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STL4P2UH7

P-channel 20 V, 0.087 Ω typ., 4 A STripFET™ VII DeepGATE™
Power MOSFET in a PowerFLAT™ 2x2 package

Datasheet - production data

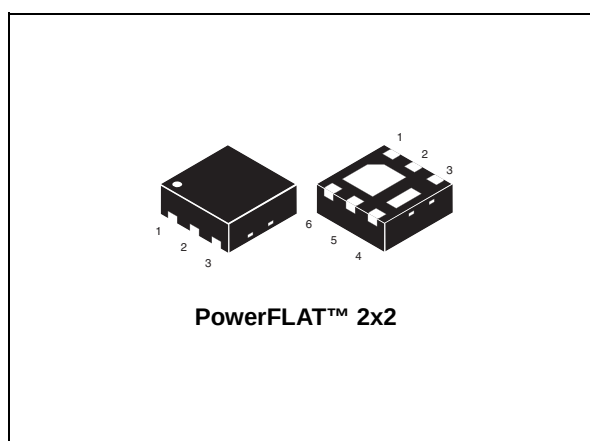
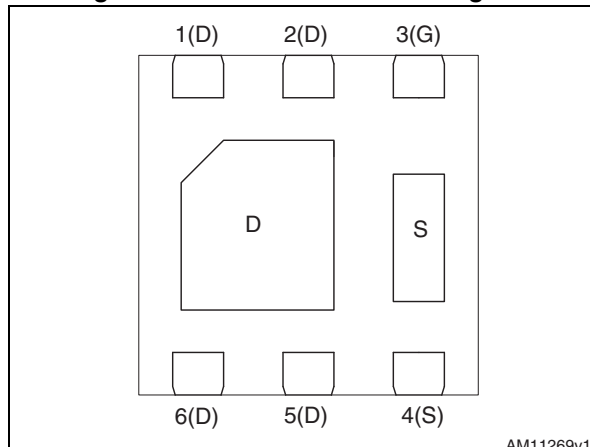


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL4P2UH7	20 V	0.1 Ω @ 4.5 V	4 A

- Ultra logic level
- Extremely low on-resistance R_{DS(on)}
- High avalanche ruggedness
- Low gate drive power losses

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
STL4P2UH7	4L2U	PowerFLAT™ 2x2	Tape and reel

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

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Electrical ratings

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 $T_{pcb} = 25\text{ }^{\circ}\text{C}$	4	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^{\circ}\text{C}$	2.5	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	16	A
$P_{TOT}^{(1)}$	Total dissipation at $T_{pcb} = 25\text{ }^{\circ}\text{C}$	2.4	W
T_{stg}	Storage temperature	- 55 to 150	$^{\circ}\text{C}$
T_j	Max. operating junction temperature	150	$^{\circ}\text{C}$

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

Table 3. Thermal data

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

1. When mounted on 1inch² FR-4 board, 2 oz Cu.

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

Electrical characteristics

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2 Electrical characteristics

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

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$	20			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 20\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = \pm 8\text{ V}$			10	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.4		1	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 4.5\text{ V}, I_D = 2\text{ A}$		0.087	0.1	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 2\text{ A}$		0.11	0.13	Ω
		$V_{GS} = 1.8\text{ V}, I_D = 2\text{ A}$		0.145	0.18	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{GS} = 0, V_{DS} = 10\text{ V}, f = 1\text{ MHz}$	-	510	-	pF
C_{oss}	Output capacitance		-	66	-	pF
C_{rss}	Reverse transfer capacitance		-	44	-	pF
Q_g	Total gate charge	$V_{DD} = 10\text{ V}, I_D = 3\text{ A},$ $V_{GS} = 4.5\text{ V}$ (see Figure 14)	-	4.8	-	nC
Q_{gs}	Gate-source charge		-	0.7	-	nC
Q_{gd}	Gate-drain charge		-	0.8	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 10\text{ V}, I_D = 1.5\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = 4.5\text{ V}$ (see Figure 15)	-	9	-	ns
t_r	Rise time		-	21	-	ns
$t_{d(off)}$	Turn-off delay time		-	40	-	ns
t_f	Fall time		-	19	-	ns

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

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Electrical characteristics

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	$I_{SD} = 1\text{ A}$, $V_{GS} = 0$	-		1	V
t_{rr}	Reverse recovery time	$V_{DD} = 16\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $I_{SD} = 1\text{ A}$ $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15)	-	12.8		ns
Q_{rr}	Reverse recovery charge		-	5		nC
I_{RRM}	Reverse recovery current		-	0.8		A

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.

