

Dual N-channel 60 V, 23 mΩ typ., 33 A STripFET™ F7 Power MOSFET in a PowerFLAT™ 5x6 double island package

Datasheet - production data

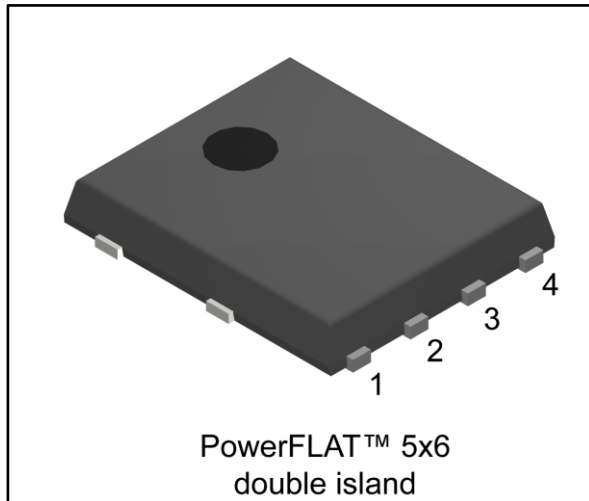
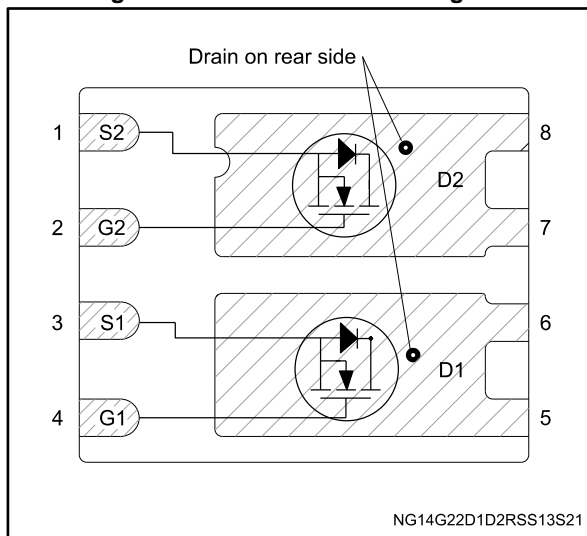


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL36DN6F7	60 V	27 mΩ	33 A

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This dual N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packing
STL36DN6F7	36DN6F7	PowerFLAT™ 5x6 double island	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	5
3	Test circuits	7
4	Package information	8
	4.1 PowerFLAT 5x6 double island type C package information	9
	4.2 Packing information	12
5	Revision history	14

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	33	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	23	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	9	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	6.7	A
$I_{DM}^{(1)(3)}$	Drain current (pulsed)	132	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	36	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	58	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
T_J	Operating junction temperature range	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature range		

Notes:

- (1) This 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 data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction- case	2.6	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	$^\circ\text{C/W}$

Notes:

- (1) When mounted on FR-4 board of 1 inch^2 , 2oz Cu, $t < 10\text{ s}$.

2 Electrical characteristics

($T_C = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Table 4: On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 60\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$			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	$V_{GS} = 10\text{ V}$, $I_D = 4.5\text{ A}$		23	27	$\text{m}\Omega$

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 30\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	420	-	pF
C_{oss}	Output capacitance		-	215	-	pF
C_{rss}	Reverse transfer capacitance		-	16	-	pF
Q_g	Total gate charge	$V_{DD} = 30\text{ V}$, $I_D = 9\text{ A}$ $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	8	-	nC
Q_{gs}	Gate-source charge		-	2.3	-	nC
Q_{gd}	Gate-drain charge		-	2.1	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}$, $I_D = 4.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	7.85	-	ns
t_r	Rise time		-	3.25	-	ns
$t_{d(off)}$	Turn-off delay time		-	12.1	-	ns
t_f	Fall time		-	3.95	-	ns

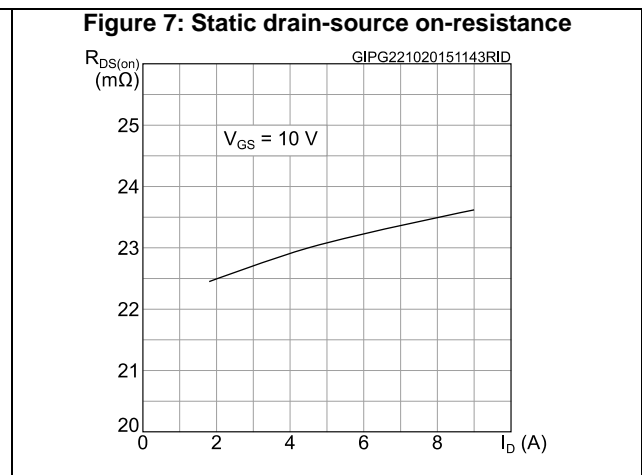
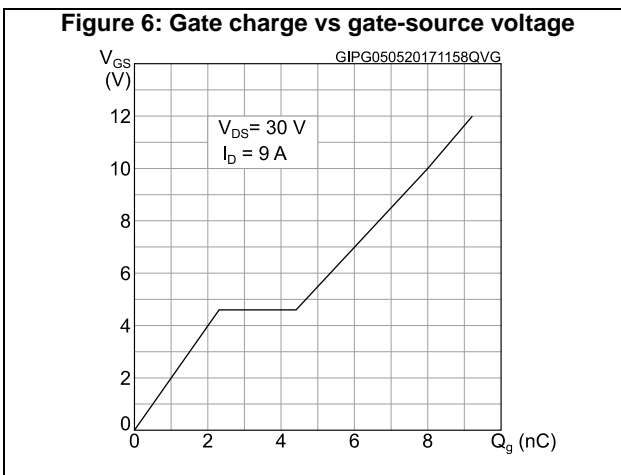
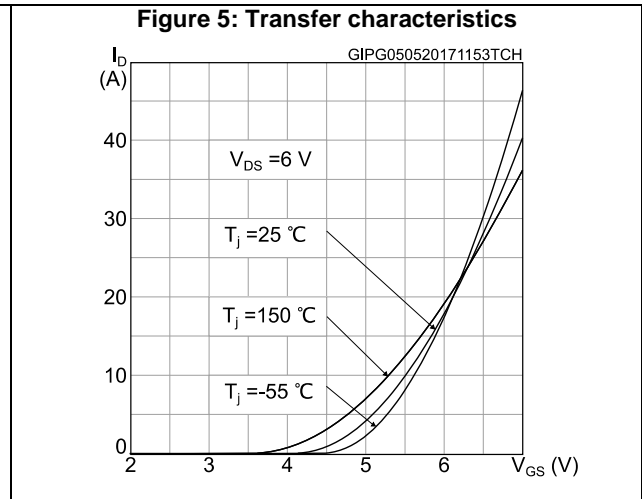
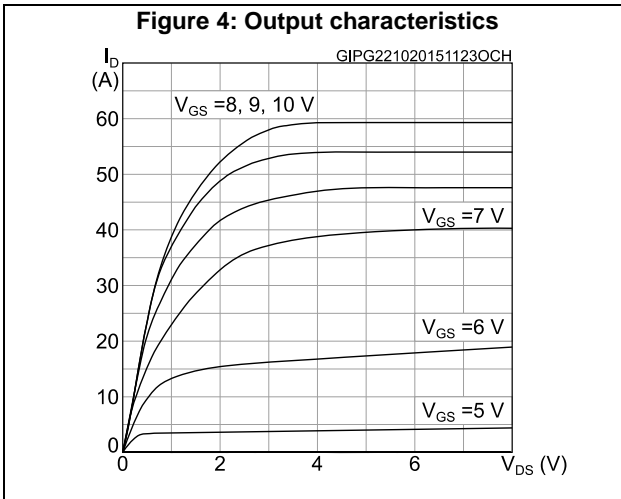
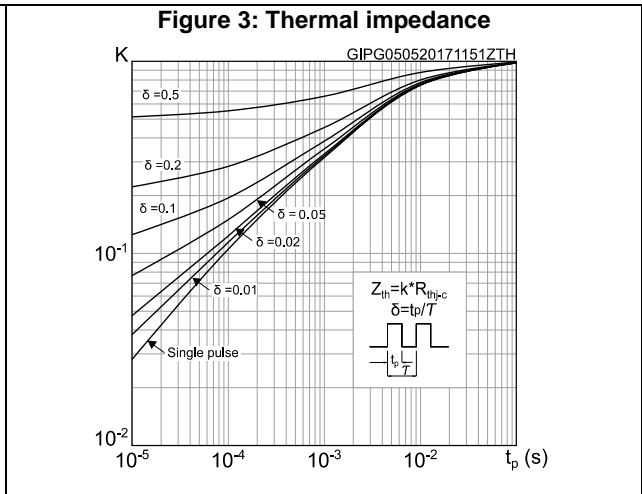
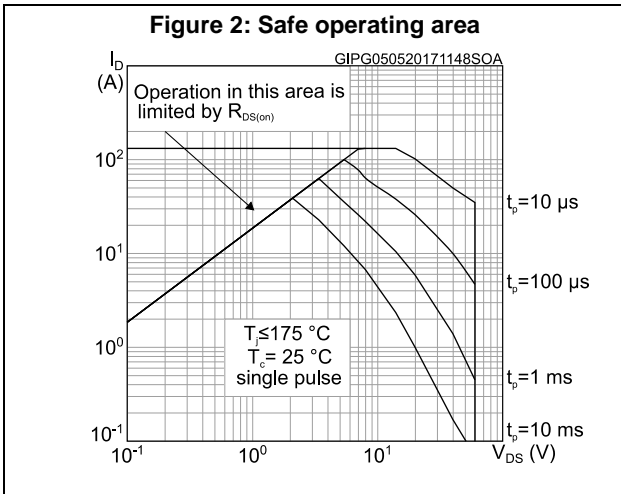
Table 7: Source-drain diode

