

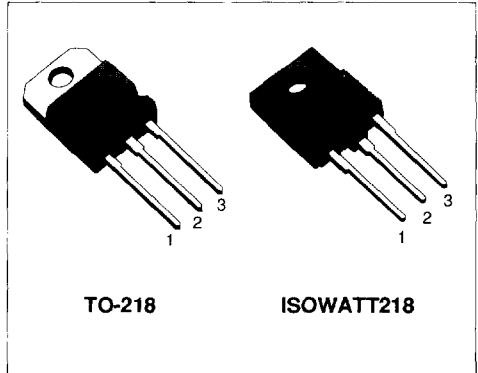
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STH80N05	50 V	0.012 Ω	80 A
STH80N05FI	50 V	0.012 Ω	52 A

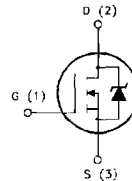
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION
- ISOLATED PACKAGE UL RECOGNIZED, ISOLATION TO 4000V DC

APPLICATIONS

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



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH80N05	STH80N05FI	
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	± 20		V
I _D	Drain Current (continuous) at T _c = 25 °C(♯)	80	52	A
I _D	Drain Current (continuous) at T _c = 100 °C	60	32	A
I _{DM} (*)	Drain Current (pulsed)	320	320	A
P _{tot}	Total Dissipation at T _c = 25 °C	200	70	W
	Derating Factor	1.33	0.56	W/°C
T _{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T _j	Max. Operating Junction Temperature	175	150	°C

(*) Pulse width limited by safe operating area

(♯) T_c = 50 °C for TO-218

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.75	1.79	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°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, $\delta < 1\%$)	70	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 25\text{ V}$)	900	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	200	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\text{ °C}$, pulse width limited by T_j max, $\delta < 1\%$)	40	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\text{ °C}$ 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 ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125\text{ °C}$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 40\text{ A}$ $T_c = 100\text{ °C}$			0.012 0.024	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	80			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 40\text{ A}$	25			S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		4100	5200	pF
C_{oss}	Output Capacitance			1800	2300	pF
C_{riss}	Reverse Transfer Capacitance			500	650	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 25\text{ V}$ $I_D = 40\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		190 900	260 1200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 40\text{ V}$ $I_D = 80\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		150		A/ μs
Q_g	Total Gate Charge	$V_{DD} = 25\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 10\text{ V}$		130	180	nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 40\text{ V}$ $I_D = 80\text{ A}$		450	600	ns
t_f	Fall Time	$R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		350	480	ns
t_c	Cross-over Time			700	950	ns

SOURCE DRAIN DIODE

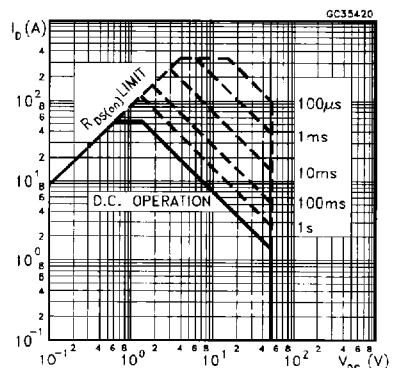
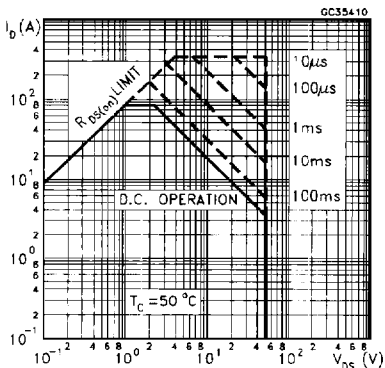
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				80	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				320	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 80\text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 80\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 35\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		120		ns
Q_{rr}	Reverse Recovery Charge			0.45		μC
I_{RRM}	Reverse Recovery Current			7		A

