STL11N3LLH6

N-channel 30 V, 6 mΩ typ., 11 A STripFET™ H6 Power MOSFET in a PowerFLAT™ 3.3x3.3 package

Datasheet - production data

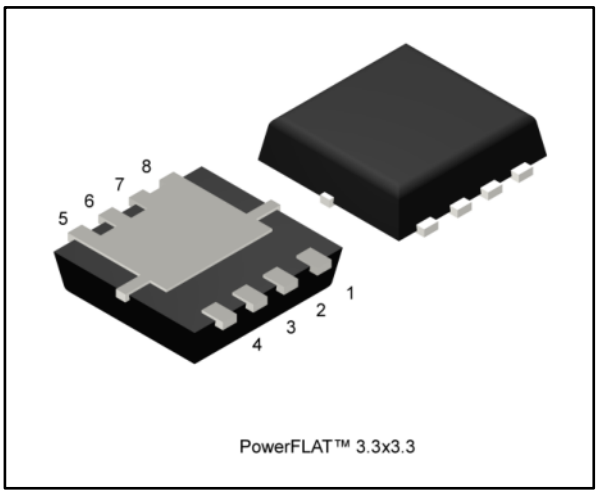
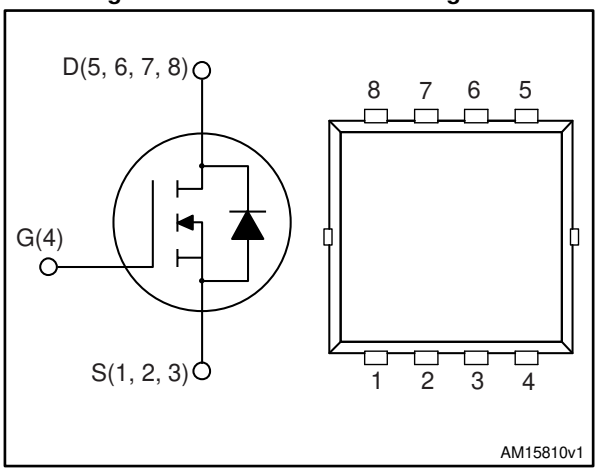


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL11N3LLH6	30 V	7.5 mΩ	11 A

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ H6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Table 1: Device summary

Order code	Marking	Package	Packing
STL11N3LLH6	11N3L	PowerFLAT™ 3.3x3.3	Tape and reel

This is information on a product in full production.

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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 °C	11	A
I_D (1)	Drain current (continuous) at T_{pcb} = 100 °C	6.9	A
I_{DM} (2)	Drain current (pulsed)	44	A
P_{TOT} (1)	Total dissipation at T_{pcb} = 25 °C	2.9	W
P_{TOT} (3)	Total dissipation at T_C = 25 °C	45	W
T_j	Operating junction temperature range	-55 to 150	°C
T_{stg}	Storage temperature range		

Notes:

(1)This value is rated according to $R_{thj\text{-}pcb}$.

(2)Pulse width limited by safe operating area.

(3)The value is rated according to $R_{thj\text{-}c}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	2.8	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb	42.8	°C/W

Notes:

(1)When mounted on FR-4 board of 1 inch², 2oz Cu, t < 10 s

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = 5.5 A, L = 6 mH)	90	mJ

2 Electrical characteristics

(T_C = 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 V	30			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 30 V			1	µA
		V_{GS} = 0 V, V_{DS} = 30 V, T_C = 125 °C(1)			10	µA
I_{GSS}	Gate-body leakage current	V_{GS} = ±20 V, V_{DS} = 0 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 = 5.5 A		6	7.5	mΩ
		V_{GS} = 4.5 V, I_D = 5.5 A		8.4	9.5	mΩ

Notes:

(1)Defined by design, not subject to production test

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 V	-	1690	-	pF
C_{oss}	Output capacitance		-	290	-	pF
C_{rss}	Reverse transfer capacitance		-	176	-	pF
Q_g	Total gate charge	V_{DD} = 15 V, I_D = 11 A, V_{GS} = 0 to 4.5 V (see *Figure 14: "Test circuit for gate charge behavior"*)	-	17	-	nC
Q_{gs}	Gate-source charge		-	8	-	nC
Q_{gd}	Gate-drain charge		-	7	-	nC
R_G	Gate input resistance charge	f=1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain	-	1.7	-	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 = 5.5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13: "Test circuit for resistive load switching times"*)	-	9.5	-	ns
t_r	Rise time		-	30	-	ns
$t_{d(off)}$	Turn-off delay time		-	37	-	ns
t_f	Fall time		-	12	-	ns

