

STB18NF25, STD18NF25

Automotive-grade N-channel 250 V, 0.14 Ω, 17 A low gate charge STripFET™ II Power MOSFET in D²PAK and DPAK packages

Datasheet - production data

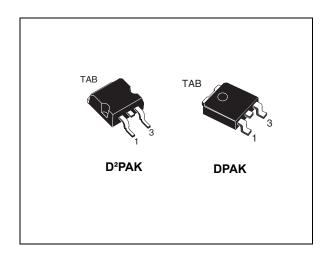
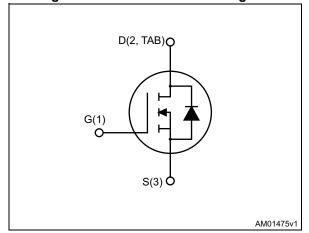


Figure 1. Internal schematic diagram



Features

Туре	V _{DS}	R _{DS(on)} max	I _D	P _{TOT}
STB18NF25	250 V	0.165Ω	17 A	110 W
STD18NF25	250 V	0.165 Ω	17 A	110 W

- Designed for automotive applications and AEC-Q101 qualified
- · Low gate charge
- 100% avalanche tested
- · Exceptional dv/dt capability

Application

· Switching applications

Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1. Device summary

Order code	Marking	Package	Packing
STB18NF25	18NF25	D²PAK	Tape and reel
STD18NF25	18NF25	DPAK	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source voltage	250	V
V _{GS}	Gate-source voltage	±20	V
I _D	Drain current (continuous) at T _C = 25 °C	17	Α
I _D	Drain current (continuous) at T _C =100 °C	12	Α
I _{DM} ⁽¹⁾	Drain current (pulsed)	68	Α
P _{TOT}	Total dissipation at T _C = 25 °C	110	W
dv/dt ⁽²⁾	Peak diode recovery voltage slope	10	V/ns
T _J T _{stg}	Operating junction temperature Storage temperature	-55 to 175	°C

^{1.} Pulse width limited by safe operating area.

Table 3. Thermal data

Symbol	Parameter	Val	Unit		
Symbol	raiailletei	D ² PAK	DPAK	Unit	
R _{thj-case}	Thermal resistance junction-case max	1.36		°C/W	
R _{thj-pcb} (1)	Thermal resistance junction-pcb max	30 50		°C/W	

^{1.} When mounted on 1inch² FR-4, 2 Oz copper board.

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I _{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by Tjmax)	17	А
E _{AS}	Single pulse avalanche energy (starting Tj = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	170	mJ

^{2.} $I_{SD} \leq$ 17 A, di/dt \leq 200 A/ μ s, $V_{DD} \leq$ 80% $V_{(BR)DSS}$

2 Electrical characteristics

(T_{CASE}=25 °C unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	V _{GS} = 0, I _D = 1 mA	250			٧
	Zoro gata valtaga drain	$V_{GS} = 0$, $V_{DS} = 250$ V,			1	μΑ
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V _{DS} = 250 V,Tc=125 °C			10	μΑ
I _{GSS}	Gate body leakage current	$V_{DS} = 0, V_{GS} = \pm 20 \text{ V}$			±100	nΑ
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2	3	4	٧
R _{DS(on)}	Static drain-source on- resistance	V _{GS} = 10 V, I _D = 8.5 A		0.14	0.165	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
g _{fs} ⁽¹⁾	Forward transconductance	$V_{DS} = 15 \text{ V}, I_D = 8.5 \text{ A}$	-	14	-	S
C _{iss}	Input capacitance		-	1000	-	pF
C _{oss}	Output capacitance	V _{DS} = 25 V, f = 1 MHz,		178		pF
C _{rss}	Reverse transfer capacitance	V _{GS} =0		28		pF
C _{o(tr)}	Equivalent capacitance time related	V 04 000 V V 0	-	106	-	pF
C _{o(er)}	Equivalent capacitance energy related	$V_{DS} = 0$ to 200 V, $V_{GS} = 0$	-	79	-	pF
Qg	Total gate charge		-	29.5	-	nC
Q_{gs}	Gate-source charge	V_{DD} = 200 V, I_{D} = 17 A V_{GS} = 10 V (see <i>Figure 17</i>)		4.8		nC
Q _{gd}	Gate-drain charge	regs to t (occ rigate rr)		15.6		nC
R_{G}	Gate input resistance	f = 1 MHz gate DC bias =0 test signal level=20 mV open drain	-	2	-	Ω

^{1.} Pulsed: pulse duration=300 μ s, duty cycle 1.5%

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Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 125 V, I _D = 8.5 A,	-	8.8	-	ns
t _r	Rise time	$R_G = 4.7 \Omega$, $V_{GS} = 10 V$ (see <i>Figure 16</i>)		17.2		ns
t _{d(off)}	Turn-off delay time	V _{DD} = 125 V, I _D = 8.5 A,	-	21	-	ns
t _f	Fall time	$R_G = 4.7 \Omega V_{GS} = 10 V$ (see <i>Figure 16</i>)		8.8		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain current		-		17	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)				68	Α
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} = 17 A, V _{GS} =0	-		1.5	V
t _{rr}	Reverse recovery time	I _{SD} = 17 A, di/dt = 100 A/μs,	-	157		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 50 V		0.91		μC
I _{RRM}	Reverse recovery current	(see Figure 18)		11.6		Α
t _{rr}	Reverse recovery time	I _{SD} = 17 A, di/dt = 100 A/μs,	-	196		ns
Q _{rr}	Reverse recovery charge	V _{DD} = 50 V, Tj = 150 °C		1.34		μC
I _{RRM}	Reverse recovery current	(see Figure 18)		13.7		Α

^{1.} Pulse width limited by safe operating area

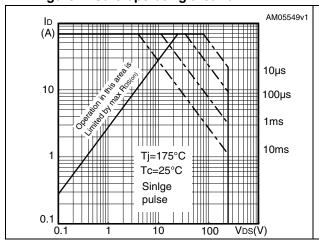


^{2.} Pulsed: pulse duration=300 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for D²PAK

Figure 3. Thermal impedance for D²PAK



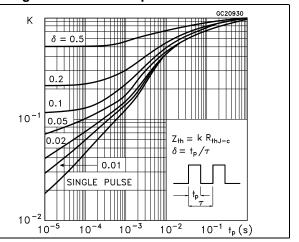
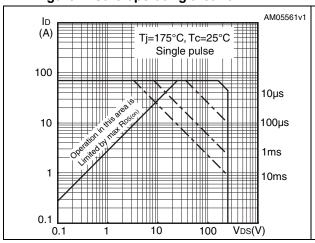


Figure 4. Safe operating area for DPAK

Figure 5. Thermal impedance for DPAK



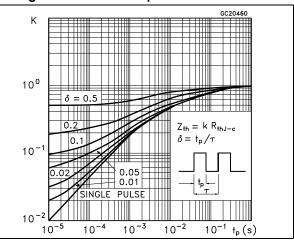
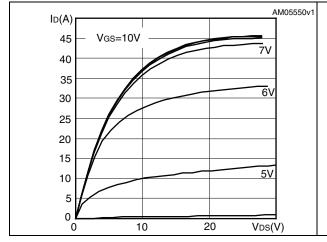


Figure 6. Output characteristics

Figure 7. Transfer characteristics



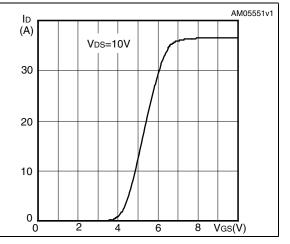
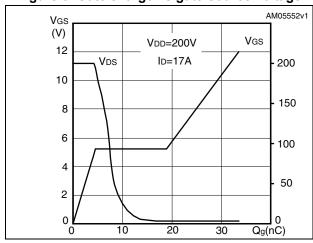


Figure 8. Gate charge vs gate-source voltage

Figure 9. Static drain-source on-resistance



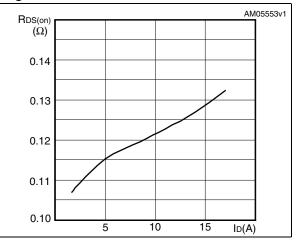
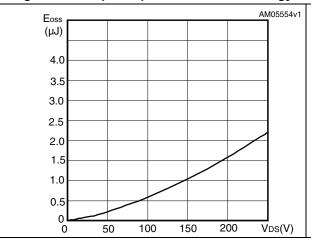


Figure 10. Output capacitance stored energy

Figure 11. Capacitance variations



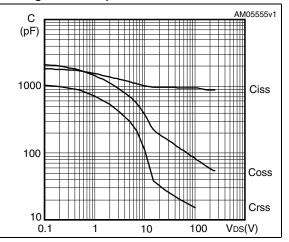
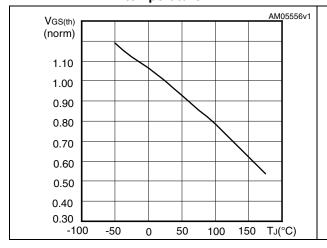
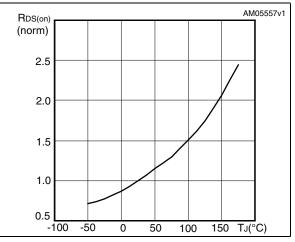


