

# SM2G100SH120-D

## NPT & Rugged Type 1200V IGBT Module

### Features

- $BV_{CES}=1200V$
- Low Conduction Loss:  $V_{CE(sat)} = 3.0V @ I_C=100A$
- Fast & Soft Anti-Parallel FWD
- Short Circuit rated:10us at  $T_C=100^{\circ}C$
- Isolation Type Package

### Applications

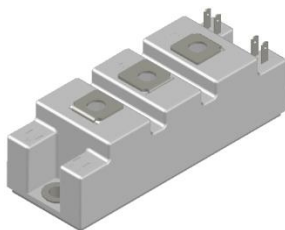
- Induction Heating, Motor Drives, High Power Inverters
- Welding Machine, UPS

### Description

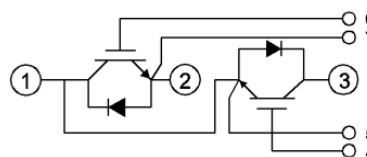
The IGBT Module 7SM-1 package devices are optimized to reduce losses and switching noise in high frequency power conditioning electrical systems.

These IGBT Module series are ideally suited for IH ,High Power inverters, Motors drives and other applications where switching losses are significant portion of the total losses.

### Package Type & Internal Circuit



7SM-1



Equivalent Circuit

### Absolute Maximum Ratings (at $T_C=25^{\circ}C$ unless otherwise noted)

| Symbol    | Parameter                            |                    | Ratings  | Unit        |
|-----------|--------------------------------------|--------------------|----------|-------------|
| $V_{CES}$ | Collector to Emitter Voltage         |                    | 1200     | V           |
| $V_{GES}$ | Gate to Emitter Voltage              |                    | $\pm 20$ | V           |
| $I_C$     | Collector Current                    | $T_C=25^{\circ}C$  | 150      | A           |
|           |                                      | $T_C=100^{\circ}C$ | 100      | A           |
| $I_{CM}$  | Pulsed Collector Current , $t_p=1ms$ |                    | 200      | A           |
| $I_F$     | Diode Continuous Forward Current     | $T_C=100^{\circ}C$ | 75       | A           |
| $I_{FM}$  | Diode Maximum Forward Current        |                    | 150      | A           |
| $P_D$     | Maximum Power Dissipation            | $T_C=25^{\circ}C$  | 625      | W           |
| $T_J$     | Operating Junction Temperature Range |                    | -55~+150 | $^{\circ}C$ |
| $T_{STG}$ | Storage Temperature Range            |                    | -55~+125 | $^{\circ}C$ |
| $V_{ISO}$ | Isolation Voltage                    | AC 1minute         | 2500     | V           |
|           | Mounting screw Torque: M6            |                    | 4        | N.M         |
|           | Weight                               |                    | 155      | g           |

### Thermal Characteristics

| Symbol               | Parameter                                      | Ratings | Unit          |
|----------------------|------------------------------------------------|---------|---------------|
| $R_{th(J-C)}(IGBT)$  | Thermal Resistance, Junction to case for IGBT  | 0.2     | $^{\circ}C/W$ |
| $R_{th(J-C)}(Diode)$ | Thermal Resistance, Junction to case for Diode | 0.45    | $^{\circ}C/W$ |
| $R_{th(J-A)}$        | Thermal Resistance, Junction to Ambient        | 0.05    | $^{\circ}C/W$ |

### Electrical Characteristics of IGBT @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol               | Parameter                               | Conditions                                                        | Min. | Typ. | Max.  | Unit |
|----------------------|-----------------------------------------|-------------------------------------------------------------------|------|------|-------|------|
| BV <sub>CES</sub>    | Collector to Emitter Breakdown Voltage  | V <sub>GE</sub> =0V, I <sub>C</sub> =1mA                          | 1200 | -    | -     | V    |
| V <sub>CE(sat)</sub> | Collector to Emitter Saturation Voltage | I <sub>C</sub> =100A, V <sub>GE</sub> =15V                        | -    | 3.0  | 3.6   | V    |
|                      |                                         | I <sub>C</sub> =100A, V <sub>GE</sub> =15V, T <sub>C</sub> =100°C | -    | 3.9  | -     | V    |
| V <sub>GE(th)</sub>  | Gate Threshold Voltage                  | V <sub>CE</sub> =V <sub>GE</sub> , I <sub>C</sub> =2mA            | 4.5  | -    | 7.5   | V    |
| I <sub>CES</sub>     | Zero Gate Voltage Collector Current     | V <sub>CE</sub> =V <sub>CES</sub> , V <sub>GE</sub> =0V           | -    | -    | 1     | mA   |
| I <sub>GES</sub>     | Gate to Emitter Leakage Current         | V <sub>GE</sub> =V <sub>GES</sub> , V <sub>CE</sub> =0V           | -    | -    | ± 250 | nA   |

