



ALPHA & OMEGA
SEMICONDUCTOR



AOD607

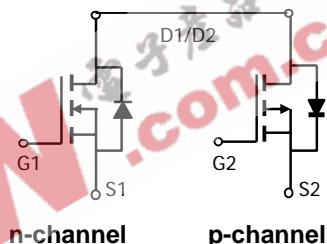
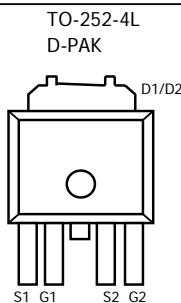
Complementary Enhancement Mode Field Effect Transistor

General Description

The AOD607 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications. Standard product AOD607 is Pb free (meets ROHS & Sony 259 specifications). AOD607L is a Green Product ordering option. AOD607 and AOD607L are electrically identical.

Features

| | |
|------------------------------|------------------------------|
| n-channel | p-channel |
| $V_{DS}(V) = 30V$ | -30V |
| $I_D = 12A$ ($V_{GS}=10V$) | -12A ($V_{GS} = -10V$) |
| $R_{DS(ON)}$ | $R_{DS(ON)}$ |
| < 25 mΩ ($V_{GS}=10V$) | < 37 mΩ ($V_{GS} = -10V$) |
| < 34 mΩ ($V_{GS}=4.5V$) | < 62 mΩ ($V_{GS} = -4.5V$) |



Absolute Maximum Ratings $T_A=25^\circ C$ 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 ^G | I_D | 12 | -12 | A |
| $T_C=100^\circ C$ | | 12 | -12 | |
| Pulsed Drain Current ^C | I_{DM} | 40 | -40 | |
| Avalanche Current ^C | I_{AR} | 18 | -18 | A |
| Repetitive avalanche energy $L=0.1mH$ ^C | E_{AR} | 40 | 40 | mJ |
| Power Dissipation ^B | P_D | 25 | 25 | W |
| $T_C=100^\circ C$ | | 12.5 | 12.5 | |
| Power Dissipation ^A | P_{DSM} | 2.1 | 2.1 | W |
| $T_A=70^\circ C$ | | 1.3 | 1.3 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | -55 to 175 | °C |

Thermal Characteristics: n-channel and p-channel

| Parameter | Symbol | Device | Typ | Max | |
|------------------------------------------|-----------------|--------|-----|-----|------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | n-ch | 19 | 23 | °C/W |
| Steady-State | | n-ch | 47 | 60 | °C/W |
| Maximum Junction-to-Case ^B | $R_{\theta JC}$ | n-ch | 4.5 | 6 | °C/W |
| Steady-State | | p-ch | 19 | 23 | °C/W |
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | p-ch | 47 | 60 | °C/W |
| Steady-State | | p-ch | 4.5 | 6 | °C/W |

N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|--------------------------------------------------------------------------------|-----|----------|----------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D=250\mu\text{A}, V_{GS}=0\text{V}$ | 30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | 1 5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$ | | | 100 | nA |
| $V_{GS(\text{th})}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$ | 1 | 1.7 | 2.5 | V |
| $I_{D(\text{ON})}$ | On state drain current | $V_{GS}=4.5\text{V}, V_{DS}=5\text{V}$ | 40 | | | A |
| $R_{DS(\text{ON})}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}, I_D=12\text{A}$ $T_J=125^\circ\text{C}$ | | 20 28 | 25 34 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}, I_D=5\text{A}$ | | 27.5 | 34 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}, I_D=12\text{A}$ | | 25 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}, V_{GS}=0\text{V}$ | | 0.75 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 18 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$ | | 1040 | 1250 | pF |
| C_{oss} | Output Capacitance | | | 180 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 110 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$ | | 0.7 | 1.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=12\text{A}$ | | 19.8 | 25 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 9.8 | 12.5 | nC |
| Q_{gs} | Gate Source Charge | | | 2.5 | | nC |
| Q_{gd} | Gate Drain Charge | | | 3.5 | | nC |
| $t_{D(\text{on})}$ | Turn-On Delay Time | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=1.25\Omega, R_{\text{GEN}}=3\Omega$ | | 4.5 | | ns |
| t_r | Turn-On Rise Time | | | 3.9 | | ns |
| $t_{D(\text{off})}$ | Turn-Off Delay Time | | | 17.4 | | ns |
| t_f | Turn-Off Fall Time | | | 3.2 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=12\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 19 | 25 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=12\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 8 | | nC |

A: The value of R_{JJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on R_{JJA} and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

B: The power dissipation P_D is based on $T_{J(\text{MAX})}=175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature $T_{J(\text{MAX})}=175^\circ\text{C}$.

D. The R_{JJA} is the sum of the thermal impedance from junction to case R_{JJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

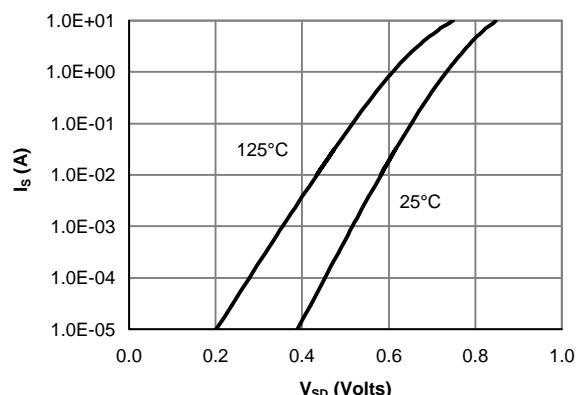
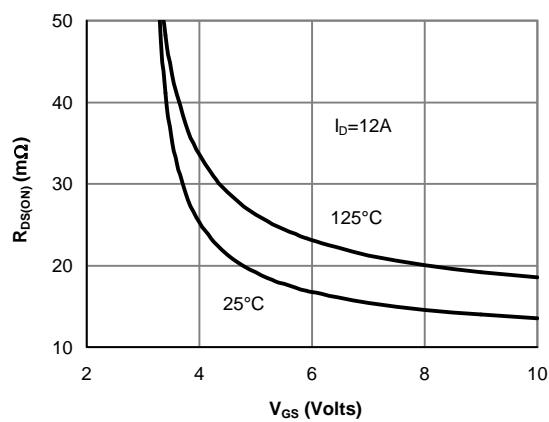
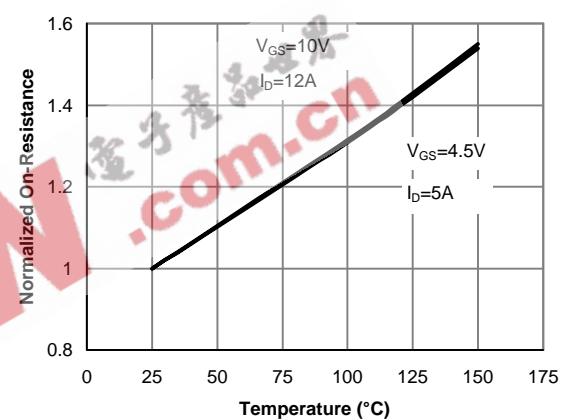
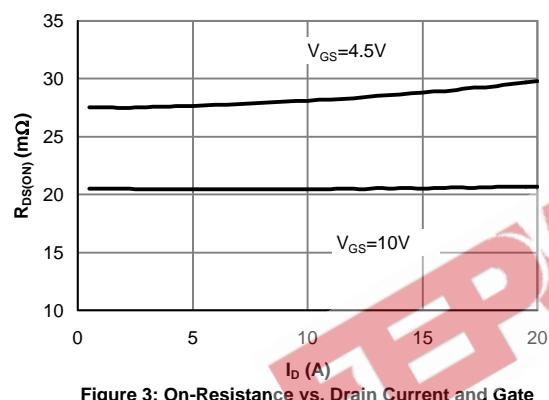
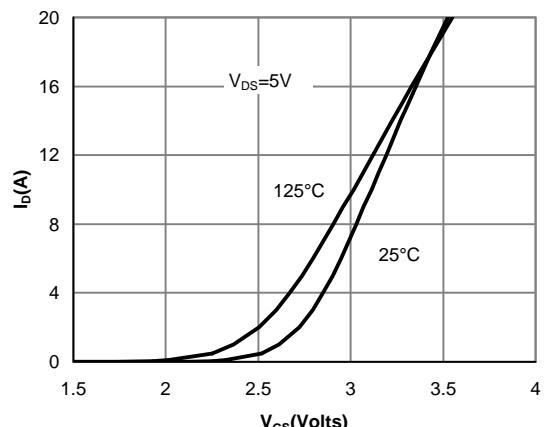
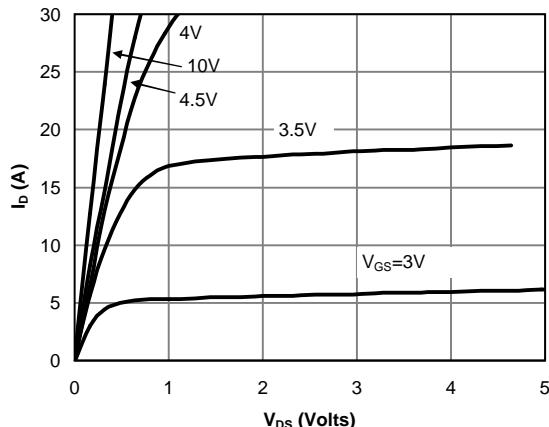
F. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

G. The maximum current rating is limited by bond-wires.

Rev 0: March 2006

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N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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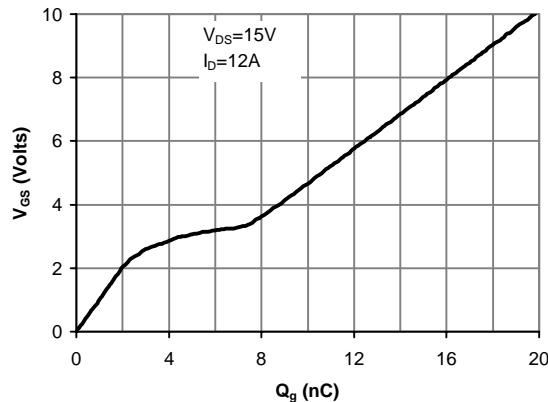


Figure 7: Gate-Charge Characteristics

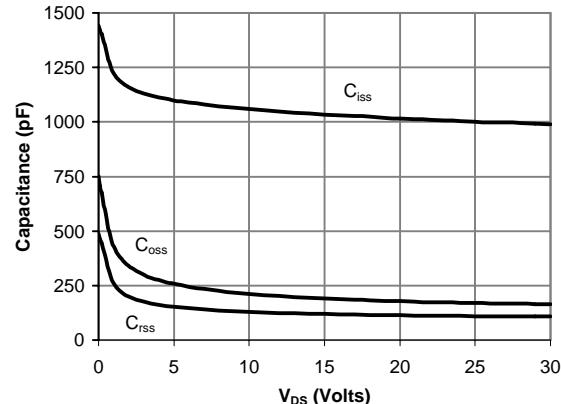


Figure 8: Capacitance Characteristics

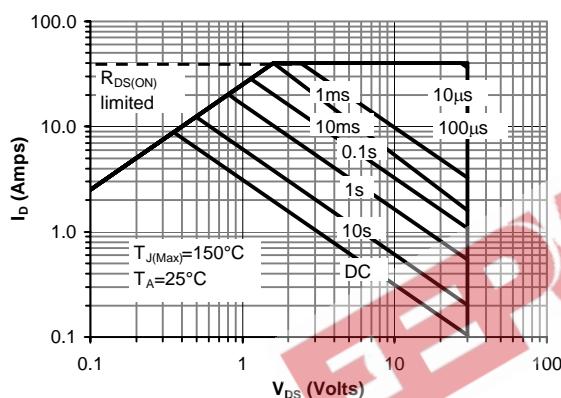


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

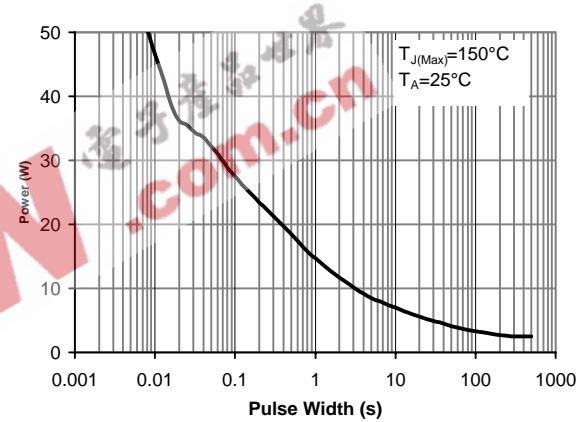


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

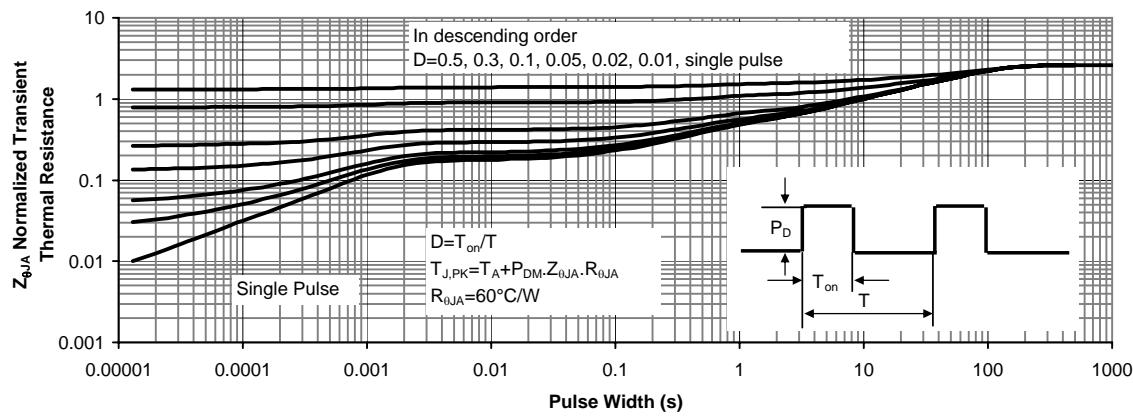


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics ($T=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|------------------------------------------------------------------------------------------------|------|--------|----------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_{\text{D}}=-250\mu\text{A}, V_{\text{GS}}=0\text{V}$ | -30 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{\text{DS}}=-24\text{V}, V_{\text{GS}}=0\text{V}$ $T_{\text{J}}=55^{\circ}\text{C}$ | | -0.003 | -1 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{\text{DS}}=0\text{V}, V_{\text{GS}}=\pm20\text{V}$ | | | ±100 | nA |
| $V_{\text{GS}(\text{th})}$ | Gate Threshold Voltage | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=-250\mu\text{A}$ | -1.2 | -2 | -2.4 | V |
| $I_{\text{D}(\text{ON})}$ | On state drain current | $V_{\text{GS}}=-10\text{V}, V_{\text{DS}}=-5\text{V}$ | -40 | | | A |
| $R_{\text{DS}(\text{ON})}$ | Static Drain-Source On-Resistance | $V_{\text{GS}}=-10\text{V}, I_{\text{D}}=-12\text{A}$ $T_{\text{J}}=125^{\circ}\text{C}$ | | 30 | 37 | $\text{m}\Omega$ |
| | | $V_{\text{GS}}=-4.5\text{V}, I_{\text{D}}=-5\text{A}$ | | 42 | 50 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{\text{DS}}=-5\text{V}, I_{\text{D}}=-12\text{A}$ | | 17 | | S |
