

## N-channel Enhancement Mode Power MOSFET

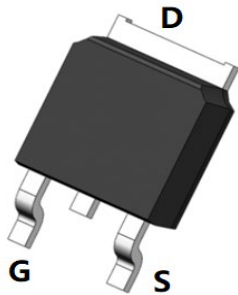
### Features

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

### General Features

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

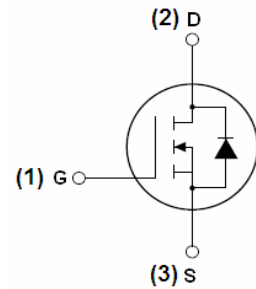
100% UIS TESTED!  
100%  $\Delta V_{ds}$  TESTED!



TO-252-2L Top View



Pin Assignment



Schematic Diagram

### Absolute Maximum Ratings ( $T_C = 25^\circ\text{C}$ 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( $T_C = 100^\circ\text{C}$ ) | $I_D(100^\circ\text{C})$ | 35.4       | A                   |
| Pulsed Drain Current                                  | $I_{DM}$                 | 200        | A                   |
| Maximum Power Dissipation                             | $P_D$                    | 85         | W                   |
| Derating factor                                       |                          | 0.57       | W/ $^\circ\text{C}$ |
| 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 | $^\circ\text{C}$    |

### Thermal Characteristic

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

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

| Parameter                           |  | Symbol              | Condition                                                                              | Min | Typ  | Max  | Unit |
|-------------------------------------|--|---------------------|----------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                 |  |                     |                                                                                        |     |      |      |      |
| Drain-Source Breakdown Voltage      |  | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                              | 60  | -    | -    | V    |
| Zero Gate Voltage Drain Current     |  | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V                                              | -   | -    | 1    | μA   |
| Gate-Body Leakage Current           |  | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                             | -   | -    | ±100 | nA   |
| On Characteristics (Note 3)         |  |                     |                                                                                        |     |      |      |      |
| Gate Threshold Voltage              |  | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               | 1.0 |      | 3.0  | V    |
| Drain-Source On-State Resistance    |  | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                              | -   | 12   |      | mΩ   |
|                                     |  |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                             | -   | 16   |      | mΩ   |
| Forward Transconductance            |  | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                               | 18  | -    | -    | S    |
| Dynamic Characteristics (Note4)     |  |                     |                                                                                        |     |      |      |      |
| Input Capacitance                   |  | C <sub>iss</sub>    | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                 | -   | 1630 | -    | PF   |
| Output Capacitance                  |  | C <sub>oss</sub>    |                                                                                        | -   | 113  | -    | PF   |
| Reverse Transfer Capacitance        |  | C <sub>rss</sub>    |                                                                                        | -   | 97   | -    | PF   |
| Switching Characteristics (Note 4.) |  |                     |                                                                                        |     |      |      |      |
| Turn-on Delay Time                  |  | t <sub>d(on)</sub>  | V <sub>DD</sub> =30V, R <sub>L</sub> =6.7Ω<br>V <sub>GS</sub> =5V, R <sub>G</sub> =3Ω  | -   | 15   | -    | nS   |
| Turn-on Rise Time                   |  | t <sub>r</sub>      |                                                                                        | -   | 20   | -    | nS   |
| Turn-Off Delay Time                 |  | t <sub>d(off)</sub> |                                                                                        | -   | 120  | -    | nS   |
| Turn-Off Fall Time                  |  | t <sub>f</sub>      |                                                                                        | -   | 15.6 | -    | nS   |
| Turn-on Delay Time                  |  | t <sub>d(on)</sub>  | V <sub>DD</sub> =30V, R <sub>L</sub> =6.7Ω<br>V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω | -   | 7.4  | -    | nS   |
| Turn-on Rise Time                   |  | t <sub>r</sub>      |                                                                                        | -   | 5.1  | -    | nS   |
| Turn-Off Delay Time                 |  | t <sub>d(off)</sub> |                                                                                        | -   | 28.2 | -    | nS   |
| Turn-Off Fall Time                  |  | t <sub>f</sub>      |                                                                                        | -   | 5.5  | -    | nS   |
| Total Gate Charge                   |  | Q <sub>g</sub>      | V <sub>DS</sub> =30V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =10V                     | -   | 39   |      | nC   |
| Gate-Source Charge                  |  | Q <sub>gs</sub>     |                                                                                        | -   | 7    |      | nC   |
| Gate-Drain Charge                   |  | Q <sub>gd</sub>     |                                                                                        | -   | 8.5  |      | nC   |
| Drain-Source Diode Characteristics  |  |                     |                                                                                        |     |      |      |      |
| Diode Forward Voltage (Note 3)      |  | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =20A                                               | -   |      | 1.2  | V    |
| Diode Forward Current (Note 2)      |  | I <sub>S</sub>      |                                                                                        | -   | -    | 50   | A    |
| Reverse Recovery Time               |  | t <sub>rr</sub>     | TJ = 25°C, IF =20A                                                                     | -   | 28   | -    | nS   |
| Reverse Recovery Charge             |  | Q <sub>rr</sub>     | di/dt = 100A/μs (Note3)                                                                | -   | 40   | -    | nC   |
| Forward Turn-On Time                |  | t <sub>on</sub>     | 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  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25\Omega$

## Typical Electrical and Thermal Characteristics (Curves)

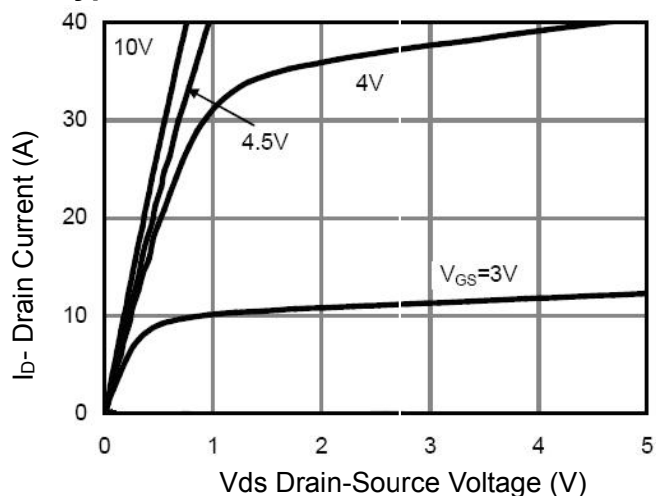


Figure 1 Output Characteristics

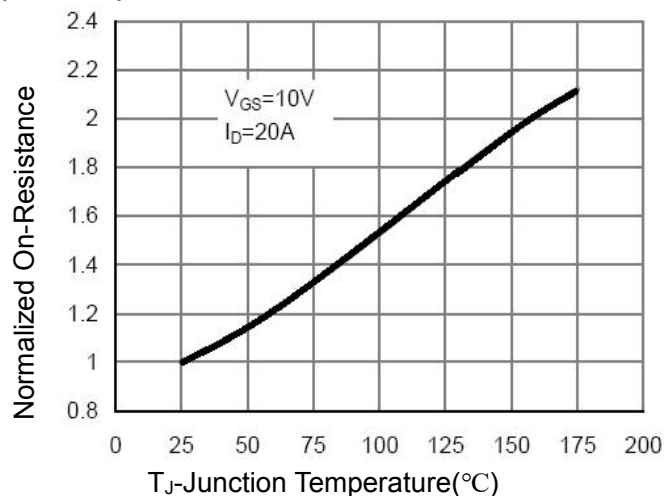


Figure 4  $R_{DS(on)}$ -Junction Temperature

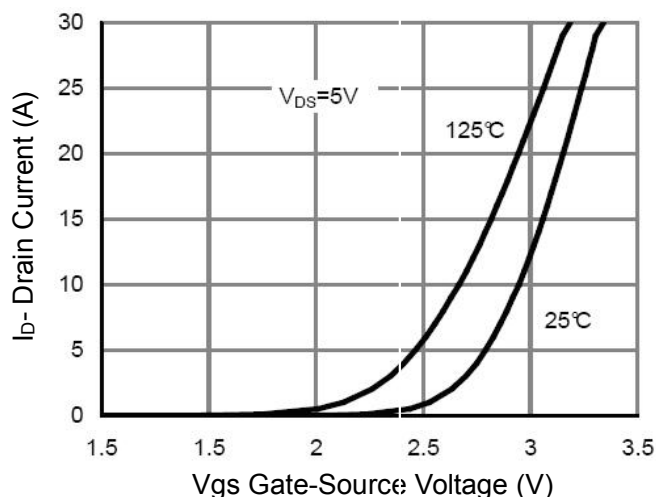


Figure 2 Transfer Characteristics

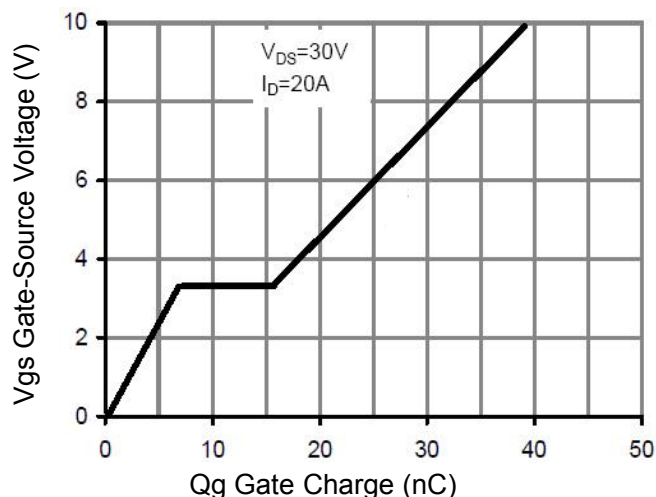


Figure 5 Gate Charge

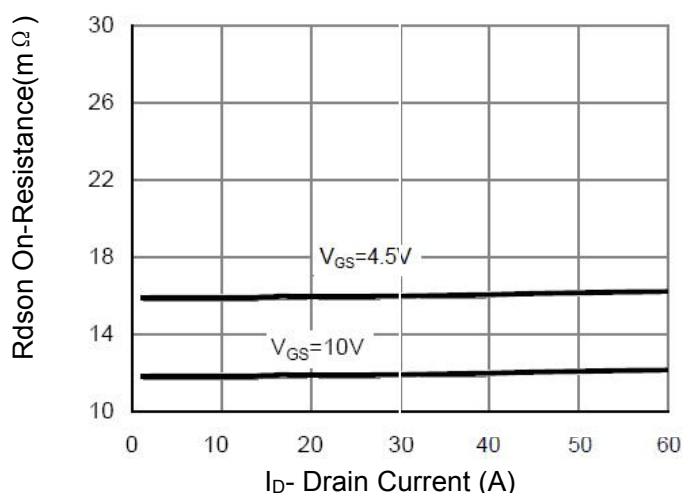


Figure 3  $R_{DS(on)}$ - Drain Current

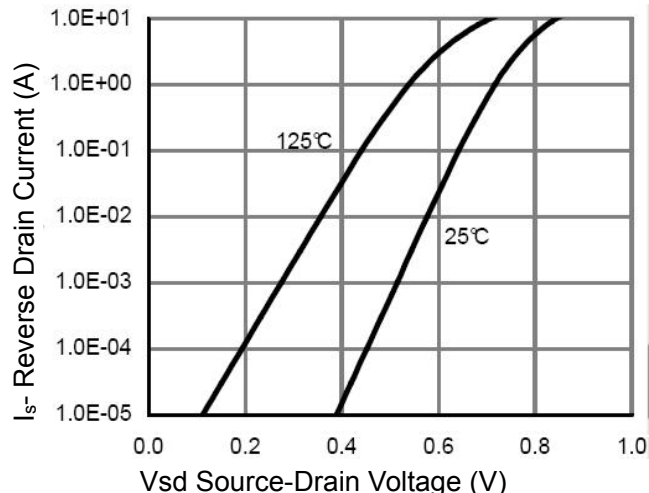


Figure 6 Source- Drain Diode Forward

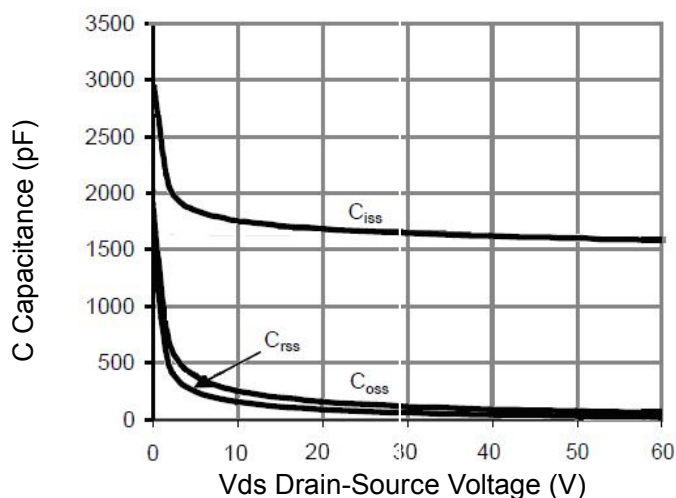


Figure 7 Capacitance vs Vds

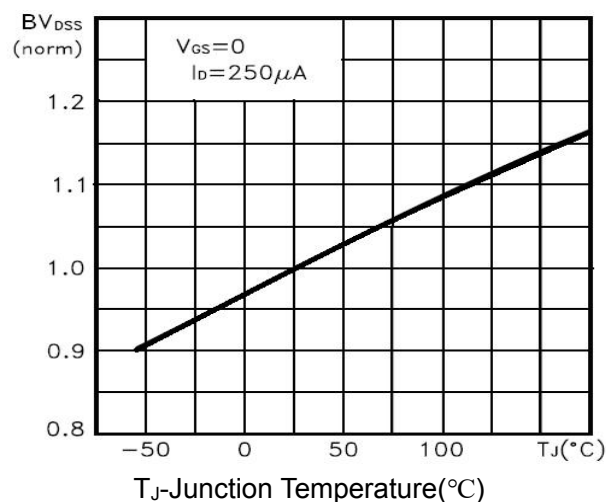


Figure 9  $BV_{DSS}$  vs Junction Temperature

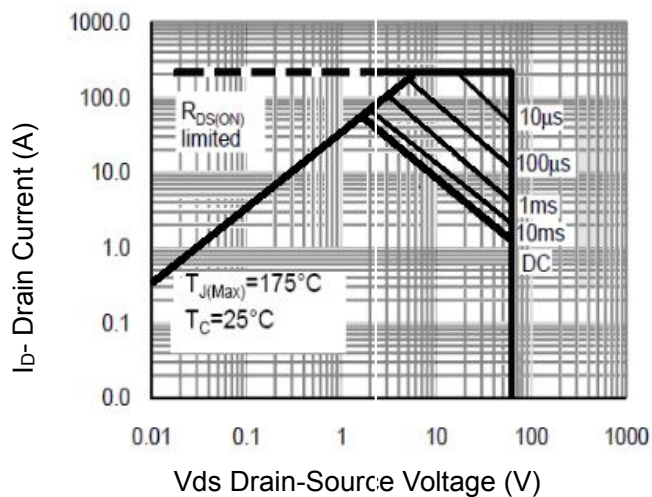


Figure 8 Safe Operation Area

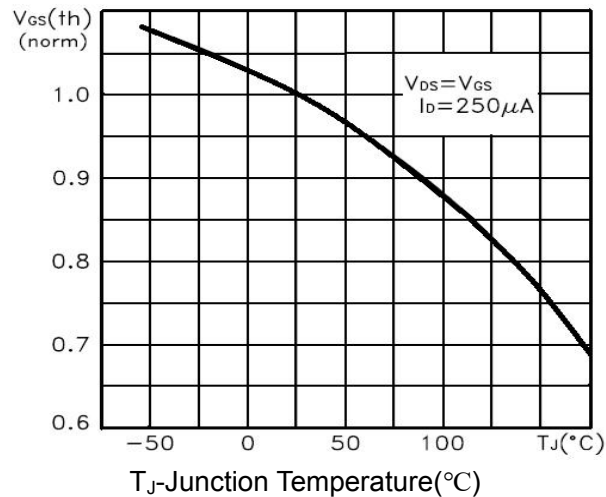


Figure 10  $V_{GS(th)}$  vs Junction Temperature

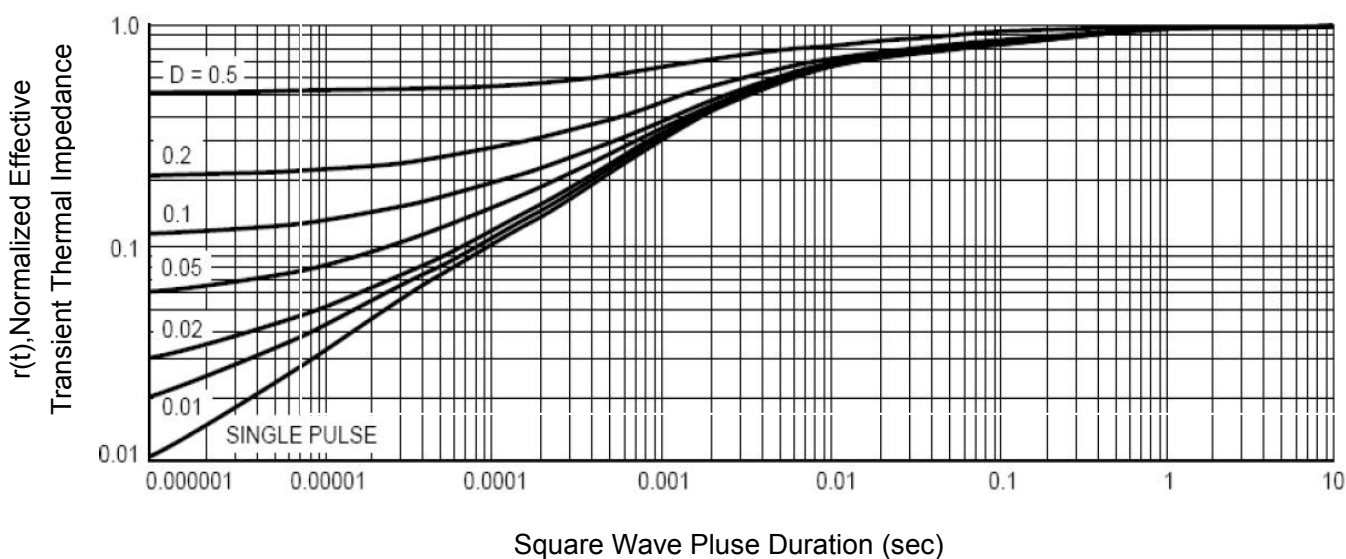


Figure 11 Normalized Maximum Transient Thermal Impedance