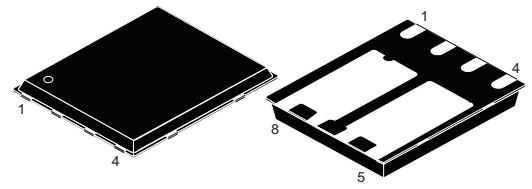
STL20DN10F7

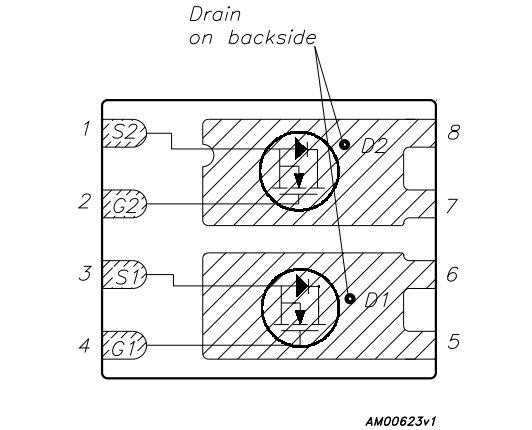
Dual N-channel 100 V, 0.059 Ω typ., 5 A STripFET™ VII DeepGATE™ Power MOSFET in a PowerFLAT™ 5x6 double island package

Datasheet - production data



PowerFLAT™ 5x6 double island

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL20DN10F7	100 V	0.067 Ω	5 A

- N-channel enhancement mode
- Lower $R_{DS(on)}$ x area vs previous generation
- 100% avalanche rated

Applications

- Switching applications

Description

This device utilizes the 7th generation of design rules of ST's proprietary STripFET™ 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	Package	Packaging
STL20DN10F7	20DN10F7	PowerFLAT™ 5x6 double island	Tape and reel

Contents

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 °C	20	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	12.3	A
I_D (2)	Drain current (continuous) at T_{pcb} = 25 °C	5	A
I_D (2)	Drain current (continuous) at T_{pcb}=100°C	3.1	A
I_{DM} (2), (3)	Drain current (pulsed)	20	A
P_{TOT} (1)	Total dissipation at T_C = 25°C	62.5	W
P_{TOT} (2)	Total dissipation at T_{pcb} = 25°C	4	W
T_J	Operating junction temperature	-55 to 150	°C
T_{stg}	Storage temperature		°C

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

Table 3. Thermal resistance

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

1. When mounted on FR-4 board of 1inc^2, 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	100			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 100 V			1	µA
		V_{DS} = 100 V, T_C= 125 °C			100	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = + 20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS}= 10 V, I_D= 2.5 A		0.059	0.067	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} =50 V, f=1 MHz, V_{GS}=0	-	408	-	pF
C_{oss}	Output capacitance		-	112	-	pF
C_{rss}	Reverse transfer capacitance		-	10	-	pF
Q_g	Total gate charge	V_{DD}=50 V, I_D = 5 A V_{GS} =10 V *(see Figure 14)*	-	7.8	-	nC
Q_{gs}	Gate-source charge		-	3	-	nC
Q_{gd}	Gate-drain charge		-	1.7	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD}=50 V, I_D= 2.5 A, R_G=4.7 Ω, V_{GS}= 10 V *(see Figure 13)*	-	6.3	-	ns
t_r	Rise time		-	3	-	ns
$t_{d(off)}$	Turn-off delay time		-	11	-	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		-		5	A
I_{SDM} (1)	Source-drain current (pulsed)		-		20	A
V_{SD} (2)	Forward on voltage	I_{SD}= 5 A, V_{GS}=0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD}= 5 A, di/dt = 100 A/µs, V_{DD}= 80 V, Tj=150 °C *(see Figure 18)*	-	30		ns
Q_{rr}	Reverse recovery charge		-	24		nC
I_{RRM}	Reverse recovery current		-	1.6		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

