

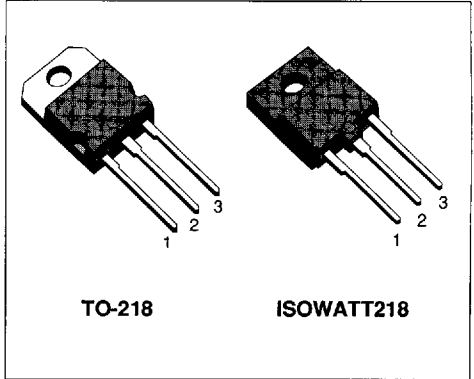
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTOR**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
IRFP350	400 V	< 0.3 Ω	16 A
IRFP350FI	400 V	< 0.3 Ω	10 A

- TYPICAL R<sub>DS(on)</sub> = 0.21 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

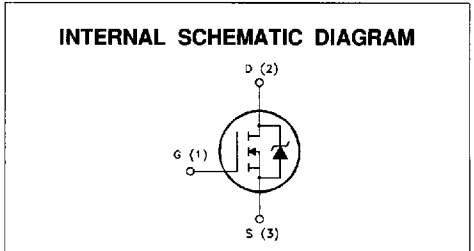
**APPLICATIONS**

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



TO-218

ISOWATT218



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value		Unit
		IRFP350	IRFP350FI	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	400		V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	400		V
V <sub>GS</sub>	Gate-source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	16	10	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	10	7	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	64	64	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	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°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
$T_l$	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, $\delta < 1\%$ )	16	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	435	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_j$ max, $\delta < 1\%$ )	23	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^\circ\text{C}$ , pulse width limited by $T_j$ max, $\delta < 1\%$ )	10	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	$I_D = 250\ \mu\text{A}$ $V_{GS} = 0$	400			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	$V_{GS} = 10\text{ V}$ $I_D = 8\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 8\text{ A}$ $T_c = 100^\circ\text{C}$		0.21	0.3 0.6	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	16			A

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 8\text{ A}$	6	12		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		2200	2900	pF
$C_{oss}$	Output Capacitance			400	550	pF
$C_{rss}$	Reverse Transfer Capacitance			205	270	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 200\text{ V}$ $I_D = 8\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		25 85	35 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320\text{ V}$ $I_D = 16\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		350		A/ $\mu$ s
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320\text{ V}$ $I_D = 16\text{ A}$ $V_{GS} = 10\text{ V}$		145 15 80	190	nC nC nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$ $t_f$	Off-voltage Rise Time Fall Time	$V_{DD} = 320\text{ V}$ $I_D = 16\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		105 35	140 50	ns ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		150	200	ns

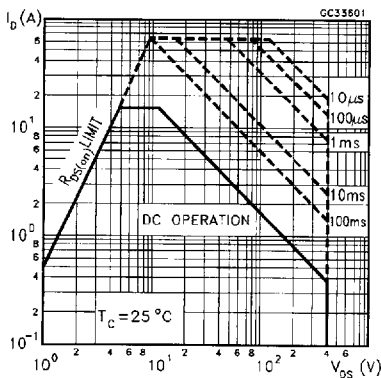
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\ast)$	Source-drain Current Source-drain Current (pulsed)				16 64	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 16\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 16\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		620		ns
$Q_{rr}$	Reverse Recovery Charge			10.9		$\mu$ C
$I_{RRM}$	Reverse Recovery Current			35		A

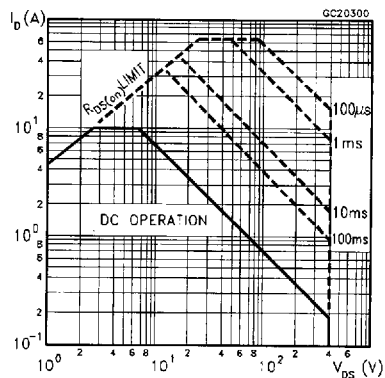
(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5 %

(\*) Pulse width limited by safe operating area

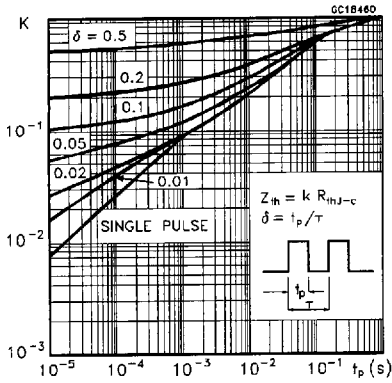
**Safe Operating Areas For TO-218**



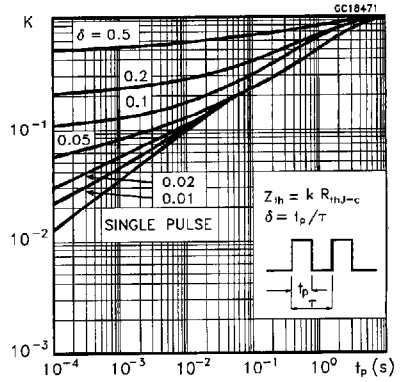
**Safe Operating Areas For ISOWATT218**



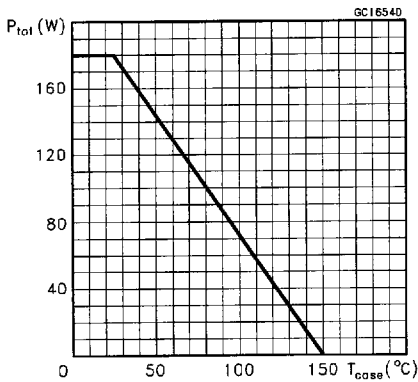
Thermal Impedance For TO-218



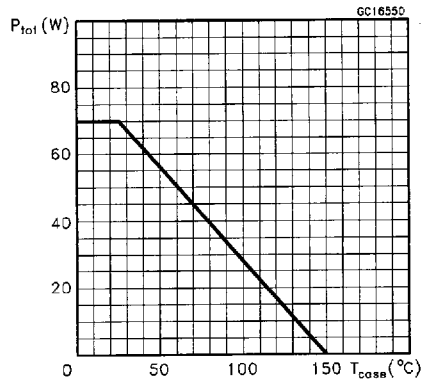
Thermal Impedance For ISOWATT218



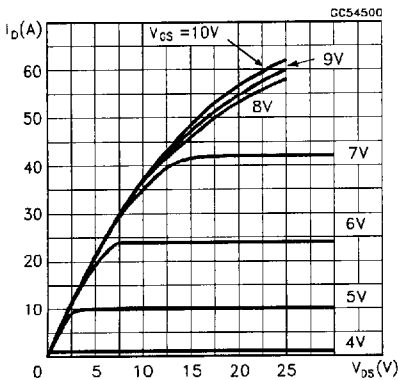
Derating Curve For TO-218



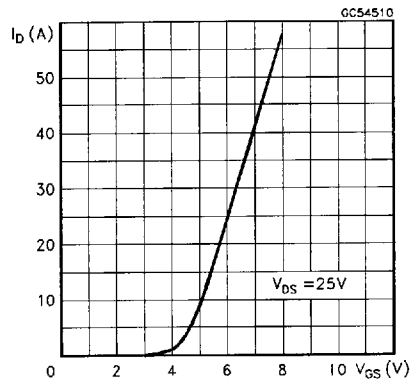
Derating Curve For ISOWATT218



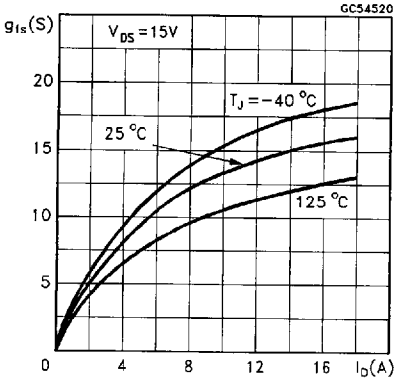
Output Characteristics



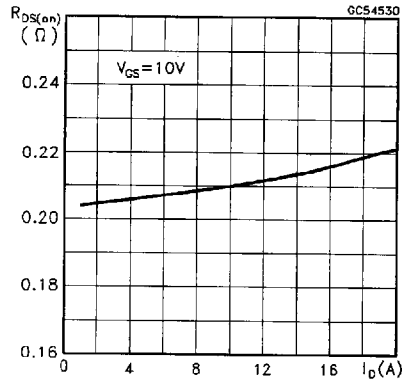
Transfer Characteristics



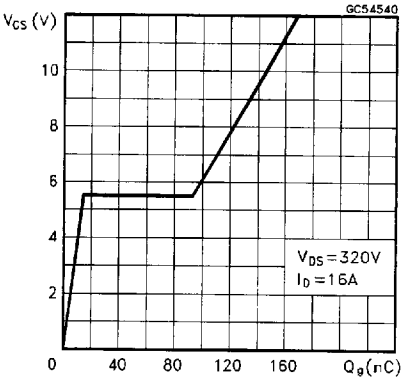
Transconductance



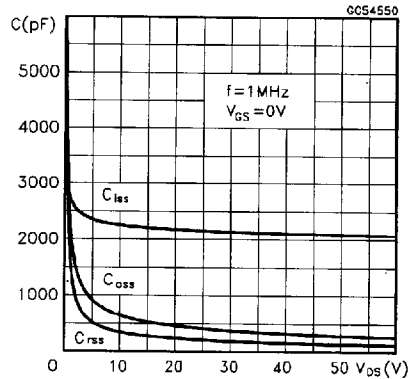
Static Drain-source On Resistance



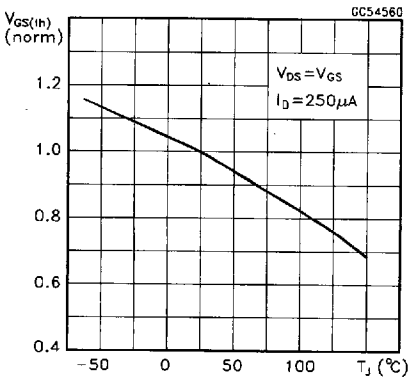
Gate Charge vs Gate-source Voltage



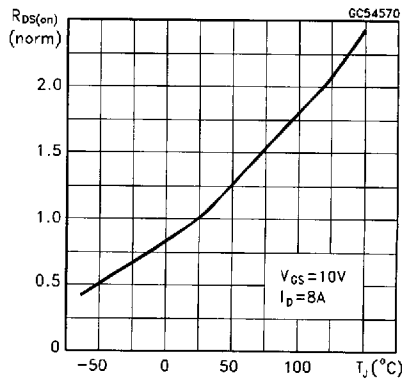
Capacitance Variations



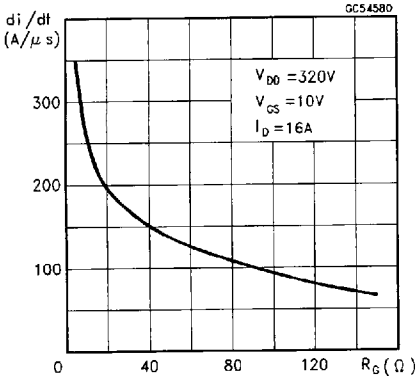
Normalized Gate Threshold Voltage vs Temperature



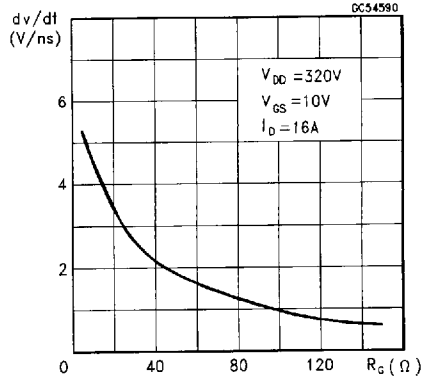
Normalized On Resistance vs Temperature



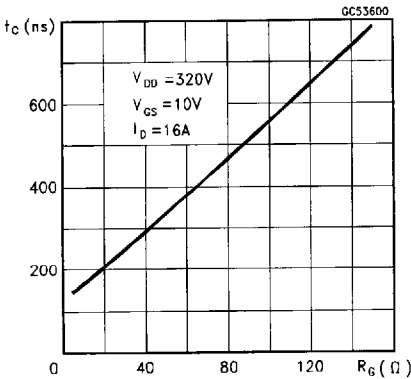
Turn-on Current Slope



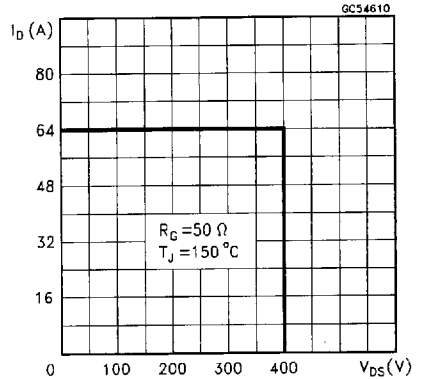
Turn-off Drain-source Voltage Slope



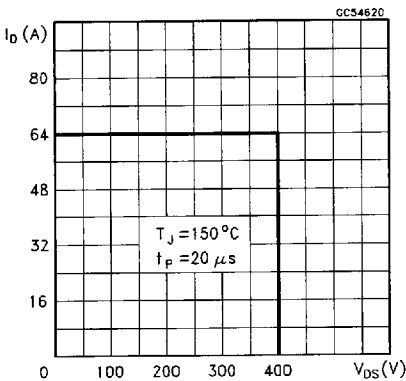
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

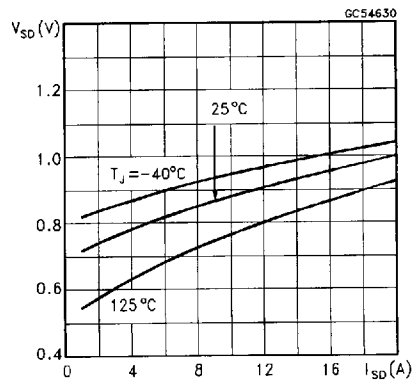


Fig. 1: Unclamped Inductive Load Test Circuits

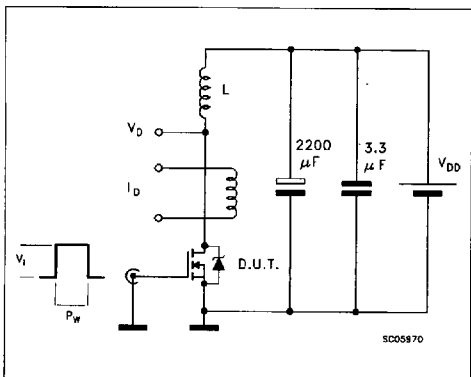


Fig. 2: Unclamped Inductive Waveforms

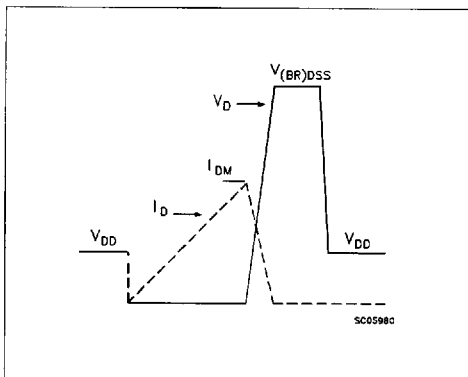


Fig. 3: Switching Times Test Circuits For Resistive Load

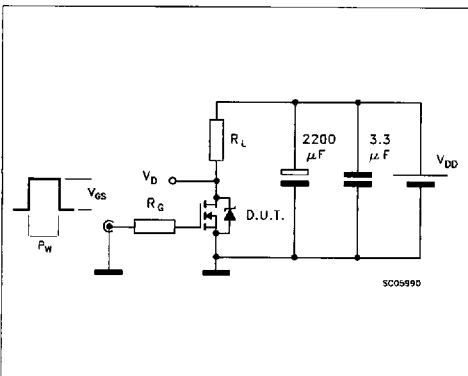


Fig. 4: Gate Charge Test Circuit

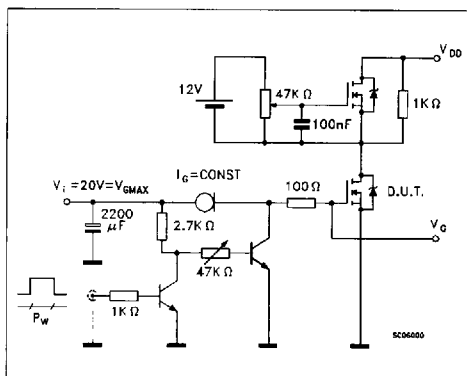


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

