

N-channel 60 V, 21 mΩ typ., 7 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 2x2 package

Datasheet - production data

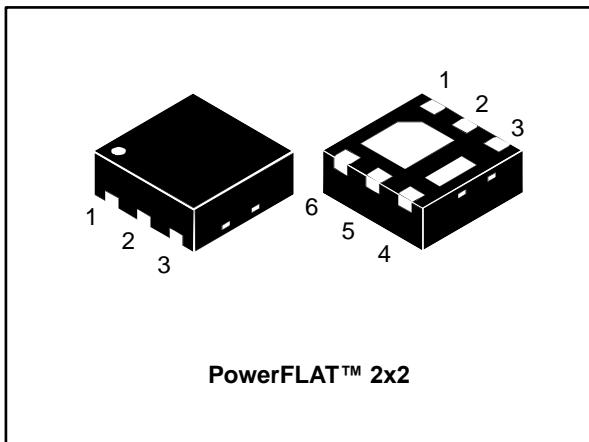
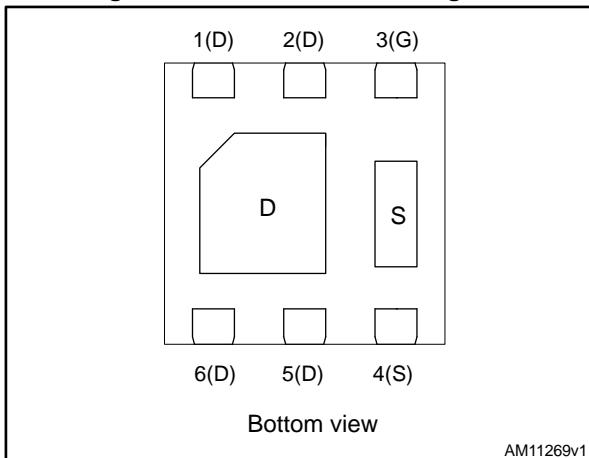


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL7N6F7	60 V	25 mΩ	7 A

- 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
STL7N6F7	ST7N	PowerFLAT™ 2x2	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuits	8
4	Package information	9
4.1	PowerFLAT 2x2 package information	10
5	Revision history	12

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	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	7	A
I_D	Drain current (continuous) at $T_{pcb} = 100^\circ\text{C}$	4.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	28	A
P_{TOT}	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	2.4	W
T_J	Operating junction temperature range	-55 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature range		

Notes:

⁽¹⁾Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	52	$^\circ\text{C}/\text{W}$

Notes:

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

2 Electrical characteristics

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

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$I_D = 1 \text{ mA}$, $V_{GS} = 0 \text{ V}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0 \text{ V}$, $V_{DS} = 60 \text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{GS} = 20 \text{ V}$, $V_{DS} = 0 \text{ V}$			100	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	2		4	V
$R_{DS(\text{on})}$	Static drain-source on-resistance	$V_{GS} = 10 \text{ V}$, $I_D = 3.5\text{A}$		21	25	$\text{m}\Omega$

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 30 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GS} = 0 \text{ V}$	-	420	-	pF
C_{oss}	Output capacitance		-	215	-	pF
C_{rss}	Reverse transfer capacitance		-	16	-	pF
Q_g	Total gate charge	$V_{DD} = 30 \text{ V}$, $I_D = 7 \text{ A}$ $V_{GS} = 0 \text{ to } 10 \text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	8	-	nC
Q_{gs}	Gate-source charge		-	2.3	-	nC
Q_{gd}	Gate-drain charge		-	2.1	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$	Turn-on delay time	$V_{DD} = 30 \text{ V}$, $I_D = 3.5\text{A}$, $R_G = 4.7 \Omega$, $V_{GS} = 10 \text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	7.85	-	ns
t_r	Rise time		-	3.25	-	ns
$t_{d(\text{off})}$	Turn-off delay time		-	12.1	-	ns
t_f	Fall time		-	3.95	-	ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 7 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 7 \text{ A}$, $dI/dt = 100 \text{ A}/\mu\text{s}$	-	17.1		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 48 \text{ V}$ (see <i>Figure 15: "Test circuit for inductive load switching and diode recovery times"</i>)	-	6.67		nC
I_{RRM}	Reverse recovery current		-	0.8		A

