

N-channel 60 V, 0.003 Ω typ., 130 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

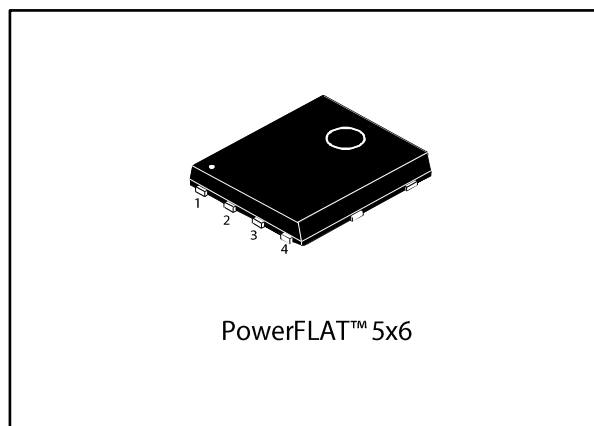
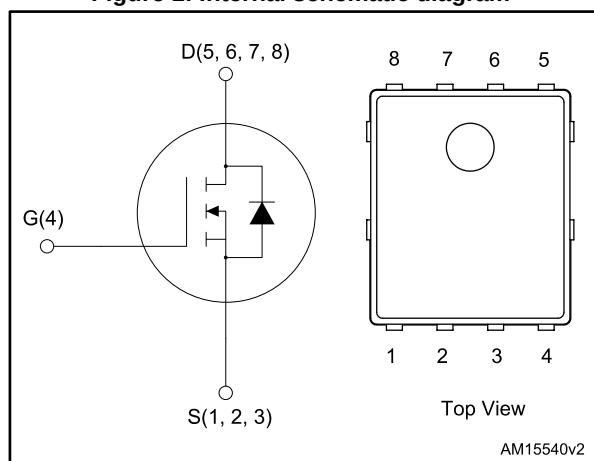


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL130N6F7	60 V	0.0035 Ω	130 A

- 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	Packaging
STL130N6F7	130N6F7	PowerFLAT™ 5x6	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	5
3	Test circuits	7
4	Package mechanical data	8
4.1	PowerFLAT™ 5x6 type C package information	9
4.2	PowerFLAT™ 5x6 packing information	11
5	Revision history	13

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 $T_C = 25\text{ }^{\circ}\text{C}$	130	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	95	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	520	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	26	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	19	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	104	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	125	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	$^{\circ}\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case max.	1.2	$^{\circ}\text{C/W}$

Notes:⁽¹⁾When mounted on FR-4 board of 1 inch², 2oz Cu, $t < 10\text{ sec}$

2 Electrical characteristics

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

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 13\text{ A}$		0.003	0.0035	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	2600	-	pF
C_{oss}	Output capacitance		-	1200	-	pF
C_{rss}	Reverse transfer capacitance		-	115	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 26\text{ A}$, $V_{GS} = 10\text{ V}$	-	42	-	nC
Q_{gs}	Gate-source charge		-	13.6	-	nC
Q_{gd}	Gate-drain charge		-	13	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 26\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	24	-	ns
t_r	Rise time		-	44	-	ns
$t_{d(off)}$	Turn-off delay time		-	62	-	ns
t_f	Fall time		-	24	-	ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 26\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 26\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$	-	50		ns
Q_{rr}	Reverse recovery charge		-	56		nC
I_{RRM}	Reverse recovery current		-	2.2		A

Notes:

