

SM2G450SH120KQ

Filed Stop & Trench Type 1200V IGBT Module

Features

- Low $V_{ce(sat)}$
- $V_{ce(sat)}$ with positive temperature coefficient
- Maximum junction temperature 150°C
- High Power Density
- Isolated Base Plate
- Standard Housing

Applications

- High Power Converters
- Motor Drivers
- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)
- Wind Turbines

Description

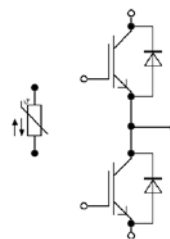
The IGBT Module devices are optimized to reduce losses and switching noise in high frequency power conditioning electrical systems.

These IGBT Module series are ideally suited for High Power Converters, Motor Drivers, AC and DC servo drive amplifier, UPS where switching losses are significant portion of the total losses and Wind Turbines.

Package Type & Internal Circuit



E02



Equivalent Circuit

IGBT Characteristics

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{CES}	Collector to Emitter Voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V
I_C	Continuous Collector Current	$T_C=25^{\circ}\text{C}, T_{vjmax}=150^{\circ}\text{C}$	670	A
		$T_C=100^{\circ}\text{C}, T_{vjmax}=150^{\circ}\text{C}$	450	
I_{CRM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	900	A
V_{GES}	Gate-Emitter Voltage		± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}\text{C}, T_{vjmax}=150^{\circ}\text{C}$	2500	W

Characteristic Values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$V_{GE}=V_{CE}$, $I_C=17mA$, $T_{vj}=25^{\circ}C$	5.0	5.5	6.5	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200V$, $V_{GE}=0V$, $T_{vj}=25^{\circ}C$			3.0	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=450A$, $V_{GE}=15V$, $T_{vj}=25^{\circ}C$		1.75	2.20	V
		$I_C=450A$, $V_{GE}=15V$, $T_{vj}=125^{\circ}C$		2.10		
		$I_C=450A$, $V_{GE}=15V$, $T_{vj}=150^{\circ}C$		2.25		
Q_G	Gate Charge	$V_{GE}=\pm 15V$		3.45		μC
C_{ies}	Input Capacitance	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$, $T_{vj}=25^{\circ}C$		29.5		nF
C_{res}	Reverse Transfer Capacitance			1.60		nF
R_{gint}	Internal Gate Resistance	$T_{vj}=25^{\circ}C$		1.8		Ω
I_{GES}	Gate-Emitter leakage current	$V_{CE}=0V$, $V_{GE}=20V$, $T_{vj}=25^{\circ}C$			400	nA
$t_{d(on)}$	Turn-on Delay Time	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.5\Omega$ $T_{vj}=25^{\circ}C$		345		ns
t_r	Rise Time			170		ns
$t_{d(off)}$	Turn-off Delay Time			720		ns
t_f	Fall Time			135		ns
E_{on}	Energy Dissipation During Turn-on Time			56.5		mJ
E_{off}	Energy Dissipation During Turn-off Time			34.5		mJ
$t_{d(on)}$	Turn-on Delay Time	$I_C=450A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.5\Omega$ $T_{vj}=150^{\circ}C$		360		ns
t_r	Rise Time			200		ns
$t_{d(off)}$	Turn-off Delay Time			730		ns
t_f	Fall Time			230		ns
E_{on}	Energy Dissipation During Turn-on Time			85.0		mJ
E_{off}	Energy Dissipation During Turn-off Time			45.0		mJ
I_{sc}	SC Data	$T_p \leq 10\mu s$, $V_{GE} \leq 15V$, $T_{vj}=150^{\circ}C$, $V_{cc}=800V$, $V_{CEM} \leq 1200V$		1780		A



Diode Characteristics

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	$T_{vj}=25^{\circ}\text{C}$	1200	V
I_F	Continuous DC Forward Current		450	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	900	A

