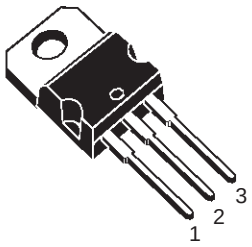
STGP10N60L

N-CHANNEL 10A - 600V TO-220
LOGIC LEVEL IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGP10N60L	600 V	< 1.95 V	10 A

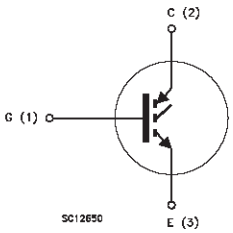
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V_{cesat})
- LOW THRESHOLD VOLTAGE (LOGIC LEVEL INPUT)
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT



TO-220

APPLICATIONS
- ELECTRONIC IGNITION
- LIGHT DIMMER
- STATIC RELAYS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage (V_{GS} = 0)	600	V
V_{ECR}	Reverse Battery Protection	25	V
V_{GE}	Gate-Emitter Voltage	± 15	V
I_C	Collector Current (continuous) at T_c = 25 °C	25	A
I_C	Collector Current (continuous) at T_c = 100 °C	20	A
I_{CM}(•)	Collector Current (pulsed)	100	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	W
	Derating Factor	0.83	W/°C
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

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.2	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.1	°C/W

ELECTRICAL CHARACTERISTICS (T_j = - 40 to 150 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(ces)}$	Collector-Emitter Breakdown Voltage	I_C = 250 µA V_{GE} = 0	600			V
I_{CES}	Collector cut-off (V_{GE} = 0)	V_{CE} = Max Rating T_j = 25 °C V_{CE} = Max Rating T_j = 125 °C			25 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 15 V V_{CE} = 0			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE} I_C = 250 µA V_{CE} = V_{GE} I_C = 250 µA T_j = 25 °C	0.6 1.0		2.4 2.0	V V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} = 4.5 V I_C = 8 A T_j = - 40 °C V_{GE} = 4.5 V I_C = 9.5 A T_j = 25 °C V_{GE} = 4.5 V I_C = 8 A T_j = 150 °C		1.5 1.4 1.25	 2.0 	V V V
I_C	Collector Current	V_{GE} = 4.5 V V_{CE} = 7 V	15	45		A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} =25 V I_C = 8 A T_j = 25 °C	7	12		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25 V f = 1 MHz V_{GE} = 0		1800 120 19	2600 165 26	pF pF pF
Q_G	Gate Charge	V_{CE} = 400 V I_C = 8 A V_{GE} = 5 V		30		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CL}	Latching Current	V_{clamp} = 480 V dV/dt = 200 V/µs T_j = 125 °C	20			A
E_{CF}	Forward Clamping Energy	T_{start} = 55 °C V_{clamp} = 480 V I_C = 10 A L = 4.2 mH - Single Pulse	210			mJ
E_{AR}	Reverse Avalanche Energy		10			mJ

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

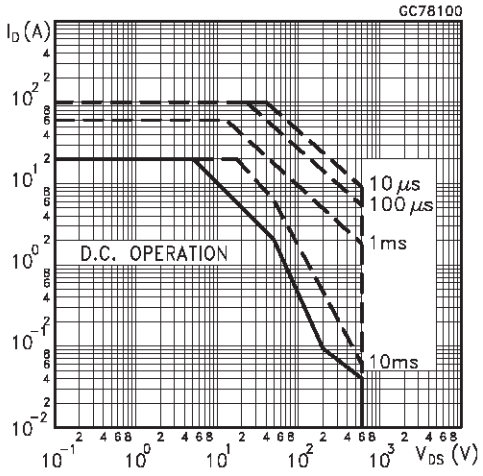
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Delay Time	V_{CC} = 480 V	I_C = 8 A		0.7		µs
t_r	Rise Time	V_{GE}= 5 V	R_G = 1 KΩ		1.9		µs
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC} = 480 V R_G = 1 KΩ	I_C = 8 A V_{GE} = 5 V		5		A/µs
E_{on}	Turn-on Switching Losses	T_j = 125 °C			2.5		mJ

SWITCHING OFF

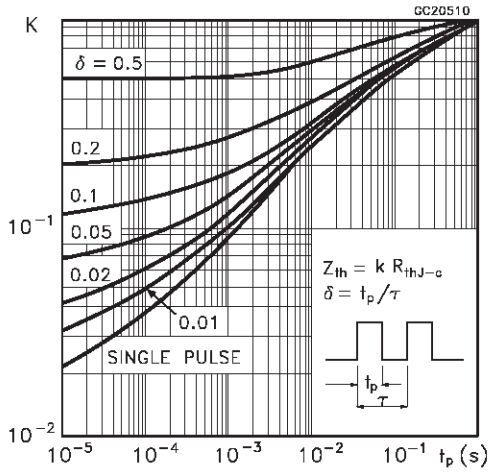
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	V_{CC} = 480 V	I_C = 8 A		4		µs
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 1 KΩ	V_{GE} = 5 V		2.5		µs
t_f	Fall Time	T_j = 25 °C			1.5		µs
E_{off}(**)	Turn-off Switching Loss				9.0		mJ
t_c	Cross-Over Time	V_{CC} = 480 V	I_C = 8 A		6		µs
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 1 KΩ	V_{GE} = 5 V		3.3		µs
t_f	Fall Time	T_j = 125 °C			2.5		µs
E_{off}(**)	Turn-off Switching Loss				10.8		mJ

(•) Pulse width limited by safe operating area
(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(**)Losses Include Also The Tail (Jedec Standardization)

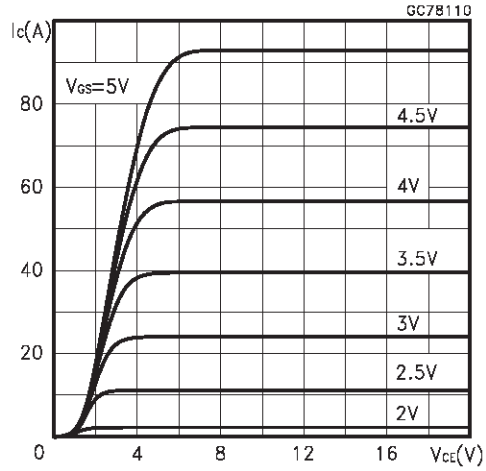
Safe Operating Area



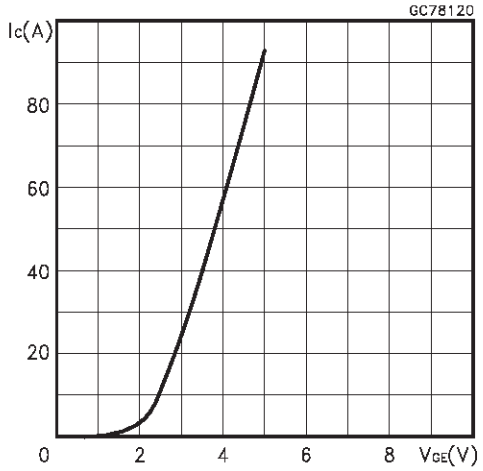
Thermal Impedance



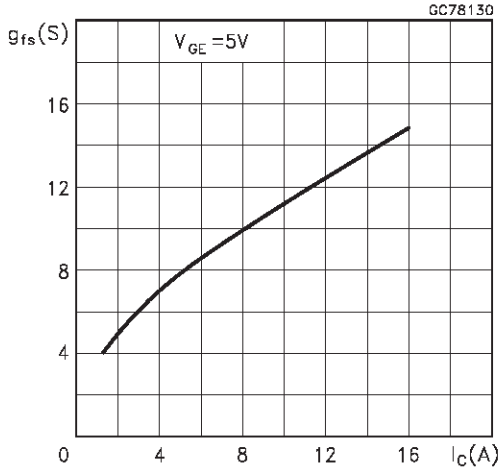
Output Characteristics



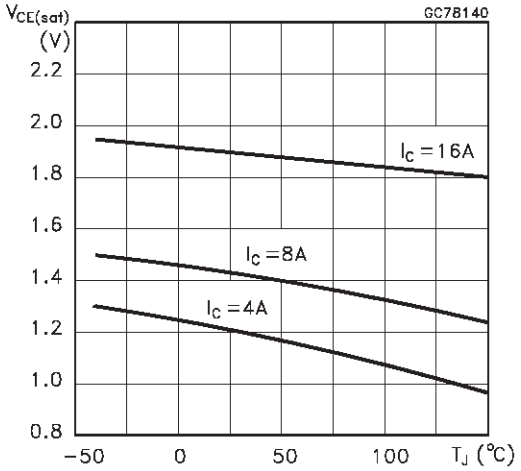
Transfer Characteristics



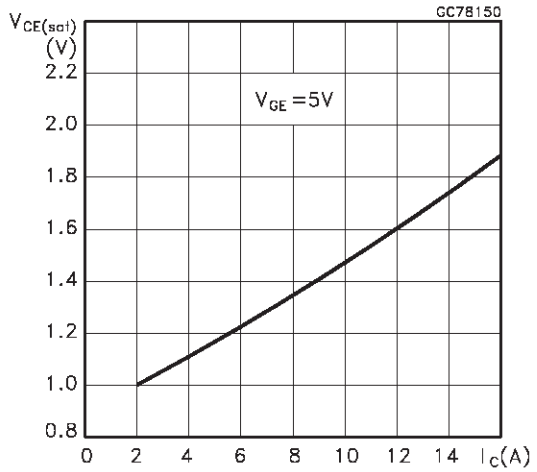
Transconductance



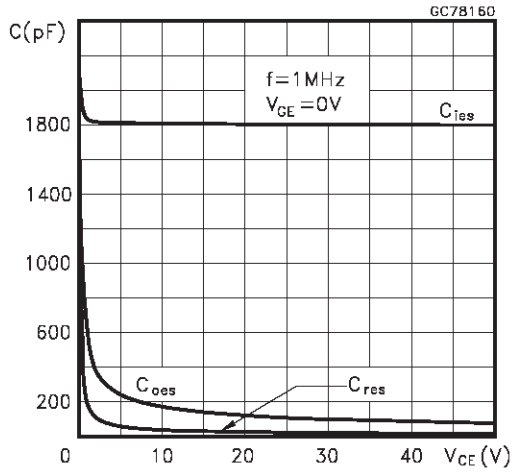
Collector-Emitter On Voltage vs Temperature



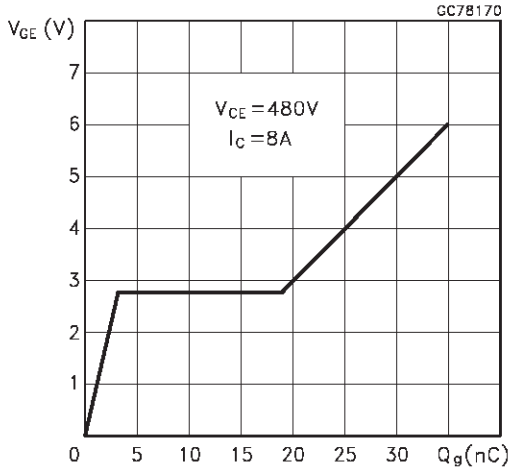
Collector-Emitter On Voltage vs Collector Current



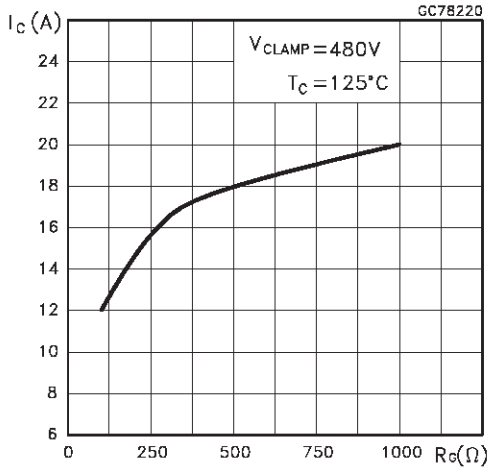
Capacitance Variations



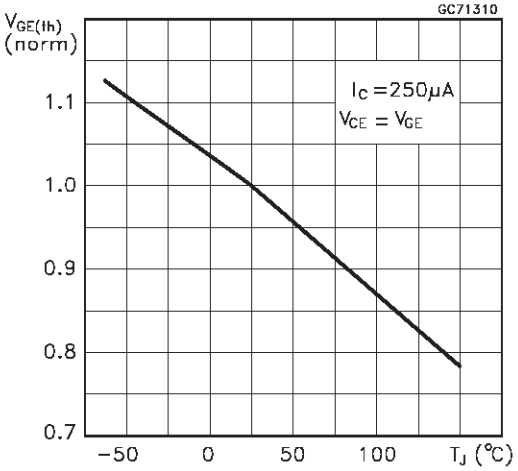
Gate Charge vs Gate-Emitter Voltage



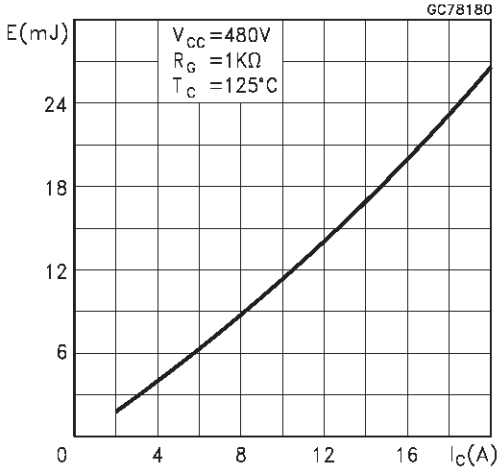
Latching Current vs Rg



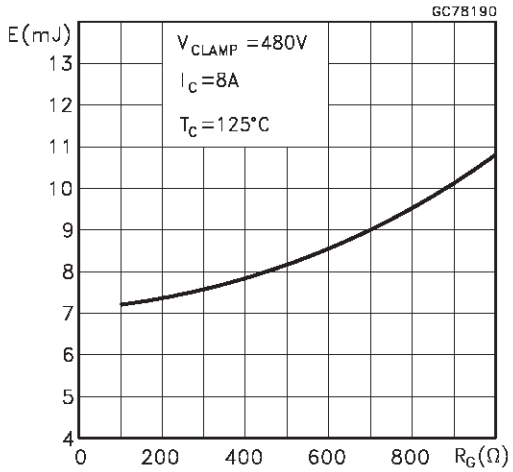
Gate Threshold vs Temperature



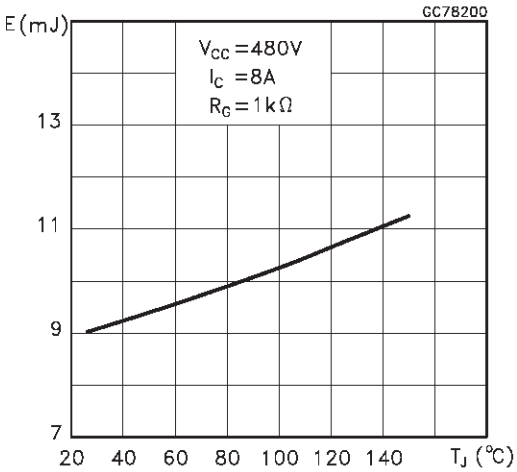
Off Losses vs Collector Current



Off Losses vs Gate Resistance



Off Losses vs Temperature



Switching Off Safe Operatin Area

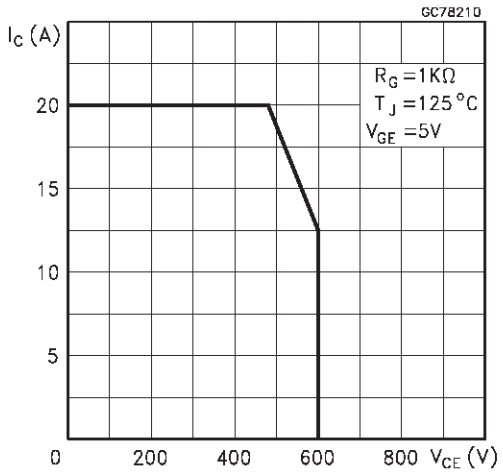


Fig. 1: Gate Charge test Circuit

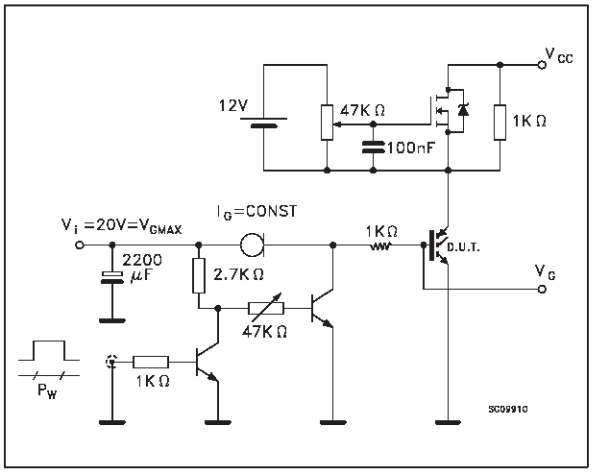


Fig. 2: Switching Times Test Circuit For Resistive Load

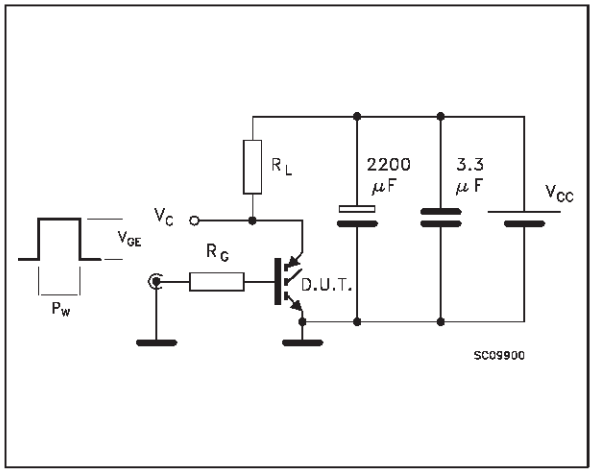
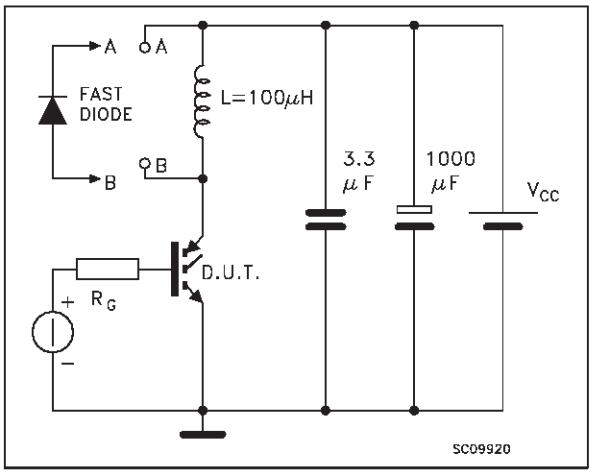


Fig. 3: Test Circuit For Inductive Load Switching



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151