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

2.1 Electrical characteristics (curves)

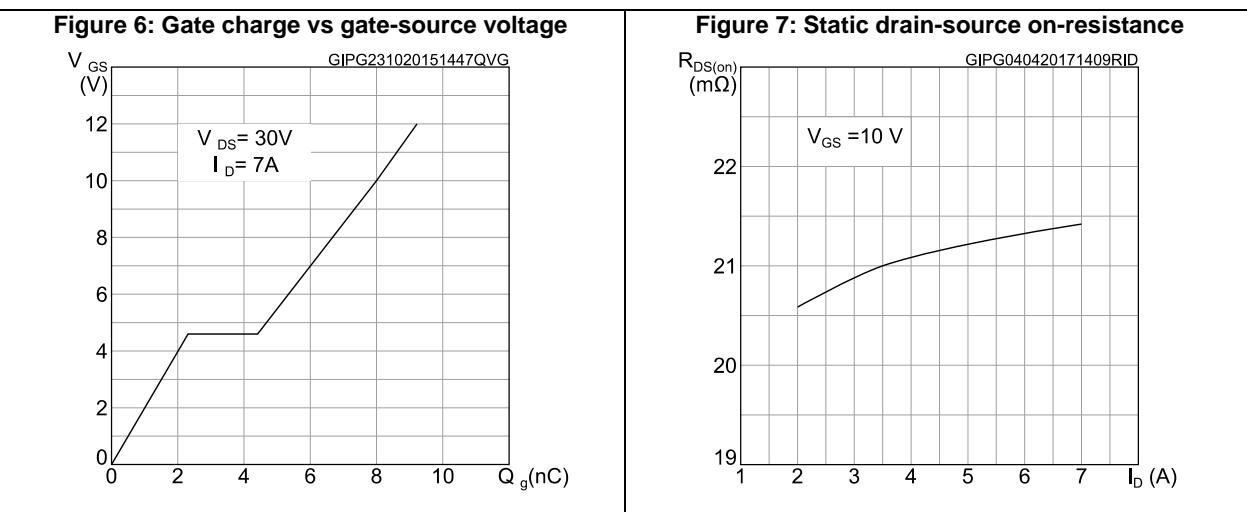
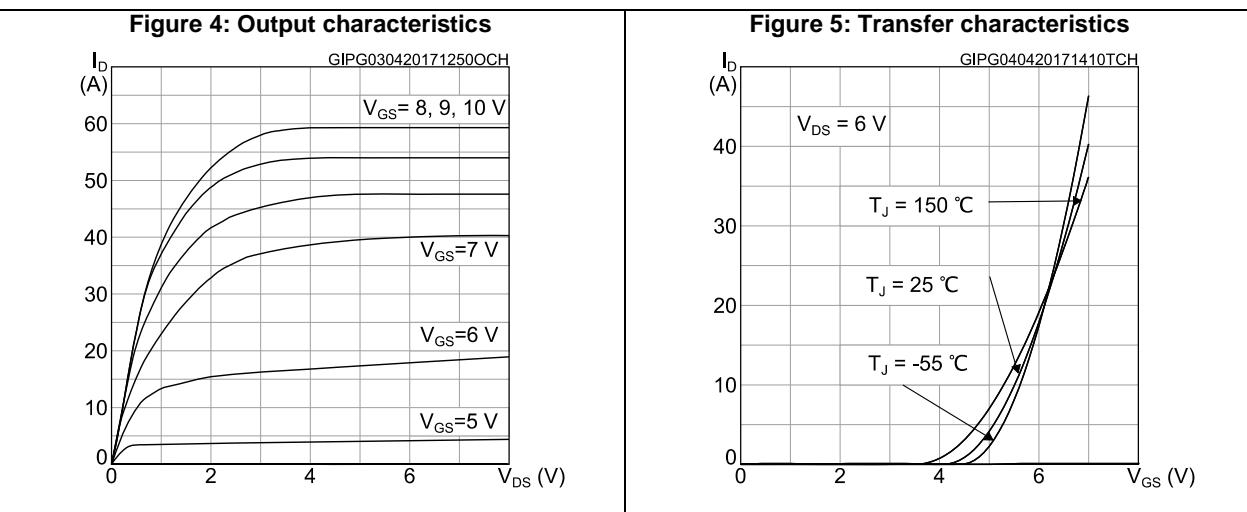
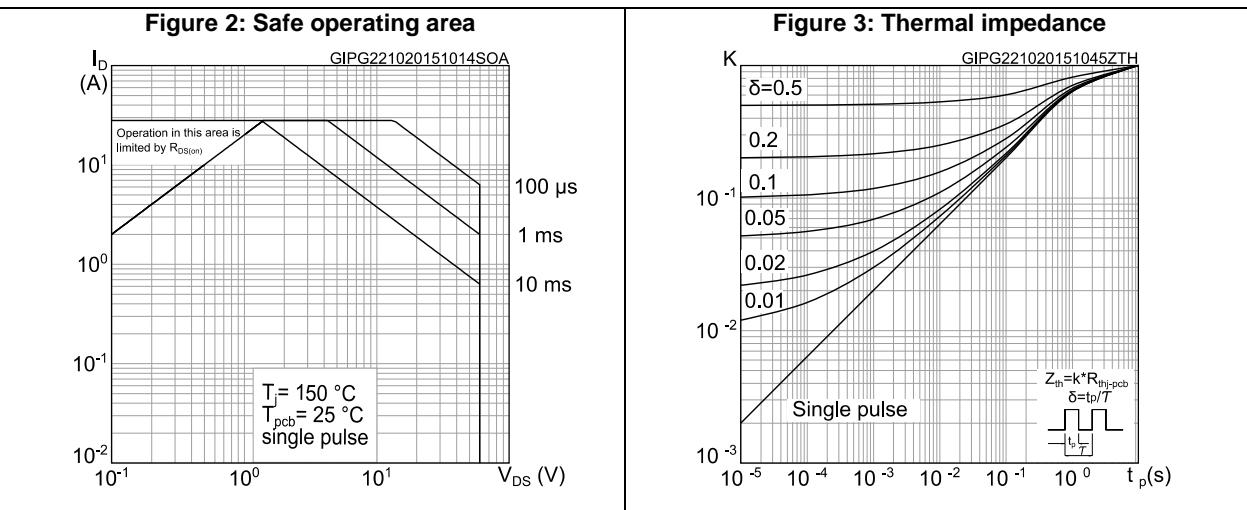


