



### General Description

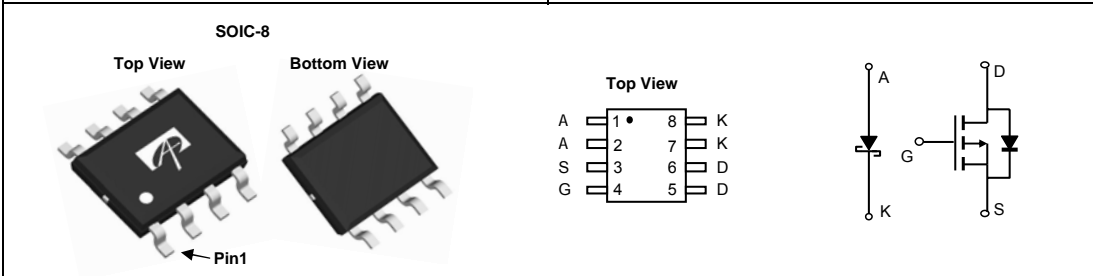
AO4771L uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for "standard buck" DC-DC conversion applications.

### Product Summary

|                                   |                 |
|-----------------------------------|-----------------|
| $V_{DS}$                          | -30V            |
| $I_D$ (at $V_{GS}=-10V$ )         | -4A             |
| $R_{DS(ON)}$ (at $V_{GS}=-10V$ )  | < 68m $\Omega$  |
| $R_{DS(ON)}$ (at $V_{GS}=-4.5V$ ) | < 105m $\Omega$ |

### Schottky

|                      |       |
|----------------------|-------|
| $V_{KA}$             | 30V   |
| $I_F$                | 4A    |
| $V_F$ (at $I_F=1A$ ) | <0.5V |



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

| Parameter                                      | Symbol           | MOSFET                 | Schottky   | Units            |
|------------------------------------------------|------------------|------------------------|------------|------------------|
| Drain-Source Voltage                           | $V_{DS}$         | -30                    |            | V                |
| Gate-Source Voltage                            | $V_{GS}$         | $\pm 20$               |            | V                |
| Continuous Drain Current                       | $I_D$            | $T_A=25^\circ\text{C}$ | -4         | A                |
|                                                |                  | $T_A=70^\circ\text{C}$ | -3         |                  |
| Pulsed Drain Current <sup>C</sup>              | $I_{DM}$         | -18                    |            |                  |
| Avalanche Current <sup>C</sup>                 | $I_{AS}, I_{AR}$ | 11                     |            | A                |
| Avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AS}, E_{AR}$ | 6                      |            | mJ               |
| Schottky reverse voltage                       | $V_{KA}$         |                        | 30         |                  |
| Continuous Forward Current                     | $I_F$            | $T_A=25^\circ\text{C}$ | 4          |                  |
|                                                |                  | $T_A=70^\circ\text{C}$ | 2.5        |                  |
| Power Dissipation <sup>B</sup>                 | $P_D$            | $T_A=25^\circ\text{C}$ | 2          | W                |
|                                                |                  | $T_A=70^\circ\text{C}$ | 1.3        |                  |
| Junction and Storage Temperature Range         | $T_J, T_{STG}$   | -55 to 150             | -55 to 150 | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter: MOSFET                                            | Symbol          | Typ | Max  | Units              |
|--------------------------------------------------------------|-----------------|-----|------|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10\text{s}$ | $R_{\theta JA}$ | 48  | 62.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> Steady-State        |                 | 74  | 90   | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead Steady-State                        | $R_{\theta JL}$ | 32  | 40   | $^\circ\text{C/W}$ |
| Parameter: Schottky                                          | Symbol          | Typ | Max  | Units              |
| Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10\text{s}$ | $R_{\theta JA}$ | 49  | 62.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> Steady-State        |                 | 72  | 90   | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead Steady-State                        | $R_{\theta JL}$ | 31  | 40   | $^\circ\text{C/W}$ |

