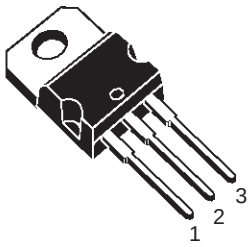
STGP10NB60S

N-CHANNEL 10A - 600V TO-220
PowerMESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGP10NB60S	600 V	< 1.7 V	10 A

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



TO-220

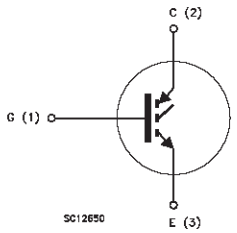
DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding perfomances. The suffix "S" identifies a family optimized to achieve minimum on-voltage drop for low frequency applications (<1kHz).

APPLICATIONS

- LIGHT DIMMER
- STATIC RELAYS
- MOTOR CONTROL

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	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at T_c = 25 °C	20	A
I_C	Collector Current (continuous) at T_c = 100 °C	10	A
I_{CM}(•)	Collector Current (pulsed)	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	W
	Derating Factor	0.64	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.56	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.2	°C/W

ELECTRICAL CHARACTERISTICS (T_j = 25 °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
$V_{BR(ECR)}$	Emitter-Collector Breakdown Voltage	IC = 1 mA V_{GE} = 0	20			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			10 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20 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	2.5		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V I_C = 5 A V_{GE} = 15 V I_C = 10 A V_{GE} = 15 V I_C = 10 A T_j = 125 °C		1.15 1.35 1.25	 1.7 	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} =25 V I_C = 10 A	5			S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25 V f = 1 MHz V_{GE} = 0		610 65 12	780 85 15	pF pF pF
Q_G	Gate Charge	V_{CE} = 400 V I_C = 10 A V_{GE} = 15 V		33		nC
I_{CL}	Latching Current	V_{clamp} = 480 V RG=1kΩ T_j = 150 °C	20			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	V_{CC} = 480 V I_C = 10 A V_{GE}= 15 V R_G = 1 KΩ		0.7 0.46		µs µs
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC} = 480 V I_C = 10 A R_G = 1 KΩ V_{GE} = 15 V		8		A/µs
E_{on}	Turn-on Switching Losses	T_j = 125 °C		0.6		mJ

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

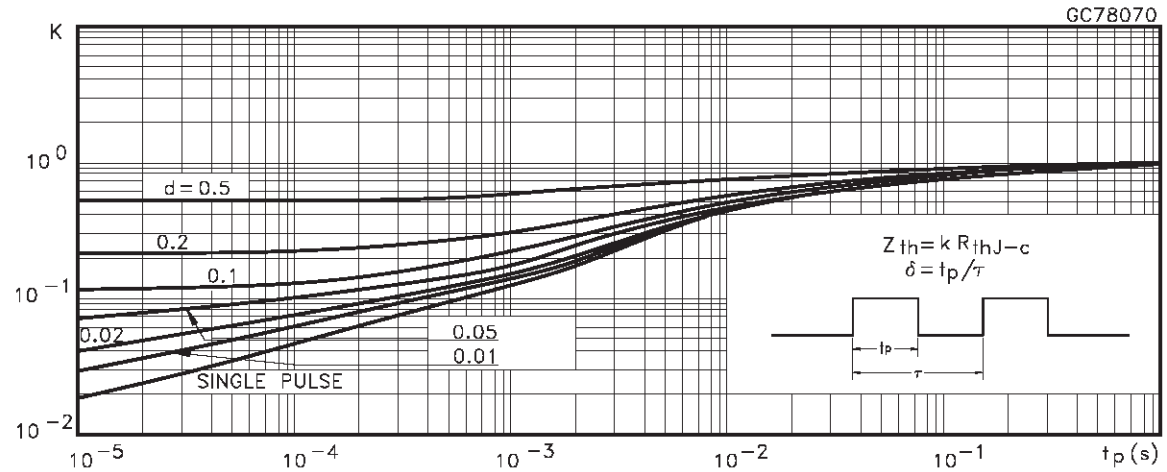
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	V_{CC} = 480 V, I_C = 10 A		2.2		µs
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 100 Ω, V_{GE} = 15 V		1.2		µs
t_f	Fall Time			1.2		µs
E_{off}(**)	Turn-off Switching Loss			5.0		mJ
t_c	Cross-Over Time	V_{CC} = 480 V, I_C = 10 A		3.8		µs
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 100 Ω, V_{GE} = 15 V		1.2		µs
t_f	Fall Time	T_j = 125 °C		1.9		µs
E_{off}(**)	Turn-off Switching Loss			8.0		mJ