Table 8: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	I_{SD} = 11 A, V_{GS} = 0 V	-		1.1	V
t_{rr}	Reverse recovery time	I_D = 11 A, di/dt = 100 A/µs, V_{DD} = 24 V	-	24		ns
Q_{rr}	Reverse recovery charge		-	16.8		nC
I_{RRM}	Reverse recovery current		-	1.4		A

Notes:

(1)Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

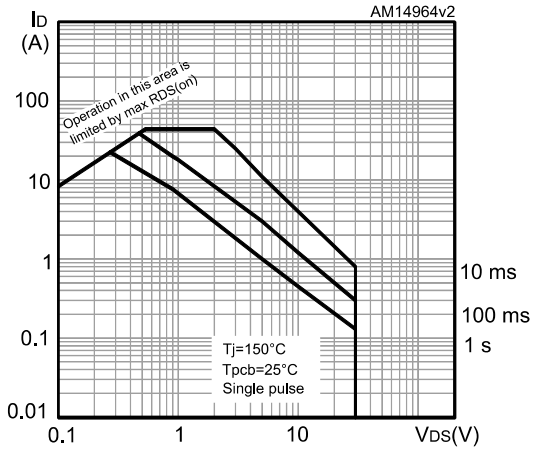


Figure 3: Thermal impedance

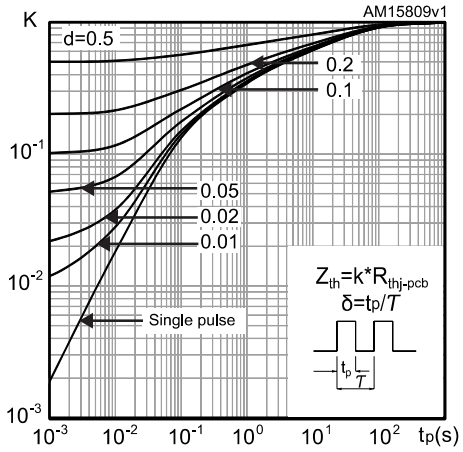


Figure 4: Output characteristics

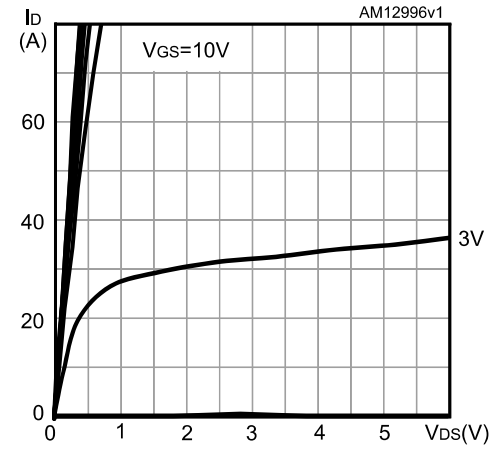


Figure 5: Transfer characteristics

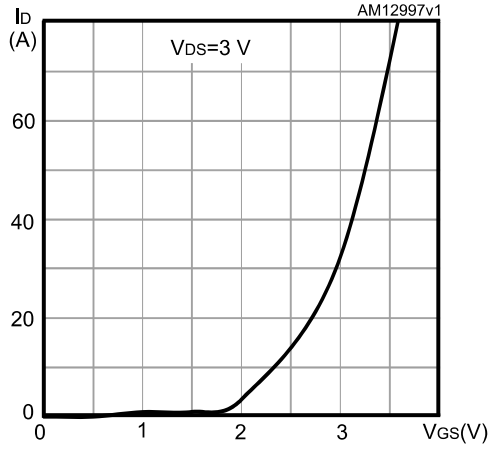


Figure 6: Normalized $V_{(BR)DSS}$ vs temperature

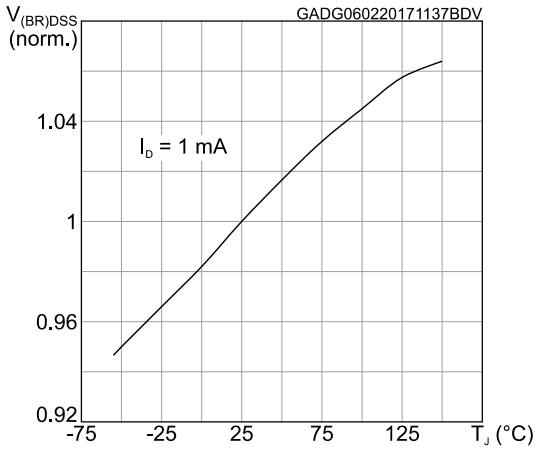


Figure 7: Static drain-source on-resistance

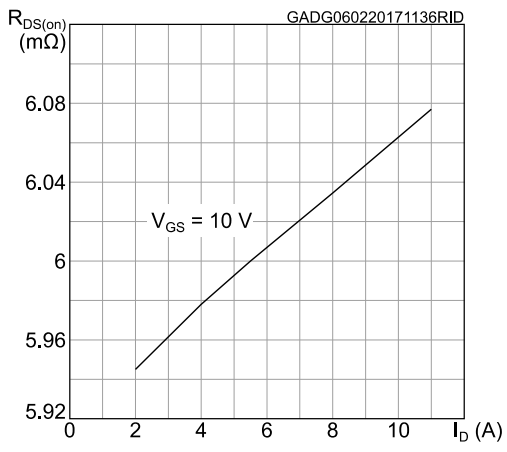


Figure 8: Gate charge vs gate-source voltage

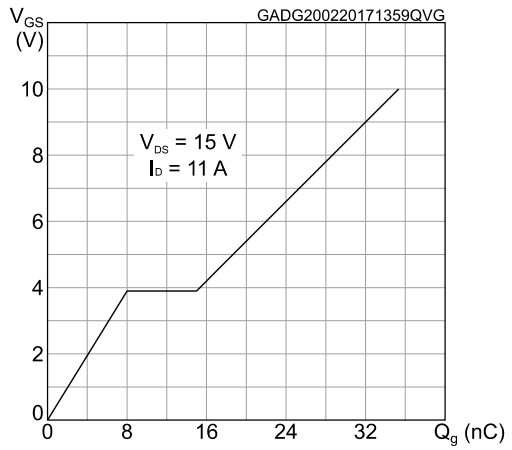


Figure 9: Capacitance variations

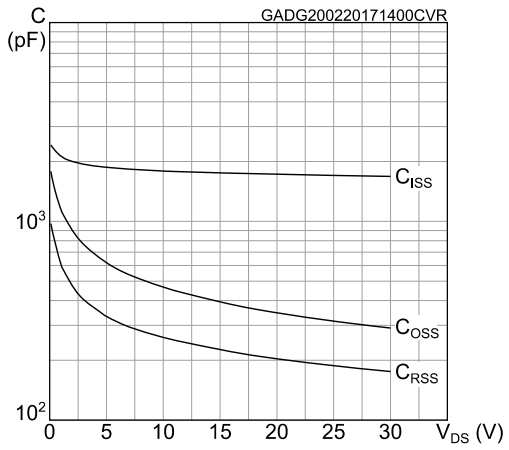


Figure 10: Normalized gate threshold voltage vs temperature

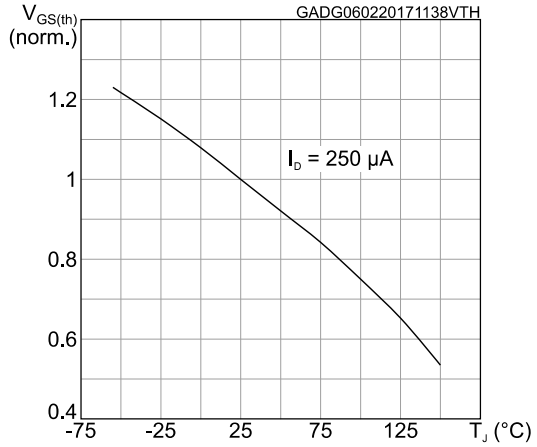


Figure 11: Normalized on-resistance vs temperature

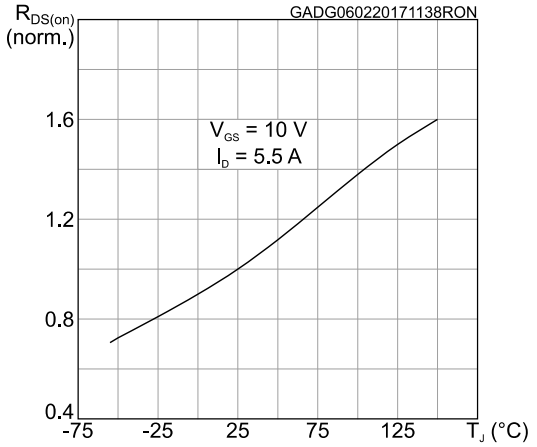
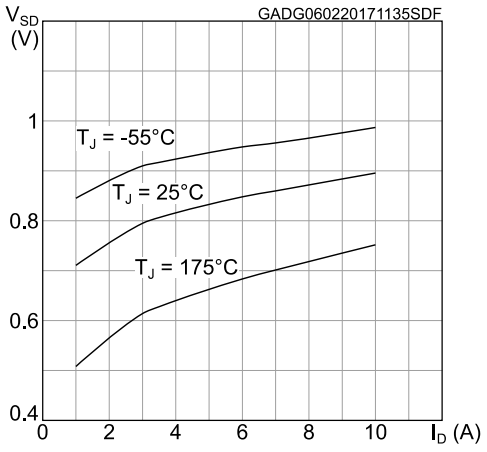


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

