





| SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |                         |   |      |         |           |                      |
|---|-------------------------|---|------|---------|-----------|----------------------|
| PARAMETER   | SYMBOL                  | TEST CONDITIONS   | MIN. | TYP.    | MAX.      | UNIT                 |
| <b>Static</b>   |                         |   |      |         |           |                      |
| Drain-source breakdown voltage  | $V_{DS}$                | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$  | 40   | -       | -         | V                    |
| $V_{DS}$ temperature coefficient  | $\Delta V_{DS}/T_J$     | $I_D = 10\text{ mA}$  | -    | 22      | -         | mV/ $^\circ\text{C}$ |
| $V_{GS(th)}$ temperature coefficient  | $\Delta V_{GS(th)}/T_J$ | $I_D = 250\text{ }\mu\text{A}$  | -    | -8.7    | -         |                      |
| Gate-source threshold voltage   | $V_{GS(th)}$            | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$  | 2.4  | -       | 3.5       | V                    |
| Gate-source leakage   | $I_{GSS}$               | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$  | -    | -       | $\pm 100$ | nA                   |
| Zero gate voltage drain current   | $I_{DSS}$               | $V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$  | -    | -       | 1         | $\mu\text{A}$        |
|   |                         | $V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^\circ\text{C}$   | -    | -       | 10        |                      |
| Drain-source on-state resistance <sup>a</sup>                               | $R_{DS(on)}$            | $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$  | -    | 0.00034 | 0.00047   | $\Omega$             |
| Forward transconductance <sup>a</sup>                                       | $g_{fs}$                | $V_{DS} = 25\text{ V}$ , $I_D = 100\text{ A}$   | -    | 450     | -         | S                    |
| <b>Dynamic <sup>b</sup></b>   |                         |   |      |         |           |                      |
| Input capacitance   | $C_{iss}$               | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$   | -    | 18 510  | -         | $\mu\text{F}$        |
| Output capacitance  | $C_{oss}$               |   | -    | 8540    | -         |                      |
| Reverse transfer capacitance  | $C_{rss}$               |   | -    | 555     | -         |                      |
| Total gate charge   | $Q_g$                   | $V_{DS} = 40\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 20\text{ A}$   | -    | 312     | 470       | nC                   |
| Gate-source charge  | $Q_{gs}$                |   | -    | 84      | -         |                      |
| Gate-drain charge   | $Q_{gd}$                |   | -    | 70      | -         |                      |
| Output charge   | $Q_{oss}$               | $V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$  | -    | 220     | -         |                      |
| Gate resistance   | $R_g$                   | $f = 1\text{ MHz}$  | 0.22 | 1.1     | 2.2       | $\Omega$             |
| Turn-on delay time  | $t_{d(on)}$             | $V_{DD} = 20\text{ V}$ , $R_L = 4\text{ }\Omega$ , $I_D \cong 10\text{ A}$ ,<br>$V_{GEN} = 10\text{ V}$ , $R_g = 1\text{ }\Omega$ | -    | 40      | 80        | ns                   |
| Rise time   | $t_r$                   |   | -    | 45      | 90        |                      |
| Turn-off delay time   | $t_{d(off)}$            |   | -    | 85      | 170       |                      |
| Fall time   | $t_f$                   |   | -    | 45      | 90        |                      |
| <b>Drain-Source Body Diode Characteristics</b>                              |                         |   |      |         |           |                      |
| Continuous source-drain diode current                                       | $I_S$                   | $T_C = 25\text{ }^\circ\text{C}$  | -    | -       | 487       | A                    |
| Pulse diode forward current   | $I_{SM}$                |   | -    | -       | 900       |                      |
| Body diode voltage  | $V_{SD}$                | $I_S = 10\text{ A}$ , $V_{GS} = 0\text{ V}$   | -    | 0.7     | 1.1       | V                    |
| Body diode reverse recovery time  | $t_{rr}$                | $I_F = 10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$T_J = 25\text{ }^\circ\text{C}$                                    | -    | 105     | 210       | ns                   |
| Body diode reverse recovery charge  | $Q_{rr}$                |   | -    | 310     | 620       | nC                   |
| Reverse recovery fall time  | $t_a$                   |   | -    | 64      | -         | ns                   |
| Reverse recovery rise time  | $t_b$                   |   | -    | 41      | -         |                      |

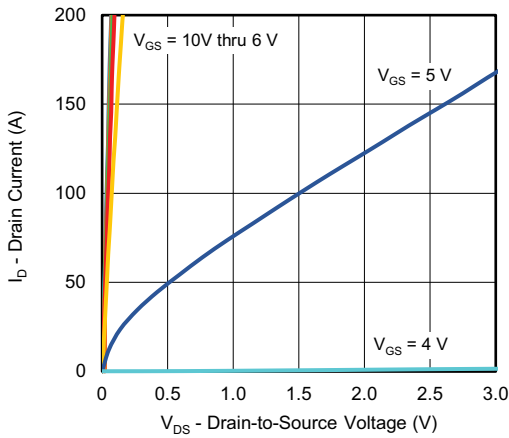
**Notes**

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
b. Guaranteed by design, not subject to production testing

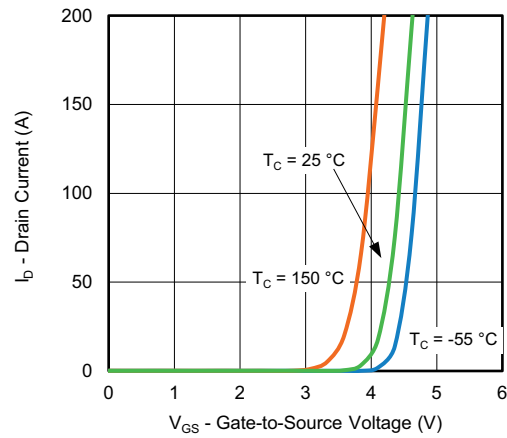
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



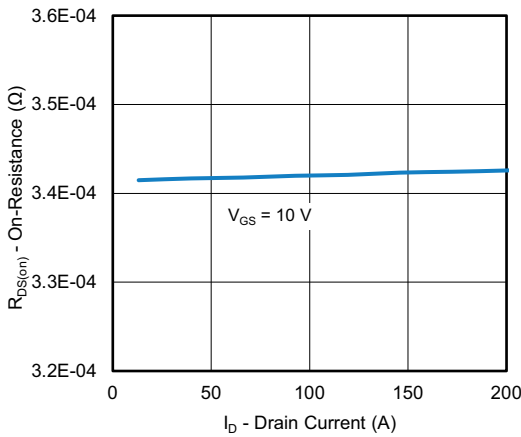
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