| V_{SD} | Diode Forward Voltage | $I_{\text{S}}=-1\text{A}, V_{\text{GS}}=0\text{V}$ | | -0.76 | -1 | V |
| I_{S} | Maximum Body-Diode Continuous Current | | | | -18 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{\text{GS}}=0\text{V}, V_{\text{DS}}=-15\text{V}, f=1\text{MHz}$ | | 920 | 1100 | pF |
| C_{oss} | Output Capacitance | | | 190 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 122 | | pF |
| R_g | Gate resistance | $V_{\text{GS}}=0\text{V}, V_{\text{DS}}=0\text{V}, f=1\text{MHz}$ | | 3.6 | 5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge (10V) | $V_{\text{GS}}=-10\text{V}, V_{\text{DS}}=-15\text{V}, I_{\text{D}}=-12\text{A}$ | | 18.7 | 23 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge (4.5V) | | | 9.7 | 11.7 | nC |
| Q_{gs} | Gate Source Charge | | | 2.54 | | nC |
| Q_{gd} | Gate Drain Charge | | | 5.4 | | nC |
| $t_{\text{D}(\text{on})}$ | Turn-On DelayTime | $V_{\text{GS}}=-10\text{V}, V_{\text{DS}}=-15\text{V}, R_L=1.25\Omega, R_{\text{GEN}}=3\Omega$ | | 9 | 13 | ns |
| t_r | Turn-On Rise Time | | | 25 | 35 | ns |
| $t_{\text{D}(\text{off})}$ | Turn-Off DelayTime | | | 20 | 30 | ns |
| t_f | Turn-Off Fall Time | | | 12 | 18 | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=-12\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 21.4 | 26 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=-12\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 13 | 16 | nC |

A: The value of R_{QJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The Power dissipation P_{DSM} is based on steady-state R_{QJA} and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB or heatsink allows it.

B. The power dissipation P_D is based on $T_{\text{J}(\text{MAX})}=175^{\circ}\text{C}$, using junction-to-case thermal resistance, and is more useful in setting 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.

C: Repetitive rating, pulse width limited by junction temperature $T_{\text{J}(\text{MAX})}=175^{\circ}\text{C}$.

