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STL4P3LLH6

P-channel 30 V, 0.048 Ω typ., 4 A STripFET™ H6 DeepGATE™
 Power MOSFET in PowerFLAT™ 2x2 package

Datasheet - preliminary data

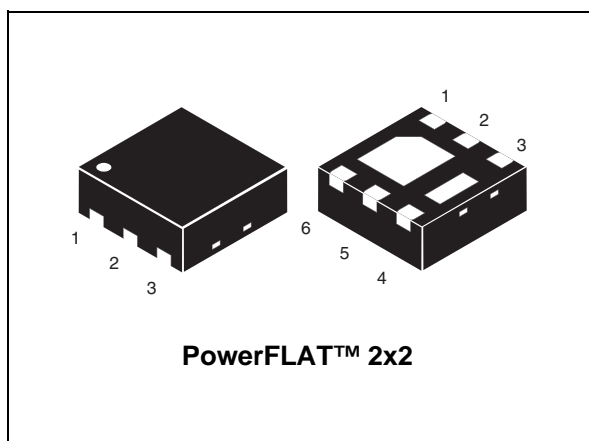
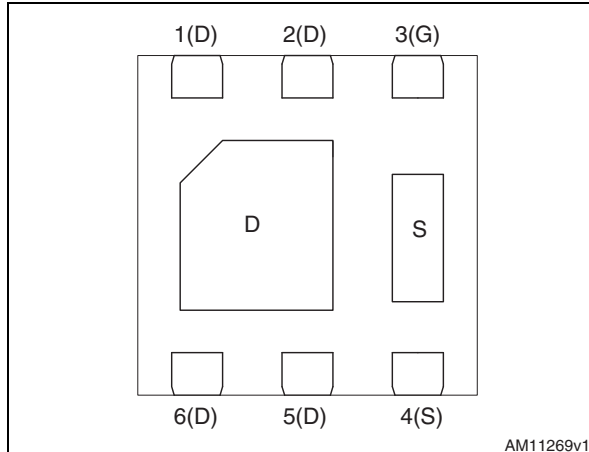


Figure 1. Internal schematic diagram



Features

Order code	V _{DSS}	R _{DS(on)} max.	I _D
STL4P3LLH6	30 V	0.056 Ω at 10 V	4 A

- Very low on-resistance R_{DS(on)}
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching application

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.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL4P3LLH6	4K3L	PowerFLAT™ 2x2	Tape and reel

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

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1 Electrical ratings

Table 2. 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 $T_{amb} = 25\text{ }^\circ\text{C}$	4	A
I_D	Drain current (continuous) at $T_{amb} = 100\text{ }^\circ\text{C}$	2.75	A
$I_{DM}^{(1)}$	Drain current (pulsed)	16	A
P_{TOT}	Total dissipation at $T_{amb} = 25\text{ }^\circ\text{C}$	2.4	W
T_J	Operating junction temperature	150	$^\circ\text{C}$
T_{stg}	Storage temperature	-55 to 150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

Table 3. Thermal resistance

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

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

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

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2 Electrical characteristics

(T_{CASE} = 25 °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 V, I _D = 250 μA	30			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 30 V			1	μA
		V _{GS} = 0 V, V _{DS} = 30 V, T _J = 125 °C			10	
I _{GSS}	Gate body leakage current	V _{DS} = 0 V, V _{GS} = ±20 V			100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1		2.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 2 A		0.048	0.056	Ω
		V _{GS} = 4.5 V, I _D = 2 A		0.075	0.09	

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0 V	-	639	-	pF
C _{oss}	Output capacitance		-	79	-	
C _{rss}	Reverse transfer capacitance		-	52	-	
Q _g	Total gate charge	V _{DD} = 15 V, I _D = 4 A, V _{GS} = 4.5 V	-	6	-	nC
Q _{gs}	Gate-source charge		-	1.9	-	
Q _{gd}	Gate-drain charge		-	2.1	-	

