

General Description

The AO4606 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

Product Summary
N-Channel

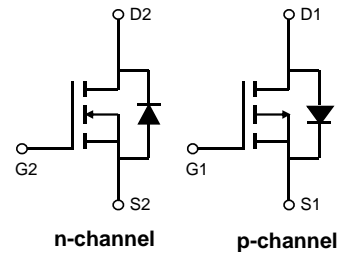
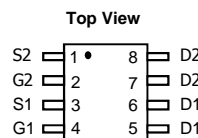
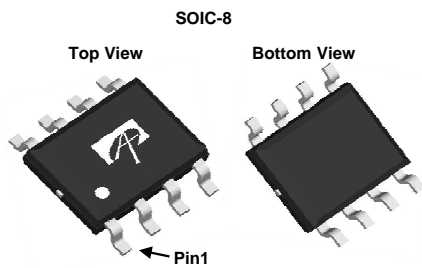
$V_{DS} = 30V$
 $I_D = 6A$ ($V_{GS} = 10V$)
 $R_{DS(ON)}$
 $< 30m\Omega$ ($V_{GS} = 10V$)
 $< 42m\Omega$ ($V_{GS} = 4.5V$)

100% UIS Tested
 100% R_g Tested

P-Channel

$-30V$
 $-6.5A$ ($V_{GS} = -10V$)
 $R_{DS(ON)}$
 $< 28m\Omega$ ($V_{GS} = -10V$)
 $< 44m\Omega$ ($V_{GS} = -4.5V$)

100% UIS Tested
 100% R_g Tested


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 | I_D | $T_A = 25^\circ C$ | 6 | -6.5 |
| | | $T_A = 70^\circ C$ | 5 | -5.3 |
| Pulsed Drain Current ^C | I_{DM} | 30 | -30 | A |
| Avalanche Current ^C | I_{AS}, I_{AR} | 10 | 23 | A |
| Avalanche energy $L=0.1mH$ ^C | E_{AS}, E_{AR} | 5 | 26 | mJ |
| Power Dissipation ^B | P_D | $T_A = 25^\circ C$ | 2 | 2 |
| | | $T_A = 70^\circ C$ | 1.3 | 1.3 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | | $^\circ C$ |

Thermal Characteristics

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

N-Channel 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} =30V, V _{GS} =0V T _J =55°C | | | 1 5 | μA |
| 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 | 1.8 | 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 =6A T _J =125°C | | 25 40 | 30 48 | mΩ |
| | | V _{GS} =4.5V, I _D =5A | | 33.5 | 42 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =6A | | 15 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.76 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | 200 | 255 | 310 | pF |
| C _{oss} | Output Capacitance | | 30 | 45 | 60 | pF |
| C _{riss} | Reverse Transfer Capacitance | | 20 | 35 | 50 | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | 1.6 | 3.25 | 4.9 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g (10V) | Total Gate Charge | V _{GS} =10V, V _{DS} =15V, I _D =6A | 4 | 5.2 | 6 | nC |
| Q _g (4.5V) | Total Gate Charge | | 2 | 2.55 | 3 | nC |
| Q _{gs} | Gate Source Charge | | | 0.85 | | nC |
| Q _{gd} | Gate Drain Charge | | | 1.3 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =2.5Ω, R _{GEN} =3Ω | | 4.5 | | ns |
| t _r | Turn-On Rise Time | | | 2.5 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 14.5 | | ns |
| t _f | Turn-Off Fall Time | | | 3.5 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =6A, di/dt=100A/μs | | 8.5 | 12 | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =6A, di/dt=100A/μs | | 2.2 | 3 | nC |

A. The value of R_{θJA} is measured with the device mounted on 1in² 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.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

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

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

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N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

