

### General Description

- Bottom Source Technology
- Very Low  $R_{DS(ON)}$
- High Current Capability
- RoHS and Halogen-Free Compliant

### Applications

- DC/DC Converters in PC, Servers
- Point of load Converters

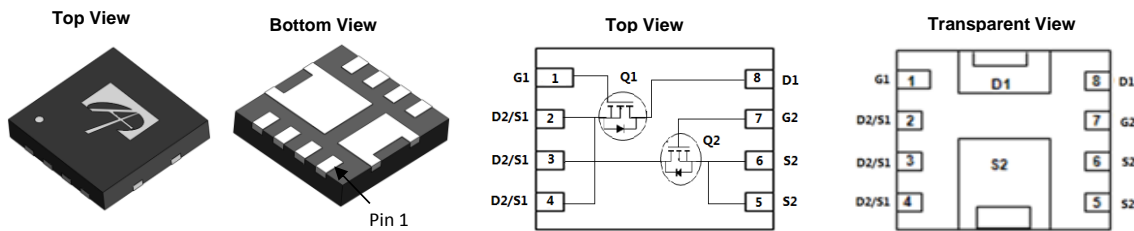
### Product Summary

	Q1	Q2
$V_{DS}$	25V	25V
$I_D$ (at $V_{GS}=10V$ )	17A	34A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	< 4.6m $\Omega$	< 1.4m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=4.5V$ )	< 6m $\Omega$	< 1.7m $\Omega$

100% UIS Tested  
100% Rg Tested



### DFN3.3x3.3A



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AONE36132	DFN3.3x3.3A	Tape & Reel	3000

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

Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	$V_{DS}$	25	25	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	$\pm 12$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	60 <sup>G</sup>	A
		$T_C=100^\circ\text{C}$	38	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	160	200	
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	17	A
		$T_A=70^\circ\text{C}$	13.5	
Avalanche Current <sup>C</sup>	$I_{AS}$	48	60	A
Avalanche energy $L=0.01\text{mH}$ <sup>C</sup>	$E_{AS}$	12	18	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	25	W
		$T_C=100^\circ\text{C}$	10	
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	2	W
		$T_A=70^\circ\text{C}$	1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$

### Thermal Characteristics

Parameter	Symbol	Typ Q1	Typ Q2	Max Q1	Max Q2	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	50	40	60	50	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A D</sup>		75	65	90	80	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	4	2.5	5	3.5	$^\circ\text{C/W}$

**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	25			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =25V, 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> =±12V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.4	1.8	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =17A T <sub>J</sub> =125°C		3.8	4.6	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A		5.3	6.4	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =17A		100		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				30	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =12.5V, f=1MHz		880		pF
C <sub>oss</sub>	Output Capacitance			250		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			55		pF
R <sub>g</sub>	Gate resistance	f=1MHz	0.35	0.7	1.05	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (10V)	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, I <sub>D</sub> =17A		14.5	21	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge			6.5	10	nC
Q <sub>gs</sub>	Gate Source Charge			2.5		nC
Q <sub>gd</sub>	Gate Drain Charge			2.5		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		4.5		ns
t <sub>r</sub>	Turn-On Rise Time			3.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			20		ns
t <sub>f</sub>	Turn-Off Fall Time			2.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =17A, di/dt=500A/μs		9		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =17A, di/dt=500A/μs		11.5		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 Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> ≤ 10s 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. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° 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 <300μs 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 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 package limited.
- 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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**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

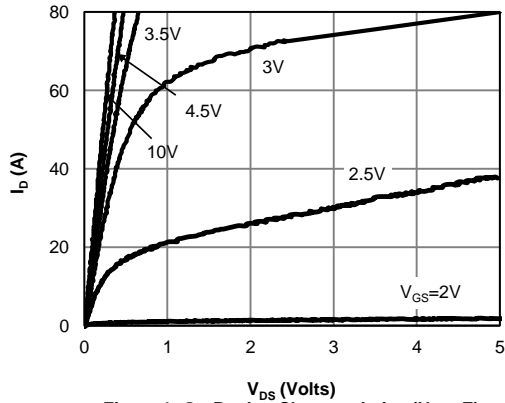


Figure 1: On-Region Characteristics (Note E)

