ALPHA & OMEGA SEMICONDUCTOR

# AO4918A

## Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

### General Description

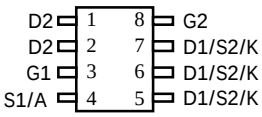
The AO4918A uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further. *AO4918A is Pb-free (meets ROHS & Sony 259 specifications). AO4918AL is a Green Product ordering option. AO4918A and AO4918AL are electrically identical.*

### Features

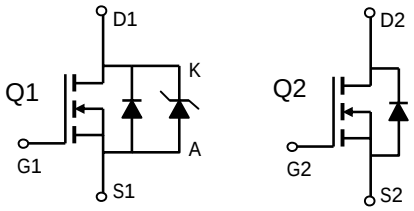
| Q1 | Q2 | |
|---|---|---|
| $V_{DS}$ (V) = 30V | $V_{DS}$(V) = 30V | |
| $I_D$ = 9.3A | $I_D$=8.5A | |
| $R_{DS(ON)}$ < 14.5mΩ | <18mΩ | ($V_{GS}$ = 10V) |
| $R_{DS(ON)}$ < 16mΩ | <27mΩ | ($V_{GS}$ = 4.5V) |

**SCHOTTKY**

$V_{DS}$ (V) = 30V, $I_F$ = 3A, $V_F$<0.5V@1A




**SOIC-8**




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Max Q1 | Max Q2 | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±12 | ±20 | V |
| Continuous Drain Current [A] | $T_A$=25°C | $I_D$ | 9.3 | 8.5 | A |
| | $T_A$=70°C | | 7.4 | 6.7 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 40 | 30 | |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2 | 2 | W |
| | $T_A$=70°C | | 1.28 | 1.28 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | -55 to 150 | °C |

| Parameter | | Symbol | Maximum Schottky | Units |
|---|---|---|---|---|
| Reverse Voltage | | $V_{DS}$ | 30 | V |
| Continuous Forward Current [A] | $T_A$=25°C | $I_F$ | 3 | A |
| | $T_A$=70°C | | 2.2 | |
| Pulsed Diode Forward Current [B] | | $I_{FM}$ | 20 | |
| Power Dissipation [A] | $T_A$=25°C | $P_D$ | 2 | W |
| | $T_A$=70°C | | 1.28 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

| **Parameter: Thermal Characteristics MOSFET Q1** | | **Symbol** | **Typ** | **Max** | **Units** |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 53 | 62.5 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 81.9 | 110 | |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 30.5 | 40 | |

| **Parameter: Thermal Characteristics MOSFET Q2** | | **Symbol** | **Typ** | **Max** | **Units** |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 53 | 62.5 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 81.9 | 110 | |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 30.5 | 40 | |

| **Thermal Characteristics Schottky** | | | | | |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 50.4 | 62.5 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 86 | 110 | |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 26.6 | 40 | |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in $^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using 80 µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in $^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The SOA curve provides a single pulse rating.

F. The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

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**Q1 Electrical Characteristics ($T_J$=25°C unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250µA, $V_{GS}$=0V | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current. (Set by Schottky leakage) | $V_R$=30V | | 0.007 | 0.05 | mA |
| | | $V_R$=30V, $T_J$=125°C | | 3.2 | 10 | |
| | | $V_R$=30V, $T_J$=150°C | | 12 | 20 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$= ±12V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250µA | 0.6 | 1.1 | 2 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=4.5V, $V_{DS}$=5V | 40 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=9.3A | | 11.7 | 14.5 | mΩ |
| | | $T_J$=125°C | | 15.4 | 19 | |
| | | $V_{GS}$=4.5V, $I_D$=8.8A | | 13.1 | 16 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=9.3A | 30 | 37 | | S |
| $V_{SD}$ | Diode+Schottky Forward Voltage | $I_S$=1A | | 0.46 | 0.5 | V |
| $I_S$ | Maximum Body-Diode+Schottky Continuous Current | | | | 3.5 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 3740 | 4488 | pF |
| $C_{oss}$ | Output Capacitance (FET + Schottky) | | | 295 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 186 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 0.86 | 1.1 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=9.3A | | 30.5 | 37 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 4.5 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 8.5 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=1.6Ω, $R_{GEN}$=3Ω | | 6 | 9 | ns |
| $t_r$ | Turn-On Rise Time | | | 8.2 | 12 | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 54.5 | 75 | ns |
| $t_f$ | Turn-Off Fall Time | | | 10.5 | 15 | ns |
| $t_{rr}$ | Body Diode + Schottky Reverse Recovery Time | $I_F$=9.3A, dI/dt=100A/µs | | 23.5 | 28 | ns |
| $Q_{rr}$ | Body Diode + Schottky Reverse Recovery Charge | $I_F$=9.3A, dI/dt=100A/µs | | 13.3 | 16 | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in $^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80 µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in $^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The SOA curve provides a single pulse rating.

