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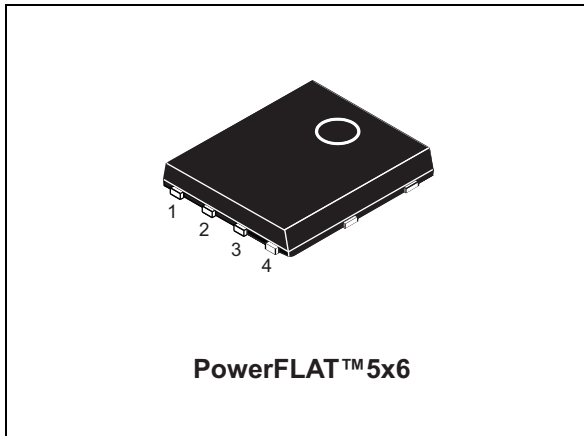
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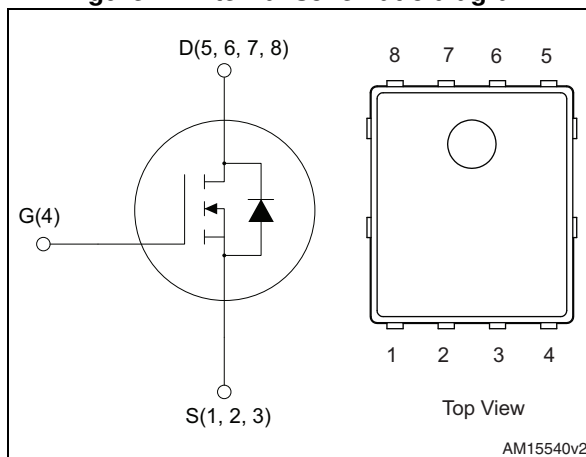


## N-channel 30 V, 0.0014 $\Omega$ typ., 35 A STripFET™ V Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data



**Figure 1. Internal schematic diagram**



### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STL150N3LLH5	30 V	0.00175 $\Omega$	35 A <sup>(1)</sup>

1. The value is rated according to  $R_{thj-pcb}$

- $R_{DS(on)} * Q_g$  industry benchmark
- Extremely low on-resistance  $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power losses

### Applications

- Switching applications

### 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 a FOM that is among the best in its class.

**Table 1. Device summary**

Order code	Marking	Packages	Packaging
STL150N3LLH5	150N3LH5	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	$\pm 22$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	195	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	122	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	35	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	21.8	A
$I_{DM}^{(3)}$	Drain current (pulsed)	140	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	114	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4	W
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

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

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.1	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	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,  $t < 10\text{ sec}$

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
$I_{AV}$	Not-repetitive avalanche current, (pulse width limited by $T_{j,max}$ )	17	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 24\text{ V}$ )	300	mJ

## 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	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current	$V_{DS} = 30\text{ V}$ $V_{GS} = 0$			1	$\mu\text{A}$
		$V_{DS} = 30\text{ V}$ , $V_{GS} = 0$ $T_C = 125\text{ °C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{GS} = \pm 22\text{ V}$ , $V_{DS} = 0$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1	1.55	2.2	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 17.5\text{ A}$		0.0014	0.00175	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 17.5\text{ A}$		0.0019	0.0024	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	5800	-	pF
$C_{oss}$	Output capacitance		-	1147	-	pF
$C_{rss}$	Reverse transfer capacitance		-	127	-	pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 35\text{ A}$ $V_{GS} = 4.5\text{ V}$ (see Figure 14)	-	40	-	nC
$Q_{gs}$	Gate-source charge		-	13.4	-	nC
$Q_{gd}$	Gate-drain charge		-	14.9	-	nC
$R_G$	Gate input resistance	$f = 1\text{ MHz}$ , gate DC Bias = 0, test signal level = 20 mV, $I_D = 0$	-	1.1	-	$\Omega$

