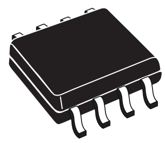
STSJ3NM50

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

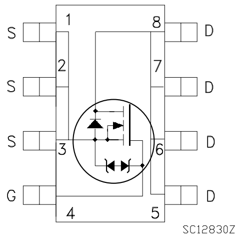
DESCRIPTION

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.

INTERNAL SCHEMATIC DIAGRAM



DRAIN CONTACT ALSO ON THE BACKSIDE

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 V_{DS} = Max Rating, T_C = 125 °C			1 10	µA 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} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0		140 40 40		pF pF 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
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{DD} = 250 V, I_D = 1.5 A R_G = 4.7Ω V_{GS} = 10 V (see test circuit, Figure 3)		7 10		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V, I_D = 3 A, V_{GS} = 10 V		5.5 2.5 2.4		nC nC nC

SWITCHING OFF

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

SOURCE DRAIN DIODE

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

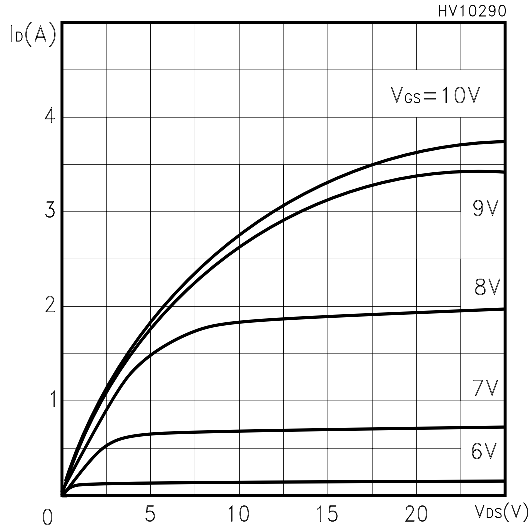
GATE-SOURCE ZENER DIODE

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

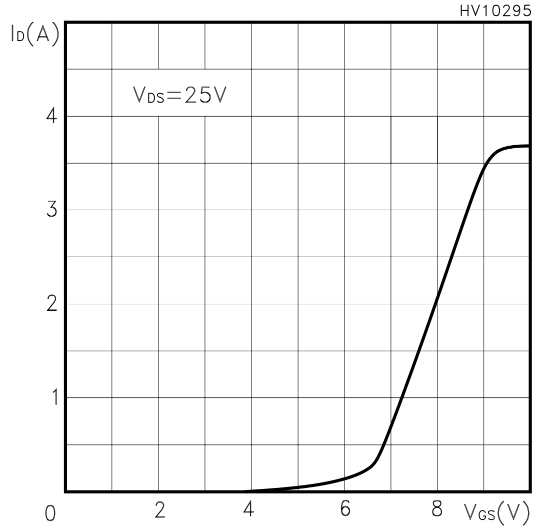
PROTECTION FEATURES OF GATE-TO-SOURCE ZENER DIODES

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.

