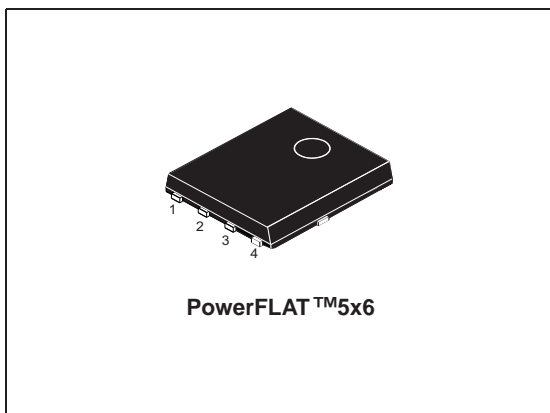


## N-channel 30 V, 0.0033 $\Omega$ typ., 27 A STripFET™ H7 Power MOSFET plus monolithic Schottky in a PowerFLAT™ 5x6

Datasheet - production data



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STL105NS3LLH7	30 V	0.0039 $\Omega$	27 A

- Very low on-resistance
- Very low Q<sub>g</sub>
- Avalanche high ruggedness
- Embedded Schottky diode

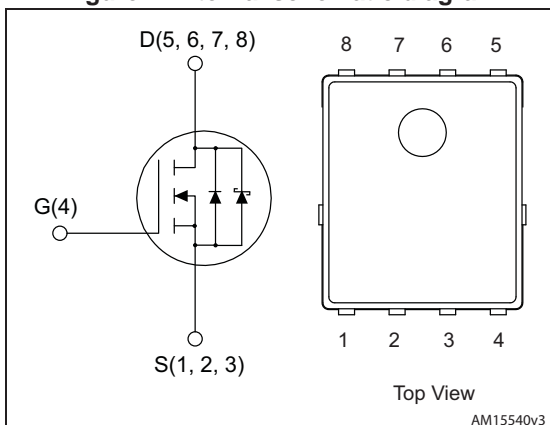
### Applications

- Switching applications

### Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
STL105NS3LLH7	105NS3LL	PowerFLAT™ 5x6	Tape and reel

## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	30	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	105	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	65	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	420	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	27	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	16	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	108	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	62.5	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$
$T_j$	Operating junction temperature		

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	$^\circ\text{C}/\text{W}$
$R_{thj-case}$	Thermal resistance junction-case max	2	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1 inch<sup>2</sup>, 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	$I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$	30			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ $V_{DS} = 24\text{ V}$			500	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 1\text{ mA}$	1.2			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 13.5\text{ A}$		0.0033	0.0039	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 13.5\text{ A}$		0.0044	0.0055	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	2110	-	pF
$C_{oss}$	Output capacitance		-	640	-	pF
$C_{riss}$	Reverse transfer capacitance		-	42	-	pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 27\text{ A}$ , $V_{GS} = 4.5\text{ V}$ (see <a href="#">Figure 11</a> )	-	13.7	-	nC
$Q_{gs}$	Gate-source charge		-	7.5	-	nC
$Q_{gd}$	Gate-drain charge		-	3.3	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$ , $I_D = 13.5\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 4.5\text{ V}$	-	26.4	-	ns
$t_r$	Rise time		-	10.4	-	ns
$t_{d(off)}$	Turn-off delay time		-	31.8	-	ns
$t_f$	Fall time		-	12.5	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		27	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		108	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2 \text{ A}, V_{GS} = 0 \text{ V}$	-	0.4	0.7	V
$t_{rr}$	Reverse recovery time	$I_D = 2 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 20 \text{ V}$	-	35.2		ns
$Q_{rr}$	Reverse recovery charge		-	26.4		nC
$I_{RRM}$	Reverse recovery current		-	1.5		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