F. The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

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## Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

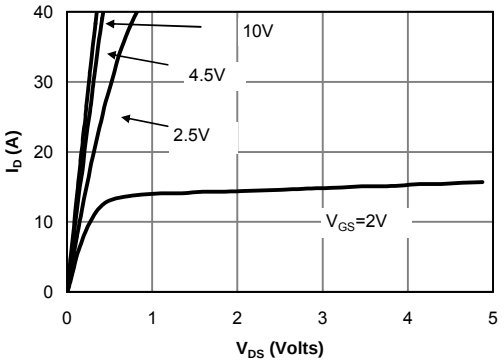


**Fig 1: On-Region Characteristics**

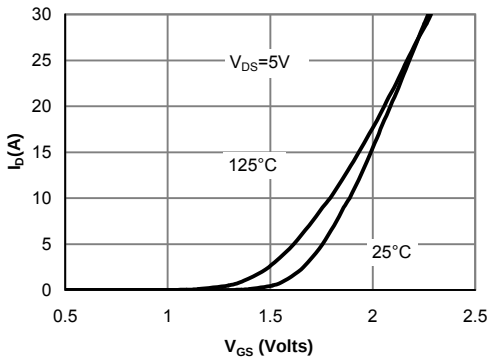


**Figure 2: Transfer Characteristics**

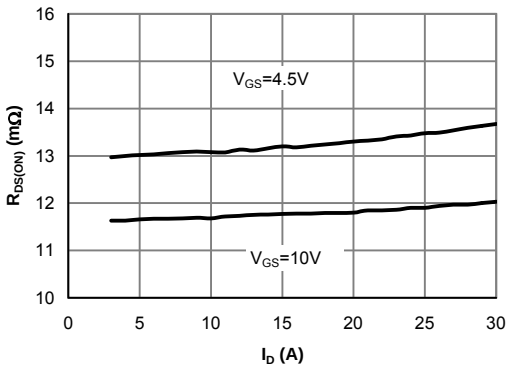


**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

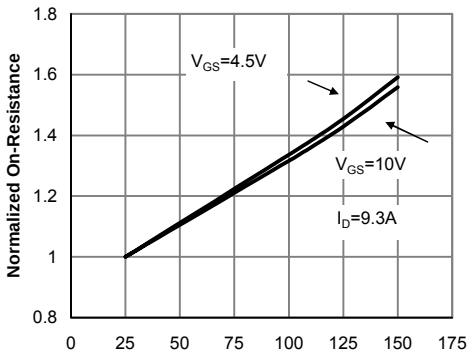


**Figure 4: On resistance vs. Junction Temperature**

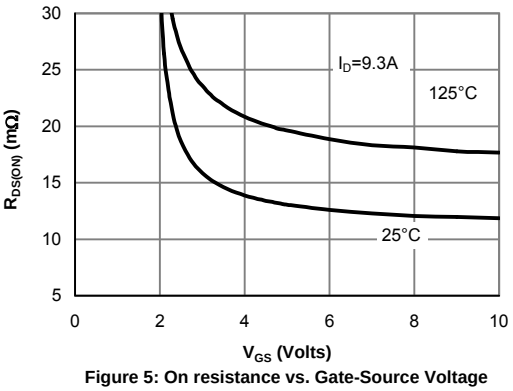


**Figure 5: On resistance vs. Gate-Source Voltage**

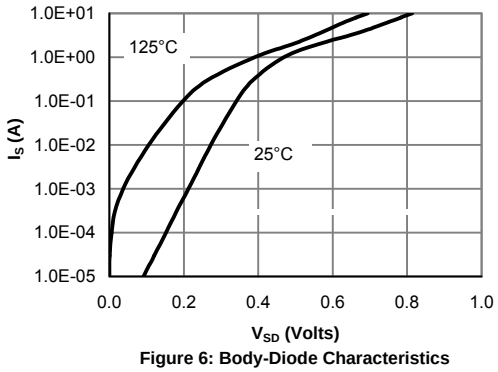


**Figure 6: Body-Diode Characteristics (Note F)**

## Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

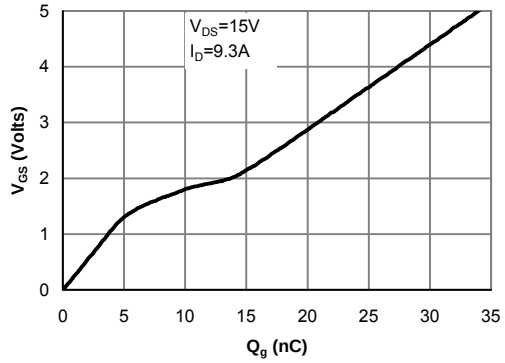


**Figure 7: Gate-Charge Characteristics**

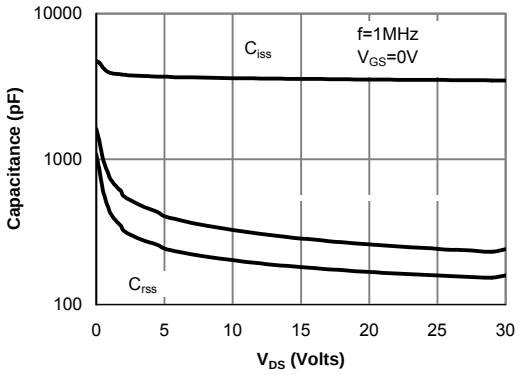


**Figure 8: Capacitance Characteristics**

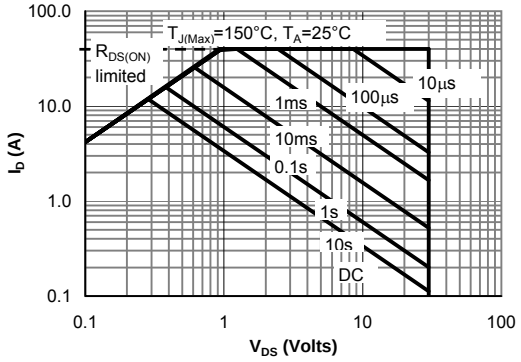


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

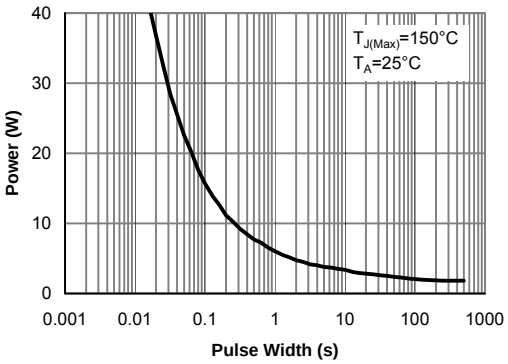


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

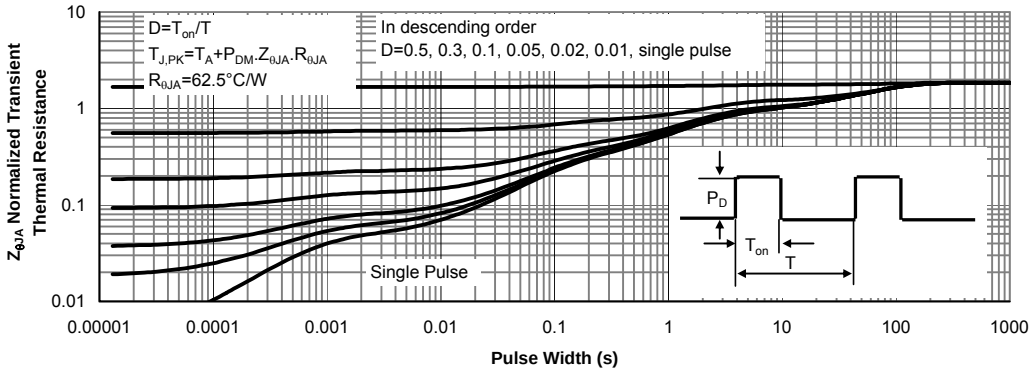


**Figure 11: Normalized Maximum Transient Thermal Impedance**

**Q2 Electrical Characteristics ($T_J$=25°C unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250µA, $V_{GS}$=0V | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=24V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$= ±20V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250µA | 1 | 1.7 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=4.5V, $V_{DS}$=5V | 30 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=8.5A | | 14.6 | 18 | mΩ |
| | | $T_J$=125°C | | 22 | 27 | |
| | | $V_{GS}$=4.5V, $I_D$=6A | | 20.6 | 27 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=8.5A | | 23 | | S |
| $V_{SD}$ | Diode Voltage | $I_S$=1A | | 0.75 | 1 | V |
| $I_S$ | Maximum Body Continuous Current | | | | 3 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 955 | 1250 | pF |
| $C_{oss}$ | Output Capacitance | | | 145 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 112 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 0.5 | 0.85 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=8.5A | | 17 | 24 | nC |
| $Q_g$ | Total Gate Charge | | | 9 | 12 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 3.4 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 4.7 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=1.8Ω, $R_{GEN}$=3Ω | | 5 | 6.5 | ns |
| $t_r$ | Turn-On Rise Time | | | 6 | 7.5 | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 19 | 25 | ns |
| $t_f$ | Turn-Off Fall Time | | | 4.5 | 6 | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=8.5A, dI/dt=100A/µs | | 16.7 | 21 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=8.5A, dI/dt=100A/µs | | 6.7 | 10 | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The SOA curve provides a single pulse rating.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

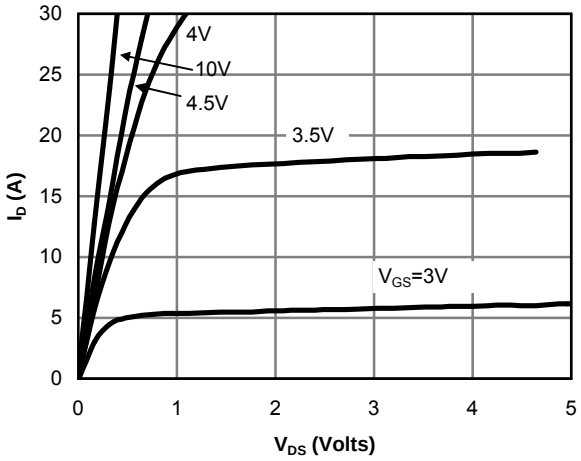


**Fig 1: On-Region Characteristics**

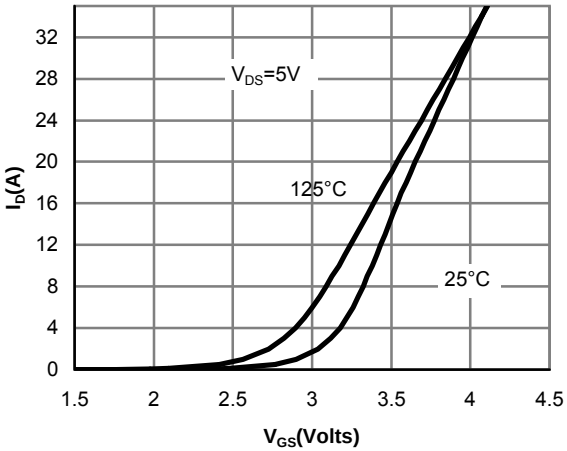


**Figure 2: Transfer Characteristics**

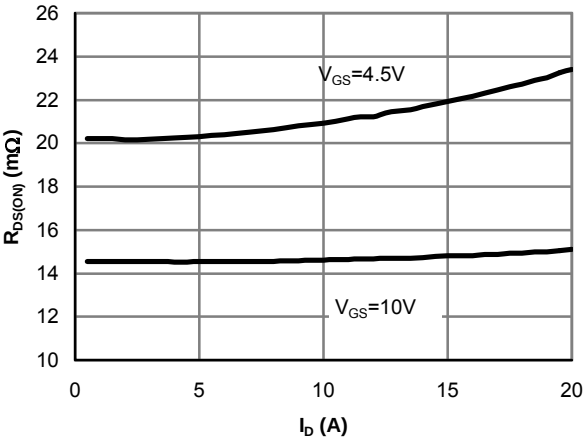


**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

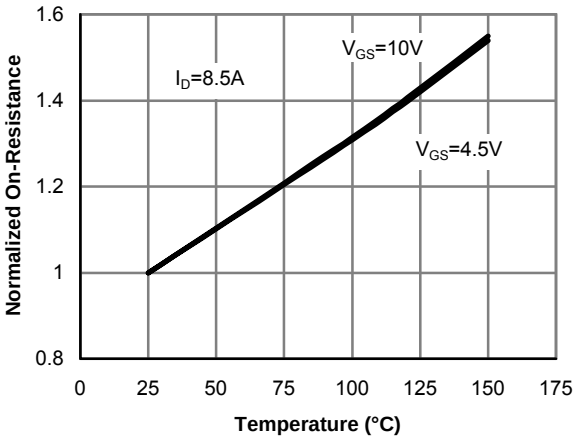


**Figure 4: On-Resistance vs. Junction Temperature**

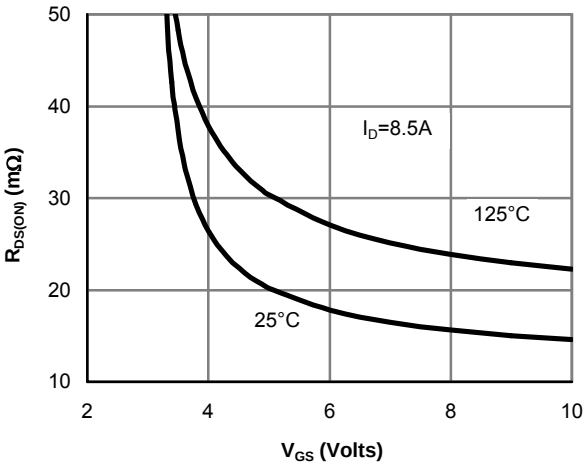


**Figure 5: On-Resistance vs. Gate-Source Voltage**

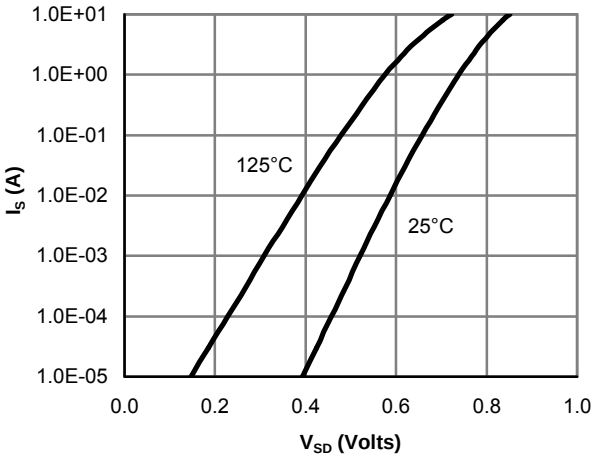


**Figure 6: Body-Diode Characteristics**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

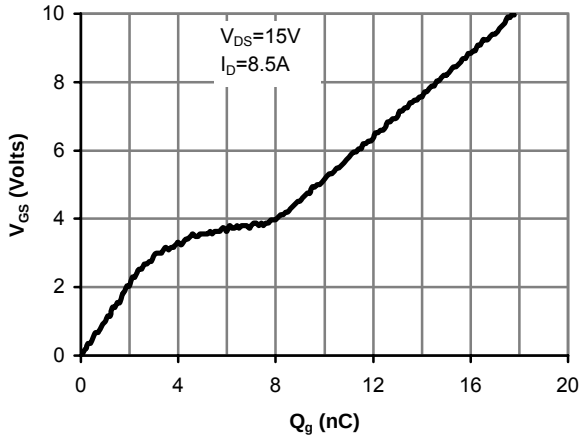


**Figure 7: Gate-Charge Characteristics**

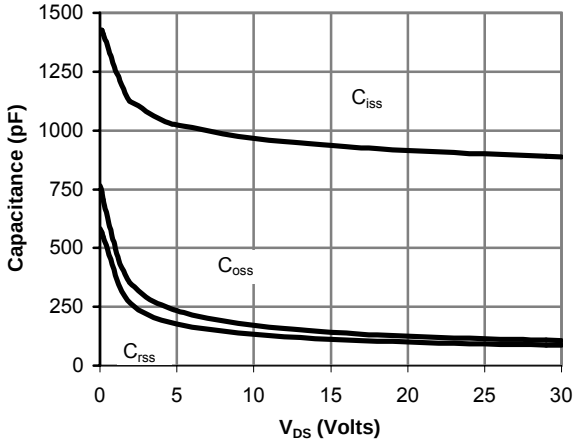


