



STE110NS20FD

N-channel 200V - 0.022Ω - 110A - ISOTOP
MESH OVERLAY™ Power MOSFET

General features

Type	V _{DSS}	R _{DS(on)}	I _D
STE110NS20FD	200V	<0.024Ω	110A

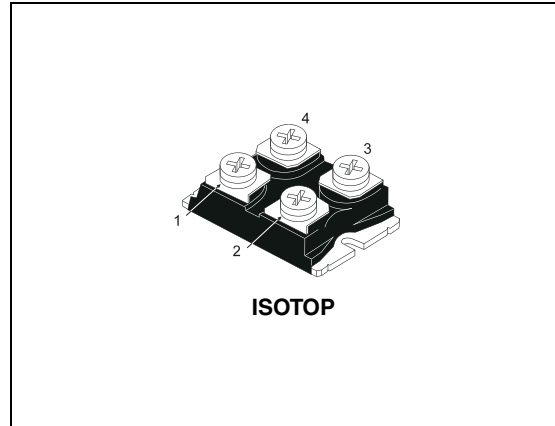
- Extremely high dv/dt capability
- 100% avalanche tested
- Gate charge minimized
- ± 20V gate to source voltage rating
- Low intrinsic capacitance
- Fast body-drain diode: low trr, Qrr

Description

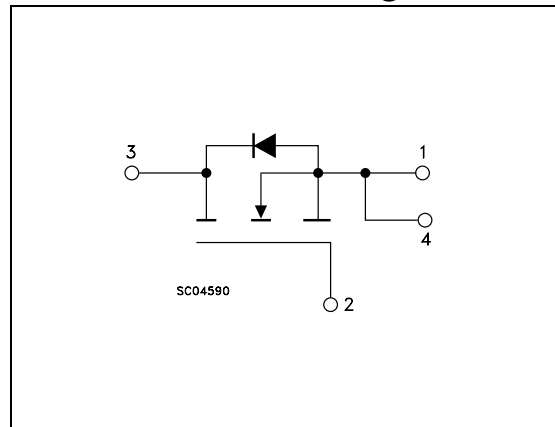
Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of Power MOSFETs with outstanding performances. The new patented STrip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(ON)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STE110NS20FD	E110NS20FD	ISOTOP	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	200	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	200	V
V_{GS}	Gate- source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	110	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	69	A
$I_{DM}^{(1)}$	Drain current (pulsed)	440	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	500	W
	Derating factor	4	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	25	V/ns
V_{ISO}	Insulation withstand voltage (AC-RMS)	2500	V
T_{stg}	Storage temperature	-65 to 150	$^\circ\text{C}$
T_j	Max. operating junction temperature	150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

2. $I_{SD} \leq 110\text{A}$, $di/dt \leq 200\text{A}/\mu\text{s}$, $V_{DD} = 80\% V_{(BR)DSS}$

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case Max	0.25	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient Max	30	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

Table 3. Avalanche data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	110	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{V}$)	750	mJ

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	200			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}, @125^{\circ}C$			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20V$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 50A$		0.022	0.024	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $I_D = 50A$		30		S
C_{iss}	Input capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		7900		pF
C_{oss}	Output capacitance			1500		pF
C_{rss}	Reverse transfer capacitance			460		pF
Q_g	Total gate charge	$V_{DD} = 100V, I_D = 100A,$		360	504	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10V$		35		nC
Q_{gd}	Gate-drain charge	(see Figure 13)		135		nC

1. Pulsed: pulse duration=300 μs , duty cycle 1.5%

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 100V, I_D = 50A$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		40		ns
t_r	Rise time			130		ns
$t_{r(Voff)}$	Off-voltage rise time	$V_{DD} = 100V, I_D = 100A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see Figure 12)		245		ns
t_f	Fall time			140		ns
t_c	Cross-over time			220		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				110	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				440	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 100A, V_{GS} = 0$			1.6	V
t_{rr}	Reverse recovery time	$I_{SD}=100A, T_j=150^\circ C$ $di/dt = 100A/\mu s,$ $V_{DD}=160V,$ (see Figure 17)		225		ns
Q_{rr}	Reverse recovery charge			1.35		μC
I_{RRM}	Reverse recovery current			12		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

