

SM6G200SH120KR

1200V 200A IGBT Power Module

Features

- Low $V_{ce(sat)}$
- Trench IGBT
- Maximum junction temperature 150°C
- Al_2O_3 Substrate with Low Thermal Resistance
- Copper Base Plate
- Standard Housing

Applications

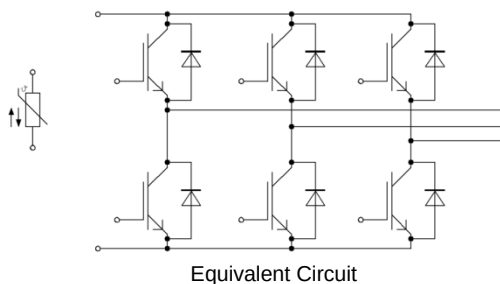
- Motor Drivers
- Servo Drivers

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 Motor Drivers, Servo Drivers.

Package Type & Internal Circuit



IGBT- inverter

Absolute Maximum Ratings

Symbol	Parameter	Conditions	Value	Unit
V_{CES}	Collector to Emitter Voltage	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
I_C	Continuous Collector Current	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	285	A
I_{CRM}	Repetitive Peak Collector Current	$t_p=1ms$	400	A
V_{GES}	Gate-Emitter Voltage	$T_{vj}=25^{\circ}C$	± 20	V
P_{tot}	Total Power Dissipation	$T_C=25^{\circ}C, T_{vjmax}=175^{\circ}C$	1000	W



Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$V_{GE}=V_{CE}, I_C=1mA, T_{vj}=25^{\circ}C$	5.2	5.6	6.4	V
I_{CES}	Collector-Emitter Cut-off Current	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=200A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.77	2.15	V
		$I_C=200A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.13		
		$I_C=200A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.21		
Q_G	Gate Charge	$V_{CE}=-15V...+15V$		1.68		uC
C_{ies}	Input Capacitance	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		14.2		nF
C_{res}	Reverse Transfer Capacitance			0.48		nF
R_{gint}	Internal Gate Resistance	$T_{vj}=25^{\circ}C$		3.5		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	$I_C=200A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.1\Omega$ $T_{vj}=25^{\circ}C$		142		ns
t_r	Rise Time			34		ns
$t_{d(off)}$	Turn-off Delay Time			323		ns
t_f	Fall Time			88		ns
E_{on}	Energy Dissipation During Turn-on Time			10.4		mJ
E_{off}	Energy Dissipation During Turn-off Time			11.1		mJ
$t_{d(on)}$	Turn-on Delay Time	$I_C=200A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=1.1\Omega$ $T_{vj}=125^{\circ}C$		148		ns
t_r	Rise Time			38		ns
$t_{d(off)}$	Turn-off Delay Time			396		ns
t_f	Fall Time			154		ns
E_{on}	Energy Dissipation During Turn-on Time			18.0		mJ
E_{off}	Energy Dissipation During Turn-off Time			16.1		mJ
I_{sc}	SC Data	$T_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C,$ $V_{cc}=800V, V_{CEM} \leq 1200V$		800		A

Diode- inverter

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		200	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	400	A

Characteristic values

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	$I_F=200\text{A}, T_{vj}=25^{\circ}\text{C}$		1.75	2.15	V
		$I_F=200\text{A}, T_{vj}=125^{\circ}\text{C}$		1.70		
		$I_F=200\text{A}, T_{vj}=150^{\circ}\text{C}$		1.70		
Q_{rr}	Recovered Charge	$I_F=200\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=25^{\circ}\text{C}$		18.1		μC
I_{rr}	Peak Reverse Recovery Current			233		A
E_{rec}	Reverse Recovery Energy			8.4		mJ
Q_{rr}	Recovered Charge	$I_F=200\text{A}$ $V_R=600\text{V}$ $-di_F/dt=5000\text{A/us}$ $T_{vj}=125^{\circ}\text{C}$		32.8		μC
I_{rr}	Peak Reverse Recovery Current			247		A
E_{rec}	Reverse Recovery Energy			14.8		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	$R_2= R_{25}\exp[B_{25/50}(1/T_2-1/(298, 15\text{K}))]$		3369		K
$B_{25/80}$		$R_2= R_{25}\exp[B_{25/80}(1/T_2-1/(298, 15\text{K}))]$		3417		
$B_{25/100}$		$R_2= R_{25}\exp[B_{25/100}(1/T_2-1/(298, 15\text{K}))]$		3442		