Characteristic Values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	$I_F=450\text{A}, T_{vj}=25^{\circ}\text{C}$		2.00	2.50	V
		$I_F=450\text{A}, T_{vj}=125^{\circ}\text{C}$		1.80		
		$I_F=450\text{A}, T_{vj}=150^{\circ}\text{C}$		1.70		
Q_{rr}	Recovered Charge	$I_F=450\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=25^{\circ}\text{C}$		52		μC
I_{rr}	Peak Reverse Recovery Current			450		A
E_{rec}	Reverse Recovery Energy			28.6		mJ
Q_{rr}	Recovered Charge	$I_F=450\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=150^{\circ}\text{C}$		98		μC
I_{rr}	Peak Reverse Recovery Current			550		A
E_{rec}	Reverse Recovery Energy			49.4		mJ

NTC- Thermistor

Characteristic Values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Rated resistance	$T_C=25^{\circ}\text{C}$		5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^{\circ}\text{C}, R_{100}=493\Omega$	-5		5	%
P_{25}	Power dissipation	$T_C=25^{\circ}\text{C}$			18.0	mW
$B_{25/50}$	B-Value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298, 15\text{K}))]$		3370		K
$B_{25/80}$		$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298, 15\text{K}))]$		3415		
$B_{25/100}$		$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298, 15\text{K}))]$		3440		



Module Characteristics $T_c=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{isol}	Isolation voltage	$t=1\text{min}, f=50\text{Hz}$	2500			V
$T_{\text{vj op}}$	Operating Junction Temperature		-40		150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature		-40		125	$^{\circ}\text{C}$
L_{CE}	Stray Inductance			20		nH
$R_{\text{cc}'+\text{EE}'}$	Module Lead Resistance, Terminal to Chip	$T_c=25^{\circ}\text{C}$, per switch		1.3		m Ω
R_{thJC}	Thermal Resistance Junction to Case	per IGBT			0.06	K/W
		per Diode			0.10	
R_{thCS}	Thermal Resistance Case to Sink	per IGBT		0.03		K/W
		per Diode		0.04		
		per Module		0.009		
M_s	Module-to-Sink Torque (M6)		3.0		6.0	N·m
G	Weight of Module			348		g

SM2G450SH120KQ – Filed Stop & Trench Type 1200V IGBT Module

Typical Performance Characteristics

Fig. 1. Typical Output Characteristics

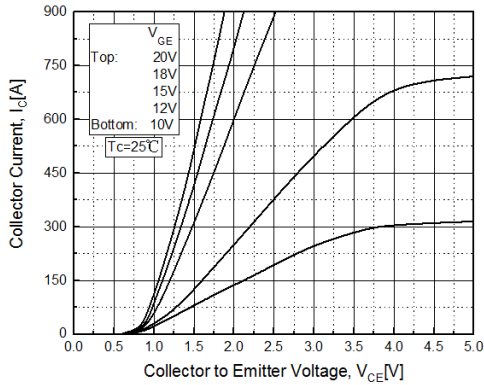


Fig. 2. Typical Output Characteristics

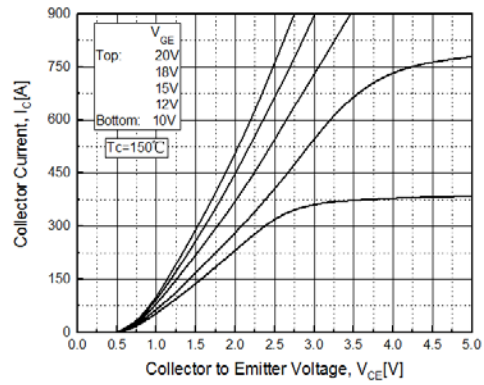


Fig. 3. Typical Saturation Voltage Characteristics

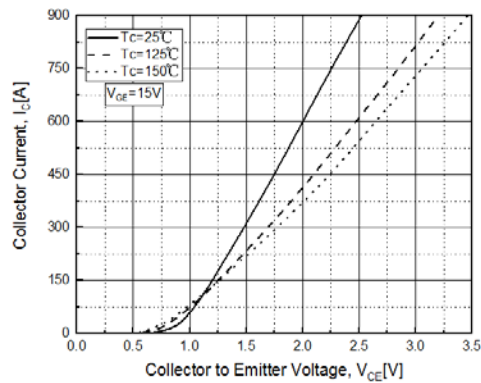


Fig. 4. Typical Transfer Characteristics

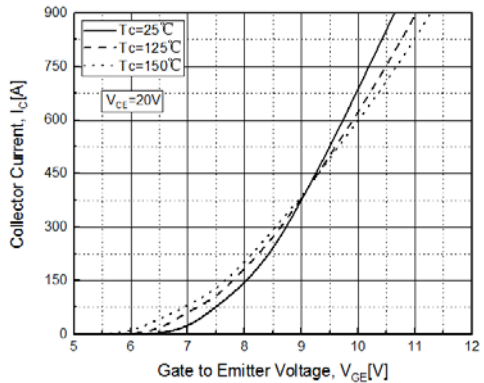
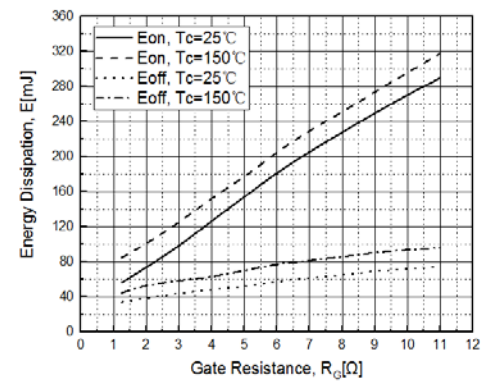
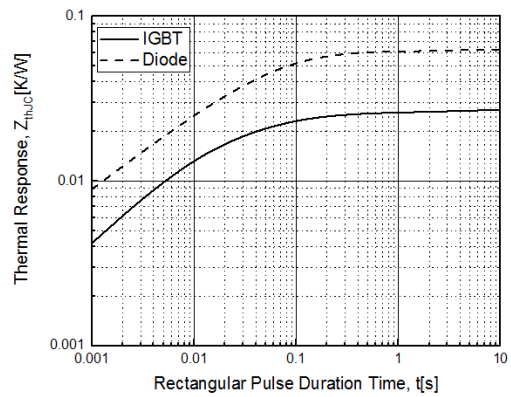

Fig. 5. Switching Characteristics vs. R_G


Fig. 6. Transient Thermal Impedance



Typical Performance Characteristics

Fig. 7. Forward Characteristics of Diode

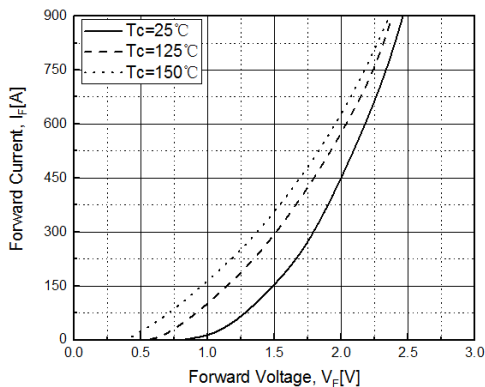


Fig. 8. Reverse Recovery Loss Characteristics vs. R_G

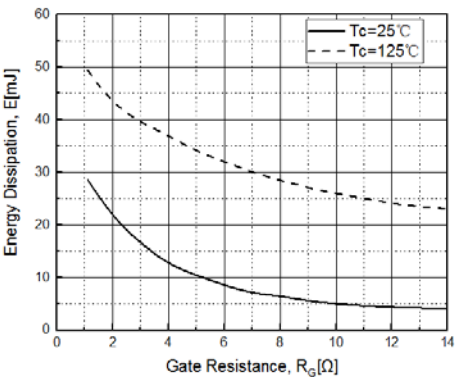


Fig. 9. Reverse Bias Safe Operating Area

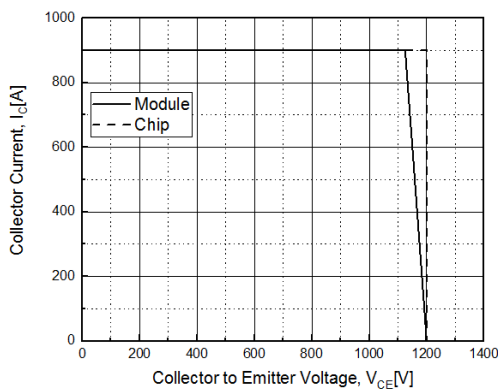
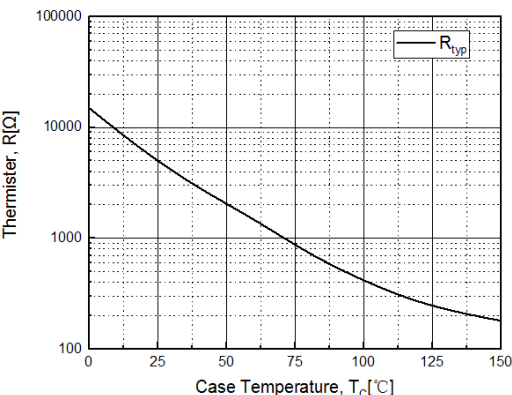
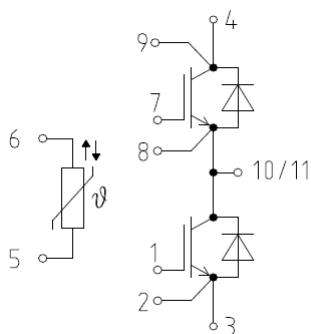


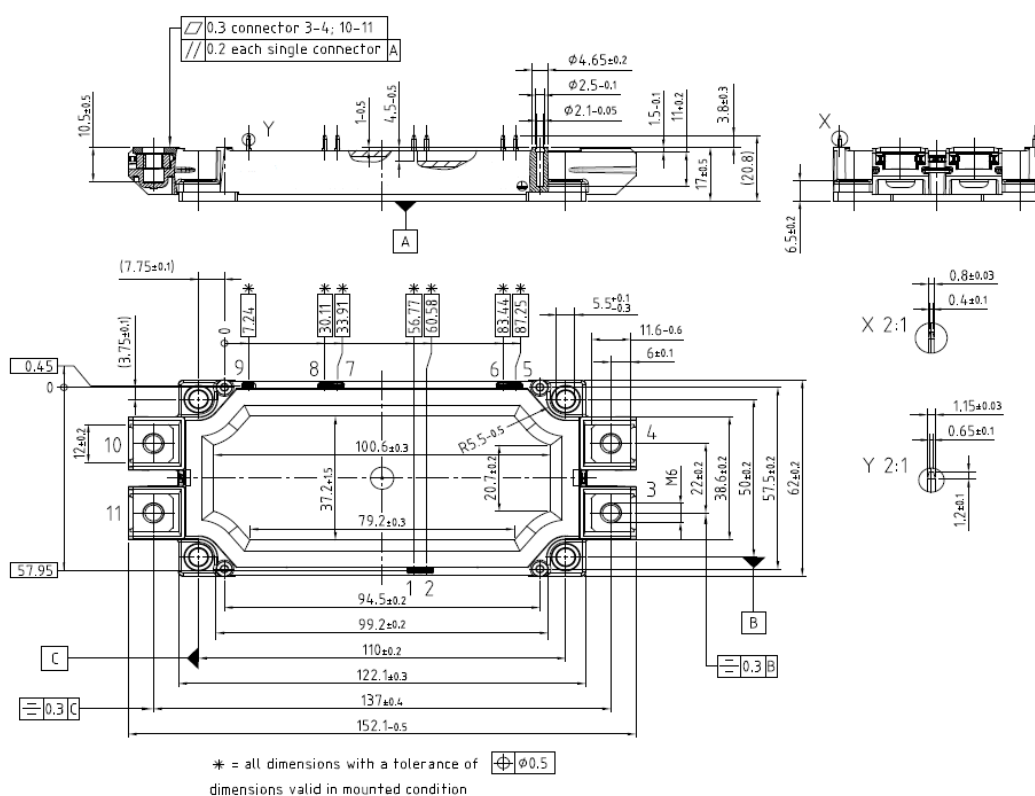
Fig. 10. NTC-Thermistor-temperature characteristic



Circuit Diagram



Package Dimensions



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