

N-channel 100 V, 17 mΩ typ., 8 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 3.3x3.3 package

Datasheet - production data

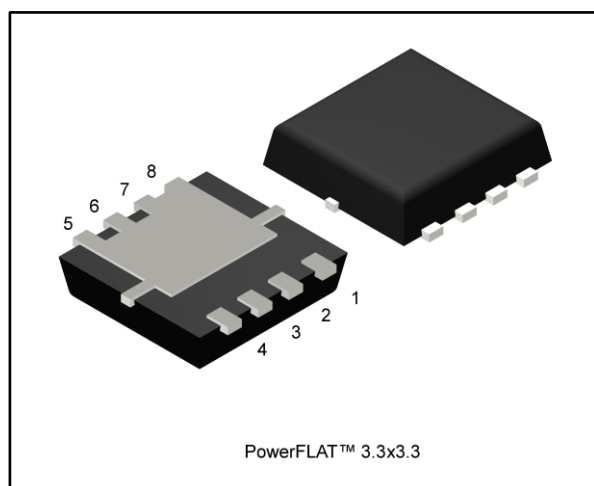
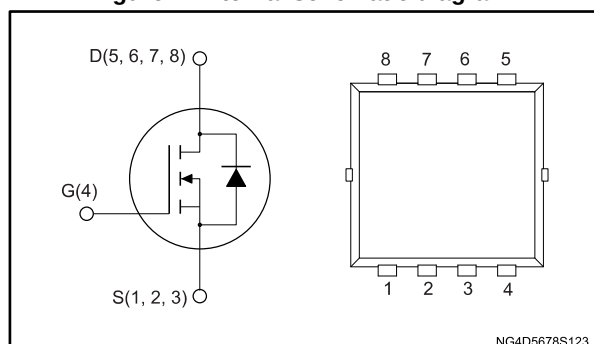


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STL8N10F7	100 V	20 mΩ	8 A	2.9 W

- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- 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
STL8N10F7	8N10F	PowerFLAT™ 3.3x3.3	Tape and reel

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	8	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	6	A
$I_D^{(2)}$	Drain current (continuous) at $T_c = 25\text{ }^{\circ}\text{C}$	35	A
$I_D^{(2)}$	Drain current (continuous) at $T_c = 100\text{ }^{\circ}\text{C}$	22	A
$I_{DM}^{(1)(3)}$	Drain current (pulsed)	32	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	140	A
$P_{TOT}^{(2)}$	Total dissipation at $T_c = 25\text{ }^{\circ}\text{C}$	50	W
$P_{TOT}^{(1)}$	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	2.9	W
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$
T_j	Operating junction temperature range		$^{\circ}\text{C}$

Notes:

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

Table 3: Thermal data

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

Notes:

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

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	V _{GS} = 0 V, I _D = 1 mA	100			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 100 V			1	μA
		V _{GS} = 0 V, V _{DS} = 100 V, T _c = 125 °C ⁽¹⁾			100	μA
I _{GSS}	Gate-body leakage current	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	2.5		4.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 4 A		17	20	mΩ

Notes:

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

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 50 V, f = 1 MHz, V _{GS} = 0 V	-	1640	-	pF
C _{oss}	Output capacitance		-	360	-	pF
C _{rss}	Reverse transfer capacitance		-	25	-	pF
Q _g	Total gate charge	V _{DD} = 50 V, I _D = 8 A, V _{GS} = 0 to 10 V (see Figure 14: "Test circuit for gate charge behavior")	-	25	-	nC
Q _{gs}	Gate-source charge		-	12	-	nC
Q _{gd}	Gate-drain charge		-	5	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 50 V, I _D = 4 A, R _G = 4.7 Ω, V _{GS} = 10 V (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	15	-	ns
t _r	Rise time		-	17	-	ns
t _{d(off)}	Turn-off-delay time		-	24	-	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	$V_{GS} = 0\text{ V}$, $I_{SD} = 8\text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 80\text{ V}$, $T_j = 150\text{ }^{\circ}\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	53		ns
Q_{rr}	Reverse recovery charge		-	67		nC
I_{RRM}	Reverse recovery current		-	2.5		A

Notes:

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

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

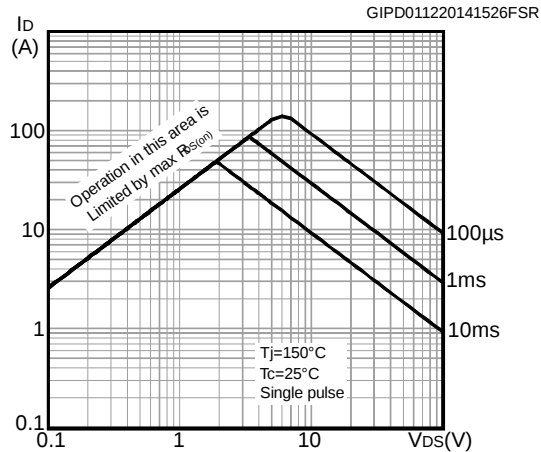


Figure 3: Thermal impedance

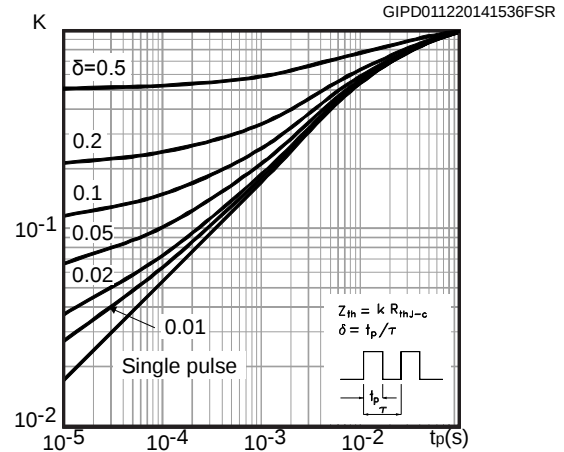


Figure 4: Output characteristics

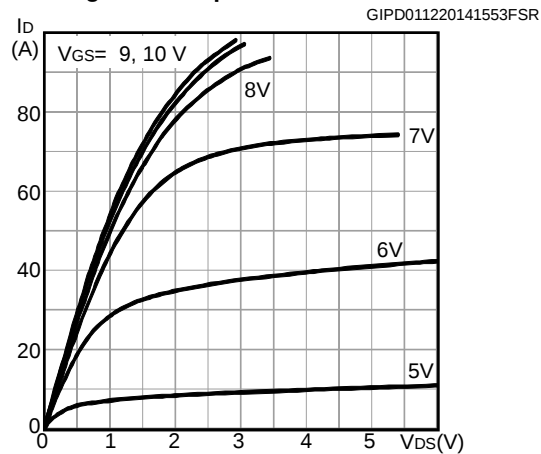


Figure 5: Transfer characteristics

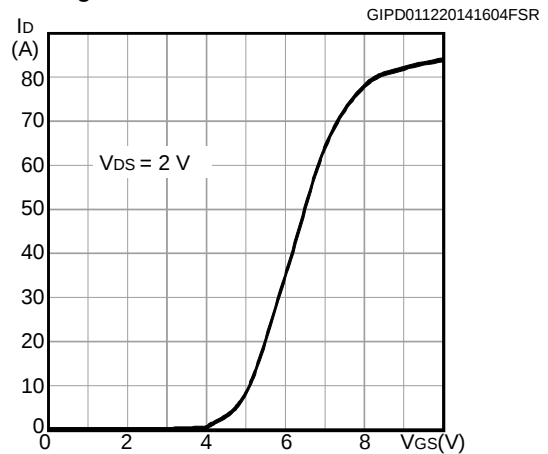


Figure 6: Gate charge vs gate-source voltage

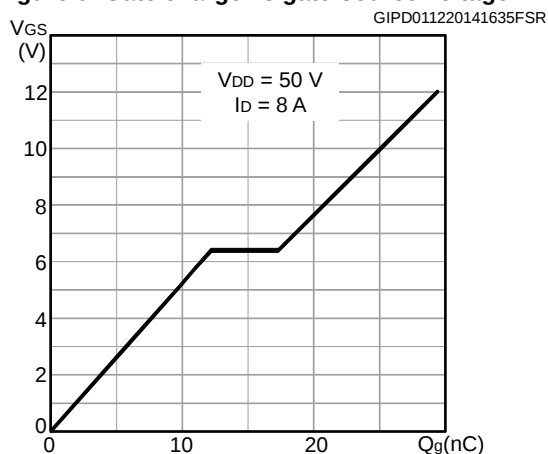