**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_{jmax}	Maximum Junction Temperature	Inverter			175	$^{\circ}\text{C}$
$T_{\text{vj op}}$	Operating Junction Temperature		-40		150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature		-40		125	$^{\circ}\text{C}$
L_{CE}	Stray Inductance			21		nH
$R_{\text{cc}'+\text{EE}'}$	Module Lead Resistance, Terminal to Chip	$T_c=25^{\circ}\text{C}$, per switch		1.8		m Ω
$R_{\text{AA}'+\text{CC}'}$				3.0		
$R_{\theta\text{jc}}$	Thermal Resistance Junction to Case	per IGBT-inverter			0.16	K/W
		per Diode-inverter			0.23	
$R_{\theta\text{CS}}$	Thermal Resistance Case to Sink	per IGBT-inverter		0.081		K/W
		per Diode-inverter		0.163		
		per Module		0.009		
M_s	Module-to-Sink Torque		3.0		6.0	N · m
G	Weight of Module			300		g

Typical Performance Characteristics

Fig. 1. Typical Output Characteristics

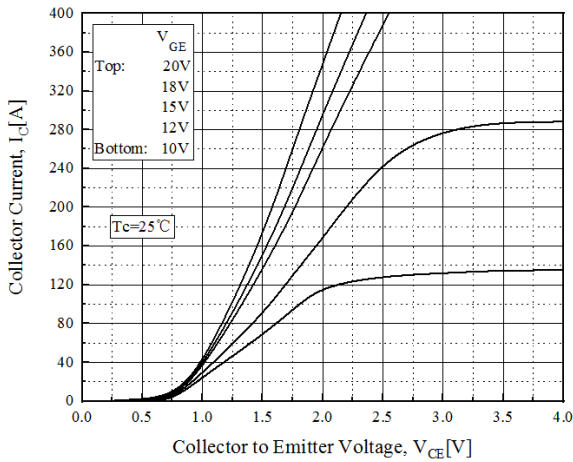


Fig. 2. Typical Output Characteristics

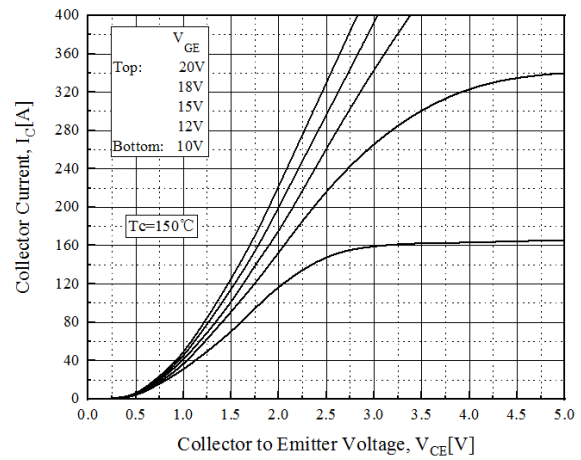


Fig. 3. Typical Saturation Voltage Characteristics

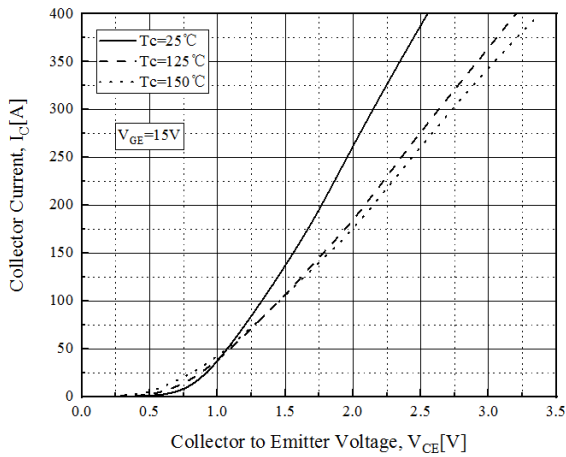


Fig. 4. Typical Transfer Characteristics

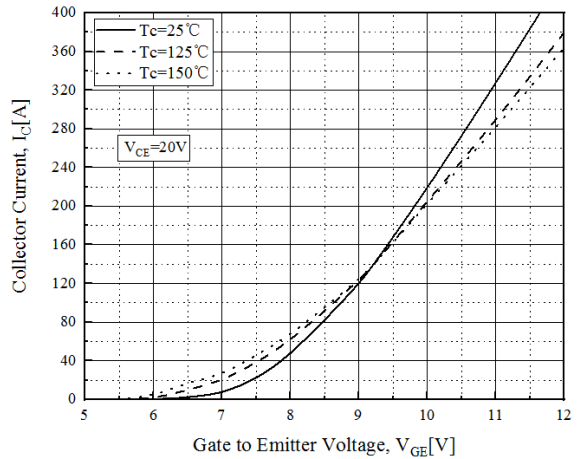


Fig. 5. Switching Loss Characteristics vs. R_G

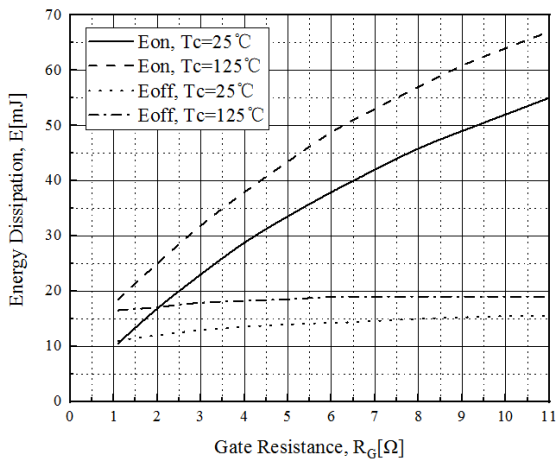
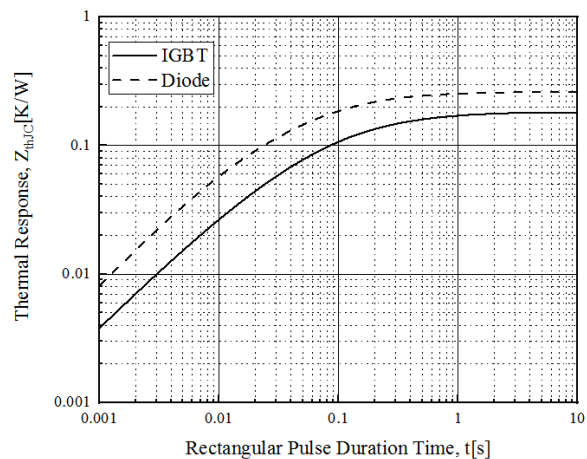


