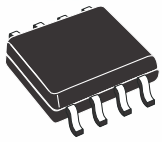
STSJ3NM50

N-CHANNEL 500V - 2.5Ω - 3A PowerSO-8
Zener-Protected MDmesh™ POWER MOSFET

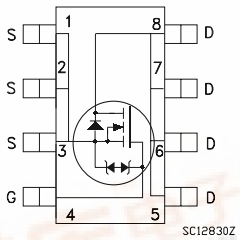
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STSJ3NM50	500 V	< 3 Ω	3 A

- TYPICAL $R_{DS}(on)$ = 2.5 Ω
- HIGH dv/dt AND AVALANCHE CAPABILITIES
- IMPROVED ESD CAPABILITY
- LOW INPUT CAPACITANCE AND GATE CHARGE
- LOW GATE INPUT RESISTANCE
- TIGHT PROCESS CONTROL AND HIGH MANUFACTORING YIELDS



PowerSO-8

INTERNAL SCHEMATIC DIAGRAM



DRAIN CONTACT ALSO ON THE BACKSIDE

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 completition's products.

APPLICATIONS

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

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 Drain Current (continuous) at T_A = 25°C (1) Drain Current (continuous) at T_C = 100°C	3 0.63 1.89	A A A
I_{DM} (2)	Drain Current (pulsed)	12	A
P_{TOT} P_{TOT}	Total Dissipation at T_C = 25°C Total Dissipation at T_A = 25°C (1)	70 3	W W
	Derating Factor (1)	0.02	W/°C
dv/dt (3)	Peak Diode Recovery voltage slope	15	V/ns
T_{stg}	Storage Temperature	– 65 to 150	°C
T_j	Max. Operating Junction Temperature		

THERMAL DATA

Rthj-c	Thermal Resistance Junction-case Max	1.78	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max (1)	42	°C/W
T_j	Max. Operating Junction Temperature	150	°C
T_{stg}	Storage Temperature	– 65 to 150	°C

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20V			±5	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} = 10 V, I_D = 1.5 A		2.5	3	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (4)	Forward Transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$, I_D = 3 A		0.7		S
C_{iss}	Input Capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		140		pF
C_{oss}	Output Capacitance			40		pF
C_{rss}	Reverse Transfer Capacitance			40		pF
R_G	Gate Input Resistance	f=1 MHz Gate DC Bias = 0 Test Signal Level = 20mV Open Drain		4		Ω

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 250 V, I_D = 1.5 A		7		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10 V (see test circuit, Figure 3)		10		ns
Q_g	Total Gate Charge	V_{DD} = 400 V, I_D = 3 A,		5.5		nC
Q_{gs}	Gate-Source Charge	V_{GS} = 10 V		2.5		nC
Q_{gd}	Gate-Drain Charge			2.4		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-Voltage Rise Time	V_{DD} = 480 V, I_D = 3 A,		8		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10 V		9		ns
t_c	Cross-Over Time	(see test circuit, Figure 3)		15		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				3	A
I_{SDM} (2)	Source-drain Current (pulsed)				12	A
V_{SD} (4)	Forward On Voltage	I_{SD} = 3 A, V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 3, di/dt = 100A/µs,		210		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 100 V, T_j = 25°C		790		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		7.5		A
t_{rr}	Reverse Recovery Time	I_{SD} = 3, di/dt = 100A/µs,		282		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 100 V, T_j = 150°C		1.1		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		7.7		A

Note: 1. When mounted on 1inch² FR4 Board, 2oz of Cu, t ≤ 10 sec.
2. Pulse width limited by safe operating area
3. I_{SD}<3.3A, di/dt<400A/µs, V_{DD}<$V_{(BR)DSS}$, T_J<T_{JMAX}
4. Pulsed: Pulse duration = 400 µs, duty cycle 1.5 %

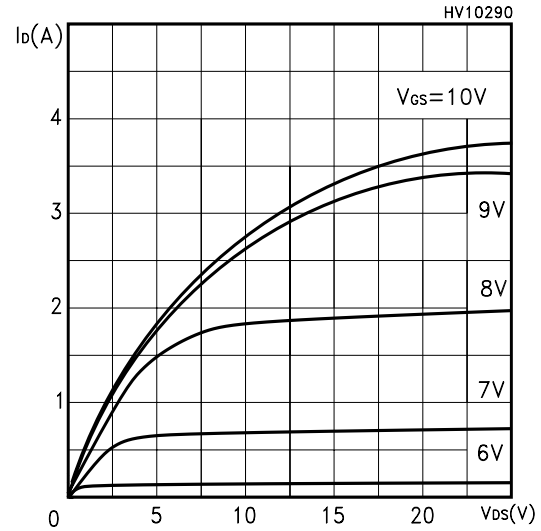
GATE-SOURCE ZENER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{GSO}	Gate-Source Breakdown Voltage	Igs=± 1mA (Open Drain)	30			V

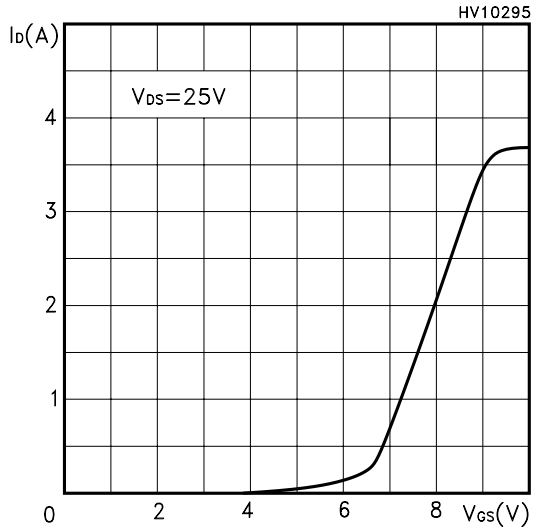
PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components.

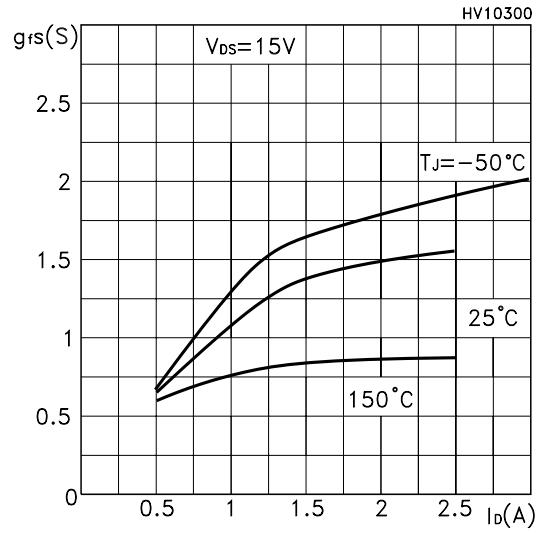
Output Characteristics



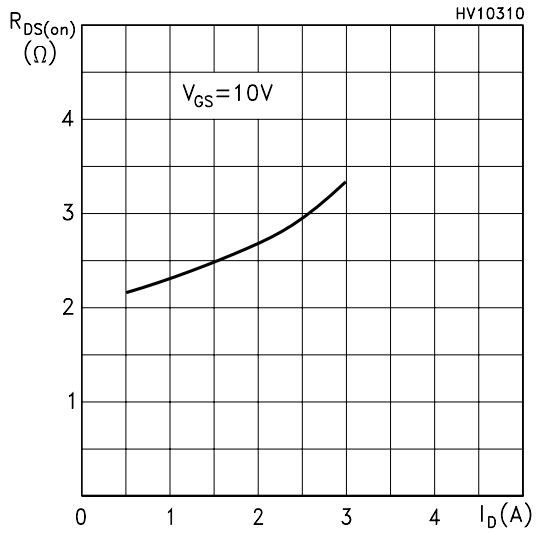
Transfer Characteristics



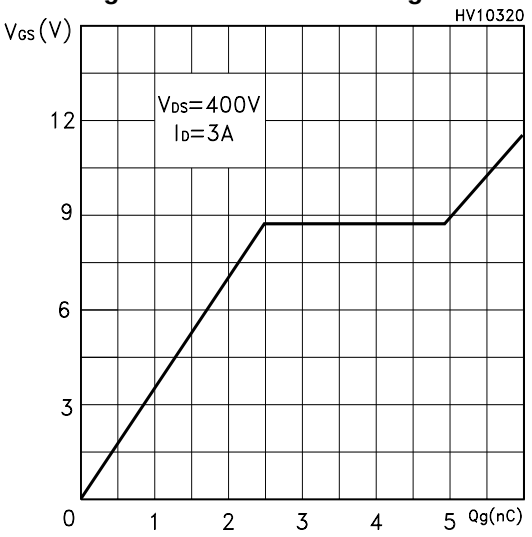
Transconductance



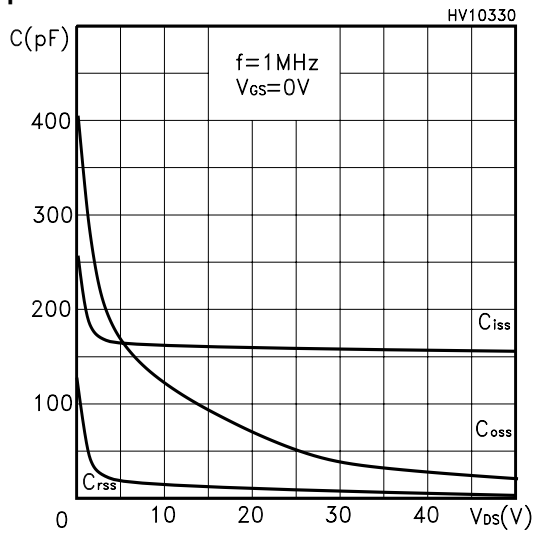
Static Drain-source On Resistance



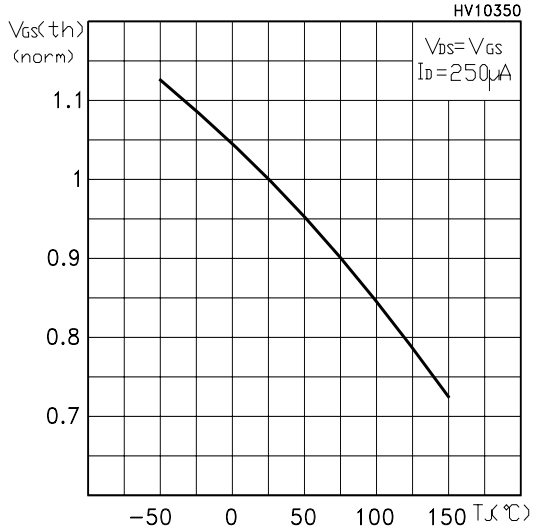
Gate Charge vs Gate-source Voltage



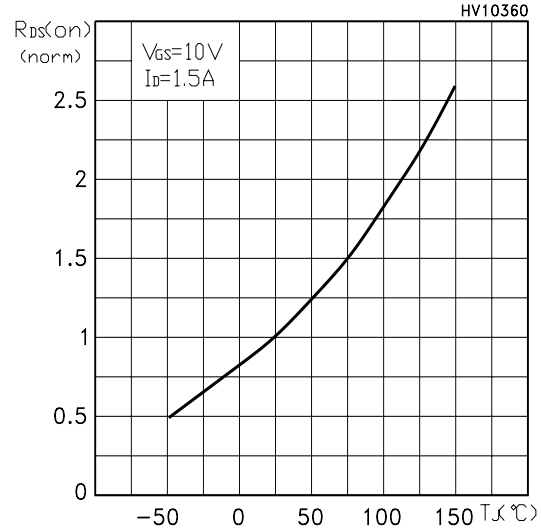
Capacitance Variations



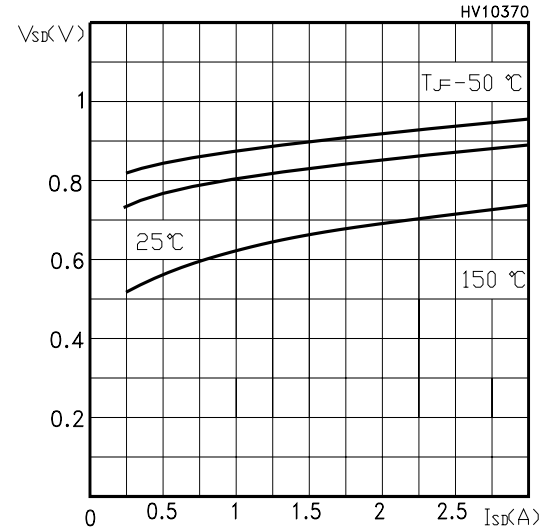
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVdss vs Temperature

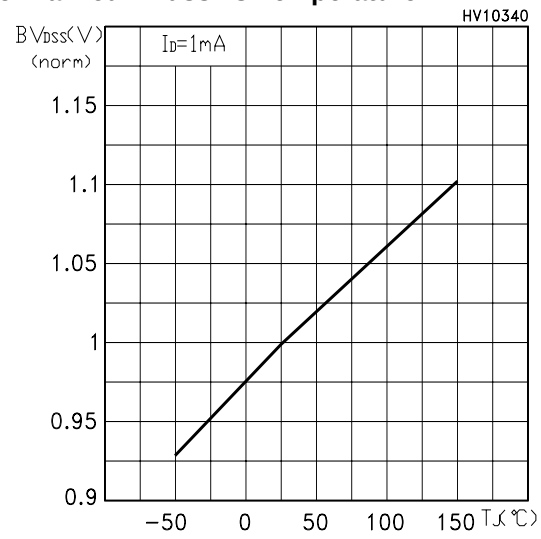


Fig. 1: Unclamped Inductive Load Test Circuit

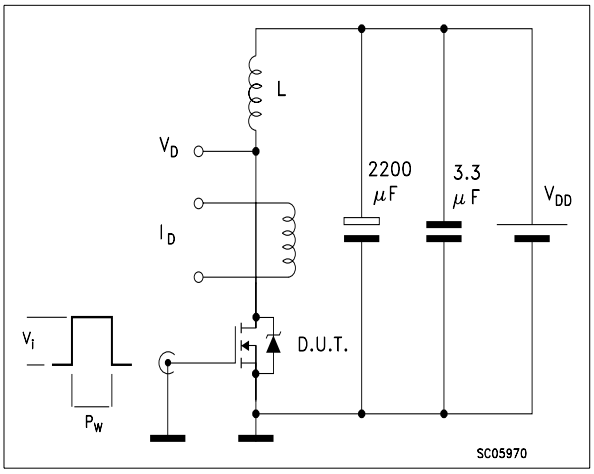


Fig. 2: Unclamped Inductive Waveform

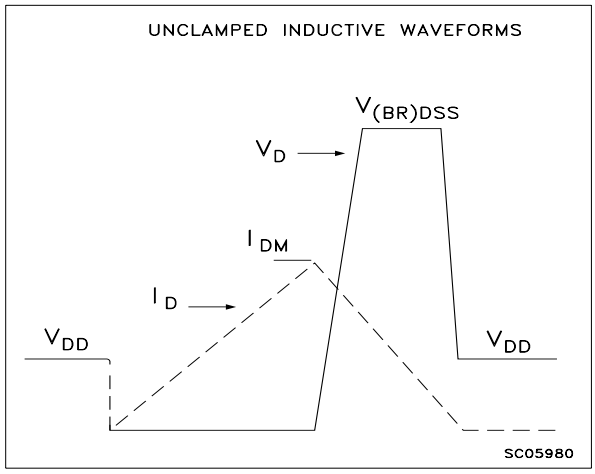


Fig. 3: Switching Times Test Circuit For Resistive Load

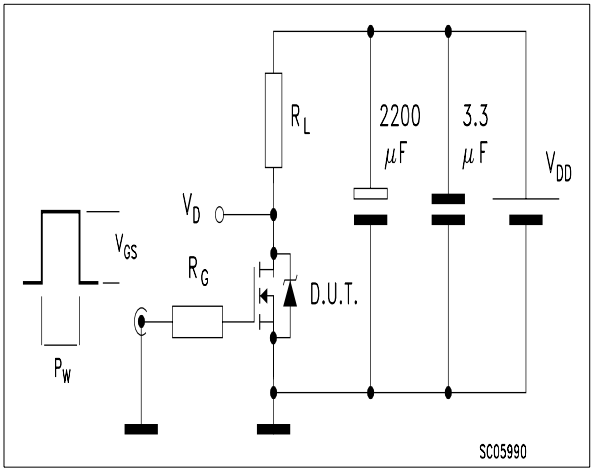


Fig. 4: Gate Charge test Circuit

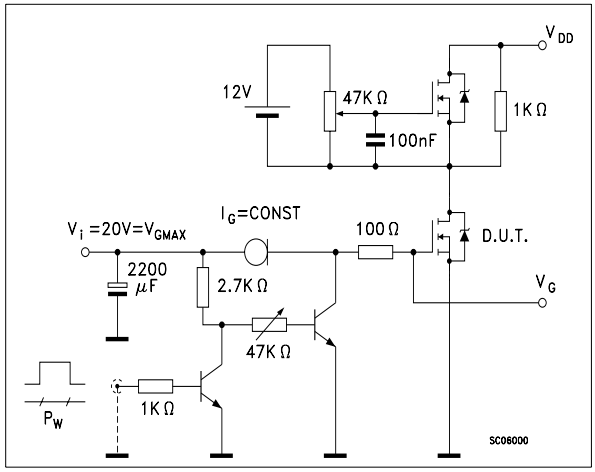
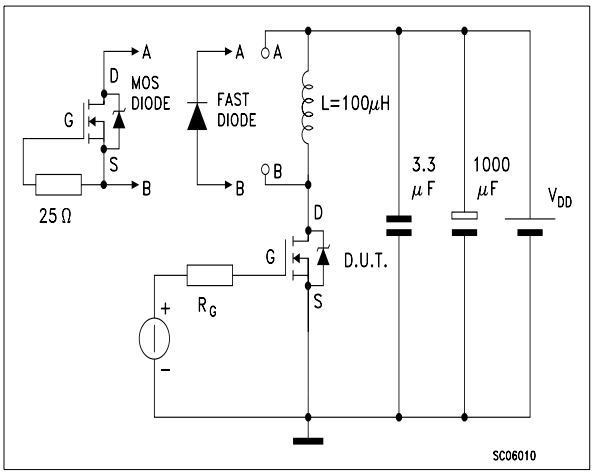


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



PowerSO-8™ MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
e4		2.79			0.110	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)