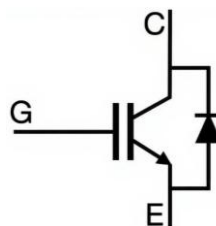


# SMGQ100H120ADB

## 1200V 100A Field Stop Trench IGBT

### Features:

- Low  $V_{CE(sat)}$  Trench IGBT Technology
- Low Switching Loss
- Low Stray Inductance
- Maximum Junction Temperature  $-40\sim+175^{\circ}\text{C}$
- Positive  $V_{CE(sat)}$  Temperature Coefficient



Schematic diagram



G C E

### Applications:

- High-power Converter
- Industrial UPS
- Motor Driver
- Welding Machine

| Type           | Package      | Marking        |
|----------------|--------------|----------------|
| SMGQ100H120ADB | TO247-PLUS-3 | SMGQ100H120ADB |

### Absolute Maximum Rated Values ( $T_C=25^{\circ}\text{C}$ unless otherwise specified)

| Symbol       | Description                                                       | Conditions                | Values        | Units              |
|--------------|-------------------------------------------------------------------|---------------------------|---------------|--------------------|
| $V_{CES}$    | Collector-Emitter Blocking Voltage                                |                           | 1200          | V                  |
| $V_{GES}$    | Gate-Emitter Voltage                                              |                           | $\pm 20$      | V                  |
| $I_C$        | Continuous Collector Current, Limited by $T_{Jmax}$               | $T_C=100^{\circ}\text{C}$ | 100           | A                  |
|              |                                                                   | $T_C=25^{\circ}\text{C}$  | 200           | A                  |
| $I_{CM}$     | Pulse Collector Current, $T_p$ limited by Bonding wire            |                           | 225           | A                  |
| $I_F$        | Continuous Forward Current, Limited by $T_{Jmax}$                 | $T_C=100^{\circ}\text{C}$ | 100           | A                  |
|              |                                                                   | $T_C=25^{\circ}\text{C}$  | 200           | A                  |
| $I_{FM}$     | Pulse Forward Current, $T_p$ limited by Bonding wire              |                           | 225           | A                  |
| $P_D$        | Maximum Power Dissipation                                         | $T_C=25^{\circ}\text{C}$  | 830           | W                  |
| $T_{JOP}$    | Maximum Operating Junction Temperature Range                      |                           | $-40\sim 175$ | $^{\circ}\text{C}$ |
| $T_{stg}$    | Storage temperature                                               |                           | $-40\sim 150$ | $^{\circ}\text{C}$ |
| $T_{Solder}$ | Soldering Temperature, 0.063 in. (1.6mm) from case for 10 seconds |                           | 260           | $^{\circ}\text{C}$ |



### Electrical Characteristics of IGBT ( $T_J=25^{\circ}\text{C}$ unless otherwise specified)

| Symbol        | Description                            | Conditions                                                              | Min.                      | Typ. | Max. | Units         |
|---------------|----------------------------------------|-------------------------------------------------------------------------|---------------------------|------|------|---------------|
| $V_{(BR)CES}$ | Collector-to-Emitter Breakdown Voltage |                                                                         | 1200                      |      |      | V             |
| $V_{GE(th)}$  | Gate-Emitter Threshold Voltage         | $I_C=3.8\text{mA}$ , $V_{CE}=V_{GE}$                                    | 5.0                       | 5.8  | 6.5  | V             |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage   | $I_C=100\text{A}$ ,<br>$V_{GE}=15\text{V}$                              | $T_J=25^{\circ}\text{C}$  | 1.84 | 2.20 | V             |
|               |                                        |                                                                         | $T_J=125^{\circ}\text{C}$ | 2.37 |      | V             |
|               |                                        |                                                                         | $T_J=175^{\circ}\text{C}$ | 2.68 |      | V             |
| $I_{CES}$     | Collector-Emitter Leakage Current      | $V_{GE}=0\text{V}$ ,<br>$V_{CE}=1200\text{V}$                           | $T_J=25^{\circ}\text{C}$  | 1    | 50   | $\mu\text{A}$ |
|               |                                        |                                                                         | $T_J=175^{\circ}\text{C}$ | 8    |      | mA            |
| $I_{GES}$     | Gate-Emitter Leakage Current           | $V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$ , $T_J=25^{\circ}\text{C}$ |                           |      | 100  | nA            |
| $C_{ies}$     | Input Capacitance                      | $V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$            |                           | 7685 |      | pF            |
| $C_{oes}$     | Output Capacitance                     |                                                                         |                           | 402  |      |               |
| $C_{res}$     | Reverse Transfer Capacitance           |                                                                         |                           | 89   |      |               |

### Switching Characteristics of IGBT ( $T_J=25^{\circ}\text{C}$ unless otherwise specified)

|              |                     |                                                                                 |                    |     |     |    |    |
|--------------|---------------------|---------------------------------------------------------------------------------|--------------------|-----|-----|----|----|
| $t_{d(on)}$  | Turn-on Delay Time  | $V_{CC}=600V, I_C=100A,$<br>$R_{Gon}=10\Omega, V_{GE}=0/15V,$<br>Inductive Load | $T_J=25^{\circ}C$  |     | 113 |    | ns |
|              |                     |                                                                                 | $T_J=125^{\circ}C$ |     | 106 |    |    |
|              |                     |                                                                                 | $T_J=175^{\circ}C$ |     | 102 |    |    |
| $t_r$        | Rise Time           |                                                                                 | $T_J=25^{\circ}C$  |     | 145 |    | ns |
|              |                     |                                                                                 | $T_J=125^{\circ}C$ |     | 154 |    |    |
|              |                     |                                                                                 | $T_J=175^{\circ}C$ |     | 162 |    |    |
| $t_{d(off)}$ | Turn-off Delay Time | $T_J=25^{\circ}C$                                                               |                    | 452 |     | ns |    |
|              |                     | $T_J=125^{\circ}C$                                                              |                    | 502 |     |    |    |
|              |                     | $T_J=175^{\circ}C$                                                              |                    | 519 |     |    |    |
| $t_f$        | Fall Time           | $T_J=25^{\circ}C$                                                               |                    | 117 |     | ns |    |
|              |                     | $T_J=125^{\circ}C$                                                              |                    | 186 |     |    |    |
|              |                     | $T_J=175^{\circ}C$                                                              |                    | 220 |     |    |    |