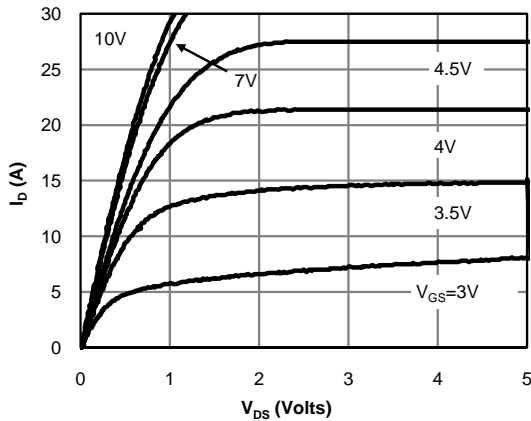


Fig 1: On-Region Characteristics (Note E)

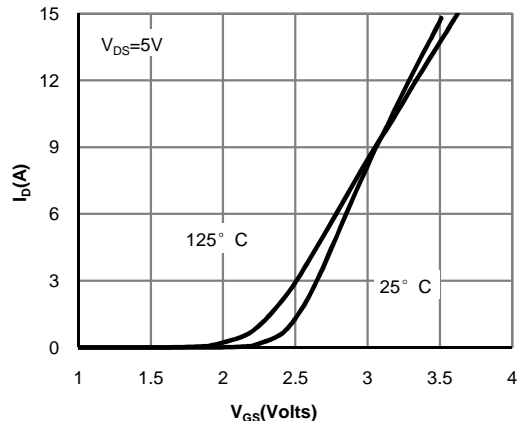


Figure 2: Transfer Characteristics (Note E)

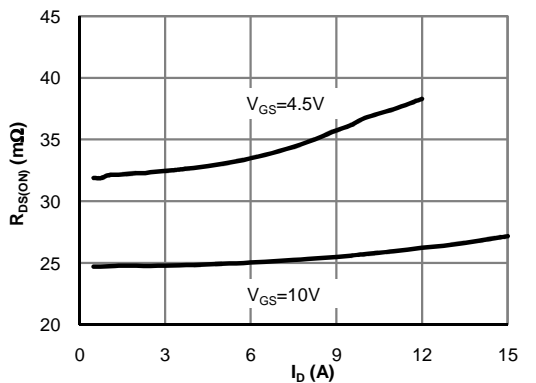


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

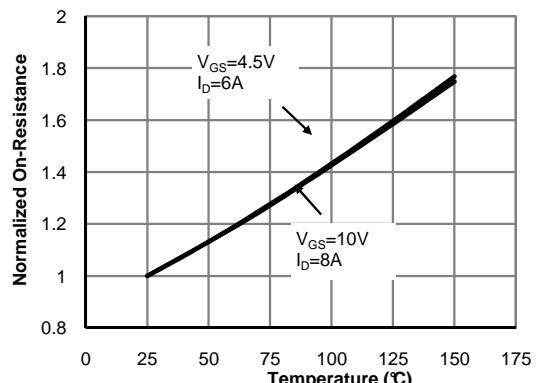


Figure 4: On-Resistance vs. Junction Temperature (Note E)

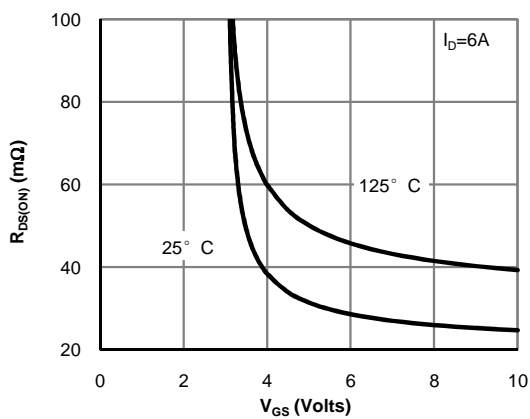


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

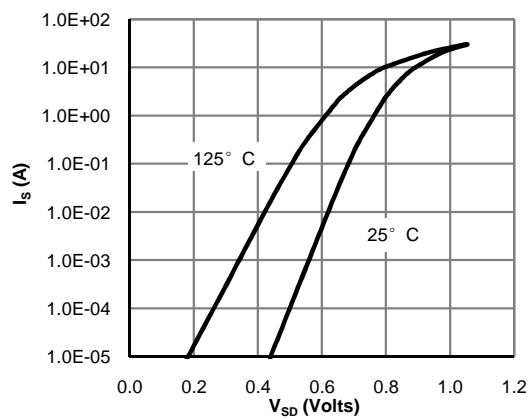


Figure 6: Body-Diode Characteristics (Note E)

