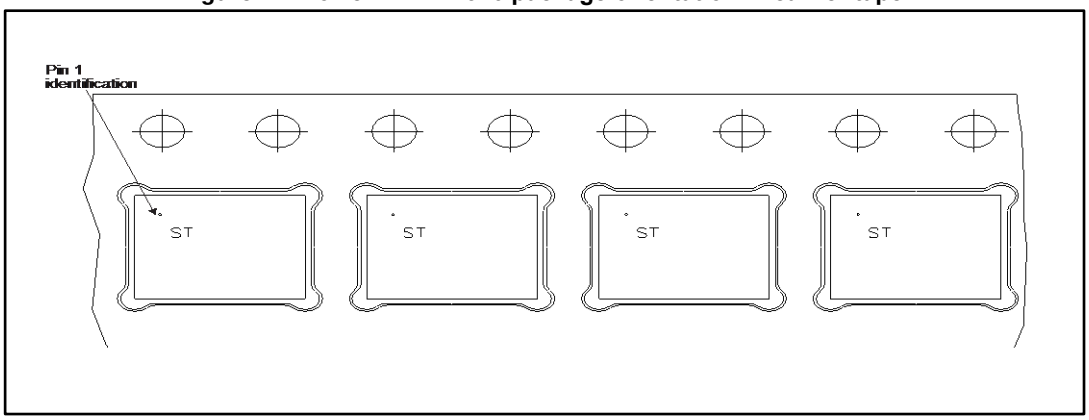
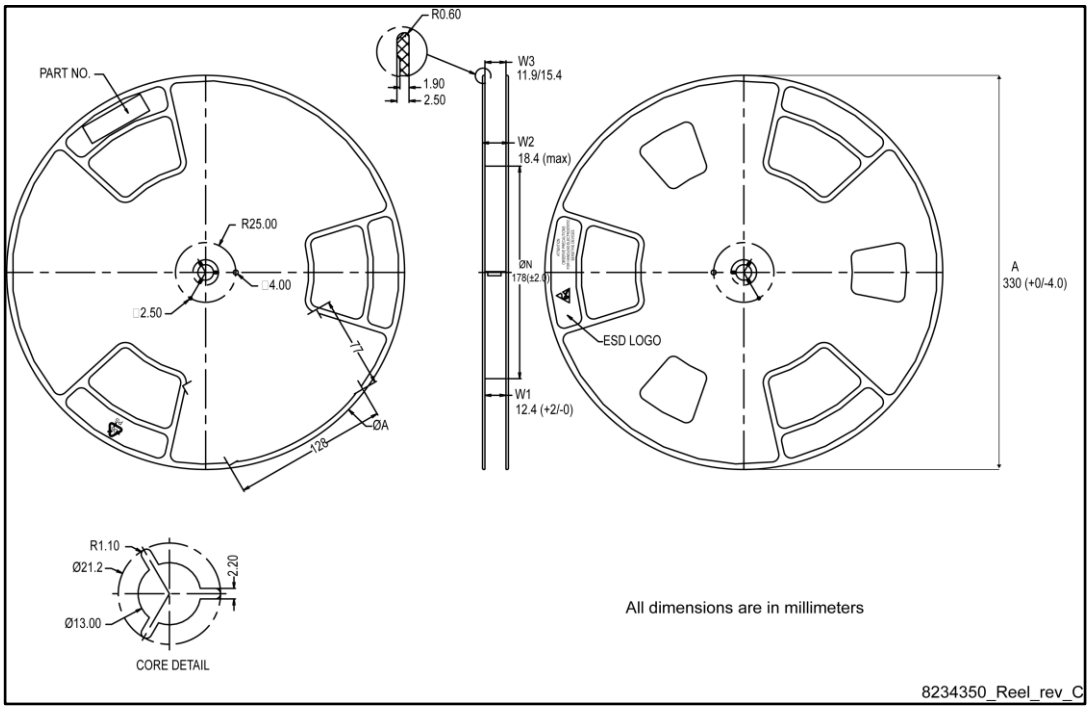


Figure 15: PowerFLAT™ 5x6 reel



6 Revision history

Table 9: Document revision history

Date	Revision	Changes
20-Aug-2015	1	First release.

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