

STE48NM60

N-CHANNEL 650V @ Tjmax - 0.09Ω - 48A ISOTOP

MDmesh[™] MOSFET

Table 1: General Features

ТҮРЕ	V _{DSS} (@Tjmax)	R _{DS(on)}	ID
STE48NM60	650V	< 0.11Ω	48 A

- TYPICAL R_{DS}(on) = 0.09Ω
- 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 'hiqi' dv/dt and excellent avalanche characteristics. The adoption of the Company's proprietary stip technique yields overall dynamic performance inat is significantly better than that of similar competition's products.

APPLICATIONS

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

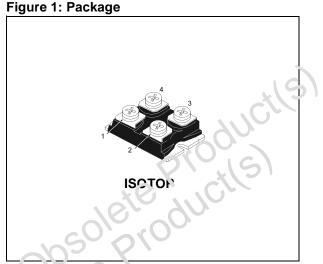


Figure 2: Internel Schematic Diagram

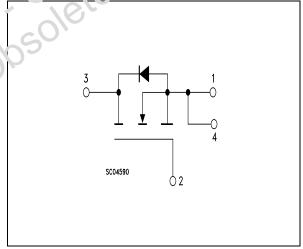


Table 2: Order Codes

SALES TYPE	MARKING	PACKAGE	PACKAGING
STE48NM60	E48NM60	ISOTOP	TUBE

Symbol Parameter		Value	Unit
V_{GS}	Gate- source Voltage	±30	V
ID	Drain Current (continuous) at T _C = 25°C	48	A
ID	Drain Current (continuous) at T _C = 100°C	30	А
I _{DM} (•)	Drain Current (pulsed)	192	А
P _{TOT}	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
VISO Insulation Winthstand Voltage (AC-RMS)		2500	V
T _{stg} Storage Temperature		-65 to 150	٦°
Tj	Max. Operating Junction Temperature	150	°C

Table 3: Absolute Maximum ratings

(•)Pulse width limited by safe operating area

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

Table 4: Thermal Data

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

(*) with conductive GREASE Applies

Table 5: Avalanche Characteristics

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

ELECTRICAL CHARACT FISTICS (T_{CASE} =25°C UNLESS OTHERWISE SPECIFIED) Table 6: On/Off

Symbol	Faraneter	Test Conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	5.a.n-source Br⊴akdown Voltage	$I_{D} = 250 \ \mu A, \ V_{GS} = 0$	600			V
il s.	Zero Gate Voltage	V _{DS} = Max Rating			10	μA
U.	Drain Current (V _{GS} = 0)	V _{DS} = Max Rating, T _C = 125°C			100	μA
IGSS	Gate-body Leakage Current (V _{DS} = 0)	$V_{GS} = \pm 30V$			±100	nA
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

ELECTRICAL CHARACTERISTICS (CONTINUED) **Table 7: Dynamic**

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
g _{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max, I_D} = 24A$		20		s
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		3800 1250 80		pF pF pF
C _{oss eq.} (2)	Equivalent Output Capacitance	$V_{GS} = 0V$, $V_{DS} = 0V$ 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
t _{d(on)} t _r	Turn-on Delay Time Rise Time	$\label{eq:VDD} \begin{array}{l} V_{DD} = 250V, \ I_D = 22.5A \ R_G = 4.7\Omega \\ V_{GS} = 10V \\ (\text{see Figure 14}) \end{array}$		30 20	20	n:3 1:3
t _{r(Voff)} t _f t _c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 400 \text{V}, \text{ I}_{D} = 45 \text{A}, \text{ R}_{G} = 4.7 \Omega,$ $V_{GS} = 10 \text{V}$		16 23 40		ns ns ns
Q _g Q _{gs} Q _{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 400V, I_D = 45A, V_{GS} = 10V$ (see Figure 18)		96 31 43	134	nC nC nC
able 8: So	urce Drain Diode	0050	512			

Table 8: Source Drain Diode

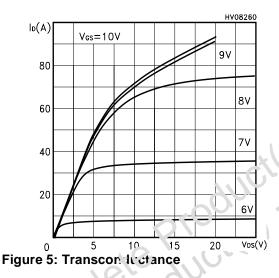
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain Current	16			48	А
I _{SDM} (2)	Source-drain Current (pulsed)	,(S) _ CO'			192	А
V _{SD} (1)	Forward On Voltage	$SD = 45A, V_{GS} = 0$			1.5	V
t _{rr} Q _{rr} I _{RRM}	Reverse Recovery Time Reverse Recovery Charac Reverse Recovery Charac	i _{SD} = 45A, di/dt = 100A/µs, V _{DD} = 100 V, T _j = 25°C (see Figure 16)		508 10 40		ns µC A
t _{rr} Q _{rr} I _{RRM}	Reverse Recovery Time Reverse Feedovery Charge Reverse Peedovery Current	I _{SD} = 45A, di/dt = 100A/µs, V _{DD} = 100 V, T _j = 150°C (see Figure 16)		650 14 43		ns µC A

Lised: Pun 2. Cost or 15 dei 1/D5 3 Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %.
C_{ost eq} is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% ¹/_{DES}

HV25420 Tj=150°C $I_D(A)$ Tc=25°C Single pulse 10^{2} $100 \mu s$ 1ms 10¹ 10ms 10⁰ D.C. 10⁻¹ 10⁻² ⁴ ⁶ ⁸ 0¹ ^⁴ 10° ^₄ 10² 10³ 10⁻¹ $V_{DS}(V)$



