

N-channel 100 V, 0.02 Ω typ., 32 A STripFET™ VII DeepGATE™ Power MOSFETs in DPAK and TO-220FP packages

Datasheet – production data

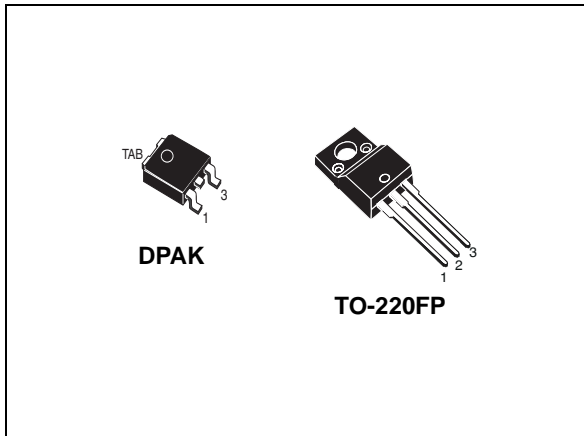
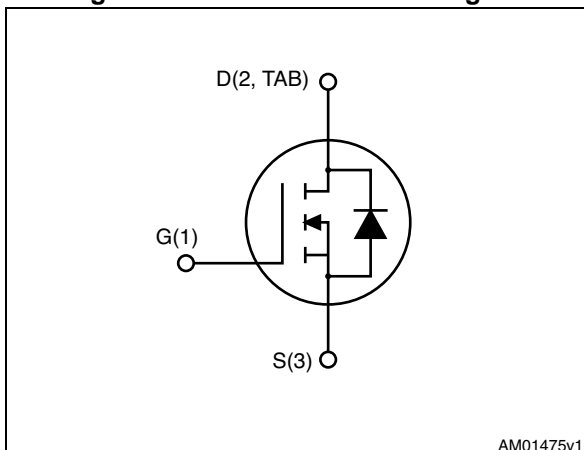


Figure 1. Internal schematic diagram



Features

Order codes	V _{DS}	R _{DS(on)} max	I _D	P _{TOT}
STD30N10F7	100 V	0.024 Ω	32 A	50 W
STF30N10F7			24 A	25 W

- Ultra low on-resistance
- 100% avalanche tested

Applications

- Switching applications

Description

These devices utilize the 7th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STD30N10F7	30N10F7	DPAK	Tape and reel
STF30N10F7		TO-220FP	Tube

Contents

- 1 Electrical ratings 3**
- 2 Electrical characteristics 4**
 - 2.1 Electrical characteristics (curves) 6
- 3 Test circuits 9**
- 4 Package mechanical data 10**
 - 4.1 DPAK, STD30N10F711
 - 4.2 TO-220FP, STF30N10F7 14
- 5 Packaging mechanical data 16**
- 6 Revision history 18**

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		DPAK	TO-220FP	
V_{DS}	Drain-source voltage	100		V
V_{GS}	Gate- source voltage	20		V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	32 ⁽¹⁾	24	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	23 ⁽¹⁾	16	A
I_{DM} ^{(2) (3)}	Drain current (pulsed) $T_C = 25\text{ °C}$	132	96	A
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	50	25	W
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1 s; TC=25 °C)		2500	V
T_J	Operating junction temperature	-55 to 175		°C
T_{stg}	Storage temperature			°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.

Table 3. Thermal data

Symbol	Parameter	Value		Unit
		DPAK	TO-220FP	
$R_{thj-pcb}$ ⁽¹⁾	Thermal resistance junction-pcb max	50		°C/W
$R_{thj-case}$	Thermal resistance junction-case max	3	6	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max		62.5	°C/W

1. When mounted on 1 inch² FR-4 board, 2 oz Cu

2 Electrical characteristics

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

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu A$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 100\ V$			1	μA
		$V_{GS} = 0, V_{DS} = 100\ V, T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = +20\ V$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 10\ V, I_D = 16\ A$		0.02	0.024	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\ V, f = 1\ MHz, V_{GS} = 0$	-	1270	-	pF
C_{oss}	Output capacitance		-	290	-	pF
C_{riss}	Reverse transfer capacitance		-	24	-	pF
Q_g	Total gate charge	$V_{DD} = 50\ V, I_D = 32\ A, V_{GS} = 10\ V$ (see Figure 16)	-	19	-	nC
Q_{gs}	Gate-source charge		-	9	-	nC
Q_{gd}	Gate-drain charge		-	4.5	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ V, I_D = 16\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (see Figure 15)	-	12	-	ns
t_r	Rise time		-	17.5	-	ns
$t_{d(off)}$	Turn-off delay time		-	22	-	ns
t_f	Fall time		-	5.6	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		32	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		128	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 32 \text{ A}$, $V_{GS} = 0$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 32 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 80 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 17)	-	41		ns
Q_{rr}	Reverse recovery charge		-	47		nC
I_{RRM}	Reverse recovery current		-	2.3		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 for DPAK

