

**Features**

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Green Device Available

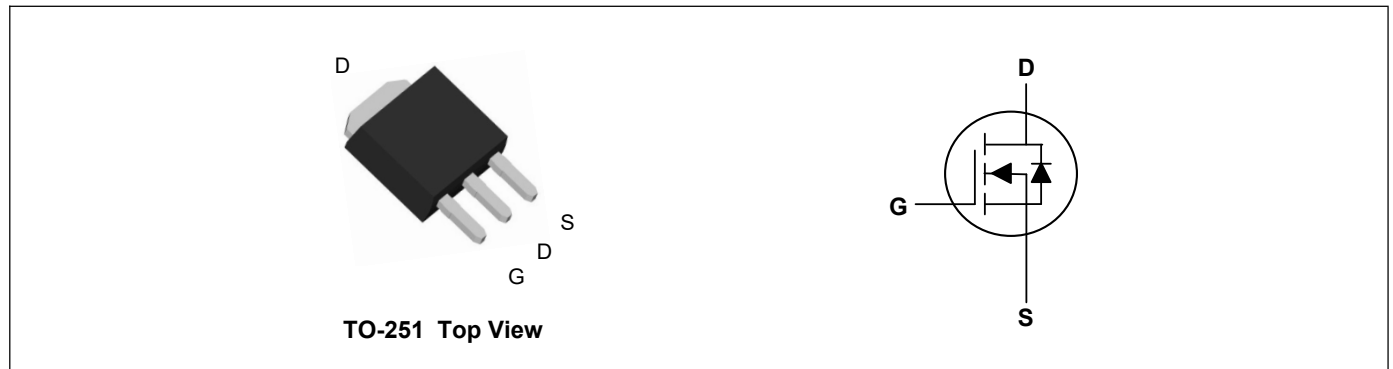
**Product Summary**



|                                  |     |            |
|----------------------------------|-----|------------|
| $V_{DS}$                         | 40  | V          |
| $I_D$                            | 120 | A          |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | 4   | m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | 7   | m $\Omega$ |

**Applications**

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switching



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

| Parameter                                  | Symbol                | Rating     | Units         |
|--|-----------------------|------------|---------------|
| Drain-Source Voltage                       | $V_{DS}$              | 40         | V             |
| Gate-Source Voltage                        | $V_{GS}$              | $\pm 20$   | V             |
| Continuous Drain Current                   | $I_D@T_C=25^\circ C$  | 120        | A             |
| Continuous Drain Current                   | $I_D@T_C=100^\circ C$ | 85         | A             |
| Pulsed Drain Current                       | $I_{DM}$              | 330        | A             |
| Single Pulse Avalanche Energy <sup>3</sup> | EAS                   | 1080       | mJ            |
| Total Power Dissipation                    | $P_D@T_C=25^\circ C$  | 120        | W             |
| Derating factor                            |                       | 0.8        | W/ $^\circ C$ |
| Storage Temperature Range                  | $T_{STG}$             | -55 to 175 | $^\circ C$    |
| Operating Junction Temperature Range       | $T_J$                 | -55 to 175 | $^\circ C$    |

**Thermal Characteristics**

| Parameter                                     | Symbol          | Typ | Max  | Unit         |
|---|-----------------|-----|------|--------------|
| Thermal Resistance Junction-Case <sup>1</sup> | $R_{\theta JC}$ | --- | 1.25 | $^\circ C/W$ |

