

## N&P-Channel complementary Power MOSFET

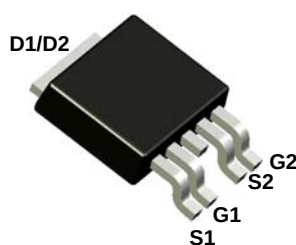
### Features

- N-Channel: 60V, 35A  
 $R_{DS(ON)} < 30m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 33m\Omega @ V_{GS} = 4.5V$
- P-Channel: -60V, -19A  
 $R_{DS(ON)} < 50m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 60m\Omega @ V_{GS} = -4.5V$

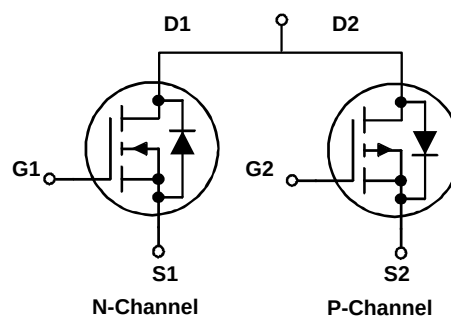
### General Features

- 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!**



Dual TO-252-4L



| ABSOLUTE MAXIMUM RATINGS (TA = 25°C UNLESS OTHERWISE NOTED) |                |                |            |       |  |
|-------------------------------------------------------------|----------------|----------------|------------|-------|--|
| Parameter                                                   | Symbol         | Nch Limit      | Pch Limit  | Units |  |
| Drain-Source Voltage                                        | $V_{DS}$       | 60             | -60        | V     |  |
| Gate-Source Voltage                                         | $V_{GS}$       | $\pm 20$       | $\pm 20$   |       |  |
| Continuous Drain Current <sup>a</sup>                       | $I_D$          | 35             | -20        | A     |  |
| Pulsed Drain Current <sup>b</sup>                           | $I_{DM}$       | 140            | -80        |       |  |
| Continuous Source Current (Diode Conduction) <sup>a</sup>   | $I_S$          | 35             | -20        | A     |  |
| Power Dissipation <sup>a</sup>                              | $P_D$          | 50             | 50         | W     |  |
| Operating Junction and Storage Temperature Range            | $T_J, T_{stg}$ | $T_J, T_{stg}$ | -55 to 175 | °C    |  |

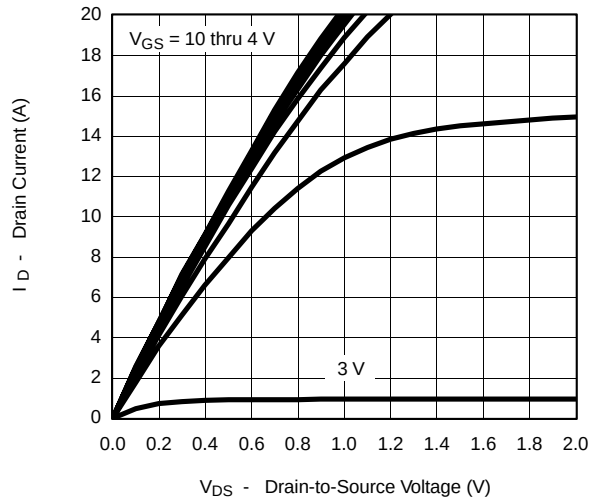
| THERMAL RESISTANCE RATINGS               |                 |         |       |
|------------------------------------------|-----------------|---------|-------|
| Parameter                                | Symbol          | Maximum | Units |
| Maximum Junction-to-Ambient <sup>c</sup> | $R_{\theta JA}$ | 50      | °C/W  |
| Maximum Junction-to-Case                 | $R_{\theta JC}$ | 3       |       |

### Notes

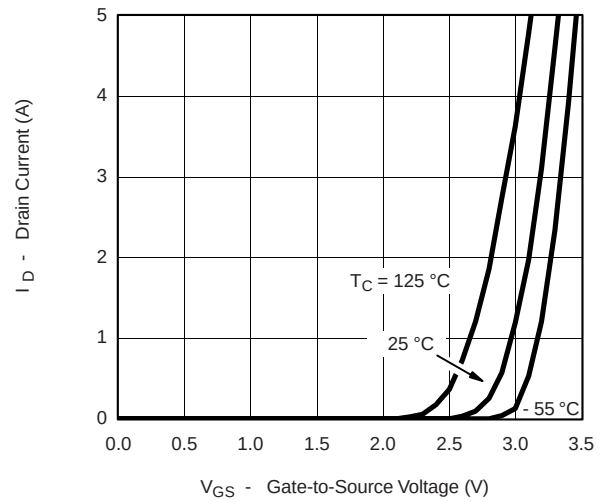
- Package Limited
- Pulse width limited by maximum junction temperature
- Surface Mounted on 1" x 1" FR4 Board.

| Parameter                               | Symbol              | Test Conditions                                                                                                                              | Min | Typ   | Max  | Unit |
|-----------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----|-------|------|------|
| Static                                  |                     |                                                                                                                                              |     |       |      |      |
| Gate-Source Threshold Voltage           | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA                                                                                  | 1   |       | 3    | V    |
|                                         |                     | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 uA                                                                                 | -1  |       | -3   | V    |
| Gate-Body Leakage                       | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V                                                                                               |     |       | ±100 | nA   |
| Zero Gate Voltage Drain Current         | I <sub>DSS</sub>    | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V                                                                                                |     |       | 1    | uA   |
|                                         |                     | V <sub>DS</sub> = -48 V, V <sub>GS</sub> = 0 V                                                                                               |     |       | -1   |      |
| On-State Drain Current <sup>a</sup>     | I <sub>D(on)</sub>  | V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V                                                                                                | 45  |       |      | A    |
|                                         |                     | V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V                                                                                              | -25 |       |      | A    |
| Drain-Source On-Resistance <sup>a</sup> | r <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A                                                                                                |     | 30    |      | mΩ   |
|                                         |                     | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 16 A                                                                                               |     | 33    |      |      |
|                                         |                     | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -10 A                                                                                              |     | 50    |      | mΩ   |
|                                         |                     | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -8 A                                                                                              |     | 60    |      |      |
| Forward Transconductance <sup>a</sup>   | g <sub>fs</sub>     | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A                                                                                                |     | 15    |      | S    |
|                                         |                     | V <sub>DS</sub> = -15 V, I <sub>D</sub> = -10 A                                                                                              |     | 11    |      | S    |
| Diode Forward Voltage <sup>a</sup>      | V <sub>SD</sub>     | I <sub>S</sub> = 17 A, V <sub>GS</sub> = 0 V                                                                                                 |     | 0.89  |      | V    |
|                                         |                     | I <sub>S</sub> = -10 A, V <sub>GS</sub> = 0 V                                                                                                |     | -0.98 |      | V    |
| Dynamic <sup>b</sup>                    |                     |                                                                                                                                              |     |       |      |      |
| Total Gate Charge                       | Q <sub>g</sub>      | N - Channel<br>V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 4.5 V,<br>I <sub>D</sub> = 20 A                                                     |     | 9     |      | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                                                                              |     | 3     |      |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                                                                              |     | 4     |      |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | N - Channel<br>V <sub>DS</sub> = 30 V, R <sub>L</sub> = 1.5 Ω,<br>I <sub>D</sub> = 20 A,<br>V <sub>GEN</sub> = 10 V, R <sub>GEN</sub> = 6 Ω  |     | 5     |      | ns   |
| Rise Time                               | t <sub>r</sub>      |                                                                                                                                              |     | 5     |      |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                                                                              |     | 27    |      |      |
| Fall Time                               | t <sub>f</sub>      |                                                                                                                                              |     | 8     |      |      |
| Input Capacitance                       | C <sub>iss</sub>    | N - Channel<br>V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 Mhz                                                                      |     | 1500  |      | pF   |
| Output Capacitance                      | C <sub>oss</sub>    |                                                                                                                                              |     | 84    |      |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    |                                                                                                                                              |     | 79    |      |      |
| Total Gate Charge                       | Q <sub>g</sub>      | P - Channel<br>V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 4.5 V,<br>I <sub>D</sub> = -10 A                                                   |     | 10    |      | nC   |
| Gate-Source Charge                      | Q <sub>gs</sub>     |                                                                                                                                              |     | 5     |      |      |
| Gate-Drain Charge                       | Q <sub>gd</sub>     |                                                                                                                                              |     | 4     |      |      |
| Turn-On Delay Time                      | t <sub>d(on)</sub>  | P - Channel<br>V <sub>DS</sub> = -30 V, R <sub>L</sub> = 3 Ω,<br>I <sub>D</sub> = -10 A,<br>V <sub>GEN</sub> = -10 V, R <sub>GEN</sub> = 6 Ω |     | 5     |      | ns   |
| Rise Time                               | t <sub>r</sub>      |                                                                                                                                              |     | 4     |      |      |
| Turn-Off Delay Time                     | t <sub>d(off)</sub> |                                                                                                                                              |     | 30    |      |      |
| Fall Time                               | t <sub>f</sub>      |                                                                                                                                              |     | 11    |      |      |
| Input Capacitance                       | C <sub>iss</sub>    | P - Channel<br>V <sub>DS</sub> = -15 V, V <sub>GS</sub> = 0 V, f = 1 Mhz                                                                     |     | 1180  |      | pF   |
| Output Capacitance                      | C <sub>oss</sub>    |                                                                                                                                              |     | 84    |      |      |
| Reverse Transfer Capacitance            | C <sub>rss</sub>    |                                                                                                                                              |     | 60    |      |      |

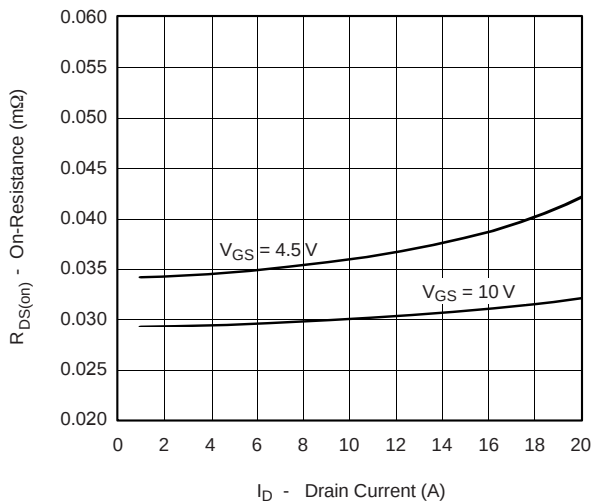
# **N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



