

## Features

- $V_{DS} = -40V$   $I_D = -80A$
- $R_{DS(ON)} < -10m\Omega$  @  $V_{GS} = -10V$  (Type: 6.5m $\Omega$ )

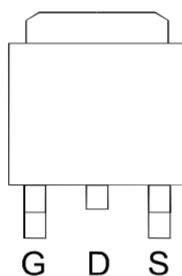
## Application

- Load/Power Switching
- Interfacing Switching
- Battery Management for Ultra Small Portable Electronics
- Logic Level Shift

## Package and Pin Configuration

(TO-252-3L)

Top View



Marking:



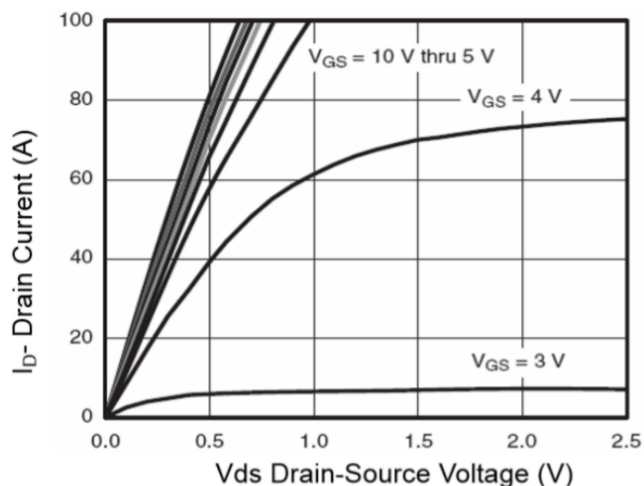
## Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

| Symbol                    | Parameter                                        | Rating     | Units        |
|---------------------------|--------------------------------------------------|------------|--------------|
| $V_{DS}$                  | Drain-Source Voltage                             | -40        | V            |
| $V_{GS}$                  | Gate-Source Voltage                              | $\pm 20$   | V            |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current, $V_{GS} @ -10V^1$      | -80        | A            |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$      | -56        | A            |
| $I_{DM}$                  | Pulsed Drain Current <sup>2</sup>                | -280       | A            |
| EAS                       | Single Pulse Avalanche Energy <sup>3</sup>       | 500        | mJ           |
| $I_{AS}$                  | Avalanche Current                                | -50        | A            |
| $P_D @ T_C = 25^\circ C$  | Total Power Dissipation <sup>4</sup>             | 52.1       | W            |
| $T_{STG}$                 | Storage Temperature Range                        | -55 to 150 | $^\circ C$   |
| $T_J$                     | Operating Junction Temperature Range             | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$           | Thermal Resistance Junction-Ambient <sup>1</sup> | 62         | $^\circ C/W$ |
| $R_{\theta JC}$           | Thermal Resistance Junction-Case <sup>1</sup>    | 2.4        | $^\circ C/W$ |

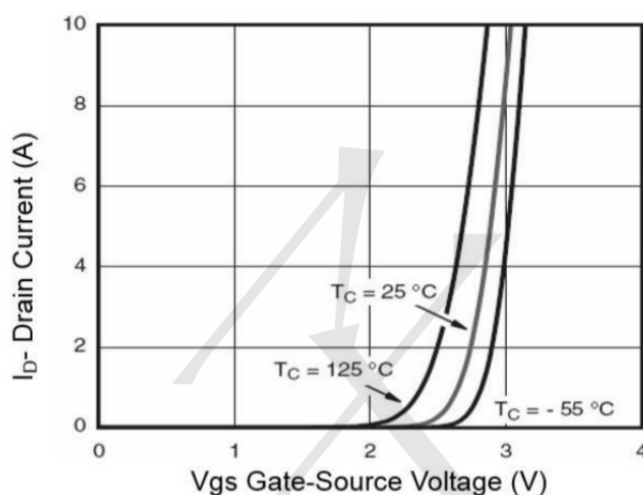
**Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