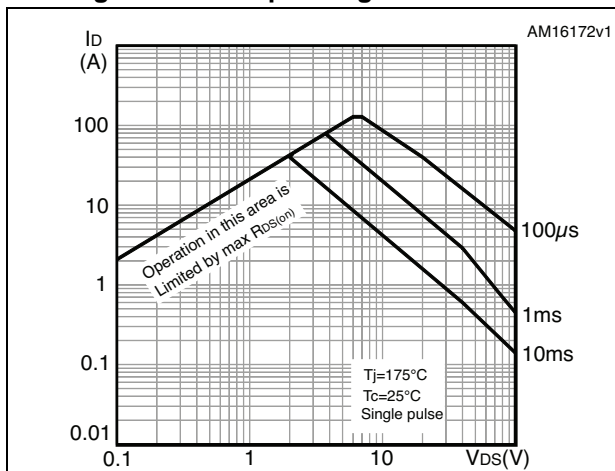


Figure 3. Thermal impedance for DPAK

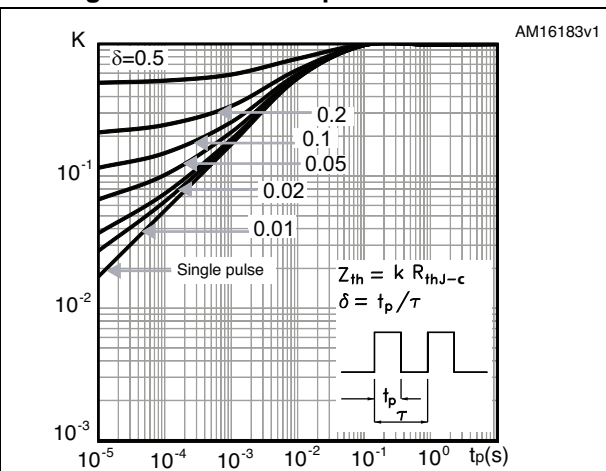


Figure 4. Safe operating area for TO-220FP

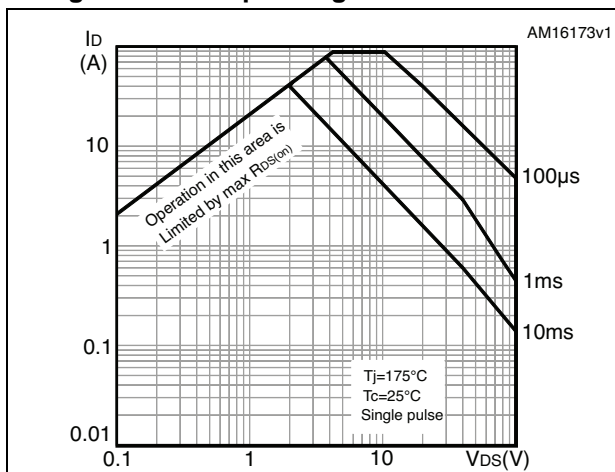


Figure 5. Thermal impedance for TO-220FP

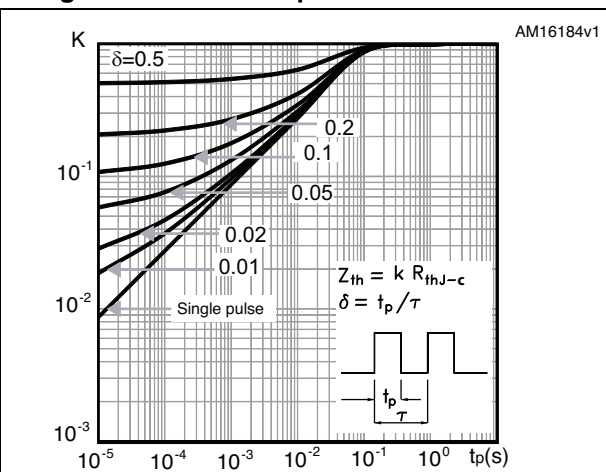


Figure 6. Output characteristics