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol                      | Parameter                             | Conditions                                                                                   | Min                                | Typ      | Max      | Units |
|-----------------------------|---------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------|----------|----------|-------|
| <b>STATIC PARAMETERS</b>    |                                       |                                                                                              |                                    |          |          |       |
| BV <sub>DSS</sub>           | Drain-Source Breakdown Voltage        | I <sub>D</sub> =-250μA, V <sub>GS</sub> =0V                                                  | -30                                |          |          | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                           |                                    |          | -1<br>-5 | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                                  |                                    |          | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA                                      | -1.3                               | -1.8     | -2.3     | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V                                                  | -18                                |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A<br>T <sub>J</sub> =125°C                          |                                    | 56<br>79 | 68<br>95 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A                                                  |                                    | 83       | 105      | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A                                                    |                                    | 8        |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                     |                                    | -0.8     | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                              |                                    |          | -2       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                              |                                    |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                           | 230                                | 290      | 350      | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                              | 40                                 | 60       | 80       | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                              | 25                                 | 40       | 55       | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             | 7.5                                | 16       | 24       | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |                                    |          |          |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-4A                            | 4.6                                | 5.8      | 7        | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge                     |                                                                                              | 2.2                                | 2.8      | 3        | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              | 0.9                                | 1.1      | 1.3      | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              | 0.8                                | 1.3      | 1.8      | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =3.75Ω,<br>R <sub>GEN</sub> =3Ω |                                    | 6        |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |                                    | 5        |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |                                    | 21       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |                                    | 9        |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      |                                                                                              | I <sub>F</sub> =-4A, di/dt=100A/μs | 8        | 10       | 12    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-4A, di/dt=100A/μs                                                           | 16                                 | 20       | 24       | nC    |
| <b>SCHOTTKY PARAMETERS</b>  |                                       |                                                                                              |                                    |          |          |       |
| V <sub>F</sub>              | Forward Voltage Drop                  | I <sub>F</sub> =1A                                                                           |                                    | 0.4      | 0.5      | V     |
| I <sub>rm</sub>             | Maximum reverse leakage current       | V <sub>R</sub> =24V                                                                          |                                    |          | 0.05     | mA    |
|                             |                                       | V <sub>R</sub> =24V, T <sub>J</sub> =125°C                                                   |                                    |          | 10       |       |
| C <sub>T</sub>              | Junction Capacitance                  | V <sub>R</sub> =15V                                                                          |                                    | 56       |          | pF    |

A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25°C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 μs 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 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

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**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

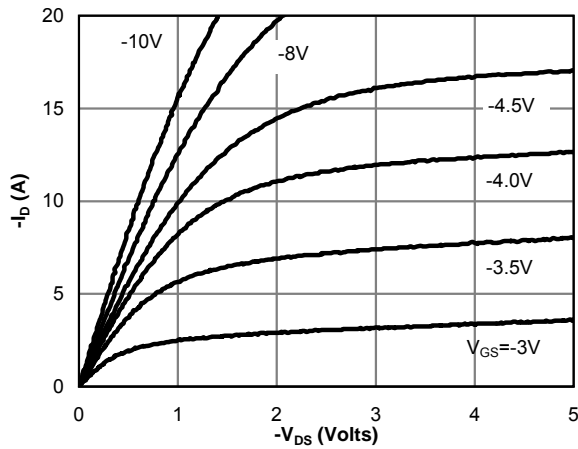


Fig 1: On-Region Characteristics(Note E)

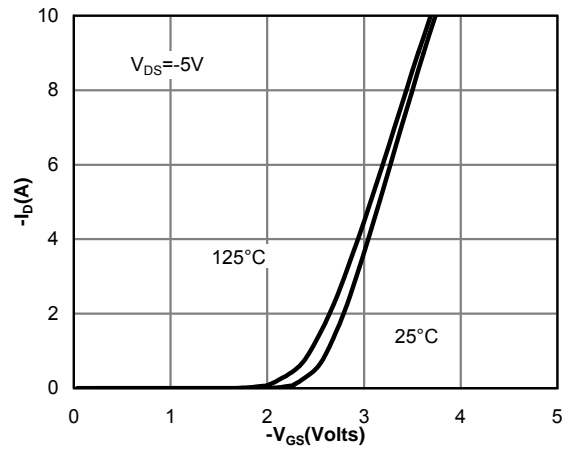


Figure 2: Transfer Characteristics(Note E)

