



# STL40N75LF3

N-channel 75 V, 16 mΩ typ., 10 A STripFET™ III Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet — production data

## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STL40N75LF3	75 V	< 19 mΩ	10 A <sup>(1)</sup>

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

- N-channel enhancement mode
- Low gate charge
- Low threshold voltage device

## Applications

- Switching applications

## Description

This device is an N-channel enhancement mode Power MOSFET produced using STMicroelectronics' STripFET™ III technology, which is specifically designed to minimize on-resistance and gate charge to provide superior switching performance.



Figure 1. Internal schematic diagram

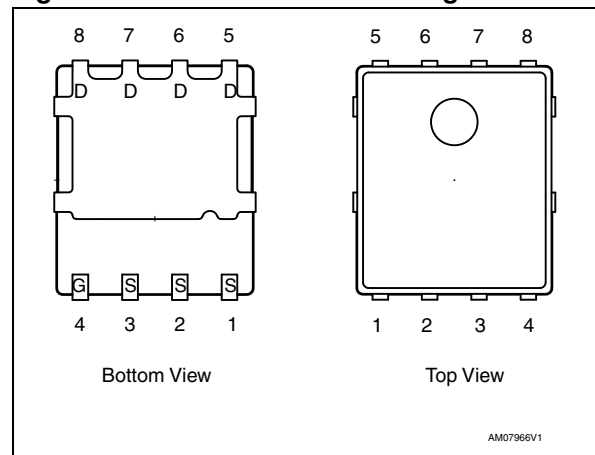


Table 1. Device summary

Order code	Marking	Package	Packaging
STL40N75LF3	40N75LF3	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	75	V
$V_{GS}$	Gate-source voltage	+20\ -16	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ °C}$	40	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ °C}$	26	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ °C}$	10	A
$I_D^{(3)}$	Drain current (continuous) at $T_{pcb}=100\text{ °C}$	6	A
$I_{DM}^{(3)}$	Drain current (pulsed)	160	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ °C}$	62	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ °C}$	4	W
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 150	°C

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

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient	31.3	°C/W

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu., t < 10 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 ( $V_{GS} = 0$ )	$I_D = 250\ \mu\text{A}$	75			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 75\ \text{V}$ , $V_{DS} = 75\ \text{V}$ , $T_C = 125\text{ °C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = +20 / -16\ \text{V}$			$\pm 100$	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	$V_{GS} = 10\ \text{V}$ , $I_D = 20\ \text{A}$ $V_{GS} = 5\ \text{V}$ , $I_D = 20\ \text{A}$		16 18.7	19 22	$\text{m}\Omega$ $\text{m}\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{GS} = 0$	-	1300	-	pF
$C_{oss}$	Output capacitance			228		
$C_{rss}$	Reverse transfer capacitance			15		
$Q_g$	Total gate charge	$V_{DD} = 37.5\ \text{V}$ , $I_D = 40\ \text{A}$ $V_{GS} = 10\ \text{V}$ (see Figure 14)	-	12	-	nC
$Q_{gs}$	Gate-source charge			5		
$Q_{gd}$	Gate-drain charge			5.3		
$R_G$	Gate input resistance	$f = 1\ \text{MHz}$ Gate DC Bias = 0 Test signal level = 20 mV open drain	-	3.5	-	$\Omega$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 32.5\ \text{V}$ , $I_D = 20\ \text{A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\ \text{V}$ (see Figure 13)	-	12	-	ns
$t_r$	Rise time			25		
$t_{d(off)}$	Turn-off delay time			25		
$t_f$	Fall time			3		

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		40	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				160	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40 \text{ A}, V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 40 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 60 \text{ V}, T_j = 25 \text{ }^\circ\text{C}$	-	35		ns
$Q_{rr}$	Reverse recovery charge			44		nC
$I_{RRM}$	Reverse recovery current			27		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

