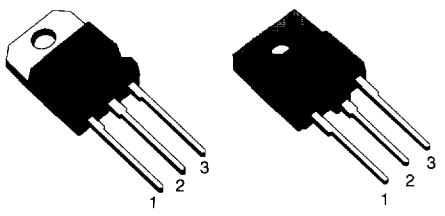
SGS-THOMSON MICROELECTRONICS

STH7N90
STH7N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

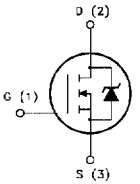
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH7N90	900 V	1.4 Ω	7.5 A
STH7N90FI	900 V	1.4 Ω	4.5 A

- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- LOW LEAKAGE CURRENT SPECIFIED AT MAXIMUM VOLTAGE
- "DIPS" EDGE TERMINATION TO SUSTAIN HIGH VOLTAGE
- APPLICATION ORIENTED CHARACTERIZATION
- ISOLATED PACKAGE UL RECOGNIZED, ISOLATION TO 4000V DC



TO-218 ISOWATT218

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH7N90	STH7N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	7.5	4.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	4.7	2.8	A
I_{DM}(•)	Drain Current (pulsed)	35	35	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.1		°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, $\delta < 1\%$)	7.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	700	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	17	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	4	A

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 = 250 µA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 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 µA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3.5 A V_{GS} = 10V I_D = 3.5 A T_c = 100°C			1.4 2.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	7.5			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 = 3.5 A	4			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			2700 350 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 400 V I_D = 7 A			70	ns
t_r	Rise Time	R_G = 5 Ω V_{GS} = 10 V (see test circuit, figure 3)			65	ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 9 A R_G = 5 Ω V_{GS} = 10 V (see test circuit, figure 5)		360		A/µs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 7 A V_{GS} = 10 V		125	170	nC

SWITCHING OFF

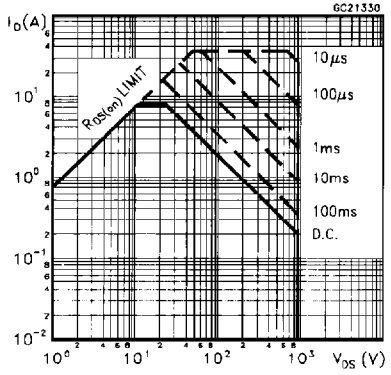
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 640 V I_D = 9 A			50	ns
t_f	Fall Time	R_G = 5 Ω V_{GS} = 10 V			20	ns
t_c	Cross-over Time	(see test circuit, figure 5)			80	ns

SOURCE DRAIN DIODE

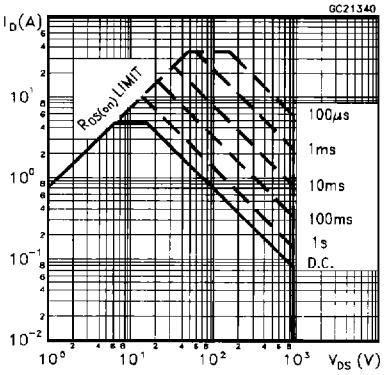
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				7.5	A
I_{SDM}(•)	Source-drain Current (pulsed)				35	A
V_{SD} (*)	Forward On Voltage	I_{SD} = 7.5 A V_{GS} = 0			2.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 7 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C		900		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, figure 5)		24.8		µC
I_{RRM}	Reverse Recovery Current			55		A

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

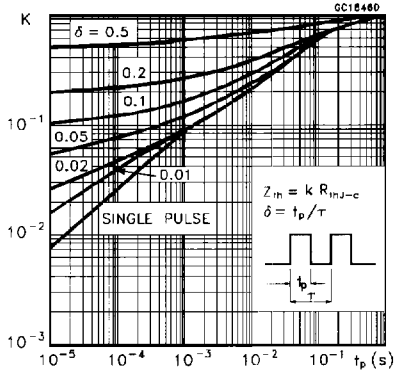
Safe Operating Areas For TO-218



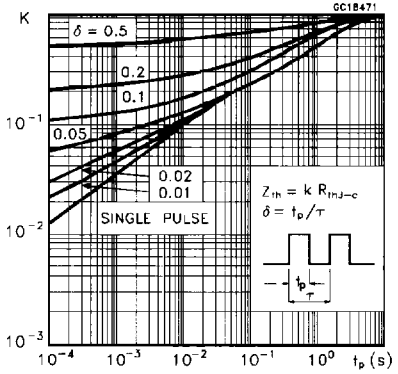
Safe Operating Areas For ISOWATT218



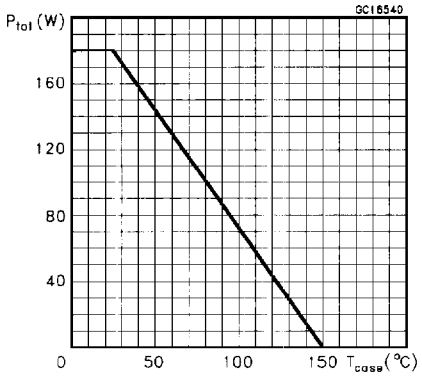
Thermal Impedeance For TO-218



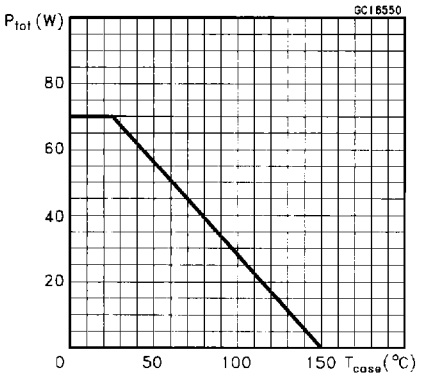
Thermal Impedance For ISOWATT218



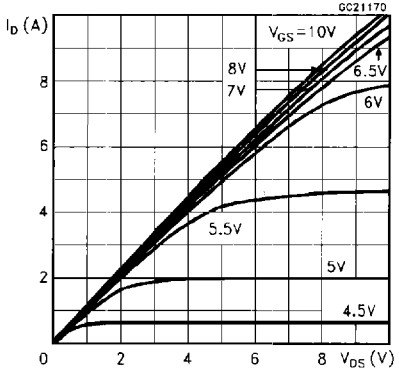
Derating Curve For TO-218



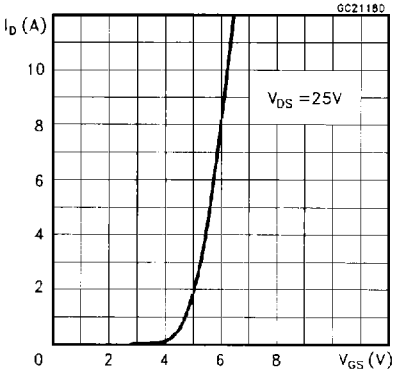
Derating Curve For ISOWATT218



