

## P-channel 40 V, 0.016 $\Omega$ typ., 10 A STripFET™ VI DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - target specification

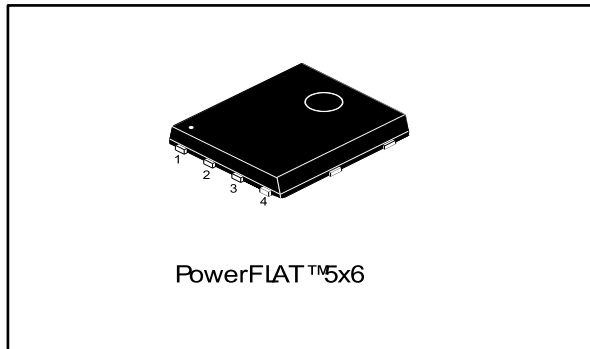
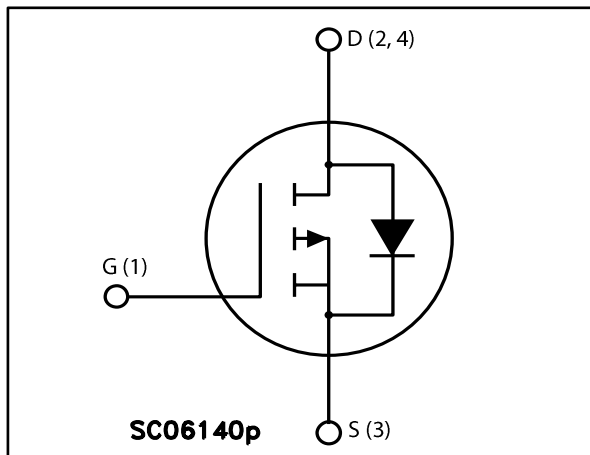


Figure 1: Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>	P <sub>TOT</sub>
STL42P4LLF6	40 V	0.022 $\Omega$	10 A	4.8 W

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- High avalanche ruggedness
- Low gate drive power losses

### Applications


- Switching applications

### Description

This device is a P-channel Power MOSFET developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

Table 1: Device summary

Order code	Marking	Package	Packaging
STL42P4LLF6	42P4LLF6	PowerFLAT™ 5x6	Tape and reel

 For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

# 1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	40	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	42	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	29	
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	10	
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	7.5	A
$I_D^{(1)(3)}$	Drain current (pulsed)	168	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	40	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	75	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
	Derating factor	0.03	W/ $^\circ\text{C}$
$T_{stg}$	Storage temperature	- 55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	150	$^\circ\text{C}$

**Notes:**

- (1)The value is rated according to  $R_{thj-c}$   
 (2)This value is rated according to  $R_{thj-pcb}$   
 (3)Pulse width is limited by safe operating area

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.00	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb, single operation	31.3	$^\circ\text{C}/\text{W}$

**Notes:**

- (1)When mounted on FR-4 board of 1 inch<sup>2</sup>, 2oz Cu, steady state



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu\text{A}$	40			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 40\ \text{V}$ $V_{DS} = 40\ \text{V}, T_C = 125\text{ °C}$			1 10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0, V_{GS} = \pm 20\ \text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}, I_D = 5\ \text{A}$ $V_{GS} = 4.5\ \text{V}, I_D = 5\ \text{A}$		0.016 0.025	0.022 0.035	$\Omega$ $\Omega$

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 32\ \text{V}, f = 1\ \text{MHz}, V_{GS} = 0$	-	2300	-	pF
$C_{oss}$	Output capacitance		-	325	-	pF
$C_{rss}$	Reverse transfer capacitance		-	120	-	pF
$Q_g$	Total gate charge	$V_{DD} = 32\ \text{V}, I_D = 10\ \text{A}, V_{GS} = 4.5\ \text{V}$	-	22	-	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	$V_{DD} = 32\ \text{V}, I_D = 5\ \text{A},$ $R_G = 4.7\ \Omega, V_{GS} = 10\ \text{V}$	-	TBD	-	ns
$t_r$	Rise time		-	TBD	-	ns
$t_{d(off)}$	Turn-off delay time		-	TBD	-	ns
$t_f$	Fall time		-	TBD	-	ns



For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		10	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		40	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 5 \text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 5 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$	-	TBD		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 16 \text{ V}$ , $T_J = 150 \text{ }^\circ\text{C}$	-	TBD		nC
$I_{RRM}$	Reverse recovery current		-	TBD		A

**Notes:**

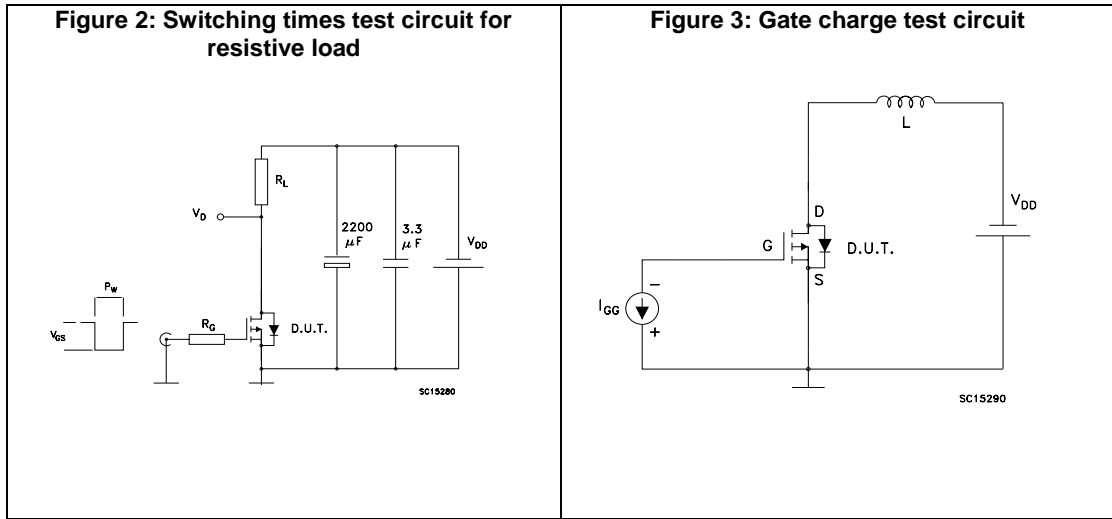
<sup>(1)</sup>Pulse width limited by safe operating area

<sup>(2)</sup>Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

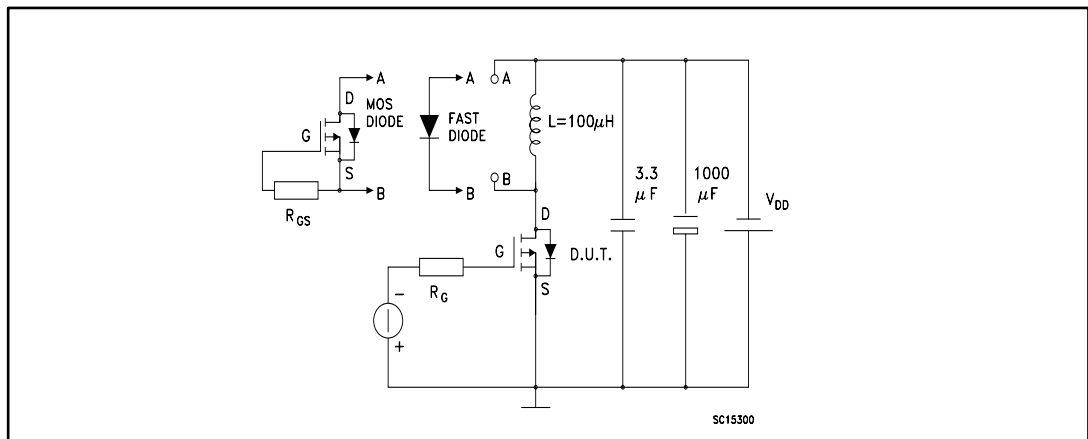


For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

### 3 Test circuits



**Figure 4: Source-drain diode forward characteristics**



## 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 S-R package mechanical data

Figure 5: PowerFLAT™ 5x6 type S-R drawing

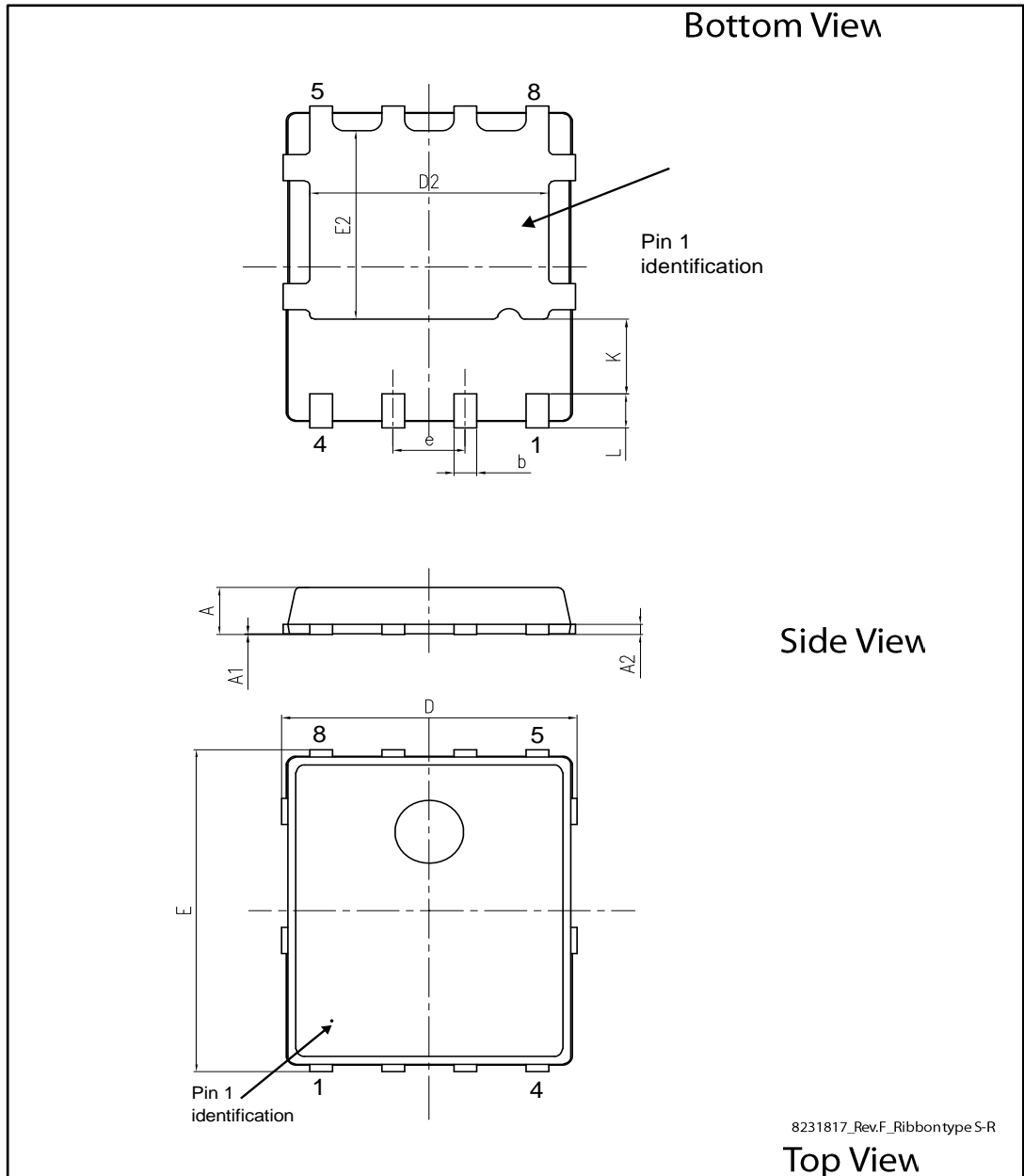
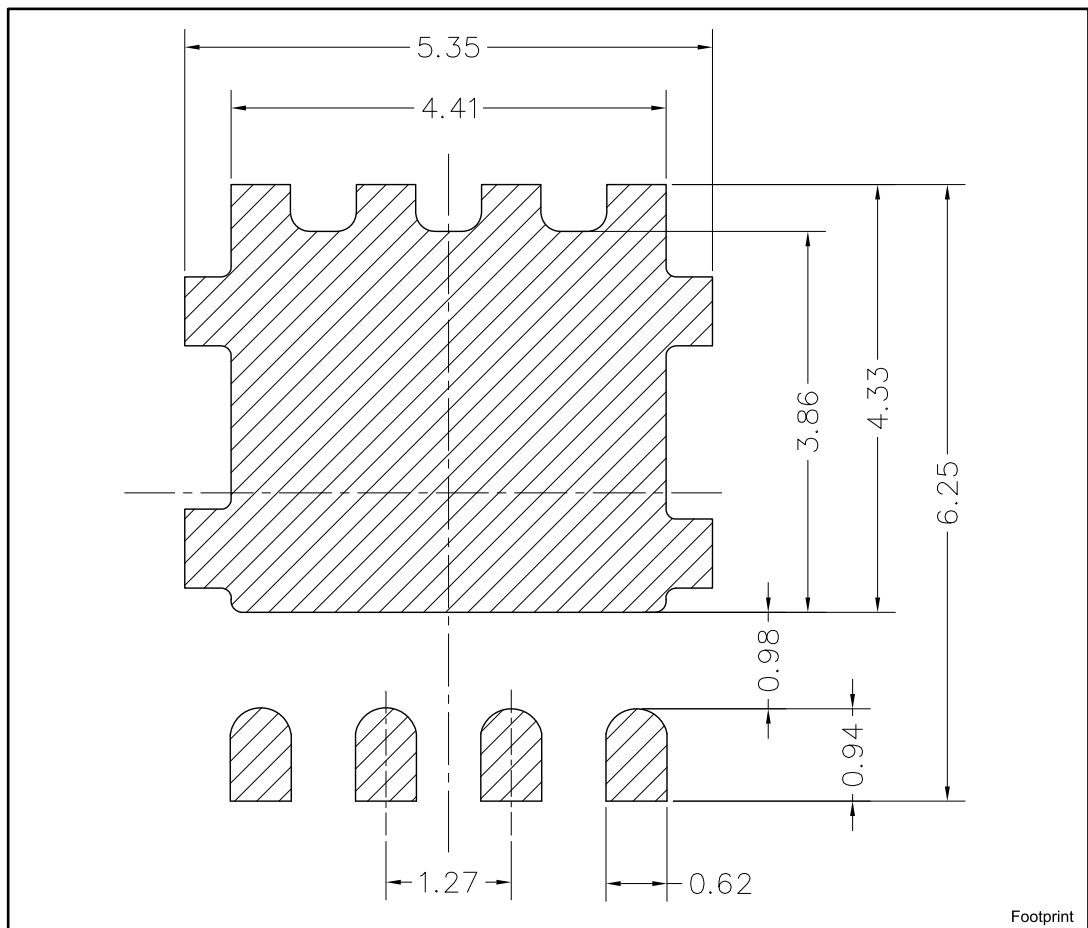


Table 8: PowerFLAT 5x6 type S-R mechanical data

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	5.95	6.15	6.35
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
L	0.60		0.80
K	1.275		1.575

Figure 6: PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



## 5 Packaging mechanical data

### 5.1 PowerFLAT™ 5x6 packaging mechanical data

Figure 7: PowerFLAT™ 5x6 tape (dimensions are in millimeters)

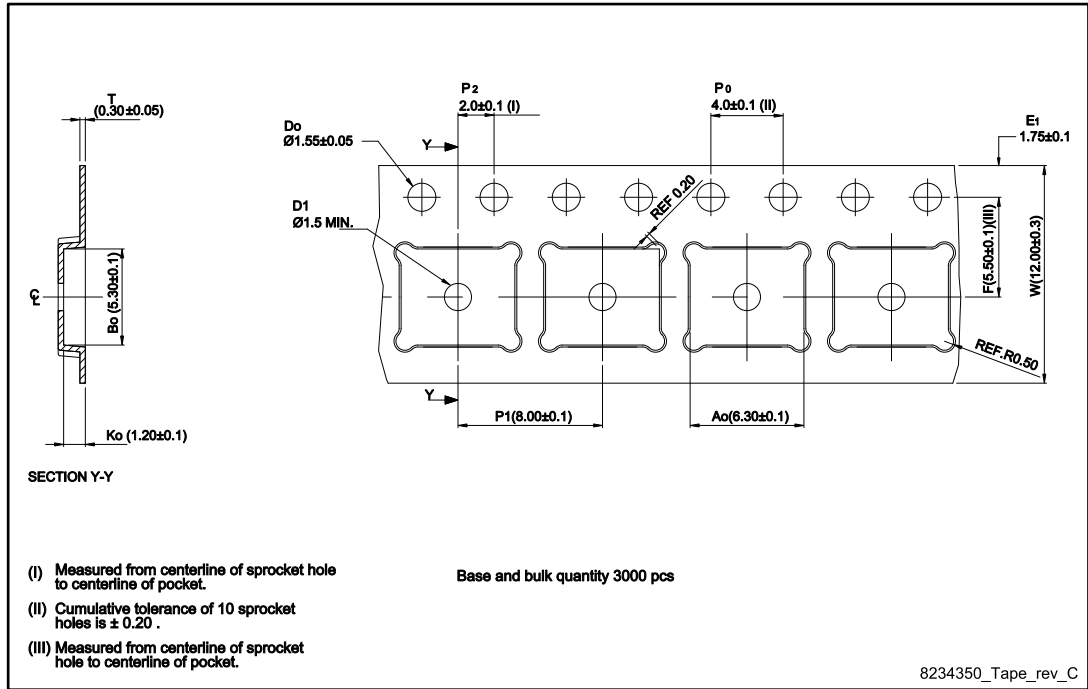


Figure 8: PowerFLAT™ 5x6 package orientation in carrier tape

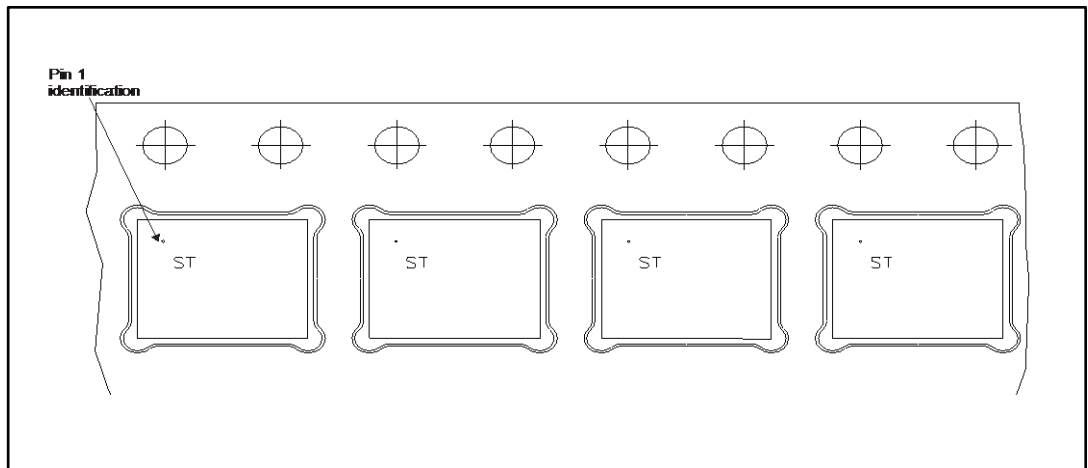
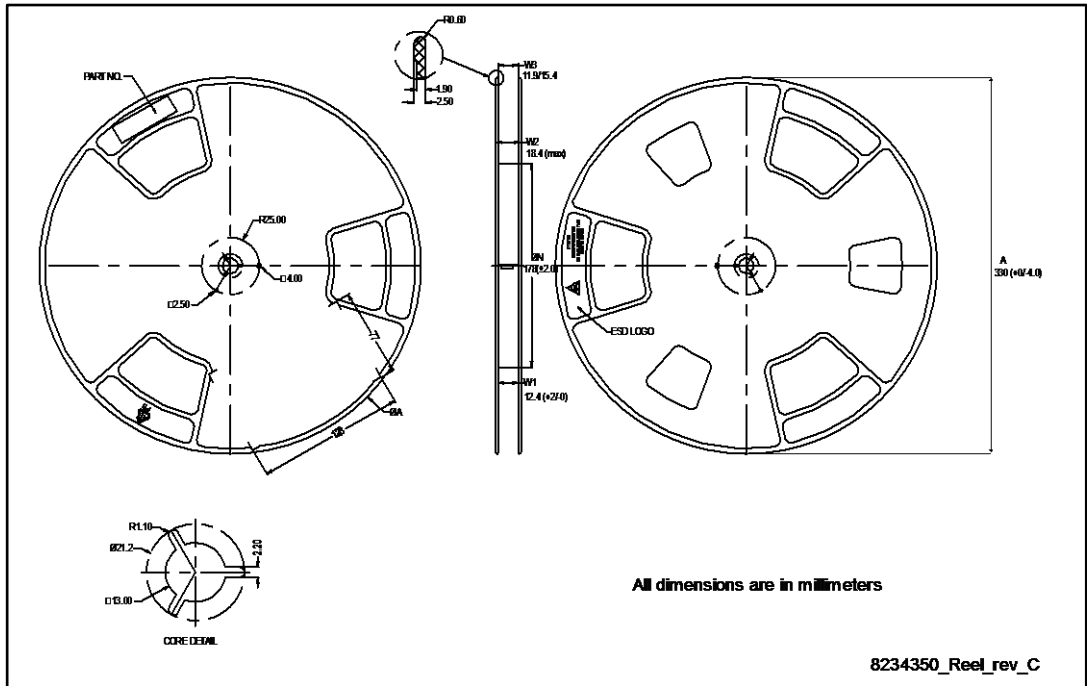




Figure 9: PowerFLAT™ 5x6 reel



## 6 Revision history

Table 9: Document revision history

Date	Revision	Changes
28-Jan-2014	1	First release.

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