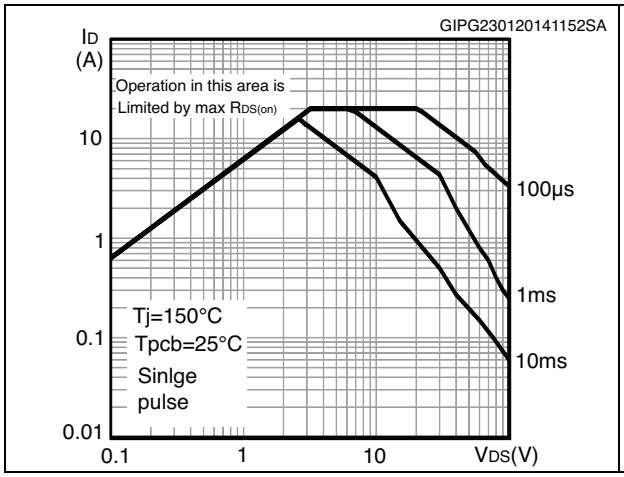


Figure 3. Thermal impedance

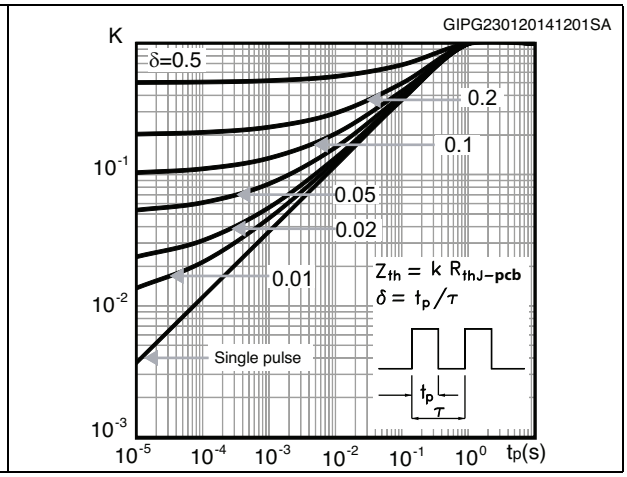


Figure 4. Output characteristics

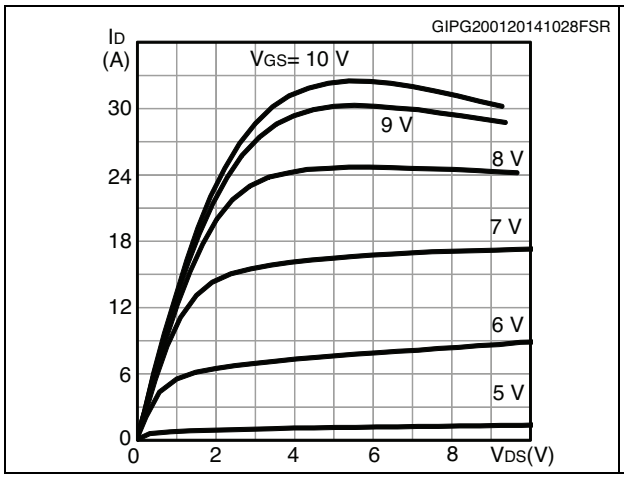


Figure 5. Transfer characteristics

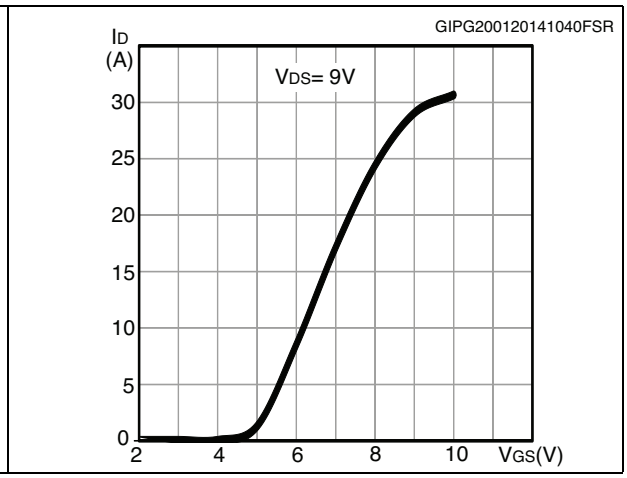


Figure 6. Gate charge vs gate-source voltage

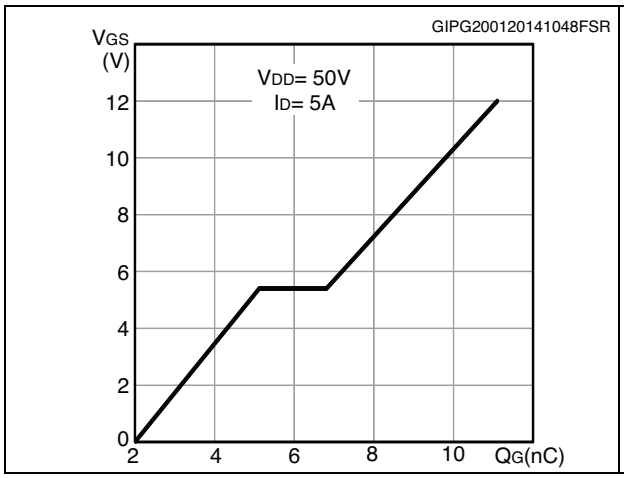


Figure 7. Static drain-source on-resistance

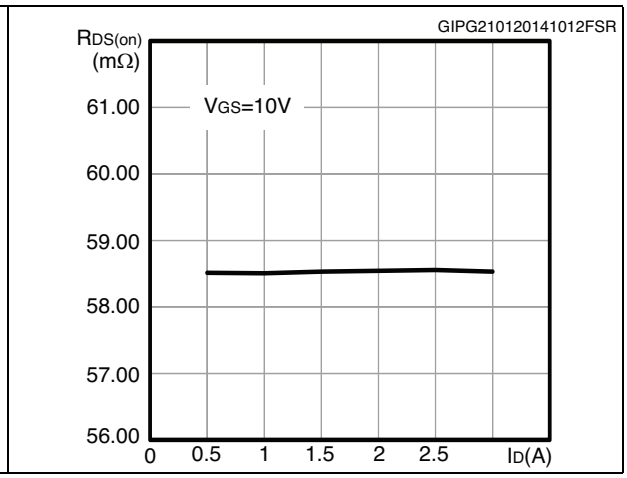


Figure 8. Capacitance variations

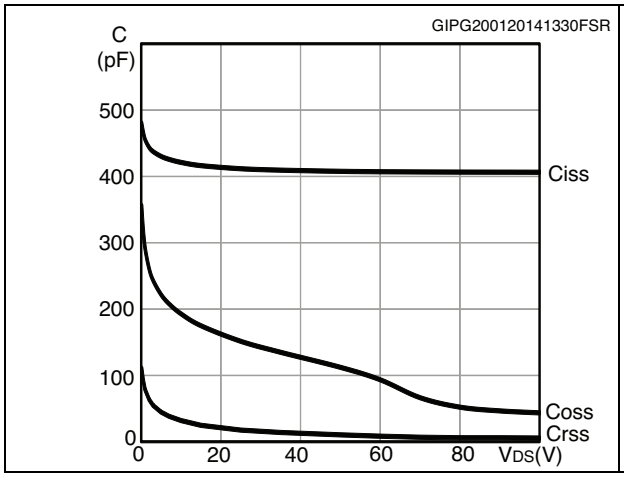


Figure 9. Normalized $V_{(BR)DSS}$ vs temperature