Figure 8: Capacitance variations

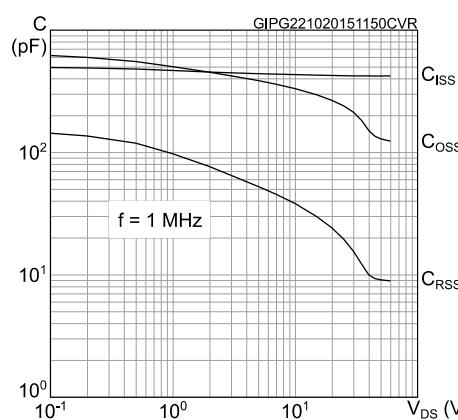


Figure 9: Normalized gate threshold voltage vs temperature

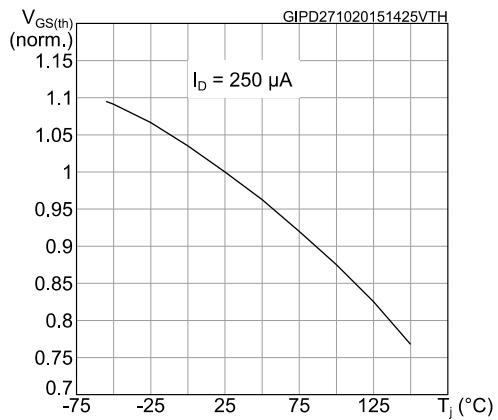


Figure 10: Normalized on-resistance vs temperature

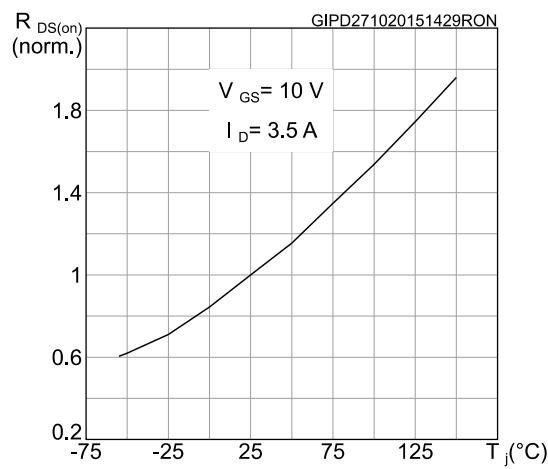


Figure 11: Normalized V_(BR)DSS vs temperature

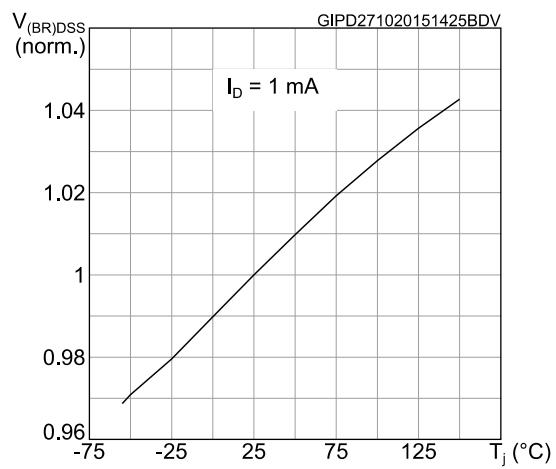
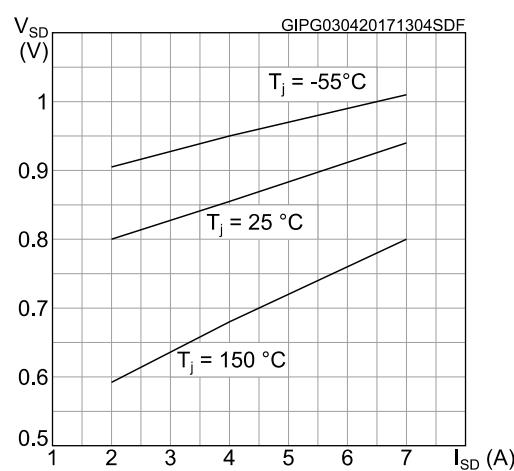


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

