

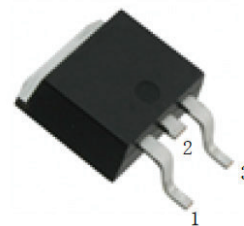
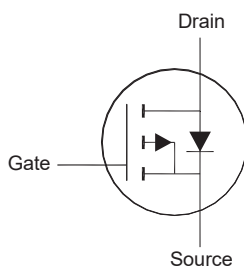
## P-Channel Enhancement Mode MOSFET

### Features

- Low On-Resistance
- Low Miller Charge
- Halogen and Antimony Free(HAF),  
RoHS compliant

### Applications

- Motor/Body Load Control
- Load Switch



1.Gate 2.Drain 3.Source  
TO-252 Plastic Package

### Key Parameters

| Parameter         | Value                  | Unit       |
|-------------------|------------------------|------------|
| $-BV_{DS}$        | 30                     | V          |
| $R_{DS(ON)}$ Max  | 5.5 @ $-V_{GS} = 10$ V | m $\Omega$ |
|                   | 7 @ $-V_{GS} = 4.5$ V  |            |
| $-V_{GS(th)}$ typ | 1.3                    | V          |
| $Q_g$ typ         | 146 @ $-V_{GS} = 10$ V | nC         |

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

| Parameter                                             | Symbol         | Value         | Unit             |
|-------------------------------------------------------|----------------|---------------|------------------|
| Drain-Source Voltage                                  | $-V_{DS}$      | 30            | V                |
| Gate-Source Voltage                                   | $V_{GS}$       | $\pm 20$      | V                |
| Drain Current                                         | $-I_D$         | 100           | A                |
| $T_c = 25^\circ\text{C}$<br>$T_c = 100^\circ\text{C}$ |                | 63            |                  |
| Peak Drain Current, Pulsed <sup>1)</sup>              | $-I_{DM}$      | 400           | A                |
| Single-Pulse Avalanche Current                        | $-I_{AS}$      | 60.9          | A                |
| Single-Pulse Avalanche Energy <sup>2)</sup>           | $E_{AS}$       | 185.4         | mJ               |
| Power Dissipation                                     | $P_D$          | 78.8          | W                |
| $T_c = 25^\circ\text{C}$                              |                |               |                  |
| Operating Junction and Storage Temperature Range      | $T_J, T_{stg}$ | - 55 to + 150 | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                                 | Symbol          | Max. | Unit               |
|-----------------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance from Junction to Case                  | $R_{\theta JC}$ | 1.5  | $^\circ\text{C/W}$ |
| Thermal Resistance from Junction to Ambient <sup>3)</sup> | $R_{\theta JA}$ | 32   | $^\circ\text{C/W}$ |

<sup>1)</sup> Pulse Test: Pulse Width  $\leq 100$   $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ , Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .

<sup>2)</sup> Limited by  $T_{J(MAX)}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.1$  mH,  $R_g = 25$   $\Omega$ ,  $-I_{AS} = 60.9$  A,  $V_{GS} = 10$  V.

