



# STL66DN3LLH5

Dual N-channel 30 V, 5.9 mΩ, 20 A STripFET™ V Power MOSFET in PowerFLAT™ 5x6 double island package

Datasheet — production data

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STL66DN3LLH5	30 V	< 6.5 mΩ	20 A <sup>(1)</sup>

1. The value is rated according R<sub>thj-pcb</sub>

- Logic level V<sub>GS(th)</sub>
- 175 °C junction temperature

## Applications

- Switching applications
- Automotive

## Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™V technology. The device has been optimized to achieve very low on-state resistance, contributing to an FOM that is among the best in its class.



Figure 1. Internal schematic diagram

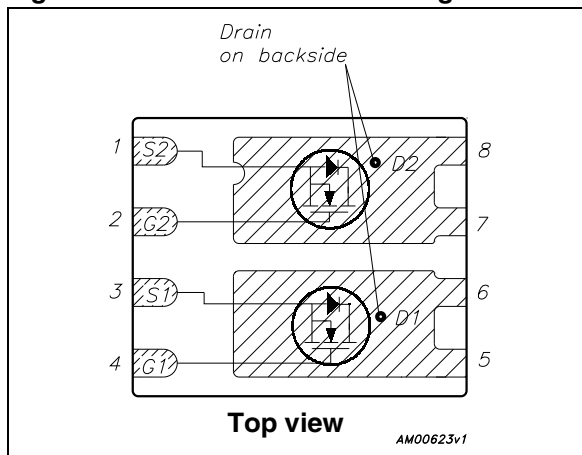


Table 1. Device summary

Order code	Marking	Package	Packaging
STL66DN3LLH5	66DN3LLH5	PowerFLAT™ 5x6 double island	Tape and reel

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## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	6
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>9</b>
<b>5</b>	<b>Packaging mechanical data</b> .....	<b>12</b>
<b>6</b>	<b>Revision history</b> .....	<b>14</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	30	V
$V_{GS}$	Gate-source voltage	$\pm 22$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	78.5	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	55.5	A
$I_D$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	20	A
$I_D$	Drain current (continuous) at $T_{pcb} = 100^\circ\text{C}$	14.2	A
$I_{DM}^{(2),(3)}$	Drain current (pulsed)	80	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	72	W
$P_{TOT}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4.7	W
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Specified by design. Not subject to production test.
2. Pulse width limited by safe operating area
3. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu,  $t < 10$  sec

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2.08	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	32	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu,  $t < 10$  sec

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current, (pulse width limited by $T_J$ max)	18.5	A
$E_{AS}^{(1)}$	Single pulse avalanche energy (starting $T_J = 25^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 24$ V)	270	mJ

1. Per channel.

## 2 Electrical characteristics

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

**Table 5. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 250\ \mu\text{A}$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 30\text{ V}$ , $V_{DS} = 30\text{ V}$ , $T_C = 125\text{ °C}$			1 100	$\mu\text{A}$ nA
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 22\text{ V}$			$\pm 10$	$\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1		3	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$ , $I_D = 10\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 10\text{ A}$		5.9 7.1	6.5 7.9	m $\Omega$ m $\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance			1500		pF
$C_{oss}$	Output capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	230	-	pF
$C_{rss}$	Reverse transfer capacitance			23		pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 19\text{ A}$		12		nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5\text{ V}$	-	5	-	nC
$Q_{gd}$	Gate-drain charge	(see <a href="#">Figure 14</a> )		4.4		nC

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$ , $I_D = 9.5\text{ A}$ ,		8.8		ns
$t_r$	Rise time	$R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$	-	18	-	ns
$t_{d(off)}$	Turn-off delay time	(see <a href="#">Figure 13</a> )		26		ns
$t_f$	Fall time			4		ns

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		20	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		80	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 19 \text{ A}, V_{GS}=0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 19 \text{ A},$		24		ns
$Q_{rr}$	Reverse recovery charge	$di/dt = 100 \text{ A}/\mu\text{s},$	-	12		nC
$I_{RRM}$	Reverse recovery current	$V_{DD}=25 \text{ V}, T_j=150 \text{ }^\circ\text{C}$		1.8		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

