

## N-channel Enhancement Mode Power MOSFET

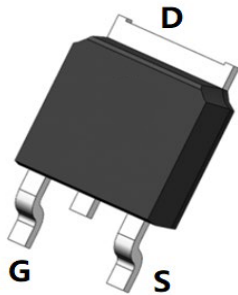
### Features

- $V_{DS} = 60V$ ,  $I_D = 50A$   
 $R_{DS(ON)} < 12\ m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(ON)} < 16\ m\Omega$  @  $V_{GS} = 4.5V$

### General Features

- Advanced Trench Technology
- Provide Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead Free and Green Available

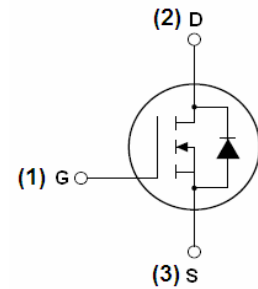
100% UIS TESTED!  
 100%  $\Delta V_{ds}$  TESTED!



TO-252-2L Top View



Pin Assignment



Schematic Diagram

### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise noted)

| Parameter                                         | Symbol             | Limit      | Unit          |
|---------------------------------------------------|--------------------|------------|---------------|
| Drain-Source Voltage                              | $V_{DS}$           | 60         | V             |
| Gate-Source Voltage                               | $V_{GS}$           | $\pm 20$   | V             |
| Drain Current-Continuous                          | $I_D$              | 50         | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )   | $I_D(100^\circ C)$ | 35.4       | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 200        | A             |
| Maximum Power Dissipation                         | $P_D$              | 85         | W             |
| Derating factor                                   |                    | 0.57       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 200        | mJ            |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$     | -55 To 175 | $^\circ C$    |

### Thermal Characteristic

|                                                          |                 |     |              |
|----------------------------------------------------------|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 1.8 | $^\circ C/W$ |
|----------------------------------------------------------|-----------------|-----|--------------|

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

| Parameter                                 | Symbol       | Condition                                                                    | Min | Typ  | Max       | Unit       |
|-------------------------------------------|--------------|------------------------------------------------------------------------------|-----|------|-----------|------------|
| <b>Off Characteristics</b>                |              |                                                                              |     |      |           |            |
| Drain-Source Breakdown Voltage            | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                                    | 60  | -    | -         | V          |
| Zero Gate Voltage Drain Current           | $I_{DSS}$    | $V_{DS}=60V, V_{GS}=0V$                                                      | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                                  | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |                                                                              |     |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                                | 1.0 |      | 3.0       | V          |
| Drain-Source On-State Resistance          | $R_{DS(on)}$ | $V_{GS}=10V, I_D=20A$                                                        | -   | 12   |           | m $\Omega$ |
|                                           |              | $V_{GS}=4.5V, I_D=20A$                                                       | -   | 16   |           | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=20A$                                                         | 18  | -    | -         | S          |
| <b>Dynamic Characteristics</b> (Note 4)   |              |                                                                              |     |      |           |            |
| Input Capacitance                         | $C_{iss}$    | $V_{DS}=30V, V_{GS}=0V,$<br>$F=1.0\text{MHz}$                                | -   | 1630 | -         | PF         |
| Output Capacitance                        | $C_{oss}$    |                                                                              | -   | 113  | -         | PF         |
| Reverse Transfer Capacitance              | $C_{rss}$    |                                                                              | -   | 97   | -         | PF         |
| <b>Switching Characteristics</b> (Note 4) |              |                                                                              |     |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=30V, R_L=6.7\Omega$<br>$V_{GS}=5V, R_G=3\Omega$                      | -   | 15   | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |                                                                              | -   | 20   | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |                                                                              | -   | 120  | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |                                                                              | -   | 15.6 | -         | nS         |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=30V, R_L=6.7\Omega$<br>$V_{GS}=10V, R_G=3\Omega$                     | -   | 7.4  | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |                                                                              | -   | 5.1  | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |                                                                              | -   | 28.2 | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |                                                                              | -   | 5.5  | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=30V, I_D=20A,$<br>$V_{GS}=10V$                                       | -   | 39   |           | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |                                                                              | -   | 7    |           | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |                                                                              | -   | 8.5  |           | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |                                                                              |     |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=20A$                                                         | -   |      | 1.2       | V          |
| Diode Forward Current (Note 2)            | $I_S$        |                                                                              | -   | -    | 50        | A          |
| Reverse Recovery Time                     | $t_{rr}$     | $T_J = 25^{\circ}\text{C}, I_F = 20A$<br>$di/dt = 100A/\mu\text{s}$ (Note 3) | -   | 28   | -         | nS         |
| Reverse Recovery Charge                   | $Q_{rr}$     |                                                                              | -   | 40   | -         | nC         |
| Forward Turn-On Time                      | $t_{on}$     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)         |     |      |           |            |

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$

Typical Electrical and Thermal Characteristics (Curves)

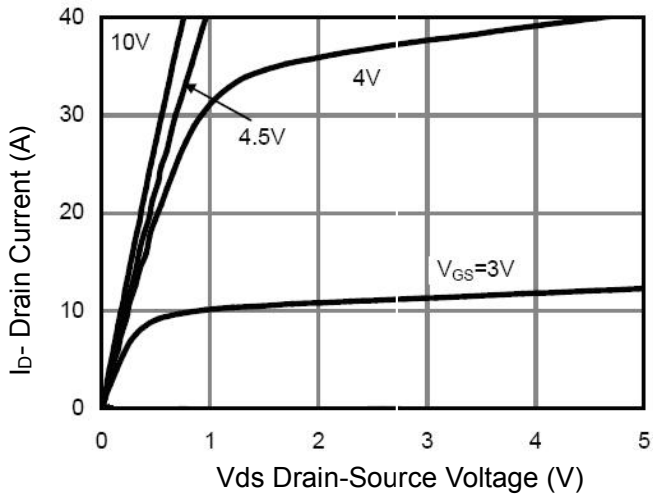


Figure 1 Output Characteristics

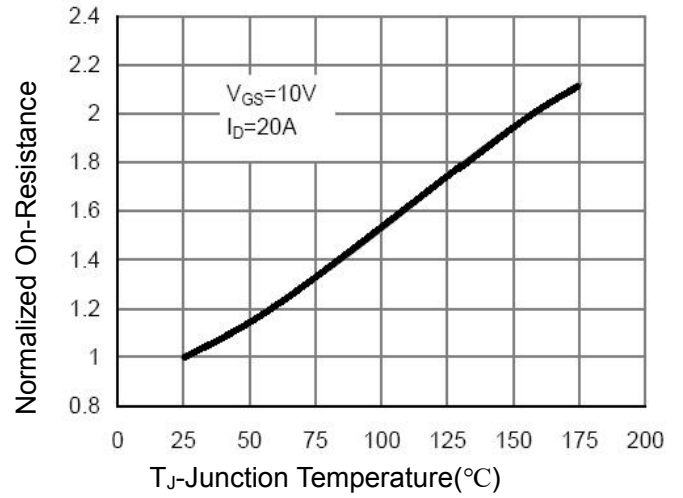


Figure 4 Rds(on)-Junction Temperature

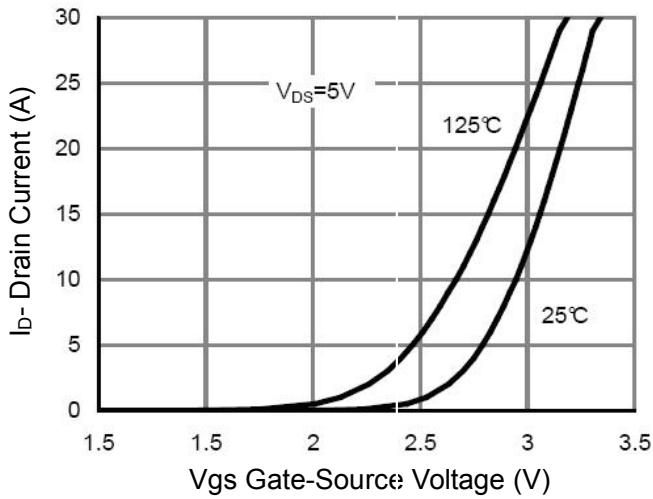


Figure 2 Transfer Characteristics

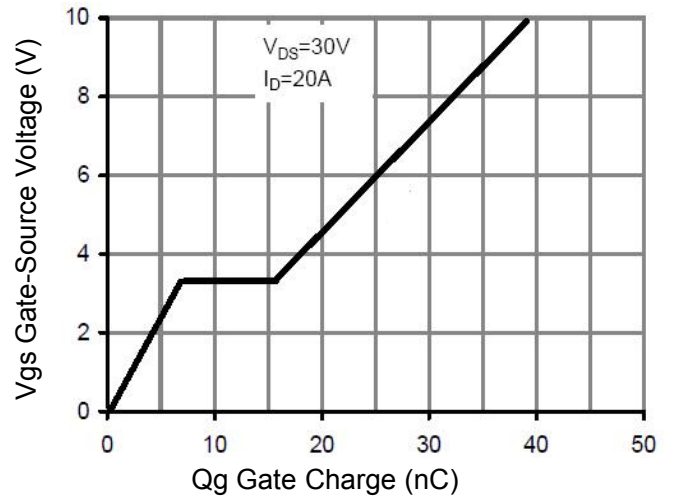


Figure 5 Gate Charge

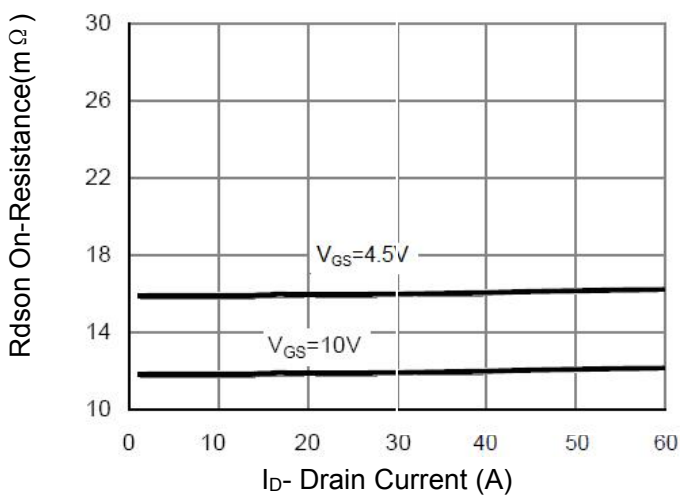


Figure 3 Rds(on)- Drain Current

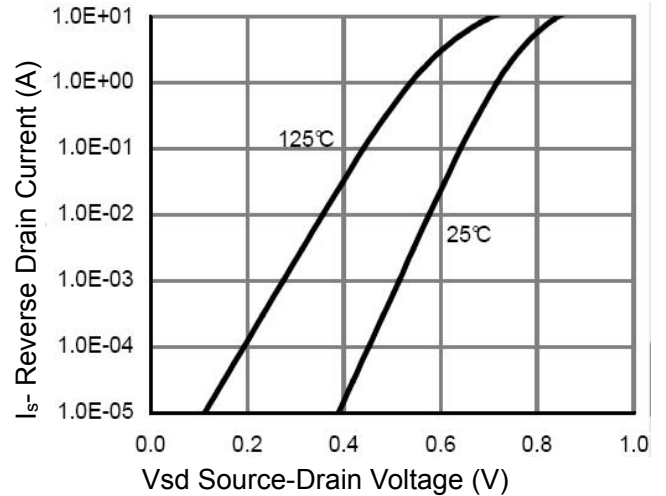


Figure 6 Source- Drain Diode Forward

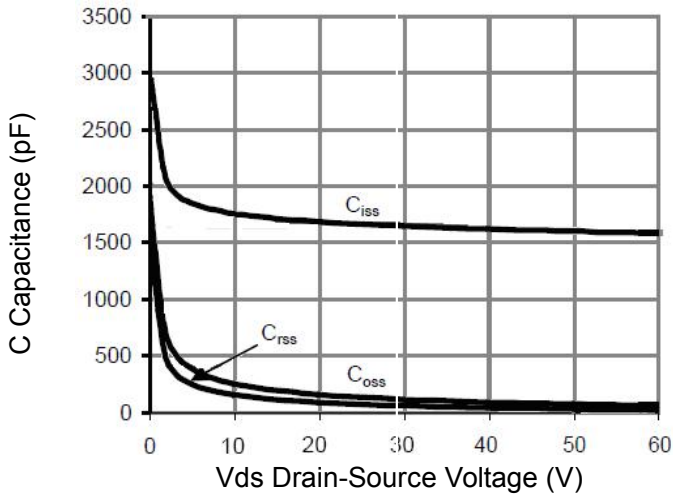


Figure 7 Capacitance vs Vds

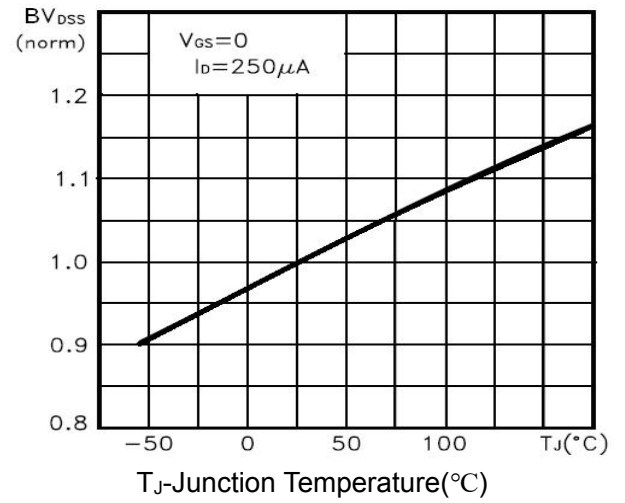


Figure 9  $BV_{DSS}$  vs Junction Temperature

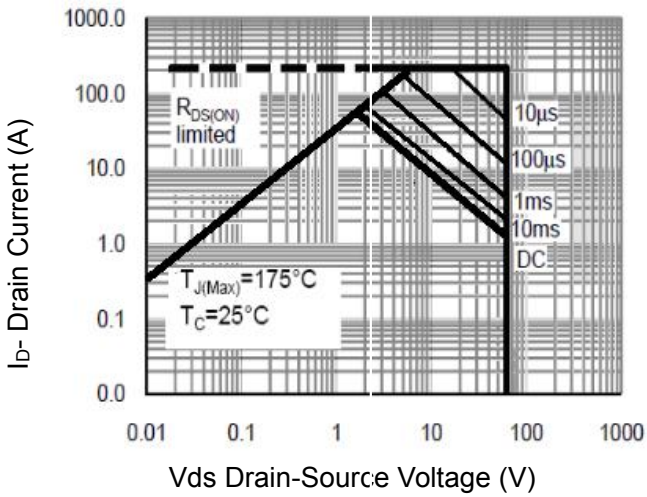


Figure 8 Safe Operation Area

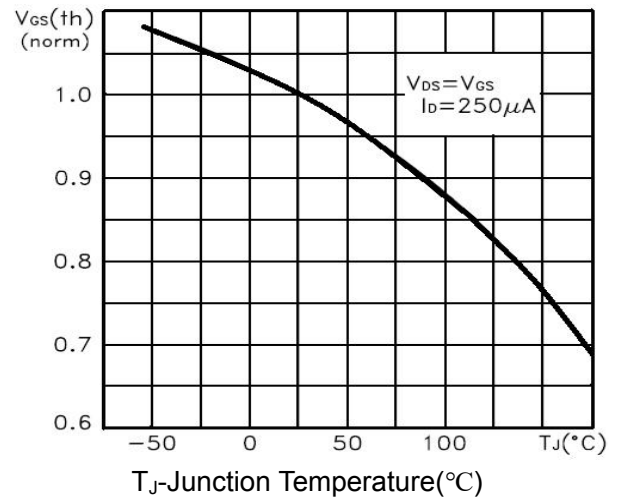


Figure 10  $V_{GS(th)}$  vs Junction Temperature

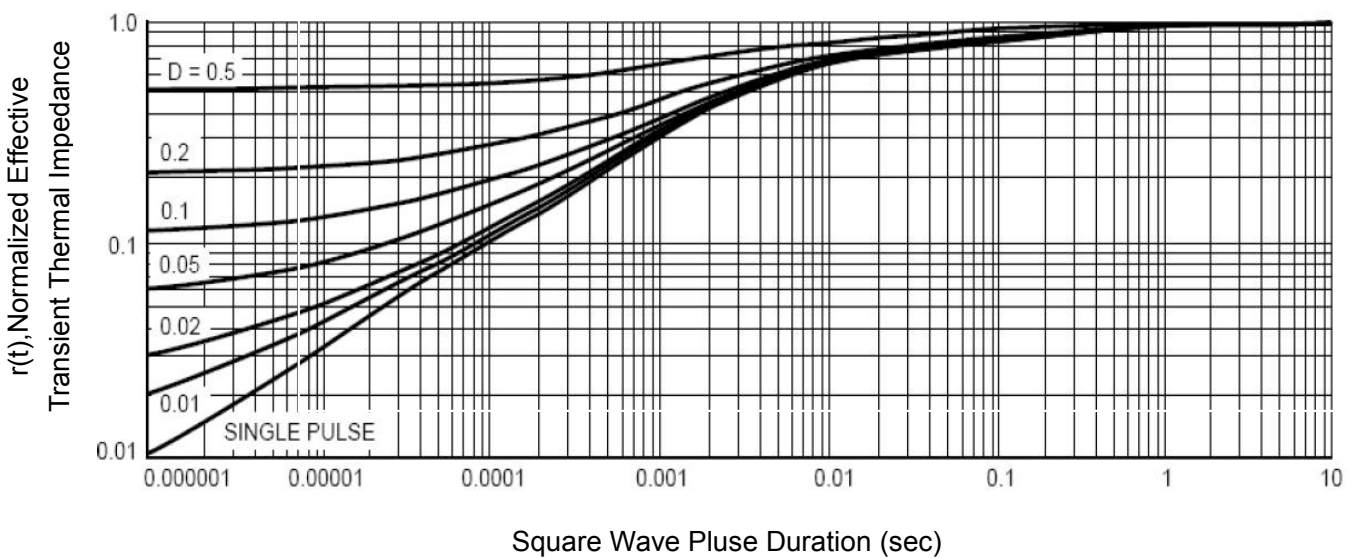


Figure 11 Normalized Maximum Transient Thermal Impedance