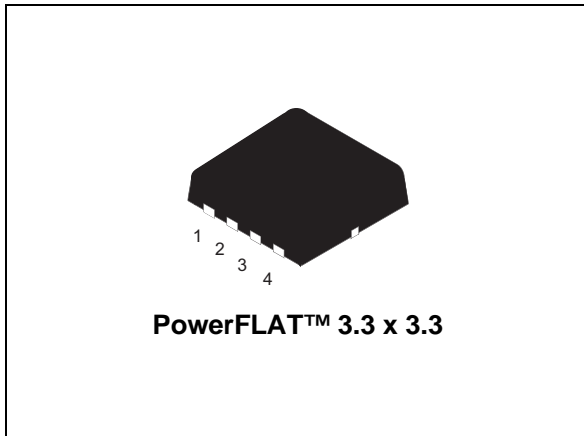


N-channel 30 V, 0.0027 Ω typ., 23 A STripFET™ VII DeepGATE™ Power MOSFET plus monolithic Schottky in a PowerFLAT™ 3.3 x 3.3

Datasheet - target specification



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL23NS3LLH7	30 V	0.0027 Ω	23 A

- Very low on-resistance
- Very low Q_g
- High avalanche ruggedness
- Embedded Schottky diode

Applications

- Switching applications

Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

Figure 1. Internal schematic diagram

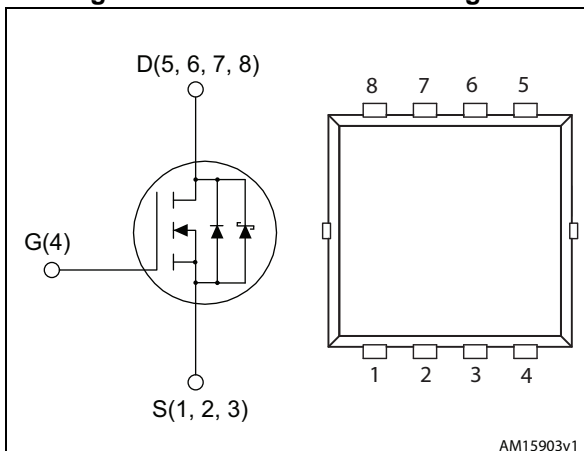


Table 1. Device summary

Order code	Marking	Package	Packaging
STL23NS3LLH7	23NS3	PowerFLAT™ 3.3x3.3	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	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	23	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	14.3	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	92	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	50	W
$P_{TOT}^{(3)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	2.9	W
T_j	Max. operating junction temperature	-55 to 150	$^\circ\text{C}$

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	42.8	$^\circ\text{C/W}$
$R_{thj-case}$	Thermal resistance junction-case max	2.5	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1 inch², 2oz Cu, $t < 10\text{ sec}$

2 Electrical characteristics

($T_C = 25\text{ °C}$ unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ $V_{DS} = 24\text{ V}$			500	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 1\text{ mA}$	1.2		2.3	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 11.5\text{ A}$		0.0027	0.0034	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 11.5\text{ A}$		0.004	0.005	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 15\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	2080	-	pF
C_{oss}	Output capacitance		-	660	-	pF
C_{rss}	Reverse transfer capacitance		-	34	-	pF
Q_g	Total gate charge	$V_{DD} = 10\text{ V}$, $I_D = 23\text{ A}$, $V_{GS} = 4.5\text{ V}$ (see Figure 3)	-	13	-	nC
Q_{gs}	Gate-source charge		-	6.7	-	nC
Q_{gd}	Gate-drain charge		-	2.5	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$, $I_D = 11.5\text{ A}$, $R_G = 3\ \Omega$, $V_{GS} = 4.5\text{ V}$	-	10	-	ns
t_r	Rise time		-	33	-	ns
$t_{d(off)}$	Turn-off delay time		-	22	-	ns
t_f	Fall time		-	7.5	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		23	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		92	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2 \text{ A}, V_{GS} = 0$	-	0.4	0.7	V
t_{rr}	Reverse recovery time	$I_{SD} = 2 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{GS} = 0 \text{ V}$	-	31.2		ns
Q_{rr}	Reverse recovery charge		-	18.7		nC
I_{RRM}	Reverse recovery current		-	1.2		A

