

AOL1702
N-Channel Enhancement Mode Field Effect Transistor
SRFET™
General Description

The AOL1702 uses advanced trench technology with a monolithically integrated Schottky diode to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a low side FET in SMPS, load switching and general purpose applications.

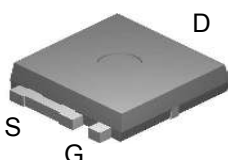
- RoHS Compliant
- Halogen and Antimony Free Green Device*

Features

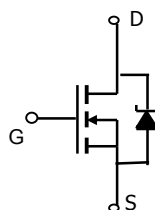
- V_{DS} (V) = 30V
- $I_D = 70A$ ($V_{GS} = 10V$)
- $R_{DS(ON)} < 5.8m\Omega$ ($V_{GS} = 10V$)
- $R_{DS(ON)} < 7.2m\Omega$ ($V_{GS} = 4.5V$)

- UIS Tested
- Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab connected to drain


SRFET™

Soft Recovery MOSFET:
Integrated Schottky Diode

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

| Parameter | Symbol | Maximum | Units |
|---|--------------------|------------|------------|
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Continuous Drain Current ^B | $T_C=25^\circ C^G$ | 70 | A |
| | $T_C=100^\circ C$ | 52 | |
| Pulsed Drain Current ^C | I_{DM} | 100 | |
| Continuous Drain Current ^A | $T_A=25^\circ C$ | 14 | A |
| | $T_A=70^\circ C$ | 11 | |
| Avalanche Current ^C | I_{AR} | 30 | A |
| Repetitive avalanche energy $L=0.3mH^C$ | E_{AR} | 135 | mJ |
| Power Dissipation ^B | $T_C=25^\circ C$ | 58 | W |
| | $T_C=100^\circ C$ | 29 | |
| Power Dissipation ^A | $T_A=25^\circ C$ | 2.1 | W |
| | $T_A=70^\circ C$ | 1.3 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | $^\circ C$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|--|-----------------|--------------|-----|--------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 20 | 25 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^A | | Steady-State | 50 | |
| Maximum Junction-to-Case ^D | $R_{\theta JC}$ | 2.1 | 2.6 | $^\circ C/W$ |

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 | $V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$ | | | 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 | 1.85 | 2.4 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=4.5\text{V}, V_{DS}=5\text{V}$ | 100 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$ | | 4.8 | 5.8 | m Ω |
| | | $V_{GS}=4.5\text{V}, I_D=20\text{A}$ | | 7.2 | 9.0 | |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}, I_D=20\text{A}$ | | 110 | | S |
| V_{SD} | Diode Forward Voltage | $I_S=1\text{A}, V_{GS}=0\text{V}$ | | 0.37 | 0.5 | V |
| I_S | Maximum Body-Diode + Schottky Continuous Current | | | | 55 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$ | | 4000 | 5000 | pF |
| C_{oss} | Output Capacitance | | | 520 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 217 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$ | | 0.6 | 0.9 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$ | | 59 | 77 | |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 27 | | nC |
| Q_{gs} | Gate Source Charge | | | 12 | | nC |
| Q_{gd} | Gate Drain Charge | | | 11 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega,$ $R_{GEN}=3\Omega$ | | 9 | | ns |
| t_r | Turn-On Rise Time | | | 9 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 37 | | ns |
| t_f | Turn-Off Fall Time | | | 8 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$ | | 16 | | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=20\text{A}, dI/dt=300\text{A}/\mu\text{s}$ | | 22 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_{DSM} and current rating I_{DSM} are based on $T_{J(MAX)}=150^\circ\text{C}$, using $t \leq 10\text{s}$ junction-to-ambient thermal resistance. 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 $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.

D: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.

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

F: These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=175^\circ\text{C}$.

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

H: 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.

