STL36DN6F7

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

Datasheet - production data

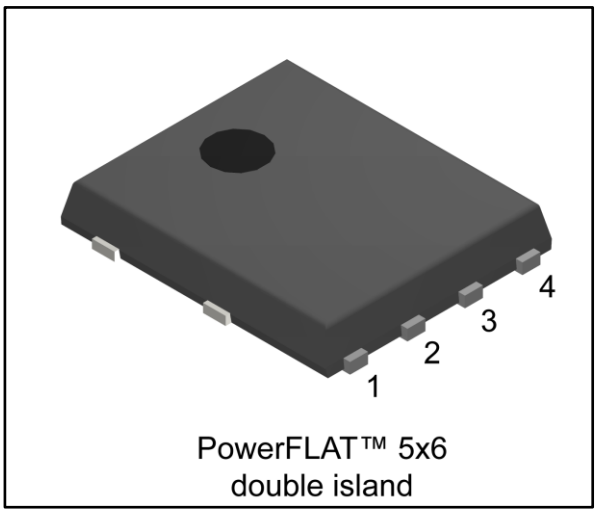
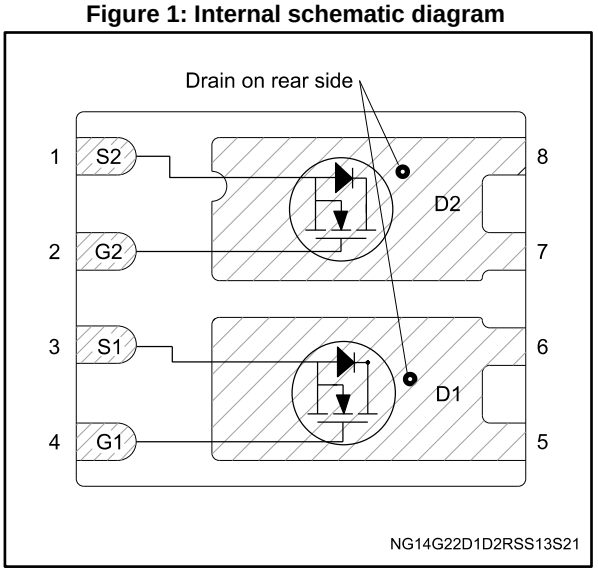


Figure 1: Internal schematic diagram



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

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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 °C	33	A
I_D(1)	Drain current (continuous) at T_C = 100 °C	23	A
I_D(2)	Drain current (continuous) at T_{pcb} = 25 °C	9	A
I_D(2)	Drain current (continuous) at T_{pcb} =100°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 °C	58	W
P_{TOT}(2)	Total dissipation at T_{pcb} = 25°C	4.8	W
T_J	Operating junction temperature range	-55 to 175	°C
T_{stg}	Storage temperature range		

Notes:

(1)This value is rated according to $R_{thj\text{-}c}$.

(2)The value is rated according to $R_{thj\text{-}pcb}$.

(3)Pulse width limited by safe operating area.

Table 3: Thermal data

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

Notes:

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

2 Electrical characteristics

(T_C = 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	V_{GS}= 0 V, I_D = 1 mA	60			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 V, V_{GS} = 0 V			1	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V ,V_{GS} = 20 V			100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 4.5 A		23	27	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 30 V, f = 1 MHz, V_{GS} = 0 V	-	420	-	pF
C_{oss}	Output capacitance		-	215	-	pF
C_{rss}	Reverse transfer capacitance		-	16	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D= 9 A V_{GS} = 0 to 10 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 V, I_D = 4.5 A, R_G = 4.7 Ω, V_{GS} = 10 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 A, V_{GS} = 0 V	-		1.2	V
t_{rr}	Reverse recovery time	I_D = 9 A, di/dt = 100 A/µs V_{DD} = 48 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)