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

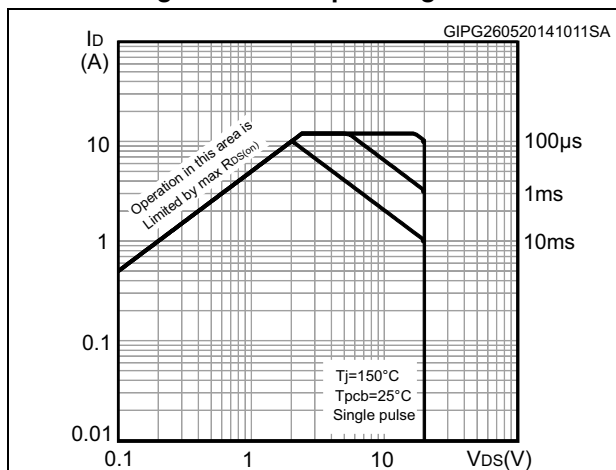


Figure 3. Thermal impedance

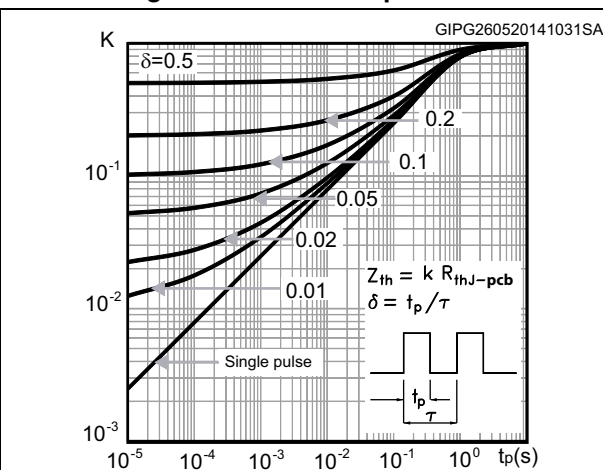


Figure 4. Output characteristics

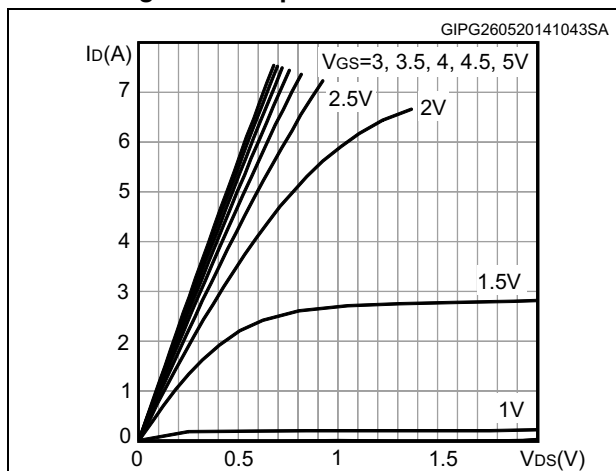


Figure 5. Transfer characteristics

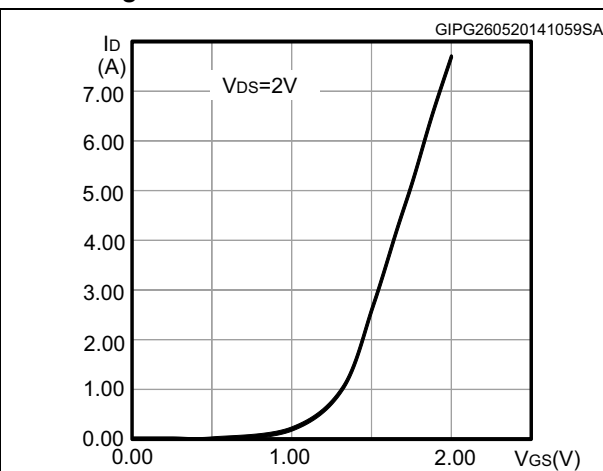


Figure 6. Gate charge vs gate-source voltage

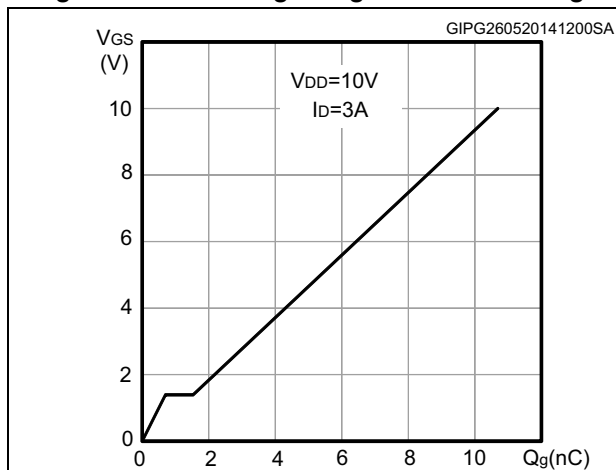
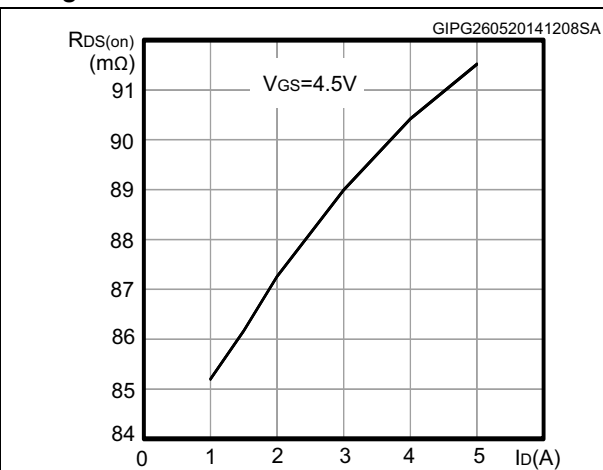


Figure 7. Static drain-source on-resistance



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Electrical characteristics

Figure 8. Capacitance variations

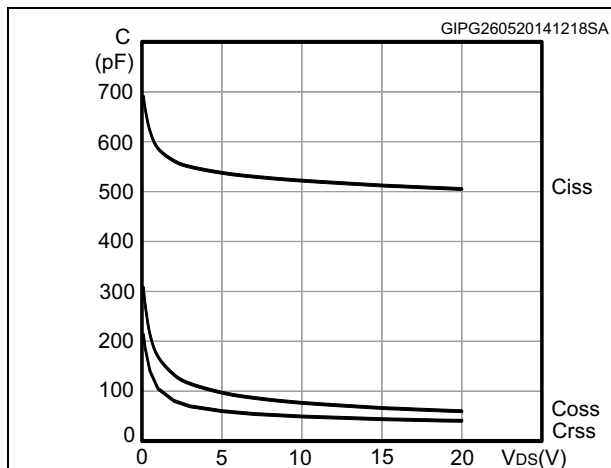


Figure 9. Normalized gate threshold voltage vs temperature

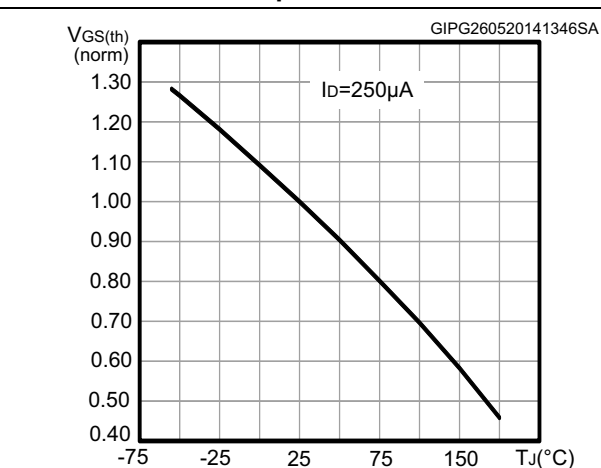


Figure 10. Normalized on-resistance vs temperature

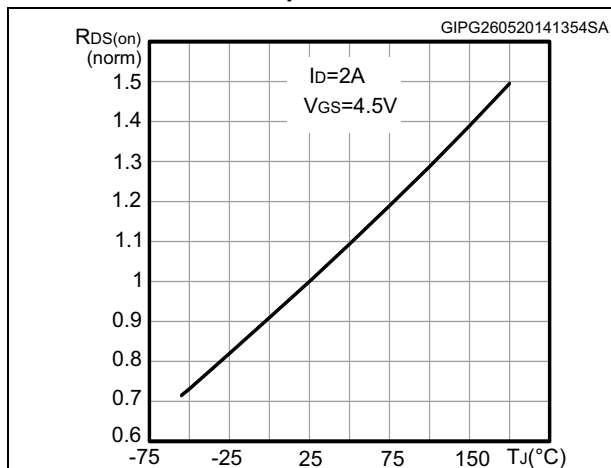


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

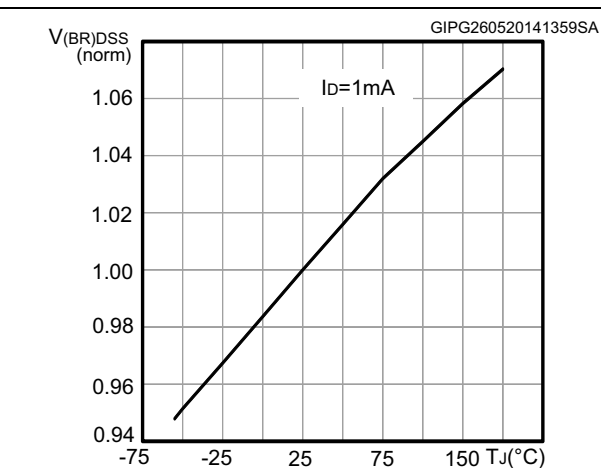
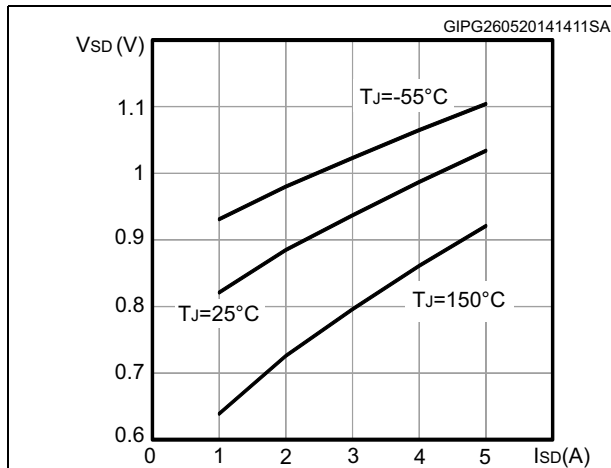


