



# STL85N6F3

N-channel 60 V, 0.0057  $\Omega$ , 19 A PowerFLAT™ 5x6  
STripFET™ Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STL85N6F3	60 V	< 0.0065 $\Omega$	19 A <sup>(1)</sup>

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

- Extremely low on-resistance R<sub>DS(on)</sub>
- 100% avalanche tested

## Applications

- Switching applications

## Description

This N-channel enhancement mode Power MOSFET benefits from the latest refinement of STMicroelectronics' unique "single feature size" strip-based process, which decreases the critical alignment steps to offer exceptional manufacturing reproducibility. The result is a transistor with extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.



Figure 1. Internal schematic diagram

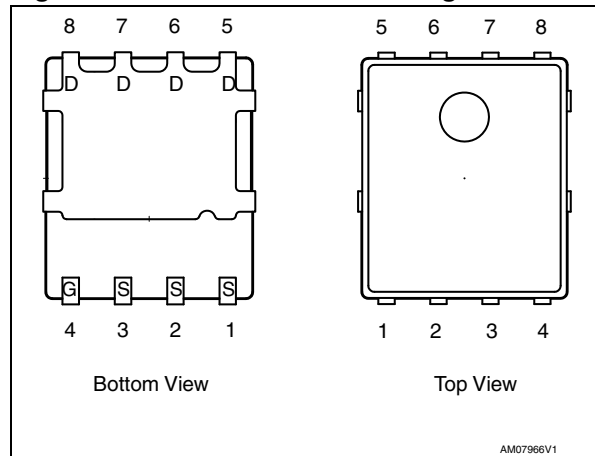


Table 1. Device summary

Order code	Marking	Package	Packaging
STL85N6F3	85N6F3	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 ( $V_{GS} = 0$ )	60	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	19	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	12	A
$I_{DM}^{(2)}$	Drain current (pulsed)	76	A
$I_D^{(3)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	85	A
$I_D^{(3)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	54	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25^\circ\text{C}$	4	W
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25^\circ\text{C}$	80	W
	Derating factor	0.03	W/ $^\circ\text{C}$
$T_J$	Operating junction temperature	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

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

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case (drain) (steady state)	1.56	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient	31.3	$^\circ\text{C}/\text{W}$

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

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	60			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ , $V_{DS} = \text{Max rating @ } 125\text{°C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\ \text{V}$			$\pm 200$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	2			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 8.5\ \text{A}$		0.0057	0.0065	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{GS} = 0$		3050		pF
$C_{oss}$	Output capacitance		-	659	-	pF
$C_{rss}$	Reverse transfer capacitance				38	pF
$Q_g$	Total gate charge	$V_{DD} = 30\ \text{V}$ , $I_D = 19\ \text{A}$		49.8		nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\ \text{V}$	-	14.6	-	nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)		12		nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$ , $I_D = 9.5\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 13)	-	21.8	-	ns
$t_r$	Rise time			14.3		ns
$t_{d(off)}$	Turn-off delay time			38.4		ns
$t_f$	Fall time			7.1		ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		19	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		76	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 19\text{ A}$ , $V_{GS} = 0$	-		1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 19\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 48\text{ V}$ , $T_j = 150^\circ\text{C}$	-	53.6		ns
$Q_{rr}$	Reverse recovery charge			120.1		nC
$I_{RRM}$	Reverse recovery current			4.5		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