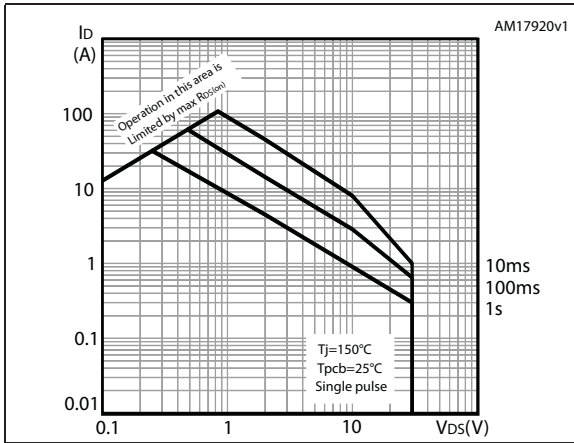


Figure 3. Thermal impedance

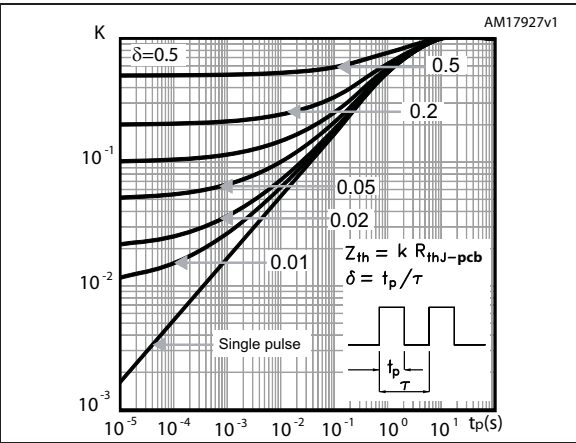


Figure 4. Output characteristics

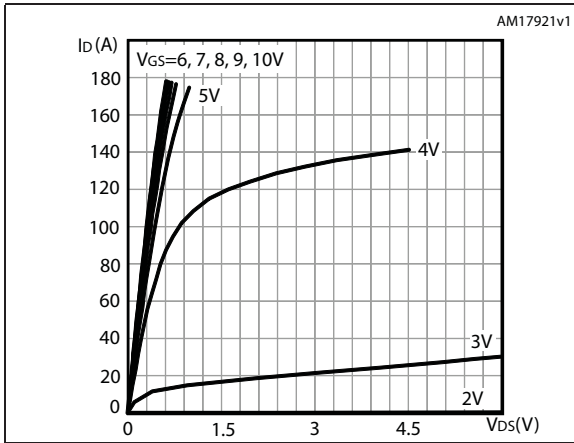


Figure 5. Transfer characteristics

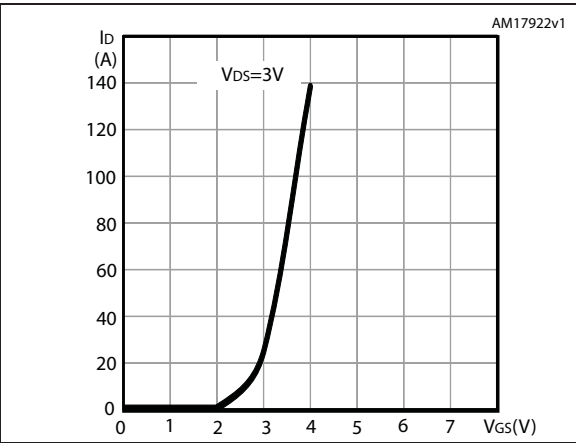


