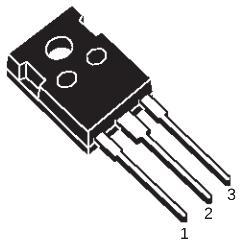
STW6NB100

N - CHANNEL 1000V - 2.3Ω - 5.4A - TO-247
PowerMESH™ MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STW6NB100	1000 V	< 2.8 Ω	5.4 A

- TYPICAL $R_{DS(on)}$ = 2.3 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED



TO-247

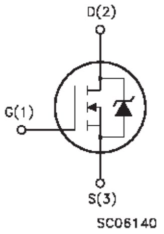
DESCRIPTION

Using the latest high voltage technology, STMicroelectronics has designed an advanced family of power Mosfets with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS}(on) per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000	V
V_{GS}	Gate-source Voltage	± 30	V
I_D	Drain Current (continuous) at T_c = 25 °C	5.4	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.4	A
I_{DM}(•)	Drain Current (pulsed)	21	A
P_{tot}	Total Dissipation at T_c = 25 °C	160	W
	Derating Factor	1.28	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	4	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) $I_{SD} \le 5.4$ A, di/dt ≤ 200 A/µs, $V_{DD} \le V_{(BR)DSS}$, $T_j \le T_{JMAX}$

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.78	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	oC/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	$^oC/W$
T_l	Maximum Lead Temperature For Soldering Purpose		300	^oC

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	5.4	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	373	mJ

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	1000			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating $T_c = 125\ ^oC$			1 50	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30$ V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	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	$V_{GS} = 10$ V $I_D = 2.7$ A		2.5	2.8	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2.7$ A	1.5	3		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1500 180 17		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 500 V I_D = 2.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		24		ns
t_r	Rise Time			11		ns
Q_g	Total Gate Charge	V_{DD} = 800 V I_D = 5 A V_{GS} = 10 V		39	55	nC
Q_{gs}	Gate-Source Charge			10		nC
Q_{gd}	Gate-Drain Charge			19		nC

SWITCHING OFF

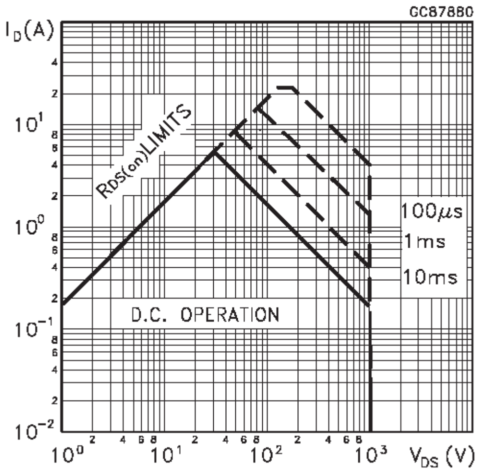
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 800 V I_D = 5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		40		ns
t_f	Fall Time			22		ns
t_c	Cross-over Time			26		ns

SOURCE DRAIN DIODE

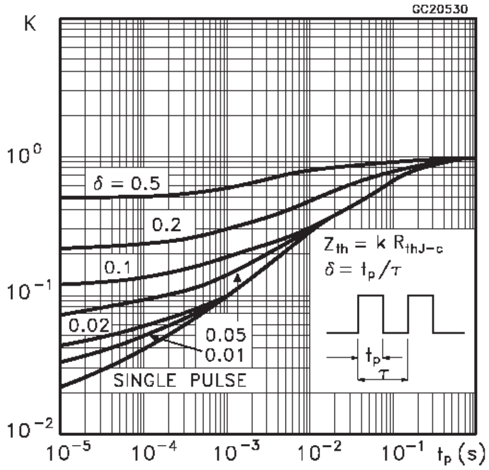
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				5.4	A
I_{SDM} (•)	Source-drain Current (pulsed)				21	A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 5.4 A V_{GS} = 0			1.6	V
t_{rr}	Reverse Recovery Time	I_{SD} = 5 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		780		ns
Q_{rr}	Reverse Recovery Charge			5.5		µC
I_{RRM}	Reverse Recovery Current			14		A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

