

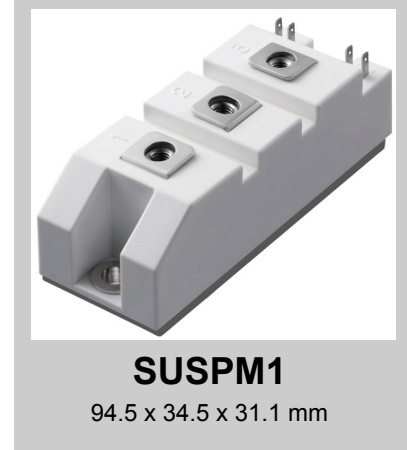
**Features**

- Non Punch Through (NPT) technology
  - Ultra-fast
  - 10μs short circuit current
  - Positive  $V_{CE(on)}$  temperature coefficient
- Free wheeling diodes with fast and soft reverse recovery
- Industrial standard package with copper base plate
- Included ESD protection function <sup>\*(1)</sup>

**Applications**

- Welder / Power Supply
- UPS / Inverter
- Industrial Motor Driver

**Preliminary data**

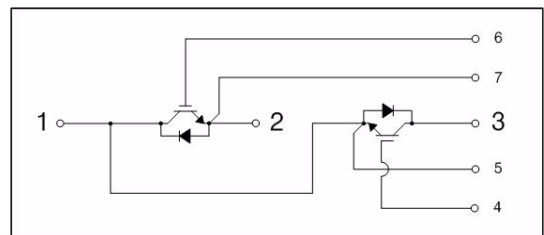


**Absolute Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted

| Item   | Symbol   | Conditions  | Value   | Units |
|--------|--|---|---------|-------|
| IGBT   | $V_{CES}$  |   | 600     | V     |
|        | $V_{GES}$  |   | ± 20    | V     |
|        | $I_C$  | @ $T_j = 150^\circ\text{C}$ , $T_C = 25^\circ\text{C}$ , Continuous                         | 90      | A     |
|        |  | @ $T_j = 150^\circ\text{C}$ , $T_C = 45^\circ\text{C}$ , Continuous                         | 75      | A     |
|        | $I_{CM}$   | @ $T_C = 45^\circ\text{C}$ , $t_p = 1\text{ ms}$  | 150     | A     |
|        | $T_{SC}$   | Chip Level, @ $T_j = 150^\circ\text{C}$ , $V_{GE} = 15\text{ V}$ , $V_{CES} < 600\text{ V}$ | 10      | μs    |
|        | $T_j$  | Operating Junction Temperature <sup>*(2)</sup>  | -40~125 | °C    |
| $P_D$  | @ $T_j = 150^\circ\text{C}$ , $T_C = 25^\circ\text{C}$ | 270   | W       |       |
|        | @ $T_j = 150^\circ\text{C}$ , $T_C = 80^\circ\text{C}$ | 150   | W       |       |
| Diode  | $V_{RRM}$  |   | 600     | V     |
|        | $I_F$  | @ $T_C = 25^\circ\text{C}$  | -       | A     |
|        |  | @ $T_C = 80^\circ\text{C}$  | -       | A     |
|        | $I_{FRM}$  | @ $T_C = 80^\circ\text{C}$ , $t_p = 1\text{ ms}$  | -       | A     |
|        | $T_j$  | Operating Junction Temperature <sup>*(2)</sup>  | -40~125 | °C    |
| $P_D$  | @ $T_C = 25^\circ\text{C}$                             | -   | W       |       |
|        | @ $T_C = 80^\circ\text{C}$                             | -   | W       |       |
| Module | $T_{stg}$  | Storage Junction Temperature  | -40~125 | °C    |
|        | $V_{iso}$  | @AC 1minute   | 2500    | V     |
|        | $M_t$  | Main Terminal Mounting torque (M5)  | 2.5~5   | Nm    |
|        | $M_S$  | Heat sink Mounting torque (M6)  | 3.0~5   | Nm    |
|        | W  | Weight  | 180     | g     |

**Internal Circuit & Pin Description**

| Pin Number | Pin Name | Pin Description             |
|------------|----------|-----------------------------|
| 1          | C2E1     | Output                      |
| 2          | E2       | Negative DC Link Output     |
| 3          | C1       | Positive DC Link Output     |
| 4          | G1       | Gate Input for High-side    |
| 5          | E1       | Emitter Input for High-side |
| 6          | G2       | Gate Input for Low-side     |
| 7          | E2       | Emitter Input for Low-side  |



(Note \*1) Option : Included ± 28V Zener Diode between Gate and Emitter  
(Note \*2) The Maximum junction temperature of chip is 150°C

## Electrical Characteristics of IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

### Static Characteristics

| Symbol        | Parameter                               | Test Conditions  | Min | Typ  | Max | Units         |
|---------------|---|--|-----|------|-----|---------------|
| $BV_{CES}$    | C-E Breakdown Voltage                   | $V_{GE} = 0\text{ V}, I_C = 250\ \mu\text{A}$                      | 600 | -    | -   | V             |
| $I_{CES}$     | C-E Cut-Off Current                     | $V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$                            | -   | -    | 250 | $\mu\text{A}$ |
| $I_{GES}$     | G-E Leakage Current                     | $V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$                            | -   | -    | -   | nA            |
| $V_{GE(th)}$  | G-E Threshold Voltage                   | $V_{GE} = V_{CE}, I_C = 75\text{ mA}$                              | -   | 5.3  | -   | V             |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 75\text{ A}, V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$  | -   | 2.68 | -   | V             |
|               |   | $I_C = 75\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$ | -   | 3.47 | -   | V             |

### Dynamic Characteristics

| Symbol     | Parameter                    | Test Conditions   | Min | Typ | Max | Units |
|------------|------------------------------|---|-----|-----|-----|-------|
| $C_{ies}$  | Input Capacitance            | $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$<br>$f = 1\text{ MHz}, T_C = 25^\circ\text{C}$   | -   | 4.4 | -   | nF    |
| $C_{oes}$  | Output Capacitance           |   | -   | 0.5 | -   | nF    |
| $C_{res}$  | Reverse Transfer Capacitance |   | -   | 0.3 | -   | nF    |
| $t_d(on)$  | Turn-On Delay Time           | $T_C = 125^\circ\text{C}, R_G = 68\ \Omega$<br>$L = 100\ \mu\text{H}, V_{DC} = 300\text{ V}$<br>$V_{GE} = 15\text{ V} \sim -15\text{ V}$<br>$I_C = 75\text{ A}$ | -   | 154 | -   | ns    |
| $t_r$      | Rise Time                    |   | -   | 106 | -   | ns    |
| $t_d(off)$ | Turn-Off Delay Time          |   | -   | 765 | -   | ns    |
| $t_f$      | Fall Time                    |   | -   | 32  | -   | ns    |
| $E_{on}$   | Turn-On Switching Loss       |   | -   | 7.1 | -   | mJ    |
| $E_{off}$  | Turn-Off Switching Loss      |   | -   | 2.2 | -   | mJ    |
| $E_{is}$   | Total Switching Loss         |   | -   | 9.3 | -   | mJ    |
| $Q_g$      | Total Gate Charge            | $V_{GE} = 0\text{ V} \sim +15\text{ V}$   | -   | 300 | -   | nC    |
| $Q_{ge}$   | Gate-Emitter Charge          |   | -   | 110 | -   | nC    |
| $Q_{gc}$   | Gate-Collector Charge        |   | -   | 70  | -   | nC    |

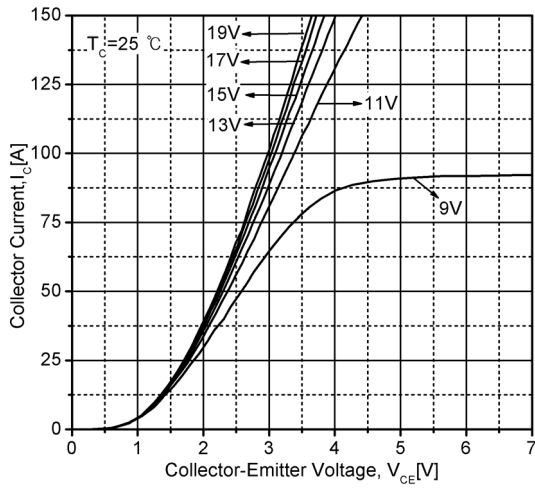
## Electrical Characteristics of Diode $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter                           | Test Conditions  | Min                       | Typ | Max  | Units |               |
|-----------|-------------------------------------|--|---------------------------|-----|------|-------|---------------|
| $V_F$     | Diode Forward Voltage               | $I_F = 75\text{ A}$<br>$V_{GE} = 0\text{ V}$   | $T_C = 25^\circ\text{C}$  | -   | 1.48 | -     | V             |
|           |                                     |  | $T_C = 125^\circ\text{C}$ | -   | 1.54 | -     |               |
| $t_{rr}$  | Diode Reverse Recovery Time         | $R_G = 68\ \Omega$<br>$L = 100\ \mu\text{H}$<br>$V_{DC} = 300\text{ V}$<br>$V_{GE} = 15\text{ V} \sim -15\text{ V}$<br>$I_C = 75\text{ A}$ | $T_C = 25^\circ\text{C}$  | -   | 246  | -     | ns            |
|           |                                     |  | $T_C = 125^\circ\text{C}$ | -   | 422  | -     |               |
| $I_{RRM}$ | Diode Peak Reverse Recovery Current |  | $T_C = 25^\circ\text{C}$  | -   | 28   | -     | A             |
|           |                                     |  | $T_C = 125^\circ\text{C}$ | -   | 39   | -     |               |
| $Q_{rr}$  | Diode Reverse Recovery Charge       |  | $T_C = 25^\circ\text{C}$  | -   | 2.6  | -     | $\mu\text{C}$ |
|           |                                     |  | $T_C = 125^\circ\text{C}$ | -   | 6.8  | -     |               |
| $E_{rr}$  | Diode Reverse Recovery Energy       | $T_C = 25^\circ\text{C}$   | -                         | 0.3 | -    | mJ    |               |
|           |                                     | $T_C = 125^\circ\text{C}$  | -                         | 0.9 | -    |       |               |

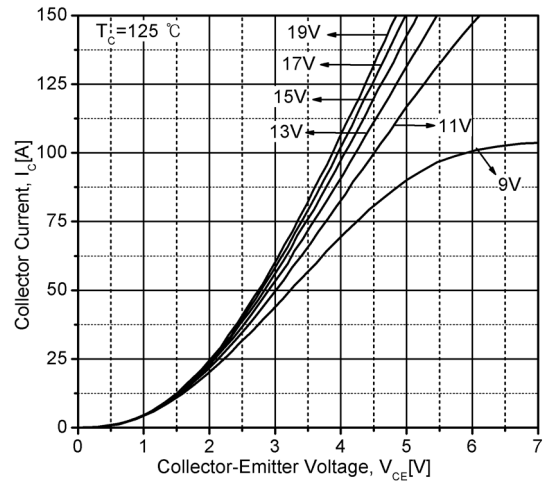
### Thermal Characteristics

| Symbol         | Parameter                       | Test Conditions  | Min | Typ  | Max | Units              |
|----------------|---------------------------------|------------------|-----|------|-----|--------------------|
| $R_{th(J-C)}$  | Thermal Resistance (IGBT Part)  | Junction-to-Case | -   | 0.46 | -   | $^\circ\text{C/W}$ |
| $R_{th(J-C)D}$ | Thermal Resistance (Diode Part) | Junction-to-Case | -   | -    | -   | $^\circ\text{C/W}$ |

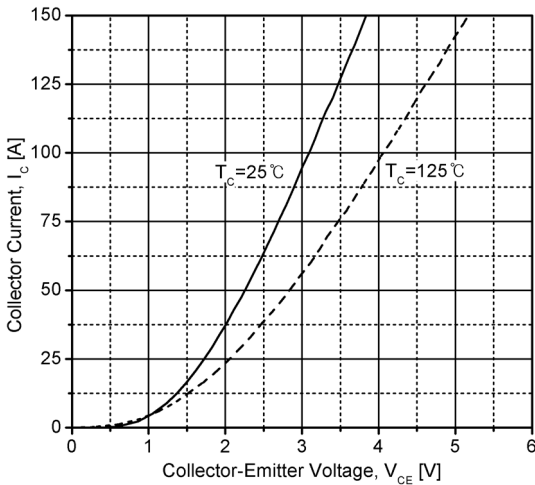
\* This specifications may not be considered as an assurance of characteristics and may not have same characteristics in case of using different test systems from @LSIS. We therefore strongly recommend prior consultation of our engineers.



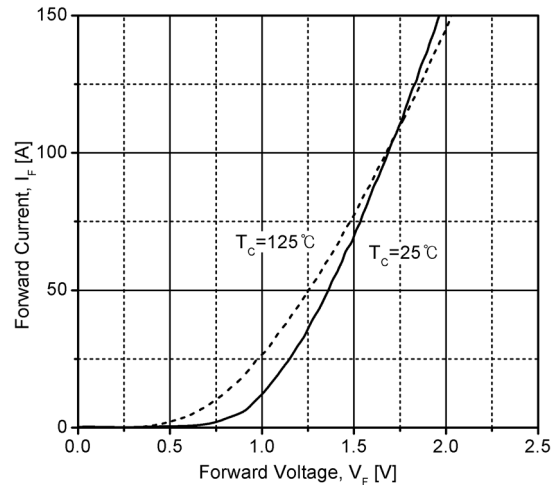
**Fig 1. Typical IGBT Output Characteristics**



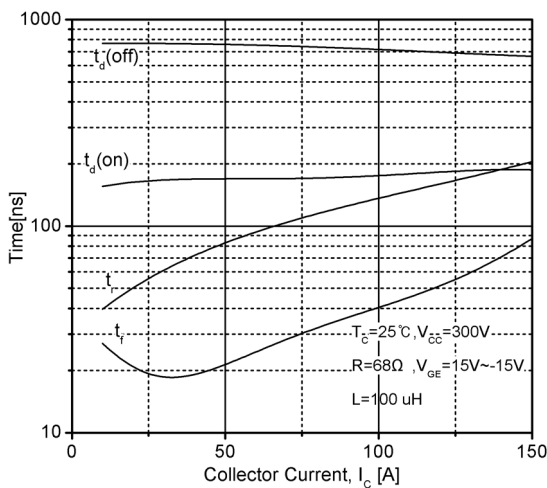
**Fig 2. Typical IGBT Output Characteristics**



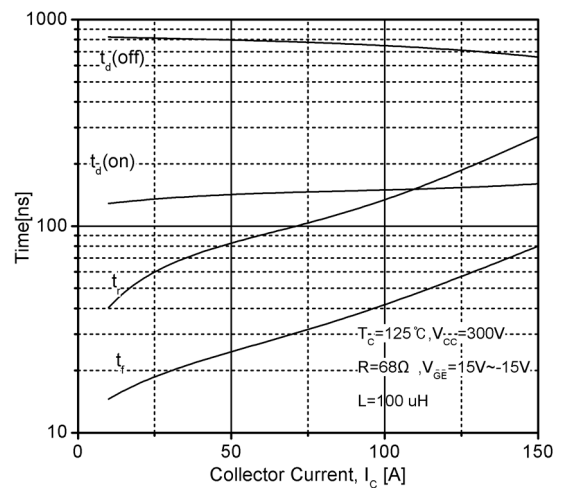
**Fig 3. Typical IGBT Output Characteristics**



**Fig 4. Typical Diode Forward Characteristics**



**Fig 5. Typical Switching Time vs. Collector Current**



**Fig 6. Typical Switching Time vs. Collector Current**

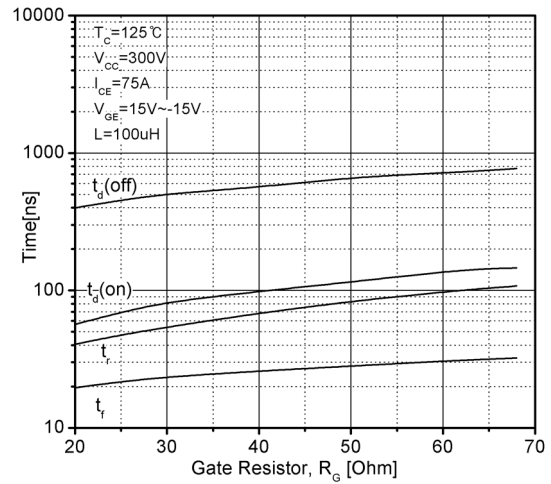
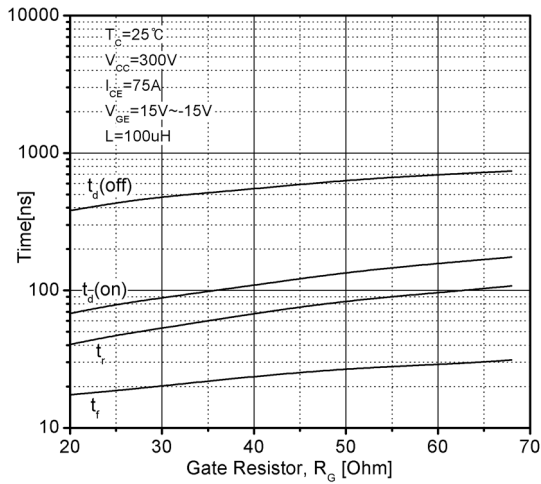


Fig 7. Typical Switching Time vs. Gate Resistor

Fig 8. Typical Switching Time vs. Gate Resistor

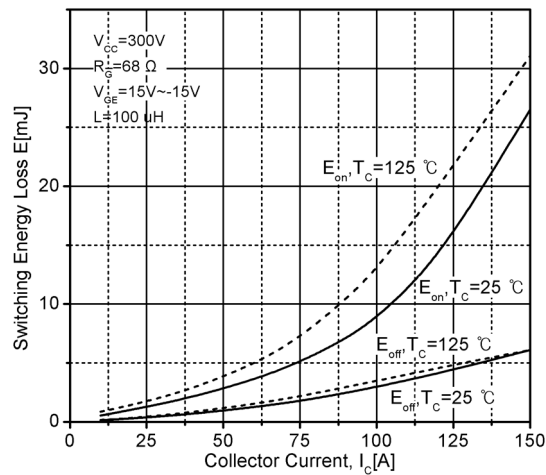


Fig 9. Typical IGBT Switching Loss

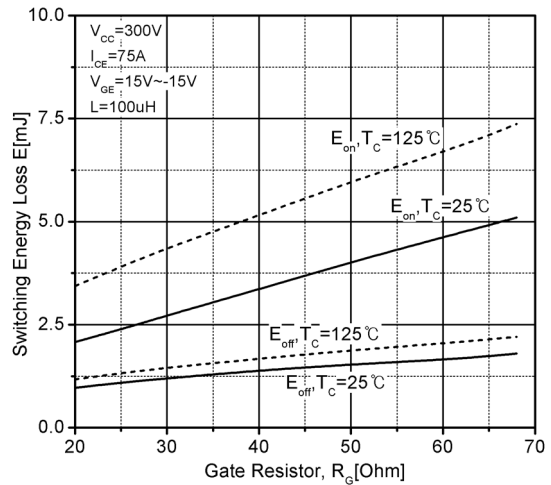


Fig 10. Typical IGBT Switching Loss

