

## General Description

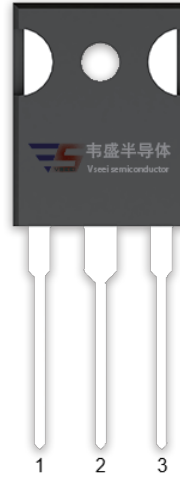
The series of devices use advanced trench gate super junction technology and design to provide ultra-low  $R_{DS(ON)}$  and low gate charge and With a rapid recovery body diode. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, industrial power applications, Fast charger, new energy vehicle charging pile, on-board OBC etc.

## Features

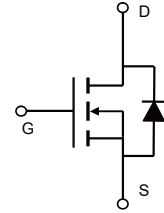
- New technology for high voltage device
- Ultra low on-resistance and ultra low conduction losses
- Ultra Low Gate Charge cause lower driving requirements
- Diode reverse recovery speed is super fast
- High reliability
- ROHS compliant&Halogen Free

## Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)
- On-board charger(OBC)



TO-247



Schematic

| Parameter                                                 | Symbol          | Value      | Unit          |
|-----------------------------------------------------------|-----------------|------------|---------------|
| Drain-Source Voltage ( $V_{GS}=0V$ )                      | $V_{DS}$        | 650        | V             |
| Gate-Source Voltage ( $V_{DS}=0V$ ) AC ( $f>1$ Hz)        | $V_{GS}$        | $\pm 30$   | V             |
| Gate-Source Voltage ( $V_{DS}=0V$ ) DC                    | $V_{GS}$        | $\pm 20$   | V             |
| Continuous Drain Current at $T_c=25^\circ C$              | $I_{D(DC)}$     | 26         | A             |
| Continuous Drain Current at $T_c=100^\circ C$             | $I_{D(DC)}$     | 18.2       | A             |
| Pulsed drain current (Note 1)                             | $I_{DM(pluse)}$ | 78         | A             |
| Maximum Power Dissipation( $T_c=25^\circ C$ )             | $P_D$           | 237        | W             |
| Derate above $25^\circ C$                                 |                 | 1.58       | W/ $^\circ C$ |
| Avalanche current(Note 1)                                 | $I_{AS}$        | 7          | A             |
| Drain Source voltage slope, $V_{DS} \leq 480$ V,          | $dv/dt$         | 50         | V/ns          |
| Reverse diode $dv/dt$ , $V_{DS} \leq 480$ V, $I_{SD}<I_D$ | $dv/dt$         | 50         | V/ns          |
| Operating Junction and Storage Temperature Range          | $T_J, T_{STG}$  | -55...+175 | $^\circ C$    |

\* limited by maximum junction temperature

**Table 2. Thermal Characteristic**

| Parameter                                         | Symbol     | Value | Unit                        |
|---------------------------------------------------|------------|-------|-----------------------------|
| Thermal Resistance, Junction-to-Case (Maximum)    | $R_{thJC}$ | 0.63  | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient (Maximum) | $R_{thJA}$ | 62    | $^{\circ}\text{C}/\text{W}$ |

