

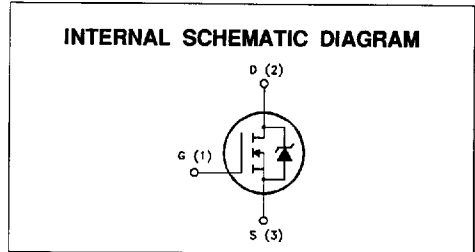
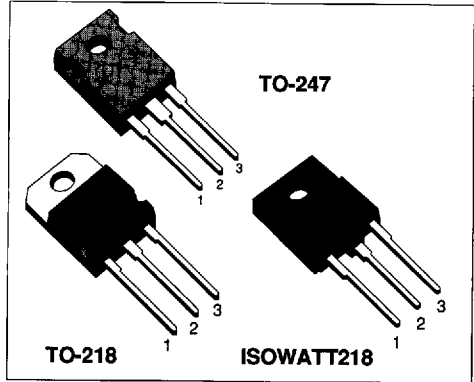
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTOR**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STH14N50	500 V	< 0.45 Ω	14.1 A
STH14N50Fl	500 V	< 0.45 Ω	8.8 A
STW14N50	500 V	< 0.45 Ω	14.1 A

- TYPICAL R<sub>DS(on)</sub> = 0.34 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- REDUCED GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

**APPLICATIONS**

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value		Unit
		STH/STW14N50	STH14N50Fl	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	500		V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	500		V
V <sub>GS</sub>	Gate-source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	14.1	8.8	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	8.8	5.5	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	60	60	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V <sub>ISO</sub>	Insulation Withstand Voltage (DC)	—	4000	V
T <sub>stg</sub>	Storage Temperature	-65 to 150		°C
T <sub>J</sub>	Max. Operating Junction Temperature	150		°C

(\*) Pulse width limited by safe operating area

**THERMAL DATA**

		TO-218/TO-247	ISOWATT218	
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max 0.69	1.78	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max 30		°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ 0.1		°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300		°C

**AVALANCHE CHARACTERISTICS**

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max, δ < 1%)	14.1	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 25 V)	800	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy (pulse width limited by T <sub>j</sub> max, δ < 1%)	26	mJ
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (T <sub>c</sub> = 100 °C, pulse width limited by T <sub>j</sub> max, δ < 1%)	8.8	A

**ELECTRICAL CHARACTERISTICS** (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0	500			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating x 0.8 T <sub>c</sub> = 125 °C			250 1000	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			± 100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 7.5 A V <sub>GS</sub> = 10V I <sub>D</sub> = 7.5 A T <sub>c</sub> = 100°C		0.34	0.45 0.9	Ω Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	14.1			A

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> I <sub>D</sub> = 7.5 A	8.5	11.2		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		2350	3000	pF
C <sub>oss</sub>	Output Capacitance			340	440	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			75	100	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 210\text{ V}$ $I_D = 7\text{ A}$		60	80	ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		55	70	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		270		A/ $\mu$ s
$Q_g$	Total Gate Charge	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$ $V_{GS} = 10\text{ V}$		90	110	nC
$Q_{gs}$	Gate-Source Charge			12		nC
$Q_{gd}$	Gate-Drain Charge			48		nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$		35	45	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		45	60	ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		65	85	ns

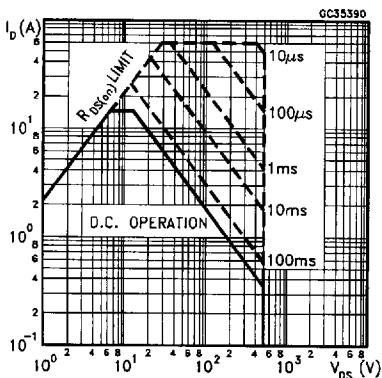
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				14.1	A
$I_{SDM}(\ast)$	Source-drain Current (pulsed)				60	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 14\text{ A}$ $V_{GS} = 0$			2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 15\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		630		ns
$Q_{rr}$	Reverse Recovery Charge			10.7		$\mu$ C
$I_{RRM}$	Reverse Recovery Current			34		A

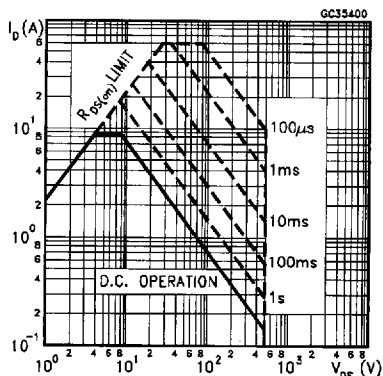
(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5 %

(\*) Pulse width limited by safe operating area

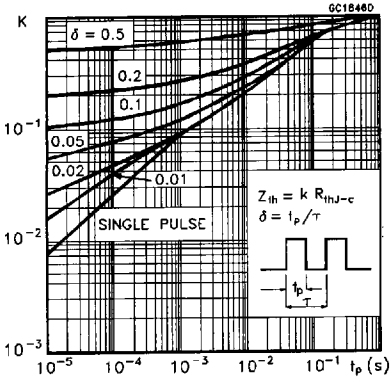
Safe Operating Areas For TO-218 and TO-247



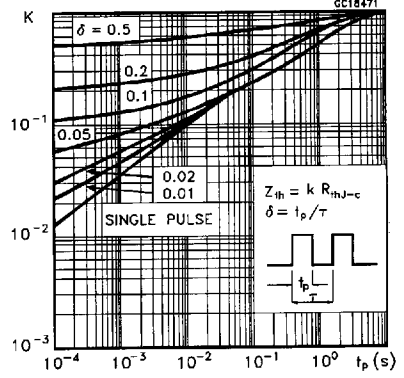
Safe Operating Areas For ISOWATT218



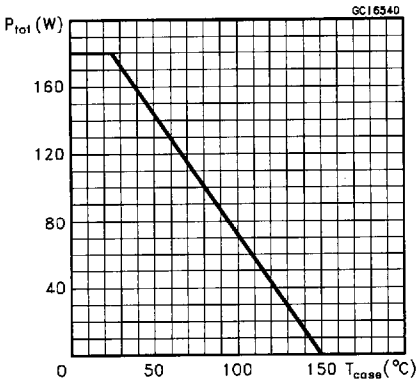
Thermal Impedance For TO218 and TO-247



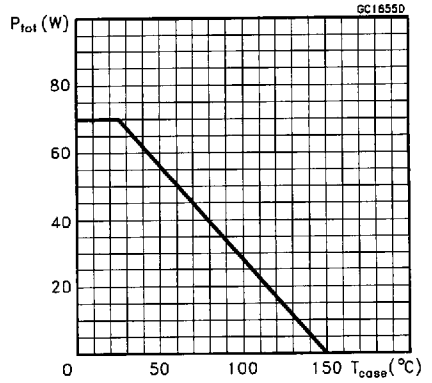
Thermal Impedance For ISOWATT218



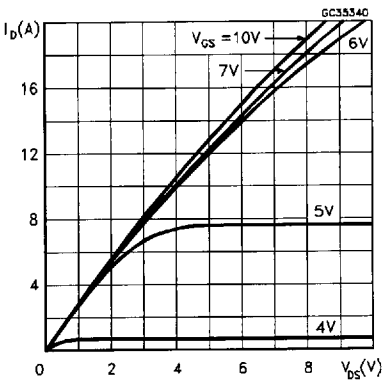
Derating Curve For TO-218 and TO-247



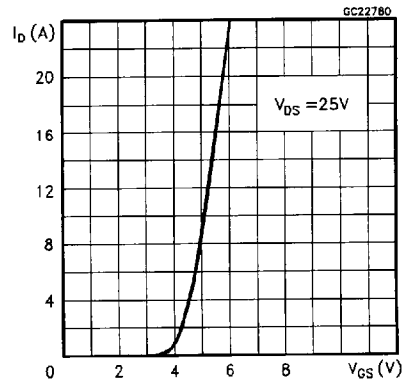
Derating Curve For ISOWATT218



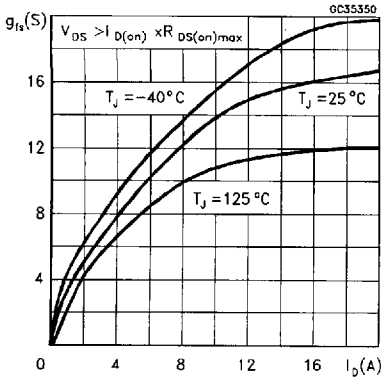
Output Characteristics



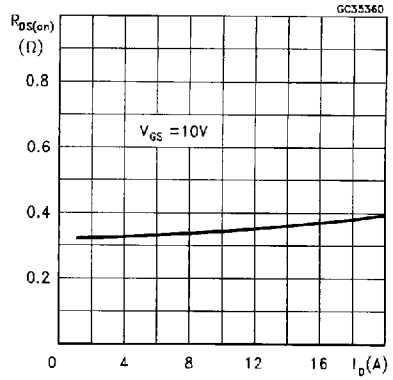
Transfer Characteristics



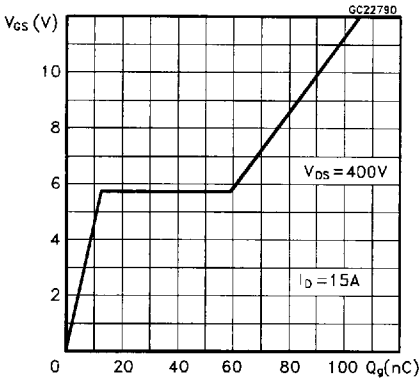
Transconductance



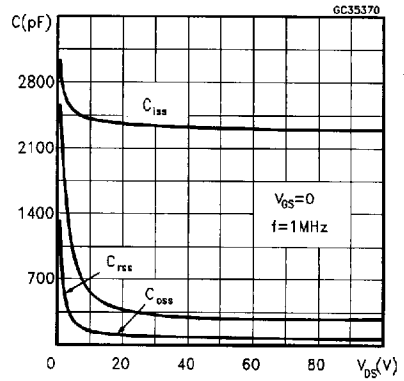
Static Drain-source On Resistance



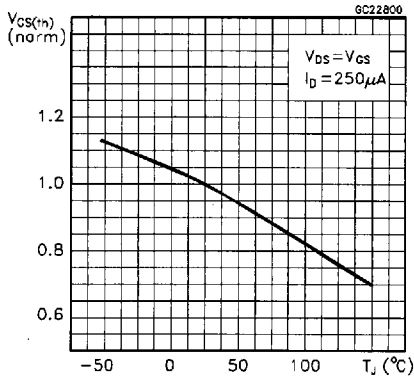
Gate Charge vs Gate-source Voltage



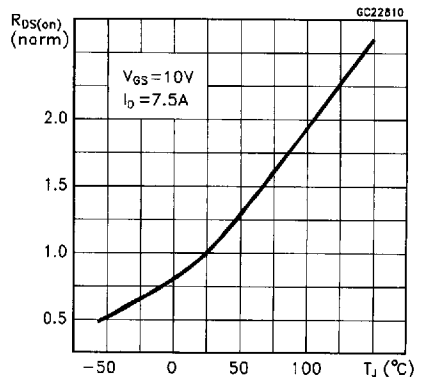
Capacitance Variations



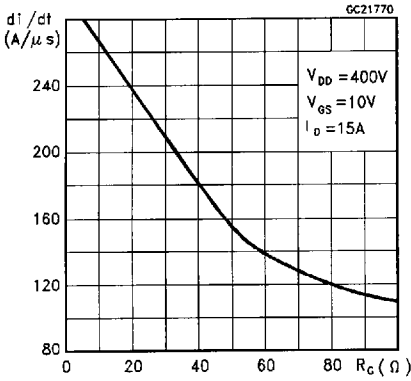
Normalized Gate Threshold Voltage vs Temperature



