



# STL66N3LLH5

N-channel 30 V, 0.0048  $\Omega$ , 21 A PowerFLAT™ 5x6  
STripFET™ V Power MOSFET

## Features

Order code	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STL66N3LLH5	30 V	<0.0058 $\Omega$	21 A <sup>(1)</sup>

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

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- Very low switching gate charge
- High avalanche ruggedness
- Low gate drive power losses



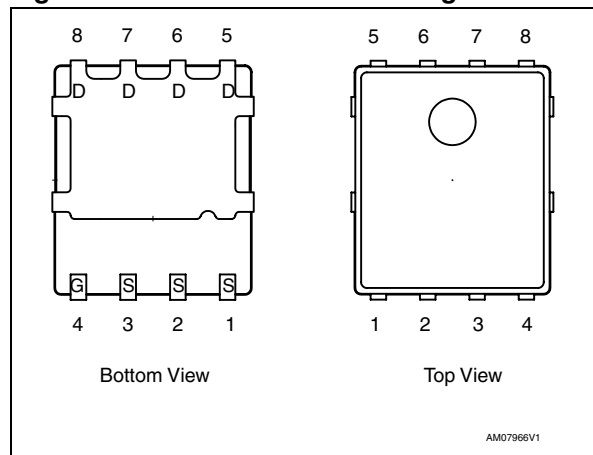
## Applications

- 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
STL66N3LLH5	66N3LLH5	PowerFLAT™ 5x6	Tape and reel

# 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>Revision history</b> .....	<b>12</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 $T_C = 25^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	57	A
$I_D$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	21	A
$I_D$	Drain current (continuous) at $T_{pcb} = 100^\circ\text{C}$	14.5	A
$I_{DM}^{(2),(3)}$	Drain current (pulsed)	84	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	72	W
$P_{TOT}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4.8	W
	Derating factor	0.03	W/ $^\circ\text{C}$
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

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	31.3	$^\circ\text{C}/\text{W}$

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)	10.5	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 24$ V)	180	mJ

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified)

**Table 5. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 30 V$ $V_{DS} = 30 V, T_C = 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 22 V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1		3	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 10.5 A$ $V_{GS} = 4.5 V, I_D = 10.5 A$		0.0048 0.006	0.0058 0.0075	$\Omega$ $\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25 V, f = 1 MHz,$ $V_{GS} = 0$	-	1500	-	$\mu F$
$C_{oss}$	Output capacitance			295		
$C_{rss}$	Reverse transfer capacitance			39		
$Q_g$	Total gate charge	$V_{DD} = 15 V, I_D = 21 A$	-	12	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5 V$	-	4	-	nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)	-	4.7	-	nC

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15 V, I_D = 10.5 A,$ $R_G = 4.7 \Omega, V_{GS} = 10 V$ (see Figure 13)	-	9.3	-	ns
$t_r$	Rise time			14.5		
$t_{d(off)}$	Turn-off delay time			22.7		
$t_f$	Fall time			4.5		

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		21	A

**Table 8. Source drain diode**

$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		84	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 19 \text{ A}, V_{GS}=0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 19 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD}=25 \text{ V}, T_j=150 \text{ }^\circ\text{C}$	-		25	ns
$Q_{rr}$	Reverse recovery charge				17.5	nC
$I_{RRM}$	Reverse recovery current				1.4	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