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Parameter                         | Symbol              | Conditions  | Min | Typ  | Max  | Unit |
|-----------------------------------|---------------------|---|-----|------|------|------|
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA  | 40  | ---  | ---  | V    |
| Static Drain-Source On-Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A   | --- | 3.6  | 4.0  | mΩ   |
|                                   |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A  | --- | 5.8  | 7.0  | mΩ   |
| Gate Threshold Voltage            | V <sub>GS(th)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA  | 1.2 | ---  | 2.5  | V    |
| Drain-Source Leakage Current      | I <sub>DSS</sub>    | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C   | --- | ---  | 1    | uA   |
| Gate-Source Leakage Current       | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  | --- | ---  | ±100 | nA   |
| Forward Transconductance          | g <sub>fs</sub>     | V <sub>DS</sub> =10V, I <sub>D</sub> =20A   | 26  | ---  | ---  | S    |
| Total Gate Charge                 | Q <sub>g</sub>      | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A   | --- | 75   | ---  | nC   |
| Gate-Source Charge                | Q <sub>gs</sub>     |   | --- | 10.5 | ---  |      |
| Gate-Drain Charge                 | Q <sub>gd</sub>     |   | --- | 17   | ---  |      |
| Turn-On Delay Time                | T <sub>d(on)</sub>  | V <sub>DD</sub> =20V, I <sub>D</sub> =2A, R <sub>L</sub> =1Ω,<br>V <sub>GS</sub> =10V, R <sub>G</sub> =3Ω | --- | 15   | ---  | ns   |
| Rise Time                         | T <sub>r</sub>      |   | --- | 18   | ---  |      |
| Turn-Off Delay Time               | T <sub>d(off)</sub> |   | --- | 52   | ---  |      |
| Fall Time                         | T <sub>f</sub>      |   | --- | 23   | ---  |      |
| Input Capacitance                 | C <sub>iss</sub>    | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz   | --- | 5400 | ---  | pF   |
| Output Capacitance                | C <sub>oss</sub>    |   | --- | 970  | ---  |      |
| Reverse Transfer Capacitance      | C <sub>rss</sub>    |   | --- | 380  | ---  |      |

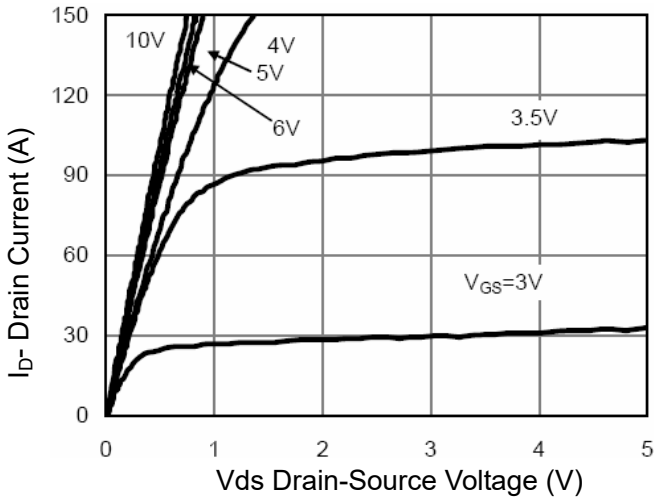
**Drain-Source Diode Characteristics**

| Parameter                              | Symbol          | Conditions   | Min | Typ | Max | Unit |
|--|-----------------|--|-----|-----|-----|------|
| Continuous Source Current <sup>1</sup> | I <sub>S</sub>  |  | --- | --- | 120 | A    |
| Diode Forward Voltage <sup>2</sup>     | V <sub>SD</sub> | V <sub>GS</sub> =0V, I <sub>S</sub> =40A, T <sub>J</sub> =25°C | --- | --- | 1.2 | V    |
| Reverse Recovery Time                  | t <sub>rr</sub> | I <sub>F</sub> =40A, di/dt=100A/μs,<br>T <sub>J</sub> =25°C    | --- | 42  | --- | nS   |
| Reverse Recovery Charge                | Q <sub>rr</sub> |  | --- | 45  | --- | nC   |

