

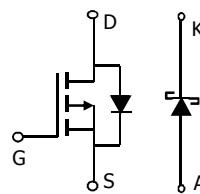
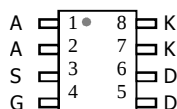
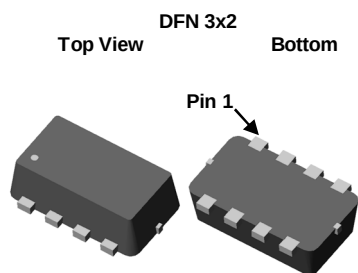
## 20V P-Channel MOSFET with Schottky Diode

### General Description

The AON4703 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 buck converter applications.

### Features

$V_{DS}$  (V) = -20V  
 $I_D$  = -3.4A ( $V_{GS}$  = -4.5V)  
 $R_{DS(ON)}$  < 90m $\Omega$  ( $V_{GS}$  = -4.5V)  
 $R_{DS(ON)}$  < 120m $\Omega$  ( $V_{GS}$  = -2.5V)  
 $R_{DS(ON)}$  < 160m $\Omega$  ( $V_{GS}$  = -1.8V)  
**SCHOTTKY**  
 $V_{KA}$  (V) = 20V,  $I_F$  = 1A,  $V_F$  < 0.5V @ 1A



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

| Parameter                               | Symbol                 | MOSFET     | Schottky   | Units            |
|-----------------------------------------|------------------------|------------|------------|------------------|
| Drain-Source Voltage                    | $V_{DS}$               | -20        |            | V                |
| Gate-Source Voltage                     | $V_{GS}$               | $\pm 8$    |            | V                |
| Continuous Drain Current <sup>A</sup>   | $T_A=25^\circ\text{C}$ | $I_D$      | -3.4       | A                |
|                                         | $T_A=70^\circ\text{C}$ |            | -2.7       |                  |
| Pulsed Drain Current <sup>B</sup>       | $I_{DM}$               | -15        |            |                  |
| Schottky reverse voltage                | $V_{KA}$               |            | 20         | V                |
| Continuous Forward Current <sup>A</sup> | $T_A=25^\circ\text{C}$ | $I_F$      | 1.9        | A                |
|                                         | $T_A=70^\circ\text{C}$ |            | 1.2        |                  |
| Pulsed Forward Current <sup>B</sup>     | $I_{FM}$               |            | 7          |                  |
| Power Dissipation                       | $T_A=25^\circ\text{C}$ | $P_D$      | 1.7        | W                |
|                                         | $T_A=70^\circ\text{C}$ |            | 1.1        |                  |
| Junction and Storage Temperature Range  | $T_J, T_{STG}$         | -55 to 150 | -55 to 150 | $^\circ\text{C}$ |

| Parameter: Thermal Characteristics MOSFET |              | Symbol           | Typ | Max | Units |
|-------------------------------------------|--------------|------------------|-----|-----|-------|
| Maximum Junction-to-Ambient <sup>A</sup>  | t ≤ 10s      | R <sub>θJA</sub> | 51  | 75  | ℃/W   |
| Maximum Junction-to-Ambient <sup>A</sup>  | Steady-State |                  | 88  | 110 |       |
| Maximum Junction-to-Lead <sup>C</sup>     | Steady-State | R <sub>θJL</sub> | 28  | 35  |       |
| Thermal Characteristics Schottky          |              |                  |     |     |       |
| Maximum Junction-to-Ambient <sup>A</sup>  | t ≤ 10s      | R <sub>θJA</sub> | 66  | 80  | ℃/W   |
| Maximum Junction-to-Ambient <sup>A</sup>  | Steady-State |                  | 95  | 130 |       |
| Maximum Junction-to-Lead <sup>C</sup>     | Steady-State | R <sub>θJL</sub> | 40  | 50  |       |

**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                                                  | -20  |          |           | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-20V, 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> =±8V                                                    |      |          | ±100      | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                    | -0.4 | -0.65    | -1        | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V                                                 | -15  |          |           | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3.4A<br>T <sub>J</sub> =125°C                       |      | 51<br>64 | 90<br>135 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2.5A                                                |      | 65       | 120       | mΩ    |
|                             |                                       | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1.5A                                                |      | 83       | 160       | mΩ    |
|                             |                                       |                                                                                              |      |          |           |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3.4A                                                  |      | 12       |           | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                     |      | -0.7     | -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> =-10V, f=1MHz                                           |      | 560      | 745       | pF    |
| C <sub>OSS</sub>            | Output Capacitance                    |                                                                                              |      | 80       |           | pF    |
| C <sub>RSS</sub>            | Reverse Transfer Capacitance          |                                                                                              |      | 70       |           | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             |      | 15       | 23        | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |      |          |           |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, I <sub>D</sub> =-3.4A                         |      | 8.5      | 11        | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              |      | 1.2      |           | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              |      | 2.1      |           | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, R <sub>L</sub> =2.9Ω,<br>R <sub>GEN</sub> =3Ω |      | 7.2      |           | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |      | 36       |           | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |      | 53       |           | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |      | 56       |           | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-3.4A, dI/dt=100A/μs                                                         |      | 37       | 49        | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-3.4A, dI/dt=100A/μs                                                         |      | 27       |           | 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> =16V                                                                          |      |          | 0.2       | mA    |
|                             |                                       | V <sub>R</sub> =16V, T <sub>J</sub> =125°C                                                   |      |          | 20        |       |
| C <sub>T</sub>              | Junction Capacitance                  | V <sub>R</sub> =10V                                                                          |      | 44       |           | pF    |
| t <sub>rr</sub>             | Schottky Reverse Recovery Time        | I <sub>F</sub> =1A, dI/dt=100A/μs                                                            |      | 11       | 14        | ns    |
| Q <sub>rr</sub>             | Schottky Reverse Recovery Charge      | I <sub>F</sub> =1A, dI/dt=100A/μs                                                            |      | 2.5      |           | nC    |

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: Repetitive rating, pulse width limited by junction temperature.

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

D: The static characteristics in Figures 1 to 6 are obtained using t ≤ 300μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The SOA curve provides a single pulse rating.

F: The current rating is based on the t ≤ 10s thermal resistance rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

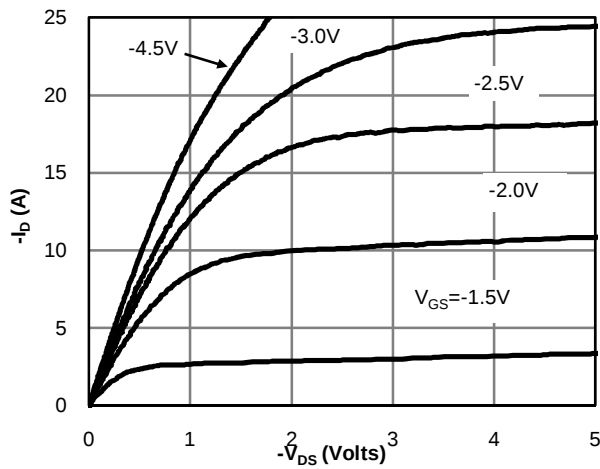


Fig 1: On-Region Characteristics

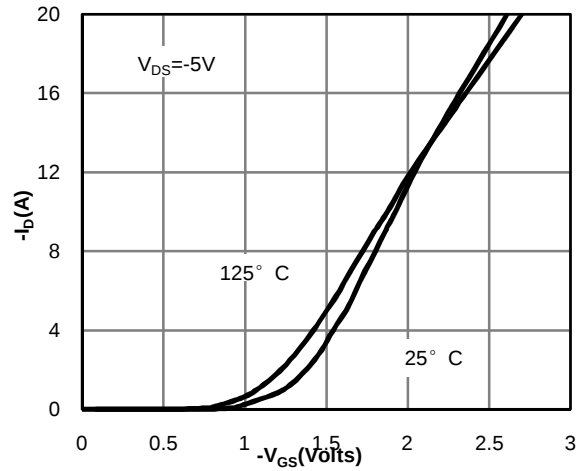


Figure 2: Transfer Characteristics

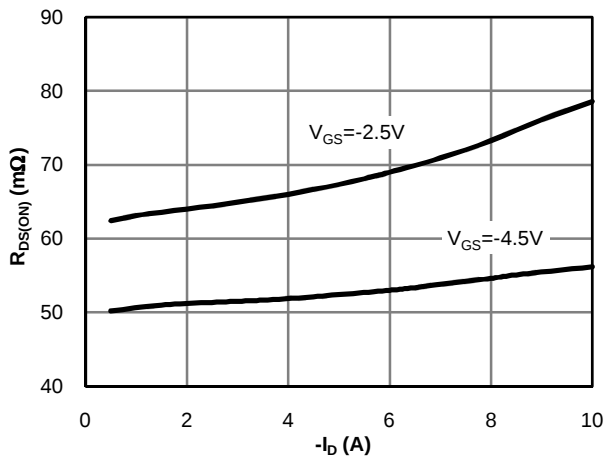


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

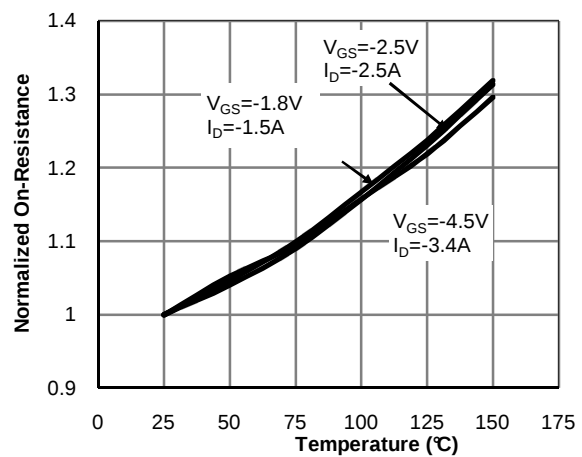


Figure 4: On-Resistance vs. Junction Temperature

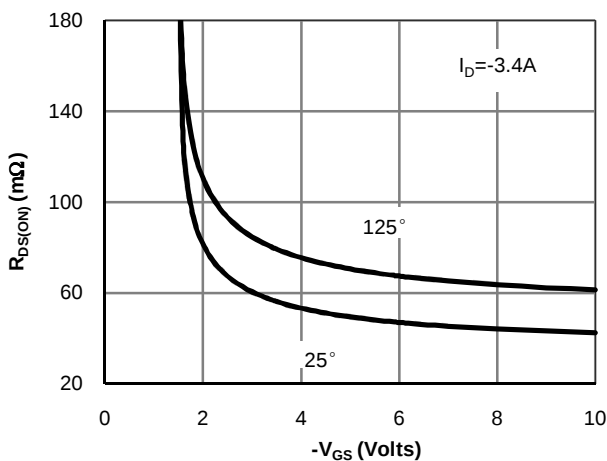


Figure 5: On-Resistance vs. Gate-Source Voltage

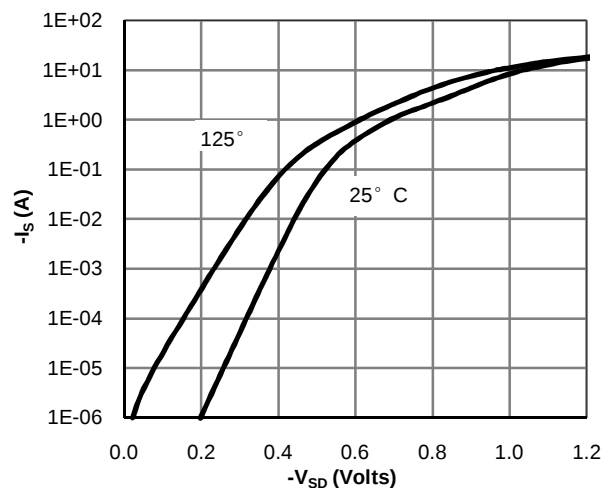


Figure 6: Body-Diode Characteristics

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

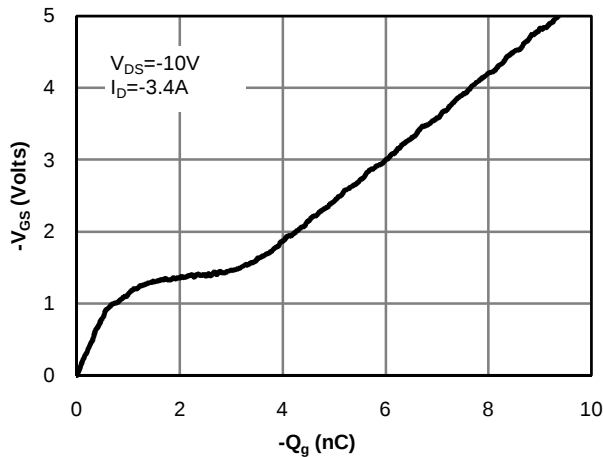


Figure 7: Gate-Charge Characteristics

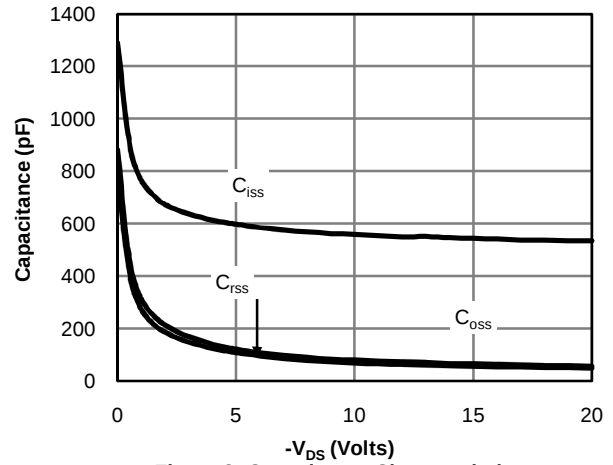


Figure 8: Capacitance Characteristics

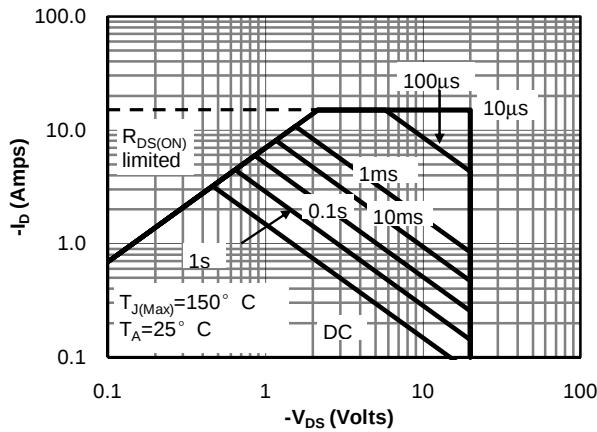


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

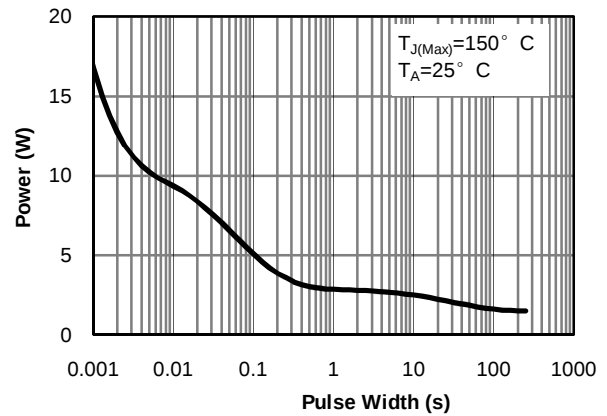


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

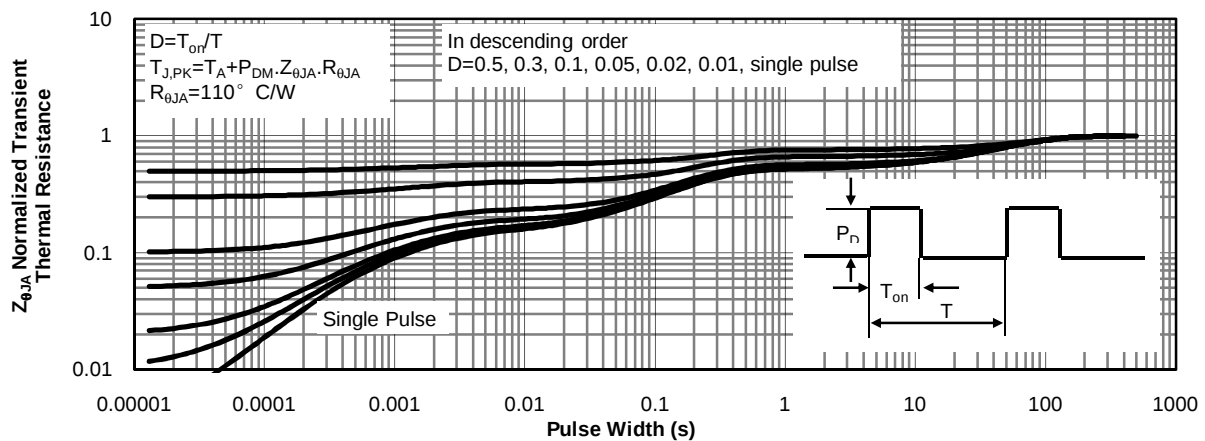


Figure 11: Normalized Maximum Transient Thermal Impedance

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY**

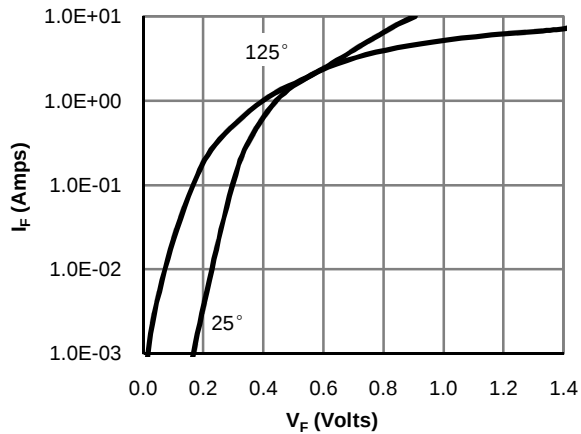


Figure 12: Schottky Forward Characteristics

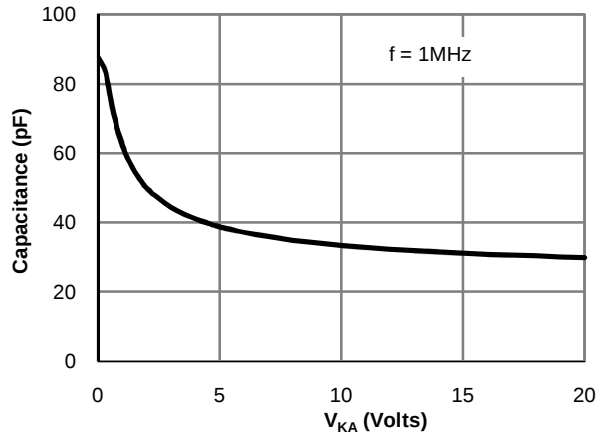


Figure 13: Schottky Capacitance Characteristics

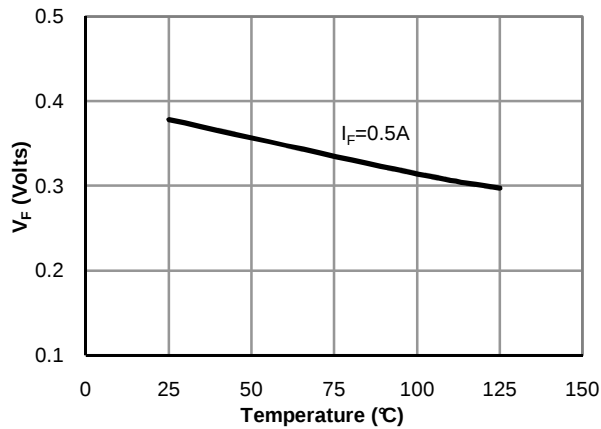


Figure 14: Schottky Forward Drop vs. Junction Temperature

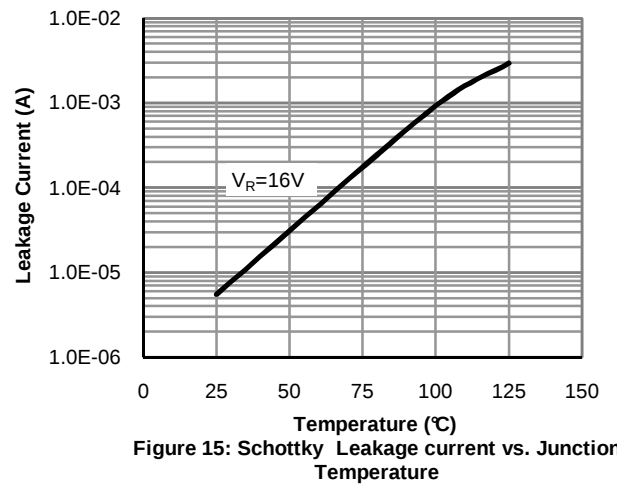


Figure 15: Schottky Leakage current vs. Junction Temperature

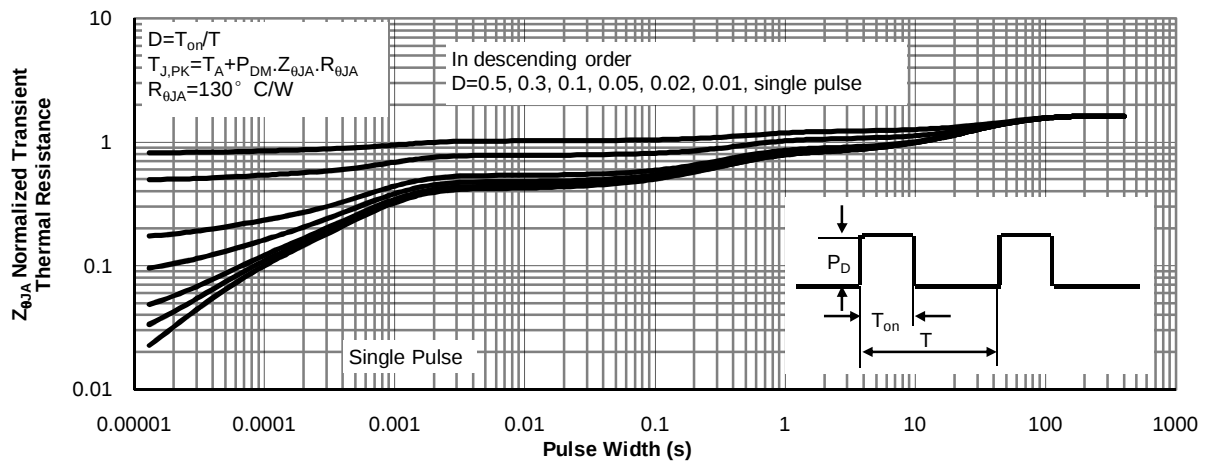
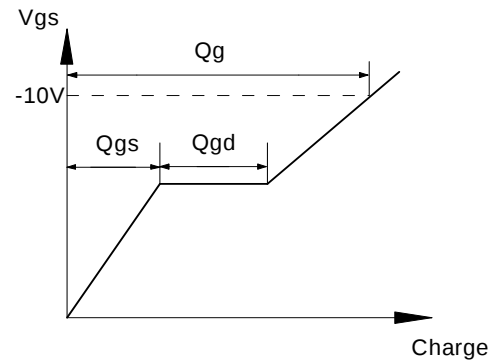
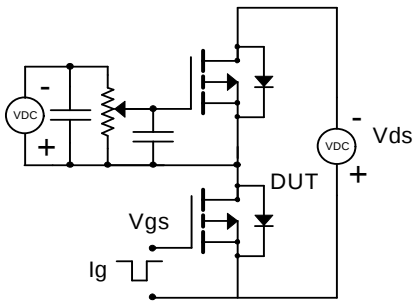
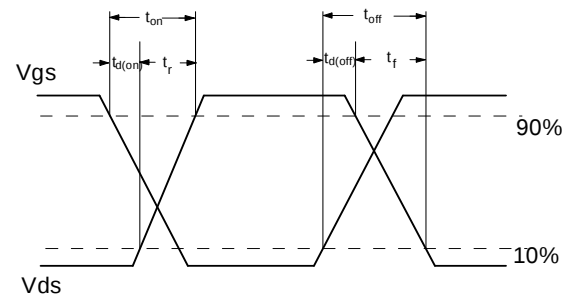
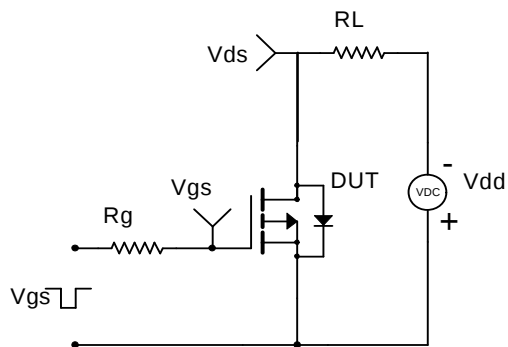


Figure 16: Schottky Normalized Maximum Transient Thermal Impedance

### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

