

N-channel 100 V, 0.005 Ω typ., 107 A, STripFET™ H7 Power MOSFET in a PowerFLAT™ 5x6 package

Datasheet - production data

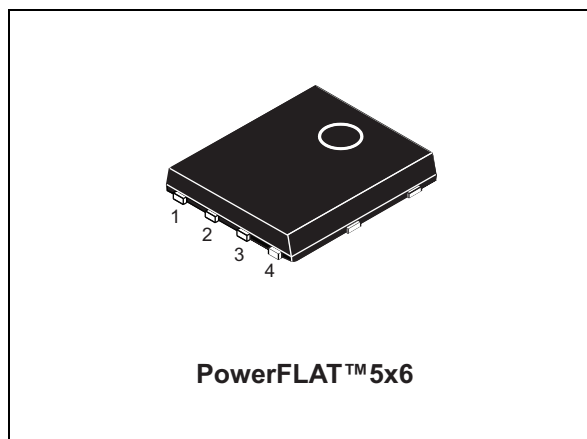
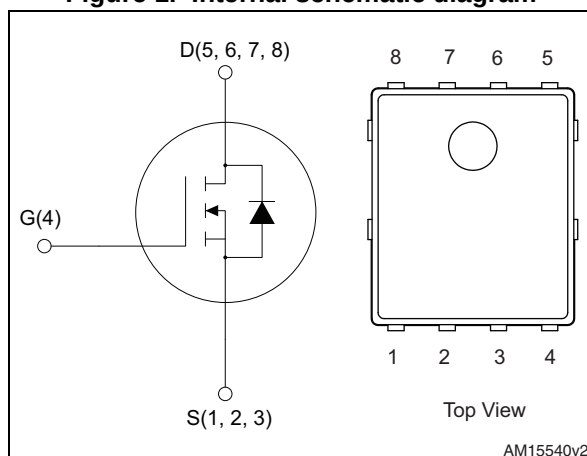


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D	P _{TOT}
STL110N10F7	100 V	0.006 Ω (V _{GS} = 10 V)	107 A	136 W

- 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 N-channel Power MOSFET utilizes the STripFET™ H7 technology with a trench gate structure combined with extremely low on-resistance. The device also offers ultra-low capacitances for higher switching frequency operations.

Table 1. Device summary

Order code	Marking	Package	Packaging
STL110N10F7	110N10F7	PowerFLAT™ 5x6	Tape and reel

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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 $T_C = 25\text{ }^\circ\text{C}$	107	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	75	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	21	A
$I_D^{(2)}$	Drain current (continuous) at $T_{pcb}=100\text{ }^\circ\text{C}$	14	A
$I_{DM}^{(2)(3)}$	Drain current (pulsed)	84	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	136	W
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	4.8	W
$E_{AS}^{(4)}$	Single pulse avalanche energy	490	mJ
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. This value is rated according to R_{thj-c} .
2. This value is rated according to $R_{thj-pcb}$.
3. Pulse width limited by safe operating area.
4. Starting $T_J=25\text{ }^\circ\text{C}$, $I_d=18\text{ A}$, $V_{dd}=50\text{ V}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.1	$^\circ\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	31.3	$^\circ\text{C/W}$

1. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10\text{ sec}$

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS}=0$, $I_D=250\text{ }\mu\text{A}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS}=0$, $V_{DS}=100\text{ V}$			1	μA
		$V_{GS}=0$, $V_{DS}=100\text{ V}$, $T_C=125\text{ }^{\circ}\text{C}$			10	μA
I_{GSS}	Gate body leakage current	$V_{DS}=0$, $V_{GS}=20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS}=10\text{ V}$, $I_D=10\text{ A}$		0.005	0.006	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS}=50\text{ V}$, $f=1\text{ MHz}$, $V_{GS}=0$	-	5117	-	pF
C_{oss}	Output capacitance		-	992	-	pF
C_{rss}	Reverse transfer capacitance		-	39	-	pF
Q_g	Total gate charge	$V_{DD}=50\text{ V}$, $I_D=21\text{ A}$ $V_{GS}=10\text{ V}$ Figure 14	-	72	-	nC
Q_{gs}	Gate-source charge		-	30	-	nC
Q_{gd}	Gate-drain charge		-	17	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=50\text{ V}$, $I_D=10\text{ A}$, $R_G=4.7\text{ }\Omega$, $V_{GS}=10\text{ V}$ Figure 13	-	25	-	ns
t_r	Rise time		-	36	-	ns
$t_{d(off)}$	Turn-off delay time		-	52	-	ns
t_f	Fall time		-	21	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		21	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		84	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS}=0$, $I_{SD} = 21$ A	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 21$ A, $di/dt = 100$ A/ μ s, $V_{DD}=80$ V, $T_j=150$ °C	-	77		ns
Q_{rr}	Reverse recovery charge		-	150		nC
I_{RRM}	Reverse recovery current		-	4.3		A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

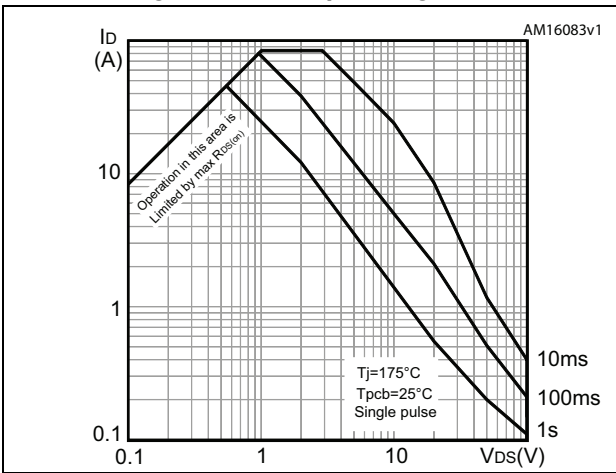


Figure 3. Thermal impedance

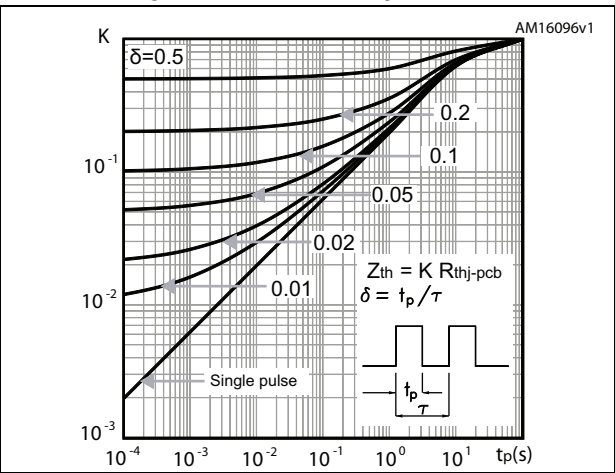


Figure 4. Output characteristics

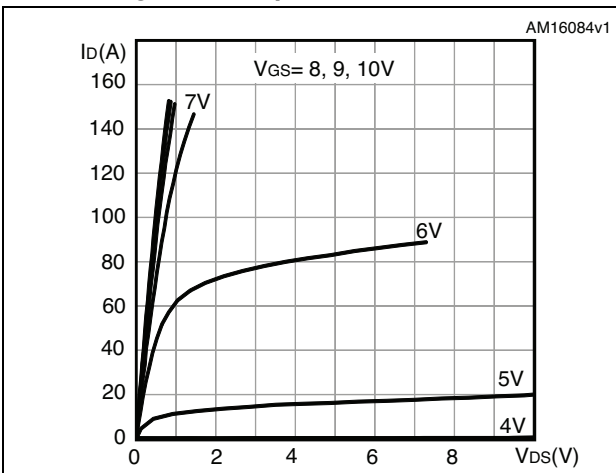


Figure 5. Transfer characteristics

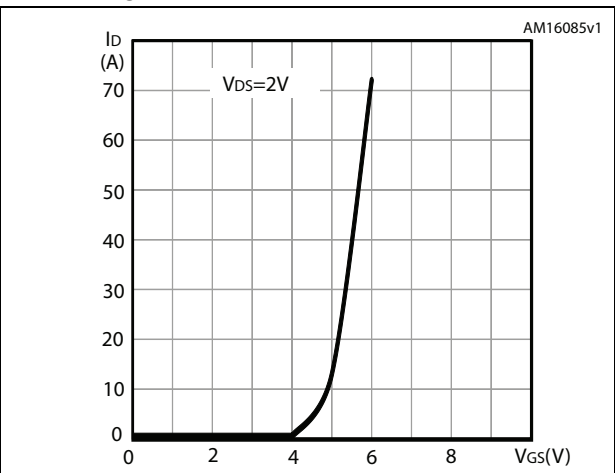


Figure 6. Gate charge vs gate-source voltage

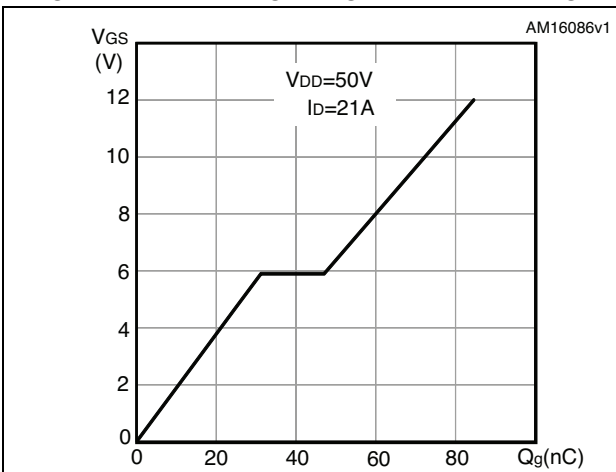


Figure 7. Static drain-source on-resistance

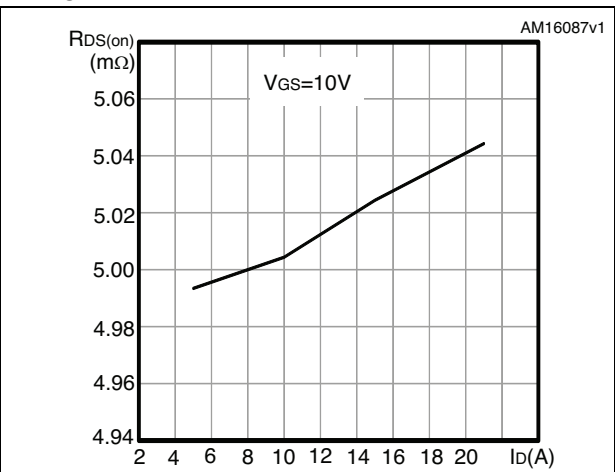


Figure 8. Capacitance variations

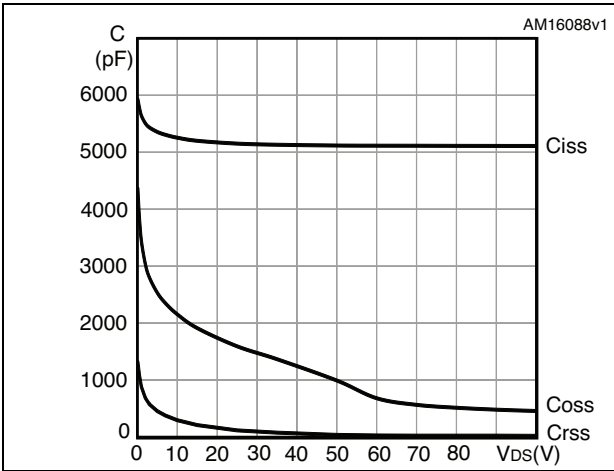


Figure 9. Normalized gate threshold voltage vs temperature

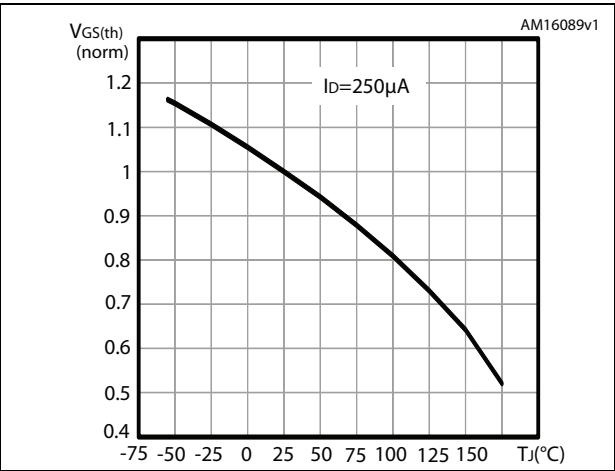


Figure 10. Normalized on-resistance vs temperature

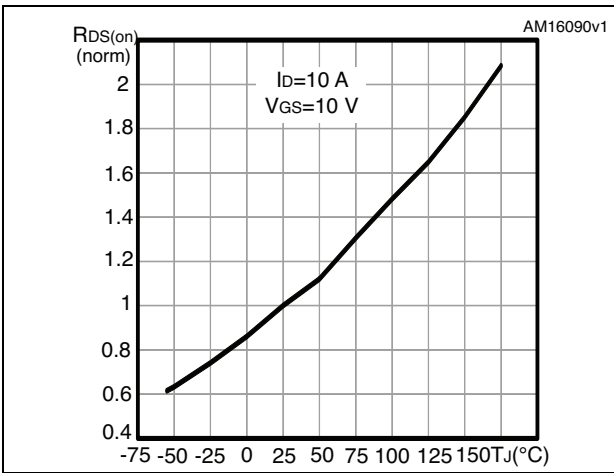


Figure 11. Source-drain diode forward characteristics

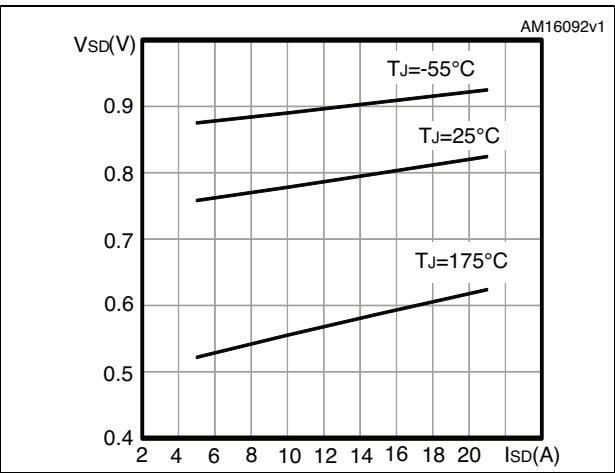
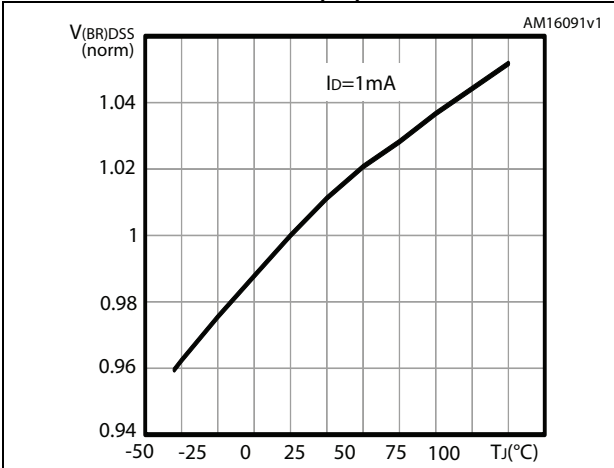


Figure 12. Normalized $V_{(BR)DSS}$ vs temperature



3 Test circuits

Figure 13. Switching times test circuit for resistive load

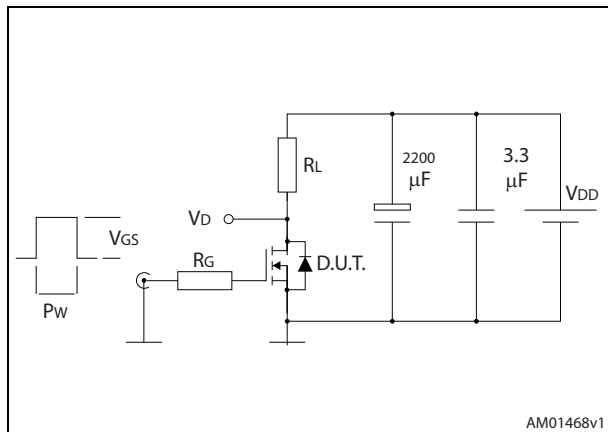


Figure 14. Gate charge test circuit

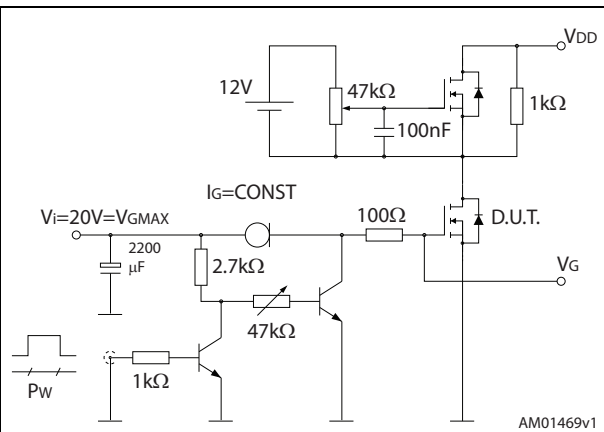


Figure 15. Test circuit for inductive load switching and diode recovery times

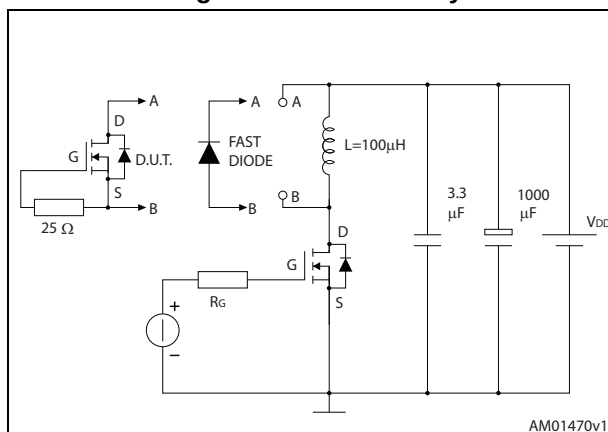


Figure 16. Unclamped inductive load test circuit

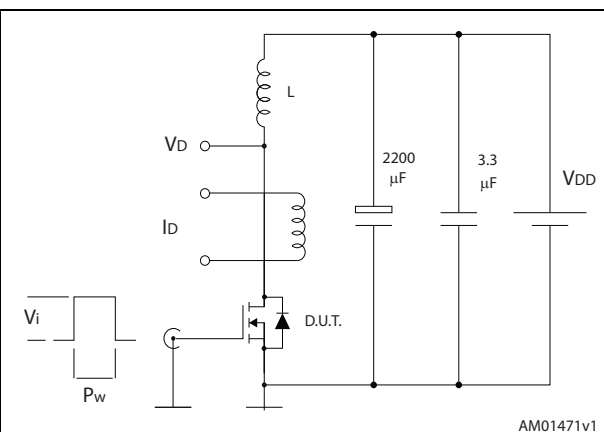


Figure 17. Unclamped inductive waveform

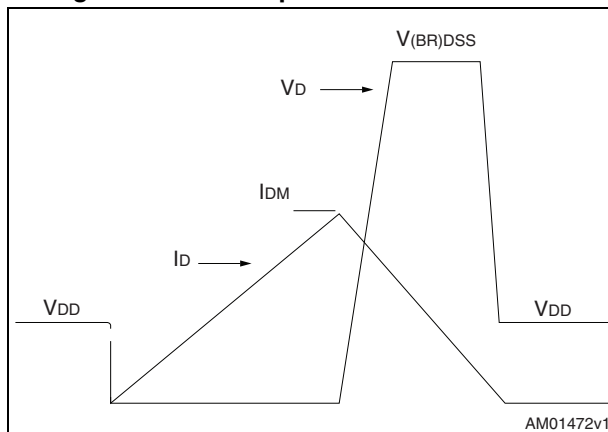
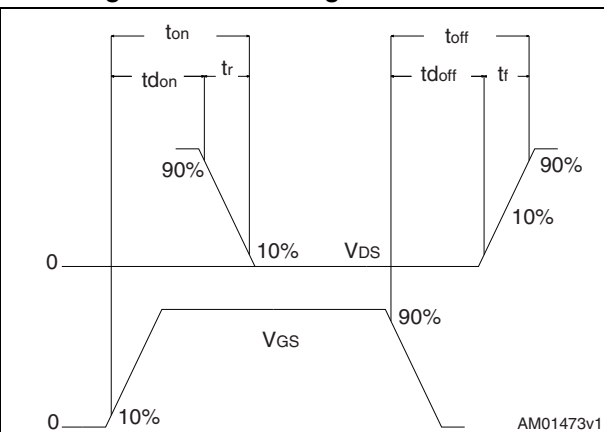