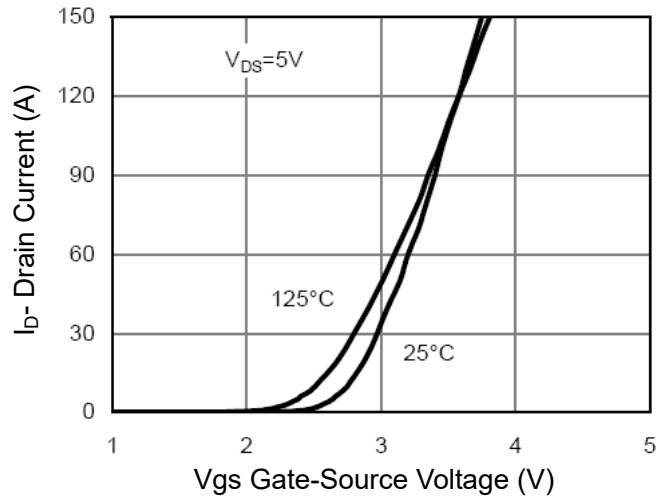
**Note:**

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=20V, V<sub>GS</sub>=10V, L=1mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=46.5A

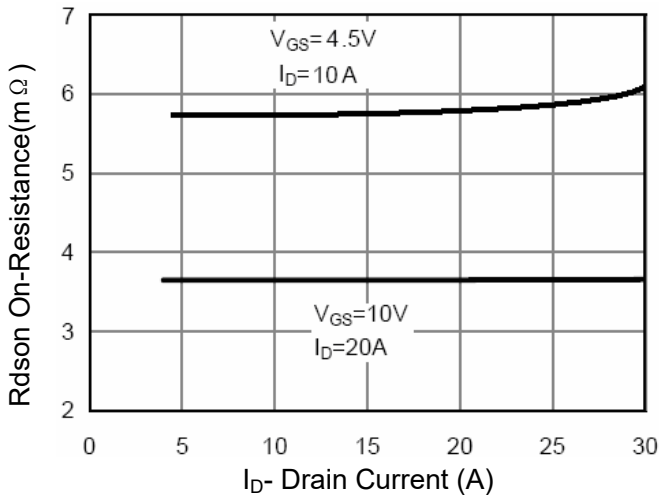
**Typical Characteristics**



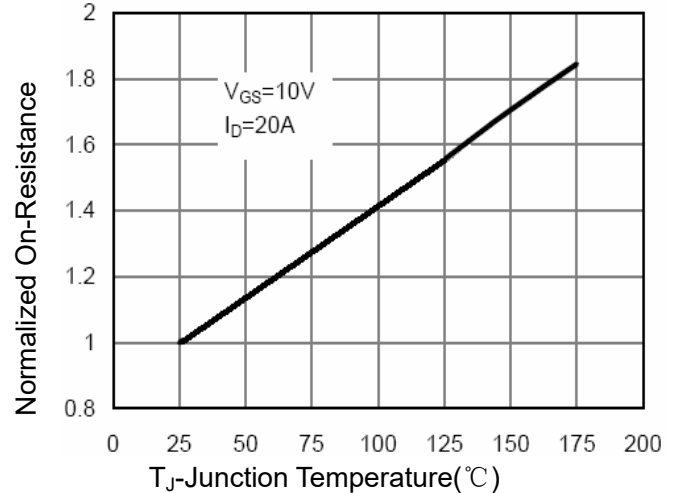
**Figure 1 Output Characteristics**



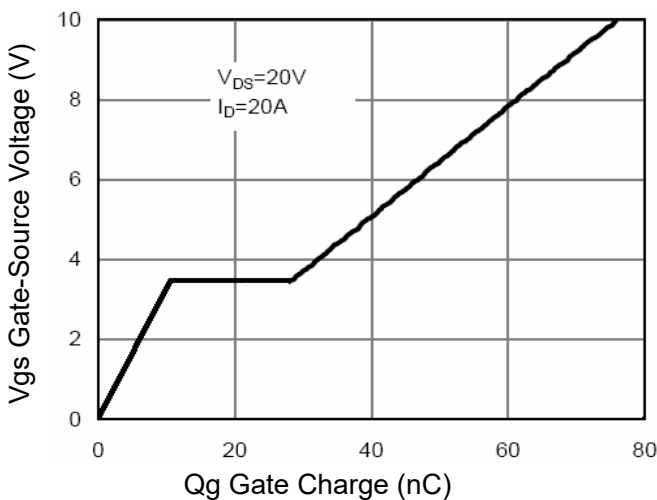
**Figure 2 Transfer Characteristics**



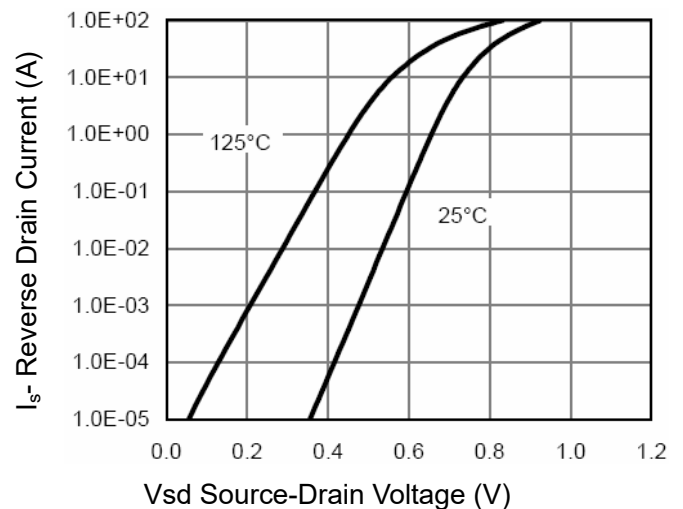
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