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

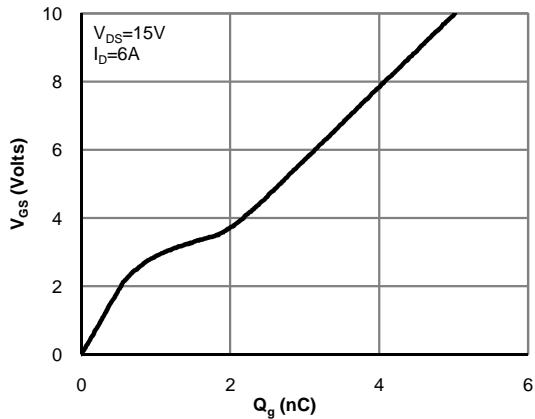


Figure 7: Gate-Charge Characteristics

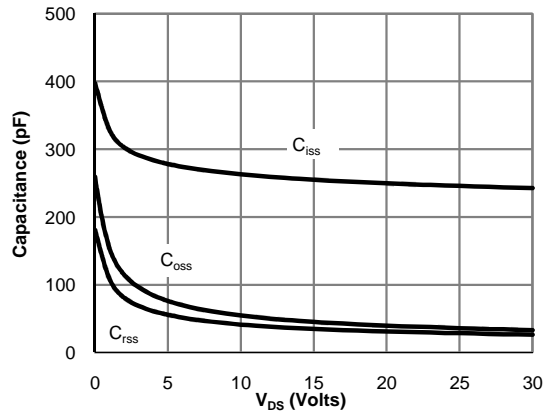


Figure 8: Capacitance Characteristics

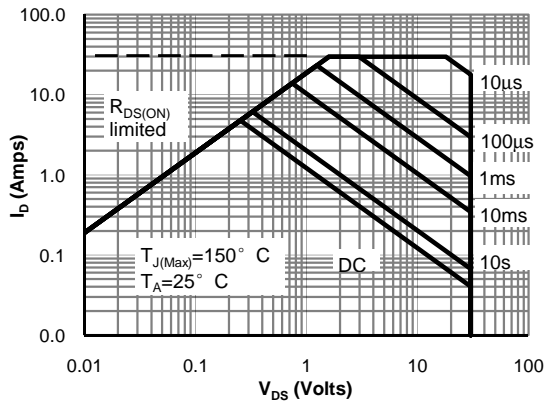


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

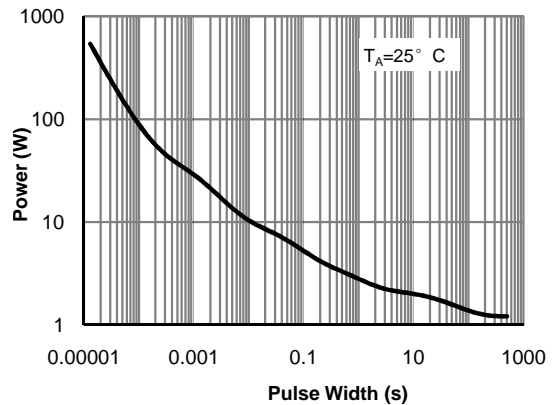