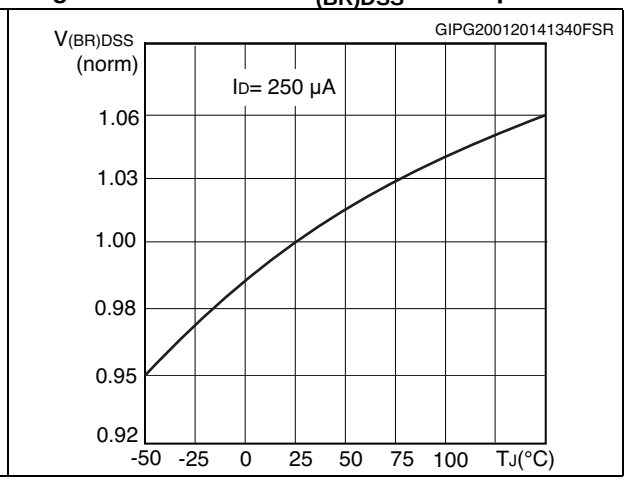


Figure 10. Normalized gate threshold voltage vs temperature

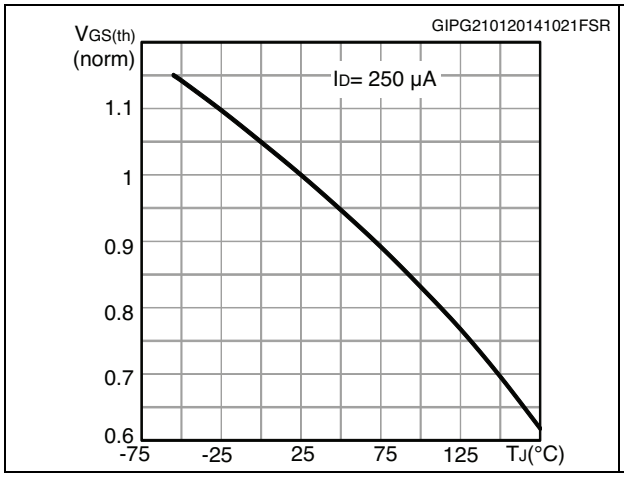


Figure 11. Normalized on-resistance vs temperature

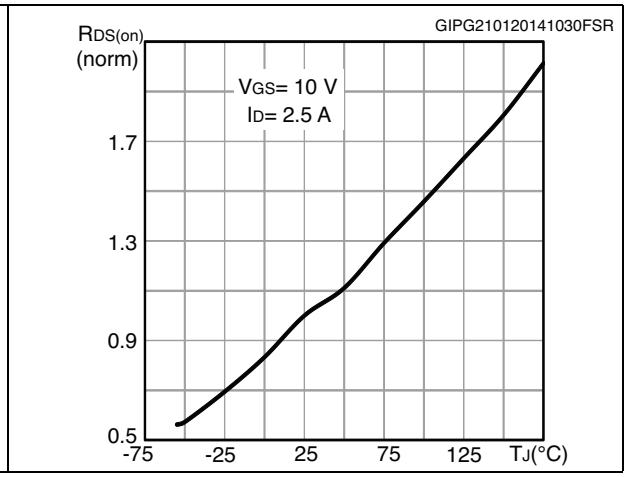
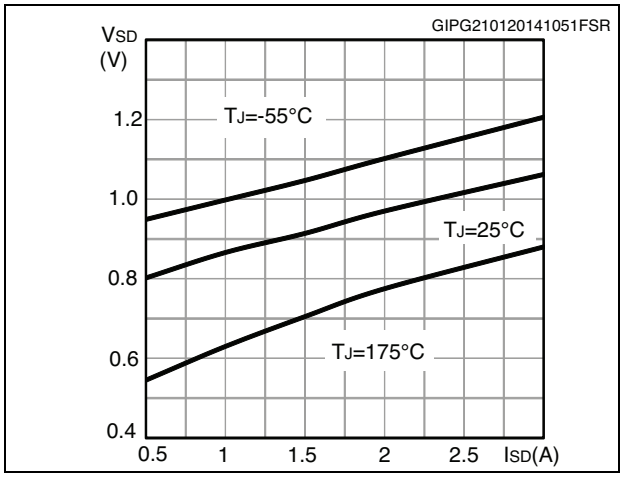