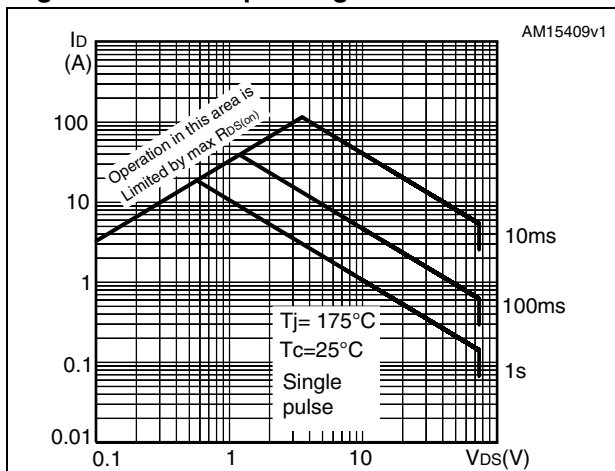


Figure 3. Thermal impedance

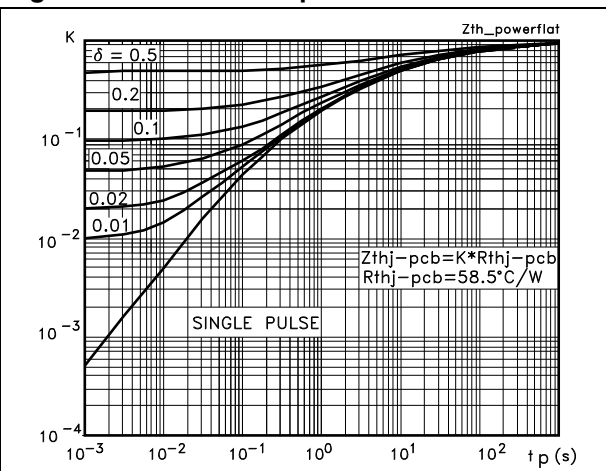


Figure 4. Output characteristics

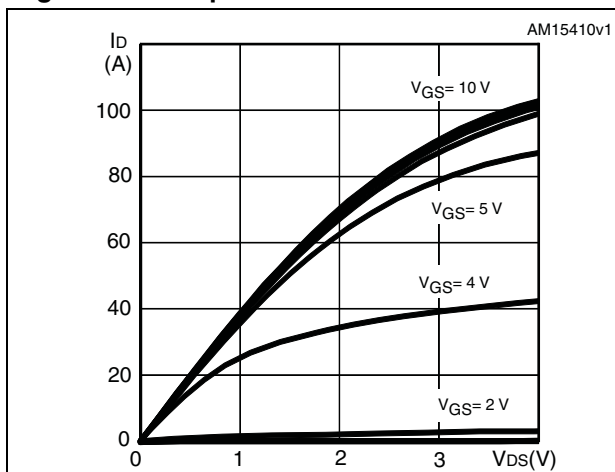


Figure 5. Transfer characteristics

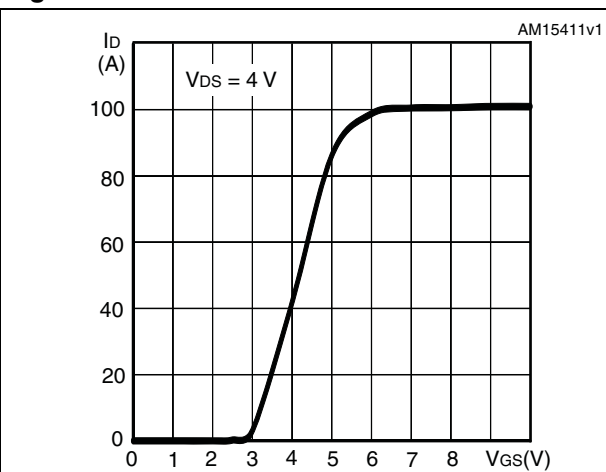


Figure 6. Gate charge vs gate-source voltage

