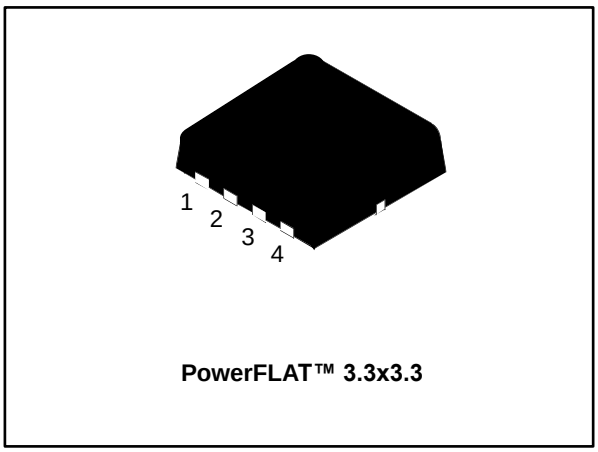
STL11N6F7

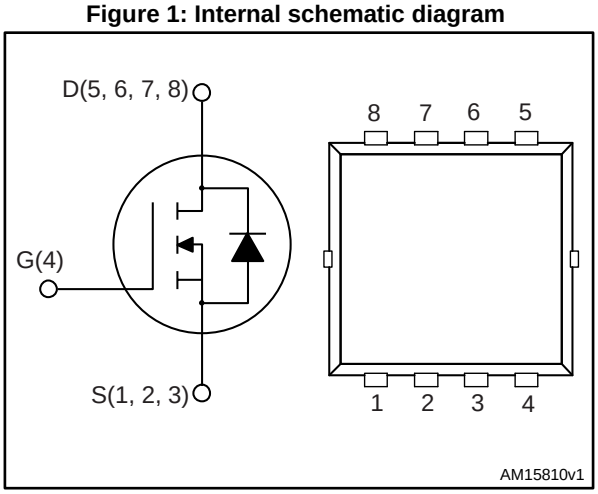
N-channel 60 V, 10 mΩ typ., 11 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 3.3x3.3 package

Datasheet - production data



PowerFLAT™ 3.3x3.3

Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STL11N6F7	60 V	12 mΩ	11 A

Features

- Among the lowest $R_{DS(on)}$ on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packing
STL11N6F7	11N6F	PowerFLAT™ 3.3x3.3	Tape and reel

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate source voltage	±20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	47	A
	Drain current (continuous) at T_C = 100 °C	30	
I_{DM} (1)(2)	Drain current (pulsed)	188	A
I_D (3)	Drain current (continuous) at T_{pcb} = 25 °C	11	A
	Drain current (continuous) at T_{pcb} = 100 °C	7	
I_{DM} (2)(3)	Drain current (pulsed)	44	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	48	W
P_{TOT} (3)	Total dissipation at T_{pcb} = 25 °C	2.9	W
T_J	Operating junction temperature	-55 to 150	°C
T_{stg}	Storage temperature		

Notes:

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

(2)Pulse width limited by safe operating area

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

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max	42.8	°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case max	2.6	°C/W

Notes:

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

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D= 1mA, V_{GS} = 0 V	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS}= 0 V , V_{DS}=60 V			1	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	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 5.5 A		10	12	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 30 V, f = 1 MHz,V_{GS} = 0 V	-	1035	-	pF
C_{oss}	Output capacitance		-	450	-	pF
C_{rss}	Reverse transfer capacitance		-	53	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 11 A, V_{GS} = 10 V (see *Figure 14: "Test circuit for gate charge behavior"*)	-	17	-	nC
Q_{gs}	Gate-source charge		-	5.7	-	nC
Q_{gd}	Gate-drain charge		-	5.7	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 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"*)	-	14.5	-	ns
t_r	Rise time		-	15.3	-	ns
$t_{d(off)}$	Turn-off delay time		-	19.4	-	ns
t_f	Fall time		-	8	-	ns

Table 7: 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	-		1.2	V
t_{rr}	Reverse recovery time	I_D = 11 A, di/dt = 100 A/µs V_{DD} = 48 V (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	26.8		ns
Q_{rr}	Reverse recovery charge		-	14.2		nC
I_{RRM}	Reverse recovery current		-	1.06		A

Notes:

