STL8DN10LF3

Automotive-grade dual N-channel 100 V, 25 mΩ typ., 7.8 A STripFET™ F3 Power MOSFET in a PowerFLAT™ 5x6 DI

Datasheet - production data

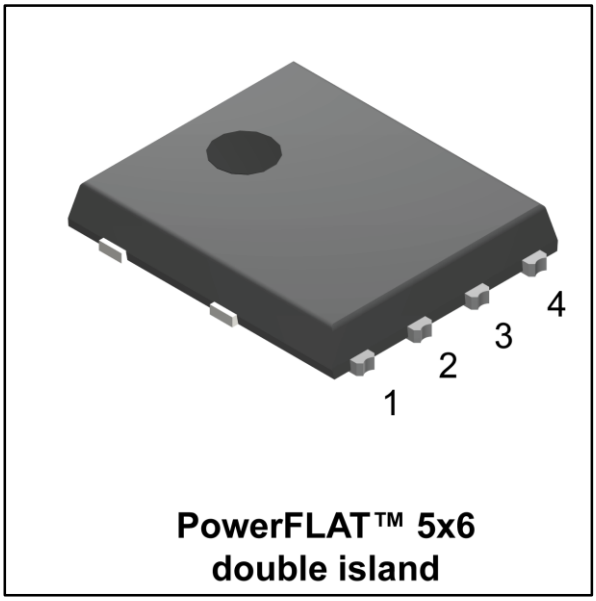
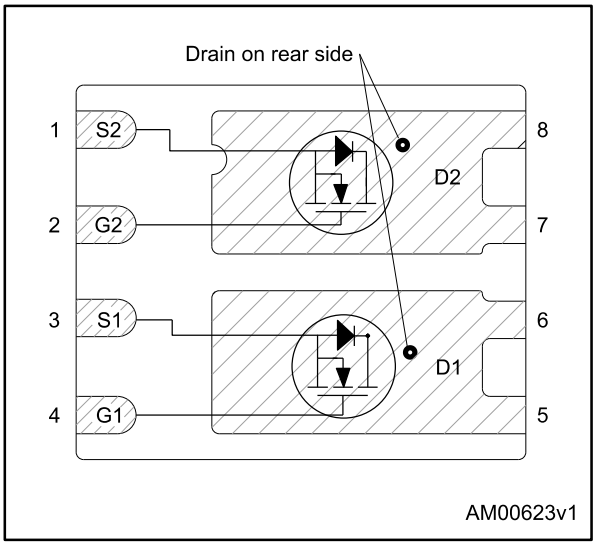


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STL8DN10LF3	100 V	35 mΩ	7.8 A

- Designed for automotive applications and AEC-Q101 qualified
- Logic level $V_{GS(th)}$
- 175 °C maximum junction temperature
- 100% avalanche rated
- Wettable flank package

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STripFET™ F3 technology. It is designed to minimize on-resistance and gate charge to provide superior switching performance.

Table 1: Device summary

Order code	Marking	Package	Packing
STL8DN10LF3	8DN10LF3	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	20	A
I_D(2)	Drain current (continuous) at T_{pcb} = 25 °C	7.8	A
I_D(2)	Drain current (continuous) at T_{pcb} = 100 °C	5.5	A
I_{DM}(2)(3)	Drain current (pulsed)	31.2	A
P_{TOT}(1)	Total dissipation at T_C = 25 °C	70	W
P_{TOT}(2)	Total dissipation at T_{pcb} = 25°C	4.3	W
I_{AV}	Not-repetitive avalanche current	7.8	A
E_{AS}	Single pulse avalanche energy	190	mJ
T_j	Operating junction temperature range	-55 to 175	°C
T_{stg}	Storage temperature range		

Notes:

(1)This value is rated according to Rthj-case and limited by package

(2)The value is rated according to Rthj-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	2.1	°C/W
$R_{thj\text{-}pcb}$(1)	Thermal resistance junction-pcb	35	°C/W

