



AO4926

Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

SRFET™

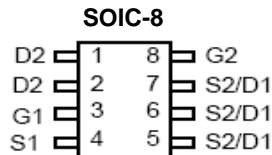
General Description

The AO4926 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 monolithically integrated Schottky diode in parallel with the synchronous MOSFET to boost efficiency further. *Standard Product AO4926 is Pb-free (meets ROHS & Sony 259 specifications).*

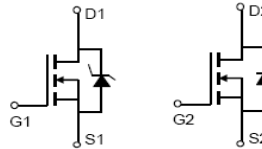
Features

| | |
|----------------------------|-----------------------------------|
| FET1 | FET2 |
| $V_{DS} (V) = 30V$ | $V_{DS}(V) = 30V$ |
| $I_D = 9.5A$ | $I_D = 7.3A$ ($V_{GS} = 10V$) |
| $R_{DS(ON)} < 13.5m\Omega$ | $< 24m\Omega$ ($V_{GS} = 10V$) |
| $R_{DS(ON)} < 16m\Omega$ | $< 29m\Omega$ ($V_{GS} = 4.5V$) |

UIS TESTED!
Rg, Ciss, Coss, Crss Tested



SRFET™
Soft Recovery MOSFET:
Integrated Schottky Diode



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

| Parameter | Symbol | Max FET1 | Max FET2 | Units |
|--|------------------|------------------|------------|------------|
| Drain-Source Voltage | V_{DS} | 30 | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | ± 12 | V |
| Continuous Drain Current ^{AF} | $T_A=25^\circ C$ | 9.5 | 7.3 | A |
| | | $T_A=70^\circ C$ | 7.8 | |
| Pulsed Drain Current ^B | I_{DM} | 40 | 40 | A |
| Avalanche Current ^B | I_{AR} | 22 | 12 | A |
| Repetitive avalanche energy $L=0.3mH$ ^B | E_{AR} | 73 | 22 | mJ |
| Power Dissipation | $T_A=25^\circ C$ | 2.0 | 2.0 | W |
| | | $T_A=70^\circ C$ | 1.3 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | -55 to 150 | $^\circ C$ |

Thermal Characteristics FET1

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|--------------|------|--------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 48 | 62.5 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 74 | 90 |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 32 | 40 | $^\circ C/W$ |

Thermal Characteristics FET2

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|--------------|------|--------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 48 | 62.5 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 74 | 90 |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 32 | 40 | $^\circ C/W$ |

FET1 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 | $V_{DS}=30\text{V}$, $V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$ | | 0.02 10 | 0.1 20 | mA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$ | | | 0.1 | μA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 1.5 | 1.8 | 2.4 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$ | 40 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}$, $I_D=9.5\text{A}$ $T_J=125^\circ\text{C}$ | | 11 17.1 | 13.5 21.3 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}$, $I_D=7\text{A}$ | | 13 | 16.0 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}$, $I_D=9.5\text{A}$ | | 78 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}$, $V_{GS}=0\text{V}$ | | 0.38 | 0.5 | V |
| I_S | Maximum Body-Diode + Schottky Continuous Current | | | | 4 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$ | | 1980 | 2574 | pF |
| C_{oss} | Output Capacitance | | | 317 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 111 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | | 1.3 | 2.0 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=9\text{A}$ | | 33.0 | 43 | |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 15.0 | 20 | nC |
| Q_{gs} | Gate Source Charge | | | 5.3 | | nC |
| Q_{gd} | Gate Drain Charge | | | 6.0 | | nC |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.6\Omega$, $R_{GEN}=3\Omega$ | | 5.5 | | ns |
| t_r | Turn-On Rise Time | | | 5.5 | | ns |
| $t_{D(off)}$ | Turn-Off Delay Time | | | 27.0 | | ns |
| t_f | Turn-Off Fall Time | | | 4.3 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=9.5\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$ | | 11 | 13 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=9.5\text{A}$, $dI/dt=300\text{A}/\mu\text{s}$ | | 7 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in ² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$.

