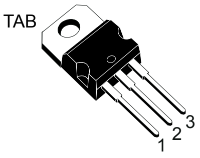
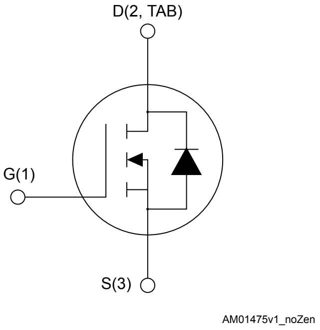
STP17NF25

Datasheet

N-channel 250 V, 140 mΩ typ., 17 A STripFET II Power MOSFET in a TO-220 package



TO-220



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STP17NF25	250 V	165 mΩ	17 A

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

Applications

- Switching applications

Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device 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.

Product status link
STP17NF25

Product summary	
Order code	STP17NF25
Marking	17NF25
Package	TO-220
Packing	Tube

1 Electrical ratings

Table 1. 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	A
	Drain current (continuous) at T_C = 100 °C	10	
I_{DM}(1)	Drain current (pulsed)	68	A
P_{TOT}	Total power dissipation at T_C = 25 °C	90	W
dv/dt(2)	Peak diode recovery voltage slope	10	V/ns
T_{stg}	Storage temperature range	-55 to 150	°C
T_J	Operating junction temperature range		°C

1. *Pulse width is limited by safe operating area.*
2. $I_{SD} \leq 17$ *A, di/dt* ≤ *200 A/µs,* V_{DS} *(peak)* < $V_{(BR)DSS}$, $V_{DD} = 80\% V_{(BR)DSS}$.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.38	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	°C/W

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	17	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	100	mJ

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 = 1 mA, V_{GS} = 0 V	250			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 250 V			1	µA
		V_{GS} = 0 V, V_{DS} = 250 V, T_C = 125 °C(1)			10	
I_{GSS}	Gate body leakage current	V_{DS} = 0 V, V_{GS} = ±20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS} = 10 V, I_D = 8.5 A		140	165	mΩ

1. *Specified by design, not tested in production.*

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	-	1000	-	pF
C_{oss}	Output capacitance		-	178	-	pF
C_{rss}	Reverse transfer capacitance		-	28	-	pF
$C_{oss\ eq.}$(1)	Equivalent output capacitance	V_{DS} = 0 to 200 V, V_{GS} = 0 V	-	135	-	pF
R_g	Gate input resistance	f = 1 MHz, I_D = 0 A	-	2	-	Ω
Q_g	Total gate charge	V_{DD} = 200 V, I_D = 17 A, V_{GS} = 0 to 10 V (see Figure 13. Test circuit for gate charge behavior)	-	29.5	-	nC
Q_{gs}	Gate-source charge		-	4.8	-	nC
Q_{gd}	Gate-drain charge		-	15.6	-	nC

1. *$C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}.*

Table 6. **Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 125 V, I_D = 8.5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	8.8	-	ns
t_r	Rise time		-	17.2	-	ns
$t_{d(off)}$	Turn-off delay time		-	21	-	ns
t_f	Fall time		-	8.8	-	ns

Table 7. **Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		17	A
I_{SDM}(1)	Source-drain current (pulsed)		-		68	A
V_{SD}(2)	Forward on voltage	I_{SD} = 17 A, V_{GS} = 0 V	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 17 A, di/dt = 100 A/µs, V_{DD} = 50 V (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	157		ns
Q_{rr}	Reverse recovery charge		-	0.91		µC
I_{RRM}	Reverse recovery current		-	11.6		A
t_{rr}	Reverse recovery time	I_{SD} = 17 A, di/dt = 100 A/µs, V_{DD} = 50 V, T_J = 150 °C (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	196		ns
Q_{rr}	Reverse recovery charge		-	1.34		µC
I_{RRM}	Reverse recovery current		-	13.7		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 1. **Safe operating area**