### Electrical Characteristics of Diode @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol          | Parameter                           | Conditions                                                      | Min. | Typ.  | Max. | Unit |
|-----------------|-------------------------------------|-----------------------------------------------------------------|------|-------|------|------|
| V <sub>F</sub>  | Diode Forward Voltage               | I <sub>F</sub> =75A                                             | -    | 2.15  | 2.5  | V    |
|                 |                                     | I <sub>F</sub> =75A, T <sub>C</sub> =100°C                      | -    | 1.8   | -    | V    |
| t <sub>rr</sub> | Diode Reverse Recovery Time         | I <sub>F</sub> =75A,<br>di/dt=-200A/us                          | -    | 160   | -    | ns   |
| I <sub>rr</sub> | Diode Peak Reverse Recovery Current |                                                                 | -    | 16    | -    | A    |
| Q <sub>rr</sub> | Diode Reverse Recovery Charge       |                                                                 | -    | 1400  | -    | nC   |
| t <sub>rr</sub> | Diode Reverse Recovery Time         | I <sub>F</sub> =75A,<br>di/dt=-200A/us<br>T <sub>C</sub> =100°C | -    | 320   | -    | ns   |
| I <sub>rr</sub> | Diode Peak Reverse Recovery Current |                                                                 | -    | 28    | -    | A    |
| Q <sub>rr</sub> | Diode Reverse Recovery Charge       |                                                                 | -    | 10000 | -    | nC   |

### Switching Characteristics @T<sub>C</sub>=25 °C unless otherwise noted

| Symbol              | Parameter                    | Conditions                                                                                                           | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| t <sub>d(on)</sub>  | Turn-on Delay Time           | I <sub>C</sub> =100A,<br>V <sub>CC</sub> =600V,<br>V <sub>GE</sub> =± 15V,<br>R <sub>G</sub> =10Ω,<br>Inductive Load | -    | 95   | -    | ns   |
| t <sub>r</sub>      | Rise Time                    |                                                                                                                      | -    | 70   | -    | ns   |
| t <sub>d(off)</sub> | Turn-off Delay Time          |                                                                                                                      | -    | 400  | -    | ns   |
| t <sub>f</sub>      | Fall Time                    |                                                                                                                      | -    | 60   | -    | ns   |
| E <sub>on</sub>     | Turn-on Switching Loss       |                                                                                                                      | -    | 5.0  | -    | mJ   |
| E <sub>off</sub>    | Turn-off Switching Loss      |                                                                                                                      | -    | 7.0  | -    | mJ   |
| E <sub>ts</sub>     | Total Switching Loss         |                                                                                                                      | -    | 12.0 | -    | mJ   |
| C <sub>ies</sub>    | Input Capacitance            | V <sub>GE</sub> =0V, V <sub>CE</sub> =30V,<br>f=1.0MHz                                                               | -    | 4760 | -    | pF   |
| C <sub>res</sub>    | Reverse Transfer Capacitance |                                                                                                                      | -    | 518  | -    | pF   |
| C <sub>oes</sub>    | Output Capacitance           |                                                                                                                      | -    | 175  | -    | pF   |
| Q <sub>g</sub>      | Total Gate Charge            | I <sub>C</sub> =100A,<br>V <sub>CC</sub> =600V<br>V <sub>GE</sub> =± 15V                                             | -    | 400  | -    | nC   |
| Q <sub>ge</sub>     | Gate to Emitter Charge       |                                                                                                                      | -    | 44   | -    | nC   |
| Q <sub>gc</sub>     | Gate to Collector Charge     |                                                                                                                      | -    | 236  | -    | nC   |
| t <sub>sc</sub>     | Short Circuit Withstand Time | V <sub>CC</sub> =600V, V <sub>GE</sub> =± 15V<br>R <sub>G</sub> =10Ω @T <sub>C</sub> =100°C                          | 10   | -    | -    | us   |

## Typical Performance Characteristics

Fig. 1. Typical Output Characteristics

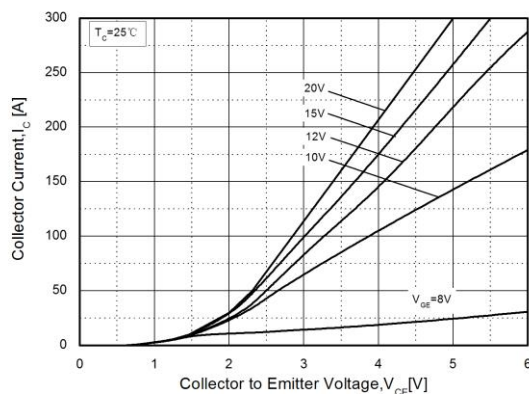


Fig. 2. Typical Output Characteristics

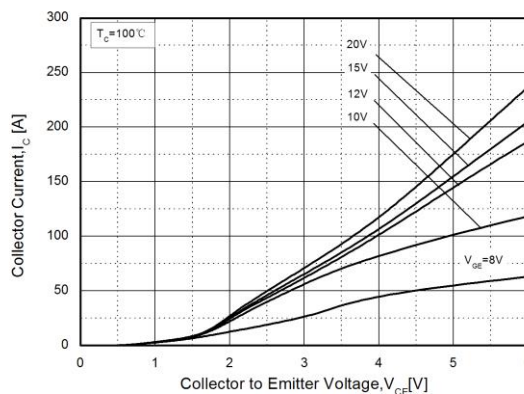


Fig. 3. Typical Saturation Voltage Characteristics

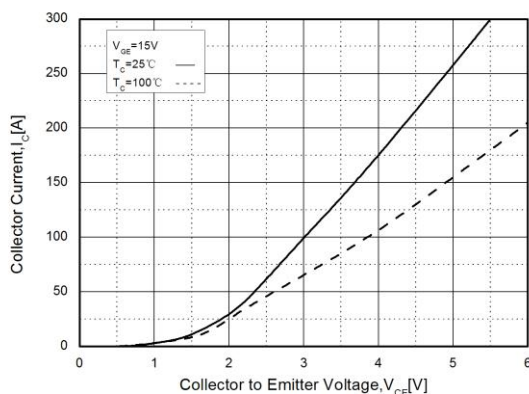


Fig. 4. Gate Charge Characteristics

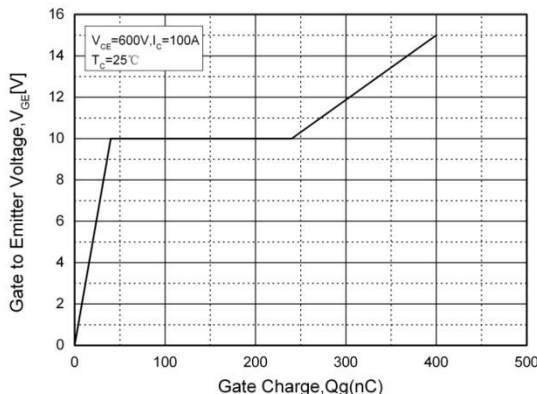


Fig. 5. Turn-on Characteristics vs.  $R_G$

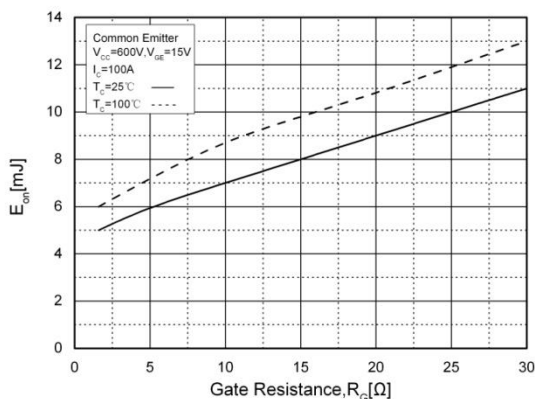
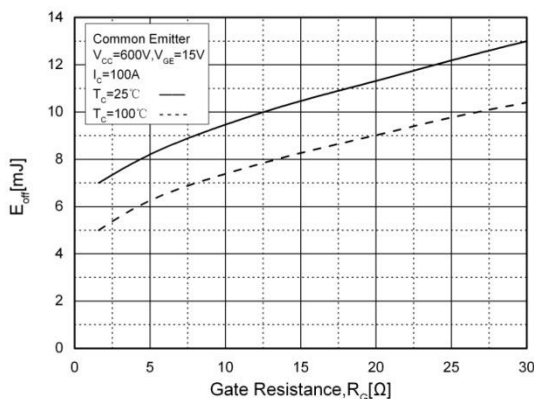


Fig. 6. Turn-off Characteristics vs.  $R_G$



## Typical Performance Characteristics

Fig. 7. Rate Current vs.  $T_C$

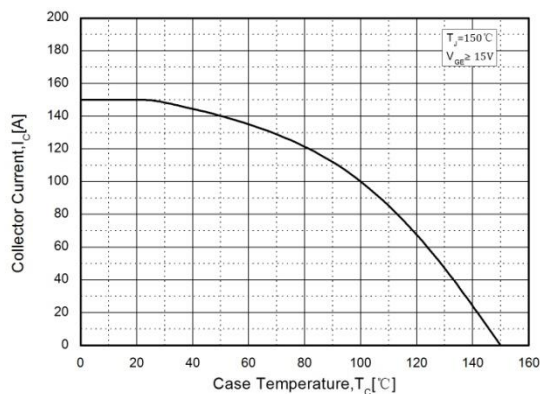


Fig. 8. Power Dissipation vs.  $T_C$

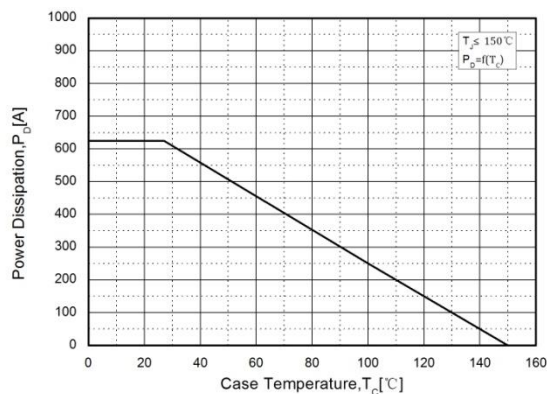


Fig. 9. Transient Thermal Impedance

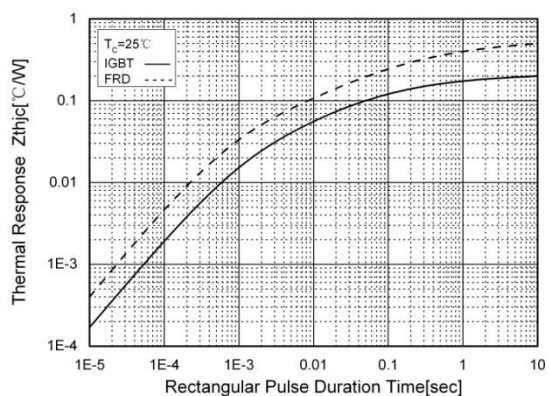
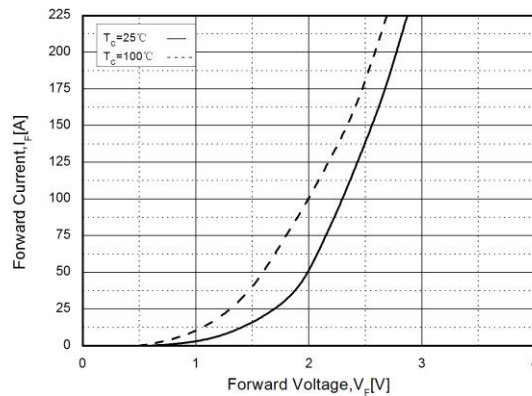
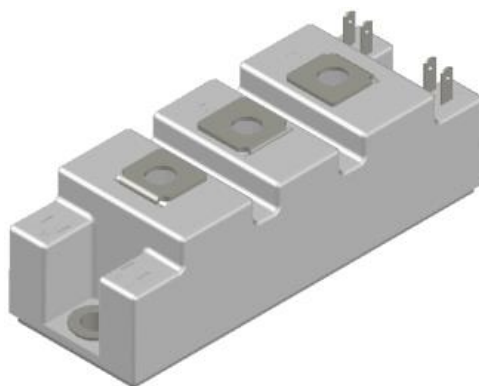


Fig. 10. Forward Characteristics

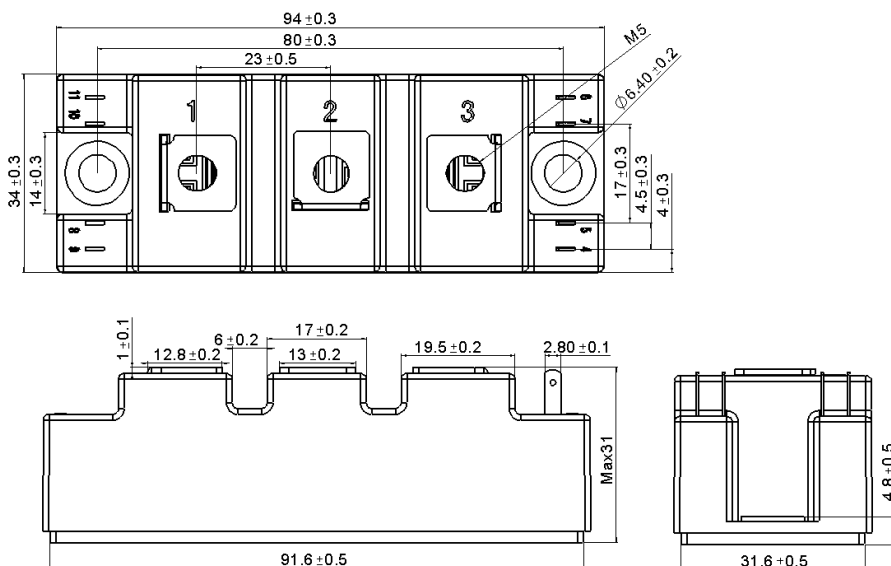


## Package Dimensions

### 7SM-1



(Dimensions in Millimeters)



#### DISCLAIMER:

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