Table 6. Switching times

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 15 V, I _D = 4 A, R _G = 4.7 Ω, V _{GS} = 10 V	-	5.4	-	ns
t _r	Rise time		-	5	-	
t _{d(off)}	Turn-off delay time		-	19.2	-	
t _f	Fall time		-	3.4	-	

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Electrical characteristics

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 4\text{ A}, V_{GS} = 0$	-	-	1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 4\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s},$ $V_{DD} = 16\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	11.2	-	ns
Q_{rr}	Reverse recovery charge		-	3.5	-	nC
I_{RRM}	Reverse recovery current		-	0.6	-	A

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

Note: For the P-channel 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

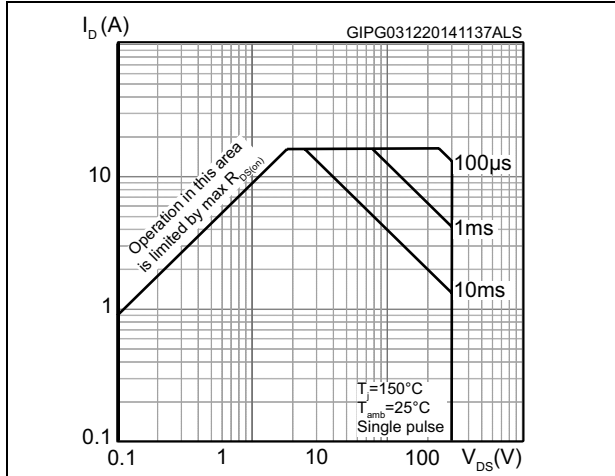


Figure 3. Thermal impedance

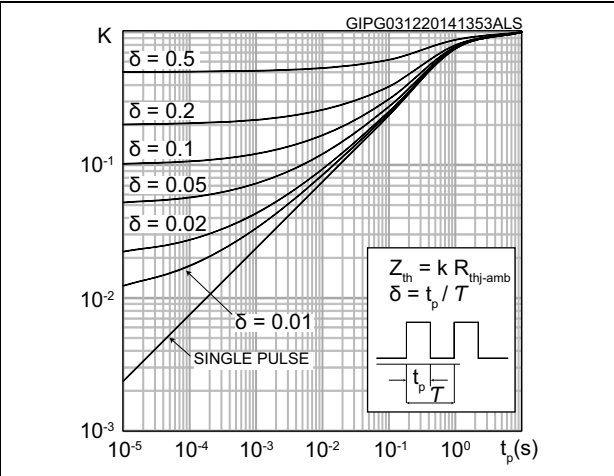


Figure 4. Output characteristics

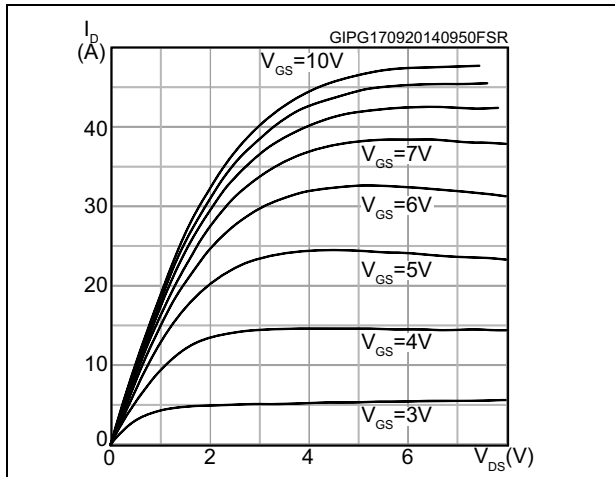


Figure 5. Transfer characteristics

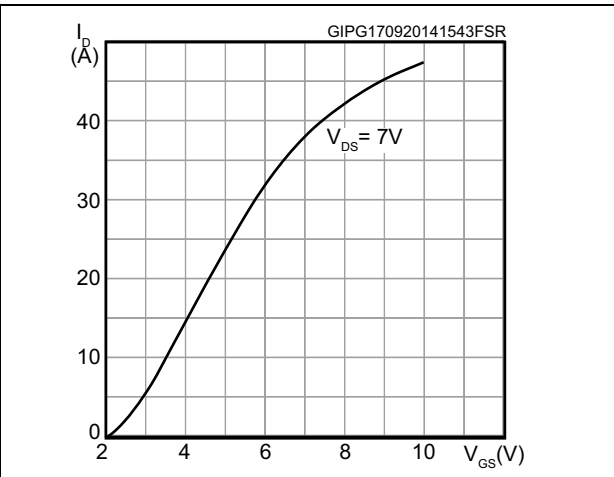


Figure 6. Gate charge vs gate-source voltage

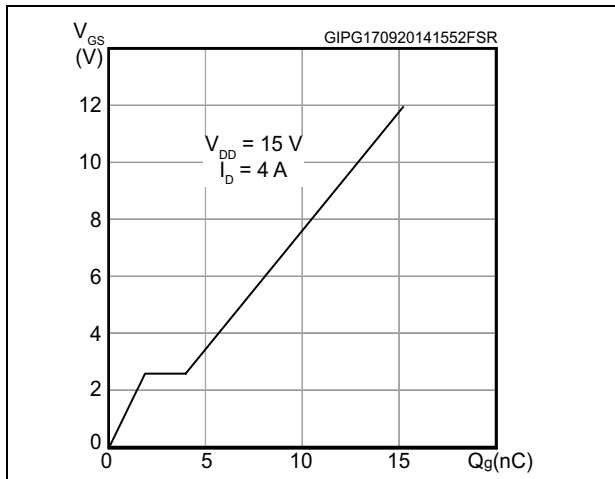
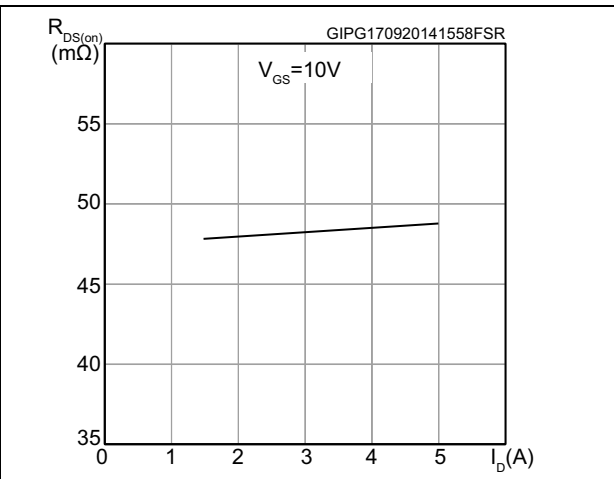


