

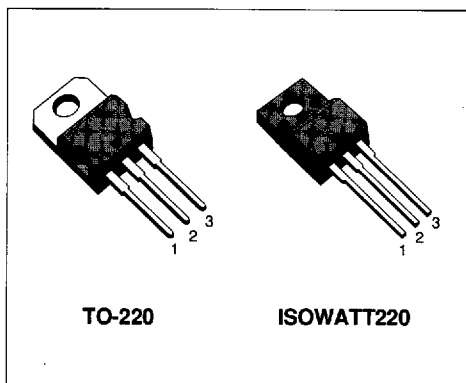
N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP50N05L	50 V	< 0.028 Ω	50 A
STP50N05LFI	50 V	< 0.028 Ω	27 A

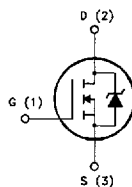
- TYPICAL R_{DS(on)} = 0.024 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP50N05L	STP50N05LFI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	50		V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	50		V
V _{GS}	Gate-source Voltage	± 15		V
I _D	Drain Current (continuous) at T _c = 25 °C	50	27	A
I _D	Drain Current (continuous) at T _c = 100 °C	35	19	A
I _{DM} (*)	Drain Current (pulsed)	200	200	A
P _{tot}	Total Dissipation at T _c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V _{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T _{stg}	Storage Temperature	-65 to 175		°C
T _J	Max. Operating Junction Temperature	175		°C

(*) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max		62.5	°C/W
$R_{thc-sink}$	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, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 25\text{ V}$)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100^\circ\text{C}$, pulse width limited by T_j max, $\delta < 1\%$)	35	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	$I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$	50			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	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15\text{ V}$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5\text{ V}$ $I_D = 25\text{ A}$ $V_{GS} = 5\text{ V}$ $I_D = 25\text{ A}$ $T_c = 100^\circ\text{C}$		0.024	0.028 0.056	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 25\text{ A}$	17	31		S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		2000	2600	pF
C_{oss}	Output Capacitance			660	900	pF
C_{rss}	Reverse Transfer Capacitance			160	220	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 25\text{ V}$ $I_D = 25\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 3)		95 550	140 800	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 40\text{ V}$ $I_D = 50\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 5)		100		A/ μ s
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 80\text{ V}$ $I_D = 50\text{ A}$ $V_{GS} = 5\text{ V}$		42 11 25	60	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 40\text{ V}$ $I_D = 50\text{ A}$		145	210	ns
t_f	Fall Time	$R_G = 50\ \Omega$ $V_{GS} = 5\text{ V}$		215	310	ns
t_c	Cross-over Time	(see test circuit, figure 5)		380	550	ns

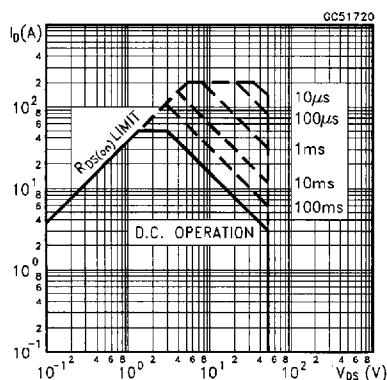
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				50 200	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 50\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 50\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		110		ns
Q_{rr}	Reverse Recovery Charge			0.27		μC
I_{RRM}	Reverse Recovery Current			5		A

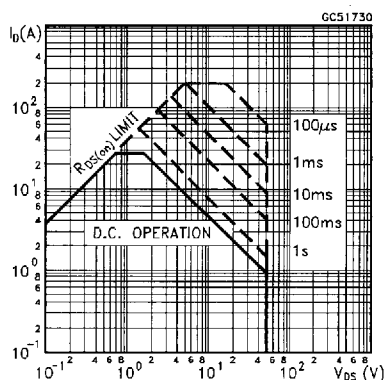
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