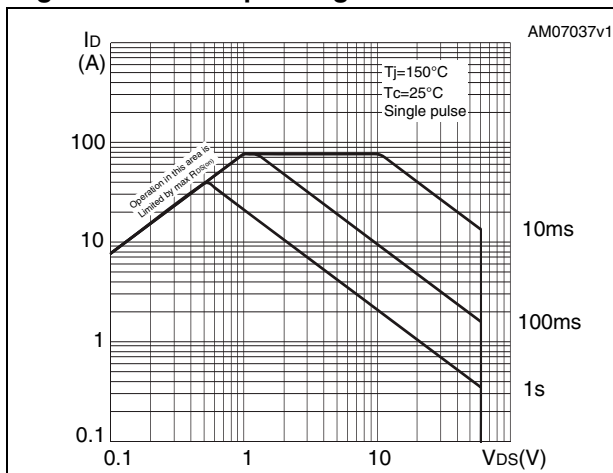


Figure 3. Thermal impedance

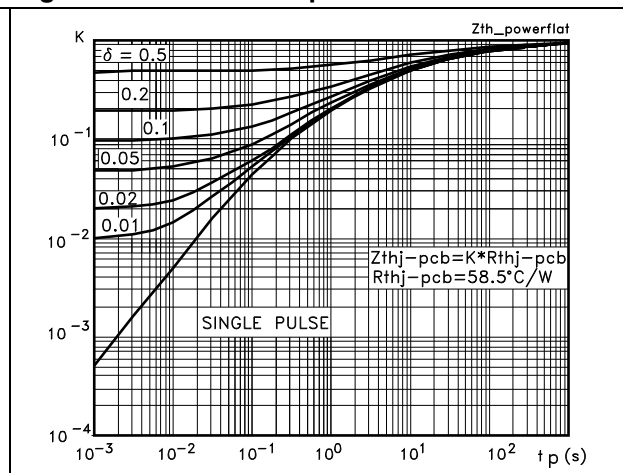


Figure 4. Output characteristics

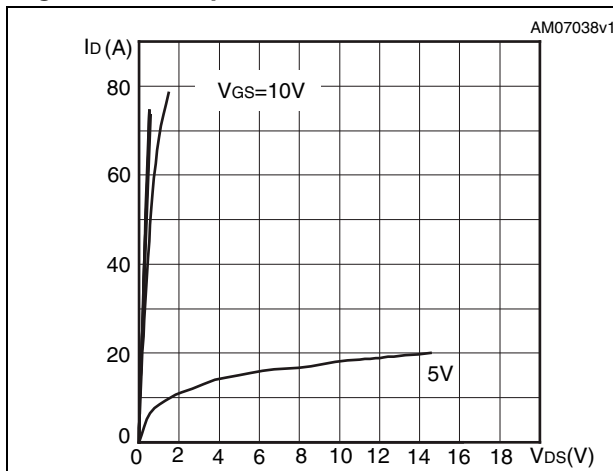


Figure 5. Transfer characteristics