Figure 7: Static drain-source on-resistance

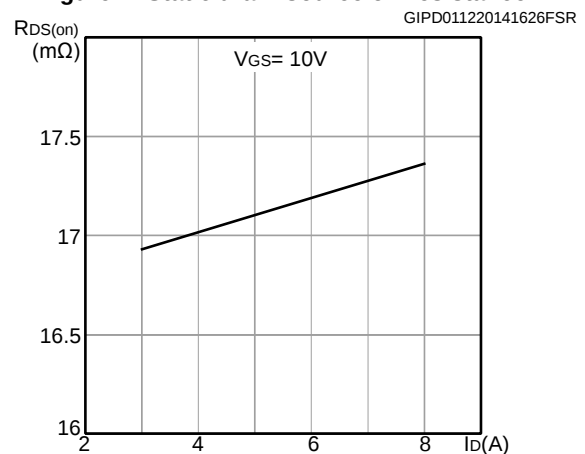


Figure 8: Capacitance variations

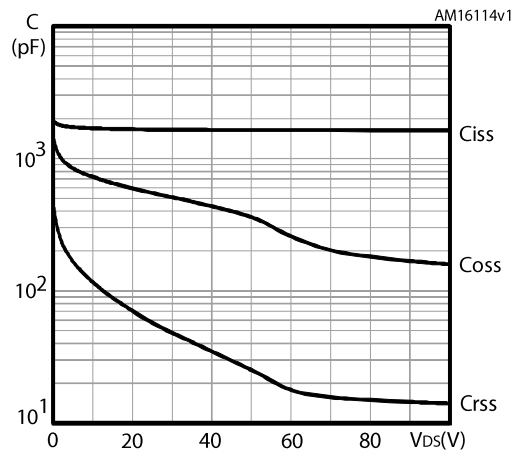


Figure 9: Normalized gate threshold voltage vs temperature

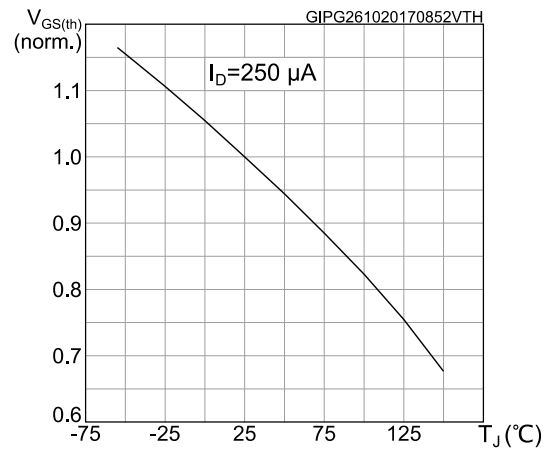


Figure 10: Normalized on-resistance vs temperature

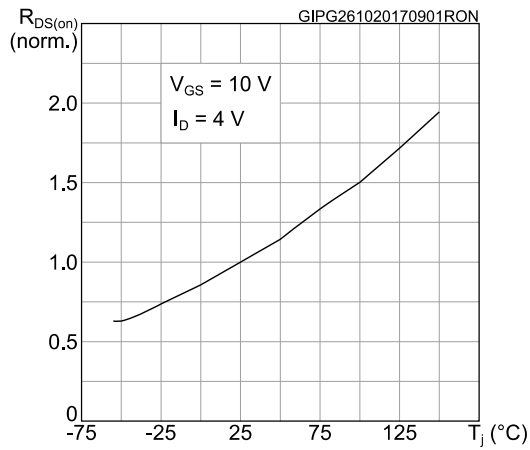
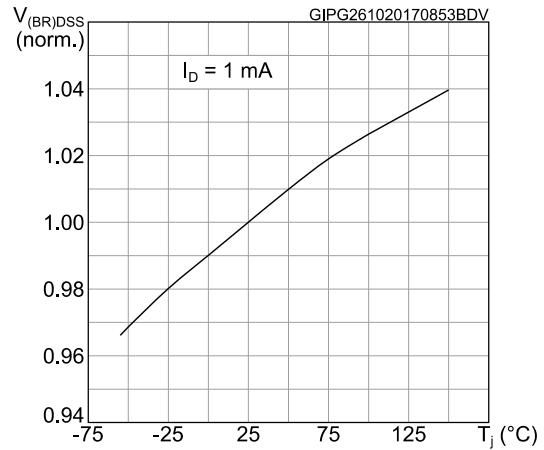
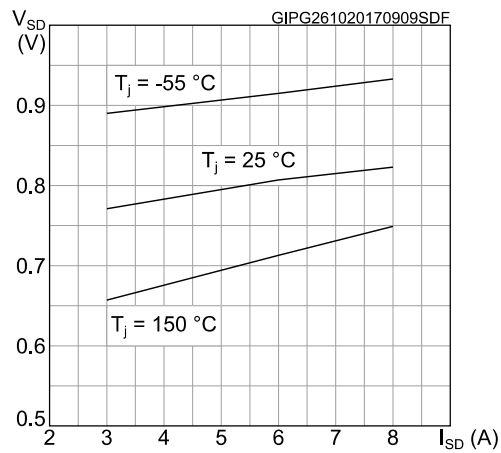
Figure 11: Normalized V_{(BR)DSS} vs temperature

Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

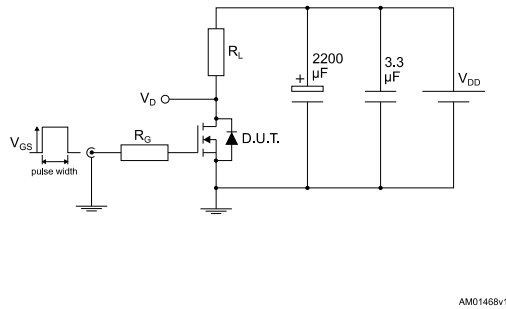


Figure 14: Test circuit for gate charge behavior

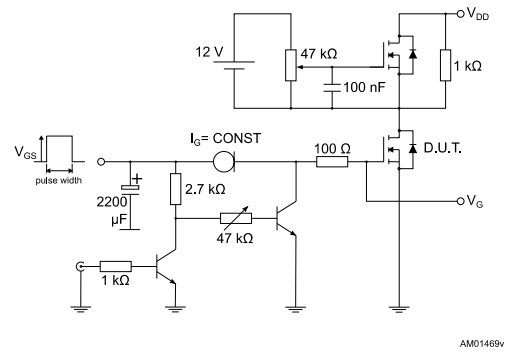


Figure 15: Test circuit for inductive load switching and diode recovery times

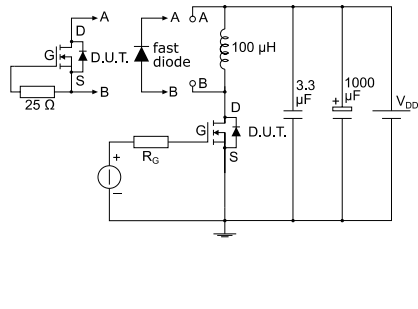


Figure 16: Unclamped inductive load test circuit

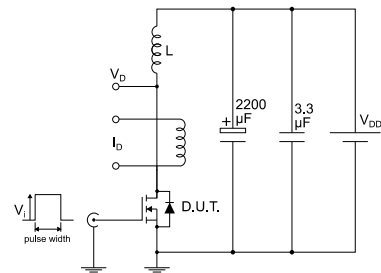


Figure 17: Unclamped inductive waveform

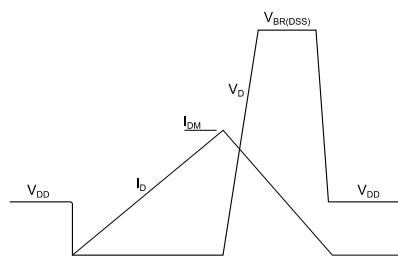
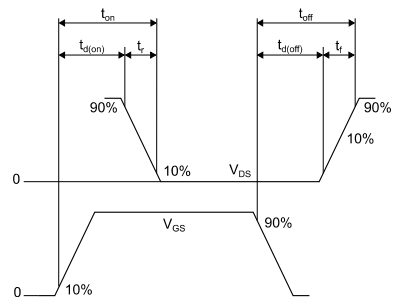


