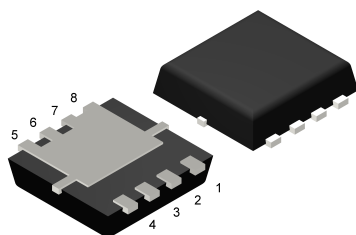
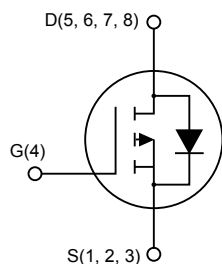


## P-channel -30 V, 12 mΩ typ., -9 A STripFET™ H6 Power MOSFET in a PowerFLAT™ 3.3x3.3 package



PowerFLAT™ 3.3x3.3



AM01475v4

### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
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<sub>DS(on)</sub> 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	$\pm 20$	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 1inch<sup>2</sup>, 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	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = -30\text{ V}$ , $T_C = 125\text{ }^{\circ}\text{C}$ <sup>(1)</sup>			-10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	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	m $\Omega$
		$V_{GS} = -4.5\text{ V}$ , $I_D = -4.5\text{ A}$		18	22.5	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

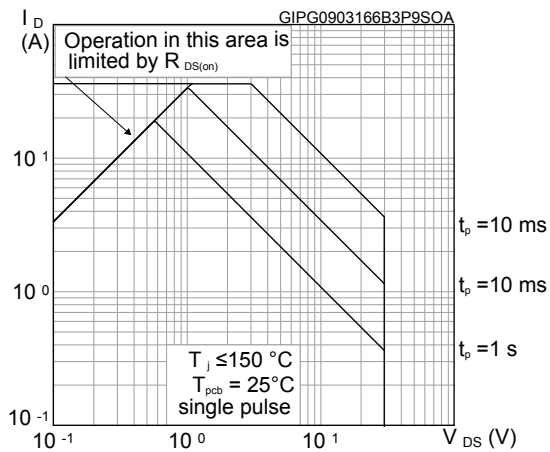
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_{SD} = -9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$  $V_{DD} = -24\text{ V}$ , $T_J = 150\text{ }^{\circ}\text{C}$  (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	20		ns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

1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

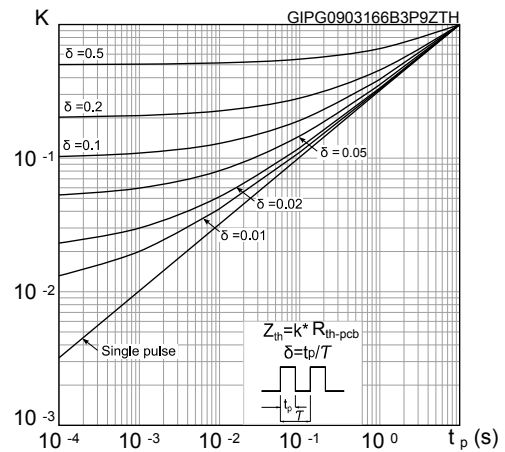
## 2.1 Electrical characteristics (curves)

