# N-Channel, 650V, 7A, POWER MOSFET

## Features

- ✧ New technology for high voltage device
- ✧ Low on-resistance and low conduction losses
- ✧ Small package : TO-220AB
- ✧ Ultra Low Gate Charge cause lower driving requirements
- ✧ 100% Avalanche Tested

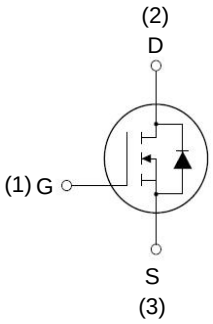
| $V_{DS}$ (V) | Typical $R_{DS(on)}$ (Ω) |
|---|---|
| 650 | 1.212 @ $V_{GS}$=10V |

## Applications

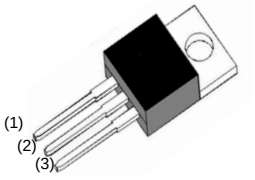
- ✧ LED power supplies
- ✧ Cell Phone Charger
- ✧ Standby Power

## Mechanical Data

- ✧ Case : Molded plastic body
- ✧ Terminals : Solder plated, solderable per MIL-STD-750,Method 2026
- ✧ Polarity : As marked
- ✧ RoHS/WEEE Compliant



Circuit Diagram



TO-220AB

## Absolute Maximum Rating at $T_A$ = 25 °C, unless otherwise specified

| Parameter | | Symbol | Value | Units |
|---|---|---|---|---|
| Drain-Source Voltage (VGS=0V) | | $V_{DS}$ | 650 | V |
| Gate-Source Voltage (VDS=0V) AC (f>1 Hz) | | $V_{GS}$ | ±30 | V |
| Continuous Drain Current | $T_C$=25℃ | $I_{D\ (DC)}$ | 7 | A |
| Power Dissipation | $T_C$=25℃ | $P_D$ | 60 | W |
| Thermal Resistance，Junction-to-Case（Maximum） | | $R_{\theta JC}$ | 2.08 | ℃/W |
| Thermal Resistance，Junction-to-Ambient （Maximum） | | $R_{\theta JA}$ | 62 | ℃/W |
| Junction Temperature | | $T_J$ | 150 | ℃ |
| Storage Temperature | | $T_{STG}$ | -55~ +150 | ℃ |

OVREG Semiconductor (Xi'an) Co.,Ltd.

# Electrical Characteristics at $T_A$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **On/off states** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 650 | | | V |
| Zero Gate Voltage Drain Current(Tc=25℃) | $I_{DSS}$ | $V_{DS}$=650V,$V_{GS}$=0V | | | 1 | μA |
| Zero Gate Voltage Drain Current(Tc=125℃) | $I_{DSS}$ | $V_{DS}$=520V,$V_{GS}$=0V | | | 100 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V,$V_{DS}$=0V | | | ±80 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 2.0 | | 4.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=3.5A | | 1.212 | 1.453 | Ω |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=50V,$V_{GS}$=0V, F=1.0MHz | | 435 | | pF |
| Output Capacitance | $C_{oss}$ | | | 28 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 3.3 | | pF |
| Total Gate Charge | $Q_g$ | $V_{DS}$=480V,$I_D$=7A, $V_{GS}$=10V | | 11 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 3.5 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 5 | | nC |
| **Switching times** | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=380V,$I_D$=3.5A, $R_G$=4.7Ω,$V_{GS}$=10V | | 8 | | nS |
| Turn-on Rise Time | $t_r$ | | | 7 | | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 58 | 75 | nS |
| Turn-Off Fall Time | $t_f$ | | | 9 | 15 | nS |
| **Source- Drain Diode Characteristics** | | | | | | |
| Source-drain current(Body Diode) | $I_{SD}$ | $T_C$=25°C | | | 7 | A |
| Pulsed Source-drain current(Body Diode) | $I_{SDM}$ | | | | 28 | A |
| Forward On Voltage | $V_{SD}$ | Tj=25°C,$I_{SD}$=7A,$V_{GS}$=0V | | 0.9 | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | Tj=25°C,$I_F$=3.5A,di/dt=100A/μs | | 210 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 0.85 | | uC |
| Peak Reverse Recovery Current | $I_{rrm}$ | | | 8 | | A |

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

2. Tj=25℃,VDD=50V,VG=10V, $R_G$=25Ω

3. $R_{DS(on)}$ CP test results, typical, is 1.212Ω @$V_{GS}$=10V, $I_D$=1A

OVREG Semiconductor (Xi'an) Co.,Ltd.

# Typical Characteristics at $T_A$ = 25 °C, unless otherwise specified

**Figure1. Safe operating area**

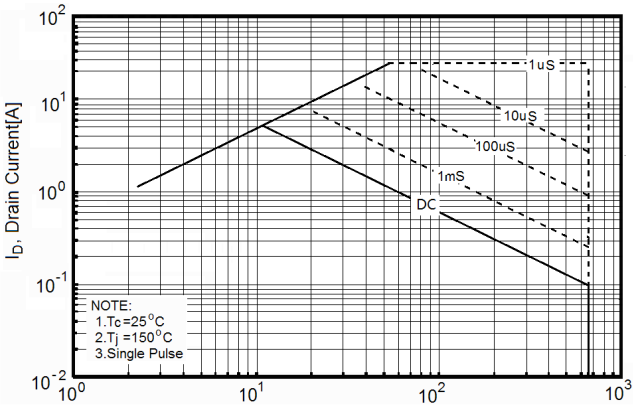



**Figure2. Output characteristics**

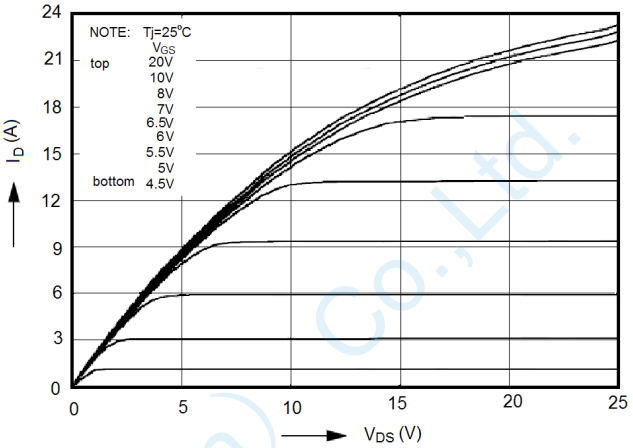



**Figure3. Source-Drain Diode Forward Voltage**

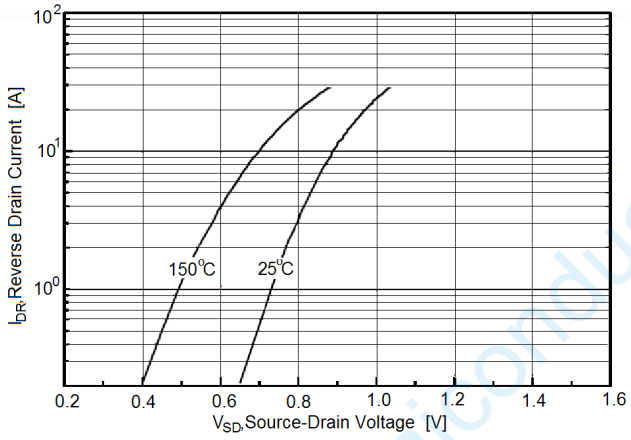



**Figure4. Static drain-source on resistance**

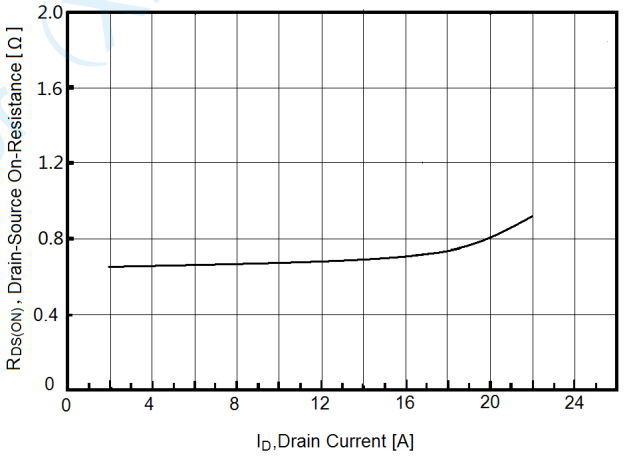



**Figure5. Transfer characteristics**

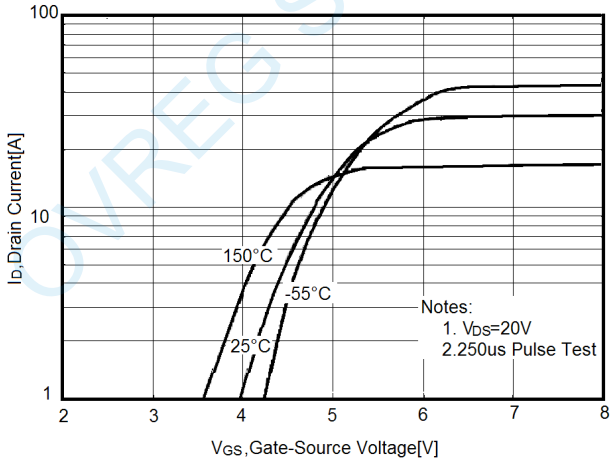
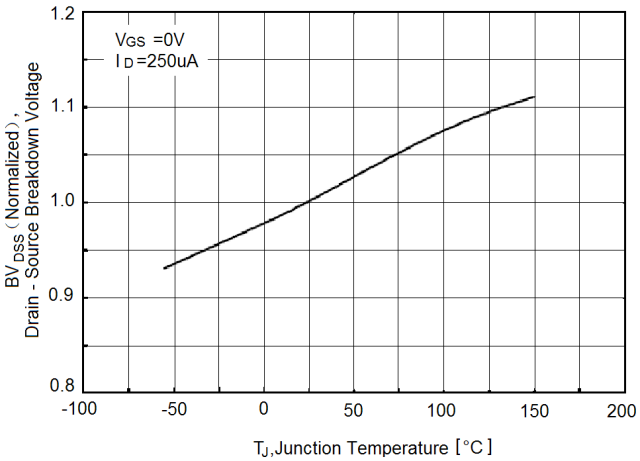



**Figure6. BVDSS vs Junction Temperature**




OVREG Semiconductor (Xi'an) Co.,Ltd.

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

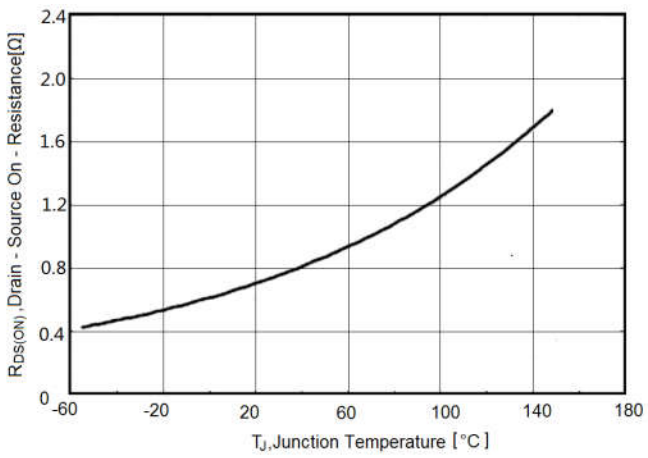



**Figure8. Maximum $I_D$ vs Junction Temperature**

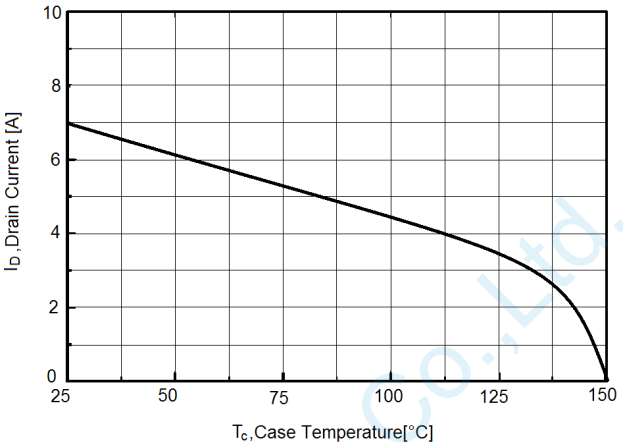



**Figure9. Transient Thermal Impedance**

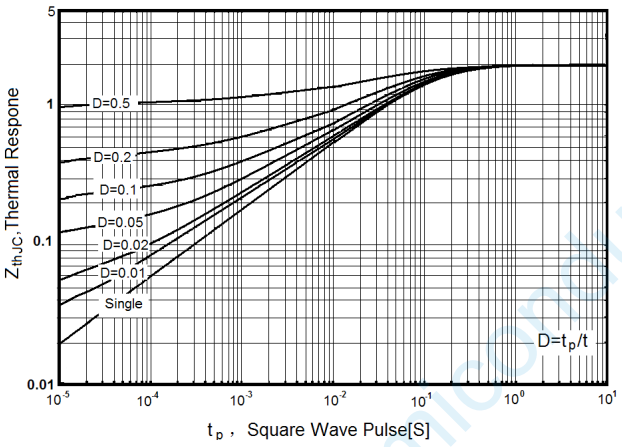



**Figure10. Capacitance**

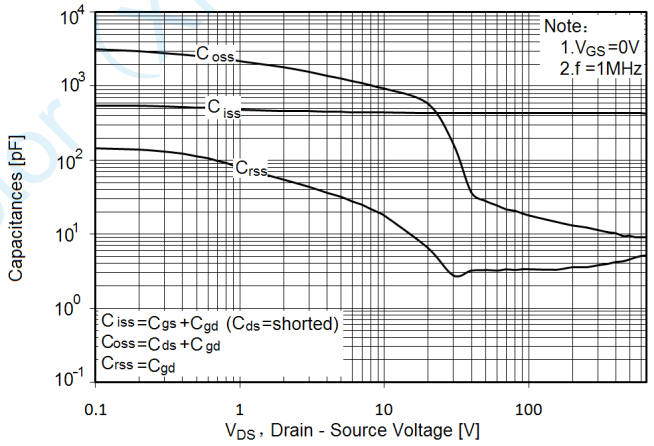
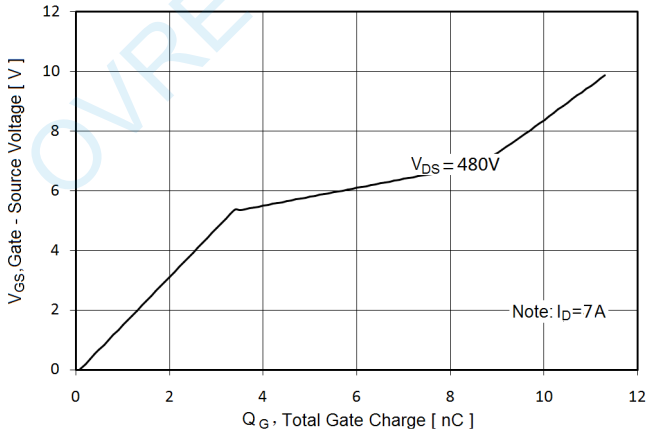


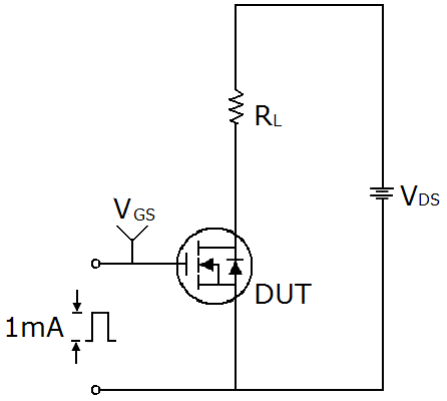

**Figure11. Gate charge waveforms**

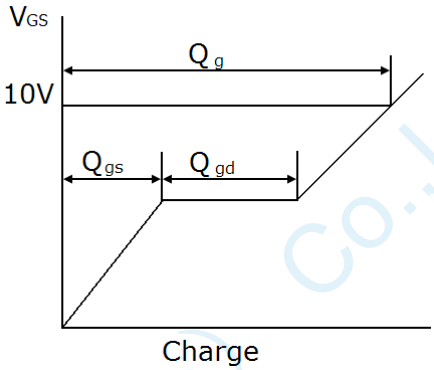



OVREG Semiconductor (Xi'an) Co.,Ltd.

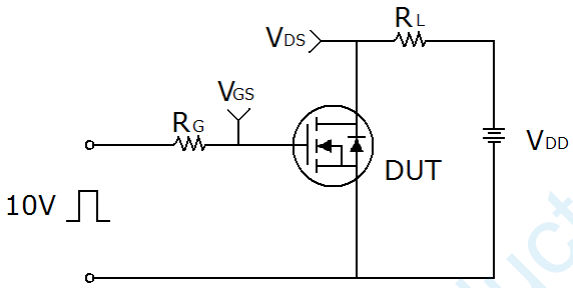
# Test circuit

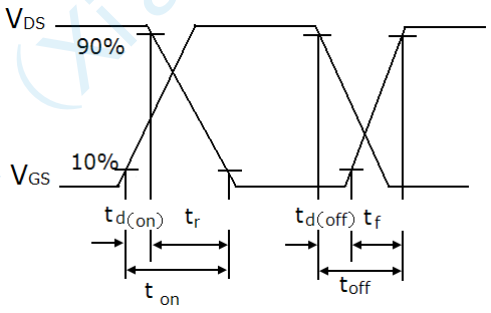
### 1）Gate charge test circuit & Waveform



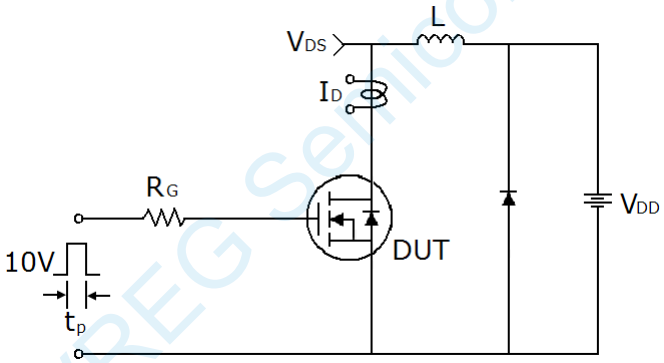



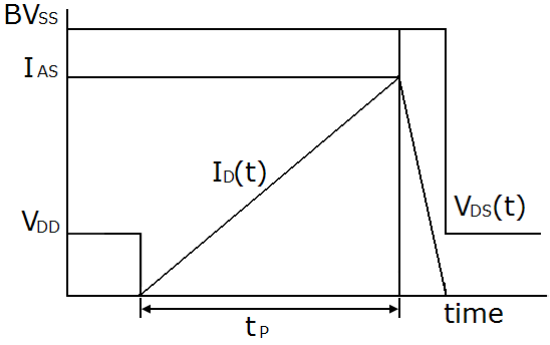

### 2）Switch Time Test Circuit:




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

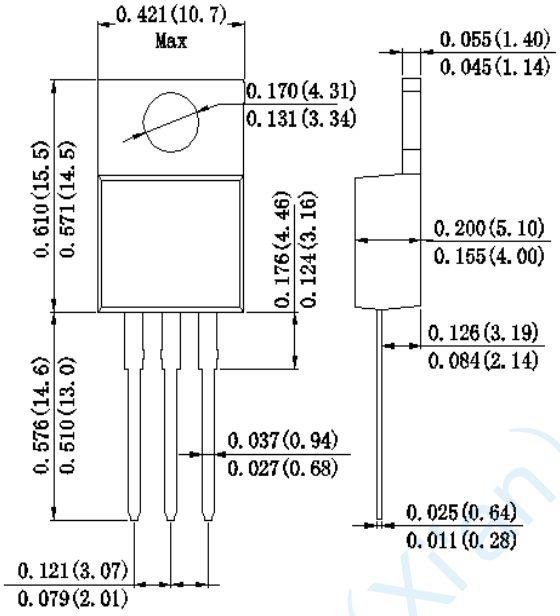


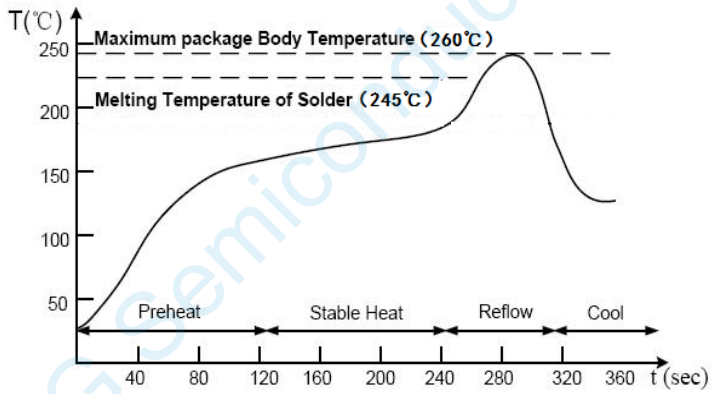

OVREG Semiconductor (Xi'an) Co.,Ltd.

# Package Information

TO-220AB




# Suggested Soldering Temperature Profile




**Note**

- Recommended reflow methods: IR, vapor phase oven, hot air oven, wave solder.
- The device can be exposed to a maximum temperature of 260°C for 10 seconds.
- Devices can be cleaned using standard industry methods and solvents.
- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

# Ordering Information

| Package | Tube (mm) | Q'TY/Tube (Kpcs) | Box Size (mm) | QTY/Box (Kpcs) | Carton Size (mm) | Q'TY/Carton (Kpcs) |
|---|---|---|---|---|---|---|
| TO-220AB | 525*31.9*6.4 | 0.05 | 545*150*45 | 1.0 | 575*245*170 | 5.0 |

OVREG Semiconductor (Xi'an) Co.,Ltd.