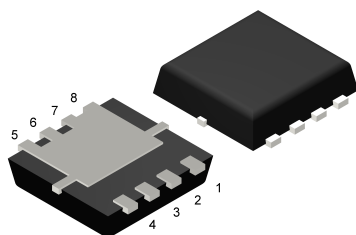
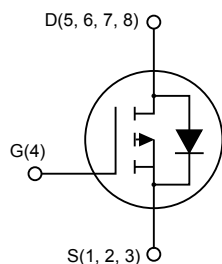


P-channel -30 V, 12 mΩ typ., -9 A STripFET™ H6 Power MOSFET in a PowerFLAT™ 3.3x3.3 package



PowerFLAT™ 3.3x3.3



AM01475v4

Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL9P3LLH6	-30 V	15 mΩ	-9 A

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

Applications

- Switching applications

Description

This device is a P-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.

Product status	
STL9P3LLH6	
Product summary	
Order code	STL9P3LLH6
Marking	9P3L
Package	PowerFLAT™ 3.3x3.3
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	-30	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	-9	A
I_D	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	-5.9	A
$I_{DM}^{(1)}$	Drain current (pulsed)	-36	A
P_{TOT}	Total dissipation at $T_{pcb}=25\text{ }^{\circ}\text{C}$	3	W
T_{stg}	Storage temperature range	- 55 to 150	$^{\circ}\text{C}$
T_j	Operating junction temperature range		

1. Pulse width limited by safe operating area.

Table 2. 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	$^{\circ}\text{C/W}$

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

2 Electrical characteristics

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

Table 3. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = -1\text{ mA}$	-30			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = -30\text{ V}$			-1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = -30\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}$ ⁽¹⁾			-10	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	-1			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = -10\text{ V}$, $I_D = -4.5\text{ A}$		12	15	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}$, $I_D = -4.5\text{ A}$		18	22.5	$\text{m}\Omega$

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

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	2615	-	pF
C_{oss}	Output capacitance		-	340	-	pF
C_{rss}	Reverse transfer capacitance		-	235	-	pF
Q_g	Total gate charge	$V_{DD} = -15\text{ V}$, $I_D = -9\text{ A}$, $V_{GS} = -4.5\text{ to }0\text{ V}$ (see Figure 13. Gate charge test circuit)	-	24	-	nC
Q_{gs}	Gate-source charge		-	9	-	nC
Q_{gd}	Gate-drain charge		-	8	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = -15\text{ V}$, $I_D = -4.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = -10\text{ V}$ (see Figure 12. Switching times test circuit for resistive load)	-	13.2	-	ns
t_r	Rise time		-	93	-	ns
$t_{d(off)}$	Turn-off delay time		-	50	-	ns
t_f	Fall time		-	18	-	ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = -9\text{ A}$, $V_{GS} = 0\text{ V}$	-		-1.1	V

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_{SD} = -9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = -24\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	20		ns
Q_{rr}	Reverse recovery charge		-	16		nC
I_{RRM}	Reverse recovery current		-	-1.6		A

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

2.1 Electrical characteristics (curves)

Note: Note: For the P-channel Power MOSFET, current and voltage polarities are reversed.

