ALPHA & OMEGA SEMICONDUCTOR

AOW296/AOWF296

100V N-Channel AlphaSGT™

General Description

- Trench Power AlphaSGT™ technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for fast-switching applications
- RoHS and Halogen-Free Compliant

Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Industrial and Motor Drive applications

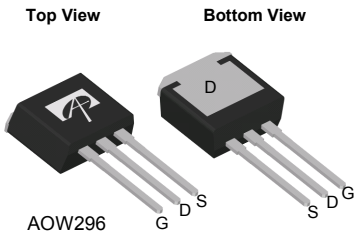
Product Summary

V_{DS}	100V
$R_{DS(ON)}$ (at V_{GS}=10V)	< 9.7mΩ
$R_{DS(ON)}$ (at V_{GS}=6V)	< 12.2mΩ

100% UIS Tested
100% Rg Tested

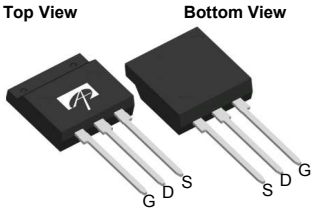
Green Product

TO-262



AOW296

TO-262F



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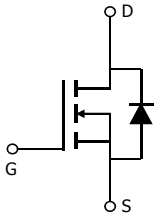

Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOW296	TO-262	Tube	1000
AOWF296	TO-262F	Tube	1000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	AOW296 (Max)	AOWF296 (Max)	Units
Drain-Source Voltage		V_{DS}	100		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current [G(AOW)]	T_C=25°C	I_D	70	37	A
	T_C=100°C		46.5	23.5	
Pulsed Drain Current [C]		I_{DM}	180	150	
Continuous Drain Current	T_A=25°C	I_{DSM}	18	21	A
	T_A=70°C		14.5	16.5	
Avalanche Current [C]		I_{AS}	40		A
Avalanche energy	L=0.1mH [C]	E_{AS}	80		mJ
V_{DS} Spike [I]	10µs	V_{SPIKE}	120		V
Power Dissipation [B]	T_C=25°C	P_D	104	26	W
	T_C=100°C		41.5	10.5	
Power Dissipation [A]	T_A=25°C	P_{DSM}	6.2	8.3	W
	T_A=70°C		4.0	5.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		°C

Thermal Characteristics

Parameter		Symbol	AOW296 (Max)	AOWF296 (Max)	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	20	15	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		65	55	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.2	4.8	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V	100			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA	2.3	2.9	3.4	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A		7.9	9.7	mΩ
		T_J=125°C		13.6	16.6	
		V_{GS}=6V, I_D=20A		9.4	12.2	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A		62		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V		0.7	1	V
I_S	Maximum Body-Diode Continuous Current [G]	AOW296			70	A
I_S	Maximum Body-Diode Continuous Current	AOWF296			30	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=50V, f=1MHz		2785		pF
C_{oss}	Output Capacitance			238		pF
C_{rss}	Reverse Transfer Capacitance			12		pF
R_g	Gate resistance	f=1MHz	0.25	0.55	0.85	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=20A		37	52	nC
Q_{gs}	Gate Source Charge			11.5		nC
Q_{gd}	Gate Drain Charge			5		nC
Q_{oss}	Output Charge	V_{GS}=0V, V_{DS}=50V		37		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=2.5Ω, R_{GEN}=3Ω		13		ns
t_r	Turn-On Rise Time			8.5		ns
$t_{D(off)}$	Turn-Off DelayTime			29		ns
t_f	Turn-Off Fall Time			4		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, di/dt=500A/µs		35		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, di/dt=500A/µs		210		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t≤ 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_D is based on $T_{J(MAX)}$=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 $T_{J(MAX)}$=150° C.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=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 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

I. The spike duty cycle 5% max, limited by junction temperature $T_{J(MAX)}$=125° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