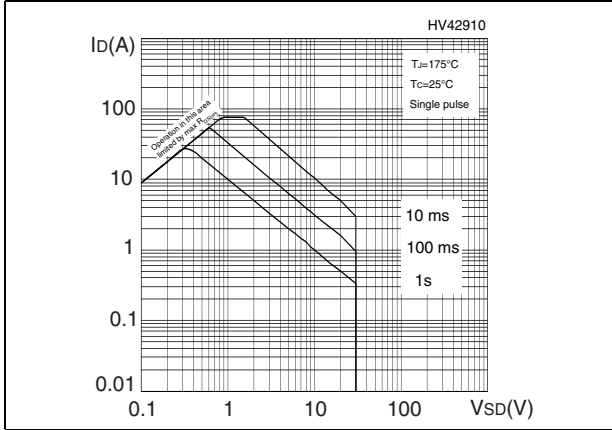


Figure 3. Thermal impedance

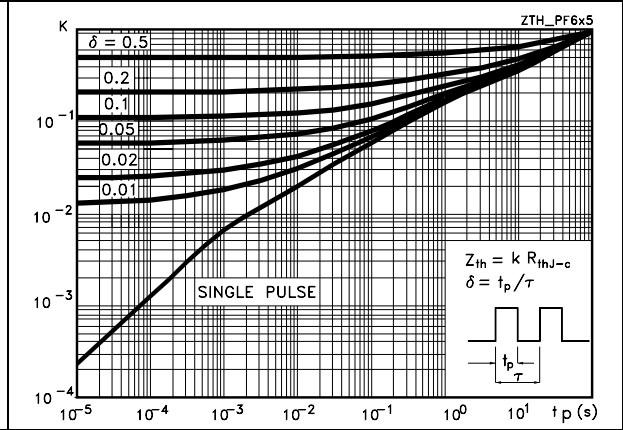


Figure 4. Output characteristics

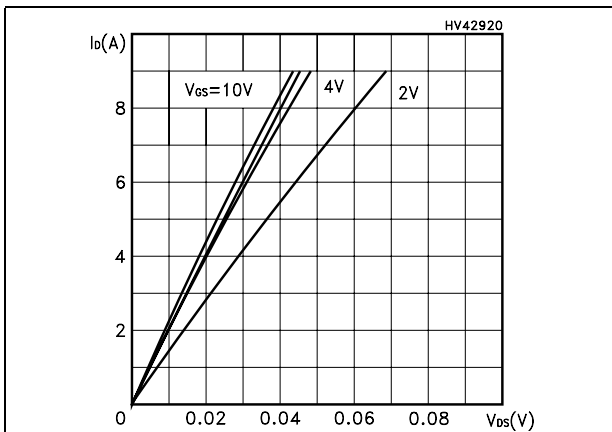


Figure 5. Transfer characteristics

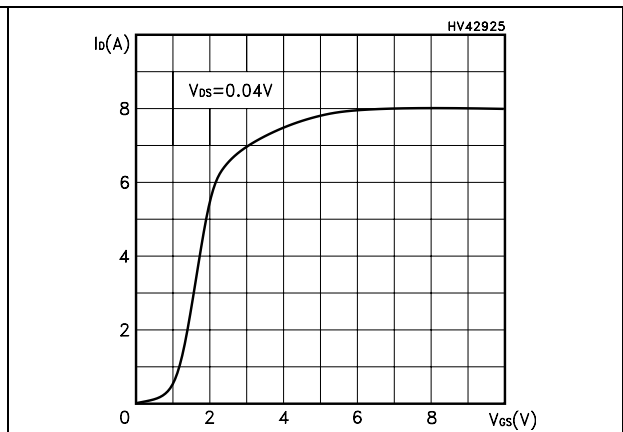


Figure 6. Normalized  $B_{V_{DSS}}$  vs temperature