Figure 7. Static drain-source on-resistance



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Electrical characteristics

Figure 8. Normalized $V_{(BR)DSS}$ vs temperature

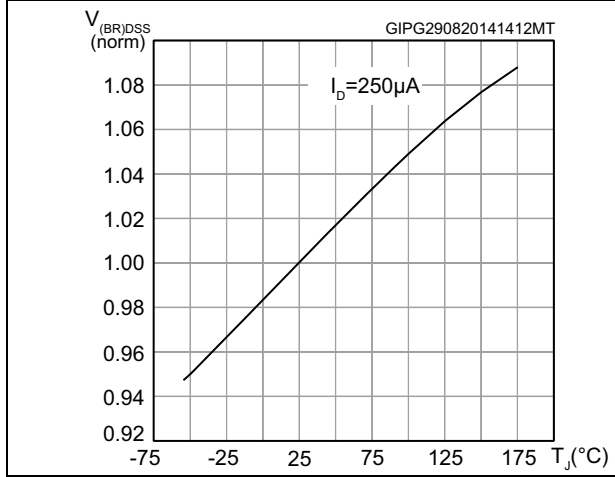


Figure 9. Capacitance variations

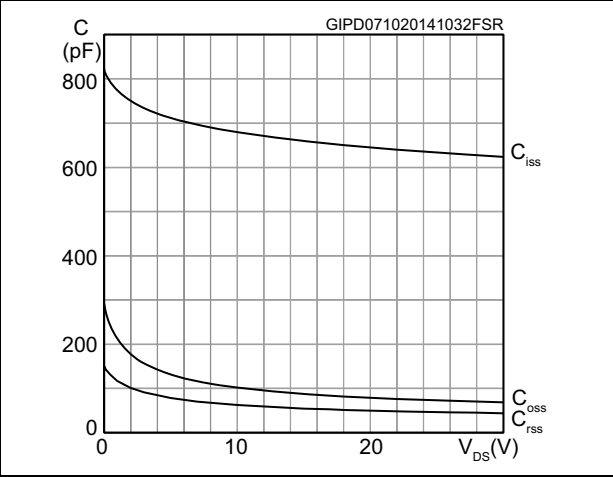


Figure 10. Normalized gate threshold voltage vs. temperature

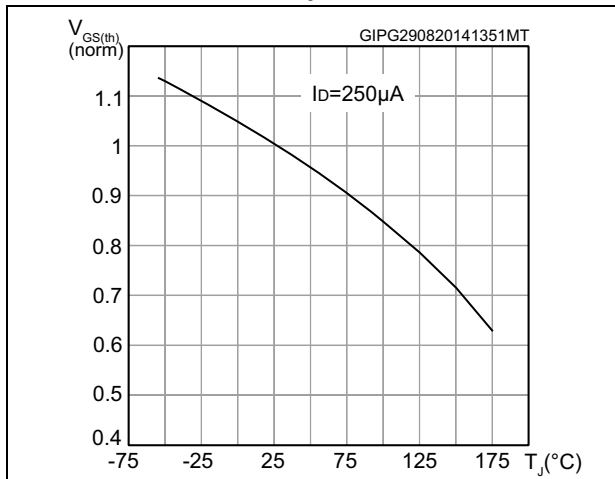


Figure 11. Normalized on-resistance vs. temperature

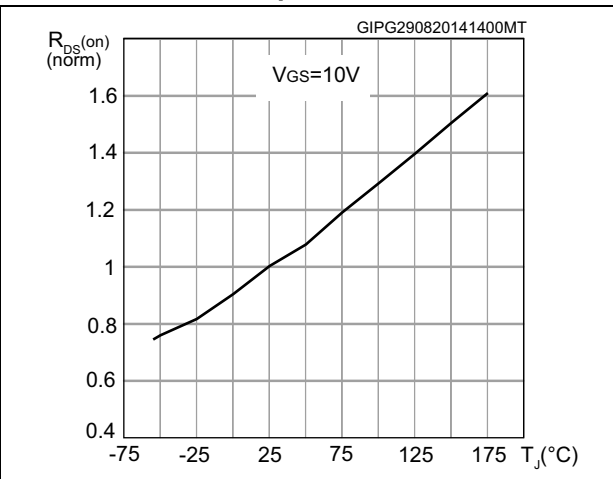
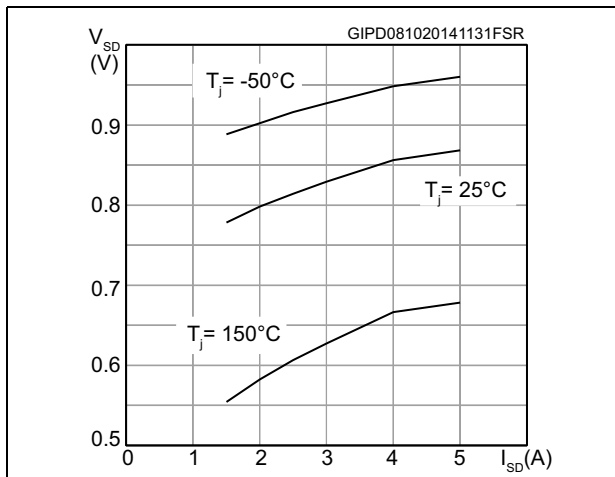


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

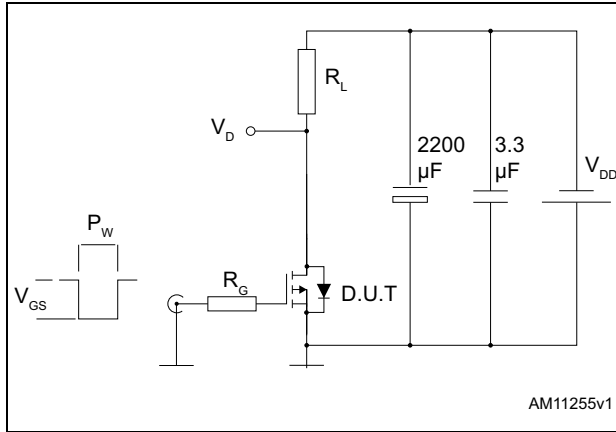


Figure 14. Gate charge test circuit

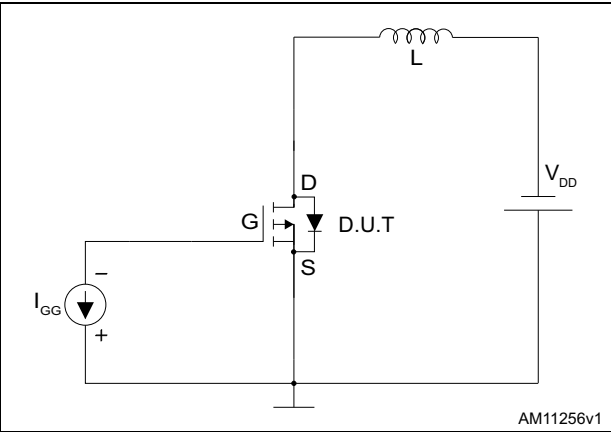
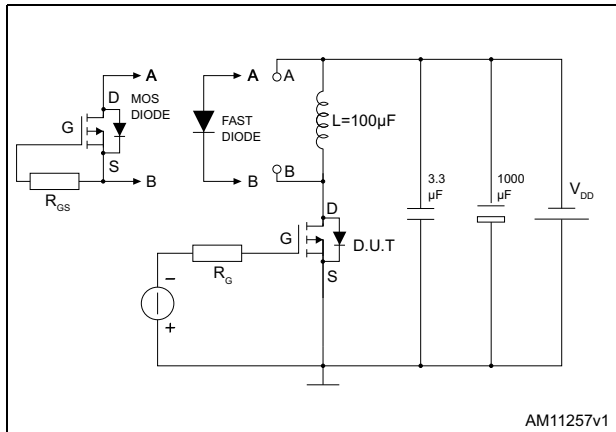


Figure 15. Test circuit for inductive load switching and diode recovery times



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.