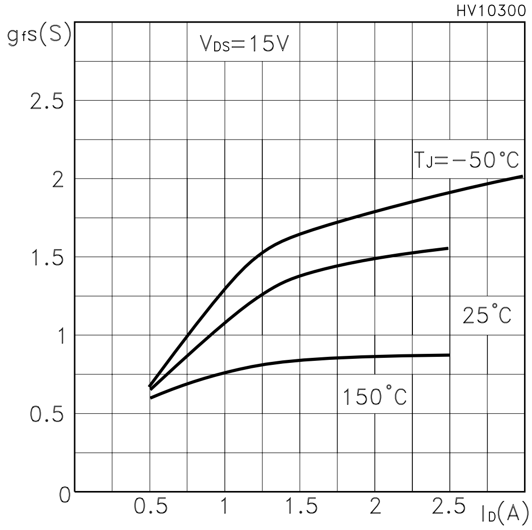
Output Characteristics



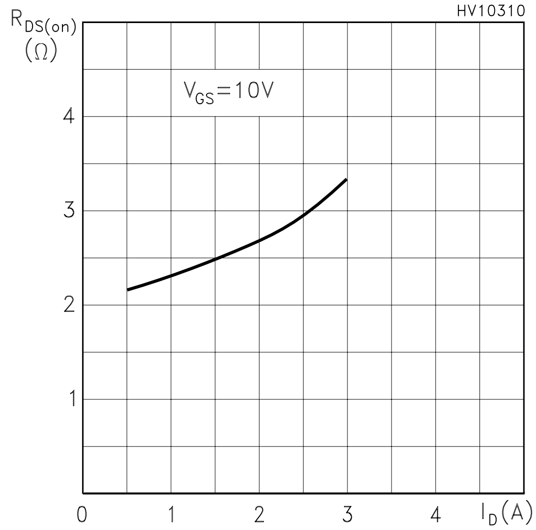
Transfer Characteristics



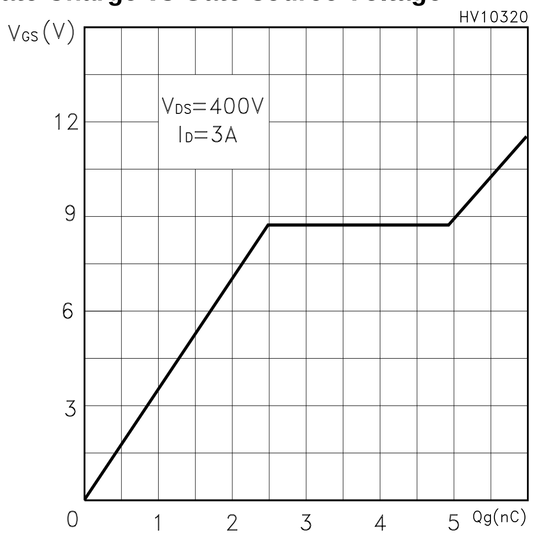
Transconductance



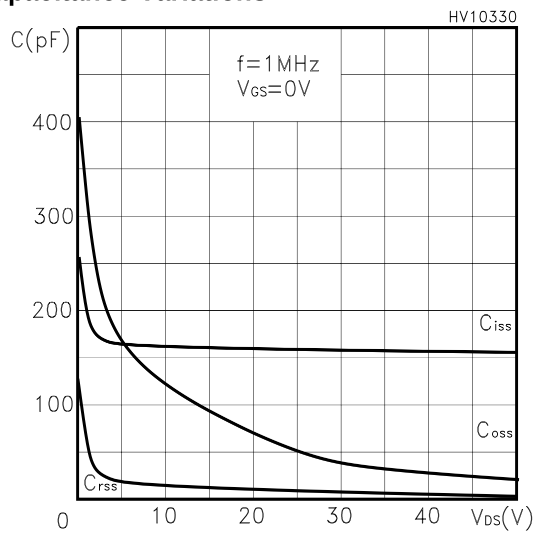
Static Drain-source On Resistance



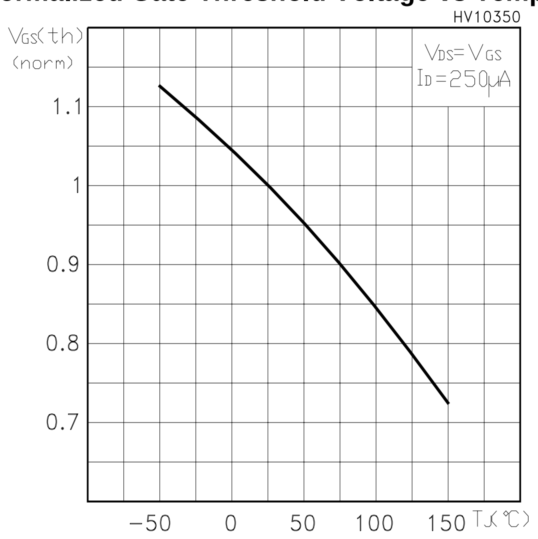
Gate Charge vs Gate-source Voltage



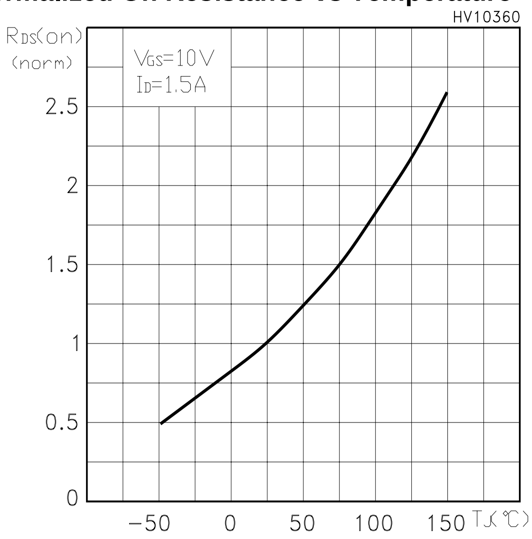
Capacitance Variations



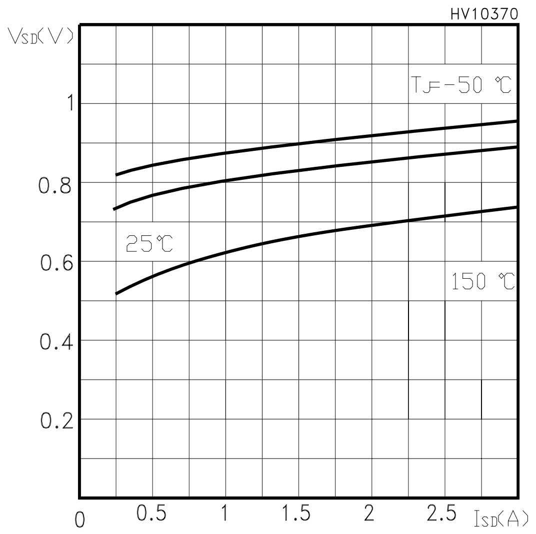
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVdss vs Temperature