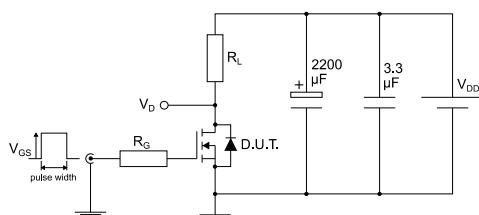


Figure 14: Test circuit for gate charge behavior

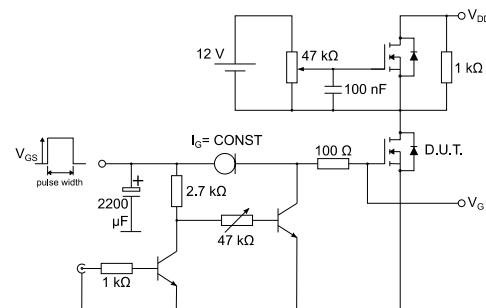


Figure 15: Test circuit for inductive load switching and diode recovery times

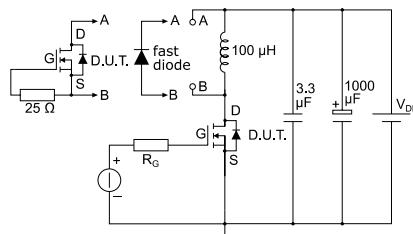


Figure 16: Unclamped inductive load test circuit

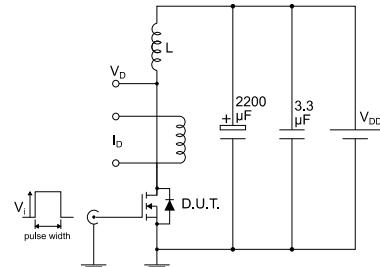


Figure 17: Unclamped inductive waveform

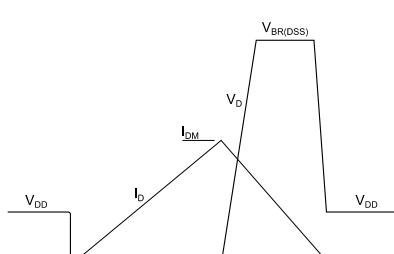
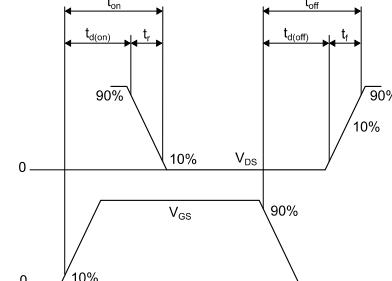


Figure 18: Switching time waveform



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 2x2 package information

Figure 19: PowerFLAT™ 2x2 package outline

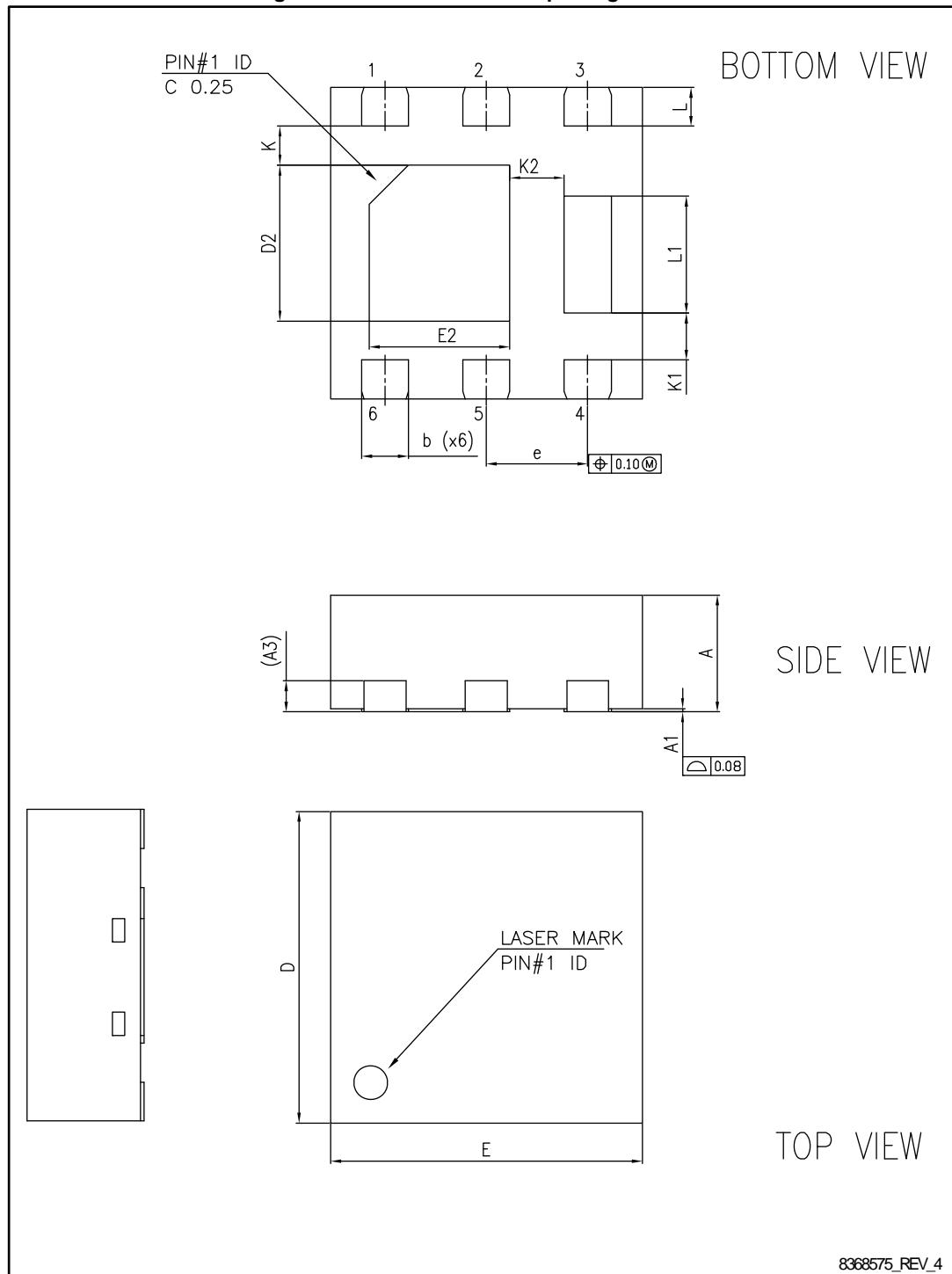
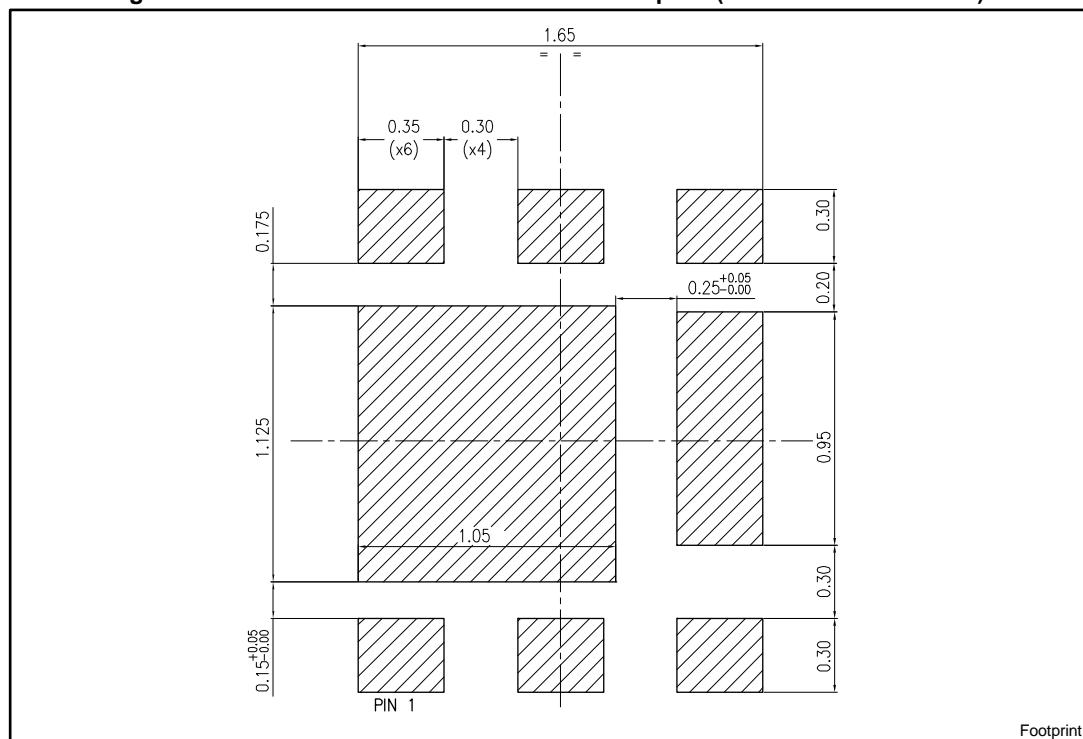


Table 8: PowerFLAT™ 2x2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3		0.20	
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.90	1.00	1.10
E2	0.80	0.90	1.00
e	0.55	0.65	0.75
K	0.15	0.25	0.35
K1	0.20	0.30	0.40
K2	0.25	0.35	0.45
L	0.20	0.25	0.30
L1	0.65	0.75	0.85

Figure 20: PowerFLAT™ 2x2 recommended footprint (dimensions are in mm)



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
27-Aug-2015	1	First release.
22-Oct-2015	2	Updated title and features in cover page Updated Table 4: "On /off states", Table 5: "Dynamic" and Table 6: "Switching times". Added Section 4.1: "Electrical characteristics (curves)"
03-Apr-2017	3	Modified title and features table on cover page Modified <i>Table 4: "On /off states"</i> Modified <i>Figure 4: "Output characteristics"</i> , <i>Figure 5: "Transfer characteristics"</i> , <i>Figure 7: "Static drain-source on-resistance"</i> and <i>Figure 12: "Source-drain diode forward characteristics"</i> 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.

© 2017 STMicroelectronics – All rights reserved

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STL7N6F7](#)