Figure 3: Safe Operating Area



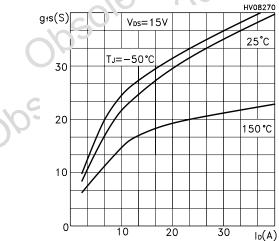
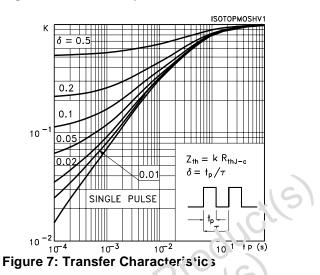
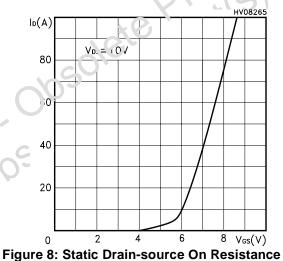
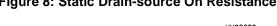


Figure 6: Thermal Impedance







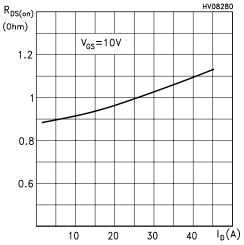


Figure 9: Gate Charge vs Gate-source Voltage

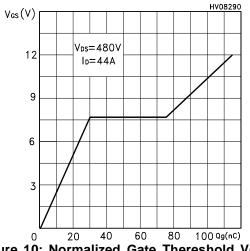


Figure 10: Normalized Gate Thereshold Voltage vs Temperature

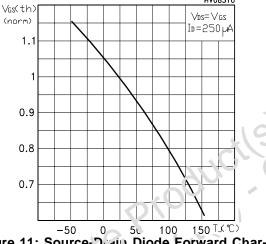
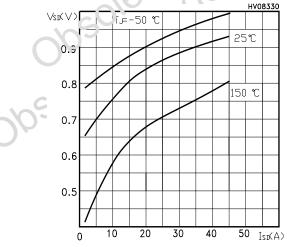


Figure 11: Source-Diain Diode Forward Characteristics



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Figure 12: Capacitance Variations

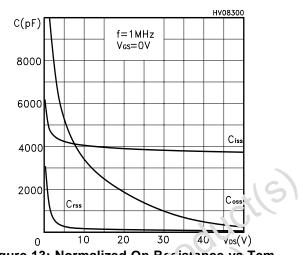


Figure 13: Normalized On Resistance vs Temperature

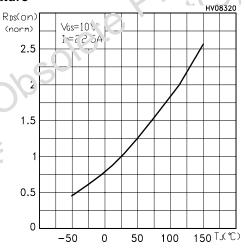


Figure 14: Unclamped Inductive Load Test Circuit

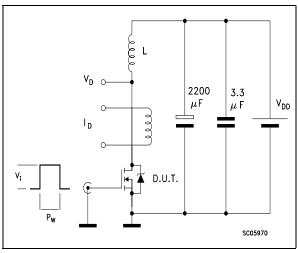


Figure 15: Switching Times Test Circuit For Resistive Load

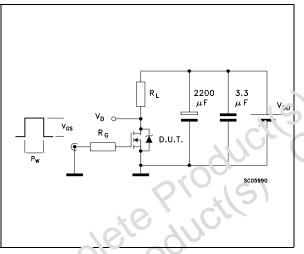


Figure 16. Sest Circuit For Inductive Load Switching and Diode Recovery Times

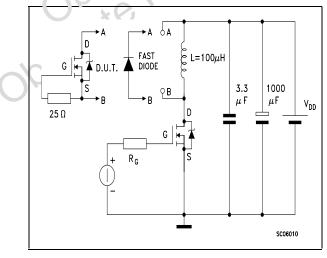


Figure 17: Unclamped Inductive Wafeform

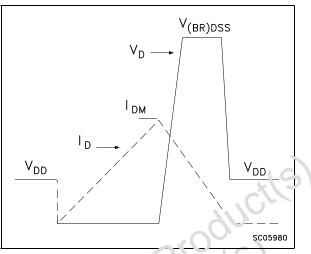
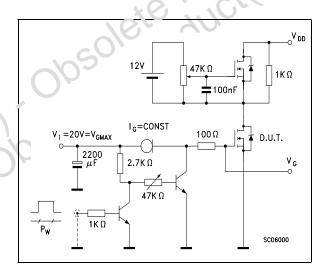
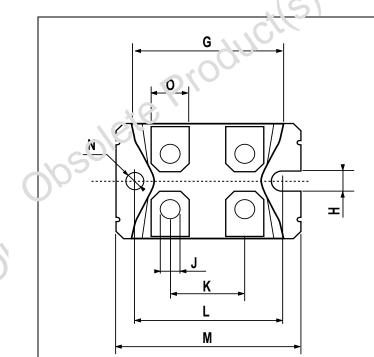


Figure 18: Gate Charge Test Circuit



DIM.		mm			inch	
Dini:	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
Е	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.70:
G	31.5		31.7	1.240		1.248
Н	4			0.157	0	
J	4.1		4.3	0.161	0	0.169
К	14.9		15.1	0.586	10	0.594
L	30.1		30.3	1.185		1.193
М	37.8		38.2	i.+03		1.503
N	4		(J.157		
0	7.8		8.2	0.307		0.322





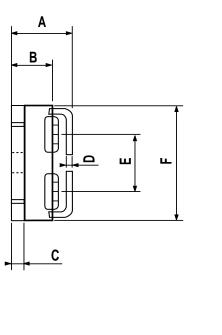


Table 9: Revision History

Date	Revision	Description of Changes
30/Mar/2005	2	Modified value in table 7

Obsolete Product(s)-Obsolete Product(s) Obsolete Product(s)-Obsolete Product(s) Obsolete Product(s)-Obsolete Product(s)

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