# SMGQ100H120ADB

## IGBT Discrete Datasheet



|                     |                                                                                           |                                                                                                                                                             |                       |    |      |  |    |
|---------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----|------|--|----|
| E <sub>on</sub>     | Turn-on Switching Loss                                                                    | V <sub>CC</sub> =600V, I <sub>C</sub> =100A,<br>R <sub>Gon</sub> =10Ω, V <sub>GE</sub> =0/15V,<br>di/dt=380A/μs(T <sub>J</sub> =175°C),<br>Inductive Load   | T <sub>J</sub> =25°C  |    | 11.2 |  | mJ |
|                     |                                                                                           |                                                                                                                                                             | T <sub>J</sub> =125°C |    | 11.7 |  |    |
|                     |                                                                                           |                                                                                                                                                             | T <sub>J</sub> =175°C |    | 12.2 |  |    |
| E <sub>off</sub>    | Turn-off Switching Loss                                                                   | V <sub>CC</sub> =600V, I <sub>C</sub> =100A,<br>R <sub>Goff</sub> =10Ω, V <sub>GE</sub> =0/15V,<br>du/dt=4250V/μs(T <sub>J</sub> =175°C),<br>Inductive Load | T <sub>J</sub> =25°C  |    | 5.09 |  | mJ |
|                     |                                                                                           |                                                                                                                                                             | T <sub>J</sub> =125°C |    | 6.56 |  |    |
|                     |                                                                                           |                                                                                                                                                             | T <sub>J</sub> =175°C |    | 7.25 |  |    |
| Q <sub>g</sub>      | Total Gate Charge                                                                         | V <sub>CC</sub> =960V, I <sub>C</sub> =100A,<br>V <sub>GE</sub> =0V/15V                                                                                     |                       |    | 296  |  | nC |
| Q <sub>ge</sub>     | Gate-emitter Charge                                                                       |                                                                                                                                                             |                       |    | 64   |  |    |
| Q <sub>gc</sub>     | Gate-collector Charge                                                                     |                                                                                                                                                             |                       |    | 154  |  |    |
| R <sub>g(int)</sub> | Internal Gate Resistance                                                                  |                                                                                                                                                             |                       |    | 7    |  | Ω  |
| T <sub>sc</sub>     | V <sub>CC</sub> =600V, V <sub>GE</sub> =0/15V, R <sub>G</sub> =10Ω, T <sub>J</sub> =175°C |                                                                                                                                                             |                       | 10 |      |  | us |

### Electrical Characteristics of Diode (T<sub>J</sub>=25°C unless otherwise specified)

| Symbol               | Description                                   | Conditions                                                                                                      |                       | Min. | Typ. | Max. | Units |
|----------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|------|------|------|-------|
| V <sub>F</sub>       | Forward Voltage                               | I <sub>F</sub> =100A                                                                                            | T <sub>J</sub> =25°C  |      | 1.74 | 2.10 | V     |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =125°C |      | 1.94 |      |       |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =175°C |      | 1.95 |      |       |
| I <sub>rr</sub>      | Peak Reverse Recovery Current                 | I <sub>F</sub> =100A,<br>di/dt=606A/μs(T <sub>J</sub> =175°C),<br>V <sub>rr</sub> =600V,<br>V <sub>GE</sub> =0V | T <sub>J</sub> =25°C  |      | 35   |      | A     |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =125°C |      | 46   |      |       |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =175°C |      | 52   |      |       |
| t <sub>rr</sub>      | Reverse Recovery Time                         |                                                                                                                 | T <sub>J</sub> =25°C  |      | 308  |      | ns    |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =125°C |      | 410  |      |       |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =175°C |      | 497  |      |       |
| dI <sub>rr</sub> /dt | Peak Rate of Fall of Reverse Recovery Current |                                                                                                                 | T <sub>J</sub> =25°C  |      | 175  |      | A/us  |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =125°C |      | 160  |      |       |
|                      |                                               |                                                                                                                 | T <sub>J</sub> =175°C |      | 144  |      |       |

# SMGQ100H120ADB

## IGBT Discrete Datasheet



|                  |                         |                                                                                                                 |                       |  |      |  |    |
|------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------|--|------|--|----|
| Q <sub>rr</sub>  | Reverse Recovery Charge | I <sub>F</sub> =100A,<br>di/dt=606A/μs(T <sub>J</sub> =175°C),<br>V <sub>rr</sub> =600V,<br>V <sub>GE</sub> =0V | T <sub>J</sub> =25°C  |  | 7.2  |  | μC |
|                  |                         |                                                                                                                 | T <sub>J</sub> =125°C |  | 12.2 |  |    |
|                  |                         |                                                                                                                 | T <sub>J</sub> =175°C |  | 15.8 |  |    |
| E <sub>rec</sub> | Reverse Recovery Energy |                                                                                                                 | T <sub>J</sub> =25°C  |  | 2.2  |  | mJ |
|                  |                         |                                                                                                                 | T <sub>J</sub> =125°C |  | 4.2  |  |    |
|                  |                         |                                                                                                                 | T <sub>J</sub> =175°C |  | 5.7  |  |    |

### Thermal Characteristics

| Symbol                  | Description                                                    | Min. | Typ. | Max. | Units |
|-------------------------|----------------------------------------------------------------|------|------|------|-------|
| R <sub>θJC(IGBT)</sub>  | Thermal Resistance: Junction-to-Case                           |      | 0.15 |      | K/W   |
| R <sub>θJC(Diode)</sub> | Thermal Resistance: Junction-to-Case                           |      | 0.25 |      | K/W   |
| R <sub>θJA</sub>        | Thermal Resistance: Junction-to-Ambient (typical socket mount) |      |      | 40   | K/W   |