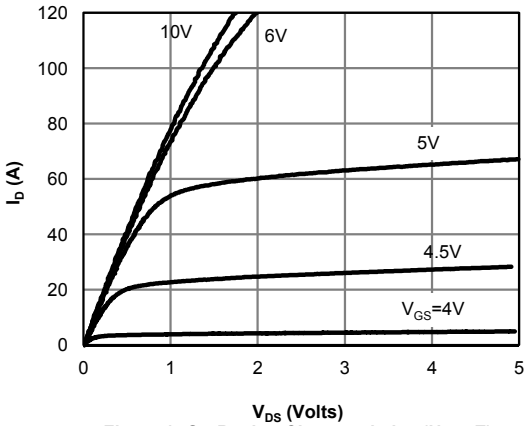

Figure 1: On-Region Characteristics (Note E)

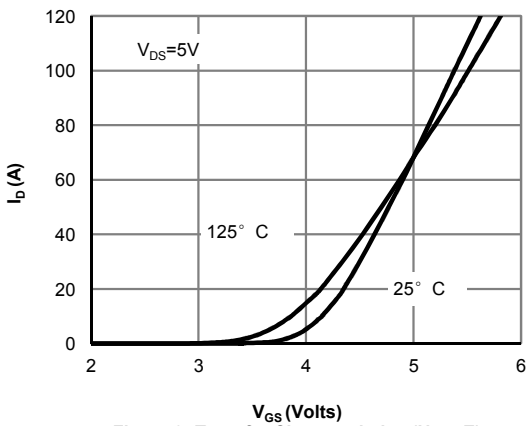

Figure 2: Transfer Characteristics (Note E)

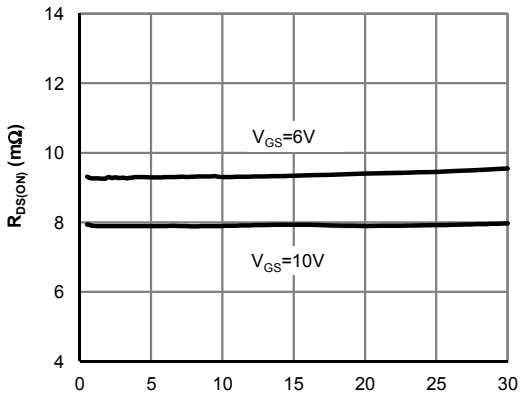

Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

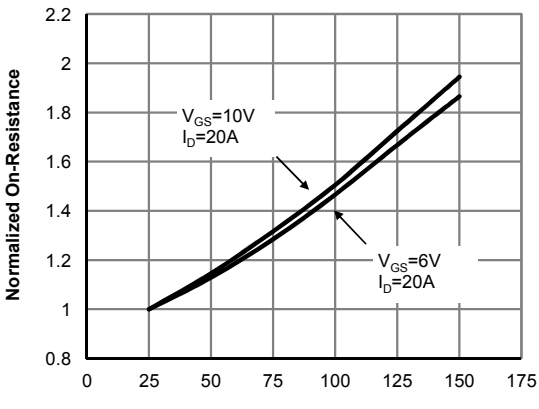

Figure 4: On-Resistance vs. Junction Temperature (Note E)

