SGS-THOMSON MICROELECTRONICS

IRF820/FI IRF822/FI

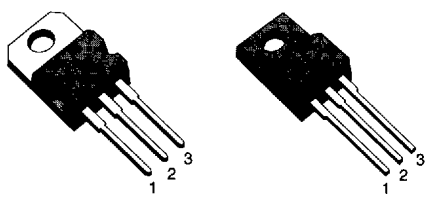
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF820	500 V	< 3 Ω	3 A
IRF820FI	500 V	< 3 Ω	2.2 A
IRF822	500 V	< 4 Ω	2.8 A
IRF822FI	500 V	< 4 Ω	1.9 A

- TYPICAL $R_{DS(on)}$ = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

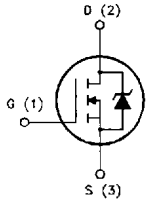
APPLICATIONS

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



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value				Unit
		IRF				
		820	822	820FI	822FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	500	500	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	500	500	500	V
V_{GS}	Gate-source Voltage	± 20				V
I_D	Drain Current (cont.) at T_c = 25 °C	3	2.8	2.2	1.9	A
I_D	Drain Current (cont.) at T_c = 100 °C	1.9	1.7	1.4	1.2	A
I_{DM}(•)	Drain Current (pulsed)	12	12	12	12	A
P_{tot}	Total Dissipation at T_c = 25 °C	75		35		W
	Derating Factor	0.6		0.28		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-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.66	3.57	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}s}$	Thermal Resistance Case-sink	Typ	0.5		°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, $\delta < 1\%$)	3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ °C$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	225	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	6	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ °C$, pulse width limited by T_j max, $\delta < 1\%$)	1.9	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	$I_D = 250\ \mu A$ $V_{GS} = 0$	500			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 ($V_{DS} = 0$)	$V_{GS} = \pm 20$ 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 $I_D = 1.5$ A for **IRF820/820FI** for **IRF822/822FI**		 2.5 2.5	 3 4	 Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V for **IRF820/820FI** for **IRF822/822FI**	 3 2.8			 A A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.5$ A	0.8	1.93		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		350 60 25	460 80 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

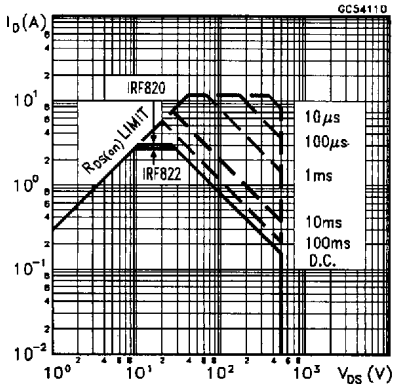
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 250 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit)		35 85 165 60	45 110 215 80	ns ns ns ns
Q_g	Total Gate Charge	I_D = 3 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		25 6 11	35	nC nC nC

SOURCE DRAIN DIODE

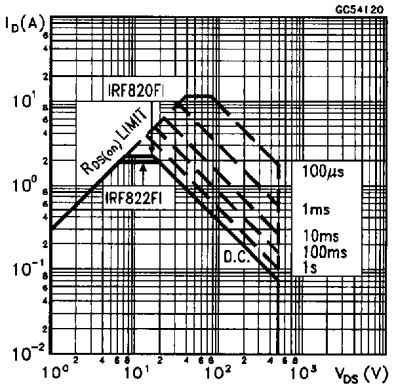
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3 12	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 3 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		380 3.8		ns µC

