

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

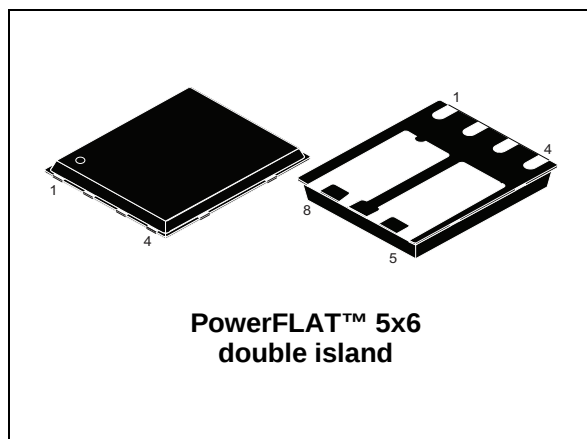
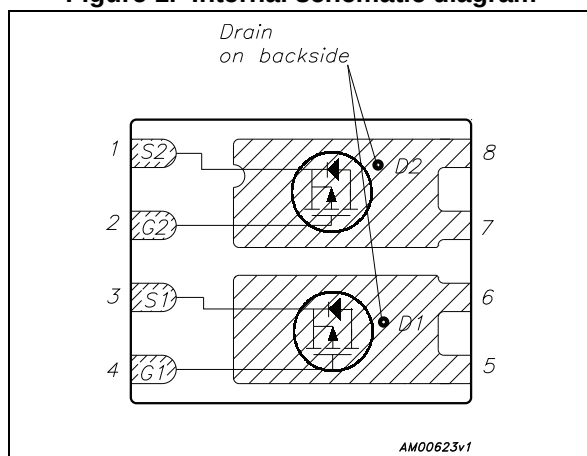


Figure 1. Internal schematic diagram



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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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 T_{stg}	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

1. The value is rated according R_{thj-c}
2. The value is rated according $R_{thj-pcb}$
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.

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	$V_{DD}=50\text{ V}$, $I_D = 3.3\text{ A}$	-	16.5	-	nC
Q_{gs}	Gate-source charge	$V_{GS}=10\text{ V}$	-	3.5	-	nC
Q_{gd}	Gate-drain charge	(see Figure 14)	-	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