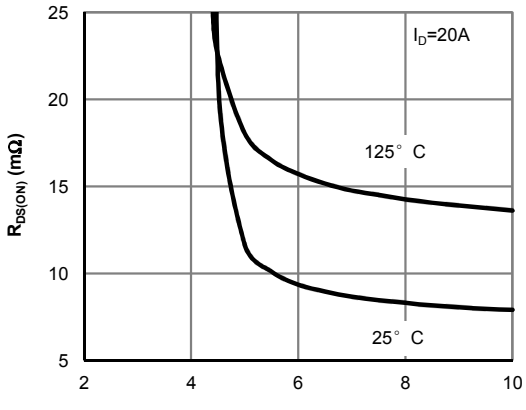

Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

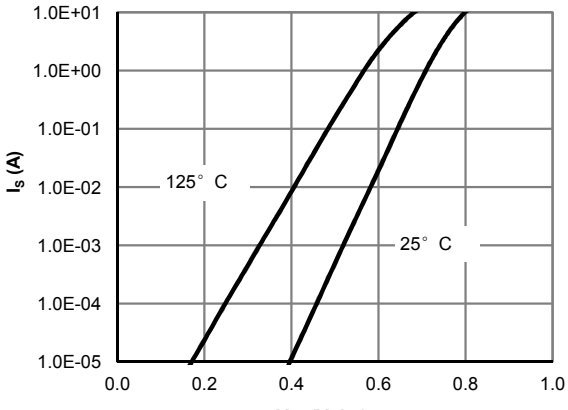

Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

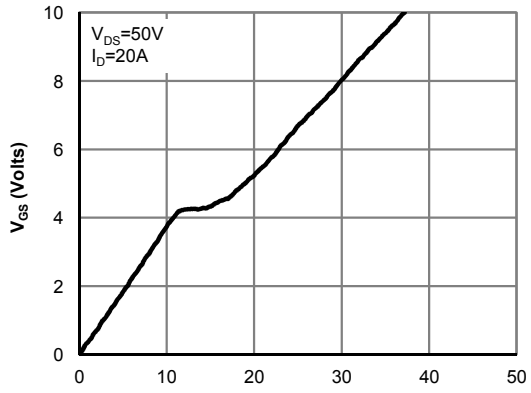

Figure 7: Gate-Charge Characteristics

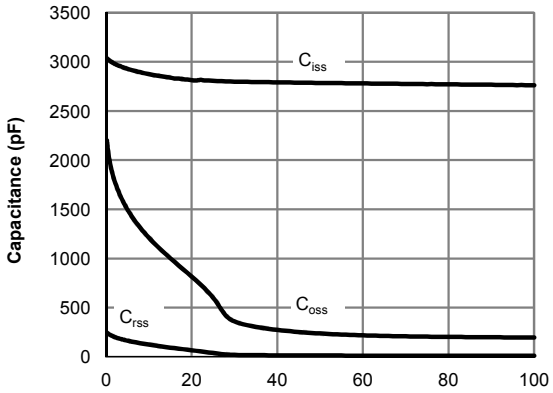

Figure 8: Capacitance Characteristics

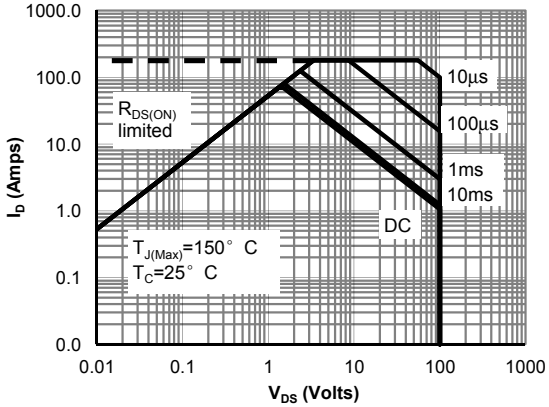