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

2.1 Electrical characteristics (curve)

Figure 2: Safe operating area

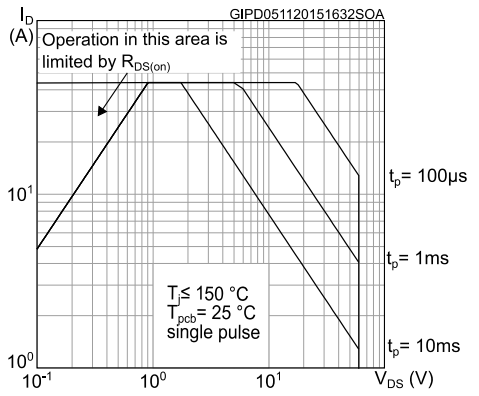


Figure 3: Thermal impedance

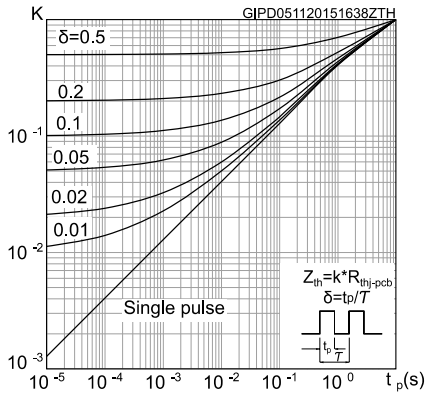


Figure 4: Output characteristics

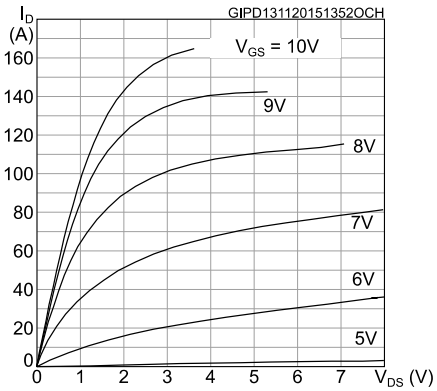


Figure 5: Transfer characteristics

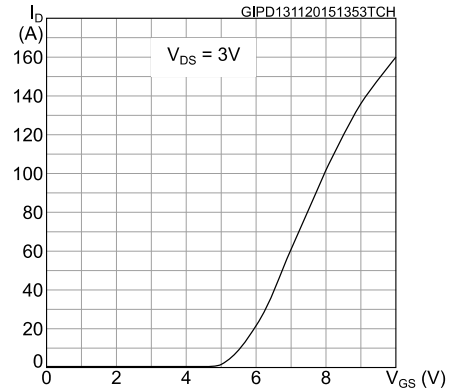


Figure 6: Gate charge vs gate-source voltage

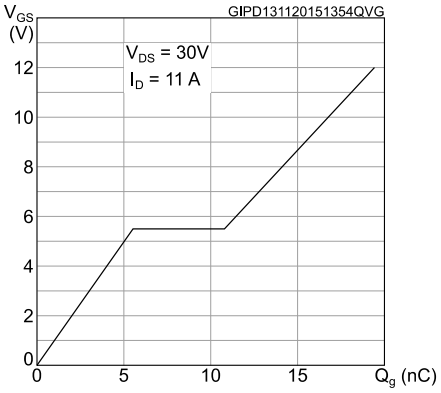


Figure 7: Static drain-source on-resistance

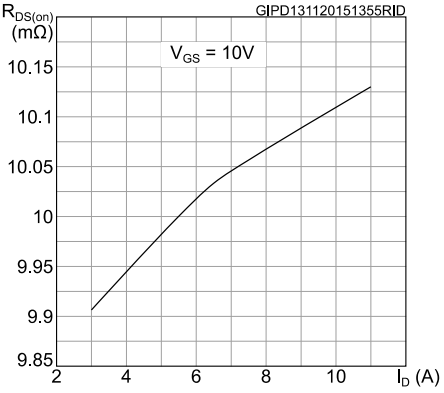


Figure 8: Capacitance variations

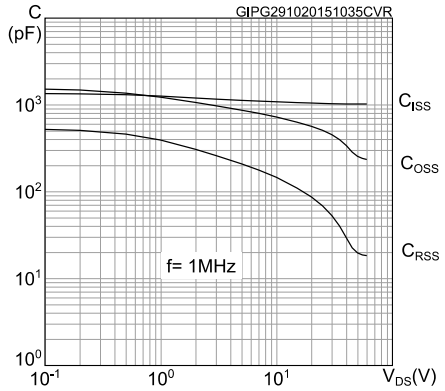


Figure 9: Normalized gate threshold voltage vs temperature

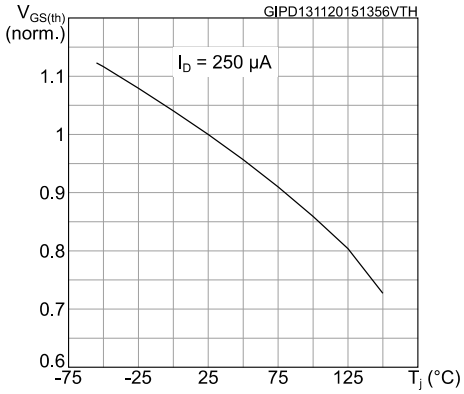


Figure 10: Normalized on-resistance vs temperature

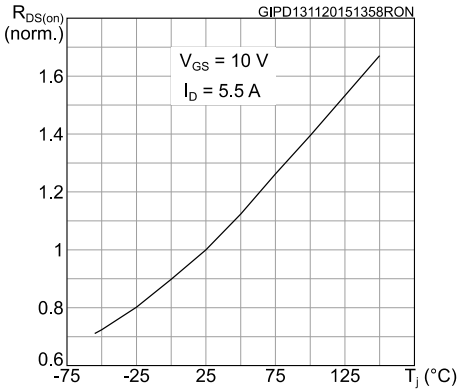


Figure 11: Normalized V(BR)DSS vs temperature

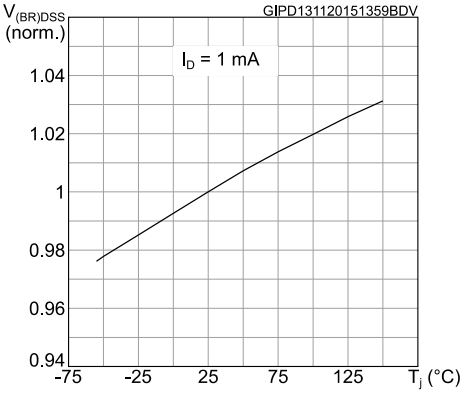
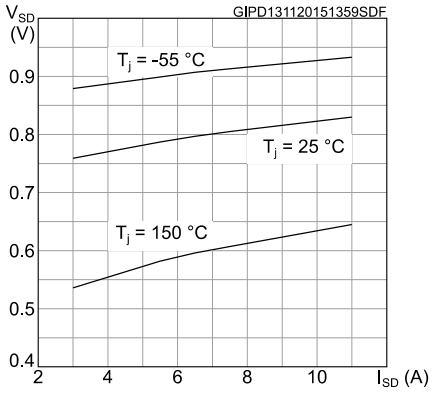


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

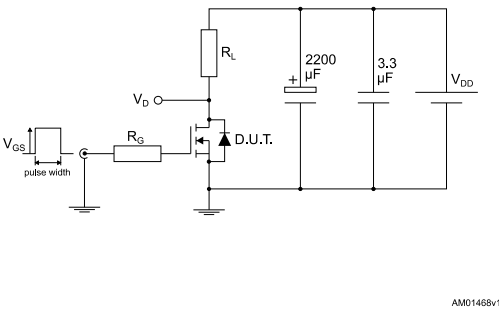


Figure 14: Test circuit for gate charge behavior

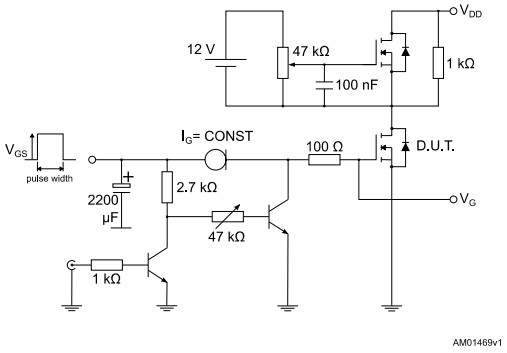


Figure 15: Test circuit for inductive load switching and diode recovery times

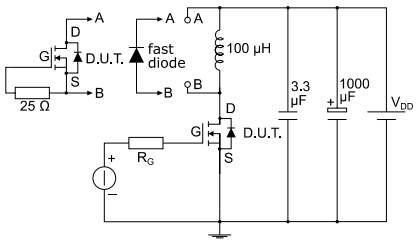


Figure 16: Unclamped inductive load test circuit

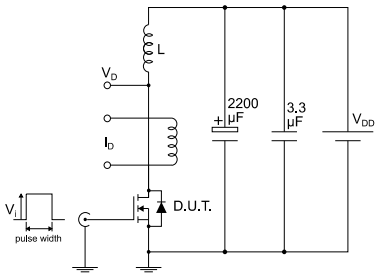


Figure 17: Unclamped inductive waveform

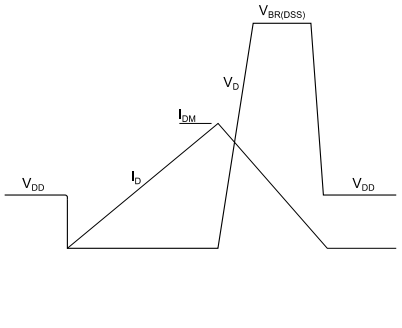
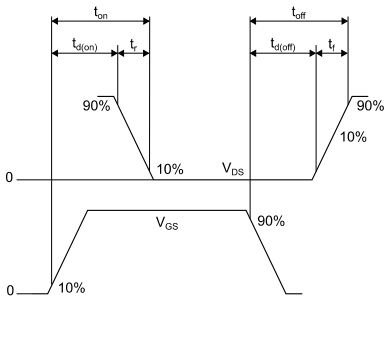