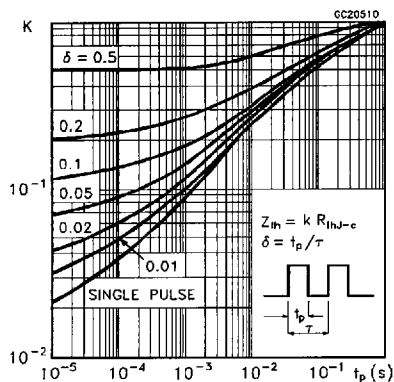
Safe Operating Areas For TO-220



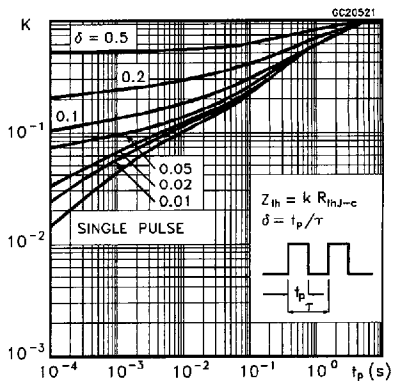
Safe Operating Areas For ISOWATT220



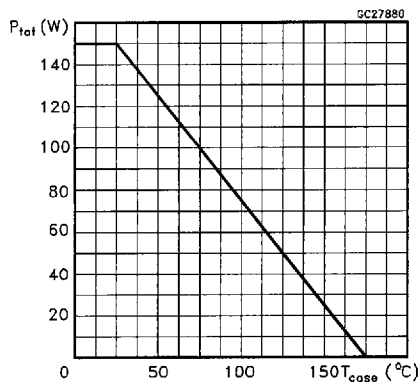
Thermal Impedance For TO-220



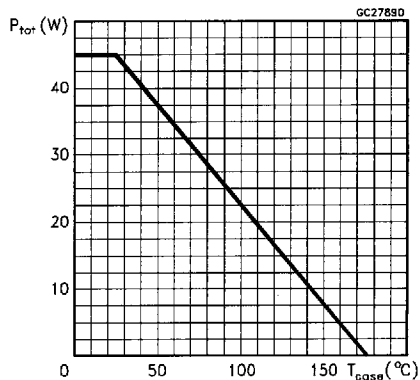
Thermal Impedance For ISOWATT220



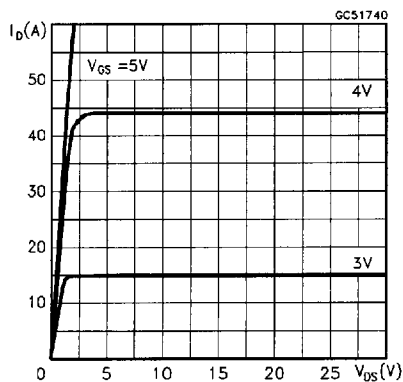
Derating Curve For TO-220



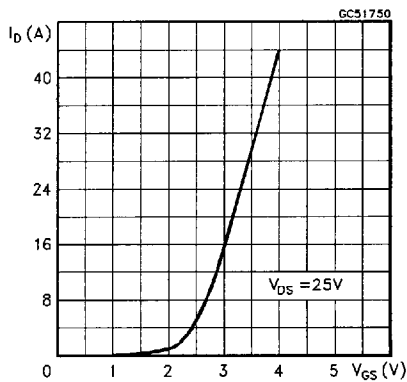
Derating Curve For ISOWATT220



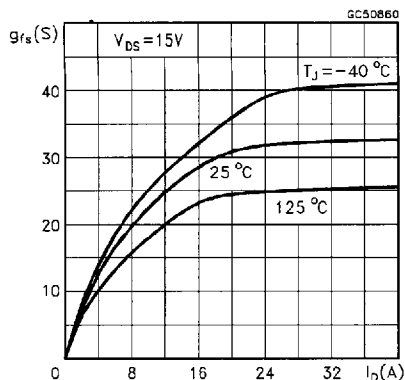
Output Characteristics



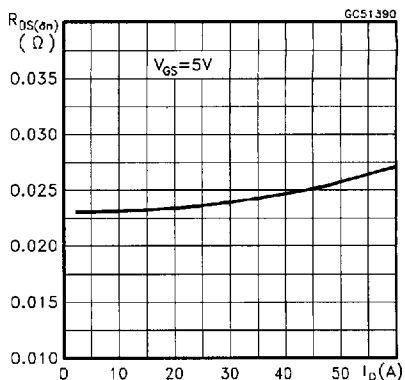
Transfer Characteristics



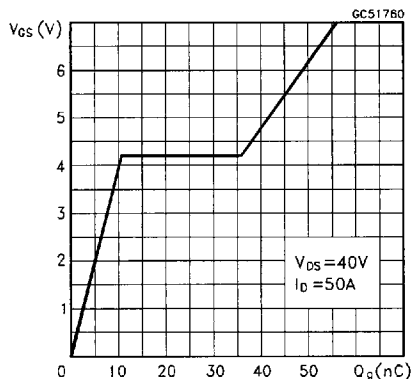
Transconductance



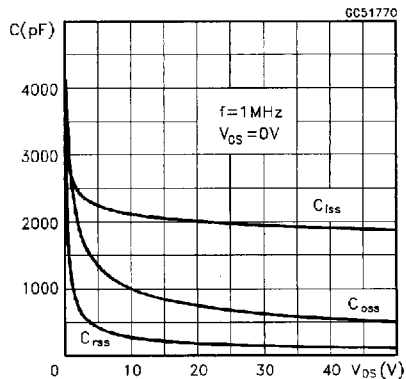
Static Drain-source On Resistance



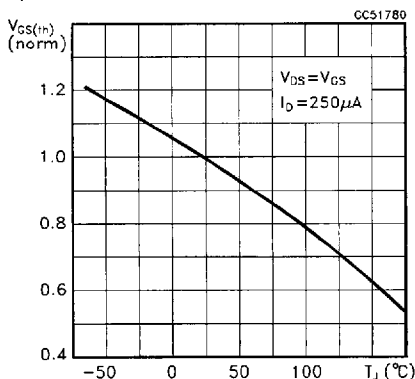
