

## N-channel 100 V, 0.062 $\Omega$ typ., 4 A STripFET™ VII DeepGATE™ Power MOSFET in a PowerFLAT™ 2x2 package

Datasheet - production data

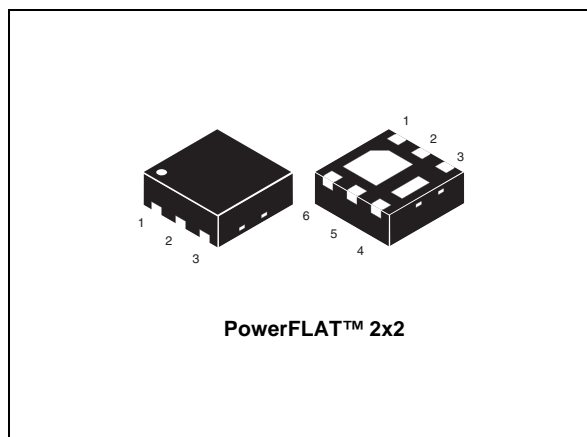
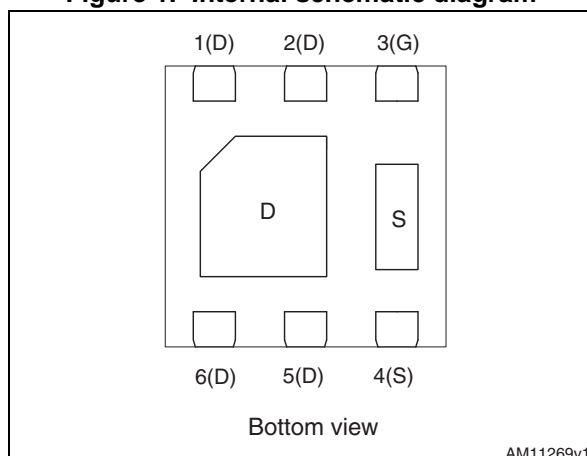


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STL3N10F7	100 V	0.07 $\Omega$	4 A

- N-channel enhancement mode
- Low gate charge
- 100% avalanche rated

### Applications

- Switching applications

### Description

This device utilizes the 7<sup>th</sup> generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STL3N10F7	ST3N	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 mechanical data** ..... 9

5      **Revision history** ..... 12



# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	4	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb}=100\text{ }^{\circ}\text{C}$	2.5	A
$I_{DM}^{(2)}$	Drain current (pulsed)	16	A
$P_{TOT}^{(1)}$	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	2.4	W
$T_J$	Operating junction temperature	-55 to 150	$^{\circ}\text{C}$
$T_{stg}$	storage temperature		$^{\circ}\text{C}$

1. The value is rated according  $R_{thj-pcb}$
2. Pulse width limited by safe operating area.

**Table 3. Thermal resistance**

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

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu,  $t < 10\text{ sec}$

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage, $V_{GS}=0$	$I_D = 250\text{ }\mu\text{A}$	100			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS}=0$ )	$V_{DS}=100\text{ V}$			1	$\mu\text{A}$
		$V_{DS}=100\text{ V}$ , $T_C=125\text{ }^{\circ}\text{C}$			100	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS}=0$ )	$V_{GS}=\pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10\text{ V}$ , $I_D=2\text{ A}$		0.062	0.07	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS}=25\text{ V}$ , $f=1\text{ MHz}$ , $V_{GS}=0$	-	408	-	pF
$C_{oss}$	Output capacitance		-	112	-	pF
$C_{rss}$	Reverse transfer capacitance		-	10	-	pF
$Q_g$	Total gate charge	$V_{DD}=50\text{ V}$ , $I_D=4\text{ A}$ $V_{GS}=10\text{ V}$ (see Figure 14)	-	7.8	-	nC
$Q_{gs}$	Gate-source charge		-	3	-	nC
$Q_{gd}$	Gate-drain charge		-	1.7	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=50\text{ V}$ , $I_D=2\text{ A}$ , $R_G=4.7\text{ }\Omega$ , $V_{GS}=10\text{ V}$ (see Figure 13)	-	6.3	-	ns
$t_r$	Rise time		-	3	-	ns
$t_{d(off)}$	Turn-off delay time		-	11	-	ns
$t_f$	Fall time		-	4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		4	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		16	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2\text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 80\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$ (see Figure 18)	-	30		ns
$Q_{rr}$	Reverse recovery charge		-	24		nC
$I_{RRM}$	Reverse recovery current		-	1.6		A

