

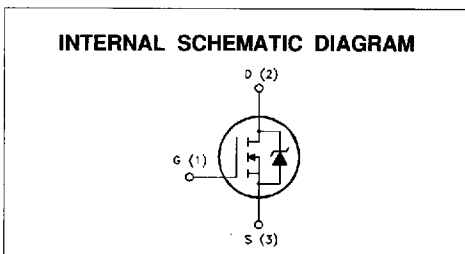
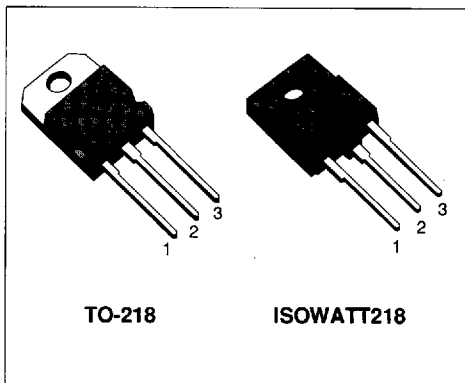
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTOR**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STH4N80	800 V	< 3 Ω	4.3 A
STH4N80FI	800 V	< 3 Ω	2.8 A

- TYPICAL R<sub>DS(on)</sub> = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

**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
		STH4N80	STH4N80FI	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	800		V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	800		V
V <sub>GS</sub>	Gate-source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	4.3	2.8	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	2.6	1.7	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	16	16	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	55	W
	Derating Factor	1	0.44	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	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	2.27	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
$T_J$	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, $\delta < 1\%$ )	4.3	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_J = 25^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	230	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_J$ max, $\delta < 1\%$ )	10	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_C = 100^\circ\text{C}$ , pulse width limited by $T_J$ max, $\delta < 1\%$ )	2.6	A

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ $V_{GS} = 0$	800			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_C = 125^\circ\text{C}$			250 1000	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{V}$ $I_D = 1.7\text{ A}$ $V_{GS} = 10\text{V}$ $I_D = 1.7\text{ A}$ $T_C = 100^\circ\text{C}$		2.5	3 6	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	4.3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$ (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.7\text{ A}$	1			S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$			1100	pF
$C_{oss}$	Output Capacitance				150	pF
$C_{rss}$	Reverse Transfer Capacitance				55	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 30\text{ V}$ $I_D = 2.3\text{ A}$		65	90	ns
$t_r$	Rise Time	$R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		150	200	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 600\text{ V}$ $I_D = 3.8\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		80	110	A/ $\mu$ s
$Q_g$	Total Gate Charge	$V_{DD} = 400\text{ V}$ $I_D = 5\text{ A}$ $V_{GS} = 10\text{ V}$		55	70	nC
$Q_{gs}$	Gate-Source Charge			8		nC
$Q_{gd}$	Gate-Drain Charge			26		nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 600\text{ V}$ $I_D = 3.8\text{ A}$		110	145	ns
$t_f$	Fall Time	$R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$		140	190	ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		150	200	ns

**SOURCE DRAIN DIODE**

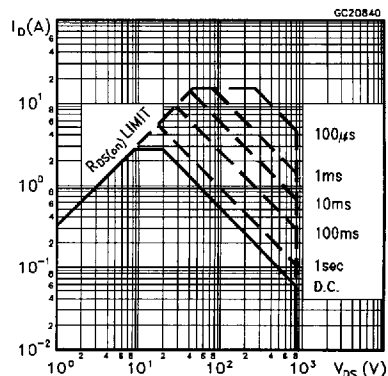
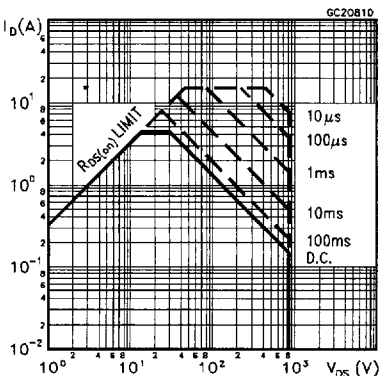
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				4.2	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				16	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 4.3\text{ A}$ $V_{GS} = 0$			2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 3.8\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		500		ns
$Q_{rr}$	Reverse Recovery Charge			4.3		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			17		A

