

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

Datasheet - production data

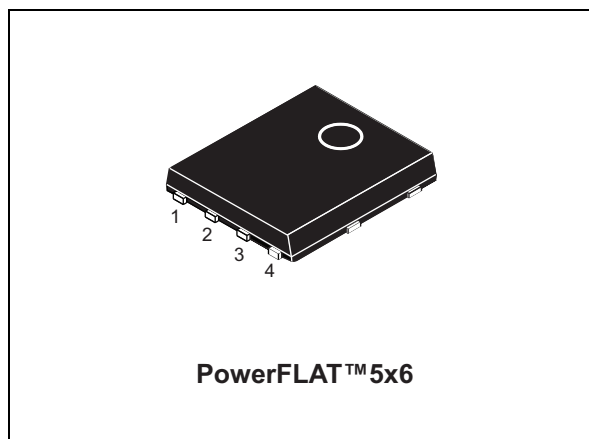
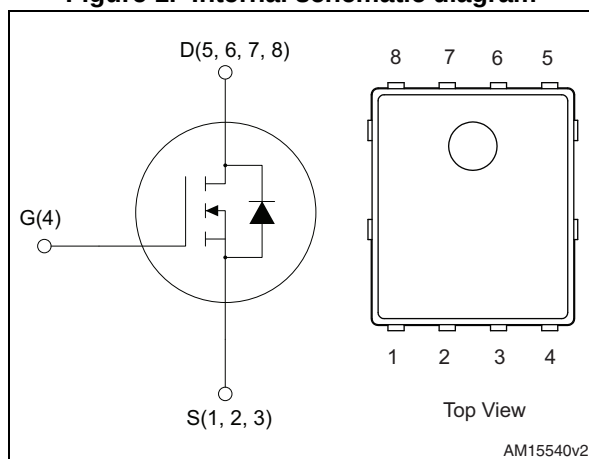


Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STL150N3LLH5	30 V	0.00175 Ω	35 A ⁽¹⁾

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

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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	± 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	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	$^{\circ}\text{C/W}$

1. When mounted on FR-4 board of 1inch², 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

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 30\text{ V}$ $V_{GS} = 0$			1	μA
		$V_{DS} = 30\text{ V}$, $V_{GS} = 0$ $T_C = 125\text{ }^{\circ}\text{C}$			10	μA
I_{GSS}	Gate body leakage current	$V_{GS} = \pm 22\text{ V}$, $V_{DS} = 0$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	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	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 17.5\text{ A}$		0.0019	0.0024	Ω

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	$V_{DD} = 15\text{ V}$, $I_D = 35\text{ A}$	-	40	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 4.5\text{ V}$	-	13.4	-	nC
Q_{gd}	Gate-drain charge	(see Figure 14)	-	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	-	Ω

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 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