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

D: The static characteristics in Figures 1 to 6 are obtained using $<300 \mu\text{s}$ 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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

F: The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

Rev1: June 2007

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FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

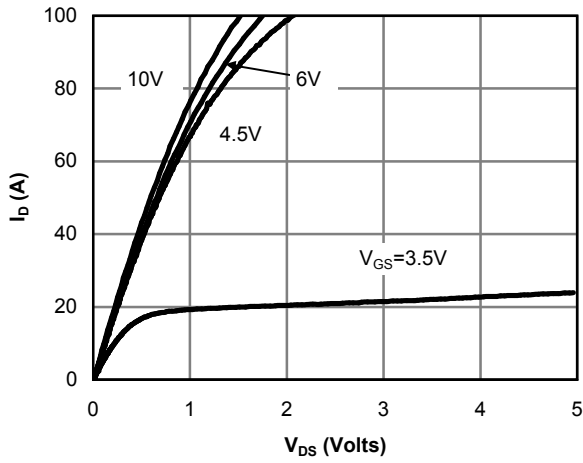


Figure 1: On-Region Characteristics

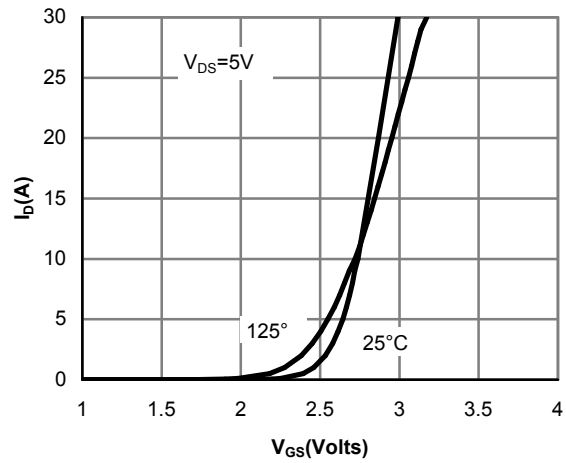


Figure 2: Transfer Characteristics

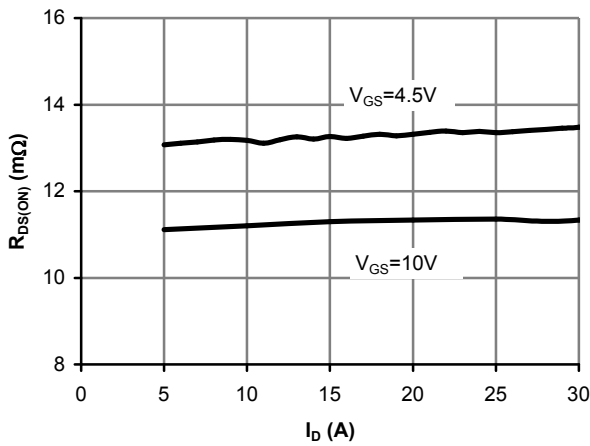


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

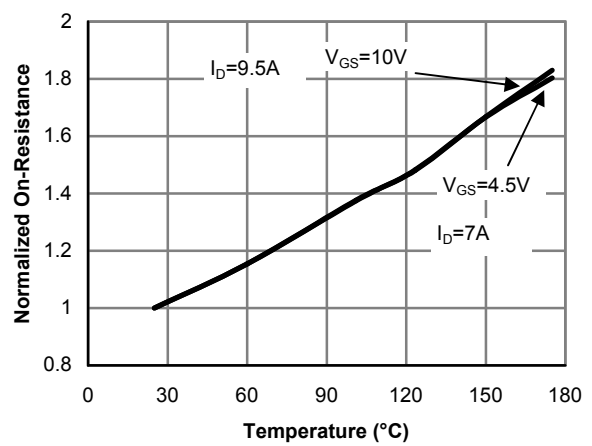


Figure 4: On-Resistance vs. Junction Temperature

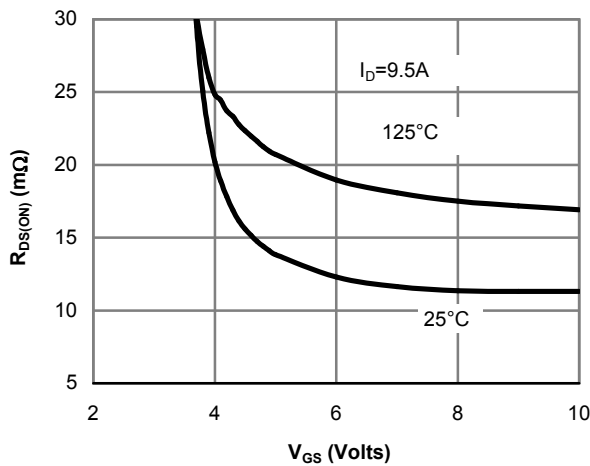


Figure 5: On-Resistance vs. Gate-Source Voltage

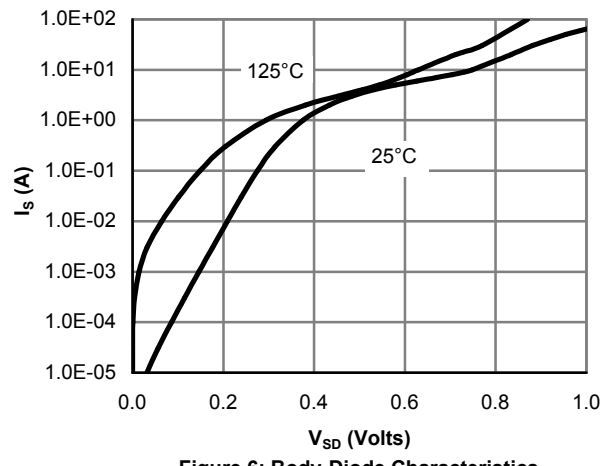


Figure 6: Body-Diode Characteristics

FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

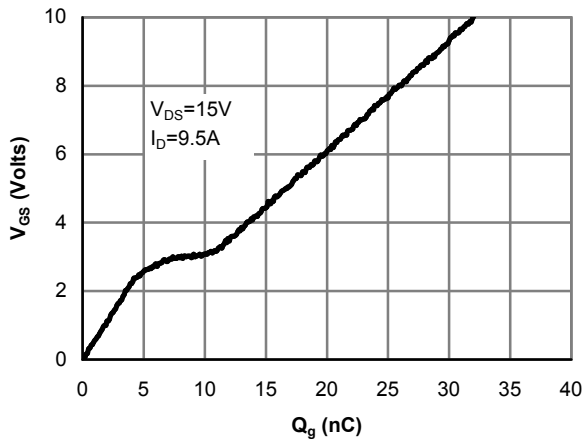


Figure 7: Gate-Charge Characteristics

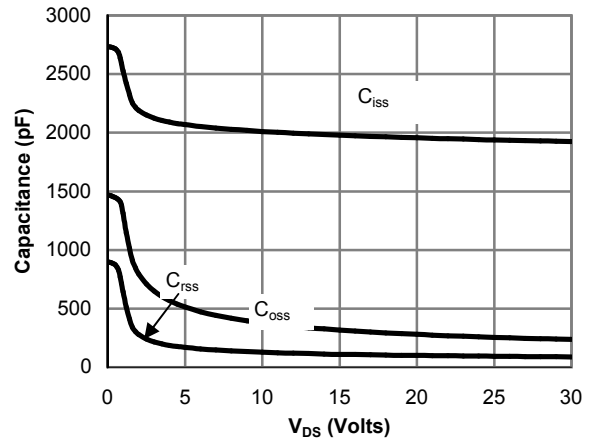