Figure 9: Maximum Forward Biased Safe Operating Area (Note F) - AOW296

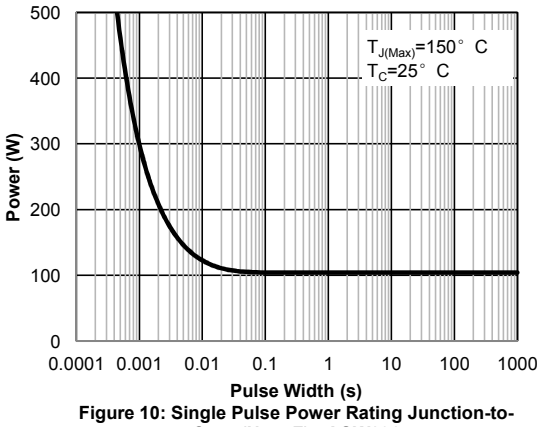

Figure 10: Single Pulse Power Rating Junction-to-Case (Note F) - AOW296

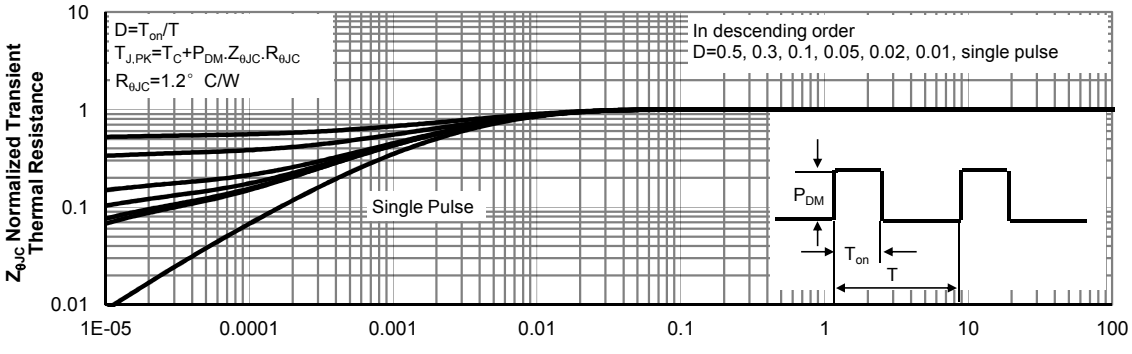

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F) - AOW296

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

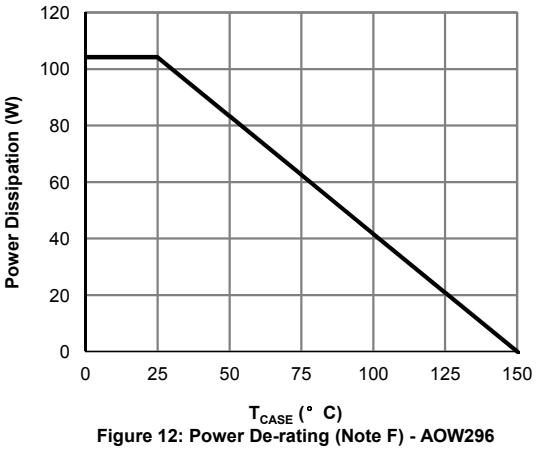

Figure 12: Power De-rating (Note F) - AOW296