Fig. 6. Transient Thermal Impedance



Typical Performance Characteristics

Fig. 7. Forward Characteristics of Diode

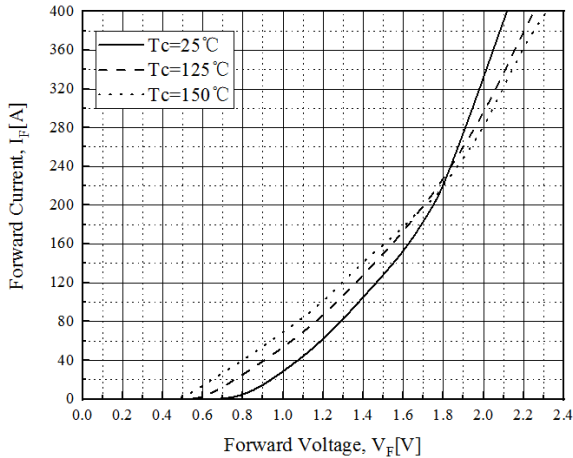


Fig. 8. Reverse Recovery Loss Characteristics vs. R_G

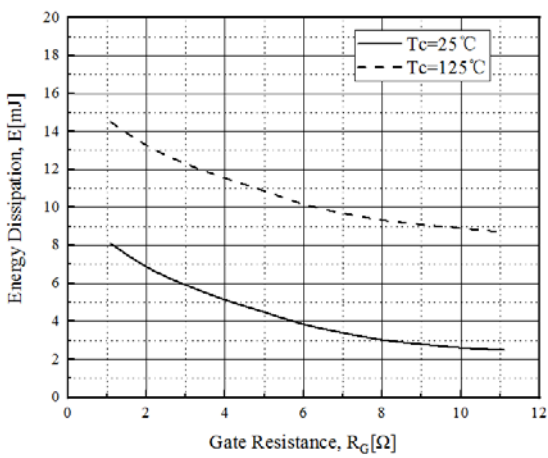


Fig. 9. Reverse Bias Safe Operating Area

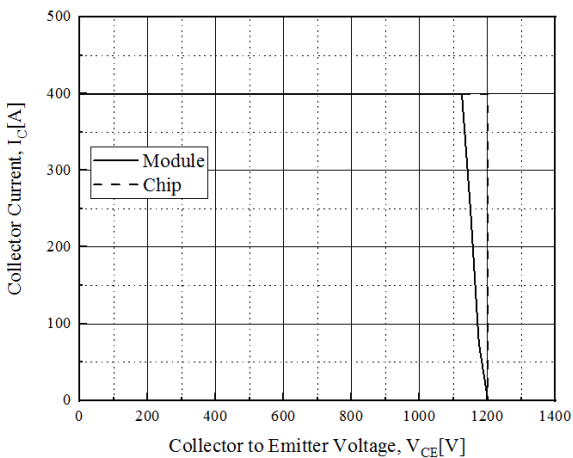
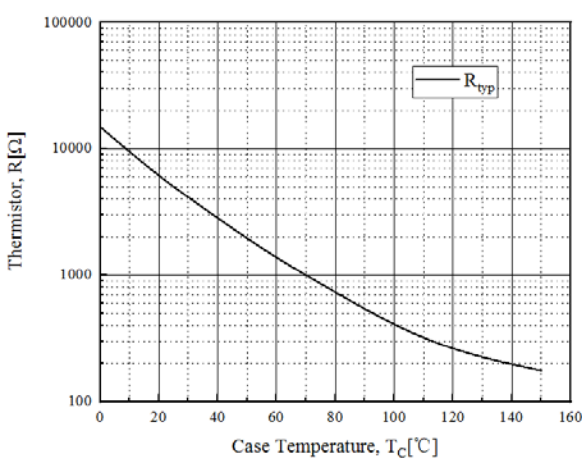
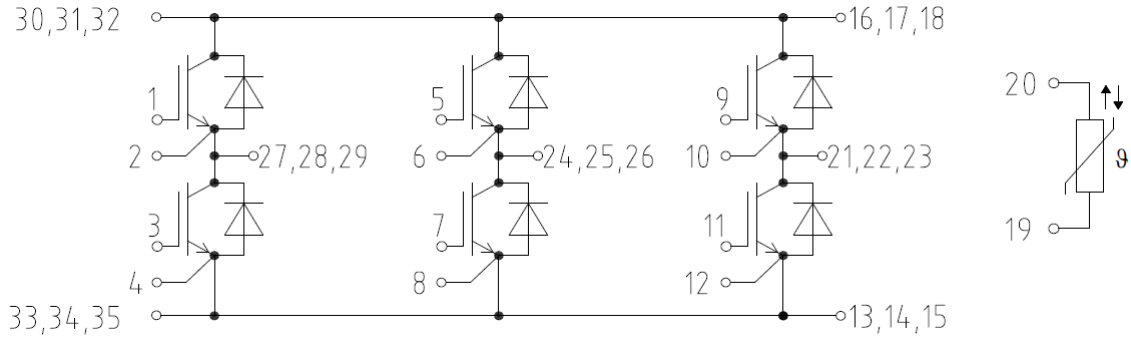


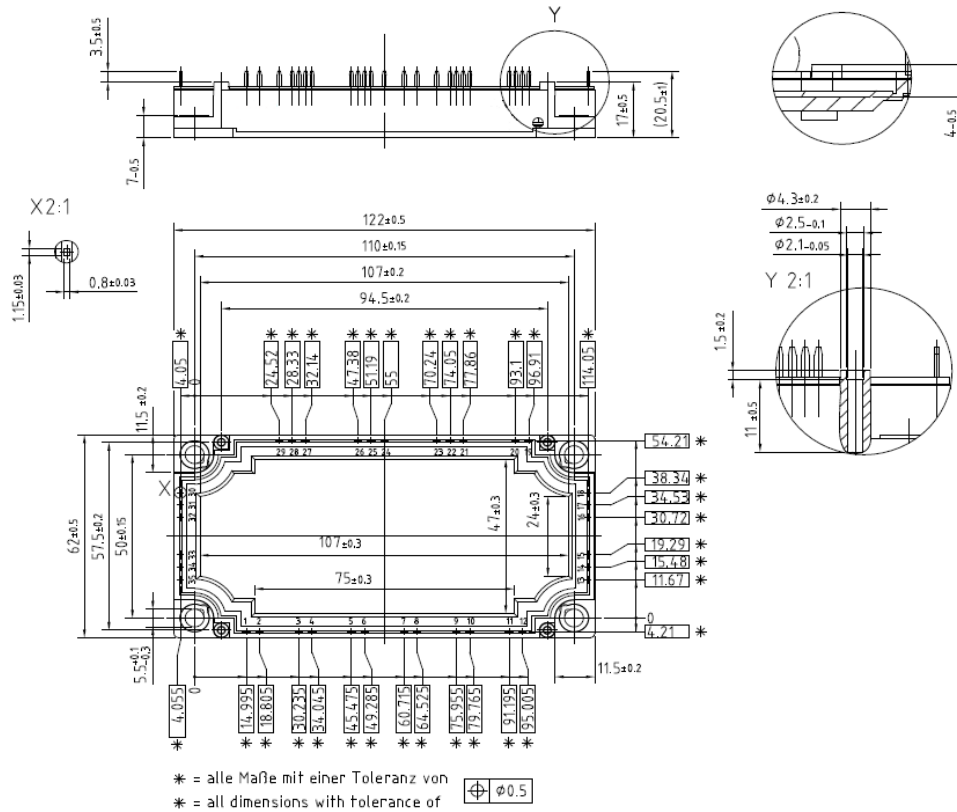
Fig. 10. NTC-Thermistor-temperature characteristic



Circuit Diagram



Package Dimensions



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