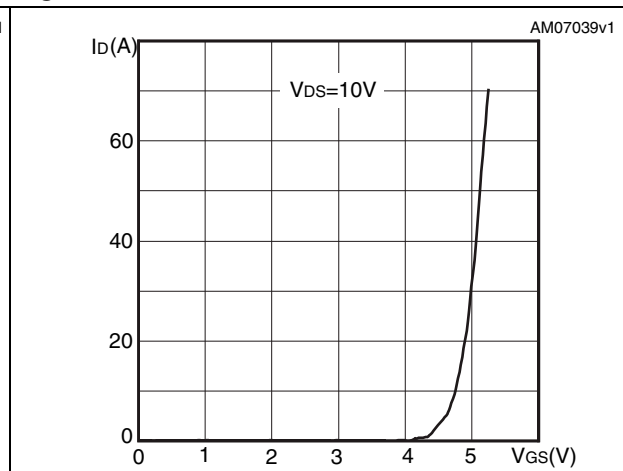


Figure 6. Normalized  $B_{V_{DS}}$  vs temperature

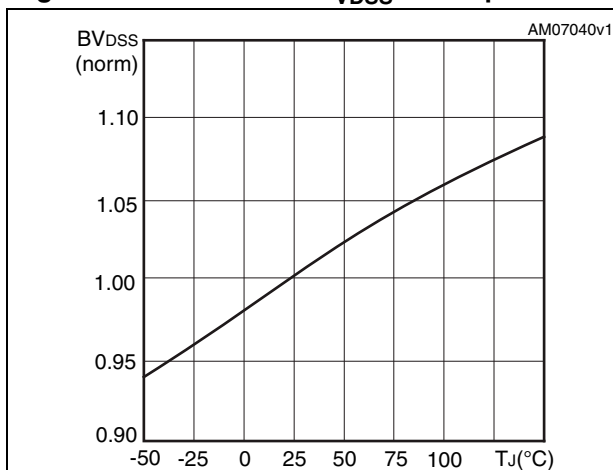
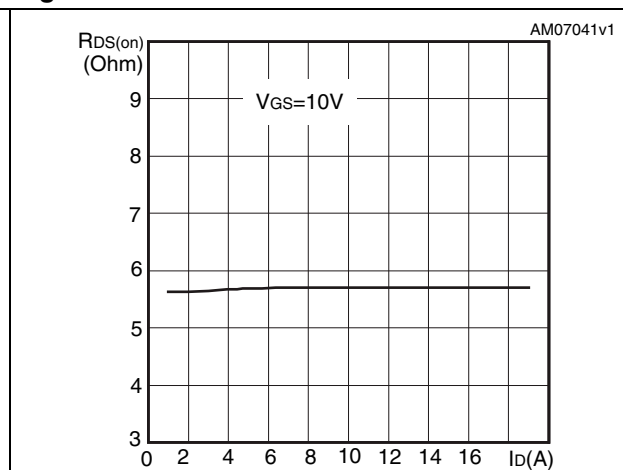
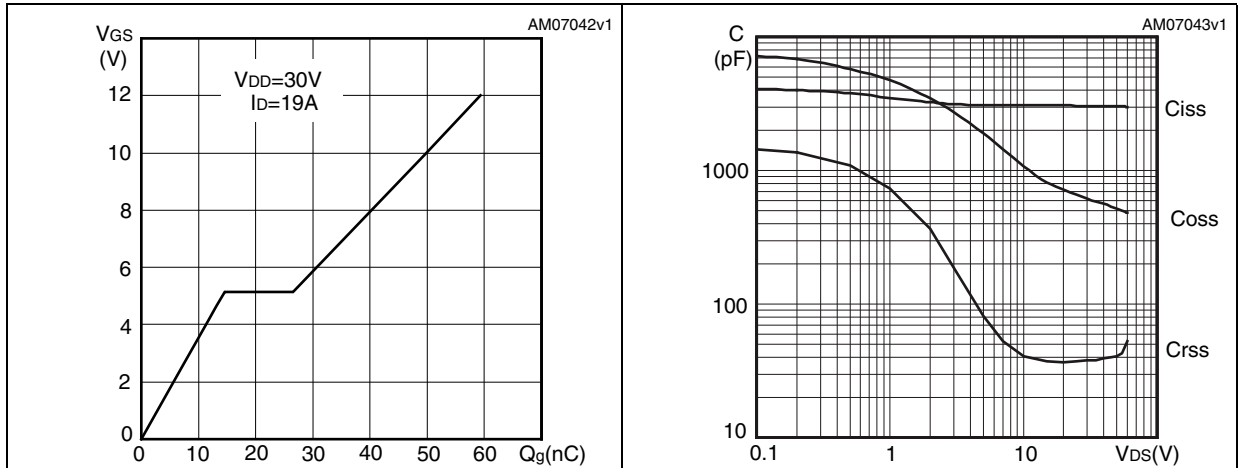


