

# AO4824L

## 30V Dual N-Channel MOSFET

### General Description

The AO4824L 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.

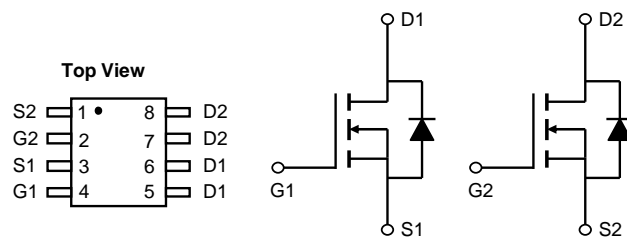
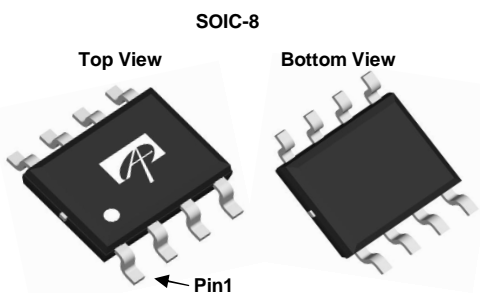
### Features

#### Q1

$V_{DS}$  (V) = 30V  
 $I_D$  = 8.5A  
 $R_{DS(ON)}$  < 17m $\Omega$   
 $R_{DS(ON)}$  < 27m $\Omega$

#### Q2

$V_{DS}$ (V) = 30V  
 $I_D$ =9.8A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 13m $\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 15m $\Omega$  ( $V_{GS}$  = 4.5V)



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

Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	$V_{DS}$	30	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$I_D$	8.5	9.8	A
$T_A=25^\circ\text{C}$		6.8	7.8	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	30	40	
Power Dissipation	$P_D$	2	2	W
		$T_A=25^\circ\text{C}$	1.28	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET Q1		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	110	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	35	40	
Parameter: Thermal Characteristics MOSFET Q2		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	110	
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	35	40	

**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	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.003	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> =10V, 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> =8.5A T <sub>J</sub> =125°C		13.8	17	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A		20	25	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =8.5A		23		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.76	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>ISS</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		1040	1250	pF
C <sub>OSS</sub>	Output Capacitance			180		pF
C <sub>RSS</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	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =8.5A		19.2	23	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge			9.36	11.2	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	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.8Ω, R <sub>GEN</sub> =3Ω		5.2	7.5	ns
t <sub>r</sub>	Turn-On Rise Time			4.4	6.5	ns
t <sub>D(off)</sub>	Turn-Off DelayTime			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 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.

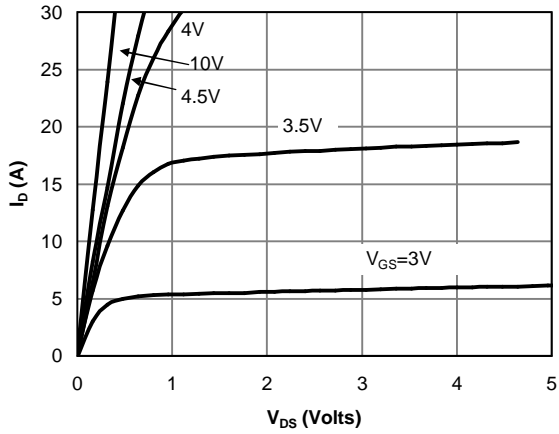
D: The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

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.