Notes:

(1)When mounted on FR-4 board of 1 inch², 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	I_D = 250 µA, V_{GS} = 0 V	100			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 100 V			1	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	1		3	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 4 A		25	35	mΩ
		V_{GS} = 5 V, I_D = 4 A		40	50	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	970	-	pF
C_{oss}	Output capacitance		-	115	-	
C_{rss}	Reverse transfer capacitance		-	11.5	-	
Q_g	Total gate charge	V_{DD} = 50 V, I_D = 7.8 A, V_{GS} = 10 V (see *Figure 13: "Test circuit for gate charge behavior"*)	-	20.5	-	nC
Q_{gs}	Gate-source charge		-	4	-	
Q_{gd}	Gate-drain charge		-	5	-	
R_G	Intrinsic gate resistance	f =1 MHz open drain	-	3.65	-	Ω

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 = 7.8 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 12: "Test circuit for resistive load switching times"*)	-	8.7	-	ns
t_r	Rise time		-	9.6	-	
$t_{d(off)}$	Turn-off delay time		-	50.6	-	
t_f	Fall time		-	5.2	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		7.8	A
I_{SDM}(1)	Source-drain current (pulsed)		-		31.2	A
V_{SD}(2)	Forward on voltage	I_{DS} = 7.8 A, V_{GS} = 0			1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 7.8 A, di/dt = 100 A/µs	-	42.5		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 48 V, T_j = 150 °C (see *Figure 14: "Test circuit for inductive load switching and diode recovery times"*)	-	87		nC
I_{RRM}	Reverse recovery current		-	4.08		A

Notes:

(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

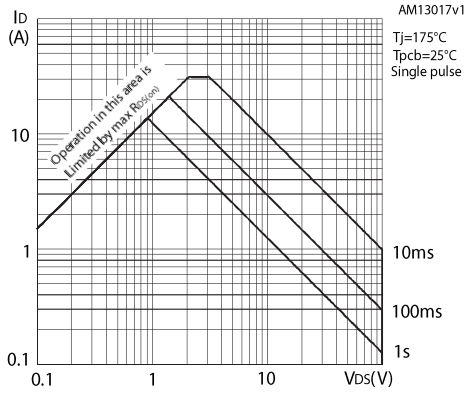


Figure 3: Thermal impedance

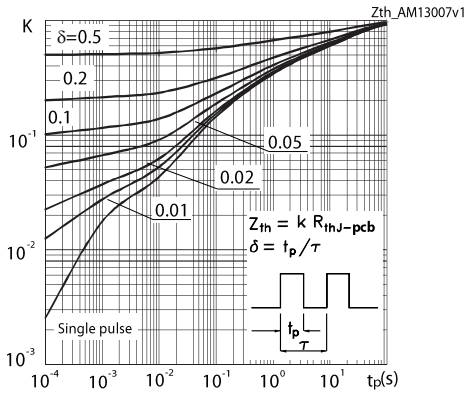


Figure 4: Output characteristics

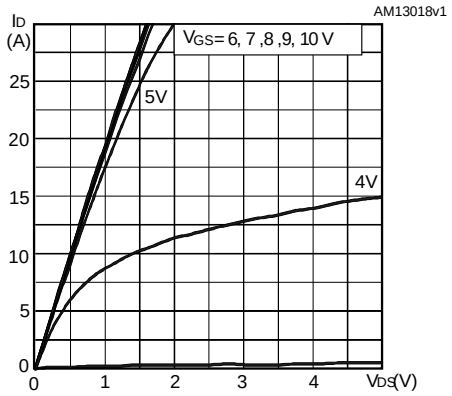


Figure 5: Transfer characteristics

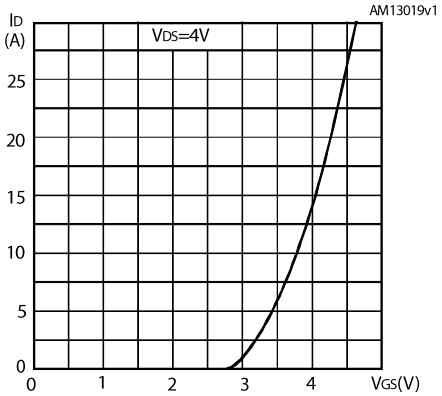


Figure 6: Gate charge vs gate-source voltage

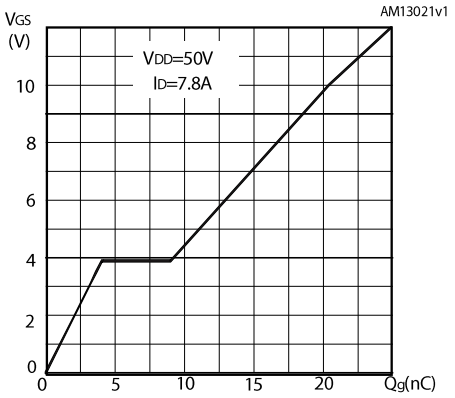


Figure 7: Static drain-source on-resistance

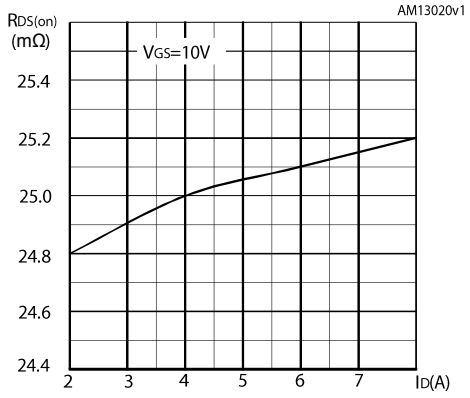


Figure 8: Capacitance variations

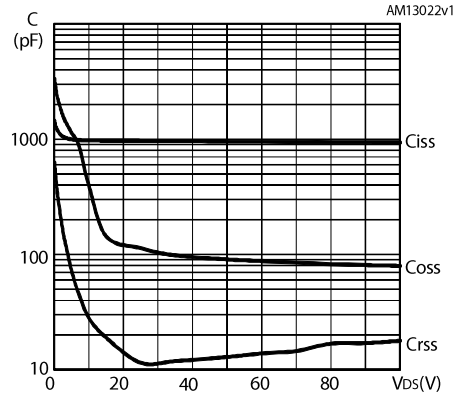


Figure 9: Normalized gate threshold voltage vs temperature

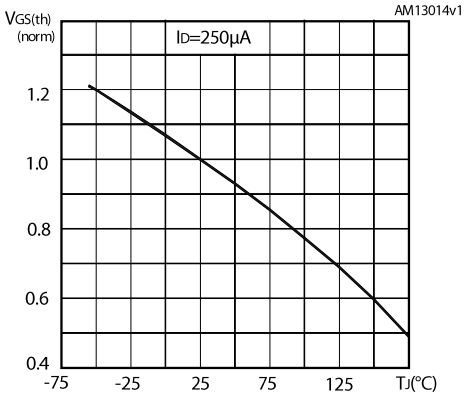


Figure 10: Normalized on-resistance vs temperature

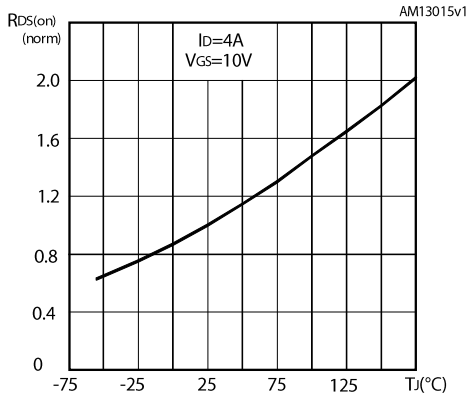
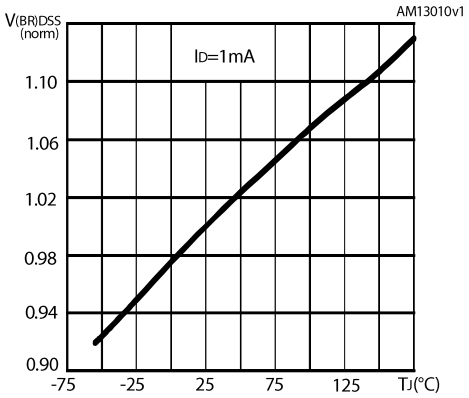


Figure 11: Normalized V(BR)DSS vs temperature



3 Test circuits

Figure 12: Test circuit for resistive load switching times

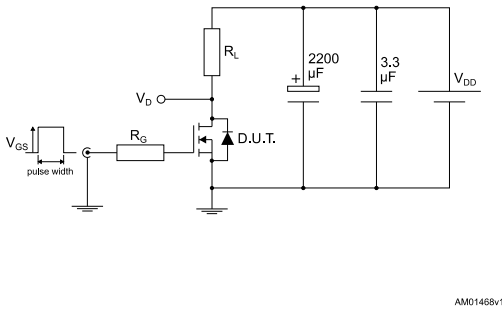


Figure 13: Test circuit for gate charge behavior

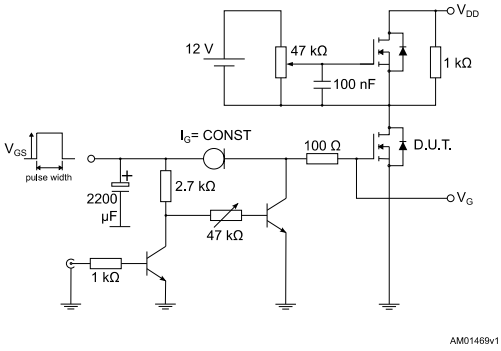


Figure 14: Test circuit for inductive load switching and diode recovery times

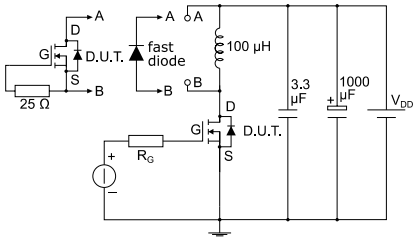


Figure 15: Unclamped inductive load test circuit

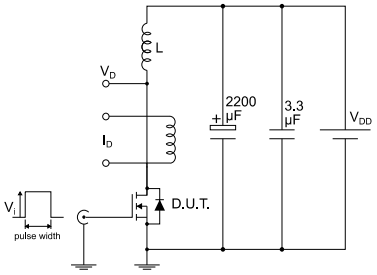


Figure 16: Unclamped inductive waveform

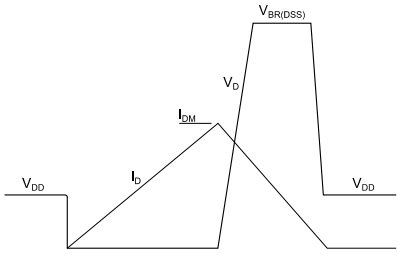
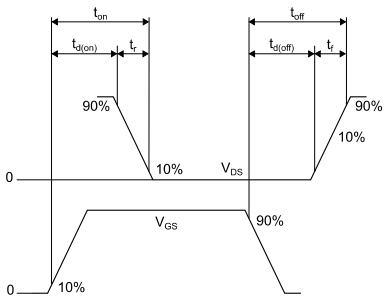


Figure 17: Switching time waveform



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 package information

Figure 18: PowerFLAT™ 5x6 double island WF type R package outline

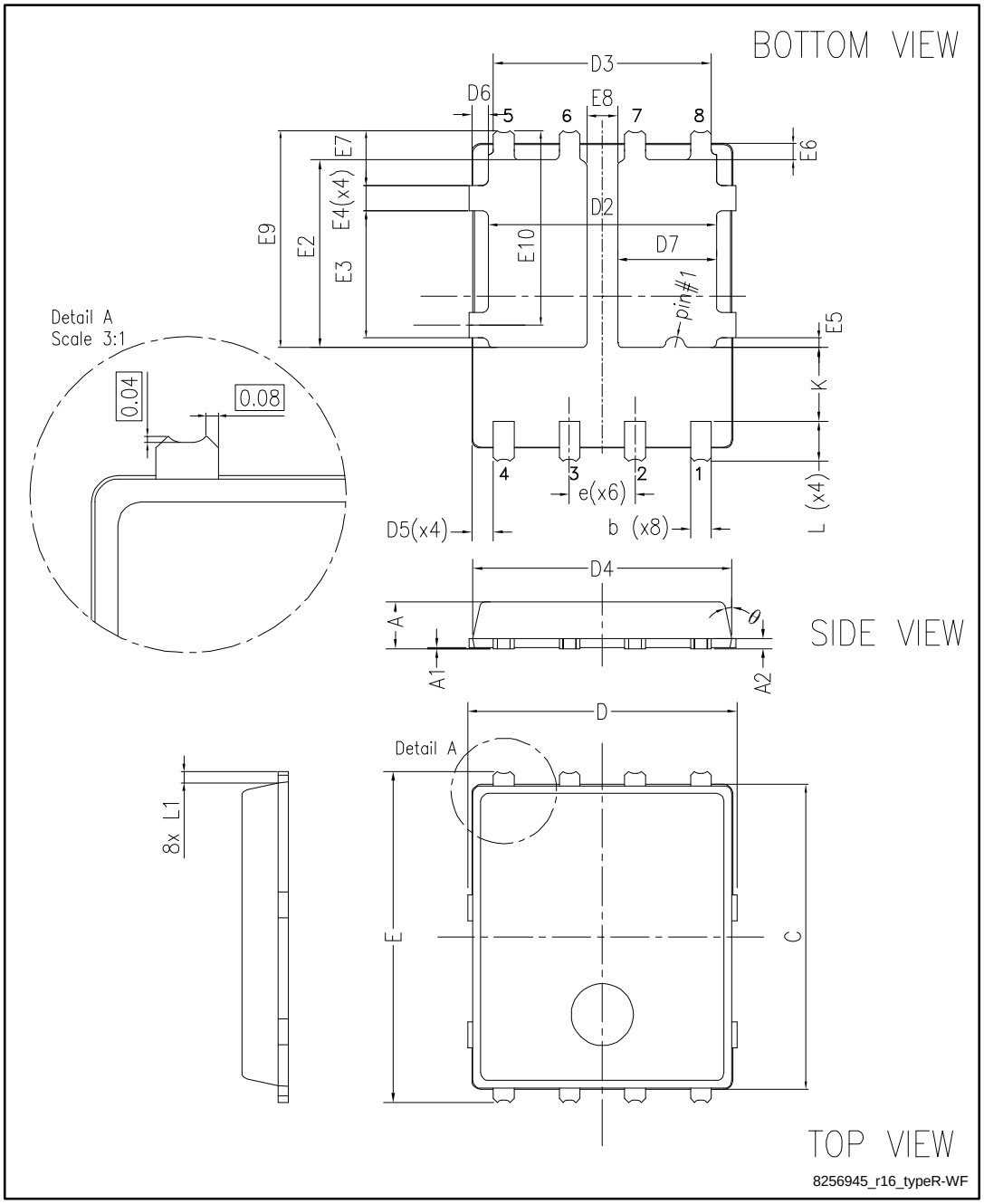
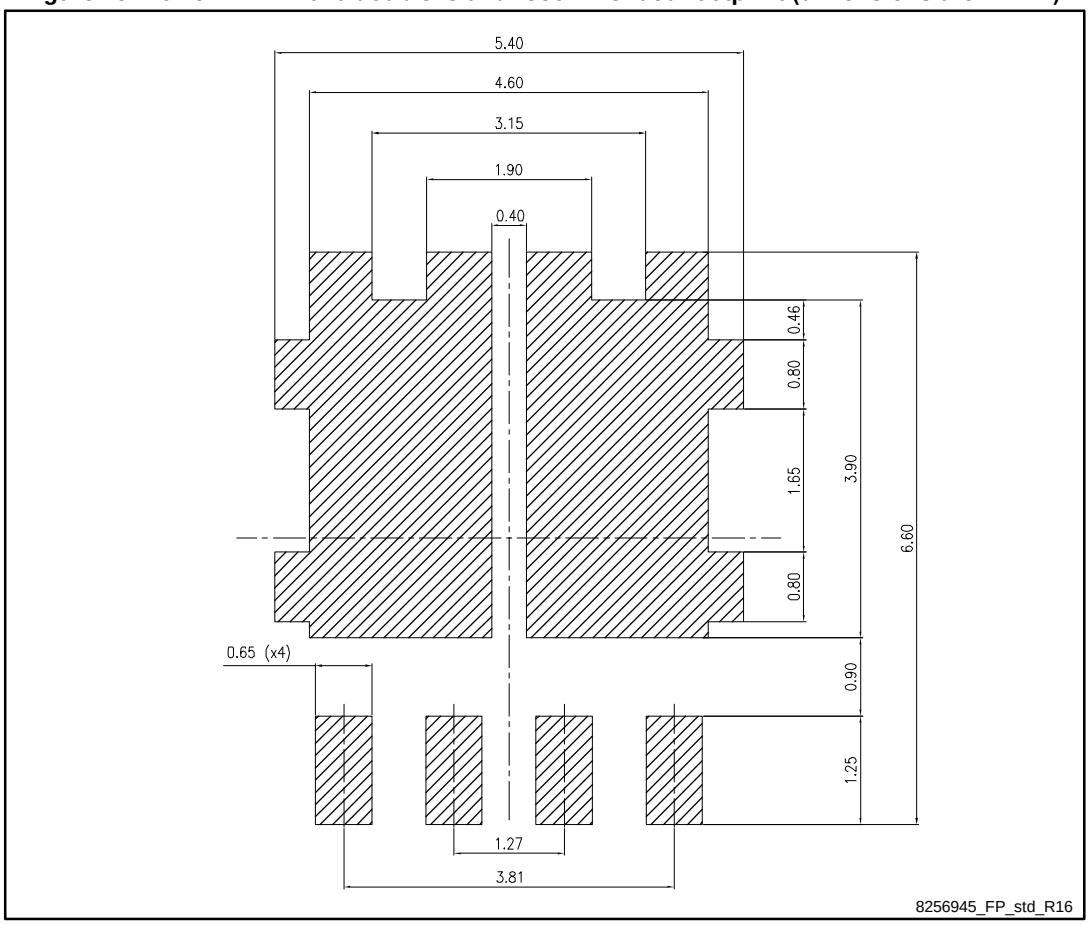


Table 8: PowerFLAT™ 5x6 double island WF type R mechanical data

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	6.10
D	5.00	5.20	5.40
D2	4.15		4.45
D3	4.05	4.20	4.35
D4	4.80	5.00	5.10
D5	0.25	0.40	0.55
D6	0.15	0.30	0.45
D7	1.68		1.98
e		1.27	
E	6.20	6.40	6.60
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	0.85	1.00	1.15
E8	0.55		0.75
E9	4.00	4.20	4.40
E10	3.55	3.70	3.85
K	1.275		1.575
L	0.725	0.825	0.925
L1	0.175	0.275	0.375
θ	0°		12°

Figure 19: PowerFLAT™ 5x6 double island recommended footprint (dimensions are in mm)



4.2 Packing information

Figure 20: PowerFLAT™ 5x6 WF tape (dimensions are in mm)

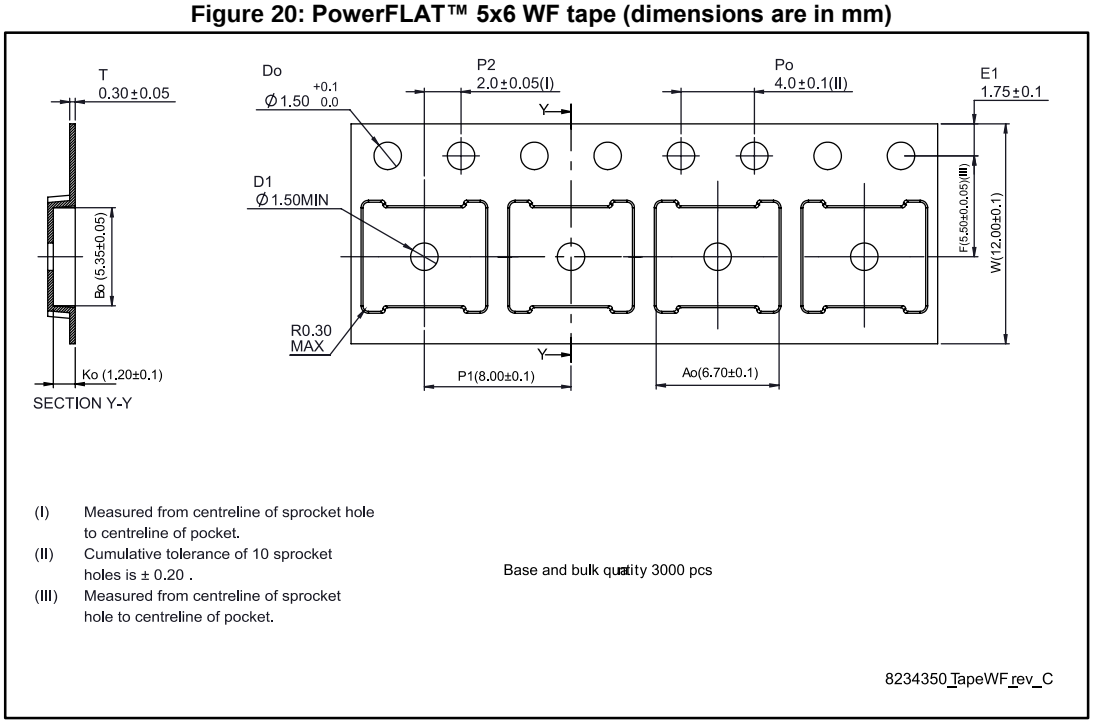


Figure 21: PowerFLAT™ 5x6 package orientation in carrier tape

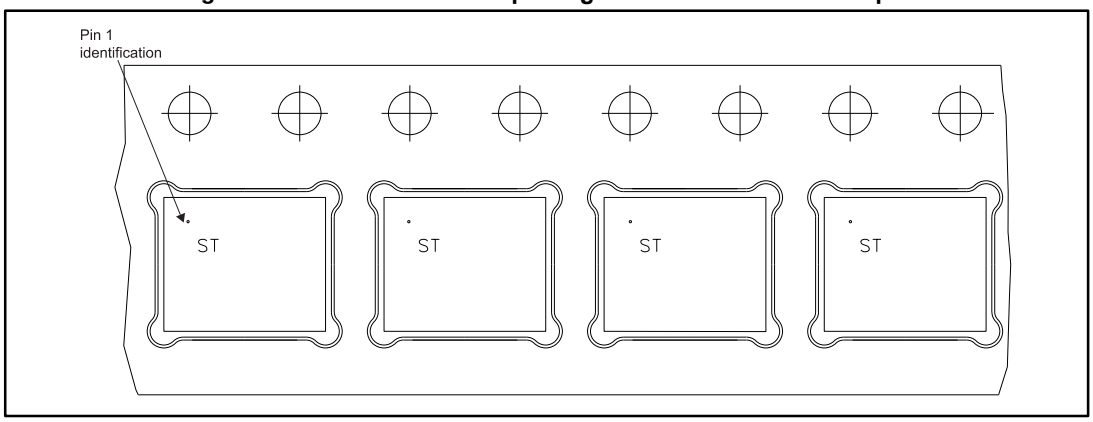
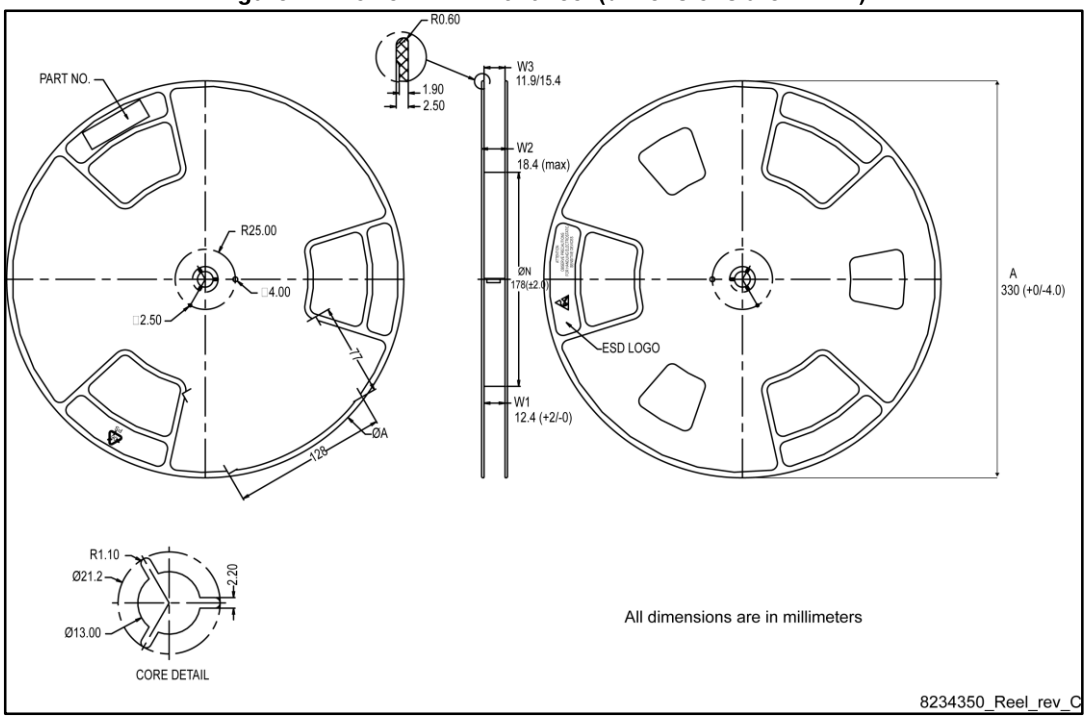


Figure 22: PowerFLAT™ 5x6 reel (dimensions are in mm)



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
28-Mar-2012	1	First release.
20-Jun-2012	2	Added Section 2.1: Electrical characteristics (curves). Updated Section 4: Package information and title on the cover page..
26-Jun-2012	3	Updated Figure 9: Capacitance variations. Document status promoted from preliminary to production data
28-Oct-2013	4	– Updated: Section 4: Package information and Section 5: Packing information Updated title and features in cover page – Modified: VGS(th) value in Table 4 – Minor text changes
20-Feb-2014	5	Added: Features in cover page – Added: note 1 in Table 1 – Added: Table 19 and Table 9 – Added: Figure 20 – Minor text changes
10-Jul-2015	6	Updated title and description in cover page. – Updated Section 4: Package information.
09-Jun-2016	7	Updated Silhouette and description in cover page. Updated Figure 18: "PowerFLAT™ 5x6 double island WF type R package outline". Minor text changes.
21-Jun-2016	8	Updated *Figure 18: "PowerFLAT™ 5x6 double island WF type R package outline"*.

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