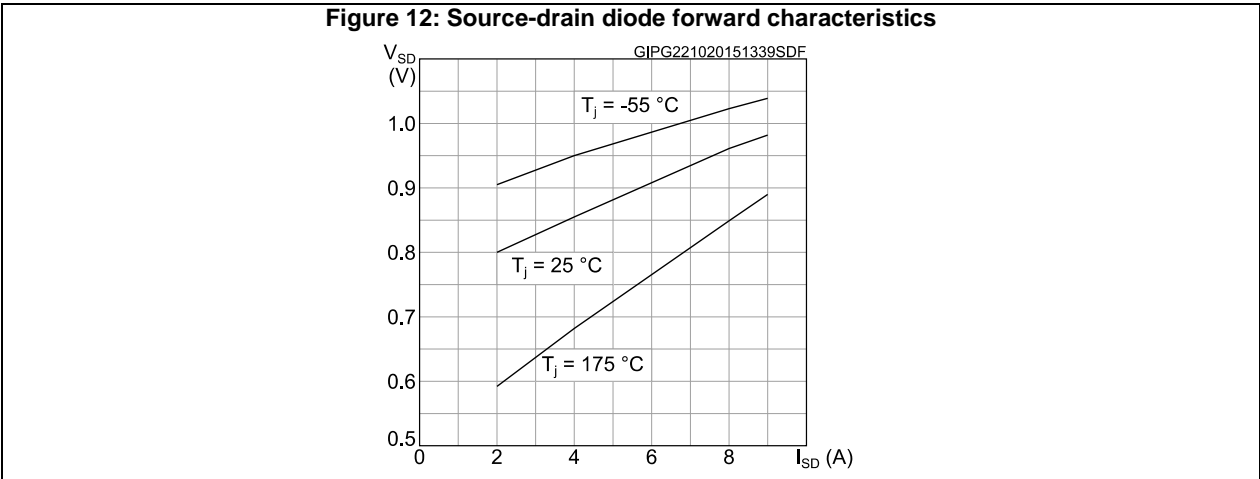
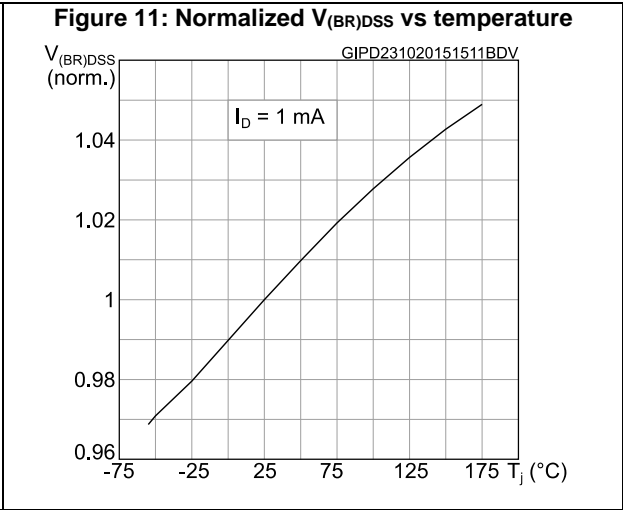
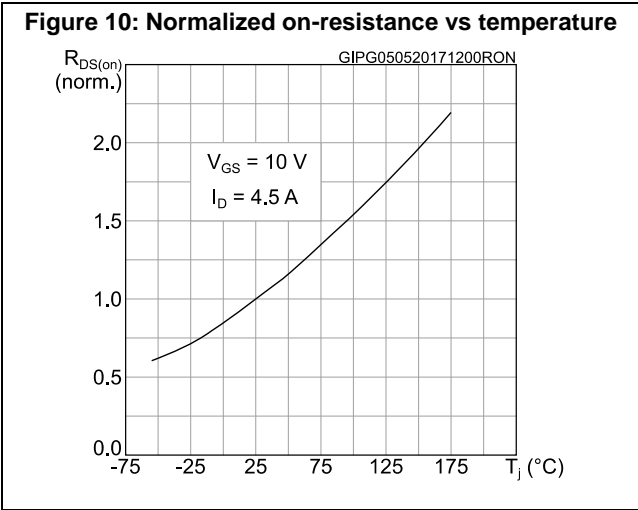
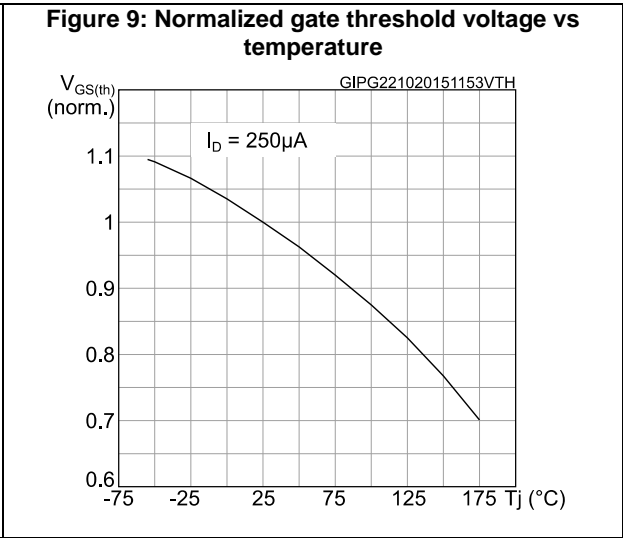
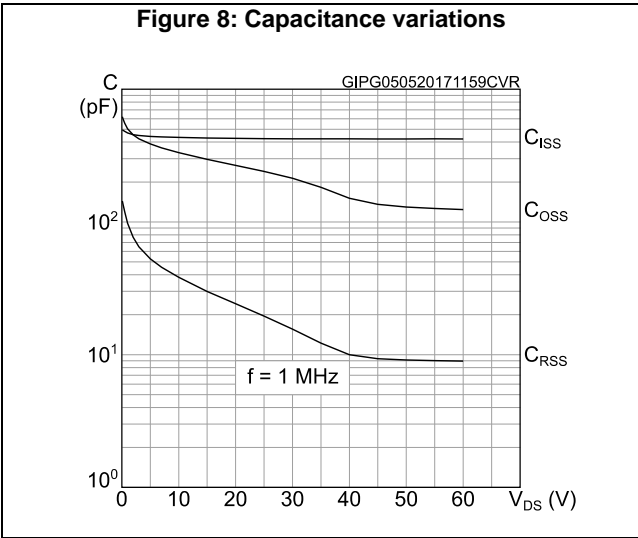
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 9\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_D = 9\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 48\text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	17.1		ns
Q_{rr}	Reverse recovery charge		-	6.67		nC
I_{RRM}	Reverse recovery current		-	0.8		A

Notes:

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

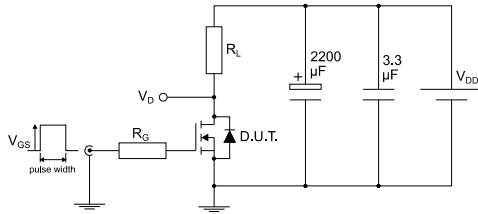
2.1 Electrical characteristics (curves)





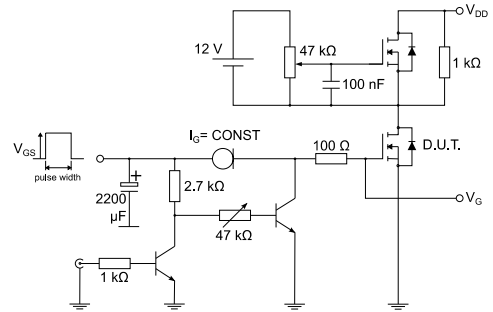
3 Test circuits

Figure 13: Test circuit for resistive load switching times



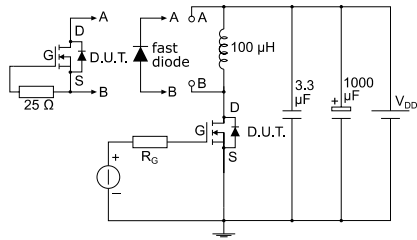
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Figure 14: Test circuit for gate charge behavior



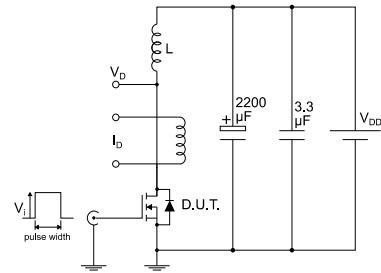
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Figure 15: Test circuit for inductive load switching and diode recovery times



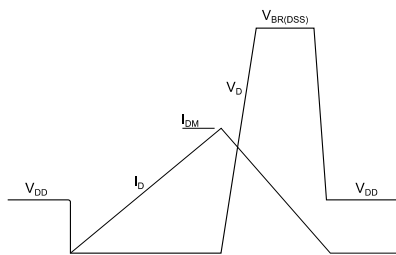
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Figure 16: Unclamped inductive load test circuit



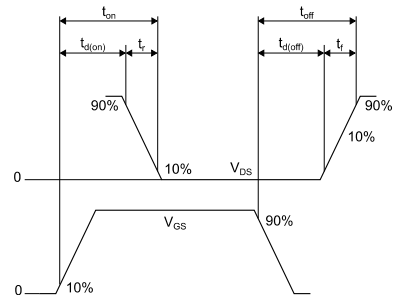
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



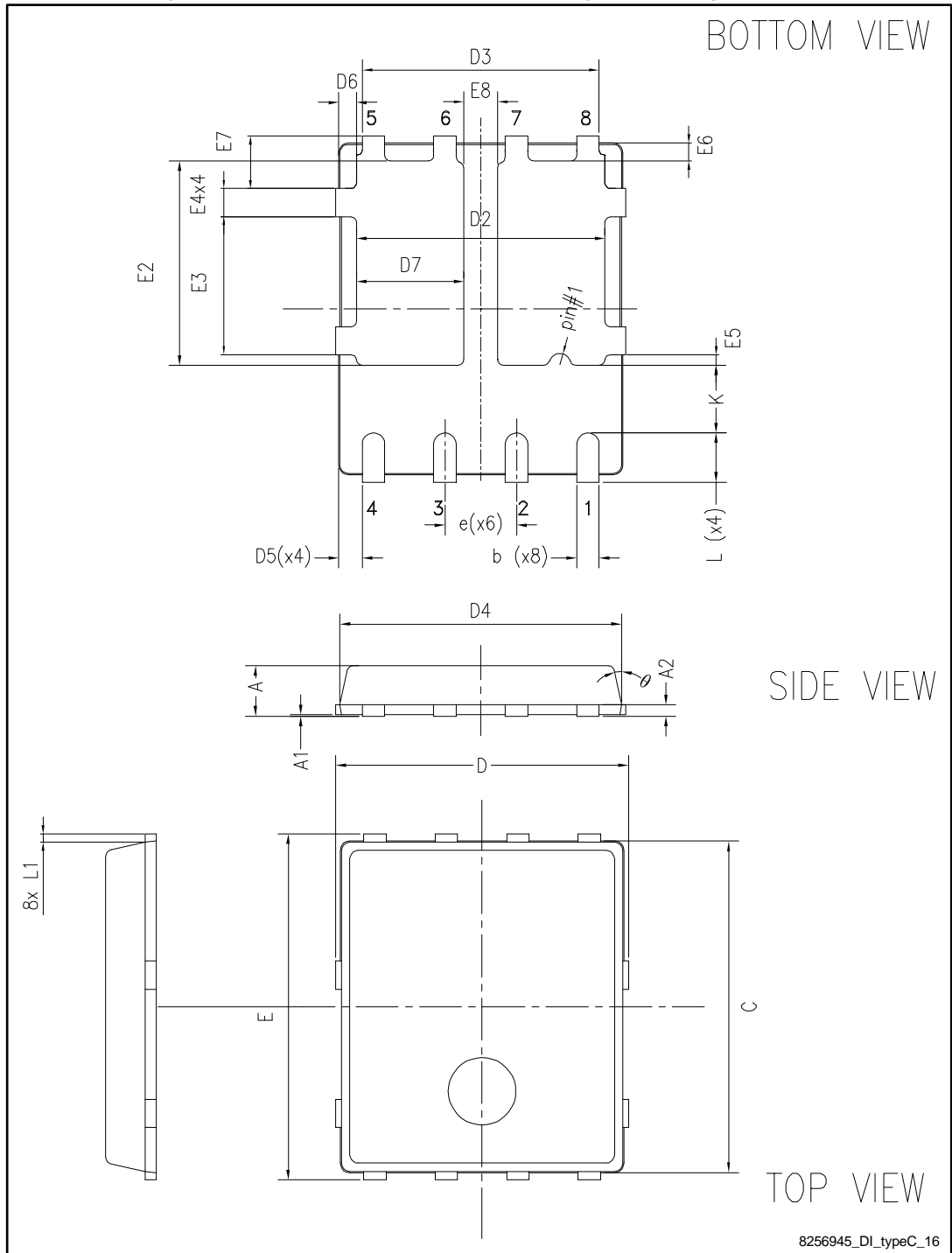
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4 Package information