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=15\text{ V}$ , $I_D=17.5\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ (see Figure 13)	-	17.2	-	ns
$t_r$	Rise time		-	30.8	-	ns
$t_{d(off)}$	Turn-off delay time		-	65.8	-	ns
$t_f$	Fall time		-	47.8	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		35	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		140	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 35\text{ A}$ , $V_{GS}=0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 35\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 25\text{ V}$	-	43.8		ns
$Q_{rr}$	Reverse recovery charge		-	46		nC
$I_{RRM}$	Reverse recovery current		-	2.1		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

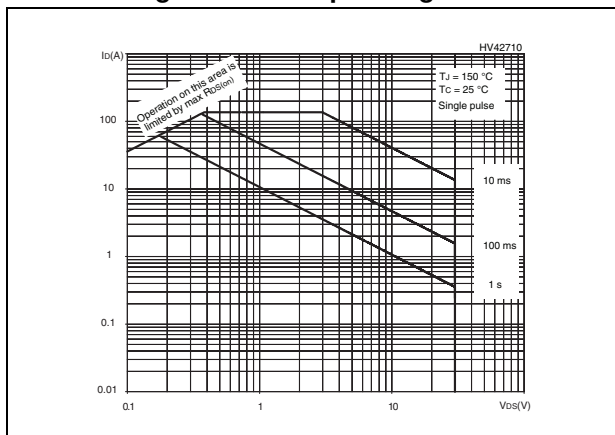


Figure 3. Thermal impedance

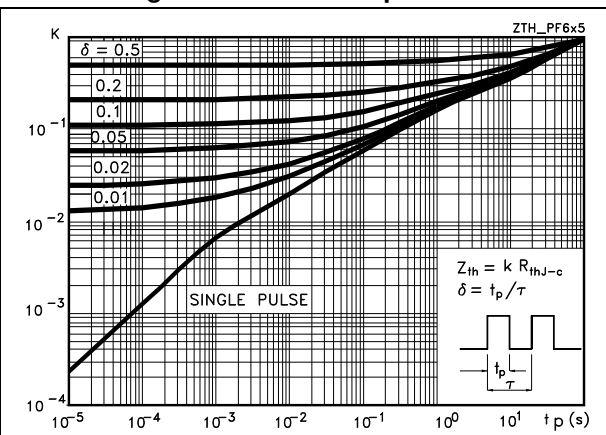


Figure 4. Output characteristics

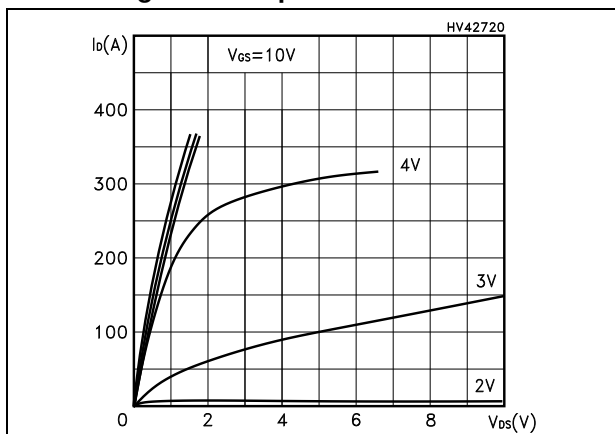


Figure 5. Transfer characteristics

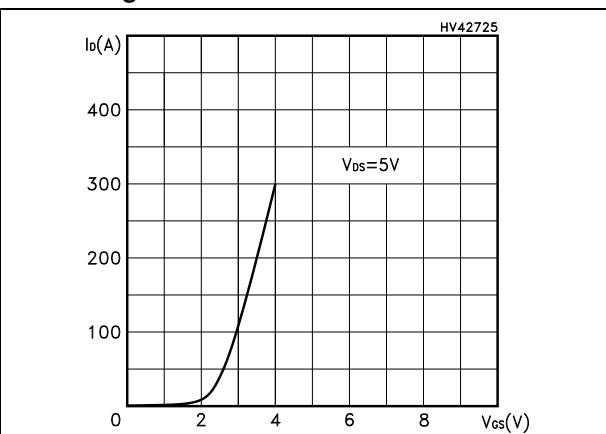


Figure 6. Normalized BV<sub>DSS</sub> vs temperature

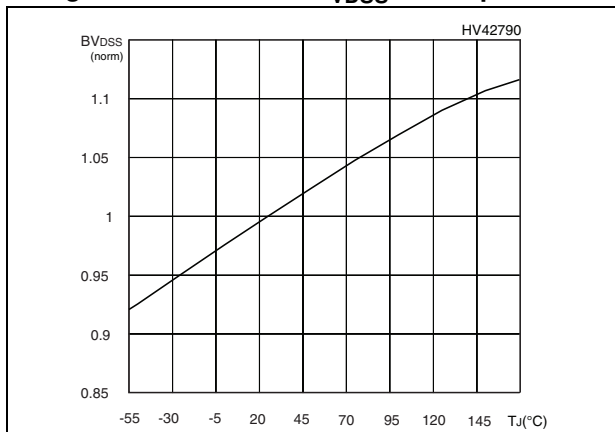


Figure 7. Static drain-source on-resistance

