



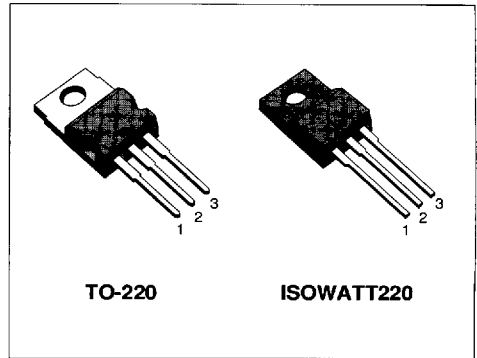
## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP5N80	800 V	< 2 Ω	5.5 A
STP5N80FI	800 V	< 2 Ω	3.1 A

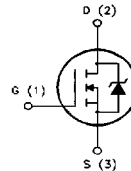
- TYPICAL R<sub>DS(on)</sub> = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

### 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)



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N80	STP5N80FI	
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	5.5	3.1	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	3.4	2	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	20	20	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V <sub>ISO</sub>	Insulation Withstand Voltage (DC)	—	2000	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-220	ISOWATT220	
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1	3.12	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max		62.5	°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ		0.5	°C/W
T <sub>j</sub>	Maximum Lead Temperature For Soldering Purpose			300	°C

## AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max, δ < 1%)	5.5	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	320	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy (pulse width limited by T <sub>j</sub> max, δ < 1%)	16	mJ
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (T <sub>c</sub> = 100 °C, pulse width limited by T <sub>j</sub> max, δ < 1%)	3.2	A

ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0	800			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating x 0.8 T <sub>c</sub> = 125 °C			250 1000	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			± 100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 2.5 A V <sub>GS</sub> = 10V I <sub>D</sub> = 2.5 A T <sub>c</sub> = 100°C		1.65	2 4	Ω Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	5			A

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> I <sub>D</sub> = 2.5 A	2	4		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		1190	1450	pF
C <sub>oss</sub>	Output Capacitance			165	200	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			70	85	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 2.5\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		50 85	65 105	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 640\text{ V}$ $I_D = 5.5\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		200		A/ $\mu$ s
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 500\text{ V}$ $I_D = 6\text{ A}$ $V_{GS} = 10\text{ V}$		75 9 33	95	nC nC nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$ $t_f$	Off-voltage Rise Time Fall Time	$V_{DD} = 640\text{ V}$ $I_D = 5.5\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$		120 30	150 40	ns ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		160	200	ns

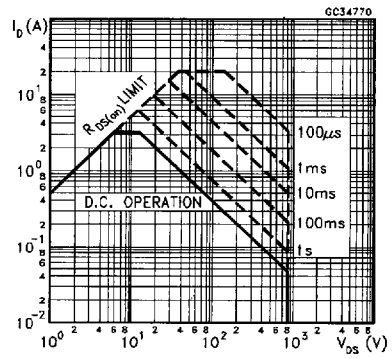
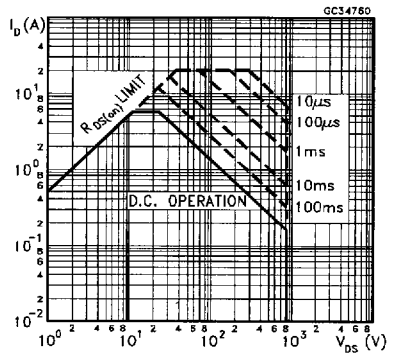
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				5.5 20	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 5.5\text{ A}$ $V_{GS} = 0$			2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 5.5\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 80\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		700		ns
$Q_{rr}$	Reverse Recovery Charge			7.7		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			22		A

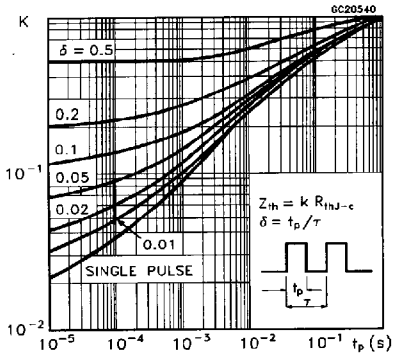
(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5 %  
 (•) Pulse width limited by safe operating area

Safe Operating Areas For TO-220

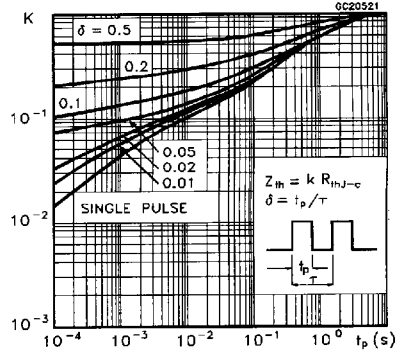
Safe Operating Areas For ISOWATT220



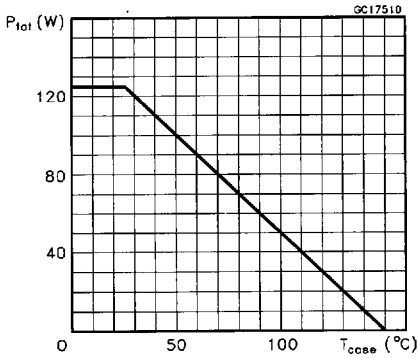
Thermal Impedance For TO-220



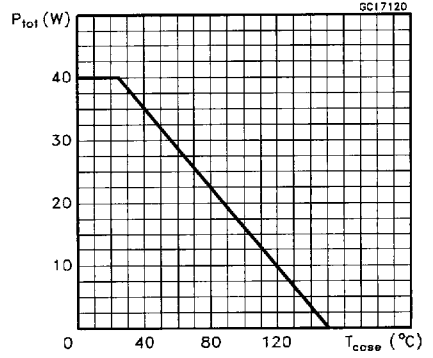
Thermal Impedance For ISOWATT220



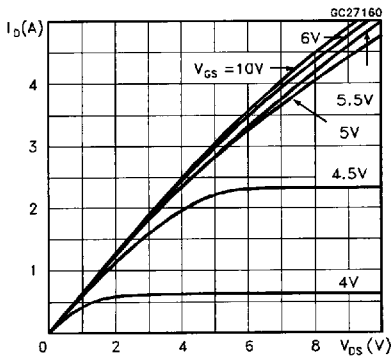
Derating Curve For TO-220



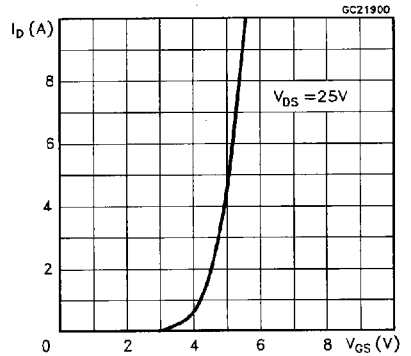
Derating Curve For ISOWATT220



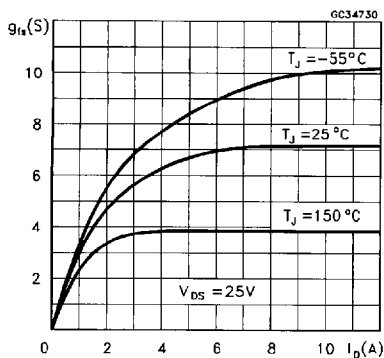
Output Characteristics



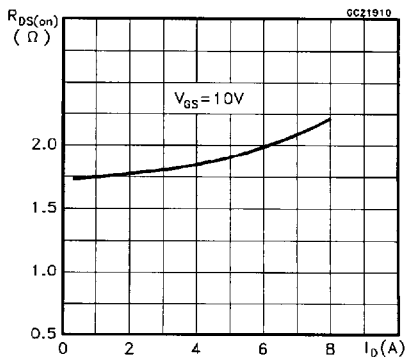
Transfer Characteristics



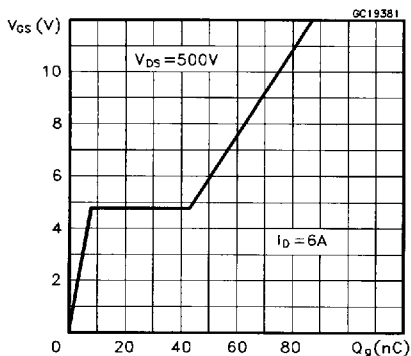
Transconductance



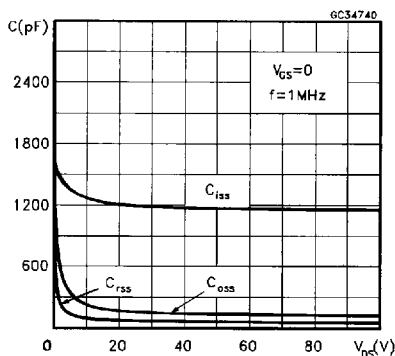
Static Drain-source On Resistance



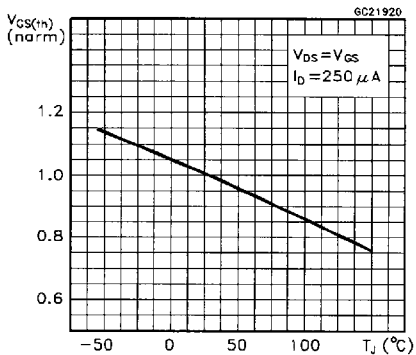
Gate Charge vs Gate-source Voltage



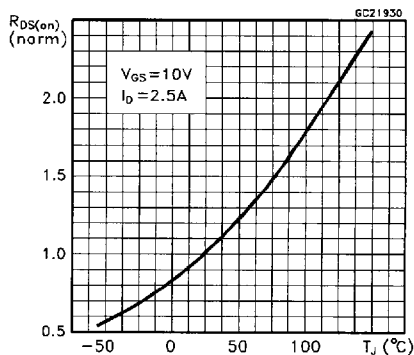
Capacitance Variations



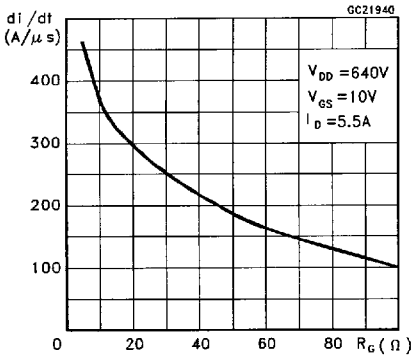
Normalized Gate Threshold Voltage vs Temperature