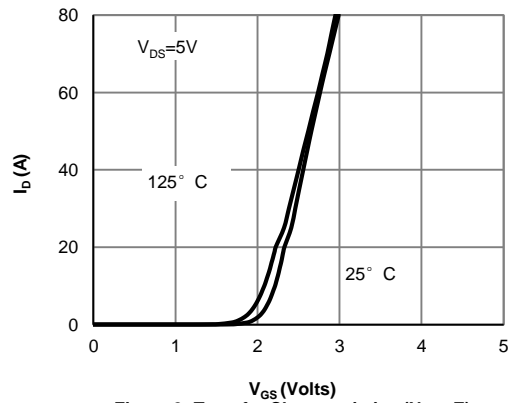


Figure 2: Transfer Characteristics (Note E)

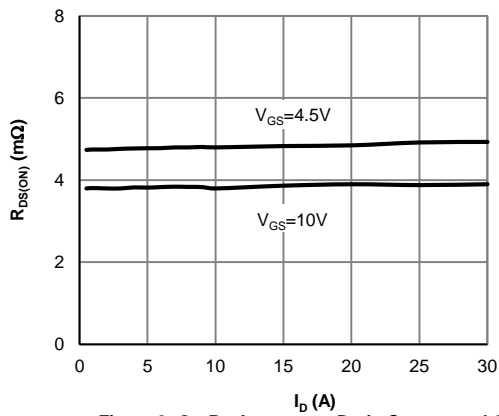


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

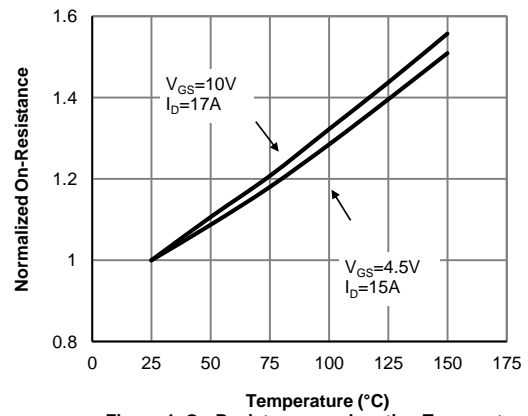


Figure 4: On-Resistance vs. Junction Temperature (Note E)

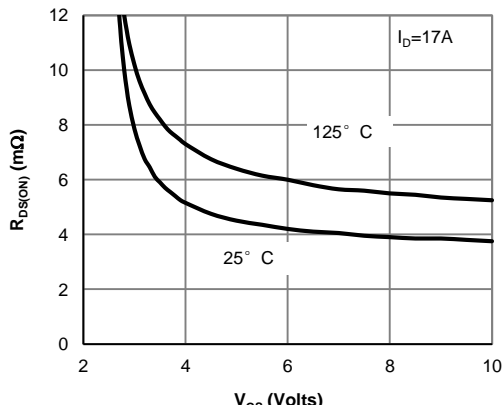


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

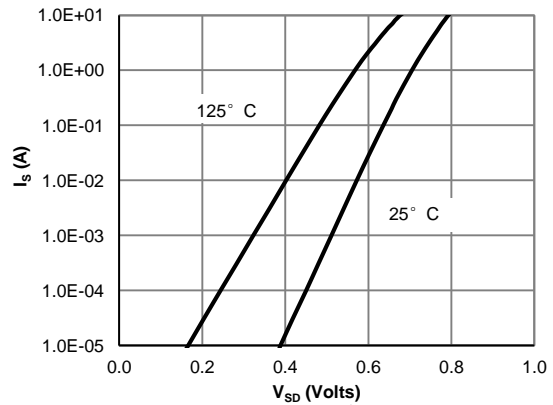


Figure 6: Body-Diode Characteristics (Note E)

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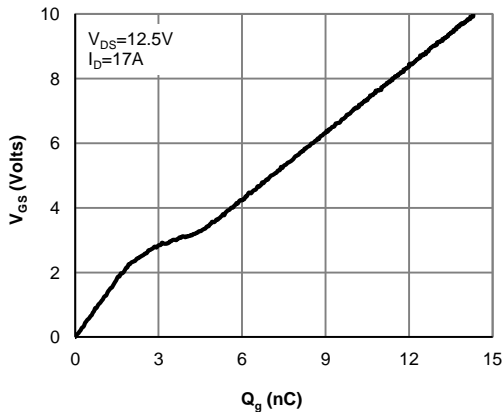


Figure 7: Gate-Charge Characteristics

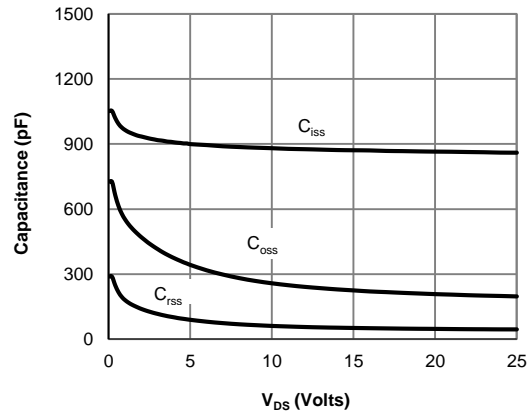


Figure 8: Capacitance Characteristics

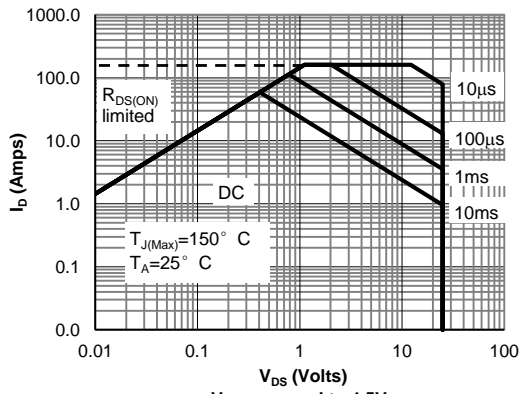


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

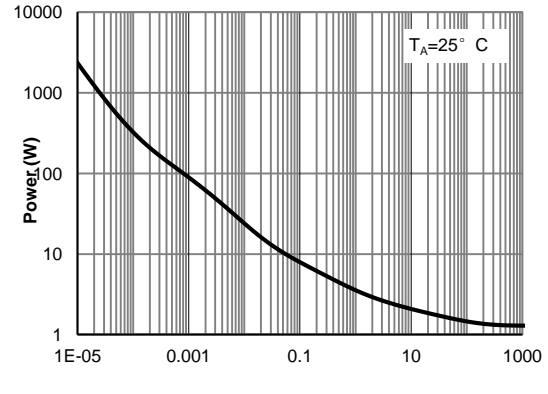


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note H)

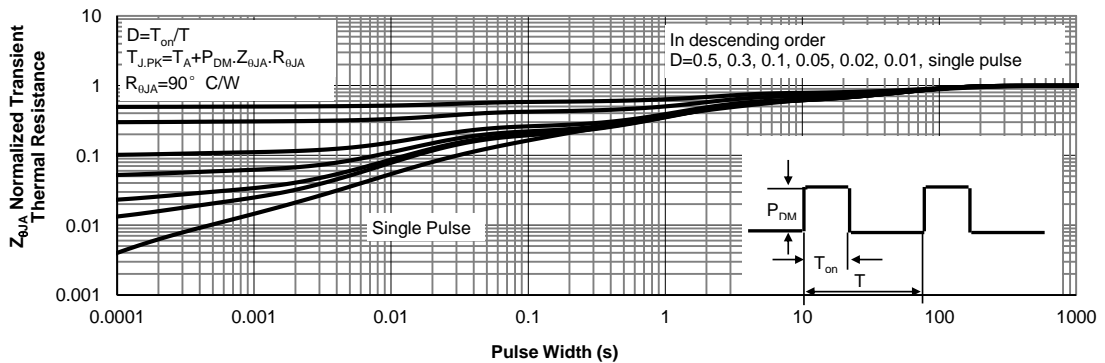


Figure 11: Normalized Maximum Transient Thermal Impedance (Note H)

**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	25			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =25V, 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> =±12V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.4	1.8	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		1.1	1.4	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		1.5	1.9	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		165		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				40	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =12.5V, f=1MHz		3215		pF
C <sub>oss</sub>	Output Capacitance			860		pF
C <sub>riss</sub>	Reverse Transfer Capacitance			200		pF
R <sub>g</sub>	Gate resistance	f=1MHz	0.4	0.8	1.2	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, I <sub>D</sub> =20A		55	80	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge			25	35	
Q <sub>gs</sub>	Gate Source Charge			9.5		
Q <sub>gd</sub>	Gate Drain Charge			5		
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =12.5V, R <sub>L</sub> =0.6Ω, R <sub>GEN</sub> =3Ω		8		ns
t <sub>r</sub>	Turn-On Rise Time			5.5		
t <sub>D(off)</sub>	Turn-Off Delay Time			39.5		
t <sub>f</sub>	Turn-Off Fall Time			7		
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, di/dt=500A/μs		16		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, di/dt=500A/μs		33.5		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 Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> t<sub>s</sub> ≤ 10s 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. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° 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 <300μs 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 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 package limited.

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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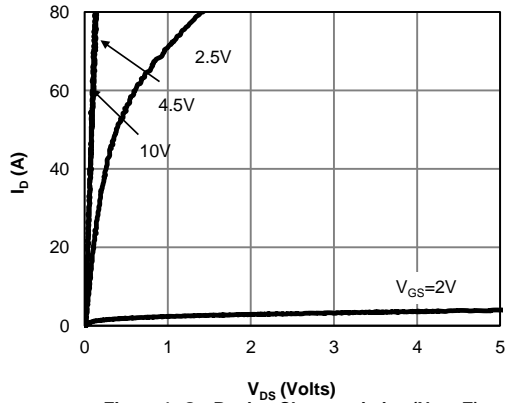


Figure 1: On-Region Characteristics (Note E)

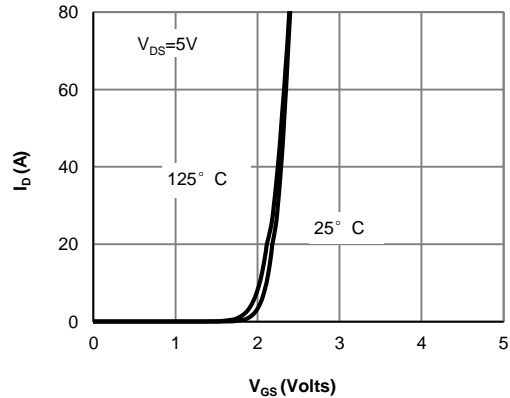


Figure 2: Transfer Characteristics (Note E)

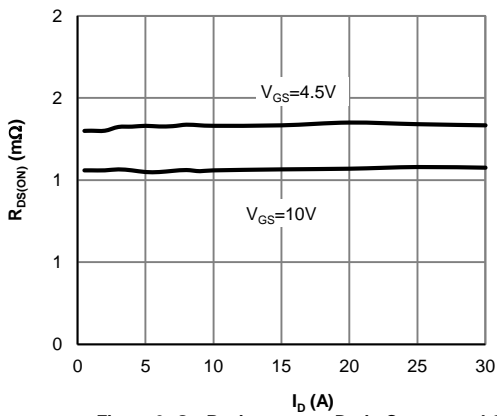


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

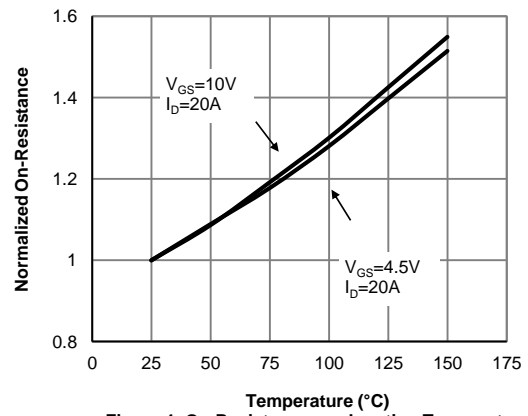


Figure 4: On-Resistance vs. Junction Temperature (Note E)

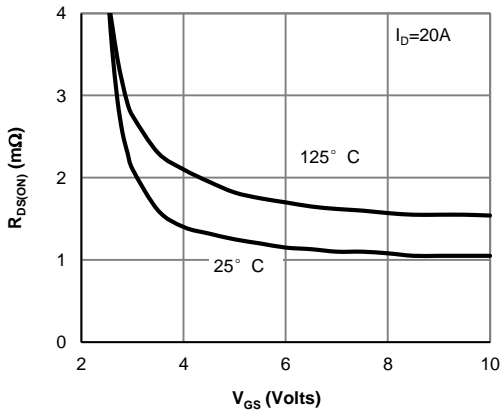


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

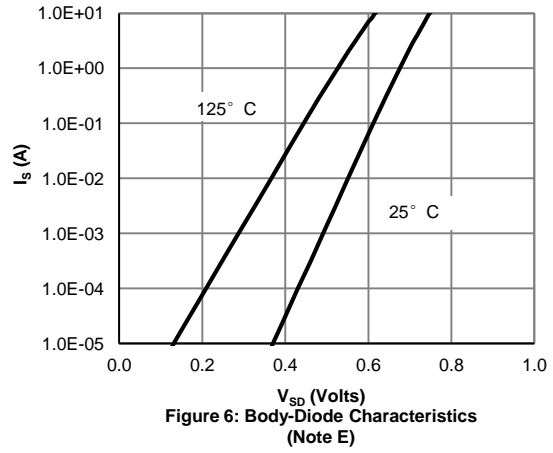


Figure 6: Body-Diode Characteristics (Note E)

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

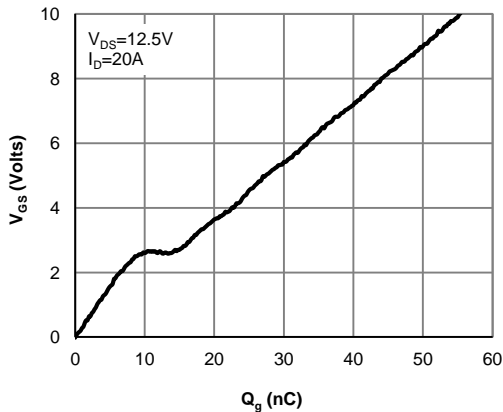


Figure 7: Gate-Charge Characteristics

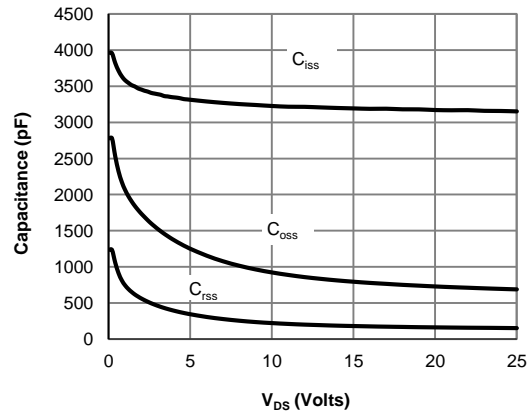


Figure 8: Capacitance Characteristics

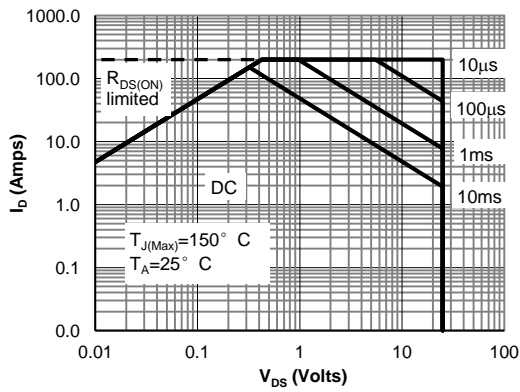


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

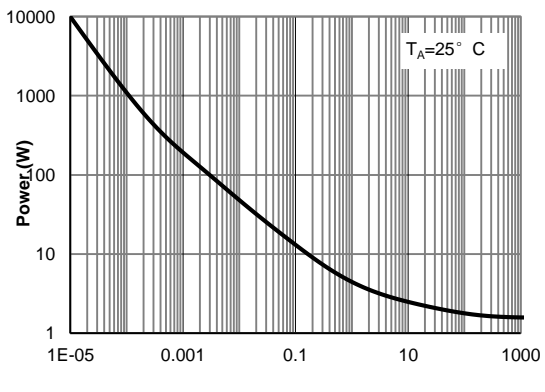


Figure 13: Single Pulse Power Rating Junction-to-Ambient (Note H)

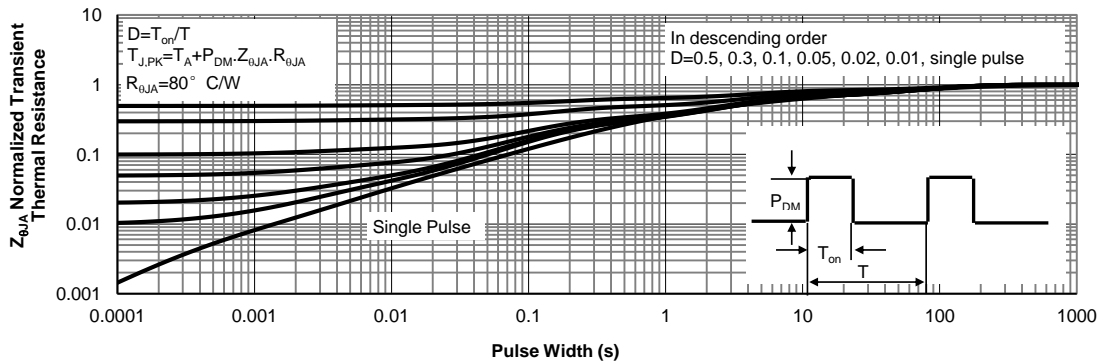


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

Figure A: Gate Charge Test Circuit & Waveforms

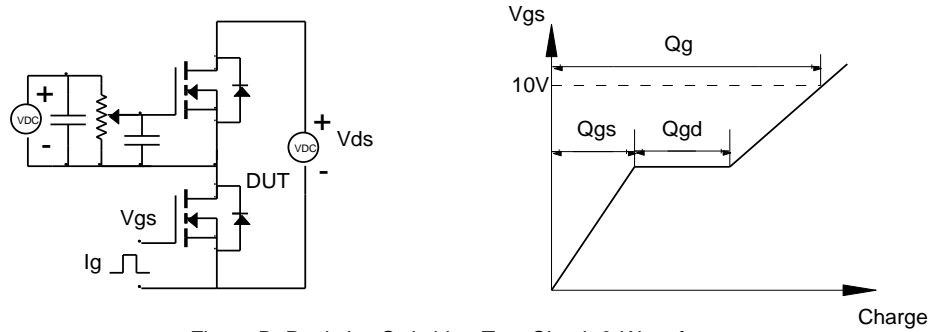


Figure B: Resistive Switching Test Circuit & Waveforms

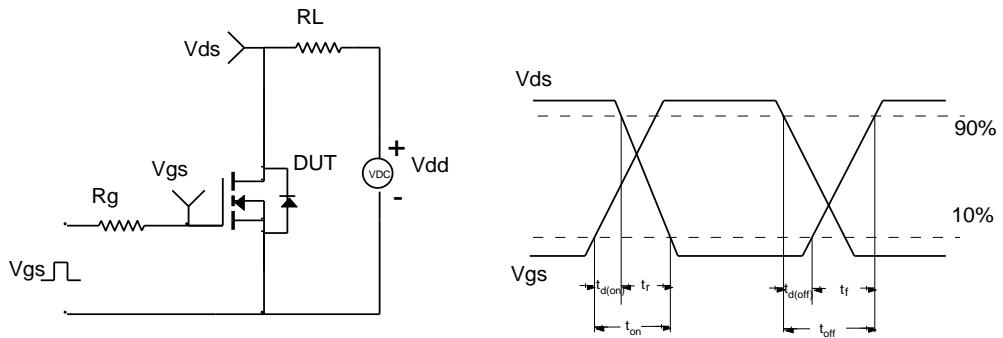


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

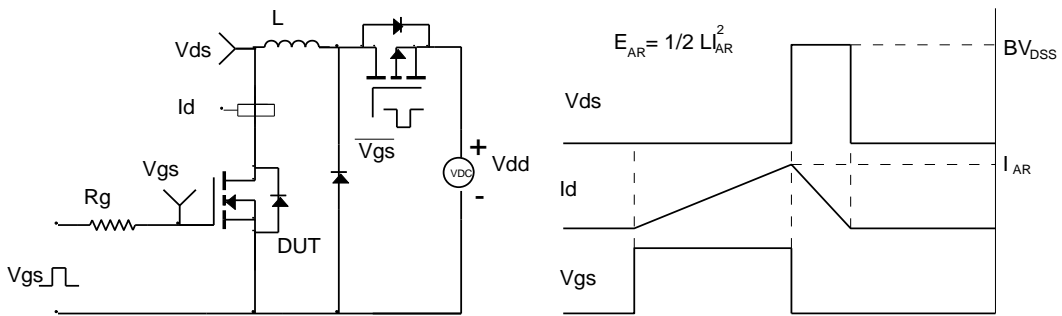


Figure D: Diode Recovery Test Circuit & Waveforms