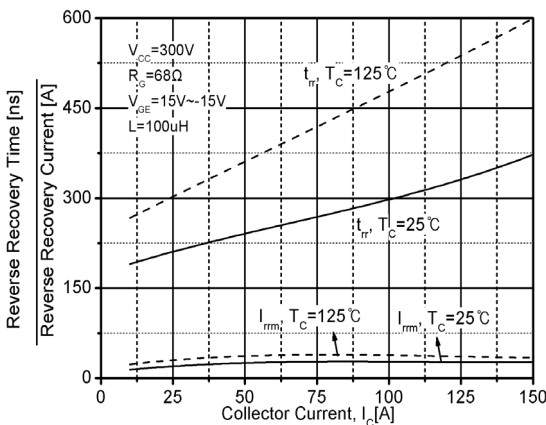


Fig 11. Typical Recovery Characteristics of Diode

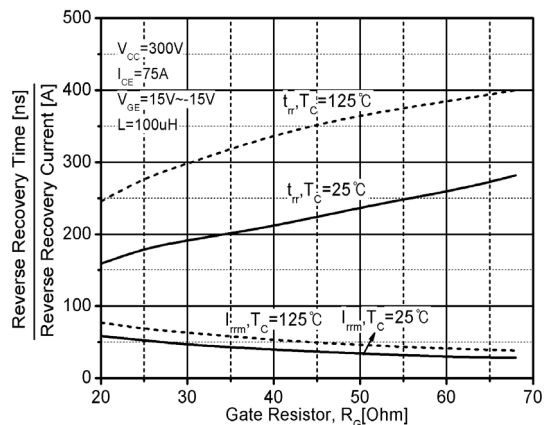
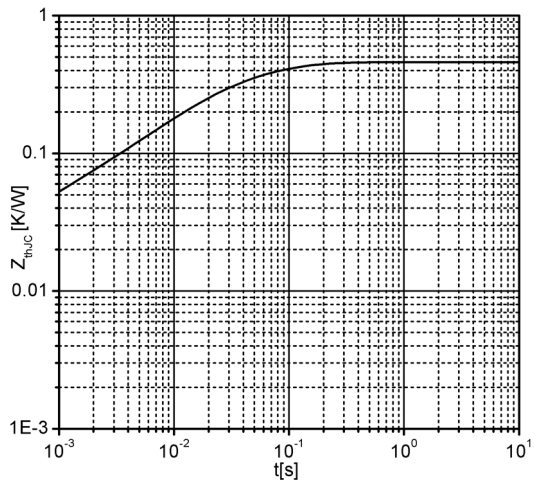
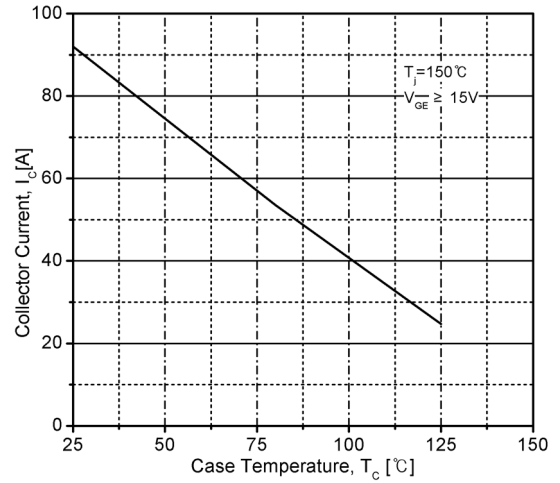
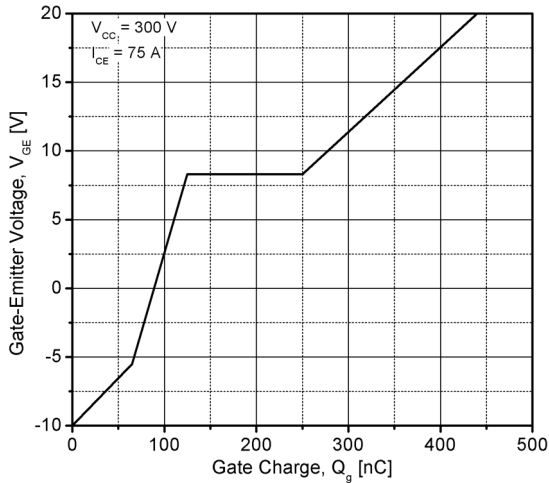
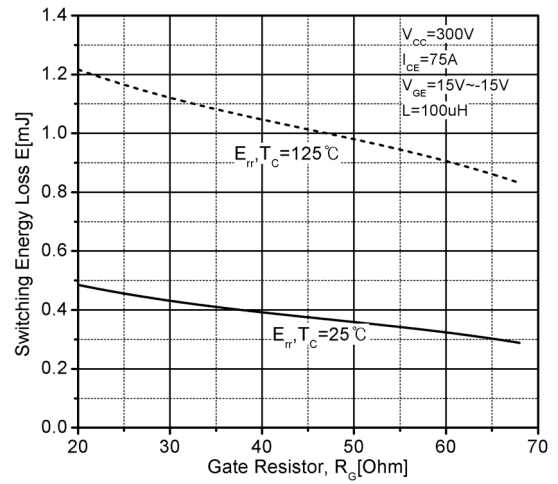
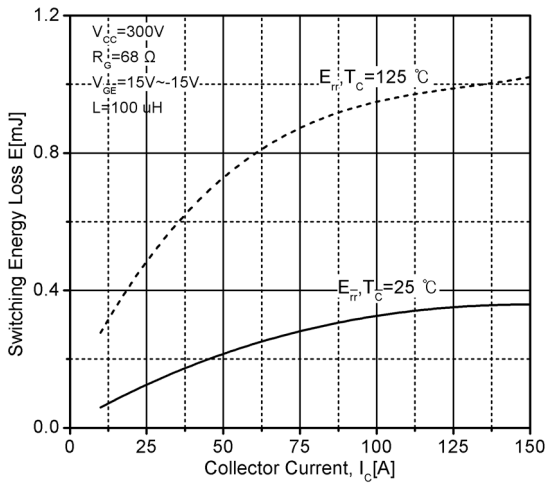
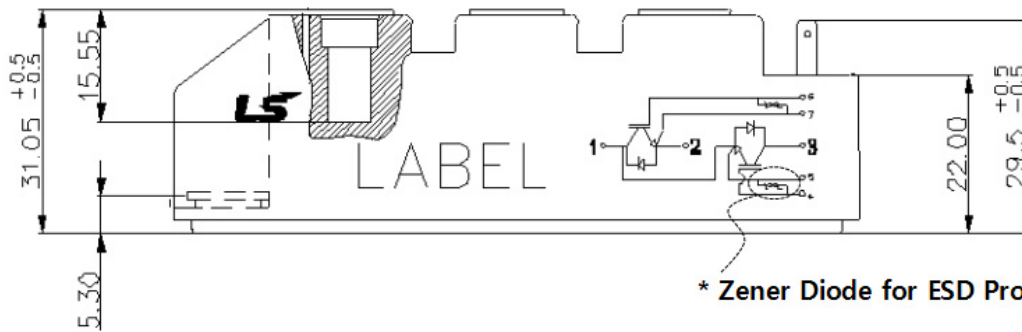
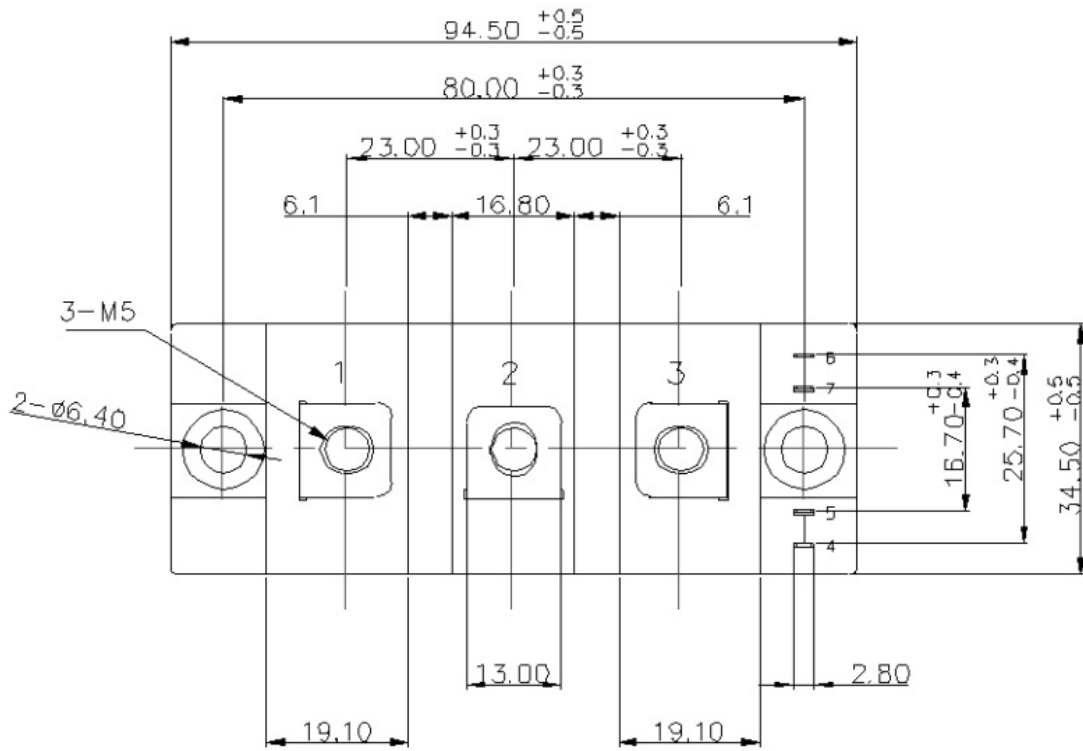


Fig 12. Typical Recovery Characteristics of Diode



## Package Dimension(Dimension in mm)



\* Zener Diode for ESD Protection.