### Characteristics diagrams

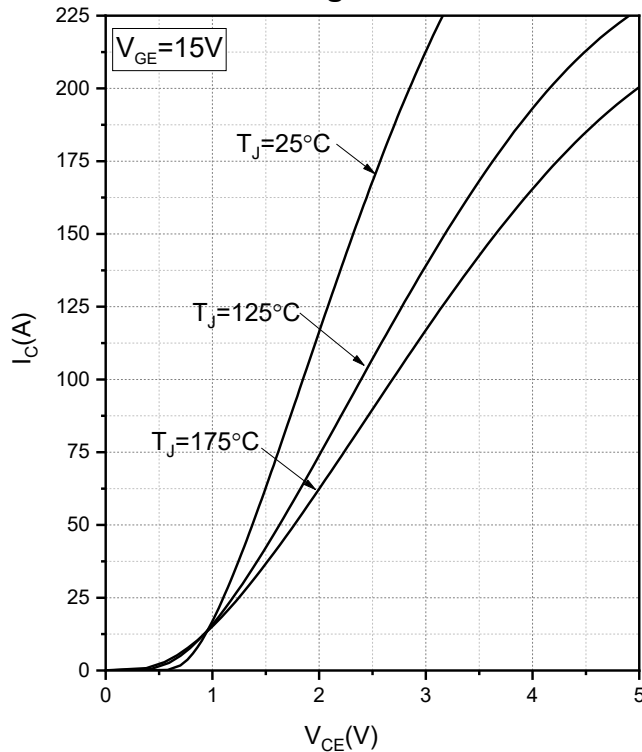


Fig.1 Typical Saturation Voltage Characteristics

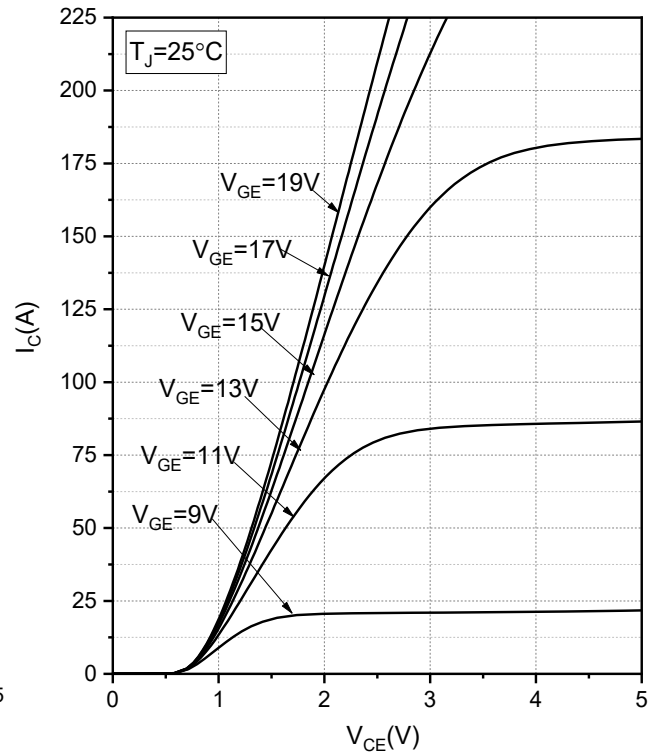


Fig.2 Typical Output Characteristics,  $T_J=25^\circ C$

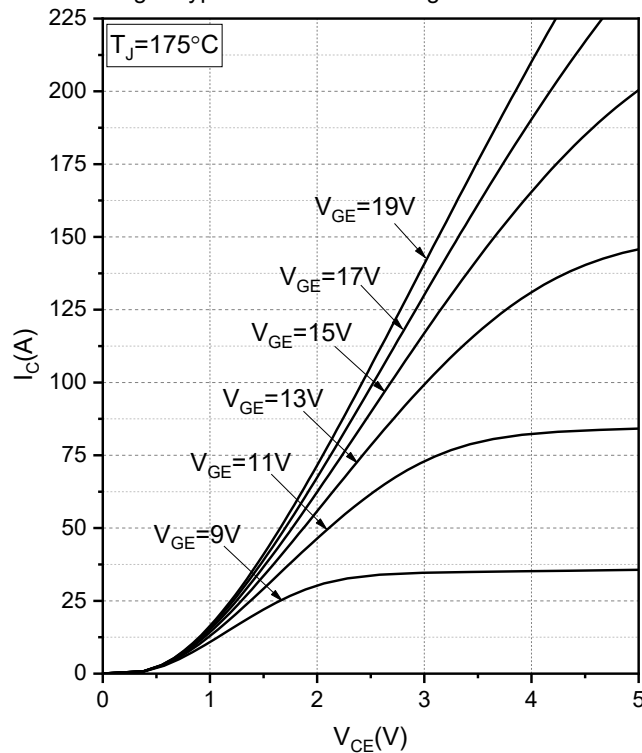