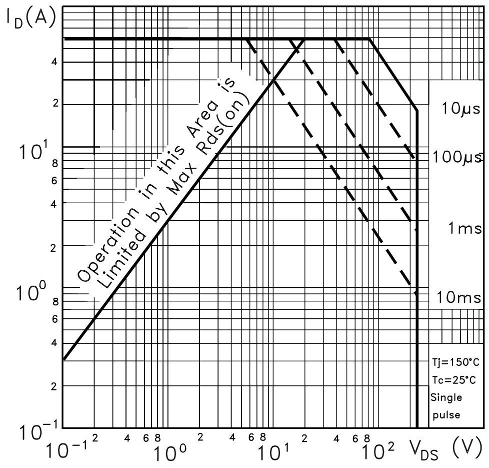


Figure 2. **Thermal impedance**

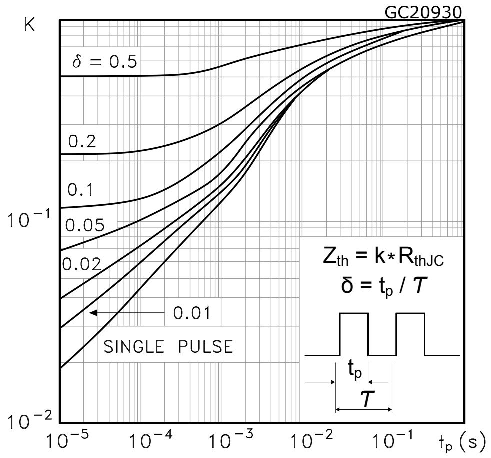


Figure 3. **Output characterisics**

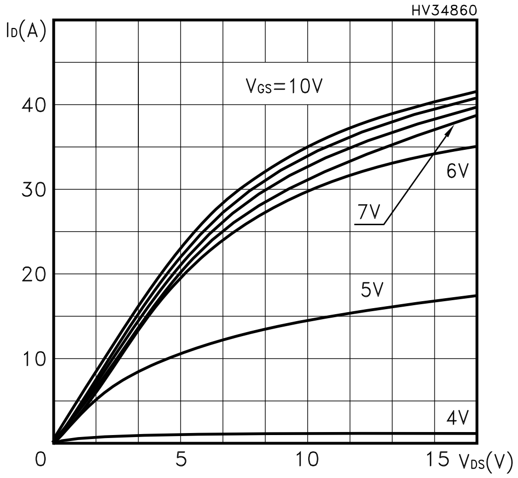


Figure 4. **Transfer characteristics**

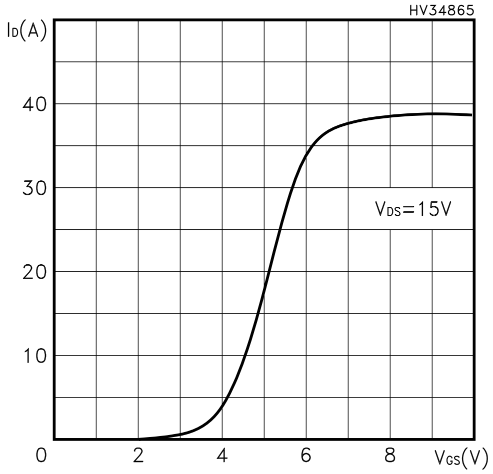


Figure 5. **Normalized $V_{(BR)DSS}$ vs temperature**

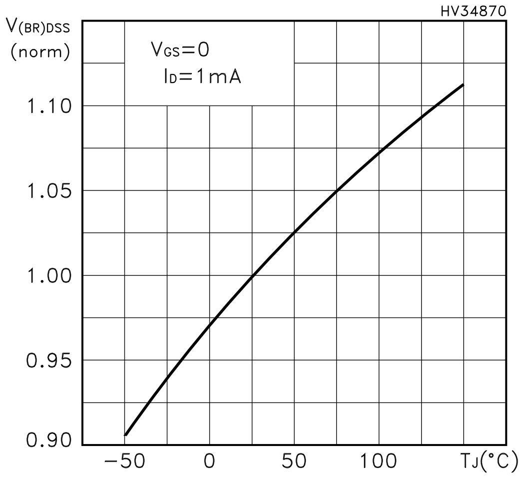


Figure 6. **Static drain-source on resistance**

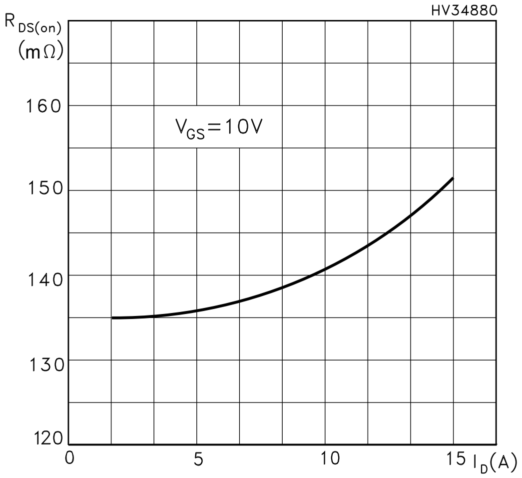


Figure 7. Gate charge vs gate-source voltage

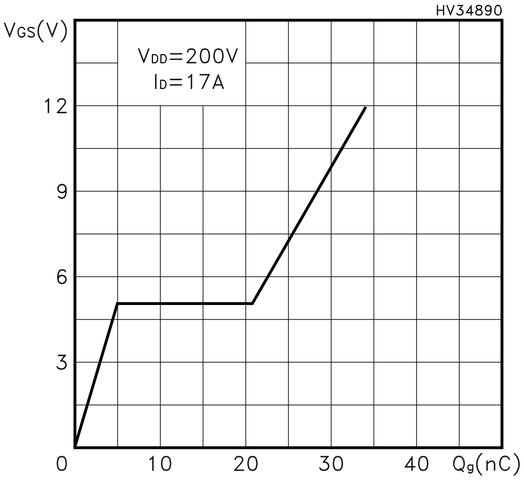


Figure 8. Capacitance variations

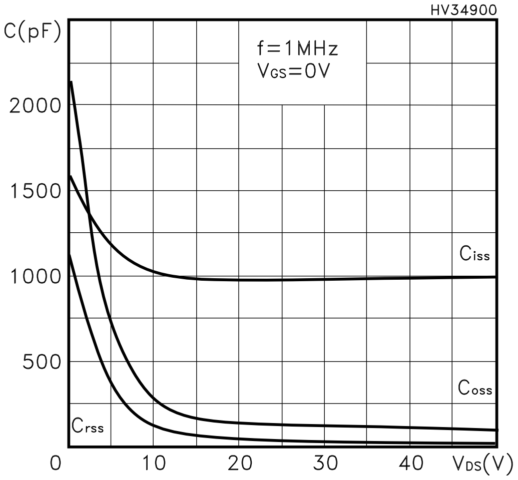


Figure 9. Normalized gate threshold voltage vs temperature

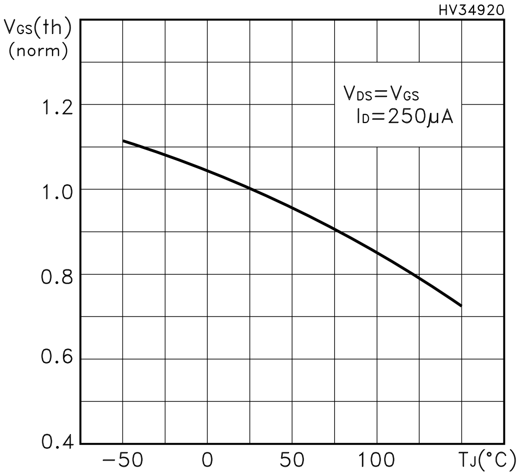


Figure 10. Normalized on resistance vs temperature

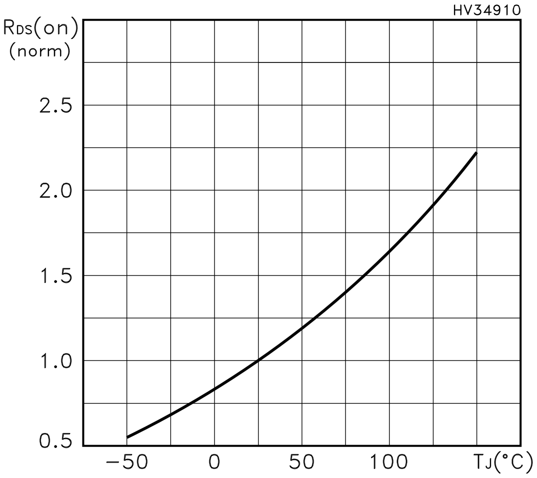
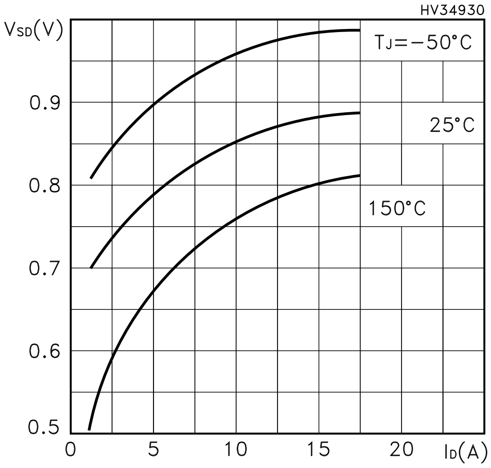


