



## AO4918

# Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

### General Description

The AO4918 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 Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further. *Standard Product AO4918 is Pb-free (meets ROHS & Sony 259 specifications). AO4918L is a Green Product ordering option. AO4918 and AO4918L are electrically identical.*

### Features

#### Q1

$$V_{DS} (V) = 30V$$

$$I_D = 9.3A (V_{GS} = 10V)$$

$$R_{DS(ON)} < 14.5m\Omega$$

$$R_{DS(ON)} < 16m\Omega$$

#### Q2

$$V_{DS}(V) = 30V$$

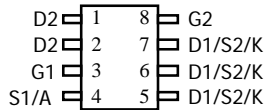
$$I_D=8.3A$$

$$<18m\Omega (V_{GS} = 10V)$$

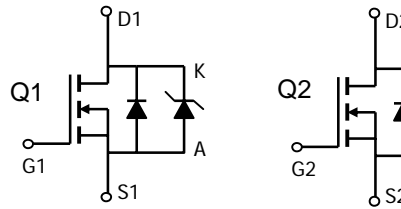
$$<27m\Omega (V_{GS} = 4.5V)$$

#### SCHOTTKY

$$V_{DS} (V) = 30V, I_F = 3A, V_F < 0.5V @ 1A$$



SOIC-8



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

Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	$V_{DS}$	30	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	$\pm 20$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	9.3	A
		$T_A=70^\circ C$	7.4	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	40	40	
Power Dissipation	$P_D$	$T_A=25^\circ C$	2	W
		$T_A=70^\circ C$	1.28	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$

Parameter	Symbol	Maximum Schottky	Units
Reverse Voltage	$V_{DS}$	30	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ C$	A
		$T_A=70^\circ C$	
Pulsed Diode Forward Current <sup>B</sup>	$I_{FM}$	20	
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	W
		$T_A=70^\circ C$	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ C$

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	53	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		81.9	110	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	30.5	40	

Parameter: Thermal Characteristics MOSFET Q2		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	53	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		81.9	110	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	30.5	40	

Thermal Characteristics Schottky					
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	50.4	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		86	110	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	26.6	40	

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

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 <300 μs 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 Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

Rev4: August 2005

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**Q1 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. (Set by Schottky leakage)	V <sub>R</sub> =30V		0.007	0.05	mA
		V <sub>R</sub> =30V, T <sub>J</sub> =125°C		3.2	10	
		V <sub>R</sub> =30V, T <sub>J</sub> =150°C		12	20	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.6	1.1	2	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	40			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =9.3A		11.7	14.5	mΩ
		T <sub>J</sub> =125°C		15.4	19	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =8.8A		13.1	16	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =9.3A	30	37		S
V <sub>SD</sub>	Diode+Schottky Forward Voltage	I <sub>S</sub> =1A		0.46	0.5	V
I <sub>S</sub>	Maximum Body-Diode+Schottky Continuous Current				3.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance			3740	4488	pF
C <sub>oss</sub>	Output Capacitance (FET + Schottky)	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		295		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			186		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.86	1.1	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge			30.5	37	nC
Q <sub>gs</sub>	Gate Source Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =9.3A		4.5		nC
Q <sub>gd</sub>	Gate Drain Charge			8.5		nC
t <sub>D(on)</sub>	Turn-On DelayTime			6	9	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.6Ω,		8.2	12	ns
t <sub>D(off)</sub>	Turn-Off DelayTime	R <sub>GEN</sub> =3Ω		54.5	75	ns
t <sub>f</sub>	Turn-Off Fall Time			10.5	15	ns
t <sub>rr</sub>	Body Diode + Schottky Reverse Recovery Time	I <sub>F</sub> =9.3A, dI/dt=100A/μs		23.5	28	ns
Q <sub>rr</sub>	Body Diode + Schottky Reverse Recovery Charge	I <sub>F</sub> =9.3A, dI/dt=100A/μs		13.3	16	nC

A: The value of R<sub>θJA</sub> is measured 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 value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

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.