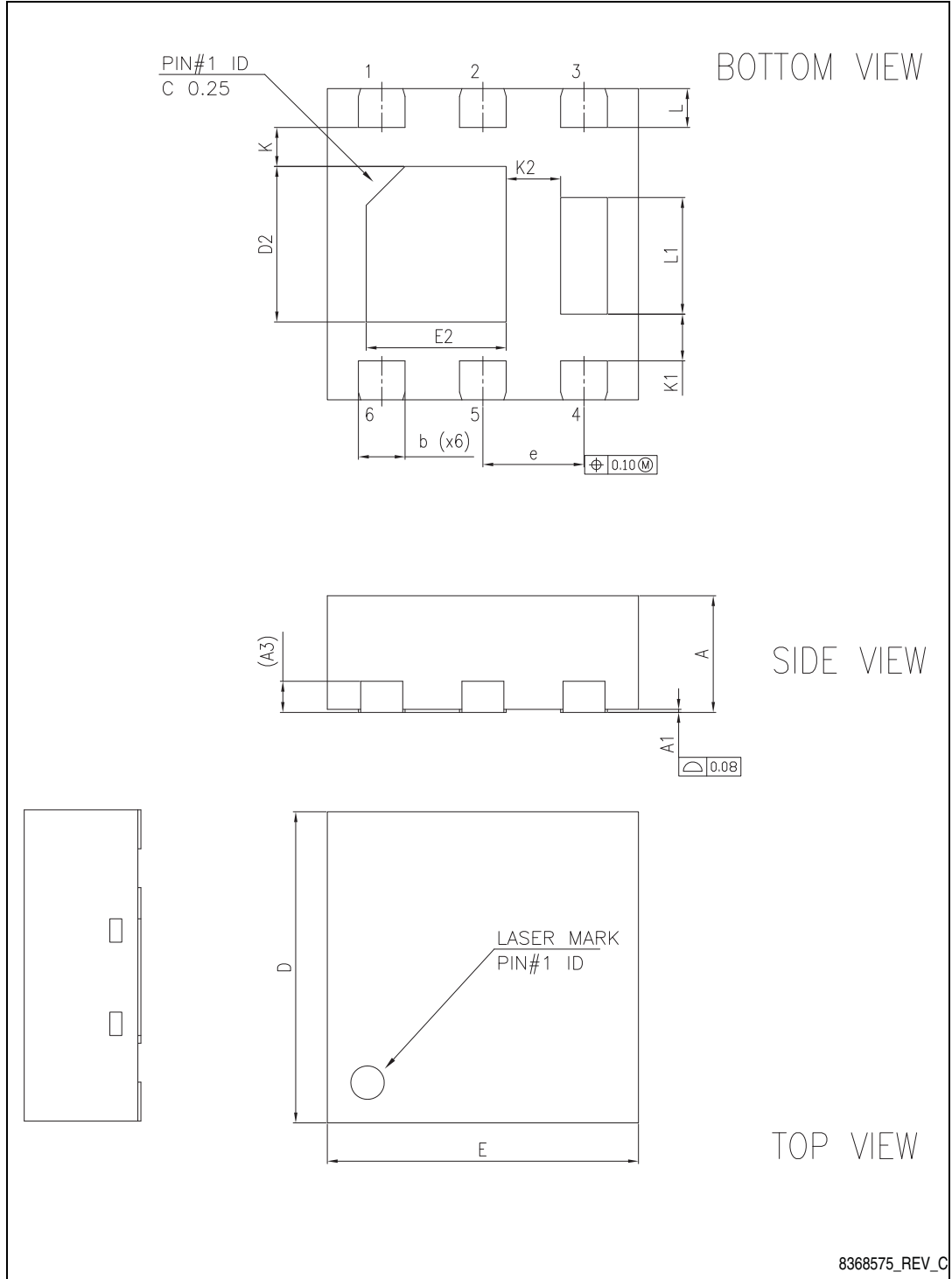
Table 8. PowerFLAT™ 2 x 2 mechanical data

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

Package mechanical data

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Figure 16. Drawing dimension PowerFLAT™ 2 x 2



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
09-May-2013	1	Initial release.
09-Dec-2014	2	Text edits throughout document On cover page: – changed title description – updated features and description In Table 4 , changed $R_{DS(on)}$ values In Table 5 , changed values and test conditions In Table 6 , changed values and test conditions In Table 7 , changed values and test conditions Added Section 2.1: Electrical characteristics (curves) Updated Section 3: Test circuits Updated Section 4: Package mechanical data

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