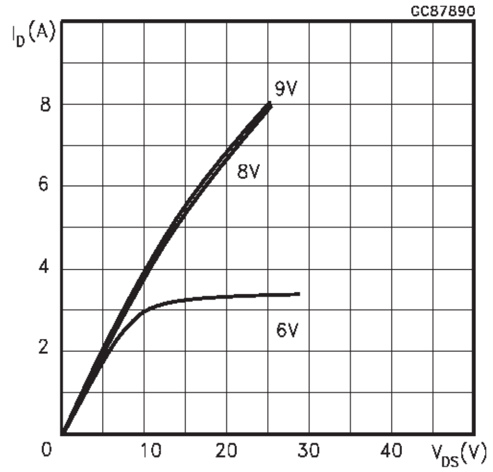
Safe Operating Area



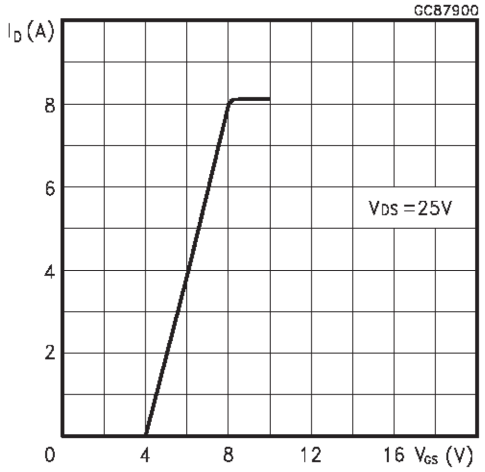
Thermal Impedance



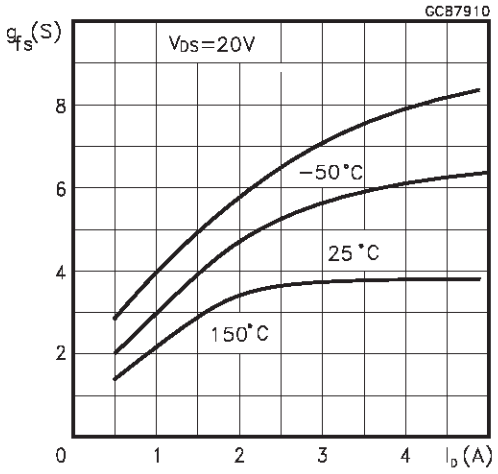
Output Characteristics



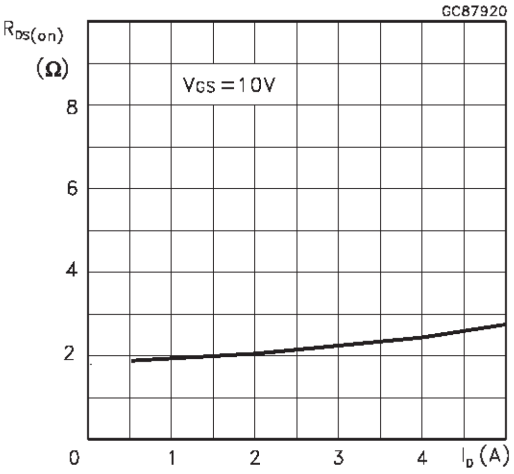
Transfer Characteristics



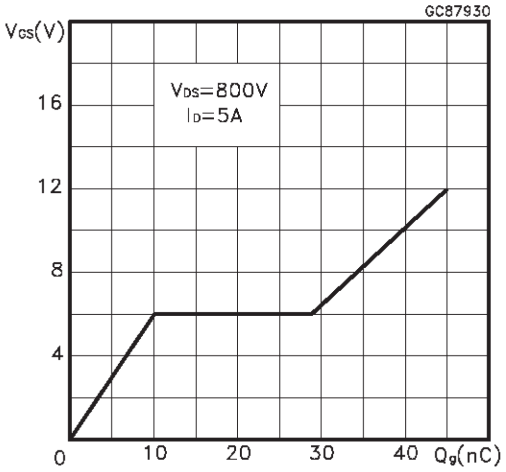
Transconductance



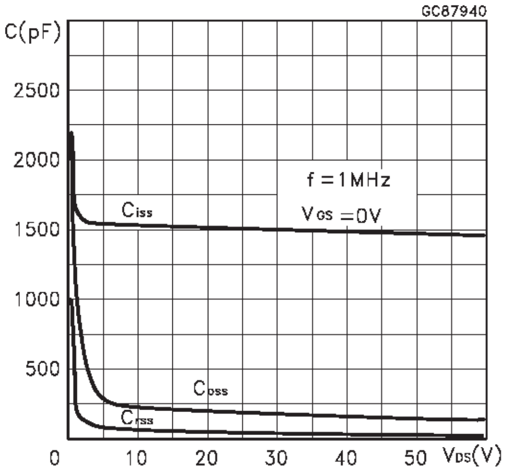
Static Drain-source On Resistance



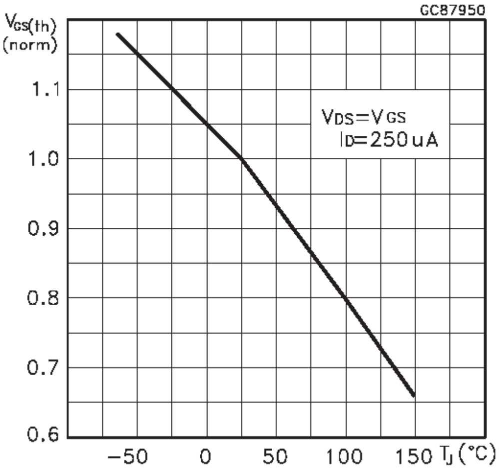
Gate Charge vs Gate-source Voltage



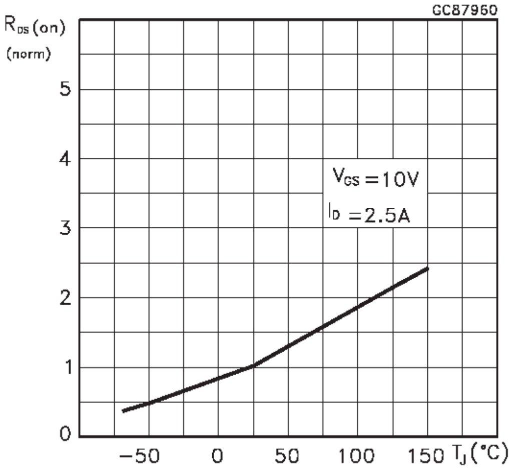
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

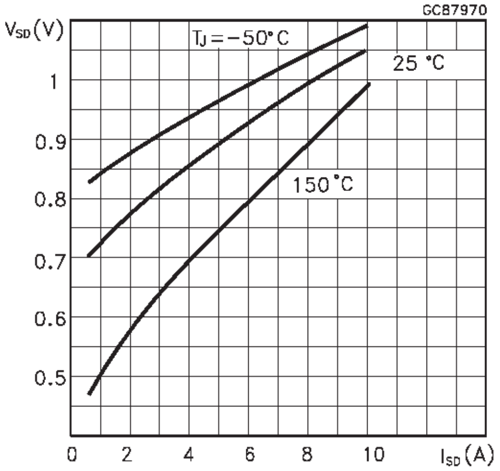


Fig. 1: Unclamped Inductive Load Test Circuit

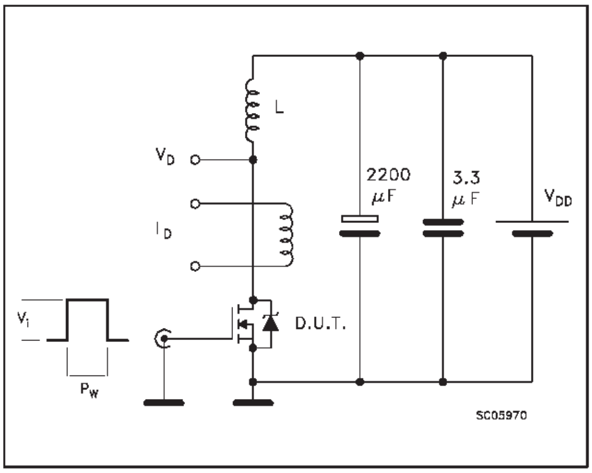


Fig. 2: Unclamped Inductive Waveform

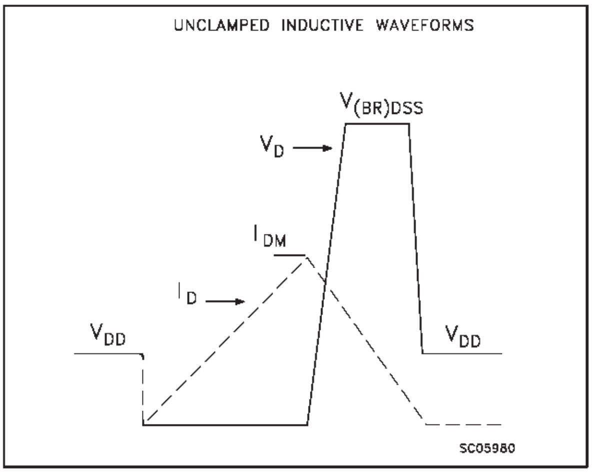


Fig. 3: Switching Times Test Circuits For Resistive Load

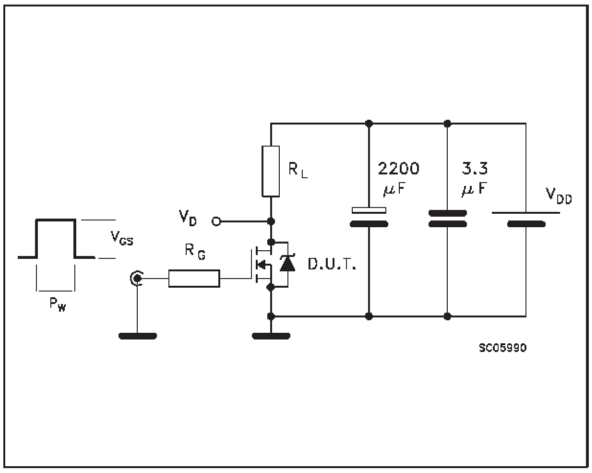


Fig. 4: Gate Charge test Circuit

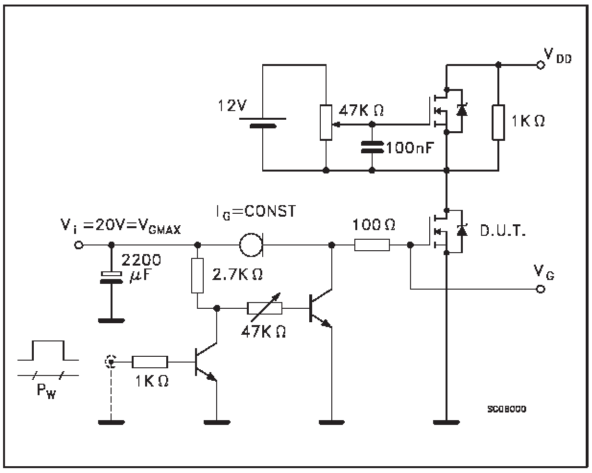
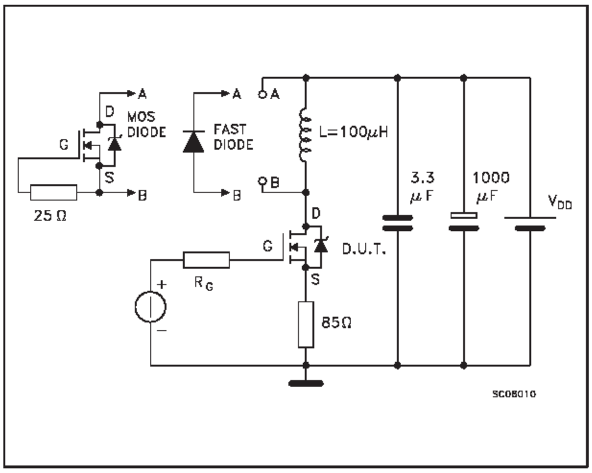
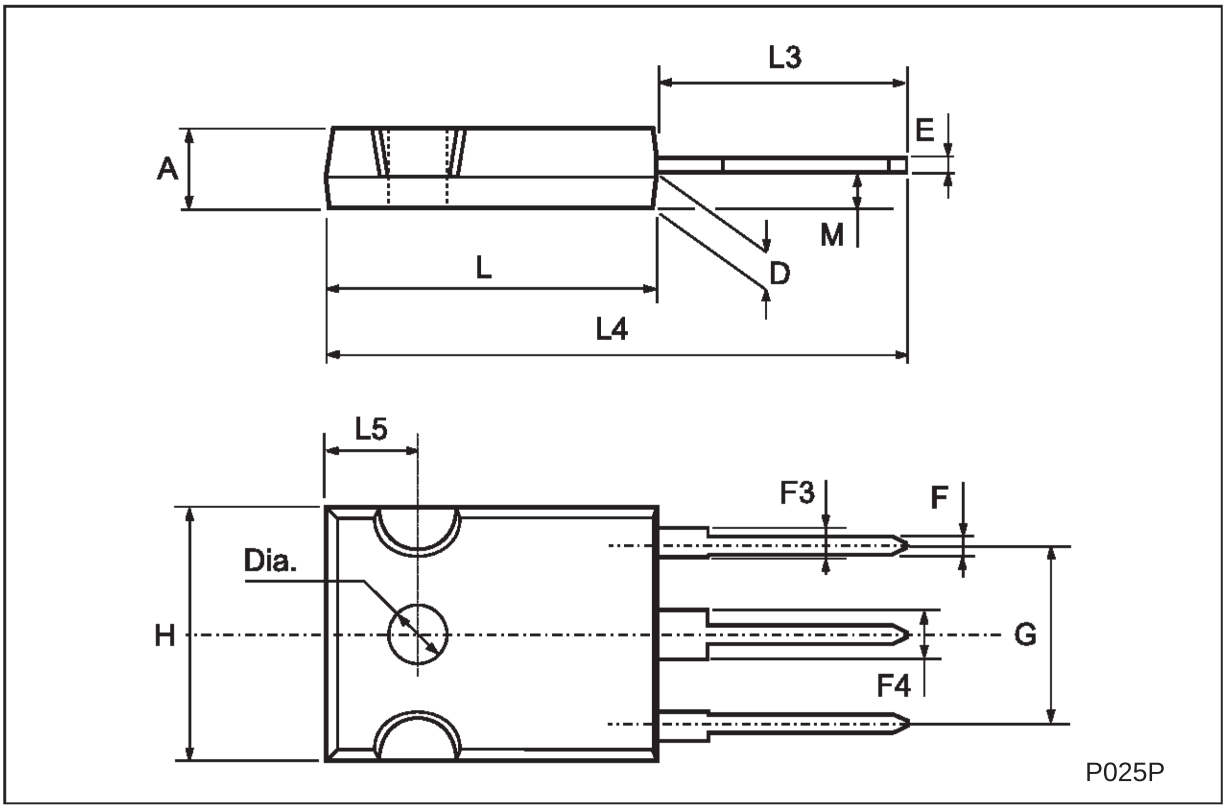


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559		0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118



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