Figure 11. Source-drain diode forward characteristics



3 Test circuits

Figure 12. Test circuit for resistive load switching times

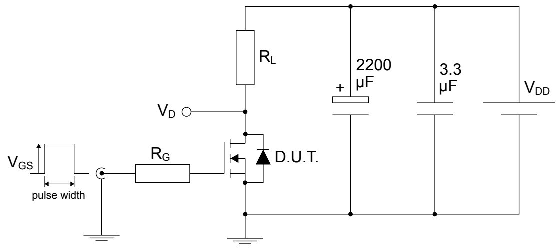


Figure 13. Test circuit for gate charge behavior

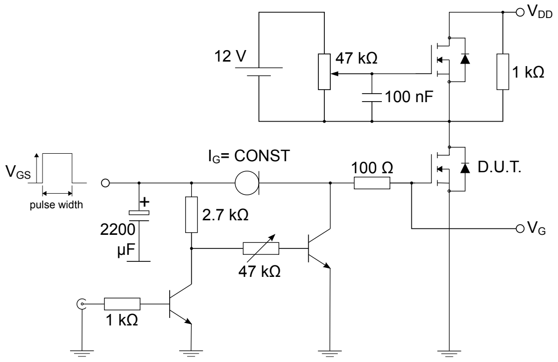


Figure 14. Test circuit for inductive load switching and diode recovery times

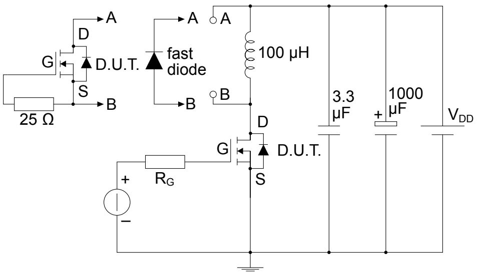


Figure 15. Unclamped inductive load test circuit

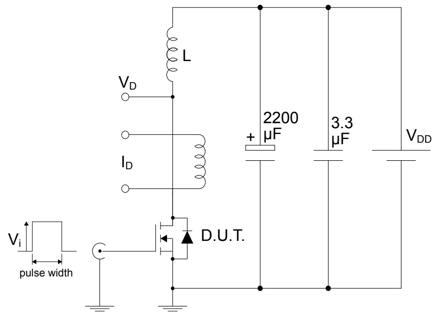


Figure 16. Unclamped inductive waveform

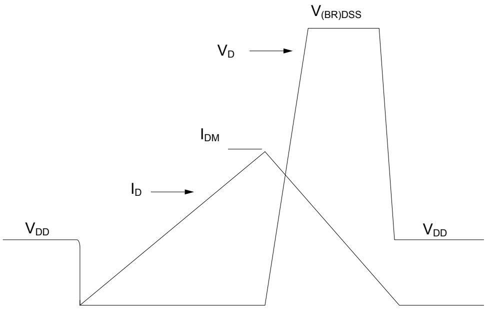
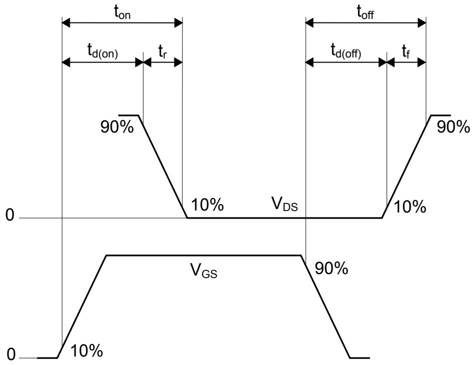