Figure 12. Source-drain diode forward characteristics



Test circuits

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3 Test circuits

Figure 13. Switching times test circuit for resistive load

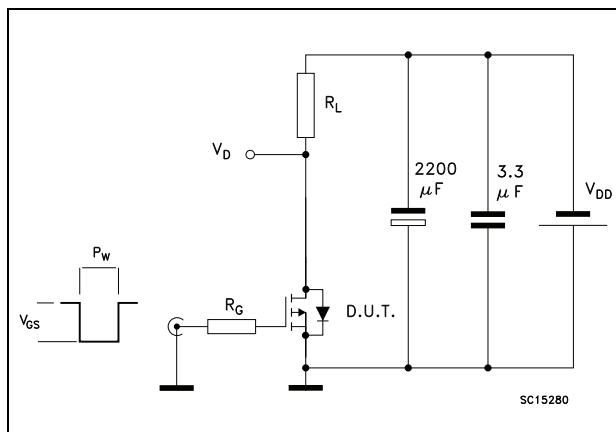


Figure 14. Gate charge test circuit

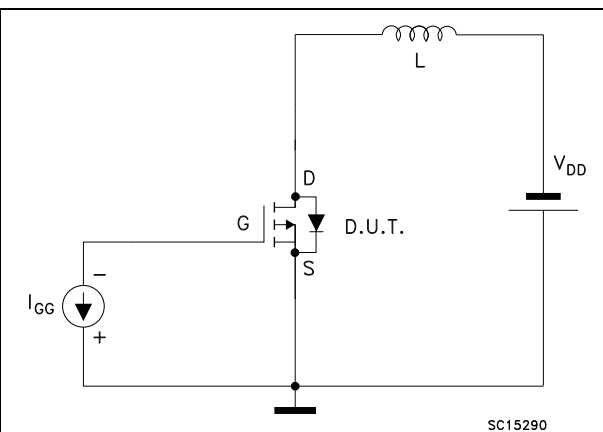
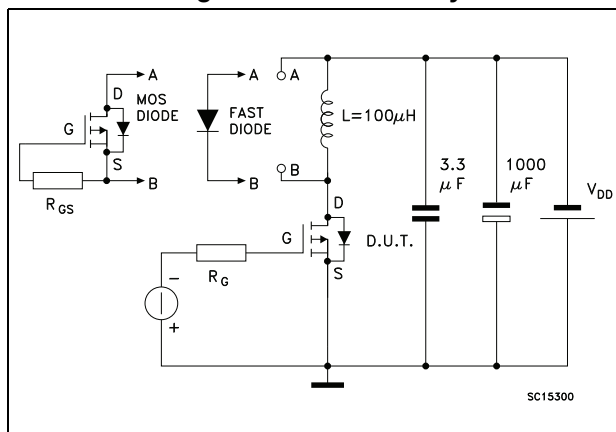