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.

4.1 PowerFLAT 5x6 double island type C package information

Figure 19: PowerFLAT™ 5x6 double island type C package outline

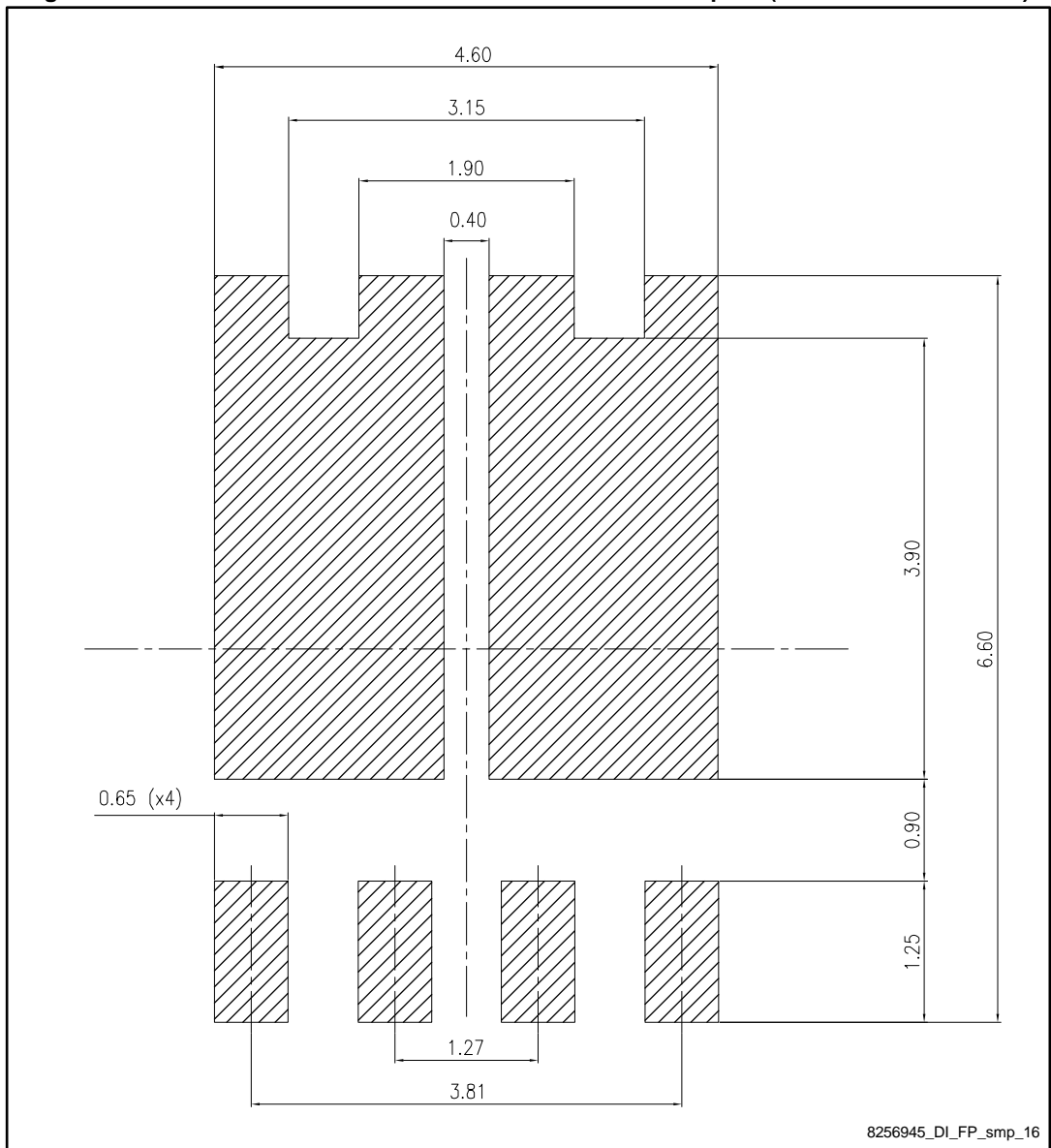


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Table 8: PowerFLAT™ 5x6 double island type C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.20
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.20
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
D7	1.68		1.98
e		1.27	
E	5.95	6.15	6.35
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.20	0.325	0.45
E7	0.75	0.90	1.05
E8	0.55		0.75
K	1.05		1.35
L	0.725		1.025
L1	0.05	0.15	0.25
θ	0°		12°

Figure 20: PowerFLAT™ 5x6 double island recommended footprint (dimensions are in mm)



4.2 Packing information

Figure 21: PowerFLAT™ 5x6 tape (dimensions are in mm)