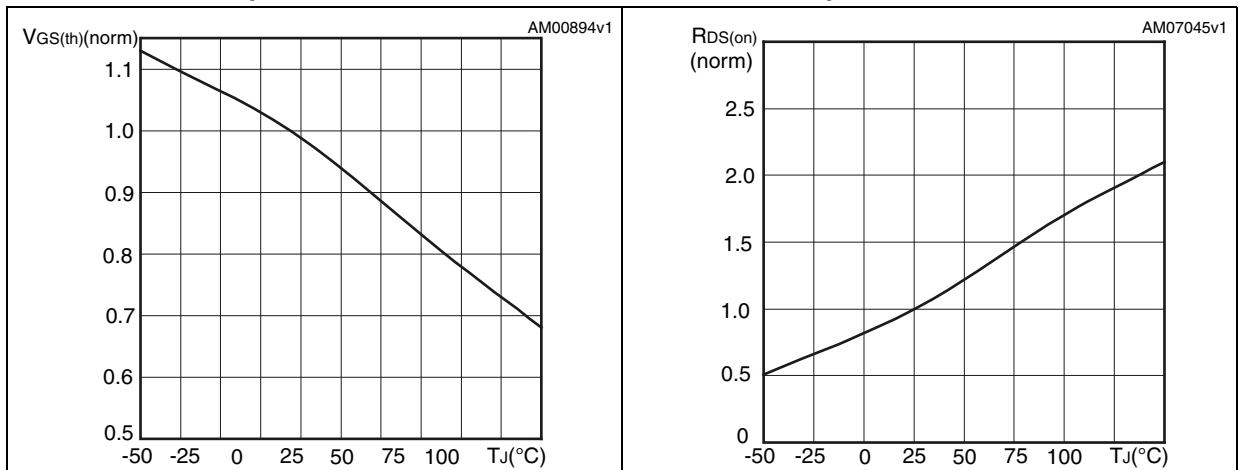
Figure 7. Static drain-source on resistance



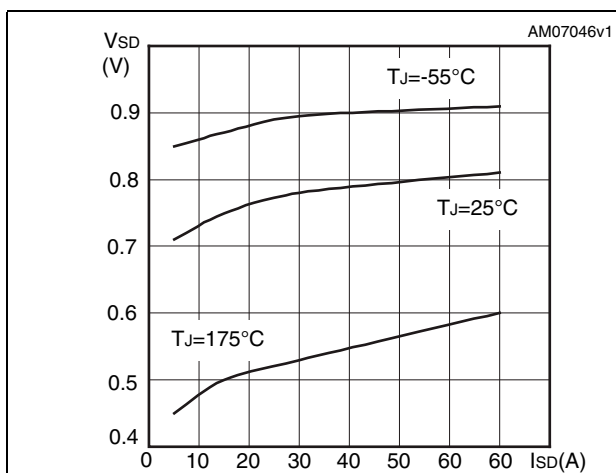
**Figure 8. Gate charge vs gate-source voltage** **Figure 9. Capacitance variations**



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

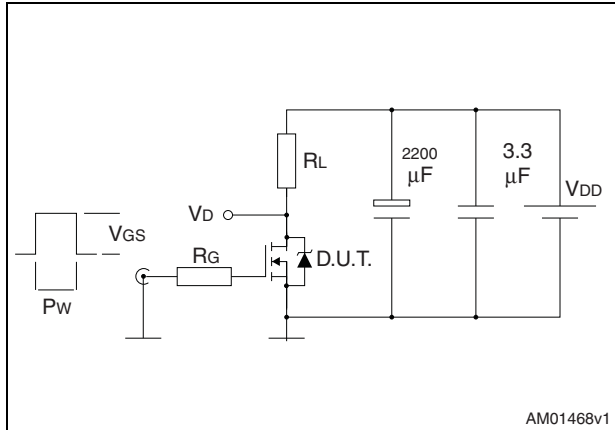


**Figure 12. Source-drain diode forward characteristics**

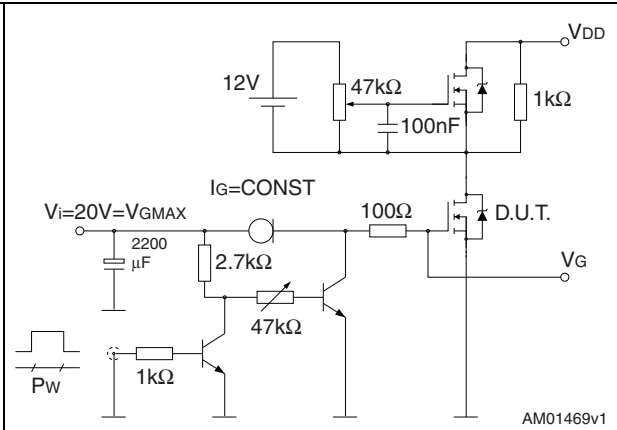


### 3 Test circuits

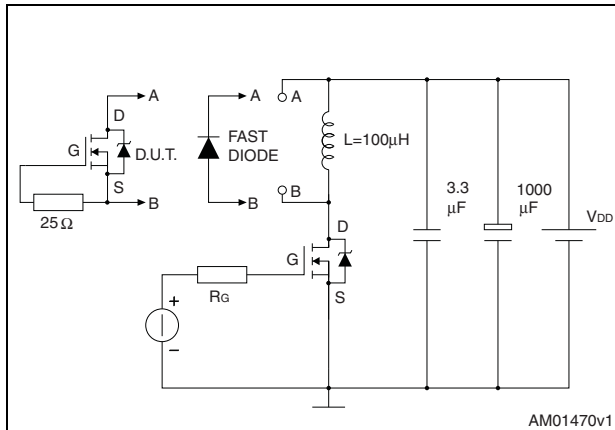
**Figure 13. Switching times test circuit for resistive load**



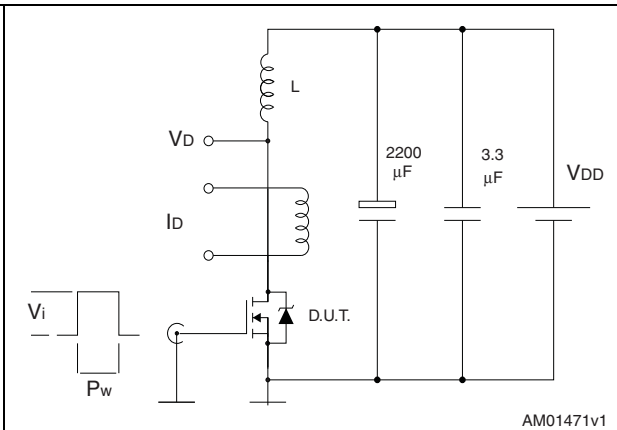
**Figure 14. Gate charge test circuit**



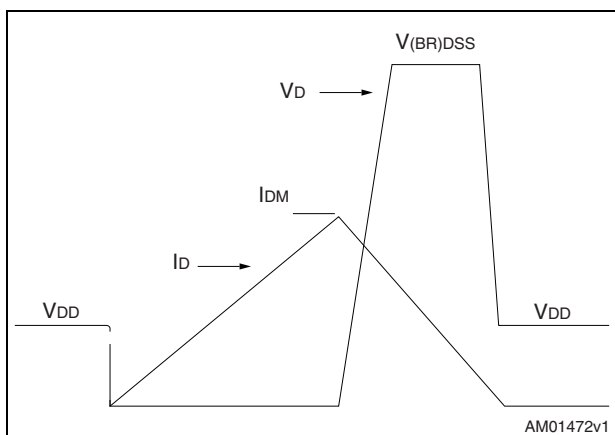
**Figure 15. Test circuit for inductive load switching and diode recovery times**