Figure 17. Switching time waveform

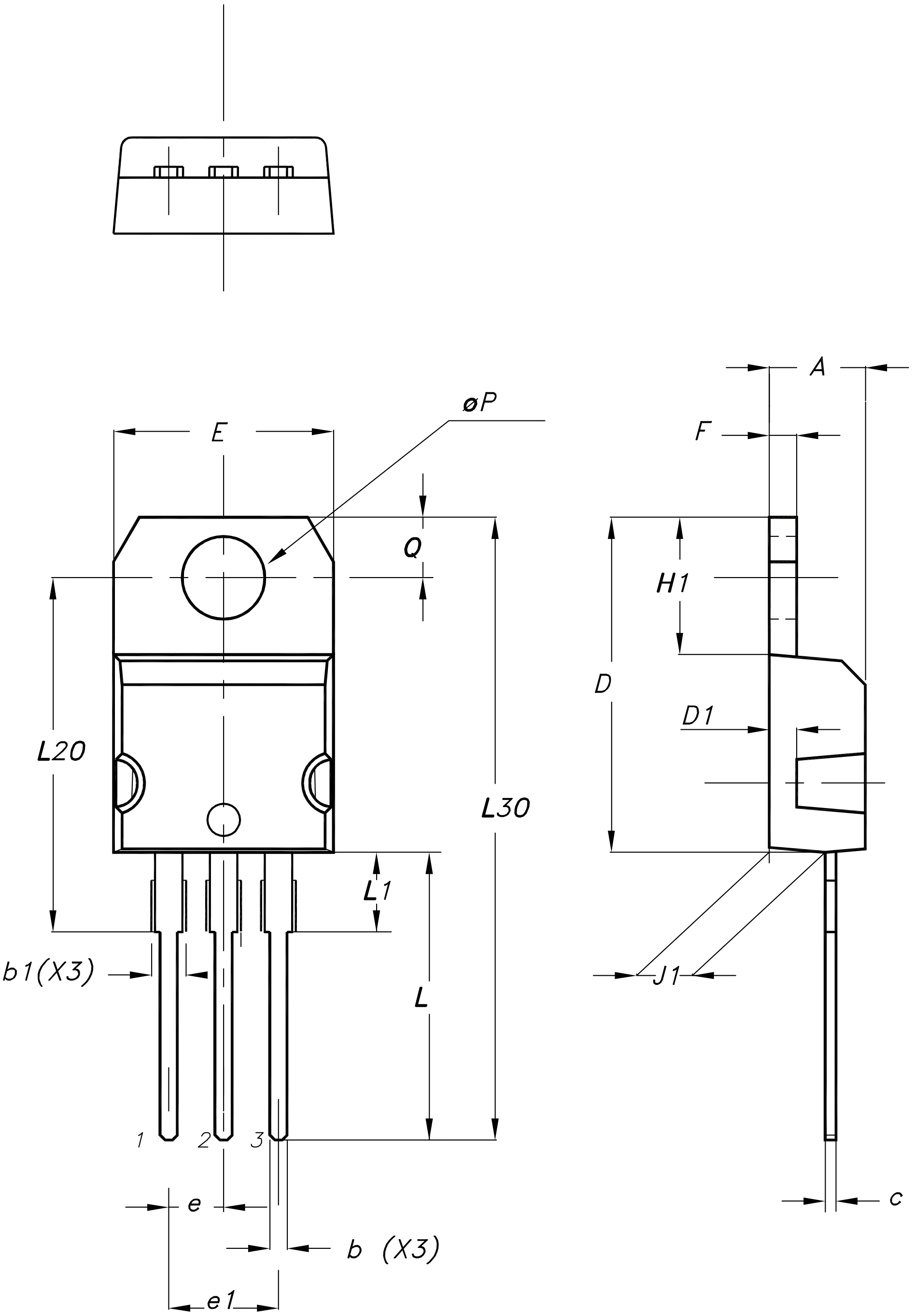


4 Package information

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 TO-220 type A package information

Figure 18. TO-220 type A package outline



0015988_typeA_Rev_23

Table 8. **TO-220 type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

Revision history

Table 9. **Document revision history**

Date	Revision	Changes
18-Jul-2023	1	First release. Part number STP17NF25 previously included in datasheet DS5089.

Contents

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