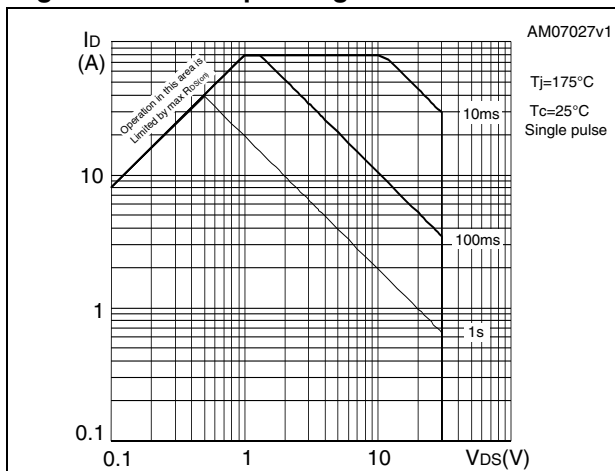


Figure 3. Thermal impedance

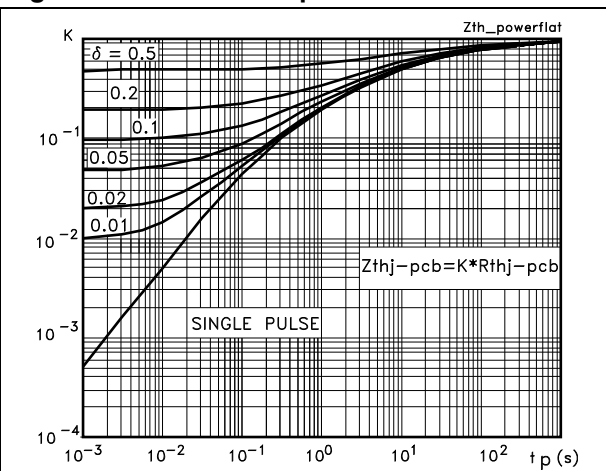


Figure 4. Output characteristics

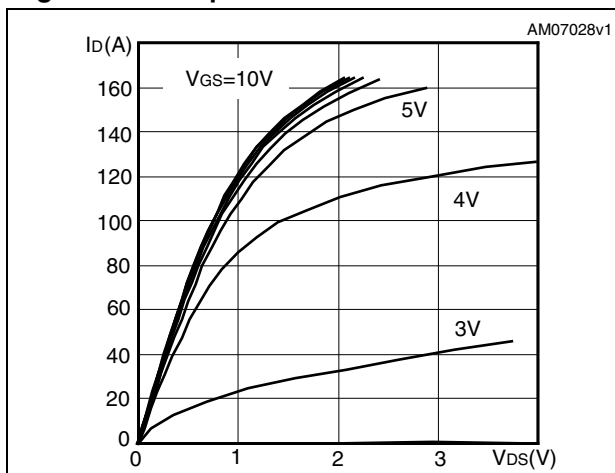


Figure 5. Transfer characteristics

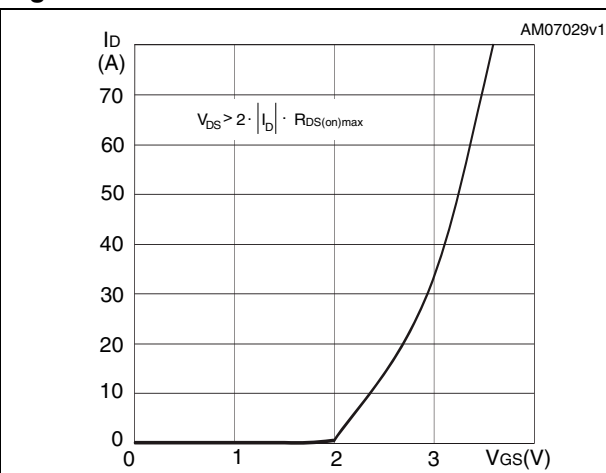


Figure 6. Normalized  $BV_{DSS}$  vs temperature