* This device is guaranteed green after date code 8P11 (June 1ST 2008)

Rev1: July 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

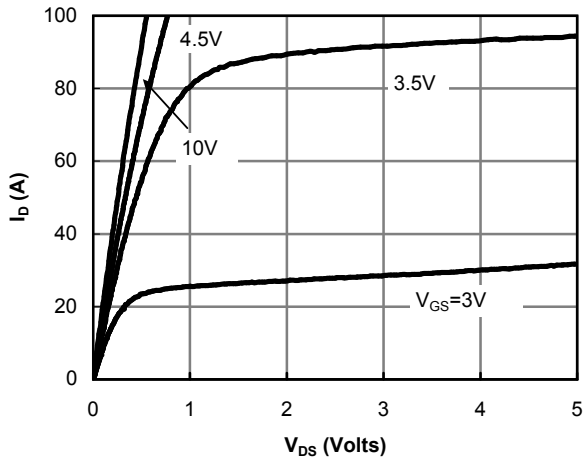


Figure 1: On-Region Characteristics

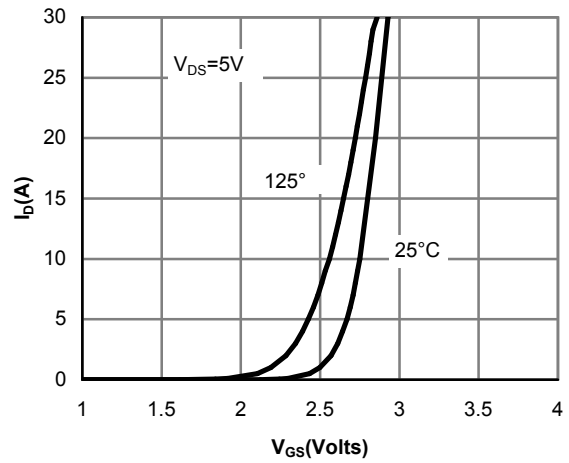


Figure 2: Transfer Characteristics

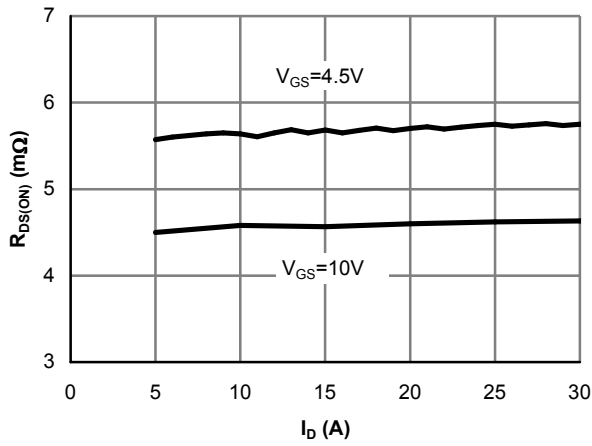


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

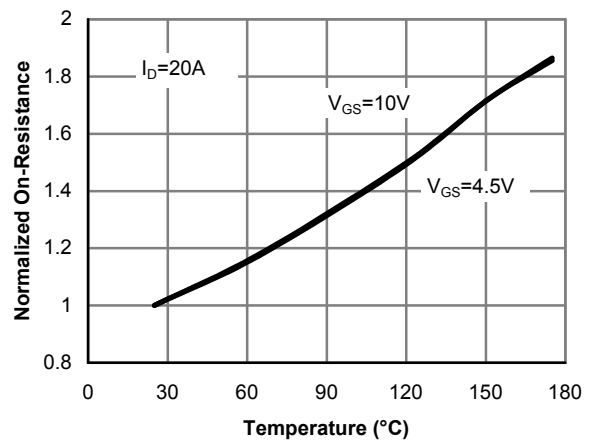


Figure 4: On-Resistance vs. Junction Temperature

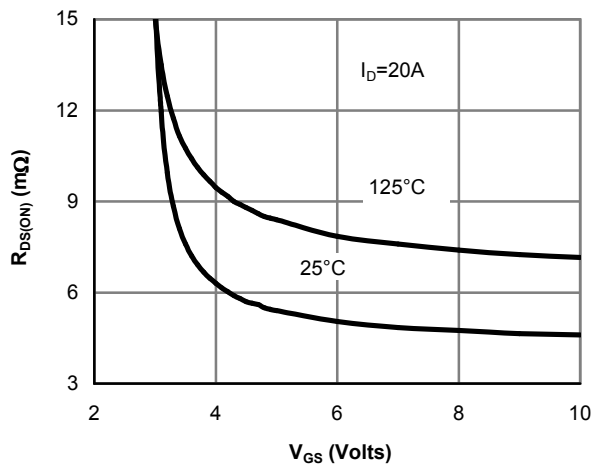


Figure 5: On-Resistance vs. Gate-Source Voltage

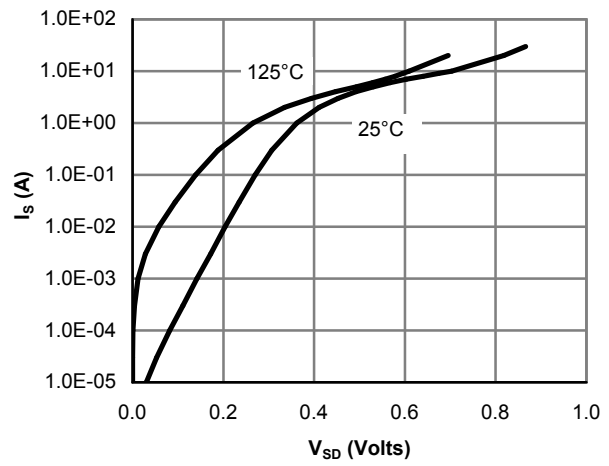


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

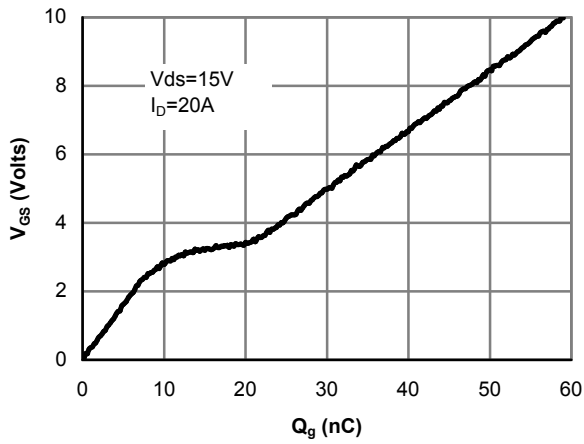


Figure 7: Gate-Charge Characteristics

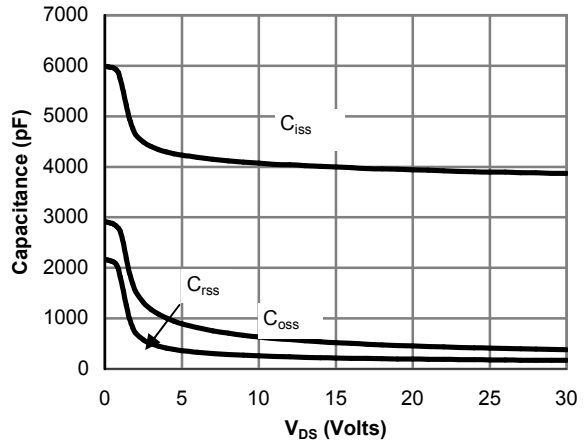


Figure 8: Capacitance Characteristics

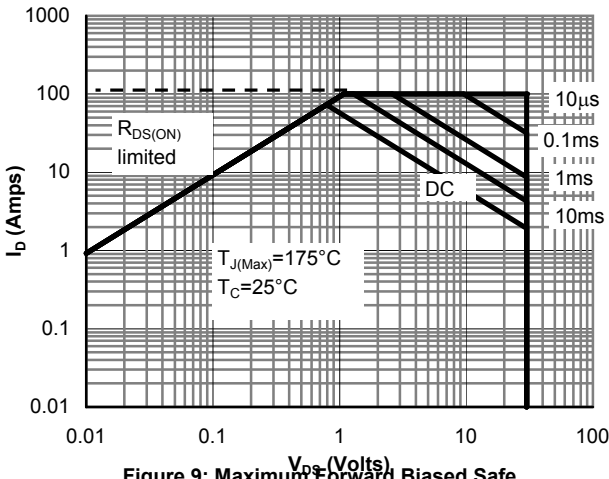


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

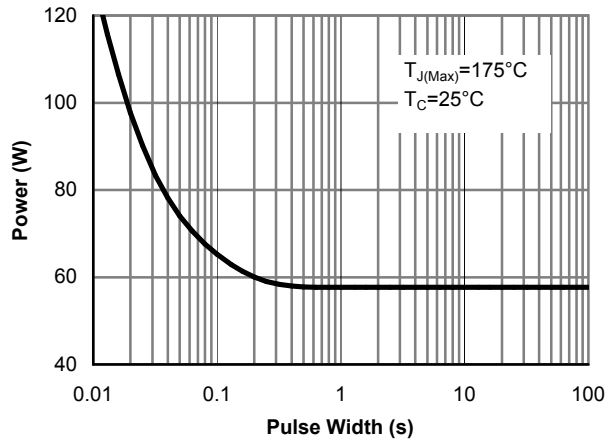


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

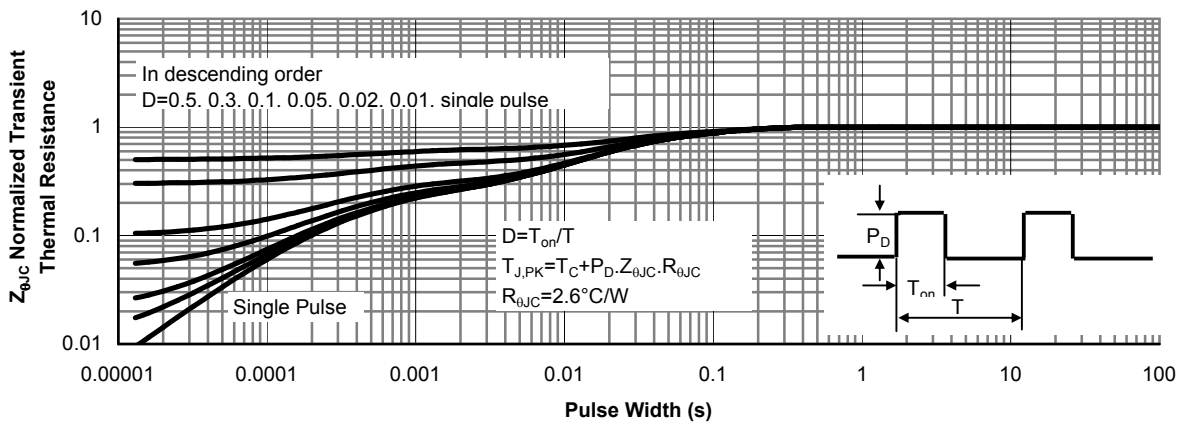


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

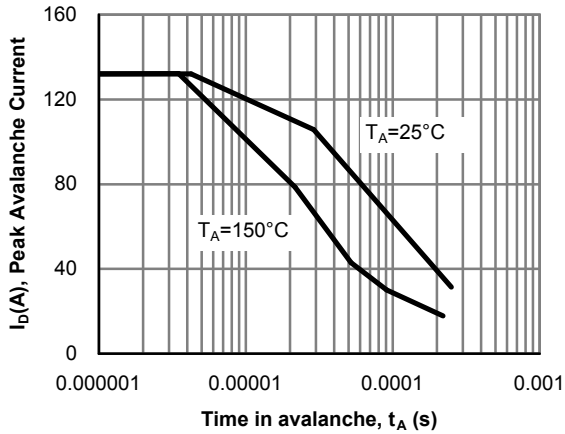


Figure 12: Single Pulse Avalanche capability

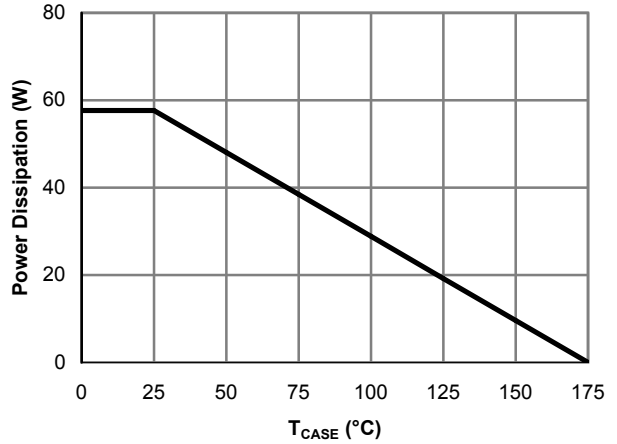


Figure 13: Power De-rating (Note B)

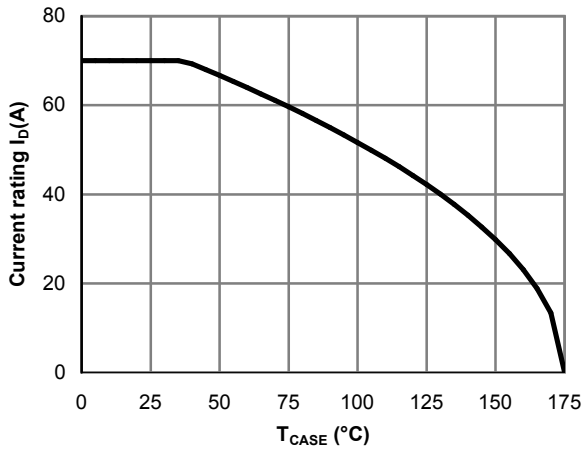


Figure 14: Current De-rating (Note B)

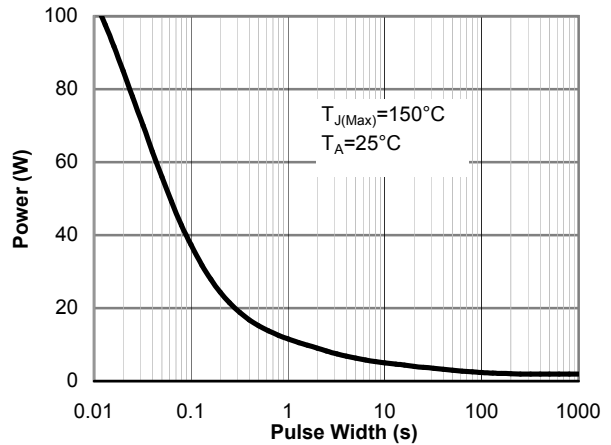


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

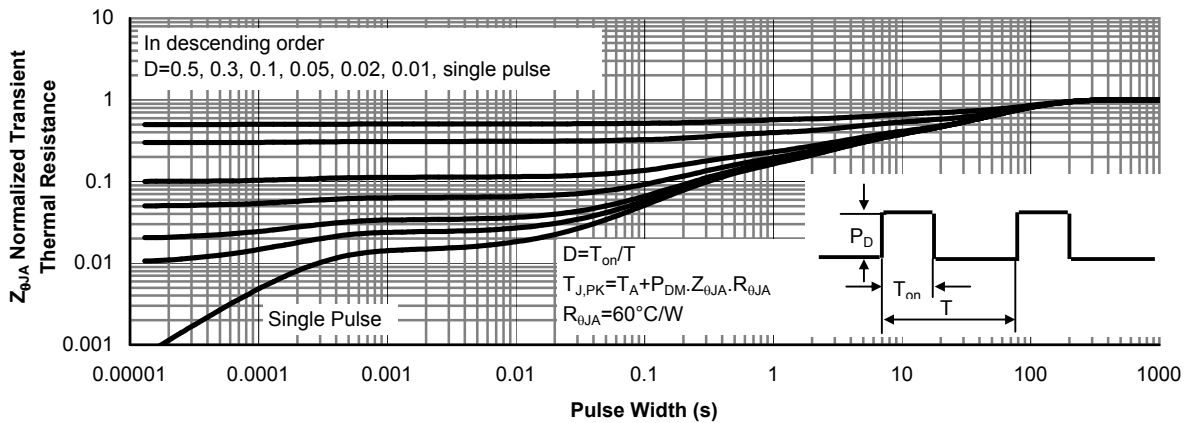


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

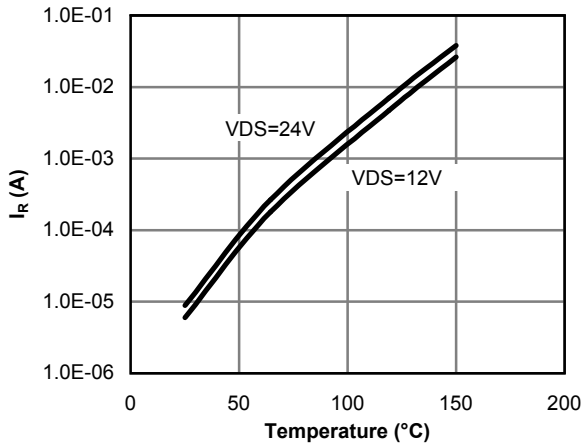


Figure 17: Diode Reverse Leakage Current vs. Junction Temperature

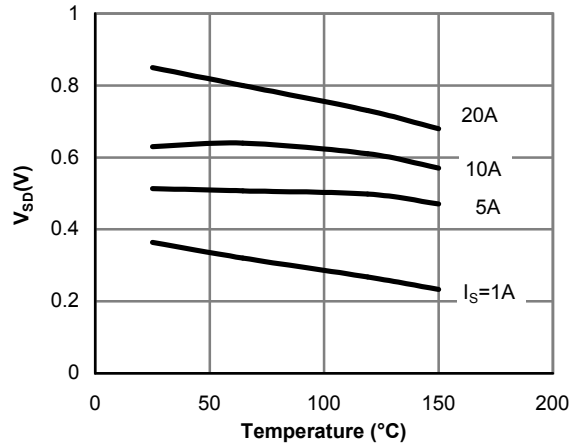


Figure 18: Diode Forward voltage vs. Junction Temperature

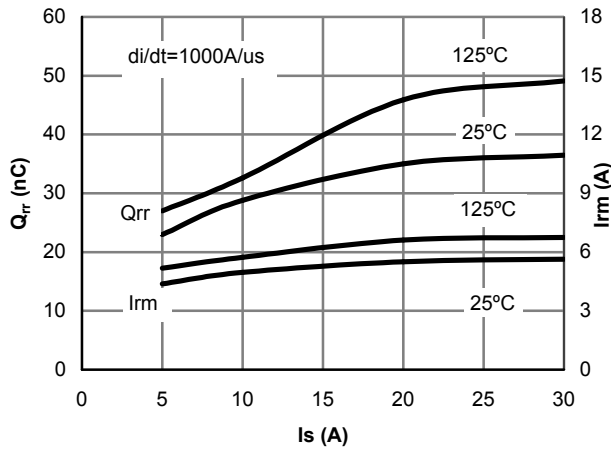


Figure 19: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current

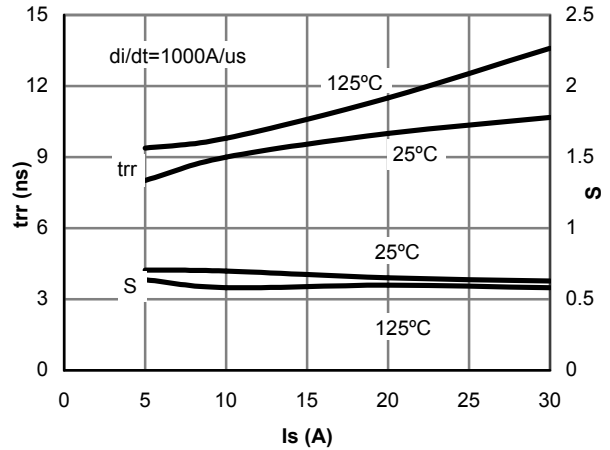


Figure 20: Diode Reverse Recovery Time and Soft Coefficient vs. Conduction Current

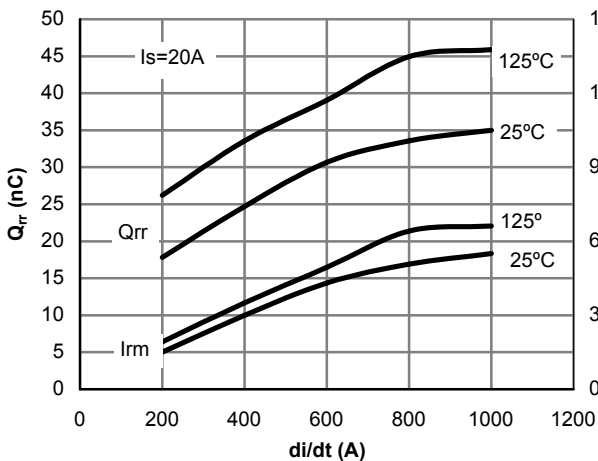


Figure 21: Diode Reverse Recovery Charge and Peak Current vs. di/dt

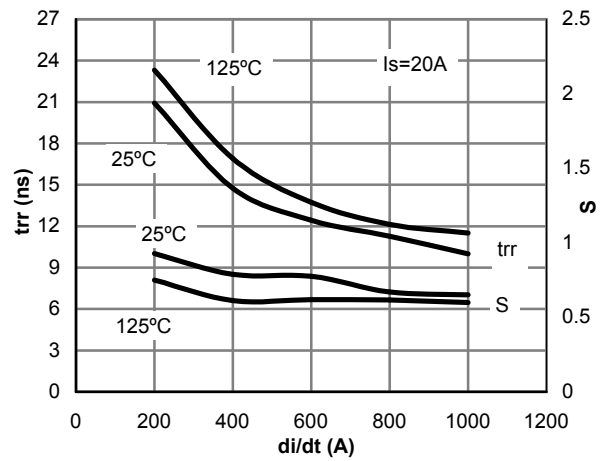
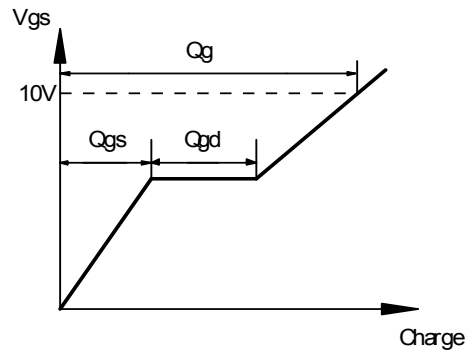
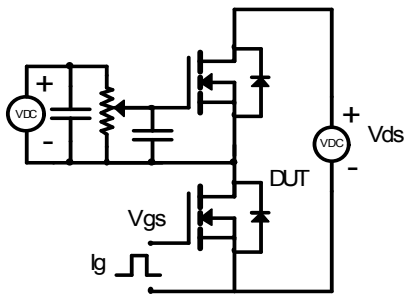
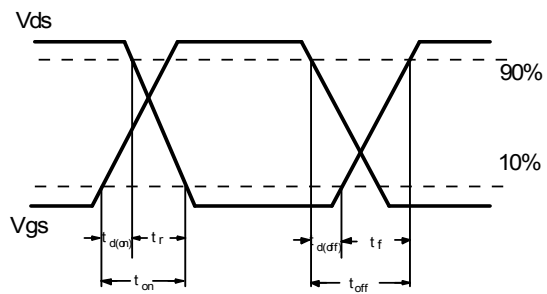
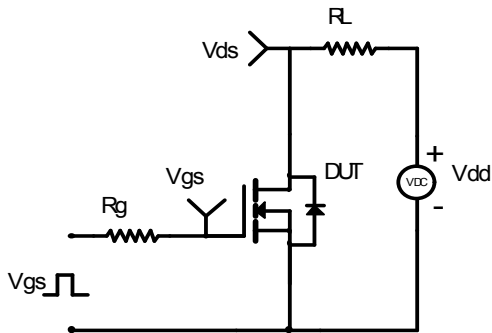


Figure 22: Diode Reverse Recovery Time and Soft Coefficient vs. di/dt

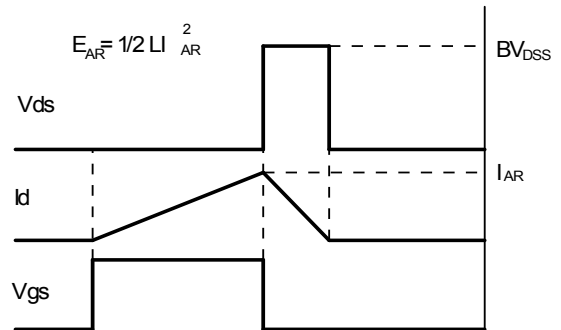
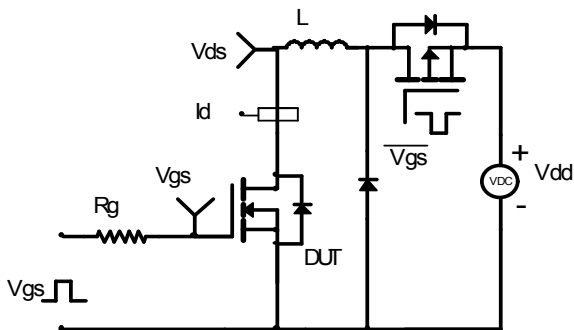
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