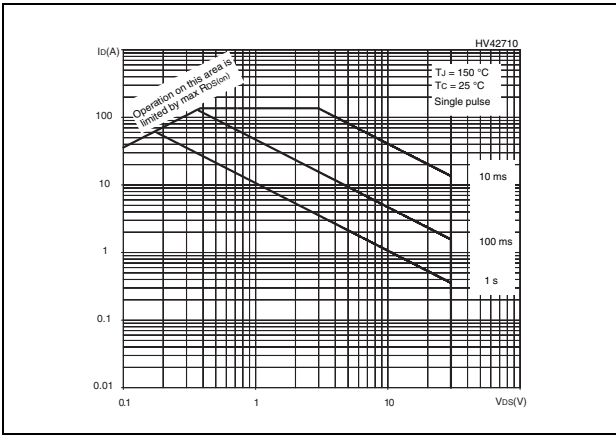


Figure 3. Thermal impedance

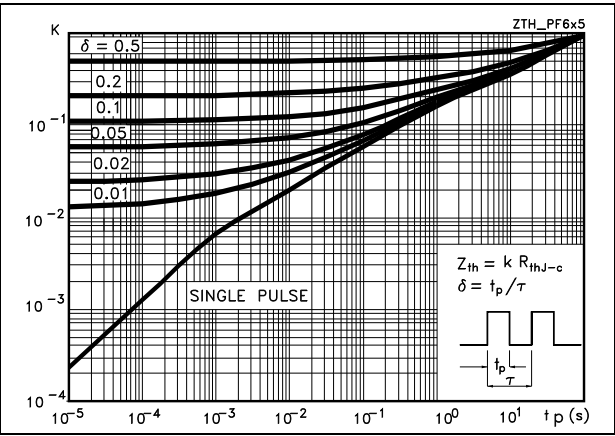


Figure 4. Output characteristics

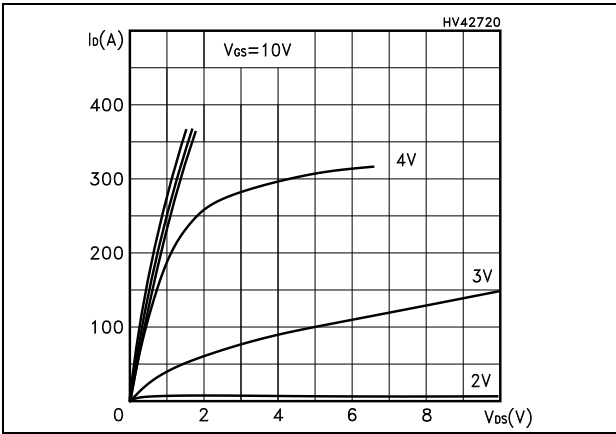


Figure 5. Transfer characteristics

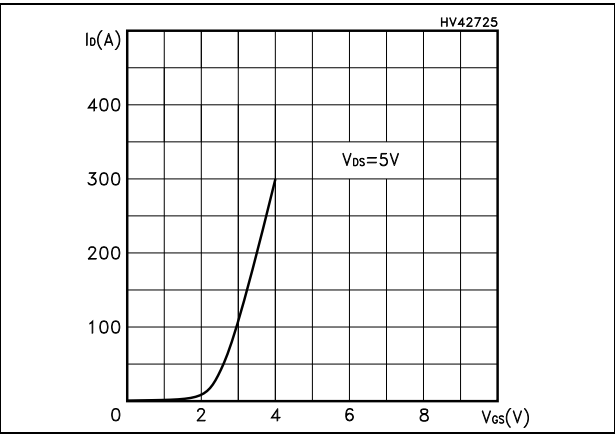


Figure 6. Normalized $B_{V_{DS}}$ vs temperature

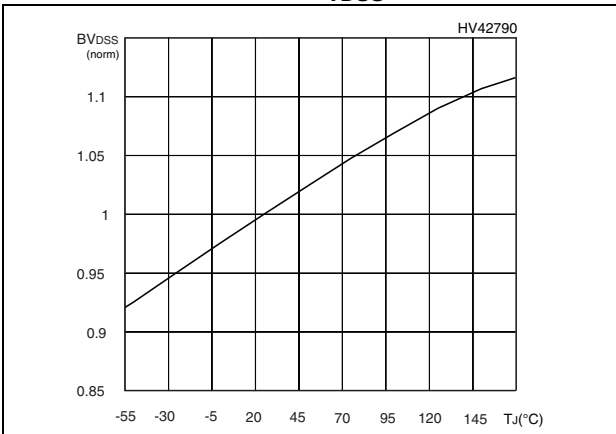


Figure 7. Static drain-source on-resistance