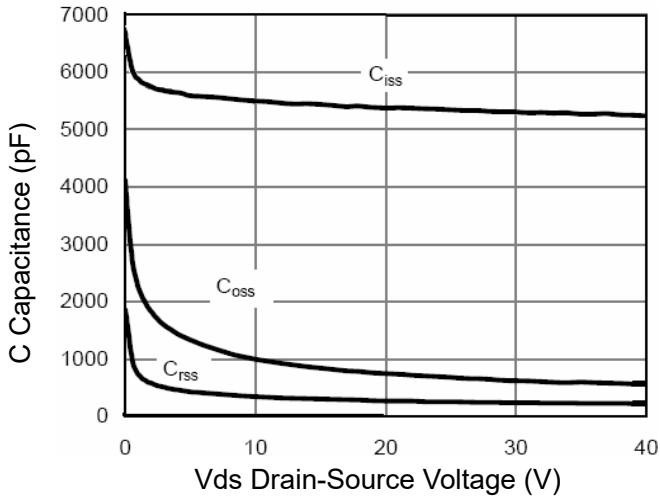


Figure 7 Capacitance vs Vds

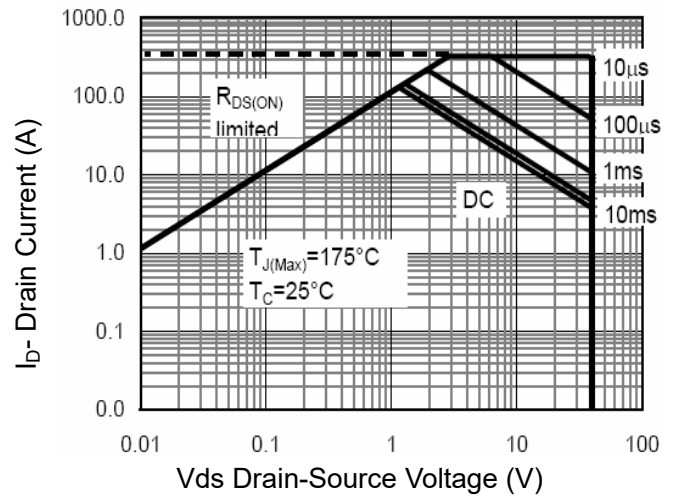


Figure 8 Safe Operation Area

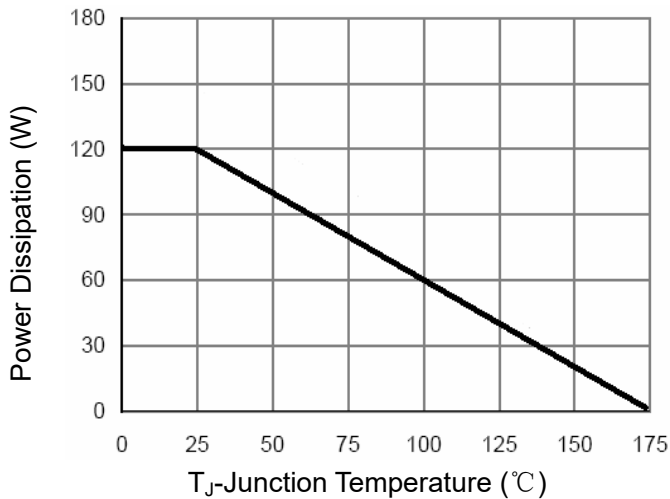


Figure 9 Power De-rating

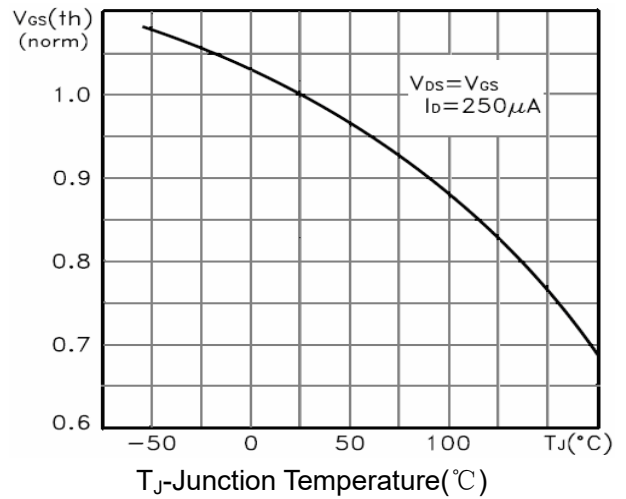


Figure 10  $V_{GS(th)}$  vs Junction Temperature

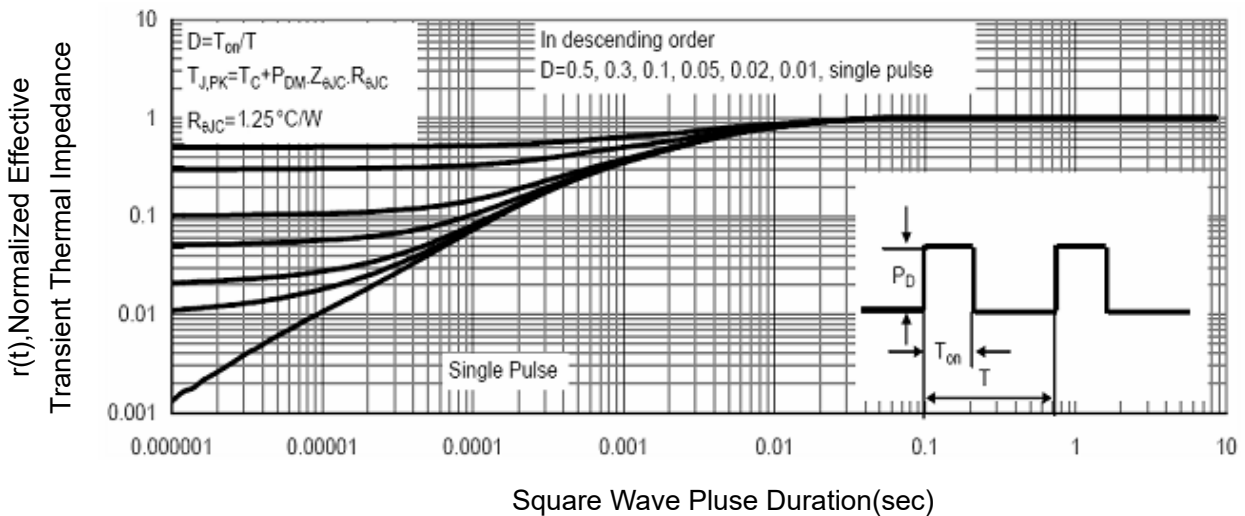
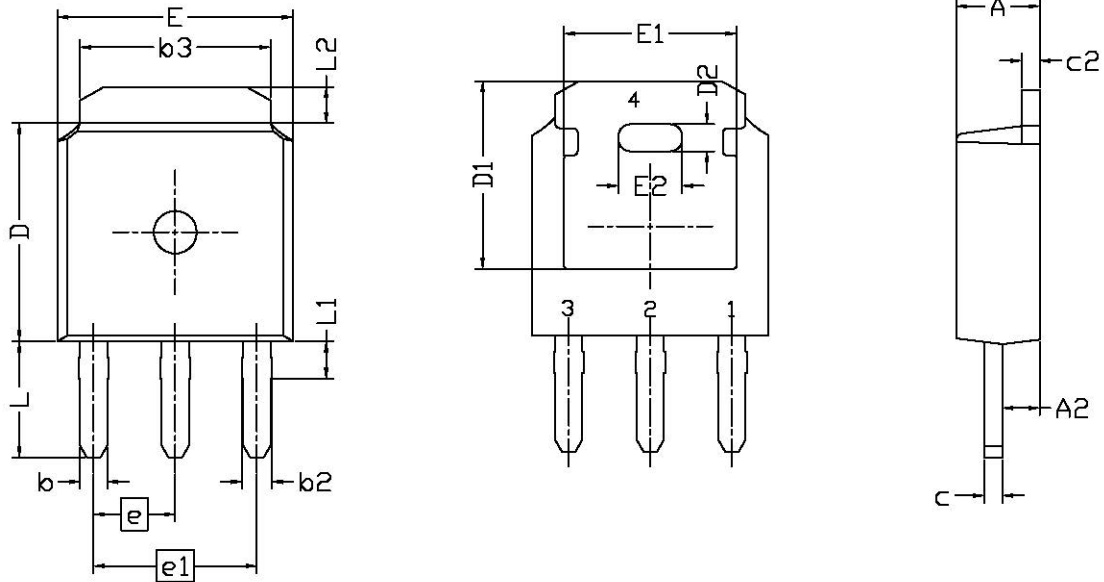


Figure 11 Normalized Maximum Transient Thermal Impedance

**TO-251 Package Outline Dimensions**



| Symbol    | Dimensions (unit:mm) |      |      | Symbol    | Dimensions (unit:mm) |      |      |