Figure 12. Normalized gate threshold voltage vs temperature

Figure 13. Normalized on resistance vs temperature

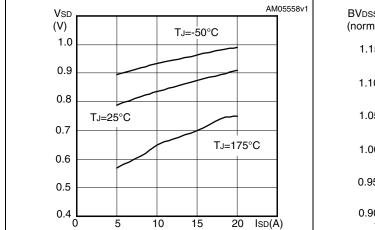


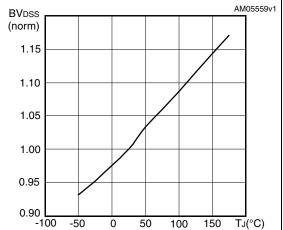


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Figure 14. Source-drain diode forward characteristics

Figure 15. Normalized B_{VDSS} vs temperature





3 Test circuits

Figure 16. Switching times test circuit for resistive load

Figure 17. Gate charge test circuit

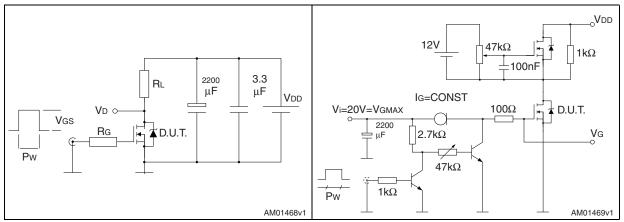


Figure 18. Test circuit for inductive load switching and diode recovery times

Figure 19. Unclamped inductive load test circuit

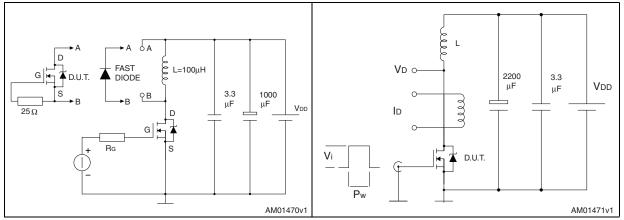
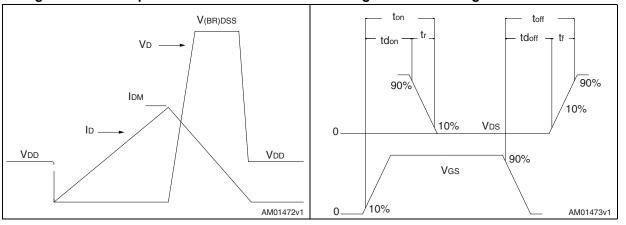


Figure 20. Unclamped inductive waveform

Figure 21. 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 D²PAK (TO-263) package information

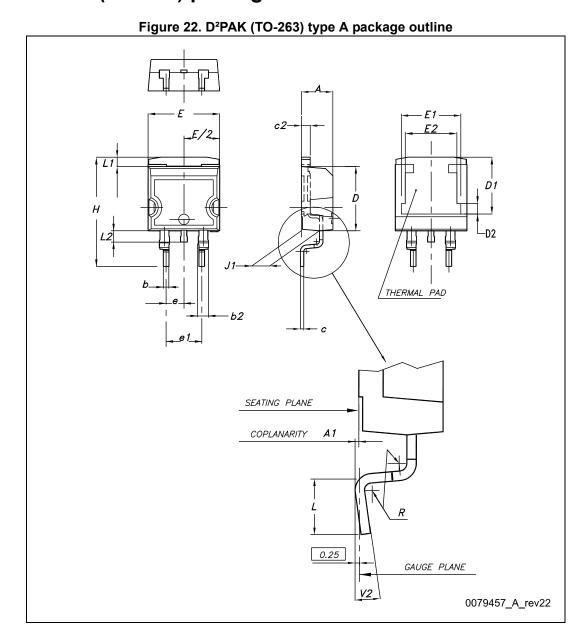


Table 9. D²PAK (TO-263) type A mechanical data

Dim	(10	mm				
Dim.	Min.	Тур.	Max.			
А	4.40		4.60			
A1	0.03		0.23			
b	0.70		0.93			
b2	1.14		1.70			
С	0.45		0.60			
c2	1.23		1.36			
D	8.95		9.35			
D1	7.50	7.75	8.00			
D2	1.10	1.30	1.50			
Е	10		10.40			
E1	8.50	8.70	8.90			
E2	6.85	7.05	7.25			
е		2.54				
e1	4.88		5.28			
Н	15		15.85			
J1	2.49		2.69			
L	2.29		2.79			
L1	1.27		1.40			
L2	1.30		1.75			
R		0.4				
V2	0°		8°			