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

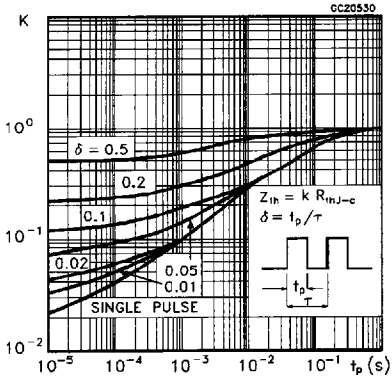
( $\bullet$ ) Pulse width limited by safe operating area

**Safe Operating Areas For TO-218**

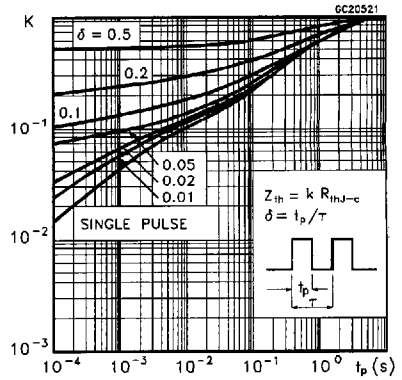
**Safe Operating Areas For ISOWATT218**



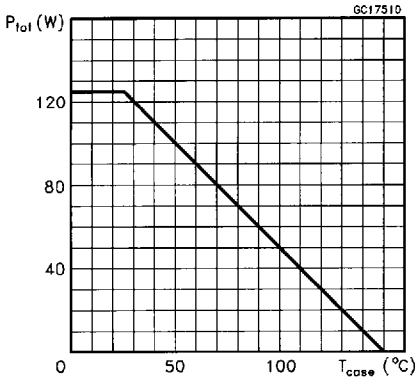
Thermal Impedance For TO-218



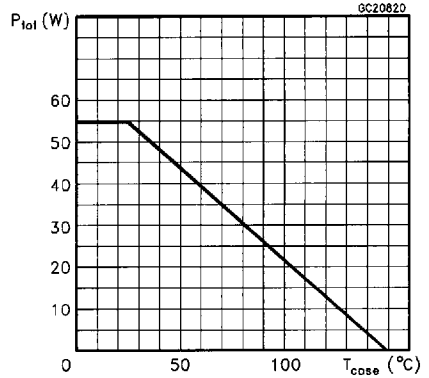
Thermal Impedance For ISOWATT218



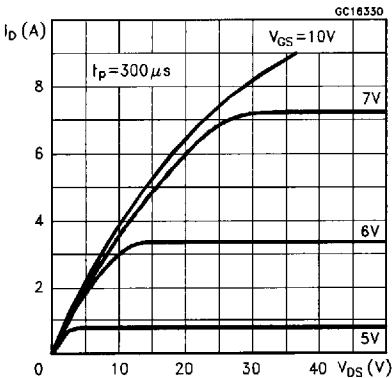
Derating Curve For TO-218



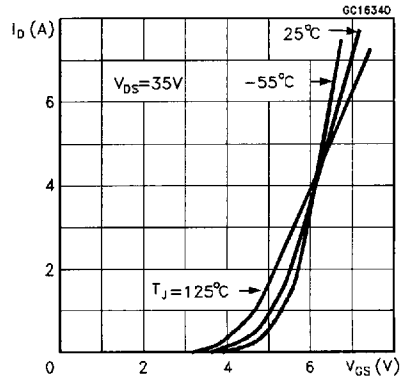
