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ALPHA & OMEGA SEMICONDUCTOR

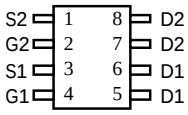
# AOP600
## Complementary Enhancement Mode Field Effect Transistor

### General Description

The AOP600 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications.
*Standard Product AOP600 is Pb-free (meets ROHS & Sony 259 specifications). AOP600L is a Green Product ordering option. AOP600 and AOP600L are electrically identical.*

### Features

| n-channel | p-channel |
|---|---|
| $V_{DS}$ (V) = 30V | -30V |
| $I_D$ = 7.5A ($V_{GS}$ = 10V) | -6.6A |
| $R_{DS(ON)}$ | |
| < 28mΩ | < 35mΩ ($V_{GS}$ = -10V) |
| < 43mΩ | < 58mΩ ($V_{GS}$ =- 4.5V) |

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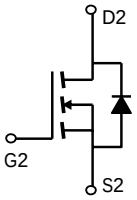
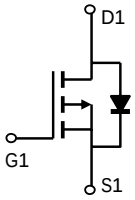



n-channel




p-channel

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

| Parameter | | Symbol | Max n-channel | Max p-channel | Units |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | -30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Continuous Drain Current [A] | $T_A$=25°C | $I_D$ | 7.5 | -6.6 | A |
| | $T_A$=70°C | | 6 | -5.3 | |
| Pulsed Drain Current [B] | | $I_{DM}$ | 30 | -30 | |
| Power Dissipation | $T_A$=25°C | $P_D$ | 2.5 | 2.5 | W |
| | $T_A$=70°C | | 1.6 | 1.6 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | -55 to 150 | °C |

**Thermal Characteristics: n-channel**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 40 | 50 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 67 | 80 | °C/W |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 33 | 40 | °C/W |

**Thermal Characteristics: p-channel**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 38 | 50 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 66 | 80 | °C/W |
| Maximum Junction-to-Lead [C] | Steady-State | $R_{\theta JL}$ | 30 | 40 | °C/W |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## n-channel MOSFET 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 | 1.8 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 30 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=7.5A | | 22.6 | 28 | mΩ |
| | | $T_J$=125°C | | | | |
| | | $V_{GS}$=4.5V, $I_D$=6.0A | | 33 | 43 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=7.5A | 12 | 16 | | S |
| $V_{SD}$ | Body Diode Forward Voltage | $I_S$=1A, $V_{GS}$=0V | | 0.76 | 1 | V |
| $I_S$ | Maximum Body-DiodeContinuous Current | | | | 4 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 680 | 820 | pF |
| $C_{oss}$ | Output Capacitance. | | | 102 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 77 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 3 | 3.6 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=4.5V, $V_{DS}$=15V, $I_D$=7.5A | | 13.84 | 16.6 | nC |
| $Q_g$ | Total Gate Charge | | | 6.74 | 8.1 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 1.82 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 3.2 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=2.0Ω, $R_{GEN}$=6Ω | | 4.6 | | ns |
| $t_r$ | Turn-On Rise Time | | | 4.1 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 20.6 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 5.2 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery time | $I_F$=7.5A, dI/dt=100A/µs | | 16.5 | 20 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery charge | $I_F$=7.5A, dI/dt=100A/µs | | 7.8 | | 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 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.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

