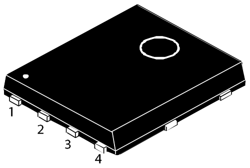
STL20NF06LAG

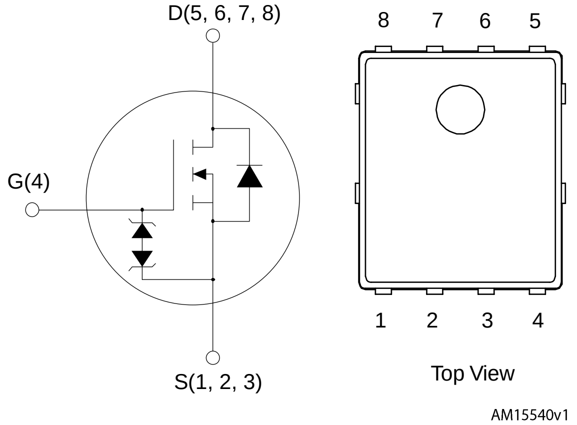
Automotive-grade N-channel 60 V, 27 mΩ typ., 20 A STripFET™ II Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data



PowerFLAT™ 5x6

Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STL20NF06LAG	60 V	40 mΩ	20 A	75 W

- Designed for Automotive applications and AEC-Q101 qualified
- PowerFLAT™ 5x6 with wettable flanks
- Logic level $V_{GS(th)}$
- Maximum junction temperature: T_J = 175 °C

Applications

- Switching applications

Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process is specifically designed to minimize input capacitance and gate charge. It is therefore ideal as a primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer applications. It is also suitable for any application with low gate charge drive requirements.

Table 1: Device summary

Order code	Marking	Package	Packing
STL20NF06LAG	20NF06L	PowerFLAT™ 5x6	Tape and reel

This is information on a product in full production.

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][2]	Drain current (continuous) at T_{case} = 25 °C	20	A
	Drain current (continuous) at T_{case} = 100 °C	20	
I_{DM} [1][3]	Drain current (pulsed)	80	A
I_D [4]	Drain current (continuous) at T_{pcb} = 25 °C	7.4	A
	Drain current (continuous) at T_{pcb} = 100 °C	5.2	
I_{DM}	Drain current (pulsed)	29.6	A
P_{TOT}	Total dissipation at T_{case} = 25 °C	75	W
P_{TOT}	Total dissipation at T_{pcb} = 25 °C	4.8	
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Operating junction temperature		

Notes:

[1] This value is rated according to R_{thj-c}.

[2] Current limited by package.

[3] Pulse width is limited by safe operating area.

[4] This value is rated according to $R_{thj-pcb}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.0	°C/W
$R_{thj-pcb}$ [1]	Thermal resistance junction-pcb	31.3	

Notes:

[1] When mounted on a 1-inch² FR-4, 2 Oz copper board, t < 10 s.

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AV}	Avalanche current, not repetitive	7.4	A
E_{AS} [1]	Single pulse avalanche energy	210	mJ

Notes:

[1] starting T_j = 25 °C, I_D = I_{AV}.

2 Electrical characteristics

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

Table 5: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 60 V			1	µA
		V_{GS} = 0 V, V_{DS} = 60 V, T_C = 125 °C			100	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	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 4 A		27	40	mΩ
		V_{GS} = 5 V, I_D = 4 A		32	50	

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	670	-	pF
C_{oss}	Output capacitance		-	170	-	
C_{rss}	Reverse transfer capacitance		-	56	-	
Q_g	Total gate charge	V_{DD} = 25 V, I_D = 7.4 A, V_{GS} = 10 V (see *Figure 15: "Gate charge test circuit"*)	-	22.5	-	nC
Q_{gs}	Gate-source charge		-	2.5	-	
Q_{gd}	Gate-drain charge		-	7	-	

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 3.7 A R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 14: "Switching times test circuit for resistive load"* and *Figure 19: "Switching time waveform"*)	-	7	-	ns
t_r	Rise time		-	15.4	-	
$t_{d(off)}$	Turn-off delay time		-	36.8	-	
t_f	Fall time		-	7.7	-	