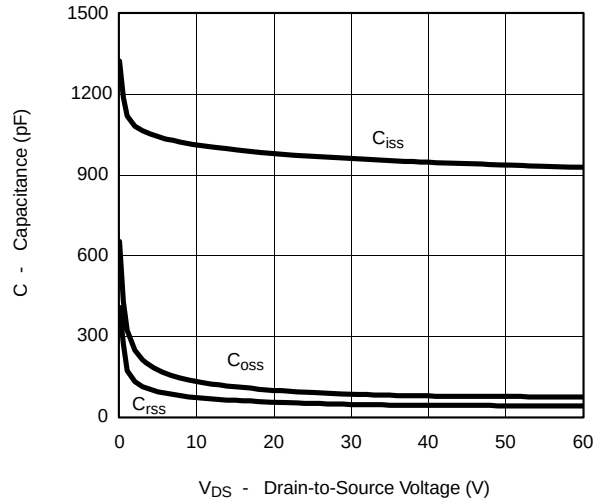
**Output Characteristics**



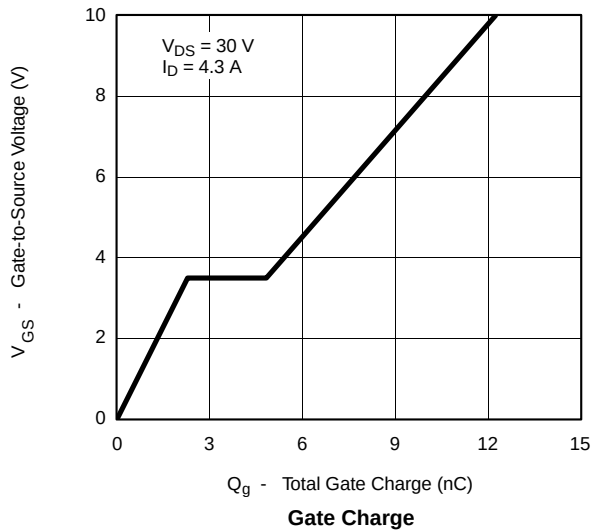
**Transfer Characteristics**



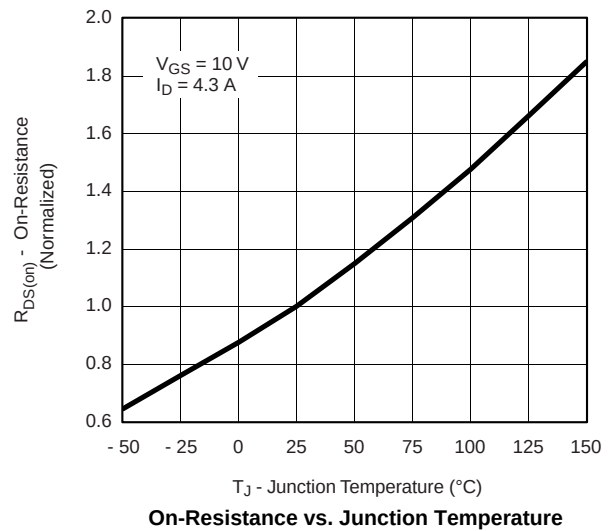
**On-Resistance vs. Drain Current and Gate Voltage**



**Capacitance**

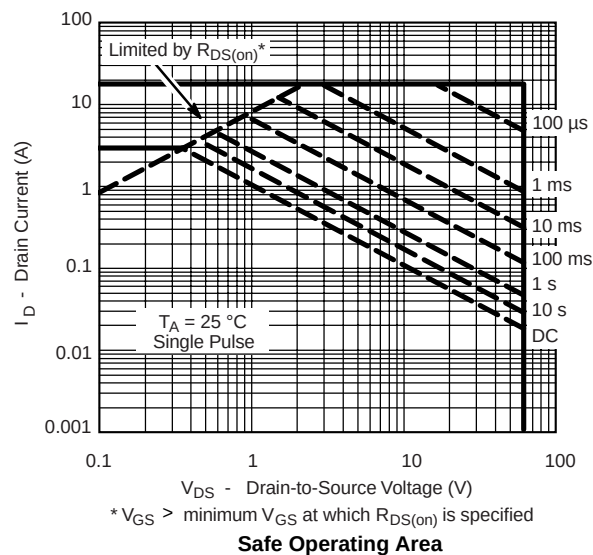
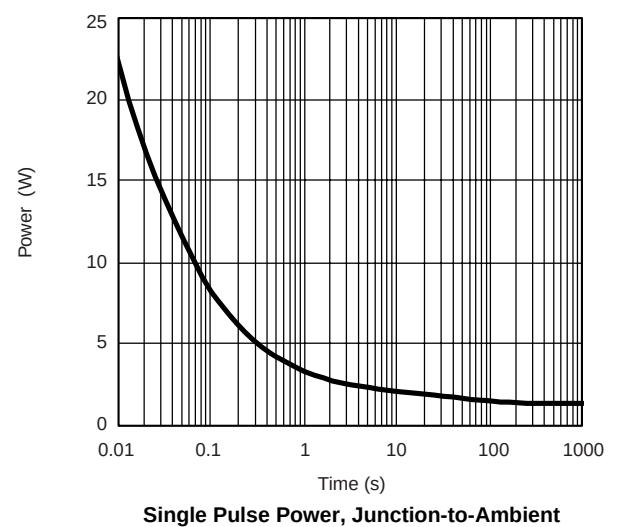
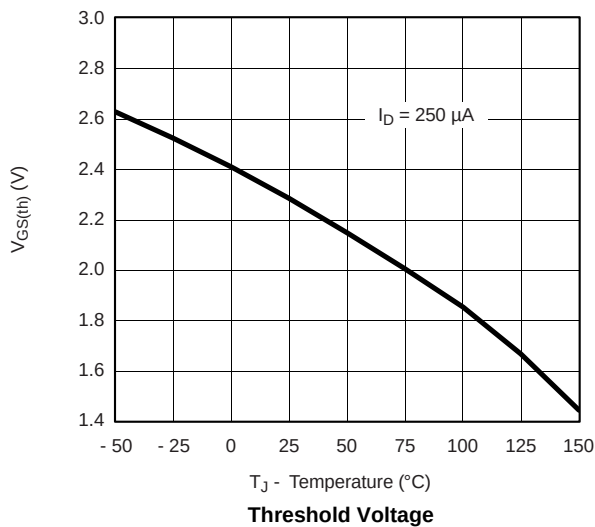
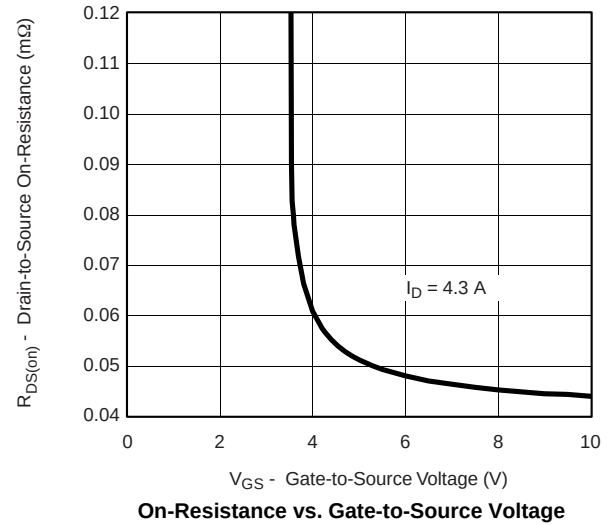
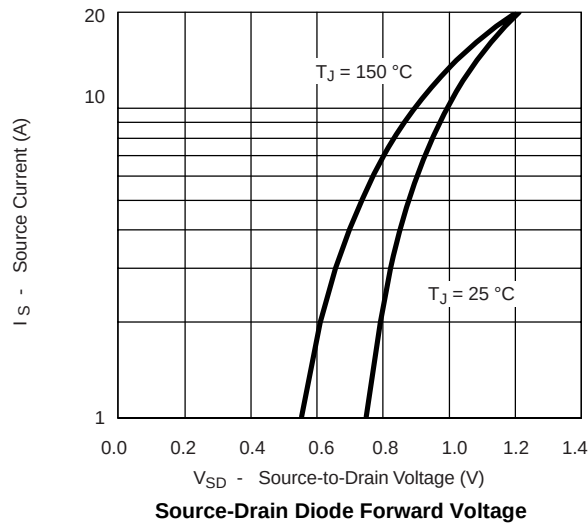