(•) Pulse width limited by safe operating area

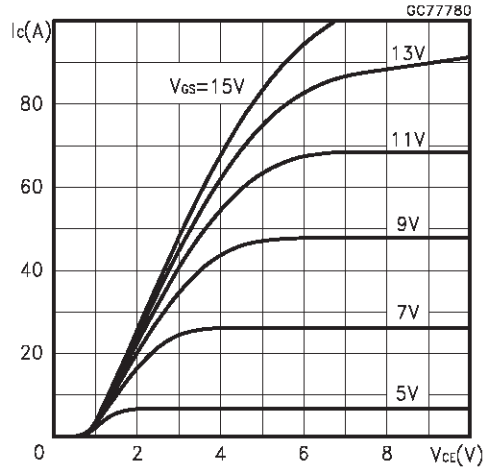
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(**)Losses Include Also The Tail (Jedec Standardization)

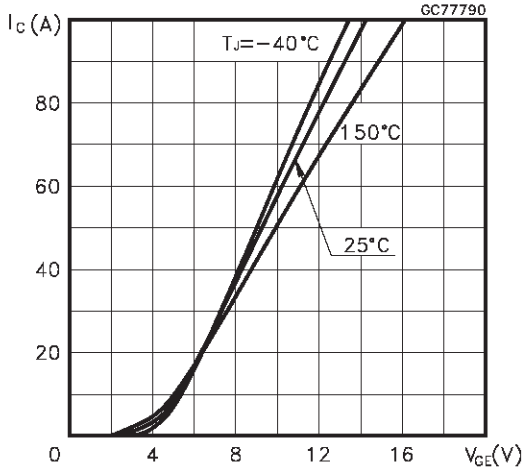
Thermal Impedance



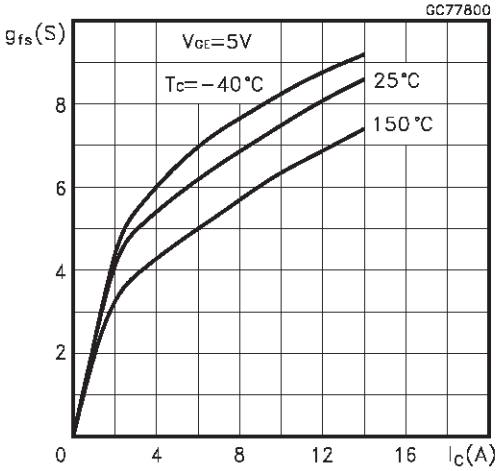
Output Characteristics



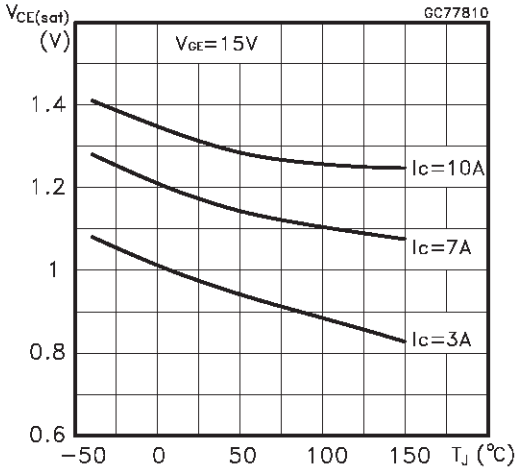
Transfer Characteristics



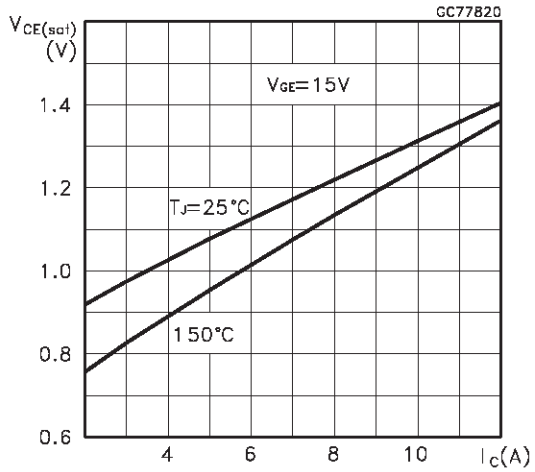
Transconductance



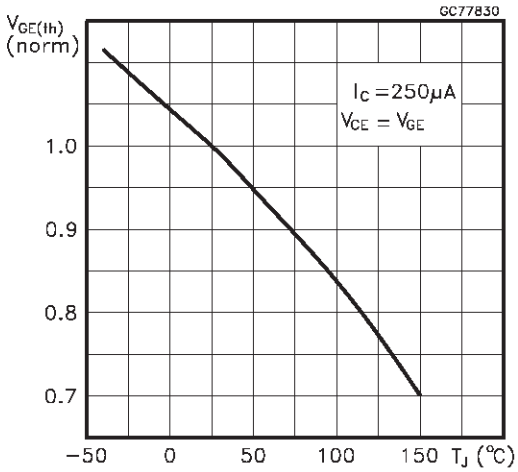
Collector-Emitter On Voltage vs Temperature



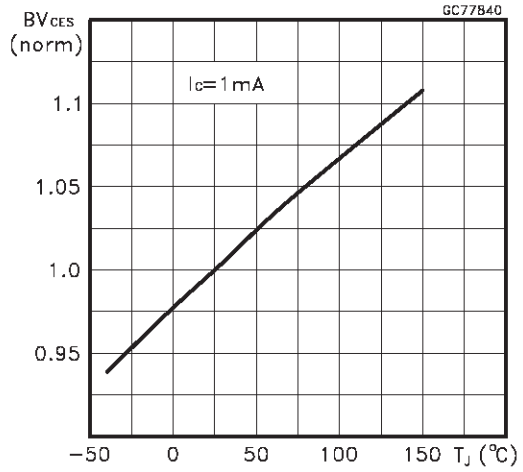
Collector-Emitter On Voltage vs Collector Current



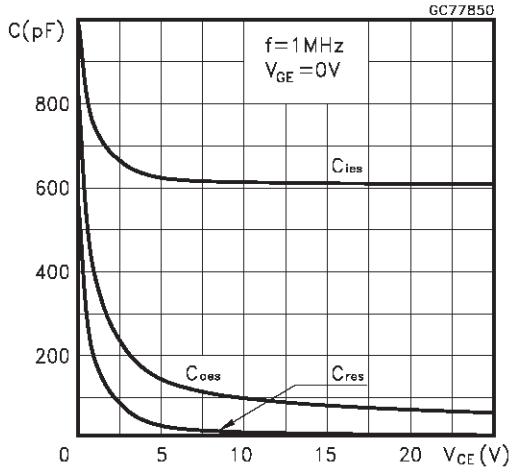
Gate Threshold vs Temperature



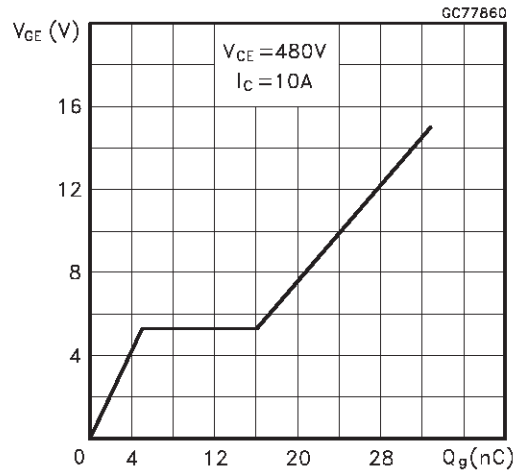
Normalized Breakdown Voltage vs Temperature