Figure 6. Gate charge vs gate-source voltage

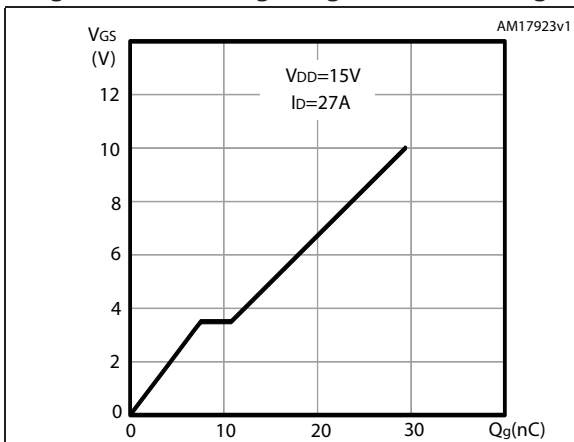


Figure 7. Static drain-source on-resistance

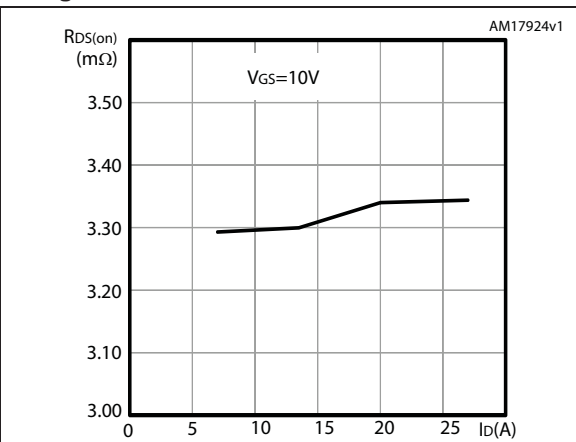


Figure 8. Capacitance variations

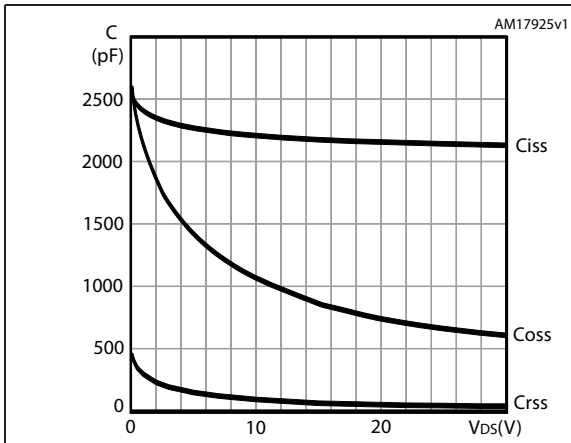
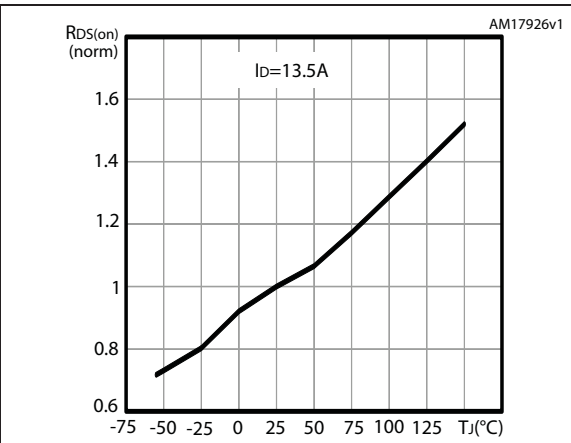