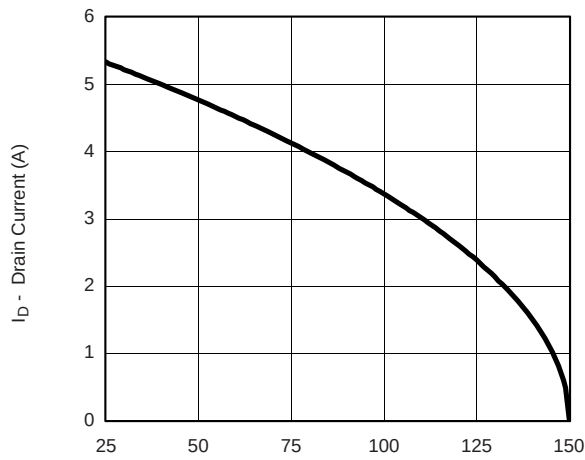
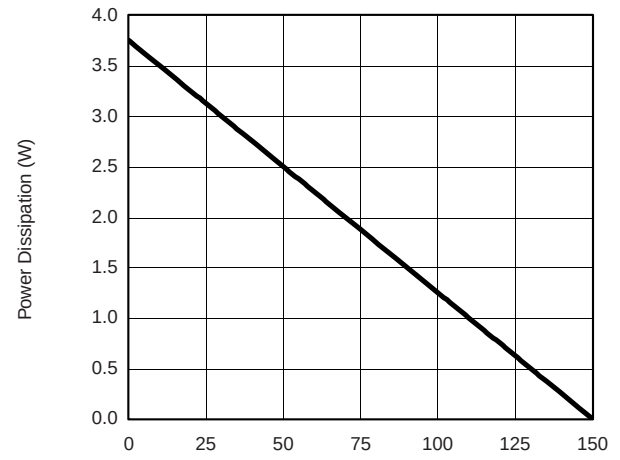
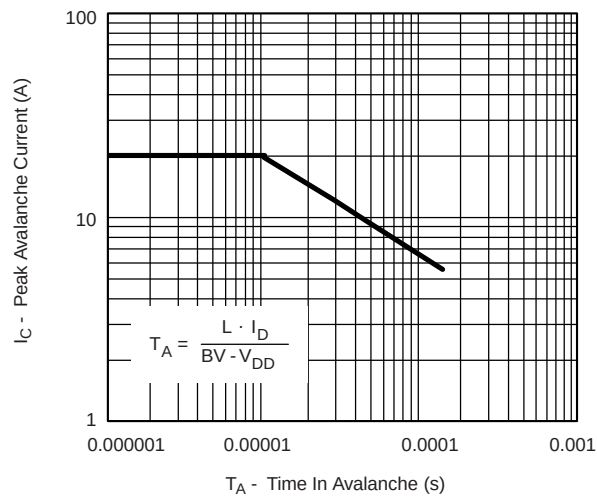
**Gate Charge**



**On-Resistance vs. Junction Temperature**

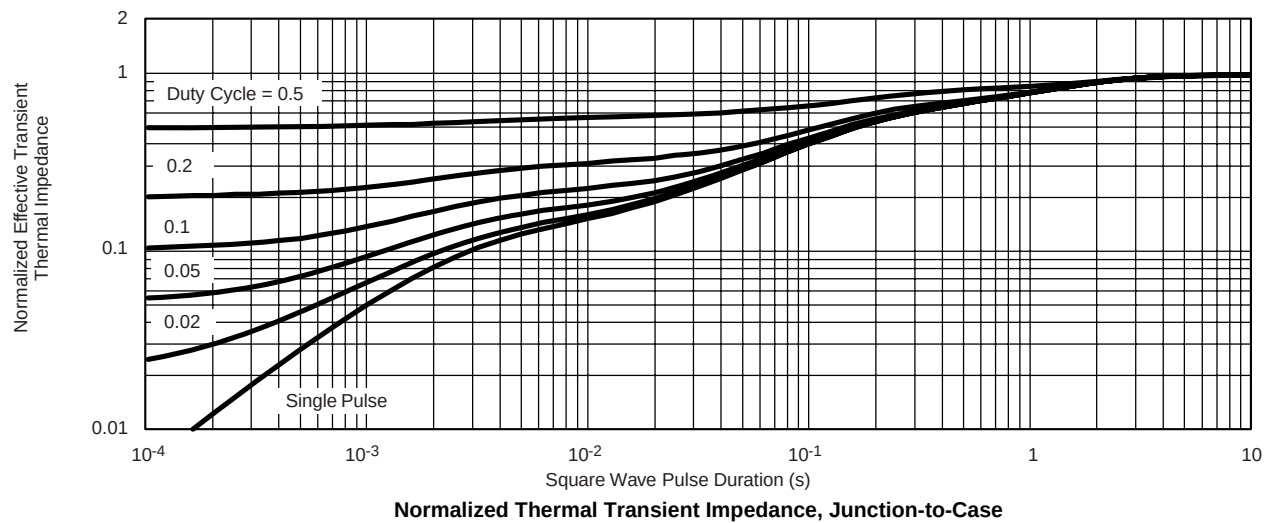
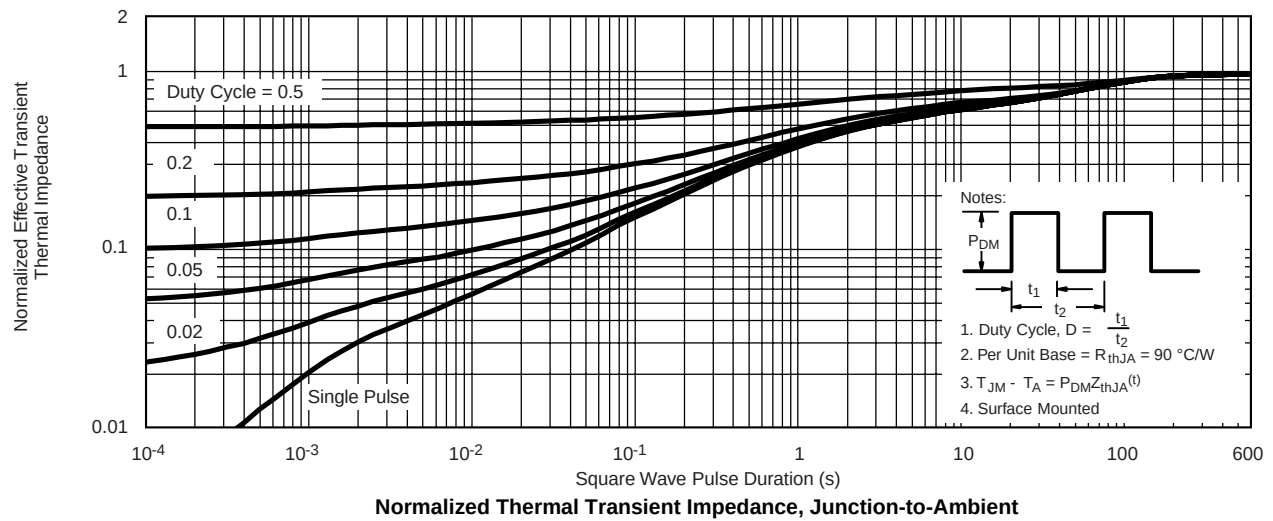
**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



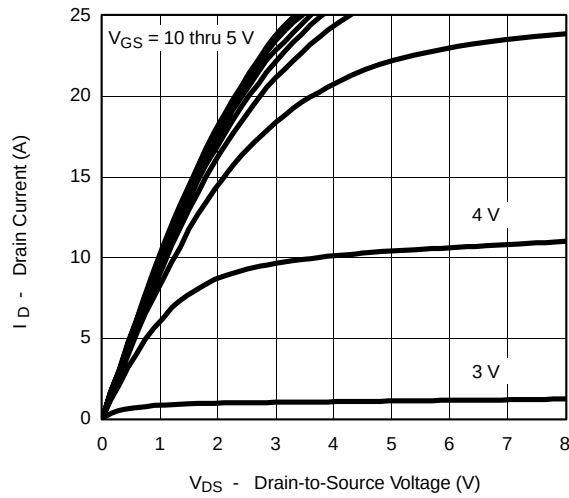
**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted $T_C$  - Case Temperature (°C)**Current Derating\*** $T_C$  - Case Temperature (°C)**Power Derating** $T_A$  - Time In Avalanche (s)**Single Pulse Avalanche Capability**

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °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.

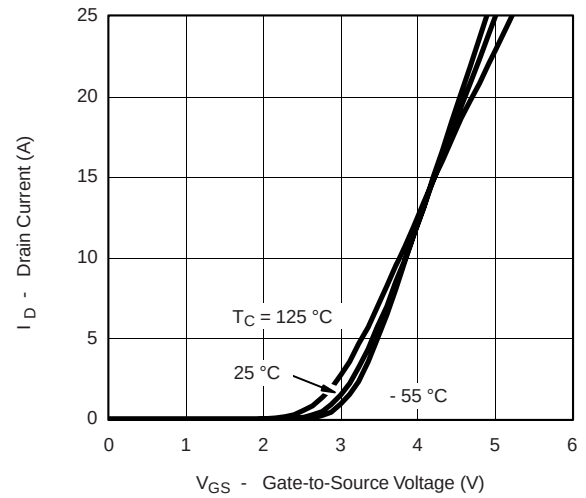
**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



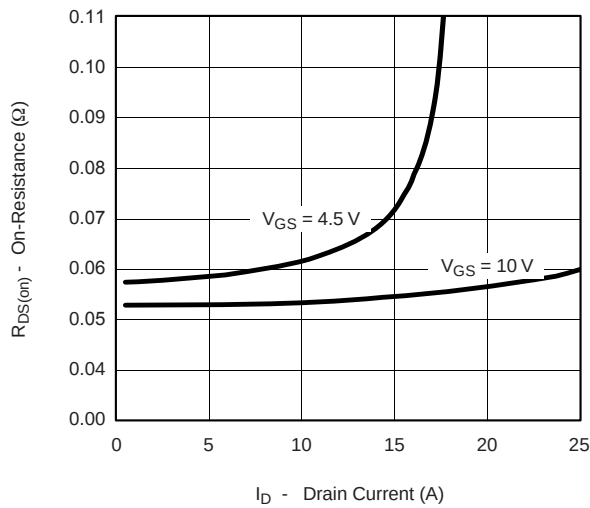
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



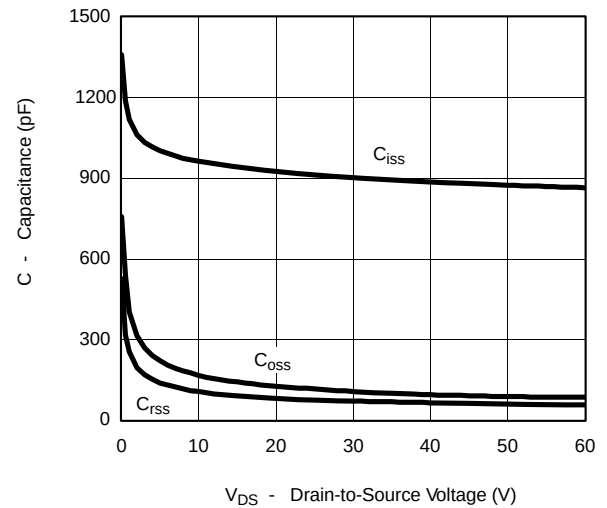
Output Characteristics



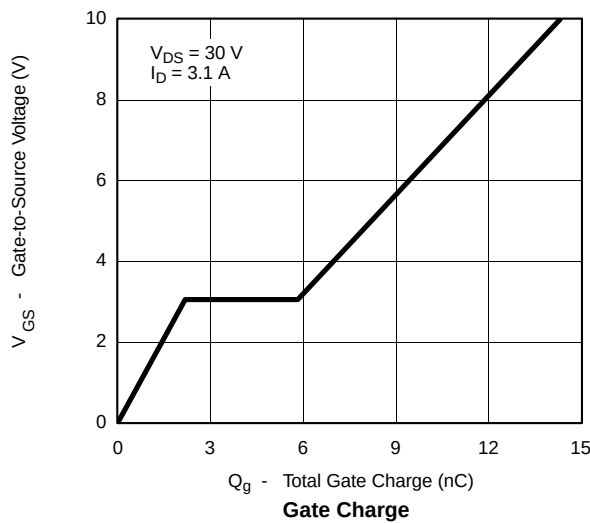
Transfer Characteristics



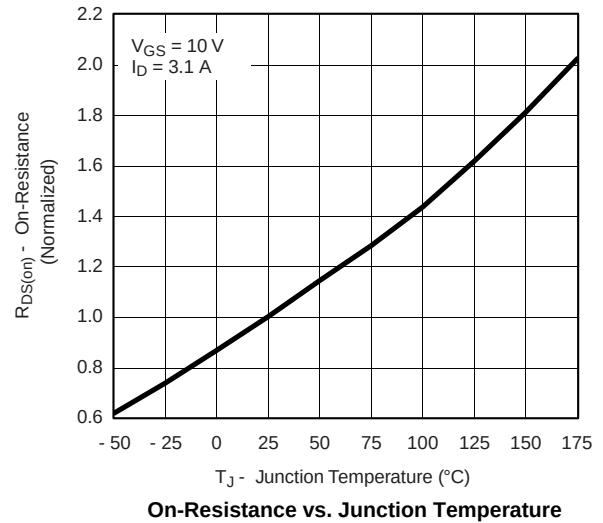