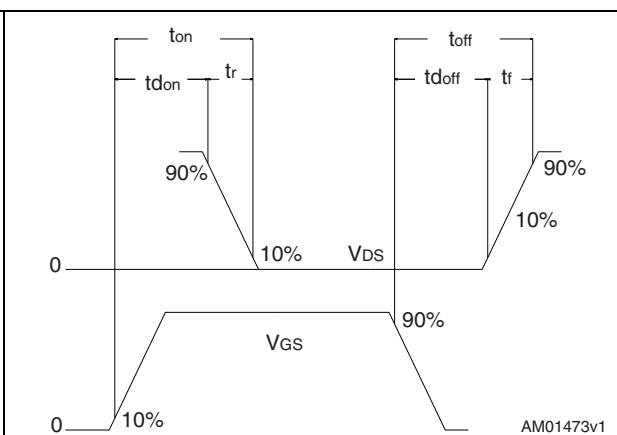
**Figure 16. Unclamped inductive load test circuit**



**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<sup>®</sup> 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 8. PowerFLAT™ 5x6 type S-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

Figure 19. PowerFLAT™ 5x6 type S-C drawing

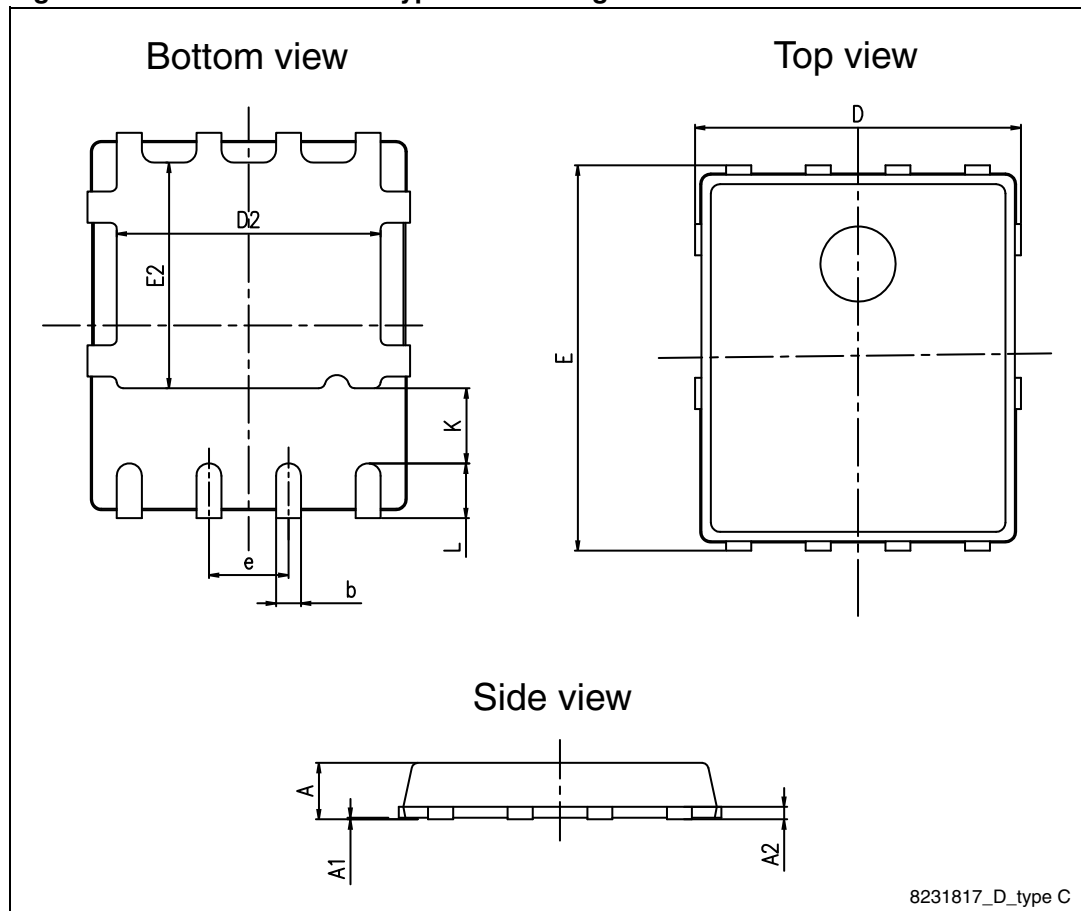


Table 9. PowerFLAT™ 5x6 type C-B mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.83	0.93
A1	0	0.02	0.05
A3		0.20	
b	0.35	0.40	0.47
D		5.00	
D1		4.75	
D2	4.15	4.20	4.25
E		6.00	
E1		5.75	
E2	3.43	3.48	3.53
E4	2.58	2.63	2.68
e		1.27	
L	0.70	0.80	0.90

