

P-channel 20 V, 0.0195 Ω typ., 9 A STripFET™ VII DeepGATE™ Power MOSFET in a PowerFLAT™ 3.3x3.3

Datasheet - production data

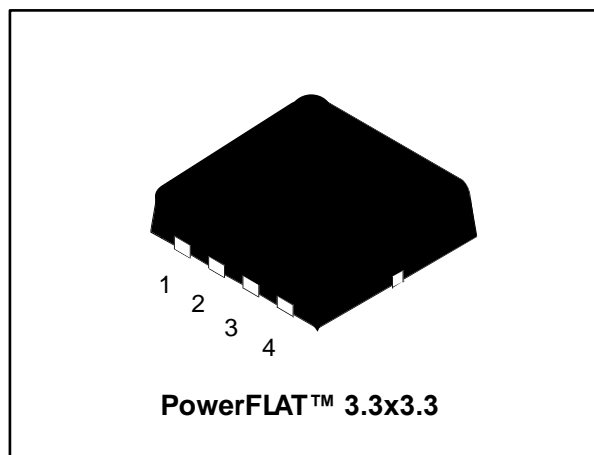
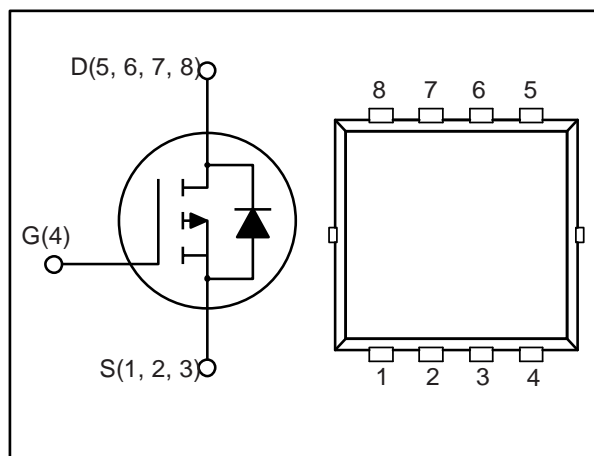


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)max}$	I_D
STL9P2UH7	20 V	0.0225 Ω @ 4.5 V	9 A

- Extremely low on-resistance $R_{DS(on)}$
- Ultra logic level

Applications

- Switching applications

Description

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

Table 1: Device summary

Order code	Marking	Package	Packaging
STL9P2UH7	9P2UH7	PowerFLAT™ 3.3x3.3	Tape and reel



For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves).....	6
3	Test circuits	8
4	Package mechanical data	9
	4.1 PowerFLAT™ 3.3 x 3.3 package mechanical data	10
5	Revision history	13

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	20	V
V_{GS}	Gate-source voltage	± 8	V
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	9	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	5.9	A
$I_{DM}^{(2)}$	Drain current (pulsed)	36	A
$P_{TOT}^{(1)}$	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	2.9	W
T_{stg}	Storage temperature	- 55 to 150	$^{\circ}\text{C}$
T_j	Max. operating junction temperature	150	$^{\circ}\text{C}$

Notes:

⁽¹⁾The value is rated according to $R_{thj-pcb}$

⁽²⁾Pulse width limited by safe operating area

Table 3: Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}^{(2)}$	Thermal resistance junction-case	2.5	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	42	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(2)}$	Thermal resistance junction-pcb	63.5	$^{\circ}\text{C/W}$

Notes:

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

⁽²⁾Steady state.