|-----------|----------------------|------|------|-----------|----------------------|------|------|
|           | Min                  | Typ  | Max  |           | Min                  | Typ  | Max  |
| <b>A</b>  | 2.20                 | 2.30 | 2.39 | <b>A2</b> | 0.90                 | 1.00 | 1.14 |
| <b>b</b>  | 0.63                 | 0.76 | 0.85 | <b>b2</b> | 0.76                 | 0.85 | 1.05 |
| <b>b3</b> | 5.10                 | 5.40 | 5.60 | <b>C</b>  | 0.46                 | 0.51 | 0.61 |
| <b>C2</b> | 0.46                 | 0.51 | 0.61 | <b>D</b>  | 5.90                 | 6.10 | 6.30 |
| <b>D1</b> | 5.25 REF             |      |      | <b>D2</b> | 0.508 BSC            |      |      |
| <b>E</b>  | 6.35                 | 6.55 | 6.70 | <b>E1</b> | 5.06 REF             |      |      |
| <b>E2</b> | 1.524 BSC            |      |      | <b>e</b>  | 2.29 BSC             |      |      |
| <b>e1</b> | 4.57 BSC             |      |      | <b>L</b>  | 3.70                 | 4.00 | 4.40 |
| <b>L1</b> | 1.15 REF             |      |      | <b>L2</b> | 0.90                 | 1.06 | 1.20 |