Figure 2: Safe operating area

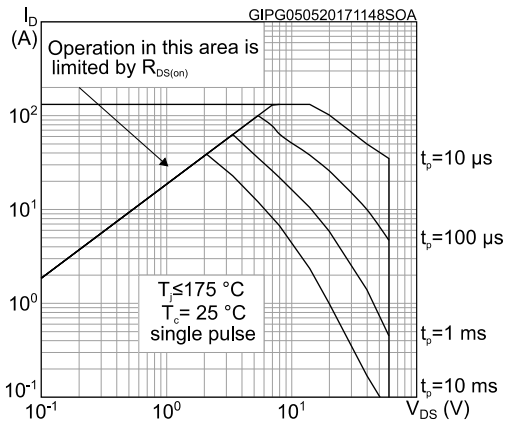


Figure 3: Thermal impedance

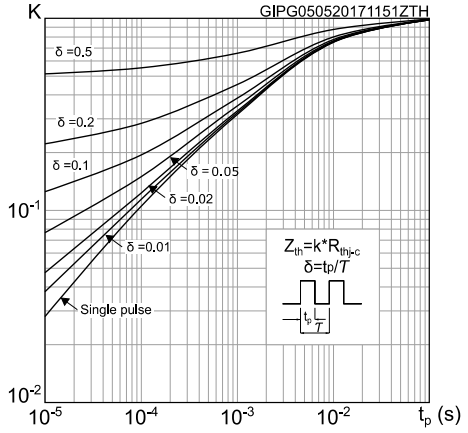


Figure 4: Output characteristics

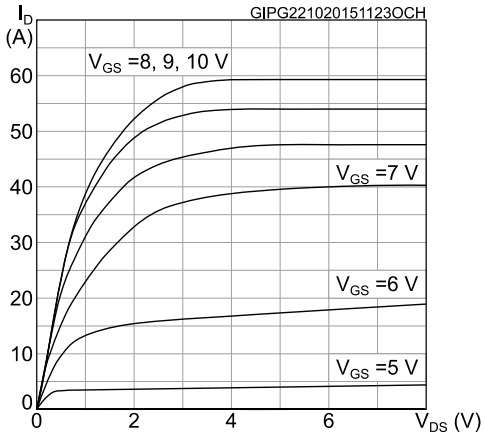


Figure 5: Transfer characteristics

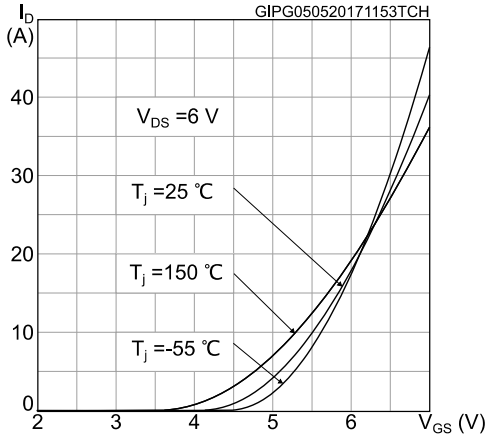


Figure 6: Gate charge vs gate-source voltage

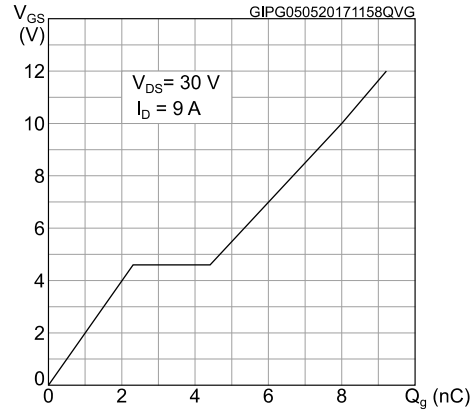


Figure 7: Static drain-source on-resistance

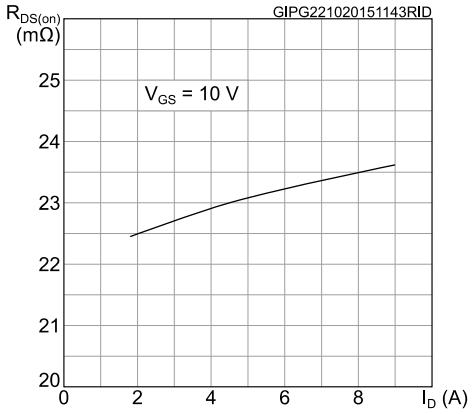


Figure 8: Capacitance variations

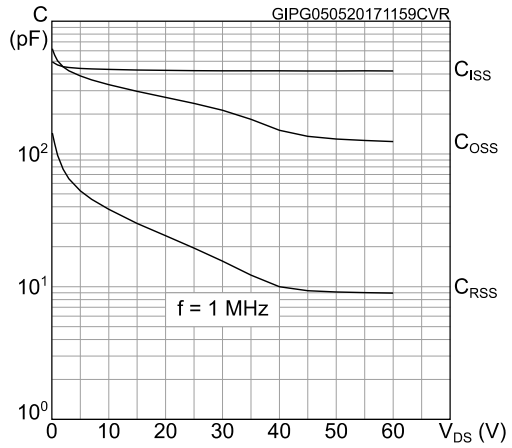


Figure 9: Normalized gate threshold voltage vs temperature

Figure 10: Normalized on-resistance vs temperature

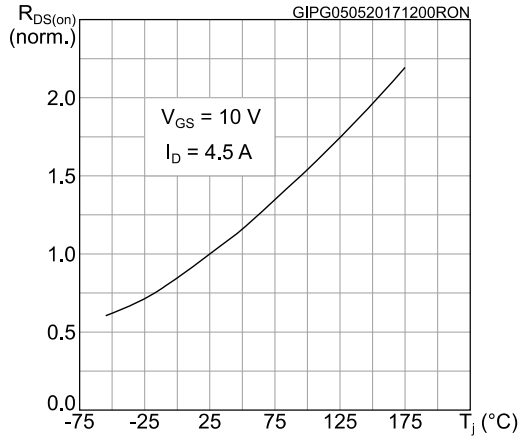


Figure 11: Normalized $V_{(BR)DSS}$ vs temperature

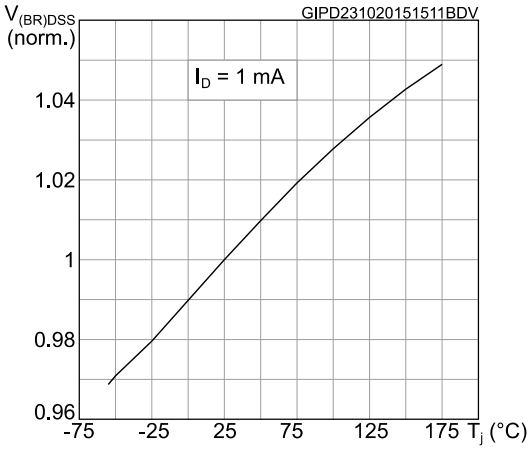
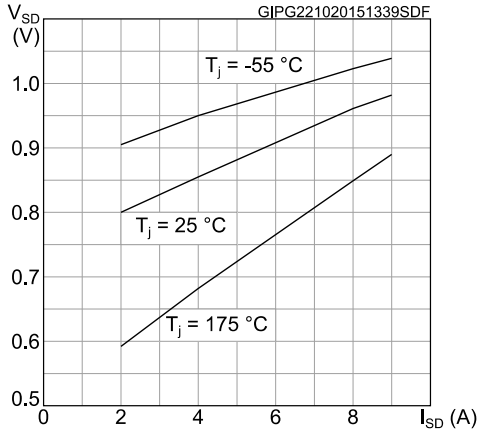


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

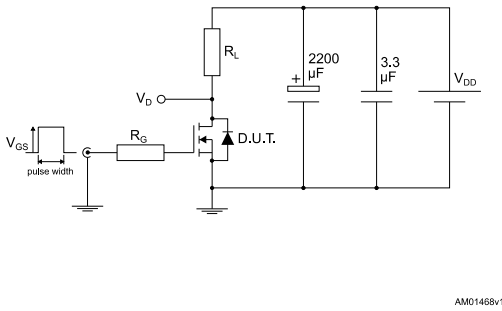


Figure 14: Test circuit for gate charge behavior

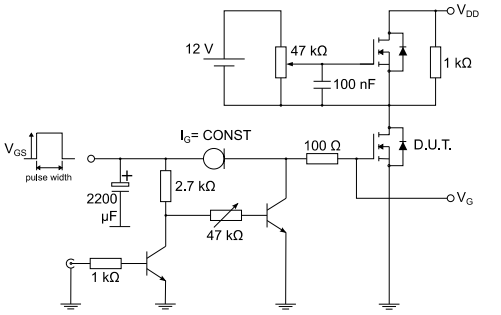


Figure 15: Test circuit for inductive load switching and diode recovery times

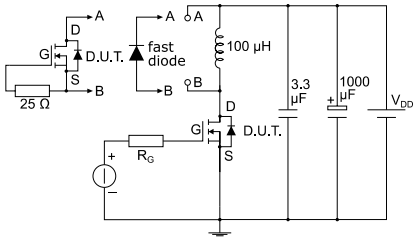


Figure 16: Unclamped inductive load test circuit

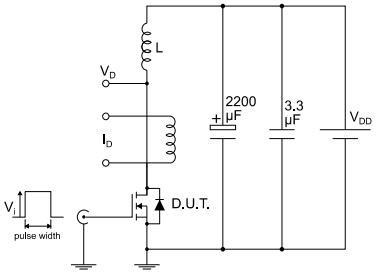


Figure 17: Unclamped inductive waveform

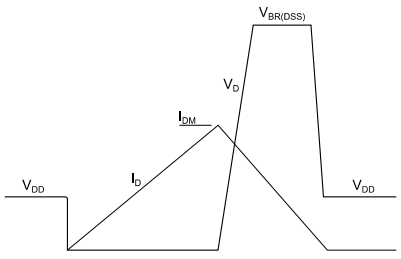
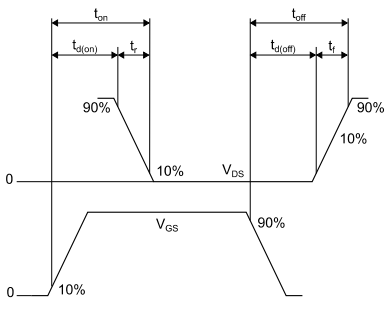


Figure 18: Switching time waveform



4 Package 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

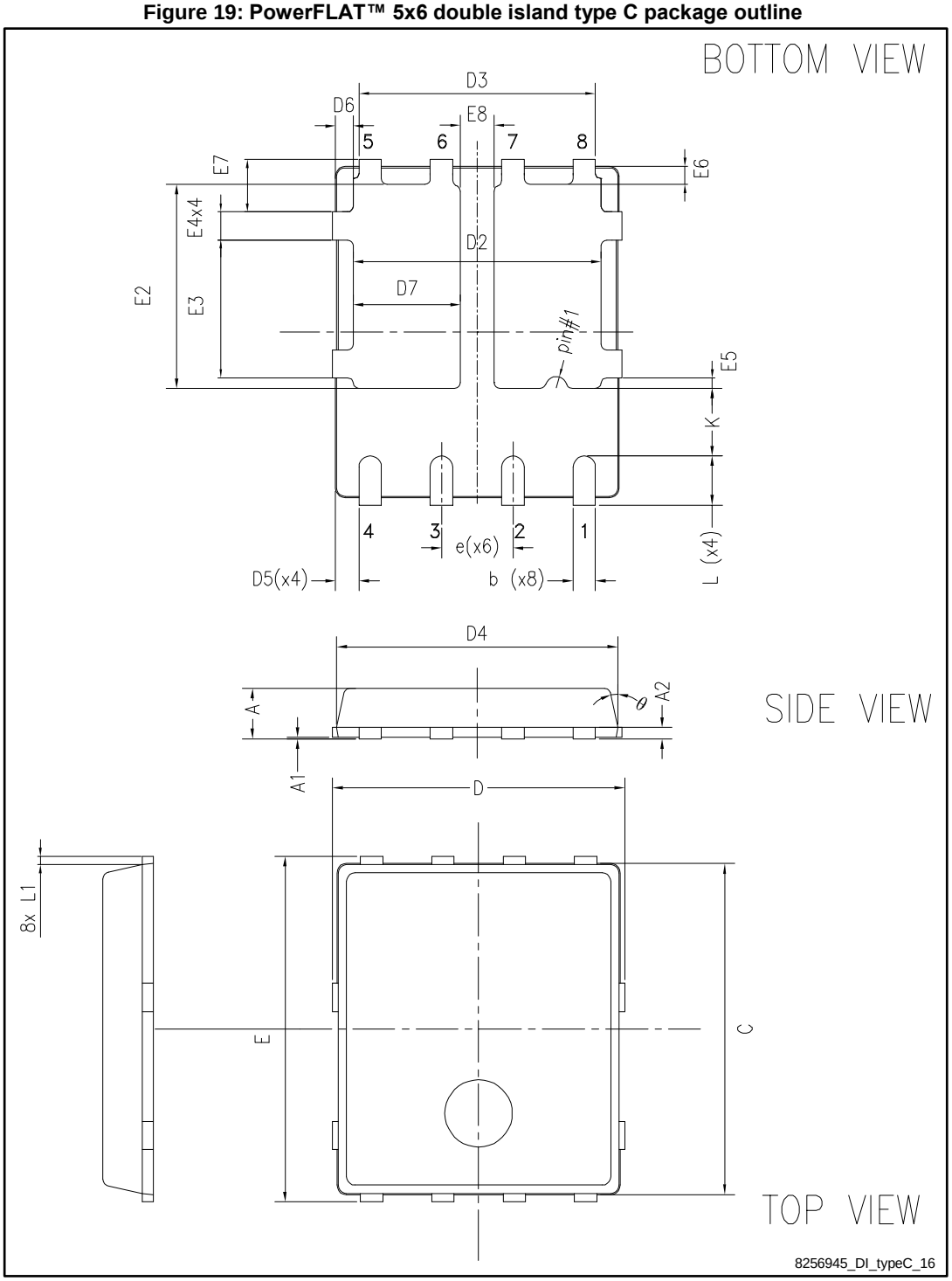
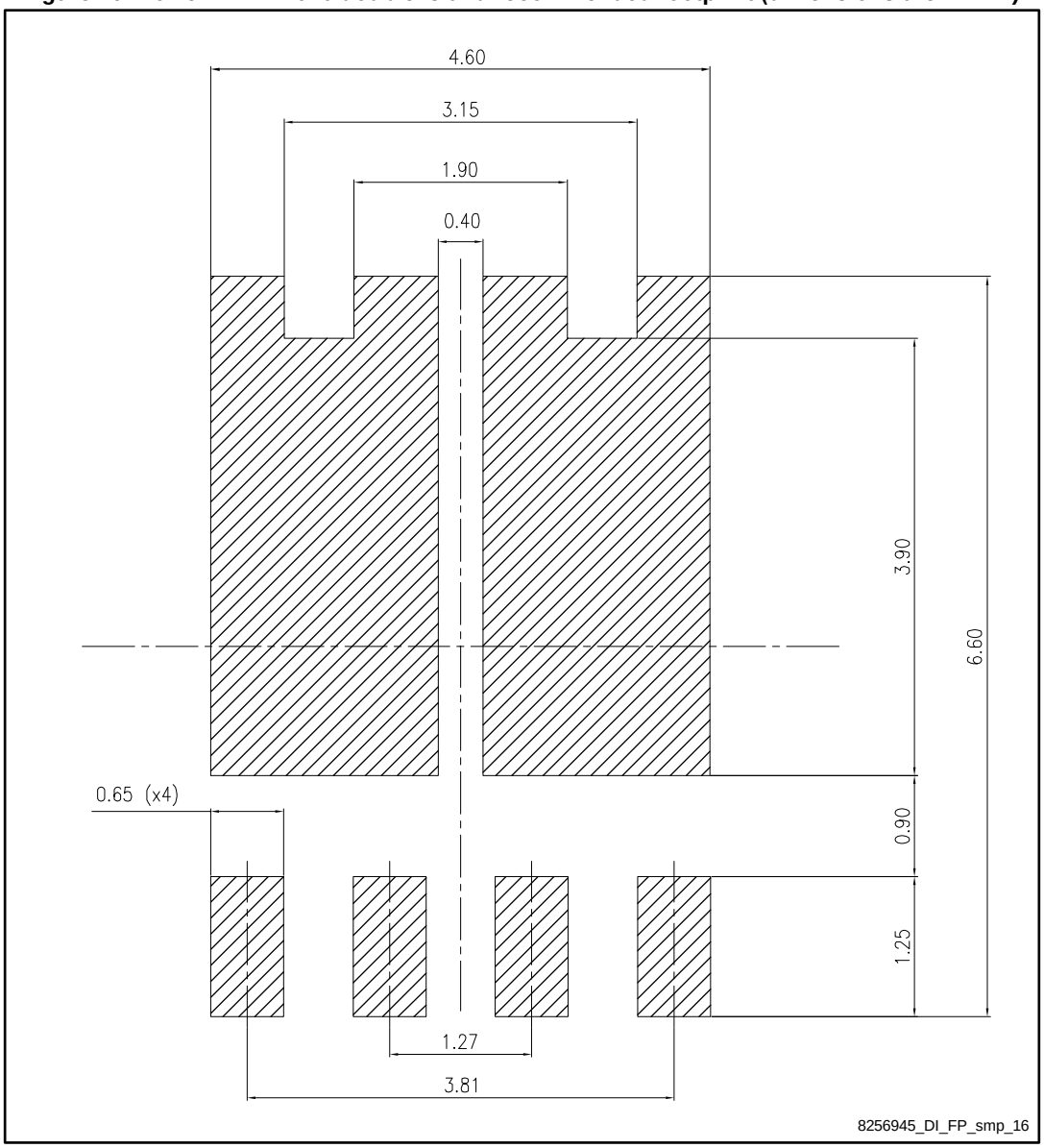


Table 8: PowerFLAT™ 5x6 double island type C mechanical data

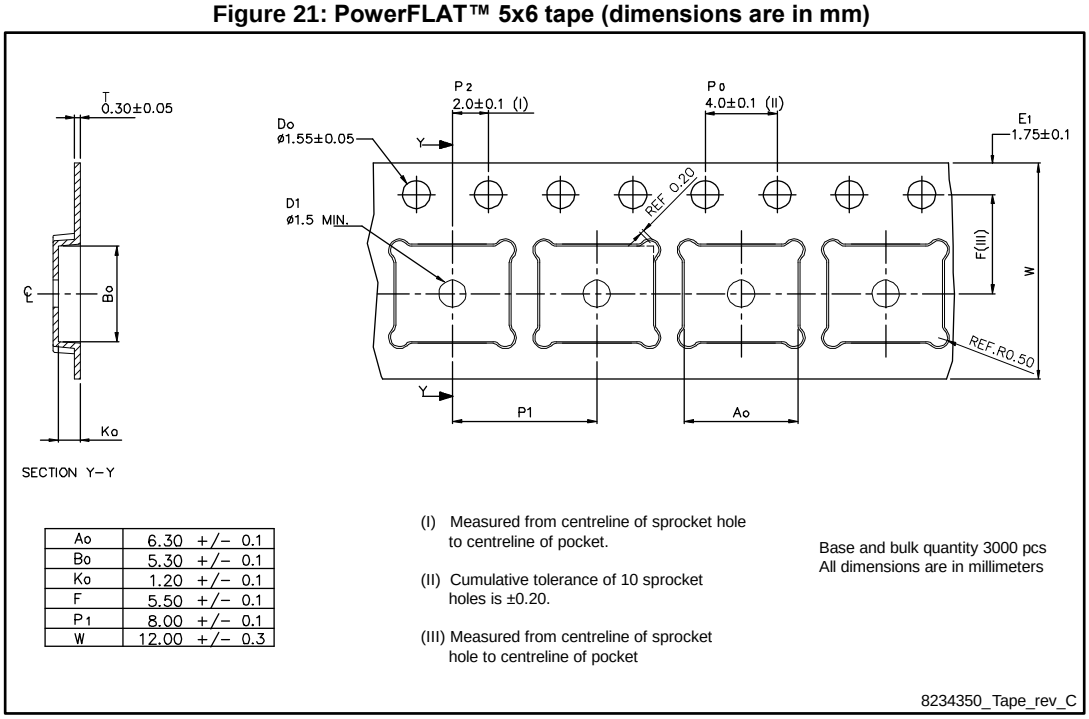
Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
C	5.80	6.00	6.20
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.20
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
D7	1.68		1.98
e		1.27	
E	5.95	6.15	6.35
E2	3.50		3.70
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28
E6	0.20	0.325	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)



Ao	6.30 +/– 0.1
Bo	5.30 +/– 0.1
Ko	1.20 +/– 0.1
F	5.50 +/– 0.1
P1	8.00 +/– 0.1
W	12.00 +/– 0.3

(I) Measured from centreline of sprocket hole to centreline of pocket.

(II) Cumulative tolerance of 10 sprocket holes is ±0.20.

(III) Measured from centreline of sprocket hole to centreline of pocket

Base and bulk quantity 3000 pcs
All dimensions are in millimeters

8234350_Tape_rev_C

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

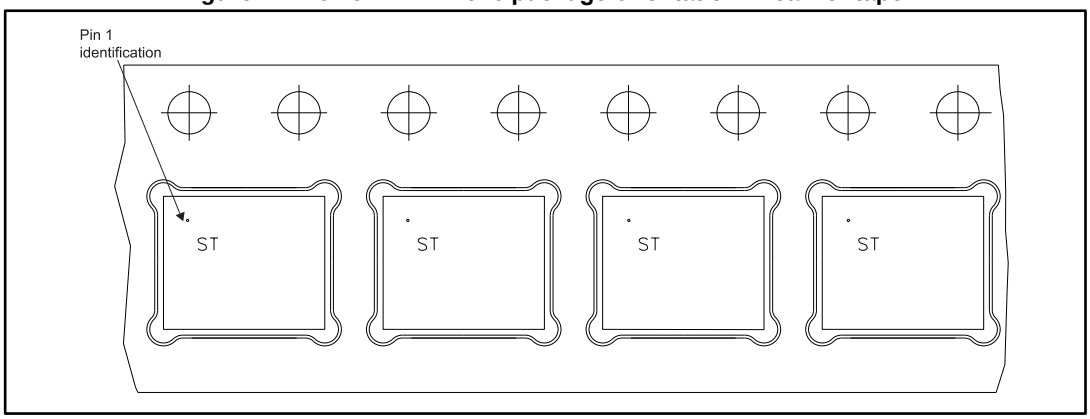
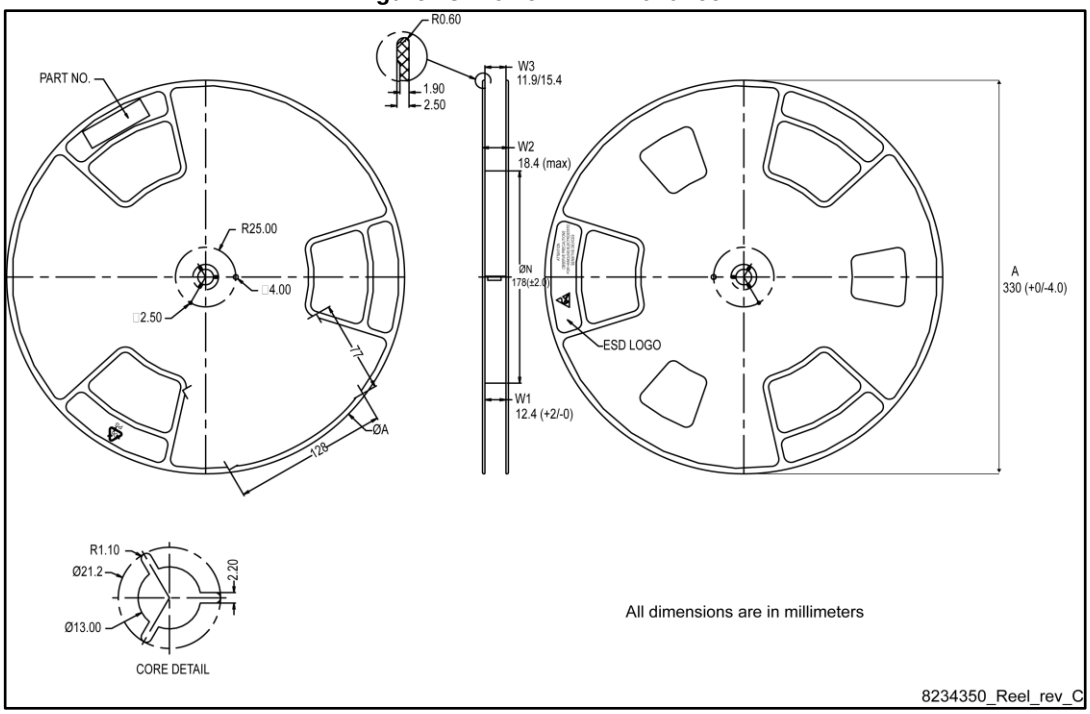


Figure 23: PowerFLAT™ 5x6 reel



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 *Section 2: "Electrical ratings"* and *Section 3: "Electrical characteristics".* Added *Section 3.1: "Electrical characteristics (curves)"*.
10-May-2017	3	Modified title and features table on cover page. Modified *Table 2: "Absolute maximum ratings"*, *Table 3: "Thermal data"*, *Table 4: "On /off states"* Modified *Figure 4: "Output characteristics"*, *Figure 5: "Transfer characteristics"*, *Figure 7: "Static drain-source on-resistance"* and *Figure 12: "Source-drain diode forward characteristics"*. Minor text changes.

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