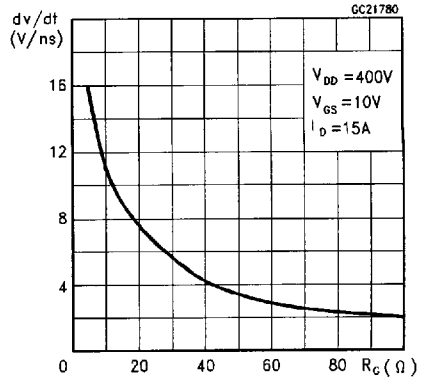
Normalized On Resistance vs Temperature



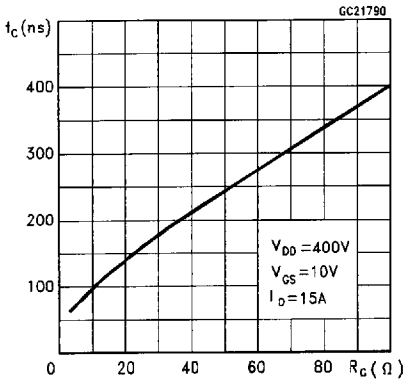
Turn-on Current Slope



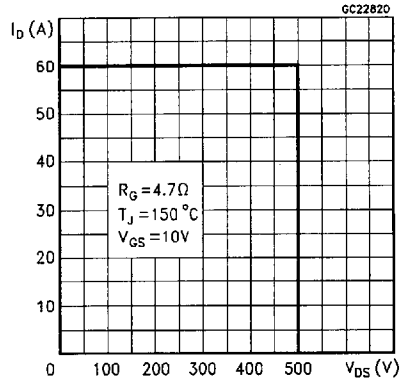
Turn-off Drain-source Voltage Slope



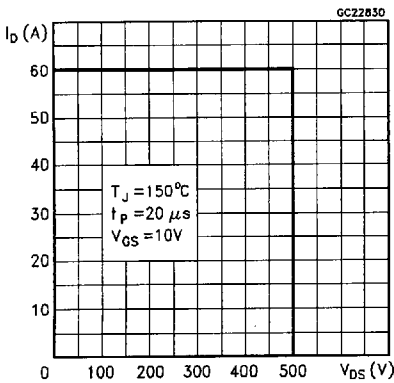
Cross-over Time



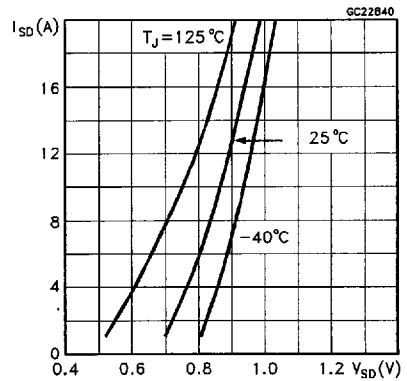
Switching Safe Operating Area



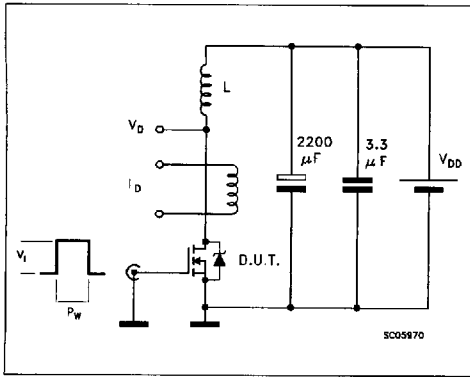
Accidental Overload Area



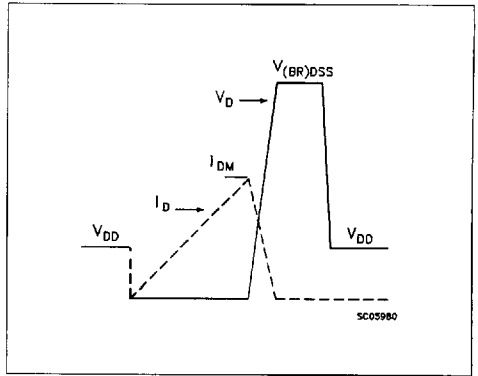
Source-drain Diode Forward Characteristics



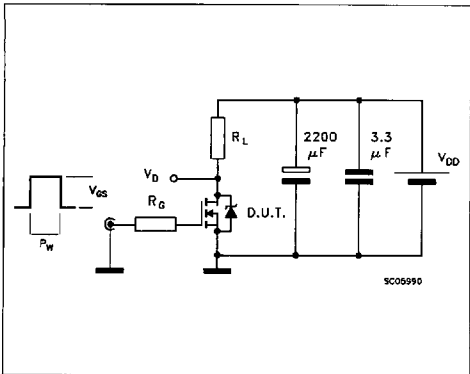
**Fig. 1: Unclamped Inductive Load Test Circuits**



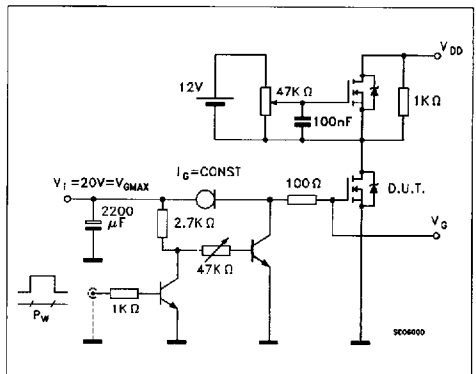
**Fig. 2: Unclamped Inductive Waveforms**



**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**