Gate Charge vs Gate-source Voltage



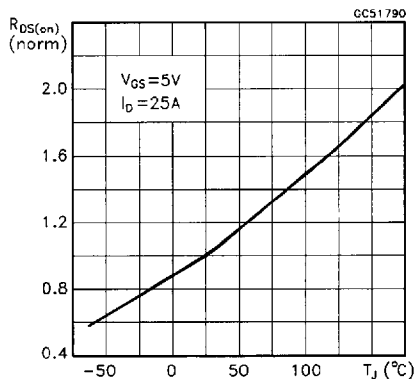
Capacitance Variations



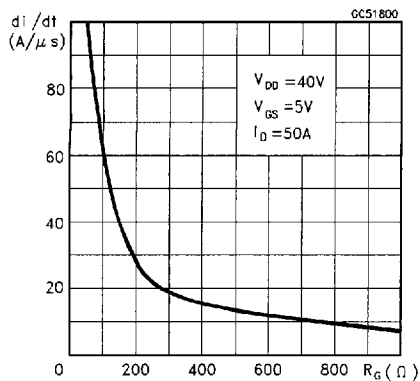
Normalized Gate Threshold Voltage vs Temperature



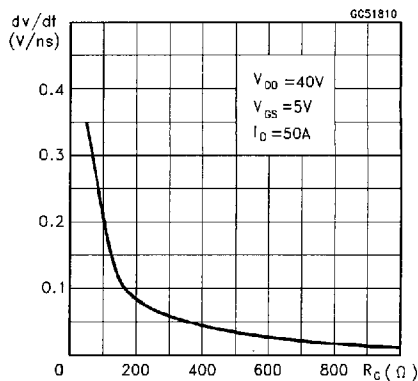
Normalized On Resistance vs Temperature



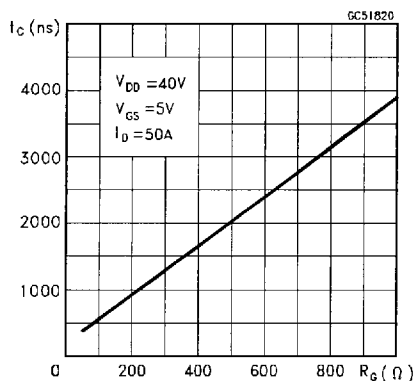
Turn-on Current Slope



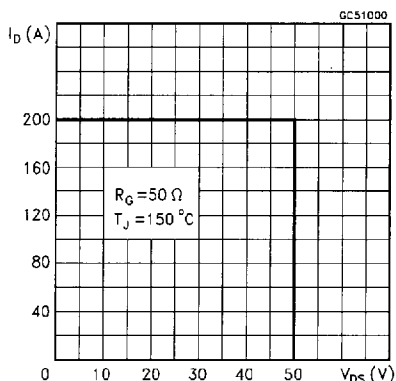
Turn-off Drain-source Voltage Slope



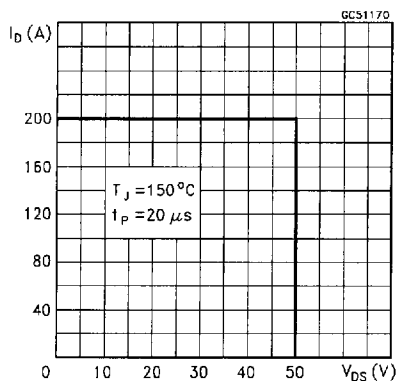
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

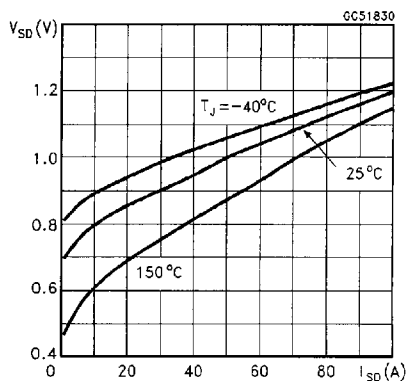


Fig. 2: Unclamped Inductive Waveforms

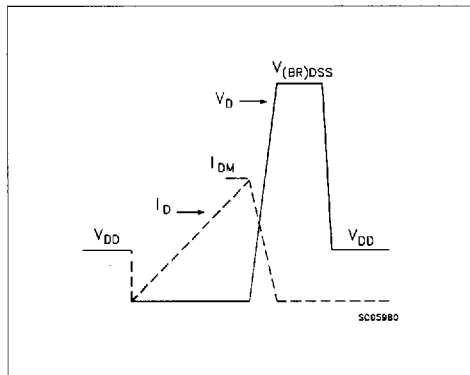
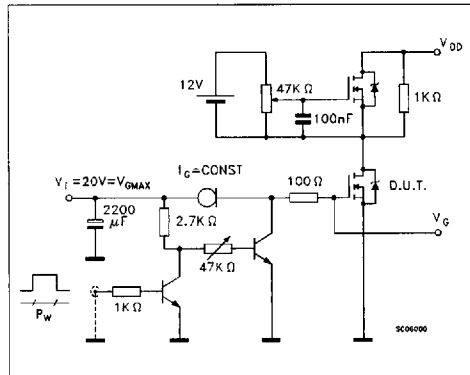


Fig. 4: Gate Charge Test Circuit

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