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

2.1 Electrical characteristics (curves)

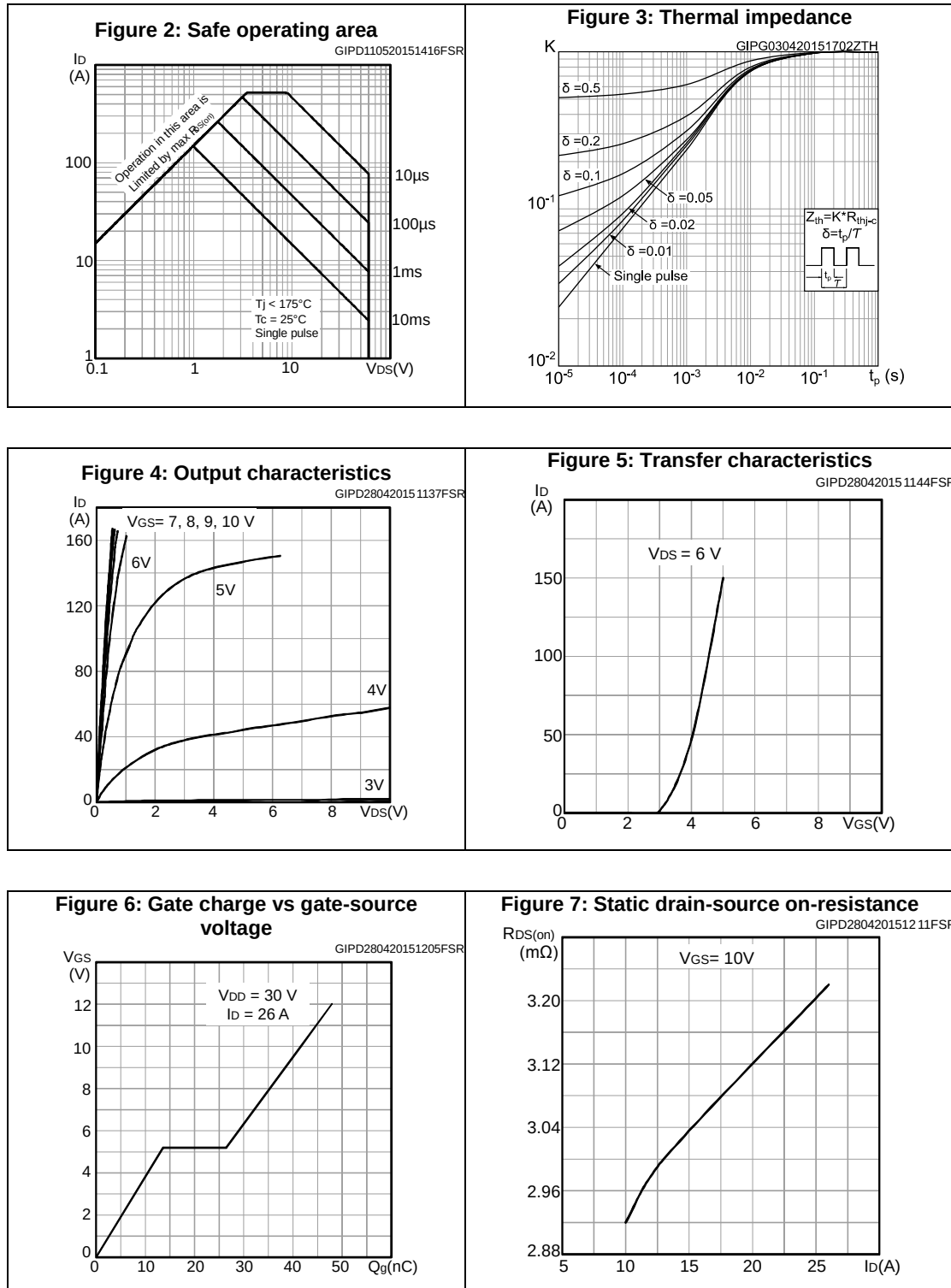


Figure 8: Capacitance variations

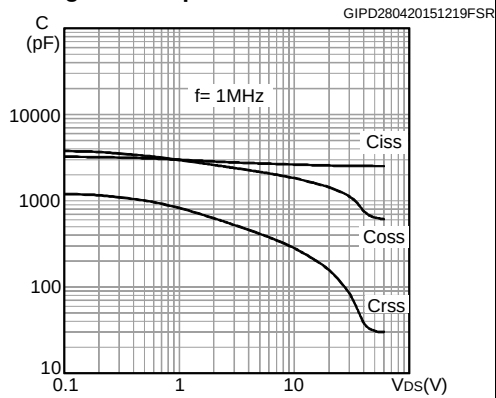


Figure 9: Normalized gate threshold voltage vs temperature