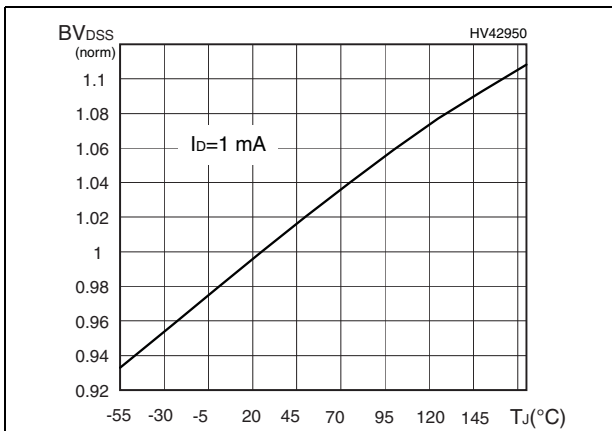


Figure 7. Static drain-source on resistance

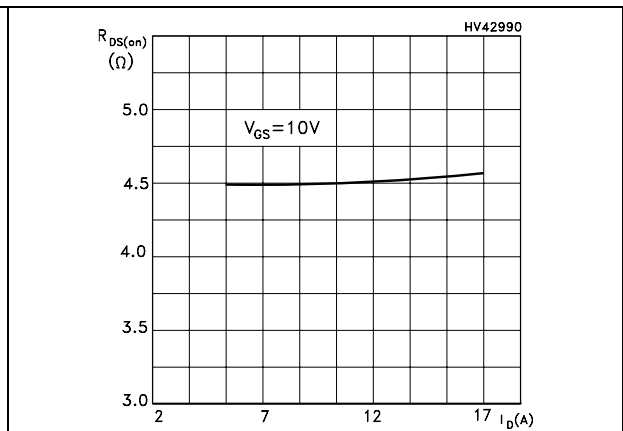


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

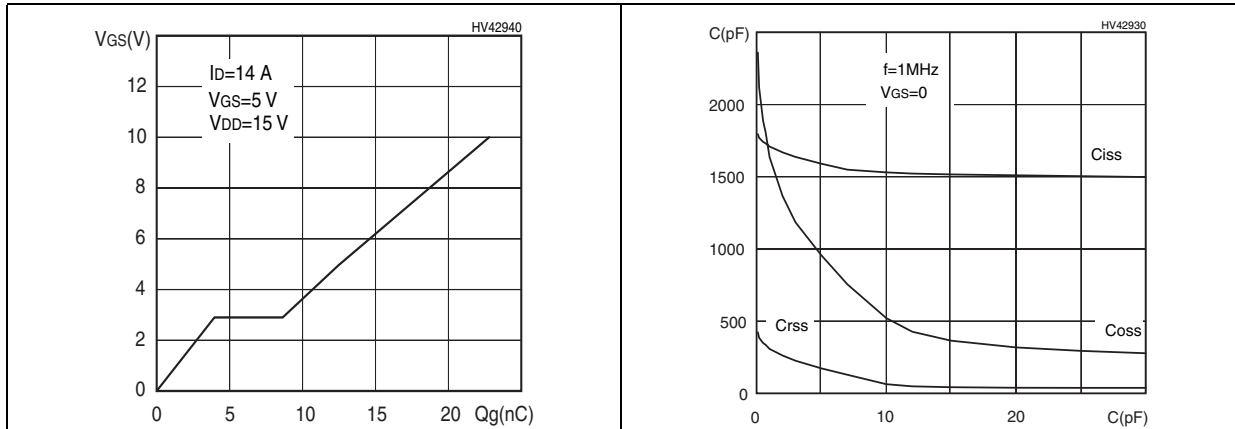


Figure 10. Normalized gate threshold voltage vs temperature

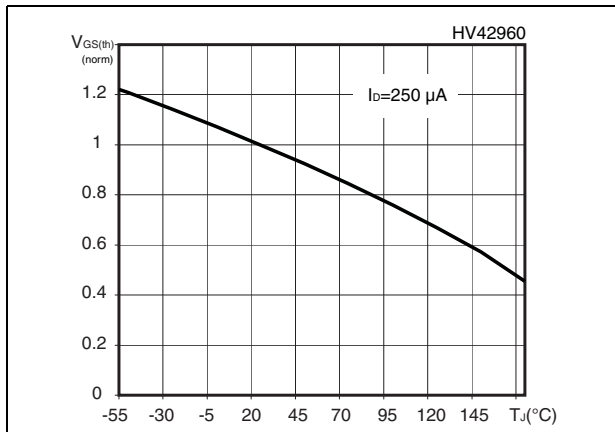


Figure 11. Normalized on resistance vs temperature

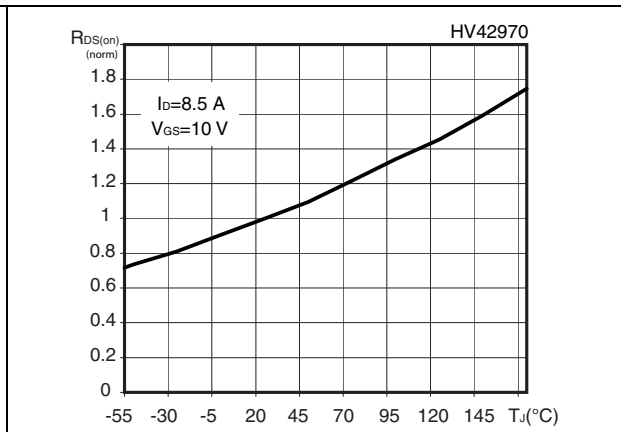
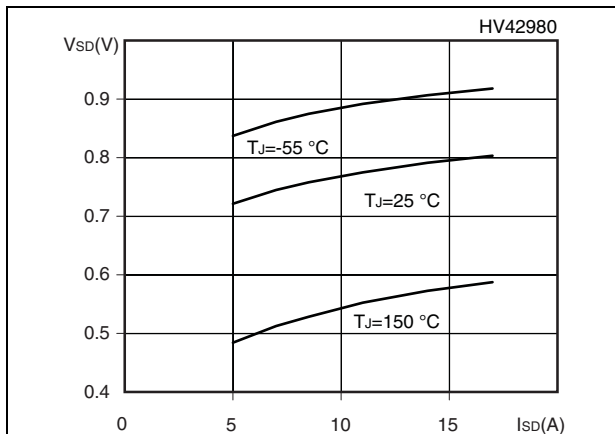


Figure 12. Source-drain diode forward characteristics

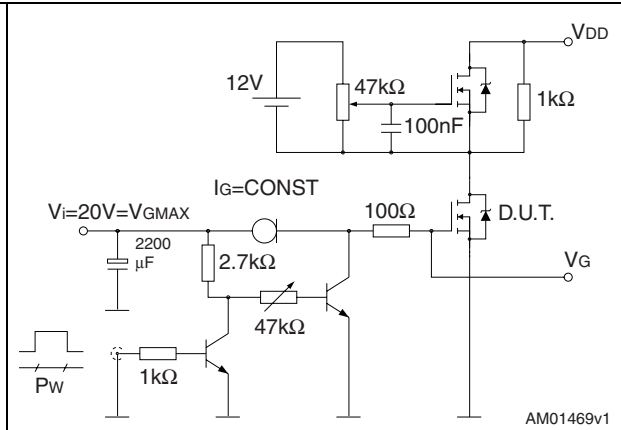


### 3 Test circuits

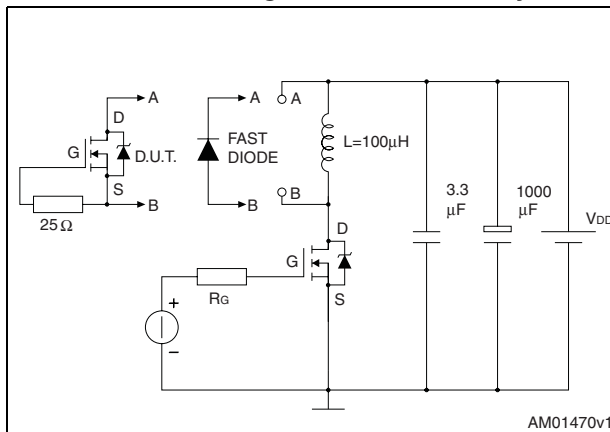
**Figure 13. Switching times test circuit for resistive load**



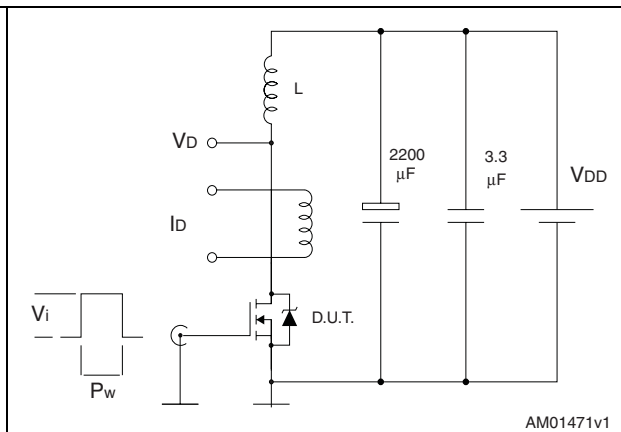
**Figure 14. Gate charge test circuit**



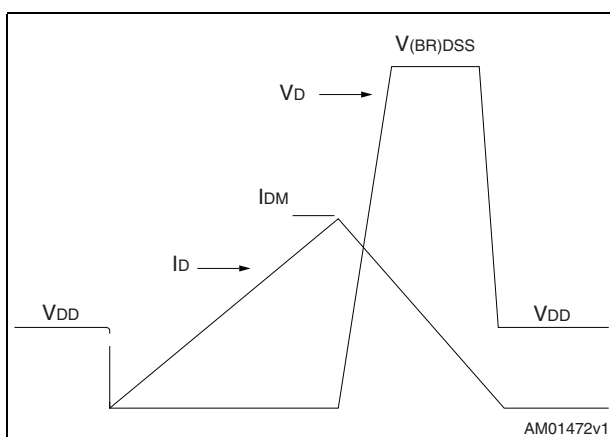
**Figure 15. Test circuit for inductive load switching and diode recovery times**



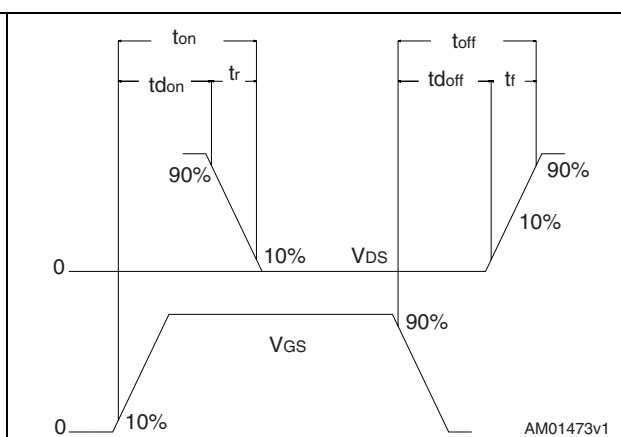
**Figure 16. Unclamped inductive load test circuit**



**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 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 mechanical data

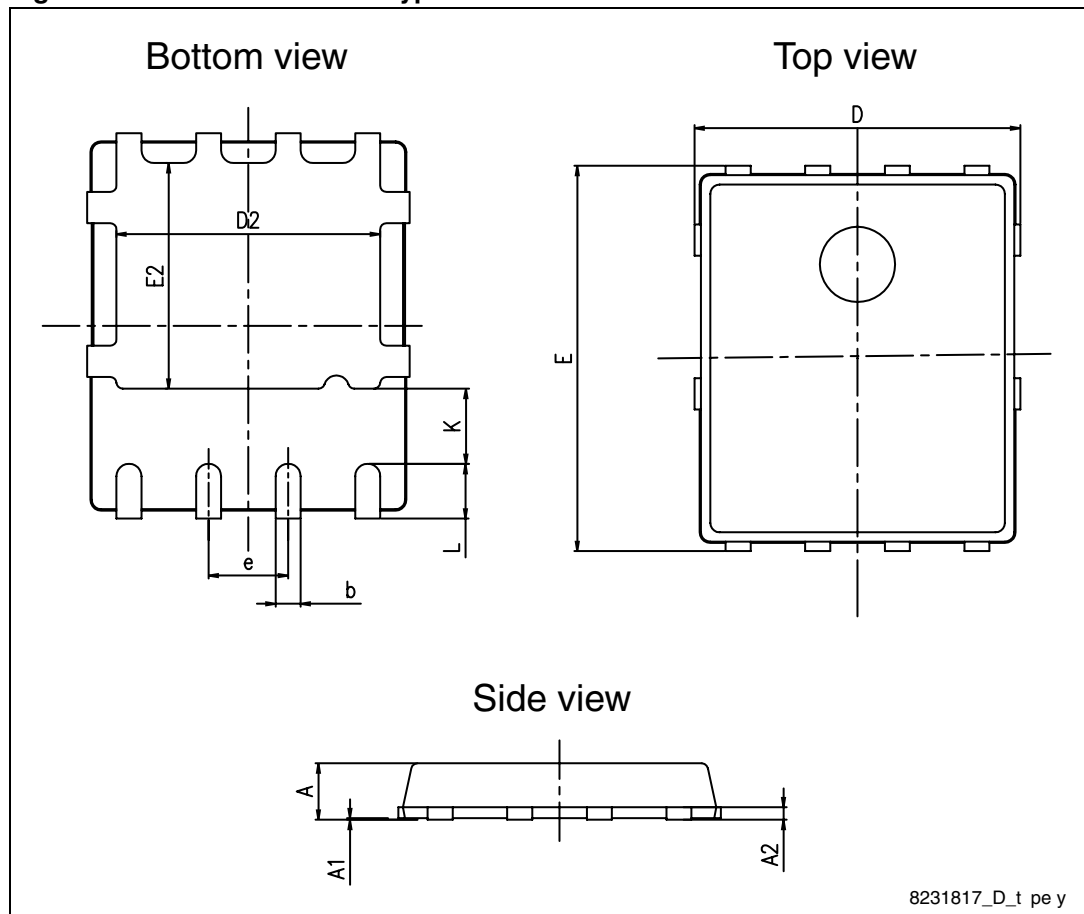
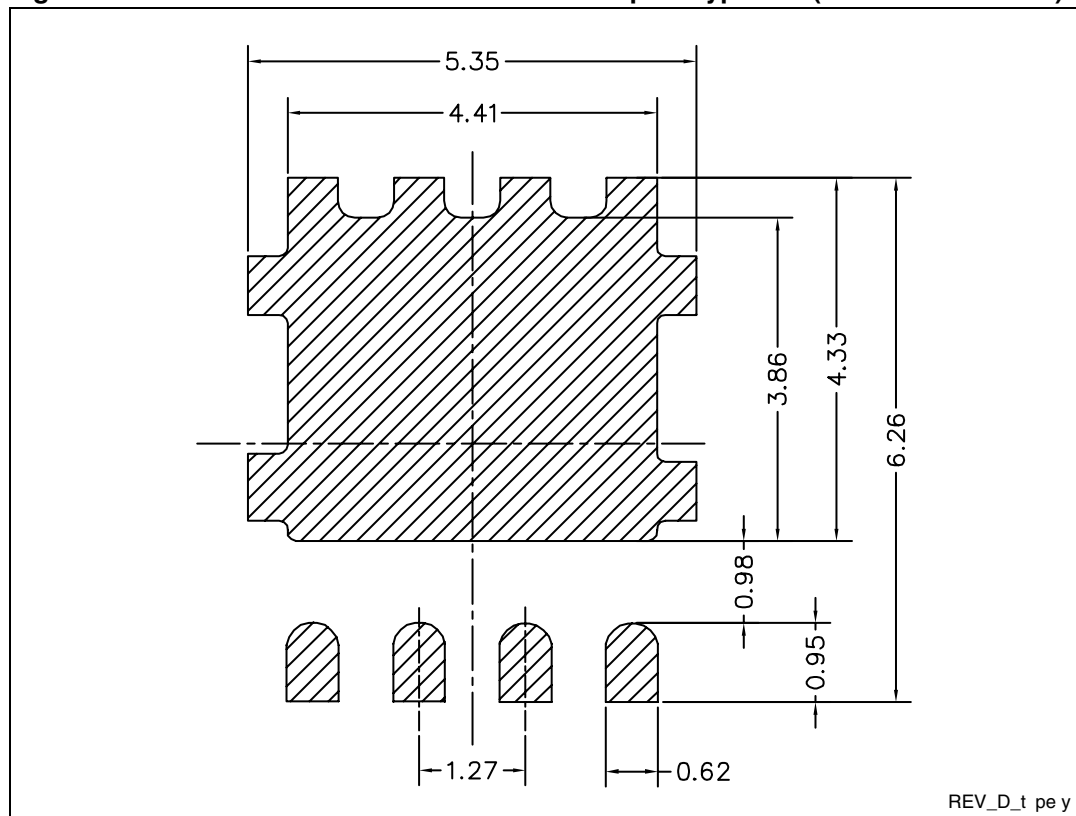


Figure 20. PowerFLAT™ 5x6 recommended footprint type S-C (dimensions in mm)



## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
19-Oct-2011	1	First release.

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