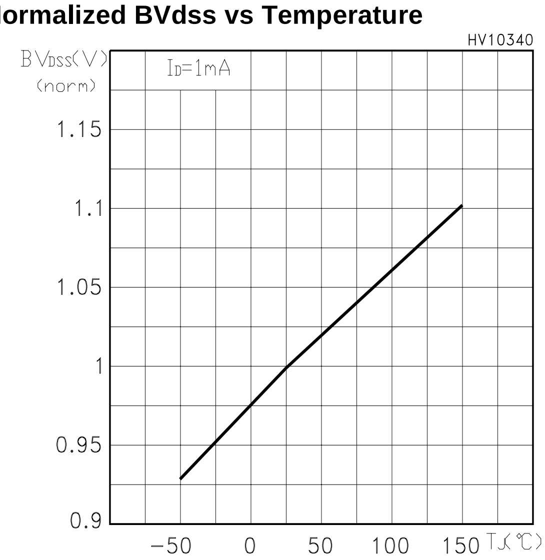


Fig. 1: Unclamped Inductive Load Test Circuit

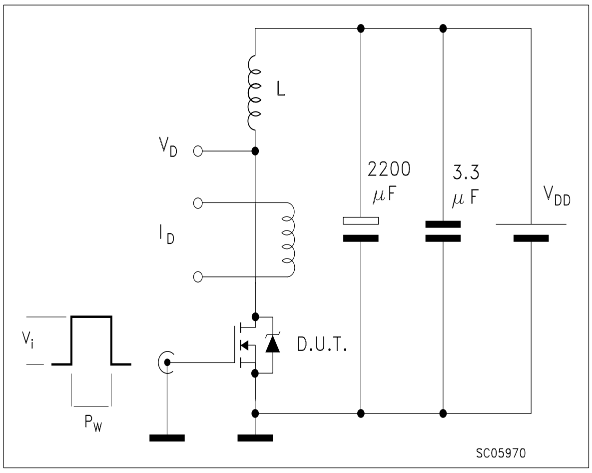


Fig. 2: Unclamped Inductive Waveform

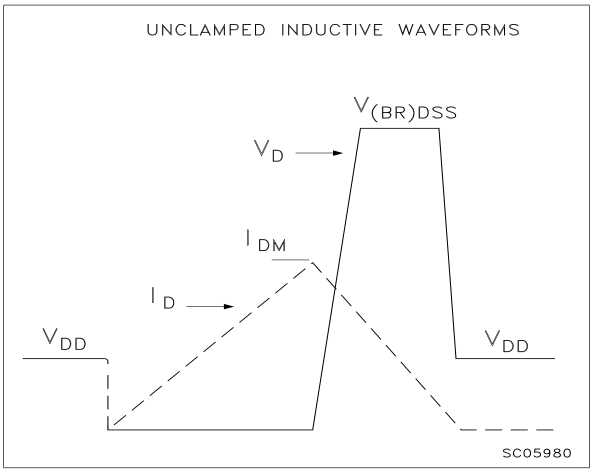


Fig. 3: Switching Times Test Circuit For Resistive Load

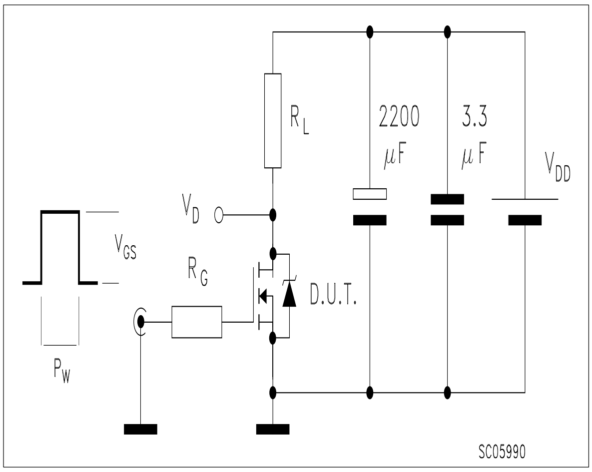


Fig. 4: Gate Charge test Circuit

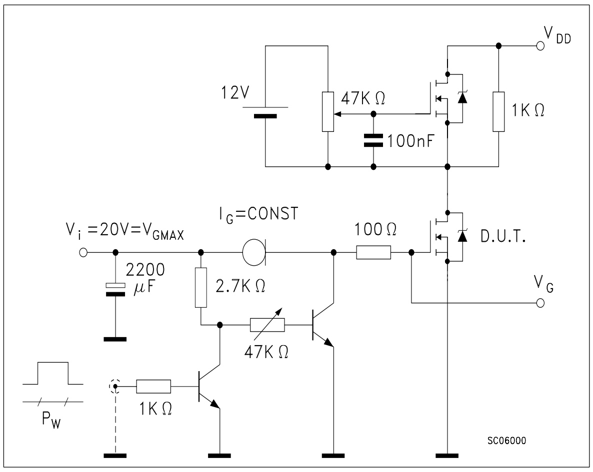
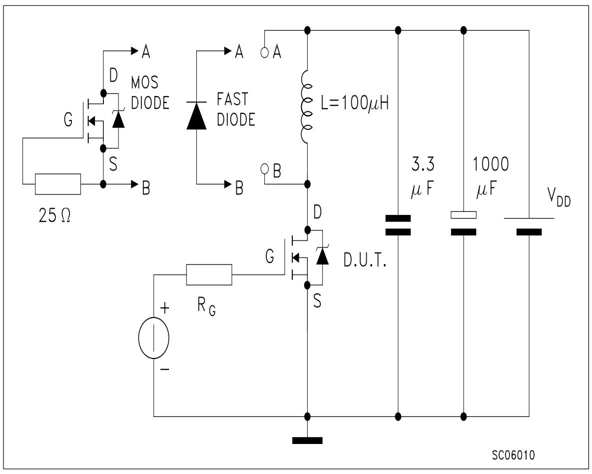


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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.)