STE140NF20D

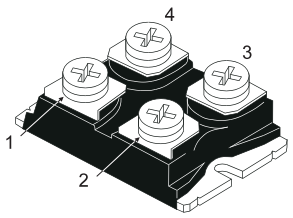
N-channel 200 V, 0.010 Ω, 140 A, ISOTOP STripFET™ II with fast recovery diode Power MOSFET

Preliminary Data

Features

Type	V_{DSS}	$R_{DS(on)}$ max	I_D
STE140NF20D	200 V	< 0.012 Ω	140 A

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



ISOTOP

Application

- Switching applications

Description

This Power MOSFET is produced using STMicroelectronics' unique STripFET™ process, which is specifically designed to minimize input capacitance and gate charge. The STE140NF20D offers extremely fast switching performance thanks to the instrinsic fast body diode, making the device ideal for hard switching topologies.

Figure 1. Internal schematic diagram

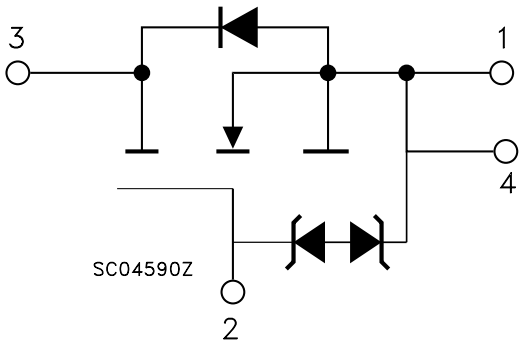


Table 1. Device summary

Order code	Marking	Package	Packaging
STE140NF20D	140NF20D	ISOTOP	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	200	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	140	A
I_D (1)	Drain current (continuous) at T_C=100 °C	260	A
I_{DM} (2)	Drain current (pulsed)	560	A
P_{TOT} (2)	Total dissipation at T_C = 25 °C	500	W
	Derating factor	4	W/°C
dv/dt (3)	Peak diode recovery voltage slope	25	V/ns
T_J T_{stg}	Operating junction temperature Storage temperature	- 55 to 150	°C

1. The value is rated according $R_{thj\text{-}pcb}$
2. Pulse width limited by safe operating area
3. $I_{SD} \leq$ 30 A, di/dt $\leq$ TBD A/µs, $V_{DD} \leq$ 80% $V_{(BR)DSS}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	0.25	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	40	°C/W

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (1)	TBD	A
E_{AS}	Single pulse avalanche energy (2)	TBD	mJ

1. Pulse width limited by Tjmax
2. Strating Tj = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V

2 Electrical characteristics

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

Table 5. 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	200			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = max rating, V_{DS} =max rating @125 °C			10 100	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±21 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= 70 A		0.010	0.012	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	I_D = 140 A, V_{DS} = 150 V		TBD		
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f=1 MHz, V_{GS}=0		9900 2000 450		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}=480 V, I_D = 140A V_{GS}= 4.5 V *(see Figure 3)*		390 TBD TBD		nC nC nC

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 100 V, I_D= 70 A, R_G=4.7 Ω, V_{GS} =10 V *(see Figure 2)*		TBD TBD TBD TBD		ns ns ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				140	A
I_{SDM}(1)	Source-drain current (pulsed)				560	A
V_{SD}(2)	Forward on voltage	I_{SD} = 70 A, V_{GS}=0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 70 A, di/dt = 100 A/µs, V_{DD}= 100 V, Tj=150 °C		TBD TBD TBD		ns nC A

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

3 Test circuit

Figure 2. Switching times test circuit for resistive load

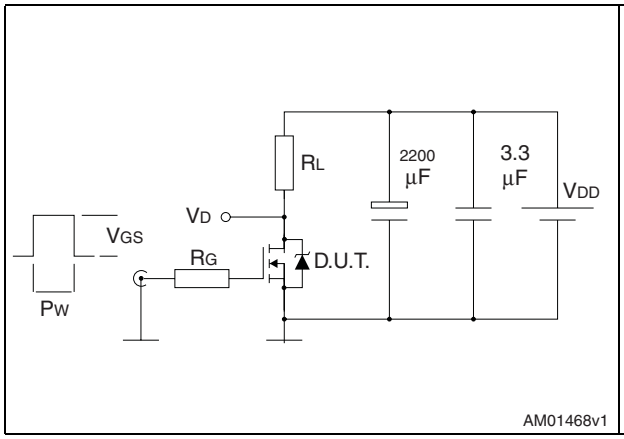


Figure 3. Gate charge test circuit

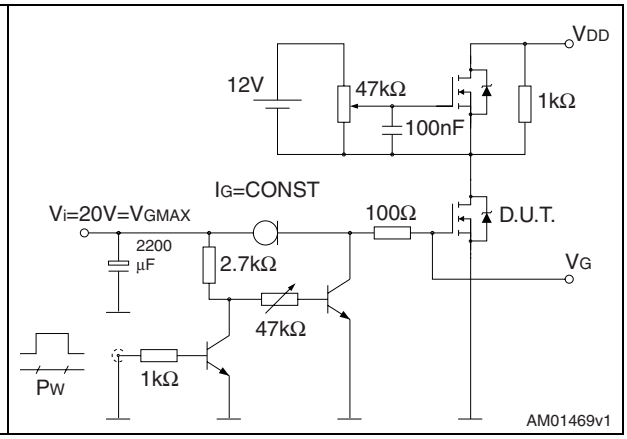


Figure 4. Test circuit for inductive load switching and diode recovery times

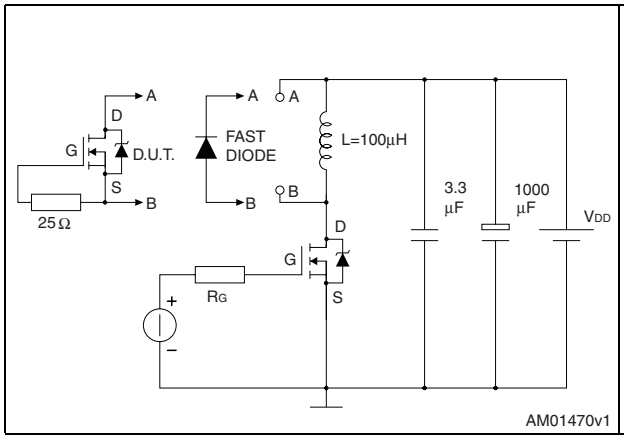


Figure 5. Unclamped inductive load test circuit

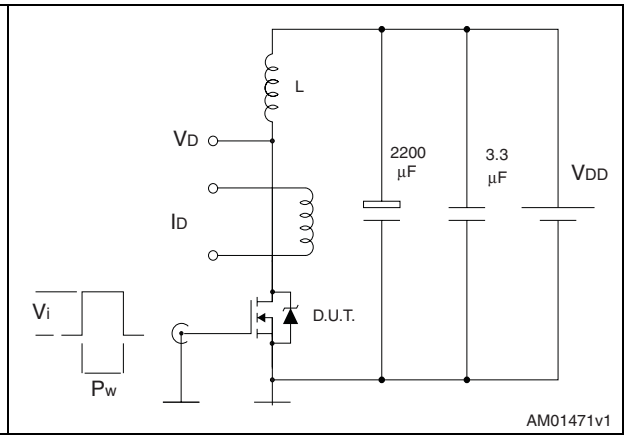


Figure 6. Unclamped inductive waveform

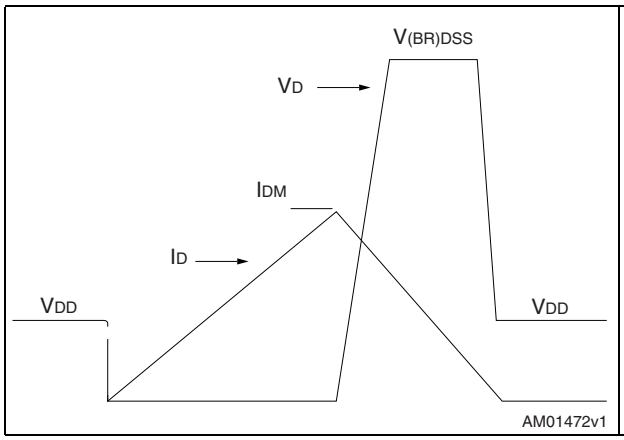
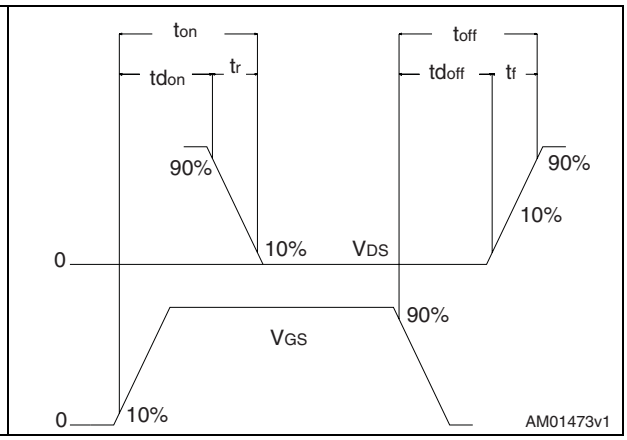


Figure 7. Switching time waveform



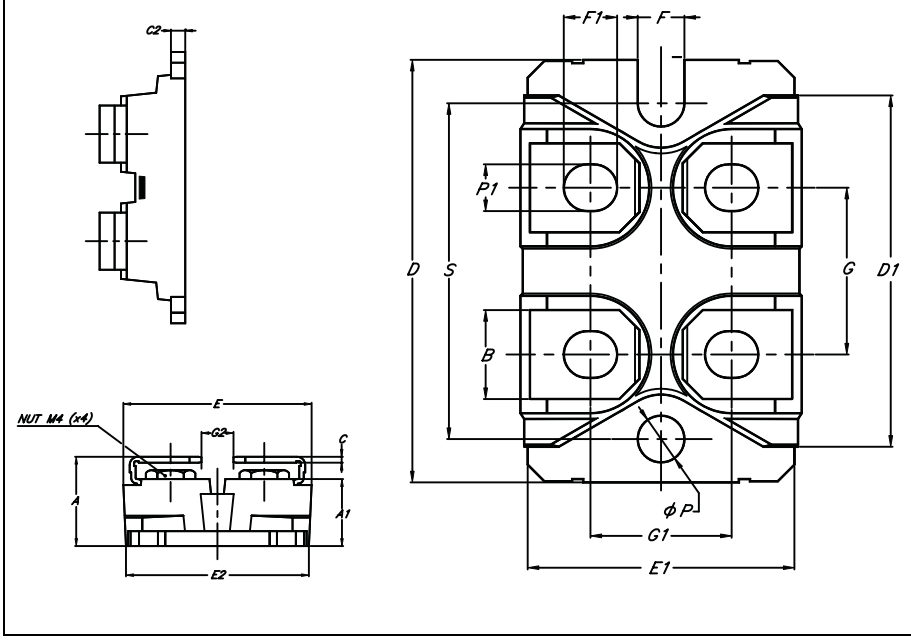
4 Package mechanical data

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.

Table 9. ISOTOP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	11.80		12.20
A1	8.90		9.10
B	7.80		8.20
C	0.75		0.85
C2	1.95		2.05
D	37.80		38.20
D1	31.50		31.70
E	25.15		25.50
E1	23.85		24.15
E2		24.80	
G	14.90		15.10
G1	12.60		12.80
G2	3.50		4.30
F	4.10		4.30
F1	4.60		5
ϕP	4		4.30
P1	4		4.40
S	30.10		30.30

Figure 8. ISOTOP drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
27-Jan-2009	1	First release

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