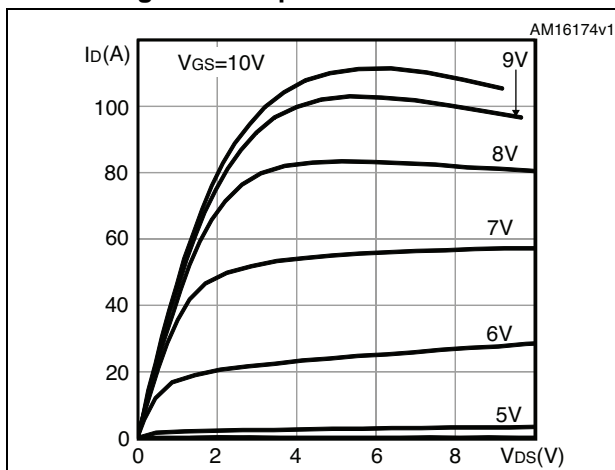


Figure 7. Transfer characteristics

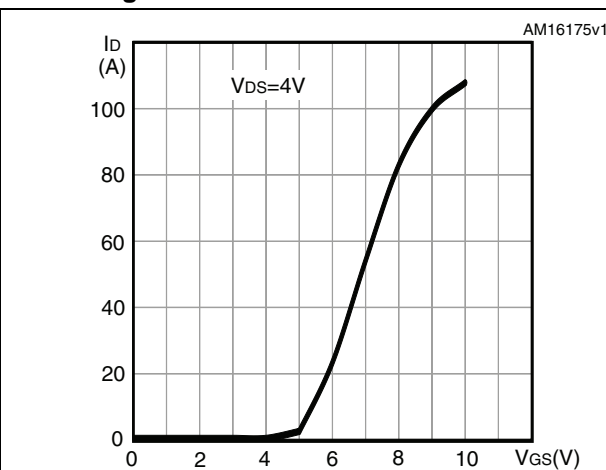


Figure 8. Gate charge vs gate-source voltage

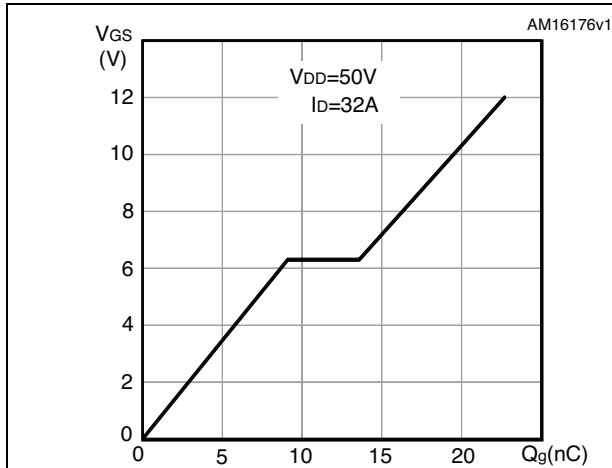


Figure 9. Static drain-source on-resistance

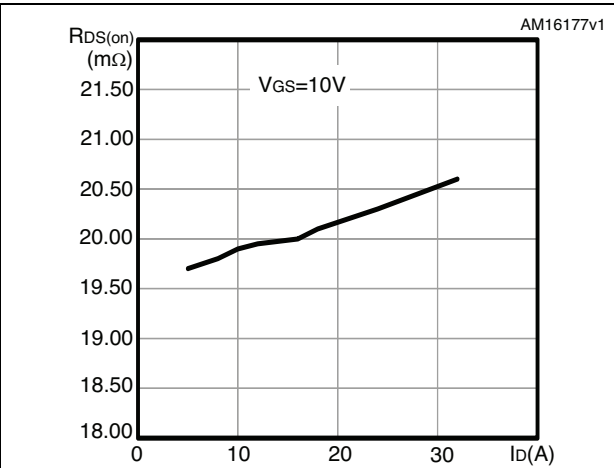


Figure 10. Capacitance variations

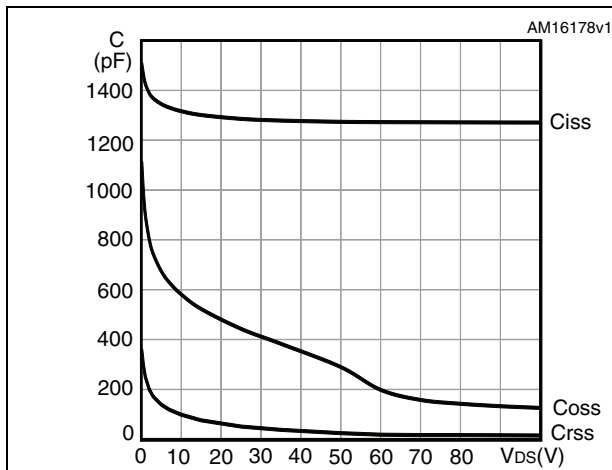


Figure 11. Normalized gate threshold voltage vs temperature

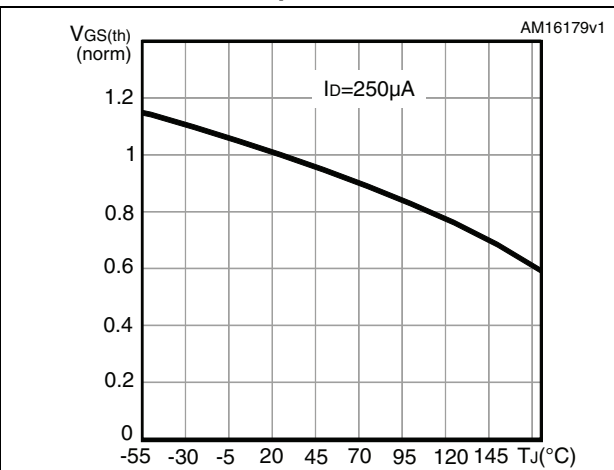


Figure 12. Normalized on-resistance vs temperature

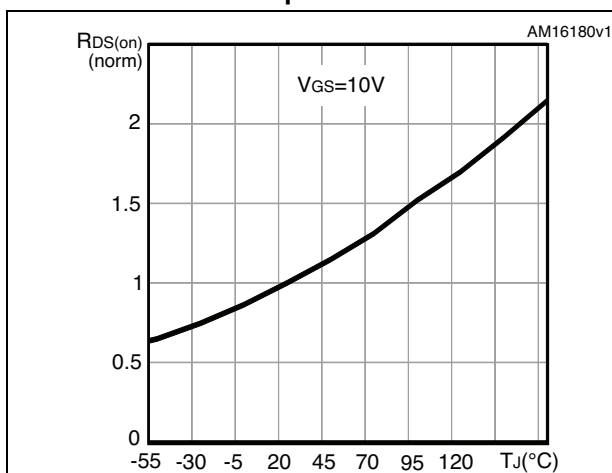


Figure 13. Normalized $V_{(BR)DSS}$ vs temperature

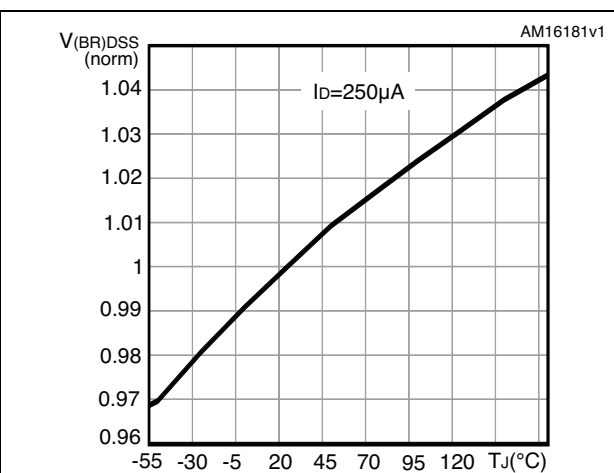
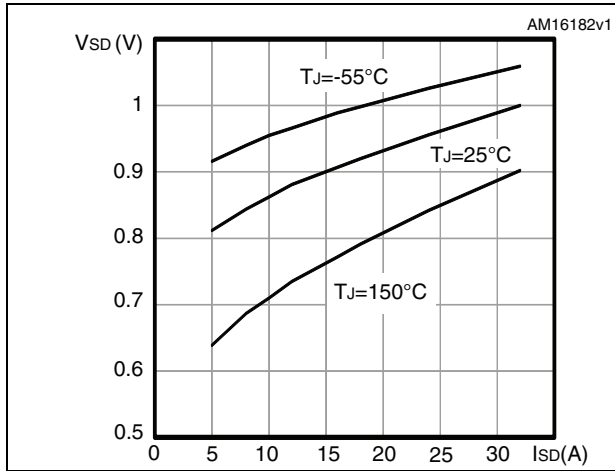


Figure 14. Source-drain diode forward characteristics



3 Test circuits

Figure 15. Switching times test circuit for resistive load

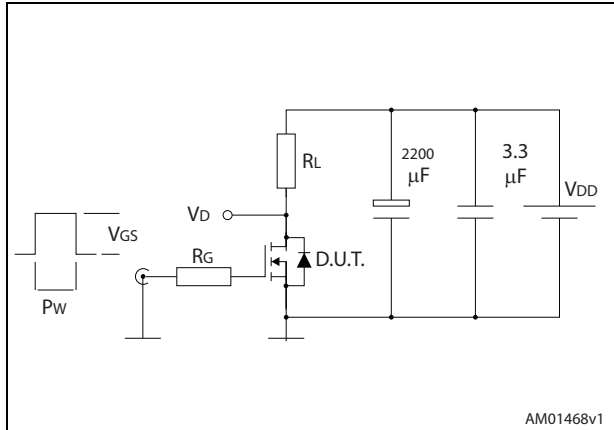


Figure 16. Gate charge test circuit

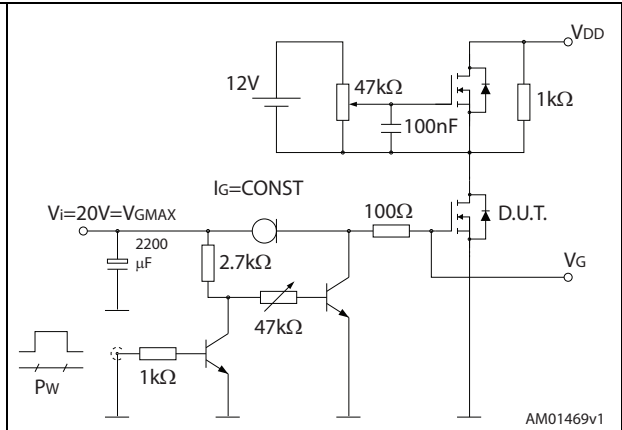


Figure 17. Test circuit for inductive load switching and diode recovery times

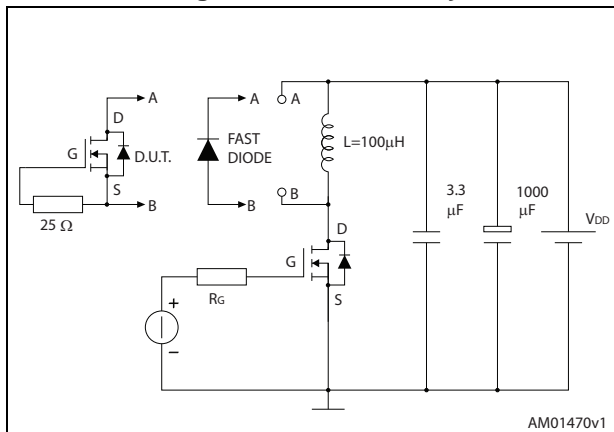


Figure 18. Unclamped inductive load test circuit

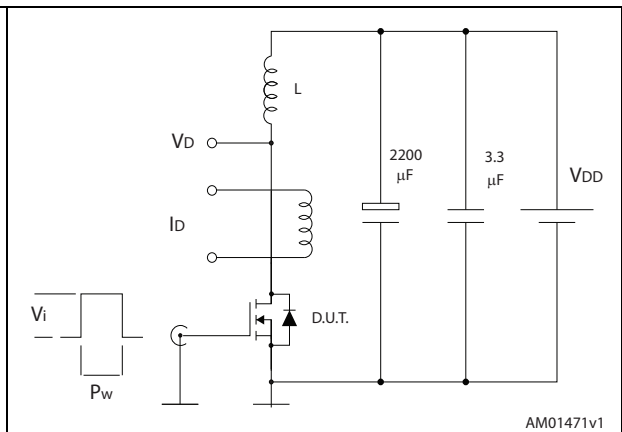


Figure 19. Unclamped inductive waveform

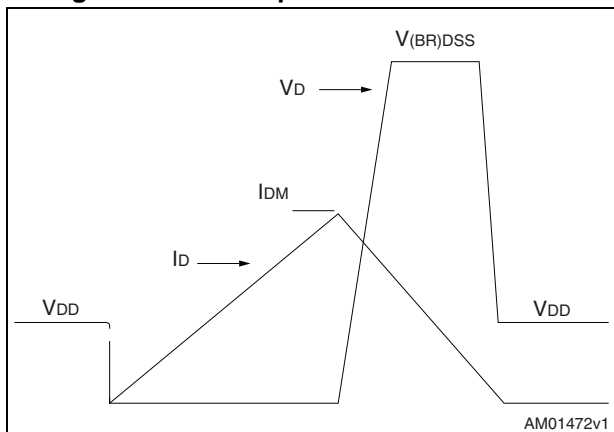
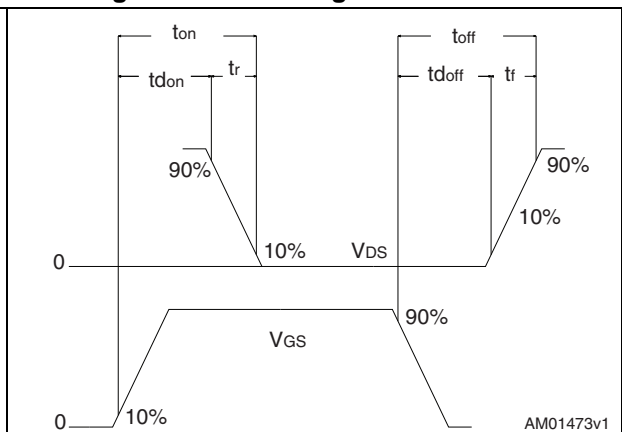


Figure 20. Switching time waveform



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.

4.1 DPAK, STD30N10F7

Figure 21. DPAK (TO-252) type A drawing

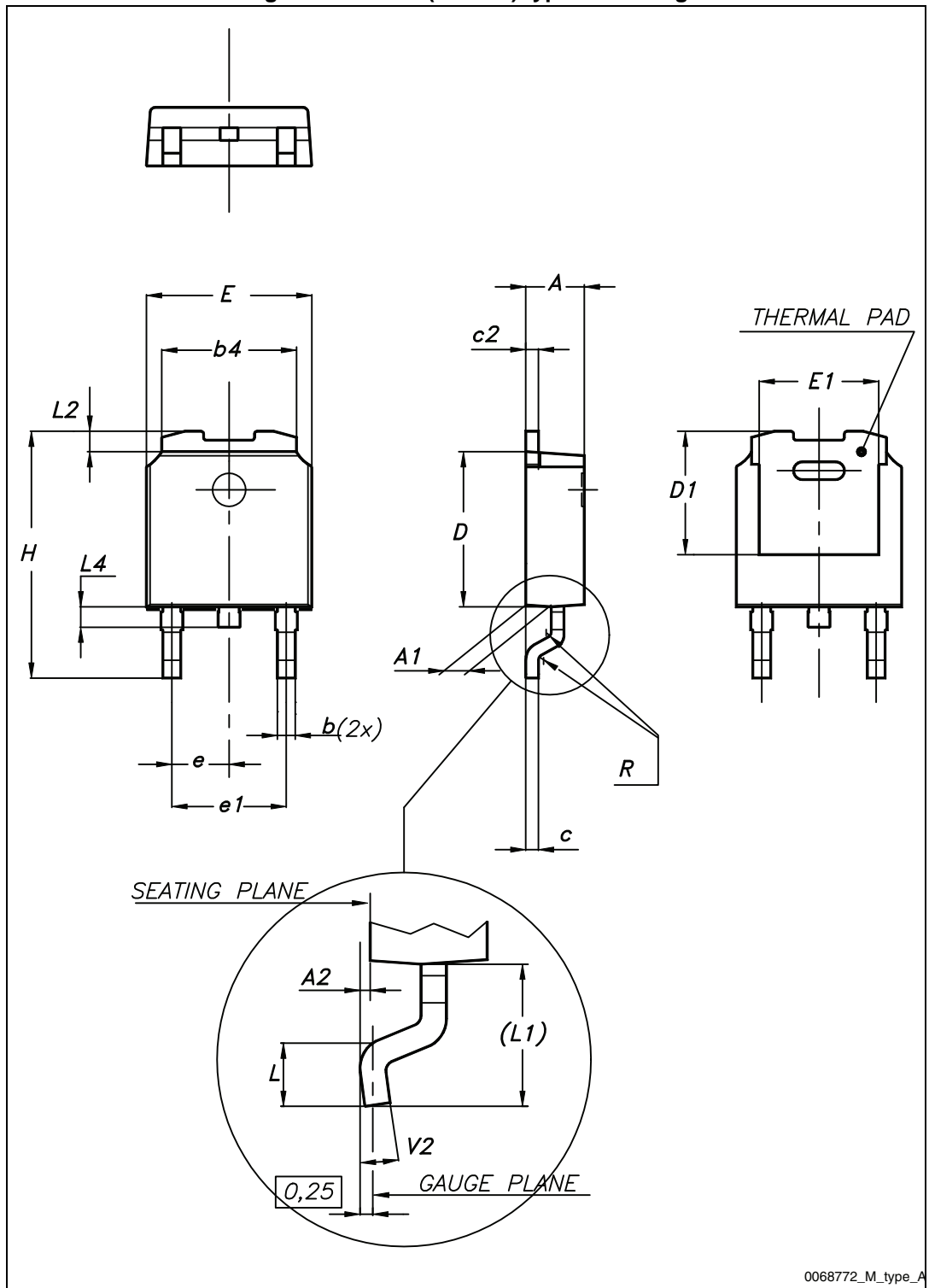
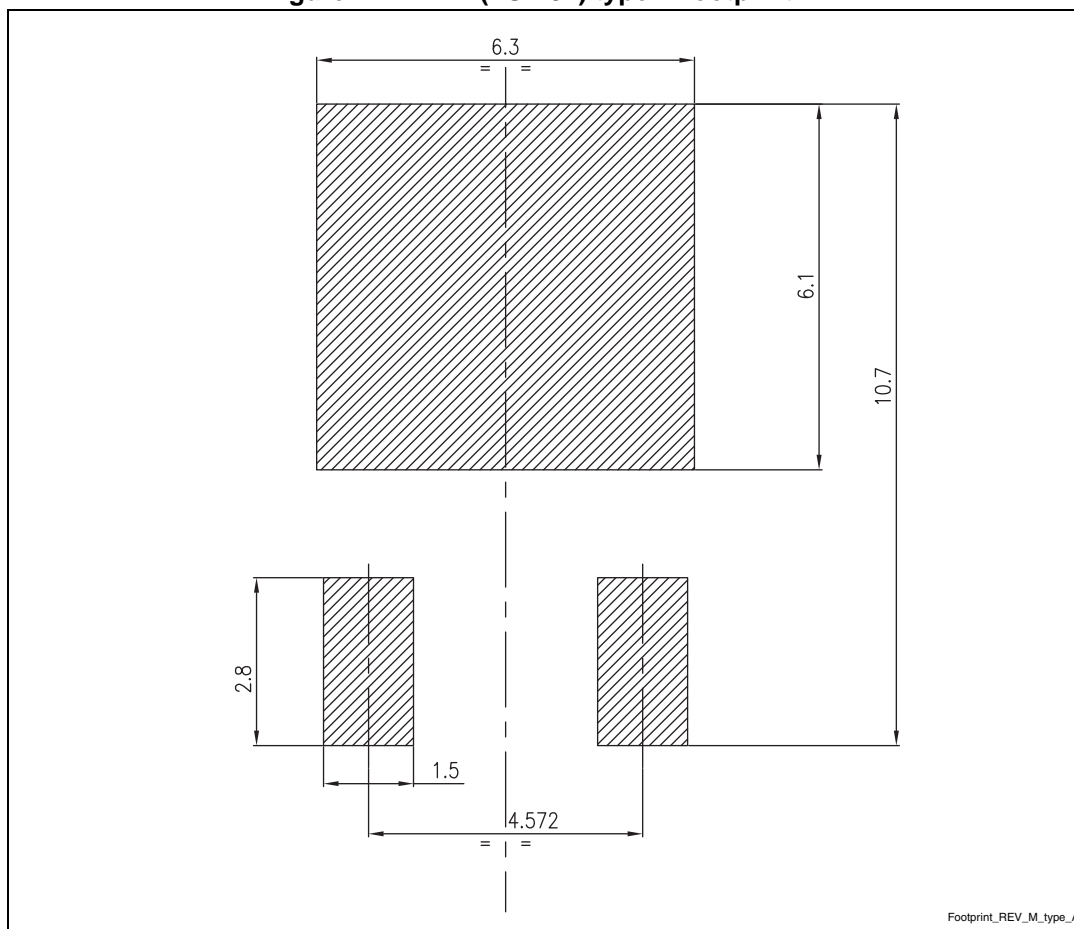


Table 8. DPAK (TO-252) type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

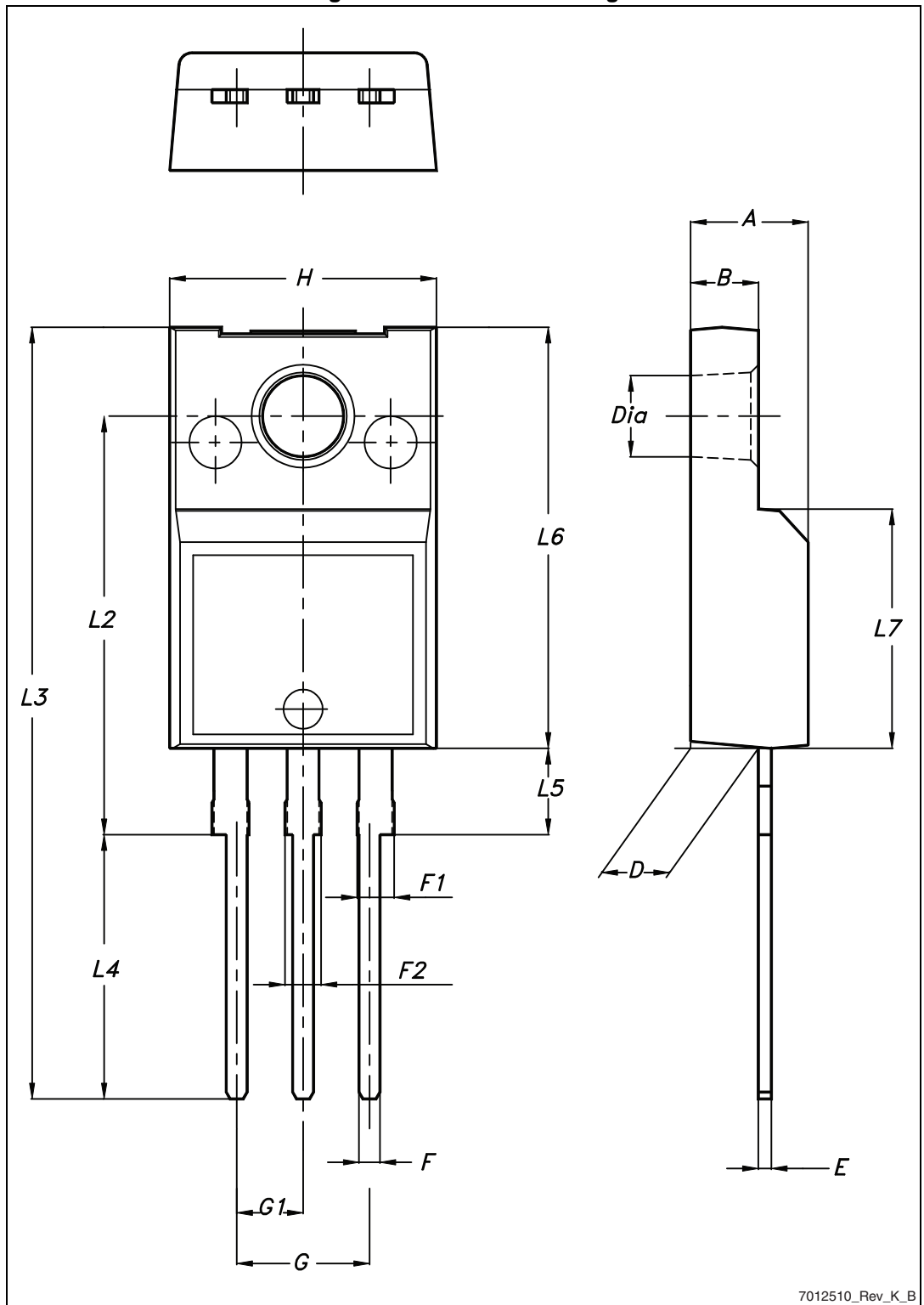
Figure 22. DPAK (TO-252) type A footprint (a)



a. All dimensions are in millimeters

4.2 TO-220FP, STF30N10F7

Figure 23. TO-220FP drawing



7012510_Rev_K_B

Table 9. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

5 Packaging mechanical data

Figure 24. Tape for DPAK (TO-252)