Figure 18: Switching time waveform



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 PoweFLAT 3.3x3.3 package information

Figure 19: PowerFLAT™ 3.3x3.3 package outline

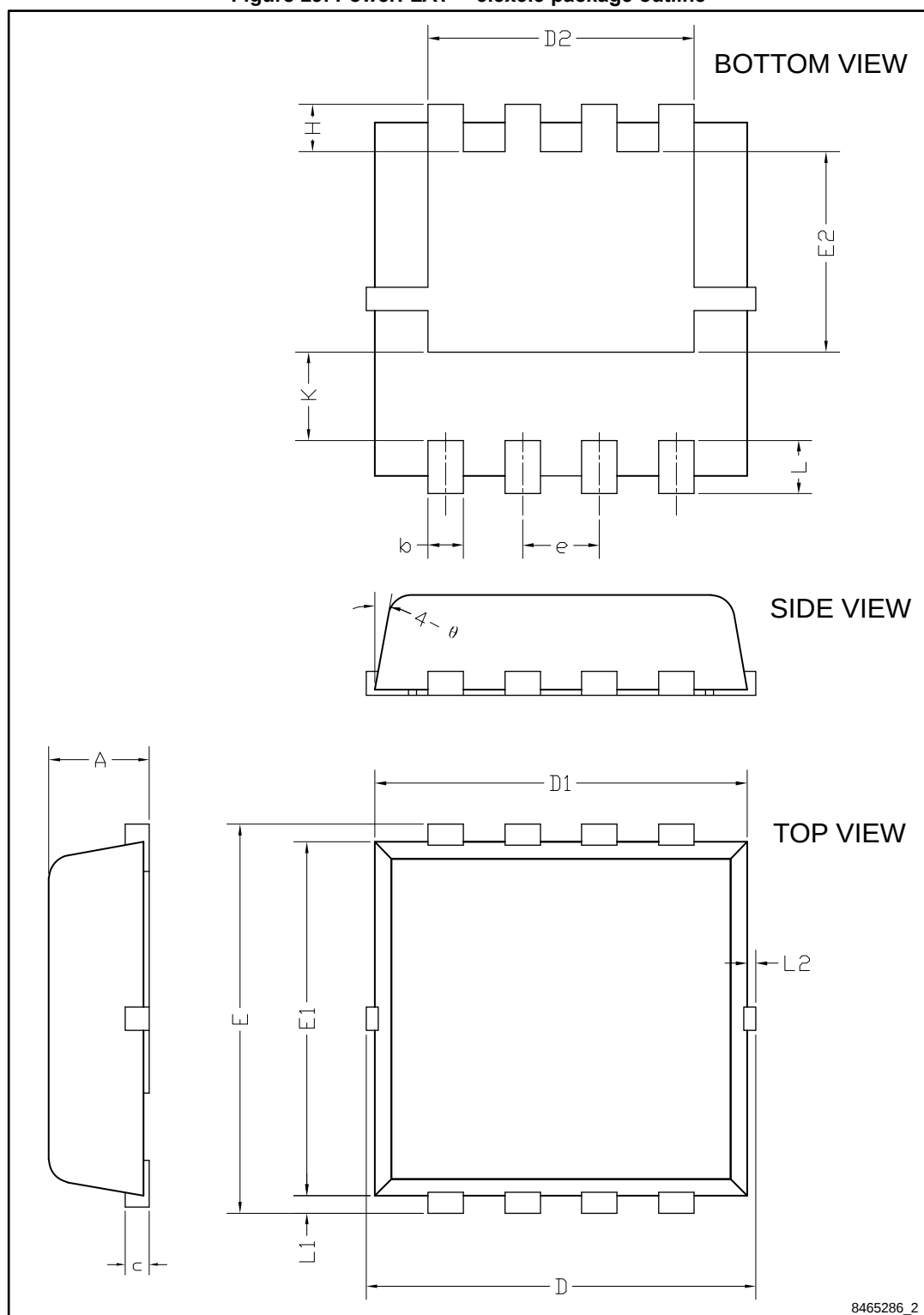
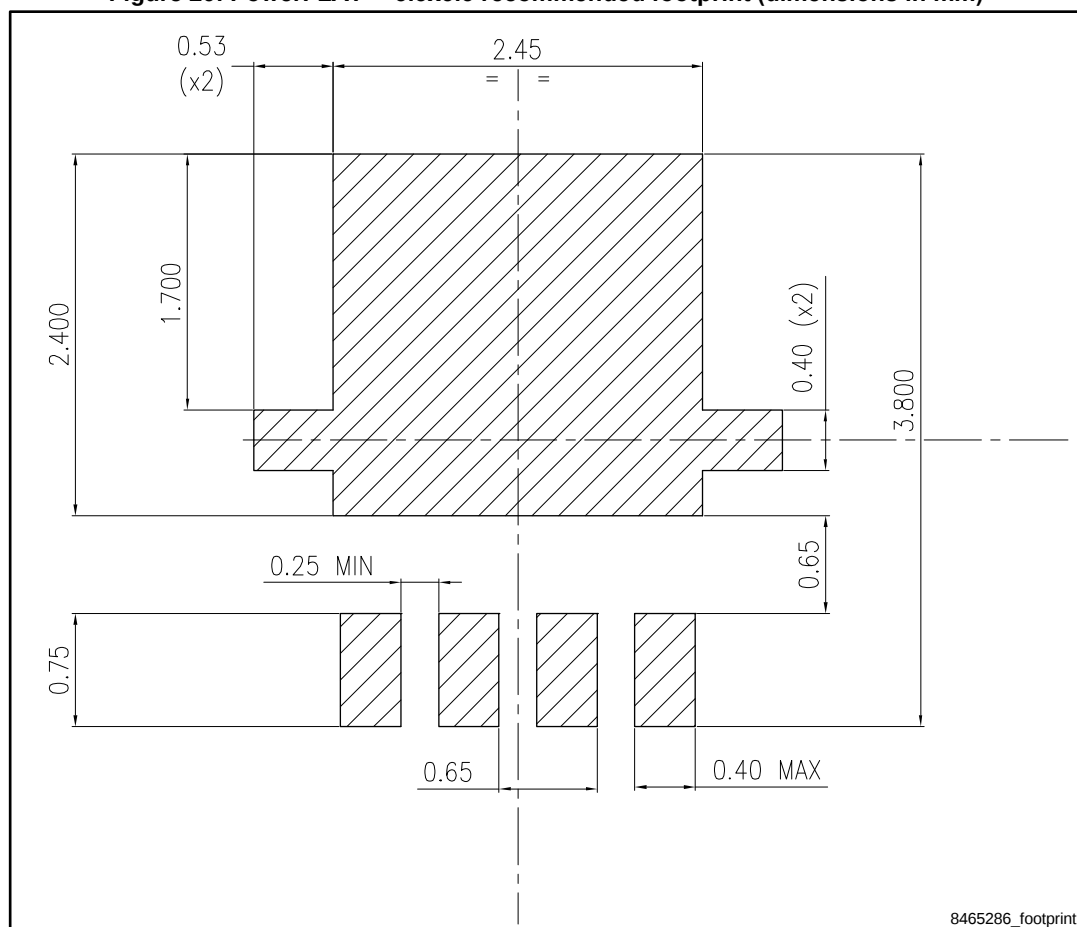


Table 8: PowerFLAT™ 3.3x3.3 package mechanical data

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	0.30	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 (dimensions in mm)



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
31-Jul-2013	1	First release.
05-Dec-2014	2	Document status promoted from preliminary to production data. Modified title, features and description in cover page. Modified: $R_{DS(on)}$ typical and max values in first page and in <i>Table 4: On/off states</i> Modified: <i>Section 4: Package mechanical data</i> Added <i>Section 2.1: Electrical characteristics (curves)</i> .
02-Nov-2017	3	Datasheet promoted from preliminary data to production data. Modified title, silhouette and features table on cover page. Modified <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 4: "Static"</i> and <i>Table 5: "Dynamic"</i> . Modified <i>Figure 8: "Capacitance variations"</i> , <i>Figure 9: "Normalized gate threshold voltage vs temperature"</i> , <i>Figure 10: "Normalized on-resistance vs temperature"</i> , <i>Figure 11: "Normalized $V_{(BR)DSS}$ vs temperature"</i> and <i>Figure 12: "Source-drain diode forward characteristics"</i> . Updated <i>Section 4: "Package information"</i> . Minor text changes.

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