1. Pulse width limited by safe operating area.

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

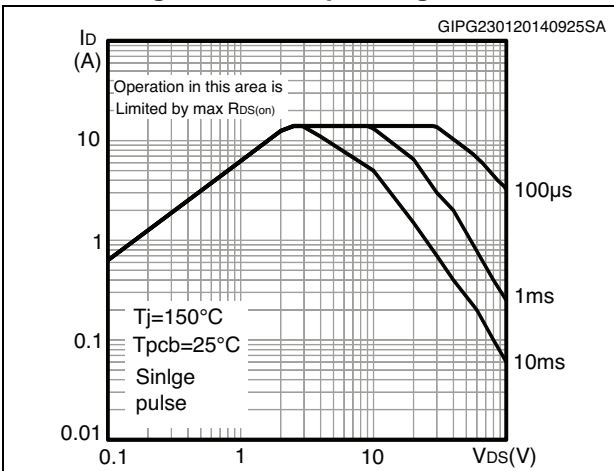


Figure 3. Thermal impedance

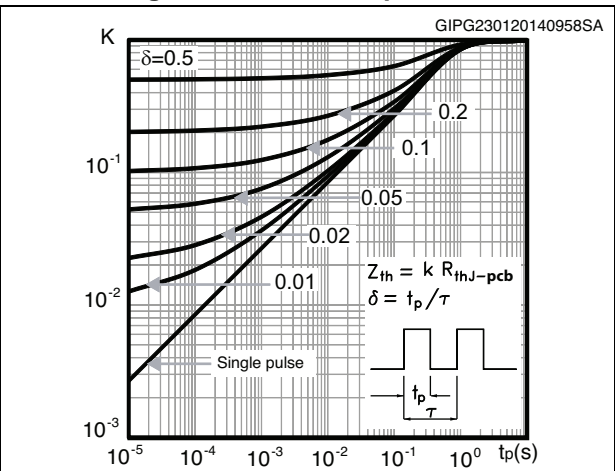


Figure 4. Output characteristics

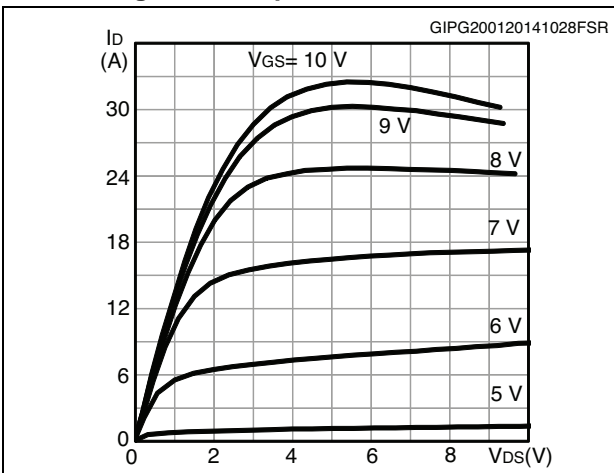


Figure 5. Transfer characteristics

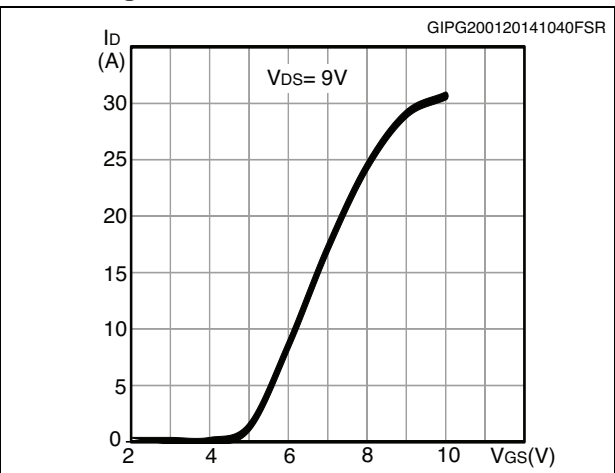


