

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

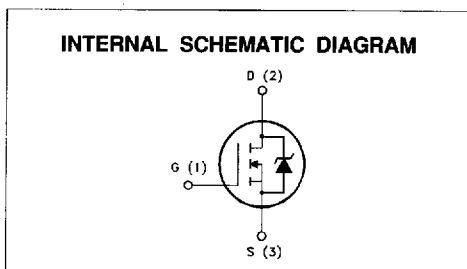
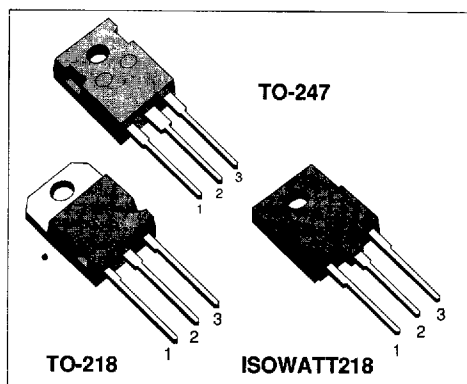
PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
IRFP450	500 V	< 0.4 Ω	14 A
IRFP450FI	500 V	< 0.4 Ω	9 A
IRFW450	500 V	< 0.4 Ω	14 A

- TYPICAL R_{DS(on)} = 0.33 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

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
		IRFP/IRFW450	IRFP450FI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	500	500	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	500	500	V
V _{GS}	Gate-source Voltage	± 20		V
I _D	Drain Current (cont.) at T _c = 25 °C	14	9	A
I _D	Drain Current (cont.) at T _c = 100 °C	8.8	5.6	A
I _{DM} (*)	Drain Current (pulsed)	56	56	A
P _{tot}	Total Dissipation at T _c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V _{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
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/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		$^{\circ}C/W$
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.1		$^{\circ}C/W$
T_l	Maximum Lead Temperature For Soldering Purpose		300		$^{\circ}C$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50 V$)	760	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	18	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100^{\circ}C$, pulse width limited by T_j max, $\delta < 1\%$)	8	A

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	500			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}C$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20 V$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10 V$ $I_D = 7.9 A$		0.33	0.4	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 7.9 A$	6	10		S
C_{iss}	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		2200	3000	pF
C_{oss}	Output Capacitance			340	440	pF
C_{rss}	Reverse Transfer Capacitance			165	220	pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING RESISTIVE LOAD**

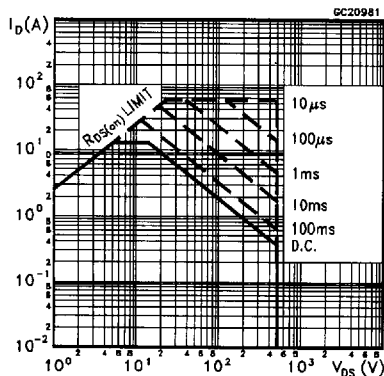
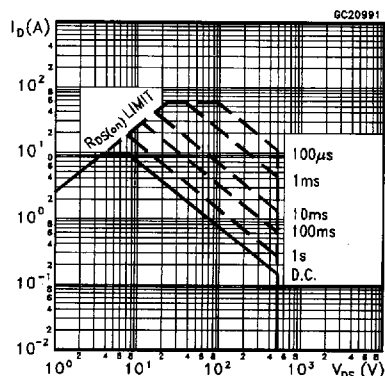
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 210\text{ V}$ $I_D = 7\text{ A}$		25	35	ns
t_r	Rise Time	$R_i = 4.7\ \Omega$		55	75	ns
$t_{d(off)}$	Turn-off Delay Time	(see test circuit)		170	225	ns
t_f	Fall Time			100	135	ns
Q_g	Total Gate Charge	$I_D = 13\text{ A}$ $V_{GS} = 10\text{ V}$		145	190	nC
Q_{gs}	Gate-Source Charge	$V_{DD} = \text{Max Rating} \times 0.8$		15		nC
Q_{gd}	Gate-Drain Charge	(see test circuit)		75		nC

SOURCE DRAIN DIODE

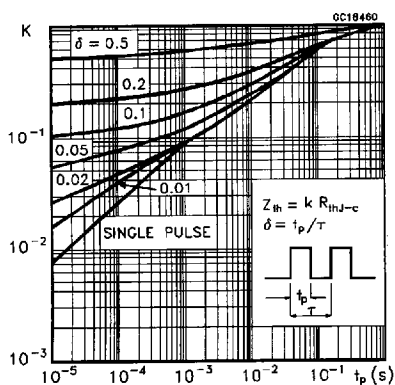
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				14	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				56	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 14\text{ A}$ $V_{GS} = 0$			1.4	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 14\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150^\circ\text{C}$		700		ns
Q_{rr}	Reverse Recovery Charge			17		μC

