

# ASC800N1700MED

1700V, 800A, Half-Bridge, Silicon Carbide MOSFET Module

Product Data Sheet

ASTC-3T03-10A A/1

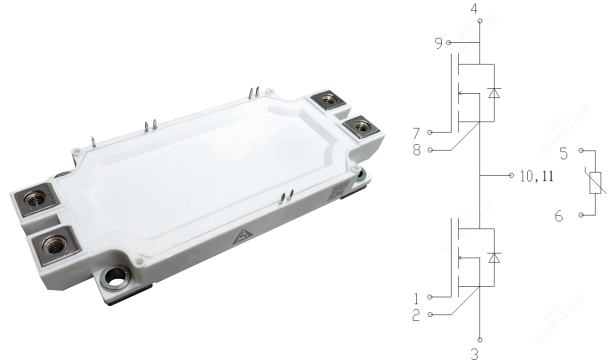


## General Description

AST MED series Silicon Carbide MOSFET module with AST 1700V Gen3 N-channel SiC MOSFET, Aluminum Nitride Insulator, and Copper baseplate. NTC temperature sensor inside.

## Features

- High Temperature, Humidity and Bias Operation
- Ultra Low Loss
- High-Frequency Operation
- Zero Turn-Off Tail Current From MOSFET
- Normally-Off, Fail-Safe Device Operation
- Integrated NTC Temperature Sensor
- Copper Baseplate and Aluminum Nitride Insulator



## Applications

- High Power Converters
- Motor Drives
- Servo Drives
- UPS Systems
- Wind Turbines

## Ordering Informations

|                        |                |
|------------------------|----------------|
| Order Number / Marking | ASC800N1700MED |
| Package Type           | MED            |

## Key Parameters

| Symbol                  | Parameter                         | Values |      |      | Unit | Test Conditions                                                                                            |
|-------------------------|-----------------------------------|--------|------|------|------|------------------------------------------------------------------------------------------------------------|
| Absolute maximum rating |                                   |        |      |      |      |                                                                                                            |
| V <sub>DS</sub>         | Drain-Source Voltage              | 1700   |      |      | V    | T <sub>c</sub> =25°C                                                                                       |
| I <sub>D</sub>          | Drain Current(continuous)         | 800    |      |      | A    | T <sub>c</sub> =25°C                                                                                       |
| T <sub>J</sub>          | Junction Temperature              | 175    |      |      | °C   |                                                                                                            |
| Symbol                  | Parameter                         | Min.   | Typ. | Max. | Unit | Test Conditions                                                                                            |
| Static characteristics  |                                   |        |      |      |      |                                                                                                            |
| R <sub>DS(on)</sub>     | Static Drain-source On Resistance | -      | 3.2  | 3.8  | mΩ   | V <sub>GS</sub> =20V; I <sub>D</sub> =400A; T <sub>c</sub> =25°C                                           |
| Dynamic characteristics |                                   |        |      |      |      |                                                                                                            |
| Q <sub>G</sub>          | Total Gate Charge                 | -      | 1344 | -    | nC   | V <sub>DD</sub> =1200V; I <sub>D</sub> =400A;<br>V <sub>GS</sub> =-5/+18V; T <sub>c</sub> =25°C            |
| Q <sub>GD</sub>         | Gate-Drain Charge                 | -      | 400  | -    |      |                                                                                                            |
| Source-drain diode      |                                   |        |      |      |      |                                                                                                            |
| Q <sub>RR</sub>         | Reverse Recovery Charge           | -      | 7875 | -    | nC   | V <sub>GS</sub> =-5V; I <sub>F</sub> =400A; V <sub>R</sub> =1200V;<br>R <sub>G/off</sub> =5.0Ω; Load=100uH |

## Absolute Maximum Ratings (at $T_c=25^\circ\text{C}$ unless otherwise specified)

| Symbol            | Parameter                                | Values      | Unit               |
|-------------------|------------------------------------------|-------------|--------------------|
| $V_{DS}$          | Drain-Source Voltage                     | 1700        | V                  |
| $V_{GS}$          | Gate-Source Voltage (dynamic)            | -10/+22     | V                  |
| $I_D$             | Drain Current (continuous)               | 800         | A                  |
| $I_{DM}$          | Drain Current (pulsed)                   | 1600        | A                  |
| $T_{op}, T_{stg}$ | Operating and Storage Temperature Range  | -40 to +175 | $^\circ\text{C}$   |
| $T_J$             | Junction Temperature                     | 175         | $^\circ\text{C}$   |
| $L_{Stray}$       | Stray Inductance                         | 20          | nH                 |
| $V_{isol}$        | Isolation Test Voltage (DC; 2mA; t=10s)  | 4.2         | kV                 |
| $R_{th Jh}$       | Thermal Resistance, Junction-to-heatsink | 0.13        | $^\circ\text{C/W}$ |

## MOSFET Characteristics

| Symbol                                                                                           | Parameter                         | Min. | Typ. | Max. | Unit          | Test Conditions                                                                        |
|--------------------------------------------------------------------------------------------------|-----------------------------------|------|------|------|---------------|----------------------------------------------------------------------------------------|
| <b>Static characteristics (at <math>T_J=25^\circ\text{C}</math> unless otherwise specified)</b>  |                                   |      |      |      |               |                                                                                        |
| $BV_{DS}$                                                                                        | Drain-source Breakdown Voltage    | 1700 | -    | -    | V             | $V_{GS}=0V$                                                                            |
| $I_{DSS}$                                                                                        | Zero Gate Voltage Drain Current   | -    | -    | 400  | $\mu\text{A}$ | $V_{DS}=1700V; V_{GS}=0V$                                                              |
| $I_{GSS}$                                                                                        | Gate-body Leakage Current         | -    | -    | 4    | $\mu\text{A}$ | $V_{GS}=-10/20V; V_{DS}=0V$                                                            |
| $V_{GS(th)}$                                                                                     | Gate Threshold Voltage            | 2.0  | -    | 4.0  | V             | $V_{DS}=V_{GS}; I_D=80mA$                                                              |
| $R_{DS(on)}$                                                                                     | Static Drain-source on Resistance | -    | 3.2  | 3.8  | $m\Omega$     | $V_{GS}=20V; I_D=400A$                                                                 |
| $V_{GS(on)}$                                                                                     | Recommended Turn-on Voltage       | -    | 18   | -    | V             | Static                                                                                 |
| $V_{GS(off)}$                                                                                    | Recommended Turn-off Voltage      | -    | -5   | -    | V             |                                                                                        |
| $R_G$                                                                                            | Gate Resistance                   | -    | 0.44 | -    | $\Omega$      | $V_{AC}=25mV; f=1MHz$                                                                  |
| <b>Dynamic characteristics (at <math>T_J=25^\circ\text{C}</math> unless otherwise specified)</b> |                                   |      |      |      |               |                                                                                        |
| $C_{iss}$                                                                                        | Input Capacitance                 | -    | 51.7 | -    | nF            | $V_{DS}=1200V; f=100kHz; V_{AC}=25mV$                                                  |
| $C_{oss}$                                                                                        | Output Capacitance                | -    | 1.6  | -    |               |                                                                                        |
| $C_{rss}$                                                                                        | Reverse Transfer Capacitance      | -    | 128  | -    | pF            |                                                                                        |
| $E_{on}$                                                                                         | Turn-on Energy Loss Per Pulse     | -    | 60.1 | -    | mJ            | $V_{DD}=1200V; V_{GS}=-5/+18V$<br>$I_D=400A; \text{Load}=100\mu H; R_{G(ext)}=5\Omega$ |
| $E_{off}$                                                                                        | Turn-off Energy Loss Per Pulse    | -    | 33.4 | -    |               |                                                                                        |
| $Q_{GS}$                                                                                         | Gate-Source Charge                | -    | 416  | -    | nC            | $V_{DD}=1200V; V_{GS}=-5/+18V; I_D=400A$                                               |
| $Q_{GD}$                                                                                         | Gate-Drain Charge                 | -    | 400  | -    |               |                                                                                        |
| $Q_G$                                                                                            | Total Gate Charge                 | -    | 1344 | -    |               |                                                                                        |
| $t_{d(on)}$                                                                                      | Turn-on Delay Time                | -    | 118  | -    | ns            | $V_{DD}=1200V; V_{GS}=-5/+18V$<br>$I_D=400A; R_{G(ext)}=5\Omega; \text{Load}=100\mu H$ |
| $t_r$                                                                                            | Rise Time                         | -    | 81   | -    |               |                                                                                        |
| $t_{d(off)}$                                                                                     | Turn-off Delay Time               | -    | 400  | -    |               |                                                                                        |
| $t_f$                                                                                            | Fall Time                         | -    | 110  | -    |               |                                                                                        |

