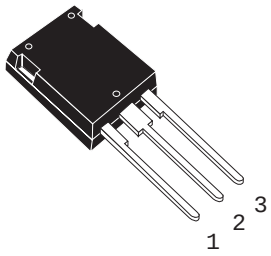
STY60NM50

N-CHANNEL 500V - 0.045Ω - 60A Max247
Zener-Protected MDmesh™Power MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STY60NM50	500V	< 0.05Ω	60 A

- TYPICAL $R_{DS}(on)$ = 0.045Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- IMPROVED ESD CAPABILITY
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL
- INDUSTRY'S LOWEST ON-RESISTANCE



Max247

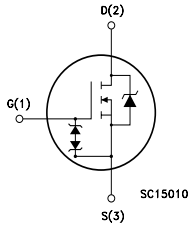
DESCRIPTION

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.

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate- source Voltage	±30	V
I_D	Drain Current (continuous) at T_C = 25°C	60	A
I_D	Drain Current (continuous) at T_C = 100°C	37.8	A
I_{DM} (•)	Drain Current (pulsed)	240	A
P_{TOT}	Total Dissipation at T_C = 25°C	560	W
$V_{ESD(G-S)}$	Gate source ESD(HBM-C=100pF, R=15KΩ)	6	KV
	Derating Factor	4.5	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	15	V/ns
T_{stg}	Storage Temperature	–65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•)Pulse width limited by safe operating area

(1)I_{SD} ≤60A, di/dt ≤400A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ T_{JMAX}

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	0.22	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	30	°C/W
T_l	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)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 35 V)	1.4	J

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			10	µA
		V_{DS} = Max Rating, T_C = 125 °C			100	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V			± 10	µA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250µA	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 30A		0.045	0.05	Ω

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 = 30A		35		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		7500		pF
C_{oss}	Output Capacitance			980		pF
C_{rss}	Reverse Transfer Capacitance			200		pF
R_G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		1.5		Ω

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

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 250V, I_D = 30A		51		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10V (see test circuit, Figure 3)		58		ns
Q_g	Total Gate Charge	V_{DD} = 400V, I_D = 60A, V_{GS} = 10V		190	266	nC
Q_{gs}	Gate-Source Charge			53		nC
Q_{gd}	Gate-Drain Charge			97		nC

SWITCHING OFF

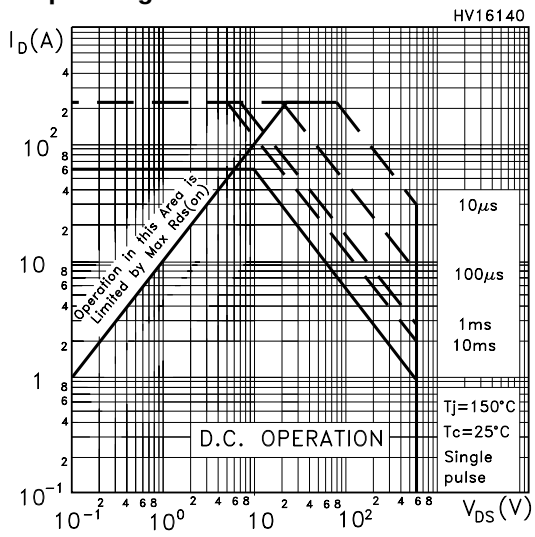
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 400V, I_D = 60A,		51		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 5)		46		ns
t_c	Cross-over Time			108		ns

SOURCE DRAIN DIODE

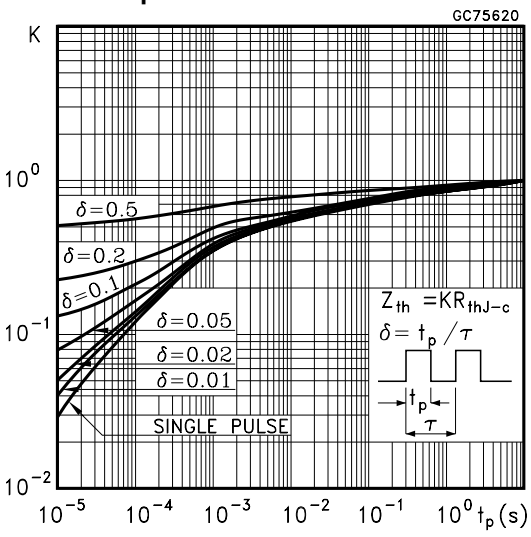
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				60	A
I_{SDM} (2)	Source-drain Current (pulsed)				240	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 60A, V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 60A, di/dt = 100A/µs,		532		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 100 V, T_j = 25°C		9.9		µC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		37		A
t_{rr}	Reverse Recovery Time	I_{SD} = 60A, di/dt = 100A/µs,		636		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 100 V, T_j = 150°C		13.4		µC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		42		A