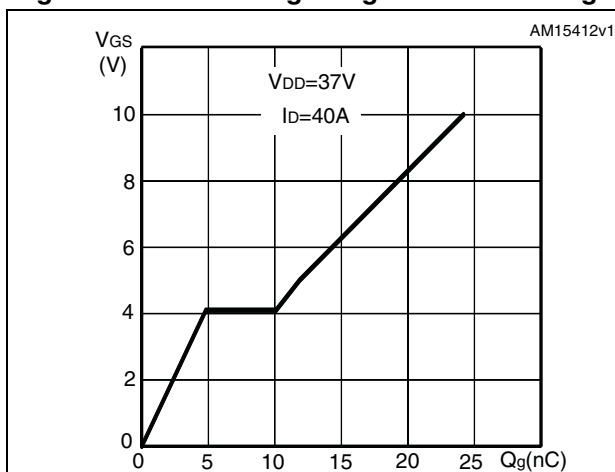


Figure 7. Static drain-source on-resistance

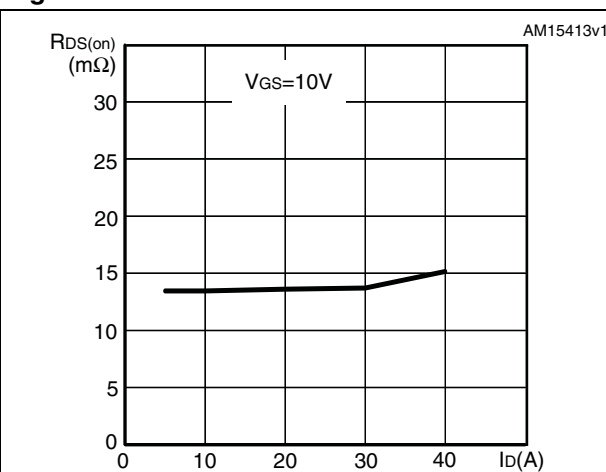


Figure 8. Capacitance variations

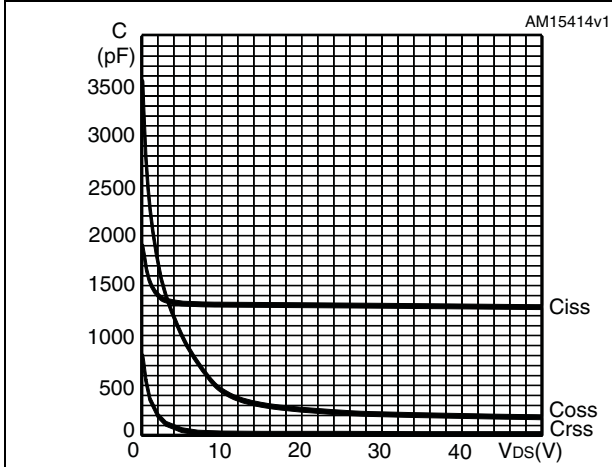


Figure 9. Normalized  $B_{V_{DS}}$  vs temperature

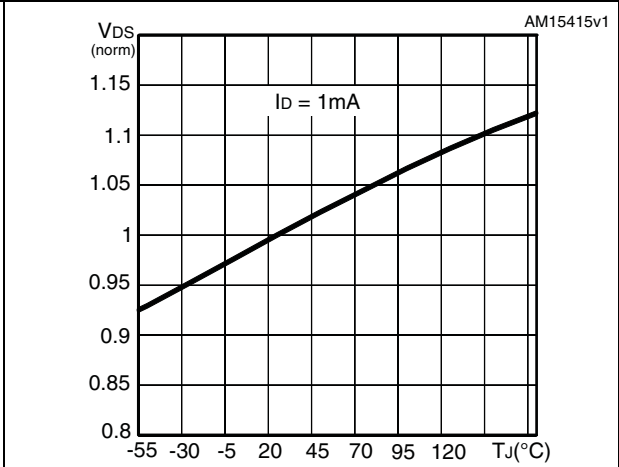


Figure 10. Normalized gate threshold voltage vs temperature

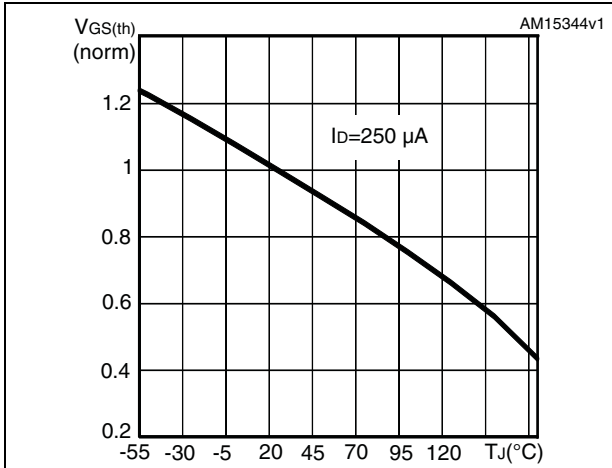


Figure 11. Normalized on-resistance vs temperature

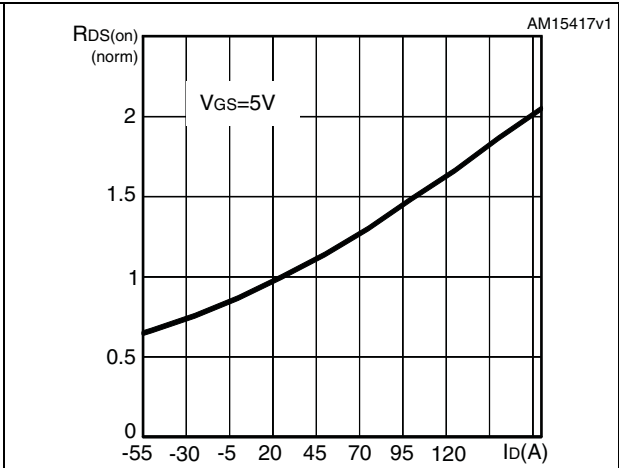
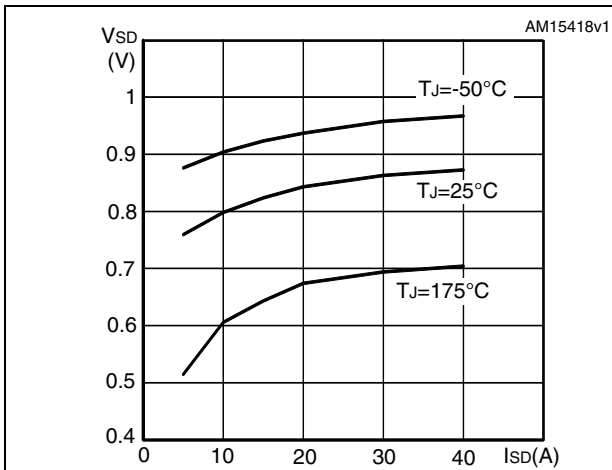
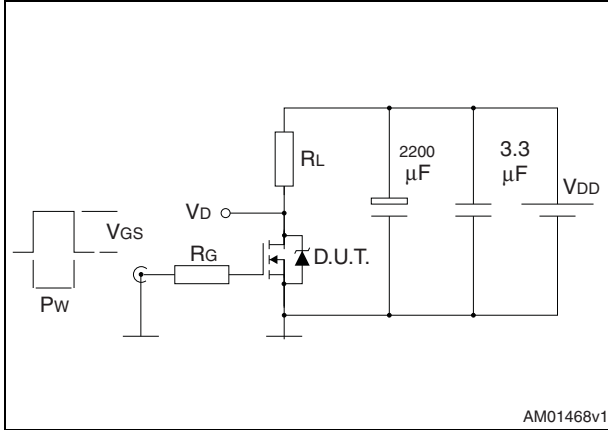