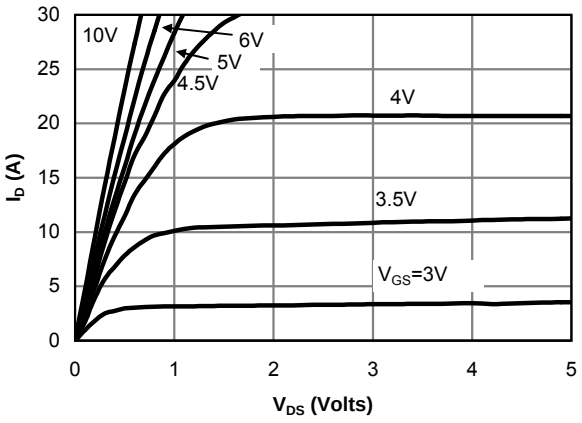


Fig 1: On-Region Characteristics

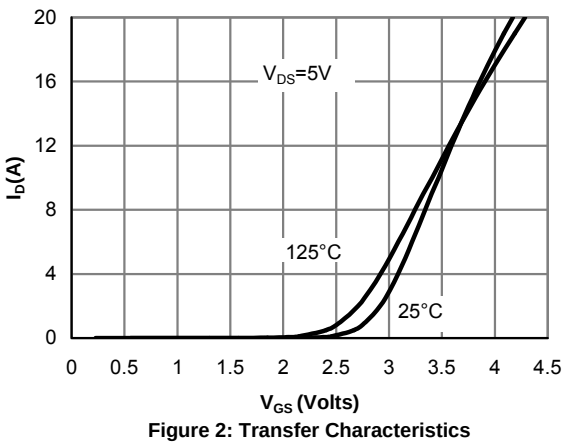


Figure 2: Transfer Characteristics

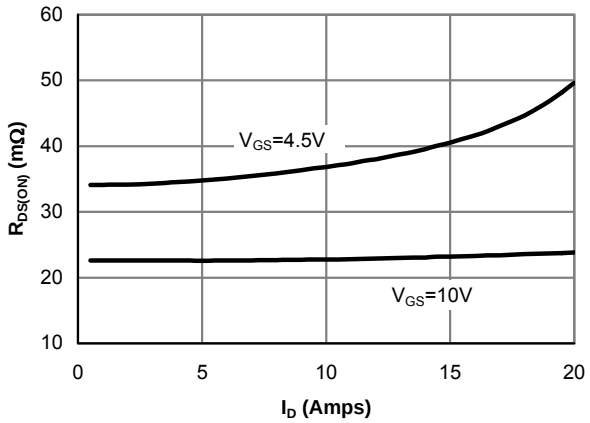


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

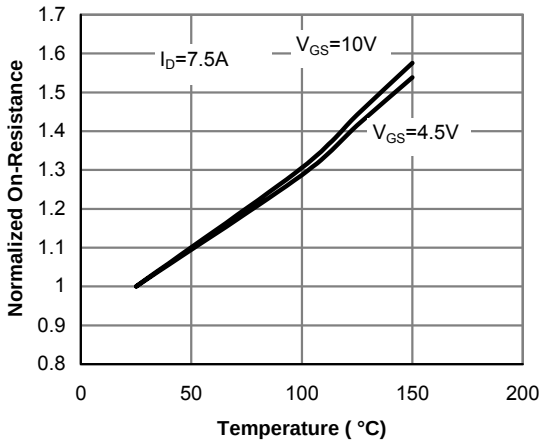


Figure 4: On-Resistance vs. Junction Temperature

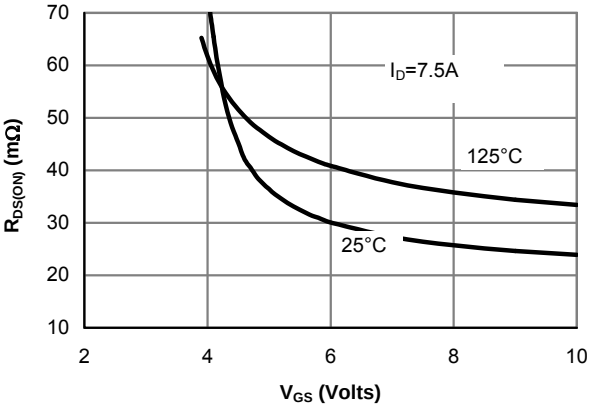


Figure 5: On-Resistance vs. Gate-Source Voltage

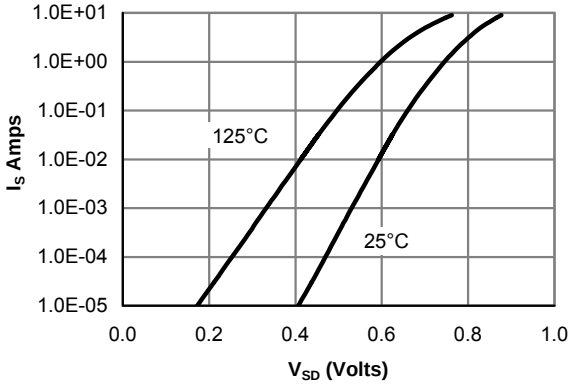


Figure 6: Body diode characteristics



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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