Table 8: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		7.4	A
I_{SDM}(1)	Source-drain current (pulsed)		-		29.6	A
V_{SD}(2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 7.4 A	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 7.4 A, di/dt = 100 A/µs, V_{DD} = 48 V (see *Figure 16: "Test circuit for inductive load switching and diode recovery times"*)	-	28		ns
Q_{rr}	Reverse recovery charge		-	31.6		nC
I_{RRM}	Reverse recovery current		-	2.26		A

Notes:

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

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

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

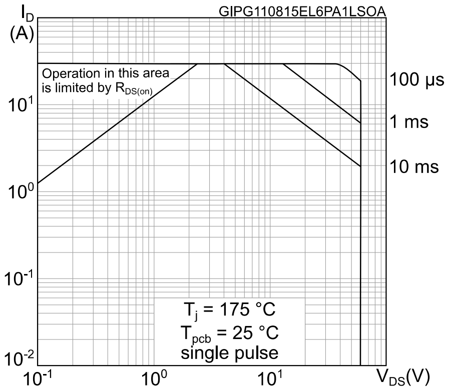


Figure 3: Thermal impedance

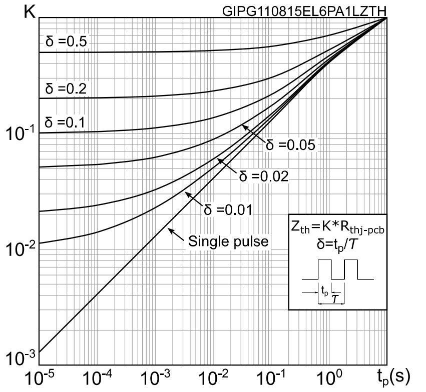


Figure 4: Output characteristics

