

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
STE110NA20	200 V	< 0.019 Ω	110 A

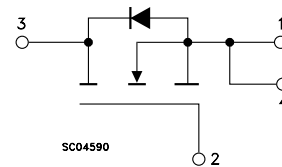
- TYPICAL R_{DS(on)} = 0.015 Ω
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} (Junction to case)
- VERY LOW INTERNAL PARASITIC INDUCTANCE
- ISOLATED PACKAGE UL RECOGNIZED



APPLICATIONS

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	200	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	110	A
I _D	Drain Current (continuous) at T _c = 100 °C	73	A
I _{DM} (•)	Drain Current (pulsed)	440	A
P _{tot}	Total Dissipation at T _c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T _{stg}	Storage Temperature	-55 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C
V _{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

STE110NA20

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
R_{thc-h}	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	55	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	500	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	175	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\text{ °C}$, pulse width limited by T_j max, $\delta < 1\%$)	32.5	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	$I_D = 1\text{ mA}$ $V_{GS} = 0$	200			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125\text{ °C}$			400 200	μA mA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30\text{ V}$			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1\text{ mA}$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 55\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 55\text{ A}$ $T_c = 100\text{ °C}$		0.015	0.019	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	110			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 15\text{ V}$ $I_D = 55\text{ A}$	38			S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		12.9		nF
C_{oss}	Output Capacitance			2870		pF
C_{rss}	Reverse Transfer Capacitance			980		pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 100\text{ V}$ $I_D = 55\text{ A}$		70	100	ns
t_r	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		95	125	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 160\text{ V}$ $I_D = 110\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		290		A/ μ s
Q_g	Total Gate Charge	$V_{DD} = 160\text{ V}$ $I_D = 110\text{ A}$ $V_{GS} = 10\text{ V}$		470	600	nC
Q_{gs}	Gate-Source Charge			43		nC
Q_{gd}	Gate-Drain Charge			226		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 160\text{ V}$ $I_D = 110\text{ A}$		115	150	ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		68	100	ns
t_c	Cross-over Time	(see test circuit, figure 5)		160	210	ns

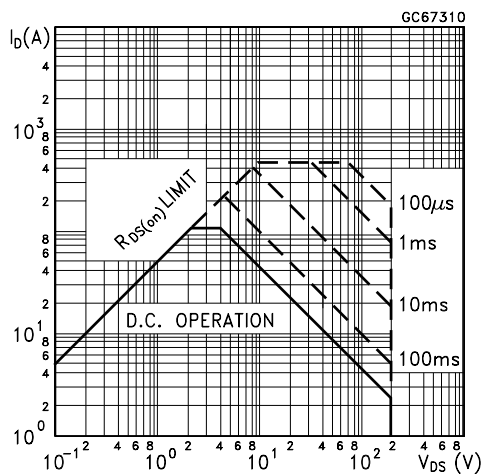
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				110	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				440	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 110\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 110\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 50\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		625		ns
Q_{rr}	Reverse Recovery Charge			11		μ C
I_{RRM}	Reverse Recovery Current			35		A

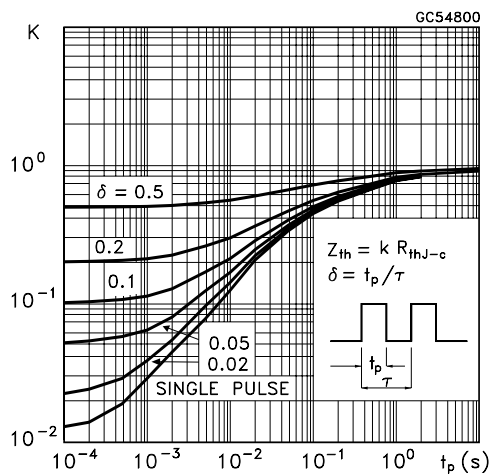
(*) Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