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

3 Test circuits

Figure 2. Switching times test circuit for resistive load

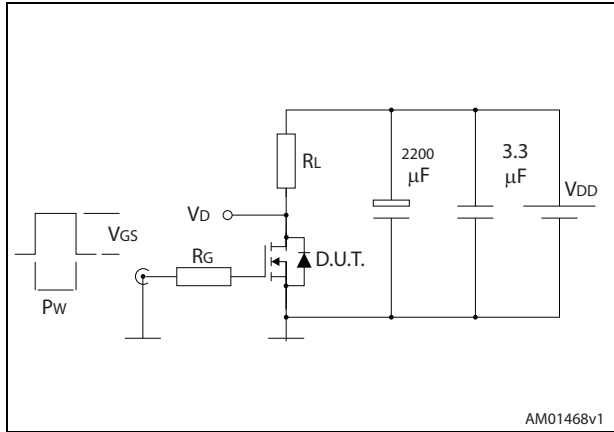


Figure 3. Gate charge test circuit

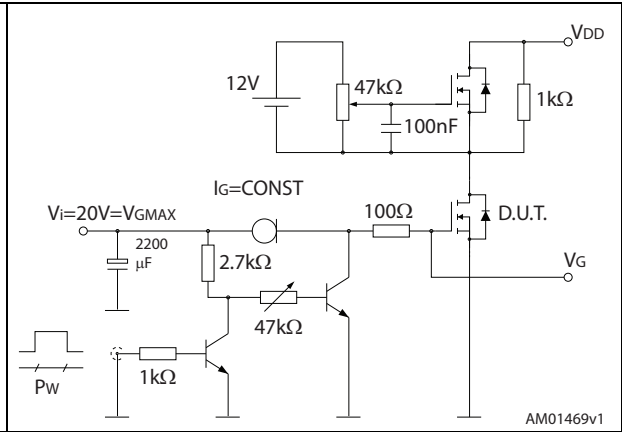


Figure 4. Test circuit for inductive load switching and diode recovery times

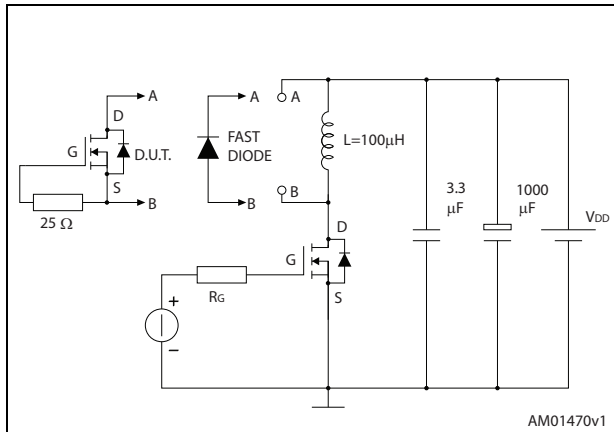


Figure 5. Unclamped inductive load test circuit

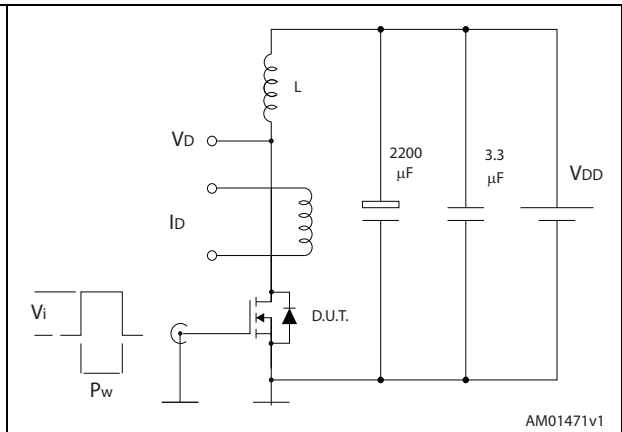


Figure 6. Unclamped inductive waveform

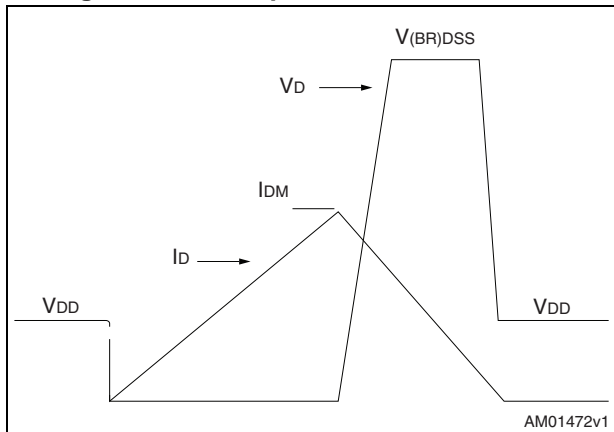
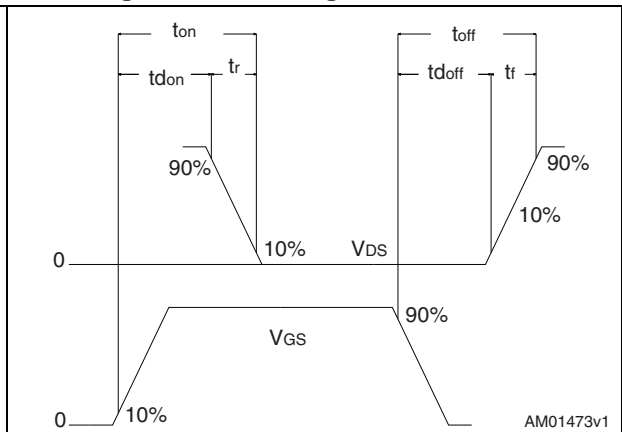


Figure 7. Switching time waveform



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 8. PowerFLAT™ 3.3 x 3.3 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.70	0.80	0.90
b	0.25	0.30	0.39
c	0.14	0.15	0.20
D	3.10	3.30	3.50
D1	3.05	3.15	3.25
D2	2.15	2.25	2.35
e	0.55	0.65	0.75
E	3.10	3.30	3.50
E1	2.90	3.00	3.10
E2	1.60	1.70	1.80
H	0.25	0.40	0.55
K	0.65	0.75	0.85
L	0.30	0.45	0.60
L1	0.05	0.15	0.25
L2			0.15
∠	8°	10°	12°

Figure 8. PowerFLAT™ 3.3 x 3.3 drawing

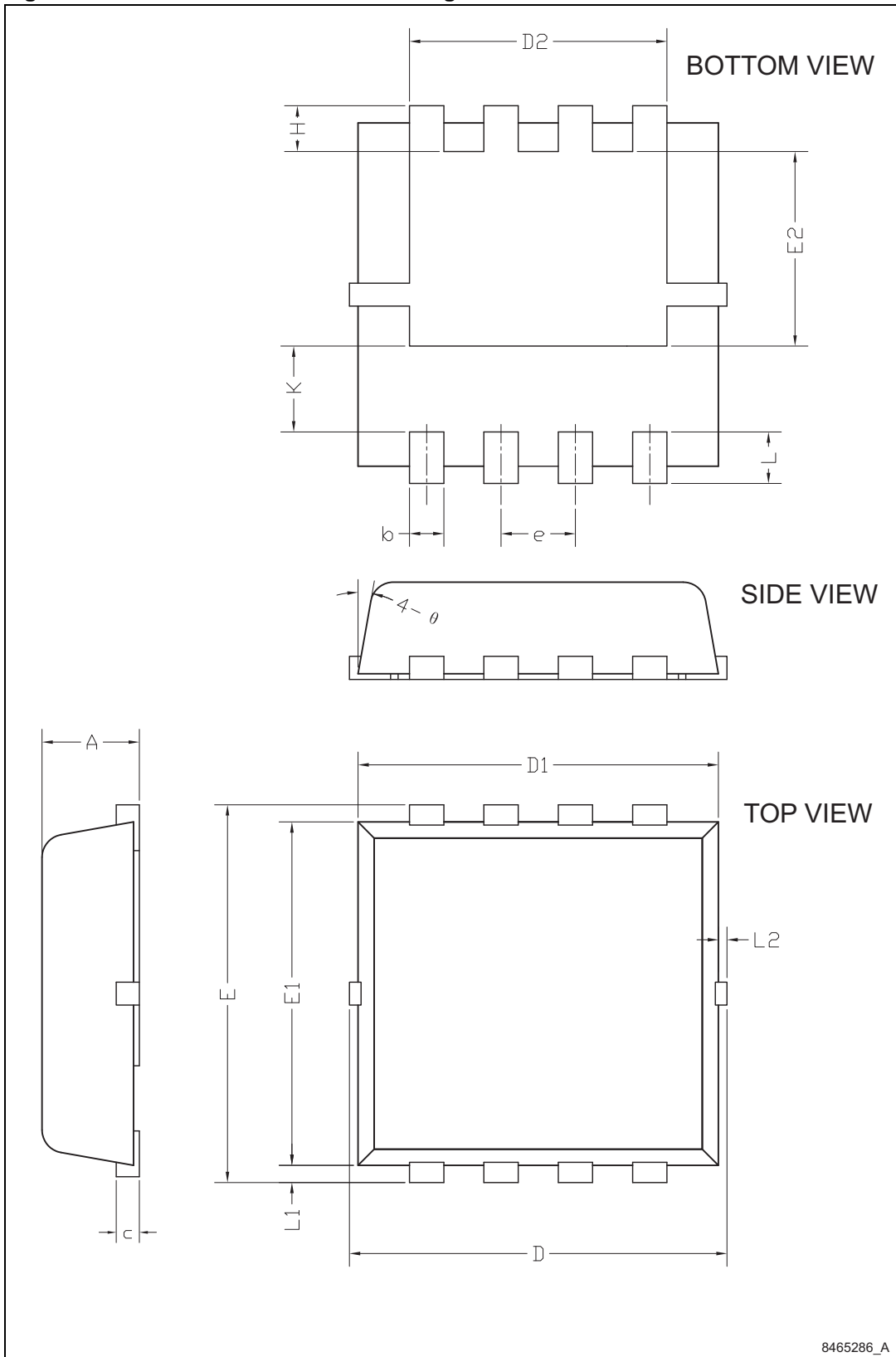
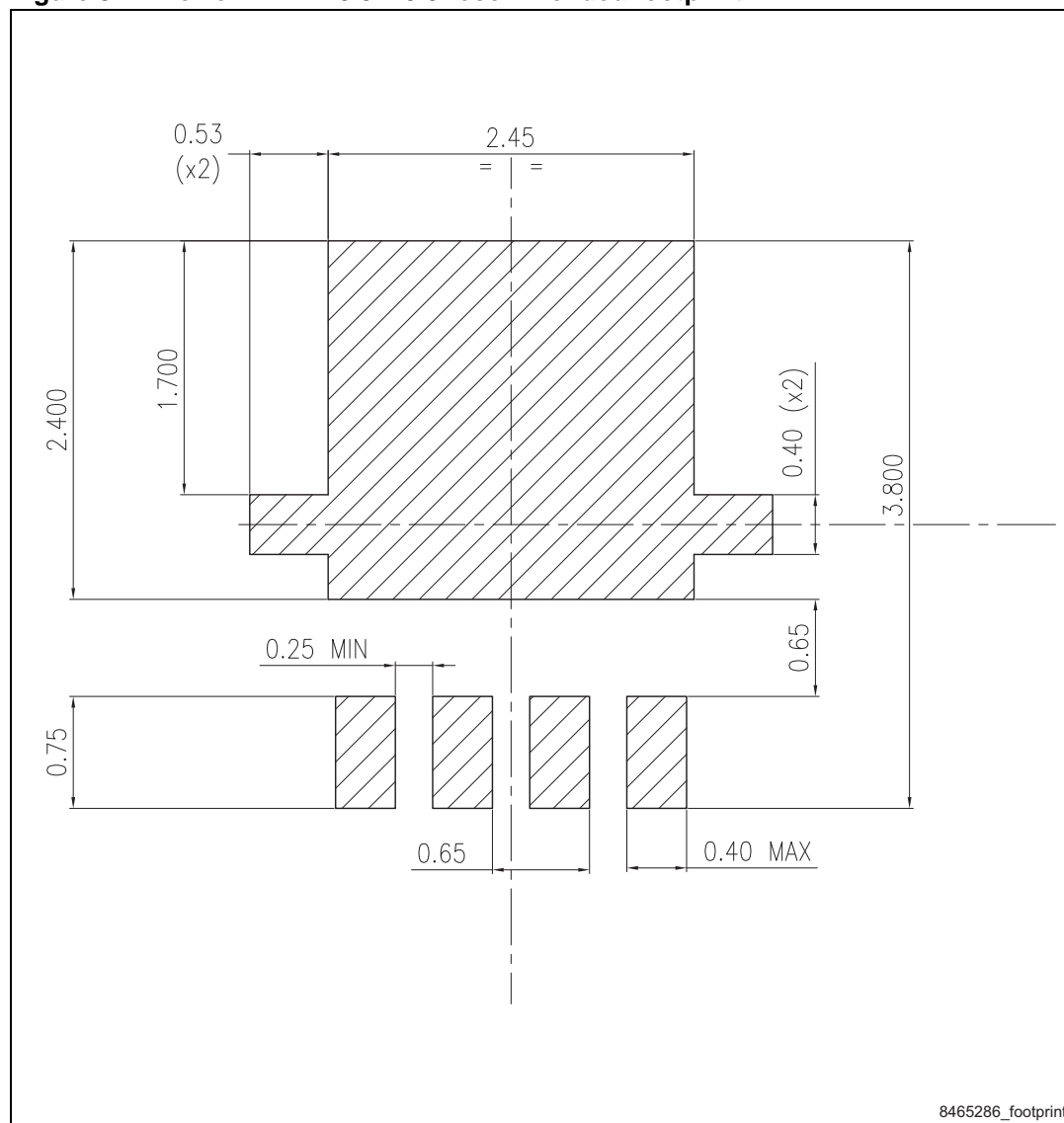


Figure 9. PowerFLAT™ 3.3 x 3.3 recommended footprint



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
31-Jul-2013	1	First release.

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