<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified

| Parameter                                                                                                                                                                              | Symbol        | Min.   | Typ.      | Max.      | Unit          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|-----------|-----------|---------------|
| <b>STATIC PARAMETERS</b>                                                                                                                                                               |               |        |           |           |               |
| Drain-Source Breakdown Voltage<br>at $-I_D = 250\ \mu\text{A}$                                                                                                                         | $-BV_{DS}$    | 30     | -         | -         | V             |
| Drain-Source Leakage Current<br>at $-V_{DS} = 30\ \text{V}$                                                                                                                            | $-I_{DSS}$    | -      | -         | 1         | $\mu\text{A}$ |
| Gate Leakage Current<br>at $V_{GS} = \pm 20\ \text{V}$                                                                                                                                 | $I_{GSS}$     | -      | -         | $\pm 100$ | nA            |
| Gate-Source Threshold Voltage<br>at $V_{DS} = V_{GS}$ , $-I_D = 250\ \mu\text{A}$                                                                                                      | $-V_{GS(th)}$ | 1      | -         | 2.3       | V             |
| Drain-Source On-State Resistance<br>at $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$<br>at $-V_{GS} = 4.5\ \text{V}$ , $-I_D = 10\ \text{A}$                                        | $R_{DS(on)}$  | -<br>- | 3.7<br>-  | 5.5<br>7  | m $\Omega$    |
| <b>DYNAMIC PARAMETERS</b>                                                                                                                                                              |               |        |           |           |               |
| Forward Transconductance<br>at $-V_{DS} = 10\ \text{V}$ , $-I_D = 5\ \text{A}$                                                                                                         | $g_{FS}$      | -      | 26.3      | -         | S             |
| Gate Resistance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                            | $R_g$         | -      | 1.7       | -         | $\Omega$      |
| Input Capacitance<br>at $-V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                        | $C_{iss}$     | -      | 8000      | -         | pF            |
| Output Capacitance<br>at $-V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                       | $C_{oss}$     | -      | 802       | -         | pF            |
| Reverse Transfer Capacitance<br>at $-V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                             | $C_{rss}$     | -      | 630       | -         | pF            |
| Total Gate Charge<br>at $-V_{DS} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$<br>at $-V_{DS} = 15\ \text{V}$ , $-V_{GS} = 4.5\ \text{V}$ , $-I_D = 18\ \text{A}$ | $Q_g$         | -<br>- | 146<br>70 | -<br>-    | nC            |
| Gate-Source Charge<br>at $-V_{DS} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$                                                                                   | $Q_{gs}$      | -      | 25        | -         | nC            |
| Gate-Drain Charge<br>at $-V_{DS} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$                                                                                    | $Q_{gd}$      | -      | 26        | -         | nC            |
| Turn-On Delay Time<br>at $-V_{DD} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$ , $R_G = 6\ \Omega$                                                               | $t_{d(on)}$   | -      | 69        | -         | ns            |
| Turn-On Rise Time<br>at $-V_{DD} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$ , $R_G = 6\ \Omega$                                                                | $t_r$         | -      | 56        | -         | ns            |
| Turn-Off Delay Time<br>at $-V_{DD} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$ , $R_G = 6\ \Omega$                                                              | $t_{d(off)}$  | -      | 68        | -         | ns            |
| Turn-Off Fall Time<br>at $-V_{DD} = 15\ \text{V}$ , $-V_{GS} = 10\ \text{V}$ , $-I_D = 18\ \text{A}$ , $R_G = 6\ \Omega$                                                               | $t_f$         | -      | 16        | -         | ns            |
| <b>Body-Diode PARAMETERS</b>                                                                                                                                                           |               |        |           |           |               |
| Drain-Source Diode Forward Voltage<br>at $-I_S = 1\ \text{A}$ , $V_{GS} = 0\ \text{V}$                                                                                                 | $-V_{SD}$     | -      | -         | 1.2       | V             |
| Body-Diode Continuous Current                                                                                                                                                          | $-I_S$        | -      | -         | 100       | A             |
| Body-Diode Continuous Current, Pulsed                                                                                                                                                  | $-I_{SM}$     | -      | -         | 400       | A             |
| Body Diode Reverse Recovery Time<br>at $-I_S = 18\ \text{A}$ , $di/dt = 100\ \text{A} / \mu\text{s}$                                                                                   | $t_{rr}$      | -      | 25.4      | -         | ns            |
| Body Diode Reverse Recovery Charge<br>at $-I_S = 18\ \text{A}$ , $di/dt = 100\ \text{A} / \mu\text{s}$                                                                                 | $Q_{rr}$      | -      | 20        | -         | nC            |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

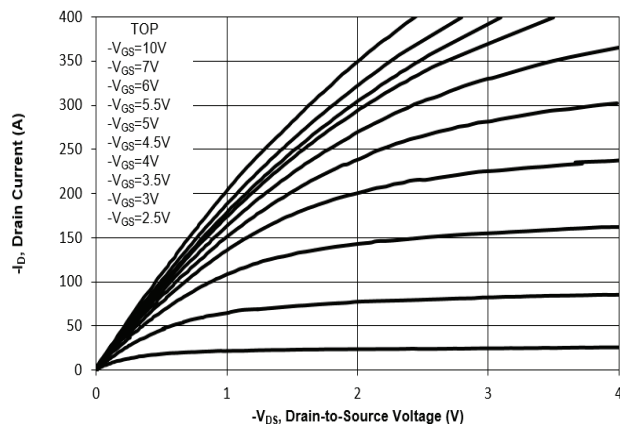


Fig. 2 Typical Transfer Characteristics

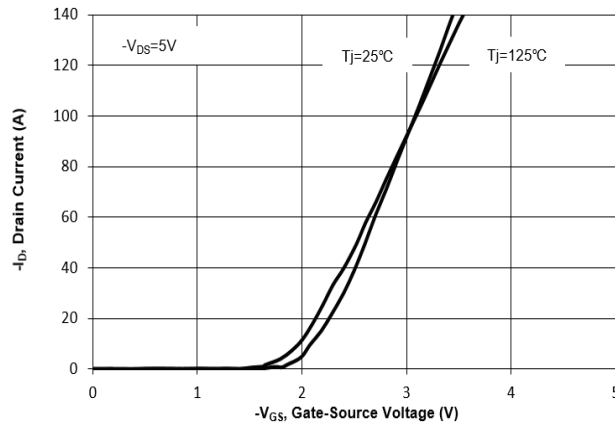


Fig. 3 on-Resistance vs. Drain Current

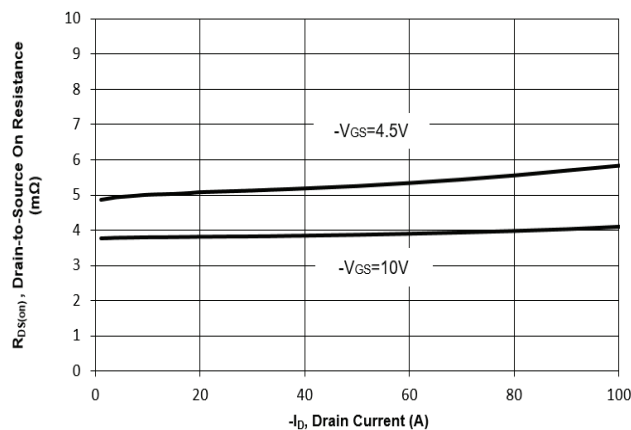


Fig. 4 on-Resistance vs. Gate to Source Voltage

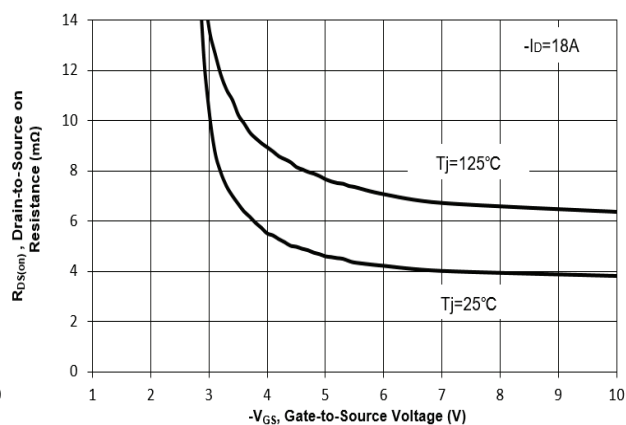


Fig. 5 on-Resistance vs.  $T_J$

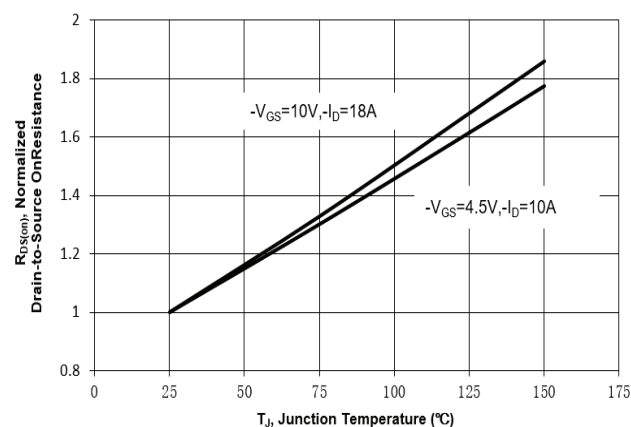
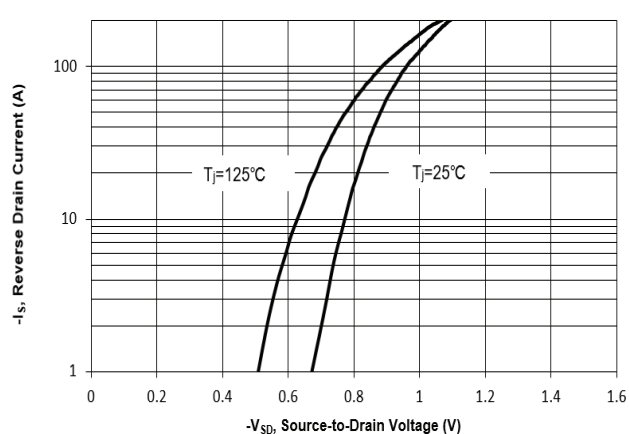


Fig. 6 Typical Body-Diode Forward Characteristics



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

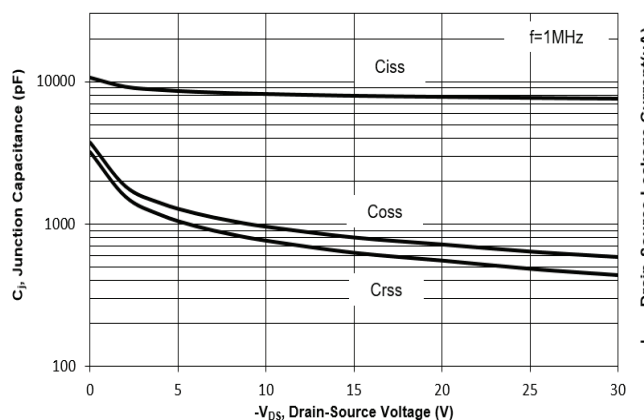


Fig. 8 Drain-Source Leakage Current vs.  $T_J$

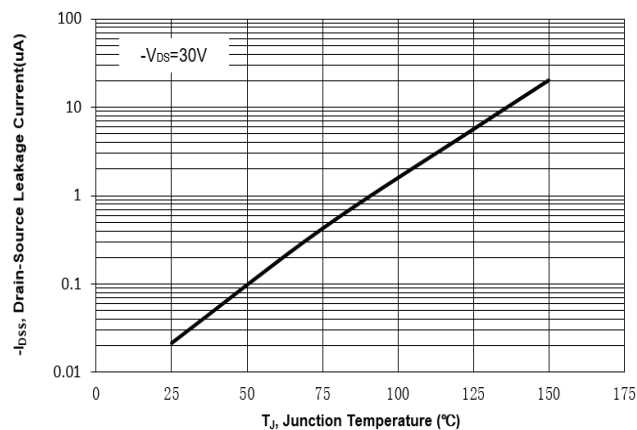


Fig. 9  $V_{(BR)DSS}$  vs. Junction Temperature