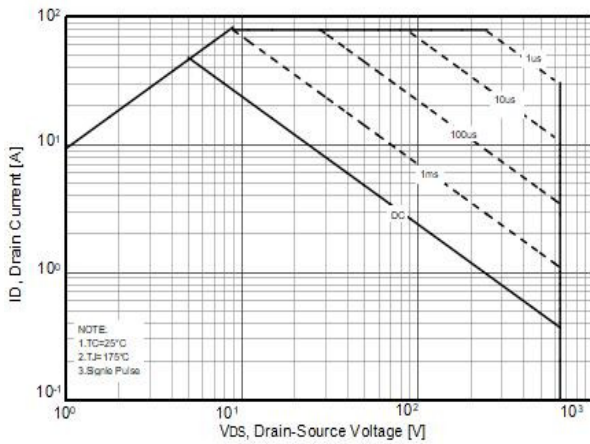
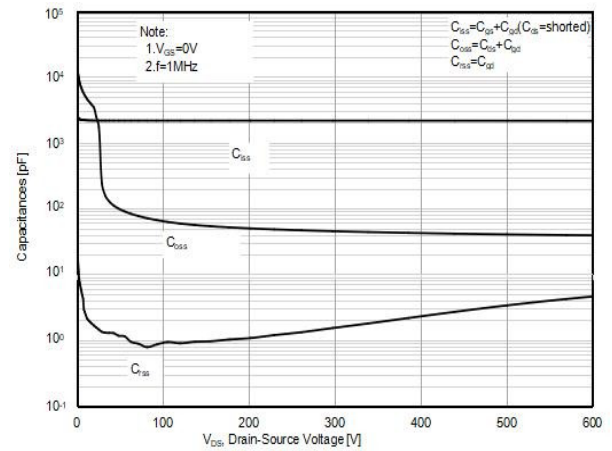
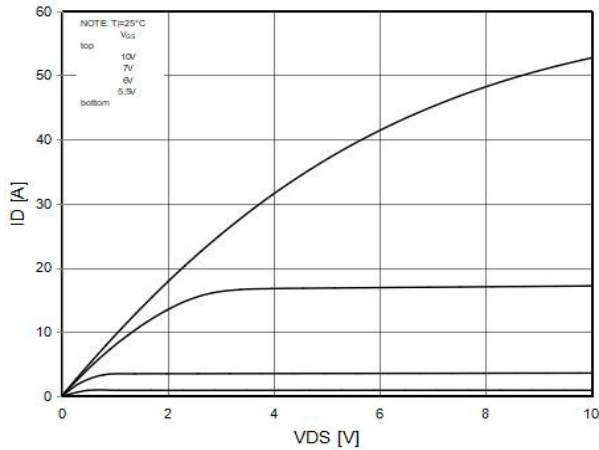
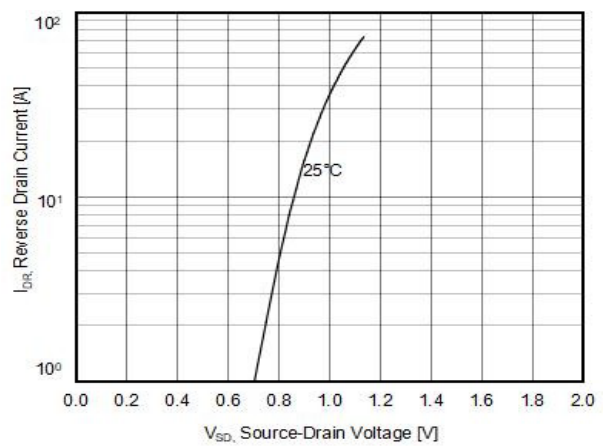
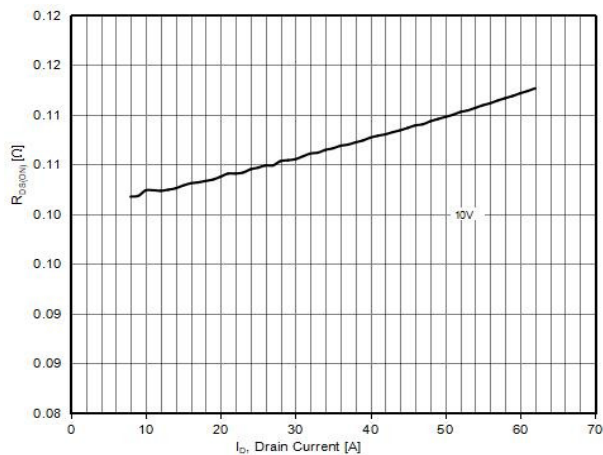
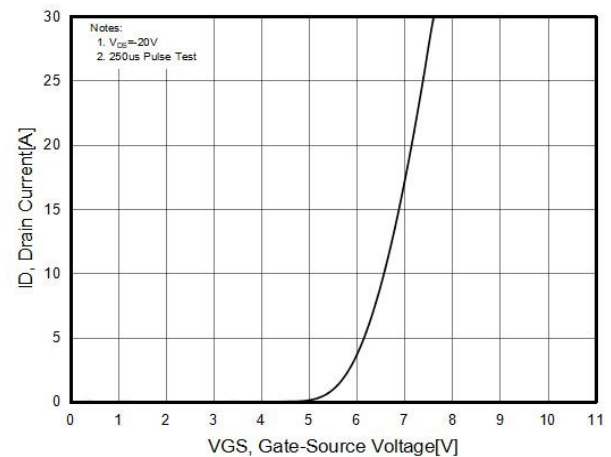
**Table 3. Electrical Characteristics ( $T_J=25^{\circ}\text{C}$  unless otherwise noted)**