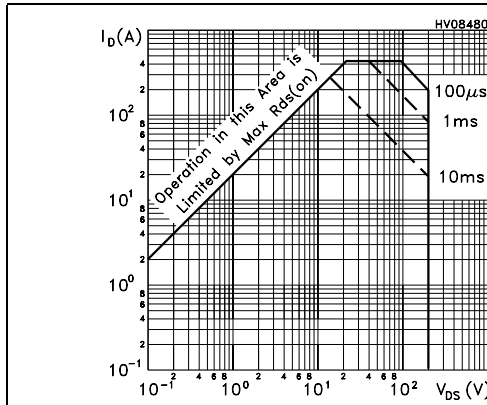


Figure 2. Thermal impedance

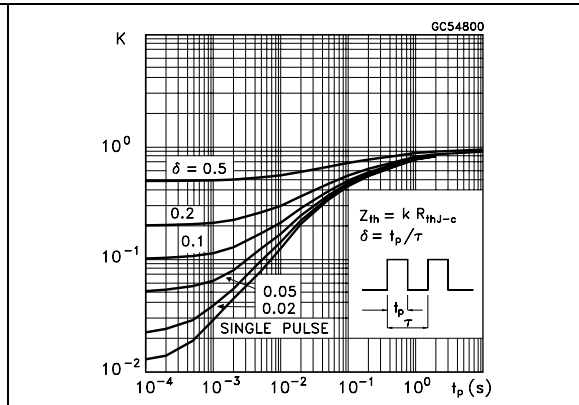


Figure 3. Output characteristics

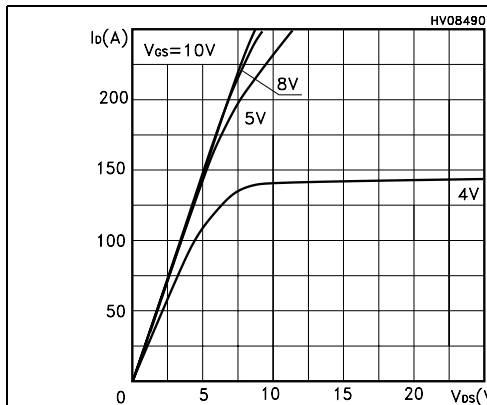


Figure 4. Transfer characteristics

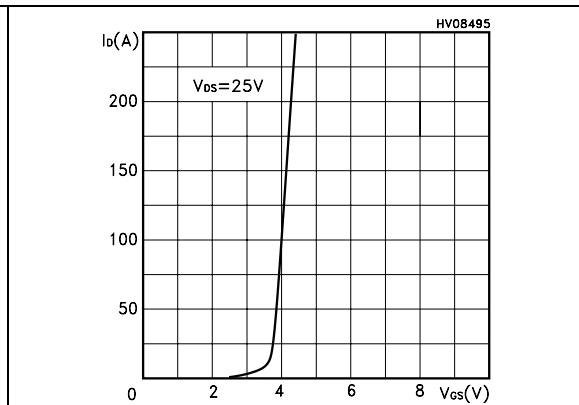


Figure 5. Transconductance

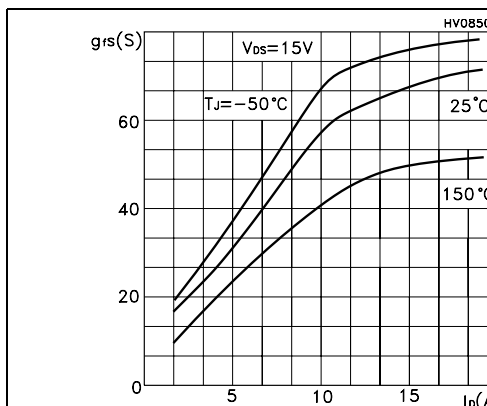


Figure 6. Static drain-source on resistance

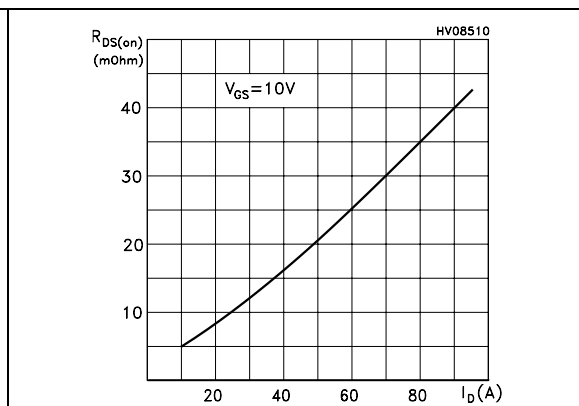


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

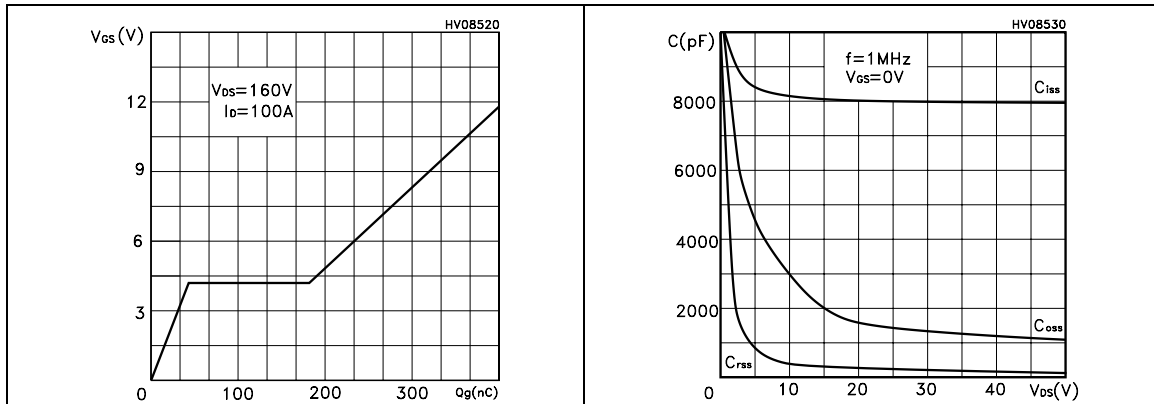


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

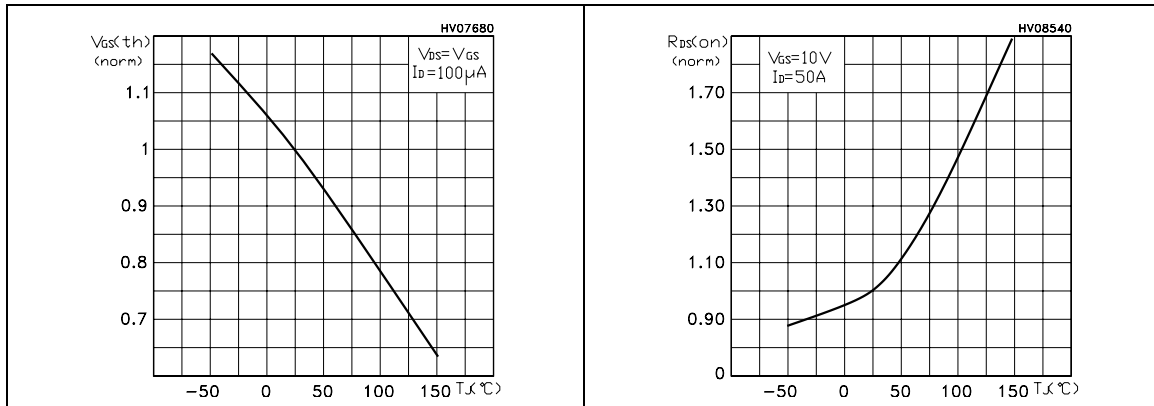
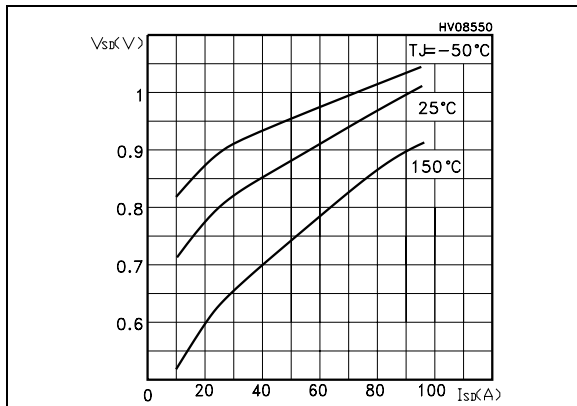


Figure 11. Source-drain diode forward characteristics



3 Test circuit

Figure 12. Switching times test circuit for resistive load

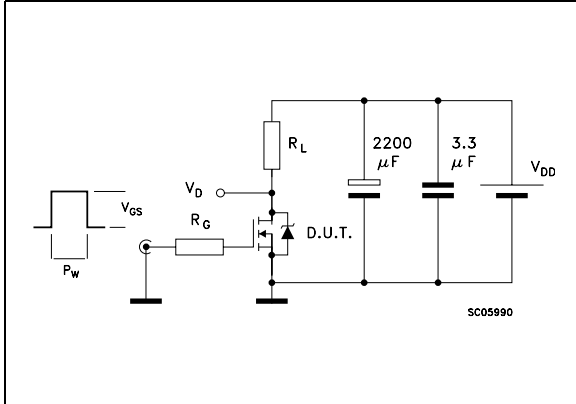


Figure 13. Gate charge test circuit

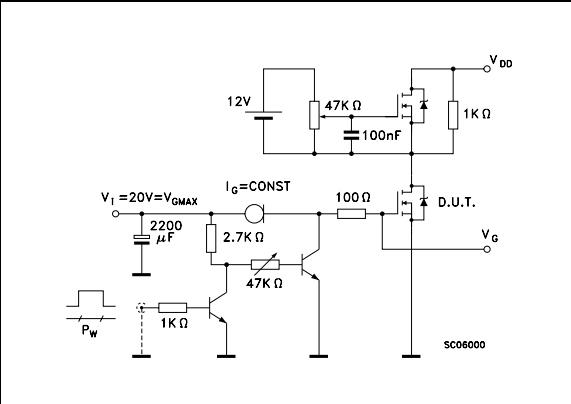


Figure 14. Test circuit for inductive load switching and diode recovery times

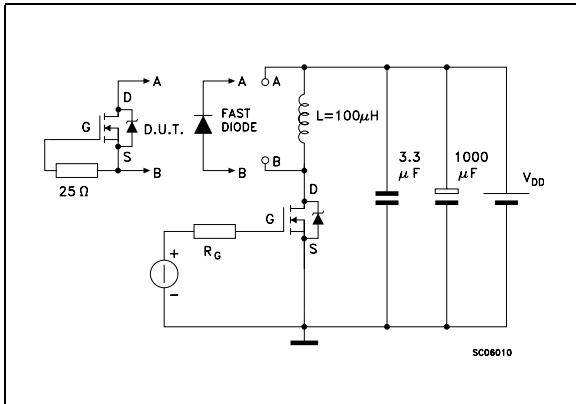


Figure 15. Unclamped inductive load test circuit

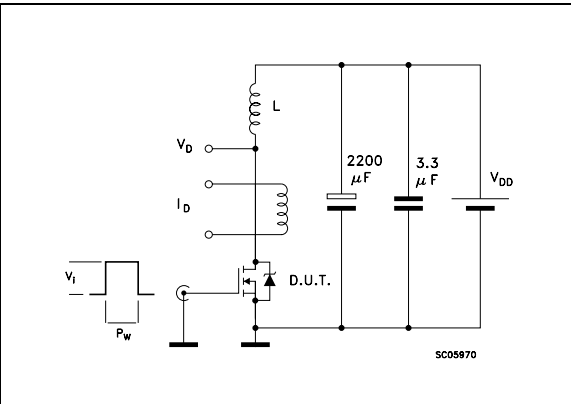


Figure 16. Unclamped inductive waveform

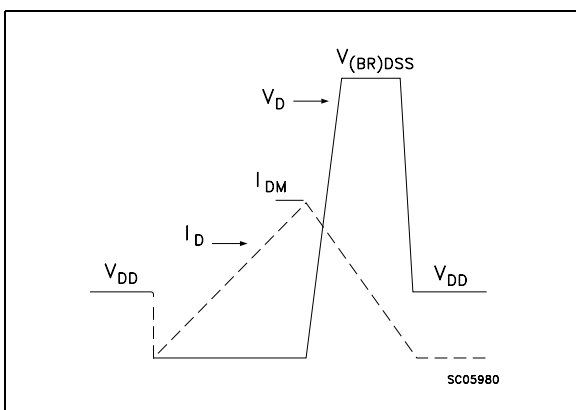
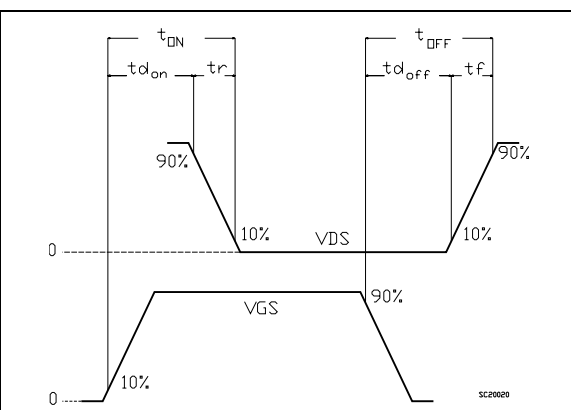


Figure 17. Switching time waveform

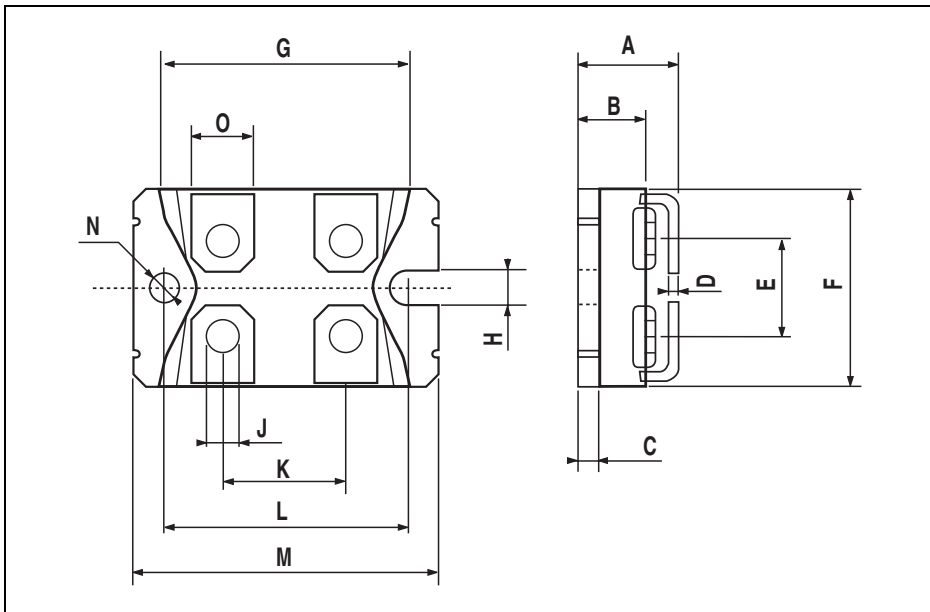


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at : www.st.com

ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



5 Revision history

Table 8. Revision history

Date	Revision	Changes
12-May-2006	3	New template

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