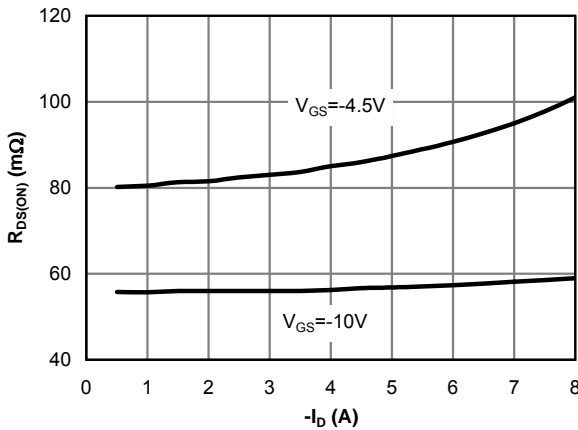


Figure 3: On-Resistance vs. Drain Current and Gate Voltage(Note E)

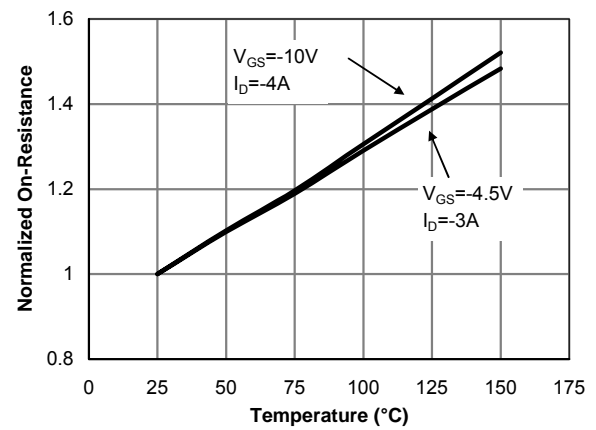


Figure 4: On-Resistance vs. Junction Temperature(Note E)

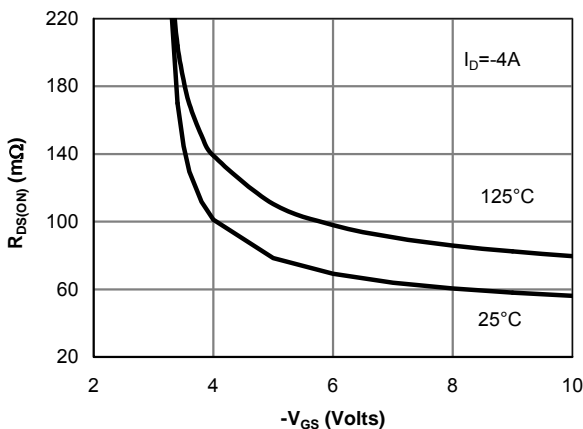


Figure 5: On-Resistance vs. Gate-Source Voltage(Note E)

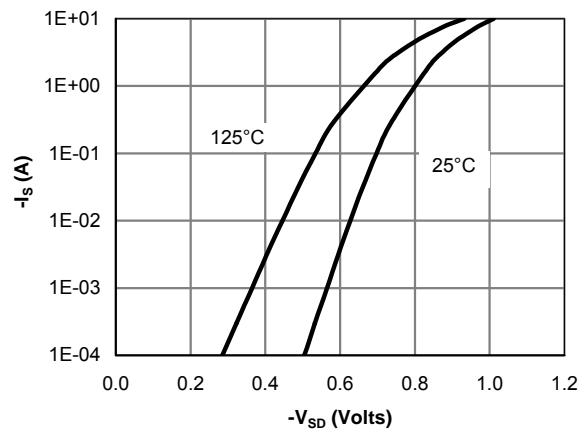


Figure 6: Body-Diode Characteristics(Note E)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

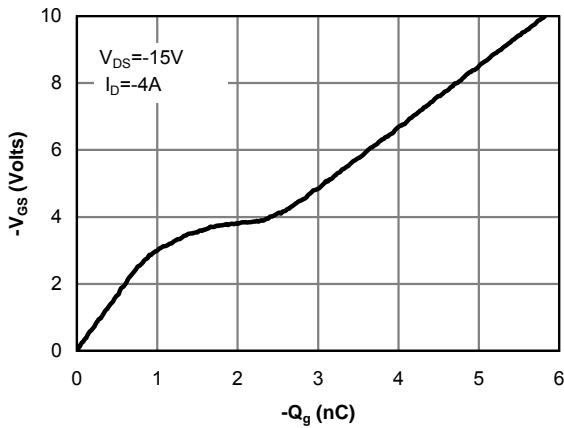


Figure 7: Gate-Charge Characteristics

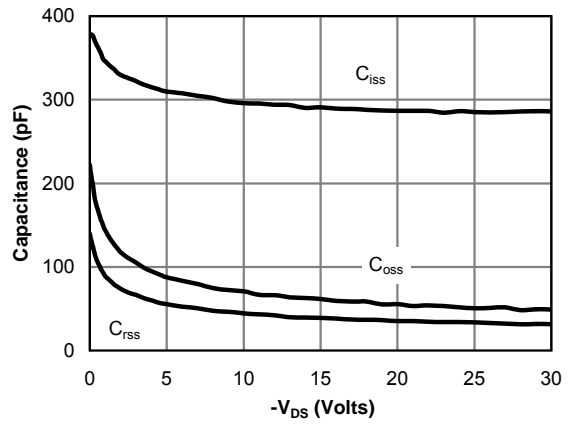


Figure 8: Capacitance Characteristics

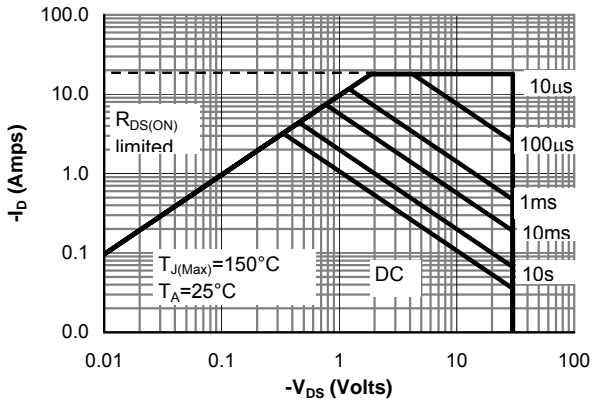


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

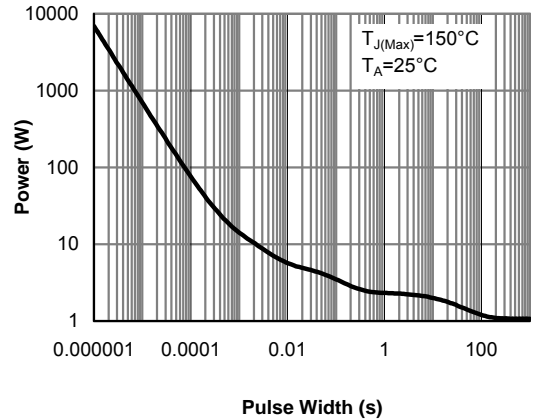


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

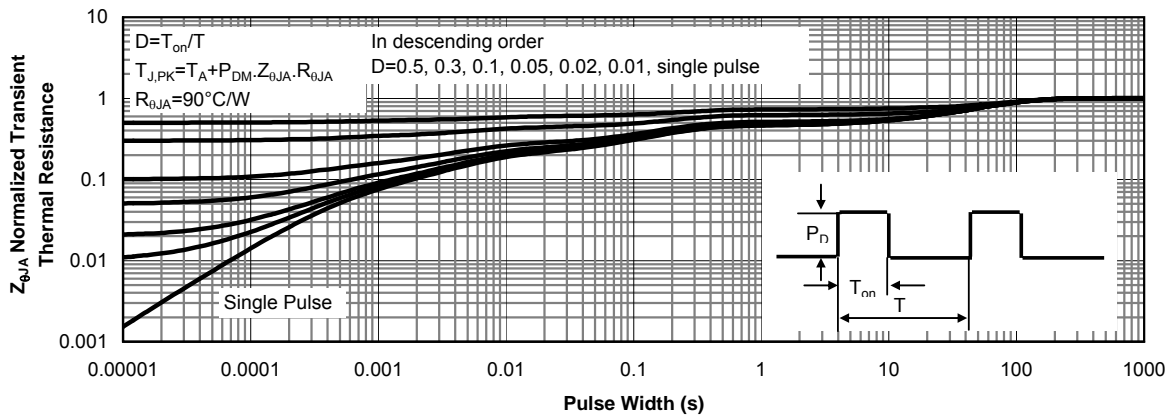


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

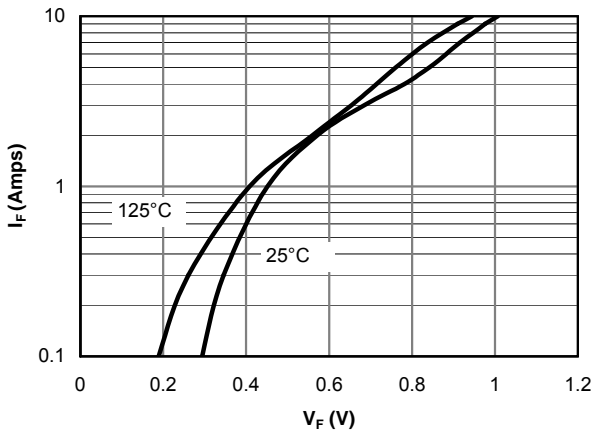


Figure 12: Schottky Forward Characteristics

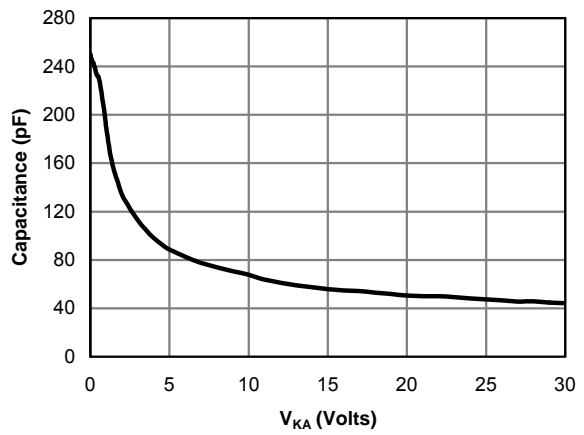


Figure 13: Schottky Capacitance Characteristics

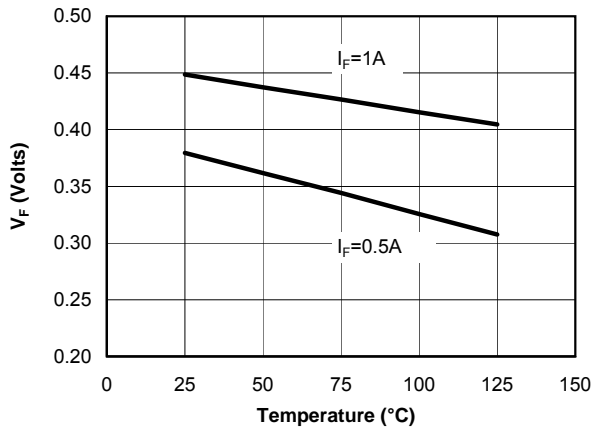


Figure 14: Schottky Forward Drop vs. Junction Temperature

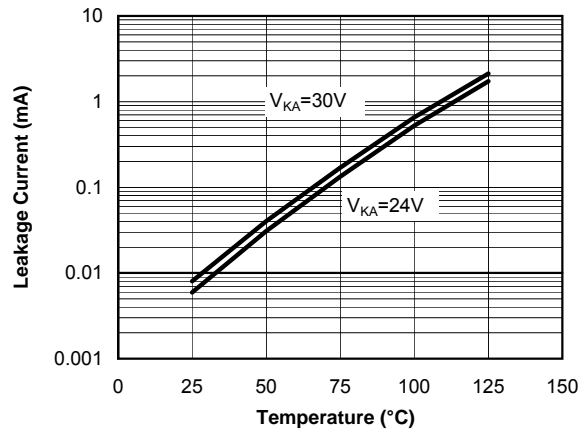
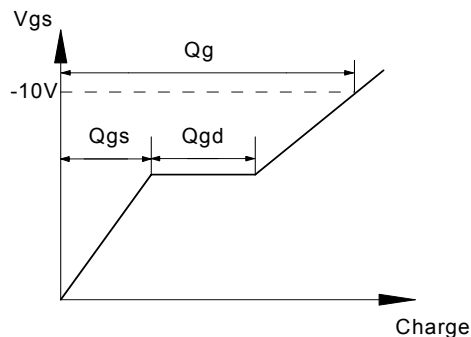
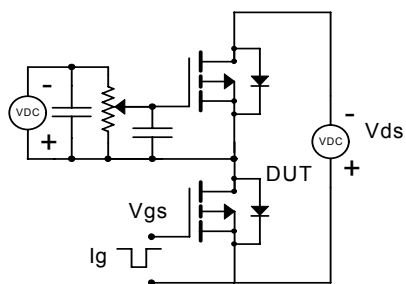
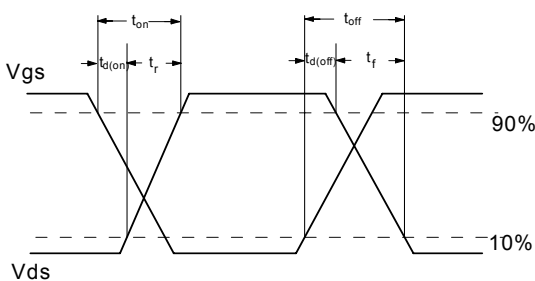
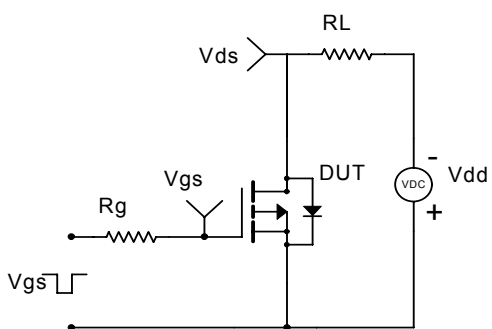


Figure 15: Schottky Leakage Current vs. Junction Temperature

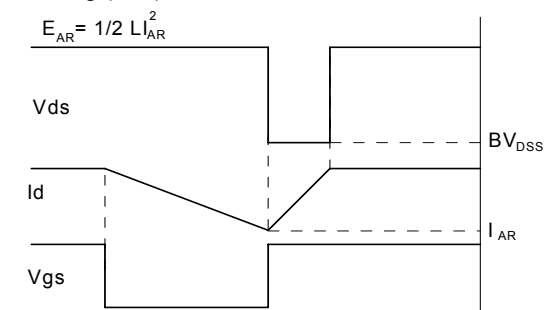
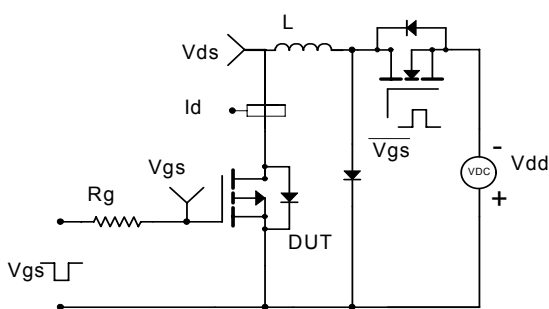
Gate Charge Test Circuit & Waveform



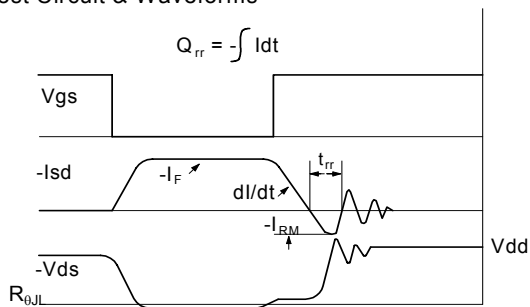
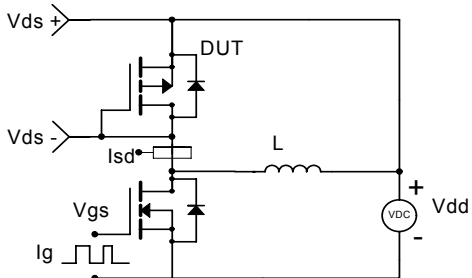
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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