Derating Curve For ISOWATT218



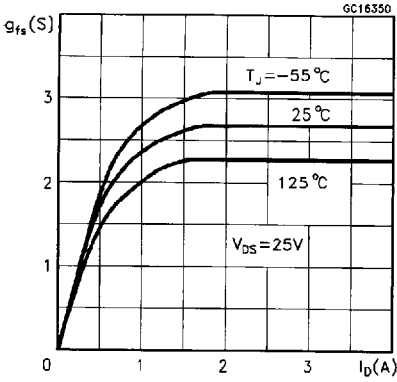
Output Characteristics



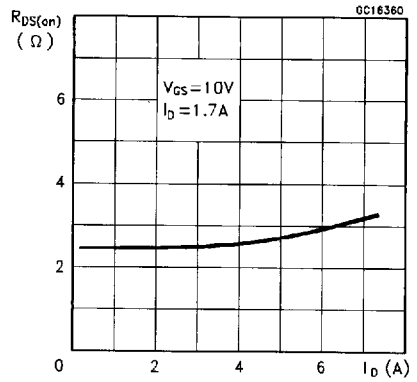
Transfer Characteristics



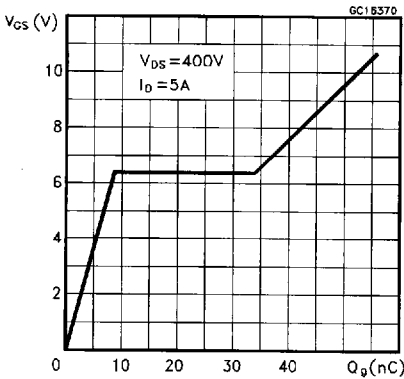
Transconductance



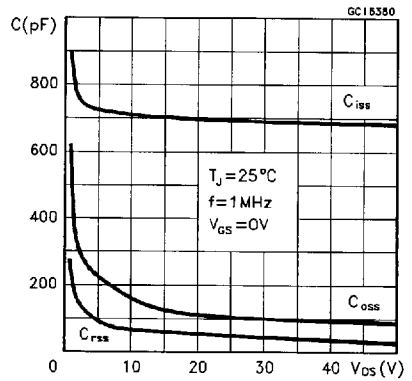
Static Drain-source On Resistance



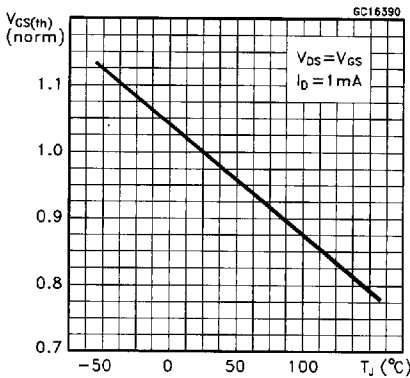
Gate Charge vs Gate-source Voltage



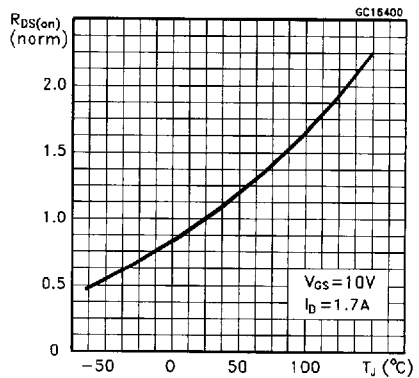
Capacitance Variations



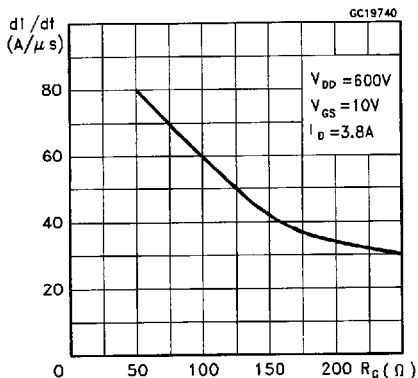
Normalized Gate Threshold Voltage vs Temperature