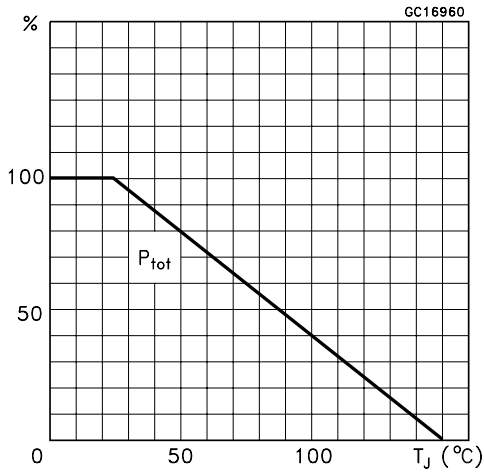
Safe Operating Area



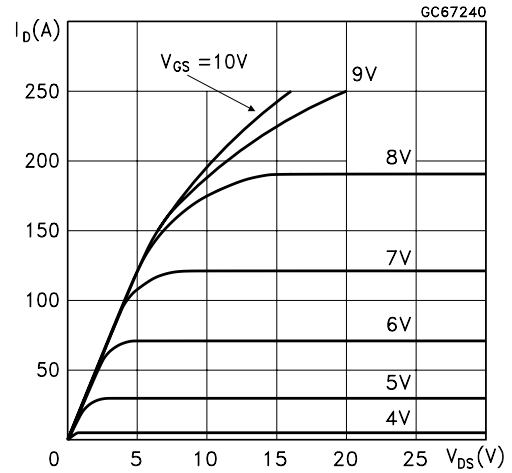
Thermal Impedance



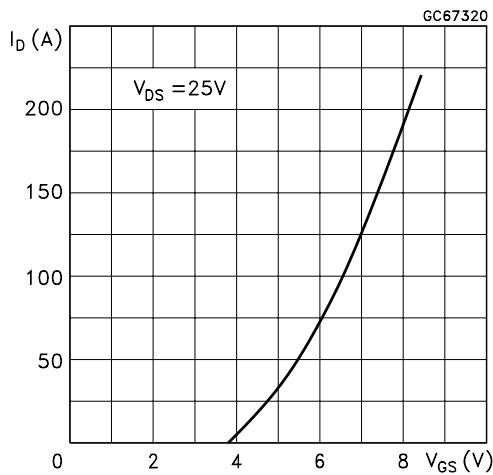
Derating Curve



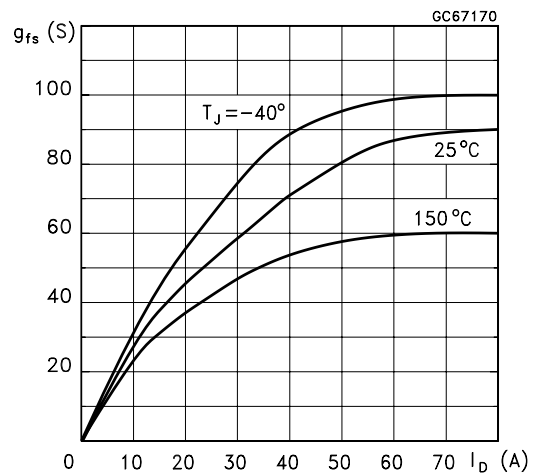
Output Characteristics



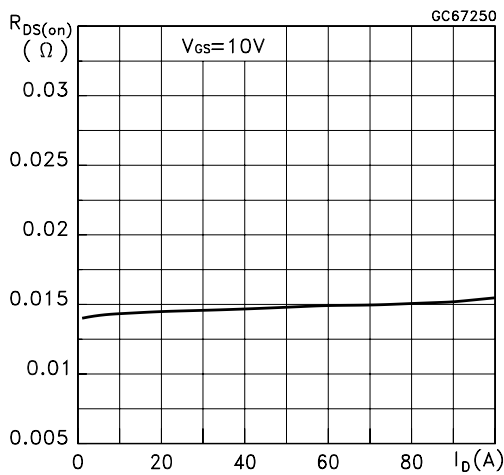
Transfer Characteristics



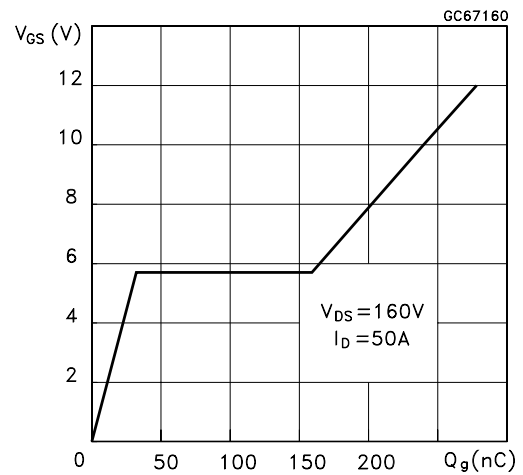
Transconductance



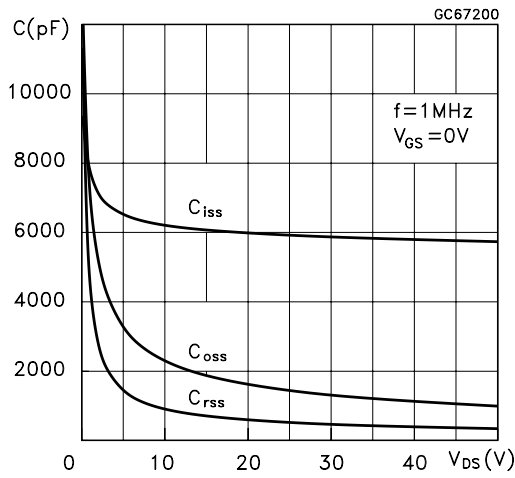
Static Drain-source On Resistance



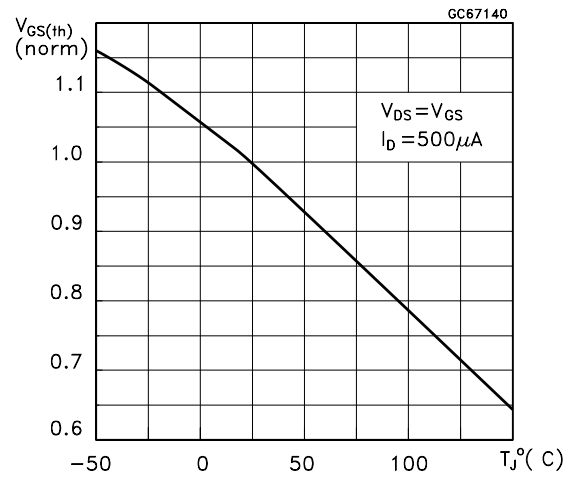
Gate Charge vs Gate-source Voltage



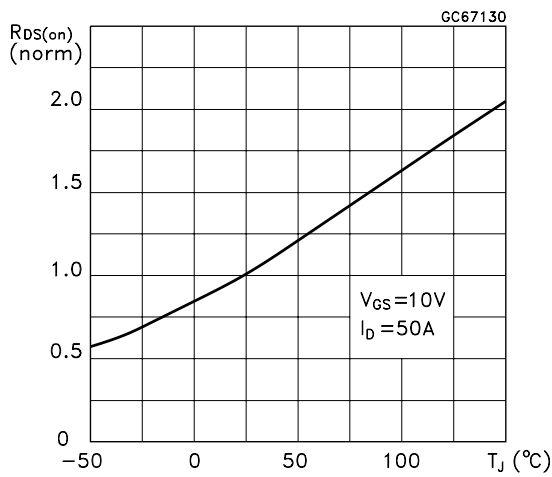
Capacitance Variations



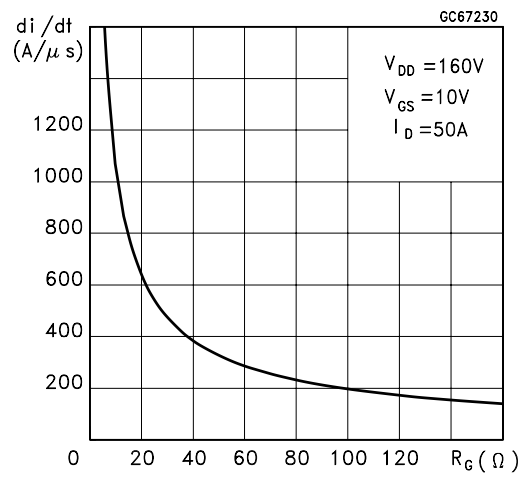
Normalized Gate Threshold Voltage vs Temperature



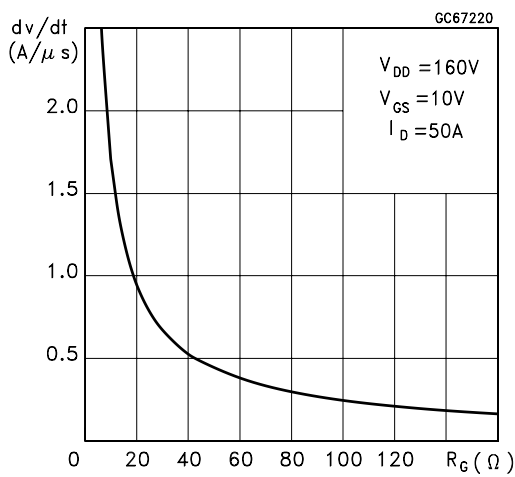
Normalized On Resistance vs Temperature



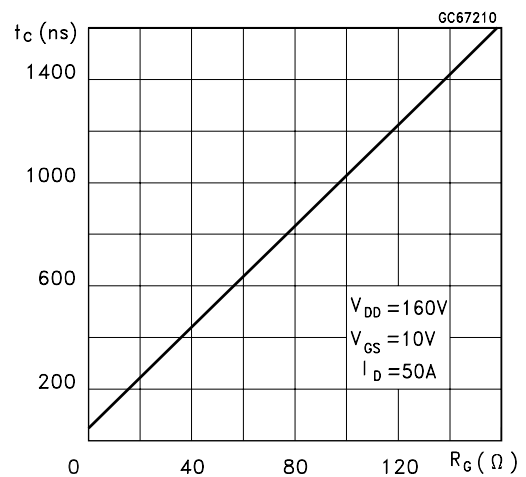
Turn-on Current Slope



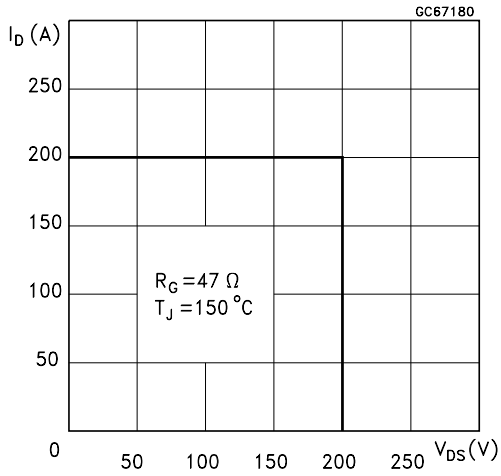
Turn-off Drain-source Voltage Slope



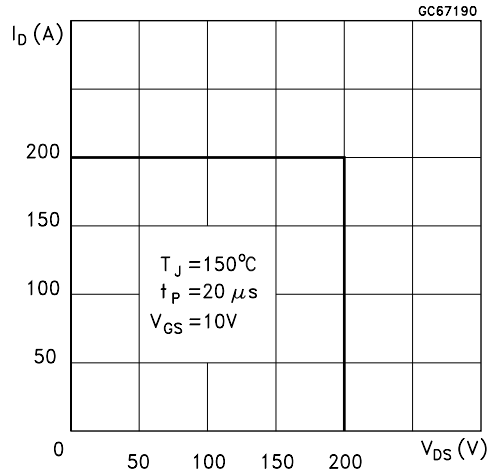
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

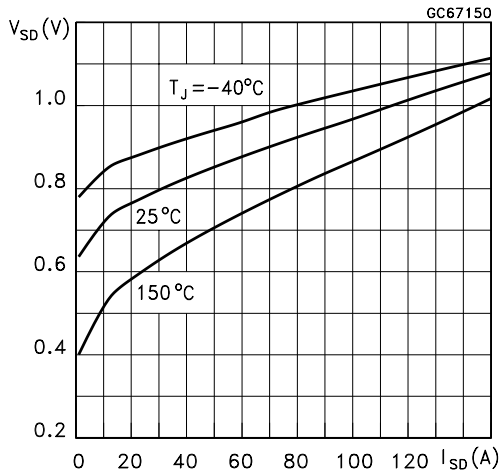


Fig. 1: Unclamped Inductive Load Test Circuit

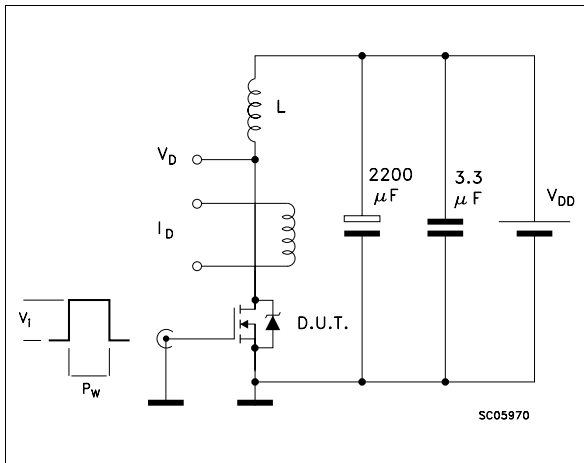


Fig. 2: Unclamped Inductive Waveform

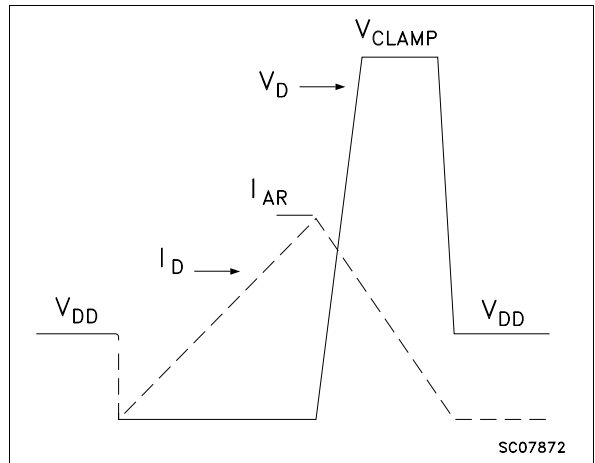


Fig. 3: Switching Times Test Circuits For Resistive Load

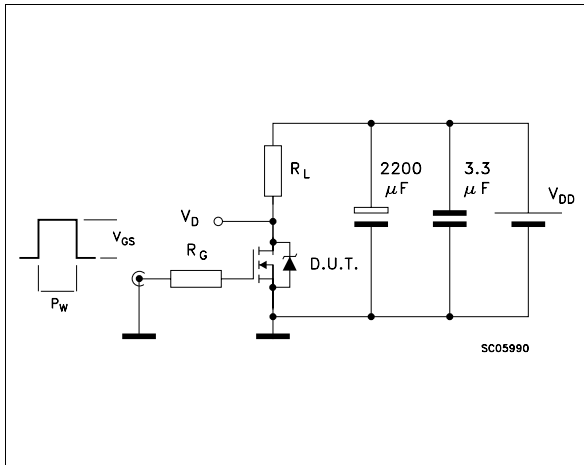


Fig. 4: Gate Charge test Circuit

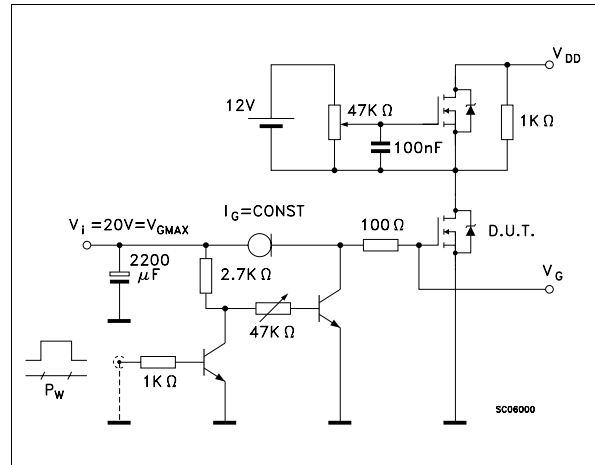
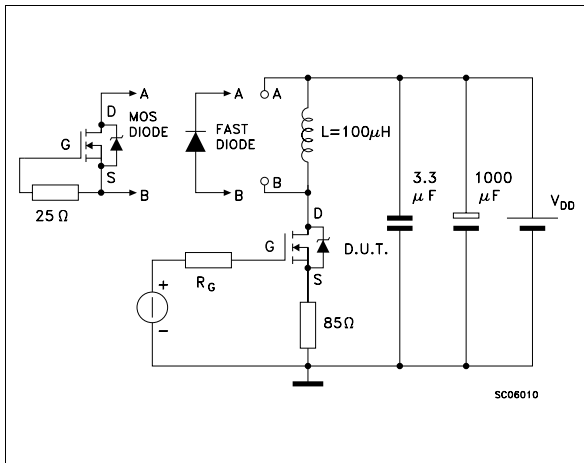


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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