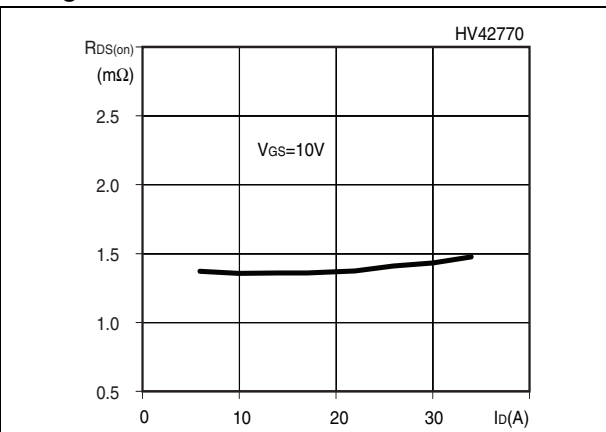


Figure 8. Gate charge vs gate-source voltage

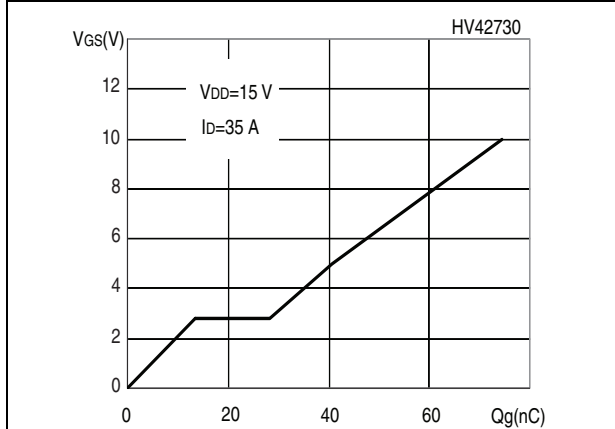


Figure 9. Capacitance variations

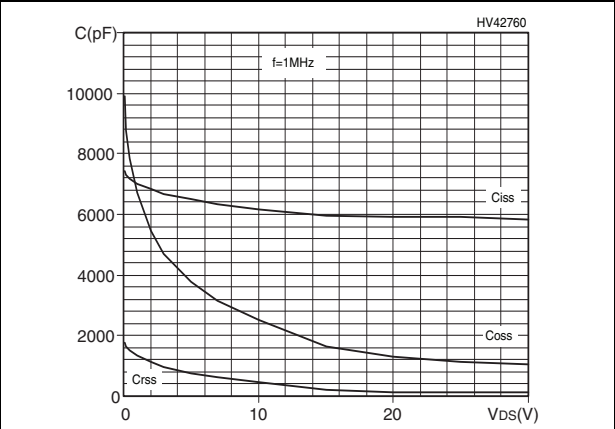


Figure 10. Normalized gate threshold voltage vs temperature

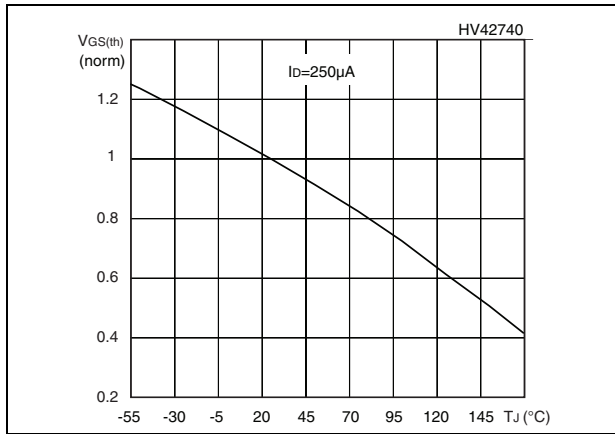


Figure 11. Normalized on-resistance vs temperature

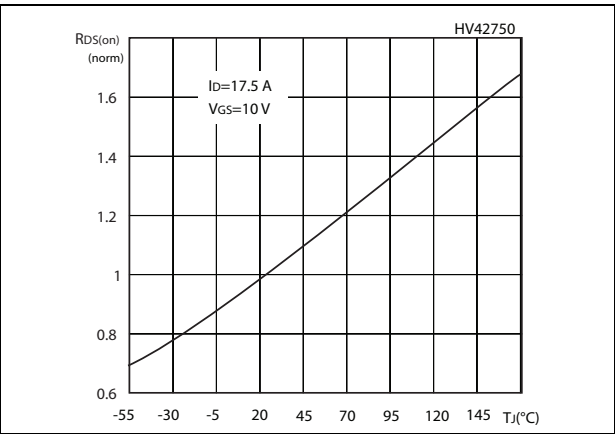
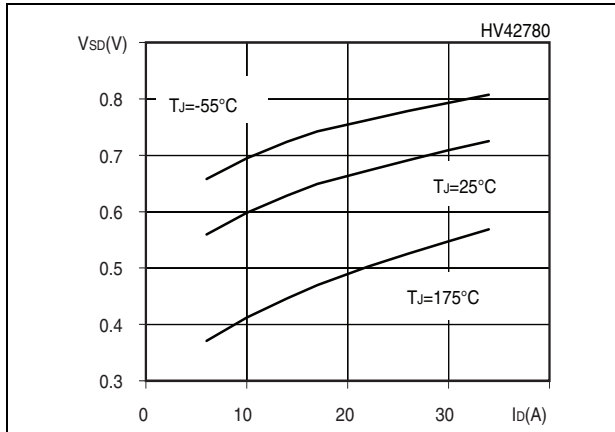


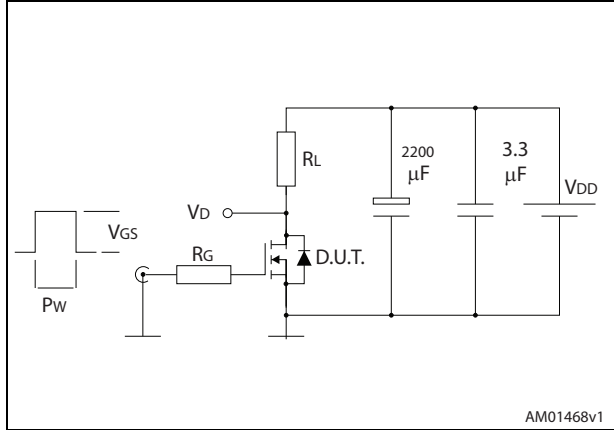
Figure 12. Source-drain diode forward characteristics



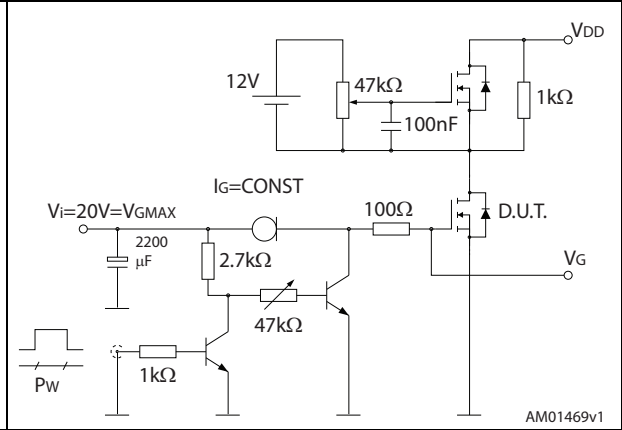


### 3 Test circuits

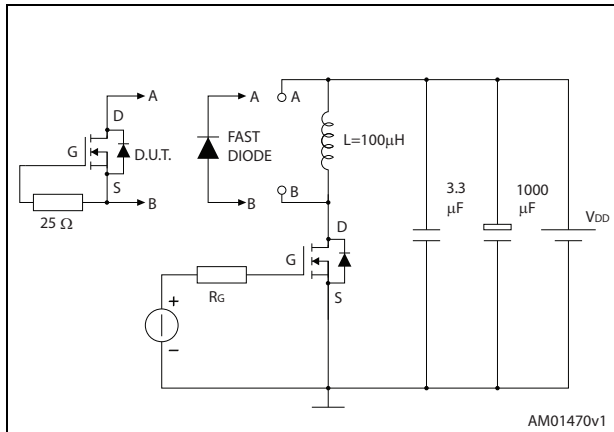
**Figure 13. Switching times test circuit for resistive load**



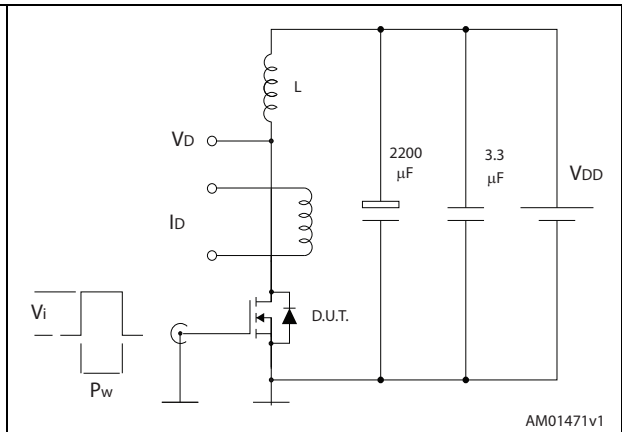
**Figure 14. Gate charge test circuit**



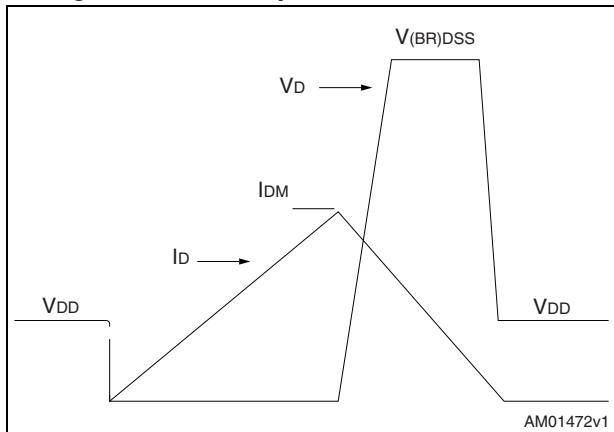
**Figure 15. Test circuit for inductive load switching and diode recovery times**



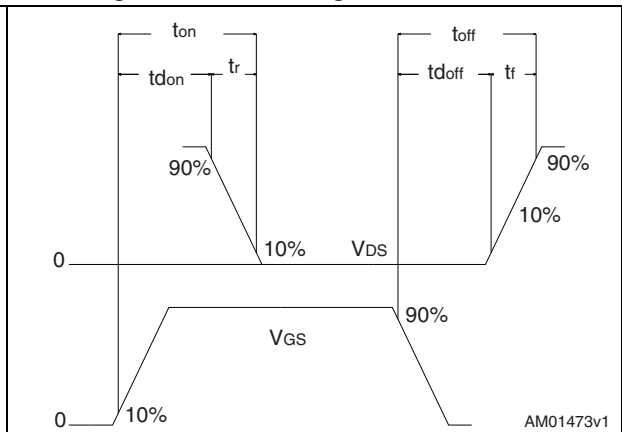
**Figure 16. Unclamped inductive load test circuit**



**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<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 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

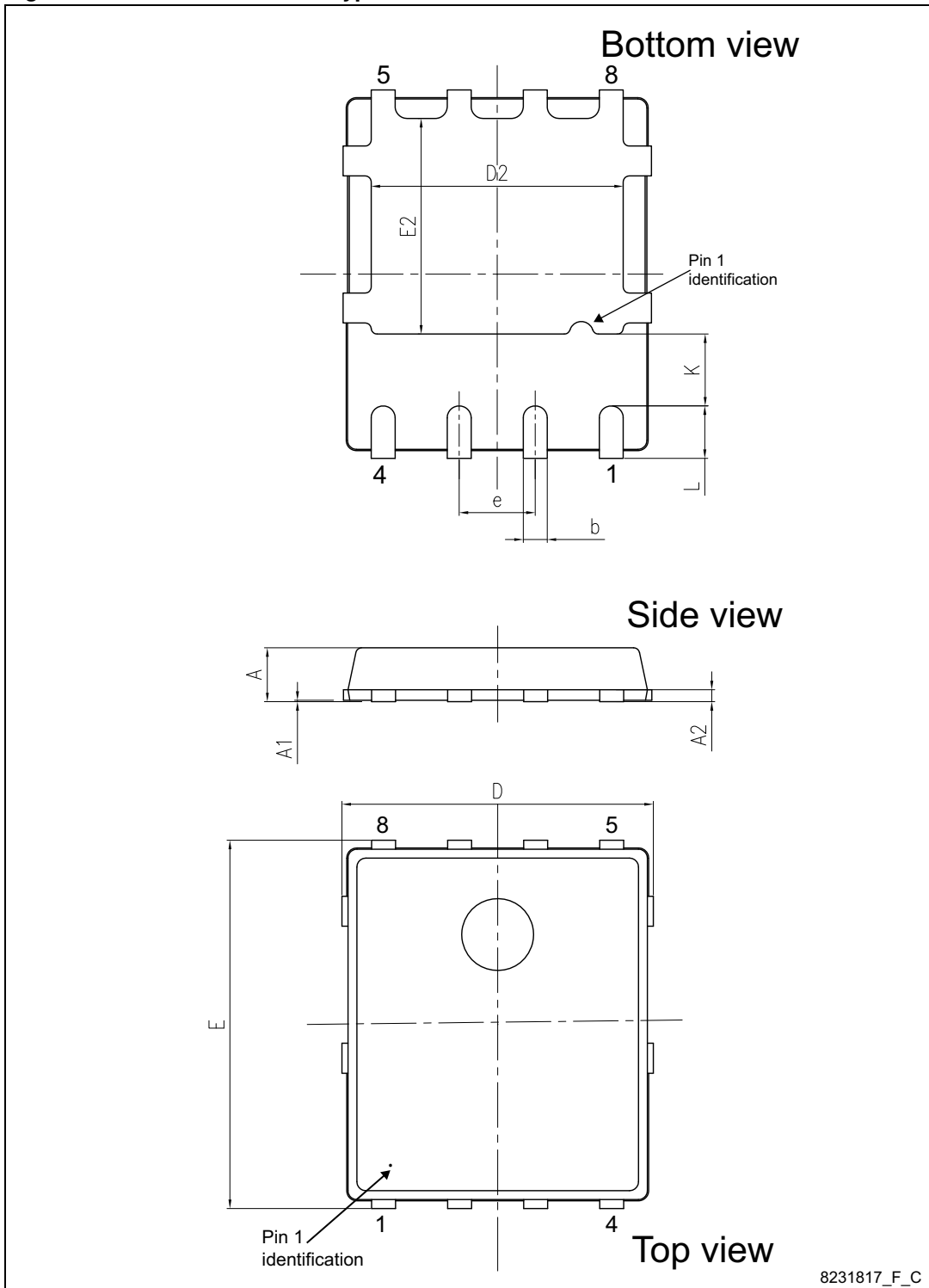
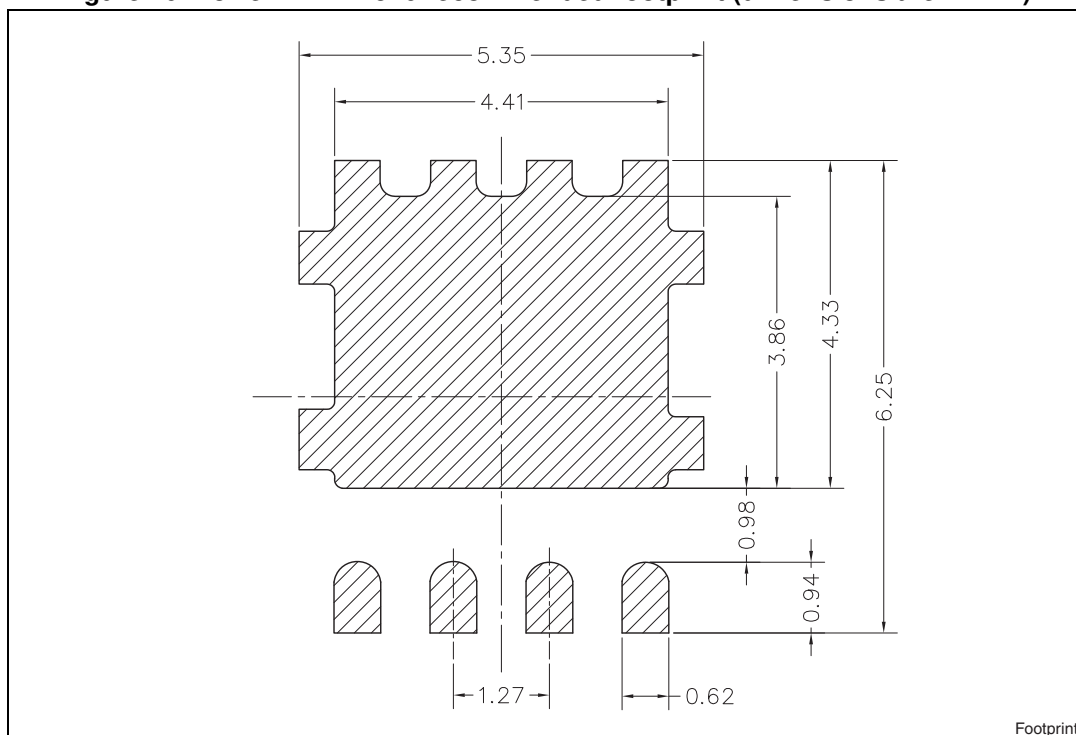


Figure 20. PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



## 5 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
22-Oct-2007	1	First release
01-Apr-2008	2	Document status promoted from preliminary data to datasheet
23-Sep-2008	3	$V_{GS}$ value has been changed on <a href="#">Table 2</a> and <a href="#">Table 5</a>
12-Jun-2009	4	$V_{GS(th)}$ value has been changed on <a href="#">Table 5</a>
05-Oct-2011	5	<a href="#">Section 4: Package mechanical data</a> has been updated. Minor text changes.
30-Aug-2013	6	<ul style="list-style-type: none"> <li>– Modified: <a href="#">Figure 1</a> and marking in <a href="#">Table 1</a></li> <li>– Modified: <math>I_D</math> value in <a href="#">Figure 11</a></li> <li>– Updated: <a href="#">Figure 13</a>, <a href="#">14</a>, <a href="#">15</a> and <a href="#">16</a></li> <li>– Updated: <a href="#">Section 4: Package mechanical data</a></li> </ul>

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