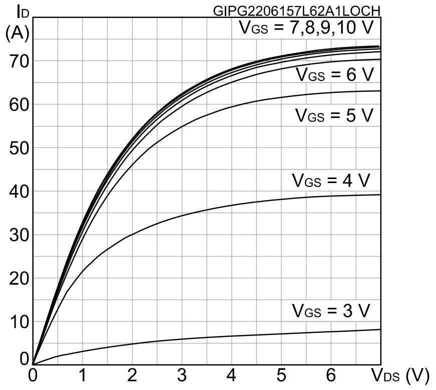


Figure 5: Transfer characteristics

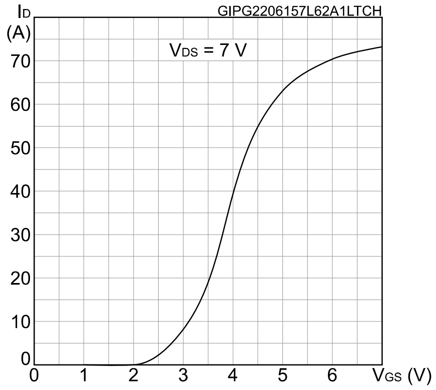


Figure 6: Gate charge vs gate-source voltage

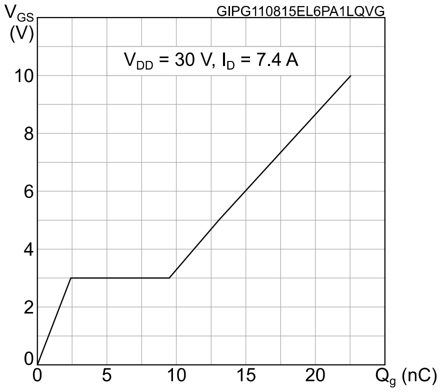


Figure 7: Static drain-source on-resistance

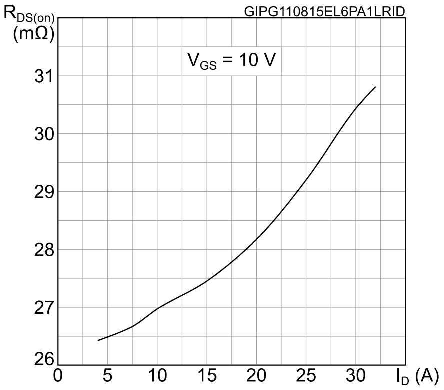


Figure 8: Capacitance variations

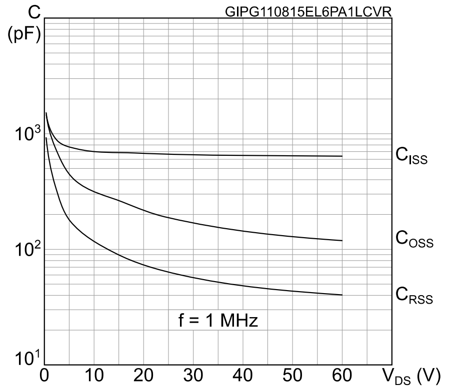


Figure 9: Normalized gate threshold voltage vs temperature

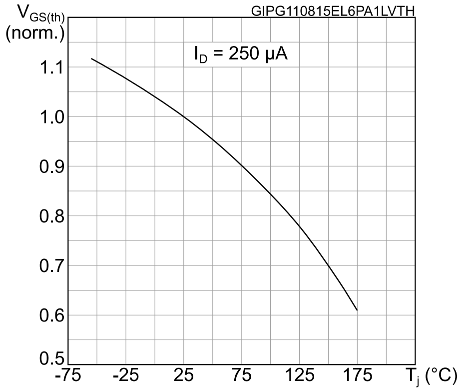


Figure 10: Normalized on-resistance vs temperature (VGS = 5 V)

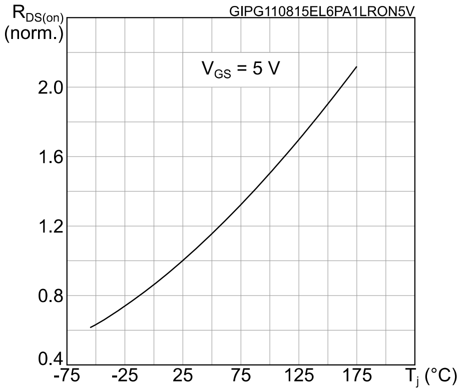


Figure 11: Normalized on-resistance vs temperature (VGS = 10 V)

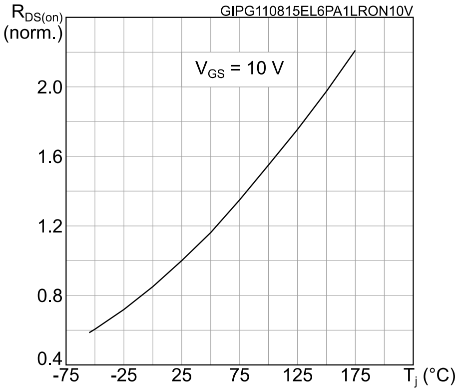


Figure 12: Normalized V(BR)DSS vs temperature

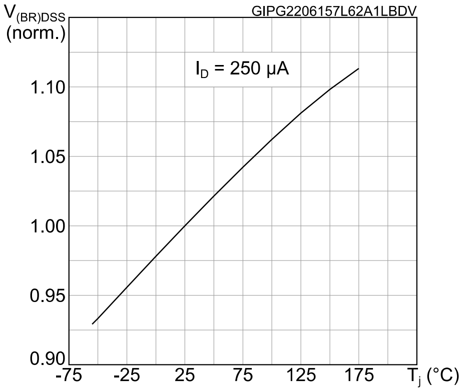
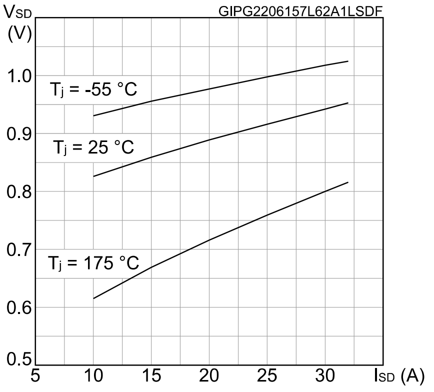


Figure 13: Source-drain diode forward characteristics



3 Test circuits

Figure 14: Switching times test circuit for resistive load

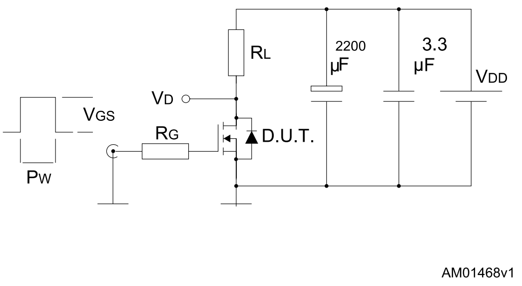


Figure 15: Gate charge test circuit

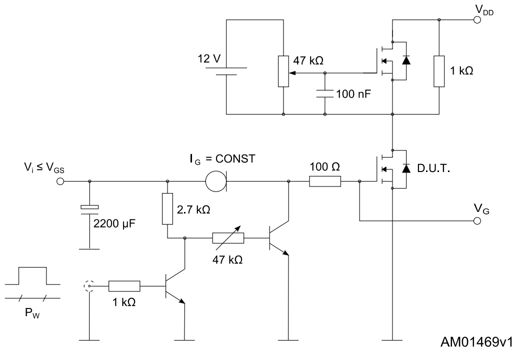


Figure 16: Test circuit for inductive load switching and diode recovery times

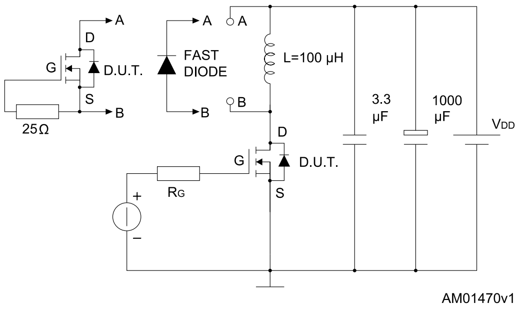


Figure 17: Unclamped inductive load test circuit

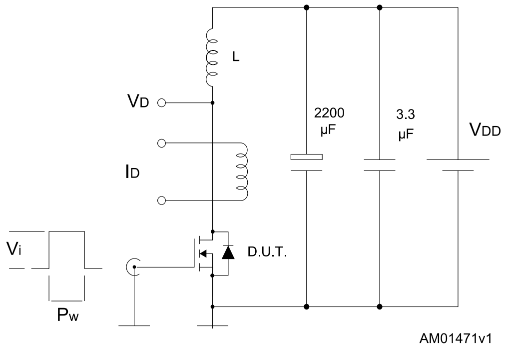


Figure 18: Unclamped inductive waveform

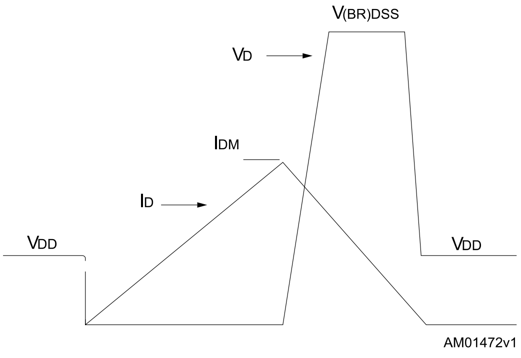
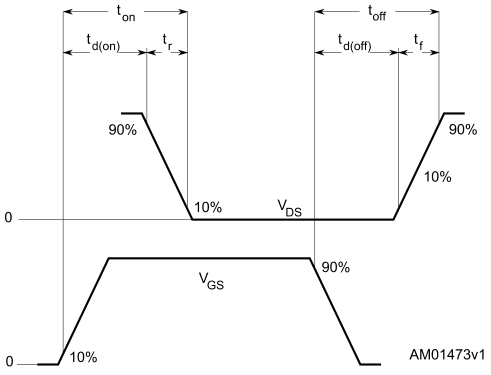


Figure 19: Switching time waveform



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 WF type R package information

Figure 20: PowerFLAT™ 5x6 WF type R package outline

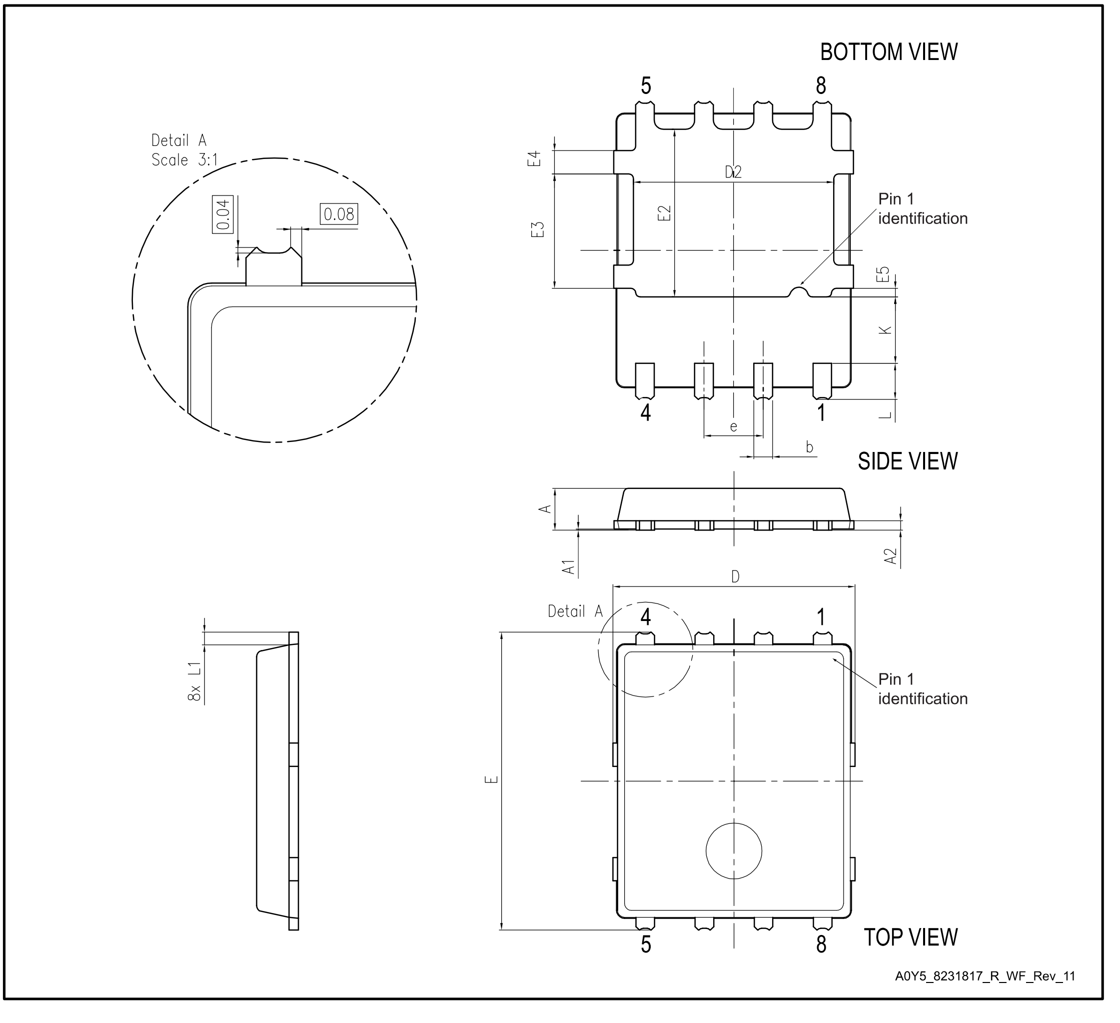
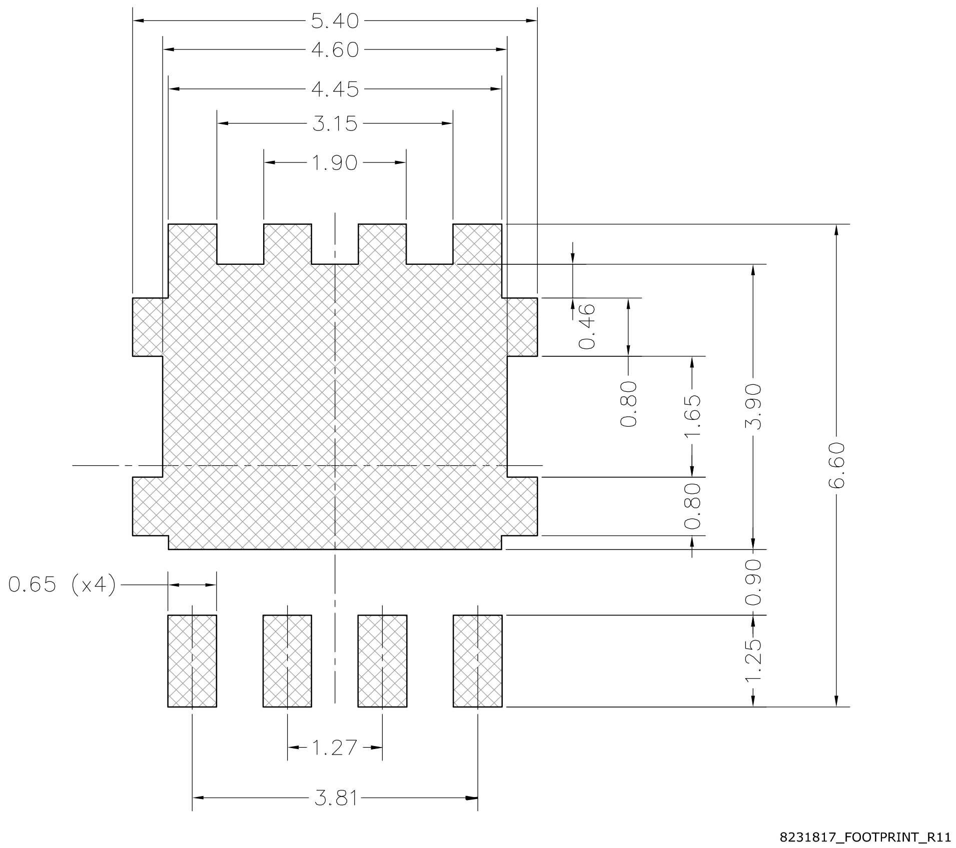


Table 9: PowerFLAT™ 5x6 WF type R mechanical data

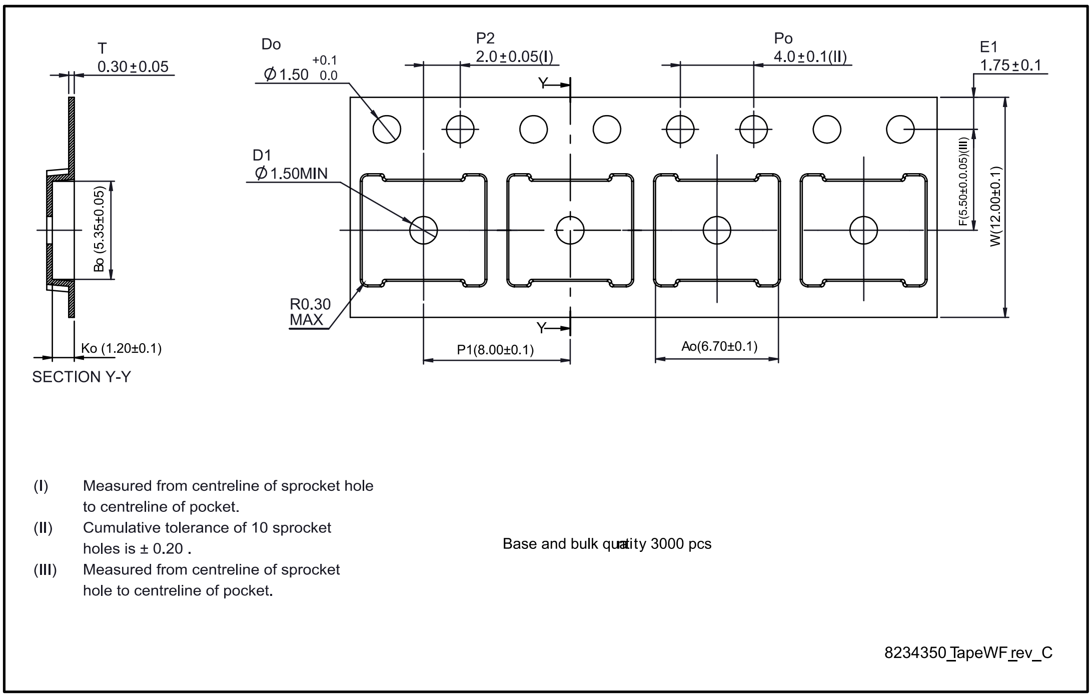
Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D	5.00	5.20	5.40
E	6.20	6.40	6.60
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
L	0.70		0.90
L1		0.275	
K	1.275		1.575
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28

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



4.2 PowerFLAT™ 5x6 WF packing information

Figure 22: PowerFLAT™ 5x6 WF tape



(I) Measured from centreline of sprocket hole to centreline of pocket.

(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .

(III) Measured from centreline of sprocket hole to centreline of pocket.