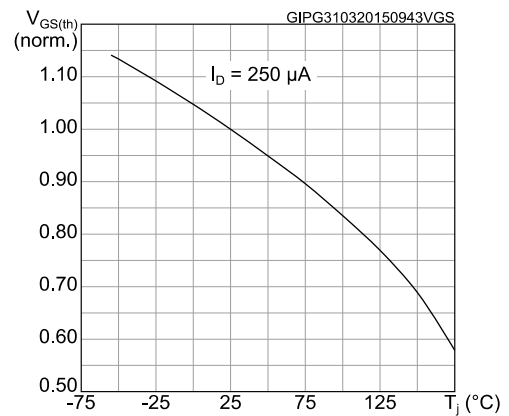


Figure 10: Normalized on-resistance vs temperature

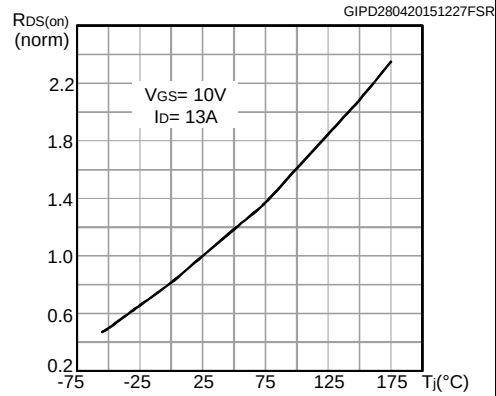


Figure 11: Normalized V(BR)DSS vs temperature

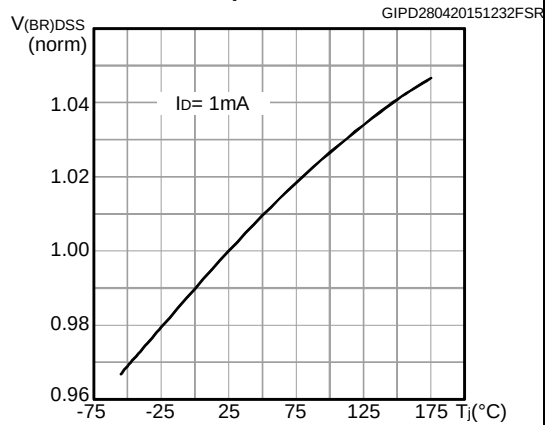
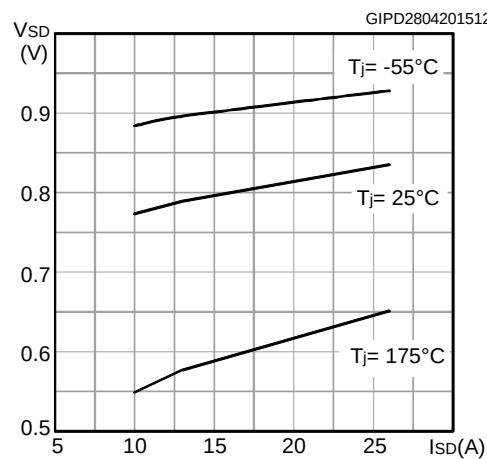
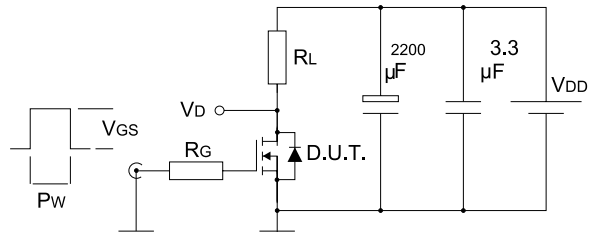