| Symbol                       | Parameter                                      | Conditions                                                         | Min. | Typ.   | Max.      | Unit                |
|------------------------------|------------------------------------------------|--------------------------------------------------------------------|------|--------|-----------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=-250\mu A$                                      | -40  |        | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=-1mA$                       | ---  | -0.023 | ---       | V/ $^\circ\text{C}$ |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=-10V$ , $I_D=-12A$                                         | ---  | 6.5    | 10        | m $\Omega$          |
|                              |                                                | $V_{GS}=-4.5V$ , $I_D=-12A$                                        | ---  | 8.5    | 15        |                     |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=-250\mu A$                                  | -1.2 | -1.8   | -2.5      | V                   |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=-40V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$               | ---  | ---    | 1         | $\mu A$             |
|                              |                                                | $V_{DS}=-40V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$               | ---  | ---    | 5         |                     |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                     | ---  | ---    | $\pm 100$ | nA                  |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=-15V$ , $I_D=-12A$                                         | ---  | 20     | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                               | ---  | 7      | 14        | $\Omega$            |
| $Q_g$                        | Total Gate Charge (-4.5V)                      | $V_{DS}=-20V$ , $V_{GS}=-10V$ ,<br>$I_D=-12A$                      | ---  | 27.9   | ---       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                                    | ---  | 7.7    | ---       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                                    | ---  | 7.5    | ---       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=-20V$ , $V_{GS}=-10V$ ,<br>$R_G=3.0\Omega$ ,<br>$I_D=-12A$ | ---  | 40     | ---       | ns                  |
| $T_r$                        | Rise Time                                      |                                                                    | ---  | 35.2   | ---       |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                                    | ---  | 100    | ---       |                     |
| $T_f$                        | Fall Time                                      |                                                                    | ---  | 9.6    | ---       |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=-20V$ , $V_{GS}=0V$ , $f=1MHz$                             | ---  | 6500   | ---       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                                    | ---  | 790    | ---       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                                    | ---  | 605    | ---       |                     |
| $I_S$                        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                                       | ---  | ---    | -80       | A                   |
| $V_{SD}$                     | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^\circ\text{C}$                   | ---  | ---    | -1.2      | V                   |