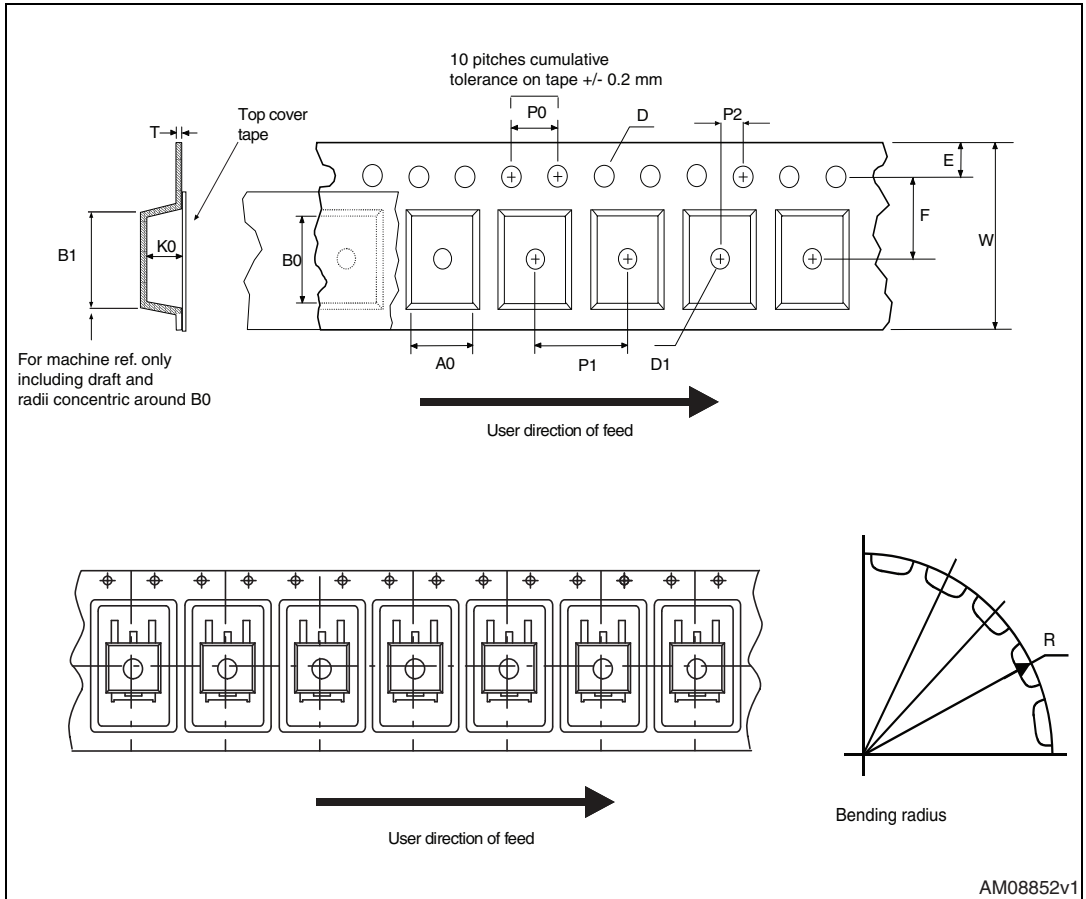


Figure 25. Reel for DPAK (TO-252)

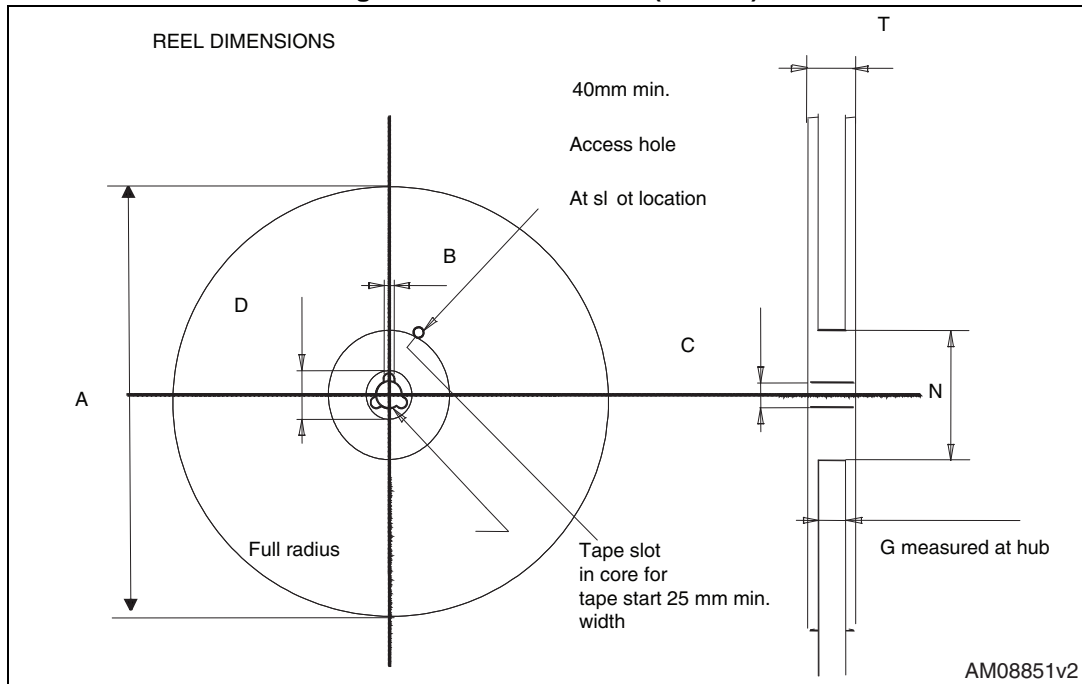


Table 10. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1		Base qty.	2500
P1	7.9	8.1		Bulk qty.	2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
28-Nov-2013	1	First release.
03-Apr-2014	2	<ul style="list-style-type: none">– Updated: Figure 15, 16, 17 and 18– Updated: Section 4.1: DPAK, STD30N10F7– Minor text changes

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