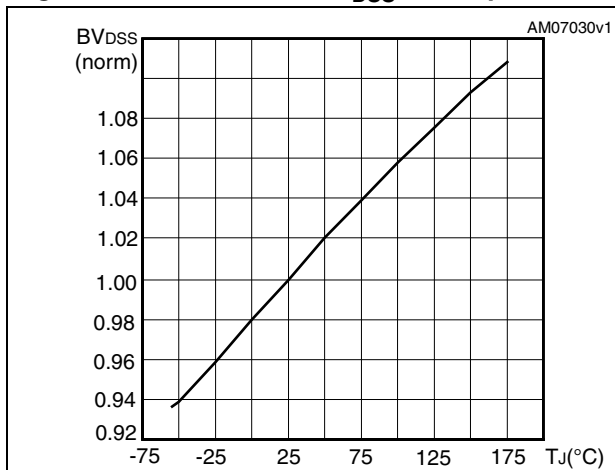


Figure 7. Static drain-source on resistance

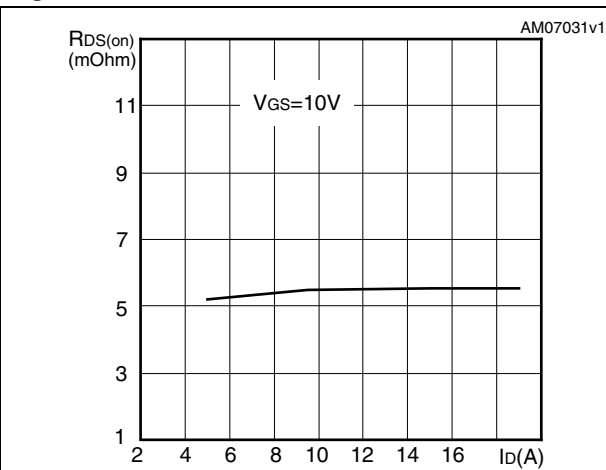


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

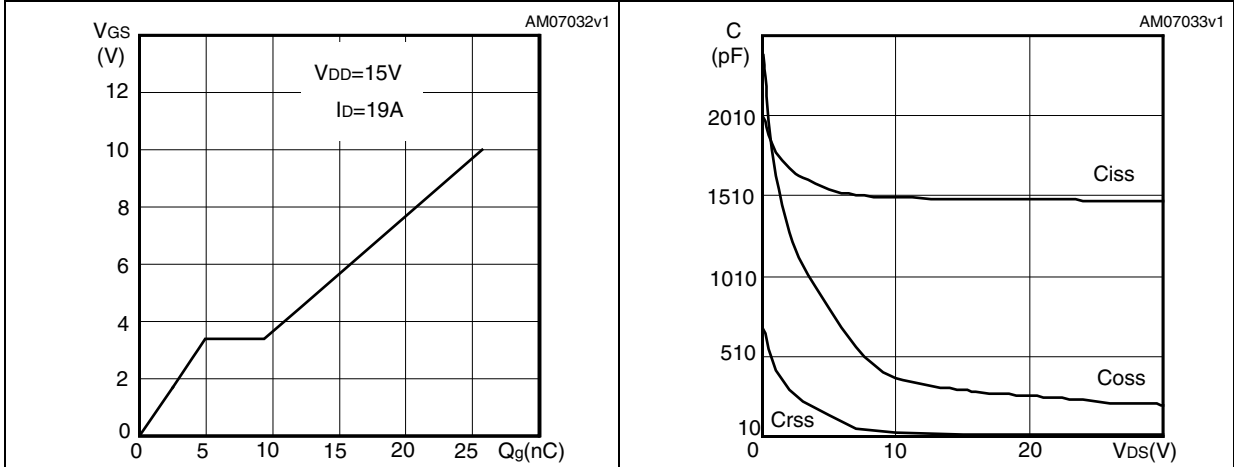


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

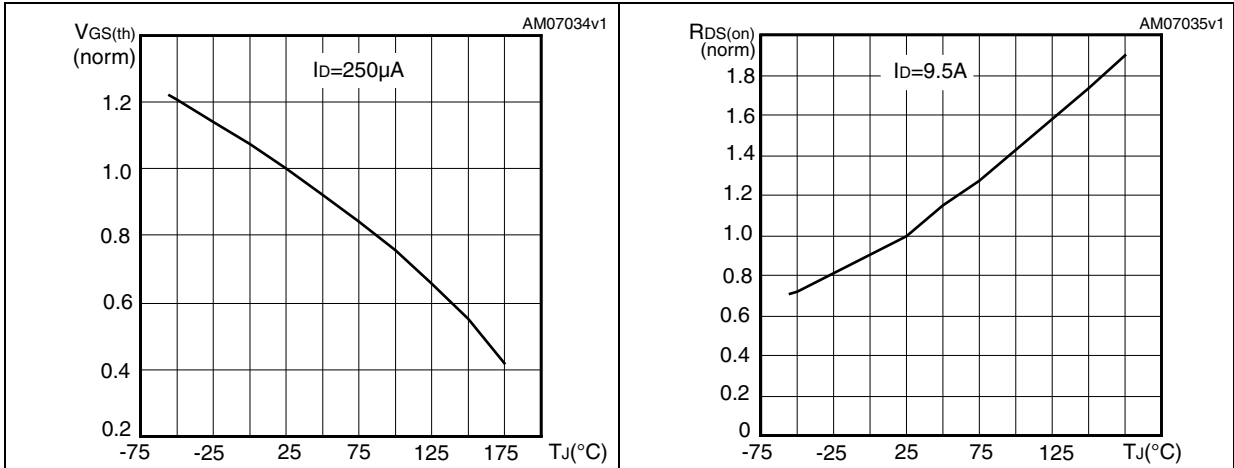
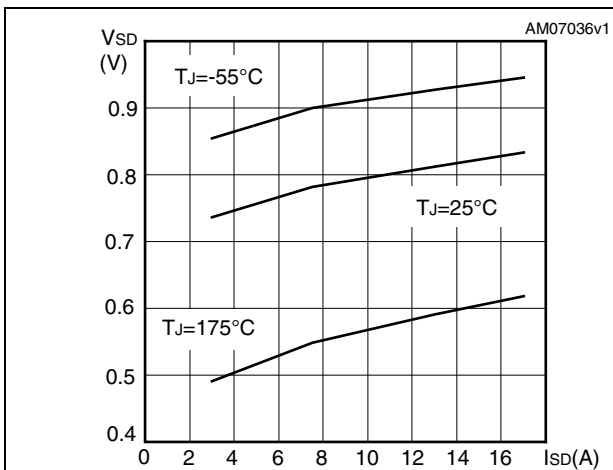


Figure 12. Source-drain diode forward characteristics

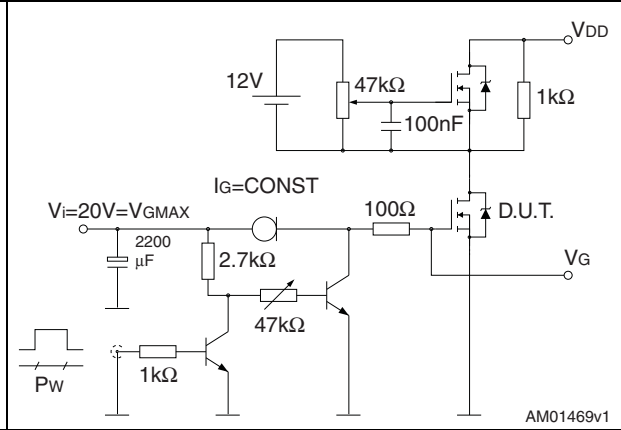


### 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**



**Figure 14. Gate charge test circuit**



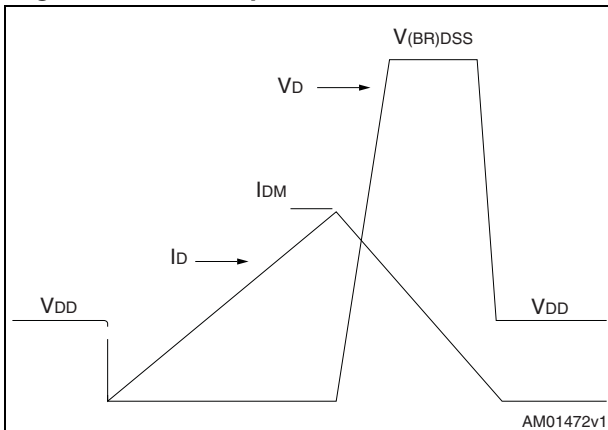
**Figure 15. Test circuit for inductive load switching and diode recovery times**