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

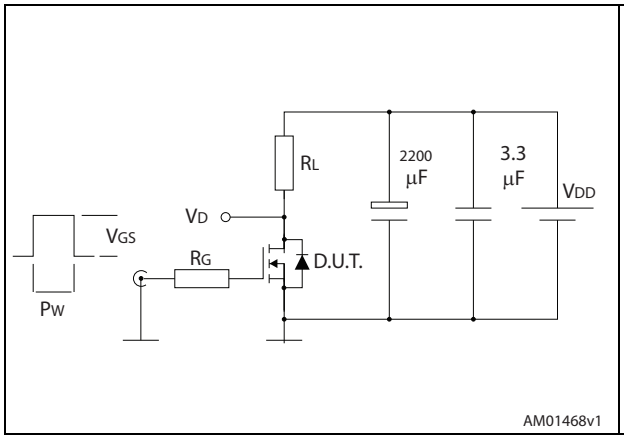


Figure 14. Gate charge test circuit

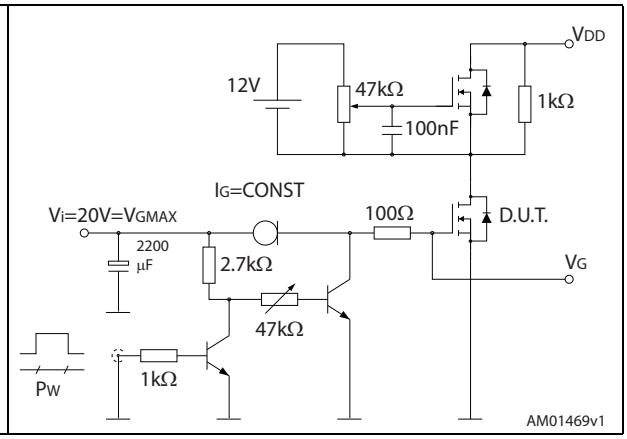


Figure 15. Test circuit for inductive load switching and diode recovery times

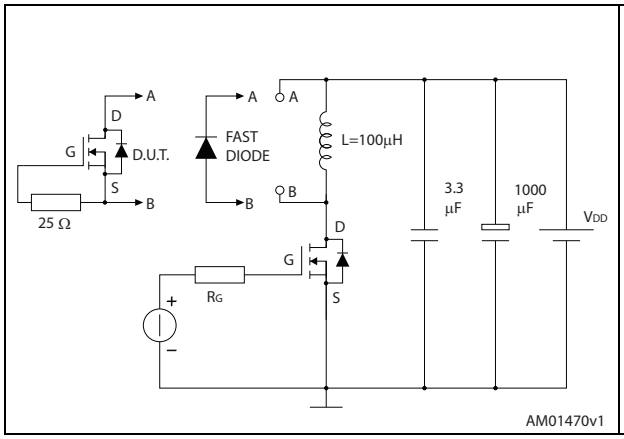


Figure 16. Unclamped inductive load test circuit

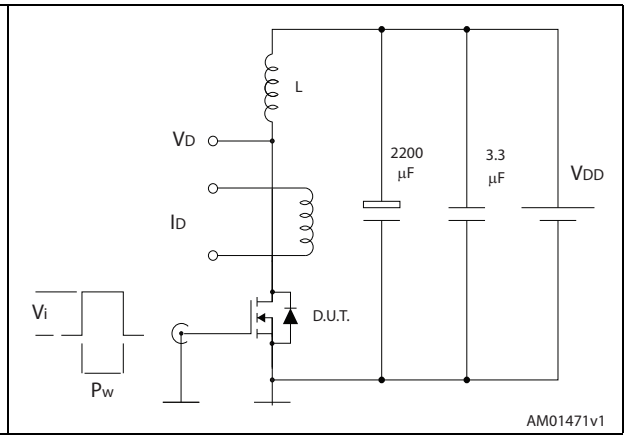


Figure 17. Unclamped inductive waveform

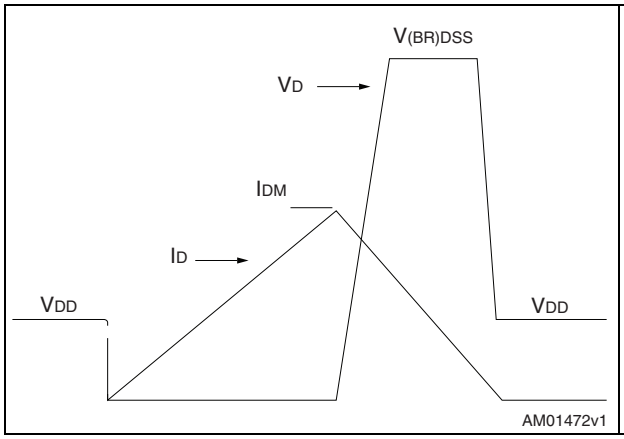
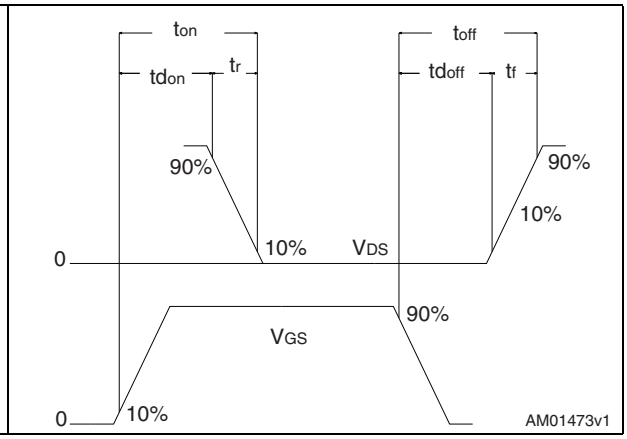


Figure 18. Switching time waveform



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™ 5x6 - double island type R-B drawing

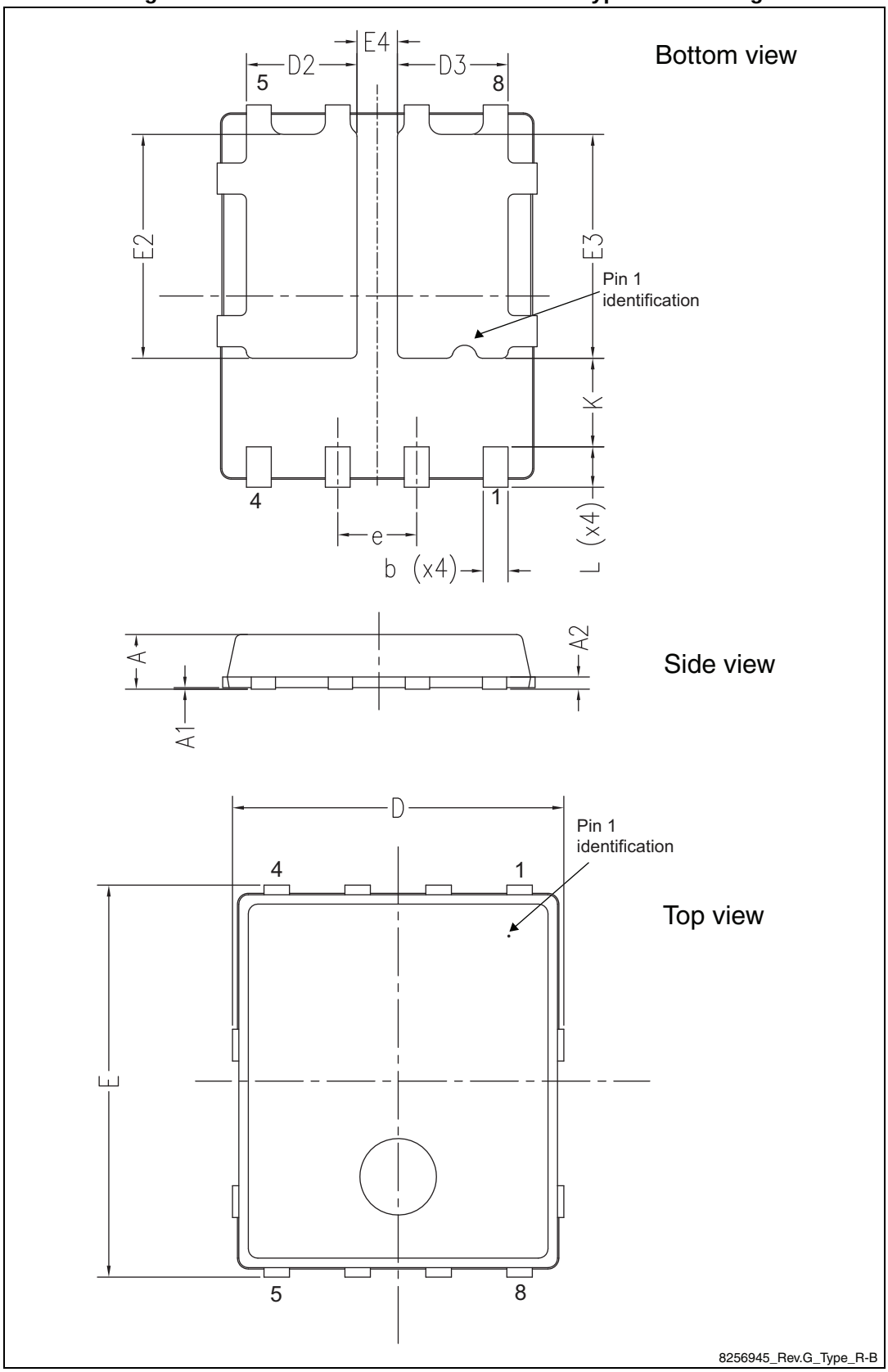
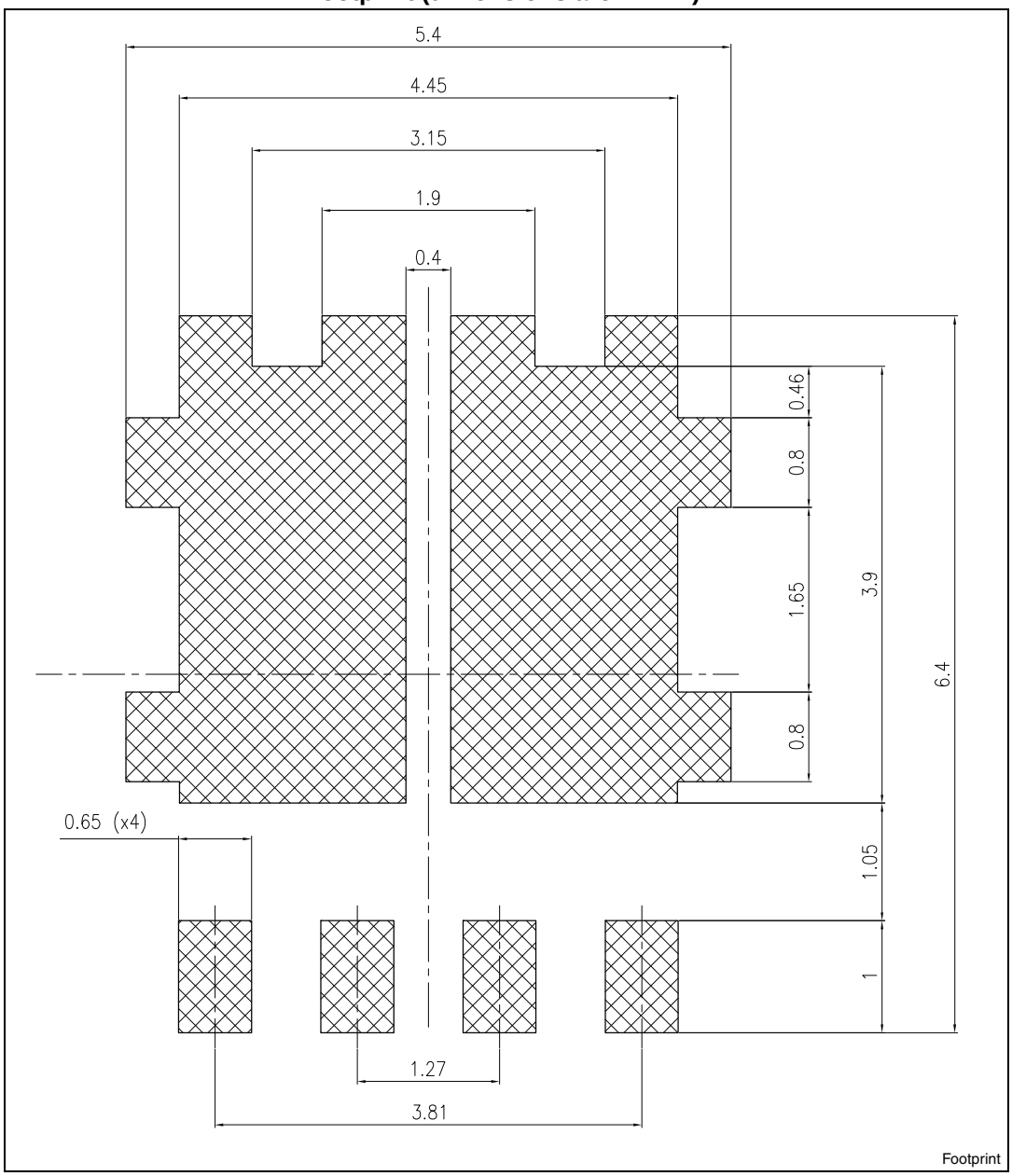


Table 8. PowerFLAT™ 5x6 - double island type R-B mechanical data

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	5.00	5.20	5.40
E	5.95	6.15	6.35
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

Figure 20. PowerFLAT™ 5x6 - double island type R-B drawing recommended footprint (dimensions are in mm)



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Nov-2012	1	First release.
18-Feb-2014	2	– Modified: $R_{DS(on)}$ value in cover page – Modified: I_{DSS}, I_{GSS}, $V_{GS(th)}$ and $R_{DS(on)}$ values in *Table 4* – Modified: the entire typical values in *Table 5* and *6* – Updated: *Section 4: Package mechanical data* – Minor text changes
02-Apr-2014	3	– Document status promoted from preliminary to production data – Modified: *Figure 7*, *10*, *11* – Updated: *Section 4: Package mechanical data* – Minor text changes

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