Figure 12. Source-drain diode forward characteristics



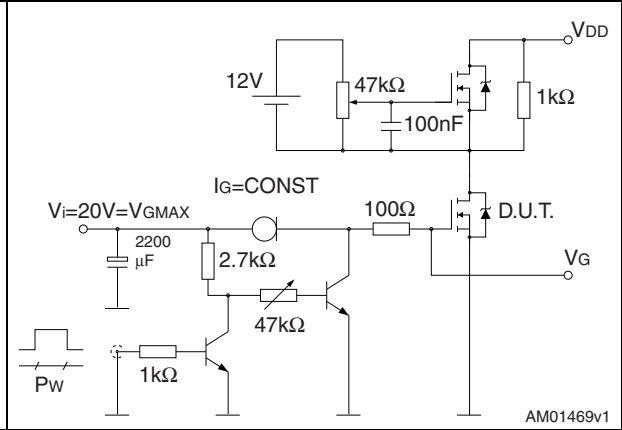
### 3 Test circuits

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



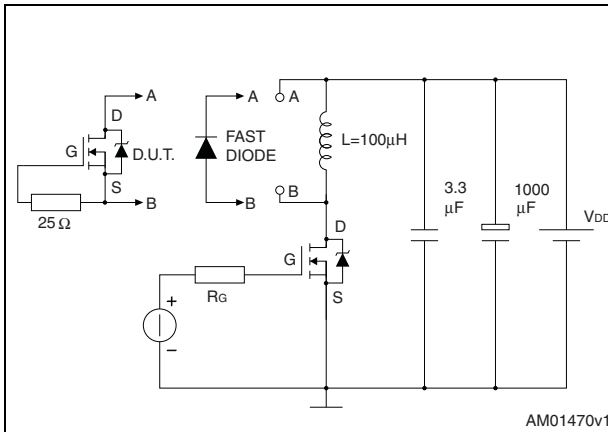
AM01468v1

**Figure 14. Gate charge test circuit**



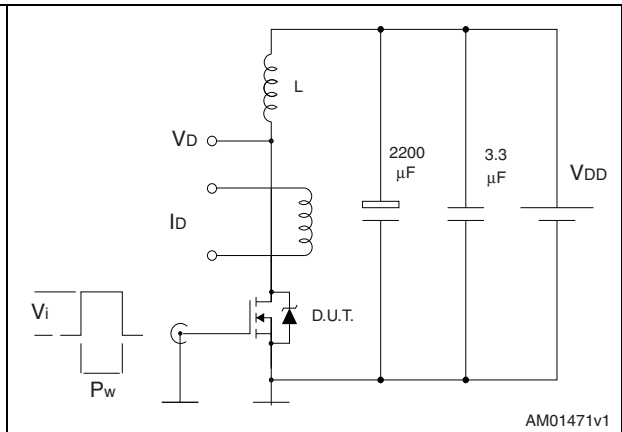
AM01469v1

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



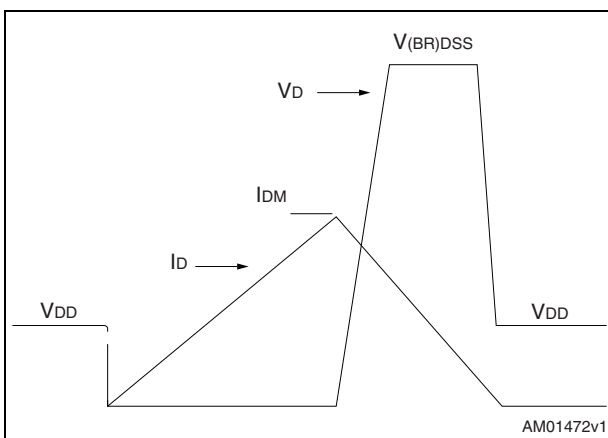
AM01470v1

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



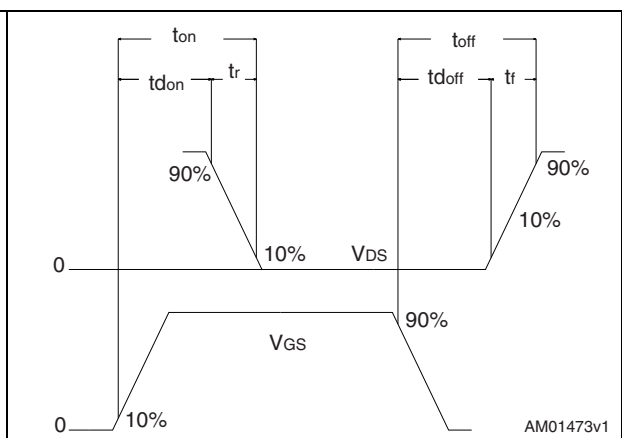
AM01471v1

**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<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.

Table 8. 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 19. PowerFLAT™ 5x6 type C-B drawing