Figure 1. Safe operating area

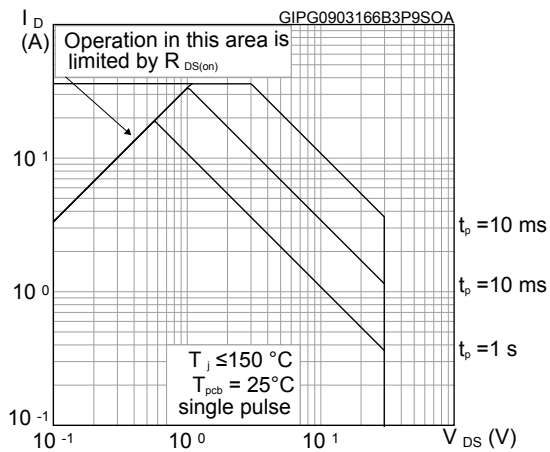


Figure 2. Thermal impedance

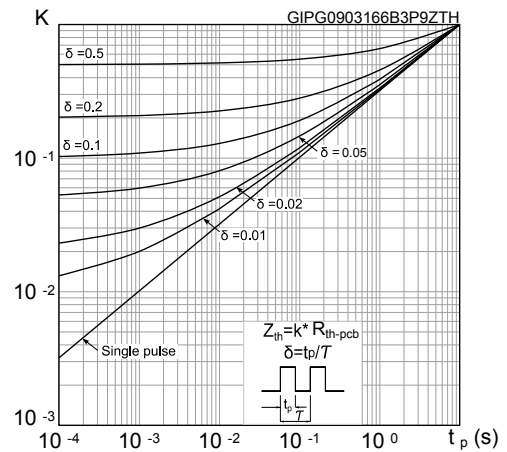


Figure 3. Output characteristics

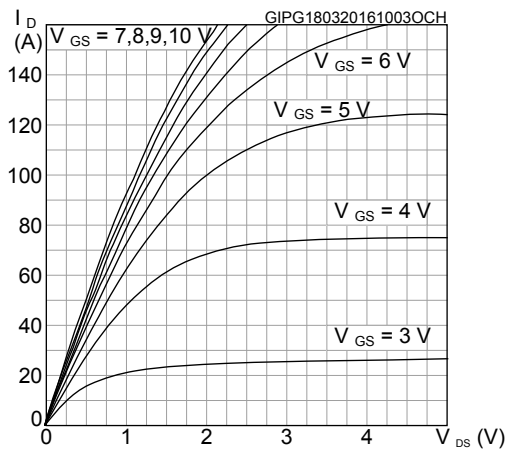


Figure 4. Transfer characteristics