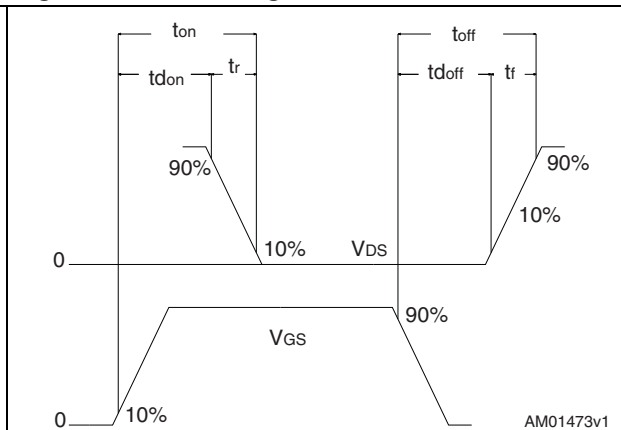
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**





## 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.

**Table 9. PowerFLAT™ 5x6 double island (clip) mechanical data**

Ref.	Dimensions (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	1.68		1.88
E2	3.50		3.70
D3	1.68		1.88
E3	3.50		3.70
E4	0.55		0.75
e		1.27	
L	0.725		1.025
K	1.05		1.35

Figure 19. PowerFLAT™ 5x6 double island (clip) drawing

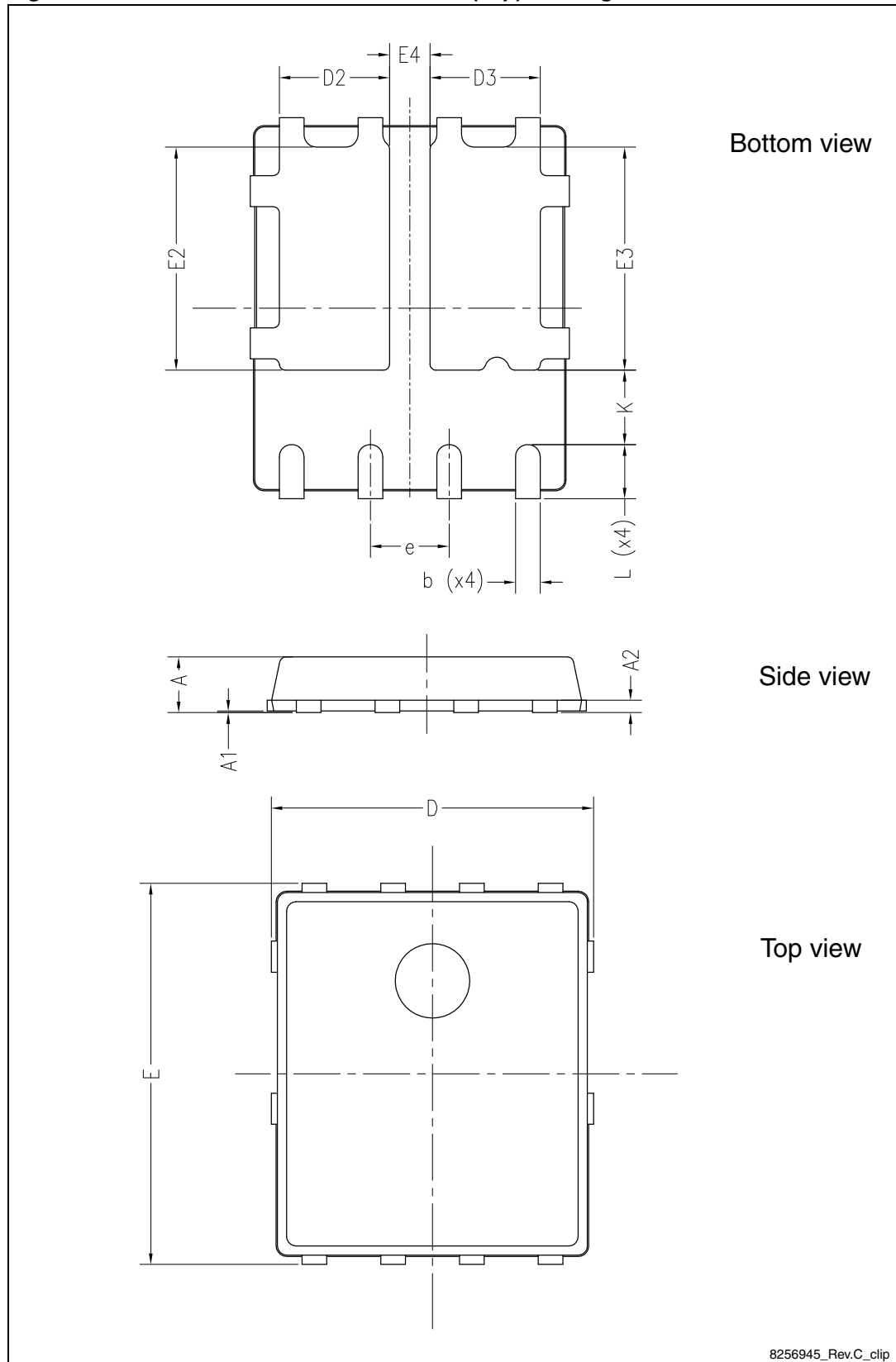
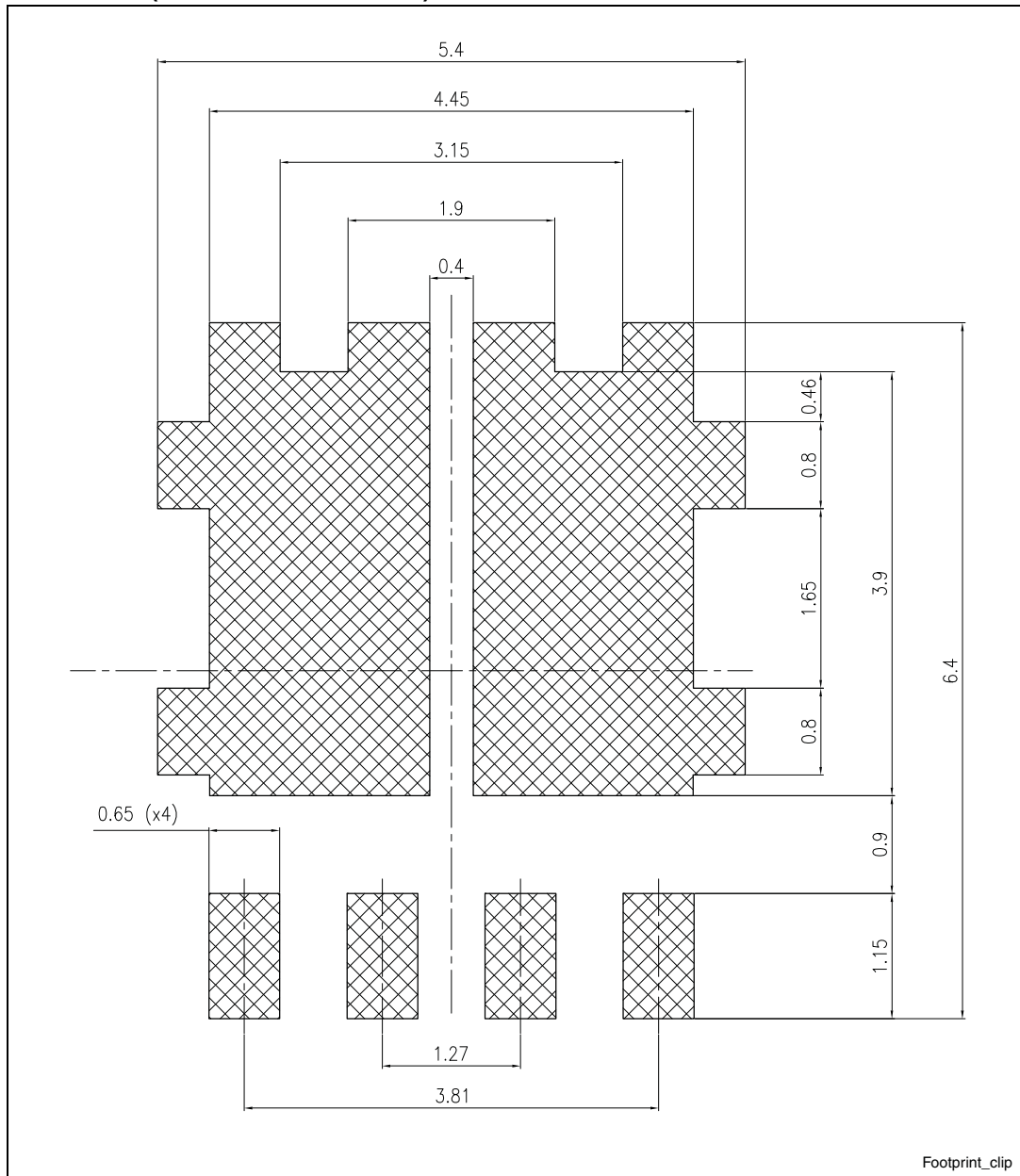