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

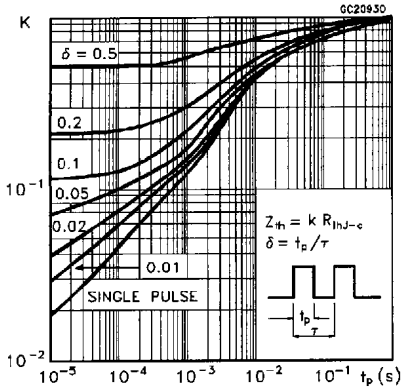
Safe Operating Area for TO-220



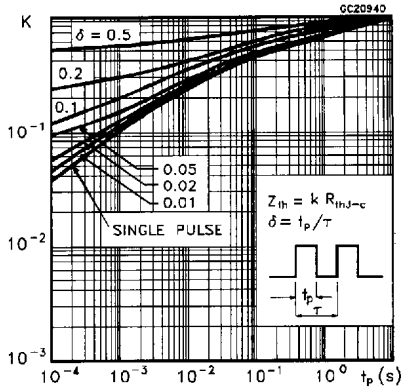
Safe Operating Area for ISOWATT220



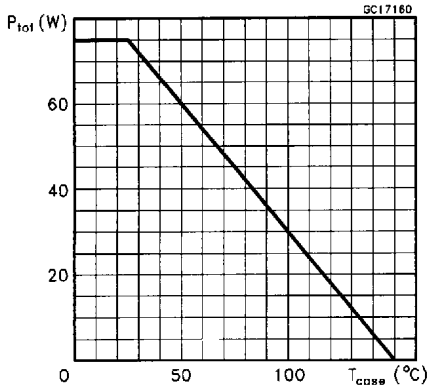
Thermal Impedance for TO-220



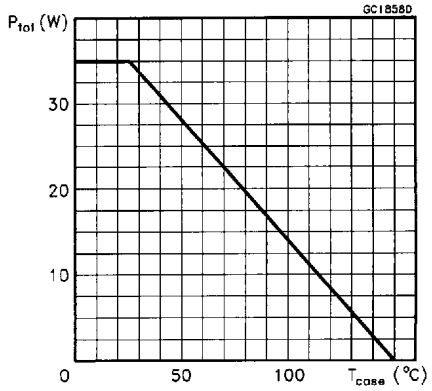
Thermal Impedance for ISOWATT220



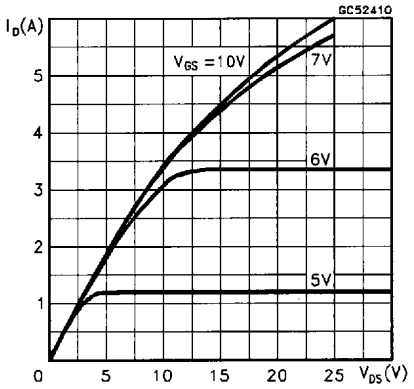
Derating Curve for TO-220



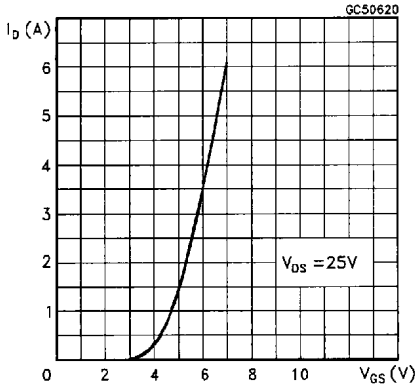
Derating Curve for ISOWATT220



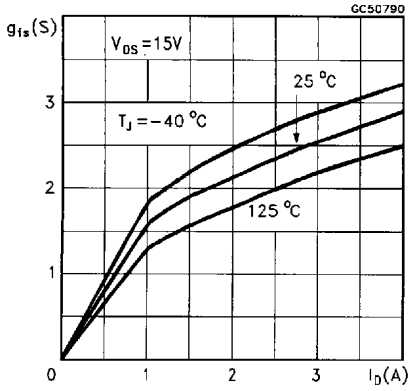
Output Characteristics



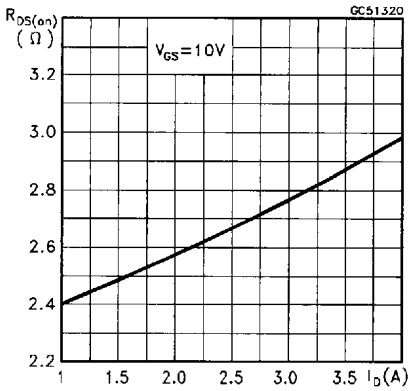
Transfer Characteristics



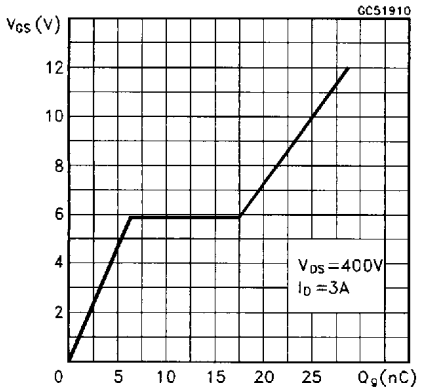
Transconductance



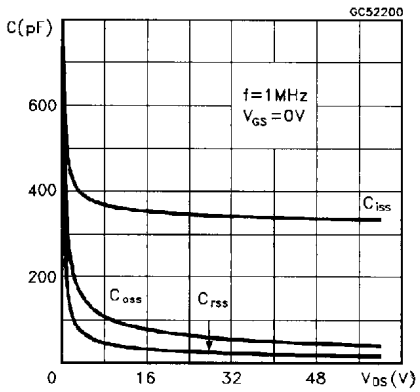
Static Drain-source On Resistance



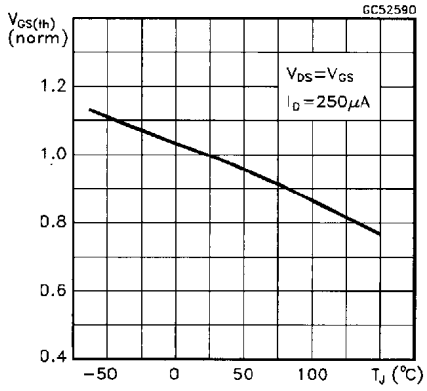
Gate Charge vs Gate-source Voltage



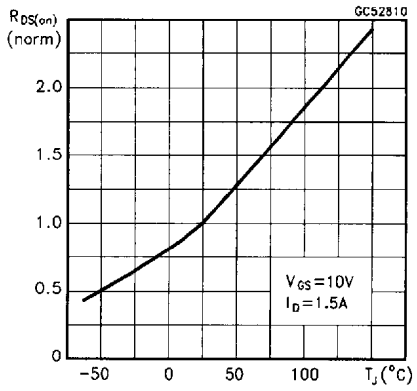
Capacitance Variations



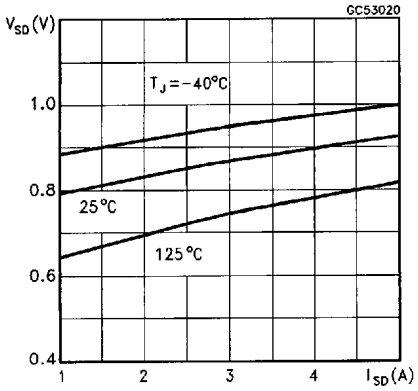
Normalized Gate Threshold Voltage vs Temperature



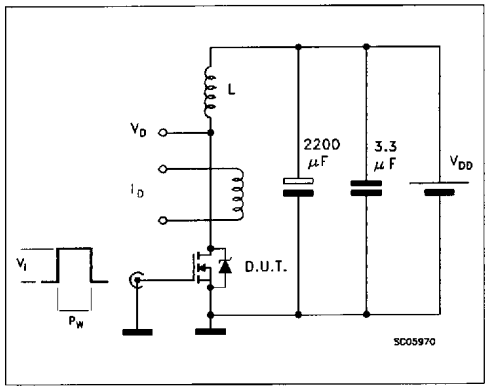
Normalized On Resistance vs Temperature



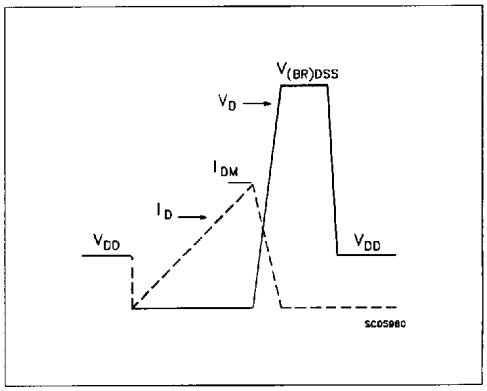
Source-drain Diode Forward Characteristics



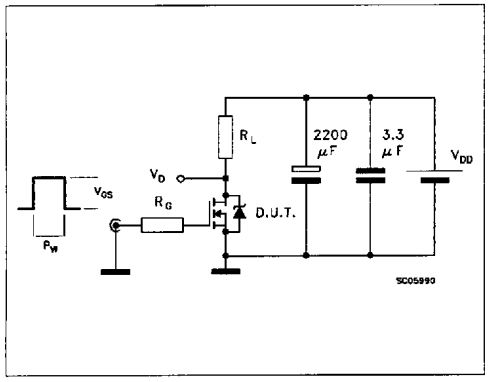
Unclamped Inductive Load Test Circuit



Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit