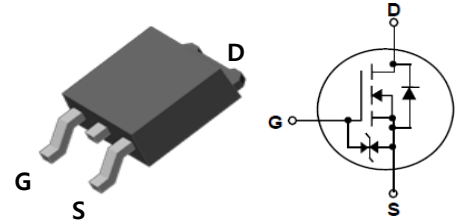


## 900V N-Channel Super Junction MOSFET

### Features

- Very Low FOM ( $R_{DS(on)} \times Q_g$ )
- Extremely low switching loss
- Excellent stability and uniformity
- 100% avalanche tested
- Built-in ESD Diode

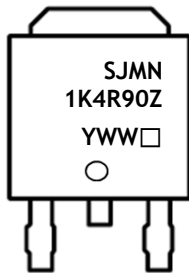


TO-252

### Ordering Information

| Part Number  | Marking     | Package |
|--------------|-------------|---------|
| SJMN1K4R90ZD | SJMN1K4R90Z | TO-252  |

### Marking Information



Column 1, 2: Device Code  
 Column 3: Production Information  
 e.g.) YWW□  
 -. YWW: Date Code (year, week)  
 -. □: Factory Management Code

### Absolute maximum ratings ( $T_C=25^\circ\text{C}$ unless otherwise noted)

| Characteristic                          | Symbol         | Rating                  | Unit             |
|-----------------------------------------|----------------|-------------------------|------------------|
| Drain-source voltage                    | $V_{DS}$       | 900                     | V                |
| Gate-source voltage                     | $V_{GS}$       | $\pm 20$                | V                |
| Drain current (DC) *                    | $I_D$          | $T_C=25^\circ\text{C}$  | 4.2              |
|                                         |                | $T_C=100^\circ\text{C}$ | 2.7              |
| Drain current (Pulsed) *                | $I_{DM}$       | 12.6                    | A                |
| Single pulsed avalanche energy (Note 2) | $E_{AS}$       | 55                      | mJ               |
| Repetitive avalanche current (Note 1)   | $I_{AR}$       | 1.1                     | A                |
| Repetitive avalanche energy (Note 1)    | $E_{AR}$       | 5.2                     | mJ               |
| Power dissipation                       | $P_D$          | 52                      | W                |
| Gate to source ESD (Human Body Model)   | $V_{ESD(G-S)}$ | 2000                    | V                |
| Junction temperature                    | $T_J$          | 150                     | $^\circ\text{C}$ |
| Storage temperature range               | $T_{stg}$      | -55~150                 | $^\circ\text{C}$ |

\* Limited only maximum junction temperature

## Thermal Characteristics

| Characteristic                          | Symbol        | Rating    | Unit |
|-----------------------------------------|---------------|-----------|------|
| Thermal resistance, junction to case    | $R_{th(j-c)}$ | Max. 4.81 | °C/W |
| Thermal resistance, junction to ambient | $R_{th(j-a)}$ | Max. 62.5 |      |

Electrical Characteristics ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

| Characteristic                 | Symbol       | Test Condition                                                   | Min. | Typ. | Max.    | Unit          |
|--------------------------------|--------------|------------------------------------------------------------------|------|------|---------|---------------|
| Drain-source breakdown voltage | $BV_{DSS}$   | $I_D=1\text{mA}$ , $V_{GS}=0$                                    | 900  | -    | -       | V             |
| Gate threshold voltage         | $V_{GS(th)}$ | $I_D=150\mu\text{A}$ , $V_{DS}=V_{GS}$                           | 2    | -    | 4       | V             |
| Drain-source cut-off current   | $I_{DSS}$    | $V_{DS}=900\text{V}$ , $V_{GS}=0\text{V}$                        | -    | -    | 1       | $\mu\text{A}$ |
|                                |              | $V_{DS}=900\text{V}$ , $T_C=150^{\circ}\text{C}$                 | -    | -    | 100     | $\mu\text{A}$ |
| Gate leakage current           | $I_{GSS}$    | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$                     | -    | -    | $\pm 1$ | $\mu\text{A}$ |
| Drain-source on-resistance     | $R_{DS(ON)}$ | $V_{GS}=10\text{V}$ , $I_D=0.9\text{A}$                          | -    | 1.12 | 1.4     | $\Omega$      |
| Input capacitance              | $C_{iss}$    | $V_{DS}=200\text{V}$ , $V_{GS}=0\text{V}$ ,<br>$f=1.0\text{MHz}$ | -    | 423  | -       | pF            |
| Output capacitance             | $C_{oss}$    |                                                                  | -    | 12   | -       |               |
| Reverse transfer capacitance   | $C_{rss}$    |                                                                  | -    | 1    | -       |               |
| Turn-on delay time (Note 3,4)  | $t_{d(on)}$  | $V_{DD}=450\text{V}$ , $I_D=2\text{A}$ ,<br>$R_G=25\Omega$       | -    | 37   | -       | ns            |
| Rise time (Note 3,4)           | $t_r$        |                                                                  | -    | 53   | -       |               |
| Turn-off delay time (Note 3,4) | $t_{d(off)}$ |                                                                  | -    | 60   | -       |               |
| Fall time (Note 3,4)           | $t_f$        |                                                                  | -    | 59   | -       |               |
| Total gate charge (Note 3,4)   | $Q_g$        | $V_{DS}=720\text{V}$ , $V_{GS}=10\text{V}$ ,<br>$I_D=2\text{A}$  | -    | 16   | -       | nC            |
| Gate-source charge (Note 3,4)  | $Q_{gs}$     |                                                                  | -    | 4.2  | -       |               |
| Gate-drain charge (Note 3,4)   | $Q_{gd}$     |                                                                  | -    | 6.5  | -       |               |

Source-Drain Diode Ratings and Characteristics ( $T_C=25^{\circ}\text{C}$  unless otherwise noted)

| Characteristic                     | Symbol   | Test Condition                                                             | Min. | Typ. | Max. | Unit          |
|------------------------------------|----------|----------------------------------------------------------------------------|------|------|------|---------------|
| Source current (DC)                | $I_S$    | Integral reverse diode<br>in the MOSFET                                    | -    | -    | 4.2  | A             |
| Source current (Pulsed)            | $I_{SM}$ |                                                                            | -    | -    | 12.6 | A             |
| Forward voltage                    | $V_{SD}$ | $V_{GS}=0\text{V}$ , $I_S=2\text{A}$                                       | -    | -    | 1.3  | V             |
| Reverse recovery time (Note 3,4)   | $t_{rr}$ | $I_S=2\text{A}$ , $V_{GS}=0\text{V}$<br>$dI_F/dt=-100\text{A}/\mu\text{s}$ | -    | 383  | -    | ns            |
| Reverse recovery charge (Note 3,4) | $Q_{rr}$ |                                                                            | -    | 1.5  | -    | $\mu\text{C}$ |

Note:

1. Repeated rating: Pulse width limited by safe operating area
2.  $I_{AS}=1.1\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$
3. Pulse test: Pulse width $\leq 300\mu\text{s}$ , Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature typical characteristics