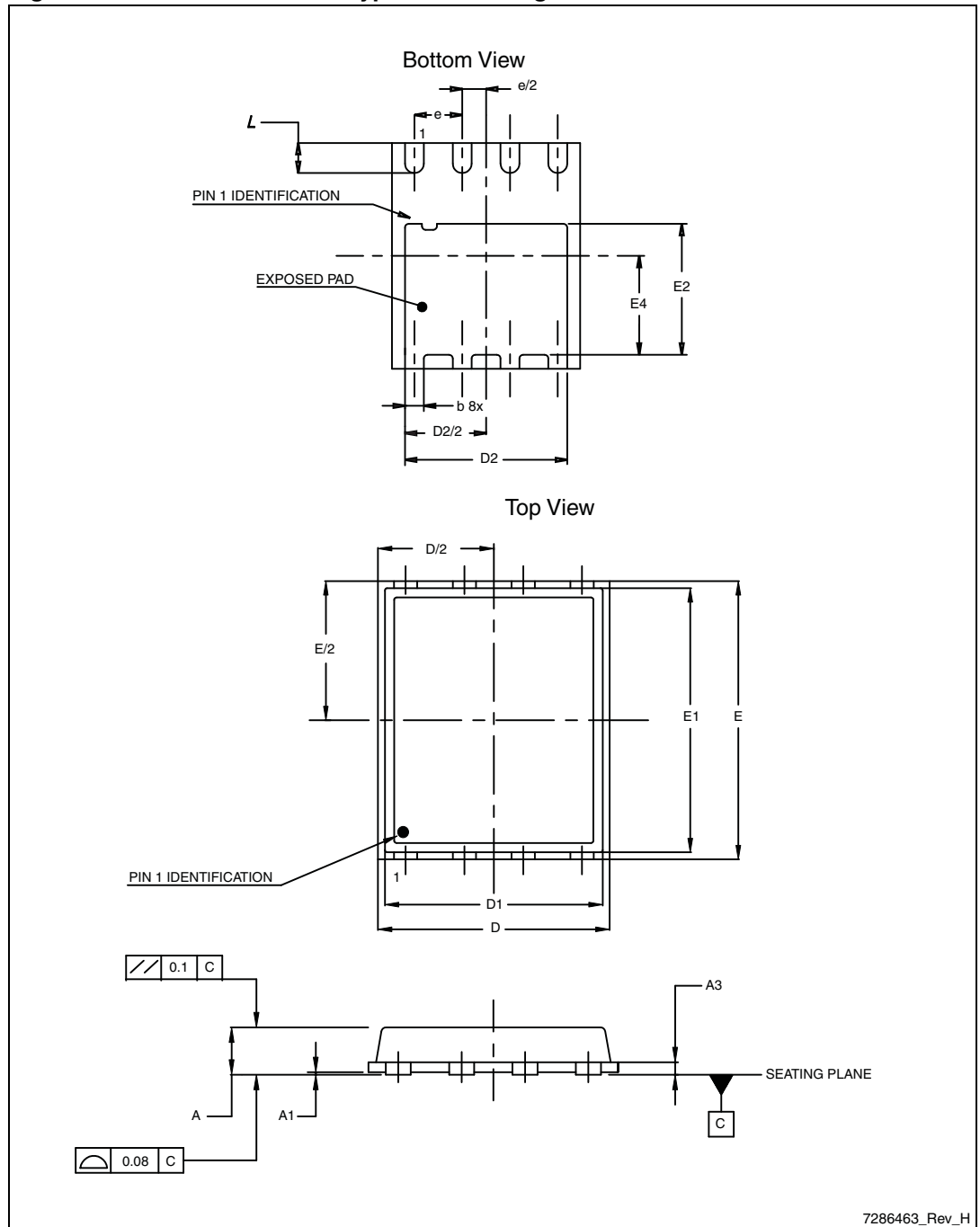


Table 9. PowerFLAT™ 5x6 type S-C mechanical data

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 20. PowerFLAT™ 5x6 type S-C mechanical data