Figure 8: Capacitance Characteristics

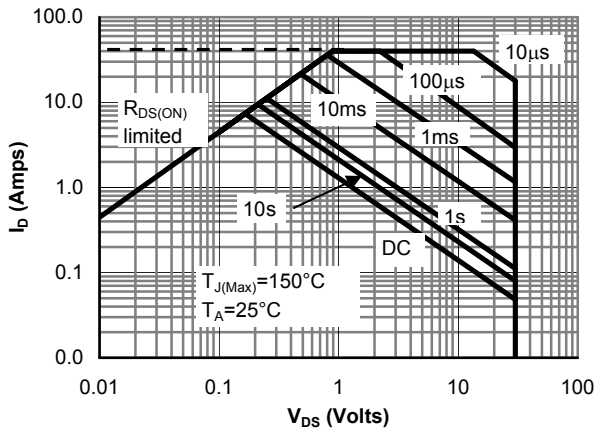


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

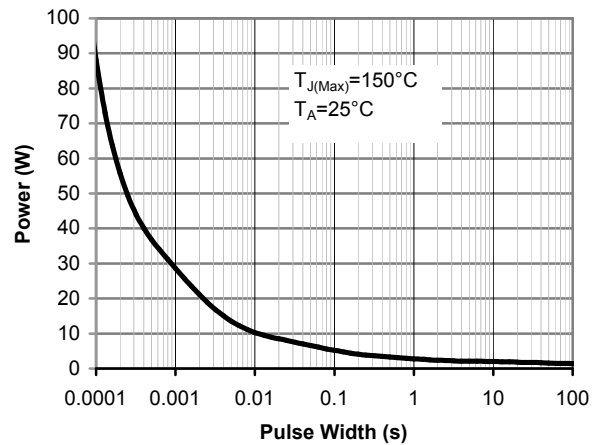


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

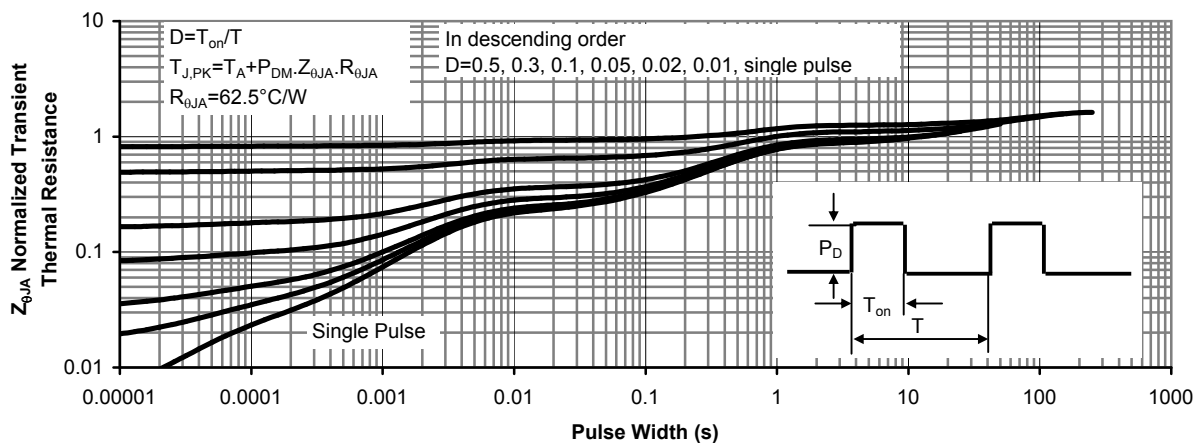


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

FET1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

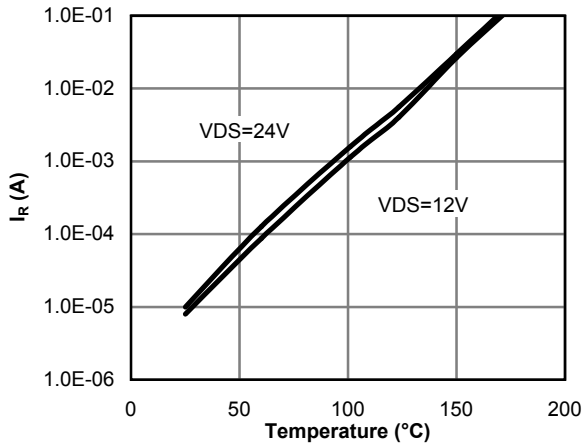


Figure 12: Diode Reverse Leakage Current vs. Junction Temperature

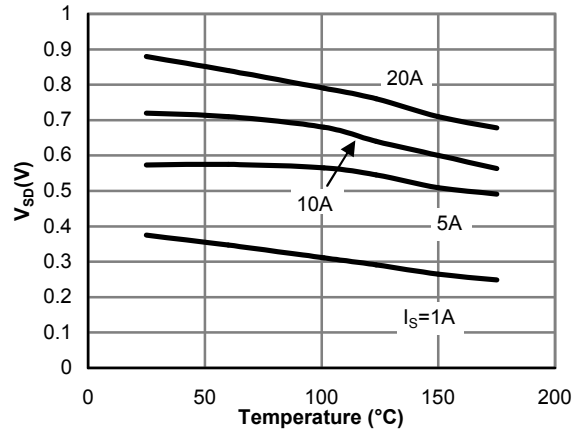


Figure 13: Diode Forward Voltage vs. Junction Temperature

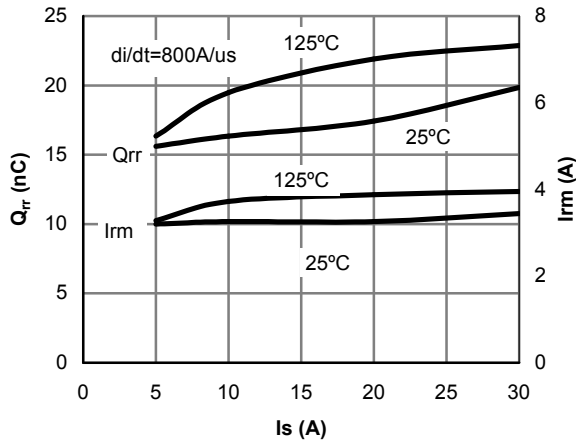


Figure 14: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

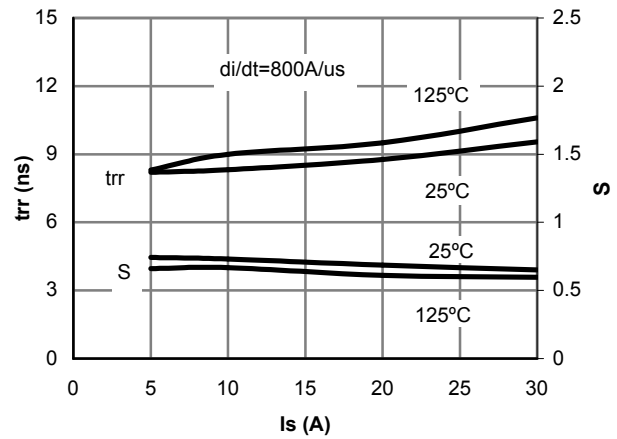


Figure 15: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

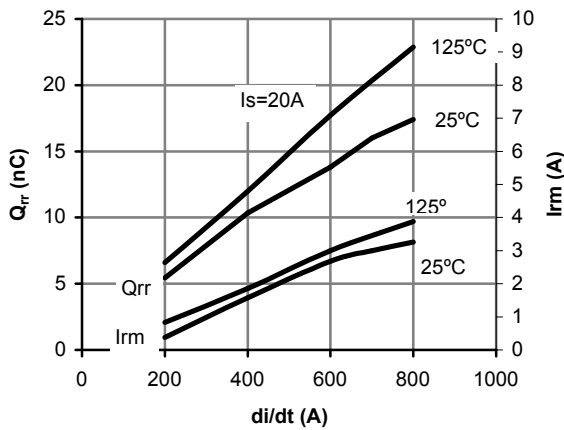


Figure 16: Diode Reverse Recovery Charge and Peak Current vs. di/dt

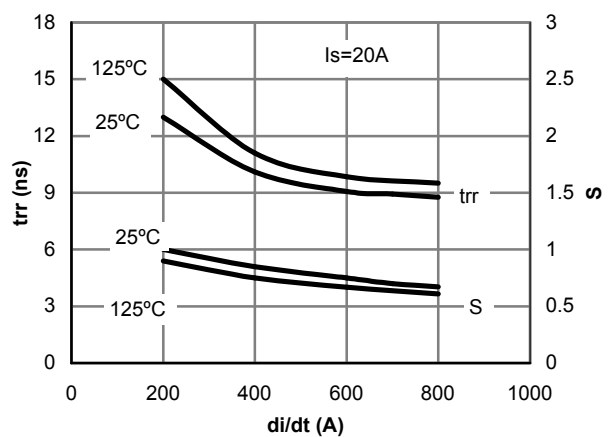


Figure 17: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

FET2 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 | $V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | 0.002 | 1 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$ | 0.7 | 1 | 1.5 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=4.5\text{V}, V_{DS}=5\text{V}$ | 40 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}, I_D=7.3\text{A}$ $T_J=125^\circ\text{C}$ | | 20 | 24 | $\text{m}\Omega$ |
| | | $V_{GS}=4.5\text{V}, I_D=6\text{A}$ | | 23.5 | 29 | $\text{m}\Omega$ |
| | | $V_{GS}=2.5\text{V}, I_D=5\text{A}$ | | 34.7 | 48 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}, I_D=7.3\text{A}$ | | 26 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}, V_{GS}=0\text{V}$ | | 0.71 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 2.8 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$ | | 900 | 1100 | pF |
| C_{oss} | Output Capacitance | | | 88 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 65 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$ | | 0.95 | 1.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q_g | Total Gate Charge | $V_{GS}=4.5\text{V}, V_{DS}=15\text{V}, I_D=7.3\text{A}$ | | 10 | 12 | nC |
| Q_{gs} | Gate Source Charge | | | 1.8 | | nC |
| Q_{gd} | Gate Drain Charge | | | 3.75 | | nC |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=2\Omega,$ $R_{GEN}=6\Omega$ | | 3.2 | | ns |
| t_r | Turn-On Rise Time | | | 3.5 | | ns |
| $t_{D(off)}$ | Turn-Off Delay Time | | | 21.5 | | ns |
| t_f | Turn-Off Fall Time | | | 2.7 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=7.3\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 16.8 | 21 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=7.3\text{A}, dI/dt=100\text{A}/\mu\text{s}$ | | 8 | | nC |

A: The value of $R_{\theta JA}$ 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 value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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

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

D: The static characteristics in Figures 1 to 6 are obtained using $<300 \mu\text{s}$ pulses, duty cycle 0.5% max.

E: 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.

Rev 1: June 2007

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FET2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