D. The R_{QJA} is the sum of the thermal impedance from junction to case R_{QJC} and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

F. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

G. The maximum current rating is limited by the package current capability.

Rev0 : March 2006

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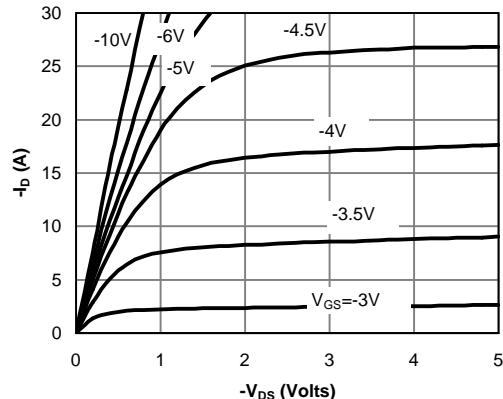


Fig 1: On-Region Characteristics

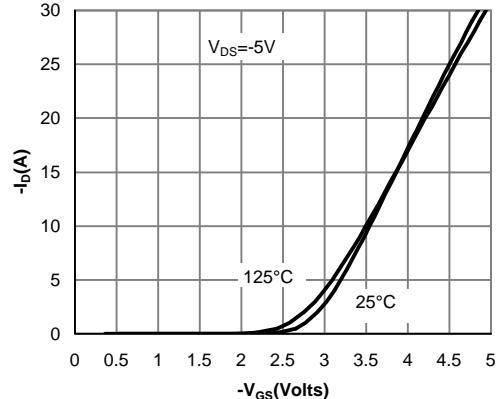


Figure 2: Transfer Characteristics

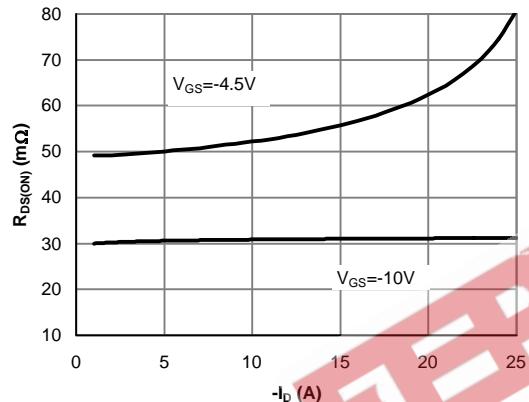


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

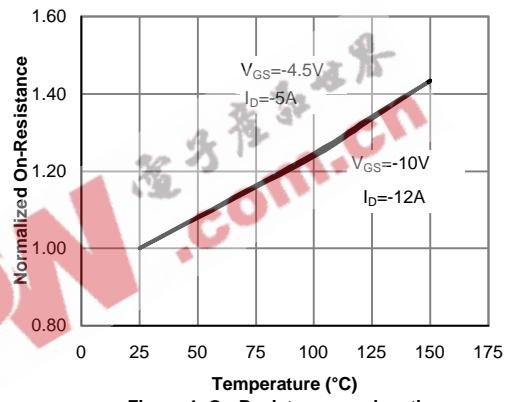


Figure 4: On-Resistance vs. Junction Temperature

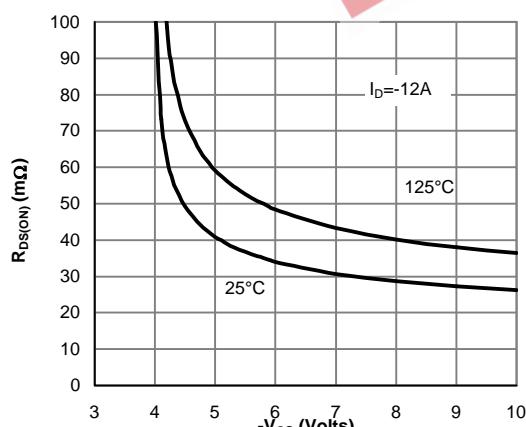


Figure 5: On-Resistance vs. Gate-Source Voltage

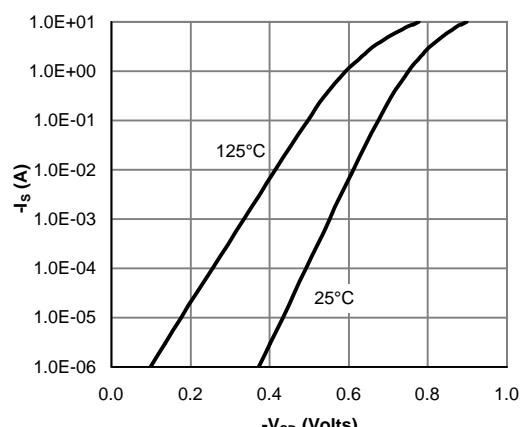


Figure 6: Body-Diode Characteristics

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