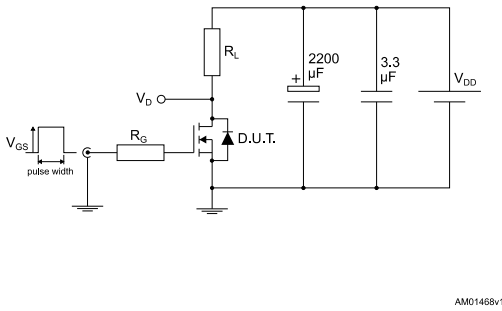


Figure 14: Test circuit for gate charge behavior

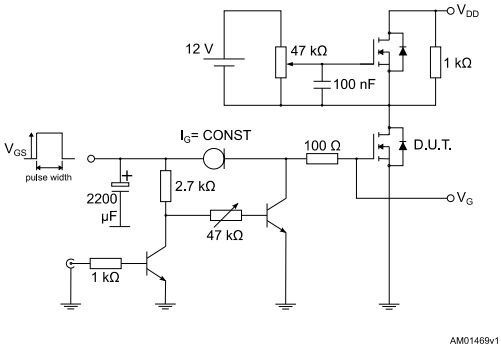


Figure 15: Test circuit for inductive load switching and diode recovery times

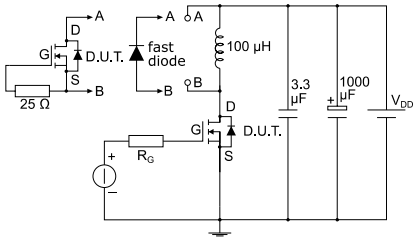


Figure 16: Unclamped inductive load test circuit

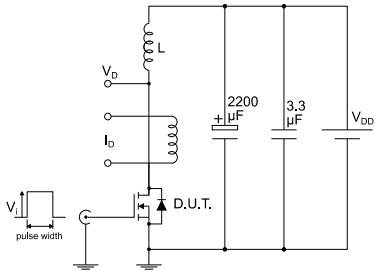


Figure 17: Unclamped inductive waveform

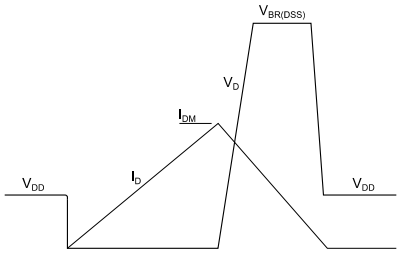
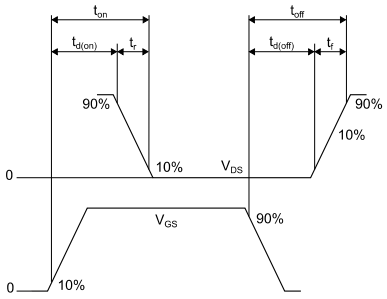


Figure 18: Switching time waveform



4 Package information

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.