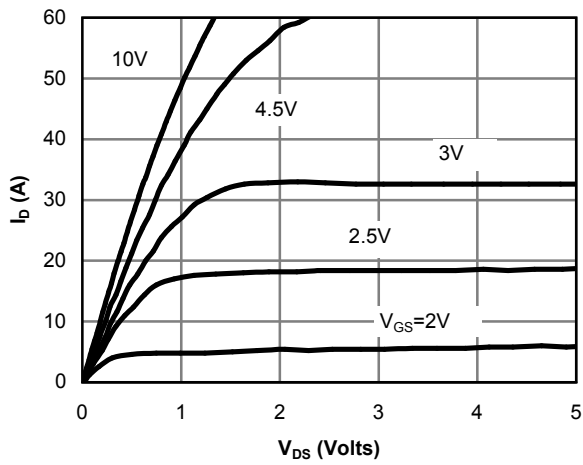


Figure 1: On-Region Characteristics

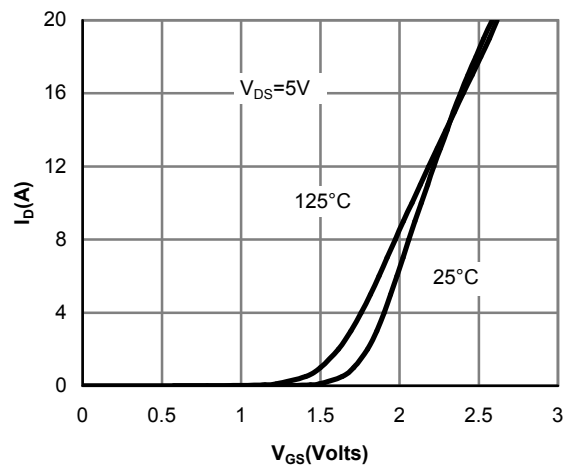


Figure 2: Transfer Characteristics

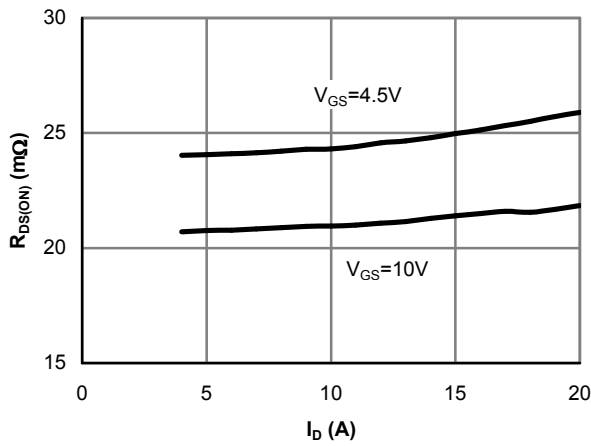


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

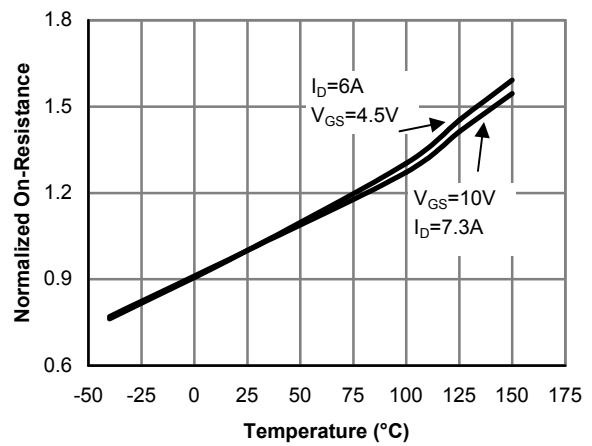


Figure 4: On-Resistance vs. Junction Temperature

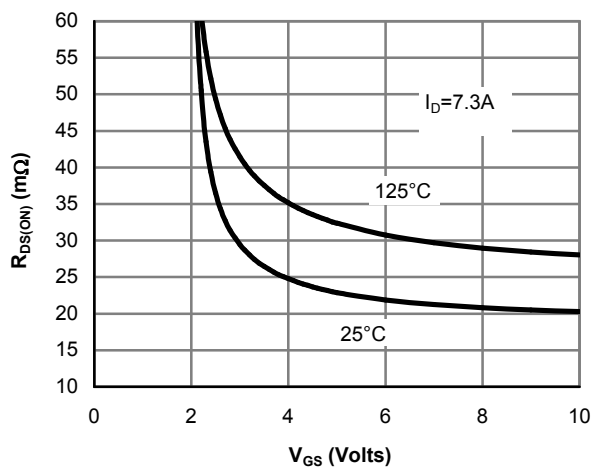


Figure 5: On-Resistance vs. Gate-Source Voltage

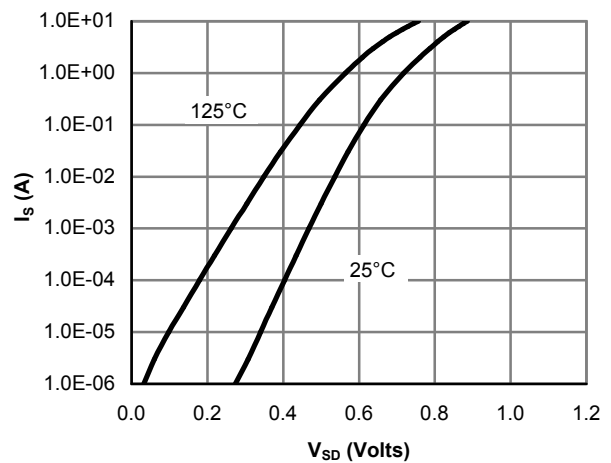


Figure 6: Body-Diode Characteristics

FET2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

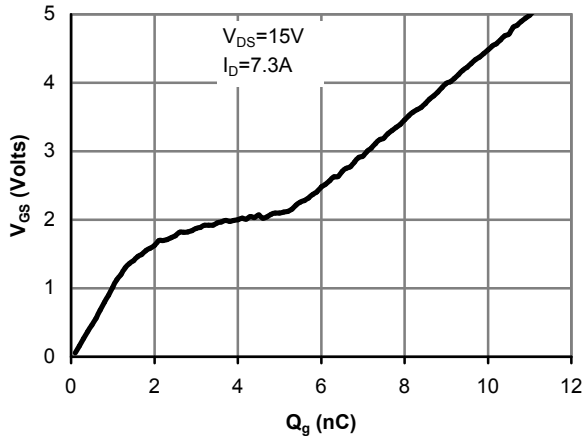


Figure 7: Gate-Charge Characteristics

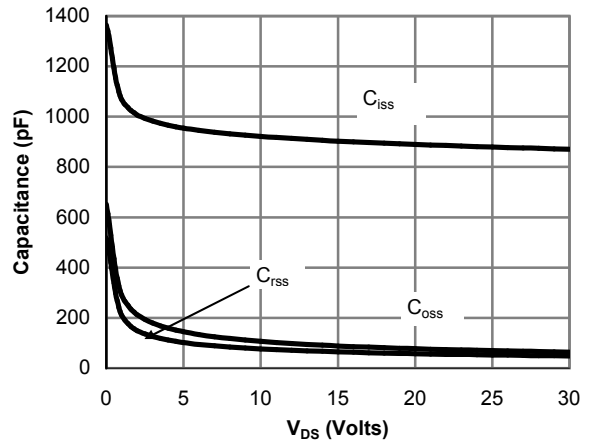


Figure 8: Capacitance Characteristics

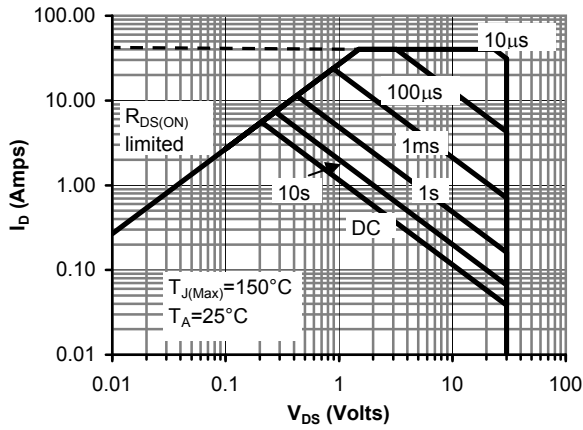


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

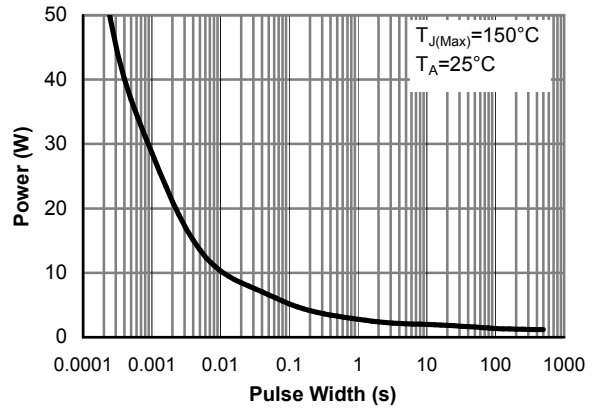


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

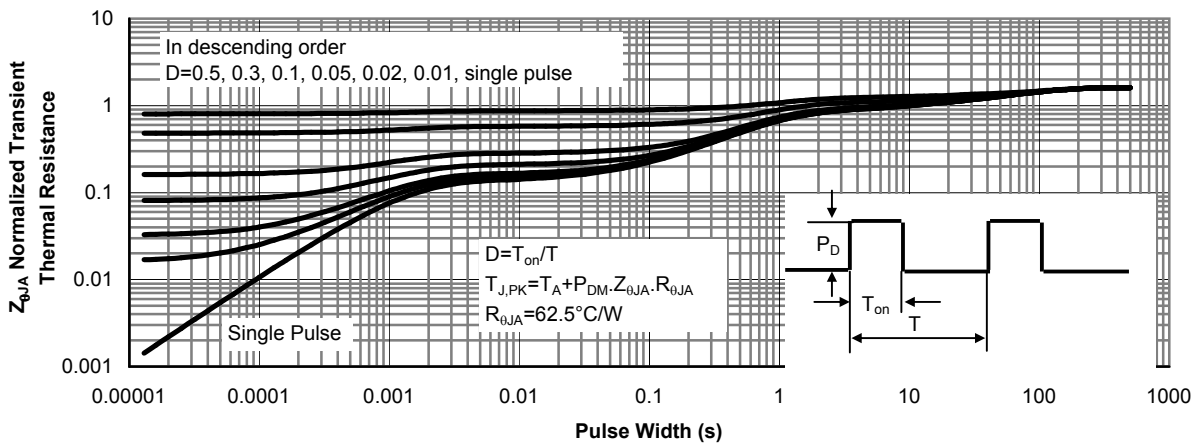


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)