Figure 20. PowerFLAT™ 5x6 double island (clip) drawing recommended footprint (dimensions are in mm)



# 5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape

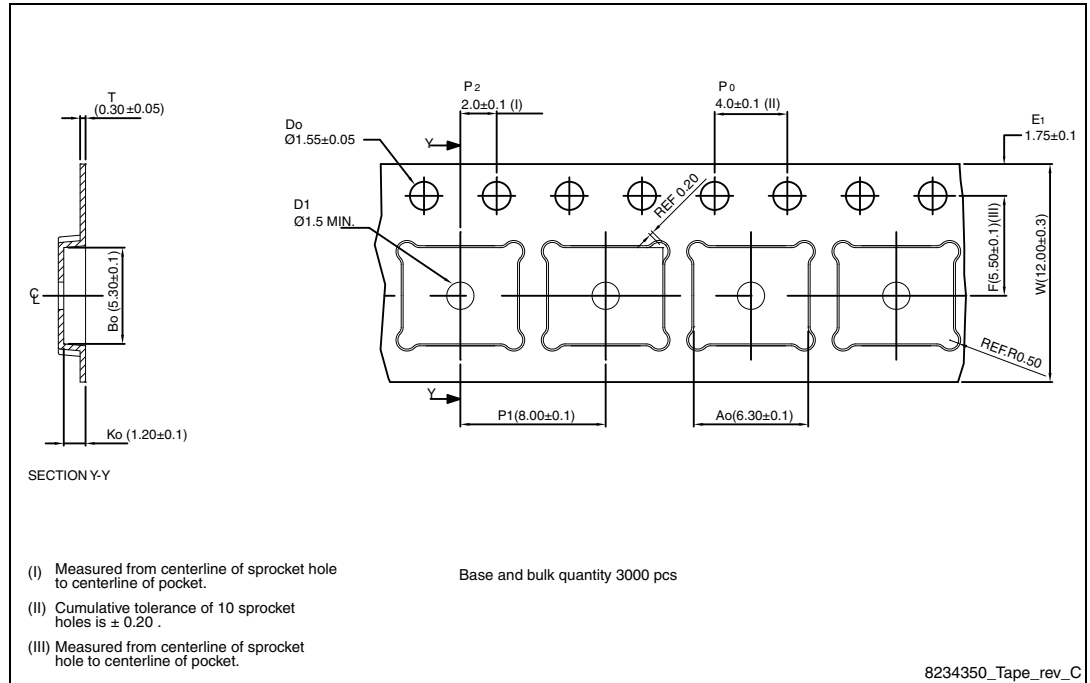


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape.