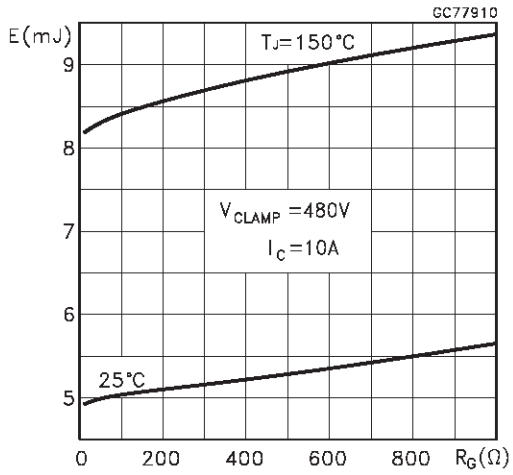
Capacitance Variations



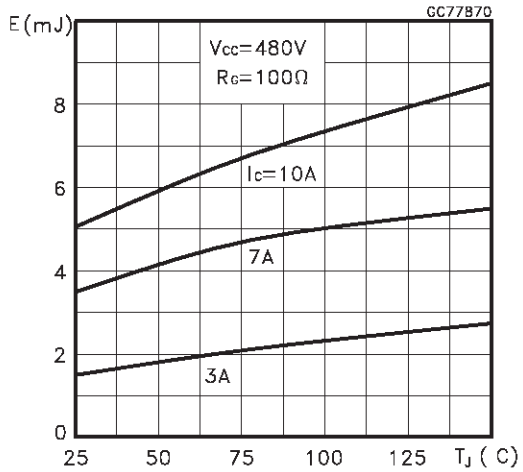
Gate Charge vs Gate-Emitter Voltage



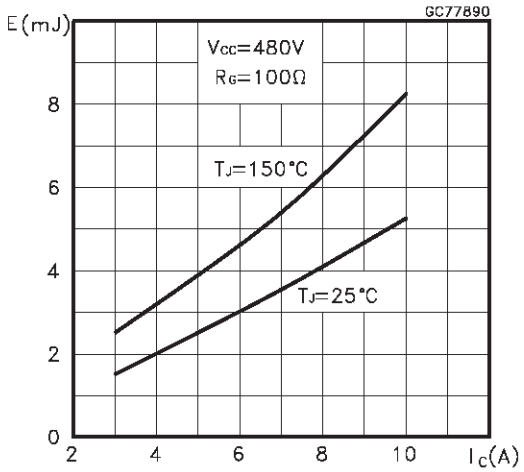
Off Losses vs Gate Resistance



Off Losses vs Temperature



Off Losses vs Collector Current



Switching Off Safe Operatin Area

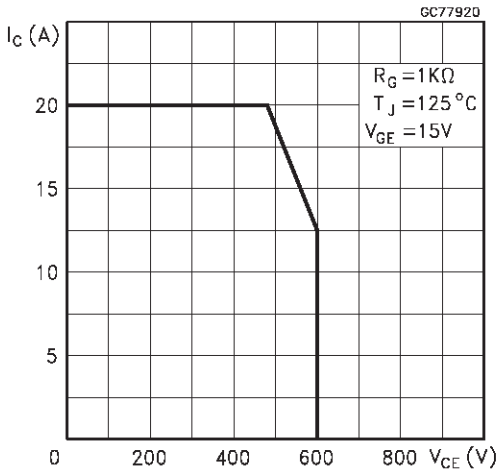
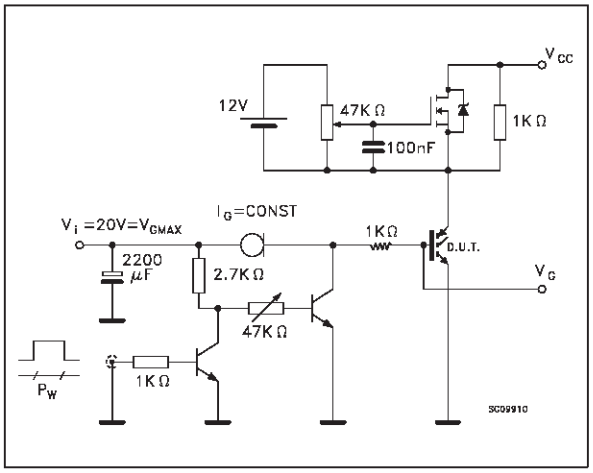


Fig. 1: Gate Charge test Circuit

Fig. 2: Test Circuit For Inductive Load Switching



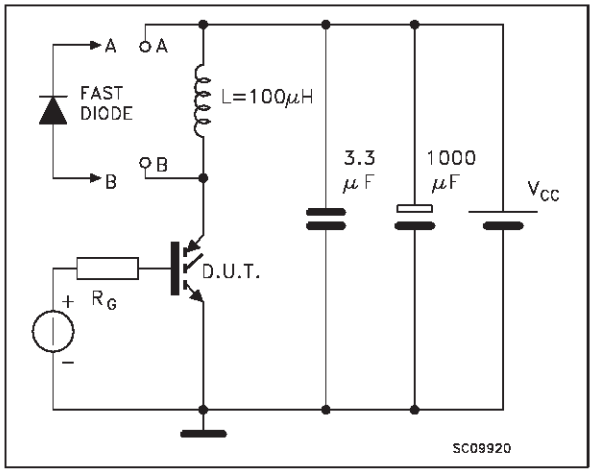
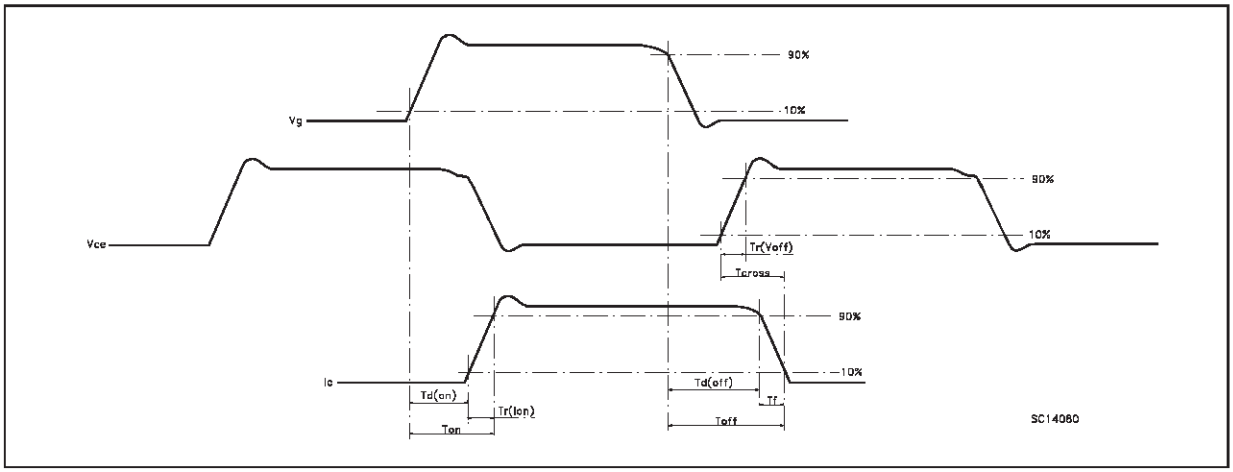


Fig. 3: Test Circuit For Inductive Load Switching



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