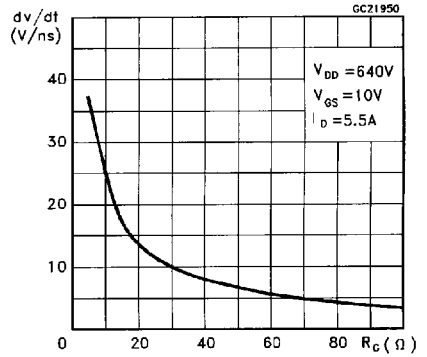
Normalized On Resistance vs Temperature



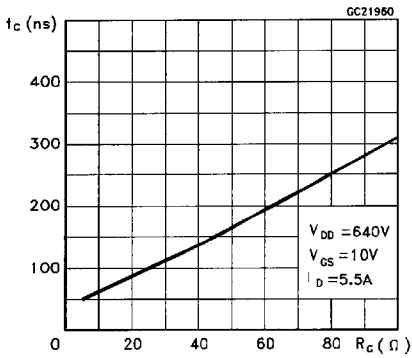
Turn-on Current Slope



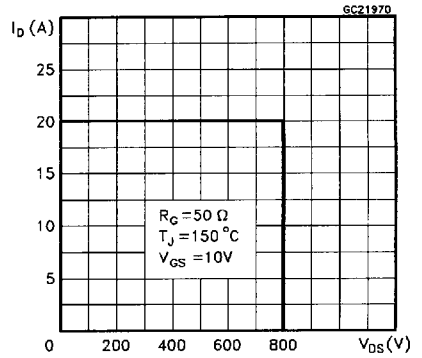
Turn-off Drain-source Voltage Slope



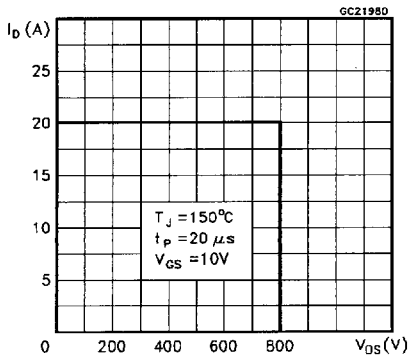
Cross-over Time



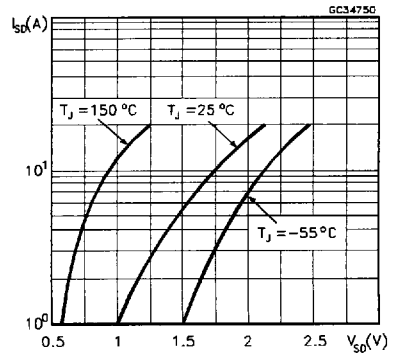
Switching Safe Operating Area



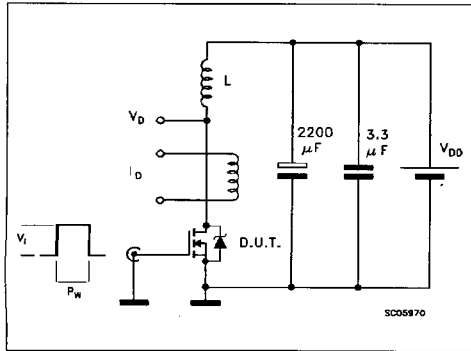
Accidental Overload Area



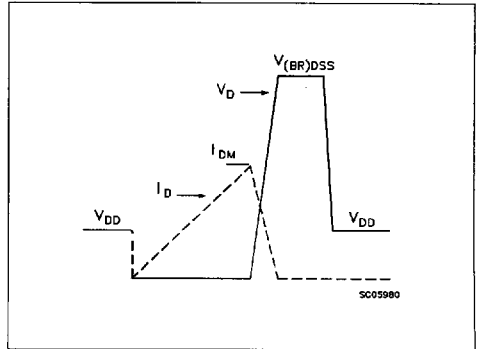
Source-drain Diode Forward Characteristics



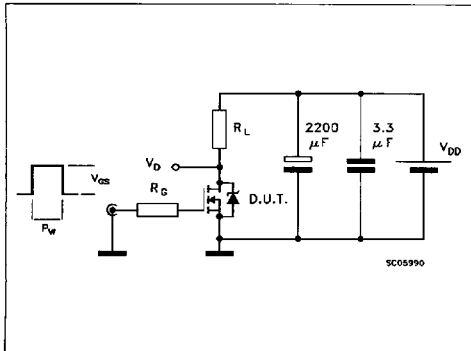
**Fig. 1: Unclamped Inductive Load Test Circuits**



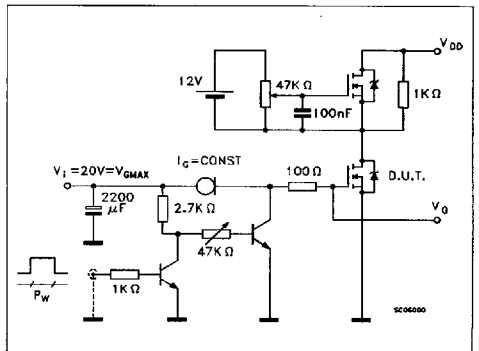
**Fig. 2: Unclamped Inductive Waveforms**



**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**