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 μs , duty cycle 1.5%

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

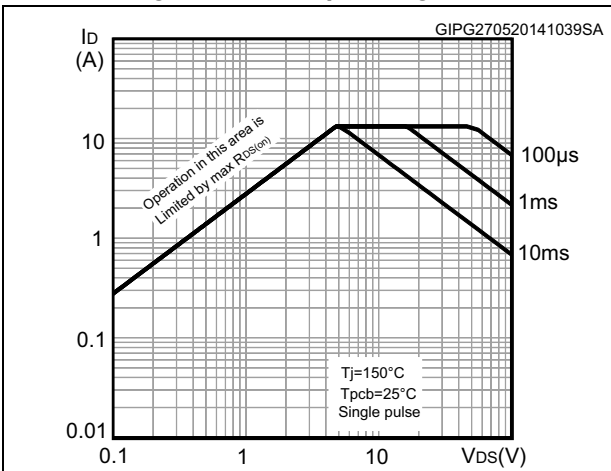


Figure 3. Thermal impedance

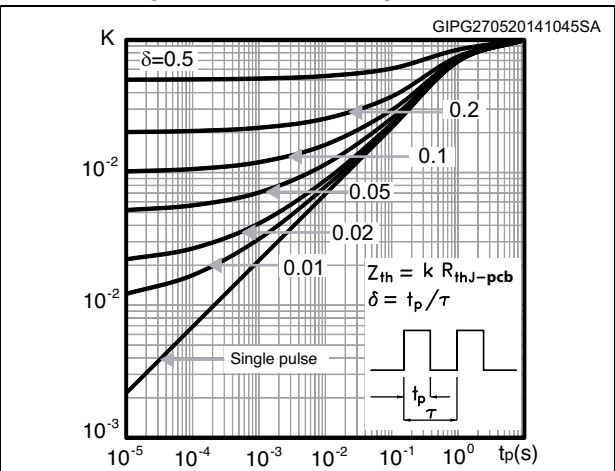


Figure 4. Output characteristics

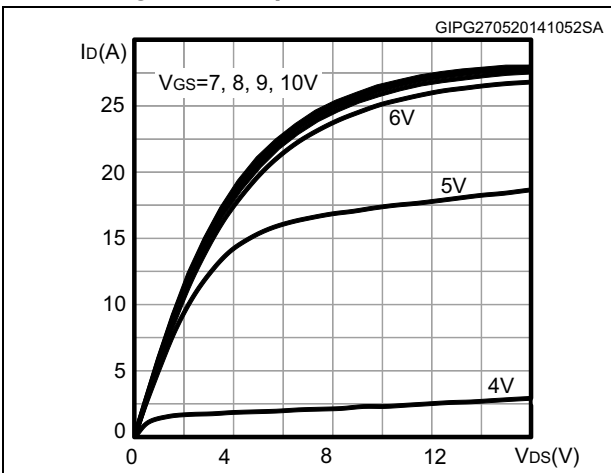


Figure 5. Transfer characteristics

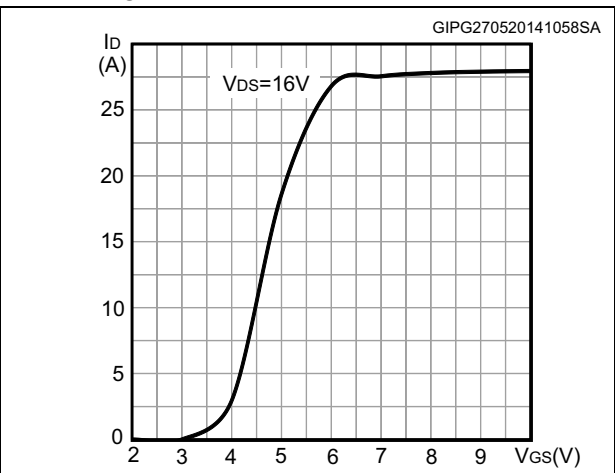


Figure 6. Gate charge vs gate-source voltage

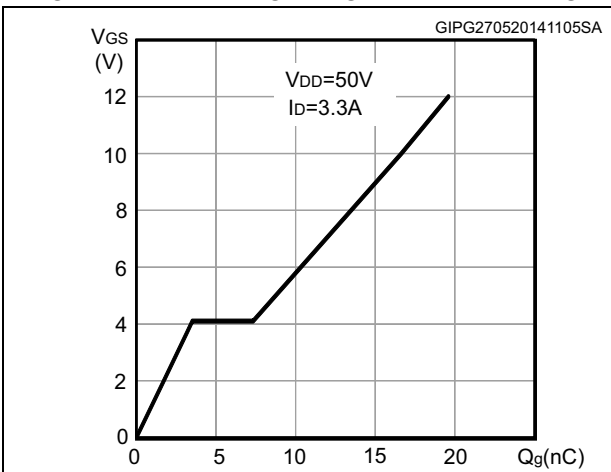


Figure 7. Static drain-source on-resistance

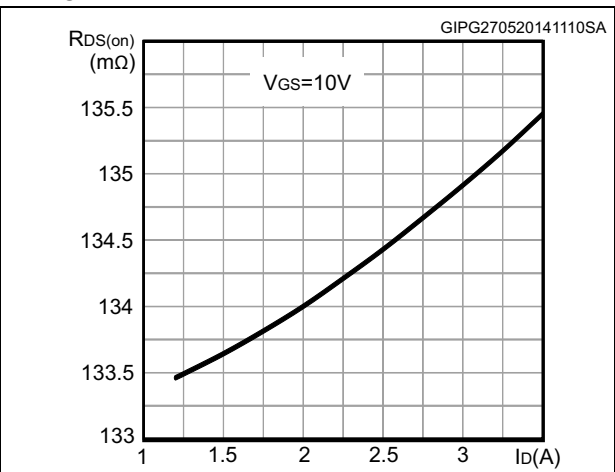


Figure 8. Capacitance variations

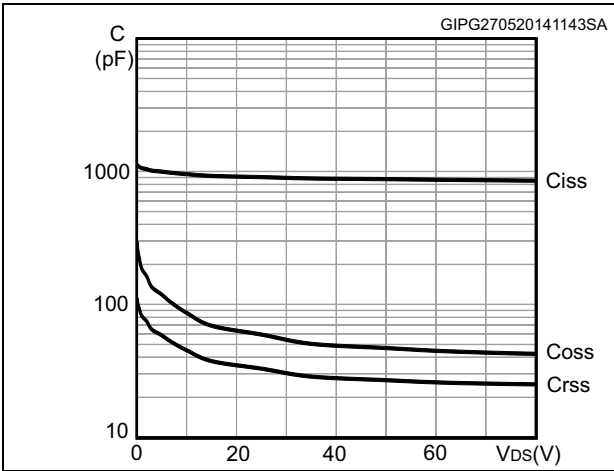


Figure 9. Normalized gate threshold voltage vs temperature

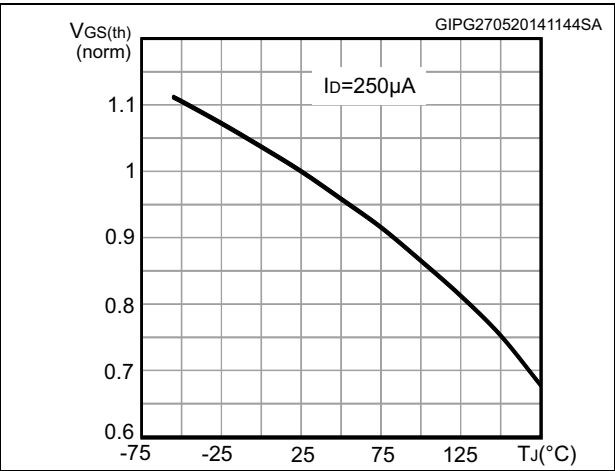


Figure 10. Normalized on-resistance vs temperature

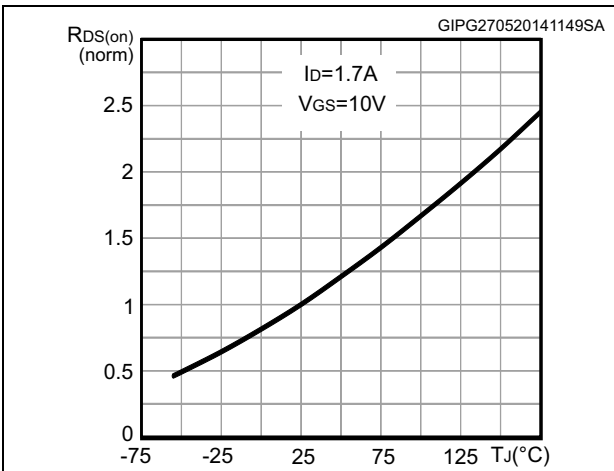


Figure 11. Normalized V(BR)DSS vs temperature

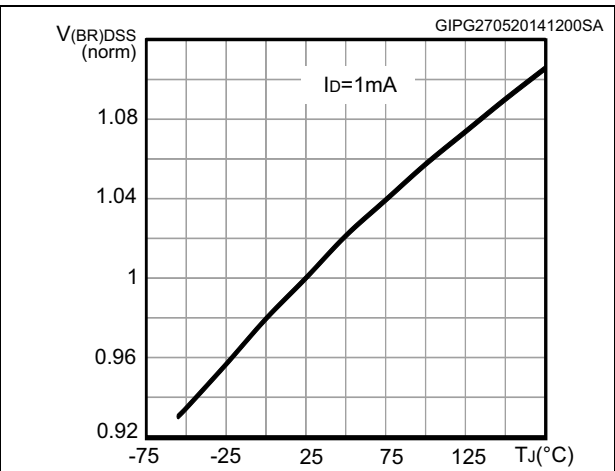
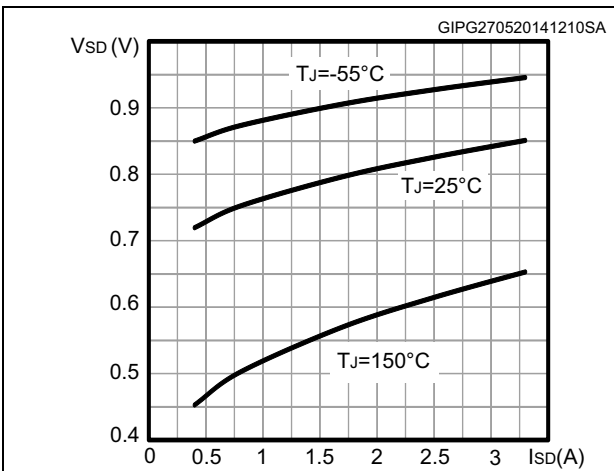