Figure 15. Test circuit for inductive load switching and diode recovery times



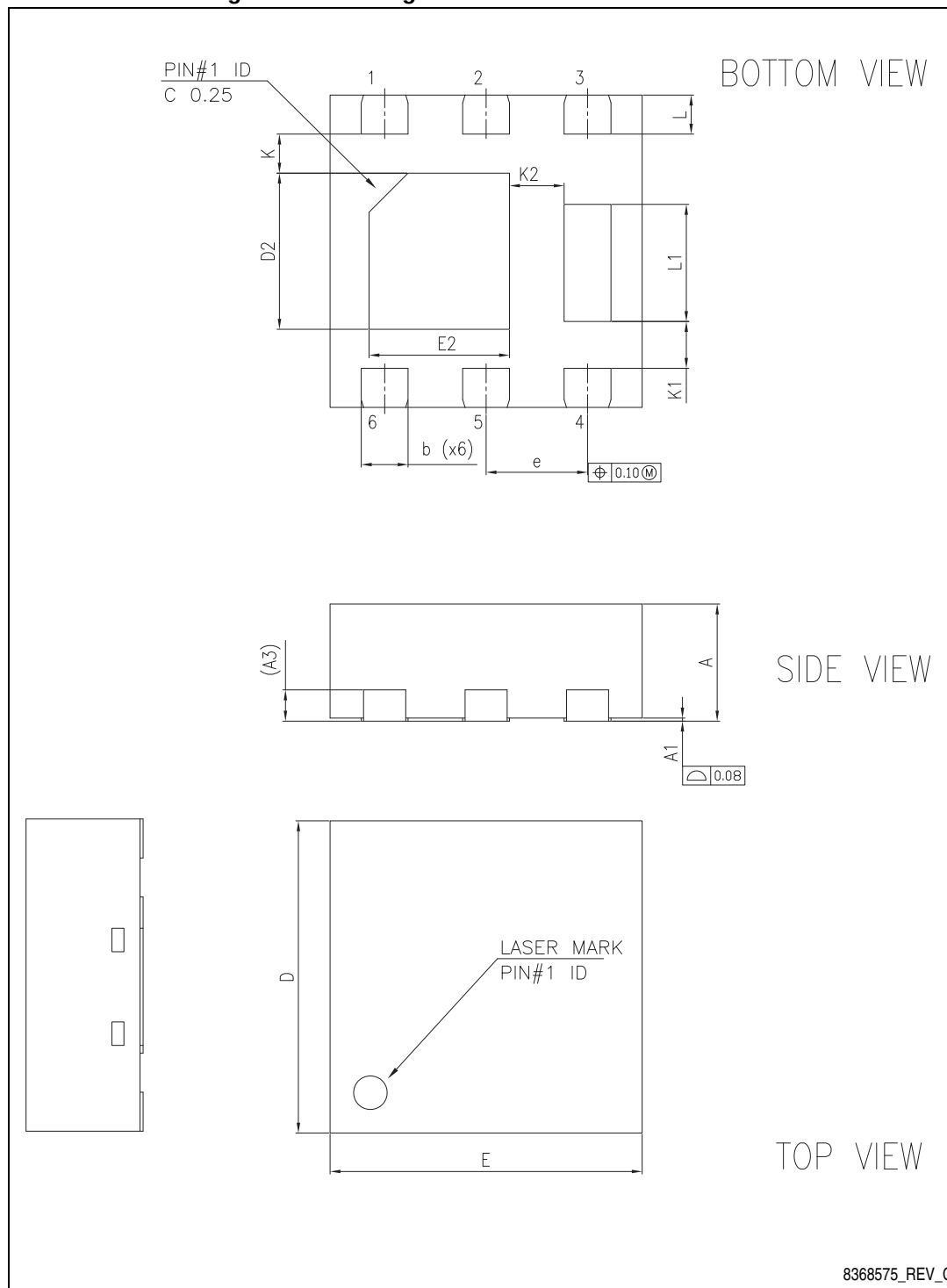
4 Package mechanical data

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.

Package mechanical data

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Figure 16. Drawing dimension PowerFLAT™ 2 x 2



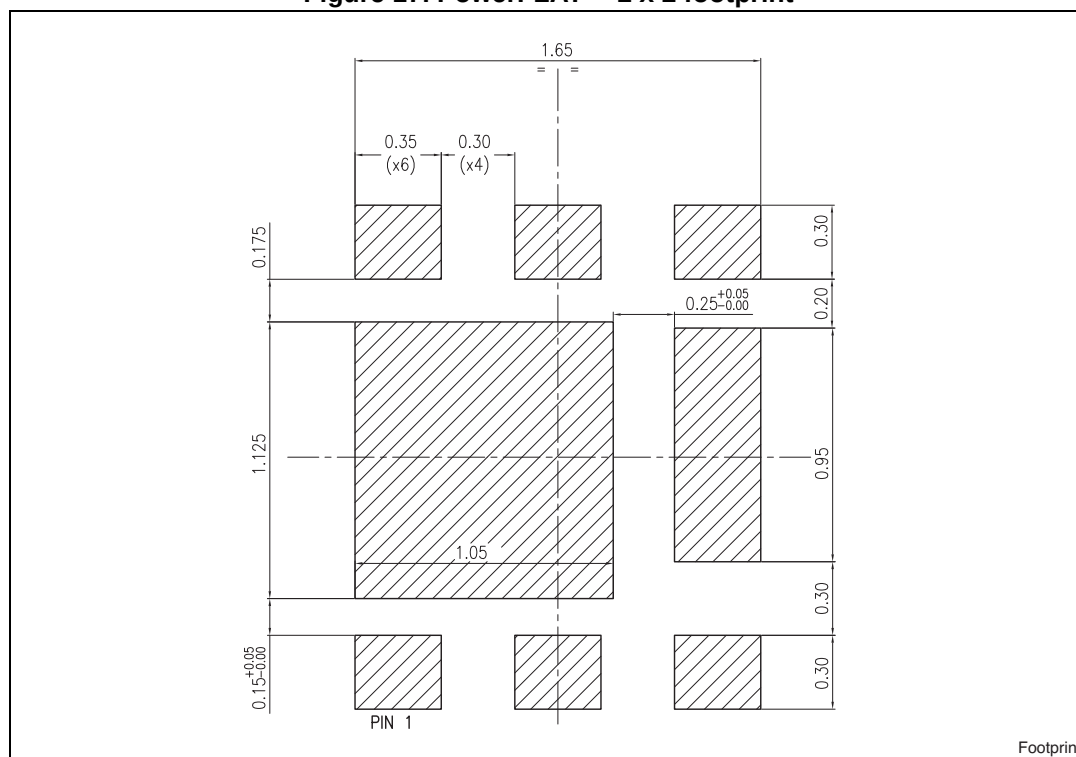
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Package mechanical data

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 17. PowerFLAT™ 2 x 2 footprint



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
22-Jul-2013	1	First release.
30-May-2014	2	– Document status promoted from target to production data – Modified: title – Modified: $R_{DS(on)}$ typical and maximum values in Table 4 – Modified: V_{DS}, V_{DD}, I_D and typical values in Table 5 and 6 – Modified: typical values in Table 7 – Added: Section 2.1: Electrical characteristics (curves) – Minor text changes
16-Jul-2014	3	– Modified: V_{DS} value in Table 2 – Minor text changes

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