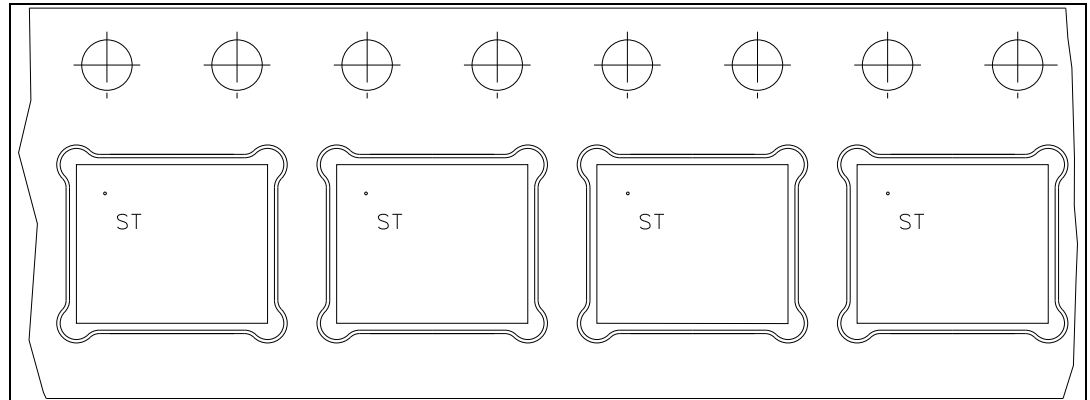
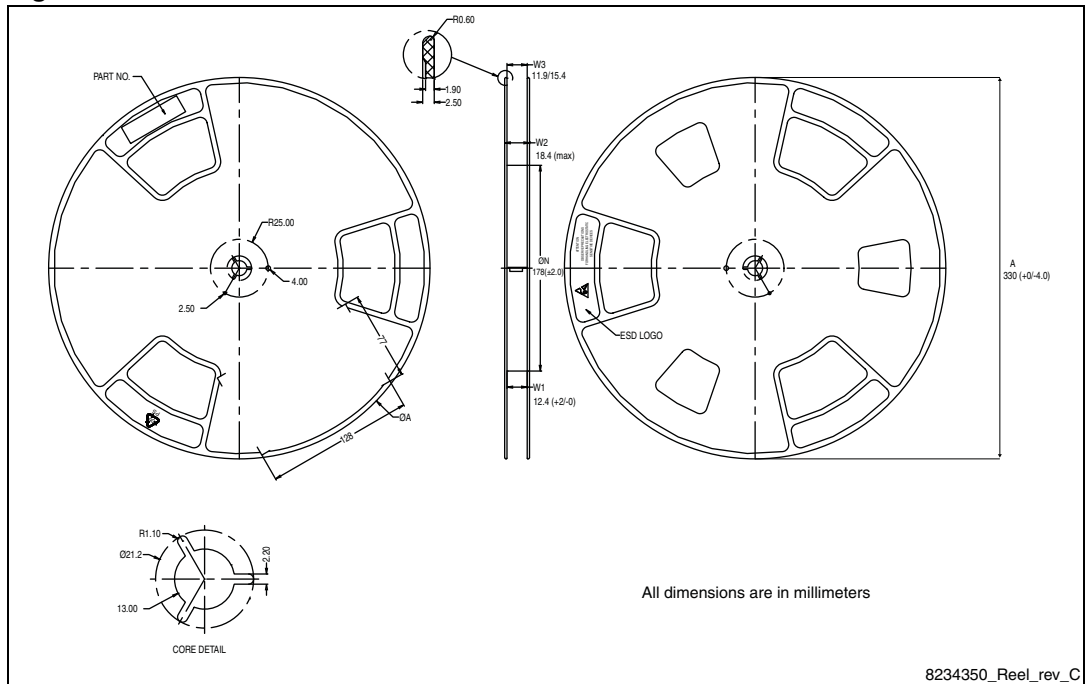


Figure 23. PowerFLAT™ 5x6 reel



## 6 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
12-Oct-2011	1	First release.
14-Mar-2012	2	Document status changed from preliminary data to production data. Inserted <a href="#">Section 5: Packaging mechanical data</a> . Minor text changes.

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