Figure 6. Gate charge vs gate-source voltage

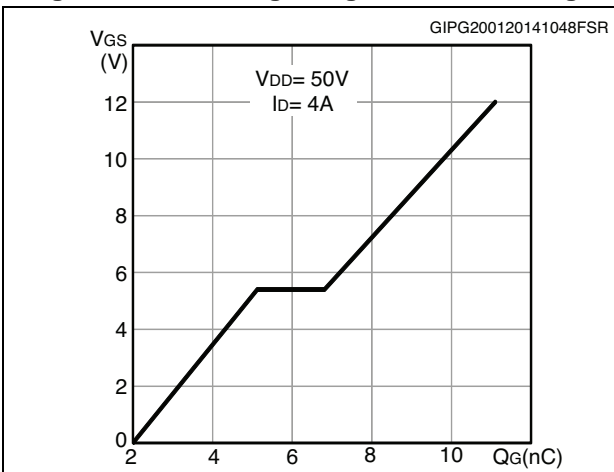


Figure 7. Static drain-source on-resistance

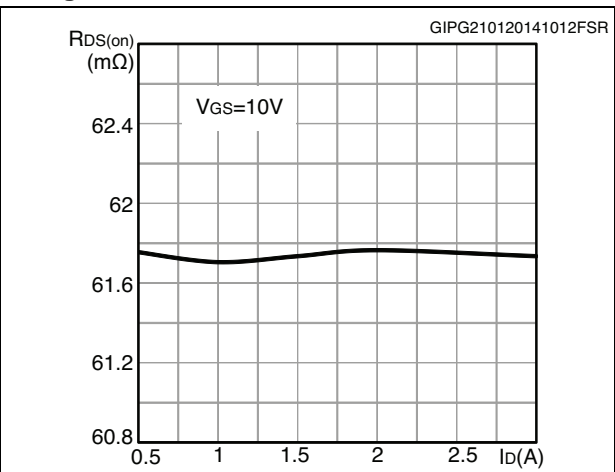


Figure 8. Capacitance variations

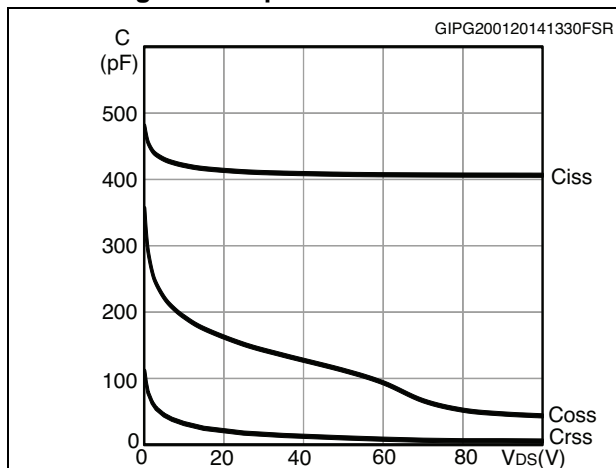
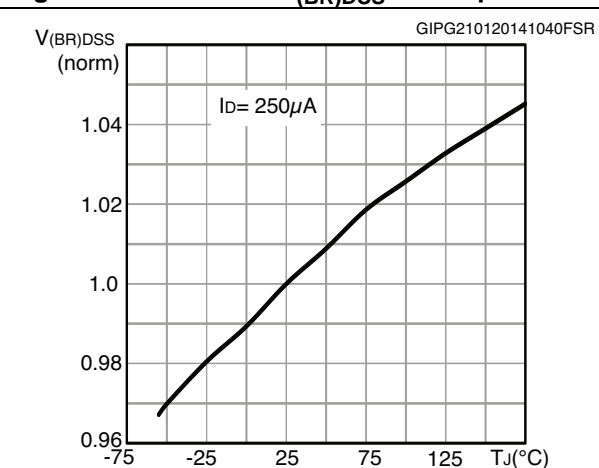
Figure 9. Normalized  $V_{(BR)DSS}$  vs temperature

Figure 10. Normalized gate threshold voltage vs temperature

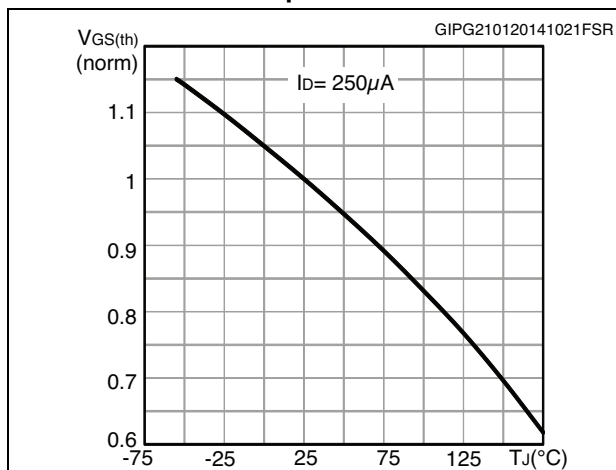


Figure 11. Normalized on-resistance vs temperature

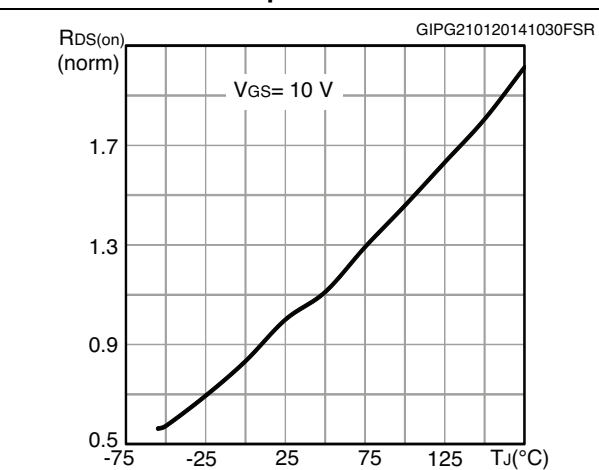
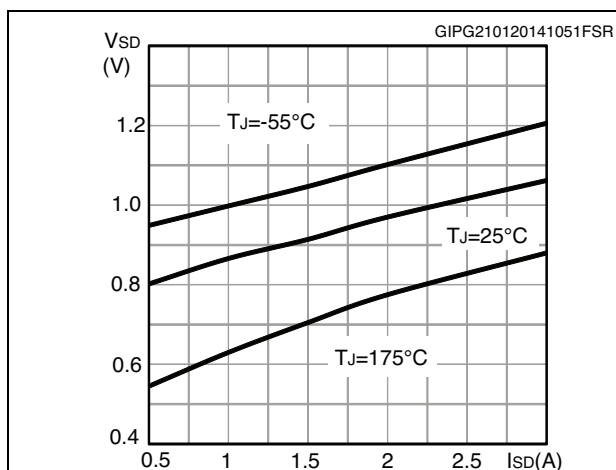


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

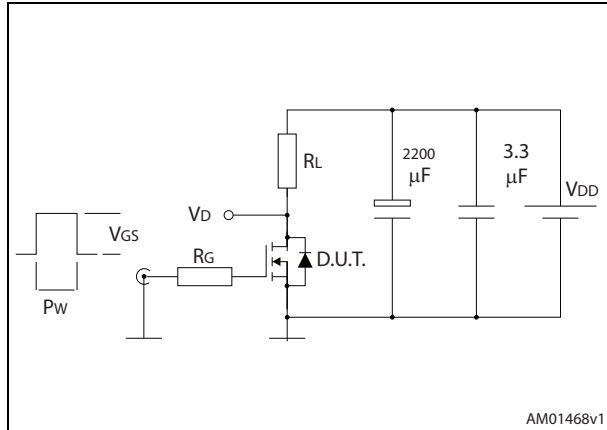


Figure 14. Gate charge test circuit

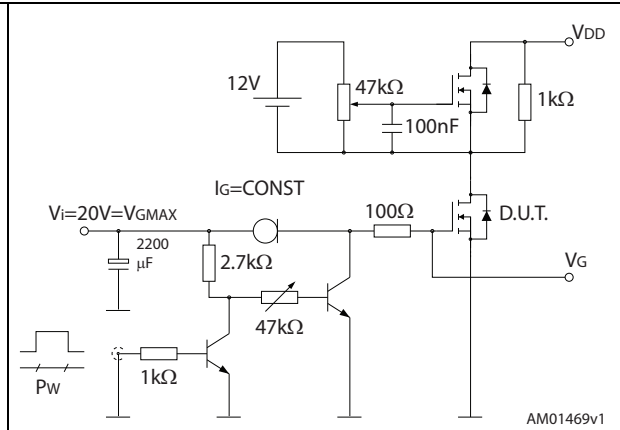


Figure 15. Test circuit for inductive load switching and diode recovery times

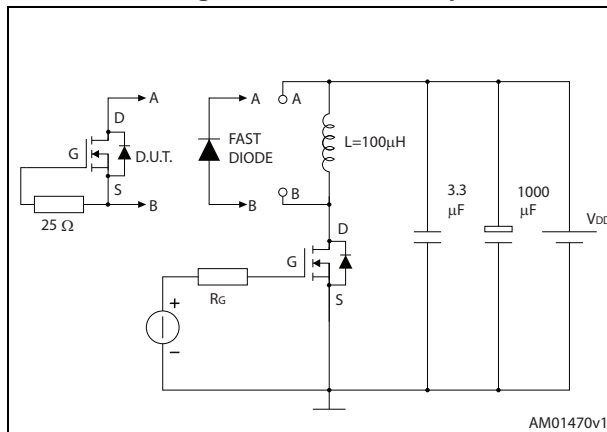


Figure 16. Unclamped inductive load test circuit

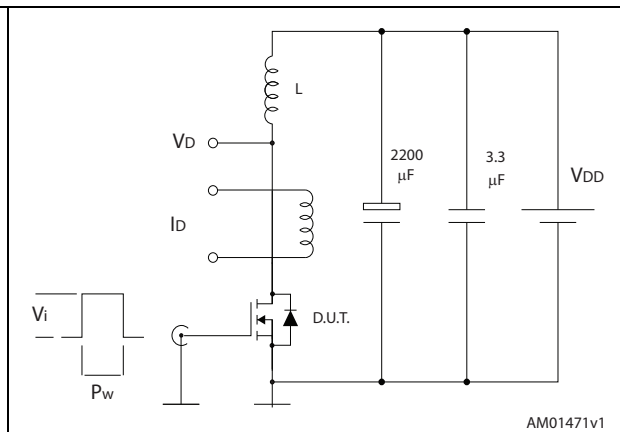


Figure 17. Unclamped inductive waveform

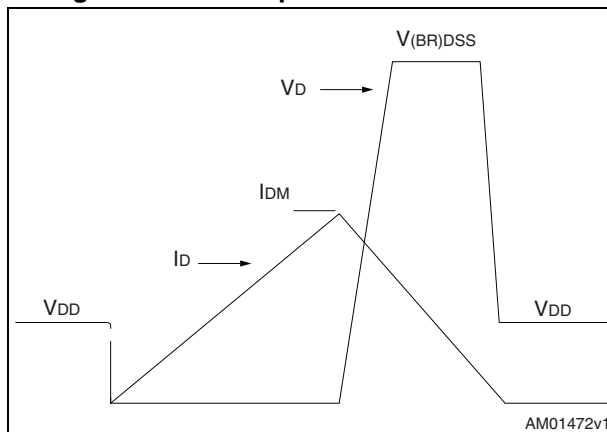
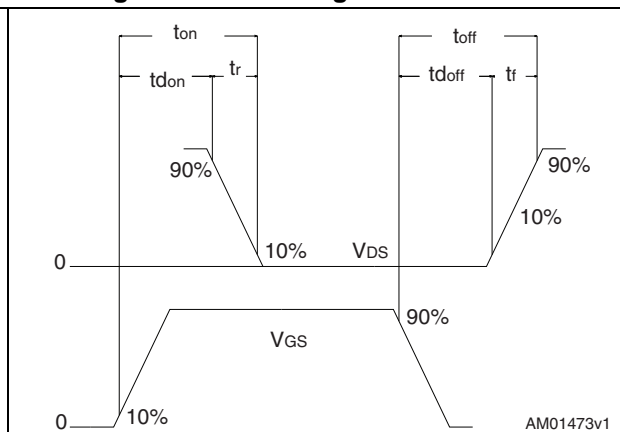


Figure 18. Switching time waveform





## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 19. Drawing dimension PowerFLAT™ 2x2

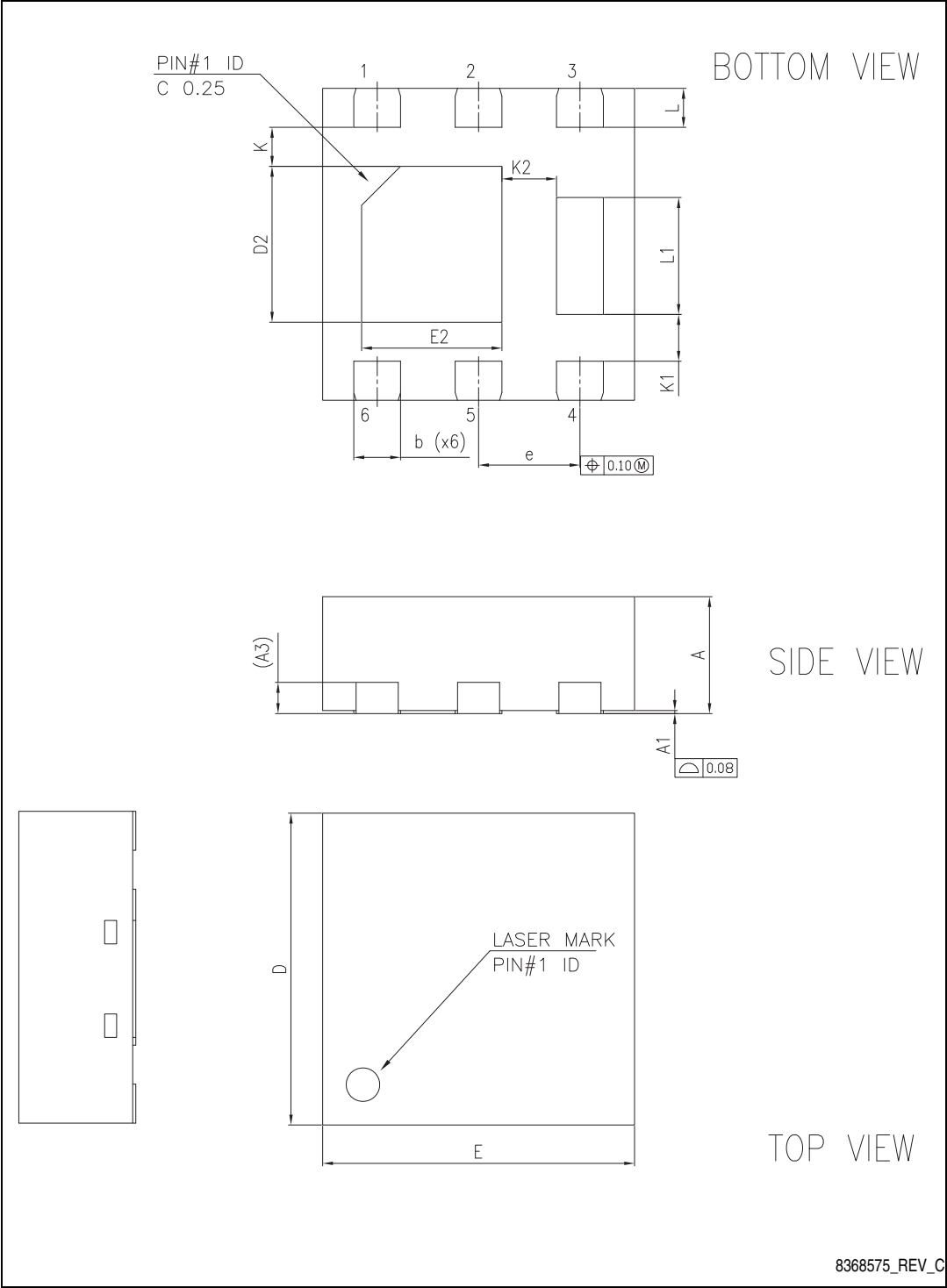
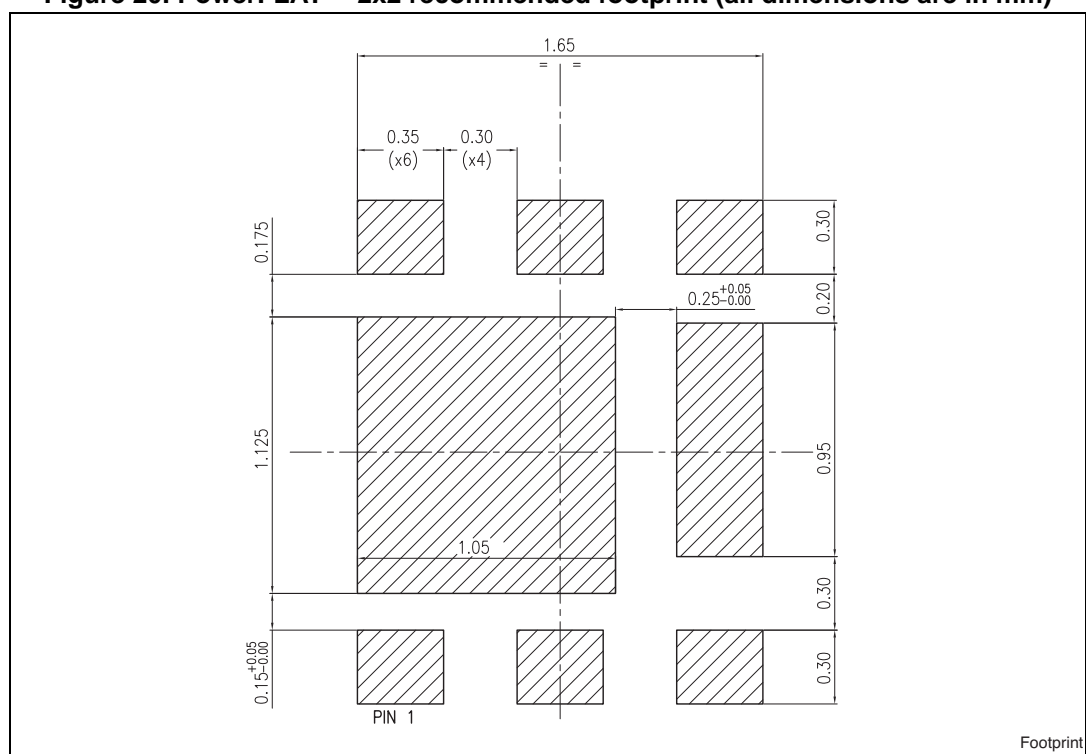


Table 8. PowerFLAT™ 2 x 2 mechanical data

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 (all dimensions are in mm)



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
18-Feb-2014	1	First release.
30-Apr-2014	2	Document status promoted from preliminary to production data

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