Figure 12: Source-drain diode forward characteristics



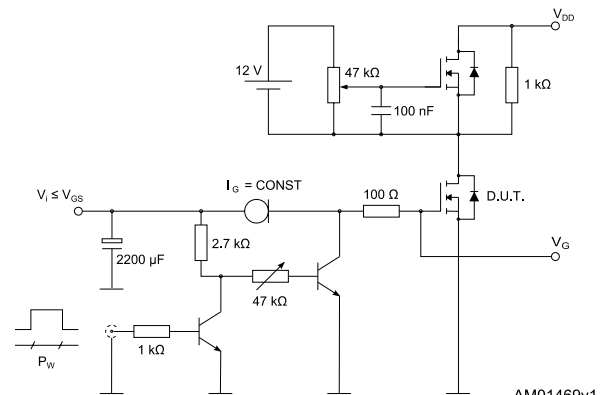
3 Test circuits

Figure 13: Switching times test circuit for resistive load



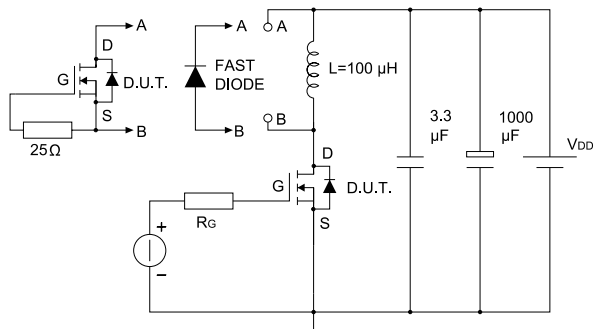
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Figure 14: Gate charge test circuit



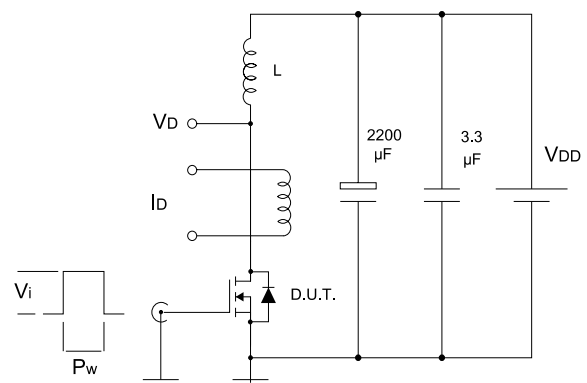
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Figure 15: Test circuit for inductive load switching and diode recovery times



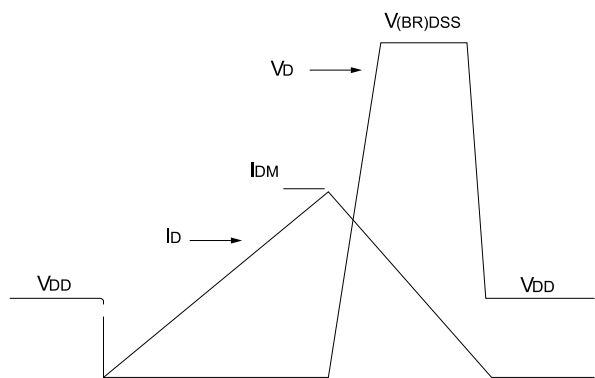
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Figure 16: Unclamped inductive load test circuit



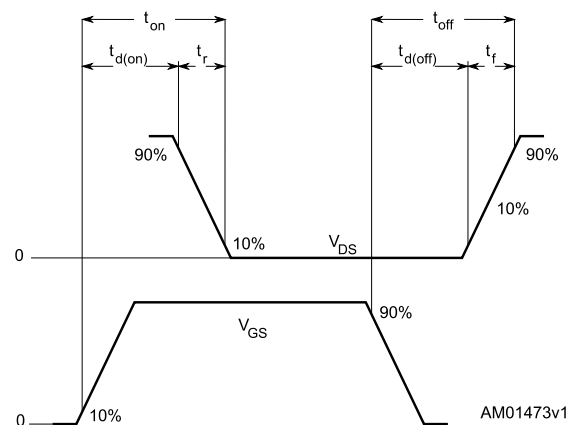
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Figure 17: Unclamped inductive waveform



AM01472v1

Figure 18: Switching time waveform



AM01473v1

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**. ECOPACK[®] is an ST trademark.

4.1 PowerFLAT™ 5x6 type C package information

Figure 19: PowerFLAT™ 5x6 type C package outline

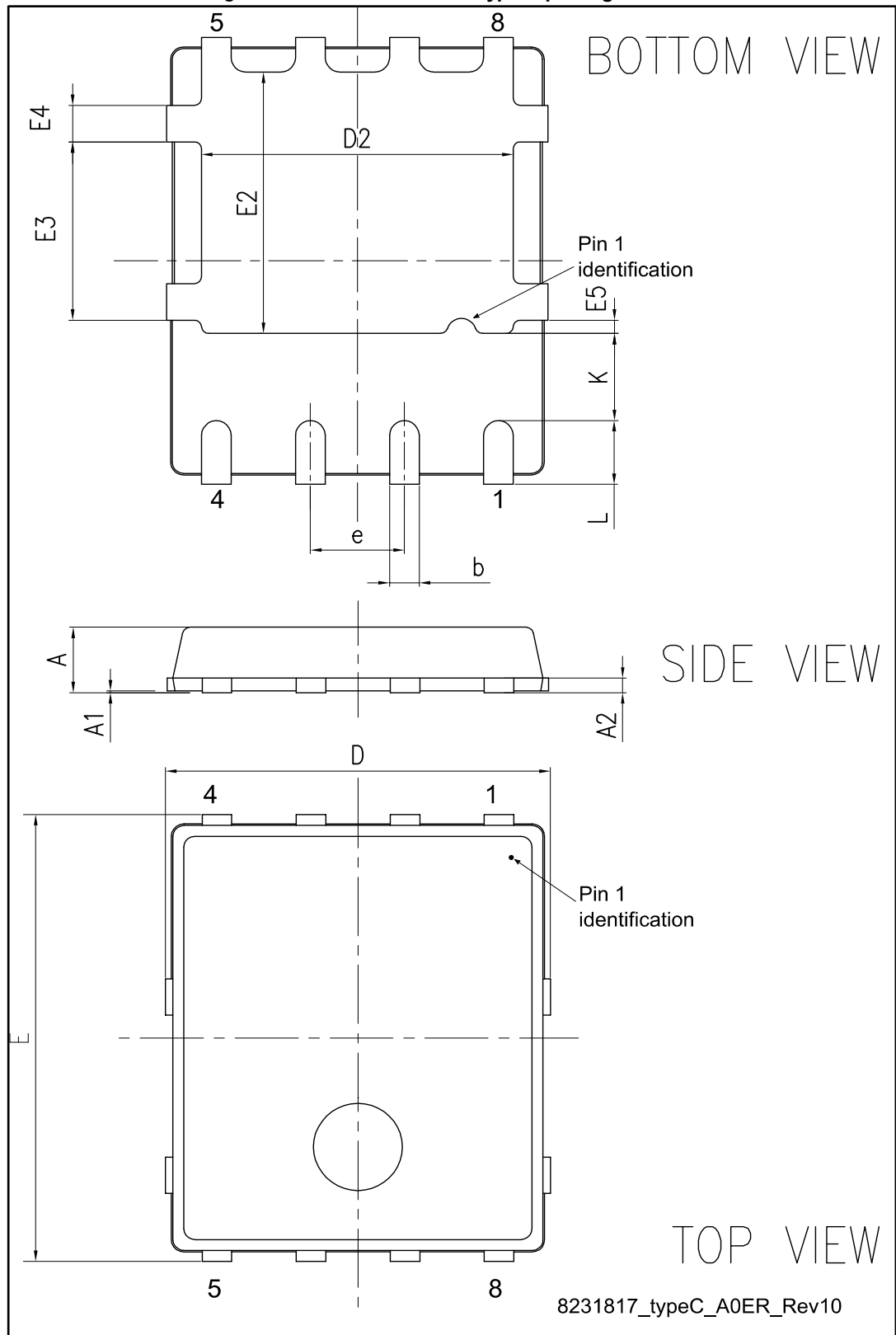
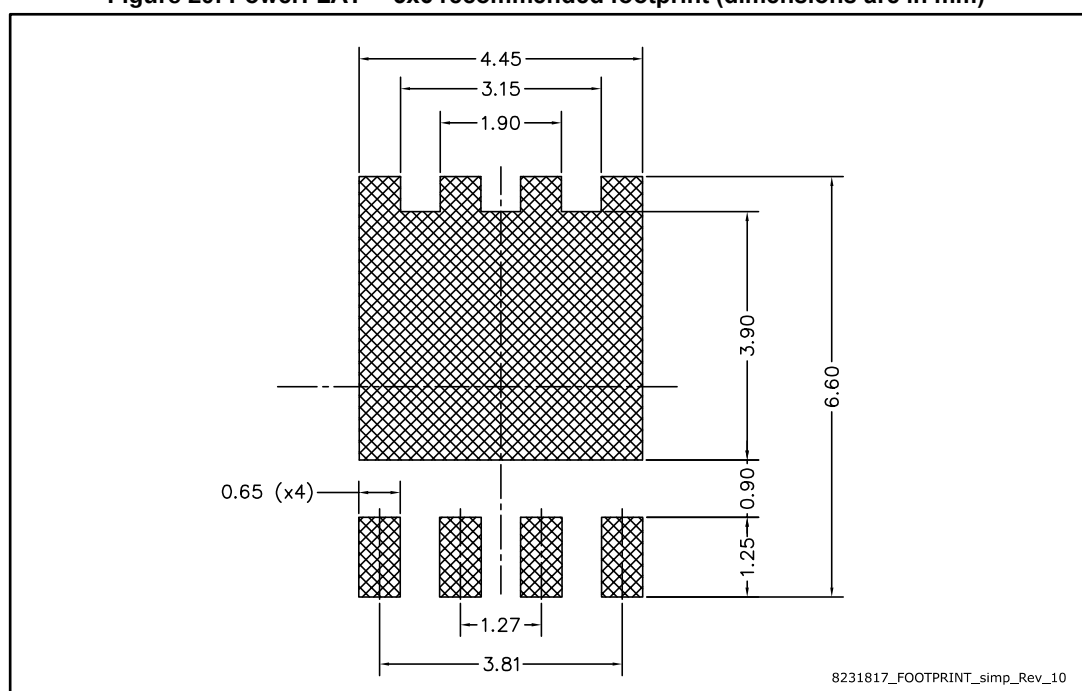


Table 8: PowerFLAT™ 5x6 type C mechanical data

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)

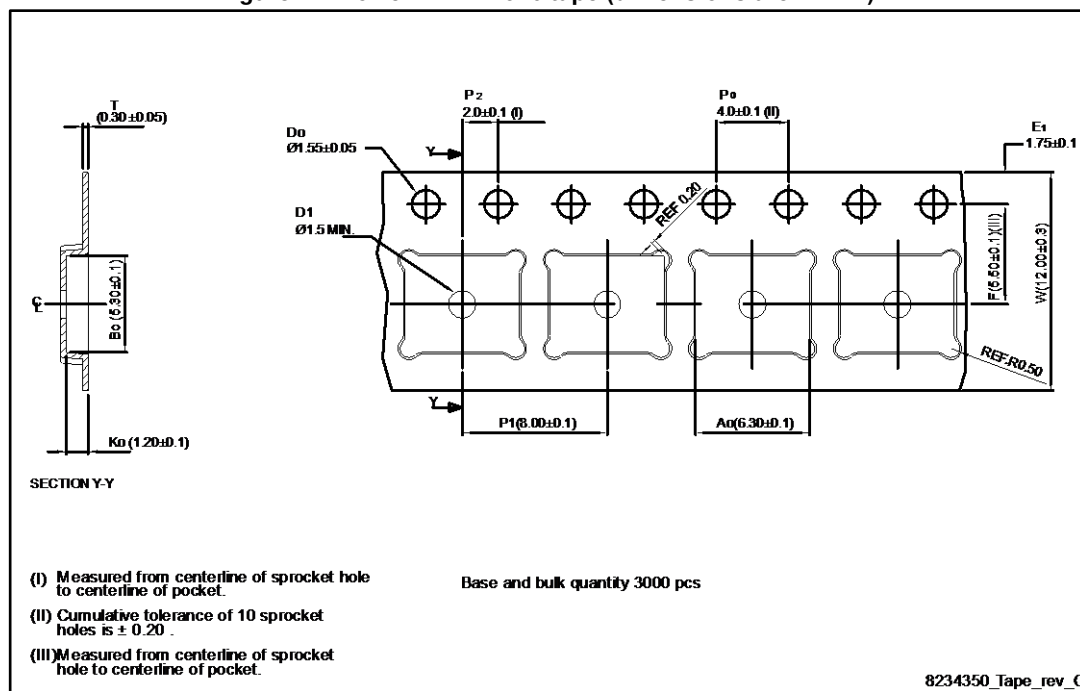
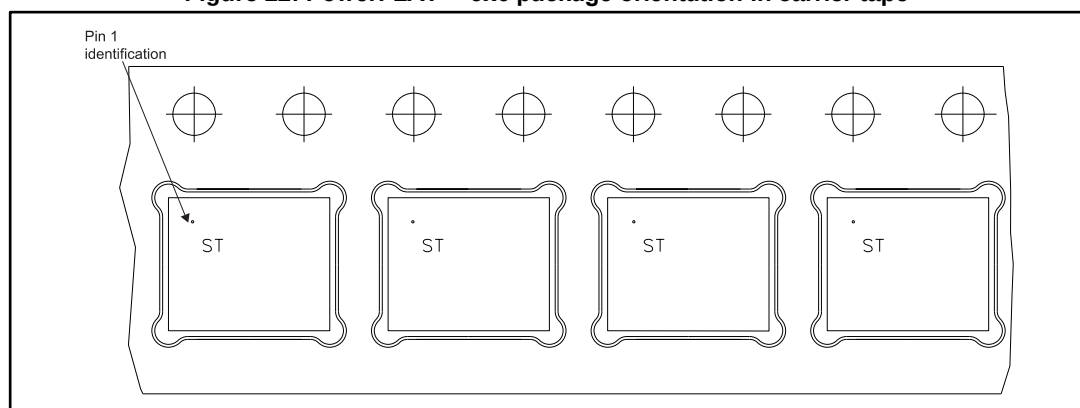


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape



Technical drawing of a 35mm film reel, showing front, side, and core detail views. Dimensions are in millimeters.

Front View (Left): Shows a circular reel with a central hub. Key dimensions include:

- Hub outer diameter: $\varnothing 2.50$
- Hub inner diameter: $\varnothing 4.00$
- Hub radius: R25.00
- Reel radius: R25.00
- Reel outer diameter: $\varnothing 25$
- Reel thickness: $\varnothing A$

Side View (Right): Shows the reel's profile with dimensions:

- W3: 11.9/15.4
- W2: 18.4 (max)
- W1: 12.4 (+2/-0)
- W4: 178 (+2/-0)
- W5: 178 (+2/-0)
- W6: 178 (+2/-0)
- W7: 178 (+2/-0)
- W8: 178 (+2/-0)
- W9: 178 (+2/-0)
- W10: 178 (+2/-0)
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- W92: 178 (+2/-0)
- W93: 178 (+2/-0)
- W94: 178 (+2/-0)
- W95: 178 (+2/-0)
- W96: 178 (+2/-0)
- W97: 178 (+2/-0)
- W98: 178 (+2/-0)
- W99: 178 (+2/-0)
- W100: 178 (+2/-0)

Core Detail (Bottom Left): Shows a cross-section of the core with dimensions:

- Core radius: R1.10
- Core outer diameter: $\varnothing 21.2$
- Core inner diameter: $\varnothing 13.00$
- Core thickness: 2.20

Other Features:

- ESD LOGO: Electrostatic Discharge Protection Logo.
- PART NO.: Part number label.
- R0.60: Fillet radius at the top of the reel.
- 1.90: Dimension from the top of the reel to the center of the hub.
- 2.50: Dimension from the center of the hub to the outer edge of the reel.

All dimensions are in millimeters.

8234350 Reel rev

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
17-Feb-2015	1	First release.
11-May-2015	2	Updated and <i>Section 2: "Electrical characteristics"</i> Added <i>Section 2.1: "Electrical characteristics (curves)"</i> Updated <i>Section 4: "Package mechanical data"</i> Minor text changes.
30-Jun-2015	3	Document status promoted from preliminary to production data.

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