## Typical Characteristics Curve

Fig. 1  $I_D - V_{DS}$

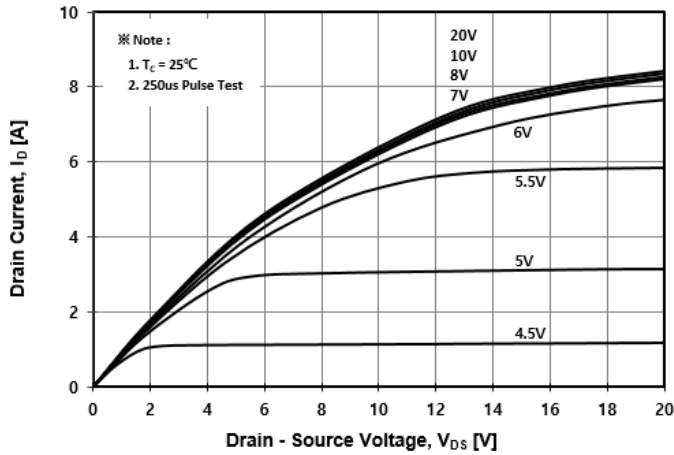


Fig. 2  $I_D - V_{GS}$

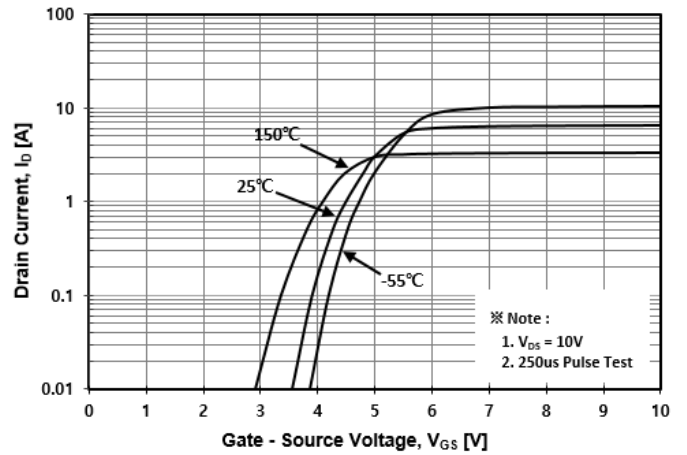


Fig. 3  $R_{DS(ON)} - I_D$

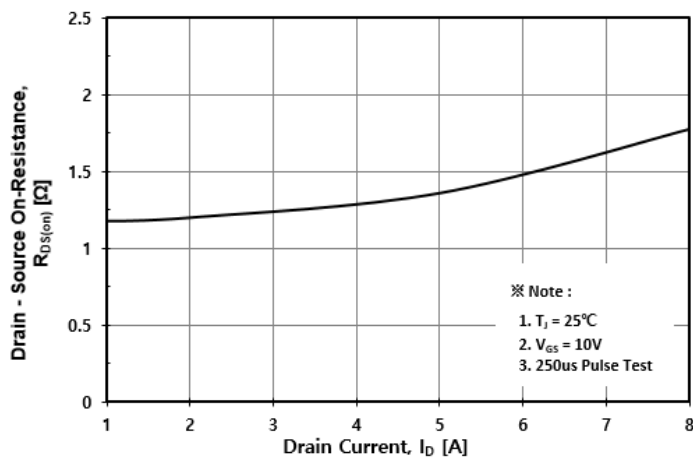


Fig. 4  $I_S - V_{SD}$

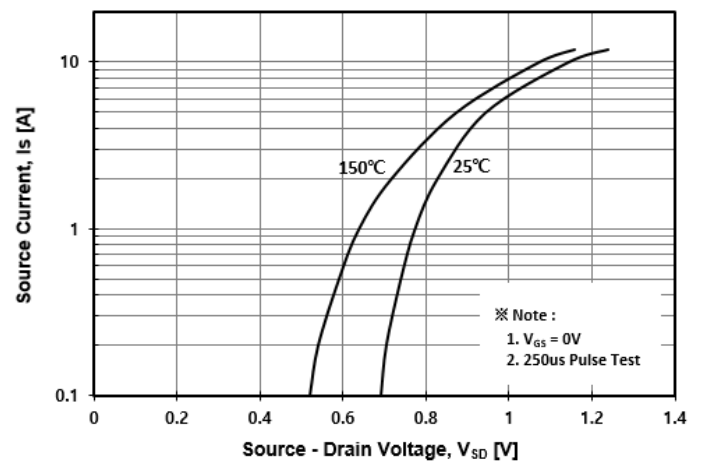


Fig. 5 Capacitance -  $V_{DS}$

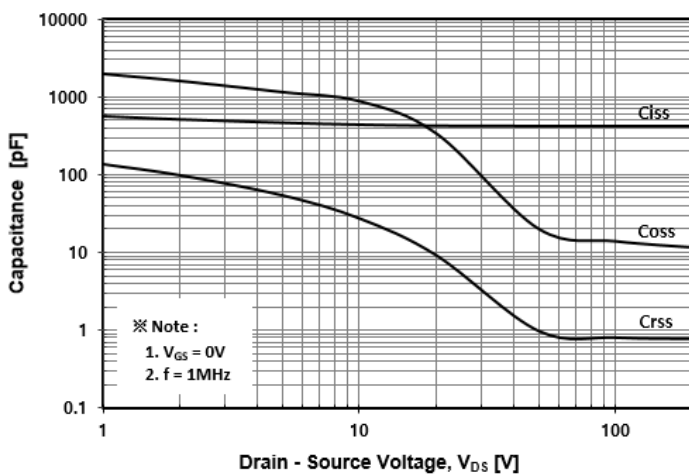
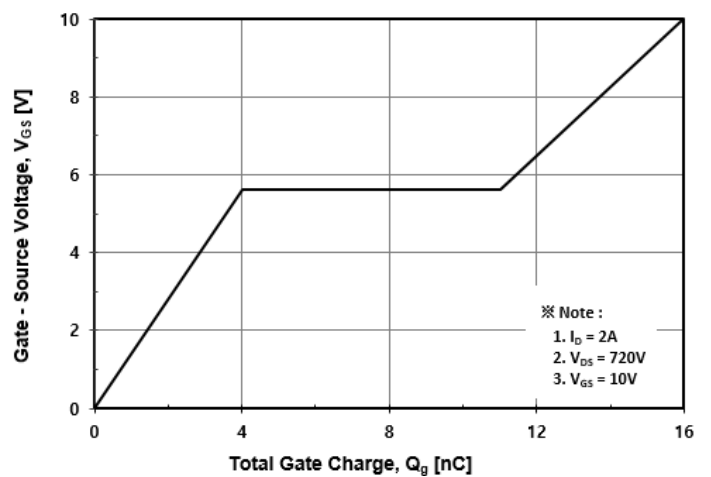


Fig. 6  $V_{GS} - Q_g$



# Typical Characteristics Curve (Continue)

Fig. 7  $BV_{DSS} - T_J$

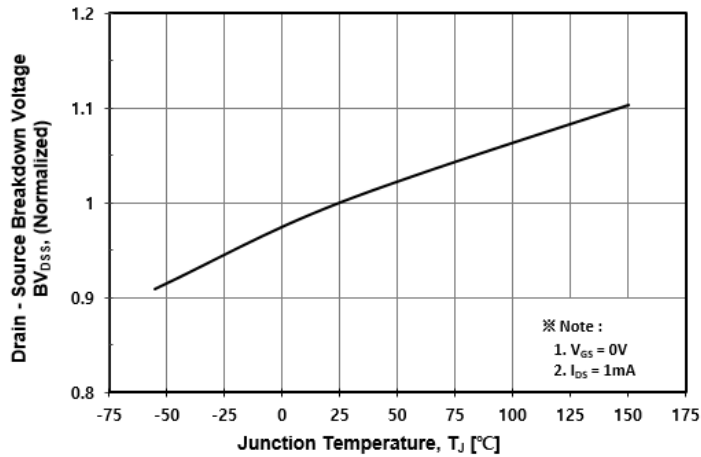


Fig. 8  $R_{DS(ON)} - T_J$

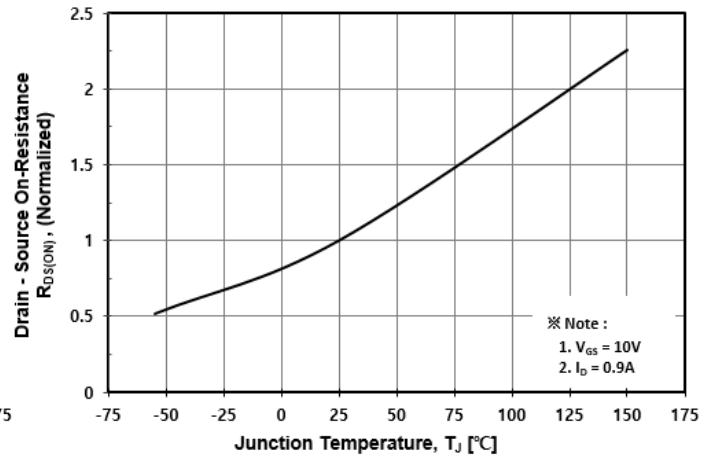


Fig. 9  $I_D - T_C$

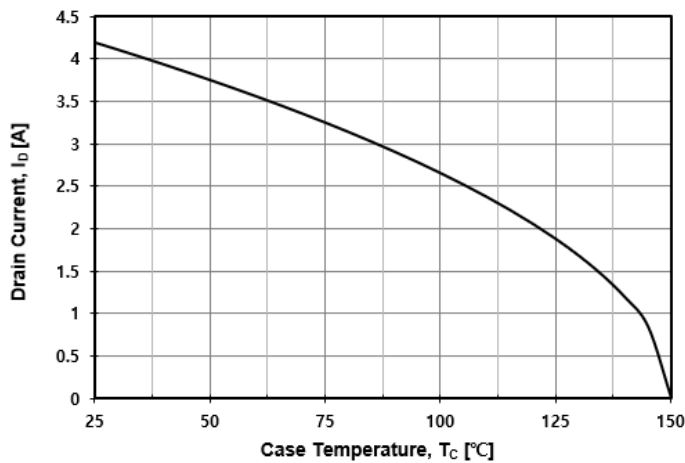


Fig. 10 Safe Operating Area

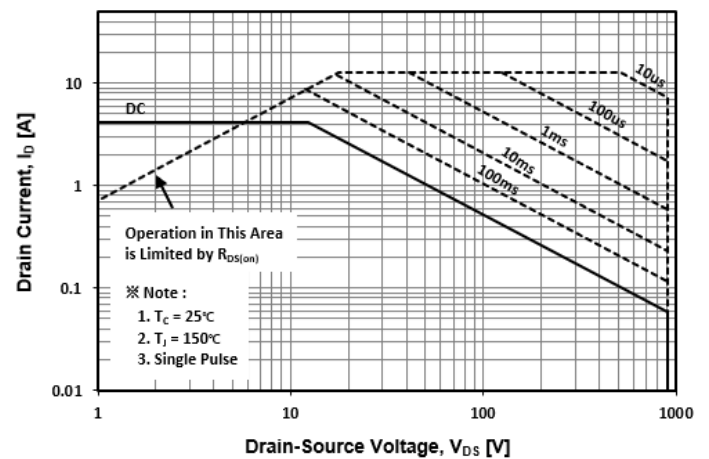


Fig. 11 Transient Thermal Impedance

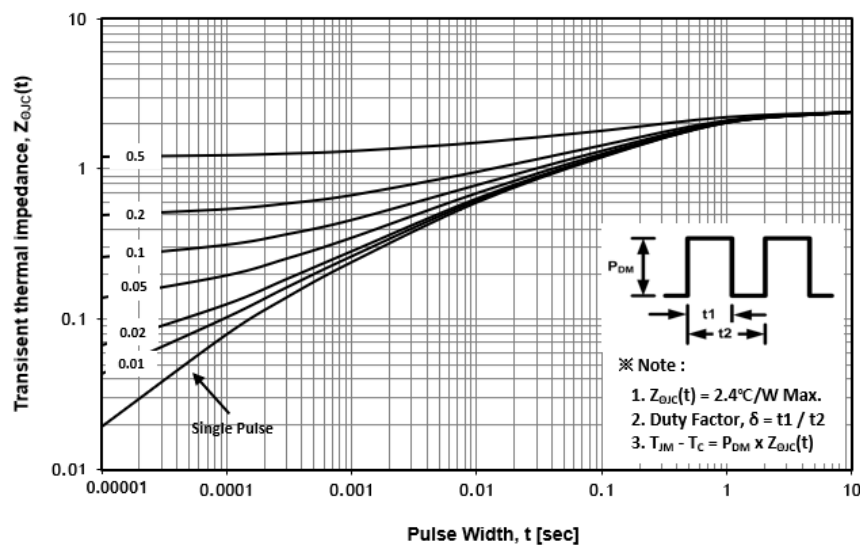


Fig. 12 Gate Charge Test Circuit & Waveform

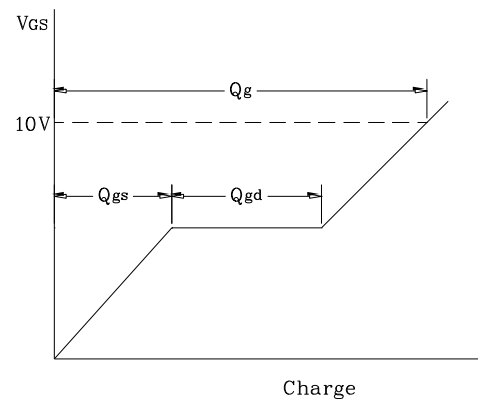
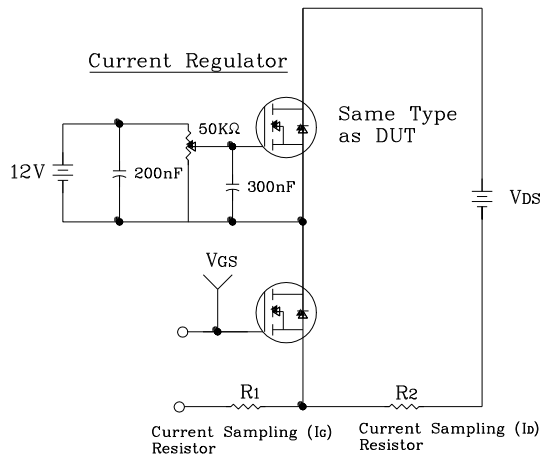


Fig. 13 Resistive Switching Test Circuit & Waveform

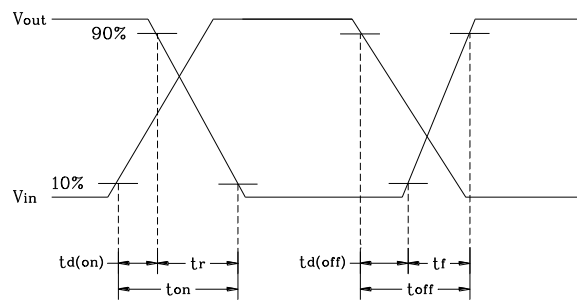
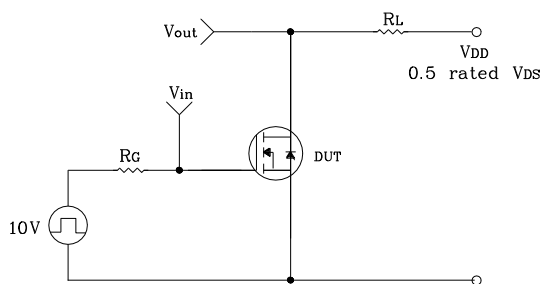


Fig. 14  $E_{AS}$  Test Circuit & Waveform

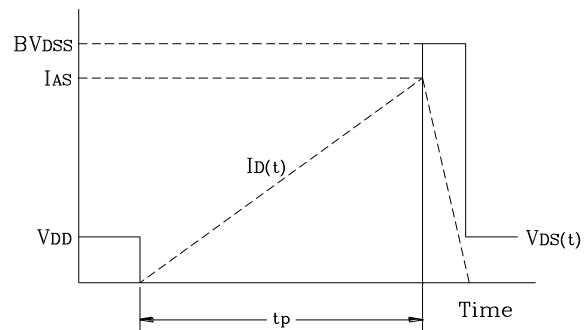
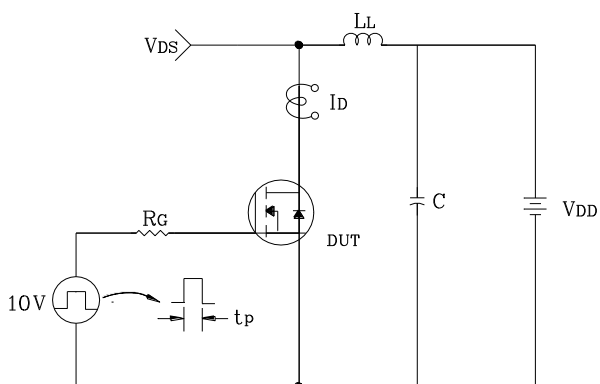
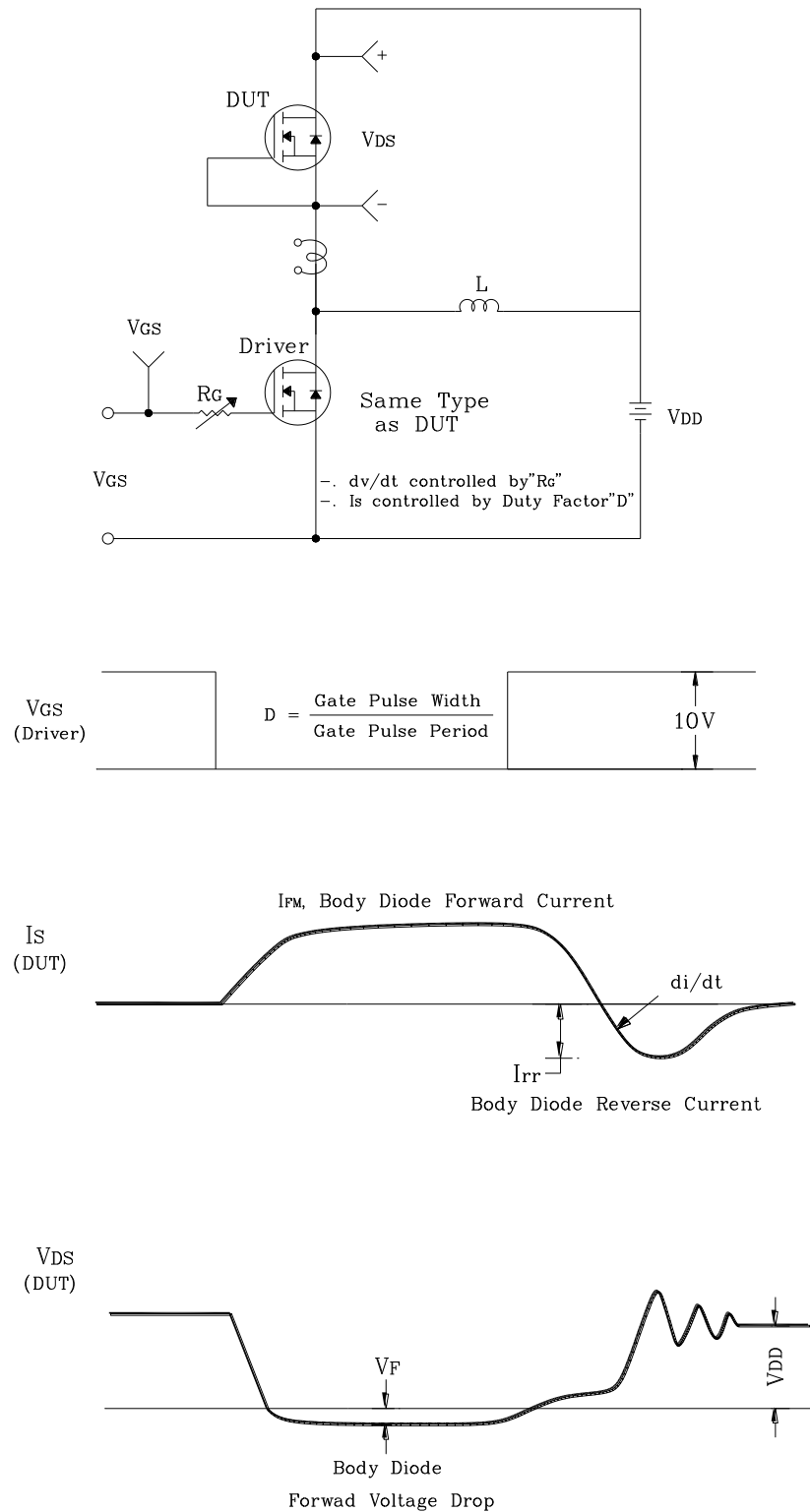
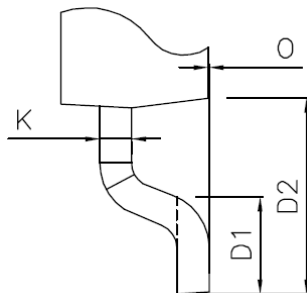
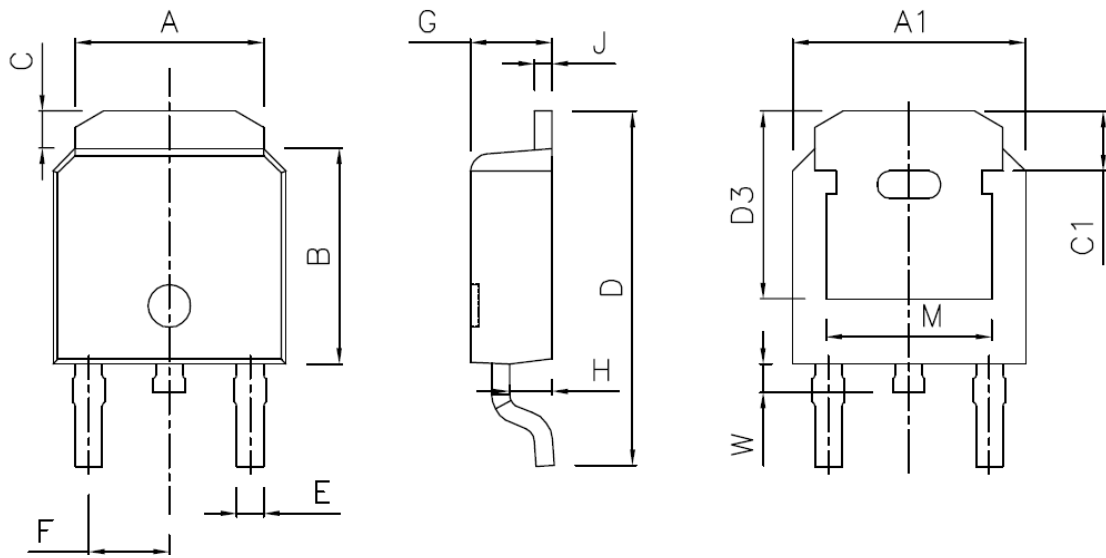


Fig. 15 Diode Reverse Recovery Time Test Circuit & Waveform



Package Outline Dimensions



| SYMBOL | MILLIMETERS |       |       |
|--------|-------------|-------|-------|
|        | MIN         | NOR   | MAX   |
| A      | 5.03        | 5.34  | 5.64  |
| A1     | 6.30        | 6.60  | 6.90  |
| B      | 5.70        | 6.00  | 6.30  |
| C      | 0.75        | 1.05  | 1.35  |
| C1     | 1.021       | 1.321 | 1.621 |
| D      | 9.65        | 9.95  | 10.25 |
| D1     | 1.30        | 1.50  | 1.70  |
| D2     | 2.70        | 2.90  | 3.10  |
| D3     | 5.00        | 5.30  | 5.60  |
| E      | 0.61        | 0.76  | 0.91  |
| F      | 2.13        | 2.28  | 2.43  |
| G      | 2.00        | 2.30  | 2.60  |
| H      | 0.76        | 1.06  | 1.36  |
| J      | 0.36        | 0.51  | 0.66  |
| K      | 0.37        | 0.52  | 0.67  |
| M      | 4.55        | 4.85  | 5.15  |
| O      | 0.00        | 0.07  | 0.17  |
| W      | 0.60        | 0.90  | 1.20  |

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