**Figure 8: Capacitance Characteristics**

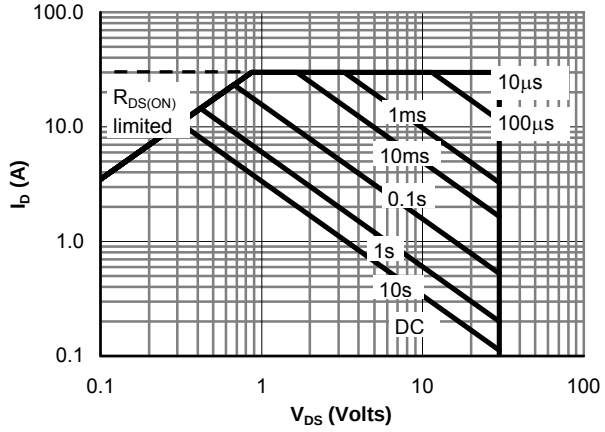


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

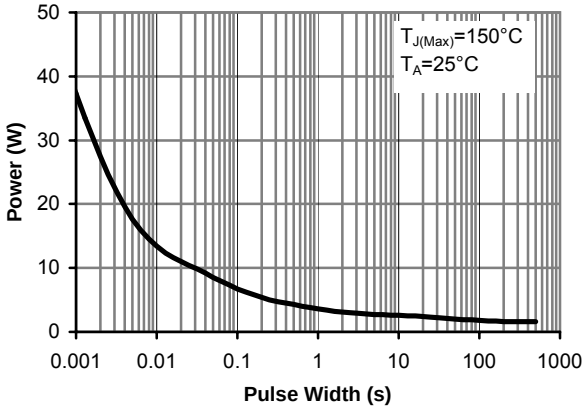


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

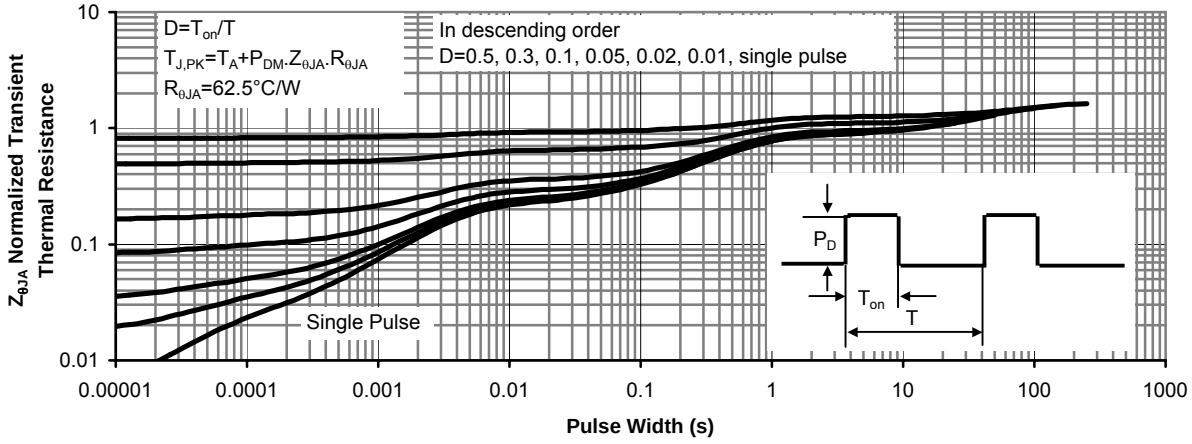


**Figure 11: Normalized Maximum Transient Thermal Impedance**