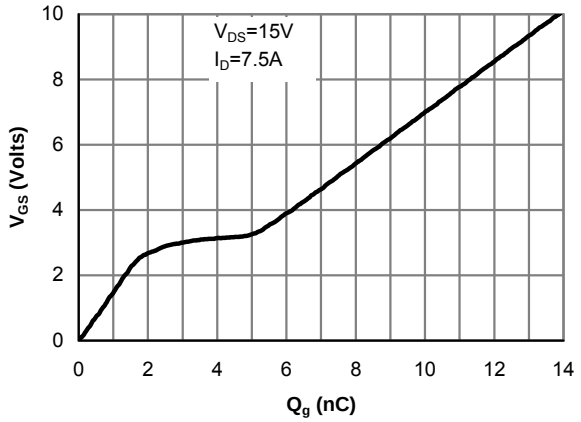


**Figure 7: Gate-Charge characteristics**

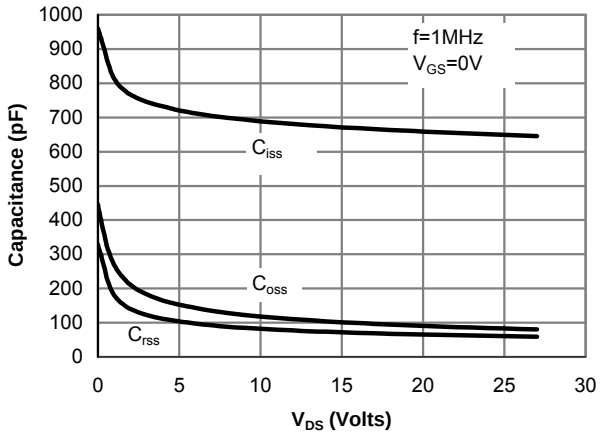


**Figure 8: Capacitance Characteristics**

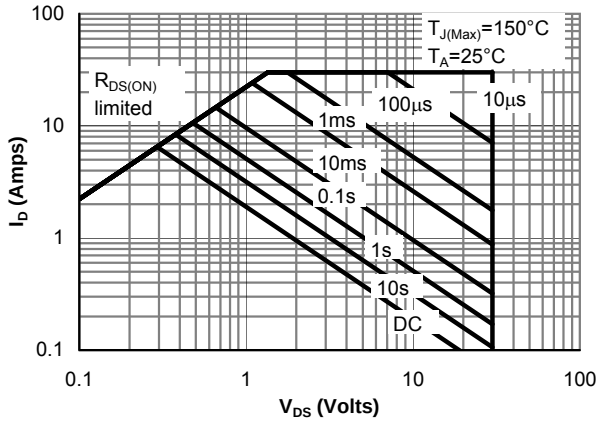


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

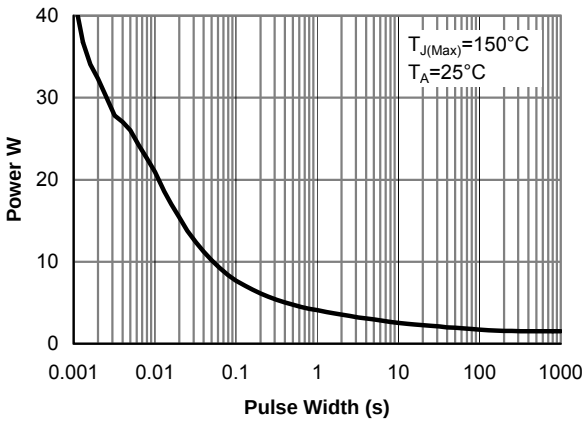


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

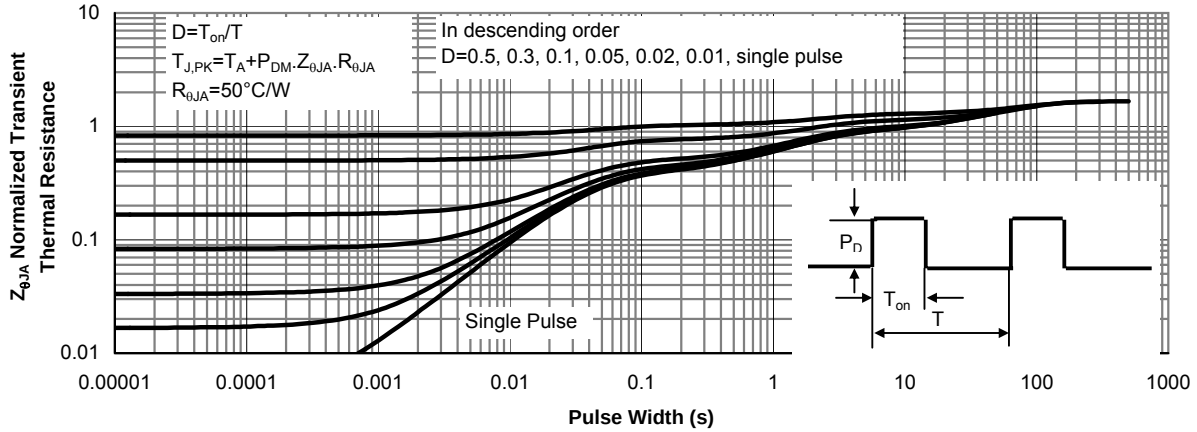


**Figure 11: Normalized Maximum Transient Thermal Impedance**



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## p-channel MOSFET 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 | -1.2 | -2 | -2.4 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=-10V, $V_{DS}$=-5V | 30 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=-10V, $I_D$=-6.6A | | 28 | 35 | mΩ |
| | | $T_J$=125°C | | 37 | 45 | |
| | | $V_{GS}$=-4.5V, $I_D$=-5A | | 44 | 58 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=-5V, $I_D$=-6.6A | | 13 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=-1A,$V_{GS}$=0V | | -0.76 | -1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | -4.2 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=-15V, f=1MHz | | 920 | 1100 | pF |
| $C_{oss}$ | Output Capacitance | | | 190 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 122 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 3.6 | 4.4 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge (10V) | $V_{GS}$=-10V, $V_{DS}$=-15V, $I_D$=-6.6A | | 18.5 | 22.2 | nC |
| $Q_g$(4.5V) | Total Gate Charge (4.5V) | | | 9.6 | 11.6 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 2.7 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 4.5 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=-10V, $V_{DS}$=-15V, $R_L$=2.3Ω, $R_{GEN}$=3Ω | | 7.7 | | ns |
| $t_r$ | Turn-On Rise Time | | | 5.7 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 20.2 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 9.5 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=-6.6A, dI/dt=100A/µs | | 20 | 24 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=-6.6A, dI/dt=100A/µs | | 8.8 | | 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.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