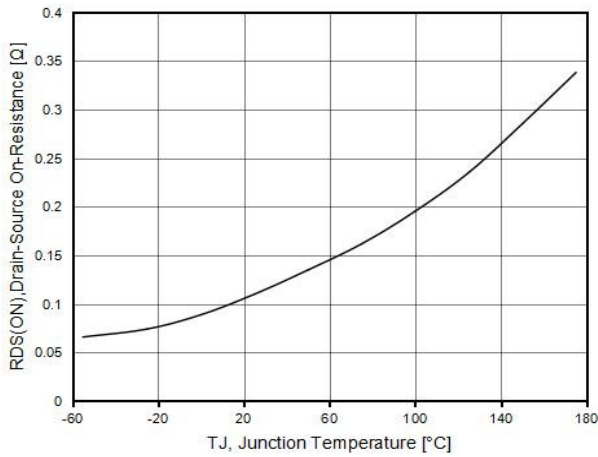
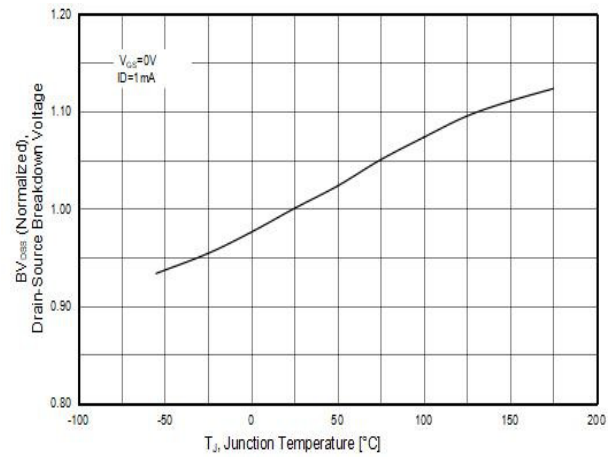
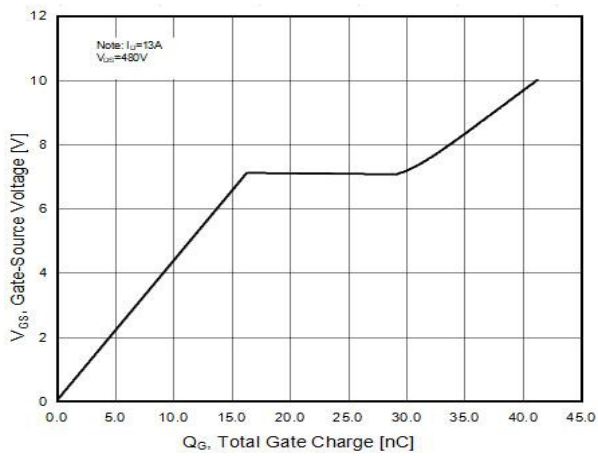
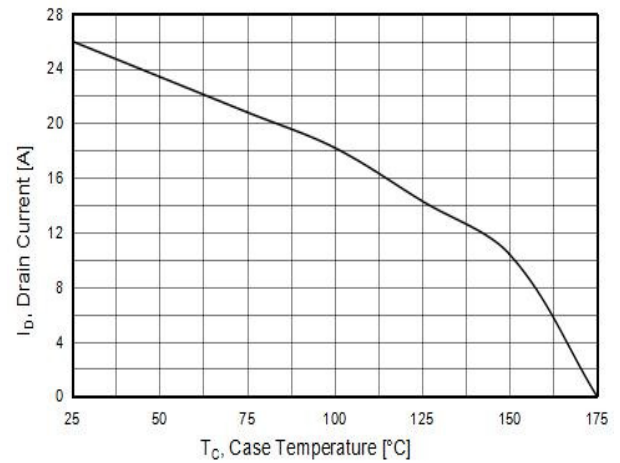
| Parameter                                | Symbol              | Condition                                                                               | Min | Typ   | Max  | Unit |
|------------------------------------------|---------------------|-----------------------------------------------------------------------------------------|-----|-------|------|------|
| On/off states                            |                     |                                                                                         |     |       |      |      |
| Drain-Source Breakdown Voltage           | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250uA                                               | 650 |       |      | V    |
| Zero Gate Voltage Drain Current(Tc=25℃)  | I <sub>DSS</sub>    | V <sub>DS</sub> =650V,V <sub>GS</sub> =0V                                               |     |       | 10   | μA   |
| Zero Gate Voltage Drain Current(Tc=125℃) | I <sub>DSS</sub>    | V <sub>DS</sub> =650V,V <sub>GS</sub> =0V                                               |     |       | 400  | μA   |
| Gate-Body Leakage Current                | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V                                               |     |       | ±100 | nA   |
| Gate Threshold Voltage                   | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =500uA                                 | 3.5 | 4.2   | 5.0  | V    |
| Drain-Source On-State Resistance         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =13A                                               |     | 110   | 130  | mΩ   |
| Dynamic Characteristics                  |                     |                                                                                         |     |       |      |      |
| Input Capacitance                        | C <sub>iss</sub>    | V <sub>DS</sub> =50V,V <sub>GS</sub> =0V,<br>F=1.0MHz                                   |     | 2161  |      | pF   |
| Output Capacitance                       | C <sub>oss</sub>    |                                                                                         |     | 95    |      | pF   |
| Reverse Transfer Capacitance             | C <sub>rss</sub>    |                                                                                         |     | 1.3   |      | pF   |
| Total Gate Charge                        | Q <sub>g</sub>      | V <sub>DS</sub> =480V,I <sub>D</sub> =13A,<br>V <sub>GS</sub> =10V                      |     | 41.2  |      | nC   |
| Gate-Source Charge                       | Q <sub>gs</sub>     |                                                                                         |     | 16.3  |      | nC   |
| Gate-Drain Charge                        | Q <sub>gd</sub>     |                                                                                         |     | 12.8  |      | nC   |
| Gate plateau voltage                     | V <sub>gp</sub>     |                                                                                         |     | 7.0   |      | V    |
| Intrinsic gate resistance                | R <sub>G</sub>      | f = 1 MHz open drain                                                                    |     | 1.5   |      | Ω    |
| Switching times                          |                     |                                                                                         |     |       |      |      |
| Turn-on Delay Time                       | t <sub>d(on)</sub>  | V <sub>DD</sub> =380V,I <sub>D</sub> =13A,<br>R <sub>G</sub> =1.7Ω,V <sub>GS</sub> =10V |     | 43    |      | nS   |
| Turn-on Rise Time                        | t <sub>r</sub>      |                                                                                         |     | 16    |      | nS   |
| Turn-Off Delay Time                      | t <sub>d(off)</sub> |                                                                                         |     | 93    |      | nS   |
| Turn-Off Fall Time                       | t <sub>f</sub>      |                                                                                         |     | 20    |      | nS   |
| Source- Drain Diode Characteristics      |                     |                                                                                         |     |       |      |      |
| Source-drain current(Body Diode)         | I <sub>SD</sub>     | T <sub>C</sub> =25℃                                                                     |     |       | 26   | A    |
| Pulsed Source-drain current(Body Diode)  | I <sub>SDM</sub>    |                                                                                         |     |       | 78   | A    |
| Forward On Voltage                       | V <sub>SD</sub>     | T <sub>j</sub> =25℃,I <sub>SD</sub> =26A,V <sub>GS</sub> =0V                            |     | 1.0   | 1.2  | V    |
| Reverse Recovery Time                    | t <sub>rr</sub>     | T <sub>j</sub> =25℃,I <sub>F</sub> =13A,di/dt=100A/μs                                   |     | 145   |      | nS   |
| Reverse Recovery Charge                  | Q <sub>rr</sub>     |                                                                                         |     | 0.725 |      | uC   |
| Peak Reverse Recovery Current            | I <sub>rm</sub>     |                                                                                         |     | 10    |      | A    |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.  $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, R_G=25\Omega$

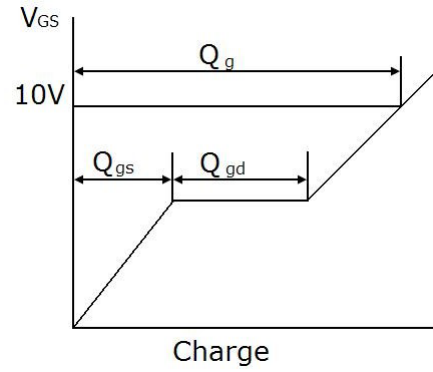
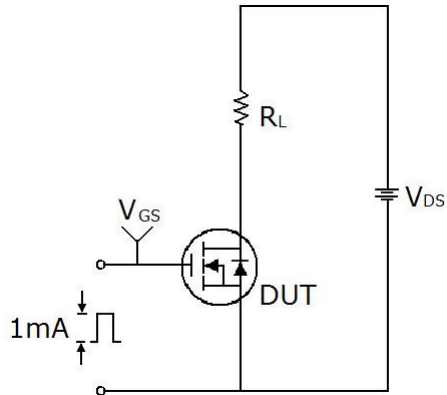
## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

**Figure1. Safe operating area**

**Figure2. Capacitance**

**Figure3. Output characteristics**

**Figure4. Source-Drain Diode Forward Voltage**

**Figure5. Static drain-source on resistance**

**Figure6. Transfer characteristics**


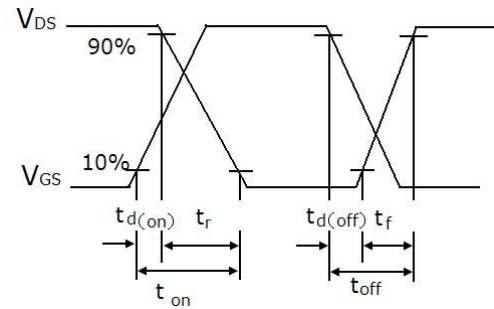
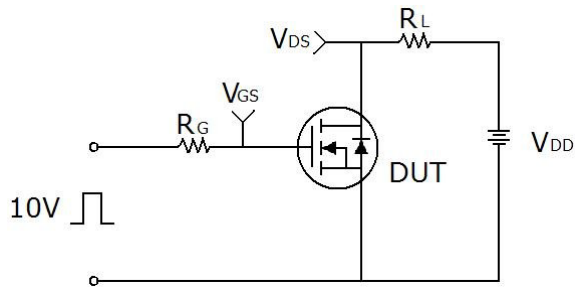
**Figure7.  $R_{DS(ON)}$  vs Junction Temperature**

**Figure8.  $BV_{DSS}$  vs Junction Temperature**

**Figure9. Gate charge waveforms**

**Figure10. Maximum  $I_D$  vs Junction Temperature**


## Test circuit

### 1) Gate charge test circuit & Waveform



### 2) Switch Time Test Circuit:



### 3) Unclamped Inductive Switching Test Circuit & Waveforms

