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STL13DP10F6

Dual P-channel 100 V, 0.136 Ω typ., 3.3 A STripFET™ VI DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 double island

Datasheet - production data

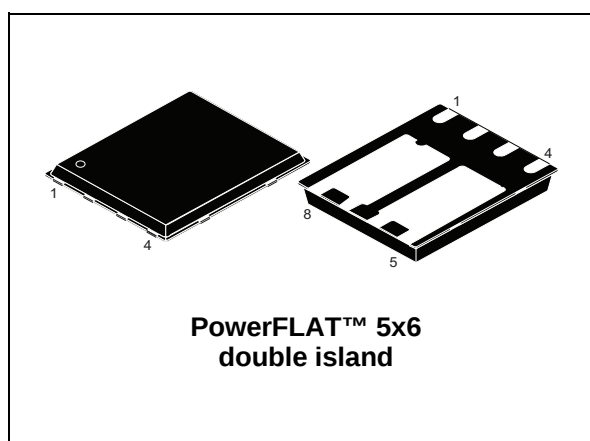
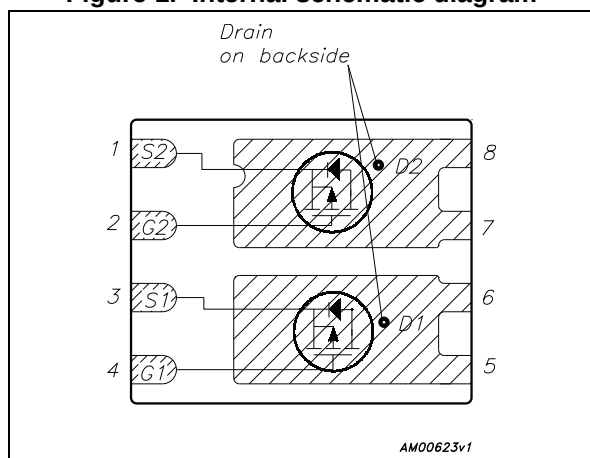


Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STL13DP10F6	100 V	0.18 Ω	3.3 A

- $R_{DS(on)} * Q_g$ industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power losses

Applications

- Switching applications

Description

This device is a dual P-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STL13DP10F6	13DP10F6	PowerFLAT™ 5x6 double island	Tape and reel

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Electrical ratings

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	13	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	7.3	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	3.3	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100^\circ\text{C}$	2	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	13.2	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25^\circ\text{C}$	62.5	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	4	W
T_J	Operating junction temperature	-55 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature		

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

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	32	$^\circ\text{C/W}$

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

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

($T_{CASE}=25\text{ }^{\circ}\text{C}$ 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	μA
		$V_{GS}=0, V_{DS}=100\text{ V}, T_C=125\text{ }^{\circ}\text{C}$			10	μA
I_{GSS}	Gate body leakage current	$V_{DS}=0, V_{GS}=\pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS}=10\text{ V}, I_D=1.7\text{ A}$		0.136	0.18	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS}=25\text{ V}, f=1\text{ MHz}, V_{GS}=0$	-	864	-	pF
C_{oss}	Output capacitance		-	45	-	pF
C_{rss}	Reverse transfer capacitance		-	25	-	pF
Q_g	Total gate charge	$V_{DD}=50\text{ V}, I_D=3.3\text{ A}$ $V_{GS}=10\text{ V}$ (see Figure 14)	-	16.5	-	nC
Q_{gs}	Gate-source charge		-	3.5	-	nC
Q_{gd}	Gate-drain charge		-	3.8	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=50\text{ V}, I_D=1.7\text{ A}, R_G=4.7\text{ }\Omega, V_{GS}=10\text{ V}$ (see Figure 13)	-	10.5	-	ns
t_r	Rise time		-	4.8	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
t_f	Fall time		-	4.5	-	ns

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Electrical characteristics

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		3.3	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		13.2	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 3.3 \text{ A}$, $V_{GS}=0$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 3.3 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD}=80 \text{ V}$, $T_j=150 \text{ }^\circ\text{C}$	-	26.5		ns
Q_{rr}	Reverse recovery charge		-	36.5		nC
I_{RRM}	Reverse recovery current		-	2.7		A

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration=300 μ s, duty cycle 1.5%

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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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

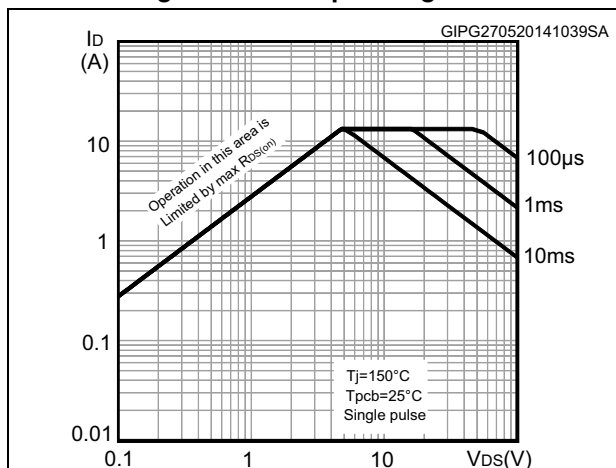


Figure 3. Thermal impedance

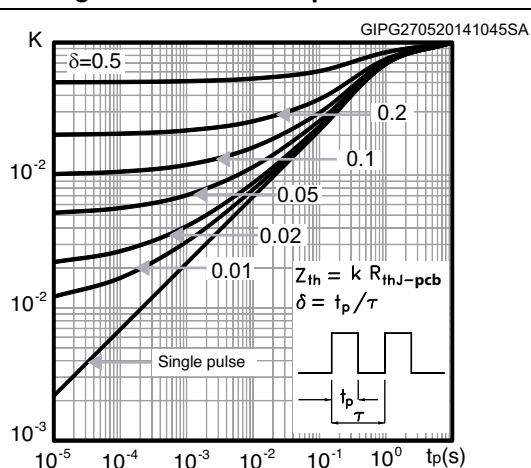


Figure 4. Output characteristics

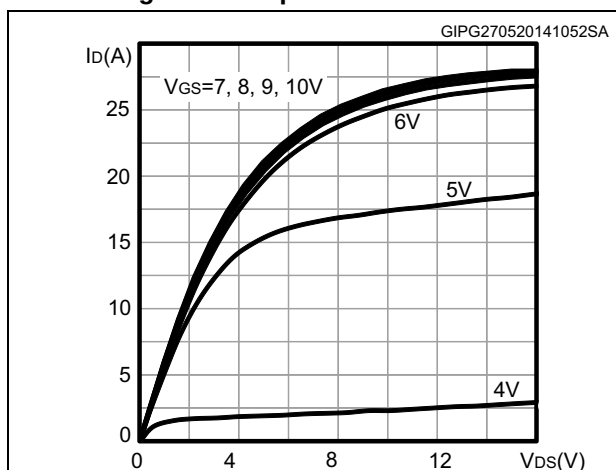


Figure 5. Transfer characteristics

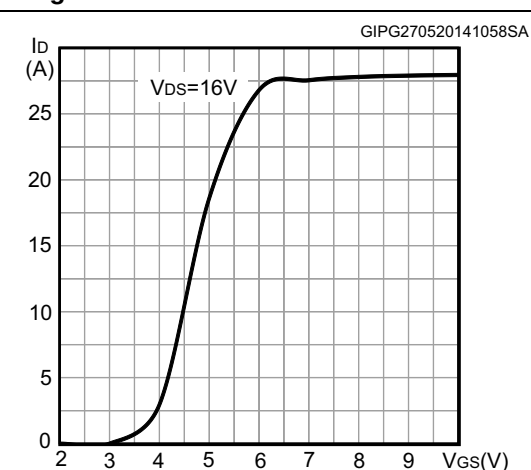


Figure 6. Gate charge vs gate-source voltage

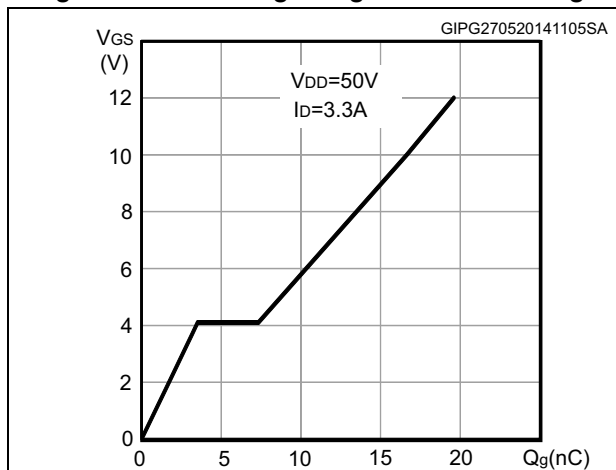
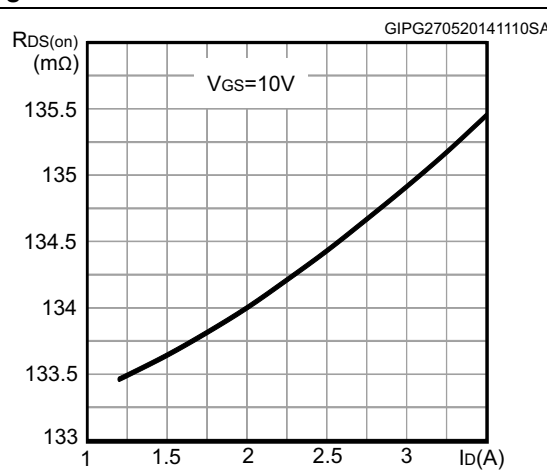


Figure 7. Static drain-source on-resistance



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Electrical characteristics

Figure 8. Capacitance variations

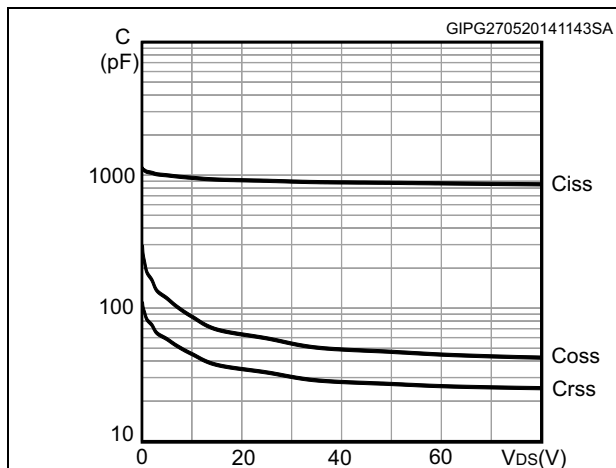


Figure 9. Normalized gate threshold voltage vs temperature

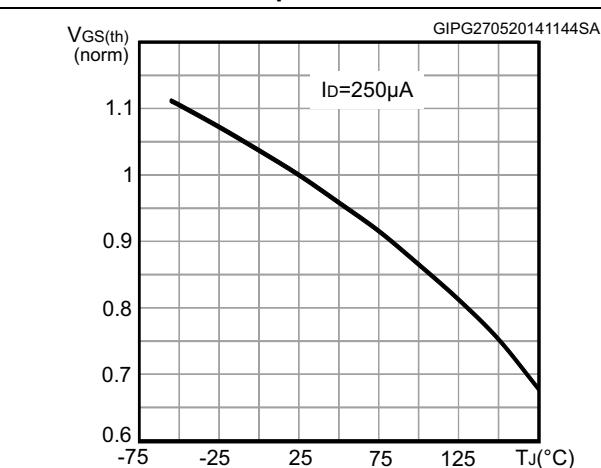


Figure 10. Normalized on-resistance vs temperature

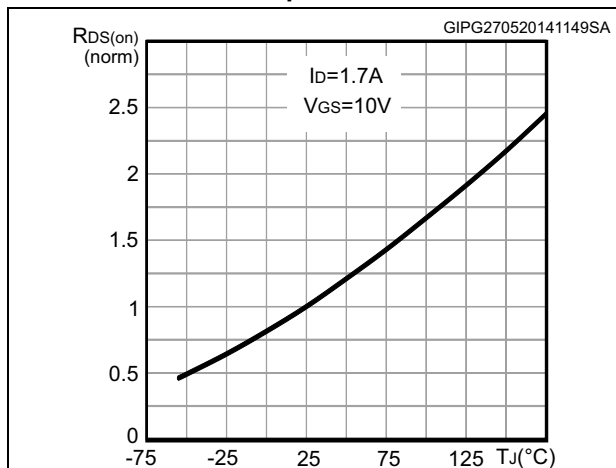


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

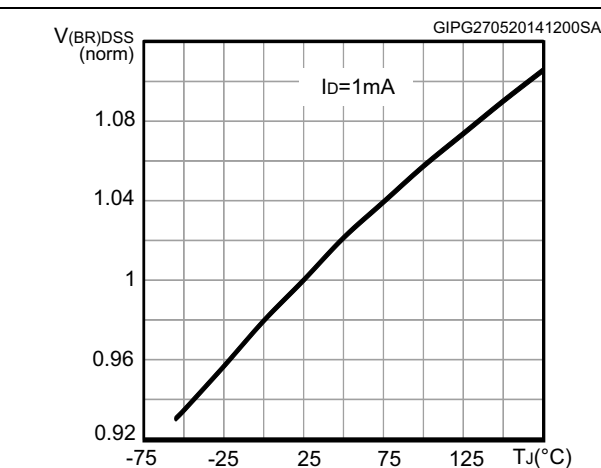
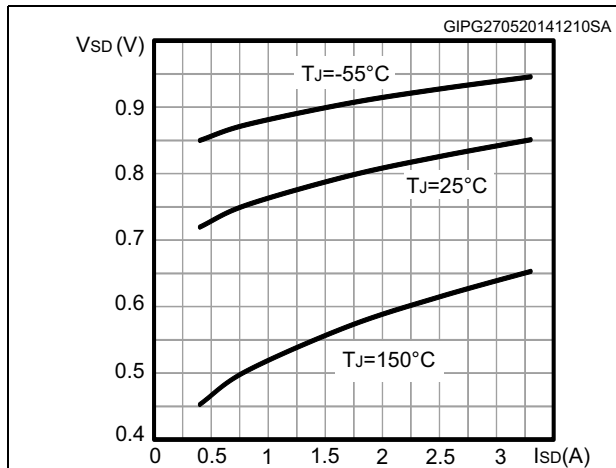


Figure 12. Source-drain diode forward characteristics



Test circuits

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3 Test circuits

Figure 13. Switching times test circuit for resistive load

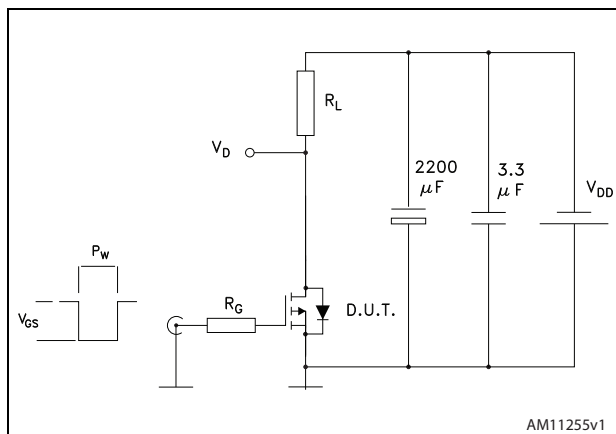


Figure 14. Gate charge test circuit

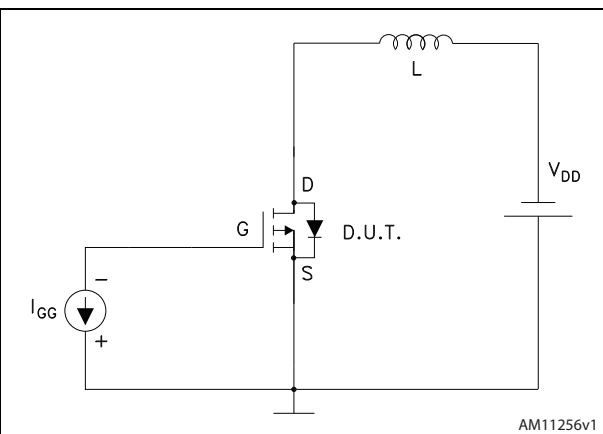
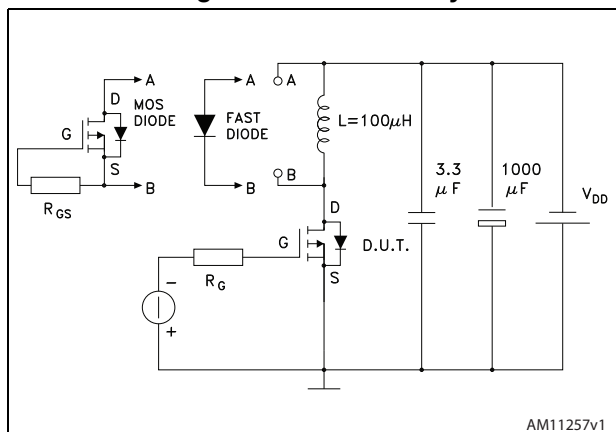


Figure 15. Test circuit for inductive load switching and diode recovery times



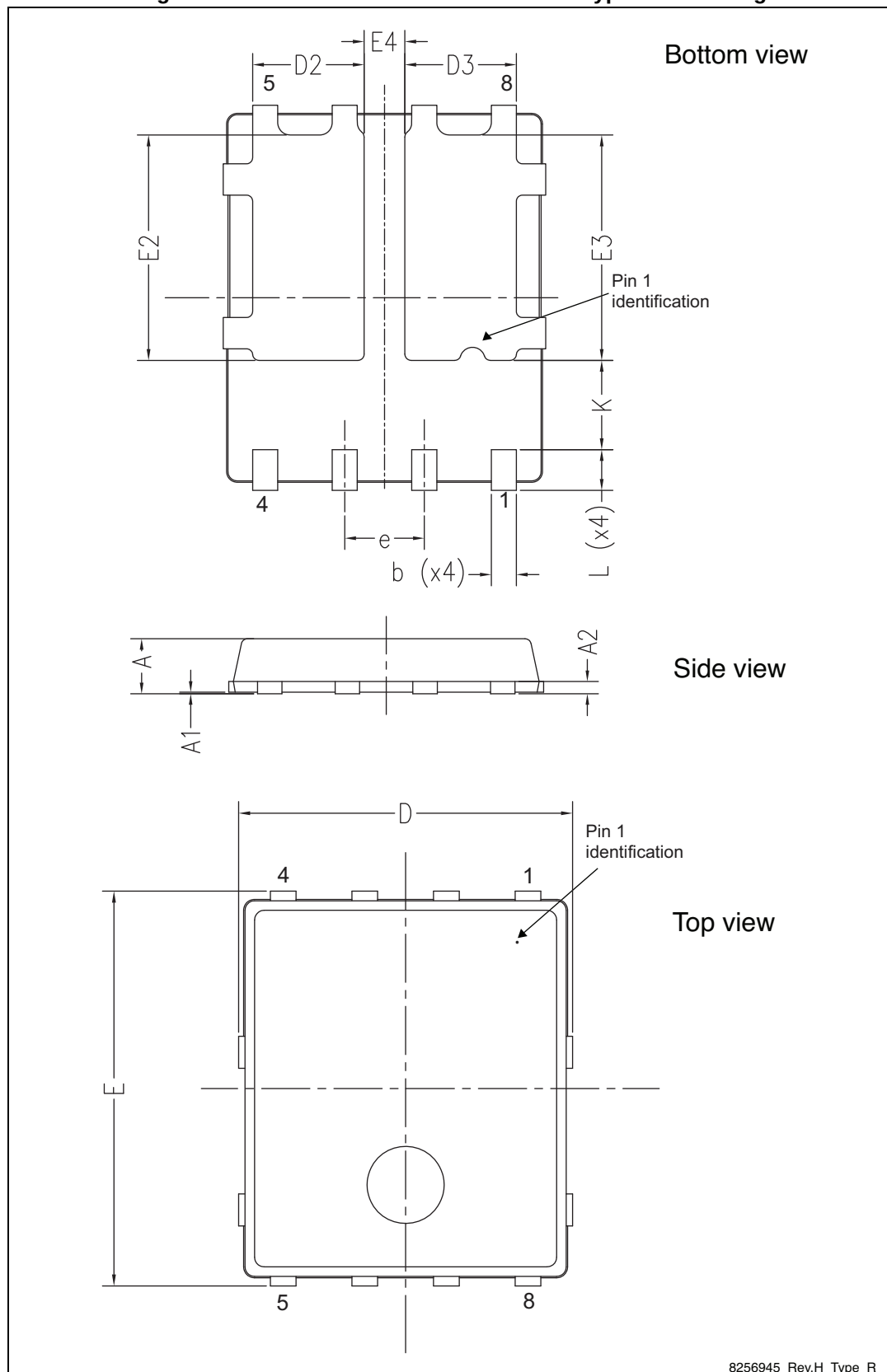
4 Package mechanical data

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. PowerFLAT™ 5x6 double island type R-A drawing



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Package mechanical data

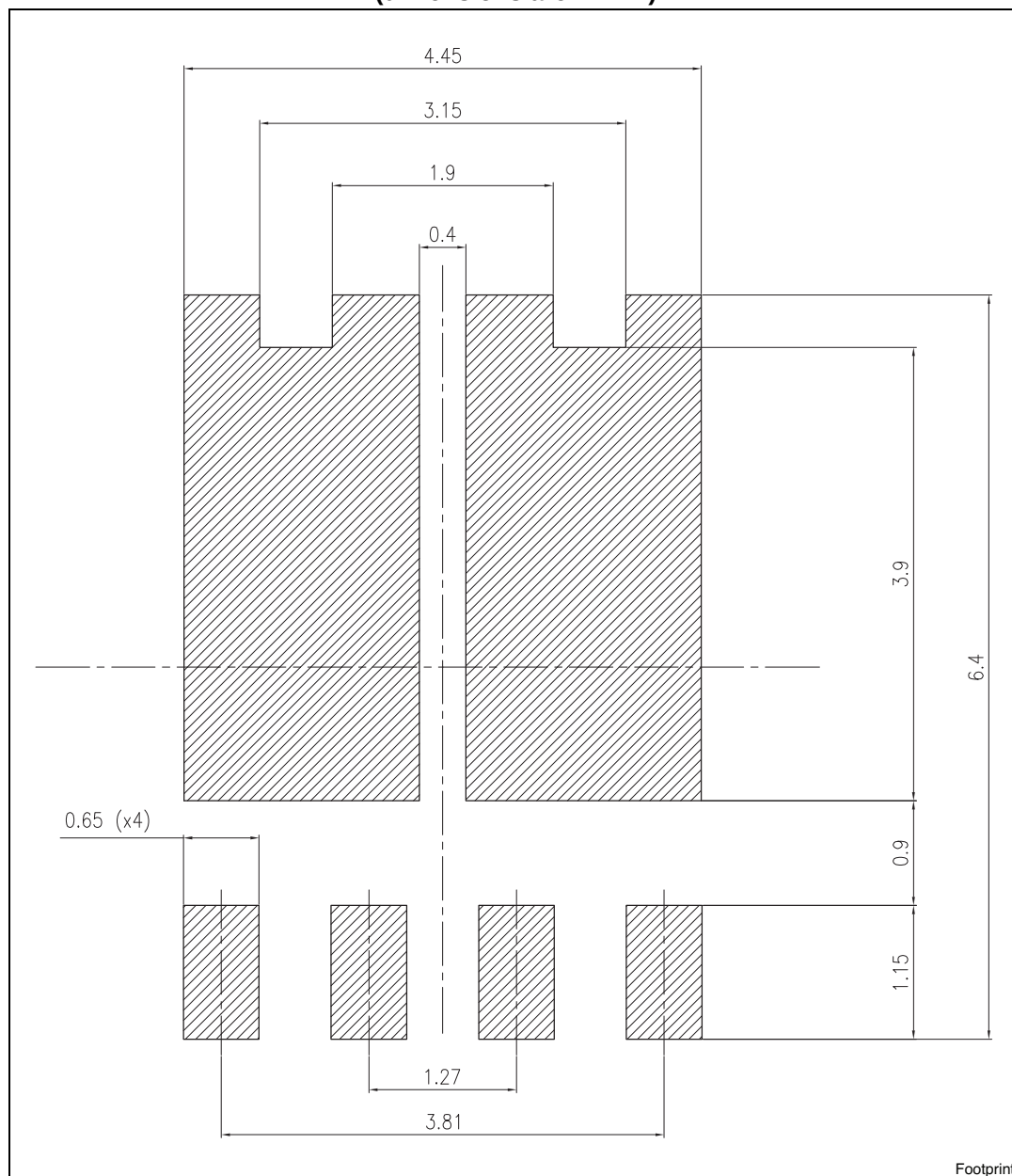
Table 8. PowerFLAT™ 5x6 double island type R-A mechanical data

Ref.	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D		5.20	
E		6.15	
D2	1.68		1.88
E2	3.50		3.70
D3	1.68		1.88
E3	3.50		3.70
E4	0.55		0.75
e		1.27	
L	0.60		0.80
K	1.275		1.575

Package mechanical data

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**Figure 17. PowerFLAT™ 5x6 double island type R-A drawing recommended footprint
(dimensions are in mm)**



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Nov-2012	1	First release.
30-May-2014	2	– Document status promoted from target to production data – Modified: title – Modified: $R_{DS(on)}$ typical value in Table 4, 5, 6, 7 and 8 – Added: Section 2.1: Electrical characteristics (curves) – Updated: Section 4: Package mechanical data – Minor text changes

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