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

(\bullet) Pulse width limited by safe operating area

Safe Operating Areas For TO-218

Safe Operating Areas For ISOWATT218

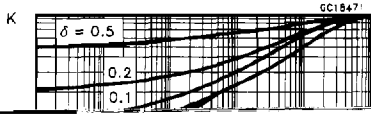


STH80N05/FI

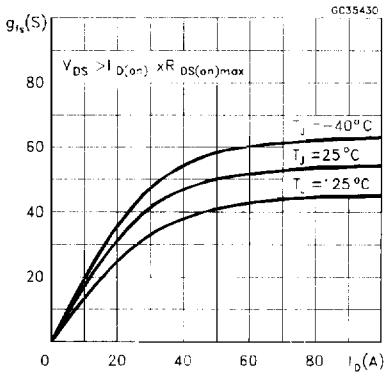
Thermal Impedance For TO-218



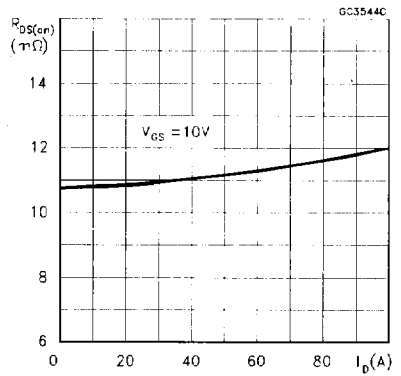
Thermal Impedance For ISOWATT218



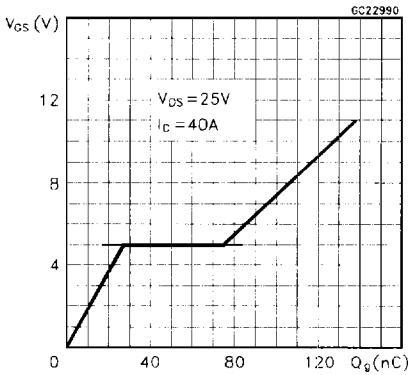
Transconductance



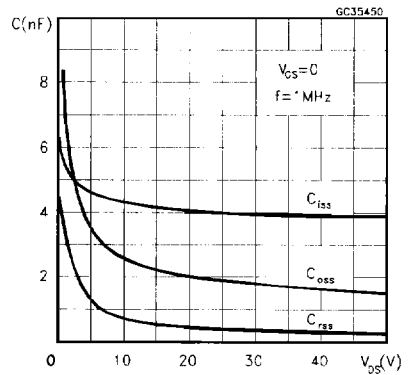
Static Drain-source On Resistance



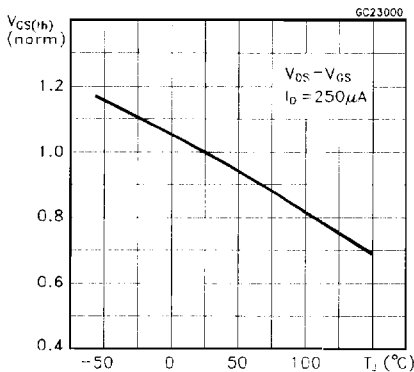
Gate Charge vs Gate-source Voltage



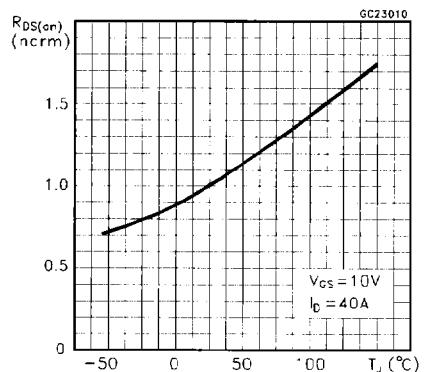
Capacitance Variations



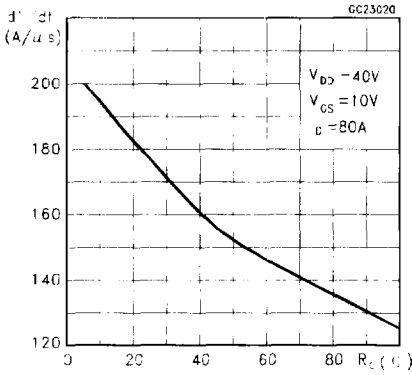
Normalized Gate Threshold Voltage vs Temperature



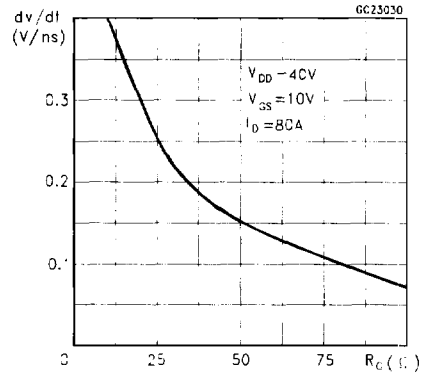
Normalized On Resistance vs Temperature



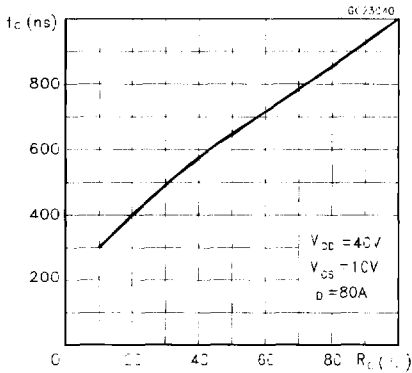
Turn-on Current Slope



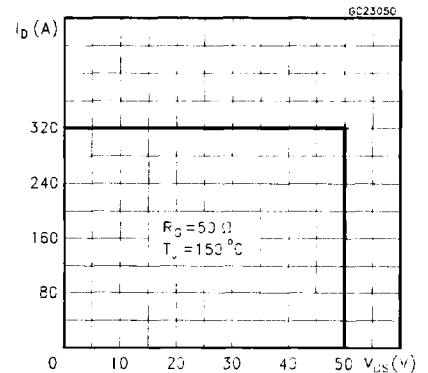
Turn-off Drain-source Voltage Slope



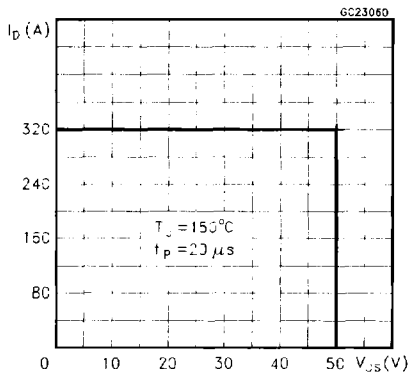
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

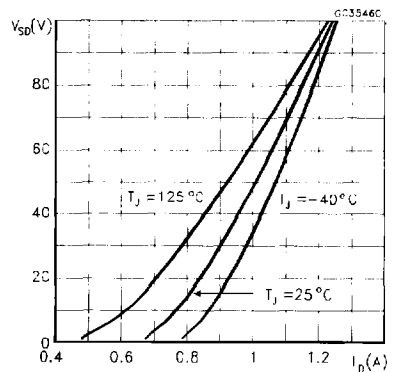


Fig. 1: Unclamped Inductive Load Test Circuits

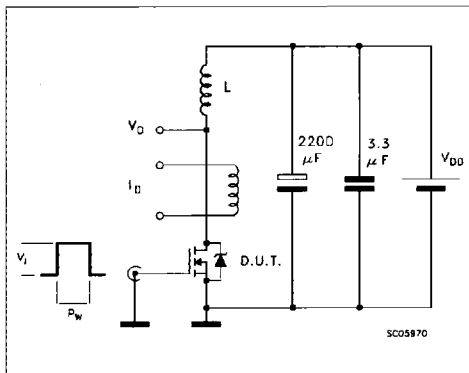


Fig. 2: Unclamped Inductive Waveforms

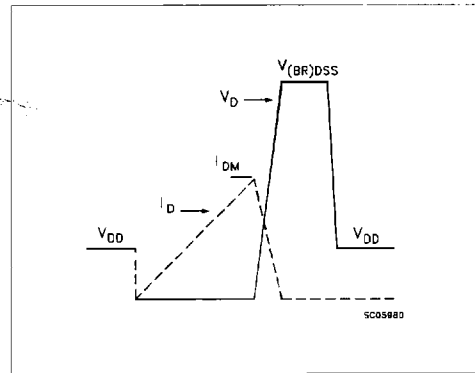


Fig. 3: Switching Times Test Circuits For Resistive Load

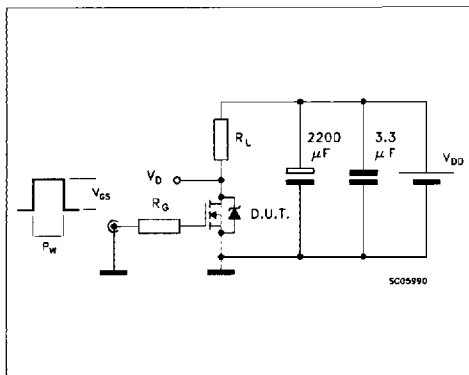


Fig. 4: Gate Charge Test Circuit

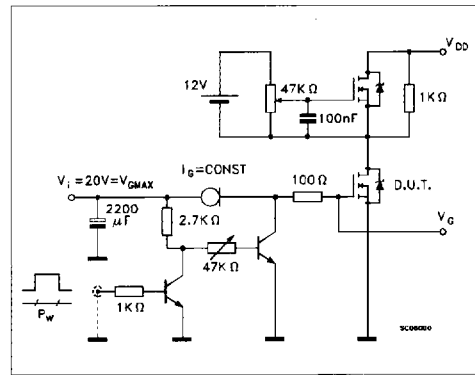


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