4.1 PowerFLAT™ 3.3x3.3 package information

Figure 19: PowerFLAT™ 3.3x3.3 package outline

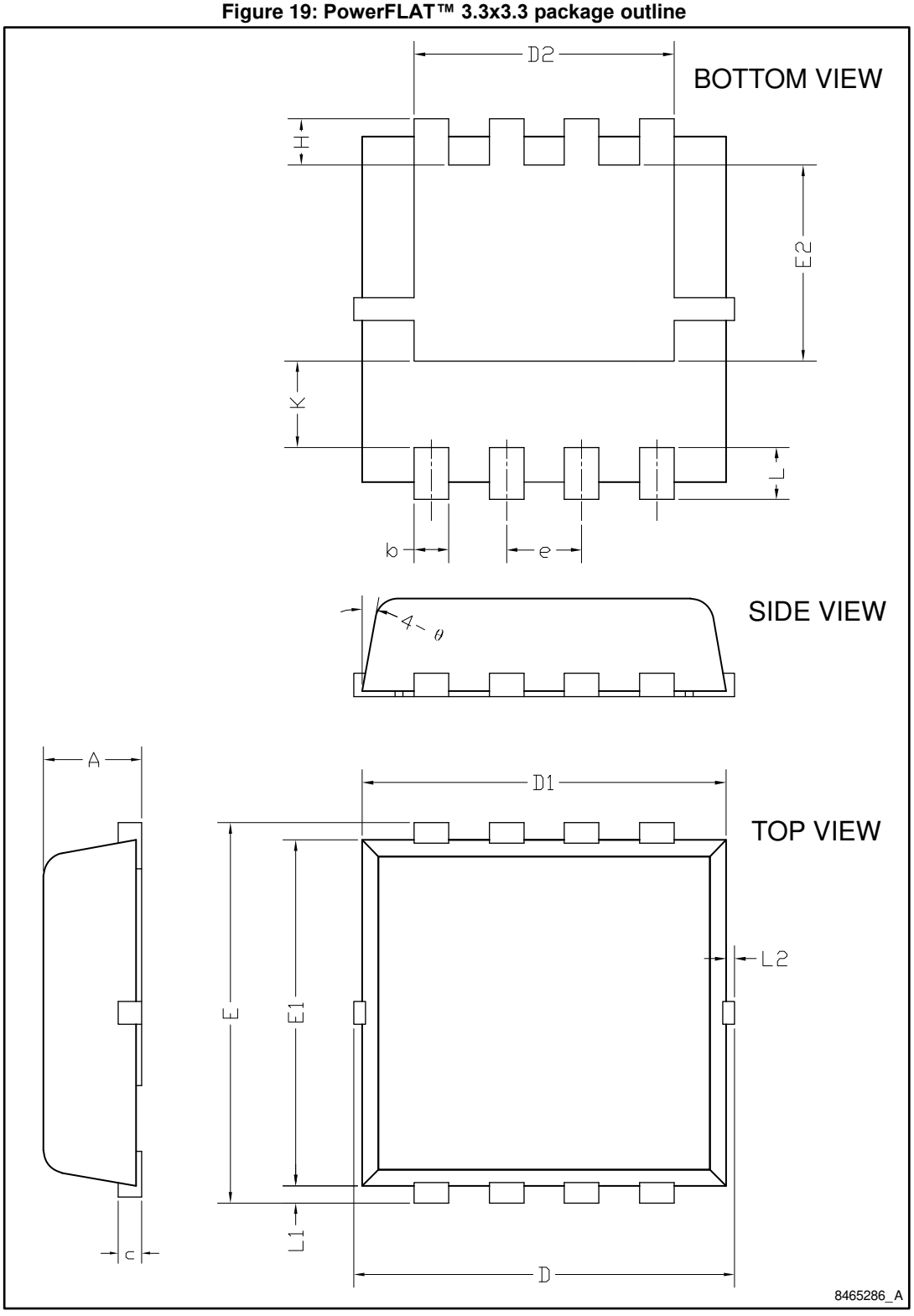
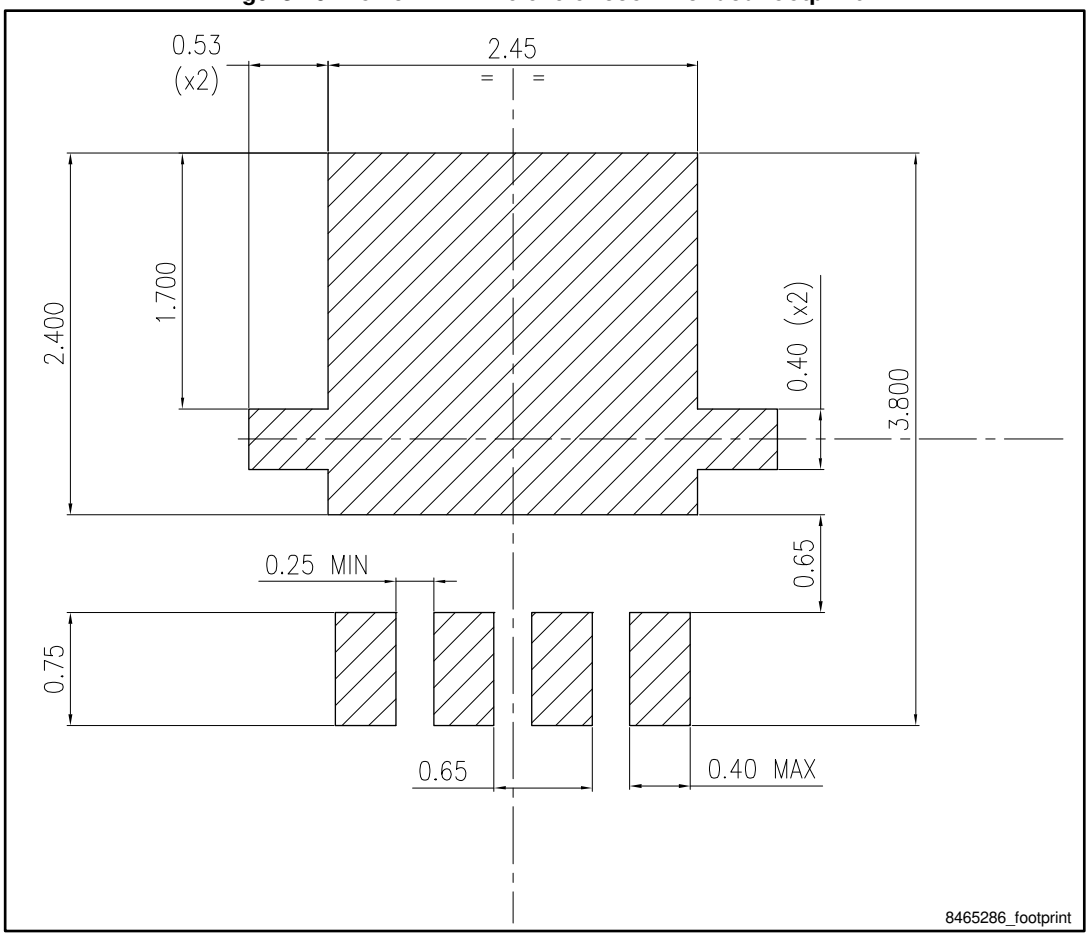


Table 9: PowerFLAT™ 3.3x3.3 package mechanical data

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	030	0.45	0.60
L1	0.05	0.15	0.25
L2			0.15
θ	8°	10°	12°

Figure 20: PowerFLAT™ 3.3x3.3 recommended footprint



5 Revision history

Table 10: Document revision history

Date	Revision	Changes
04-Jan-2017	1	First release
11-Jan-2017	2	Updated information on cover page.
20-Feb-2017	3	Updated title, features and description on cover page. Updated *Section 1: "Electrical ratings"*. Updated *Section 2: "Electrical characteristics"*. Minor text changes

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