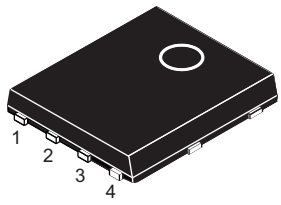
STL7N6LF3

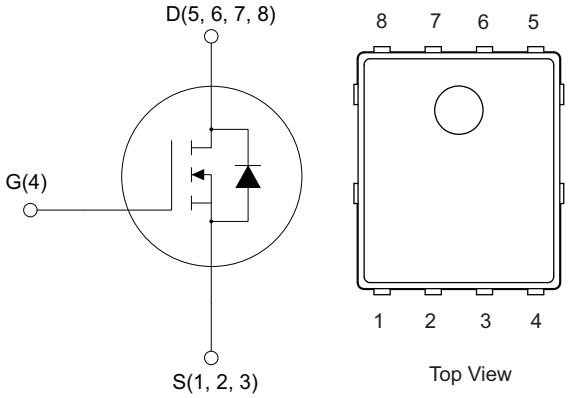
Automotive-grade N-channel 60 V, 35 mΩ typ., 6.5 A STripFET™ F3 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet — production data



PowerFLAT™5x6

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STL7N6LF3	60 V	43 mΩ	6.5 A

- Designed for automotive applications and AEC-Q101 qualified
- Logic level $V_{GS(th)}$
- 175 °C 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	Packages	Packaging
STL7N6LF3	7N6LF3	PowerFLAT™ 5x6	Tape and reel

Contents

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),(2)	Drain current (continuous) at T_C = 25 °C	20	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	16	A
I_D (4)	Drain current (continuous) at T_{pcb} = 25 °C	6.5	A
I_D (4)	Drain current (continuous) at T_{pcb}=100 °C	4.6	A
I_{DM} (3),(4)	Drain current (pulsed)	26	A
P_{TOT}	Total dissipation at T_C = 25°C	52	W
P_{TOT} (4)	Total dissipation at T_{pcb} = 25°C	4.3	W
I_{AV}	Not-repetitive avalanche current	6.5	A
E_{AS} (5)	Single pulse avalanche energy	190	mJ
T_J	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		°C

1. Specified by design. Not subject to production test.
2. Current is limited by bonding, with an R_{thJC} = 2.9 °C/W the chip is able to carry 22 A at 25 °C.
3. Pulse width limited by safe operating area
4. When mounted on FR-4 board of 1inch², 2oz Cu, t < 10 sec
5. Starting T_J= 25 °C, I_D= 8 A, V_{DD}= 25 V

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	2.9	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb	35	°C/W

1. When mounted on FR-4 board of 1inch², 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	V_{GS}= 0, I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 60 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		2.5	V
$R_{DS(on)}$	Static drain-source on- resistance	V_{GS}= 10 V, I_D= 3 A		35	43	mΩ
		V_{GS}= 5 V, I_D= 3 A		48	60	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{GS}=0, V_{DS} =25 V, f=1 MHz	-	432	-	pF
C_{oss}	Output capacitance		-	93	-	pF
C_{rss}	Reverse transfer capacitance		-	10.5	-	pF
Q_g	Total gate charge	V_{DD}=30 V, I_D = 6.5 A V_{GS} =10 V *Figure 14*	-	8.7	-	nC
Q_{gs}	Gate-source charge		-	1.9	-	nC
Q_{gd}	Gate-drain charge		-	1.9	-	nC
R_G	Intrinsic gate resistance	f=1 MHz, I_D = 0	-	6.3	-	Ω

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= 3 A, R_G=4.7 Ω, V_{GS}=10 V *Figure 12*	-	6.7	-	ns
t_r	Rise time		-	10.4	-	ns
$t_{d(off)}$	Turn-off delay time		-	32.4	-	ns
t_f	Fall time		-	5.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current		-		6.5	A
I_{SDM}(1)	Source-drain current (pulsed)		-		26	A
V_{SD}(2)	Forward on voltage	V_{GS}=0, I_{SD} = 6.5 A	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 6.5 A, di/dt = 100 A/µs, V_{DD}=48 V, Tj=150 °C	-	24		ns
Q_{rr}	Reverse recovery charge		-	23.3		nC
I_{RRM}	Reverse recovery current		-	1.9		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

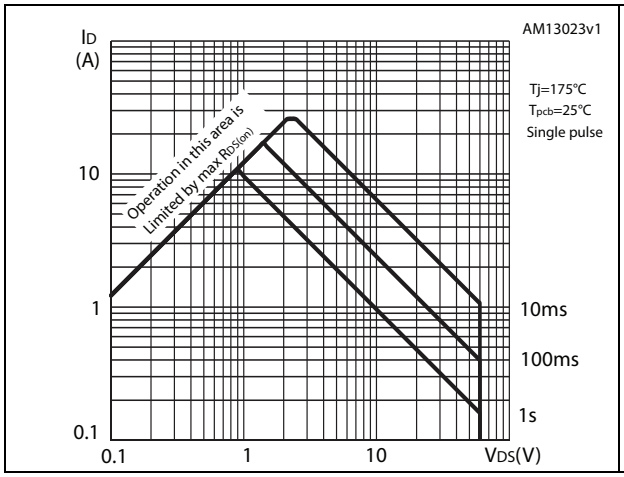


Figure 3. Thermal impedance

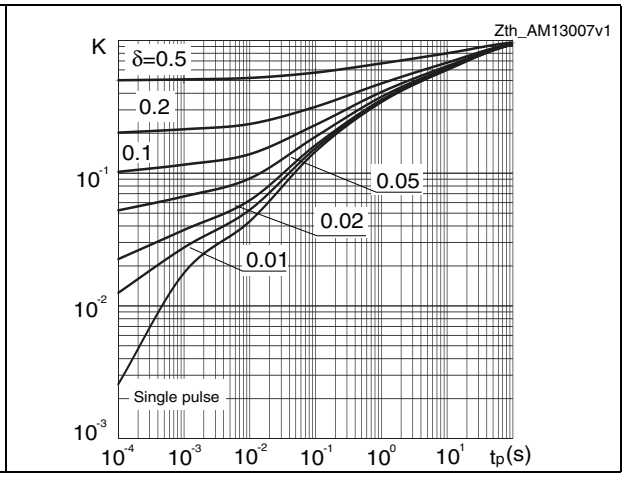


Figure 4. Output characteristics

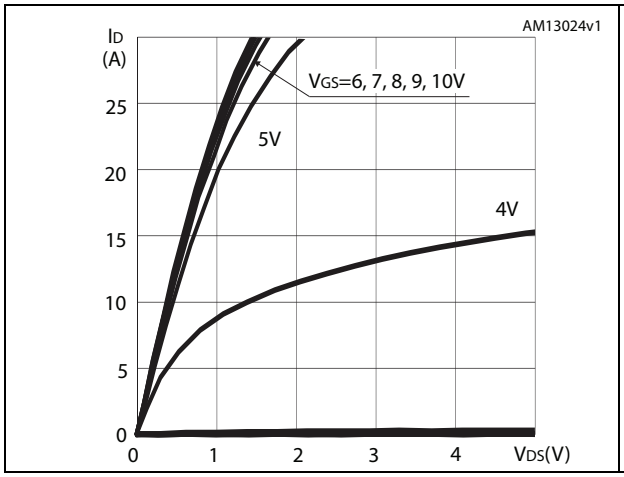


Figure 5. Transfer characteristics

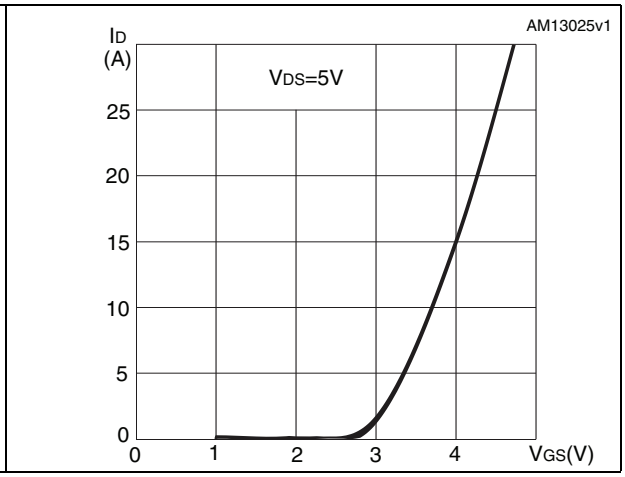


Figure 6. Normalized $V_{(BR)DSS}$ vs temperature

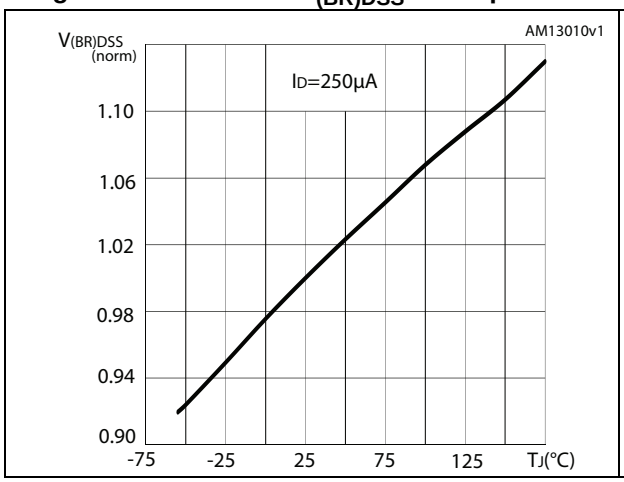