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

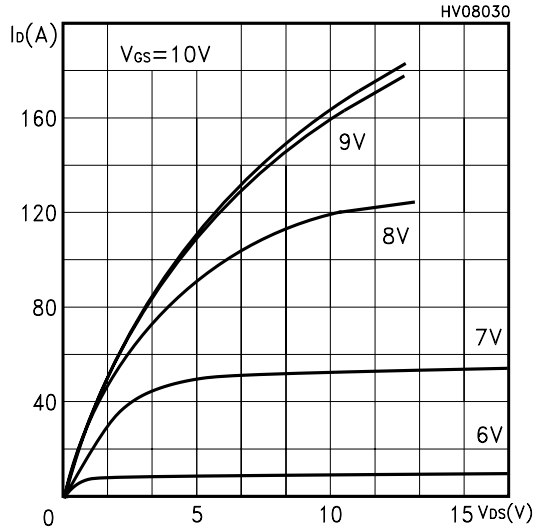
Safe Operating Area



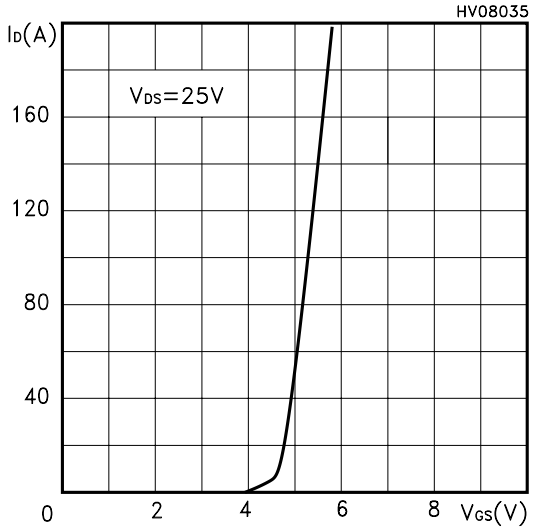
Thermal Impedance



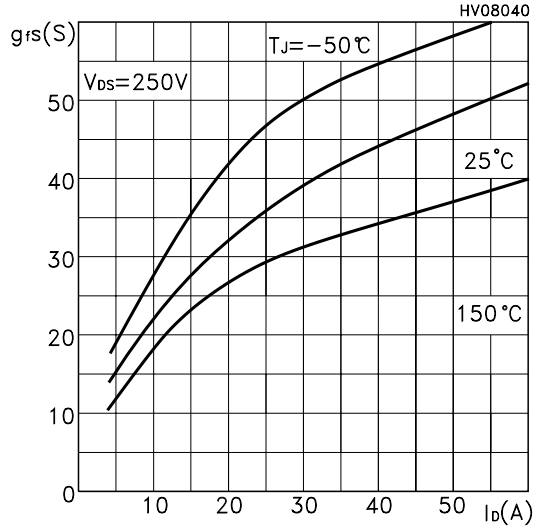
Output Characteristics



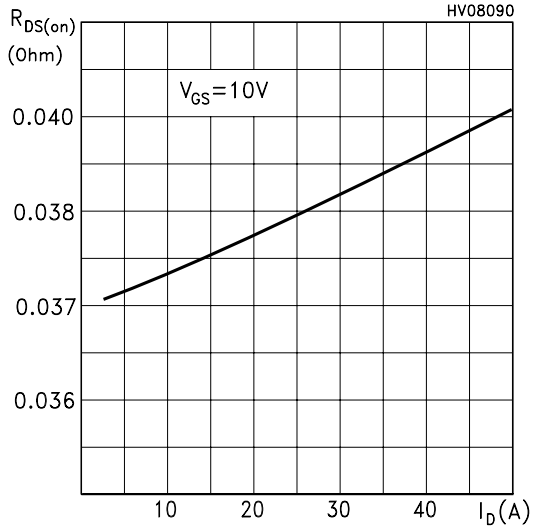
Transfer Characteristics



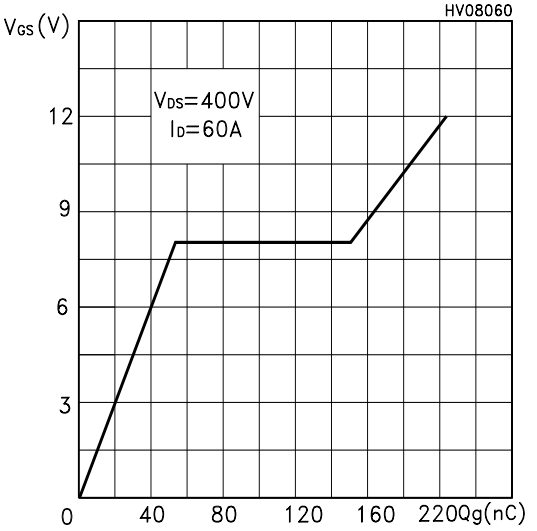
Transconductance



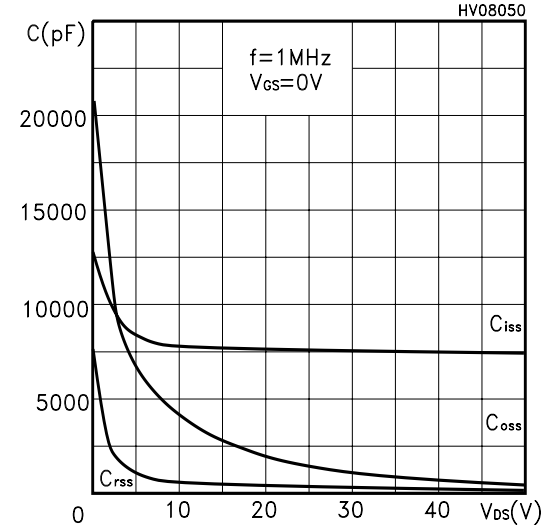
Static Drain-source On Resistance



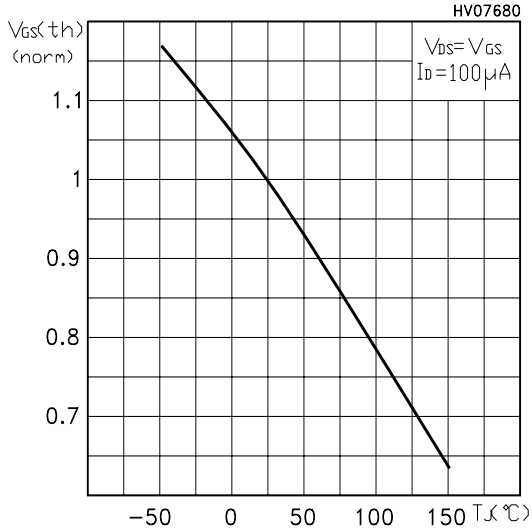
Gate Charge vs Gate-source Voltage



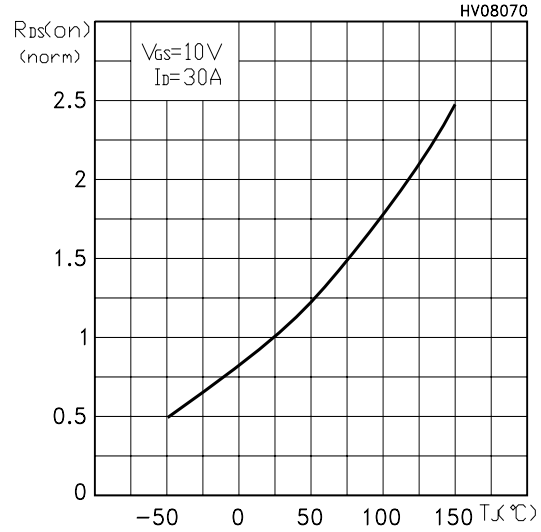
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

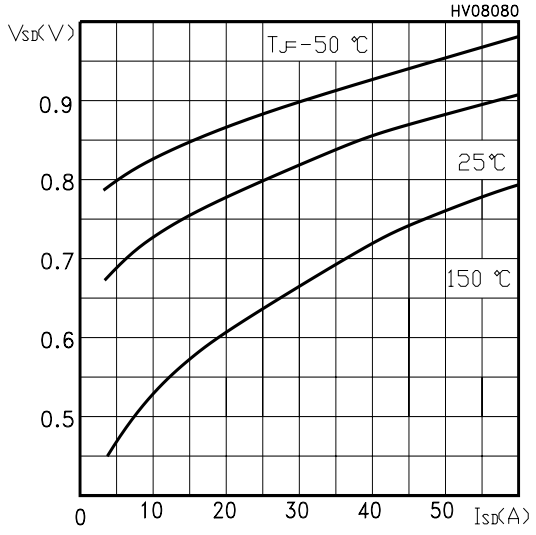


Fig. 1: Unclamped Inductive Load Test Circuit

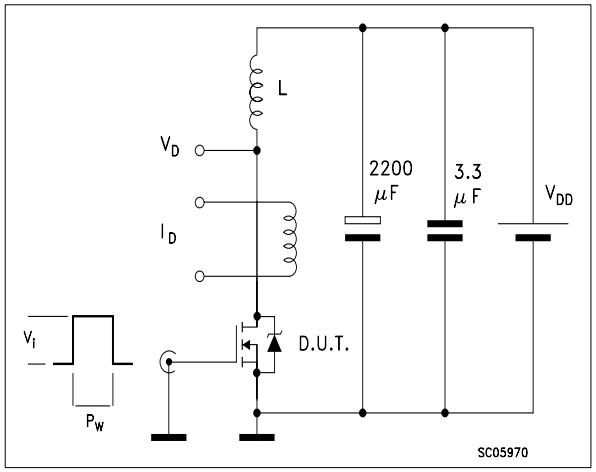


Fig. 2: Unclamped Inductive Waveform

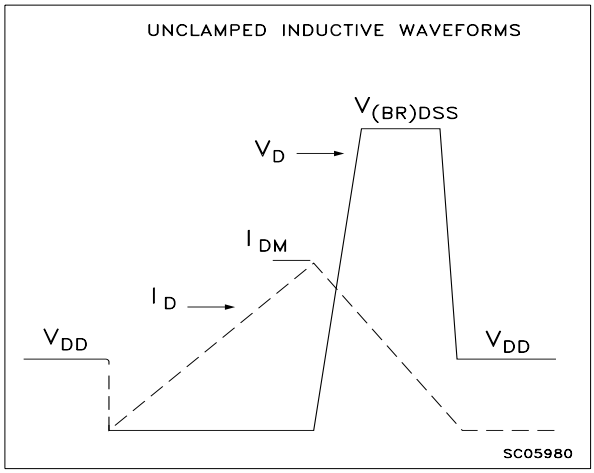


Fig. 3: Switching Times Test Circuit For Resistive Load

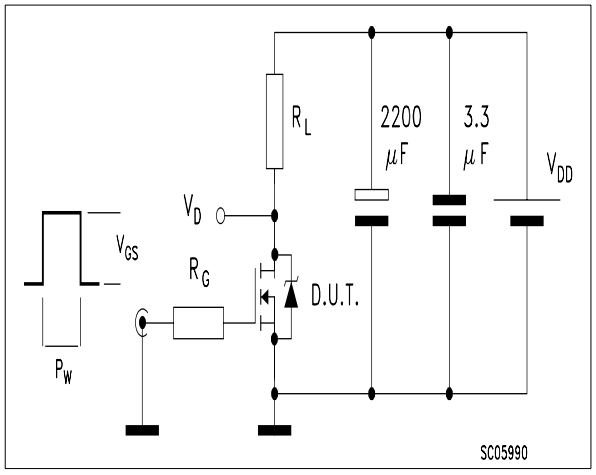


Fig. 4: Gate Charge test Circuit

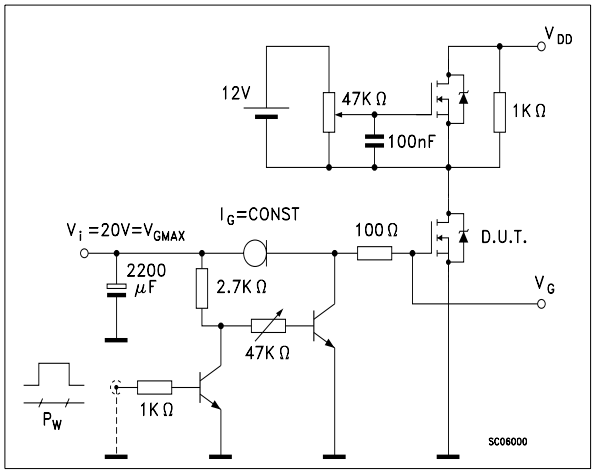
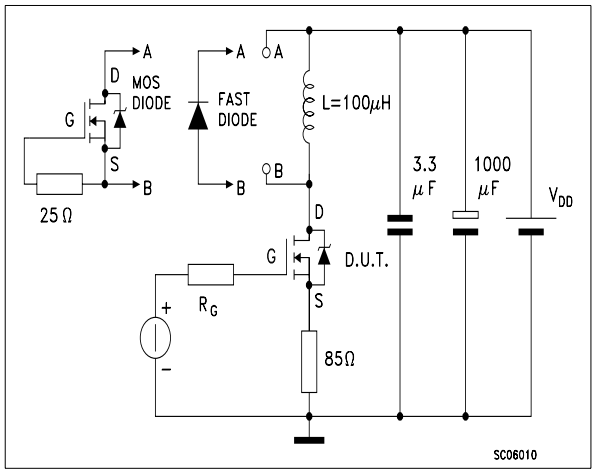
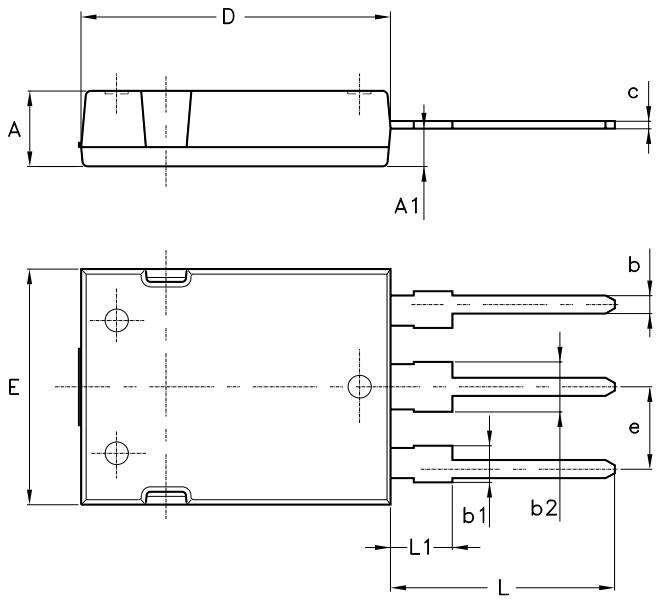


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



Max247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.70		5.30			
A1	2.20		2.60			
b	1.00		1.40			
b1	2.00		2.40			
b2	3.00		3.40			
c	0.40		0.80			
D	19.70		20.30			
e	5.35		5.55			
E	15.30		15.90			
L	14.20		15.20			
L1	3.70		4.30			



P025Q

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

STMicroelectronics:

STY60NM50