Base and bulk quantity 3000 pcs

Figure 23: PowerFLAT™ 5x6 package orientation in carrier tape

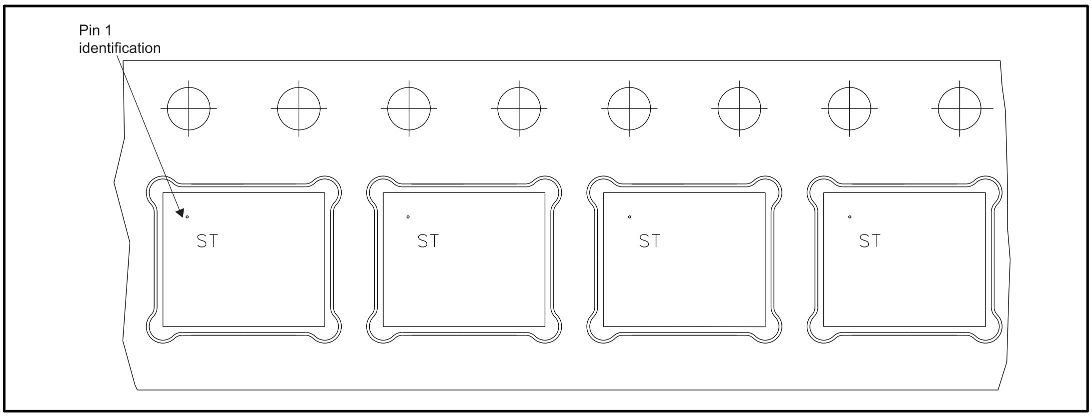
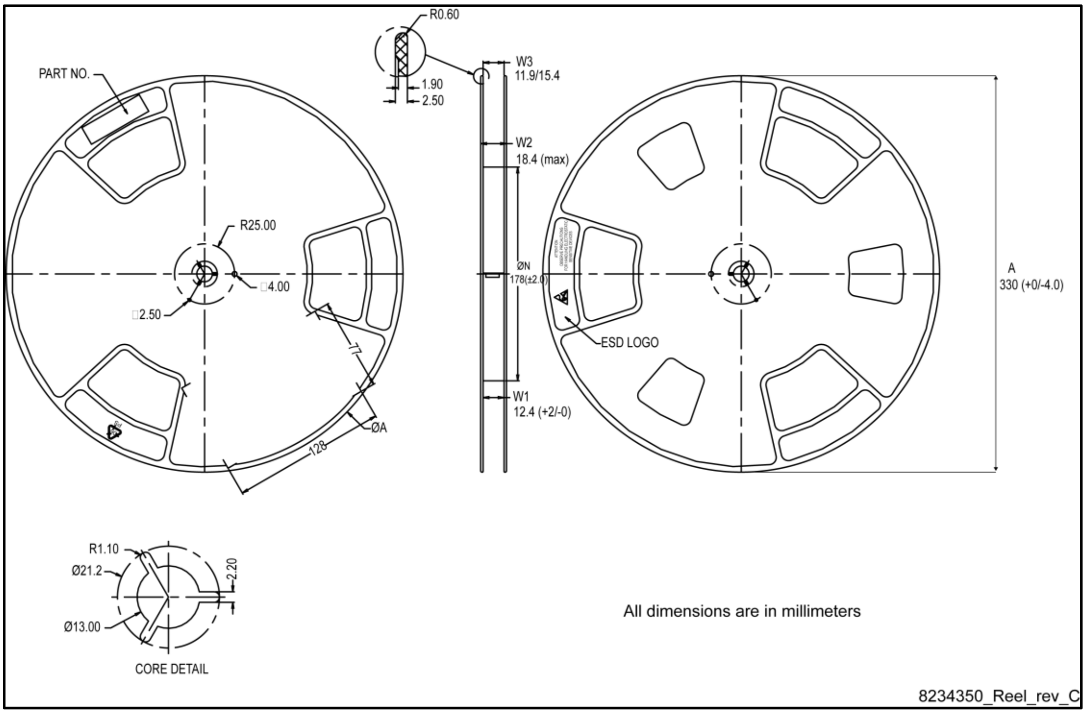


Figure 24: PowerFLAT™ 5x6 reel



5 Revision history

Table 10: Document revision history

Date	Revision	Changes
28-Sep-2015	1	First release.

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Электрон
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