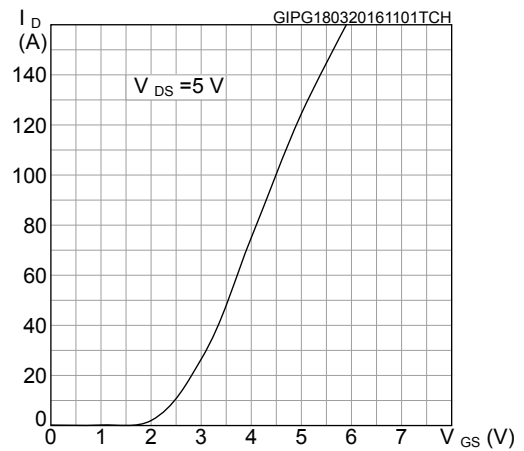


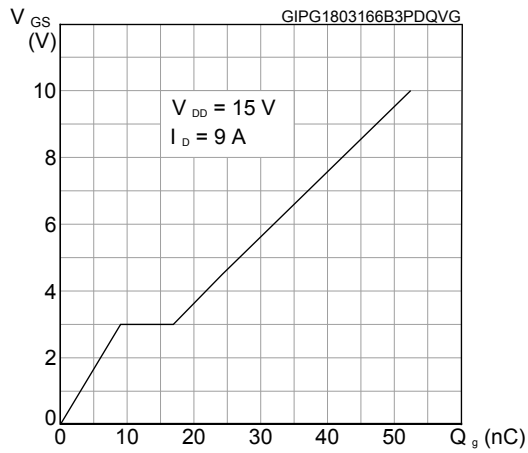
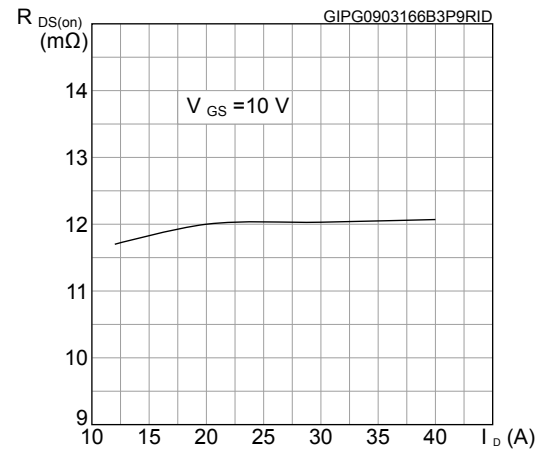
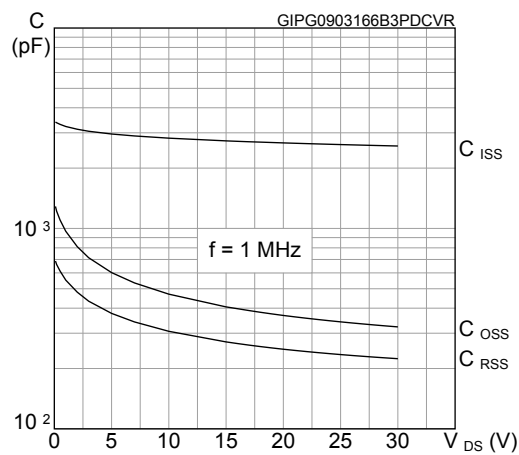
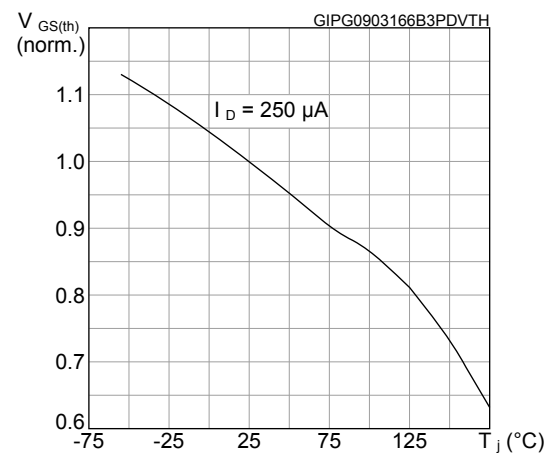
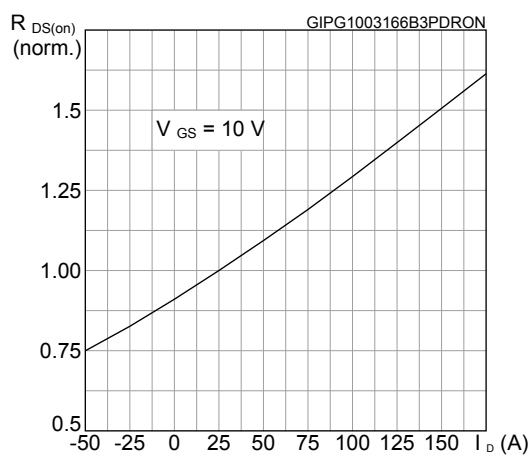
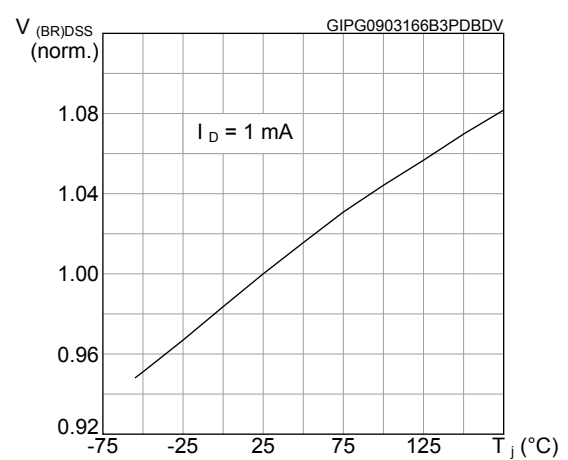
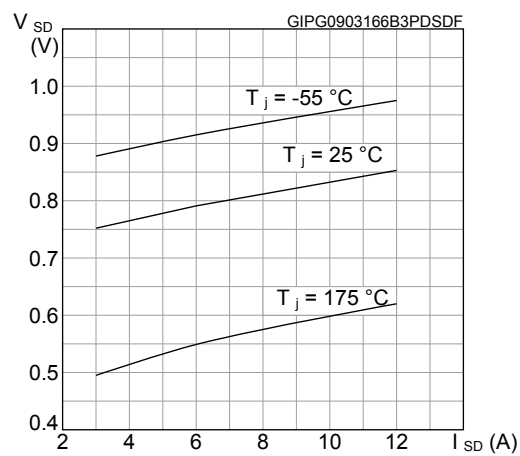
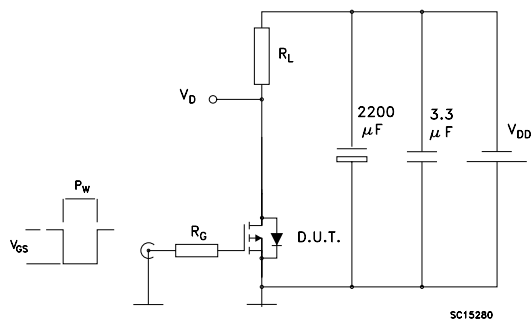
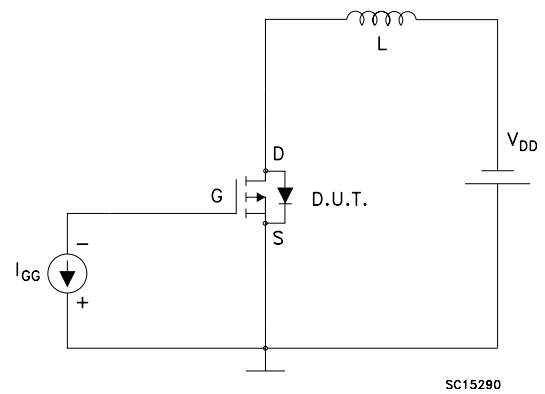
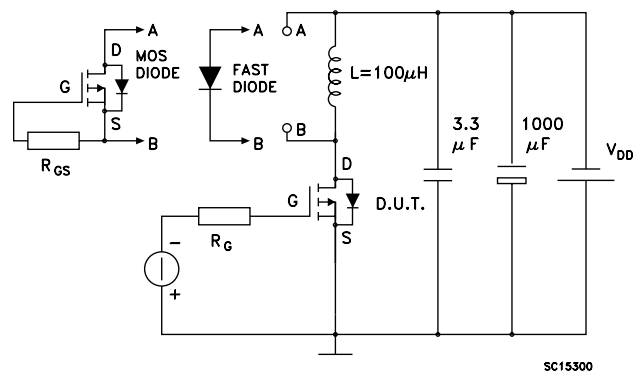
Figure 5. Gate charge vs gate-source voltage

Figure 6. Static drain-source on-resistance

Figure 7. Capacitance variations

Figure 8. Normalized gate threshold voltage vs temperature

Figure 9. Normalized on-resistance vs temperature

Figure 10. Normalized $V_{(BR)DSS}$ vs temperature


Figure 11. Source-drain diode forward characteristics



3 Test circuits

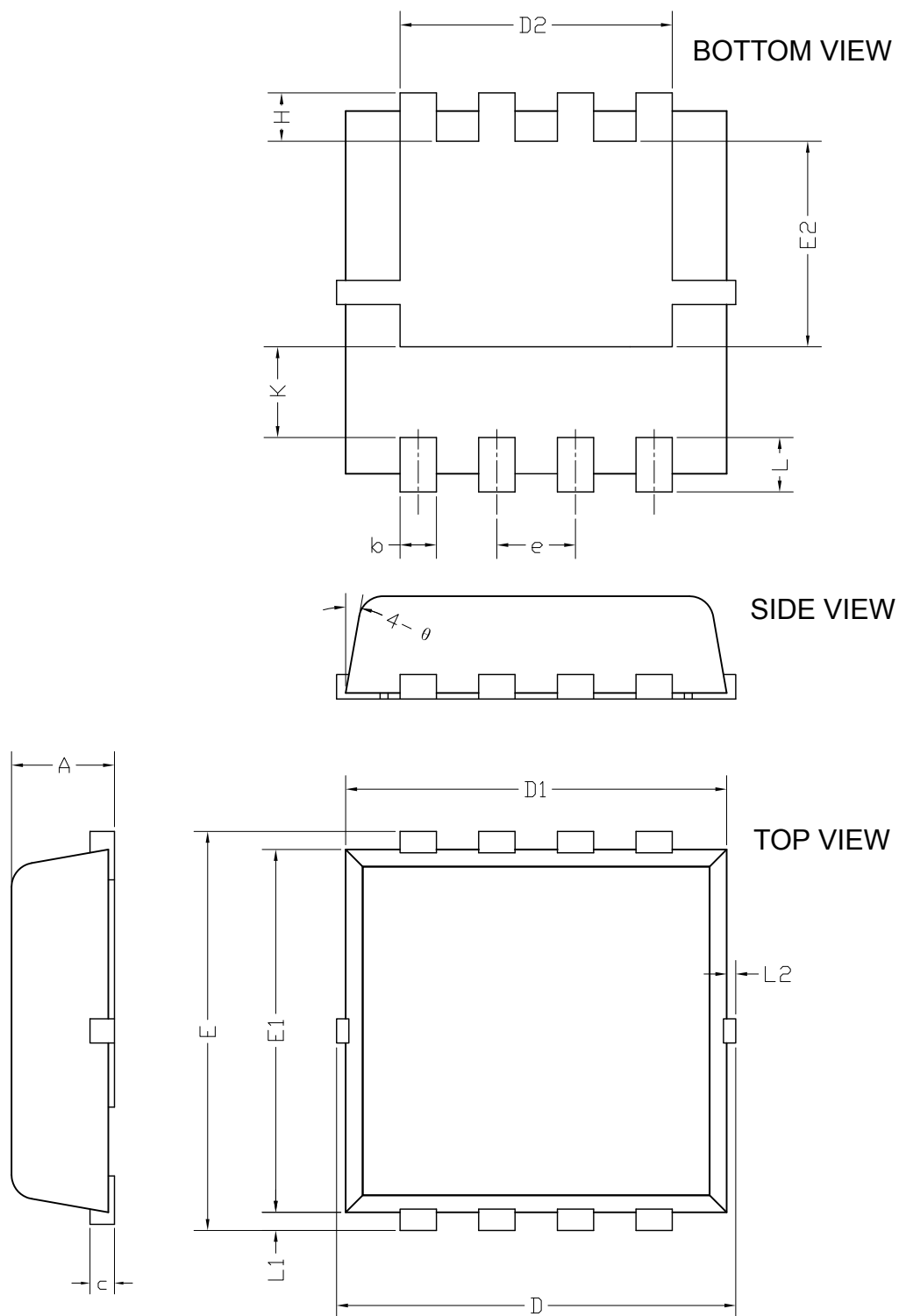
Figure 12. Switching times test circuit for resistive load

Figure 13. Gate charge test circuit

Figure 14. Test circuit for inductive load switching and diode recovery times


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 15. PowerFLAT™ 3.3x3.3 package outline

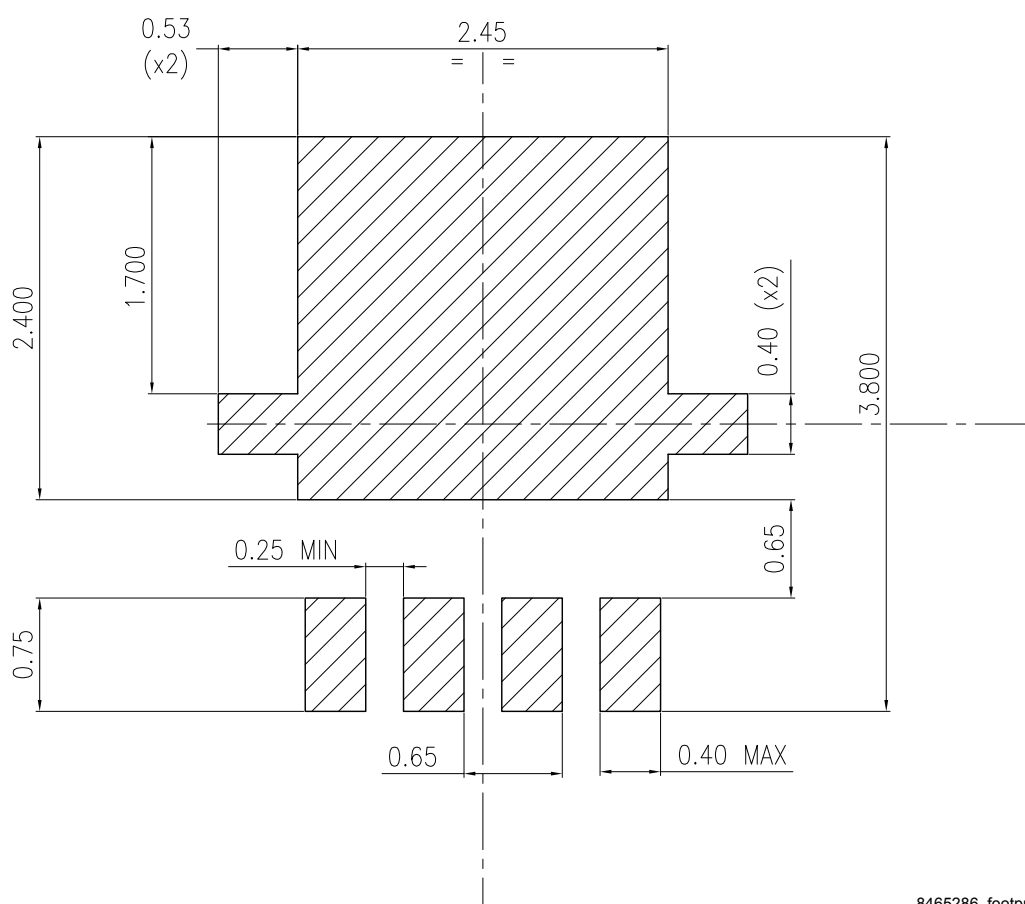


8465286_2

Table 7. 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 16. PowerFLAT™ 3.3x3.3 recommended footprint (dimensions are in mm)



8465286_footprint

Revision history

Table 8. Document revision history

Date	Revision	Changes
23-Jan-2014	1	First release.
07-Mar-2016	2	Modified: title and $R_{DS(on)}$ max value Modified: <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 4: "On /off states"</i> , <i>Table 5: "Dynamic"</i> , <i>Table 6: "Switching times"</i> and <i>Table 7: "Source drain diode"</i> Minor text changes.
20-Feb-2018	3	Updated Figure 1. Safe operating area and Figure 2. Thermal impedance . Removed maturity status indication from cover page. The document status is production data.

Contents

1	Electrical ratings.....	2
2	Electrical characteristics.....	3
2.1	Electrical characteristics (curves).....	5
3	Test circuits	8
4	Package information.....	9
4.1	PowerFLAT™ 3.3x3.3 package information	9
	Revision history	13
	Contents	14
	Disclaimer.....	15

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.

© 2018 STMicroelectronics – All rights reserved