Fig.3 Typical Output Characteristics,  $T_J=175^\circ C$

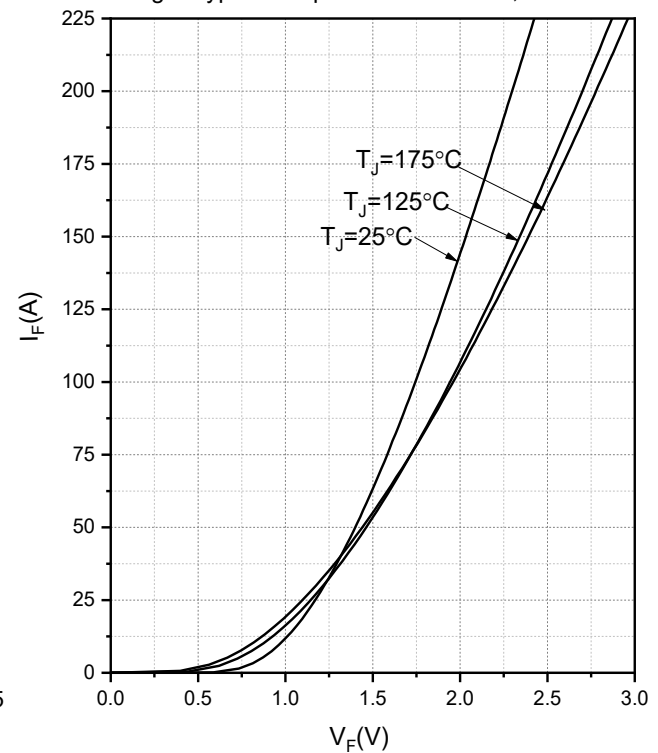
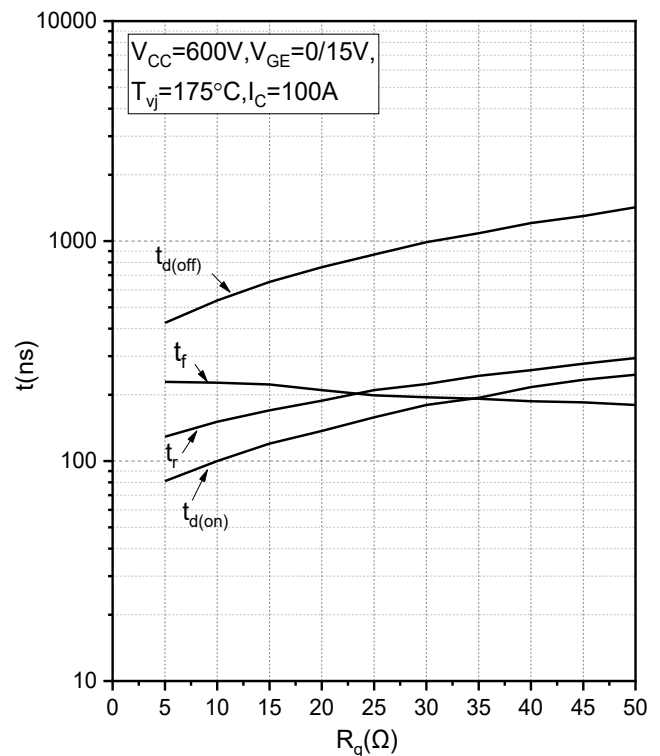
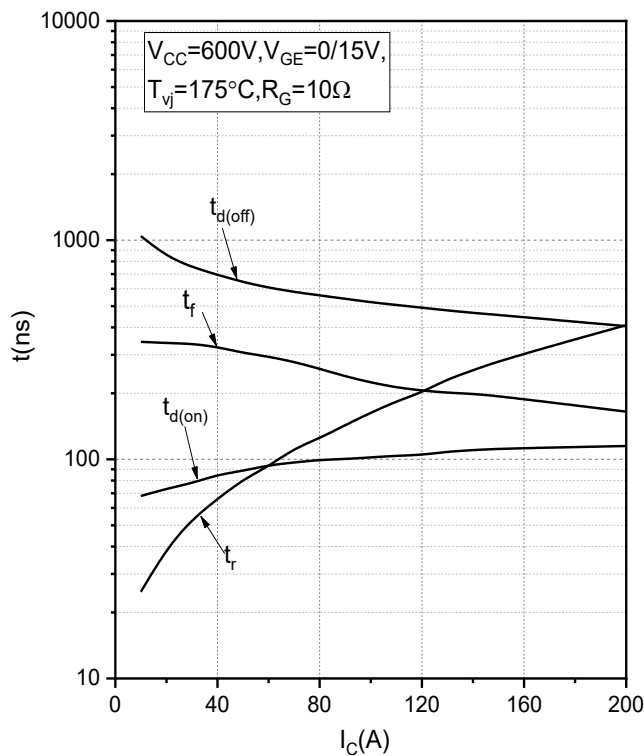
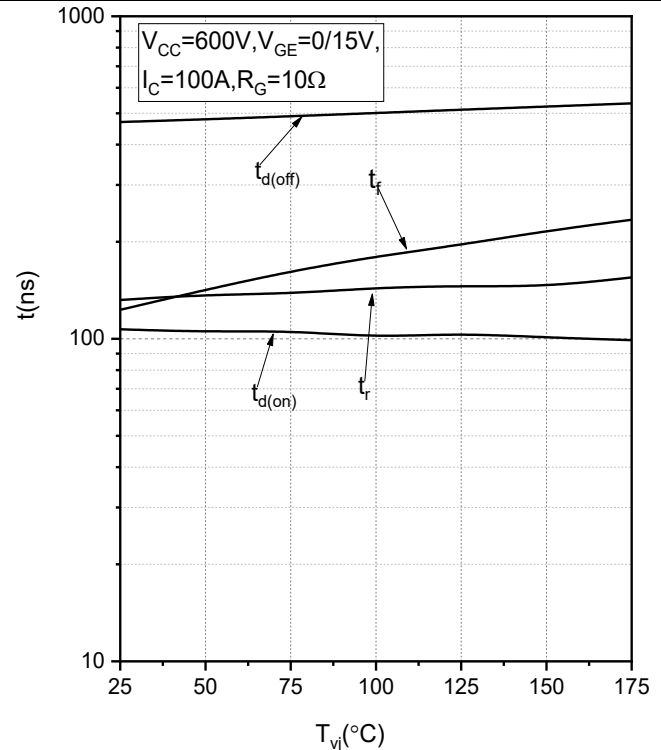
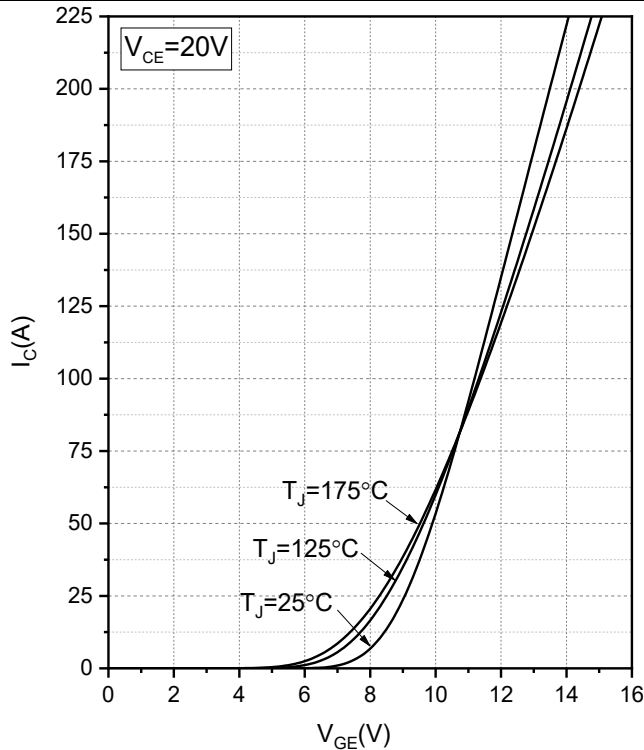


Fig.4 Forward Characteristics of Diode

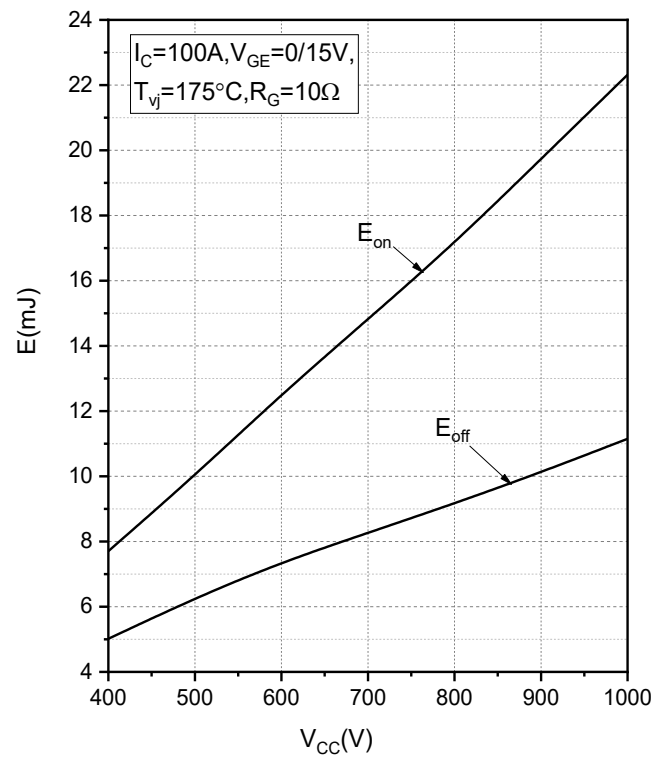
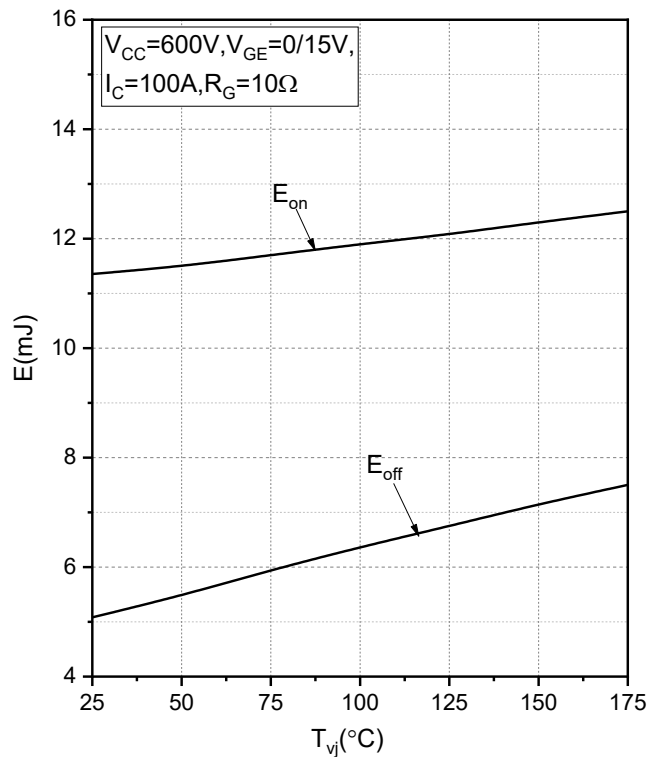
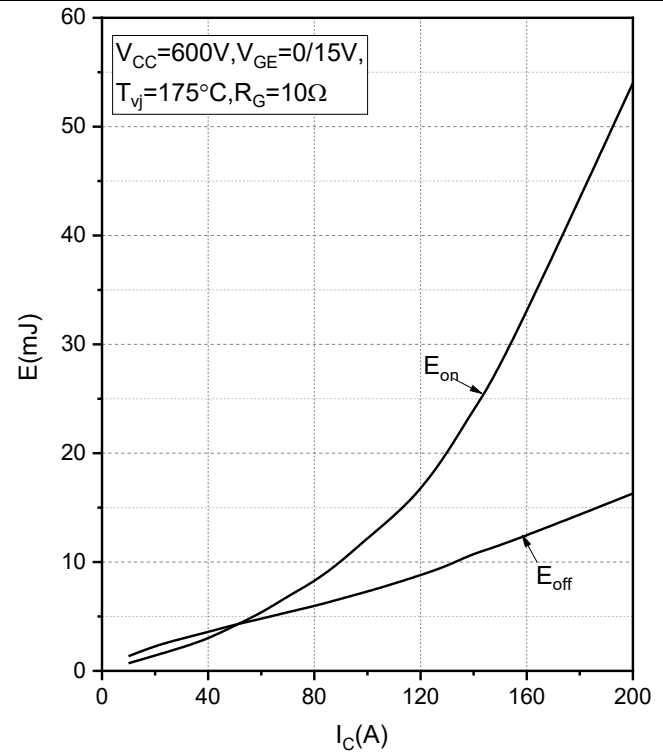
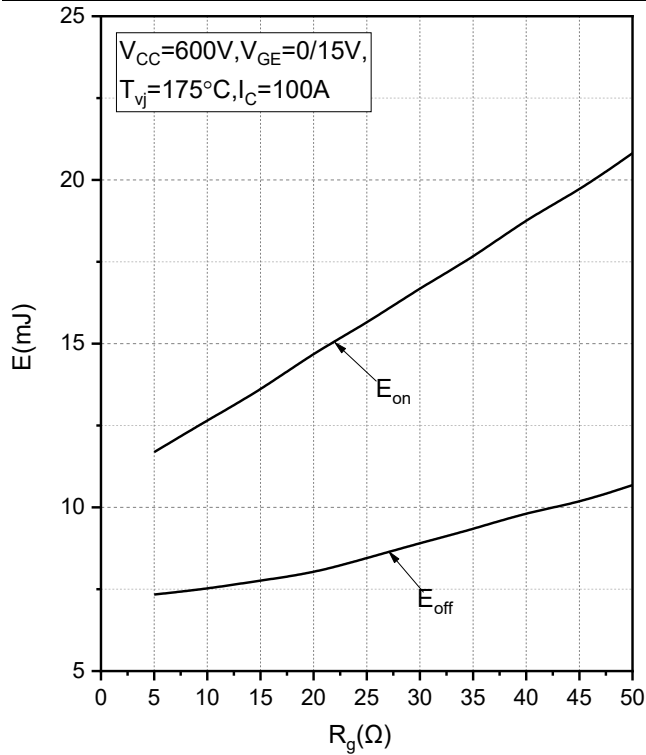
# SMGQ100H120ADB

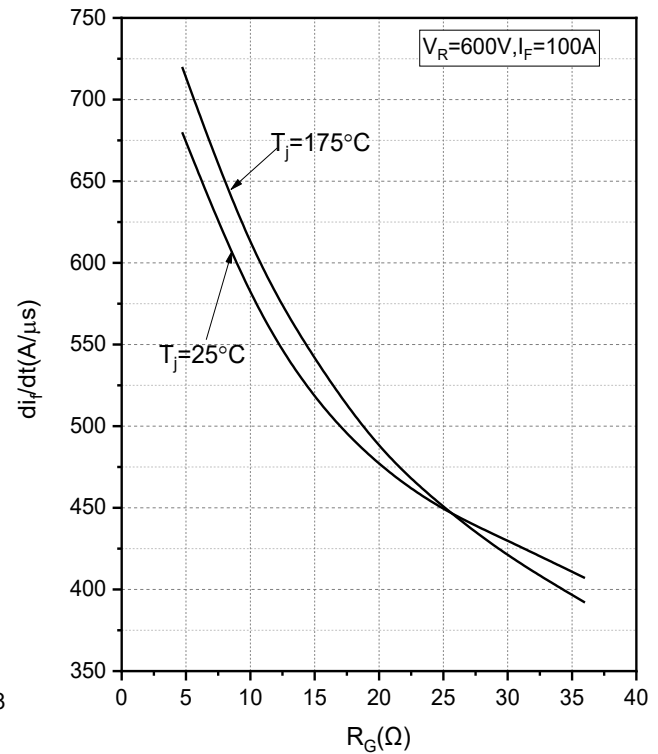
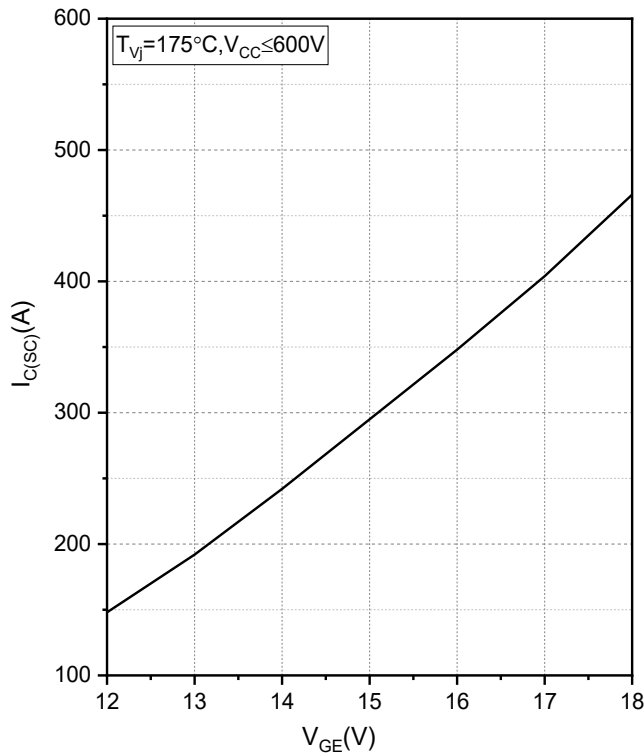
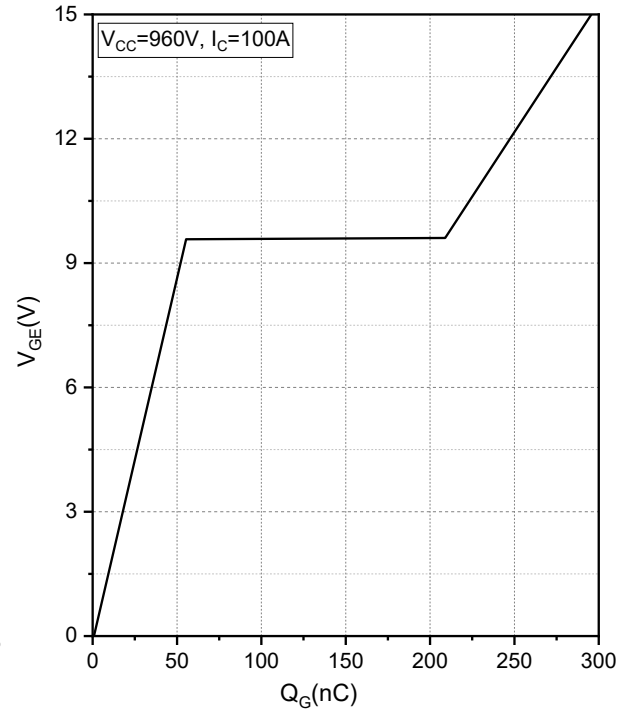
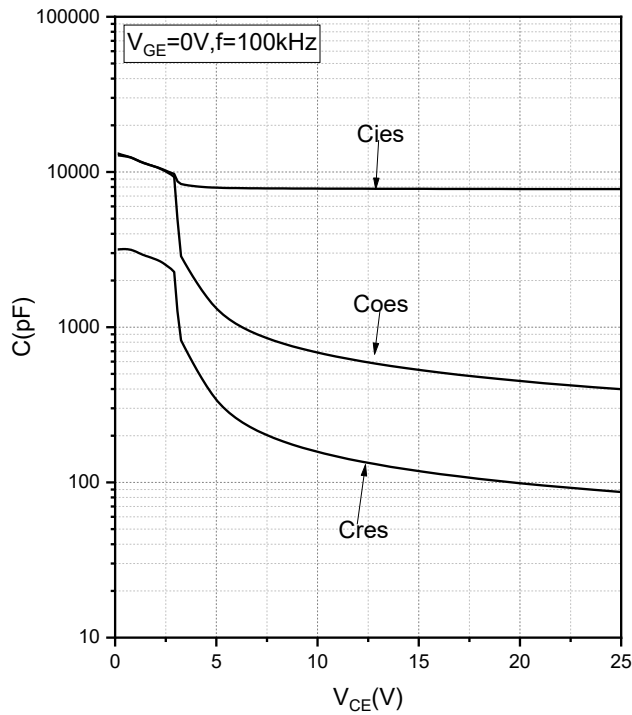
## IGBT Discrete Datasheet

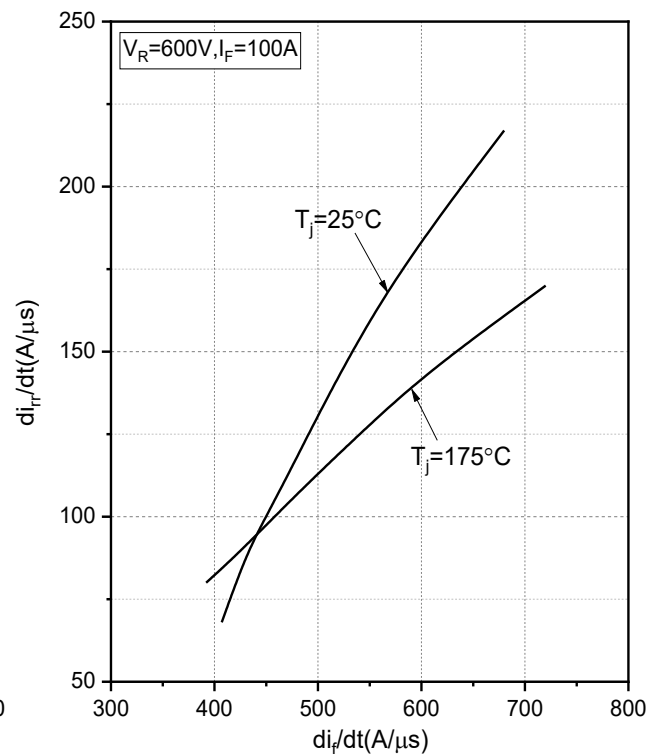
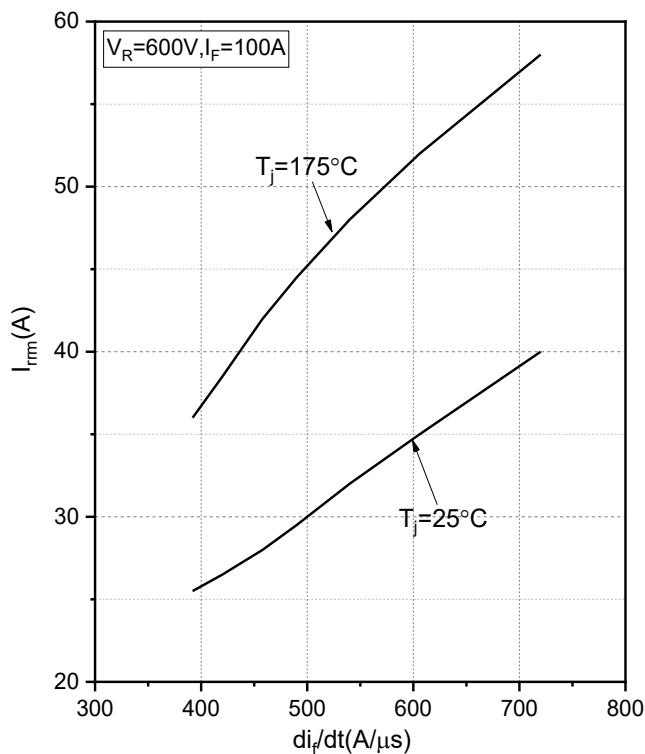
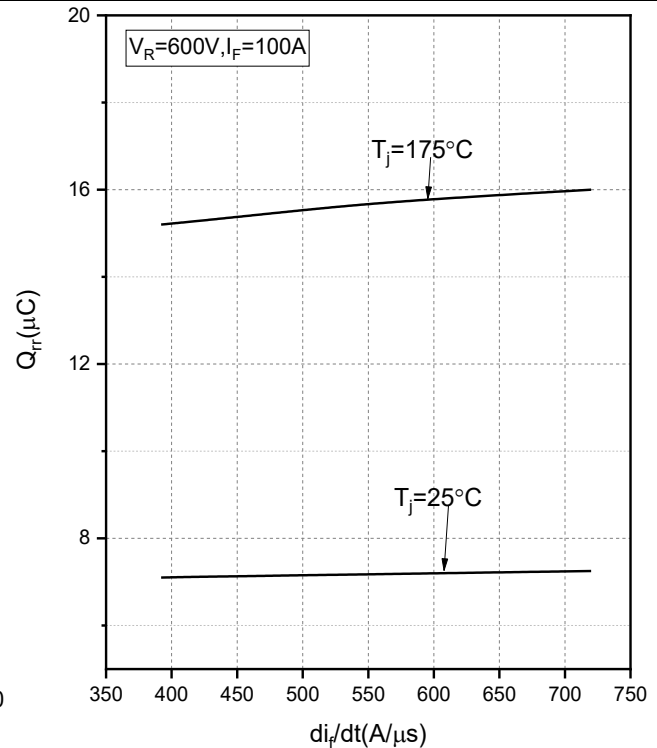
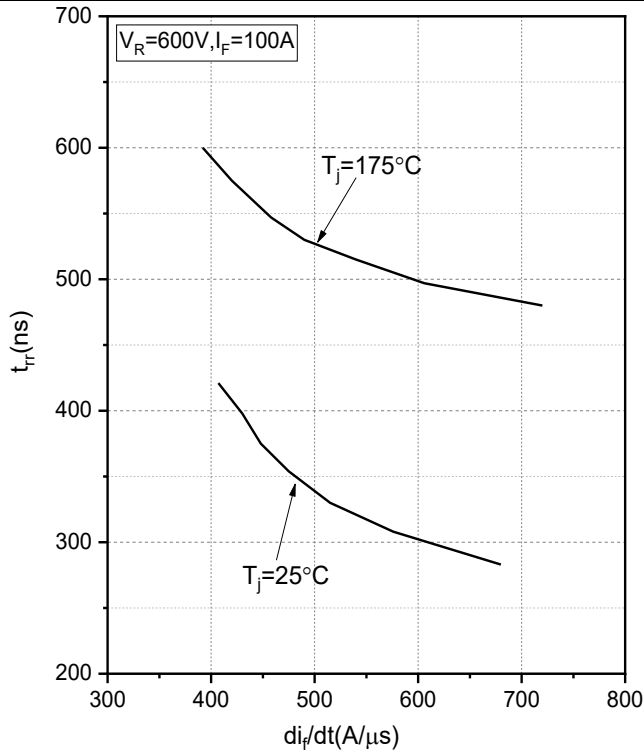


# SMGQ100H120ADB

## IGBT Discrete Datasheet







# SMGQ100H120ADB

## IGBT Discrete Datasheet

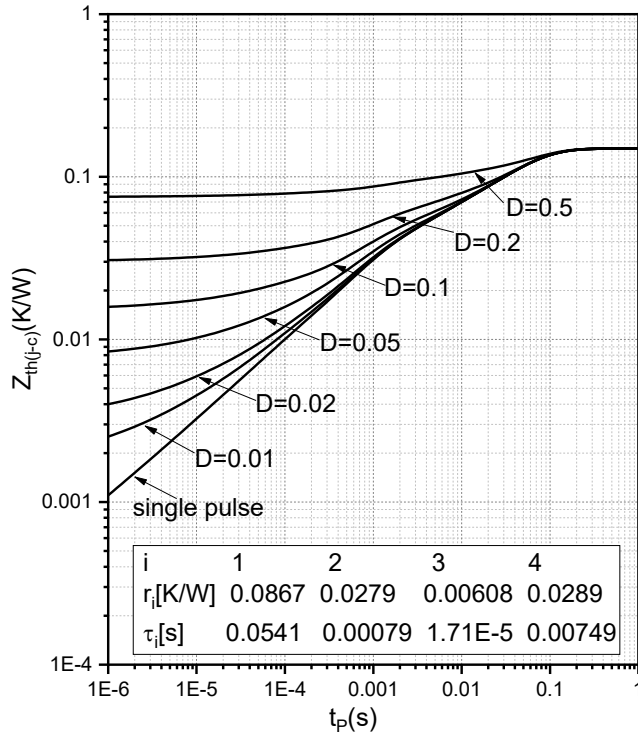


Fig.21 Transient Thermal Impedance (IGBT)

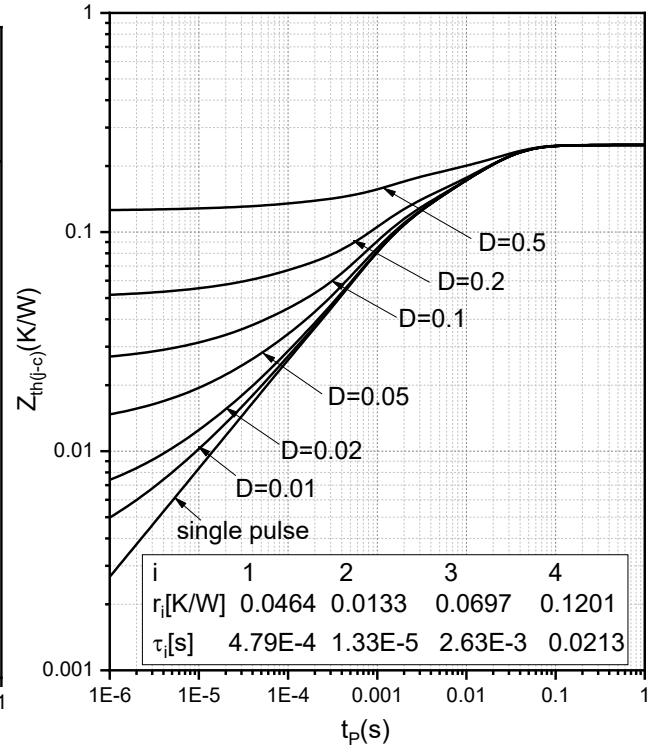


Fig.22 Transient Thermal Impedance (Diode)

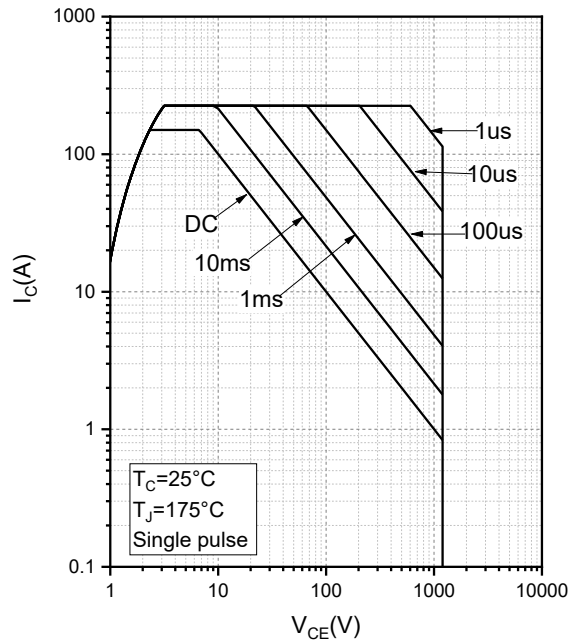


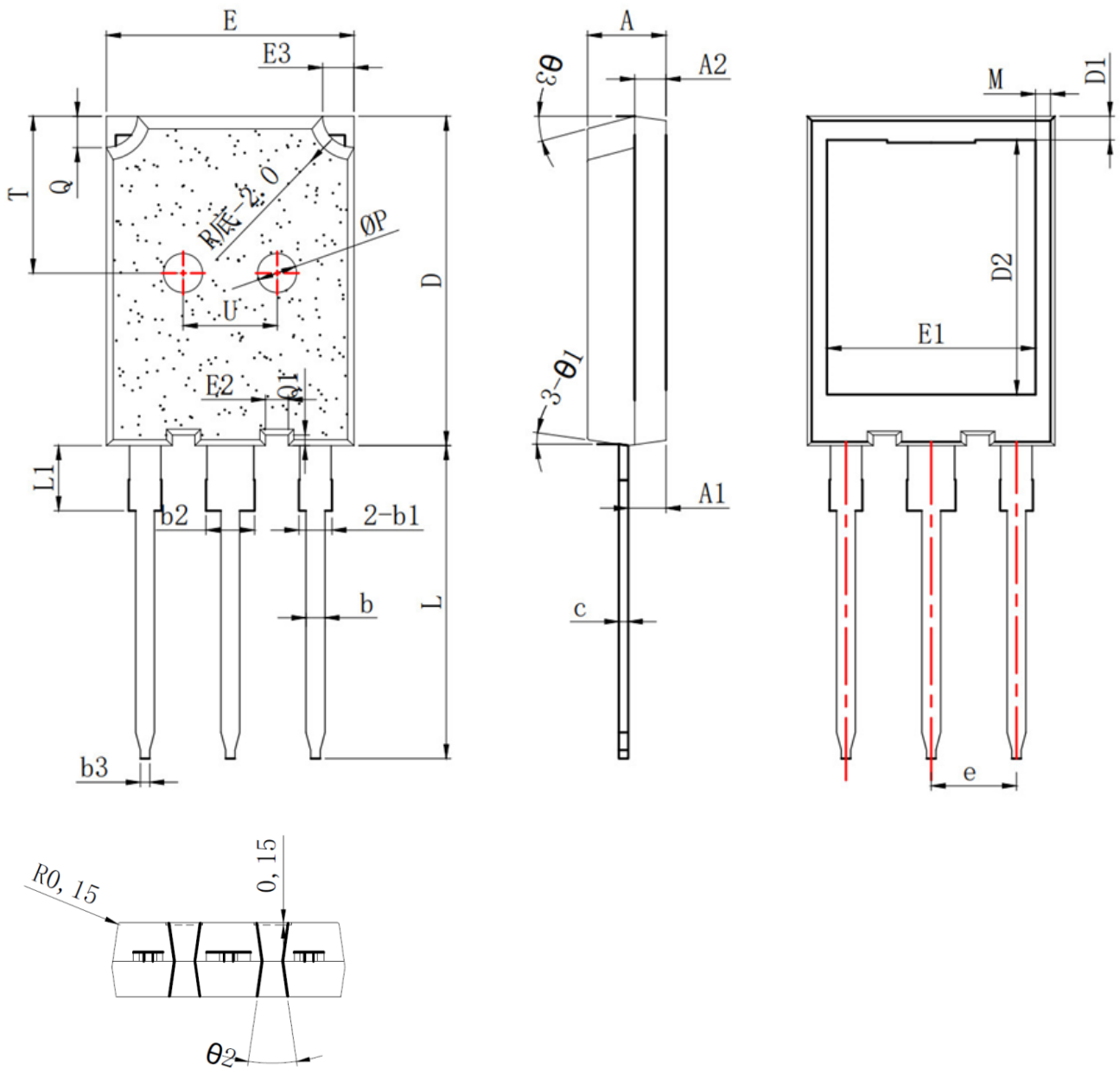
Fig.23 Forward Bias Safe Operating Area, IGBT

# SMGQ100H120ADB

## IGBT Discrete Datasheet



TO-247 Plus Package Outline (Unit: mm):



# SMGQ100H120ADB

## IGBT Discrete Datasheet



### TO-247 Plus Package Mechanical Data:

| SYMBOL | mm    |       |       |
|--------|-------|-------|-------|
|        | MIN   | NOM   | MAX   |
| *A     | 4.90  | 5.00  | 5.10  |
| *A1    | 2.30  | 2.40  | 2.50  |
| A2     | 1.90  | 2.00  | 2.10  |
| *b     | 1.15  | 1.20  | 1.25  |
| *b1    | 1.95  | 2.10  | 2.25  |
| *b2    | 2.95  | 3.10  | 3.25  |
| b3     | 0.45  | 0.60  | 0.75  |
| *C     | 0.55  | 0.60  | 0.68  |
| *D     | 20.90 | 21.00 | 21.10 |
| D1     | 1.00  | 1.20  | 1.40  |
| D2     | 16.05 | 16.35 | 16.65 |
| *E     | 15.70 | 15.80 | 15.90 |
| E1     | 13.10 | 13.30 | 13.50 |
| E2     | 1.25  | 1.45  | 1.65  |
| E3     | 1.80  | 2.00  | 2.20  |
| *e     | 5.40  | 5.44  | 5.48  |
| *L     | 19.80 | 19.95 | 20.10 |
| *L1    | —     | —     | 4.30  |
| M      | 0.50  | 0.70  | 0.90  |
| ΦP     | 2.30  | 2.50  | 2.70  |
| Q      | 1.80  | 2.00  | 2.20  |
| Q1     | 0.50  | 0.68  | 0.80  |
| T      | 9.80  | 10.00 | 10.20 |
| U      | 5.80  | 6.00  | 6.20  |
| θ1     | 5°    | 7°    | 9°    |
| θ2     | 13°   | 16°   | 19°   |
| θ3     | 13°   | 15°   | 17°   |

# SMGQ100H120ADB

## IGBT Discrete Datasheet



| Revision | Notes                        |
|----------|------------------------------|
| 01       | Engineering Sample Datasheet |
|          |                              |

### Announcement

Information in this document is believed to be accurate and reliable. However, NJSME does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

### Right to Make Changes

NJSME reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

The released datasheet would be issued with “REV.” + “alphabet characters”.