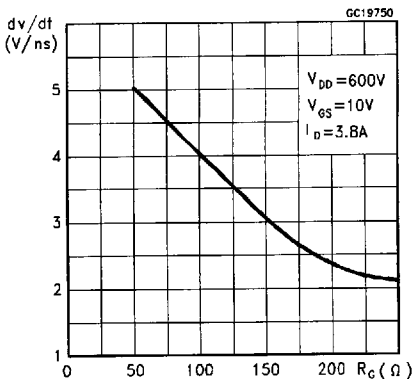
Normalized On Resistance vs Temperature



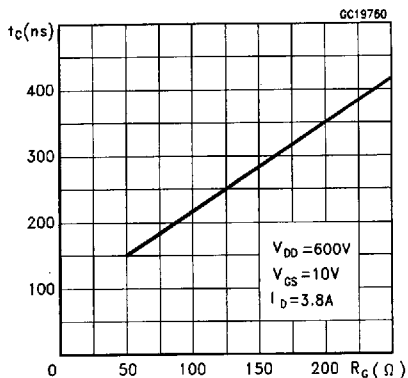
Turn-on Current Slope



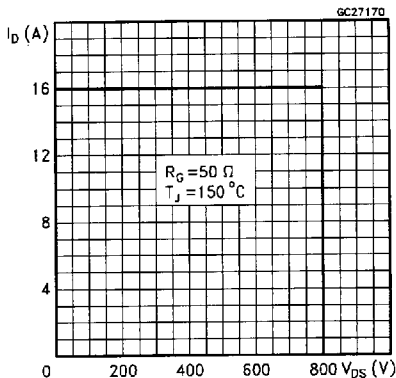
Turn-off Drain-source Voltage Slope



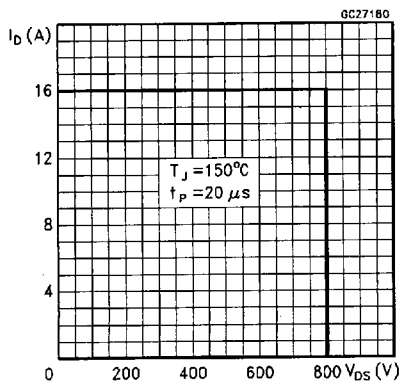
Cross-over Time



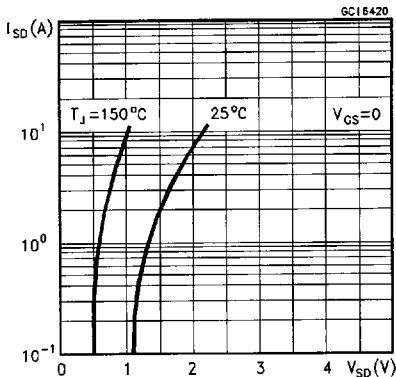
Switching Safe Operating Area



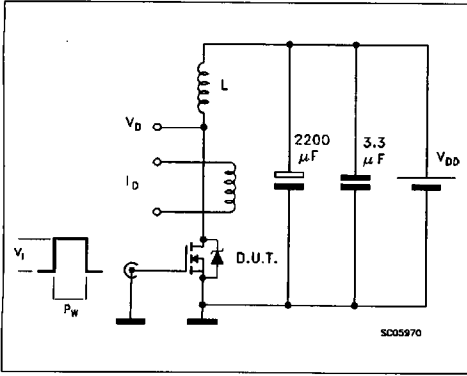
Accidental Overload Area



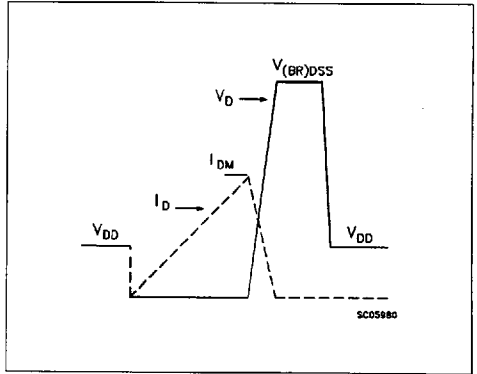
Source-drain Diode Forward Characteristics



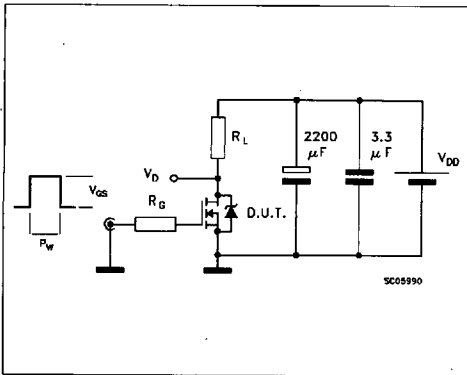
**Fig. 1: Unclamped Inductive Load Test Circuits**



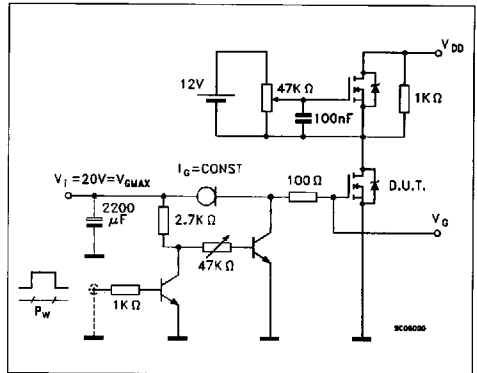
**Fig. 2: Unclamped Inductive Waveforms**



**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**