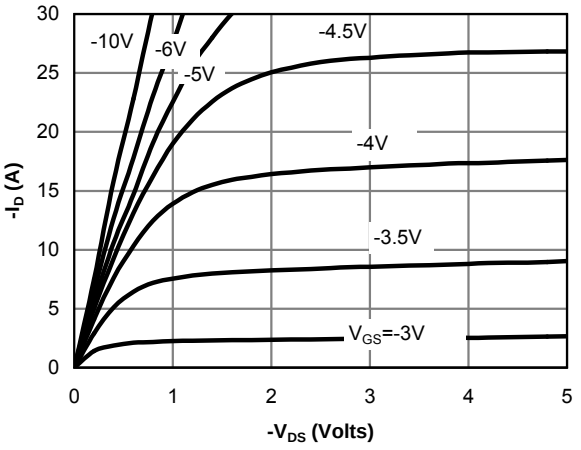


**Fig 1: On-Region Characteristics**

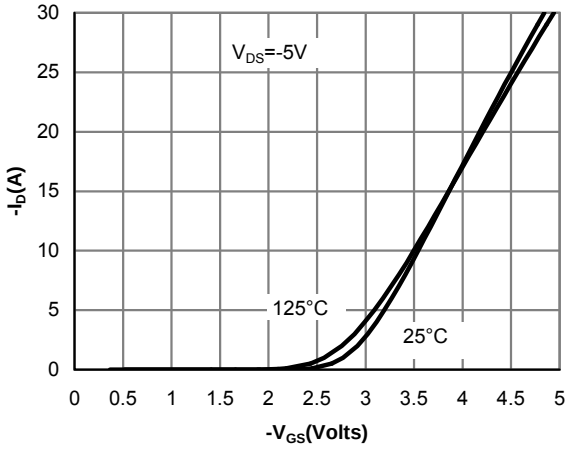


**Figure 2: Transfer Characteristics**

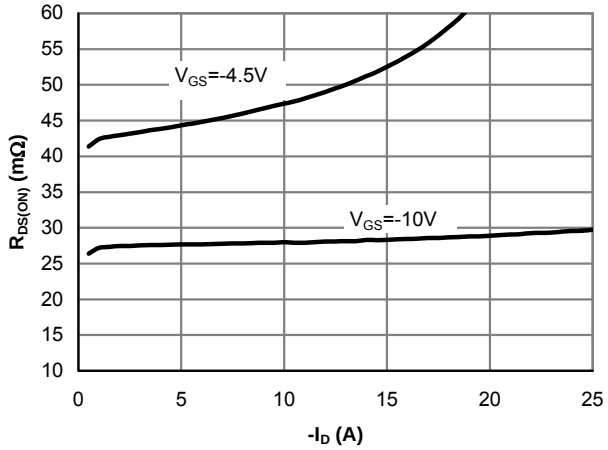


**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**

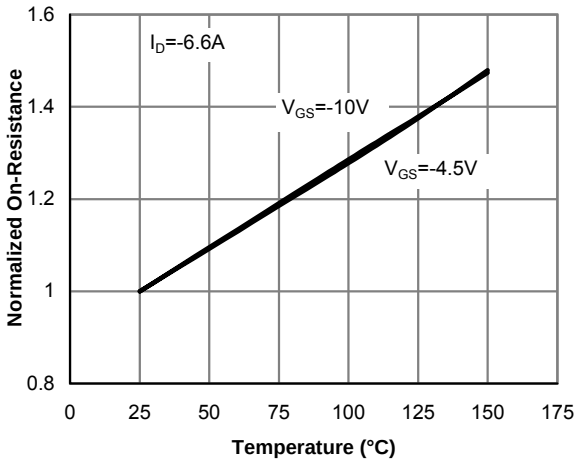


**Figure 4: On-Resistance vs. Junction Temperature**

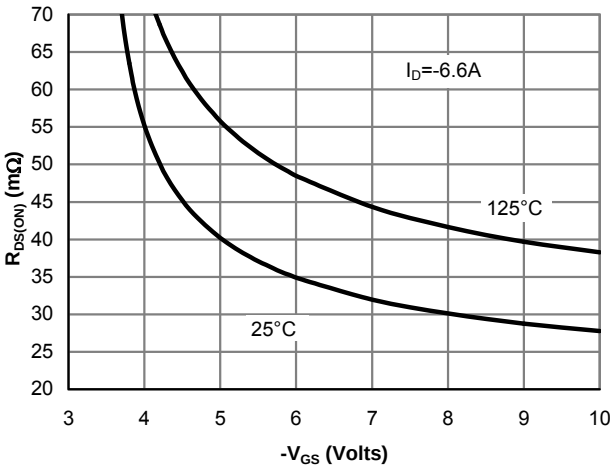


**Figure 5: On-Resistance vs. Gate-Source Voltage**

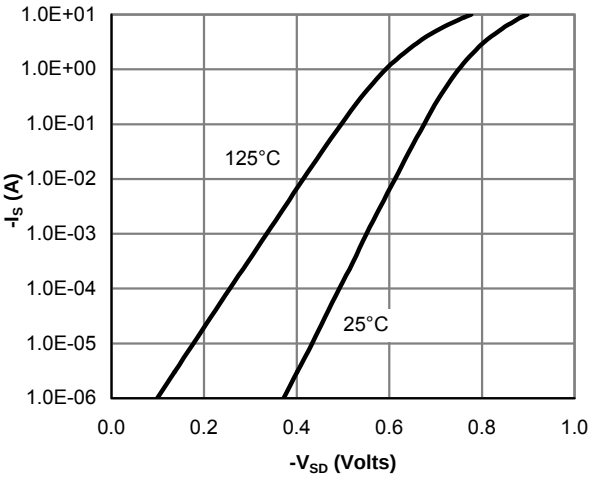


**Figure 6: Body-Diode Characteristics**



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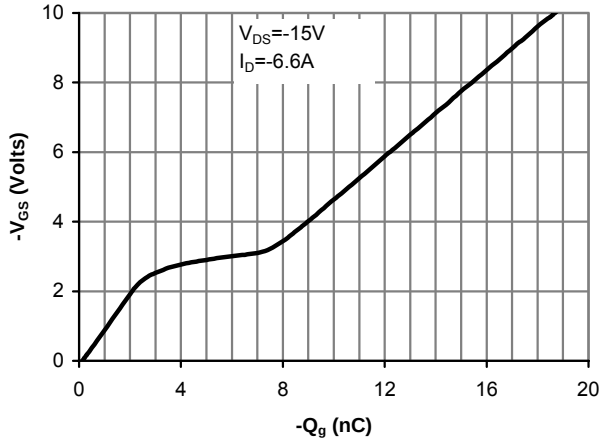


