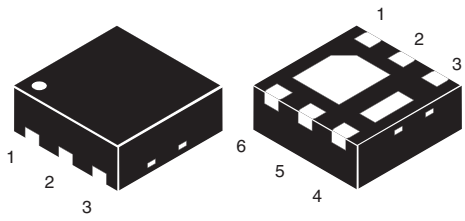
STL6N2VH5

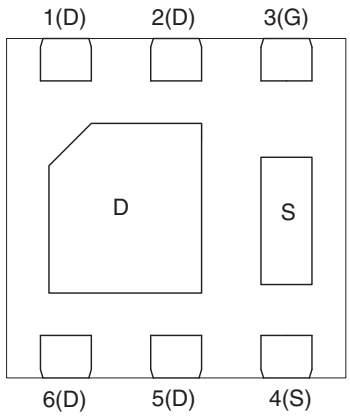
N-channel 20 V, 0.025 Ω typ., 6 A STripFET™ V Power MOSFET in a PowerFLAT™ 2x2 package

Datasheet — production data



PowerFLAT™ 2x2

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STL6N2VH5	20 V	0.03 Ω (V_{GS}=4.5 V)	6 A	2.4 W
		0.04 Ω (V_{GS}=2.5 V)		

- Very low switching gate charge
- Very low thermal resistance
- Conduction losses reduced
- Switching losses reduced
- 2.5 V gate drive
- Very low threshold device

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™V technology. The device has been optimized to achieve very low on-state resistance, contributing to a FOM that is among the best in its class.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STL6N2VH5	STD1	PowerFLAT™ 2x2	Tape and reel

This is information on a product in full production. www.st.com

Contents

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 °C	6	A
I_D (1)	Drain current (continuous) at T_{pcb} = 100 °C	3.75	A
I_{DM} (1),(2)	Drain current (pulsed)	24	A
P_{TOT} (1)	Total dissipation at T_{pcb} = 25 °C	2.4	W
T_J	Operating junction temperature	-55 to 150	°C
T_{stg}	Storage temperature		°C

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

Table 3. Thermal resistance

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

1. When mounted on FR-4 board of 1inch², 2oz Cu, t < 10 sec

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	I_D = 250 µA, V_{GS} = 0	20			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 20 V,			1	µA
		V_{DS} = 20 V, T_J = 125 °C			10	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±8 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.7			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 4.5 V, I_D = 3 A		0.025	0.03	Ω
		V_{GS} =2.5 V, I_D = 3 A		0.031	0.04	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 16 V, f=1 MHz, V_{GS}=0	-	367	-	pF
C_{oss}	Output capacitance		-	92	-	pF
C_{rss}	Reverse transfer capacitance		-	16	-	pF
Q_g	Total gate charge	V_{DD} = 10 V, I_D = 2 A V_{GS} = 4.5 V *(see Figure 14)*	-	4.6	-	nC
Q_{gs}	Gate-source charge		-	0.9	-	nC
Q_{gd}	Gate-drain charge		-	1	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD}= 10 V, I_D = 2 A, R_G = 4.7 Ω, V_{GS} = 4.5 V *(see Figure 13)*	-	4.8	-	ns
t_r	Rise time		-	14.4	-	ns
$t_{d(off)}$	Turn-off delay time		-	17	-	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		-		6	A
I_{SDM}(1)	Source-drain current (pulsed)		-		24	A
V_{SD}(2)	Forward on voltage	I_{SD} = 2 A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 2 A, di/dt = 100 A/µs, V_{DD}= 16 V, T_J = 150 °C	-	10		ns
Q_{rr}	Reverse recovery charge		-	24		nC
I_{RRM}	Reverse recovery current		-	4.8		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

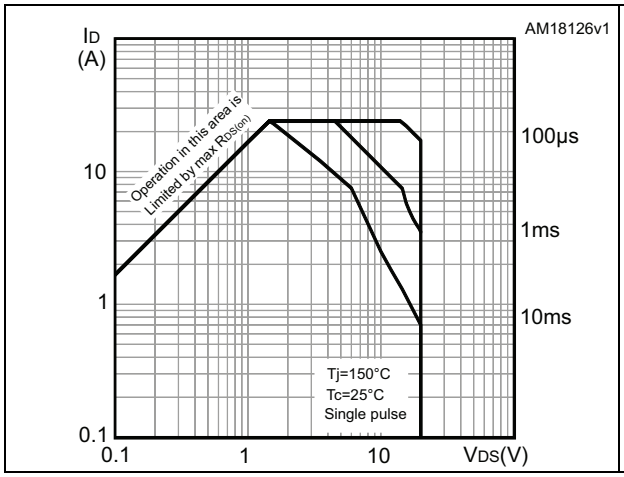


Figure 3. Thermal impedance

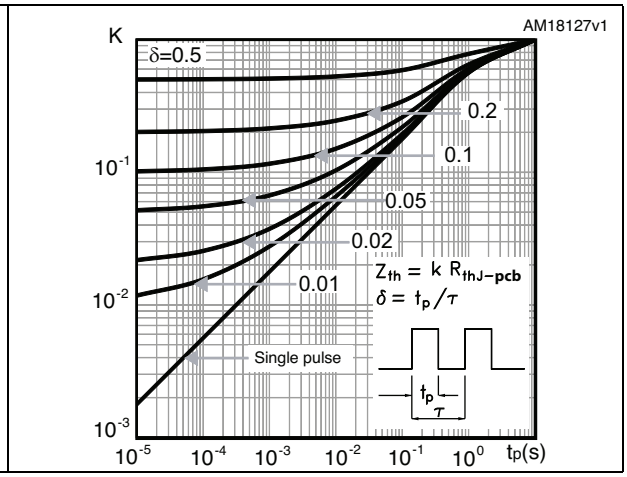


Figure 4. Output characteristics

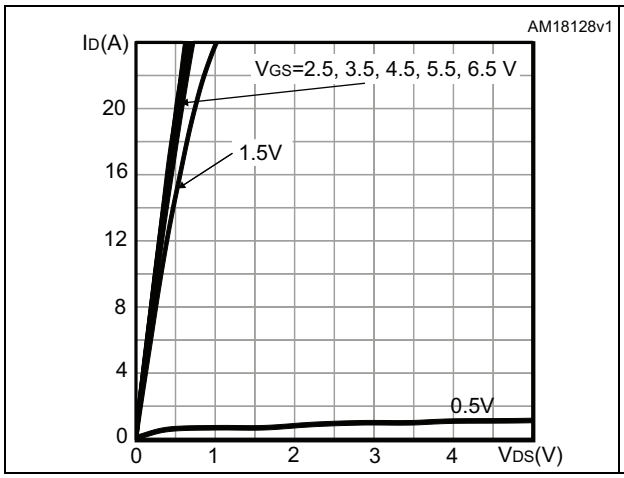


Figure 5. Transfer characteristics

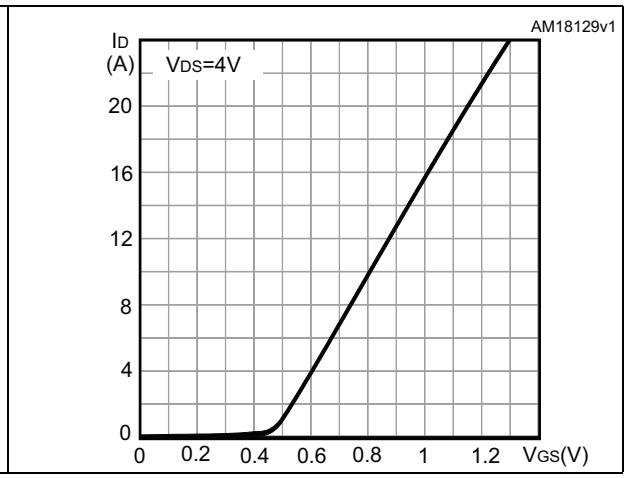


Figure 6. Gate charge vs gate-source voltage

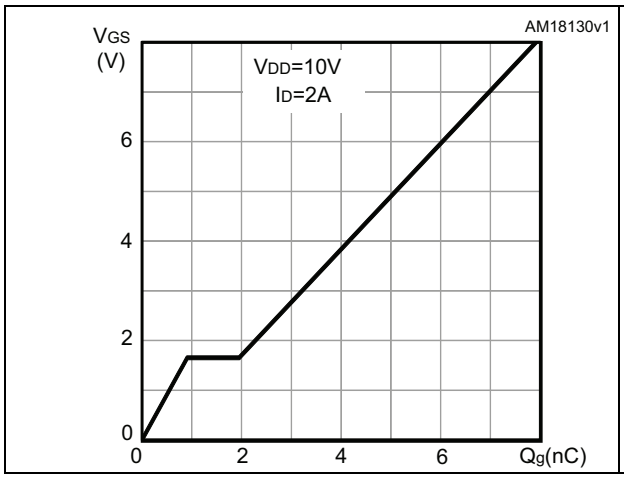


Figure 7. Static drain-source on-resistance

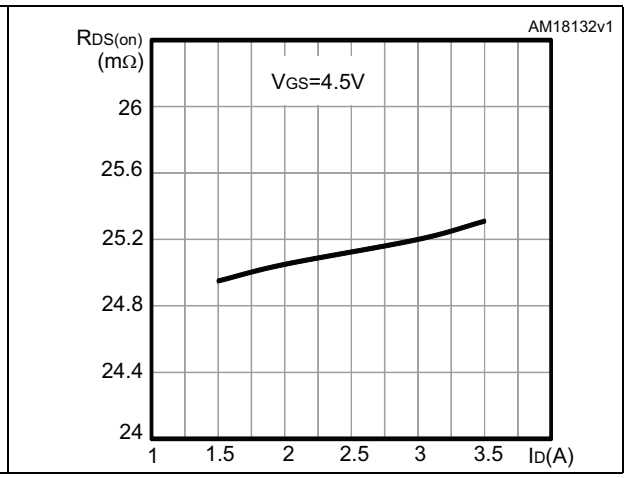


Figure 8. Capacitance variations

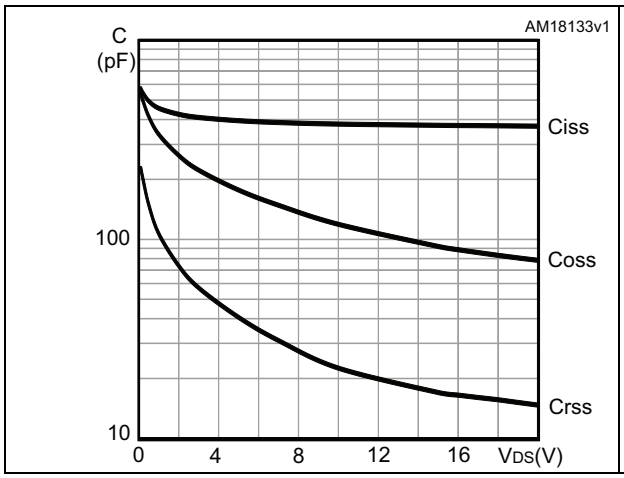


Figure 9. Normalized gate threshold voltage vs temperature

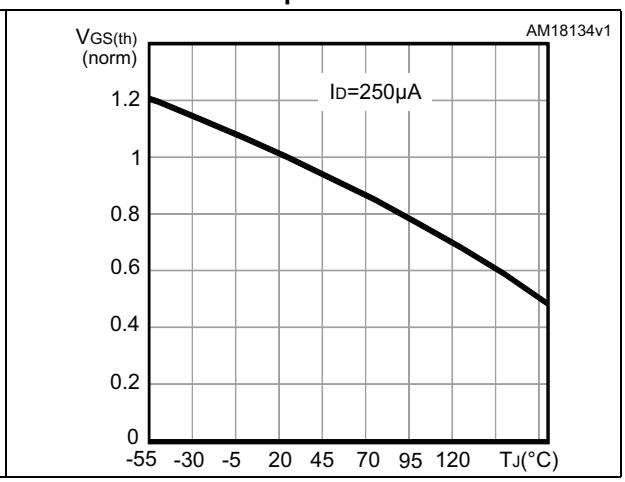


Figure 10. Normalized on-resistance vs temperature

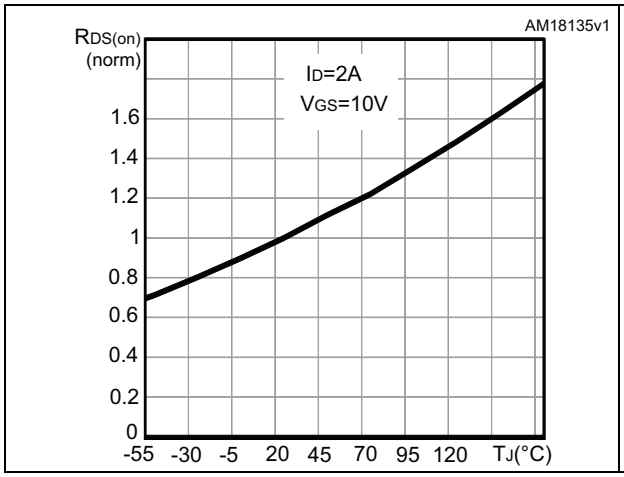


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

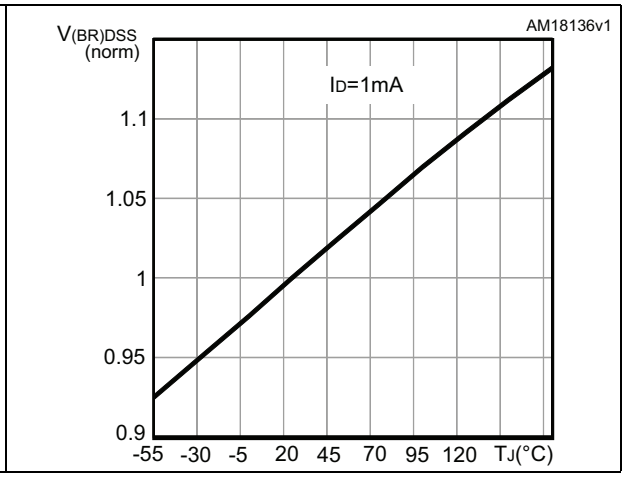
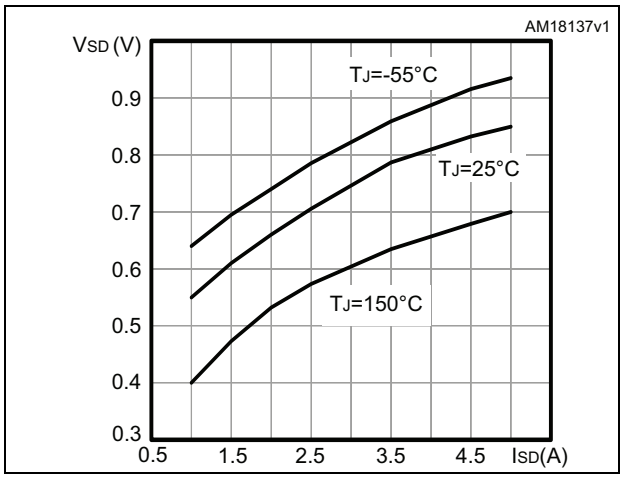


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

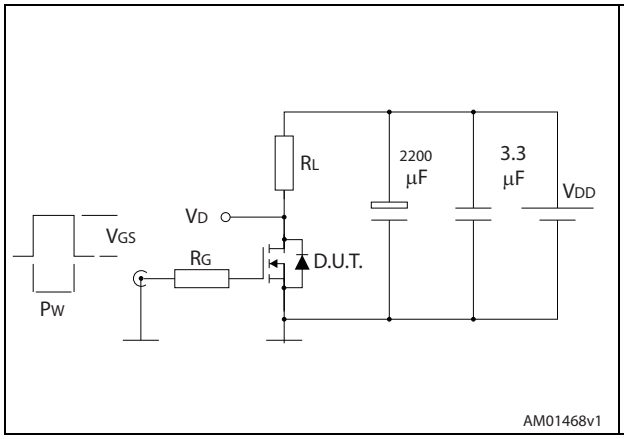


Figure 14. Gate charge test circuit

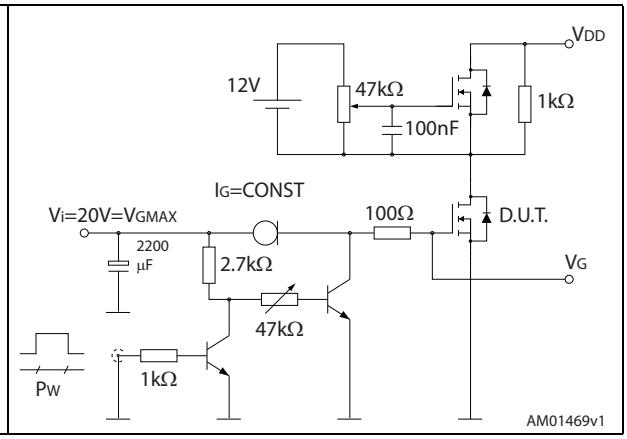


Figure 15. Test circuit for inductive load switching and diode recovery times

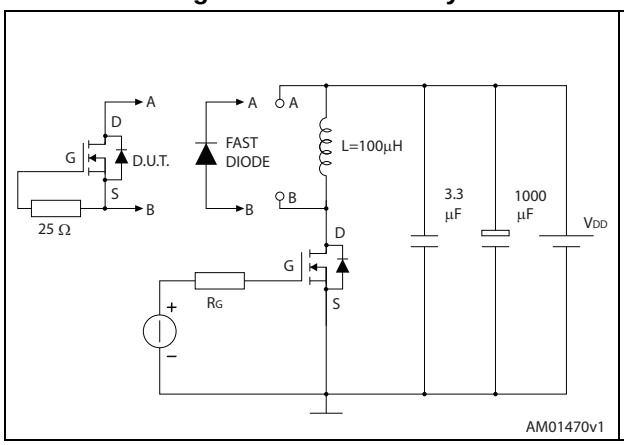


Figure 16. Unclamped inductive load test circuit

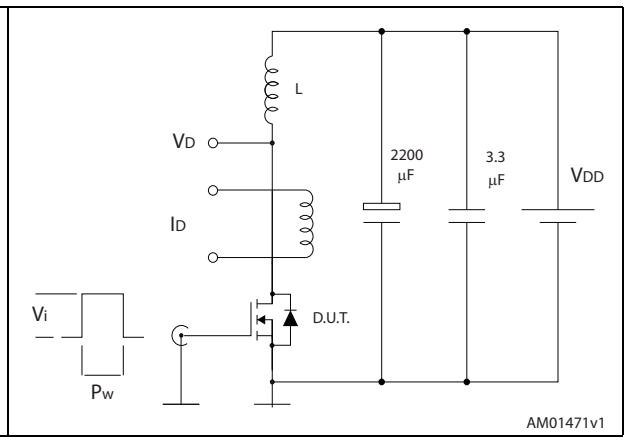


Figure 17. Unclamped inductive waveform

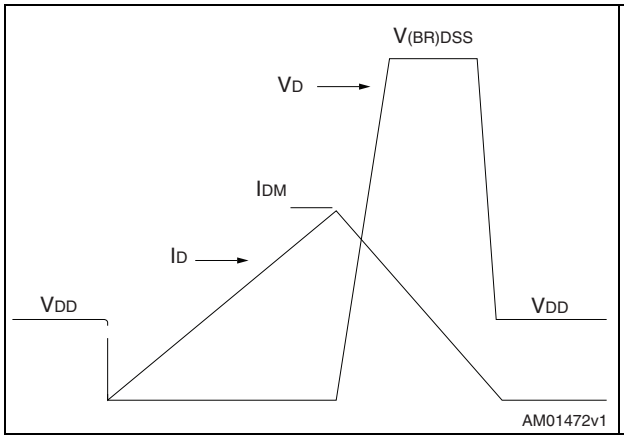
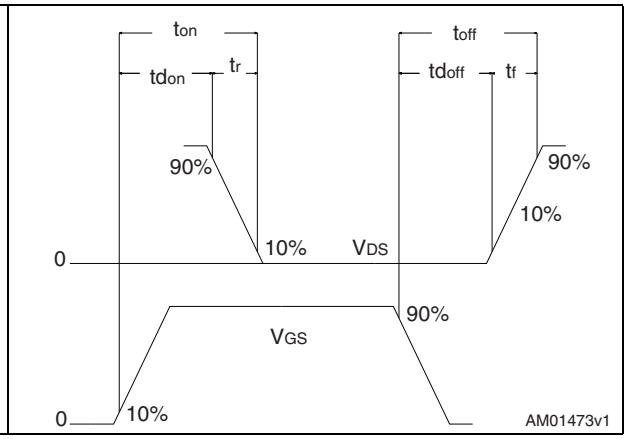


Figure 18. Switching time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
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Figure 19. PowerFLAT™ 2 x 2 drawing

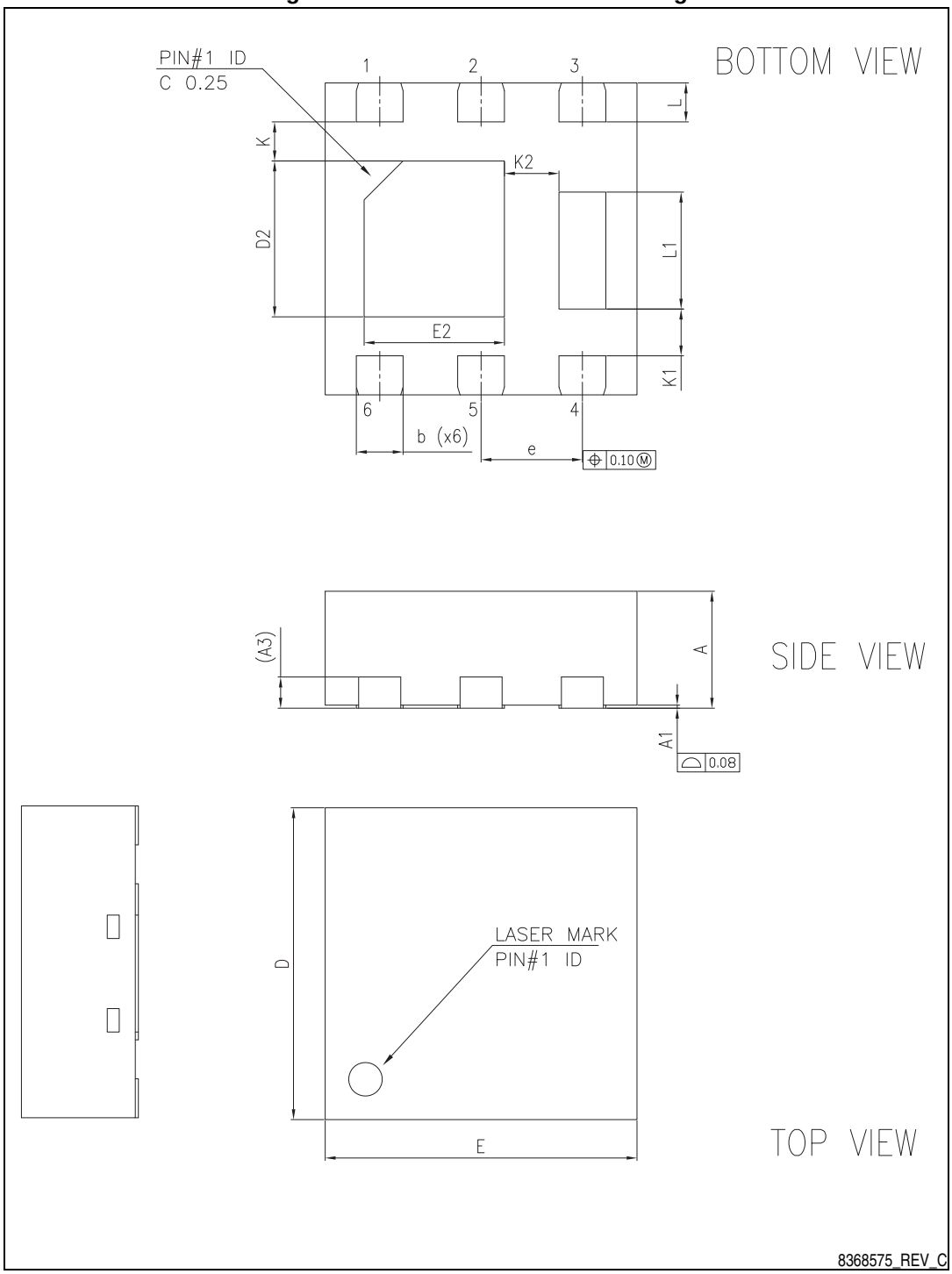
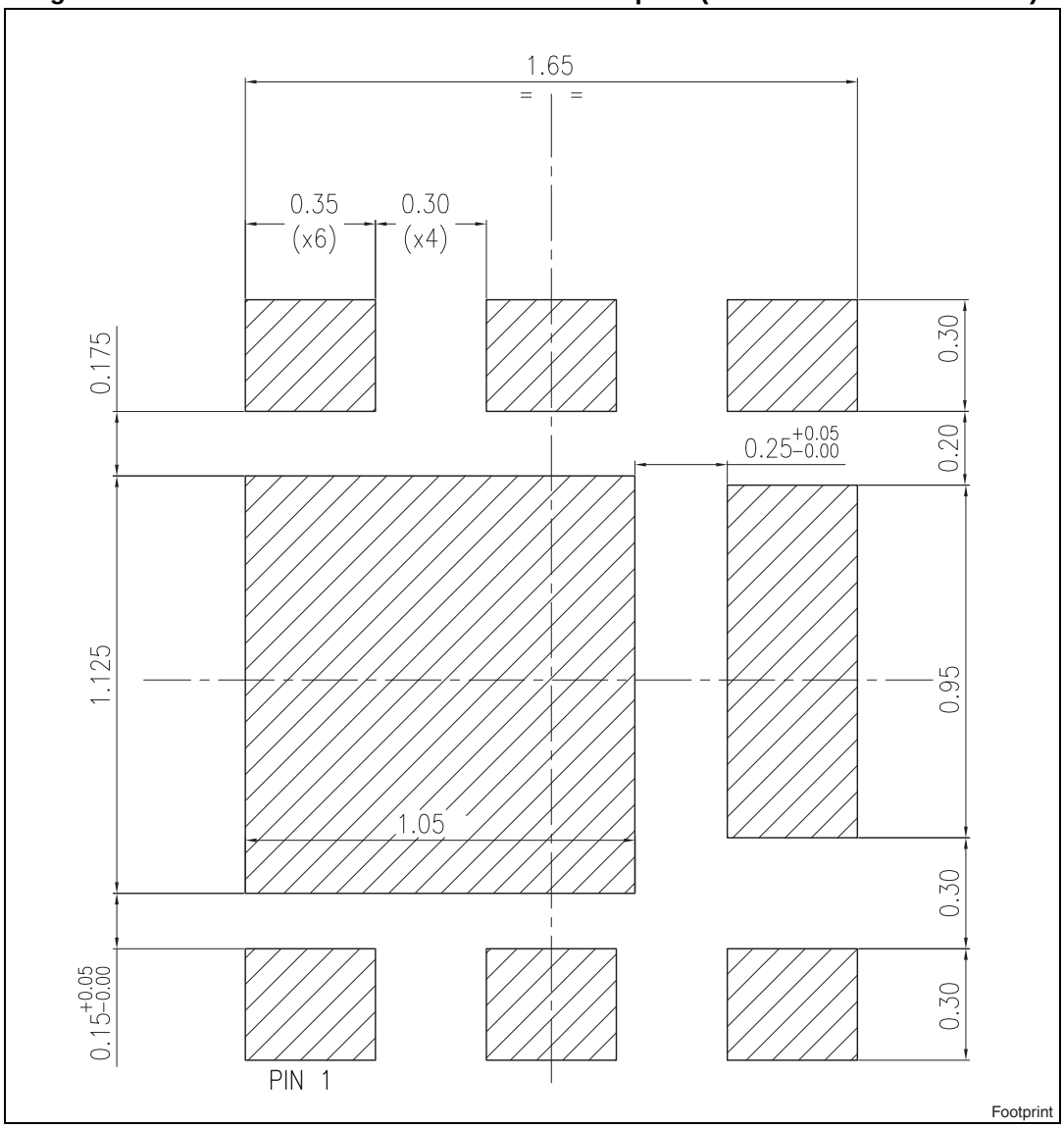


Table 8. PowerFLAT™ 2x2 mechanical data

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™ 2 x 2 recommended footprint (dimensions in millimeters)



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
24-Apr-2012	1	First release.
10-Jan-2013	2	– Modified: $R_{DS(on)}$ values – Document status promoted from target data to preliminary data
19-Mar-2014	3	– Modified: the entire typical values in *Table 5*, *6* and *7* – Added: *Section 2.1: Electrical characteristics (curves)* – Minor text changes

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