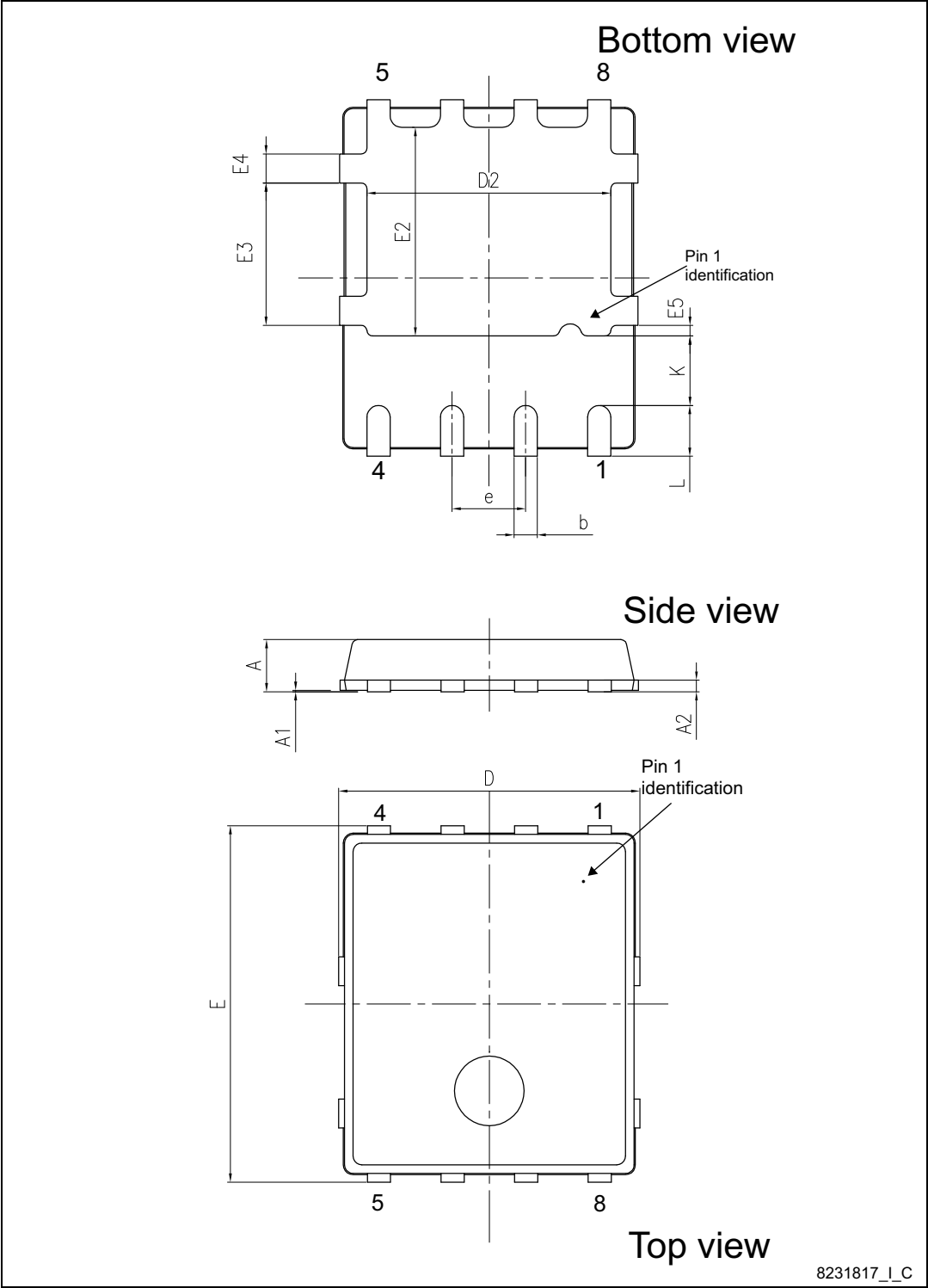
Figure 18. Switching time waveform



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. ECOPACK[®] is an ST trademark.

Figure 19. PowerFLAT™ 5x6 type S-C mechanical data



5 Packaging mechanical data

Figure 21. PowerFLAT™ 5x6 tape^(a)

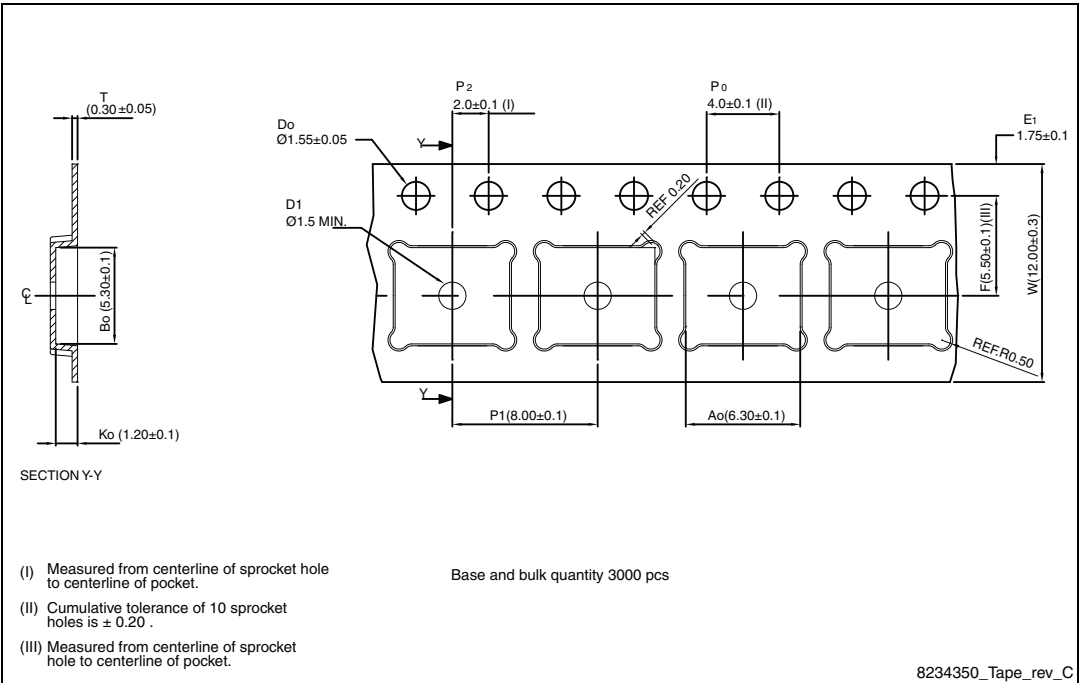
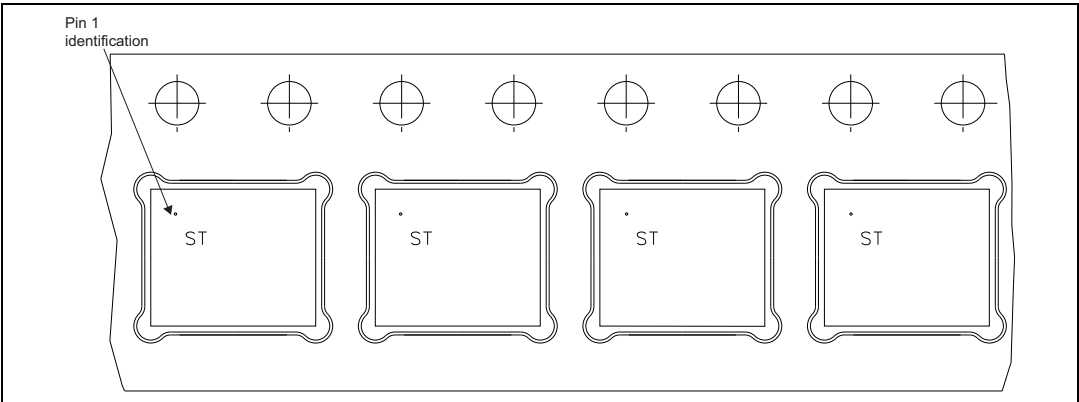


Figure 22. PowerFLAT™ 5x6 package orientation in carrier tape



a. All dimensions are in millimeters.

6 Revision history

Table 9. Document revision history

Date	Revision	Changes
03-Dec-2012	1	First release.
12-Dec-2013	2	– Modified: P_{TOT} value and Figure 1 in cover page – Modified: I_D, I_{DM} and P_{TOT} values in Table 2 – Added: E_{AS} value in Table 2 – Modified: all values in Table 3 – Modified: I_{DSS}, I_{GSS} and I_D for $R_{DS(on)}$ – Updated: the entire typical values in Table 5, 6 and 7 – Updated: Figure 13, 14, 15 and 16 – Minor text changes
25-Mar-2014	3	– Updated title and features on cover page. – Added P_{TOT} value at $T_C = 25\text{ °C}$ in Table 2: Absolute maximum ratings. – Updated Section 4: Package mechanical data.
20-Aug-2014	4	– Modified: title, features and description – Modified: Figure 2 and 3 – Updated: Section 4: Package mechanical data – Minor text changes

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