Figure 20. PowerFLAT™ 5x6 type C-B drawing

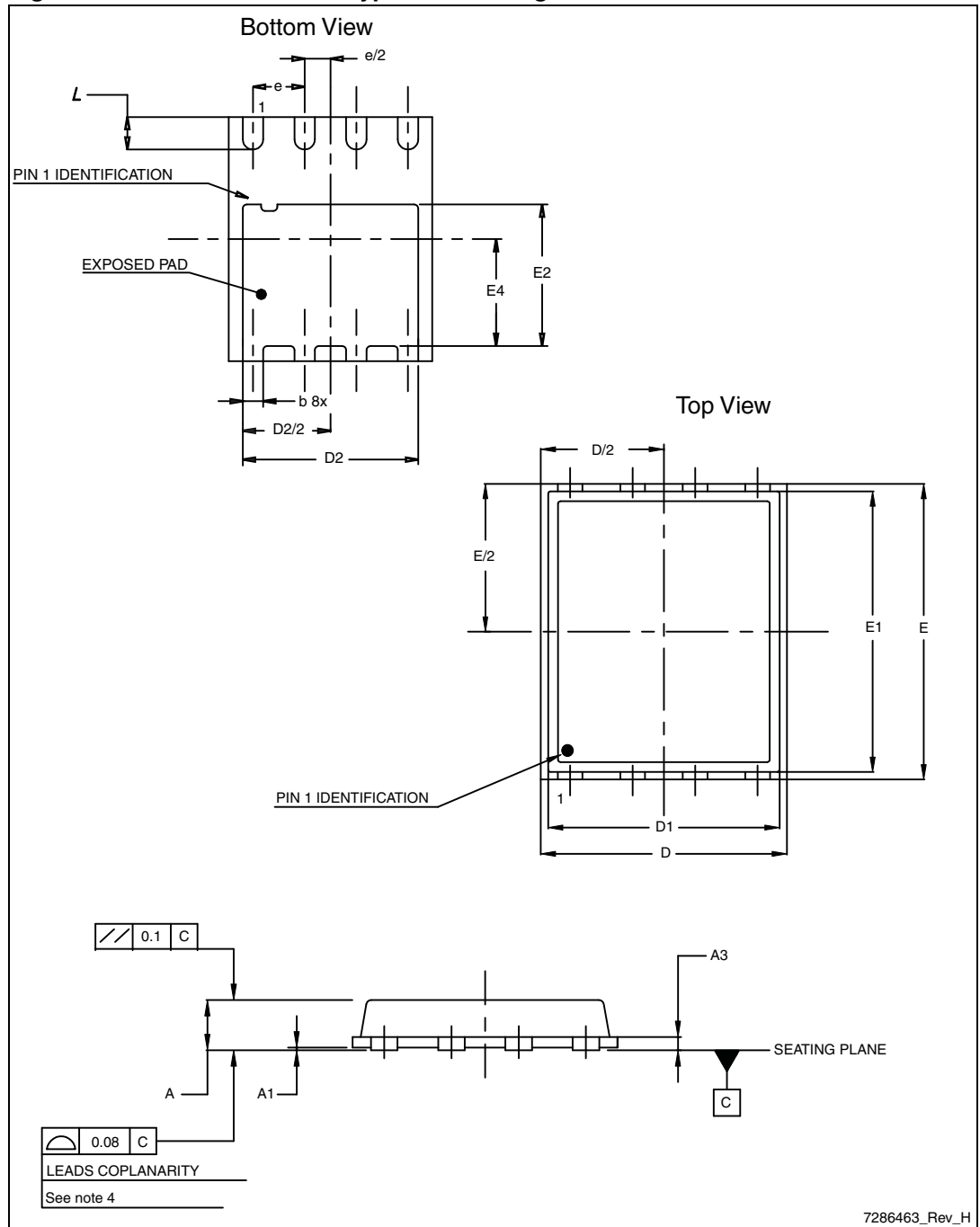
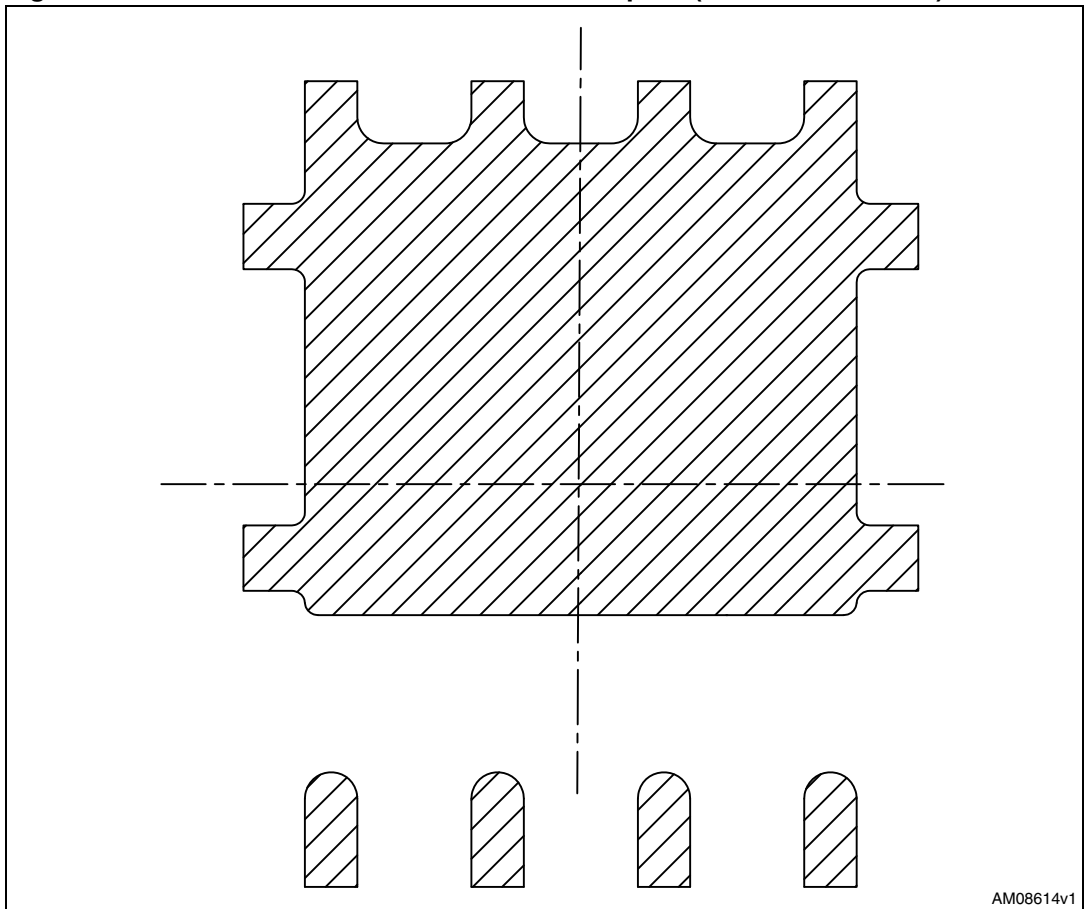


Figure 21. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



## 5 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
22-Jan-2009	1	First release.
08-Jul-2011	2	Datasheet promoted from preliminary data to datasheet.

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