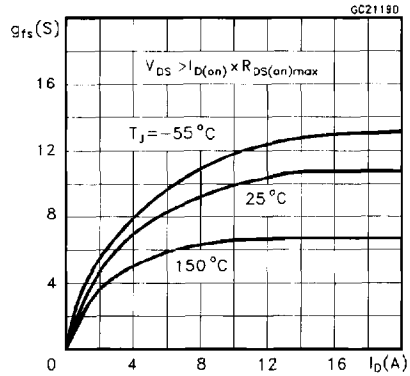
Output Characteristics



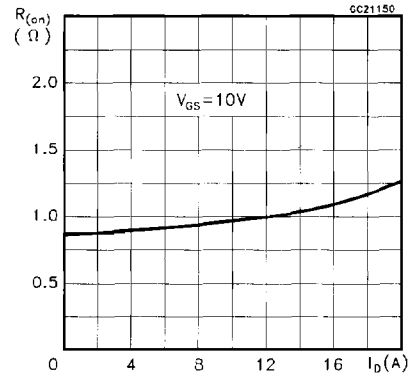
Transfer Characteristics



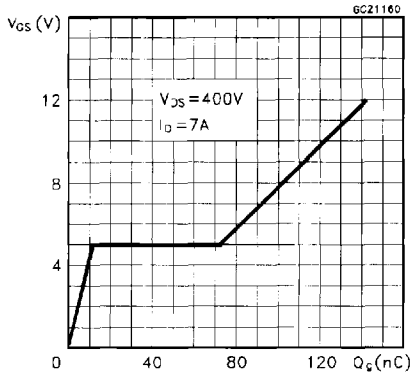
Transconductance



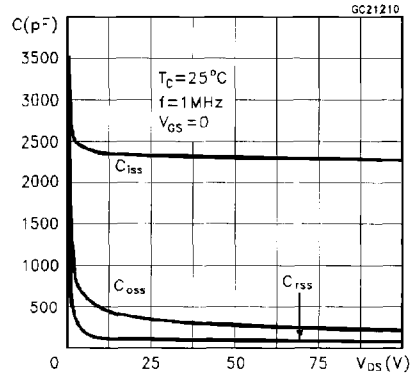
Static Drain-source On Resistance



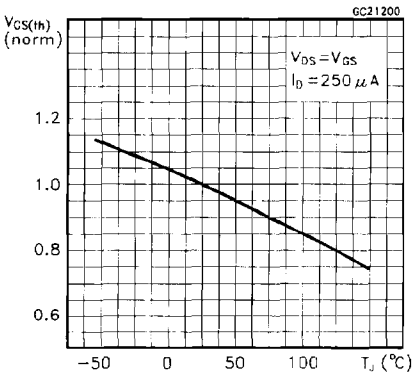
Gate Charge vs Gate-source Voltage



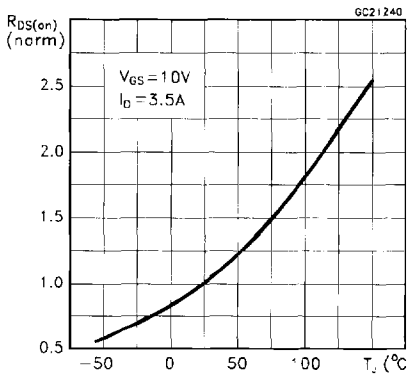
Capacitance Variations



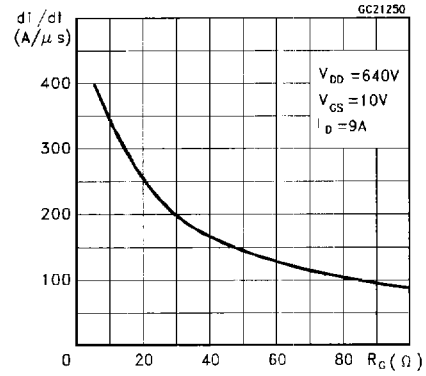
Normalized Gate Threshold Voltage vs Temperature



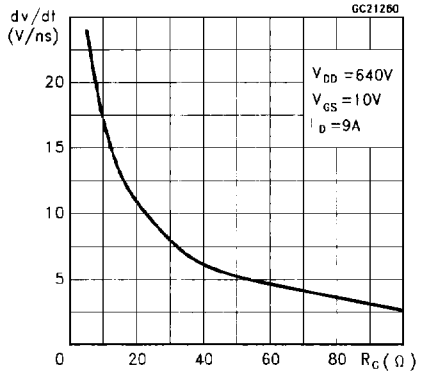
Normalized On Resistance vs Temperature



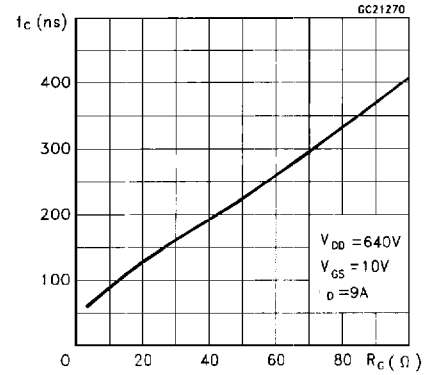
Turn-on Current Slope



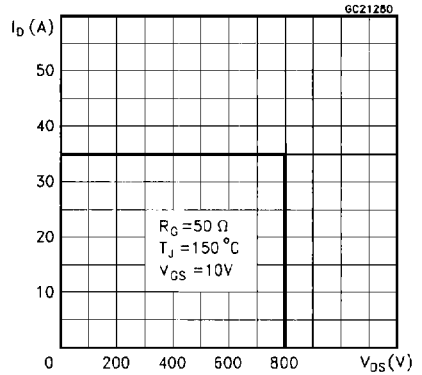
Turn-off Drain-source Voltage Slope



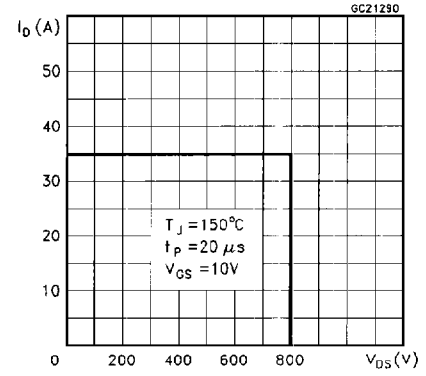
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

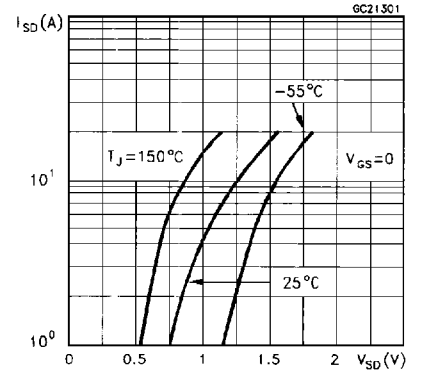


Fig. 1: Unclamped Inductive Load Test Circuits

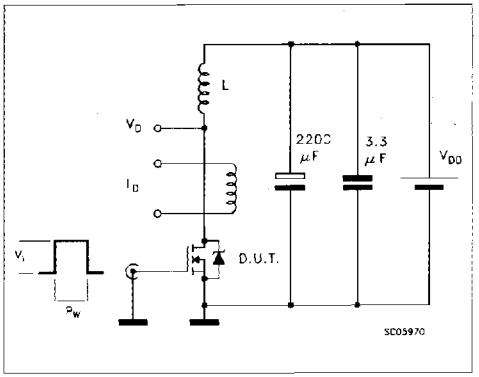


Fig. 2: Unclamped Inductive Waveforms

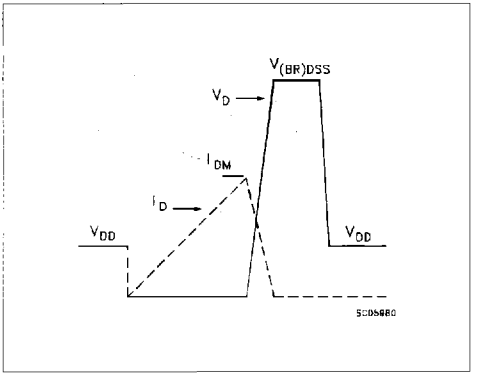


Fig. 3: Switching Times Test Circuits For Resistive Load

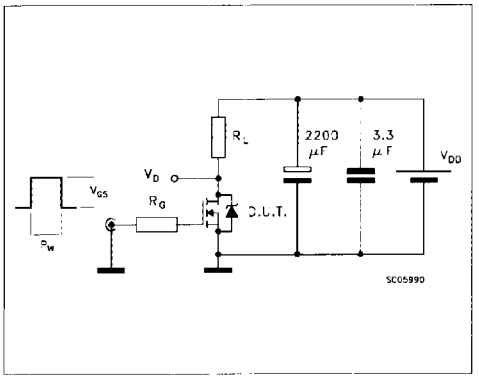


Fig. 4: Gate Charge Test Circuit

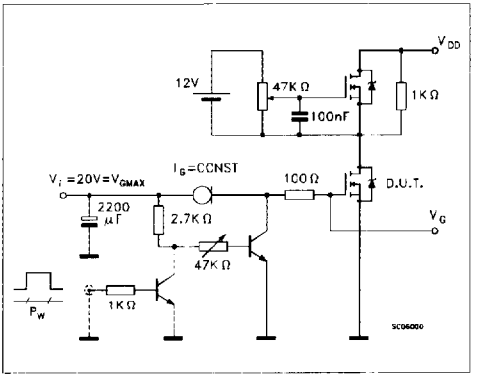


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time