Figure 18: Switching time waveform



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

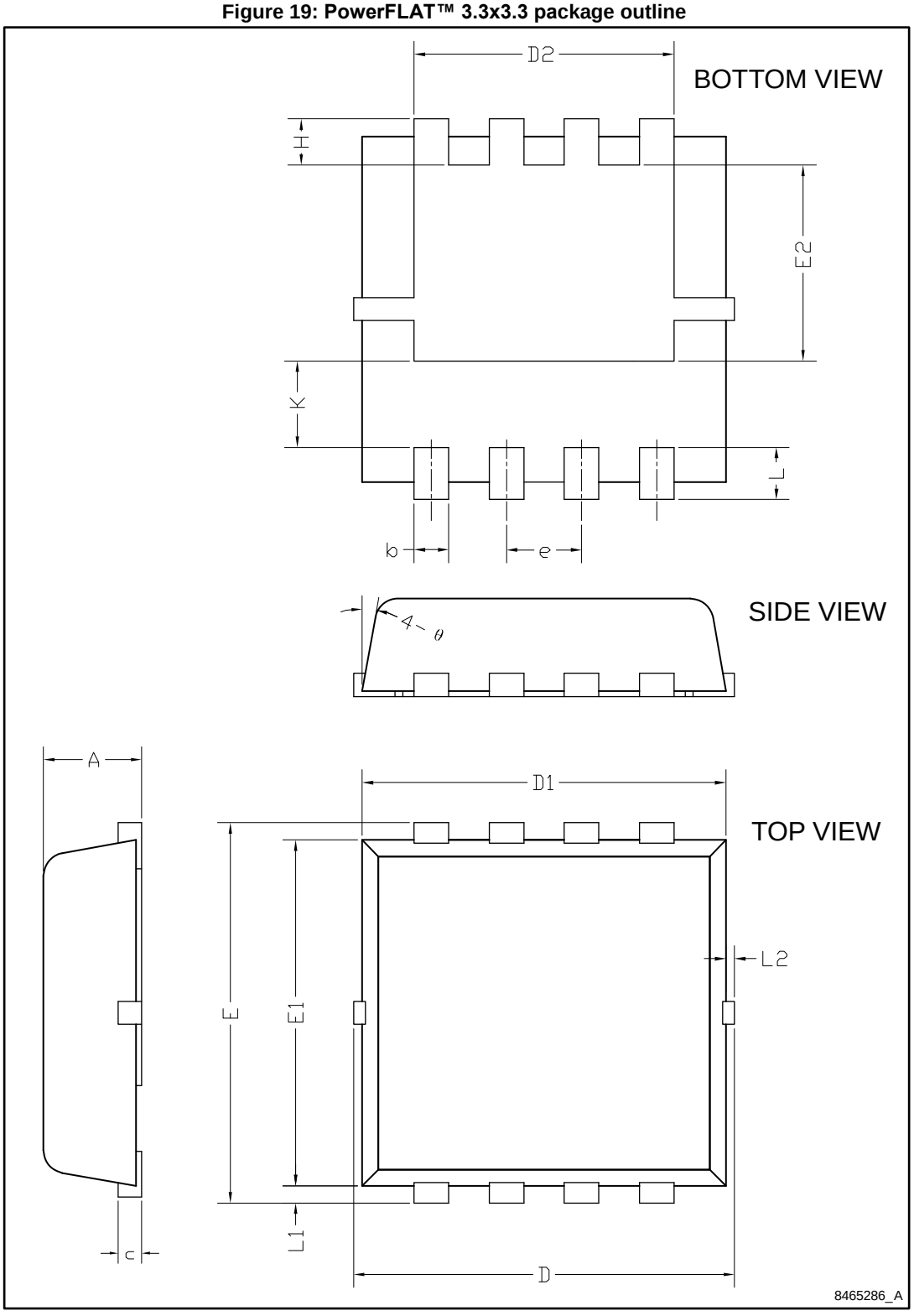
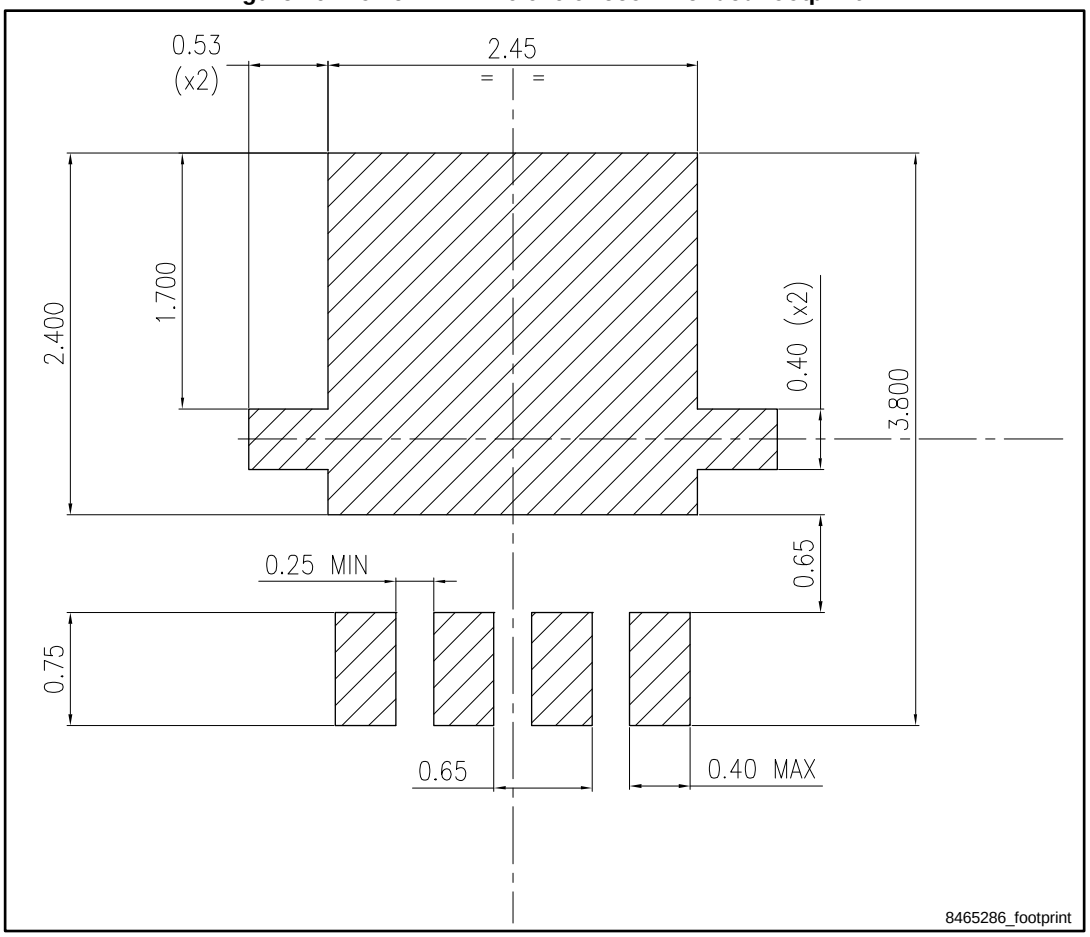


Table 8: PowerFLAT™ 3.3x3.3 package mechanical data

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 9: Document revision history

Date	Revision	Changes
21-Jul-2015	1	First release.
17-Nov-2015	2	Document status changed from preliminary to production data. Updated title and features in cover page Updated *Table 2: "Absolute maximum ratings"* and *Section 4: "Electrical characteristics"*. Added *Section 4.1: "Electrical characteristics (curve)"*. Minor text changes

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.