On-Resistance vs. Drain Current



Capacitance

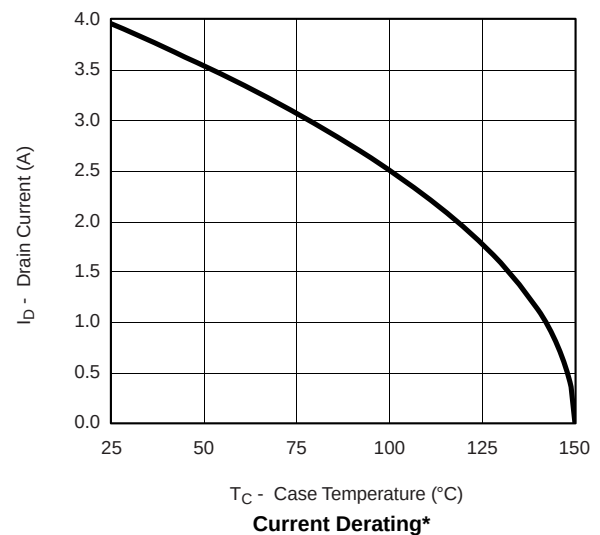
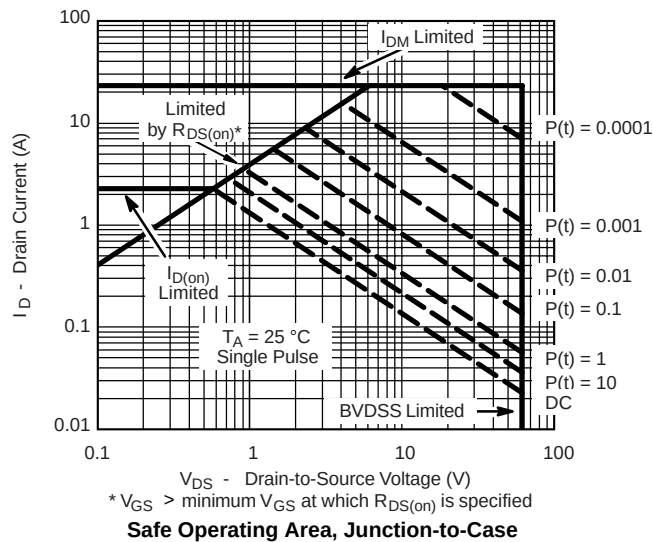
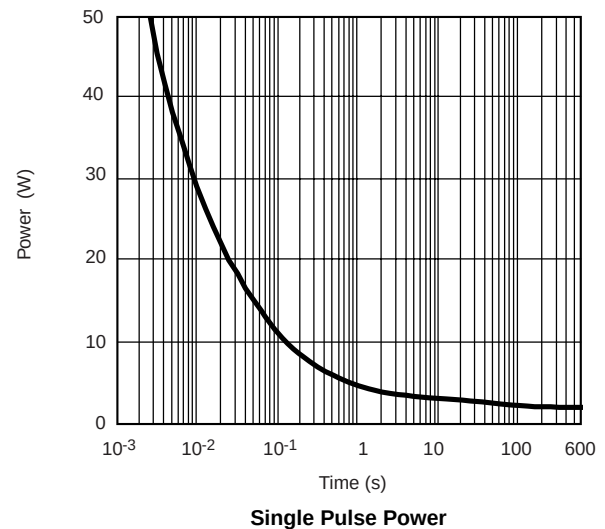
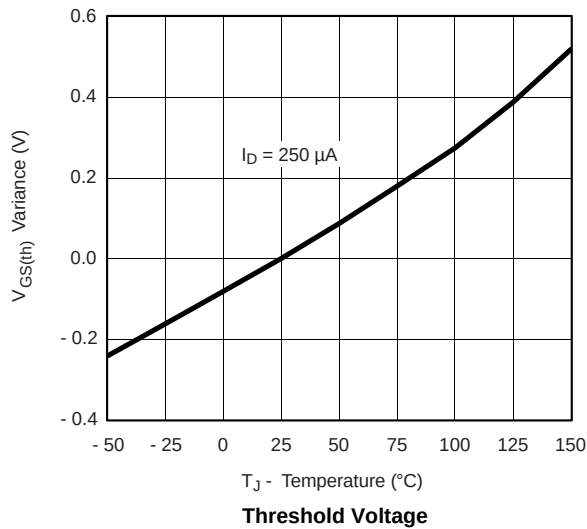
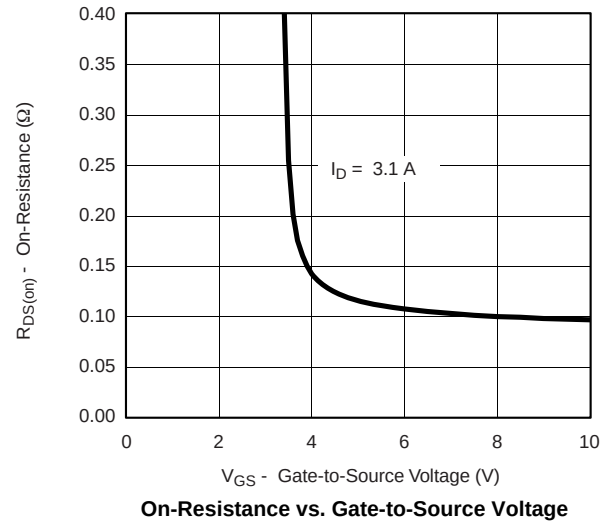
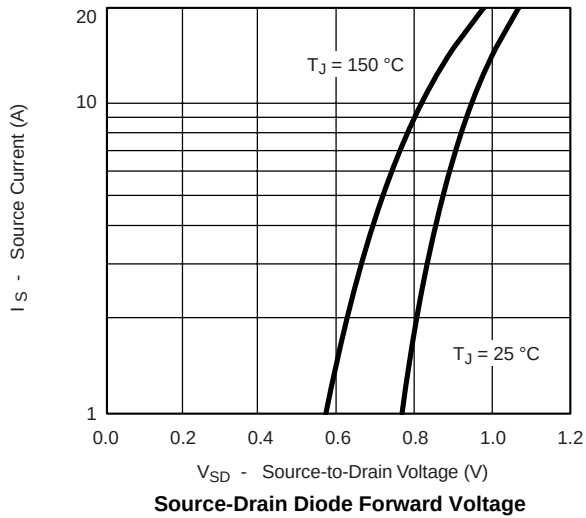