**Figure 7: Gate-Charge Characteristics**

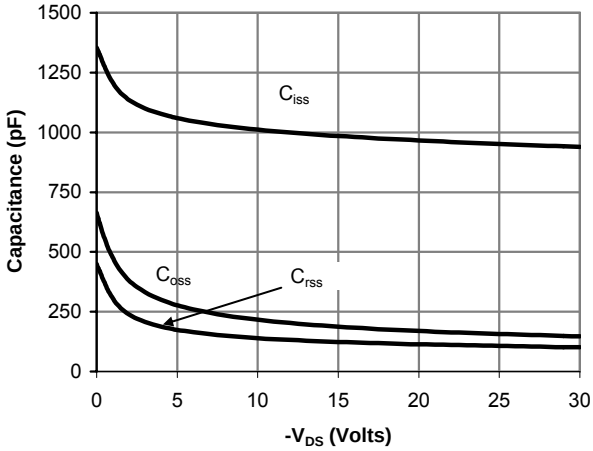


**Figure 8: Capacitance Characteristics**

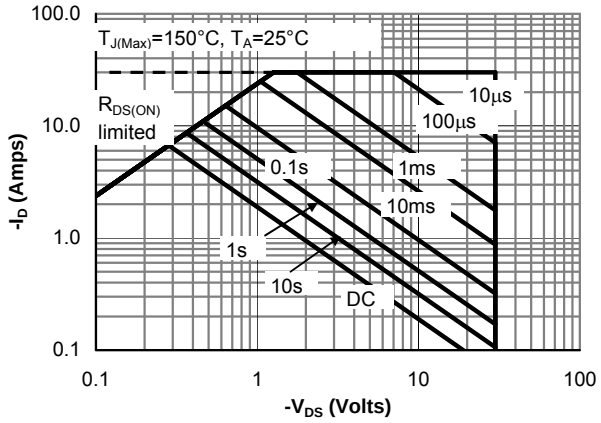


**Figure 9: Maximum Forward Biased Safe Operating Area (Note E)**

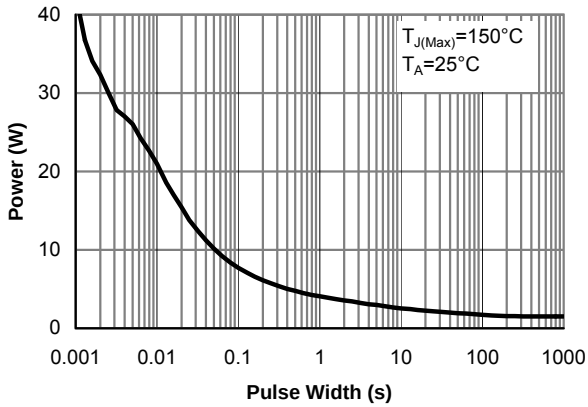


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

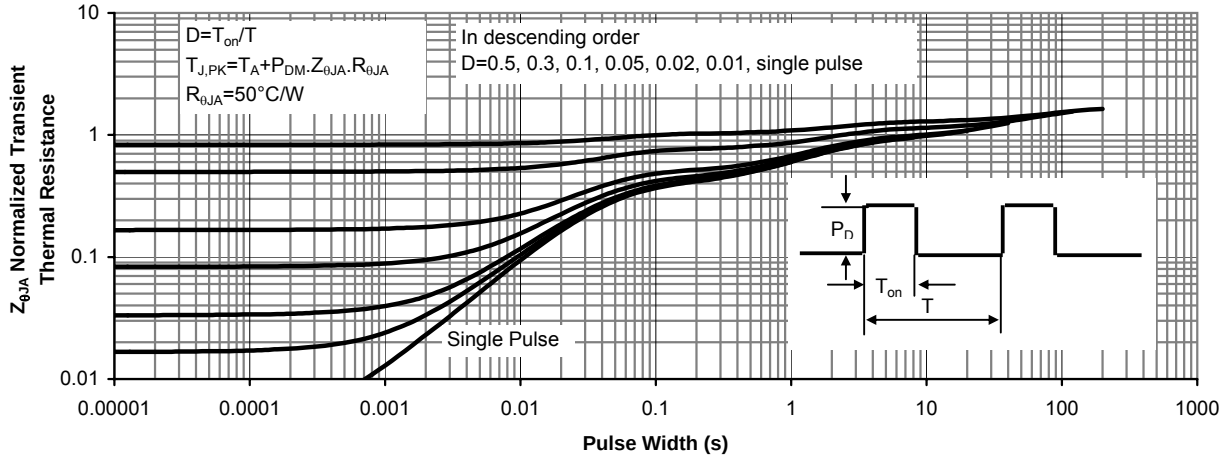


**Figure 11: Normalized Maximum Transient Thermal Impedance**



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