Figure 9. Normalized on-resistance vs temperature



### 3 Test circuits

Figure 10. Switching times test circuit for resistive load

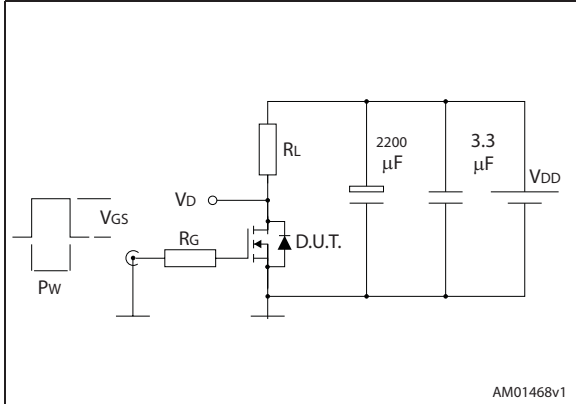


Figure 11. Gate charge test circuit

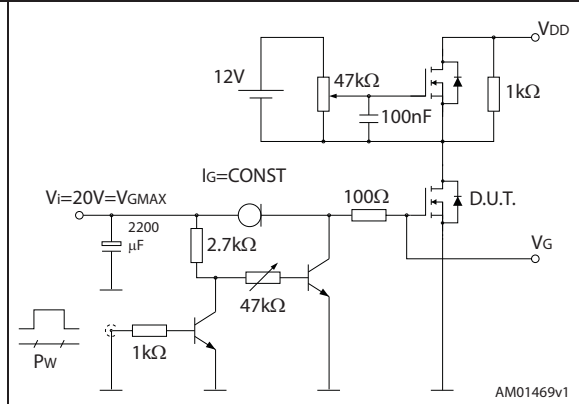


Figure 12. Test circuit for inductive load switching and diode recovery times

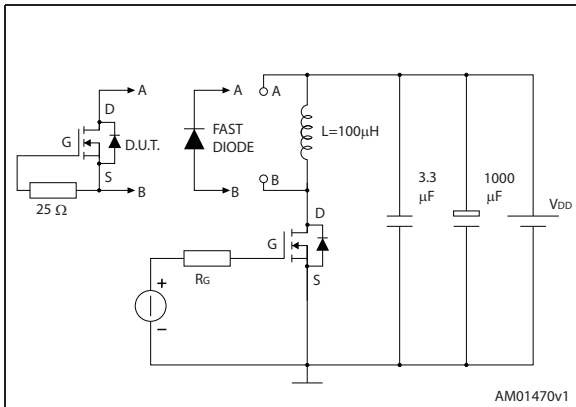


Figure 13. Unclamped inductive load test circuit

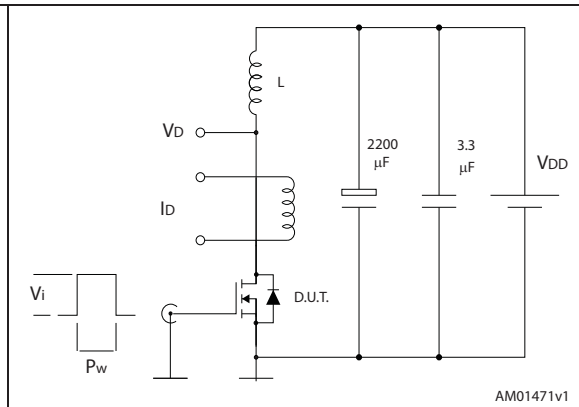


Figure 14. Unclamped inductive waveform

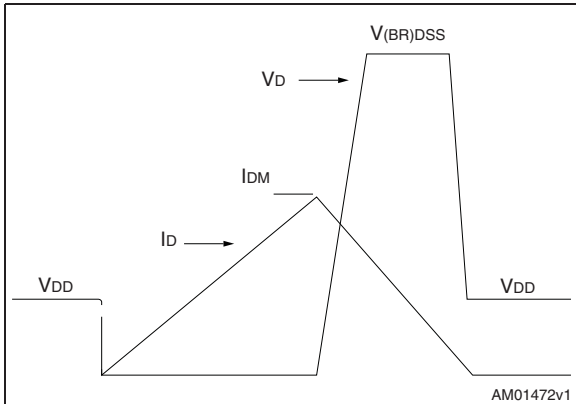
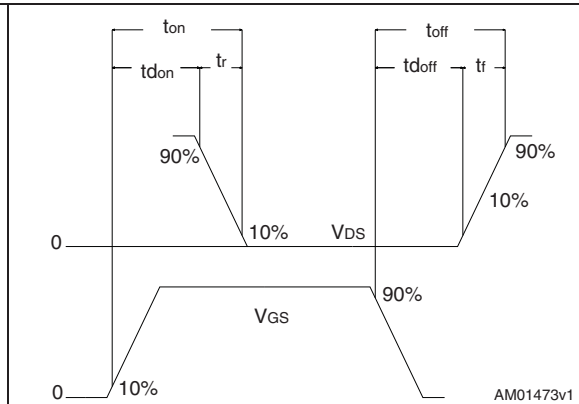


Figure 15. Switching time waveform





## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 16. PowerFLAT™ 5x6 type F outline

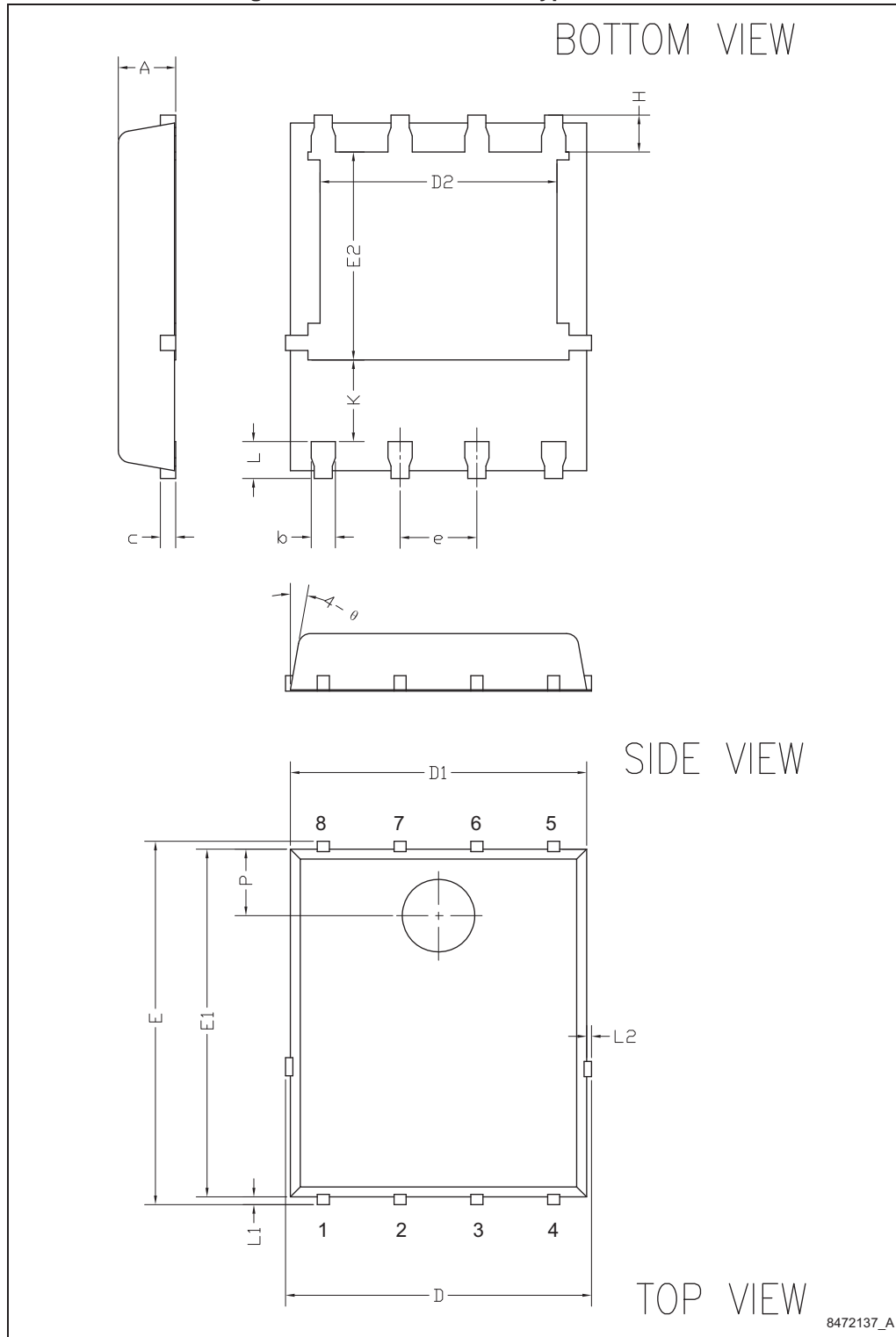
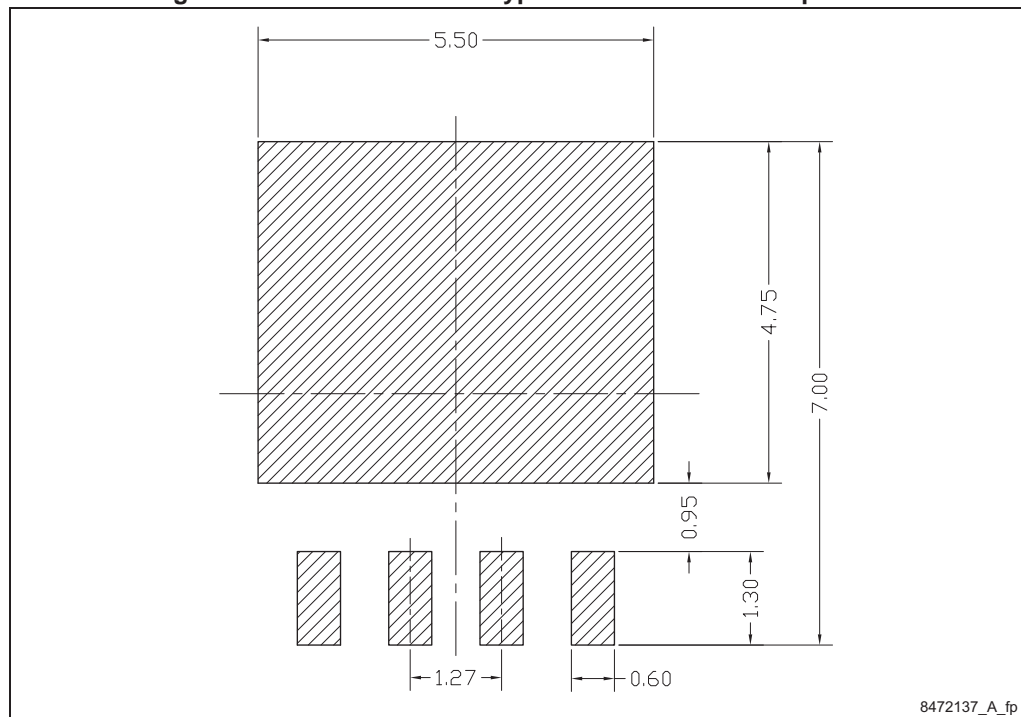


Table 8. PowerFLAT™ 5x6 type F package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.90	0.95	1.00
b	0.35	0.40	0.45
c	0.21	0.25	0.34
D			5.10
D1	4.80	4.90	5.00
D2	3.91	4.01	4.11
e	1.17	1.27	1.37
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.34	3.44	3.54
H	0.51	0.61	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
L2			0.10
P	1.00	1.10	1.20
θ	8°	10°	12°

Figure 17. PowerFLAT™ 5x6 type F recommended footprint<sup>(a)</sup>



8472137\_A\_fp

a. All dimensions are in mm.

# 5 Packing information

Figure 18. PowerFLAT™ 5x6 tape<sup>(b)</sup>

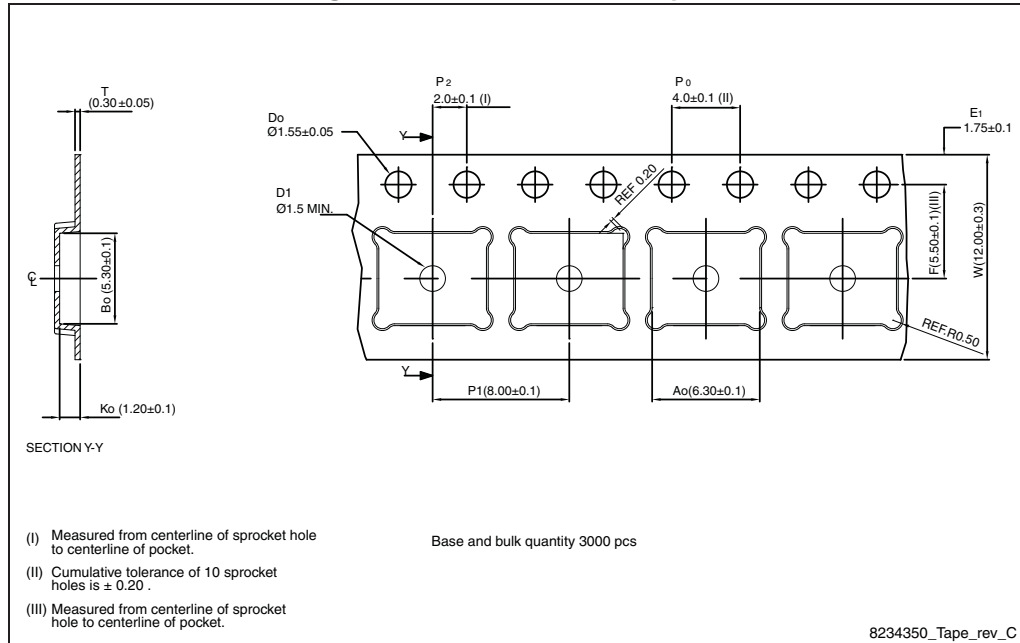
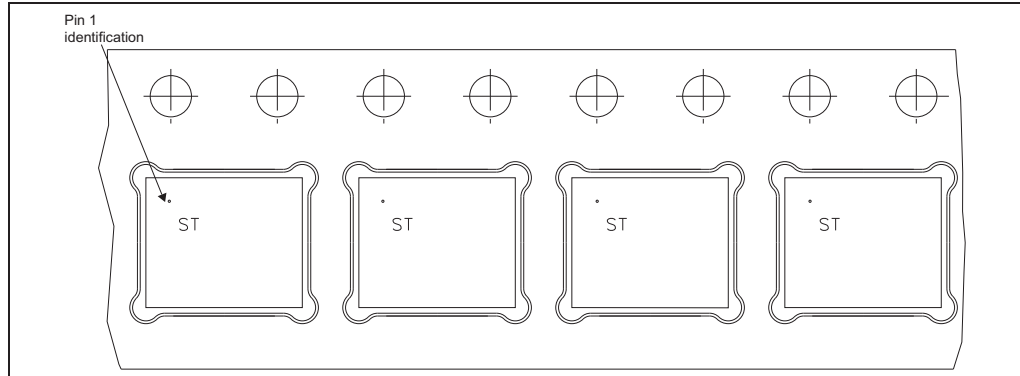
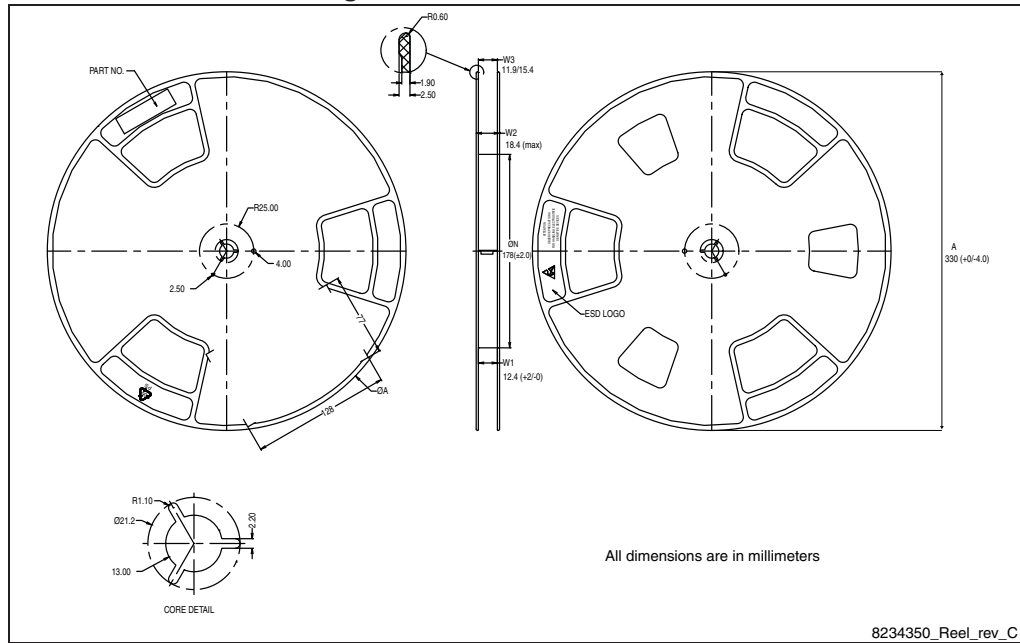


Figure 19. PowerFLAT™ 5x6 package orientation in carrier tape.



b. All dimensions are in millimeters.

Figure 20. PowerFLAT™ 5x6 reel



## 6 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
07-May-2013	1	First release.
11-Jun-2013	2	<ul style="list-style-type: none"> <li>– Changed: <i>Description</i></li> <li>– Minor text changes</li> </ul>
22-Nov-2013	3	<ul style="list-style-type: none"> <li>– Modified: <math>I_D</math> (at <math>T_C = 100\text{ °C}</math>) and <math>I_D</math> (at <math>T_{pcb} = 100\text{ °C}</math>) in <i>Table 2</i></li> <li>– Modified: <math>P_{TOT}</math> and <math>T_J</math> values in <i>Table 2</i></li> <li>– Modified: <math>R_{DS(on)}</math> values in <i>Table 4</i></li> <li>– Modified: the entire typical values in <i>Table 5, 6 and 7</i></li> <li>– Added: <i>Section 2.1: Electrical characteristics (curves)</i></li> <li>– Minor text changes</li> </ul>
13-Apr-2015	4	<ul style="list-style-type: none"> <li>– Document status promoted from preliminary to production data.</li> <li>– Minor text changes.</li> </ul>

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