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

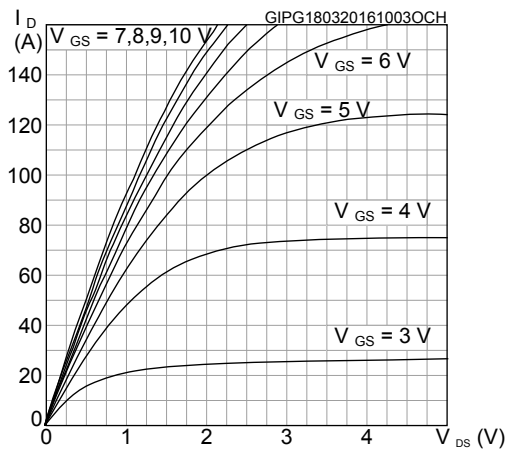
**Figure 1. Safe operating area**



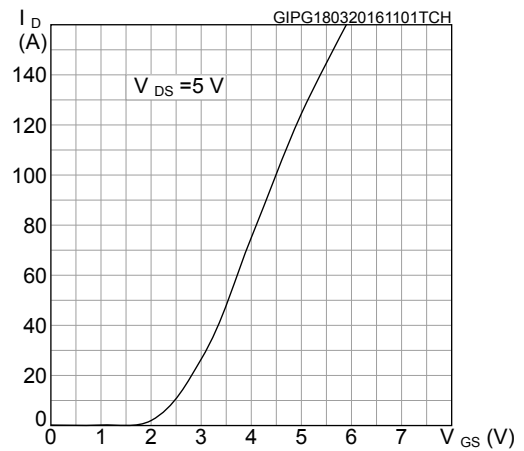
**Figure 2. Thermal impedance**

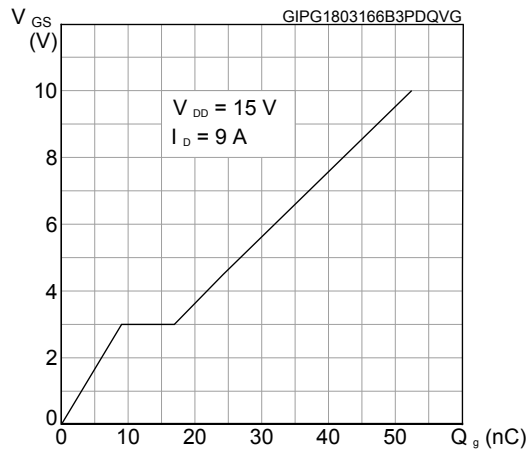
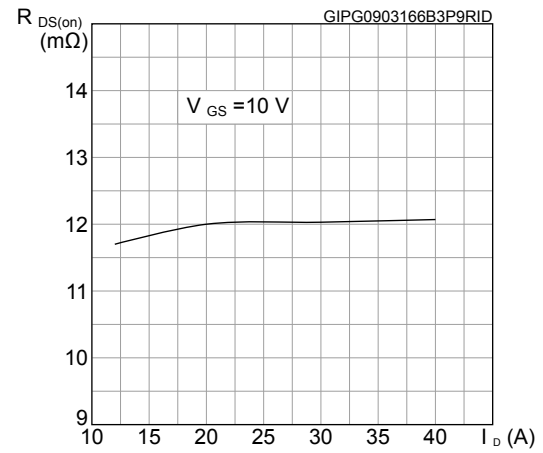
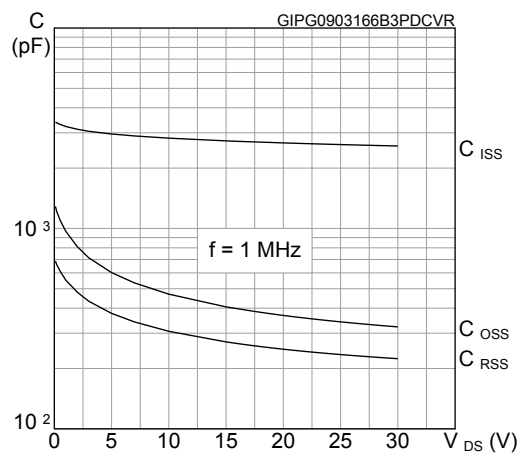
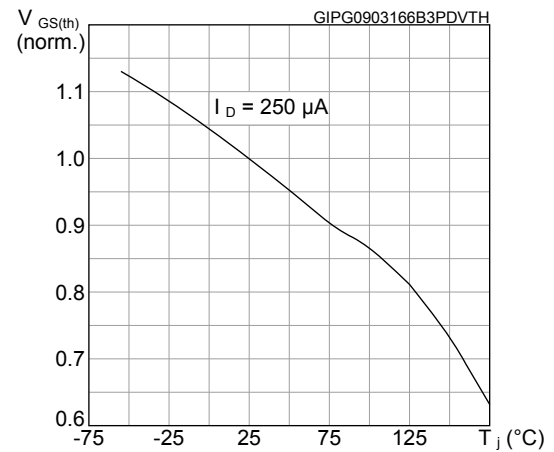
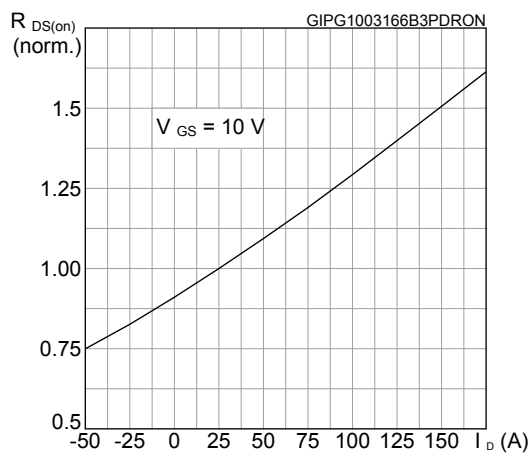
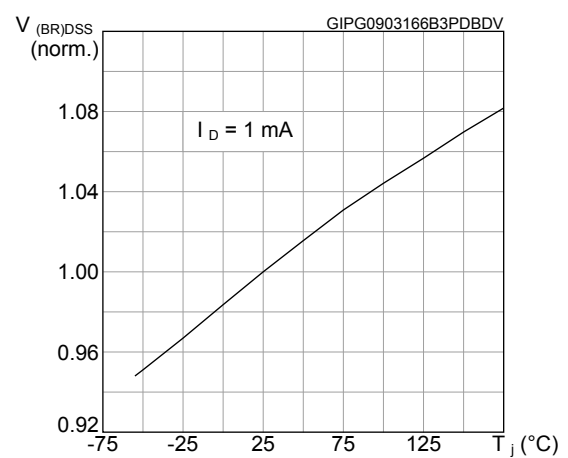


**Figure 3. Output characteristics**

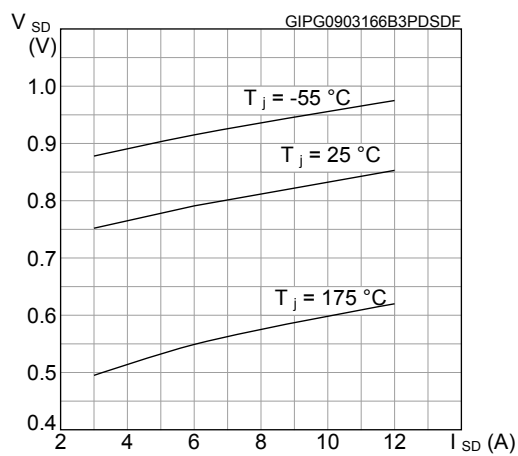


**Figure 4. Transfer characteristics**

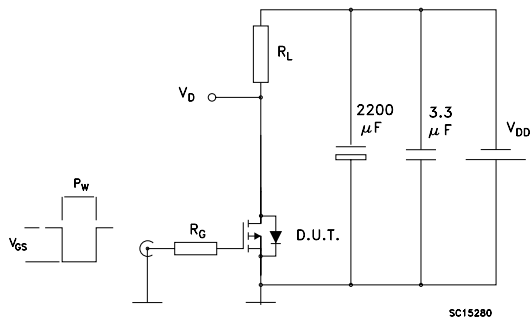
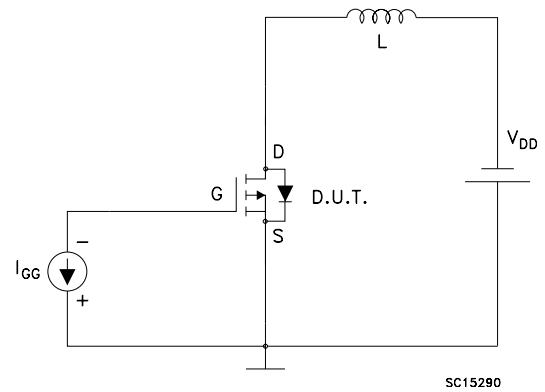
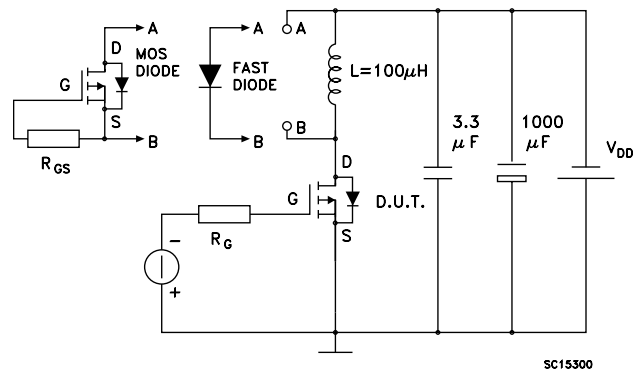


**Figure 5. Gate charge vs gate-source voltage**

**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**




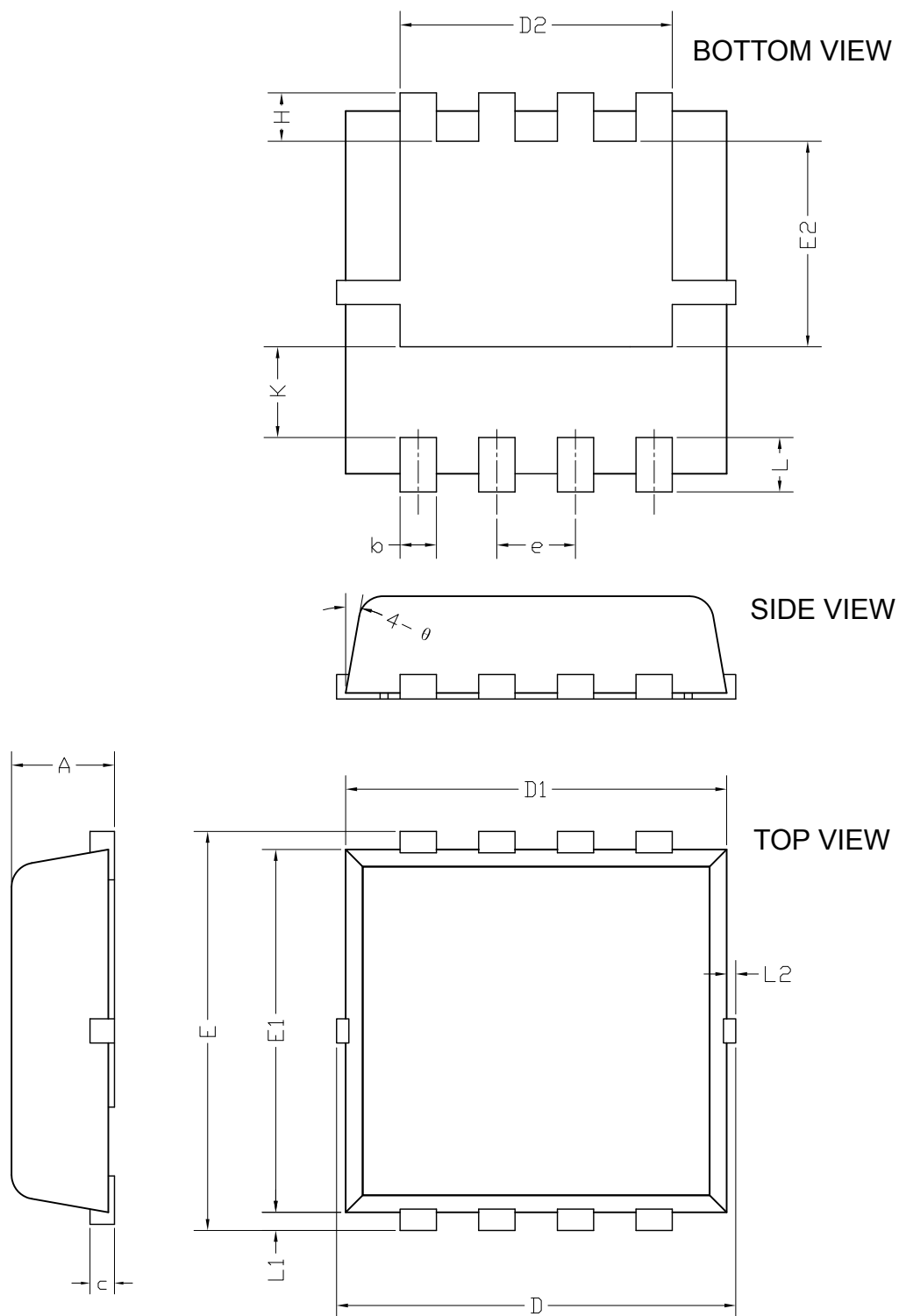
## **4 Package information**

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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](http://www.st.com). ECOPACK® is an ST trademark.

## 4.1 PowerFLAT™ 3.3x3.3 package information

Figure 15. PowerFLAT™ 3.3x3.3 package outline

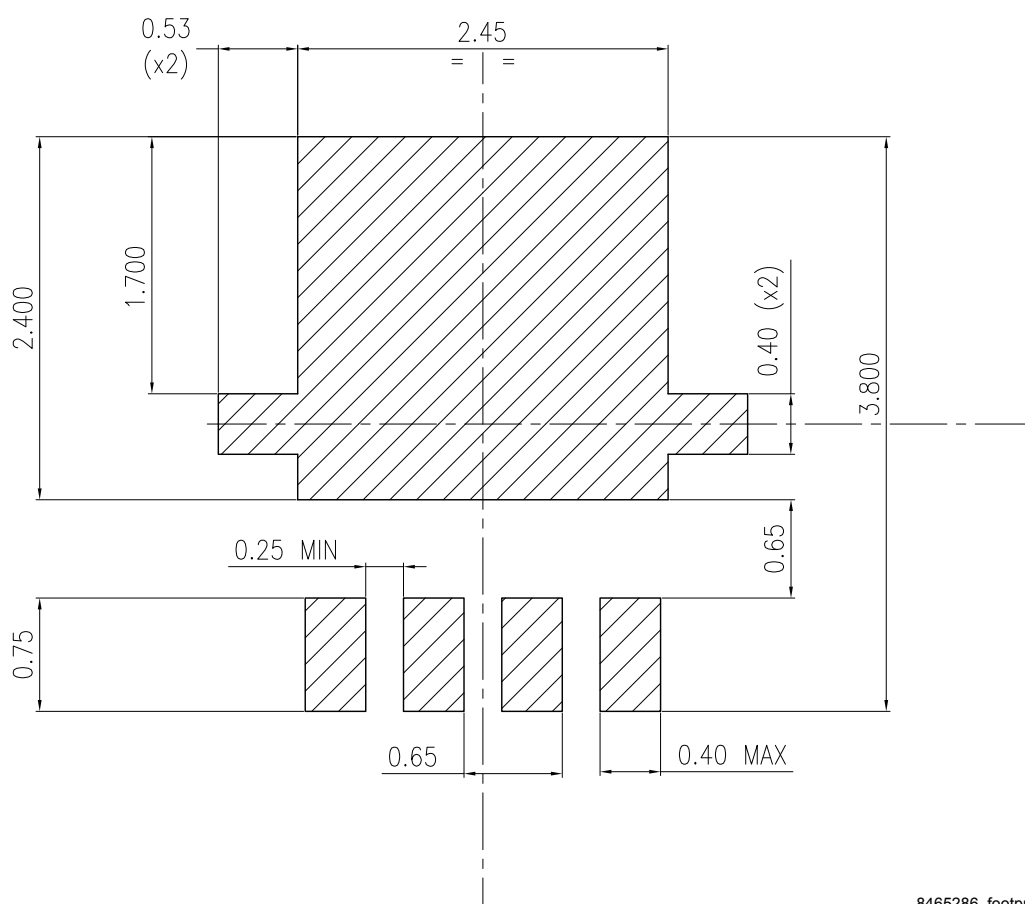


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**Table 7. PowerFLAT™ 3.3x3.3 package mechanical data**

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 <a href="#">Figure 1. Safe operating area</a> and <a href="#">Figure 2. Thermal impedance</a> . Removed maturity status indication from cover page. The document status is production data.

## Contents

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

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