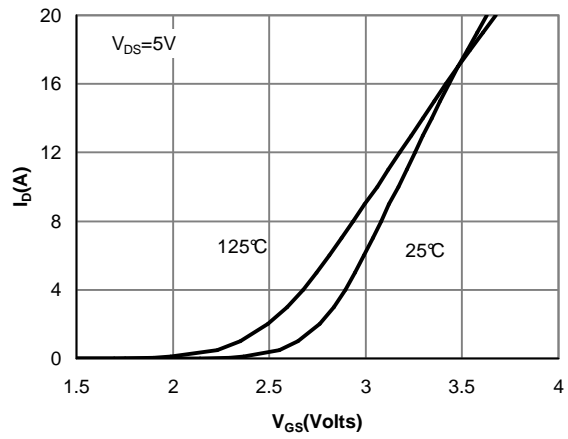
Rev 5 : Sep 2009

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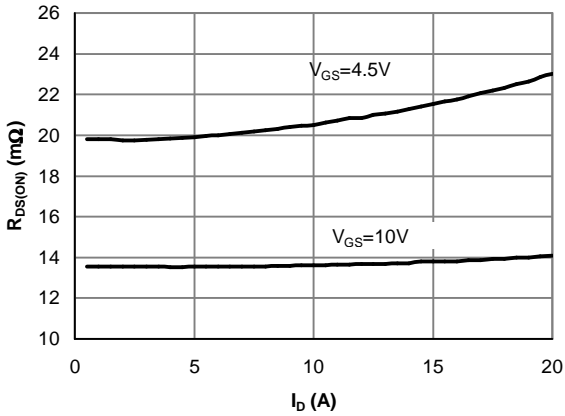
**Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



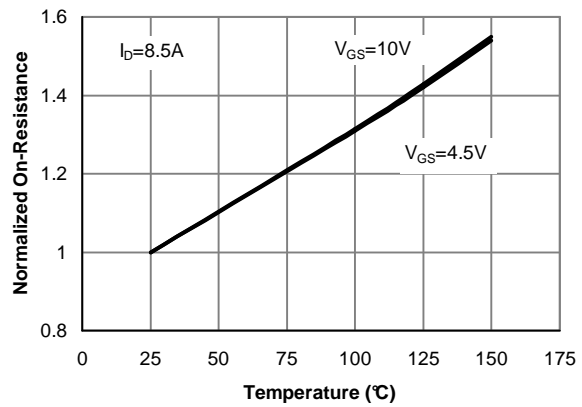
**Fig 1: On-Region Characteristics**



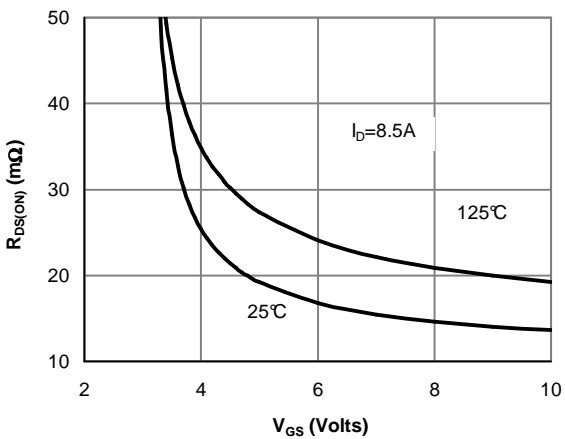
**Figure 2: Transfer Characteristics**



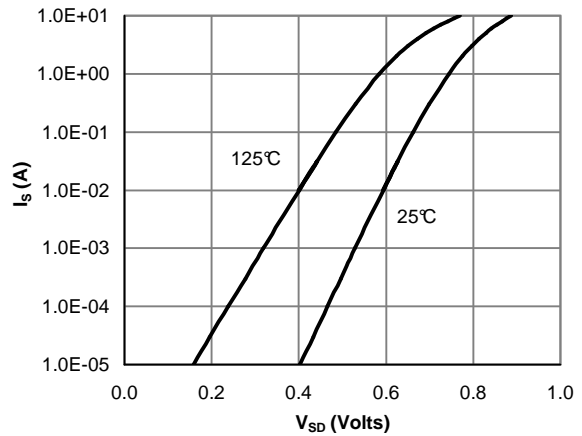
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**