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

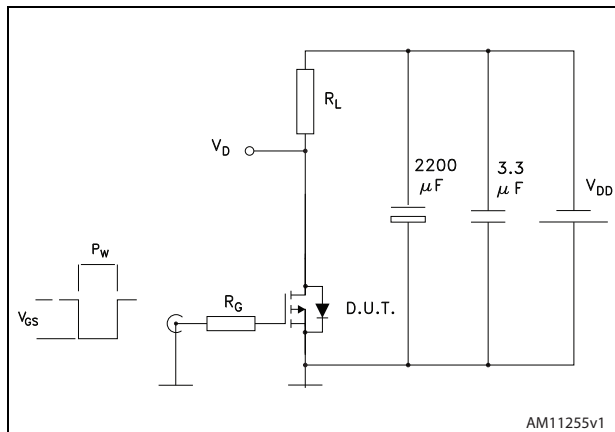


Figure 14. Gate charge test circuit

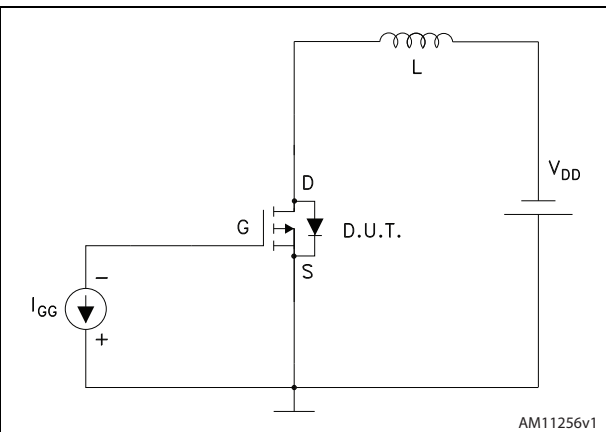
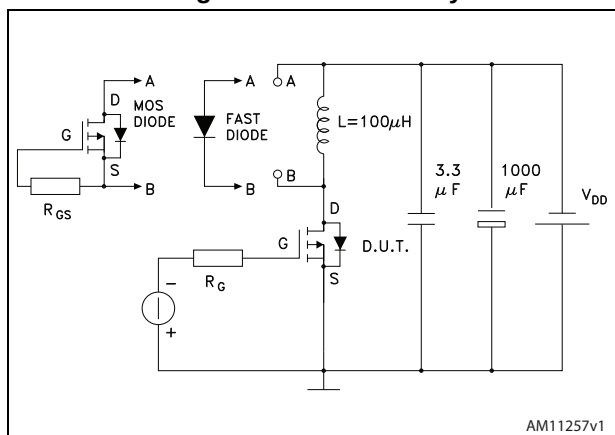


Figure 15. Test circuit for inductive load switching and diode recovery times



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.

Figure 16. PowerFLAT™ 5x6 double island type R-A drawing

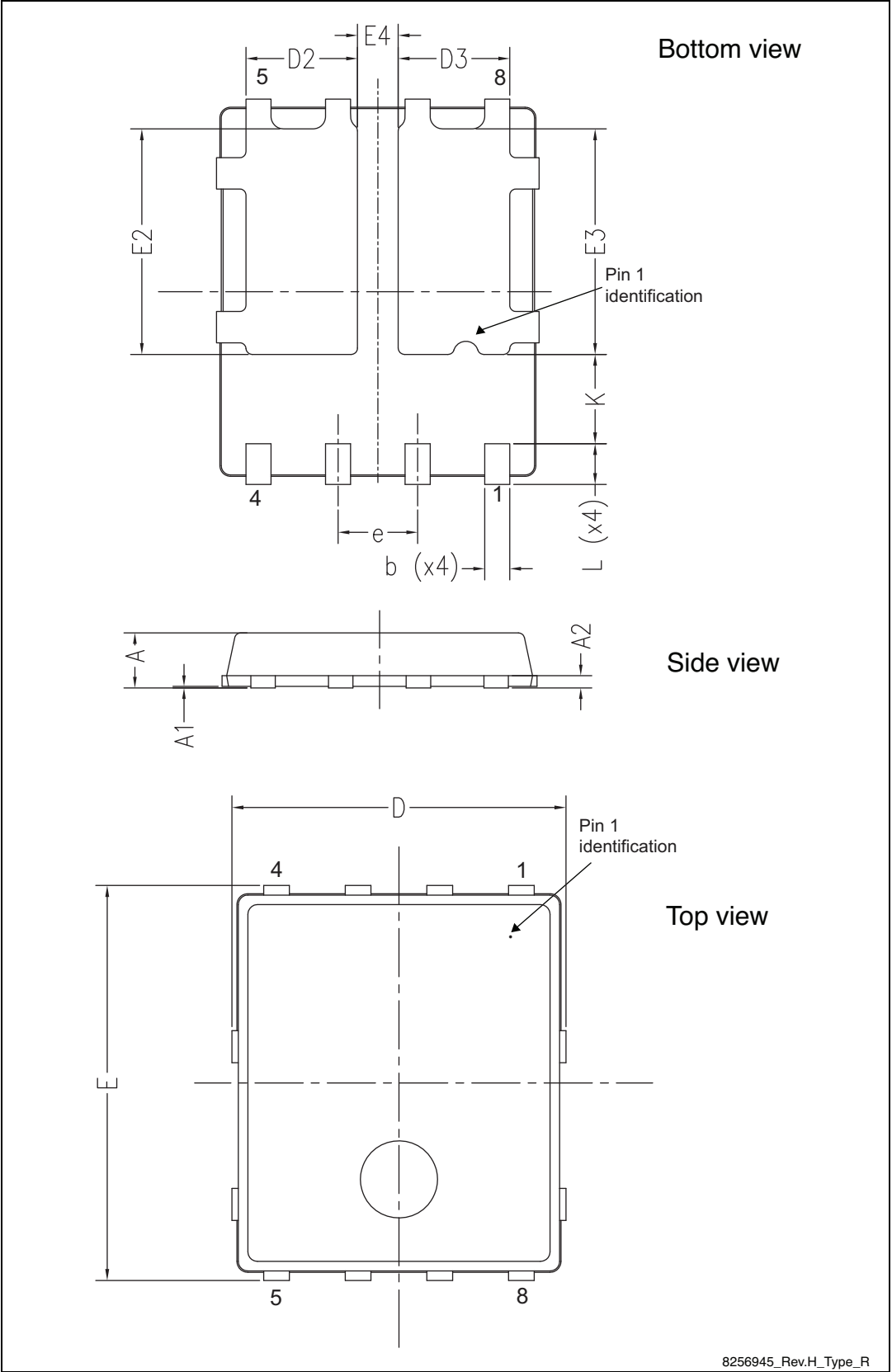


Table 8. PowerFLAT™ 5x6 double island type R-A mechanical data

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

Technical drawing of a mechanical part, showing a top view and a side view. The part is symmetrical about a vertical centerline (indicated by a dashed line).

Top View Dimensions:

- Overall width: 4.45
- Inner width (top): 3.15
- Inner width (middle): 1.9
- Inner width (bottom): 0.4
- Overall height: 6.4
- Height of the central rectangular section: 3.9
- Height of the bottom flange: 0.9
- Height of the bottom flange (from the bottom surface): 1.15
- Width of the bottom flange (from the centerline): 0.65 (x4)
- Distance between the centers of the bottom flanges: 1.27
- Overall distance between the centers of the bottom flanges: 3.81

Side View Dimensions:

- Overall height: 6.4
- Height of the central rectangular section: 3.9
- Height of the bottom flange: 0.9
- Height of the bottom flange (from the bottom surface): 1.15

The part features a central rectangular section with a width of 1.9 and a height of 3.9. This section is flanked by two side sections, each with a width of 1.27. The bottom flange has a width of 0.65 (x4) and a height of 0.9. The overall width of the part is 4.45, and the overall height is 6.4.

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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