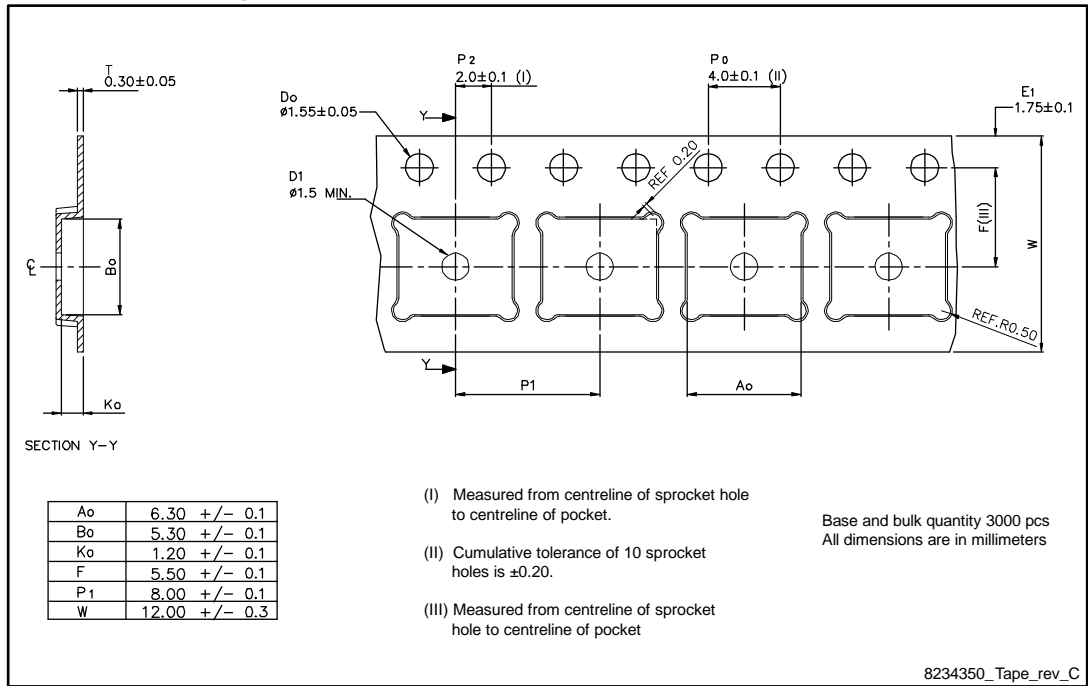


Figure 22: PowerFLAT™ 5x6 package orientation in carrier tape

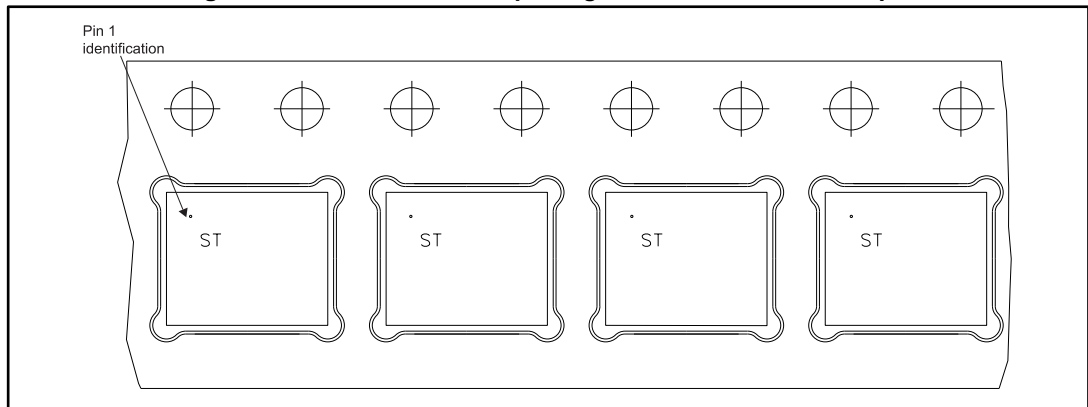
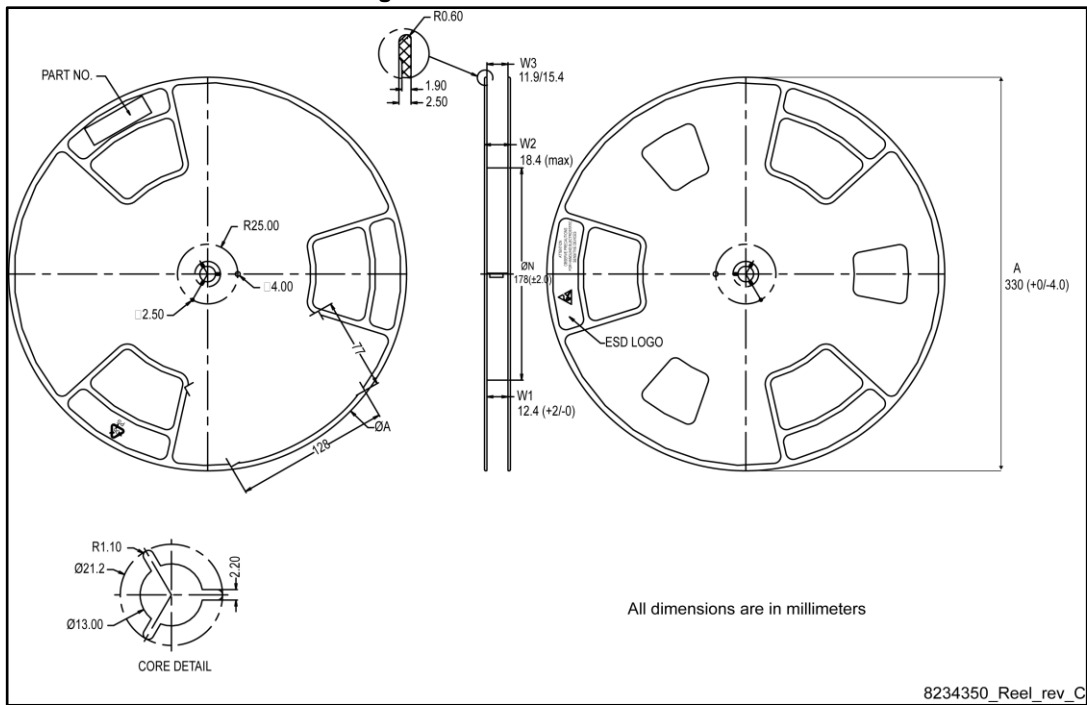


Figure 23: PowerFLAT™ 5x6 reel



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
20-Aug-2015	1	First release.
22-Oct-2015	2	Document status promoted from preliminary to production data. Updated <i>Section 2: "Electrical ratings"</i> and <i>Section 3: "Electrical characteristics"</i> . Added <i>Section 3.1: "Electrical characteristics (curves)"</i> .
10-May-2017	3	Modified title and features table on cover page. Modified <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 3: "Thermal data"</i> , <i>Table 4: "On /off states"</i> Modified <i>Figure 4: "Output characteristics"</i> , <i>Figure 5: "Transfer characteristics"</i> , <i>Figure 7: "Static drain-source on-resistance"</i> and <i>Figure 12: "Source-drain diode forward characteristics"</i> . Minor text changes.

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