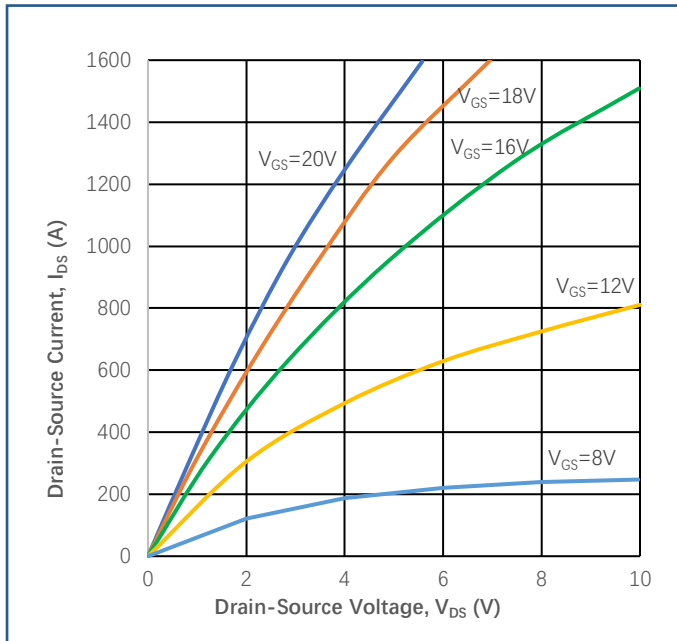
## Diode Characteristics (at $T_J=25^{\circ}\text{C}$ unless otherwise specified)

| Symbol    | Parameter                        | Min. | Typ. | Max. | Unit | Test Conditions                                                                                                   |
|-----------|----------------------------------|------|------|------|------|-------------------------------------------------------------------------------------------------------------------|
| $V_{FSD}$ | Forward Voltage                  | -    | 3.9  | 6    | V    | $V_{GS}=0\text{V}$ ; $I_F=400\text{A}$                                                                            |
| $I_S$     | Continuous Diode Forward Current | -    | 400  | -    | A    | $V_{GS}=0\text{V}$ ; $T_C=25^{\circ}\text{C}$                                                                     |
| $t_{RR}$  | Reverse Recovery Time            | -    | 90.5 | -    | ns   | $V_{GS}=-5\text{V}$ ; $I_F=400\text{A}$ ; $V_R=1200\text{V}$ ;<br>$R_{G(off)}=5.0\Omega$ ; Load=100 $\mu\text{H}$ |
| $Q_{RR}$  | Reverse Recovery Charge          | -    | 7875 | -    | nC   |                                                                                                                   |
| $I_{RRM}$ | Peak Reverse Recovery Current    | -    | 220  | -    | A    |                                                                                                                   |

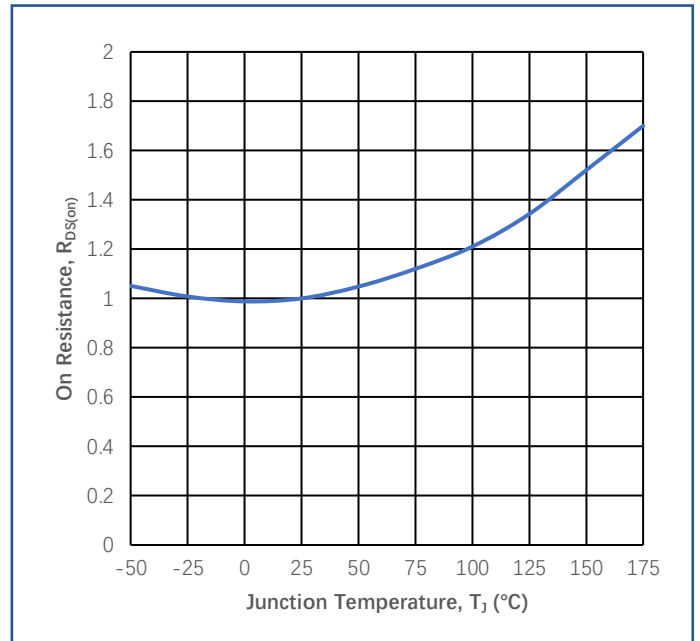
## NTC Thermistor Characteristics

| Symbol       | Parameter                                                    | Min. | Typ. | Max. | Unit             | Test Conditions                                           |
|--------------|--------------------------------------------------------------|------|------|------|------------------|-----------------------------------------------------------|
| $R_{25}$     | Rated Resistance                                             | -    | 5.00 | -    | $\text{k}\Omega$ | $T_{NTC}=25^{\circ}\text{C}$                              |
| $\Delta R/R$ | Deviation of $R_{100}$                                       | -5   | -    | 5    | %                | $T_{NTC}=100^{\circ}\text{C}$ ; $R_{100}=493.3\Omega$     |
| $B_{25/50}$  | Beta Value for $25^{\circ}\text{C}$ to $50^{\circ}\text{C}$  | -    | 3375 | -    | K                | $R_2=R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15\text{K}))]$  |
| $B_{25/80}$  | Beta Value for $25^{\circ}\text{C}$ to $80^{\circ}\text{C}$  | -    | 3414 | -    | K                | $R_2=R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$  |
| $B_{25/100}$ | Beta Value for $25^{\circ}\text{C}$ to $100^{\circ}\text{C}$ | -    | 3436 | -    | K                | $R_2=R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$ |

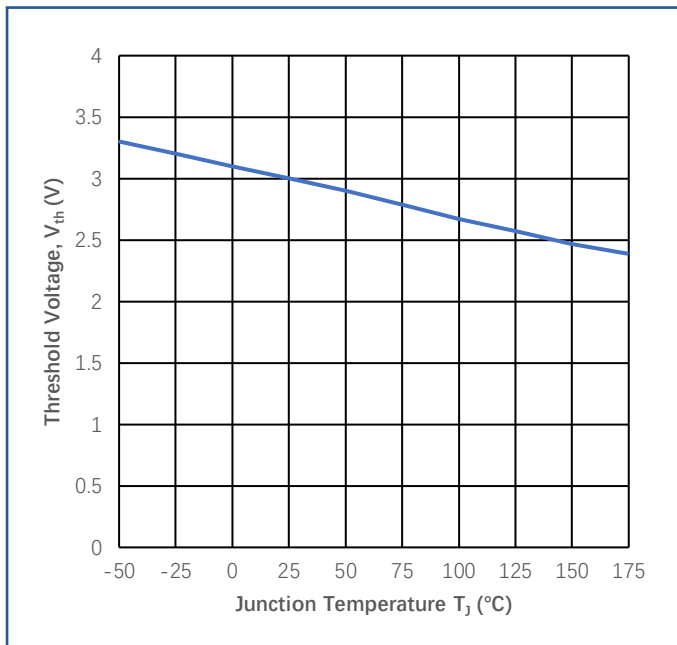
## Typical Performance



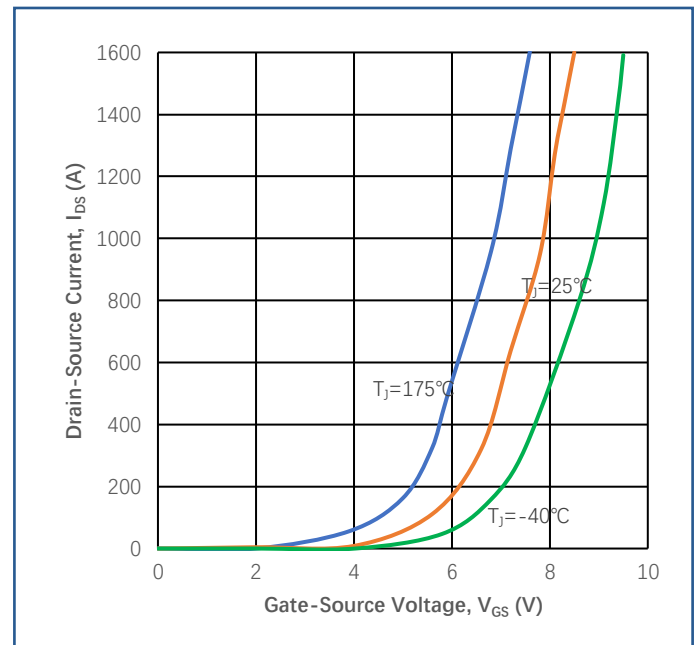
**Figure 1**  
Output Characteristics (T<sub>j</sub> = 25 °C)



**Figure 2**  
Normalized On-Resistance vs. Temperature

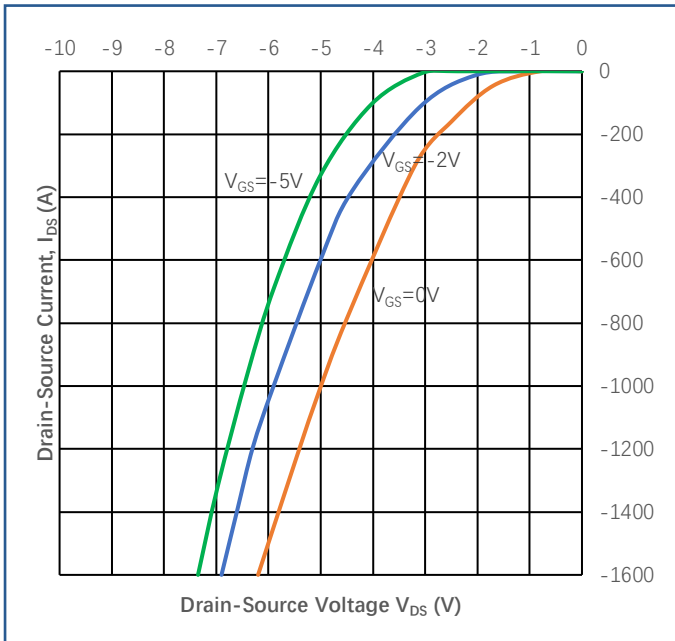


**Figure 3**  
Threshold Voltage vs. Temperature

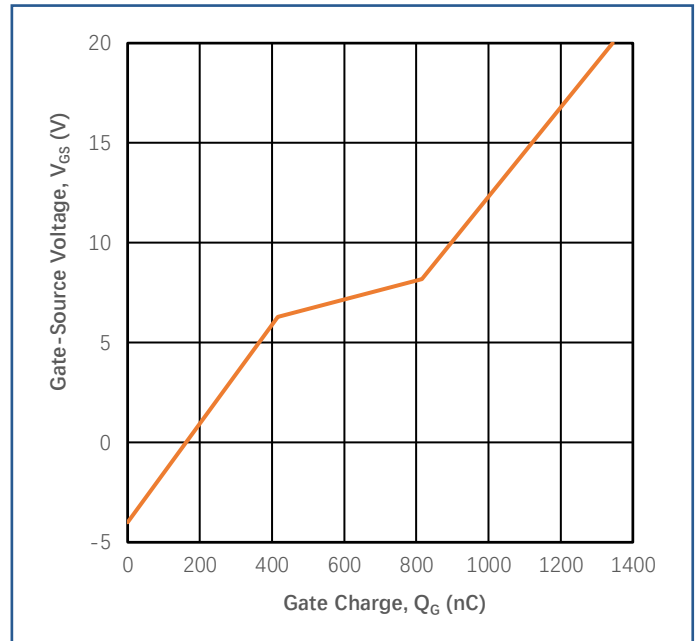


**Figure 4**  
Transfer Characteristic for Various T<sub>j</sub>

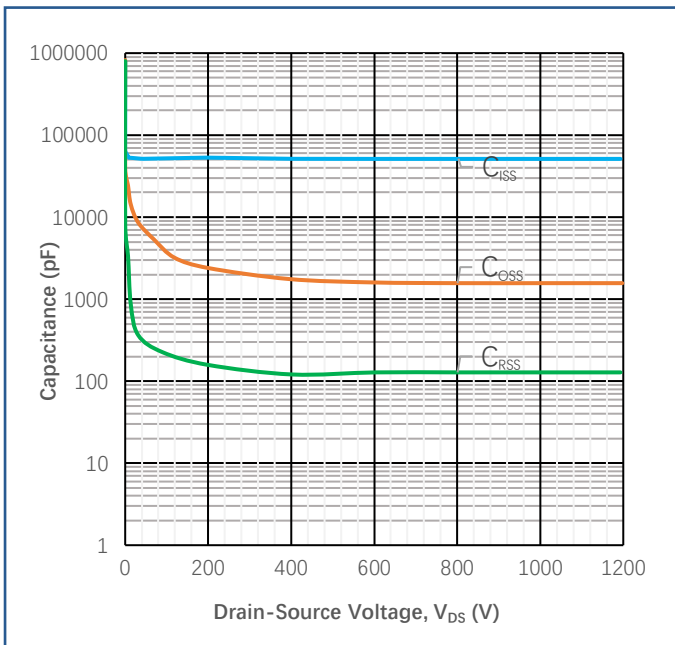
## Typical Performance



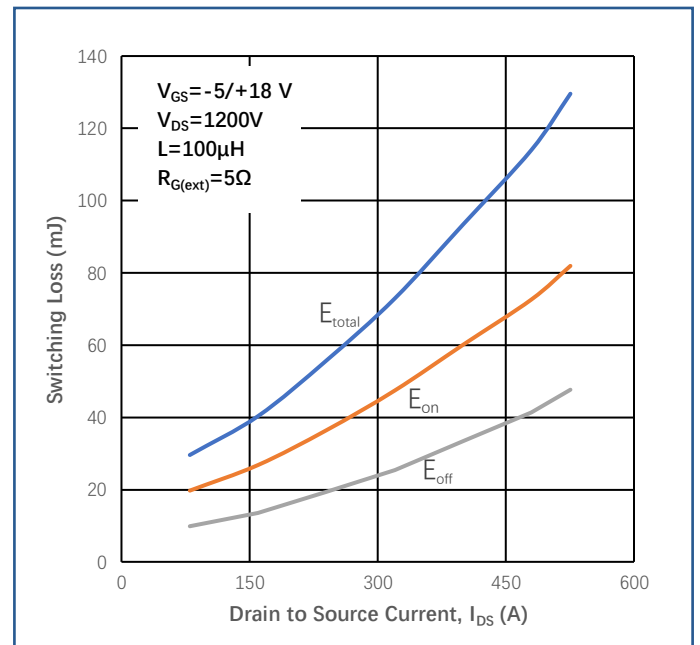
**Figure 5**  
 Diode Characteristic ( $T_J = 25\text{ }^{\circ}\text{C}$ )



**Figure 6**  
 Typical Gate Charge Characteristics

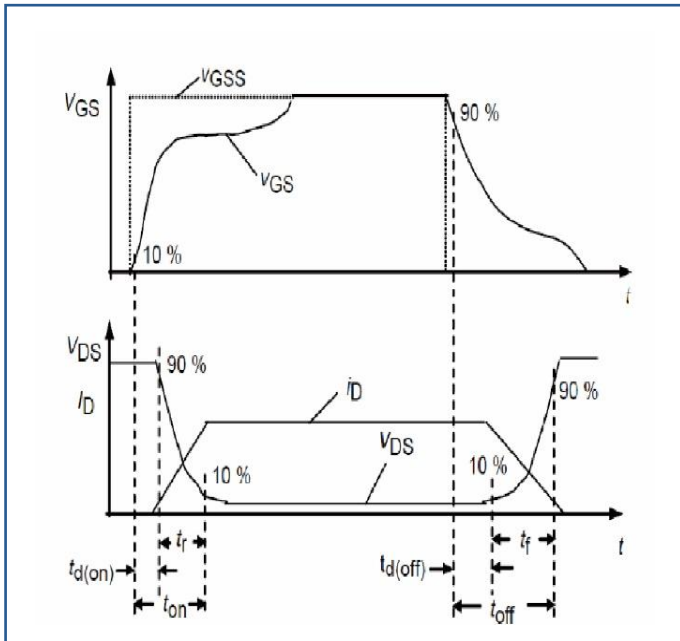


**Figure 7**  
 Typical Capacitances vs. Drain-Source Voltage

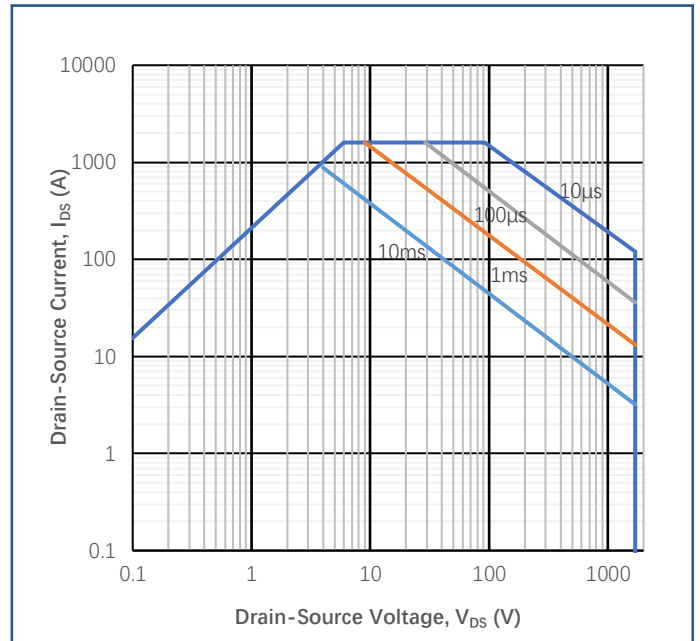


**Figure 8**  
 Inductive Switching Energy vs. Drain Current

## Typical Performance

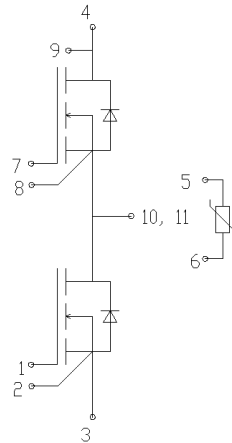


**Figure 9**  
Switching Time Description



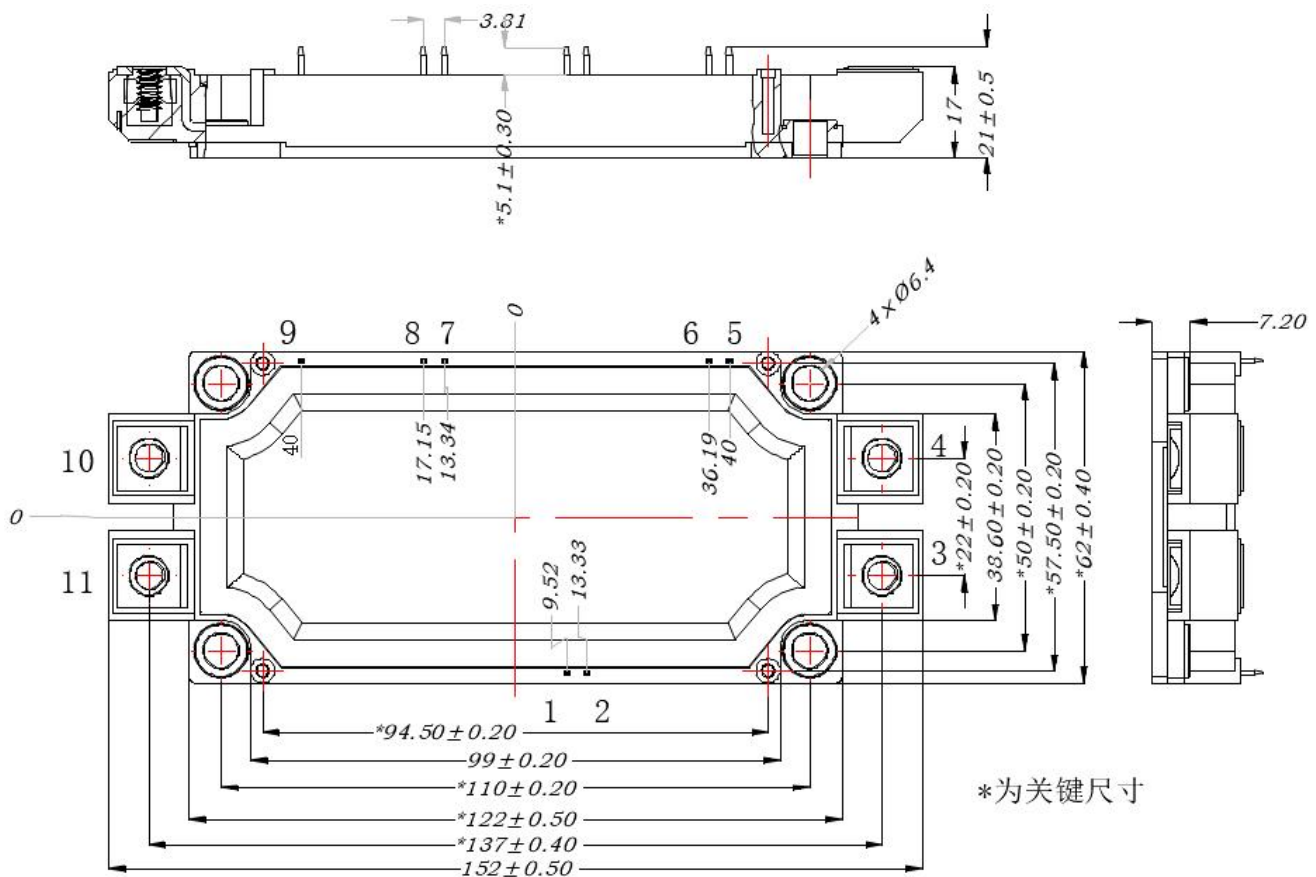
**Figure 10**  
Safe Operating Area

## Circuit Diagram Headline



## Package Dimensions (mm)

### Package Type: MED



| 未标注线性公差按<br>GB/1804-2000c 级执行 | 公差分段 | 0.5-3     | 3-6       | 6-30      | 30-120    | 120-400   |
|-------------------------------|------|-----------|-----------|-----------|-----------|-----------|
|                               | c 级  | $\pm 0.2$ | $\pm 0.3$ | $\pm 0.5$ | $\pm 0.8$ | $\pm 1.2$ |

## Notes & Disclaimer

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