Gate Charge



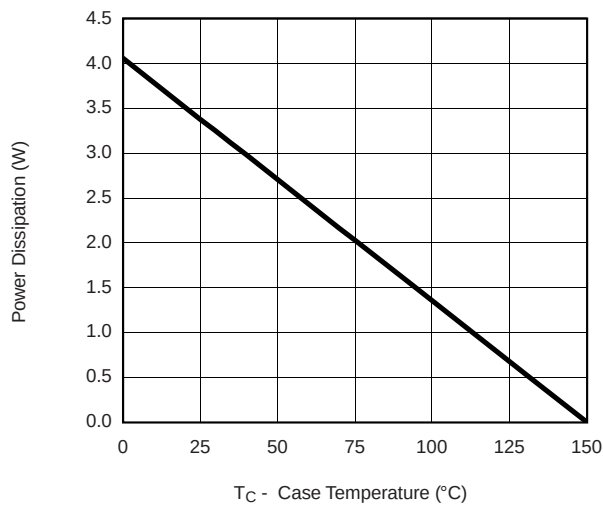
On-Resistance vs. Junction Temperature

**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

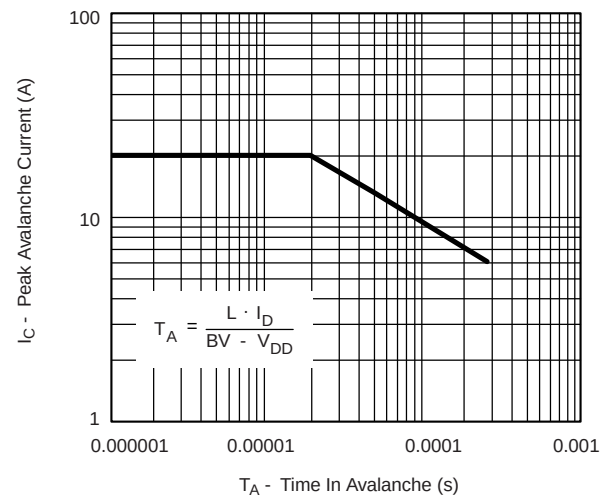




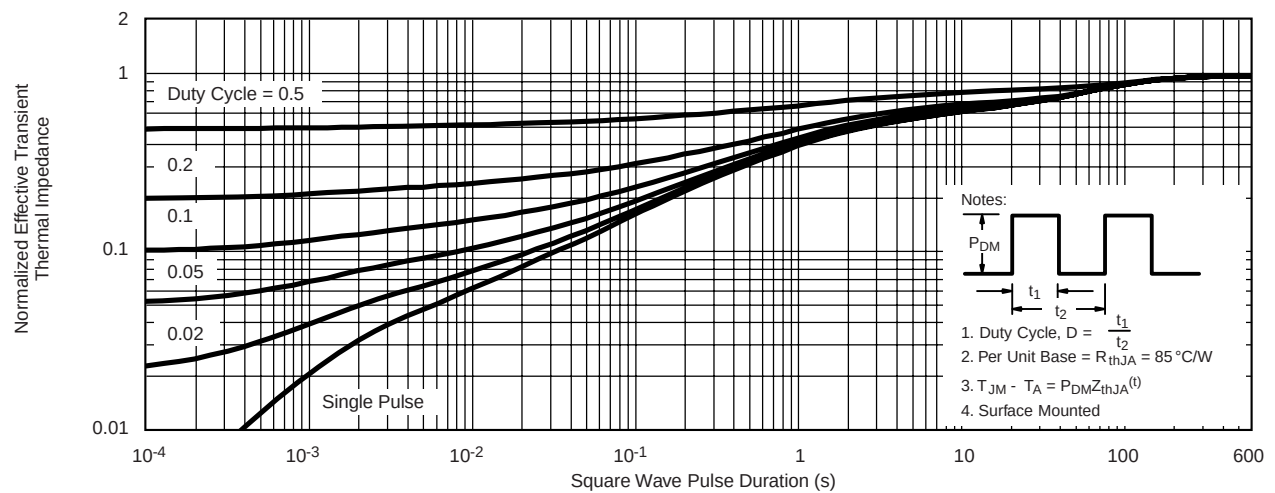
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



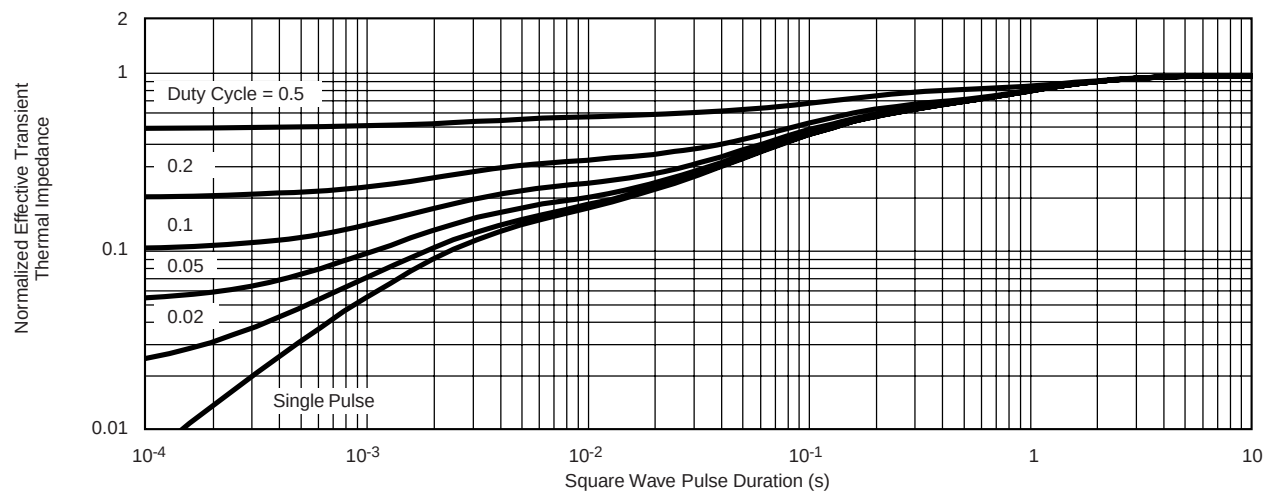
**Power Derating, Junction-to-Foot**



**Single Pulse Avalanche Capability**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Foot**