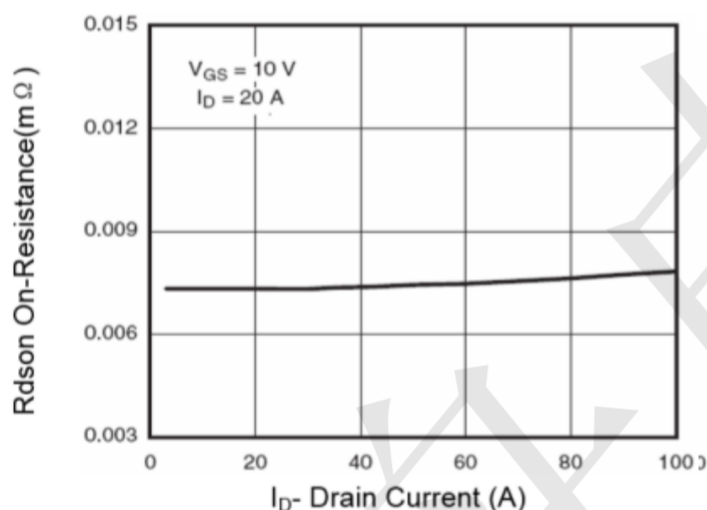
## Typical Characteristics



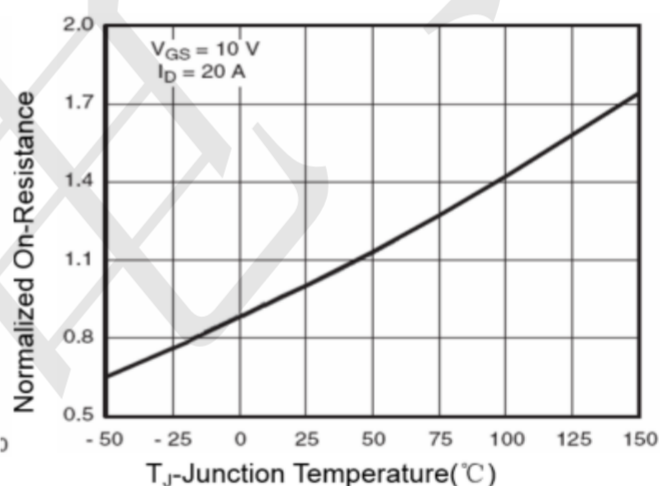
**Figure 1 Output Characteristics**



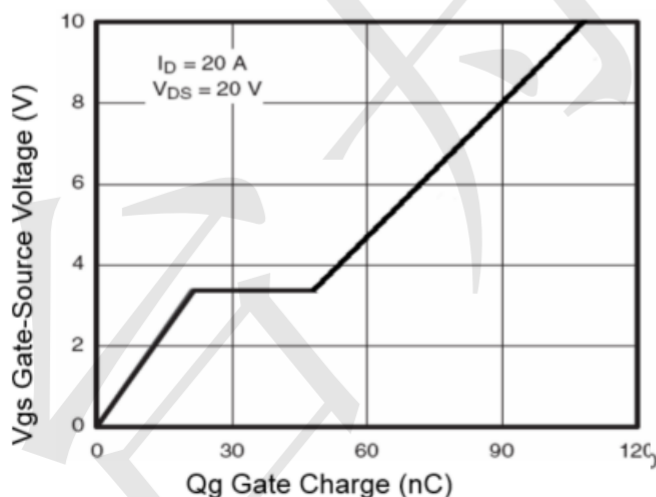
**Figure 2 Transfer Characteristics**



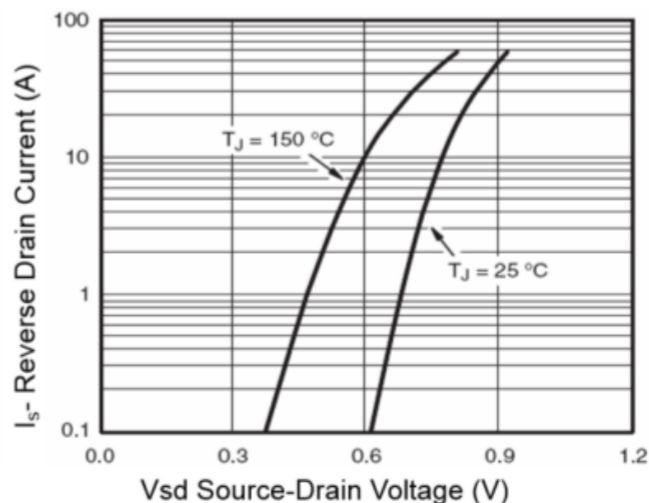
**Figure 3 Rdson- Drain Current**



**Figure 4 Rdson-Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**

## Typical Characteristics

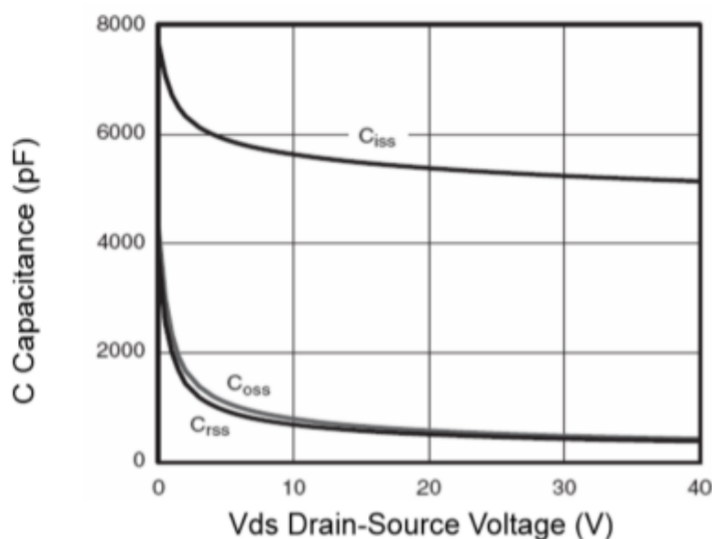


Figure 7 Capacitance vs Vds

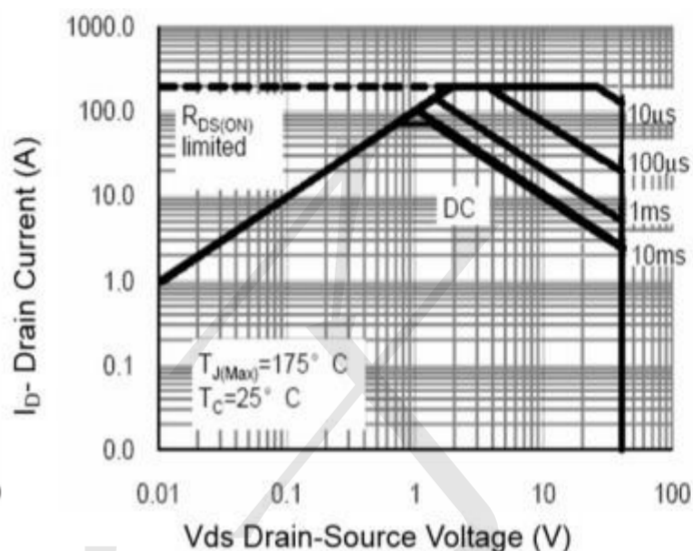


Figure 8 Safe Operation Area

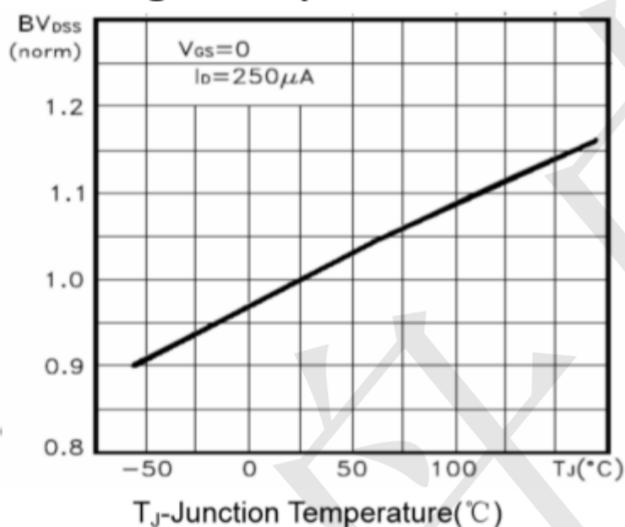


Figure 9  $BV_{dss}$  vs Junction Temperature

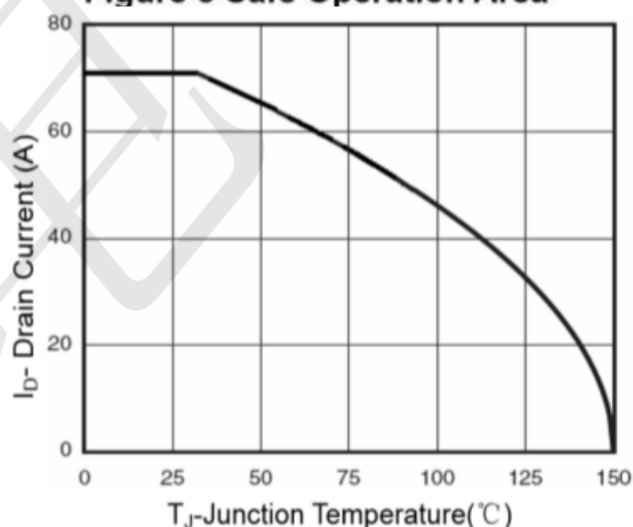