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

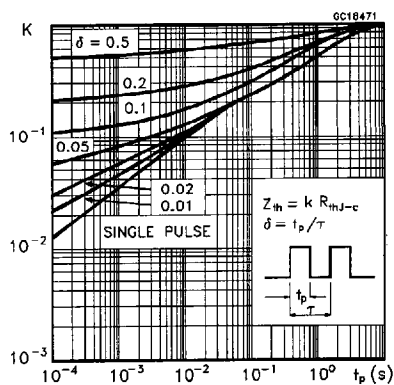
(\bullet) Pulse width limited by safe operating area

Safe Operating Area for TO-218 and TO-247**Safe Operating Area for ISOWATT218**

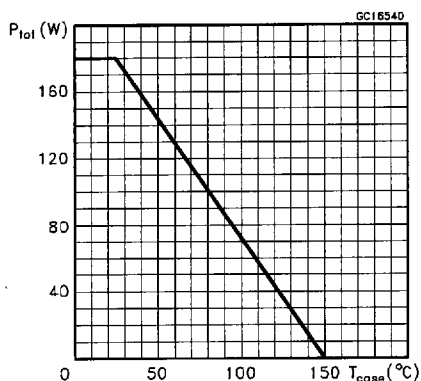
Thermal Impedance for TO-218 and TO-247



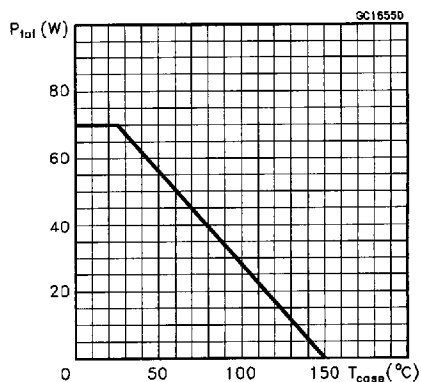
Thermal Impedance for ISOWATT218



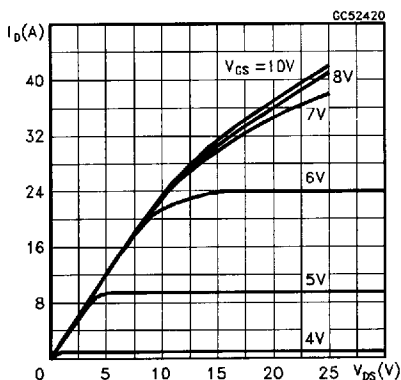
Derating Curve for TO-218 and TO-247



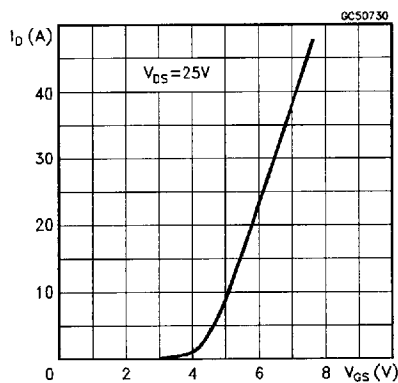
Derating Curve for ISOWATT218



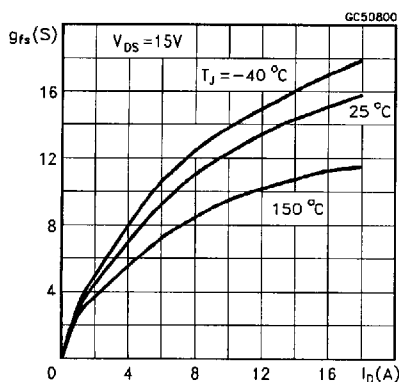
Output Characteristics



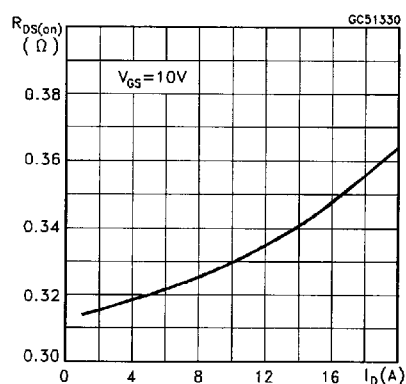
Transfer Characteristics



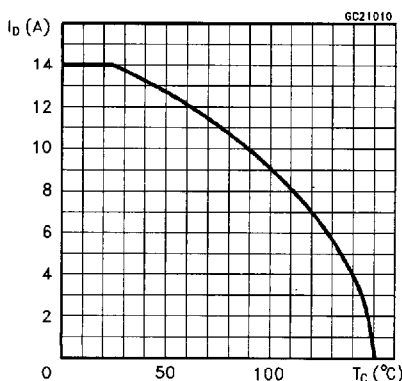
Transconductance



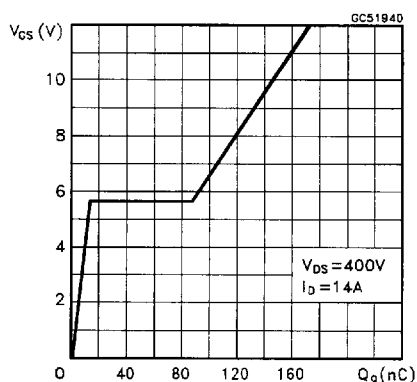
Static Drain-source On Resistance



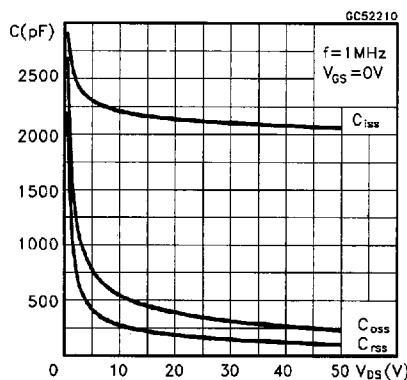
Maximum Drain Current vs Temperature



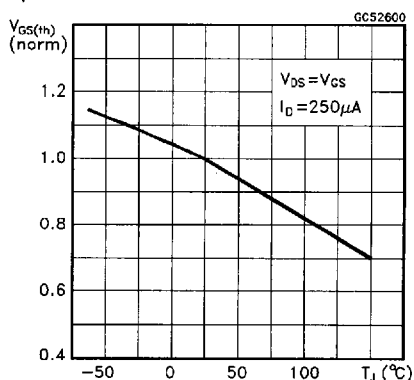
Gate Charge vs Gate-source Voltage



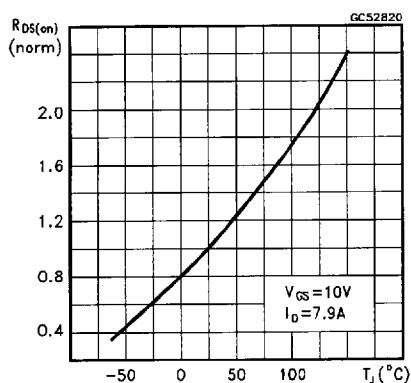
Capacitance Variations



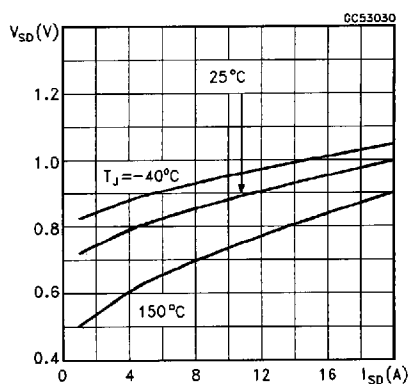
Normalized Gate Threshold Voltage vs Temperature



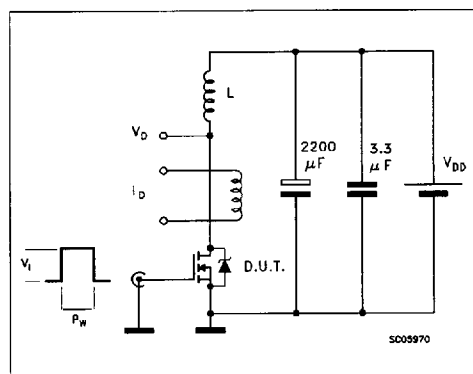
Normalized On Resistance vs Temperature



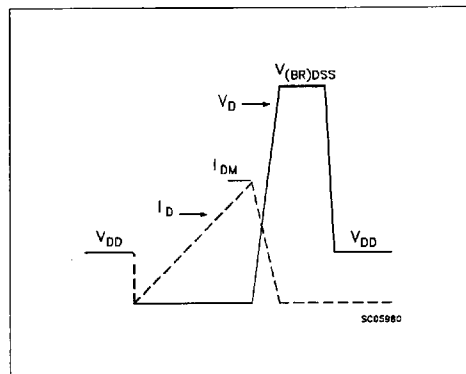
Source-drain Diode Forward Characteristics



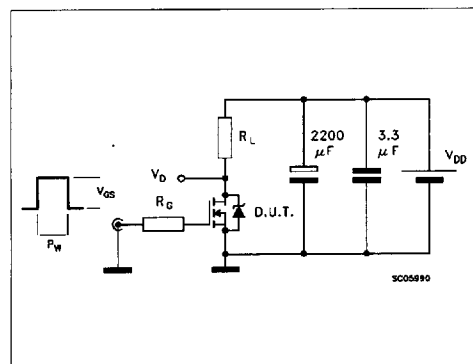
Unclamped Inductive Load Test Circuit



Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit