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

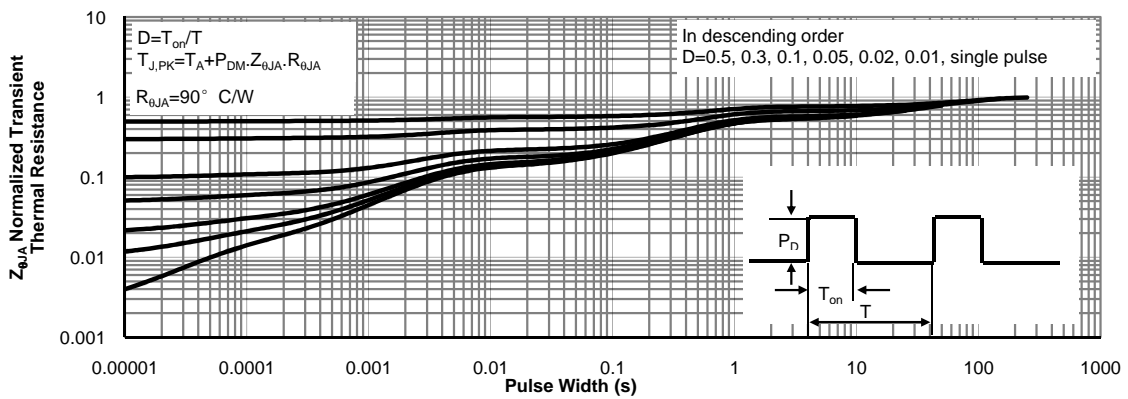
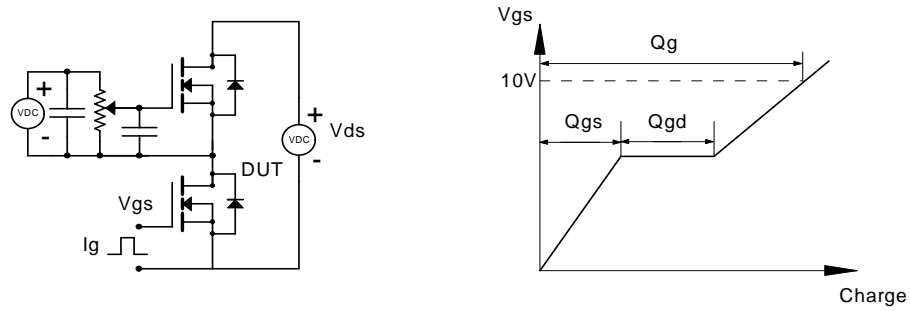
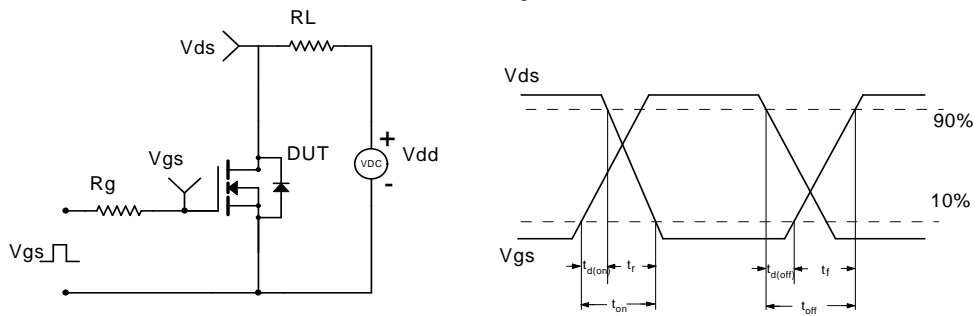


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Gate Charge Test Circuit & Waveform



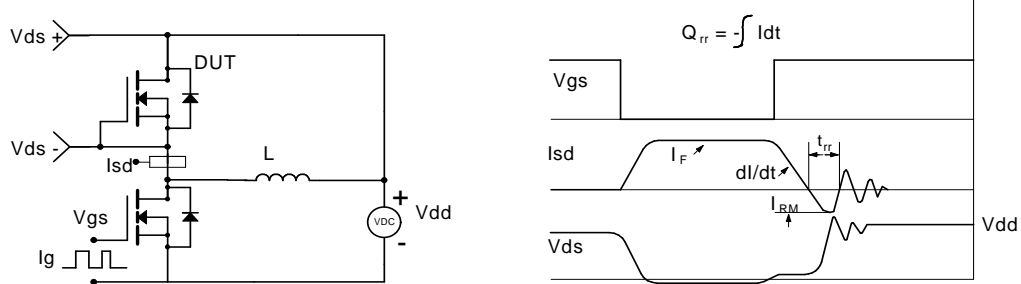
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



P-Channel 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} =-30V, V _{GS} =0V T _J =55°C | | | -1 -5 | μA |
| 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 | -1.3 | -1.85 | -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 =-6.5A T _J =125°C | | 22 32 | 28 40 | mΩ |
| | | V _{GS} =-4.5V, I _D =-5A | | 34 | 44 | mΩ |
| g _{FS} | Forward Transconductance | V _{DS} =-5V, I _D =-6.5A | | 18 | | S |
| V _{SD} | Diode Forward Voltage | I _S =-1A, V _{GS} =0V | | -0.8 | -1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | -2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =-15V, f=1MHz | | 760 | | pF |
| C _{oss} | Output Capacitance | | | 140 | | pF |
| C _{riss} | Reverse Transfer Capacitance | | | 95 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | 1.5 | 3.2 | 5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g (10V) | Total Gate Charge | V _{GS} =10V, V _{DS} =-15V, I _D =-6.5A | | 13.6 | 16 | nC |
| Q _g (4.5V) | Total Gate Charge | | | 6.7 | 8 | nC |
| Q _{gs} | Gate Source Charge | | | 2.5 | | nC |
| Q _{gd} | Gate Drain Charge | | | 3.2 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =-15V, R _L =2.3Ω, R _{GEN} =3Ω | | 8 | | ns |
| t _r | Turn-On Rise Time | | | 6 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 17 | | ns |
| t _f | Turn-Off Fall Time | | | 5 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =-6.5A, dI/dt=100A/μs | | 15 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =-6.5A, dI/dt=100A/μs | | 9.7 | | nC |

A. The value of R_{θJA} is measured with the device mounted on 1in² 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.

B. The power dissipation P_D is based on T_{J(MAX)}=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T_{J(MAX)}=150° C. Ratings are based on low frequency and duty cycles to keep initial T_J=25° C.

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P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

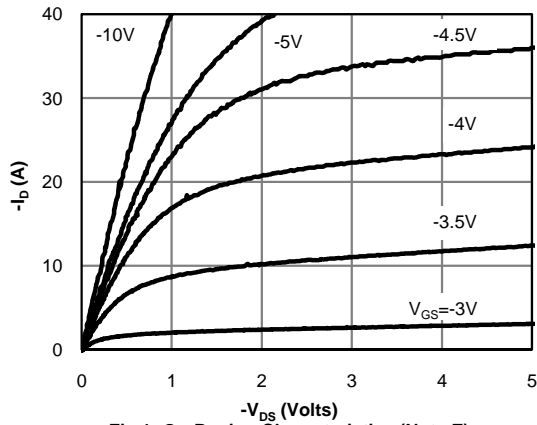


Fig 1: On-Region Characteristics (Note E)

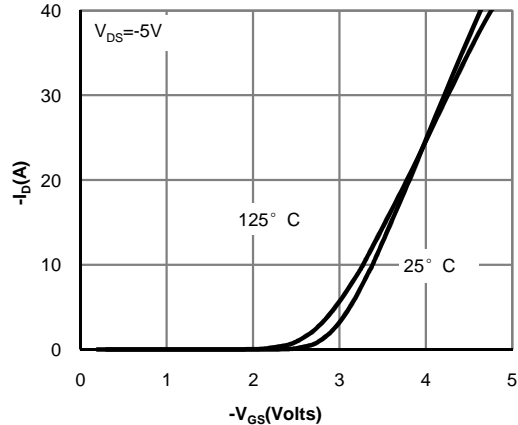


Figure 2: Transfer Characteristics (Note E)