Figure 10 Id Current Derating vs Junction Temperature

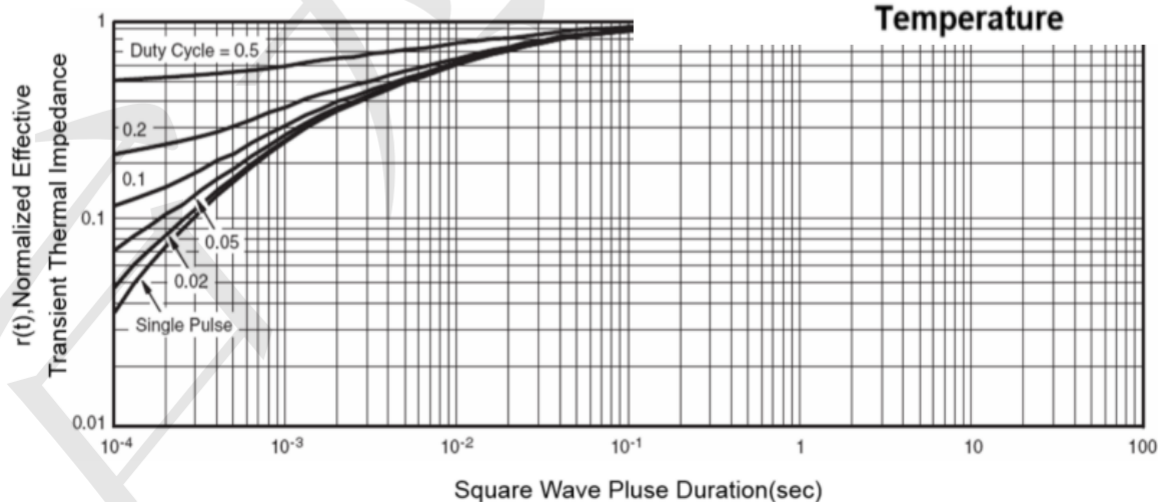
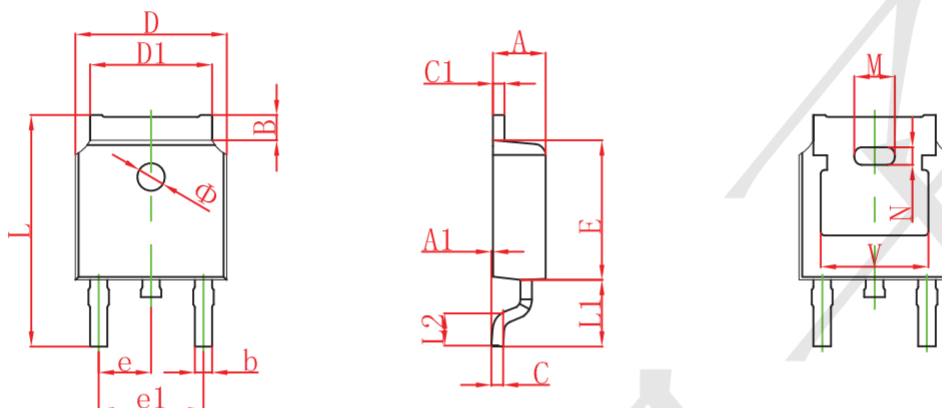


Figure 11 Normalized Maximum Transient Thermal Impedance

## TO252 Package Information



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.380  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.100  | 0.000                | 0.004 |
| B      | 0.800                     | 1.400  | 0.031                | 0.055 |
| b      | 0.710                     | 0.810  | 0.028                | 0.032 |
| c      | 0.460                     | 0.560  | 0.018                | 0.022 |
| c1     | 0.460                     | 0.560  | 0.018                | 0.022 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.130                     | 5.460  | 0.202                | 0.215 |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.286 TYP.                |        | 0.090 TYP.           |       |
| e1     | 4.327                     | 4.727  | 0.170                | 0.186 |
| M      | 1.778 REF.                |        | 0.070 REF.           |       |
| N      | 0.762 REF.                |        | 0.018 REF.           |       |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.9 REF.                  |        | 0.114 REF.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| V      | 4.830 REF.                |        | 0.190 REF.           |       |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |