

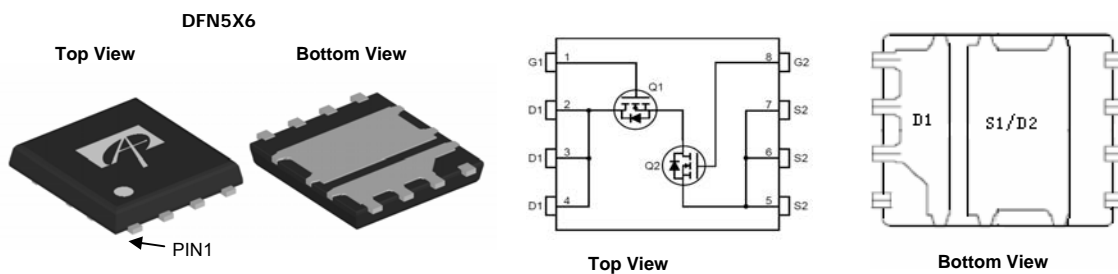
### General Description

The AON6906A is designed to provide a high efficiency synchronous buck power stage with optimal layout and board space utilization. It includes two specialized MOSFETs in a dual Power DFN5x6A package. The Q1 "High Side" MOSFET is designed to minimize switching losses. The Q2 "Low Side" MOSFET is designed for low  $R_{DS(ON)}$  to reduce conduction losses. Power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $C_{rss}$ . In addition, switching behavior is well controlled with a "Schottky style" soft recovery body diode.

### Product Summary

	Q1	Q2
$V_{DS}$	30V	30V
$I_D$ (at $V_{GS}=10V$ )	37A	48A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	<14.4m $\Omega$	<11.7m $\Omega$
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$ )	<21.3m $\Omega$	<17.5m $\Omega$

100% UIS Tested  
 100% Rg Tested



### 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		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V	
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	37	48	A
		$T_C=100^\circ\text{C}$	23	30	
Pulsed Drain Current <sup>c</sup>	$I_{DM}$	85	100		
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	9.1	10	A
		$T_A=70^\circ\text{C}$	7.2	8.1	
Avalanche Current <sup>c</sup>	$I_{AS}, I_{AR}$	21	23	A	
Avalanche Energy $L=0.1\text{mH}$ <sup>c</sup>	$E_{AS}, E_{AR}$	22	26	mJ	
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	31	45	W
		$T_C=100^\circ\text{C}$	12.5	18	
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	1.9	2	W
		$T_A=70^\circ\text{C}$	1.2	1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$	

### Thermal Characteristics

Parameter	Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	29	27	35	32	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A D</sup>		Steady-State	56	51	67	61
Maximum Junction-to-Case	$R_{\theta JC}$	3.3	2.3	4	2.8	$^\circ\text{C/W}$

**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> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			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	1.3	1.8	2.4	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	85			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =9.1A T <sub>J</sub> =125°C		12 17.5	14.4 21	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =9.1A		17	21.3	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =9.1A		30		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.73	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				33	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz	400	510	670	pF
C <sub>oss</sub>	Output Capacitance		150	220	310	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		13	22	38	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	0.9	1.8	2.7	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> =9.1A	5.9	7.4	9	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge		2.6	3.3	4.0	nC
Q <sub>gs</sub>	Gate Source Charge		1.2	1.5	1.8	nC
Q <sub>gd</sub>	Gate Drain Charge		0.8	1.4	2	nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		4.3		ns
t <sub>r</sub>	Turn-On Rise Time			8		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			15.8		ns
t <sub>f</sub>	Turn-Off Fall Time			3.4		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =9.1A, dI/dt=500A/μs	7.2	9	11	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =9.1A, dI/dt=500A/μs	11.8	14.7	17.7	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 Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°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 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<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 case R<sub>θJC</sub> and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

G. The maximum current rating is limited by package.

H. 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.

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**Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

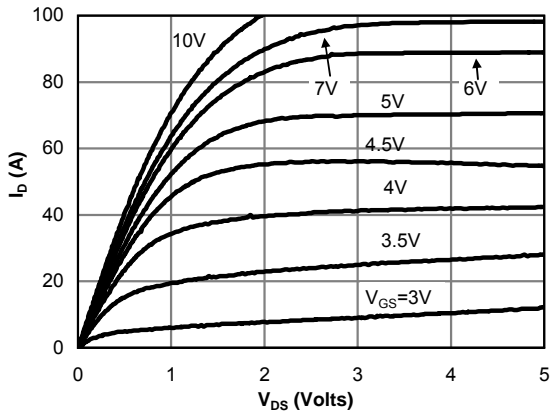


Fig 1: On-Region Characteristics (Note E)

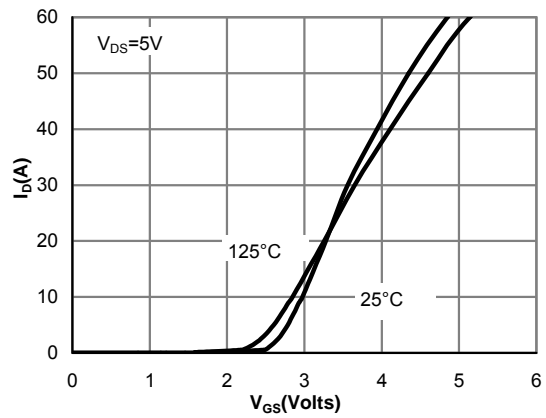


Figure 2: Transfer Characteristics (Note E)

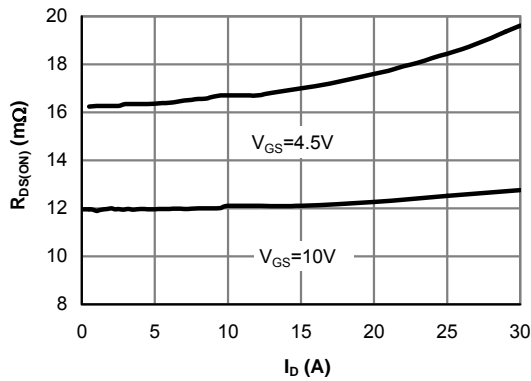


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

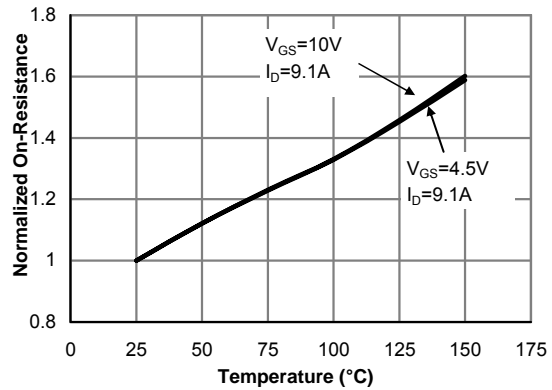


Figure 4: On-Resistance vs. Junction Temperature (Note E)

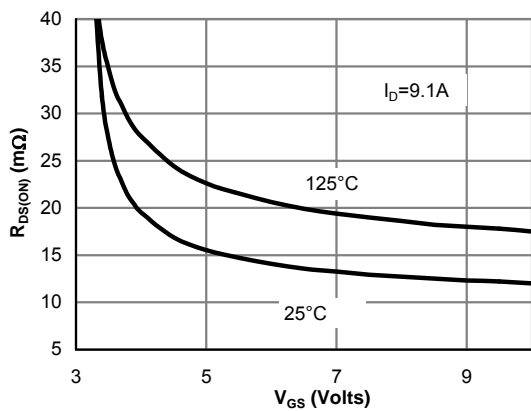


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

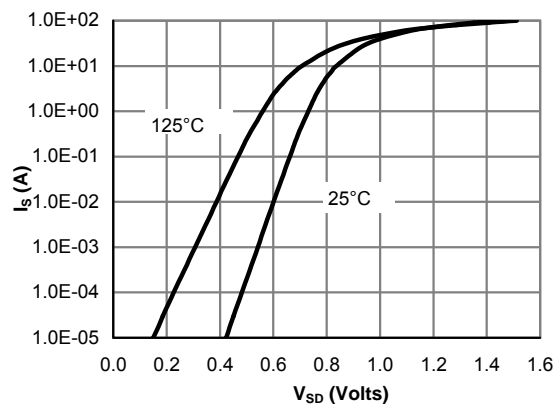


Figure 6: Body-Diode Characteristics (Note E)

**Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

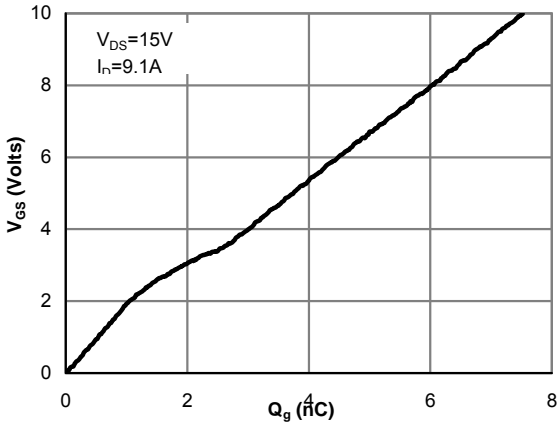


Figure 7: Gate-Charge Characteristics

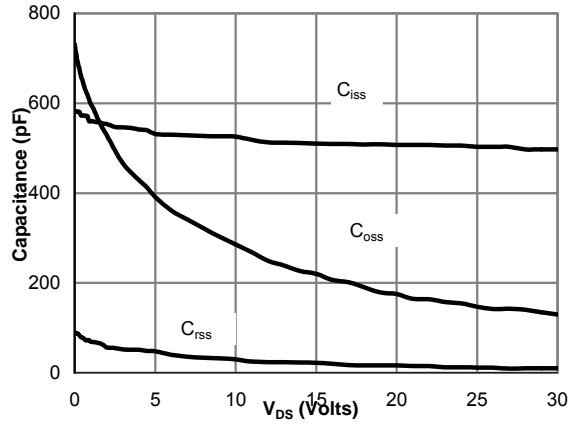


Figure 8: Capacitance Characteristics

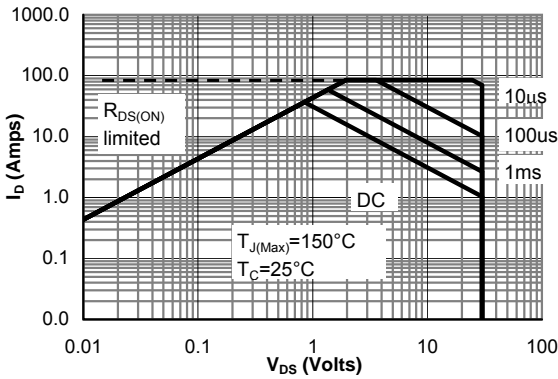


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

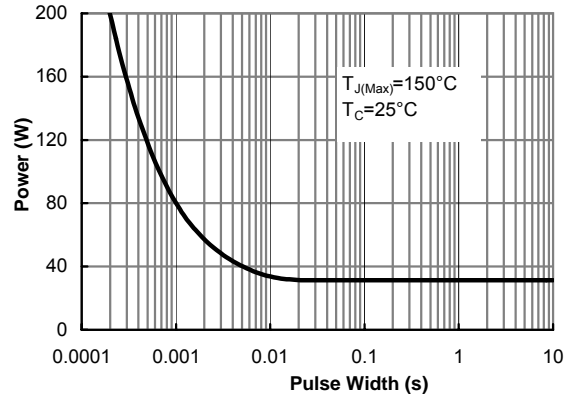


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

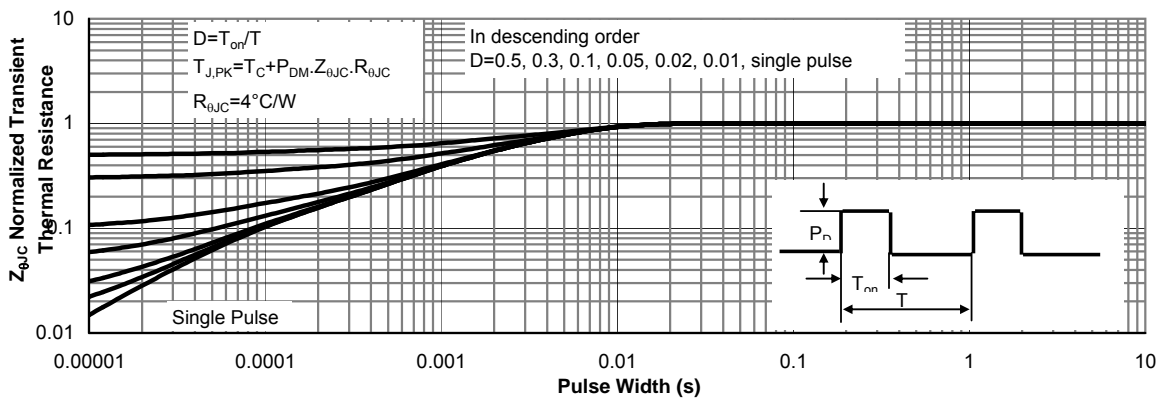


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

**Q1-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

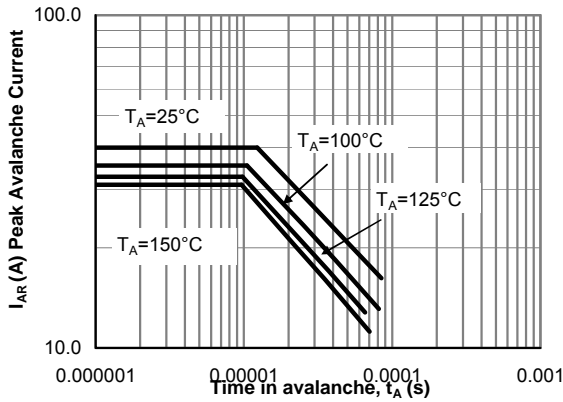


Figure 12: Single Pulse Avalanche capability (Note C)

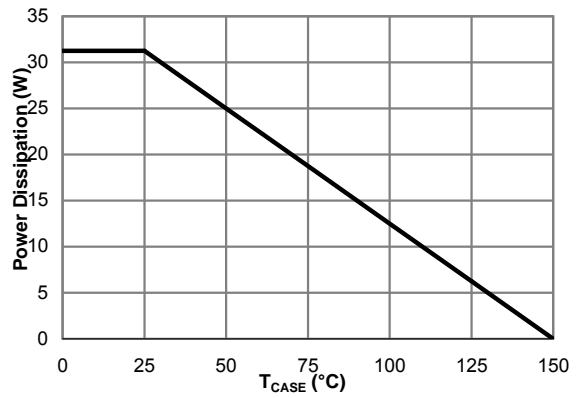


Figure 13: Power De-rating (Note F)

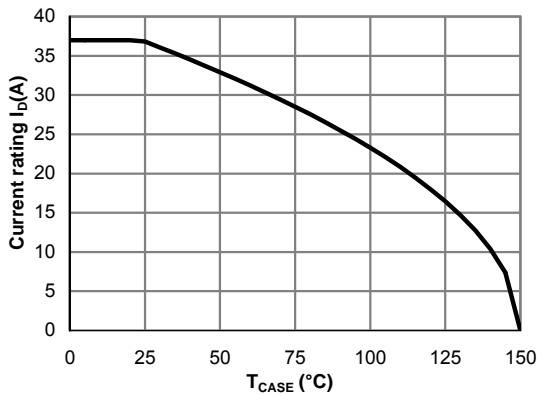


Figure 14: Current De-rating (Note F)

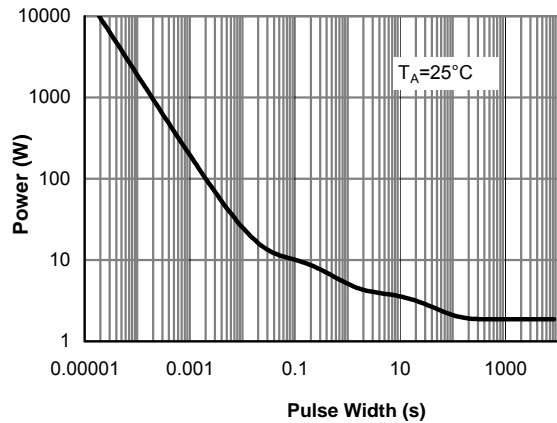


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

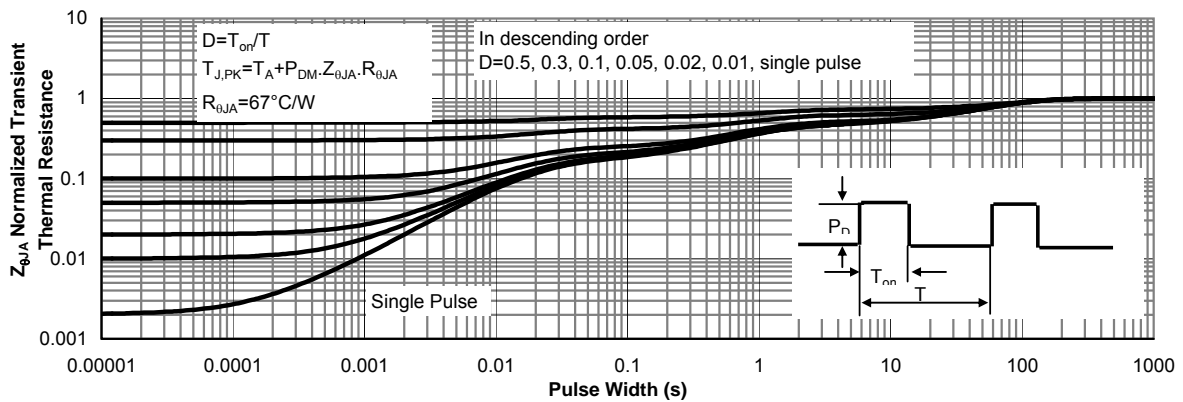


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

**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> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			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	1.3	1.8	2.3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	100			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =10A T <sub>J</sub> =125°C		9.7 15.1	11.7 18.2	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A		14	17.5	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =10A		25		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.72	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				48	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz	450	570	750	pF
C <sub>oss</sub>	Output Capacitance		180	260	370	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		12	20	35	pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	0.9	1.8	2.7	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> =10A	6.5	8.2	10	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge		2.8	3.5	4.2	nC
Q <sub>gs</sub>	Gate Source Charge		1.2	1.6	2	nC
Q <sub>gd</sub>	Gate Drain Charge		0.8	1.4	2	nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		4.1		ns
t <sub>r</sub>	Turn-On Rise Time			7.8		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			15.2		ns
t <sub>f</sub>	Turn-Off Fall Time			3.3		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =10A, dI/dt=500A/μs	6.8	8.6	10	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =10A, dI/dt=500A/μs	11.3	14.1	17	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 Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°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 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<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 case R<sub>θJC</sub> and case to ambient.

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

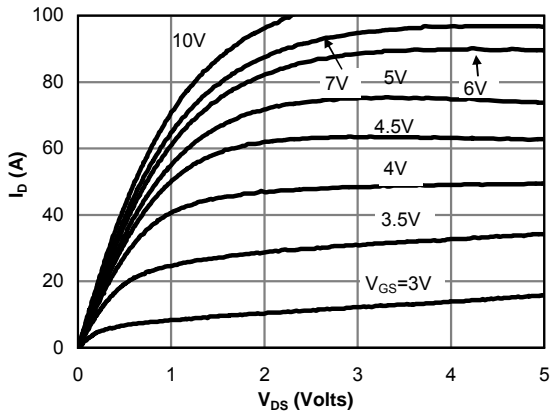
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

G. The maximum current rating is limited by package.

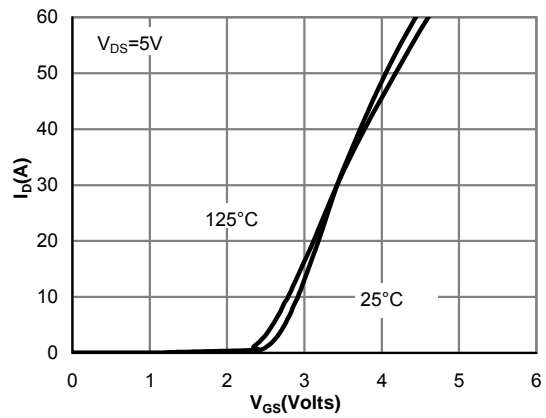
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C.

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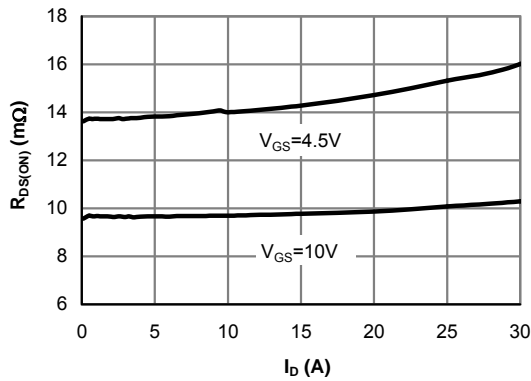
**Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



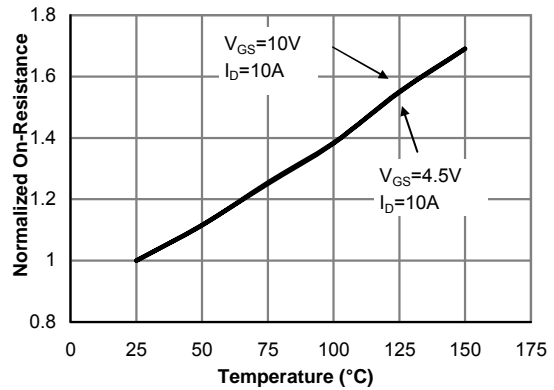
**Fig 1: On-Region Characteristics (Note E)**



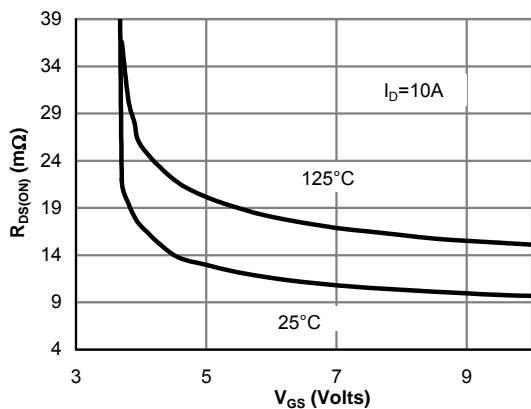
**Figure 2: Transfer Characteristics (Note E)**



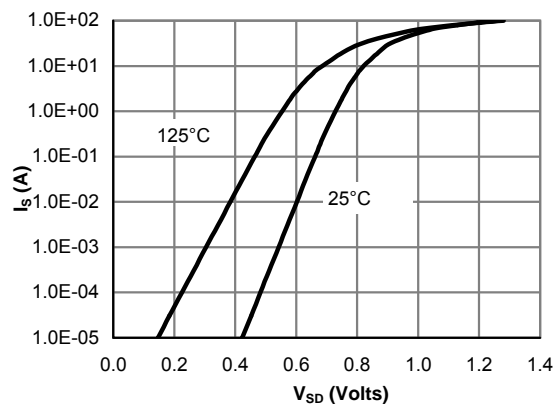
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**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)**

**Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

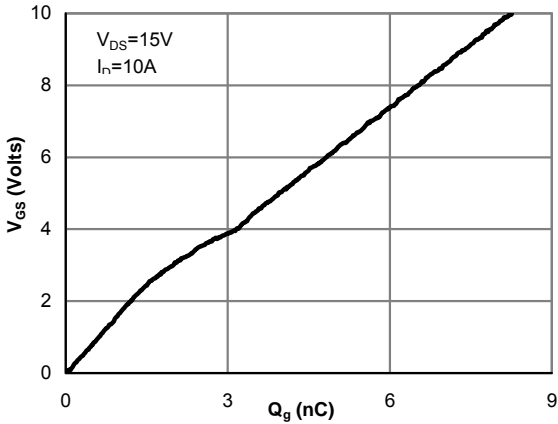


Figure 7: Gate-Charge Characteristics

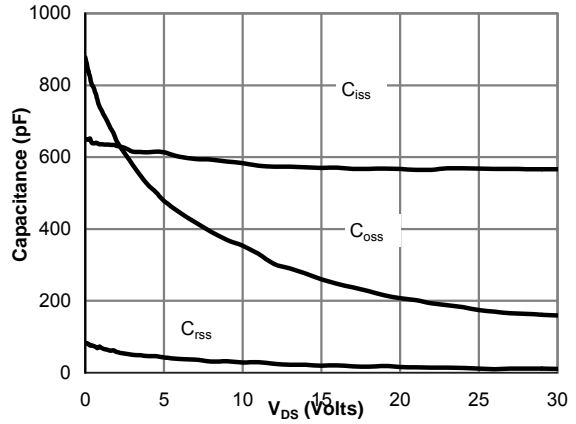


Figure 8: Capacitance Characteristics

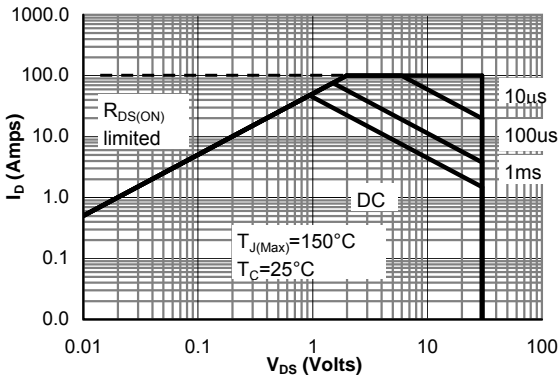


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

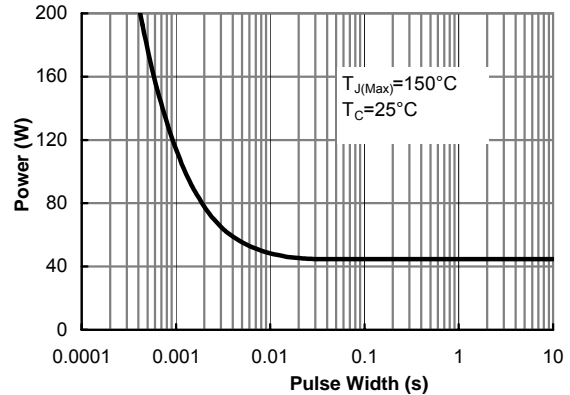


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

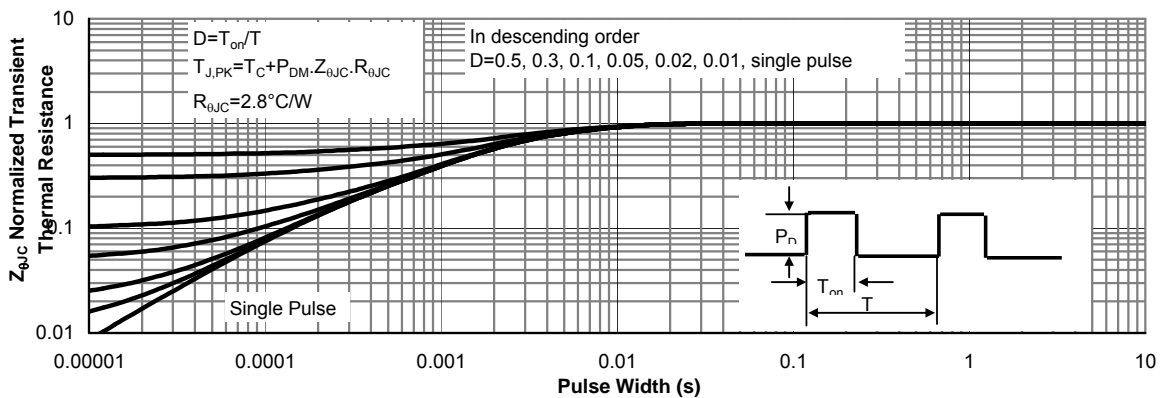


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)



**Q2-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

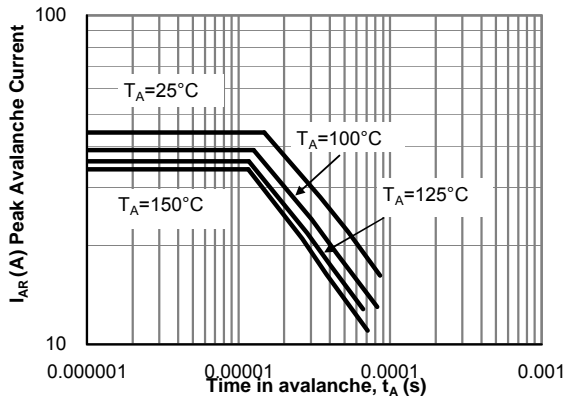


Figure 12: Single Pulse Avalanche capability (Note C)

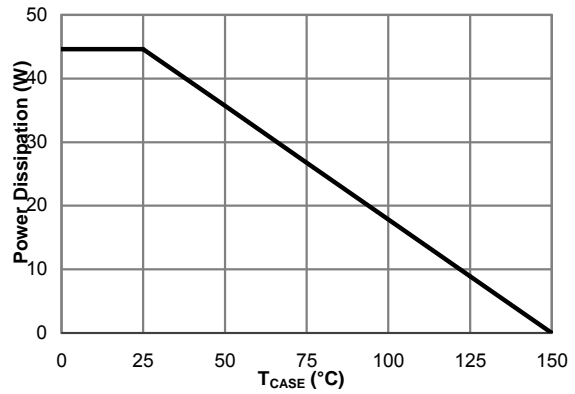


Figure 13: Power De-rating (Note F)

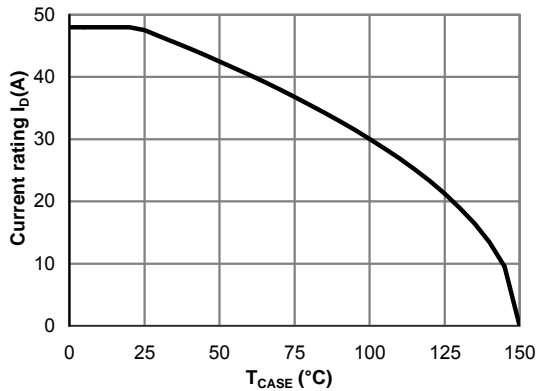


Figure 14: Current De-rating (Note F)

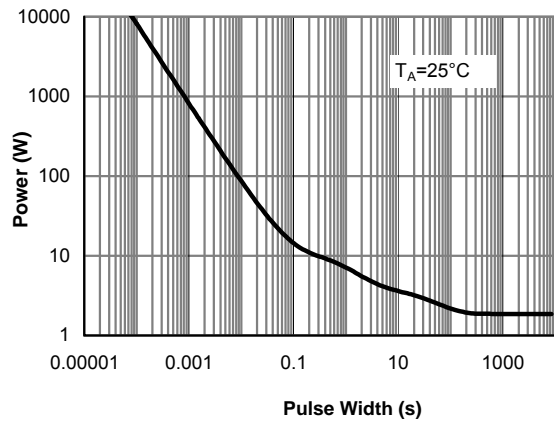


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

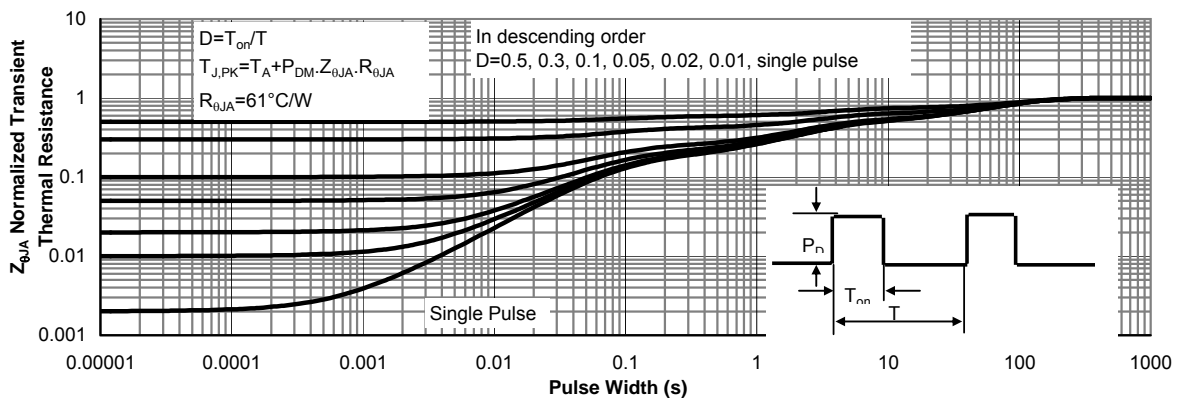
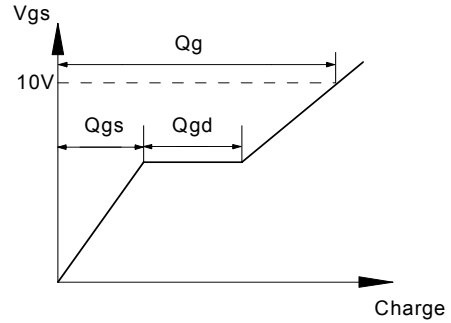
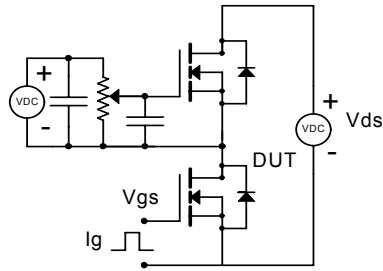
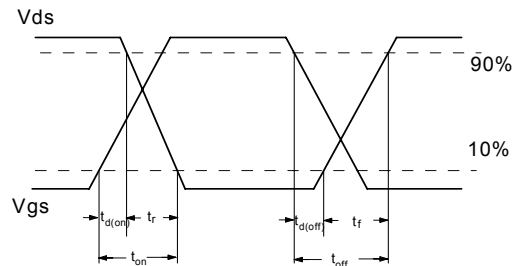
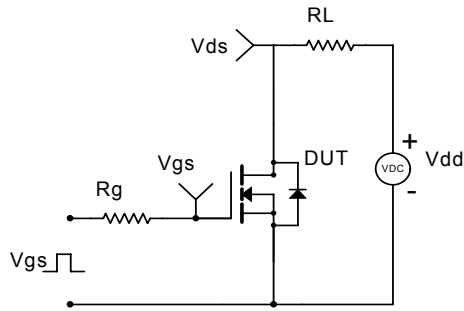


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

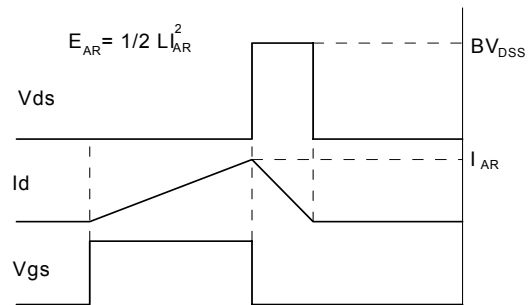
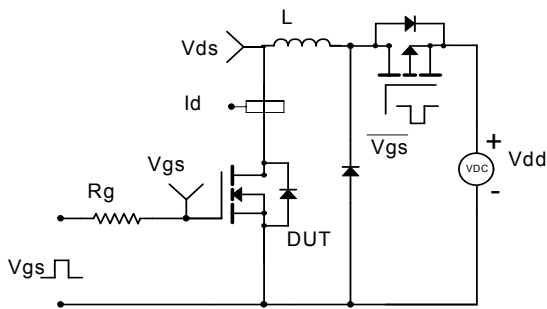
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