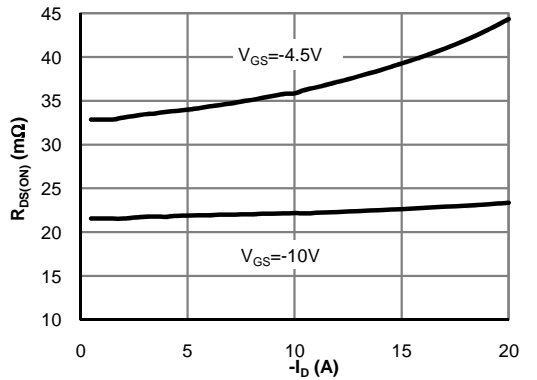


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

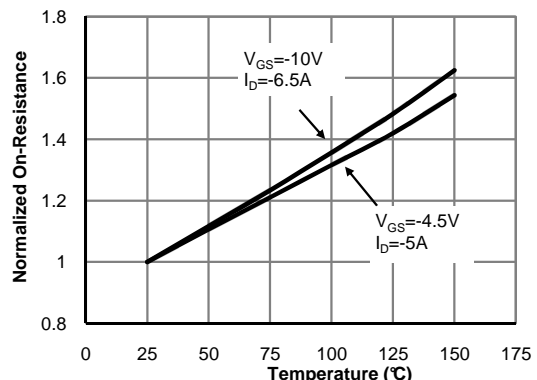


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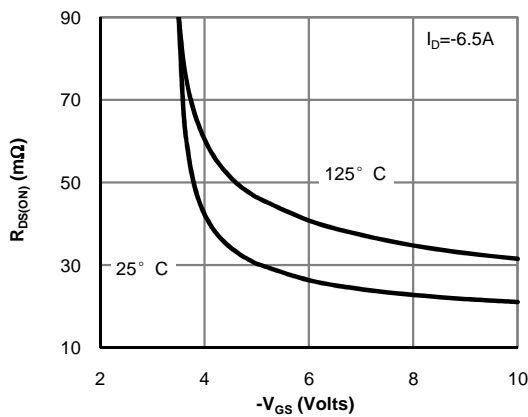


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

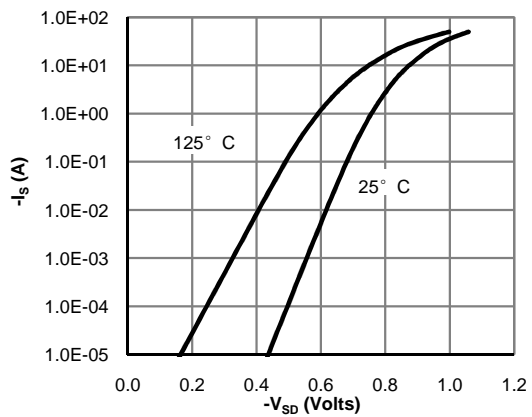


Figure 6: Body-Diode Characteristics (Note E)

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

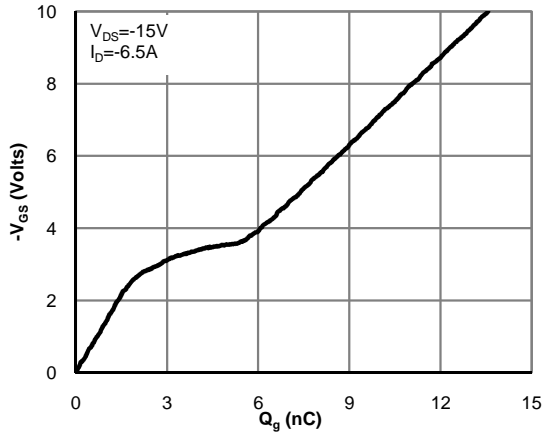


Figure 7: Gate-Charge Characteristics

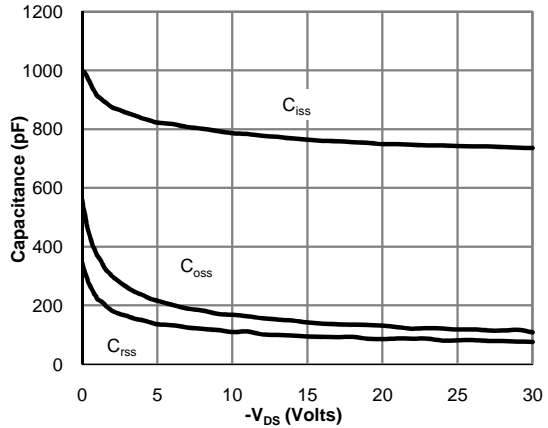


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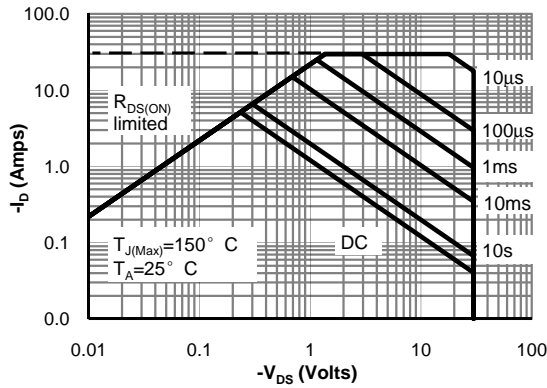


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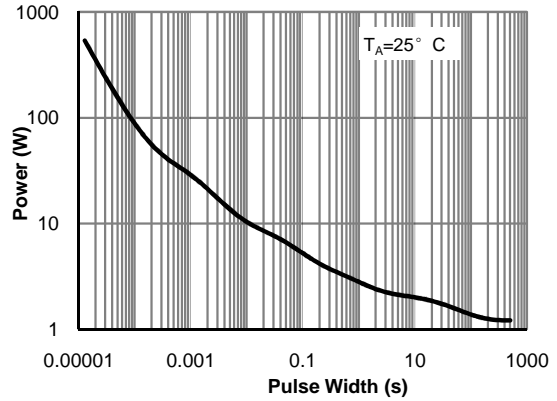


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

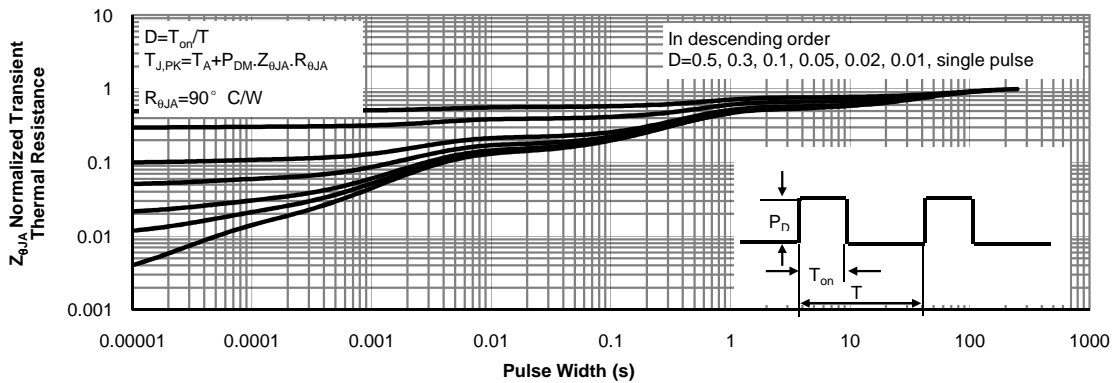
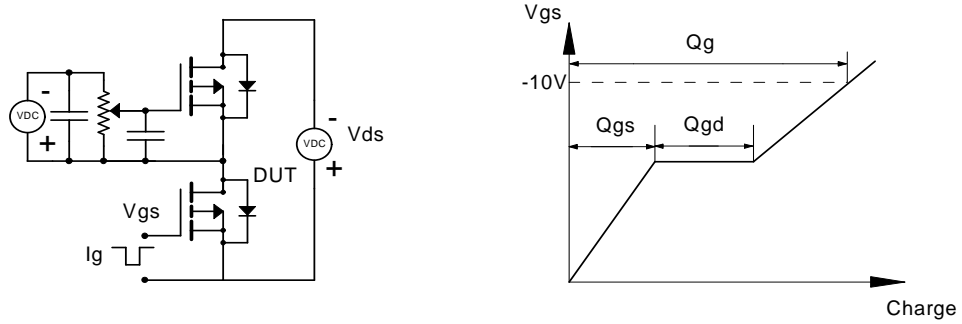
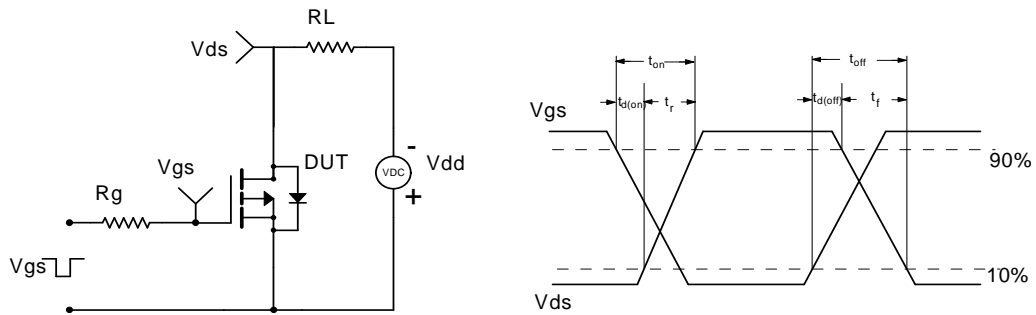


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

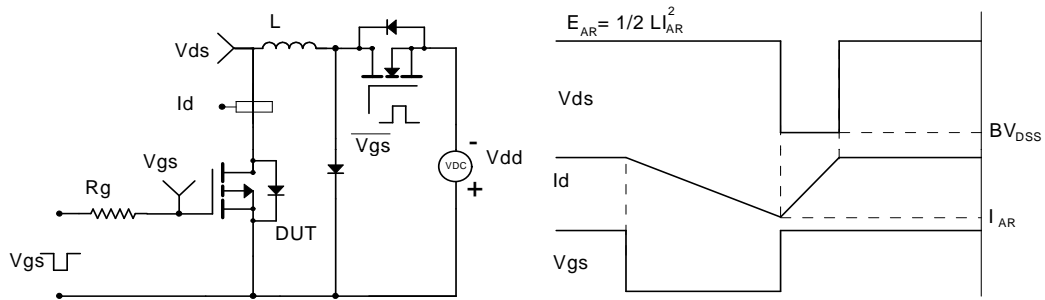
Gate Charge Test Circuit & Waveform



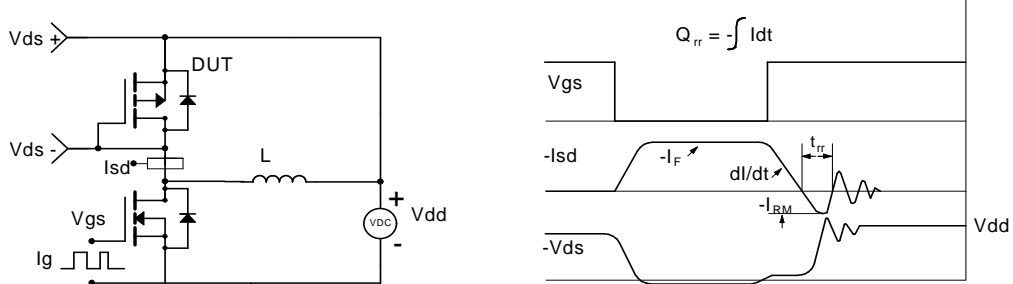
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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