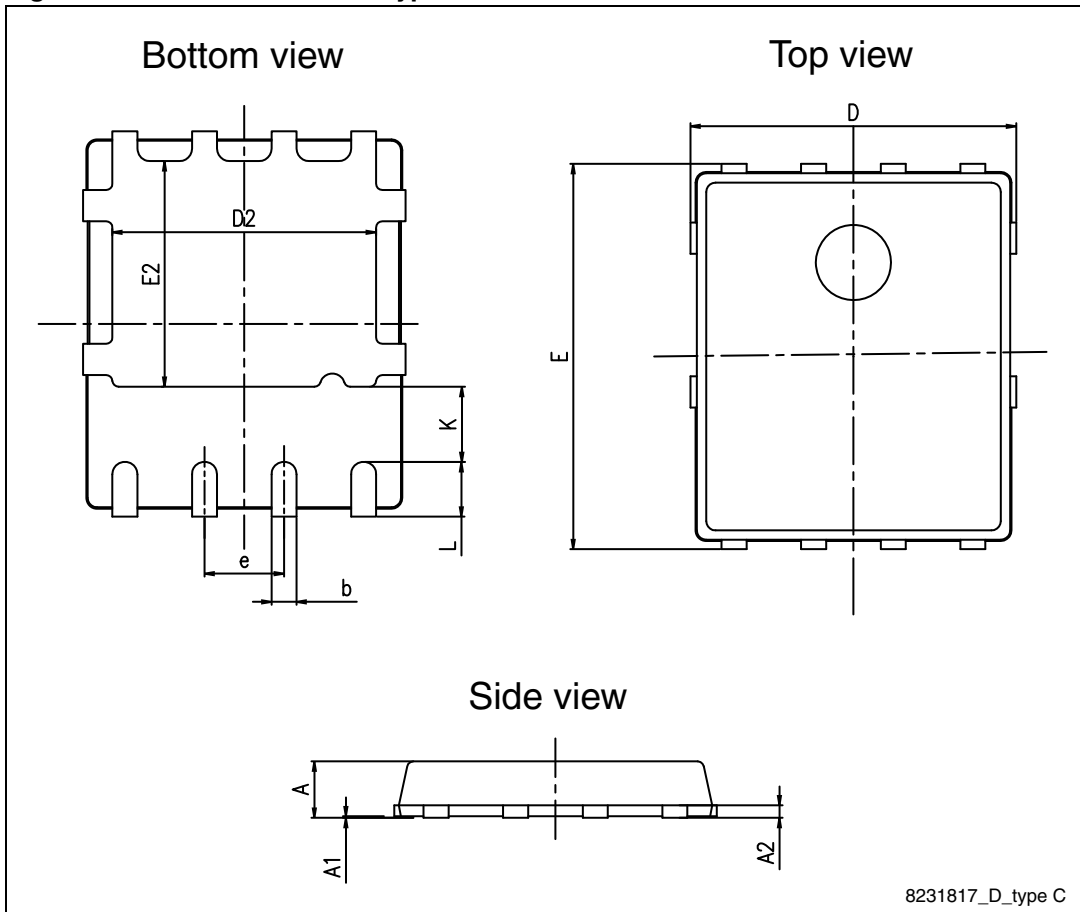
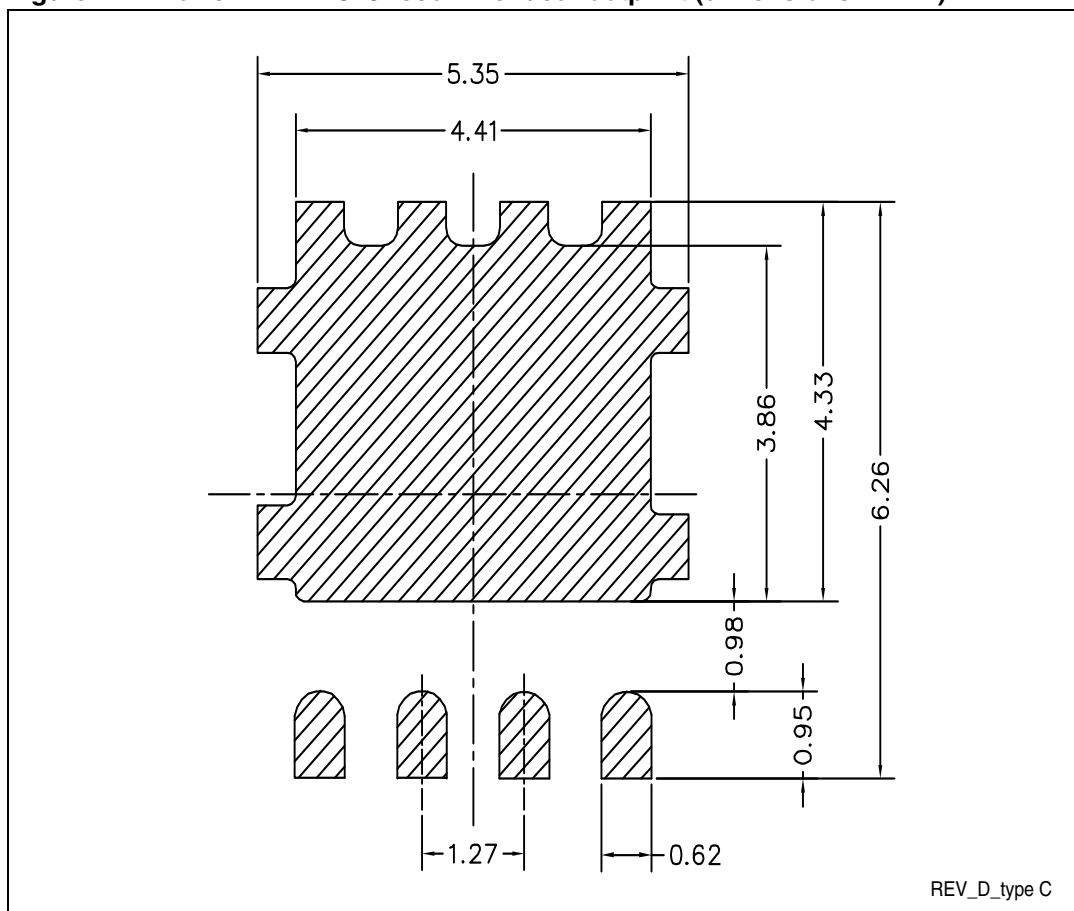


Figure 21. PowerFLAT™ 5x6 recommended footprint (dimensions in mm)



## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
19-Oct-2012	1	First release.

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