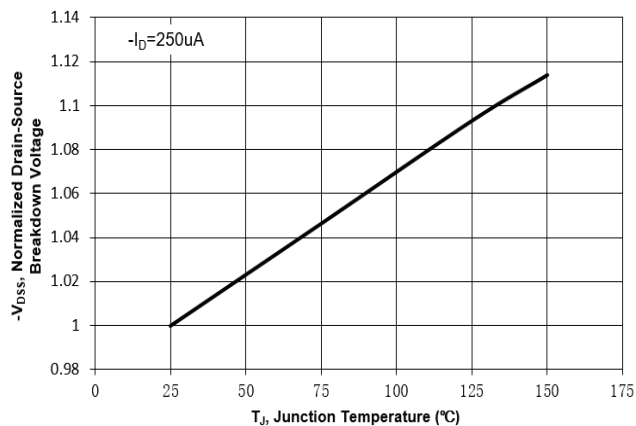


Fig. 10 Gate Threshold Variation vs.  $T_J$

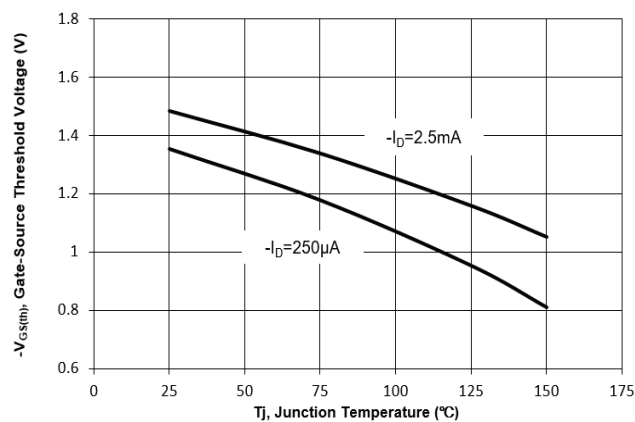


Fig. 11 Gate Charge

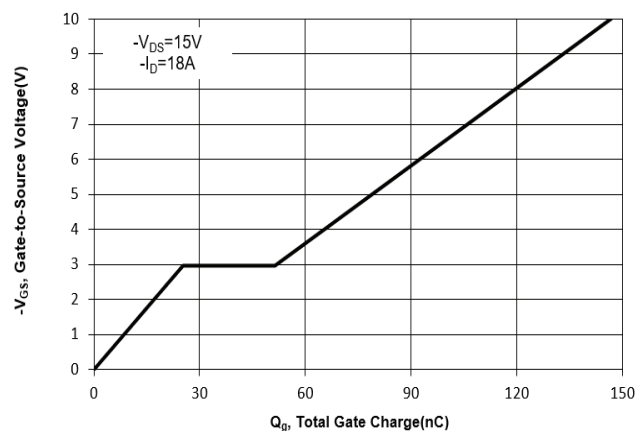
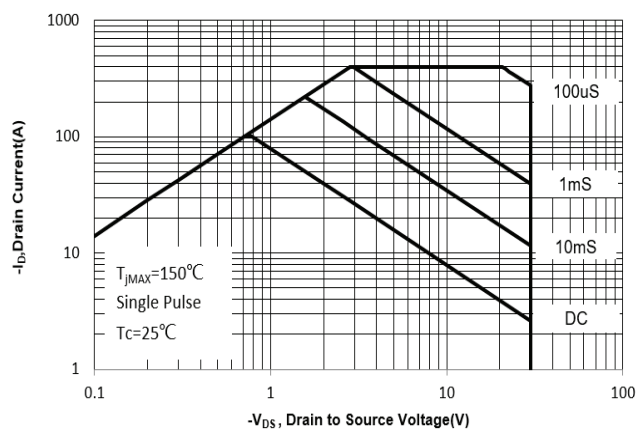
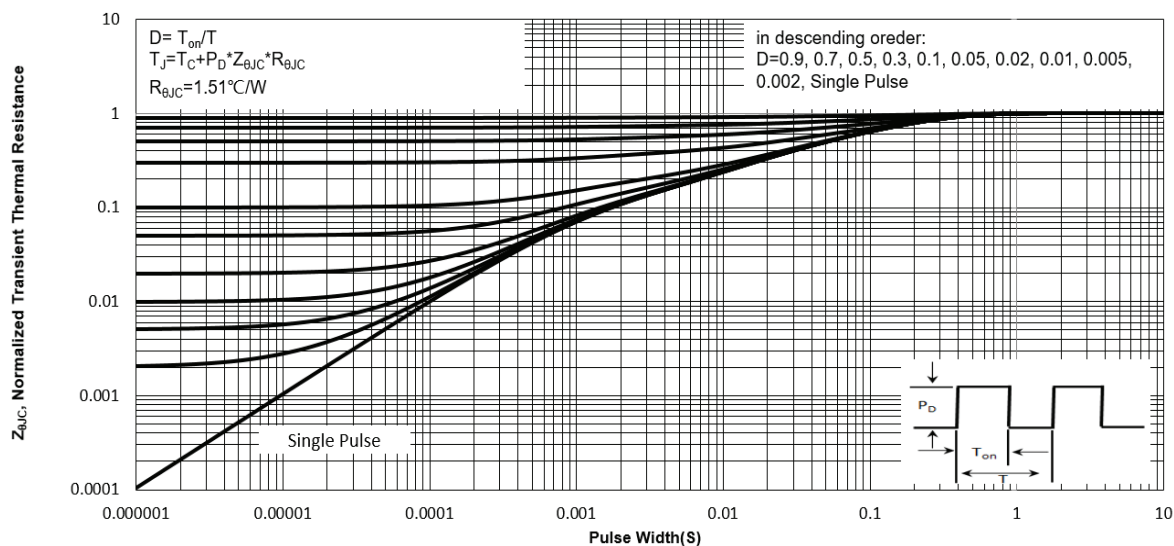
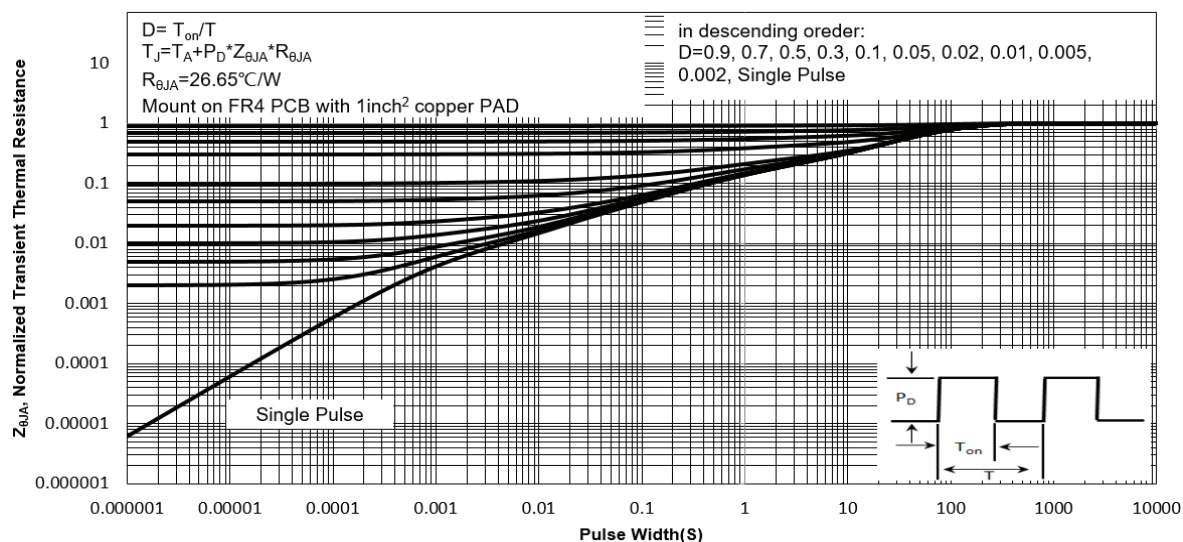


Fig. 12 Safe Operation Area



**Electrical Characteristics Curves**
**Fig. 13 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JC}$ )**

**Fig. 14 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JA}$ )**


### Test Circuits

Fig.1-1 Switching times test circuit

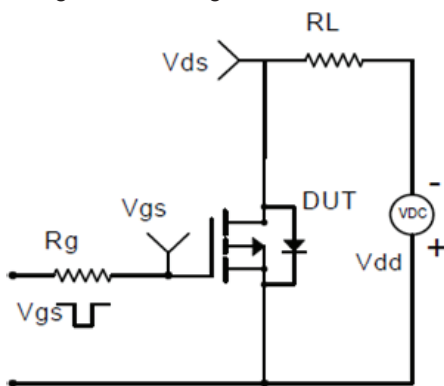


Fig.1-2 Switching Waveform

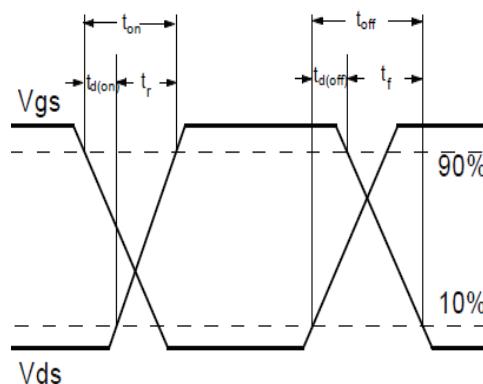


Fig.2-1 Gate charge test circuit

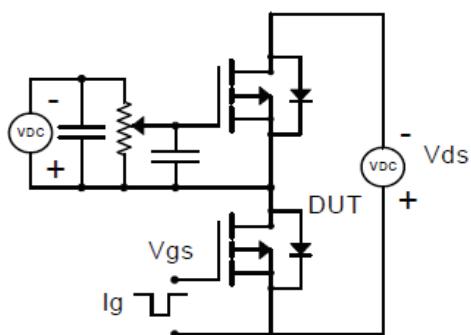


Fig.2-2 Gate charge waveform

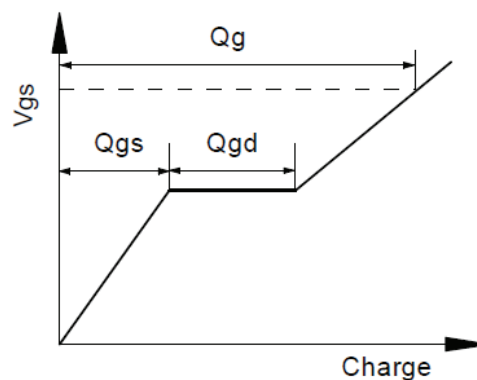


Fig.3-1 Avalanche test circuit

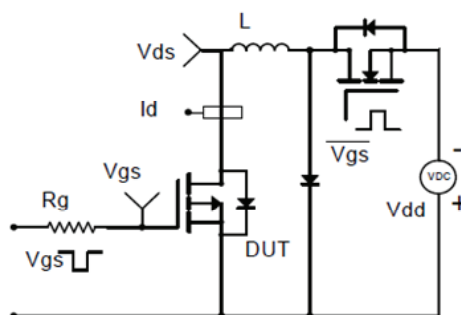
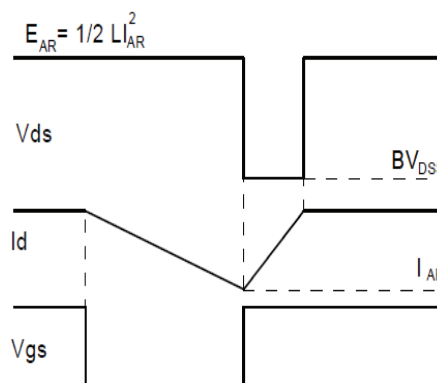
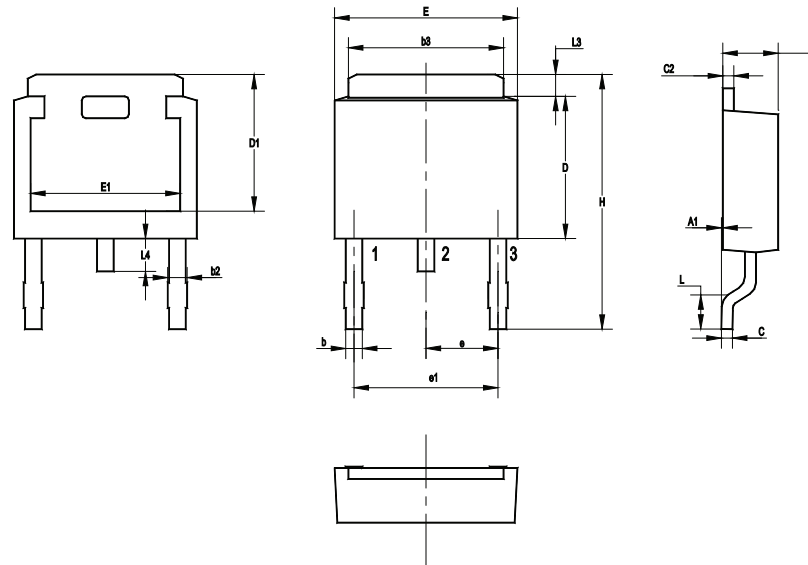


Fig.3-2 Avalanche waveform



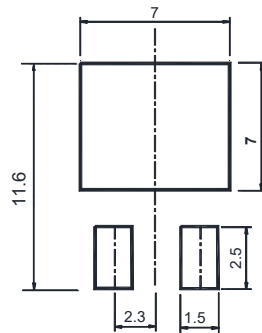
Package Outline (Dimensions in mm)

TO-252



| UNIT | A   | A1   | b   | b2   | b3  | C    | C2   | D   | D1  | E   | E1  | e    | e1   | H    | L    | L3   | L4   |
|------|-----|------|-----|------|-----|------|------|-----|-----|-----|-----|------|------|------|------|------|------|
| mm   | 2.5 | 0.15 | 1.0 | 1.15 | 5.5 | 0.65 | 0.65 | 6.2 | 5.4 | 6.7 | 5.0 | 2.30 | 4.60 | 10.7 | 1.78 | 1.20 | 1.10 |
|      | 2.1 | 0    | 0.5 | 0.65 | 4.9 | 0.4  | 0.4  | 5.6 | 5.0 | 6.1 | 4.6 | TYP. | TYP. | 9    | 1.40 | 0.85 | 0.51 |

Recommended Soldering Footprint



Packing information

| Package | Tape Width (mm) | Pitch   |               | Reel Size |      | Per Reel Packing Quantity |
|---------|-----------------|---------|---------------|-----------|------|---------------------------|
|         |                 | mm      | inch          | mm        | inch |                           |
| TO-252  | 16              | 8 ± 0.1 | 0.315 ± 0.004 | 330       | 13   | 2,500                     |

Marking information

" TR03P055LS " = Part No.

" \*\*\*\*\* " = Date Code Marking

Font type: Arial



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