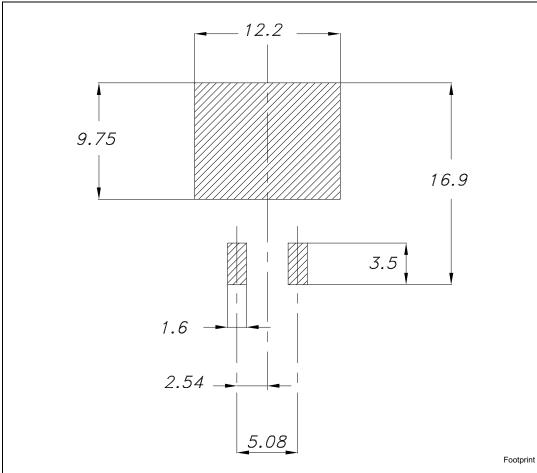


Figure 23. D²PAK footprint^(a)

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a. All dimensions are in millimeters

4.2 DPAK (TO-252) package information

THERMAL PAD <u>c</u>2 E1 **L4** <u>b(</u>2x) R e1-С SEATING PLANE (L1) *V2* GAUGE PL 0,25 0068772_A19

Figure 24. DPAK (TO-252) type A package outline

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Table 10. DPAK (TO-252) type A mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
С	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1	4.95	5.10	5.25
Е	6.40		6.60
E1	4.60	4.70	4.80
е	2.16	2.28	2.40
e1	4.40		4.60
Н	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

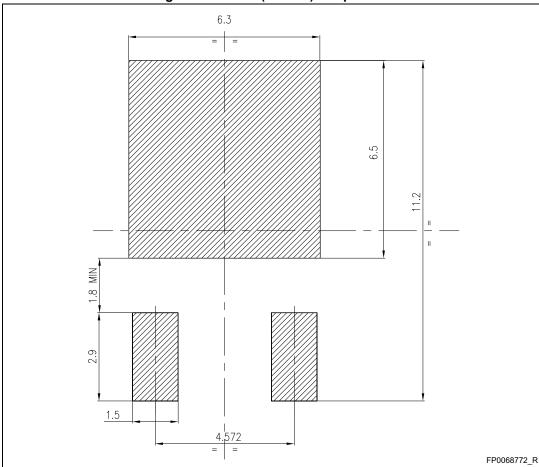
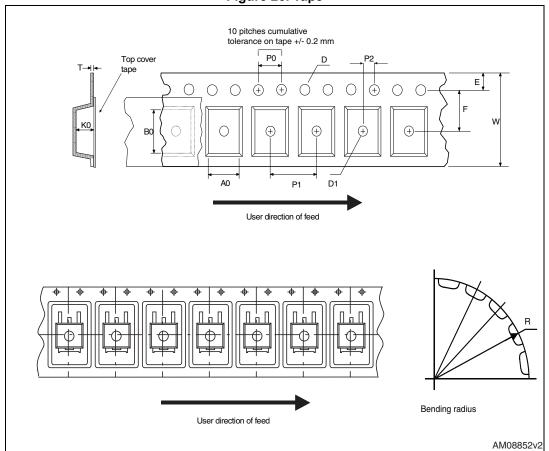


Figure 25. DPAK (TO-252) footprint ^(b)

b. All dimensions are in millimeters

4.3 Packing information

Figure 26. Tape



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REEL DIMENSIONS

T

40mm min.

Access hole

At slot location

Full radius

Tape slot in core for tape start 25 mm min. width

AM08851v2

Figure 27. Reel

Table 11. D²PAK (TO-263) tape and reel mechanical data

Таре				Reel		
Dim.	mm		Dim.	mm		
	Min.	Max.	Dim.	Min.	Max.	
A0	10.5	10.7	Α		330	
В0	15.7	15.9	В	1.5		
D	1.5	1.6	С	12.8	13.2	
D1	1.59	1.61	D	20.2		
Е	1.65	1.85	G	24.4	26.4	
F	11.4	11.6	N	100		
K0	4.8	5.0	Т		30.4	
P0	3.9	4.1				
P1	11.9	12.1	Base qty 1000		1000	
P2	1.9	2.1	Bulk qty 1000			
R	50					
Т	0.25	0.35				
W	23.7	24.3				

Table 12. DPAK (TO-252) tape and reel mechanical data

Таре				Reel		
Dim.	m	nm	Dim.	mm		
	Min.	Max.		Min.	Max.	
A0	6.8	7	Α		330	
В0	10.4	10.6	В	1.5		
B1		12.1	С	12.8	13.2	
D	1.5	1.6	D	20.2		
D1	1.5		G	16.4	18.4	
Е	1.65	1.85	N	50		
F	7.4	7.6	Т		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					
Т	0.25	0.35				
W	15.7	16.3				

5 Revision history

Table 13. Document revision history

Date	Revision	Changes
16-Nov-2009	1	First release
19-Feb-2010	2	V _{DS} value in <i>Table 8</i> has been corrected.
26-Apr-2012 3		Updated E _{AS} in <i>Table 4: Avalanche data</i> , Section 4: Package information and Section 4.3: Packing information. Minor text changes.
10-Sep-2015 4		Updated 4.2: DPAK (TO-252) package information Minor text changes.



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