STL160N3LLH6

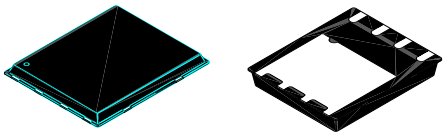
N-channel 30 V, 0.0011 Ω, 35 A PowerFLAT™ (5x6) STripFET™ VI DeepGATE™ Power MOSFET

Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STL160N3LLH6	30 V	0.0013 Ω	35 A (1)

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

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



PowerFLAT™ (5x6)

Application

Switching applications

Description

The STL160N3LLH6 is a N-channel 30 V Power MOSFET. This product utilizes the 6th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure.The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Figure 1. Internal schematic diagram

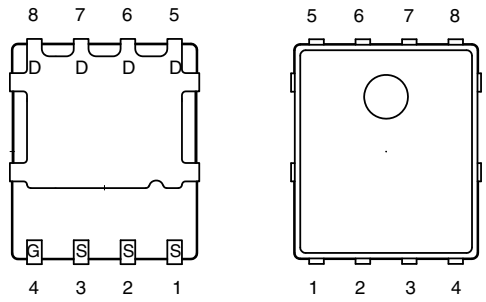


Table 1. Device summary

Order code	Marking	Package	Packaging
STL160N3LLH6	160N3LLH6	PowerFLAT™ (5x6)	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	30	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	160	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	100	A
I_D (2)	Drain current (continuous) at T_C = 25 °C	35	A
I_D (2)	Drain current (continuous) at T_C=100 °C	21.8	A
I_{DM} (3)	Drain current (pulsed)	140	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	80	W
P_{TOT} (3)	Total dissipation at T_C = 25 °C	4	W
	Derating factor	0.03	W/°C
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 150	°C

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

Table 3. Thermal data

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

1. When mounted on FR-4 board of 1inch², 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)	35	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AV})	900	mJ

2 Electrical characteristics

(T_{CASE} = 25 °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 µA, V_{GS}= 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating @125 °C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	1			V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10 V, I_D= 17.5 A V_{GS}= 4.5 V, I_D= 17.5 A		0.0011 0.0016	0.0013 0.0020	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f=1 MHz, V_{GS}=0	-	6375 1230 675	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=15 V, I_D = 35 A V_{GS} =4.5 V *(see Figure 14)*	-	61.5 20 24	-	nC nC nC
R_G	Gate input resistance	f=1 MHz gate DC bias = 0 test signal level = 20 mV open drain	-	1.4	-	Ω

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= 17.5 A,		18.5		ns
t_r	Rise time	R_G=4.7 Ω, V_{GS}=10 V	-	32	-	ns
$t_{d(off)}$	Turn-off delay time	*(see Figure 13)*		107.5		ns
t_f	Fall time			54		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 A, V_{GS}=0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 35 A,		37.2		ns
Q_{rr}	Reverse recovery charge	di/dt = 100 A/µs,	-	36		nC
I_{RRM}	Reverse recovery current	V_{DD}=25 V		1.9		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration=300µs, duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

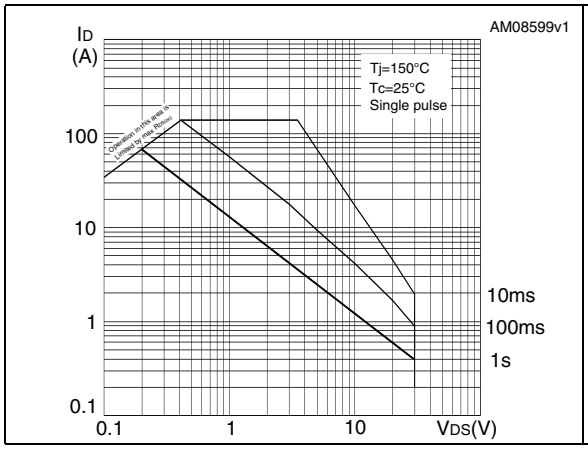


Figure 3. Thermal impedance

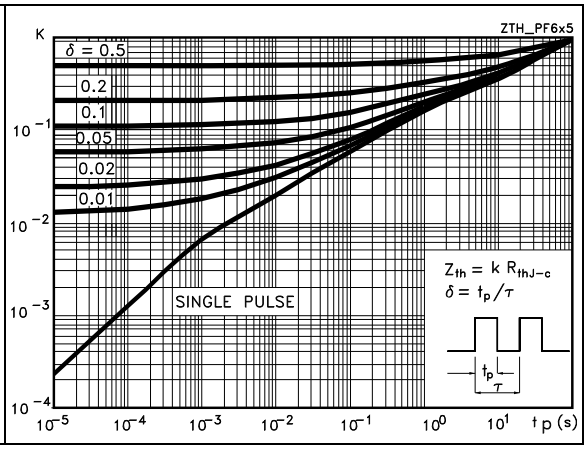


Figure 4. Output characteristics

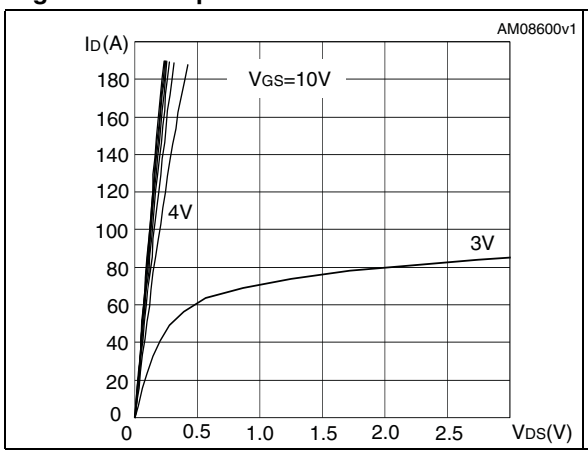


Figure 5. Transfer characteristics

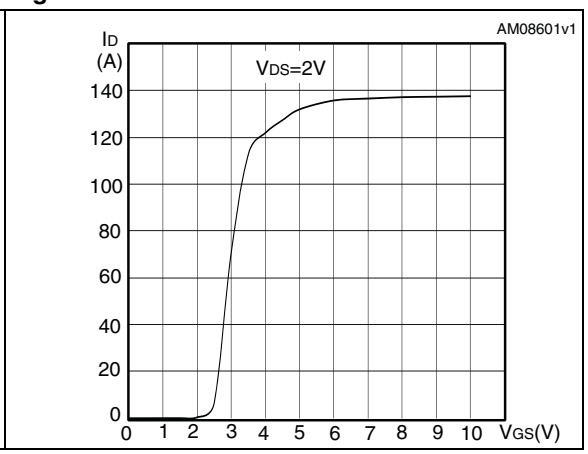


Figure 6. Normalized B_{VDSS} vs temperature

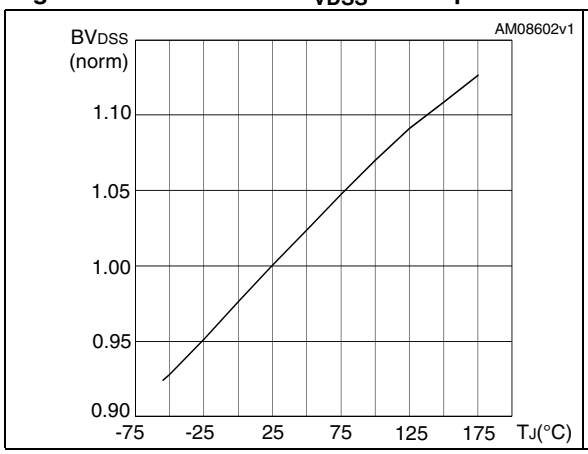


Figure 7. Static drain-source on resistance

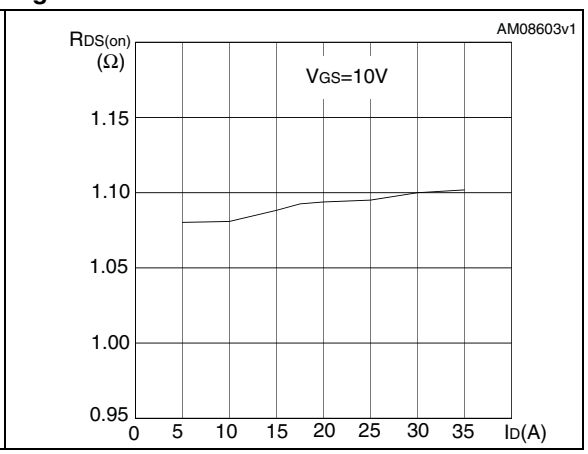


Figure 8. Gate charge vs gate-source voltage

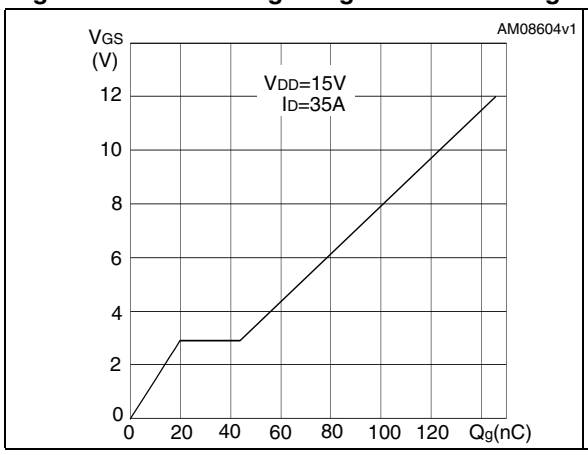


Figure 9. Capacitance variations

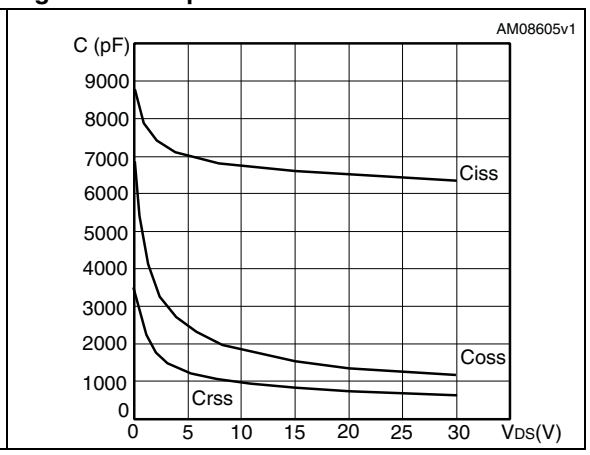


Figure 10. Normalized gate threshold voltage vs temperature

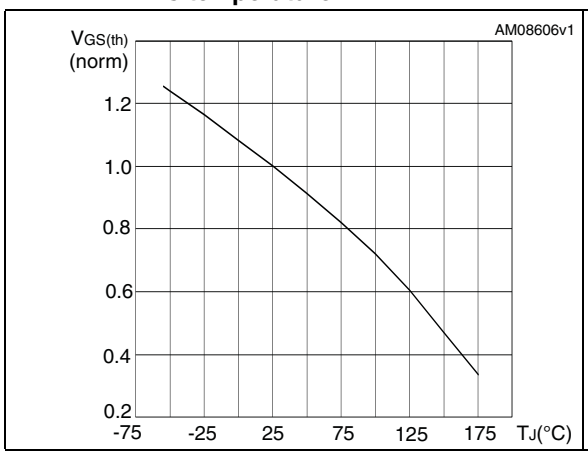


Figure 11. Normalized on resistance vs temperature

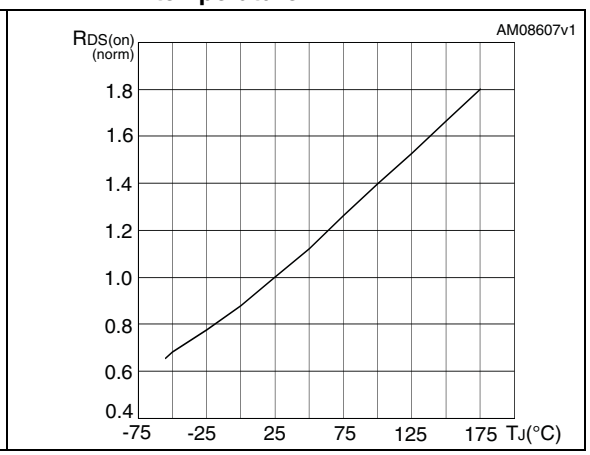
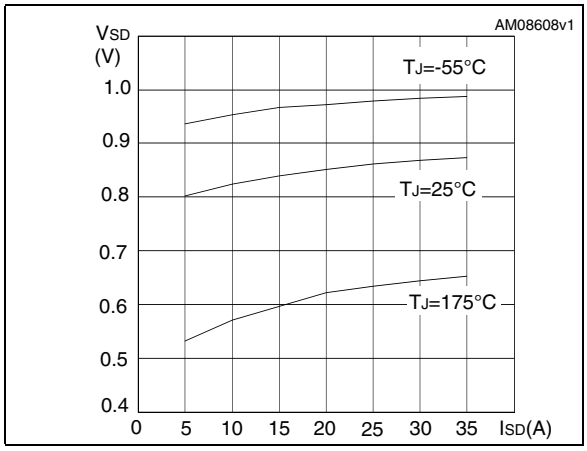


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

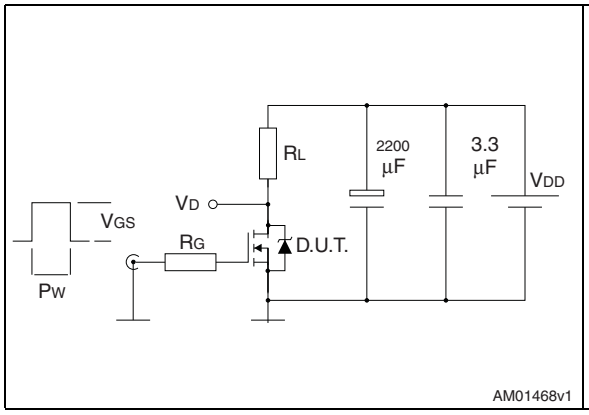


Figure 14. Gate charge test circuit

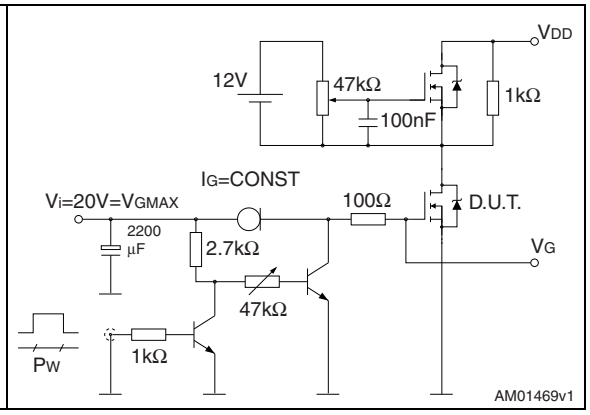


Figure 15. Test circuit for inductive load switching and diode recovery times

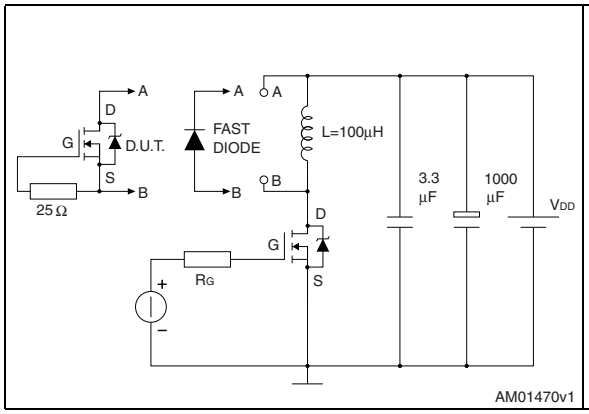


Figure 16. Unclamped inductive load test circuit

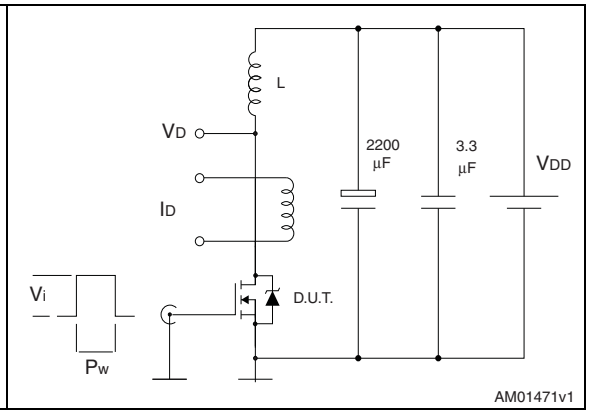


Figure 17. Unclamped inductive waveform

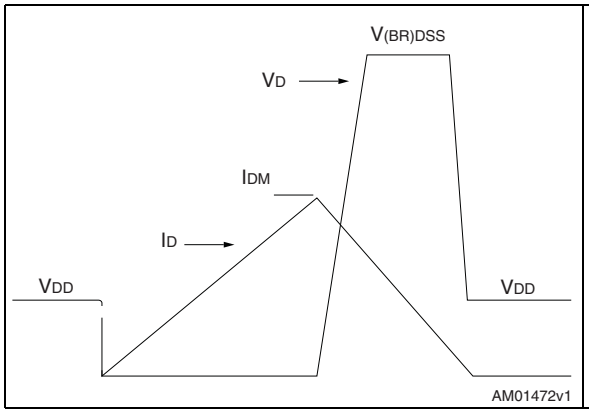
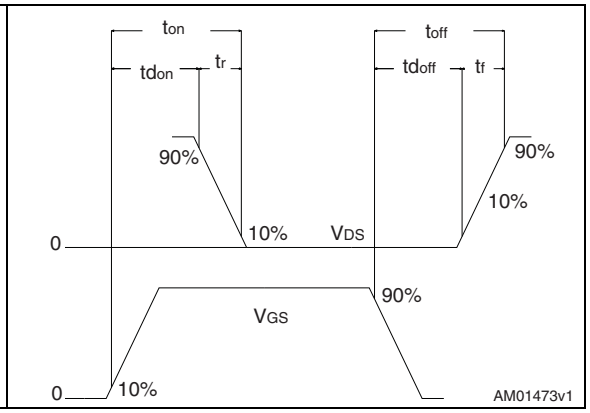


Figure 18. Switching time waveform



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 mechanical data_subcontractor

Dim.	mm		
	Min.	Typ.	Max.
A	0.80	0.83	0.93
A1		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 drawing_subcontractor

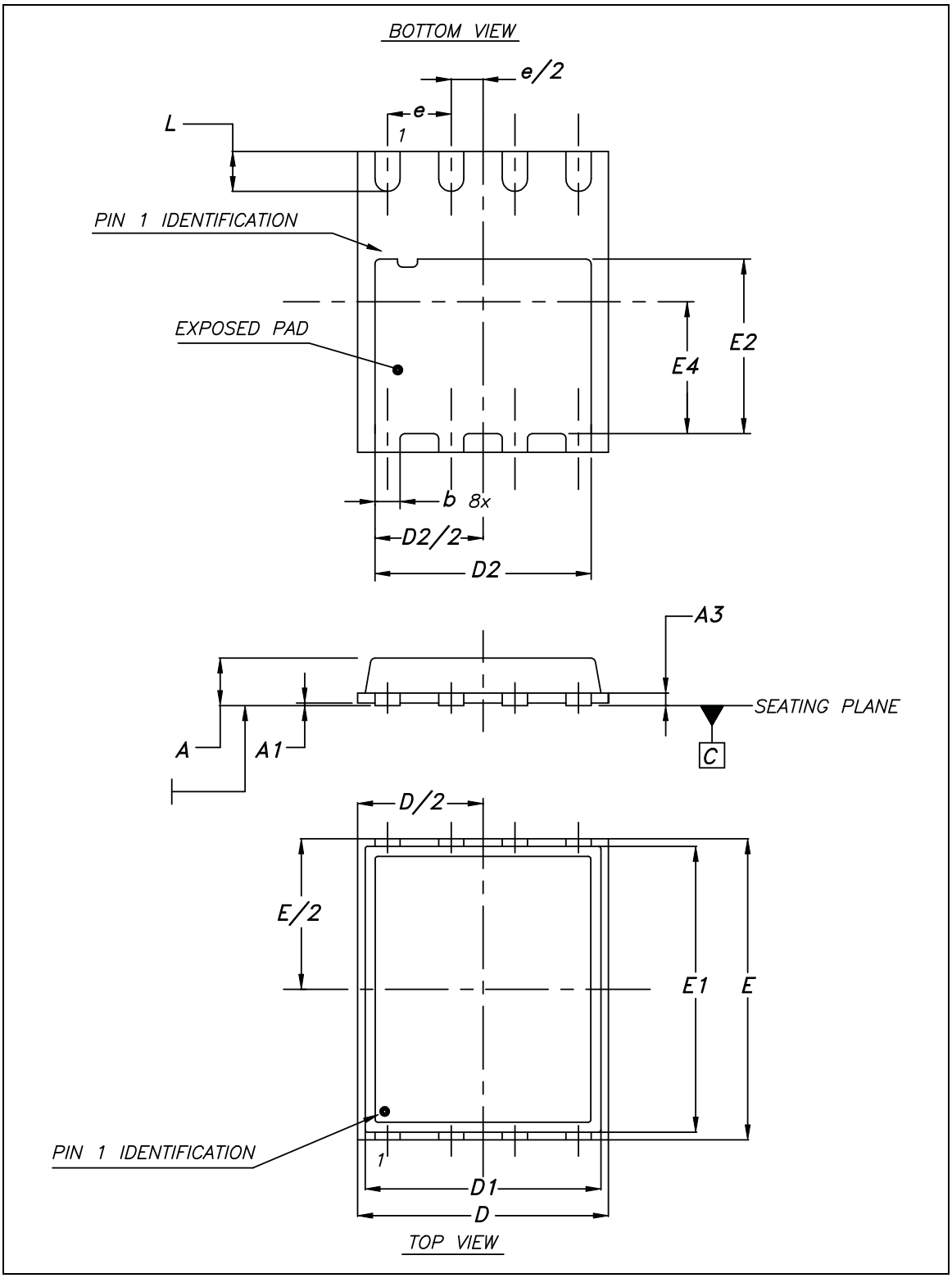


Table 10. PowerFLAT 5x6 mechanical data_ST

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 drawing_ST

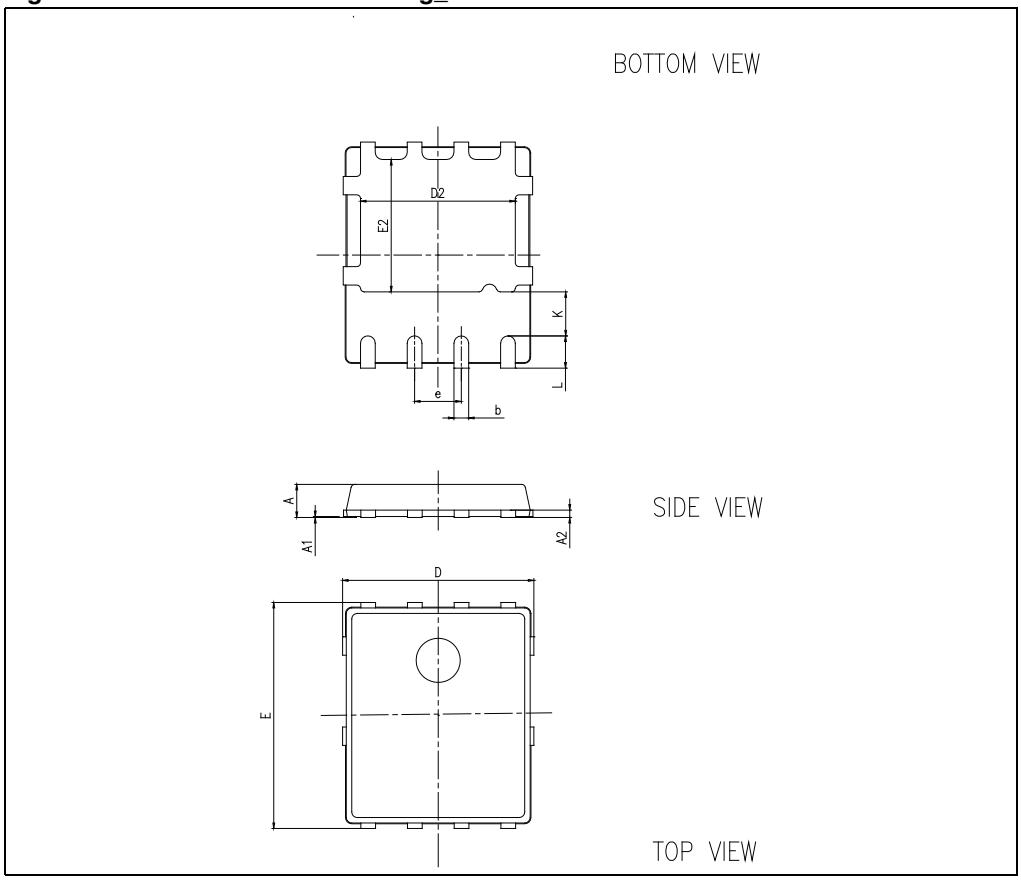
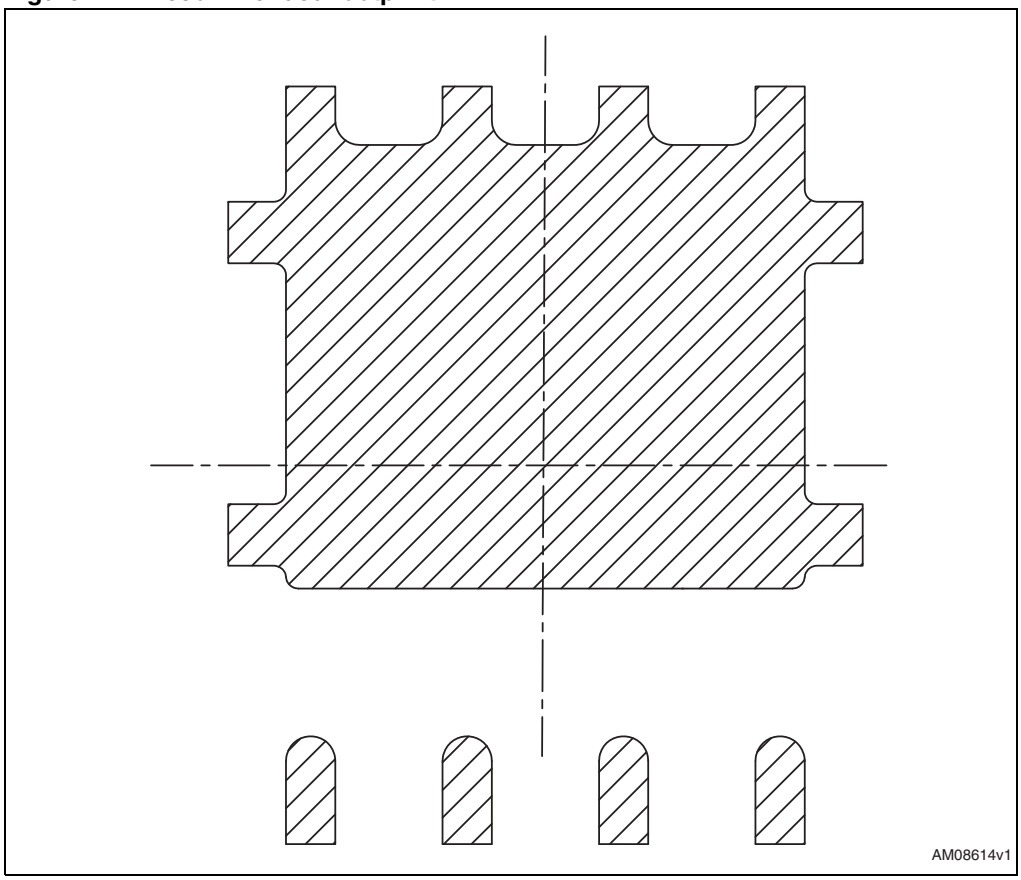


Figure 21. Recommended footprint



5 Revision history

Table 11. Document revision history

Date	Revision	Changes
10-Nov-2010	1	First release.

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