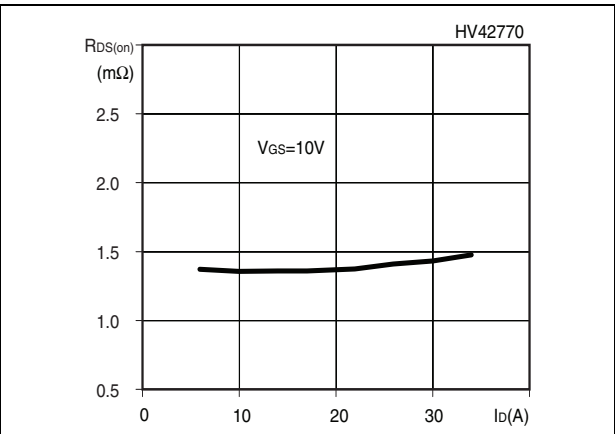


Figure 8. Gate charge vs gate-source voltage

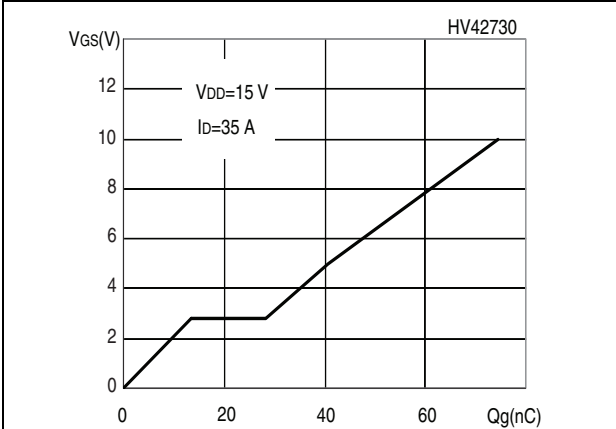


Figure 9. Capacitance variations

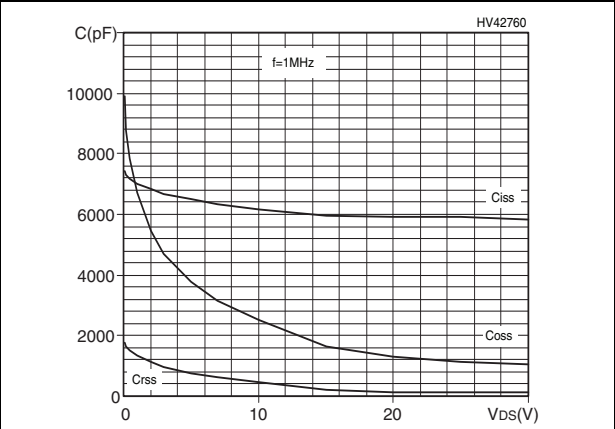


Figure 10. Normalized gate threshold voltage vs temperature

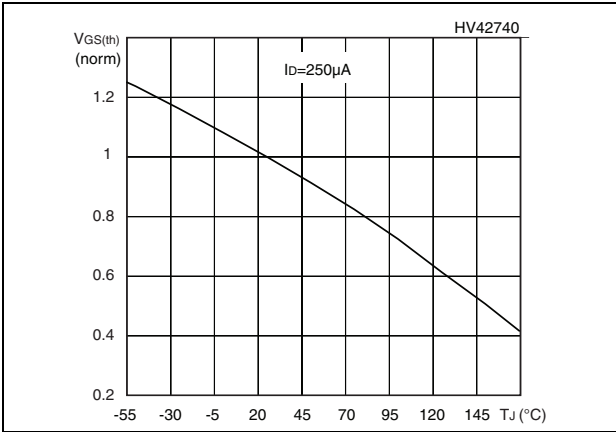


Figure 11. Normalized on-resistance vs temperature

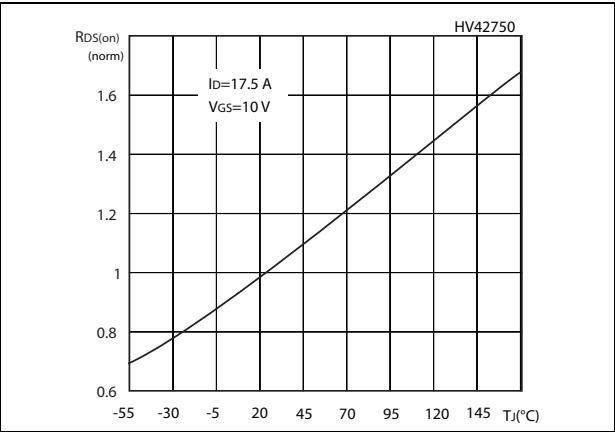
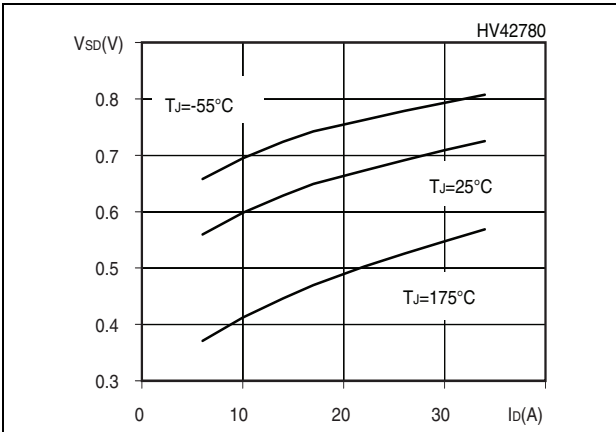


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

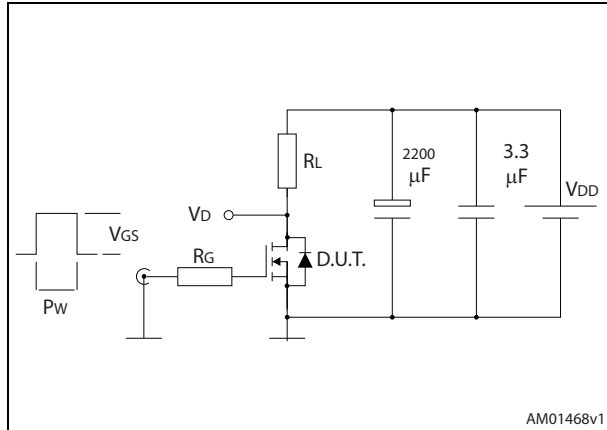


Figure 14. Gate charge test circuit

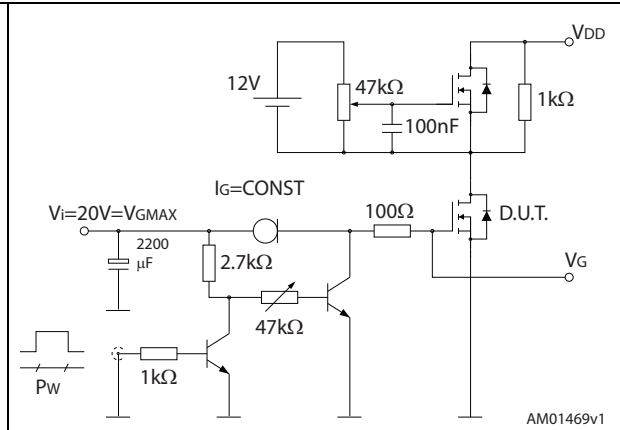


Figure 15. Test circuit for inductive load switching and diode recovery times



Figure 16. Unclamped inductive load test circuit

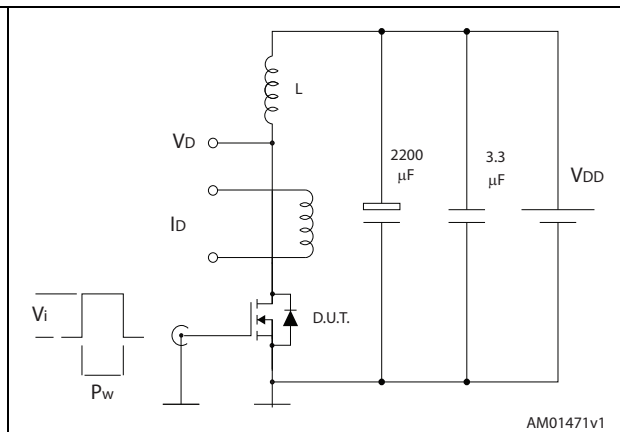
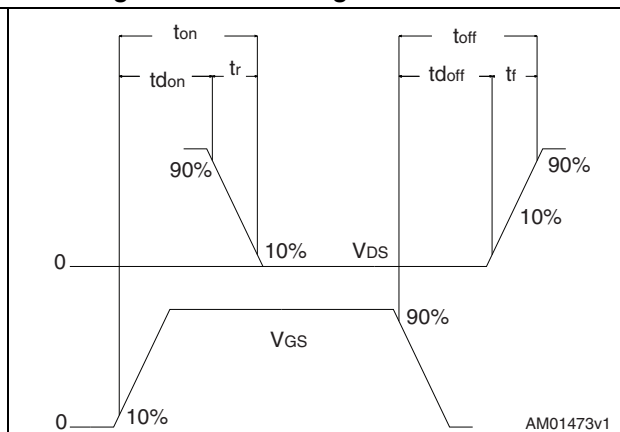


Figure 17. Unclamped inductive waveform



Figure 18. Switching time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: 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

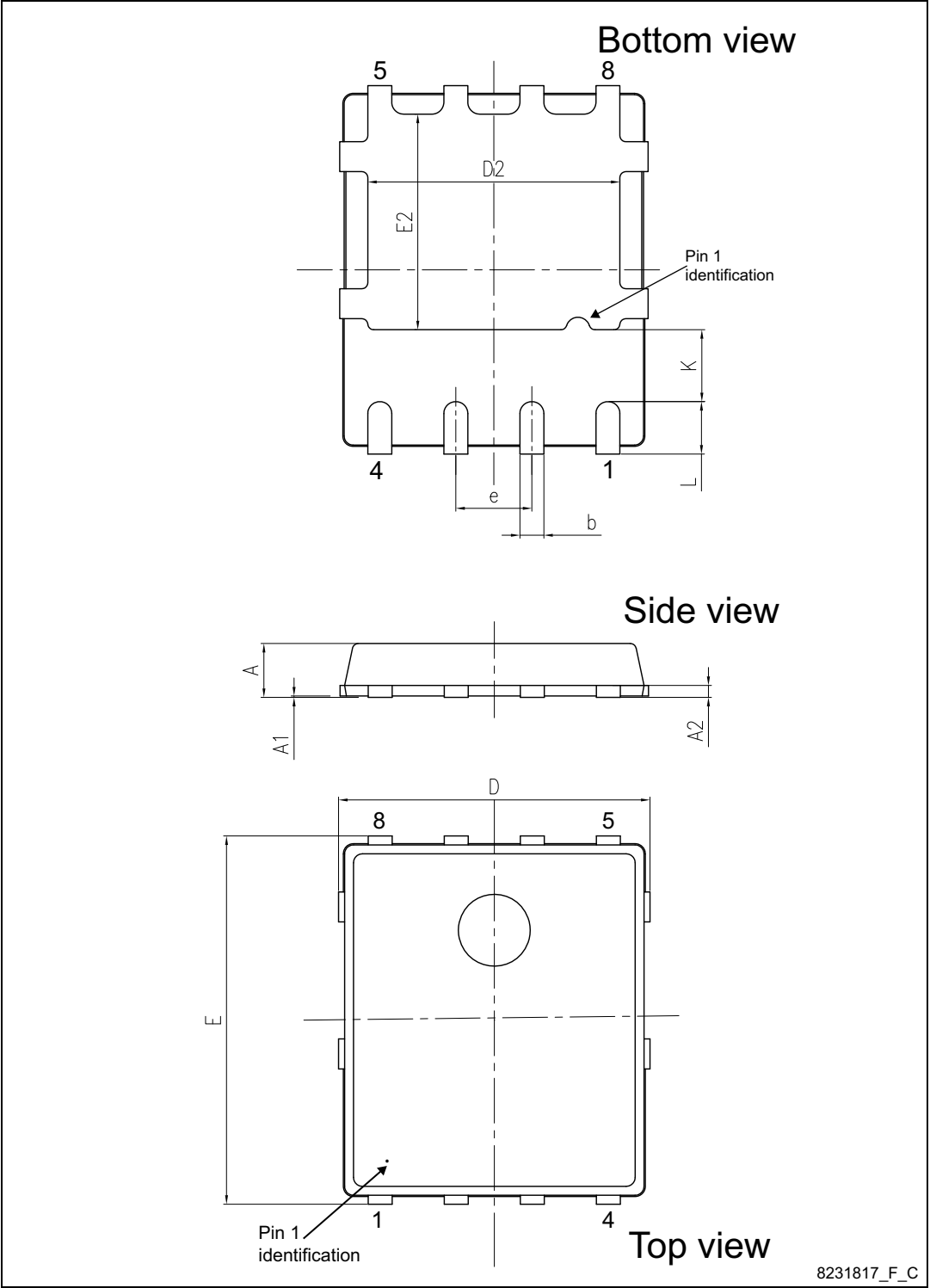
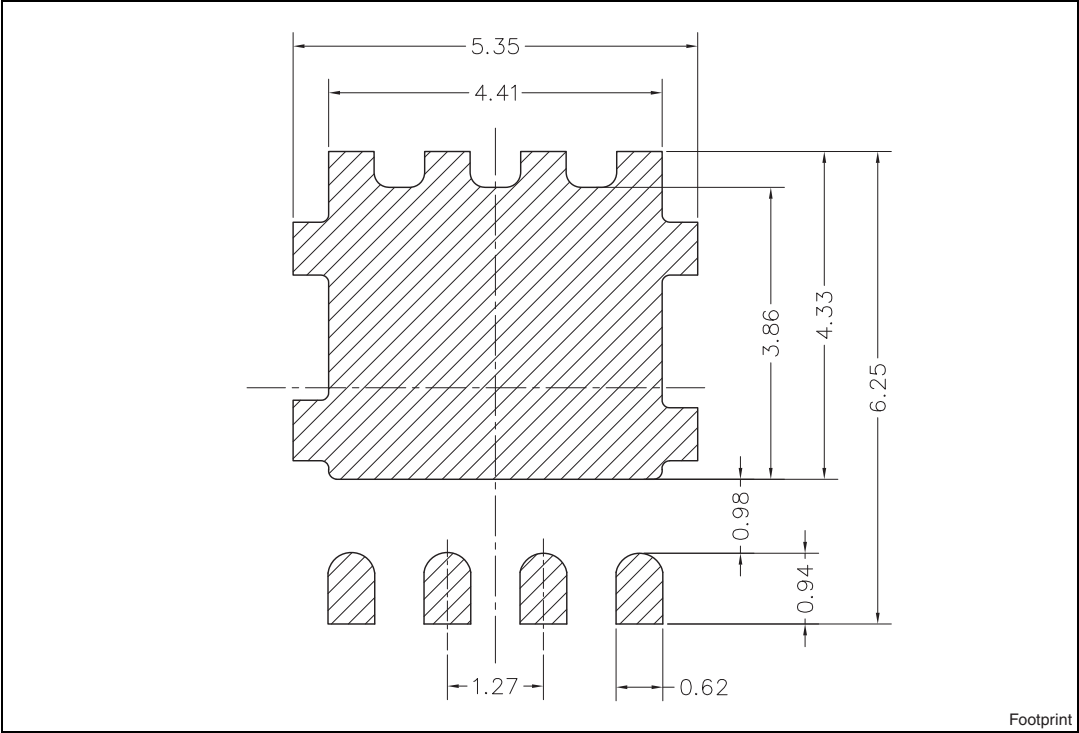


Figure 20. PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)



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 Table 2 and Table 5
12-Jun-2009	4	$V_{GS(th)}$ value has been changed on Table 5
05-Oct-2011	5	Section 4: Package mechanical data has been updated. Minor text changes.
30-Aug-2013	6	– Modified: Figure 1 and marking in Table 1 – Modified: I_D value in Figure 11 – Updated: Figure 13, 14, 15 and 16 – Updated: Section 4: Package mechanical data

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