For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	V _{GS} = 0, I _D = 250 μA	20			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0, V _{DS} = 20 V			1	μA
I _{GSS}	Gate-body leakage current	V _{DS} = 0, V _{GS} = ± 5 V			± 5	μA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	0.4		1	V
R _{DS(on)}	Static drain-source on- resistance	V _{GS} = 4.5 V, I _D = 4.5 A		0.0195	0.0225	Ω
		V _{GS} = 2.5 V, I _D = 4.5 A		0.02	0.025	Ω
		V _{GS} = 1.8 V, I _D = 4.5 A		0.036	0.043	Ω
		V _{GS} = 1.5 V, I _D = 4.5 A		0.05	0.085	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{GS} = 0, V _{DS} = 16 V, f = 1 MHz	-	2390	-	pF
C _{oss}	Output capacitance		-	220	-	pF
C _{rss}	Reverse transfer capacitance		-	188	-	pF
Q _g	Total gate charge	V _{DD} = 15 V, I _D = 9 A, V _{GS} = 4.5 V	-	22	-	nC
Q _{gs}	Gate-source charge		-	4.2	-	nC
Q _{gd}	Gate-drain charge		-	3.6	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 16 V, I _D = 9 A, R _G = 1 Ω, V _{GS} = 4.5 V	-	12.5	-	ns
t _r	Rise time		-	30.5	-	ns
t _{d(off)}	Turn-off delay time		-	128	-	ns
t _f	Fall time		-	84.5	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	9	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	36	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0, I_{SD} = 1 \text{ A}$	-	-	1	V
t_{rr}	Reverse recovery time	$V_{DD} = 16 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s}, I_{SD} = 1 \text{ A}$	-	15.8		ns
Q_{rr}	Reverse recovery charge		-	5.9		nC
I_{RRM}	Reverse recovery current		-	0.7		A

Notes:

⁽¹⁾ Pulse width limited by safe operating area.

⁽²⁾ Pulsed: pulse duration = 300 μs , duty cycle 1.5%



For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

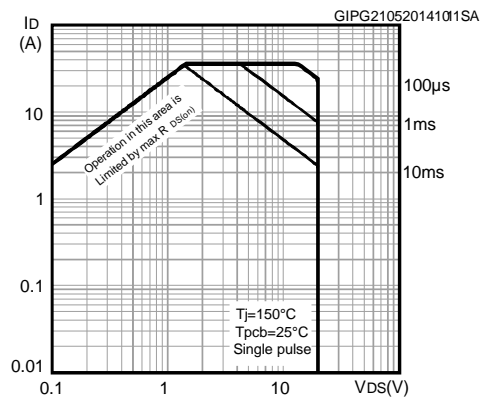


Figure 3: Thermal impedance

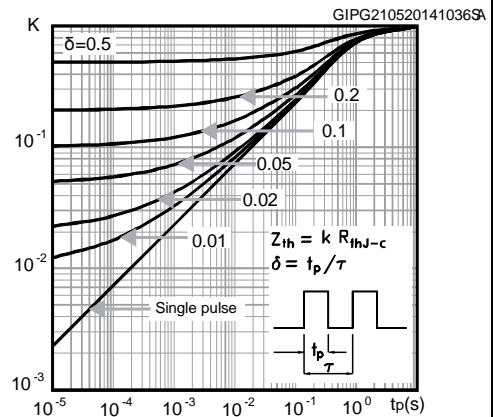


Figure 4: Output characteristics

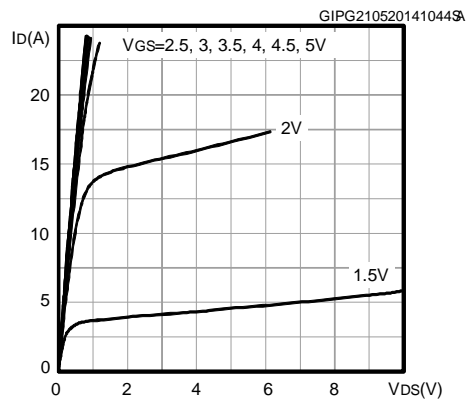


Figure 5: Transfer characteristics

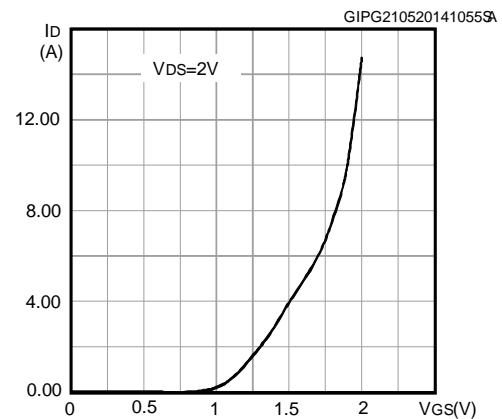


Figure 6: Gate charge vs gate-source voltage

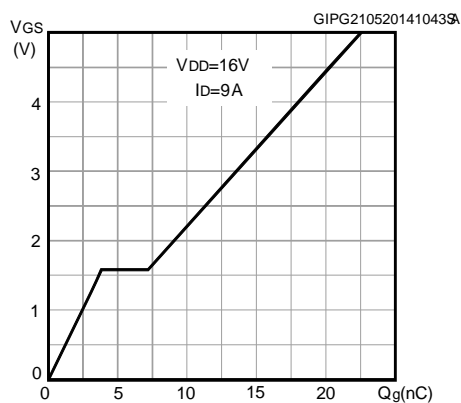


Figure 7: Static drain-source on-resistance

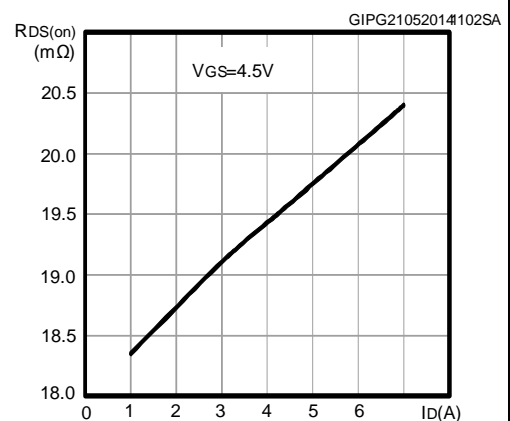


Figure 8: Capacitance variations

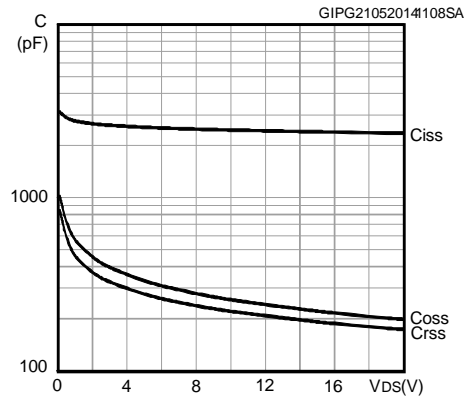


Figure 9: Normalized gate threshold voltage vs temperature

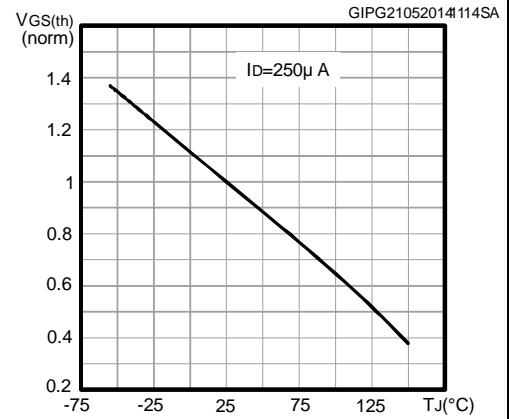


Figure 10: Normalized on-resistance vs temperature

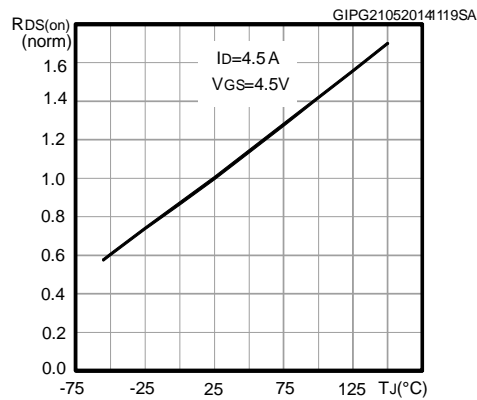


Figure 11: Normalized V(BR)DSS vs temperature

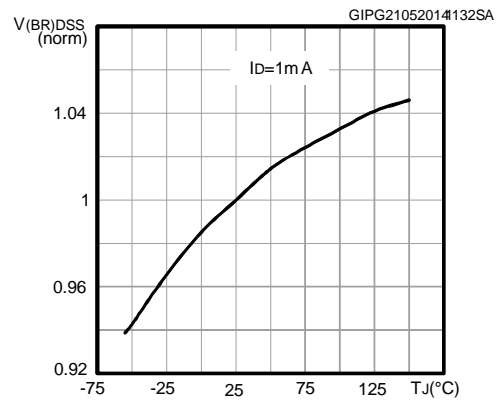
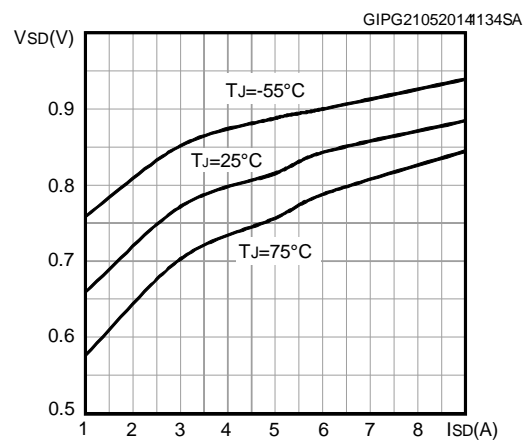


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

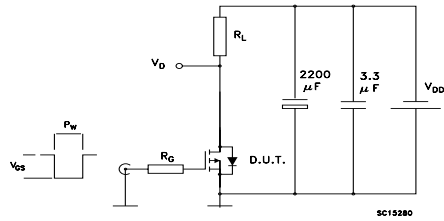


Figure 14: Gate charge test circuit

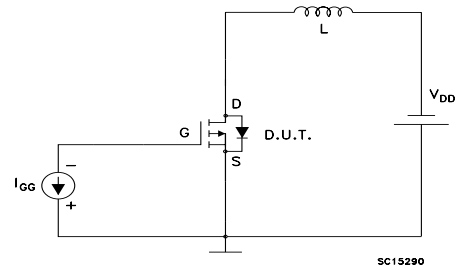
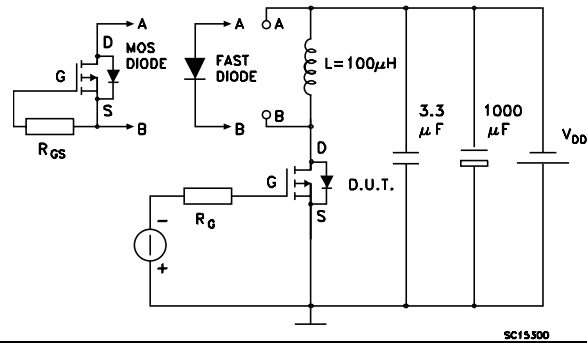


Figure 15: Test circuit for inductive load switching and diode recovery times



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.

4.1 PowerFLAT™ 3.3 x 3.3 package mechanical data

Figure 16: PowerFLAT™ 3.3 x 3.3 drawing

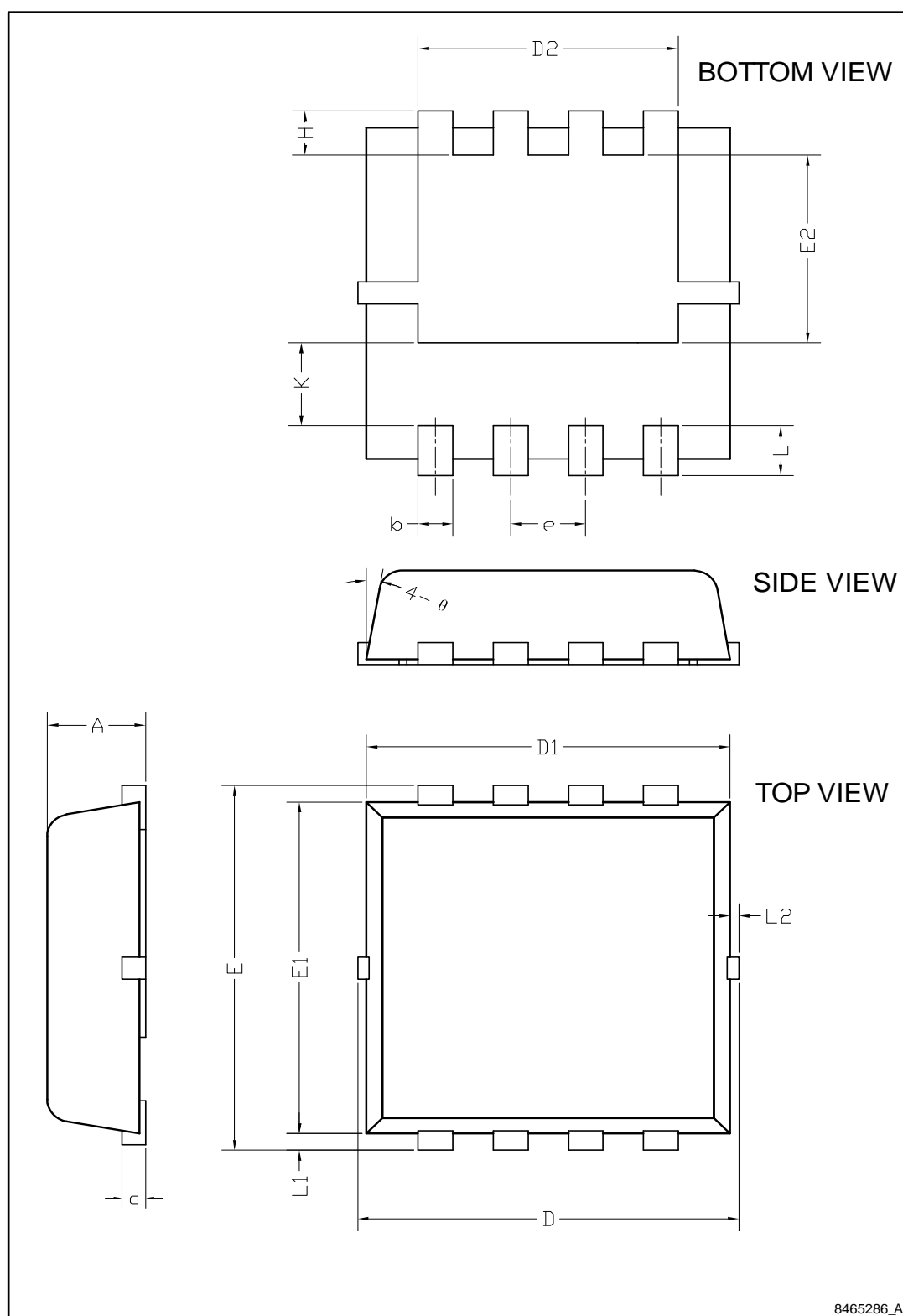
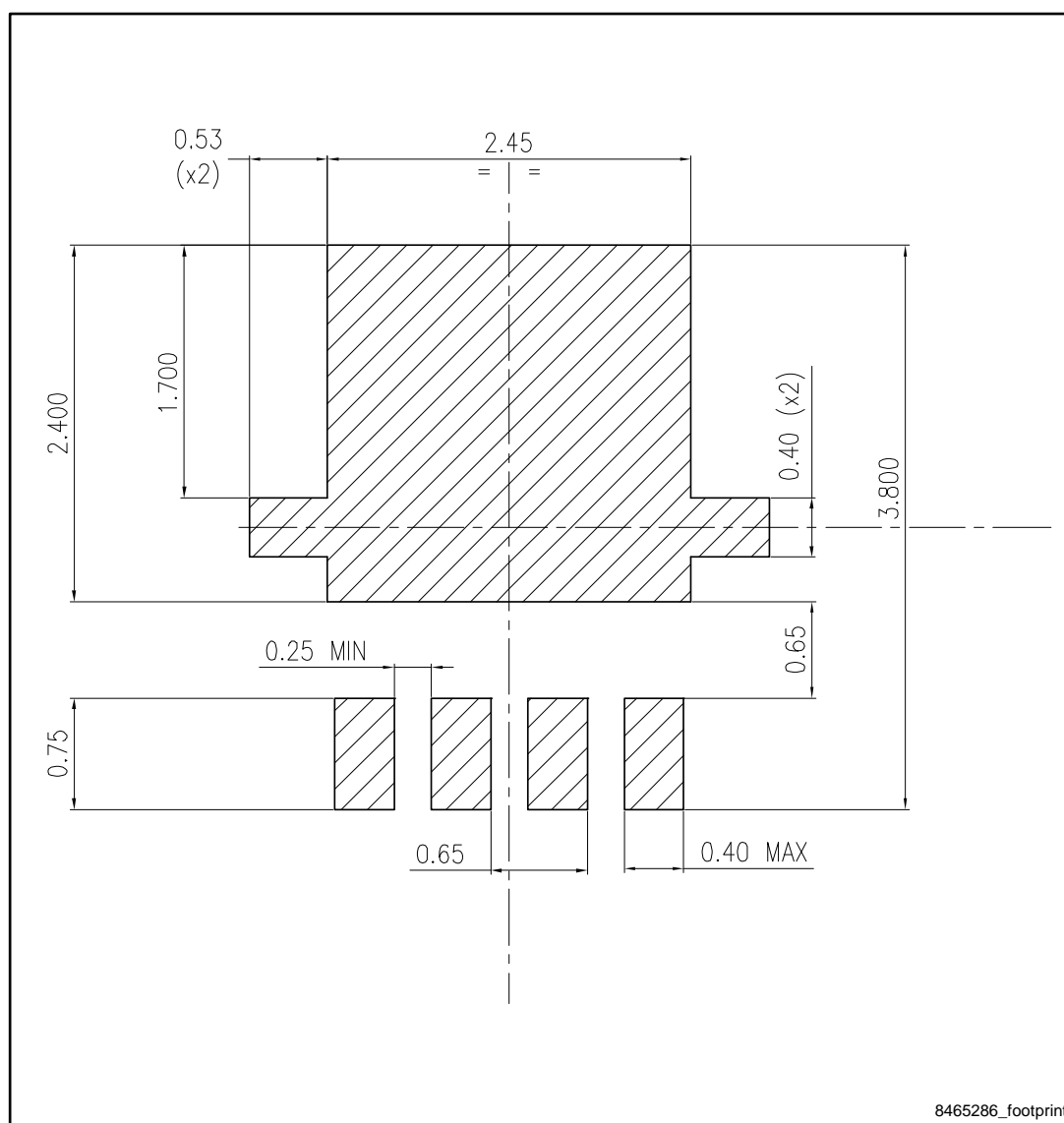


Table 8: PowerFLAT™ 3.3 x 3.3 mechanical data

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
J	8°	10°	12°

Figure 17: PowerFLAT™ 3.3 x 3.3 recommended footprint



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
26-Aug-2013	1	First release.
04-Jun-2014	2	Document status promoted from preliminary data to production data Modified: title Modified: $R_{DS(on)}$ max value in cover page Modified: $R_{DS(on)}$ (typical and maximum) values in Table 4: "On /off states" Modified: the entire typical values in Table 5: "Dynamic" , Table 6: "Switching times" and Table 7: "Source drain diode" Added: Section 8.1: "Electrical characteristics (curves)" Minor text changes

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