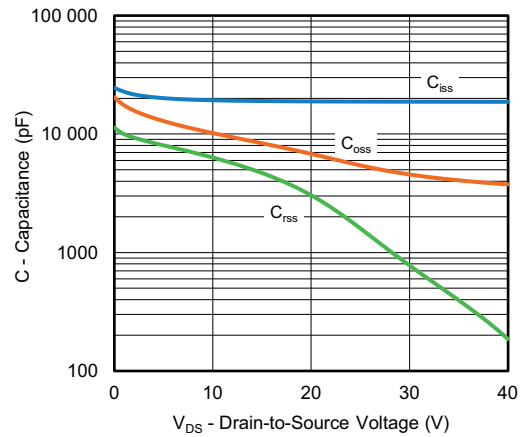
**Output Characteristics**



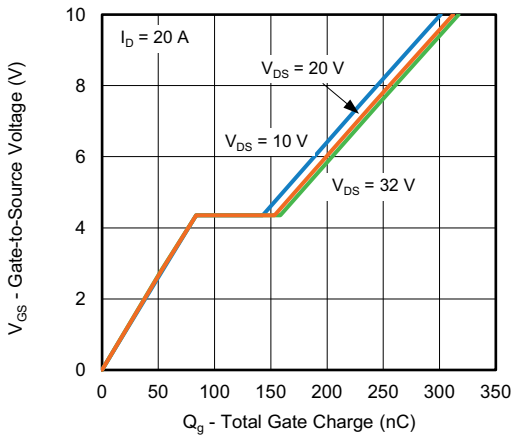
**Transfer Characteristics**



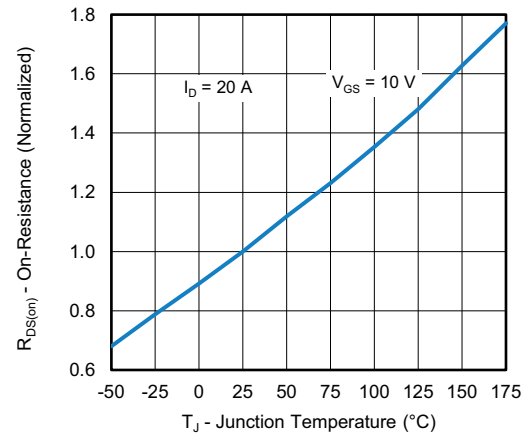
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**



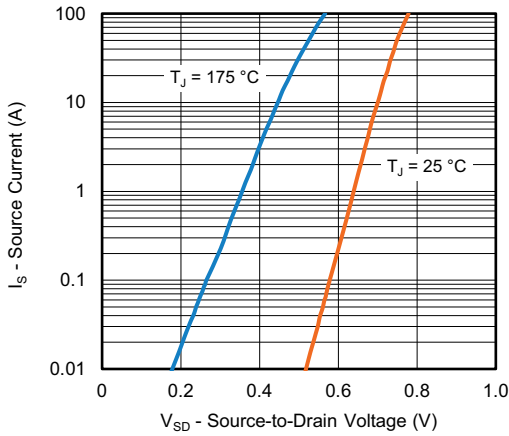
**Gate Charge**



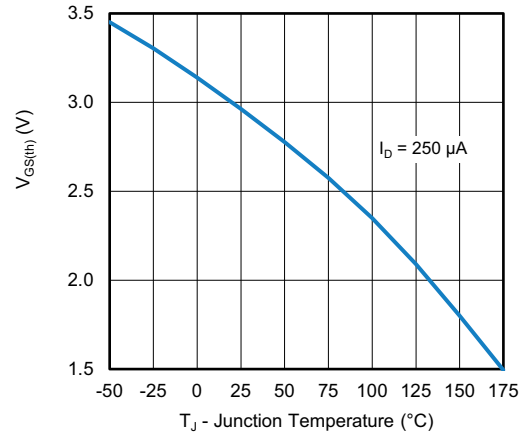
**On-Resistance vs. Junction Temperature**



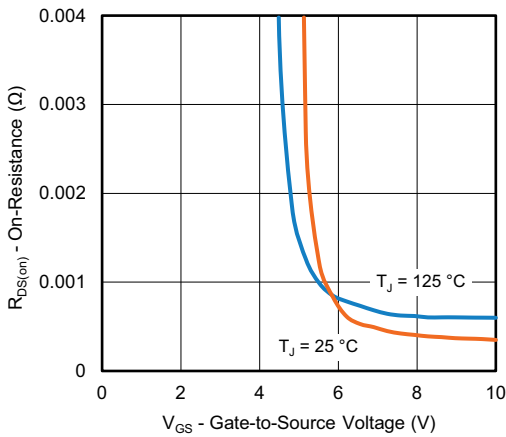
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