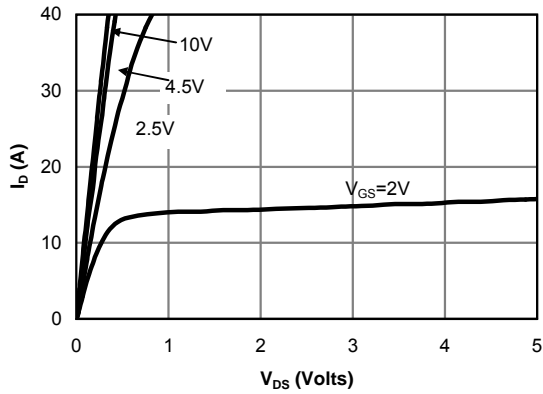
D: The static characteristics in Figures 1 to 6,12,14 are obtained using <300 μs pulses, duty cycle 0.5% max.

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.

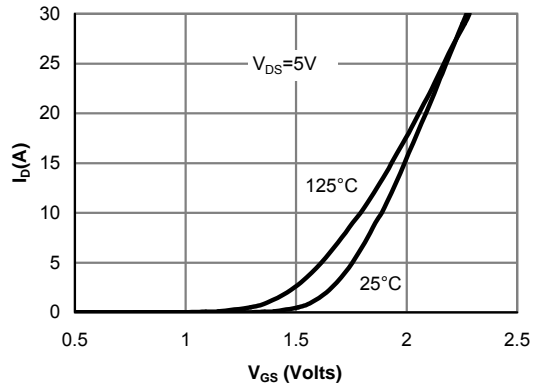
F: The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

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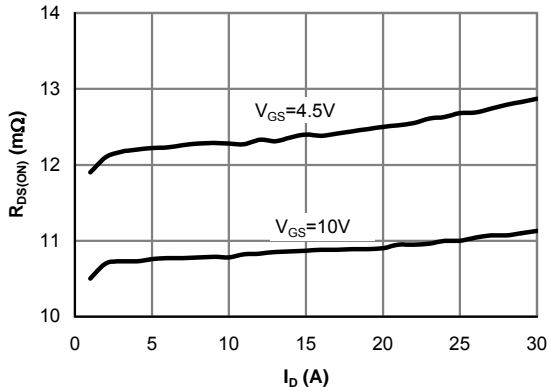
**Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



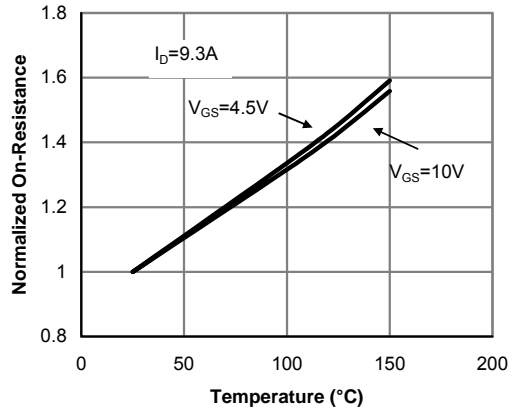
**Fig 1: On-Region Characteristics**



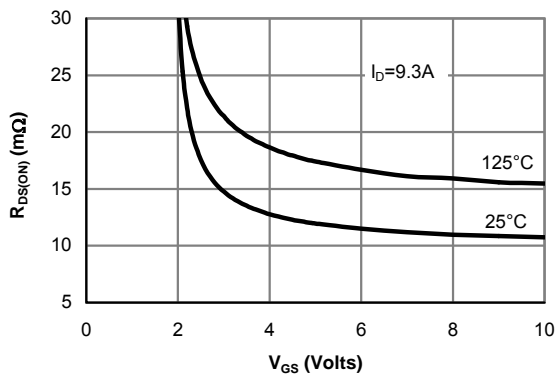
**Figure 2: Transfer Characteristics**



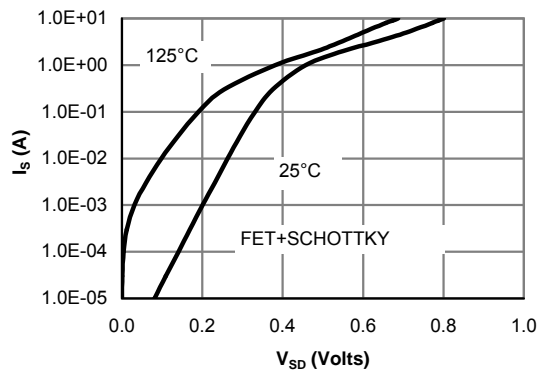
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



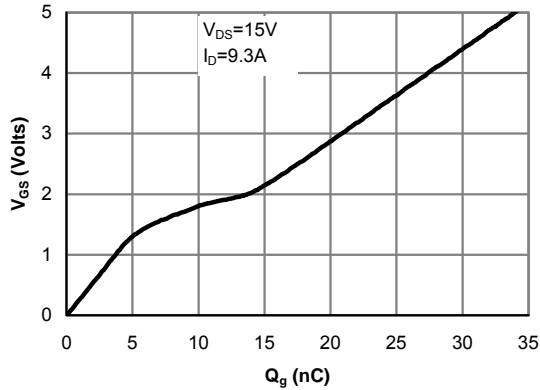
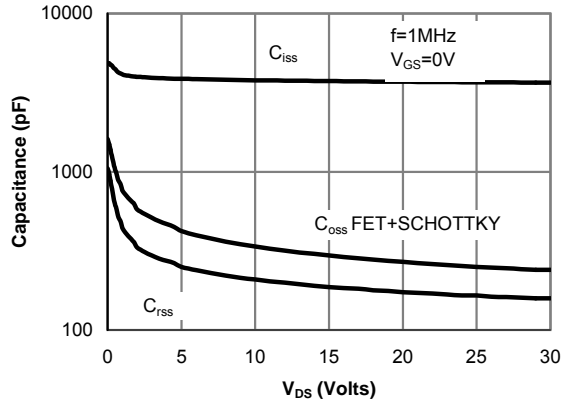
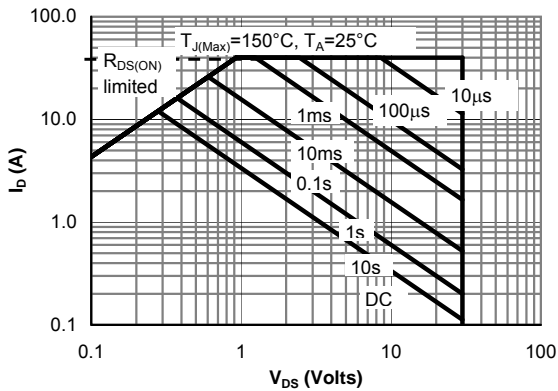
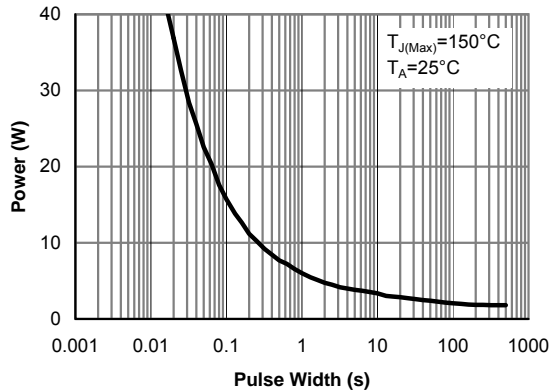
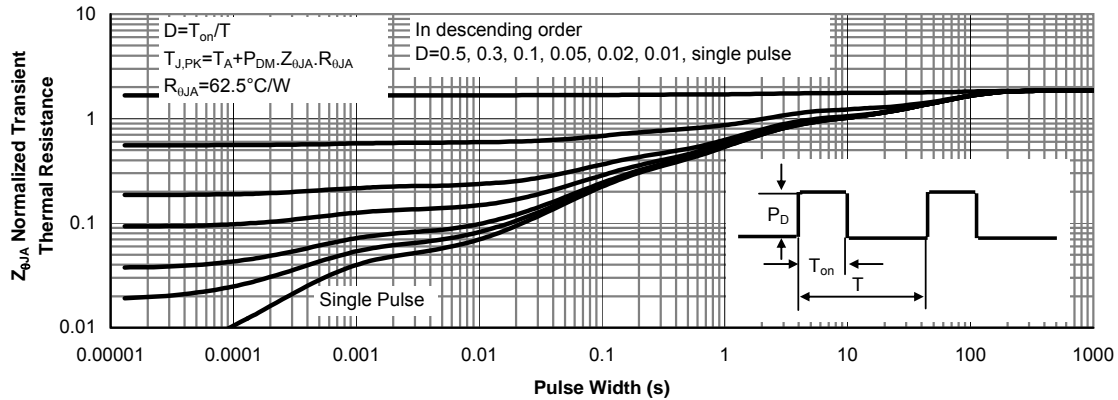
**Figure 4: On resistance vs. Junction Temperature**



**Figure 5: On resistance vs. Gate-Source Voltage**



**Figure 6: Body-Diode Characteristics (Note F)**

**Q1 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**

**Q2 Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
B <sub>V</sub> DSS	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> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.004	1 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	1.8	3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	30			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =8.3A T <sub>J</sub> =125°C		14.9 22	18 27	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A		21.6	27	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =8.3A		23		S
V <sub>SD</sub>	Diode+Schottky Forward Voltage	I <sub>S</sub> =1A		0.45	0.5	V
I <sub>S</sub>	Maximum Body-Diode+Schottky Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance			1040	1250	pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		180		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			110		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.7	0.85	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge			19.2	24	nC
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =8.3A		9.36	12	nC
Q <sub>gs</sub>	Gate Source Charge			2.6		nC
Q <sub>gd</sub>	Gate Drain Charge			4.2		nC
t <sub>D(on)</sub>	Turn-On DelayTime			5.2	7.5	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.8Ω,		4.4	6.5	ns
t <sub>D(off)</sub>	Turn-Off DelayTime	R <sub>GEN</sub> =3Ω		17.3	25	ns
t <sub>f</sub>	Turn-Off Fall Time			3.3	5	ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =8.5A, di/dt=100A/μs		16.7	21	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =8.5A, di/dt=100A/μs		6.7	10	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. The current rating is based on the t<sub>s</sub> ≤ 10s thermal resistance rating.

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

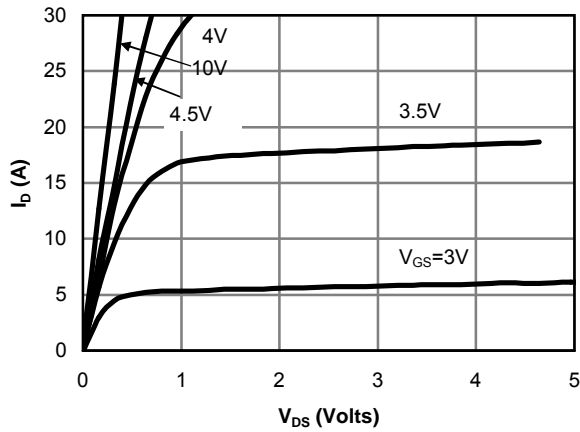
C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using <300μs pulses, duty cycle 0.5% max.

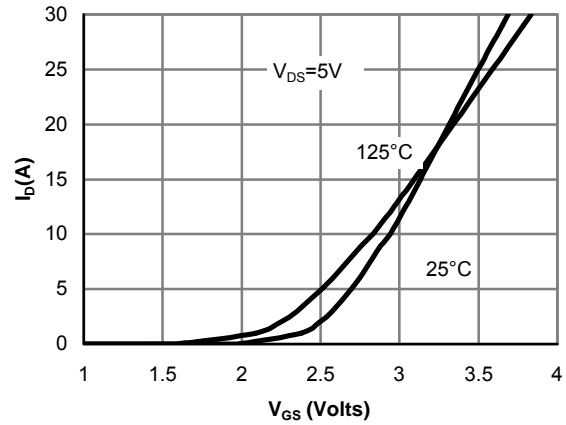
E: These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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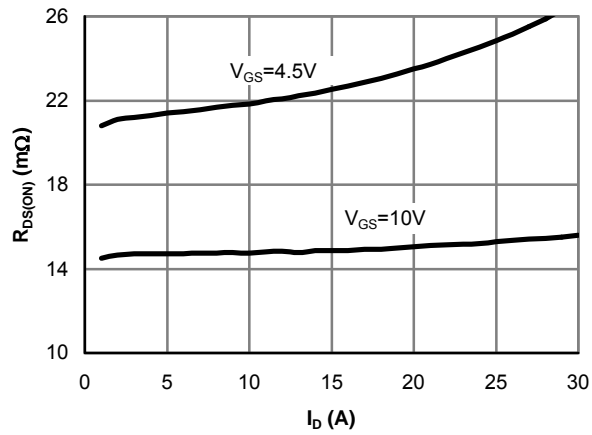
**Q2 Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**



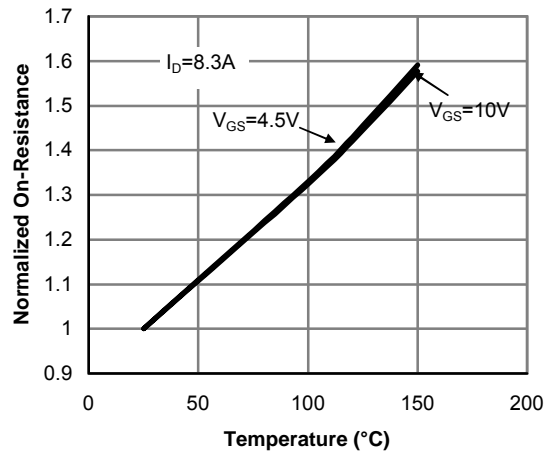
**Fig 1: On-Region Characteristics**



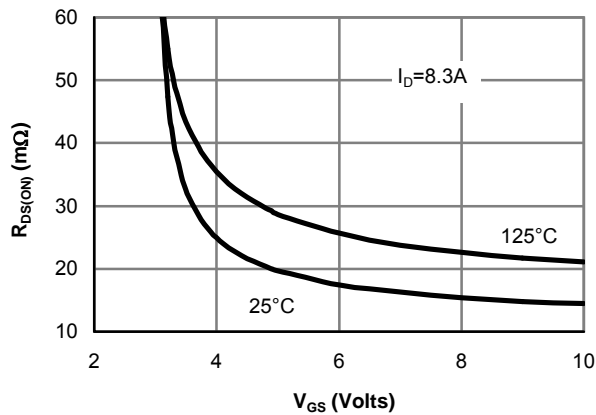
**Figure 2: Transfer Characteristics**



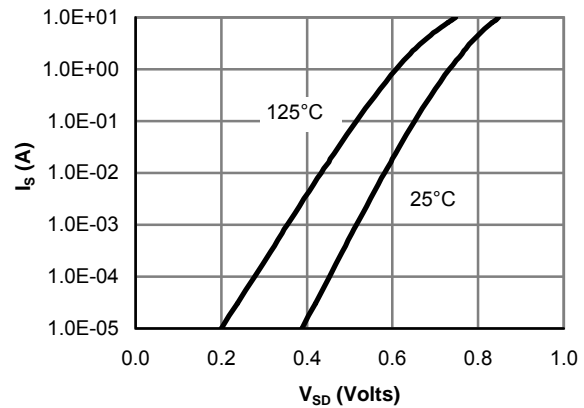
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On resistance vs. Junction Temperature**

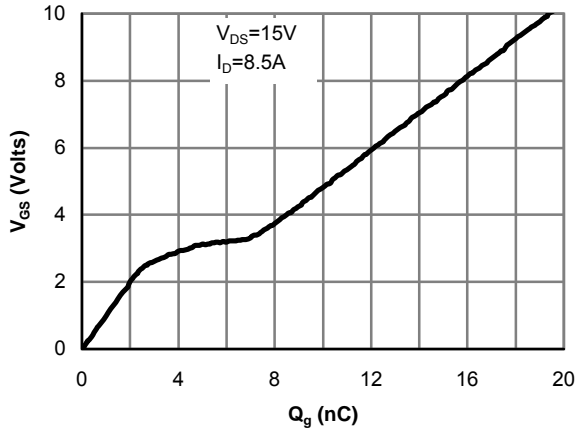


**Figure 5: On resistance vs. Gate-Source Voltage**

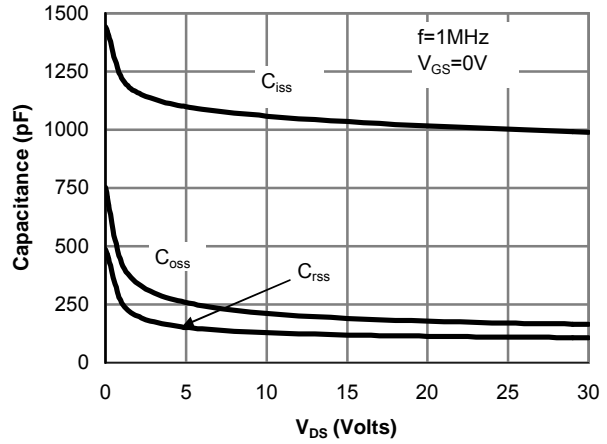


**Figure 6: Body-Diode Characteristics**

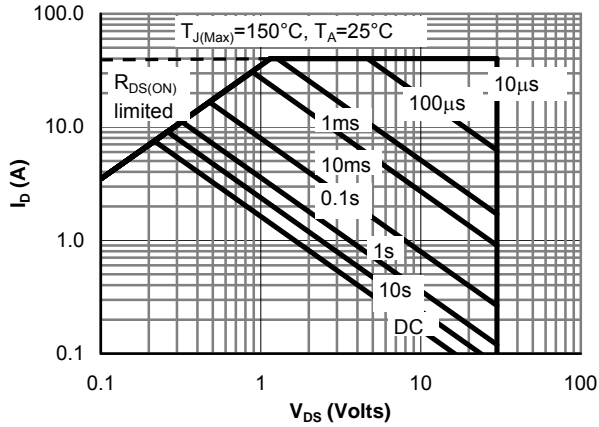
**Q2 Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)**



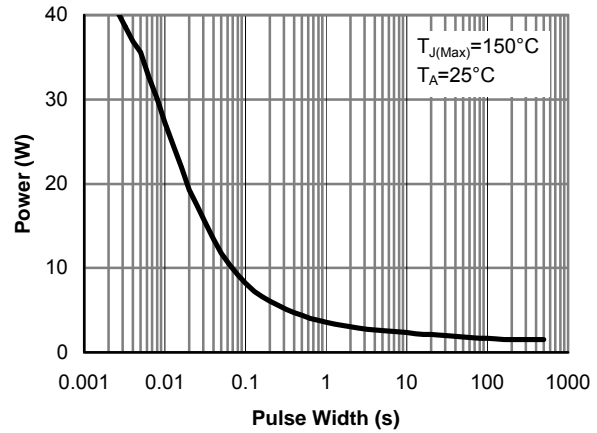
**Figure 7: Gate-Charge Characteristics**



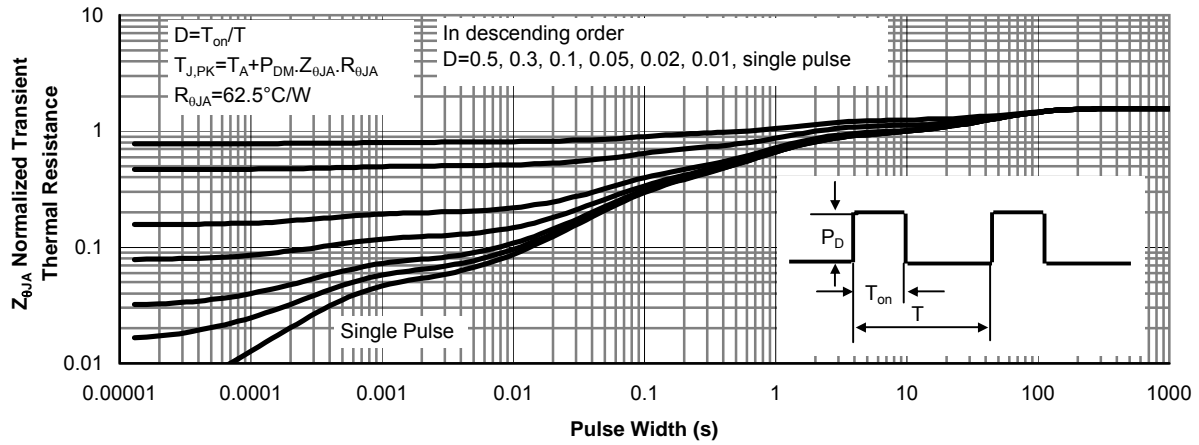
**Figure 8: Capacitance Characteristics**



**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**