Figure 7. Static drain-source on-resistance

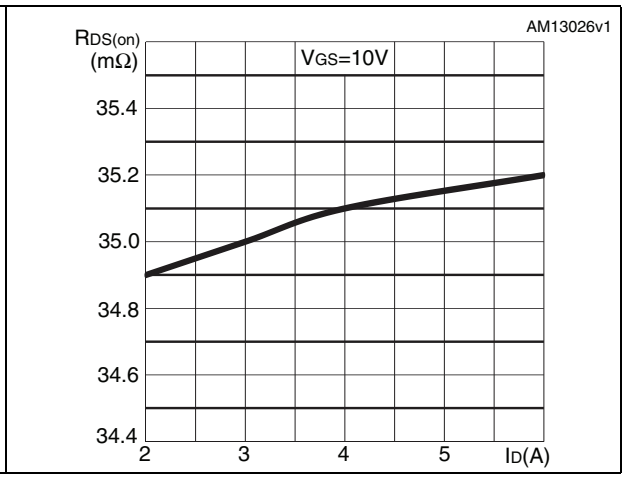


Figure 8. Gate charge vs gate-source voltage

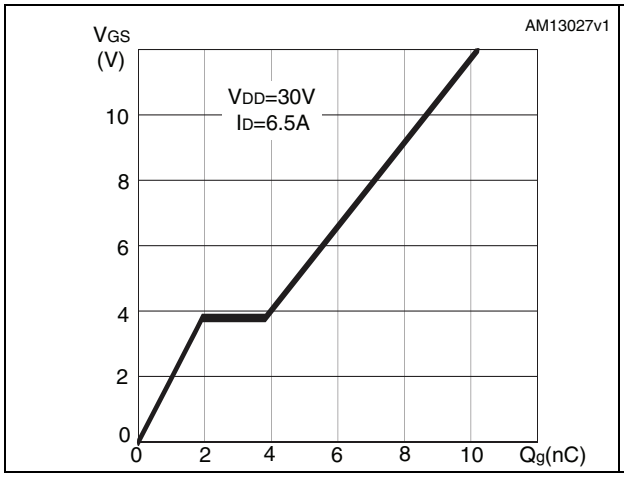


Figure 9. Capacitance variations

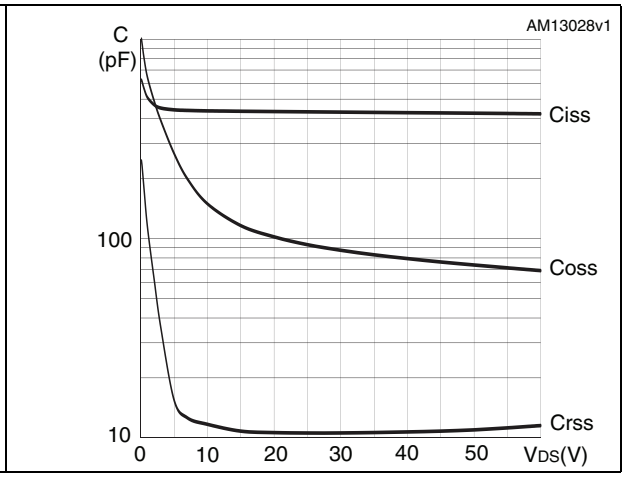


Figure 10. Normalized gate threshold voltage vs temperature

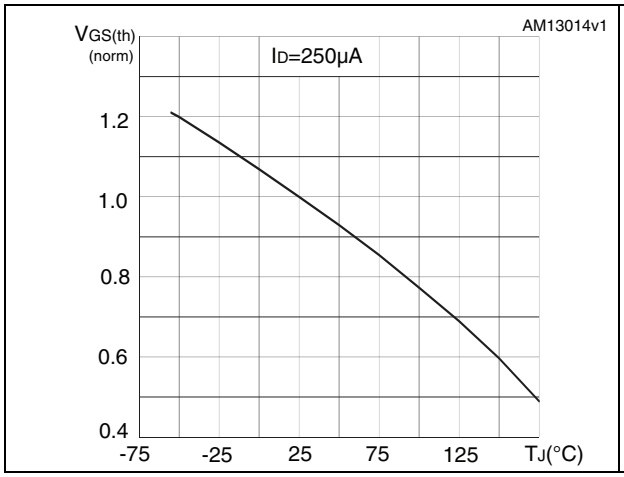
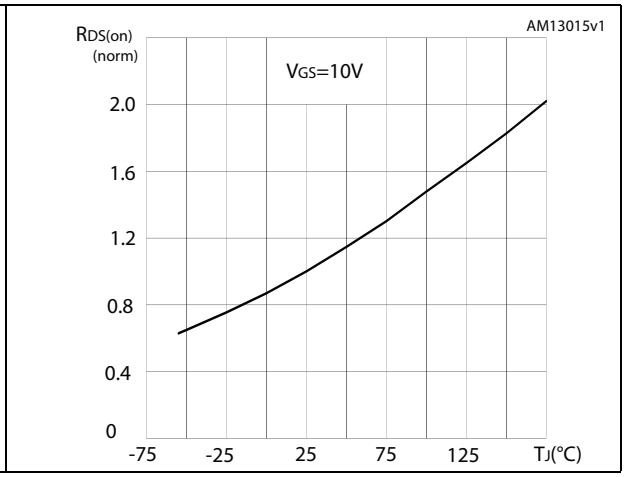


Figure 11. Normalized on-resistance vs temperature



3 Test circuits

Figure 12. Switching times test circuit for resistive load

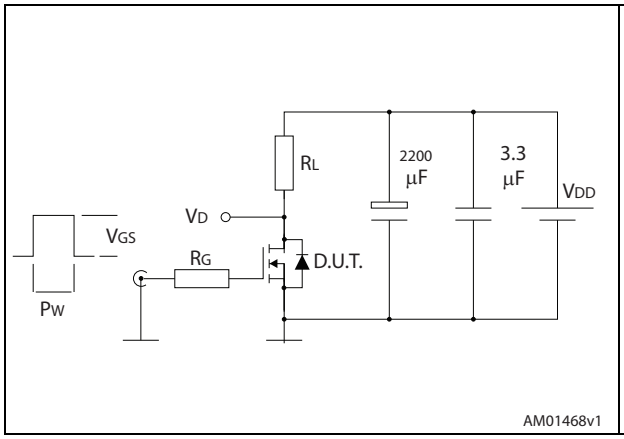


Figure 13. Gate charge test circuit

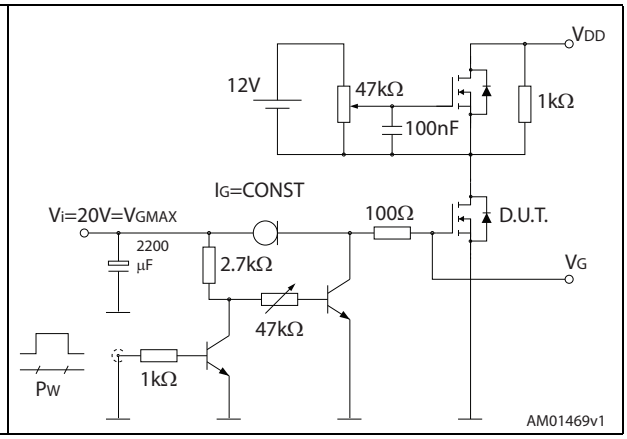


Figure 14. Test circuit for inductive load switching and diode recovery times

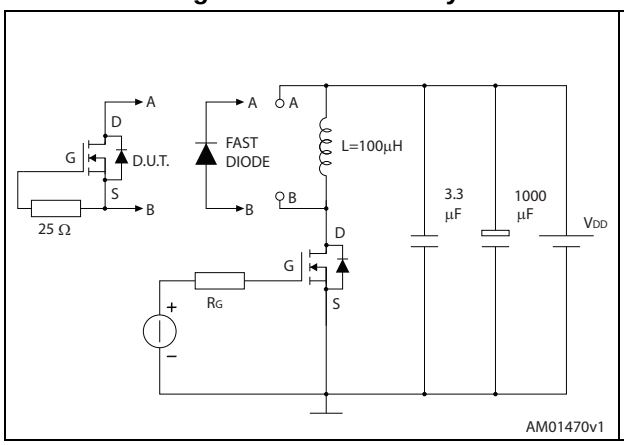


Figure 15. Unclamped inductive load test circuit

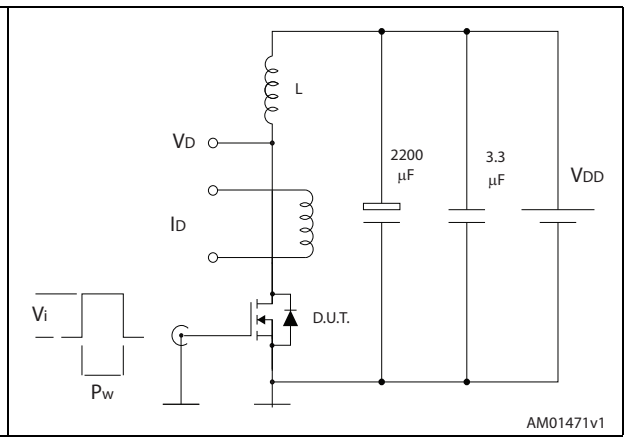


Figure 16. Unclamped inductive waveform

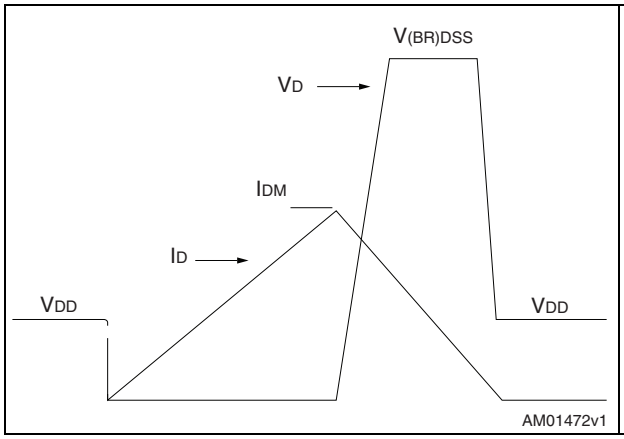
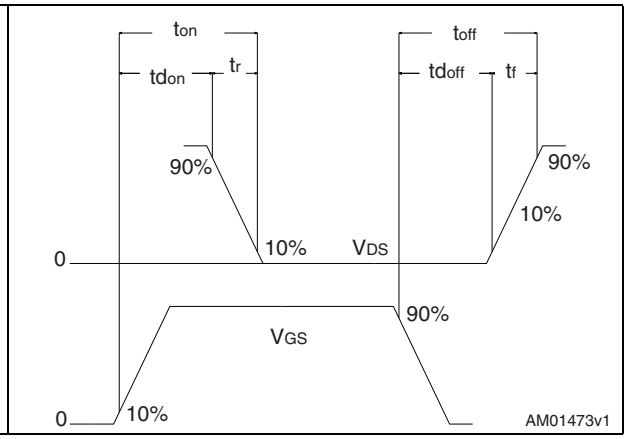


Figure 17. Switching time waveform



4 Package 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 18. PowerFLAT™ 5x6 WF type R outline

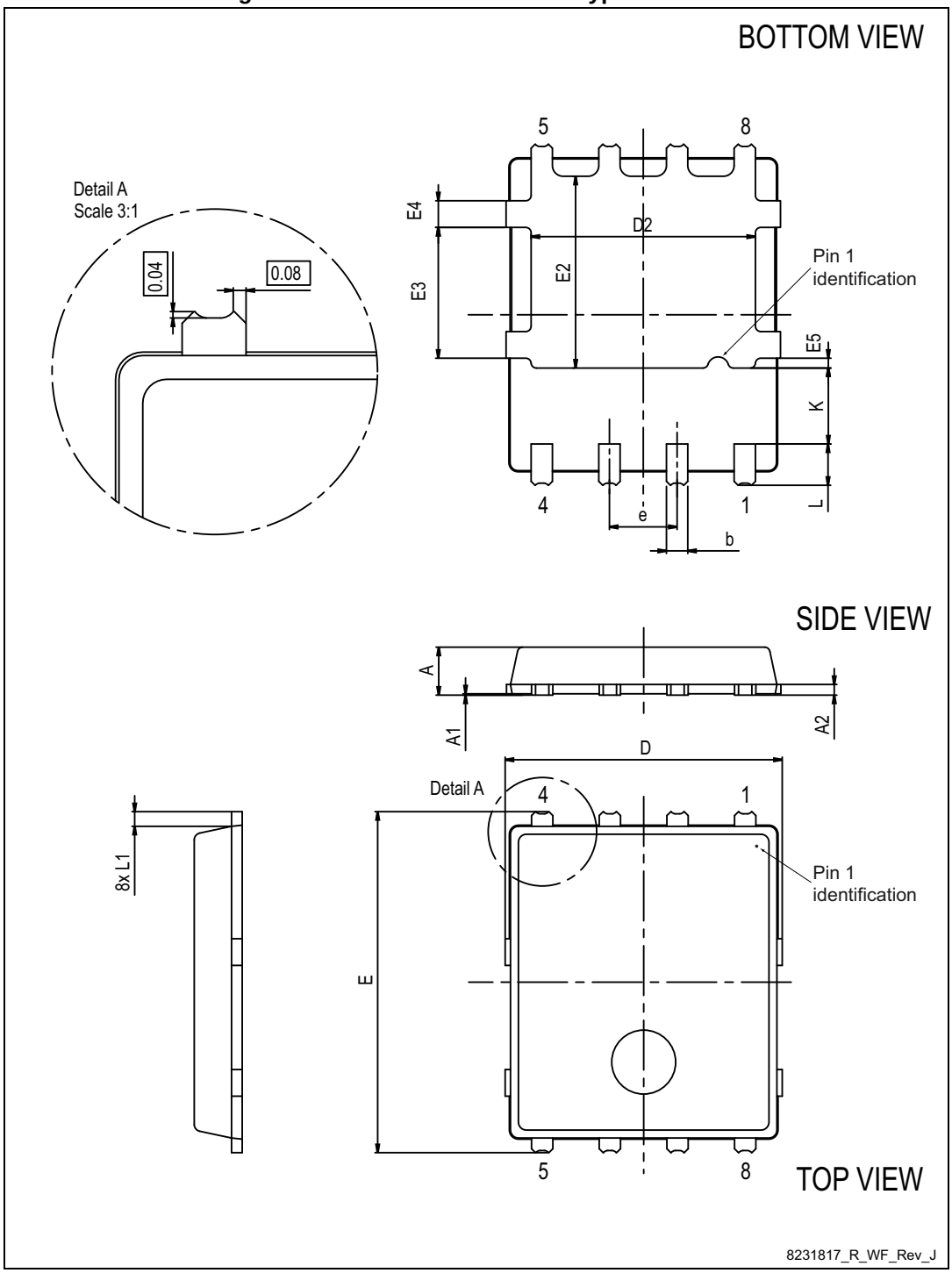
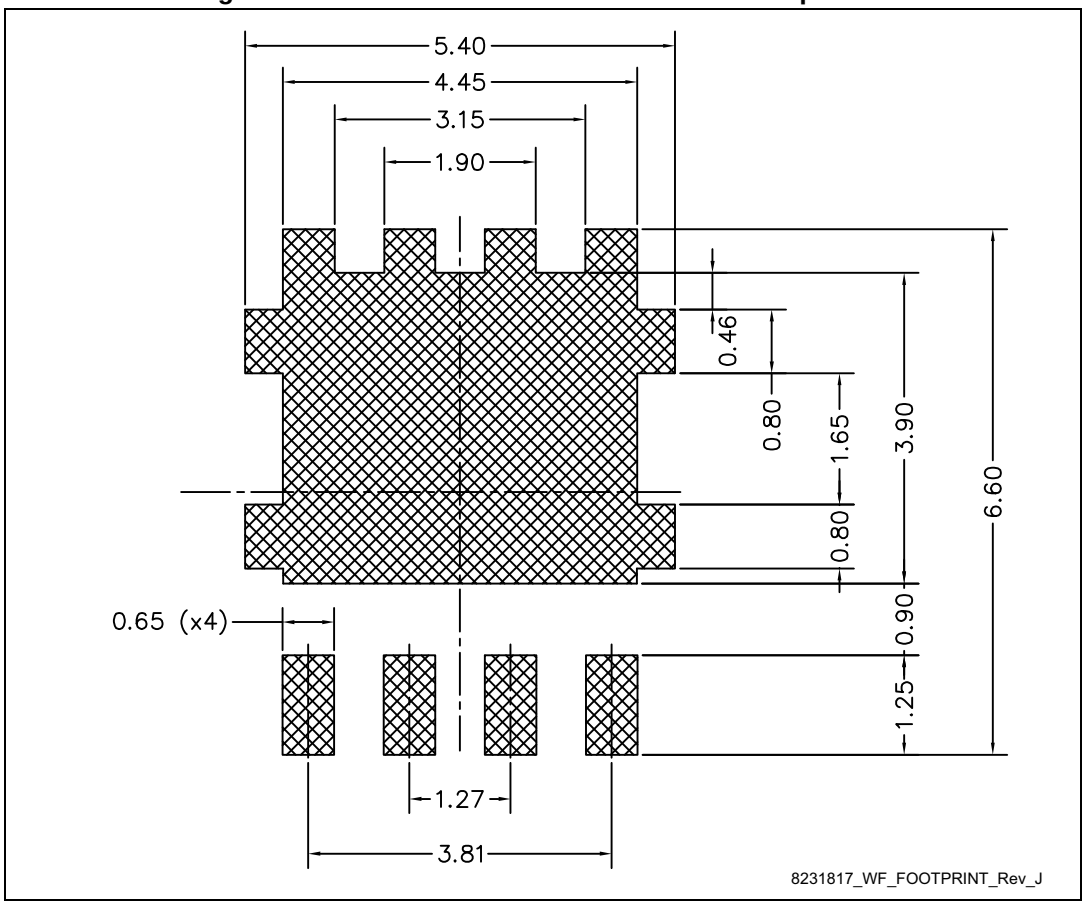


Table 8. PowerFLAT™ 5x6 WF type R mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	0.80		1.00
A1	0.02		0.05
A2		0.25	
b	0.30		0.50
D	5.00	5.20	5.40
E	6.20	6.40	6.60
D2	4.11		4.31
E2	3.50		3.70
e		1.27	
L	0.70		0.90
L1		0.275	
K	1.275		1.575
E3	2.35		2.55
E4	0.40		0.60
E5	0.08		0.28

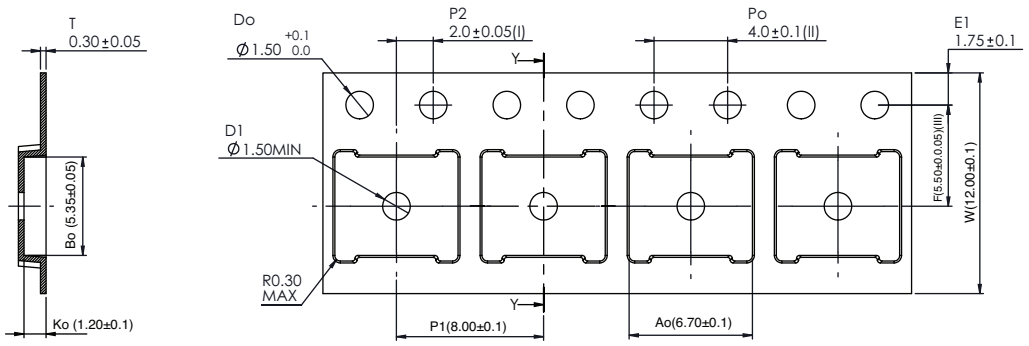
Figure 19. PowerFLAT™ 5x6 recommended footprint [(a)]



a. All dimensions are in mm.

5 Packaging mechanical data

Figure 20. PowerFLAT 5x6 WF tape(a)



(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

8234350_TapeWF_rev_C

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

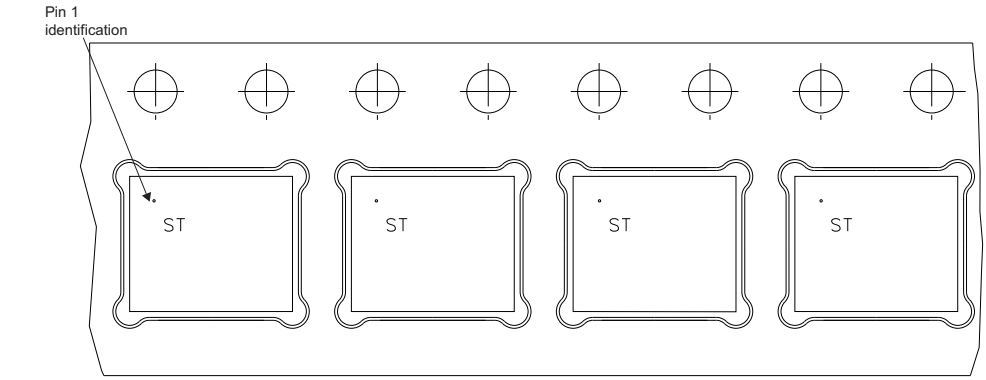
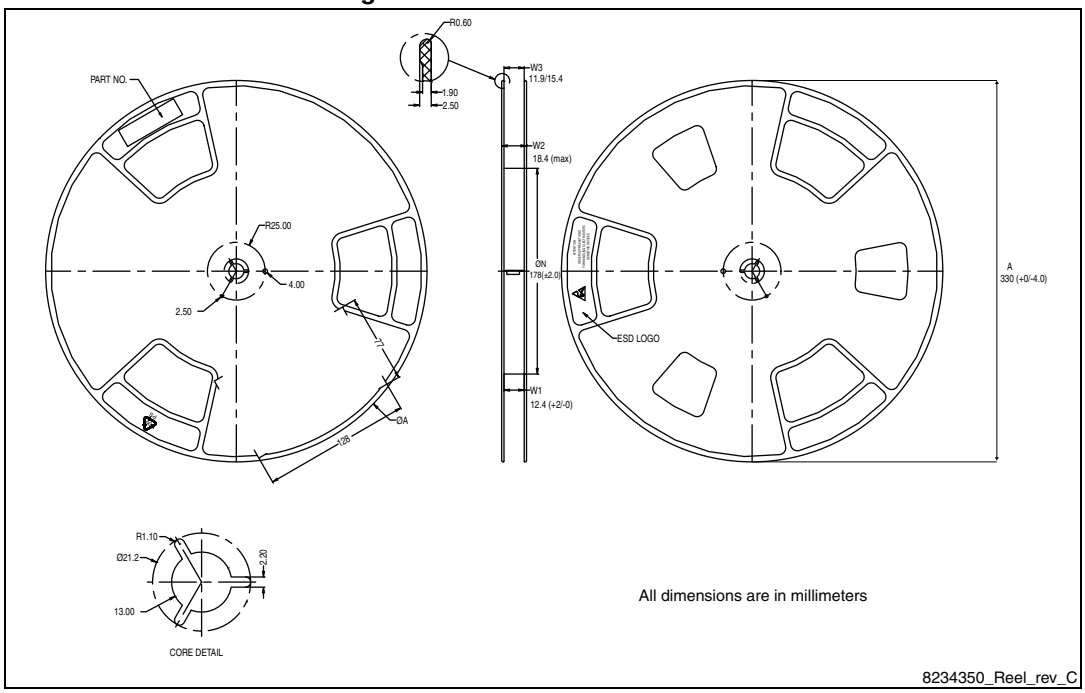


Figure 22. PowerFLAT™ 5x6 reel



6 Revision history

Table 9. Document revision history

Date	Revision	Changes
14-Oct-2014	1	First release.
10-Feb-2015	2	Updated *Table 4: On/off states*, *Table 5: Dynamic*, *Table 6: Switching times*, *Table 7: Source drain diode* and *Section 4: Package mechanical data*.
26-May-2015	3	Updated title and features. Document status from preliminary to production data.

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