

STE48NM60

N-CHANNEL 600V - 0.09Ω - 48A ISOTOP MDmesh[™]Power MOSFET

TYPE	V _{DSS}	R _{DS(on)}	ID
STE48NM60	600V	< 0.11Ω	48 A

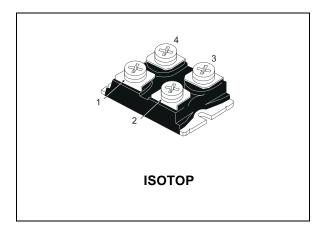
- TYPICAL $R_{DS}(on) = 0.09\Omega$
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- 100% AVALANCHE TESTED
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTURING YIELDS

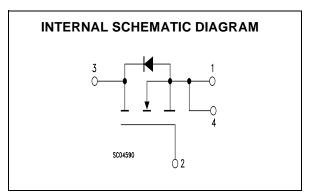
DESCRIPTION

The MDmesh[™] is a new revolutionary MOSFET technology that associates the Multiple Drain process with the Company's PowerMESH[™] horizontal layout. The resulting product has an outstanding low on-resistance, impressively high dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary strip technique yields overall dynamic performance that is significantly better than that of similar competition's products.

APPLICATIONS

The MDmesh[™] family is very suitable for increasing power density of high voltage converters allowing system miniaturization and higher efficiencies.





Symbol Parameter Value Unit VDS Drain-source Voltage ($V_{GS} = 0$) V 600 Drain-gate Voltage ($R_{GS} = 20 \text{ k}\Omega$) VDGR 600 V VGS Gate- source Voltage ±30 V Drain Current (continuous) at T_C = 25°C I_D 48 А Drain Current (continuous) at T_C = 100°C ID 30 А $I_{DM}(\bullet)$ Drain Current (pulsed) 192 А Ртот Total Dissipation at $T_{C} = 25^{\circ}C$ 450 W **Derating Factor** 3.57 W/°C dv/dt (1) Peak Diode Recovery voltage slope 15 V/ns °C Storage Temperature -65 to 150 T_{stg} °C Ti Max. Operating Junction Temperature 150

(•)Pulse width limited by safe operating area

ABSOLUTE MAXIMUM RATINGS

(1) $I_{SD} \leq 48A$, di/dt $\leq 400A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$.

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THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.28	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
ΤI	Maximum Lead Temperature For Soldering Purpose	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	15	A
E _{AS}	Single Pulse Avalanche Energy (starting $T_j = 25 \text{ °C}, I_D = I_{AR}, V_{DD} = 35 \text{ V}$)	850	mJ

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED) OFF

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage	V _{DS} = Max Rating			10	μA
	Drain Current (V _{GS} = 0)	V_{DS} = Max Rating, T _C = 125 °C			100	μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	$V_{GS} = \pm 30V$			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 22.5A		0.09	0.11	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
g _{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max,}$ $I_D = 22.5A$		15		S
C _{iss}	Input Capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		3800		pF
Coss	Output Capacitance			1250		pF
C _{rss}	Reverse Transfer Capacitance			46		pF
C _{oss eq.} (2)	Equivalent Output Capacitance	$V_{GS} = 0V, V_{DS} = 0V \text{ to } 480V$		340		pF
R _G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		1.4		Ω

1. Pulsed: Pulse duration = $300 \ \mu$ s, duty cycle 1.5 %.2. $C_{oss \ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% VDSS

ELECTRICAL CHARACTERISTICS (CONTINUED) SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on Delay Time	$V_{DD} = 250V, I_D = 22.5A$		30		ns
tr	Rise Time	$R_G = 4.7\Omega V_{GS} = 10V$ (see test circuit, Figure 3)		20		ns
Qg	Total Gate Charge	$V_{DD} = 400 V, I_D = 45 A,$		96	134	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10V		31		nC
Q _{gd}	Gate-Drain Charge			43		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{r(Voff)}	Off-voltage Rise Time	V _{DD} = 400V, I _D = 45A,		16		ns
t _f	Fall Time	$R_G = 4.7\Omega$, $V_{GS} = 10V$ (see test circuit, Figure 5)		23		ns
t _c	Cross-over Time			40		ns

SOURCE DRAIN DIODE

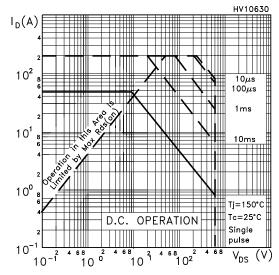
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain Current				48	А
I _{SDM} (2)	Source-drain Current (pulsed)				192	А
V _{SD} (1)	Forward On Voltage	$I_{SD} = 45A, V_{GS} = 0$			1.5	V
t _{rr} Q _{rr} IRRM	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$\begin{split} I_{SD} &= 45\text{A}, \text{ di/dt} = 100\text{A}/\mu\text{s}, \\ V_{DD} &= 100 \text{ V}, \text{ T}_{\text{j}} = 25^{\circ}\text{C} \\ (\text{see test circuit, Figure 5}) \end{split}$		508 10 40		ns µC A
t _{rr} Q _{rr} I _{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$\begin{split} I_{SD} &= 45A, \ di/dt = 100A/\mu s, \\ V_{DD} &= 100 \ V, \ T_j = 150^\circ C \\ (see test circuit, \ Figure 5) \end{split}$		650 14 43		ns μC Α

Note: 1. Pulsed: Pulse duration = 300 $\mu s,$ duty cycle 1.5 %.

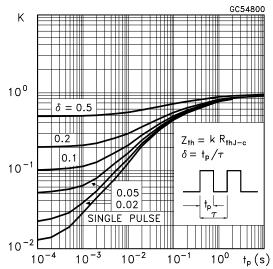
2. Pulse width limited by safe operating area.

Safe Operating Area

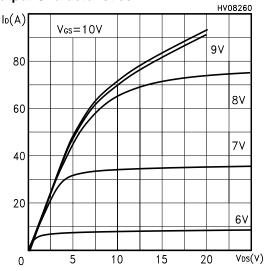
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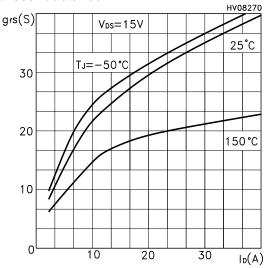
Thermal Impedance



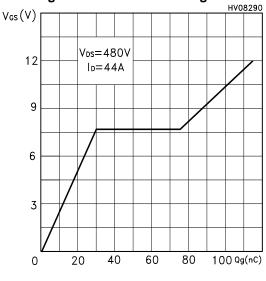
Output Characteristics



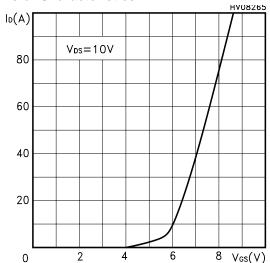
Transconductance



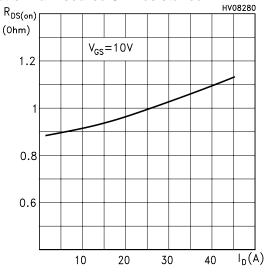
Gate Charge vs Gate-source Voltage



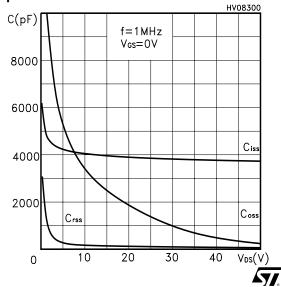
Transfer Characteristics



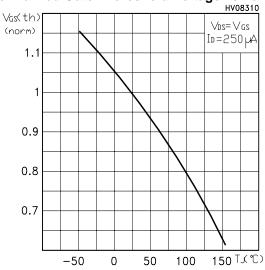
Static Drain-source On Resistance



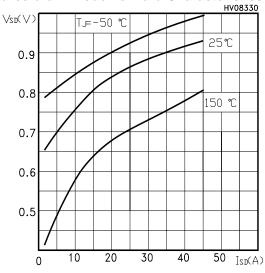
Capacitance Variations



Normalized Gate Thereshold Voltage vs Temp.



Source-drain Diode Forward Characteristics



Normalized On Resistance vs Temperature

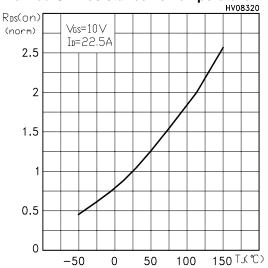


Fig. 1: Unclamped Inductive Load Test Circuit

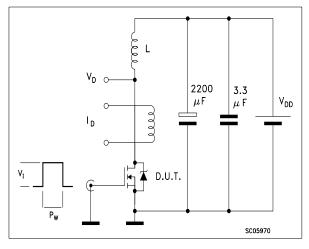


Fig. 3: Switching Times Test Circuit For Resistive Load

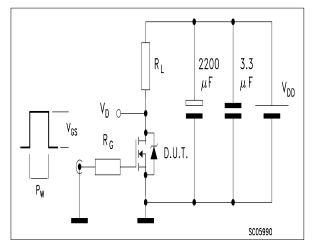


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

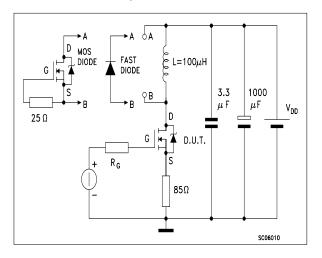


Fig. 2: Unclamped Inductive Waveform

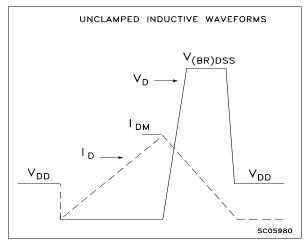
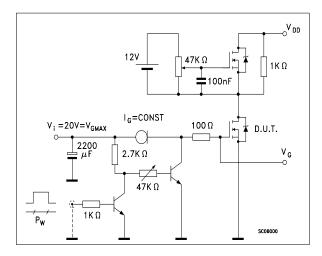
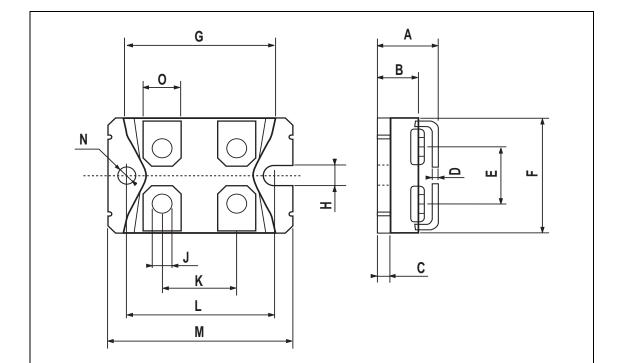


Fig. 4: Gate Charge test Circuit



DIM.		mm			inch	
Diwi.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
А	11.8		12.2	0.466		0.480
В	8.9		9.1	0.350		0.358
С	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
Н	4			0.157		
J	4.1		4.3	0.161		0.169
К	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
М	37.8		38.2	1.488		1.503
Ν	4			0.157		
0	7.8		8.2	0.307		0.322





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