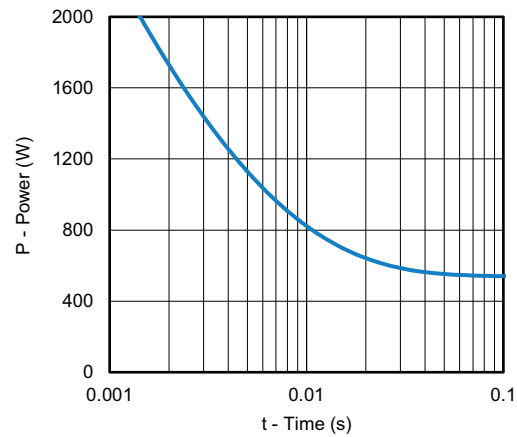
Source-Drain Diode Forward Voltage



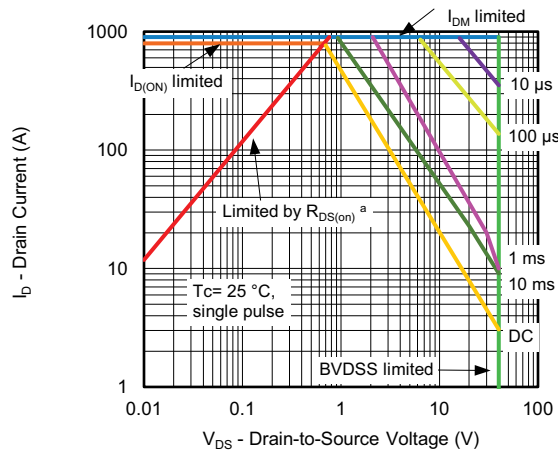
Threshold Voltage



On-Resistance vs. Gate-to-Source Voltage



Single Pulse Power, Junction-to-Case



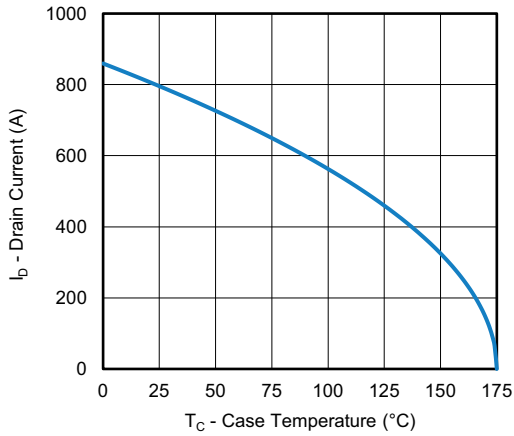
Safe Operating Area, Junction-to-Ambient

Note

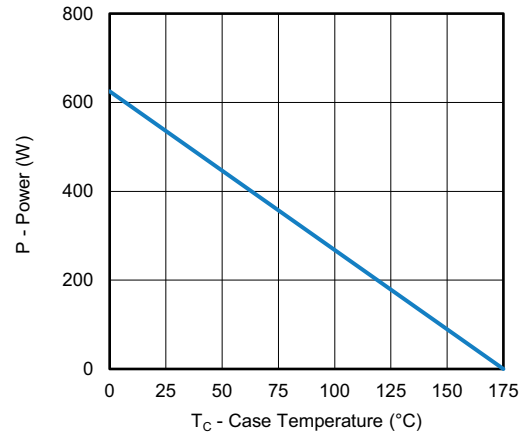
a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



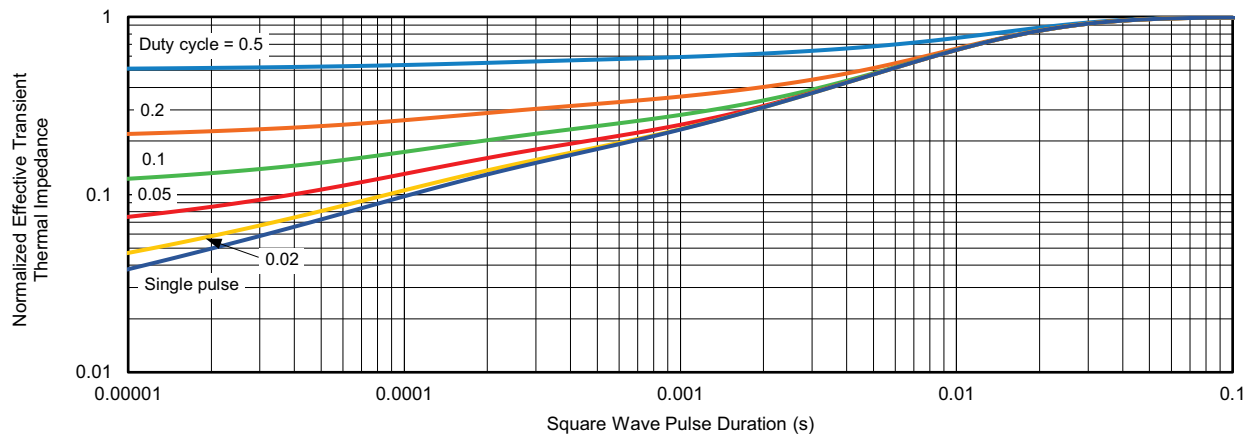
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating <sup>a</sup>



Power, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- a. The power dissipation  $P_D$  is based on  $T_{J \text{ max.}} = 150 \text{ °C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit

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