

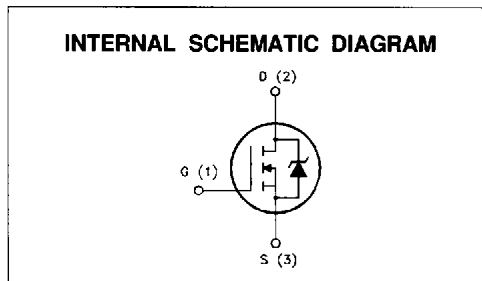
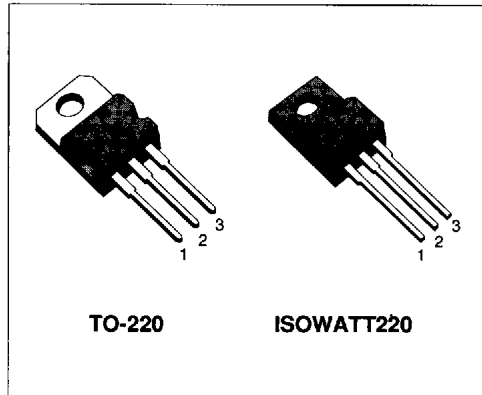
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTORS**

TYPE	V <sub>DS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
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<sub>DS(on)</sub> = 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



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value				Unit
		IRF				
		820	822	820FI	822FI	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	500	500	500	500	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	500	500	500	500	V
V <sub>GS</sub>	Gate-source Voltage	± 20				V
I <sub>D</sub>	Drain Current (cont.) at T <sub>c</sub> = 25 °C	3	2.8	2.2	1.9	A
I <sub>D</sub>	Drain Current (cont.) at T <sub>c</sub> = 100 °C	1.9	1.7	1.4	1.2	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	12	12	12	12	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	75		35		W
	Derating Factor	0.6		0.28		W/°C
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-220	ISOWATT220		
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.66	3.57	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		$^{\circ}C/W$
$R_{thc-s}$	Thermal Resistance Case-sink	Typ	0.5		$^{\circ}C/W$
$T_l$	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, $\delta < 1\%$ )	3	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 25 V$ )	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 ( $T_c = 100^{\circ}C$ , pulse width limited by $T_j$ max, $\delta < 1\%$ )	1.9	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	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20 V$			$\pm 100$	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	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	$\Omega$ $\Omega$
$I_{D(on)}$	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
$C_{iss}$	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		350	460	pF
$C_{oss}$	Output Capacitance			60	80	pF
$C_{rss}$	Reverse Transfer Capacitance			25	35	pF

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

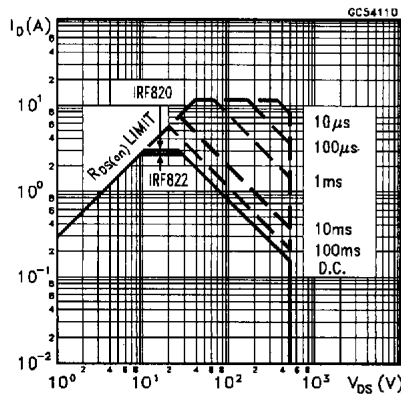
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 250\text{ V}$ $I_D = 1.5\text{ A}$		35	45	ns
$t_r$	Rise Time	$R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$		85	110	ns
$t_{d(off)}$	Turn-off Delay Time	(see test circuit)		165	215	ns
$t_f$	Fall Time			60	80	ns
$Q_g$	Total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

**SOURCE DRAIN DIODE**

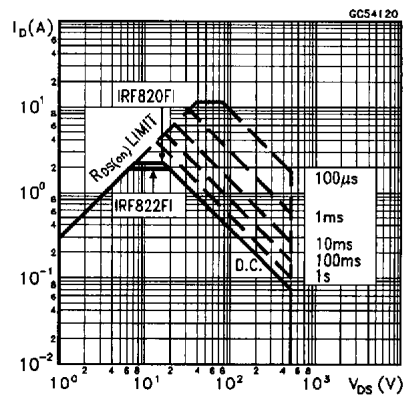
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				3	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				12	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 3\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 3\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$		380		ns
$Q_{rr}$	Reverse Recovery Charge			3.8		$\mu\text{C}$

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %  
( $\bullet$ ) Pulse width limited by safe operating area

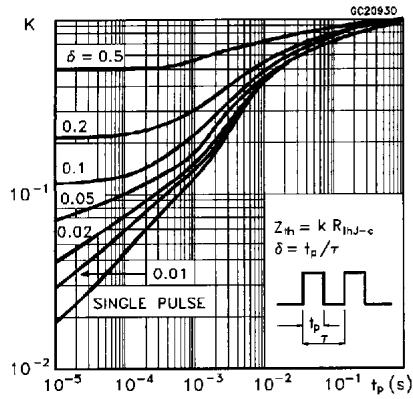
Safe Operating Area for TO-220



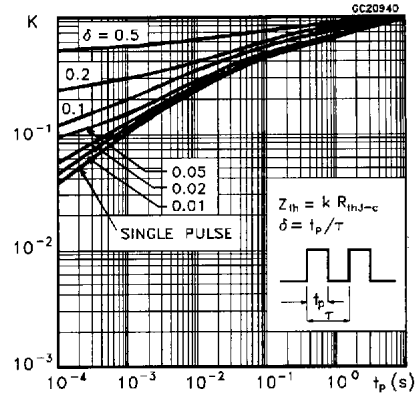
Safe Operating Area for ISOWATT220



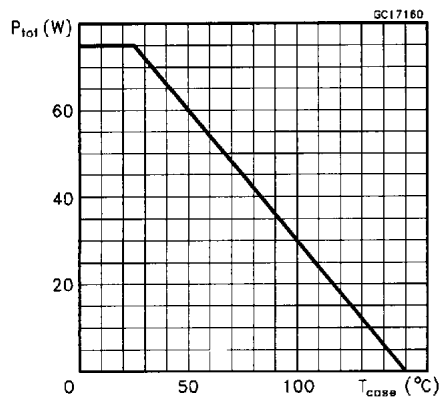
Thermal Impedance for TO-220



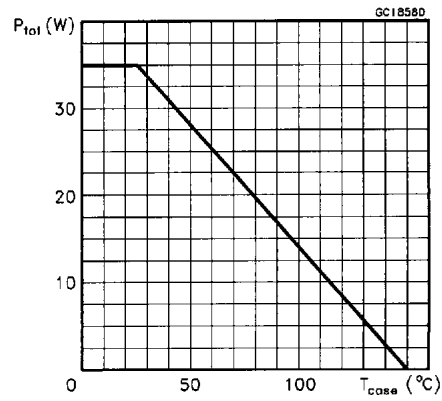
Thermal Impedance for ISOWATT220



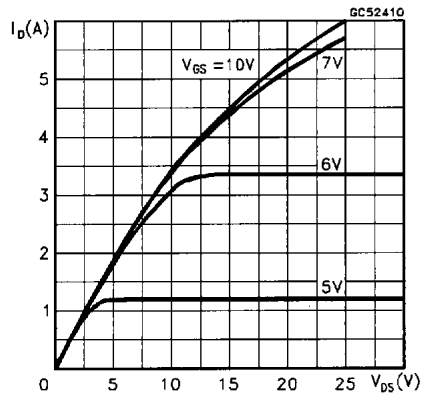
Derating Curve for TO-220



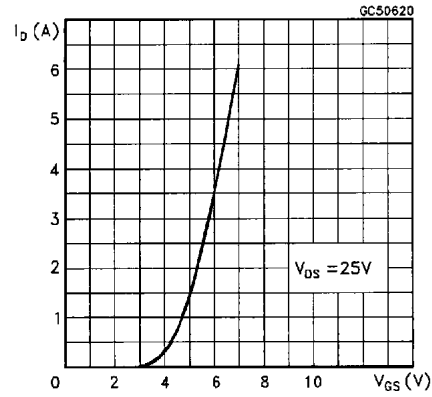
Derating Curve for ISOWATT220



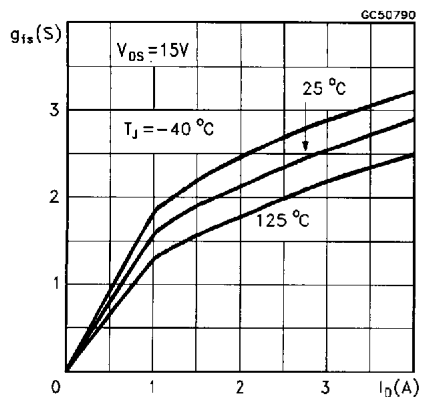
Output Characteristics



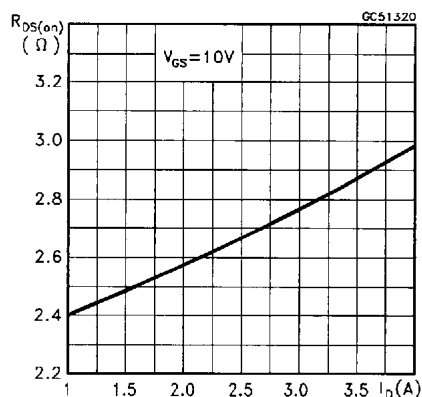
Transfer Characteristics



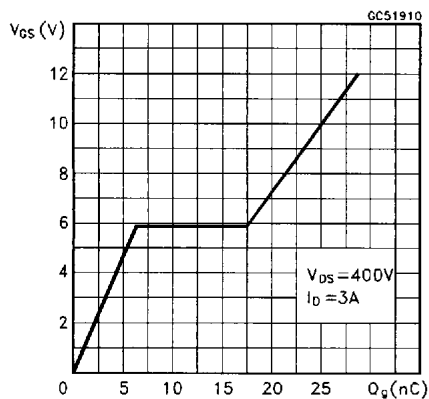
Transconductance



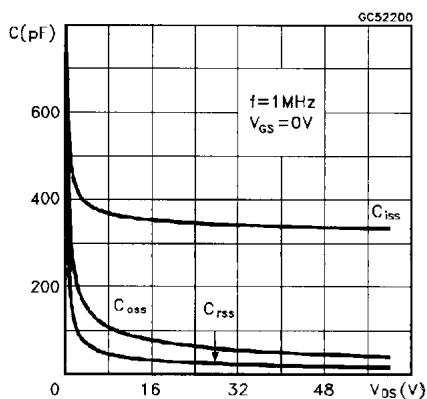
Static Drain-source On Resistance



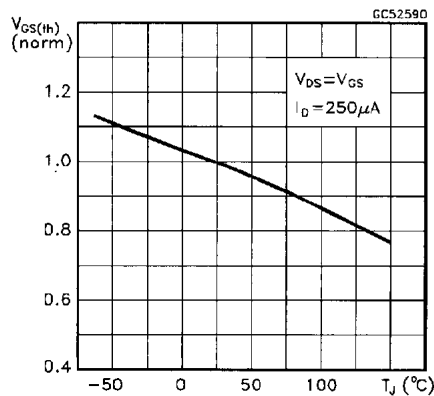
Gate Charge vs Gate-source Voltage



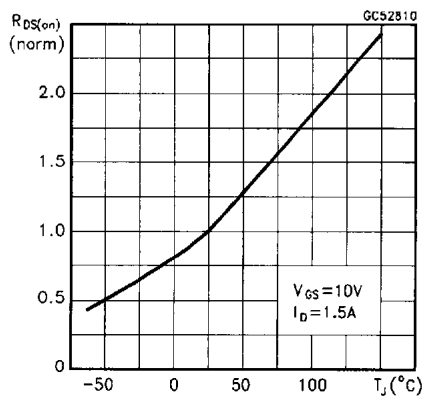
Capacitance Variations



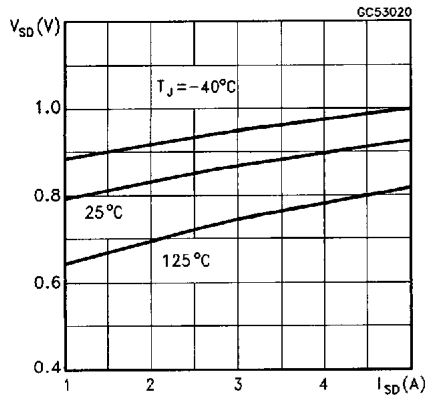
Normalized Gate Threshold Voltage vs Temperature



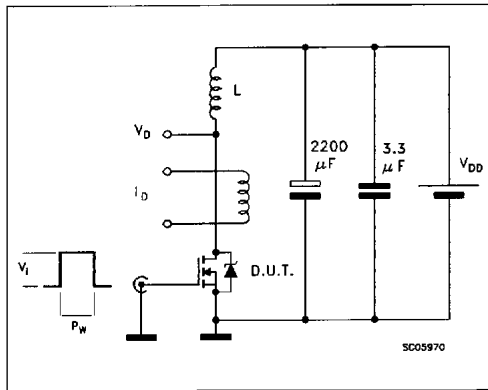
Normalized On Resistance vs Temperature



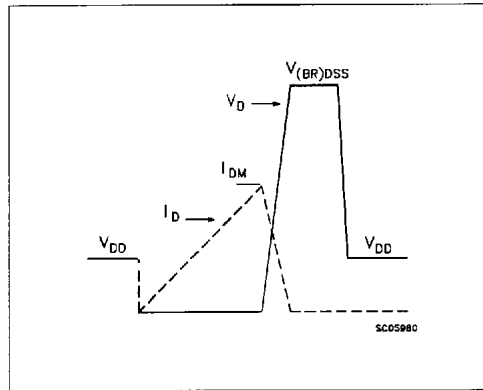
Source-drain Diode Forward Characteristics



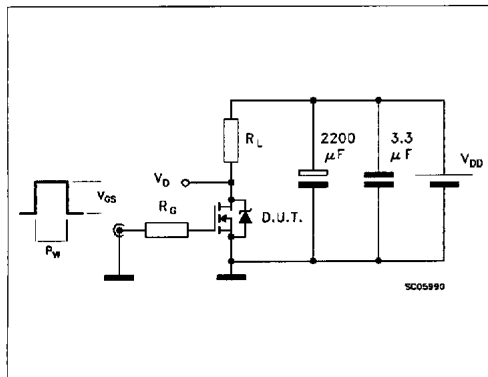
Unclamped Inductive Load Test Circuit



Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit