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



**Figure 6: Body-Diode Characteristics**

**Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

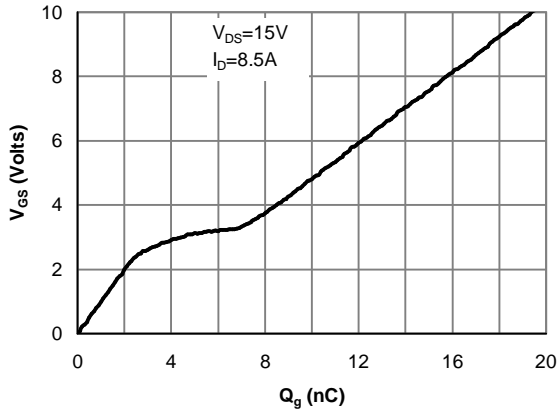


Figure 7: Gate-Charge Characteristics

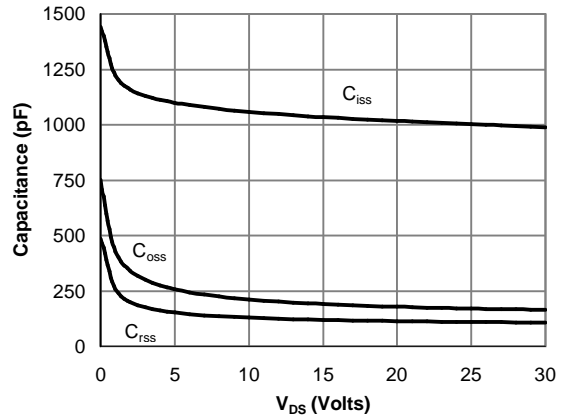


Figure 8: Capacitance Characteristics

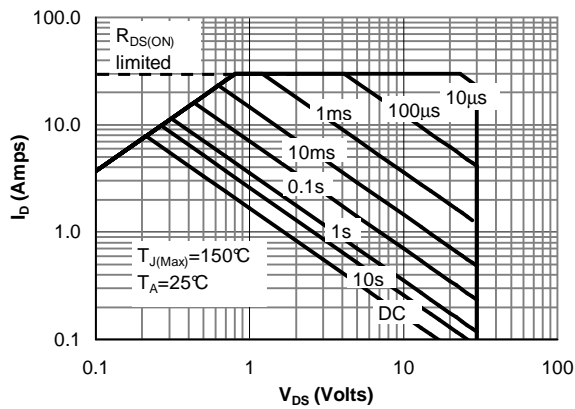


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

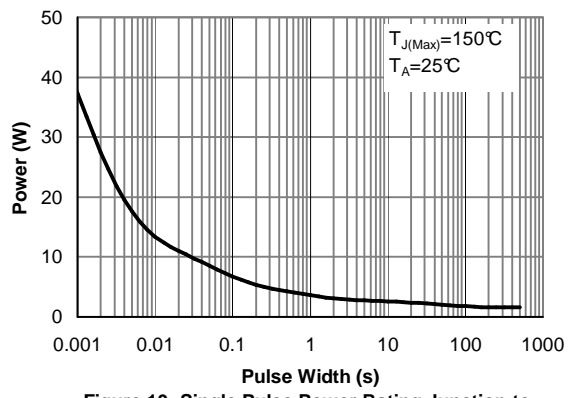


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

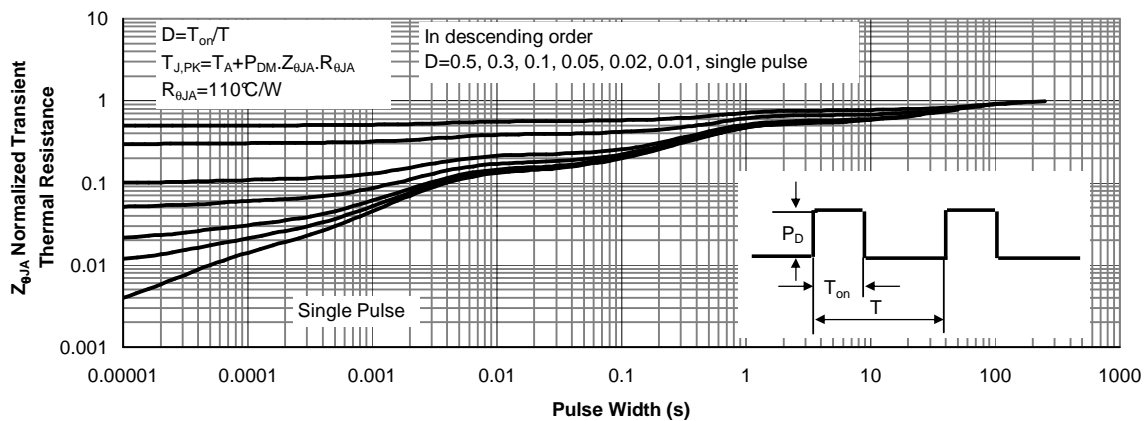


Figure 11: Normalized Maximum Transient Thermal Impedance

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
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> =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> = ±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> =9.8A T <sub>J</sub> =125°C		10.5 13.4	13 17	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =9A		12	15	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =9.8A	30	37		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A		0.73	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		3656	4250	pF
C <sub>oss</sub>	Output Capacitance			256		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			168		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.86	1.05	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =9.8A		30.5	36	nC
Q <sub>gs</sub>	Gate Source Charge			4.5		nC
Q <sub>gd</sub>	Gate Drain Charge			8.5		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.6Ω, R <sub>GEN</sub> =3Ω		5.5	8.2	ns
t <sub>r</sub>	Turn-On Rise Time			3.1	5	ns
t <sub>D(off)</sub>	Turn-Off DelayTime			52.4	75	ns
t <sub>f</sub>	Turn-Off Fall Time			5.7	8.5	ns
t <sub>rr</sub>	Body Diode Reverse Recovery time	I <sub>F</sub> =9.8A, di/dt=100A/μs		21.5	26	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery charge	I <sub>F</sub> =9.8A, di/dt=100A/μs		11	15	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.

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Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

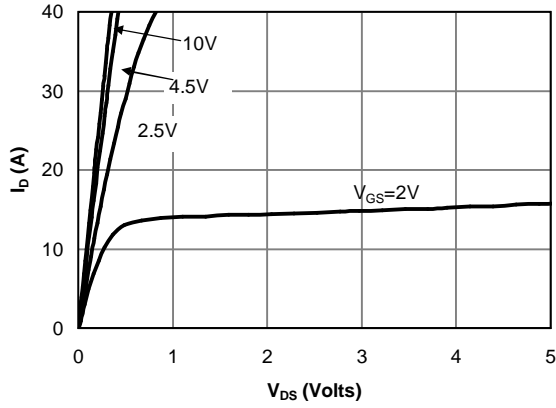


Fig 1: On-Region Characteristics

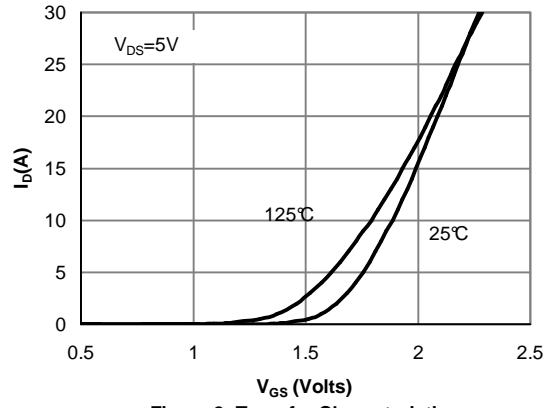


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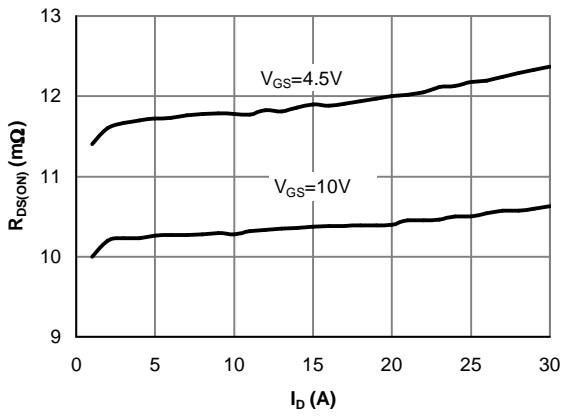


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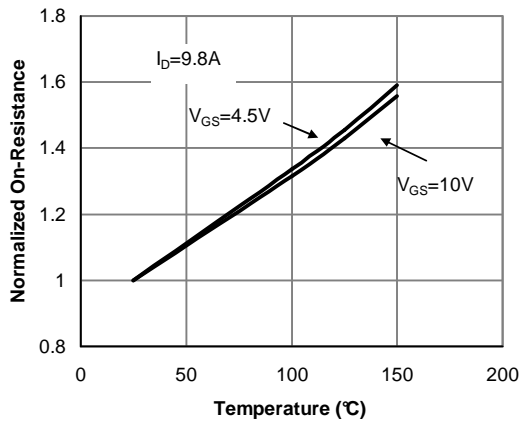


Figure 4: On resistance vs. Junction Temperature

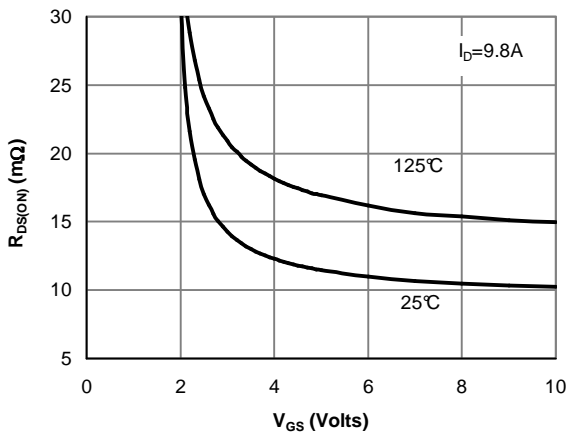


Figure 5: On resistance vs. Gate-Source Voltage

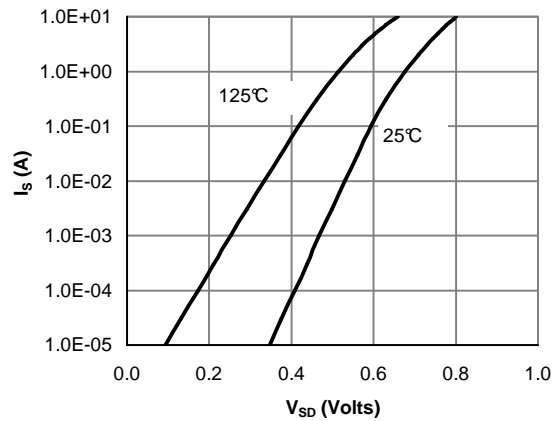


Figure 6: Body-Diode Characteristics

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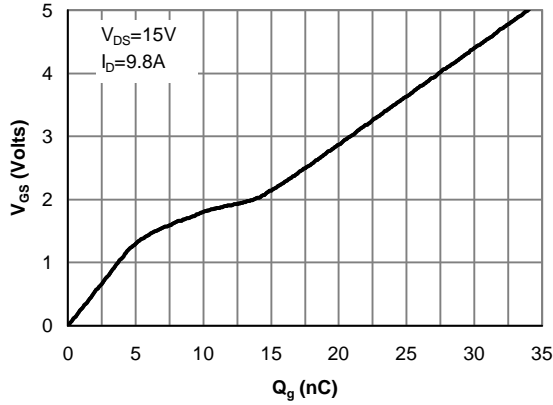


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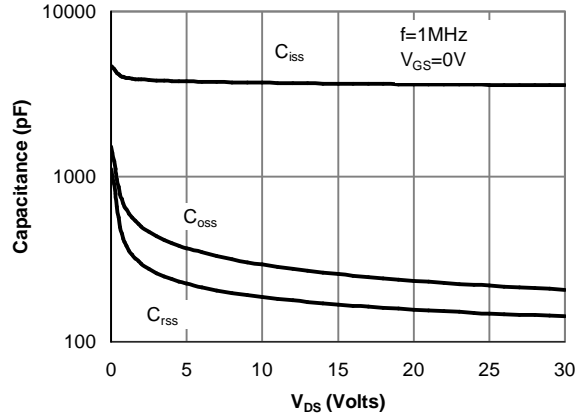


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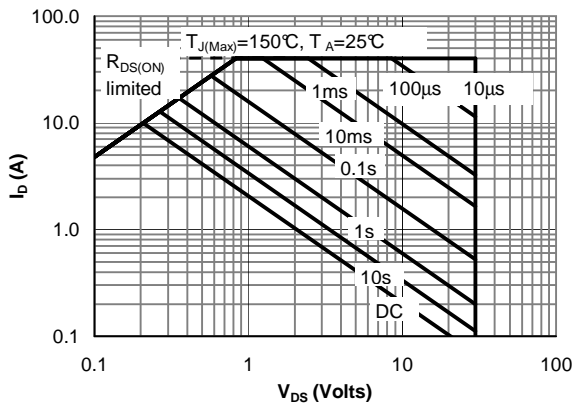


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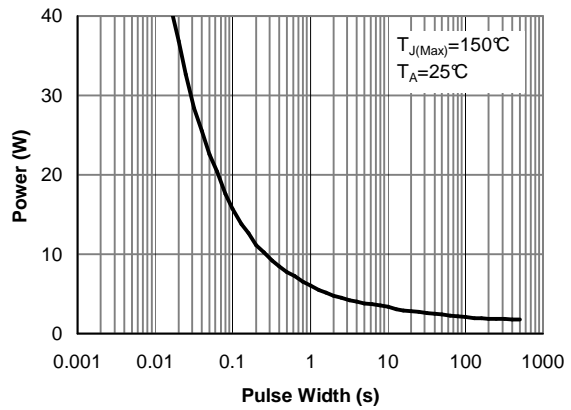


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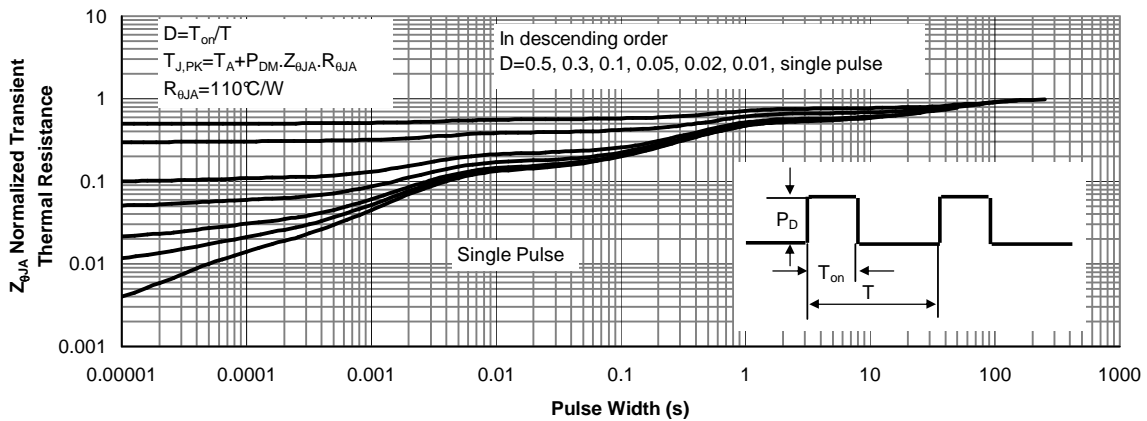


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