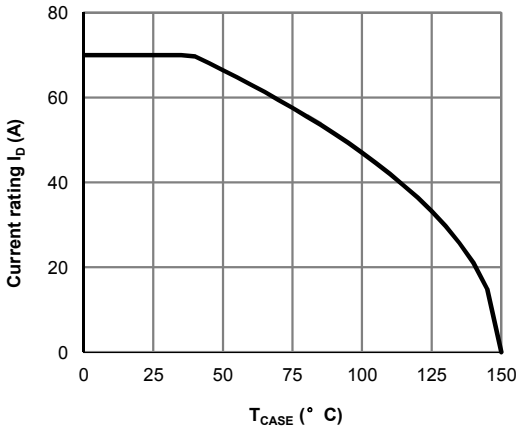

Figure 13: Current De-rating (Note F) - AOW296

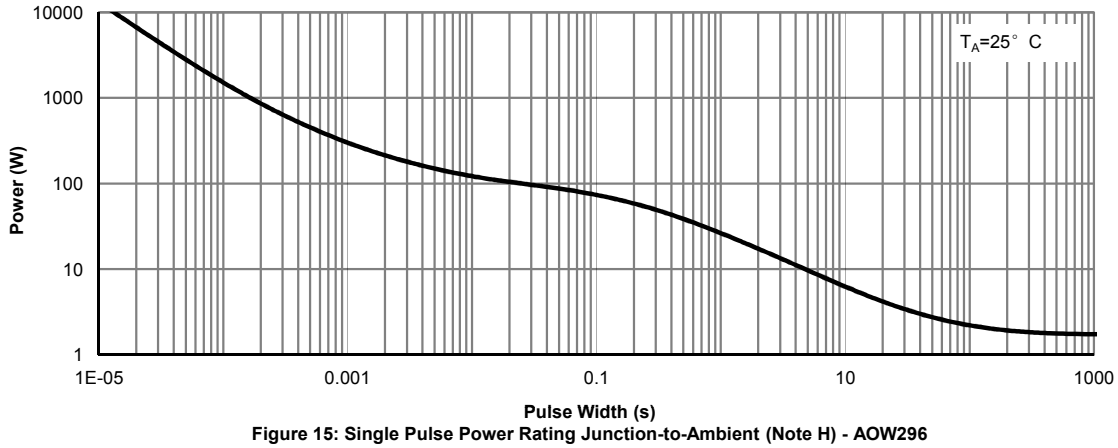

Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H) - AOW296

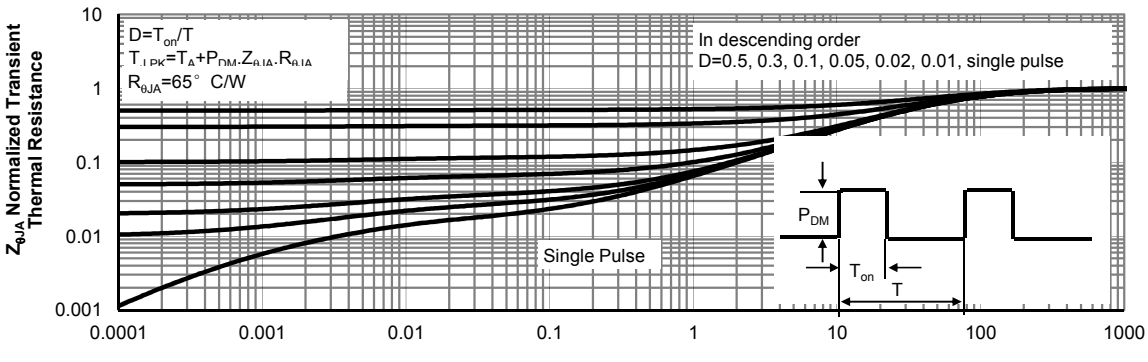

Figure 16: Normalized Maximum Transient Thermal Impedance (Note H) - AOW296

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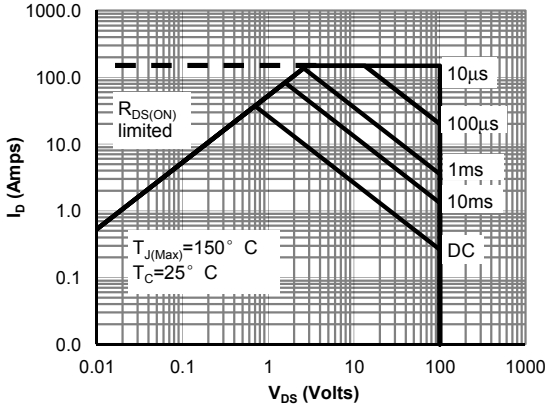

Figure 9: Maximum Forward Biased Safe Operating Area (Note F) - AOWF296

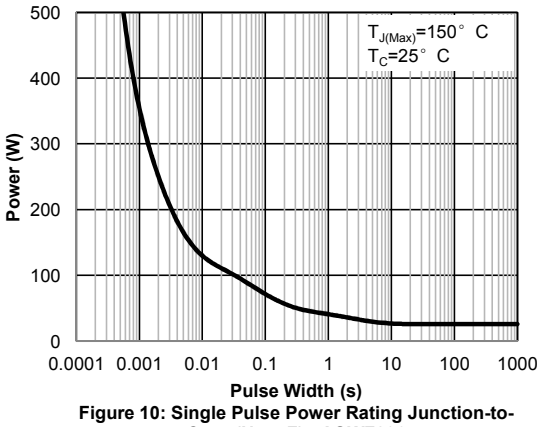

Figure 10: Single Pulse Power Rating Junction-to-Case (Note F) - AOWF296

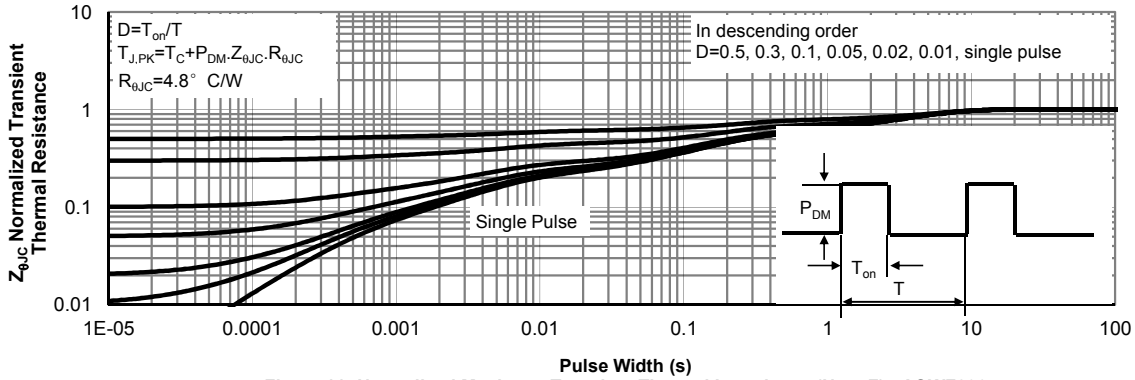

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F) - AOWF296

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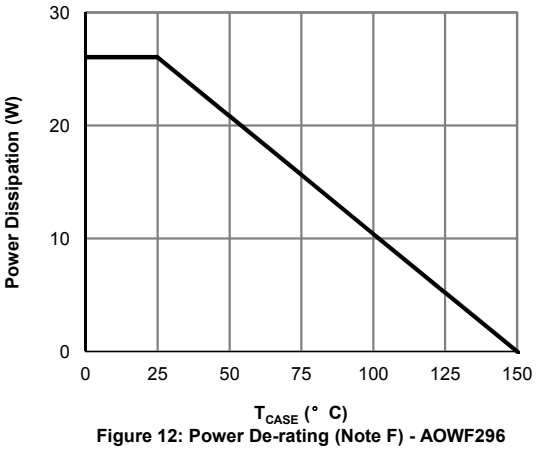

Figure 12: Power De-rating (Note F) - AOWF296

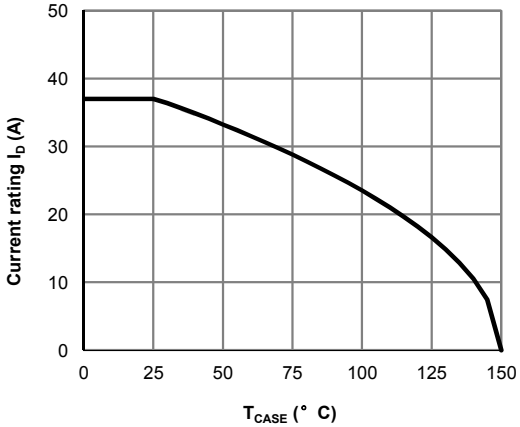

Figure 13: Current De-rating (Note F) - AOWF296

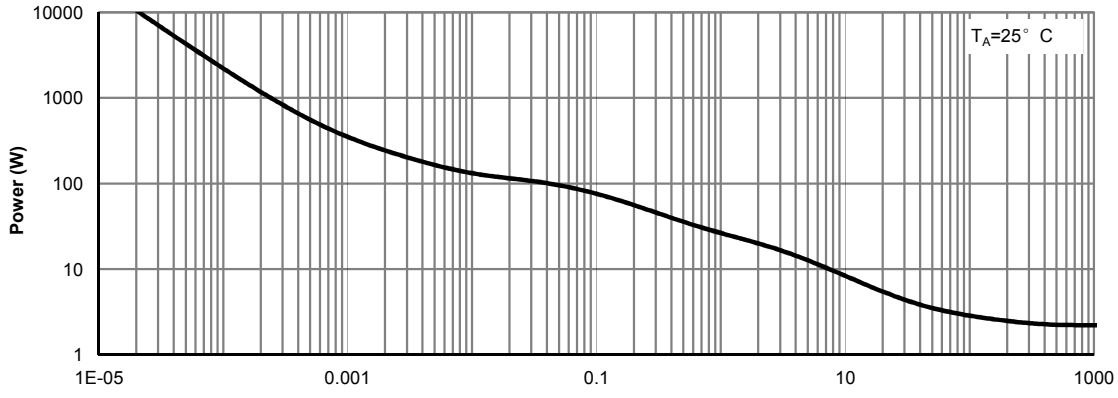

Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H) - AOWF296

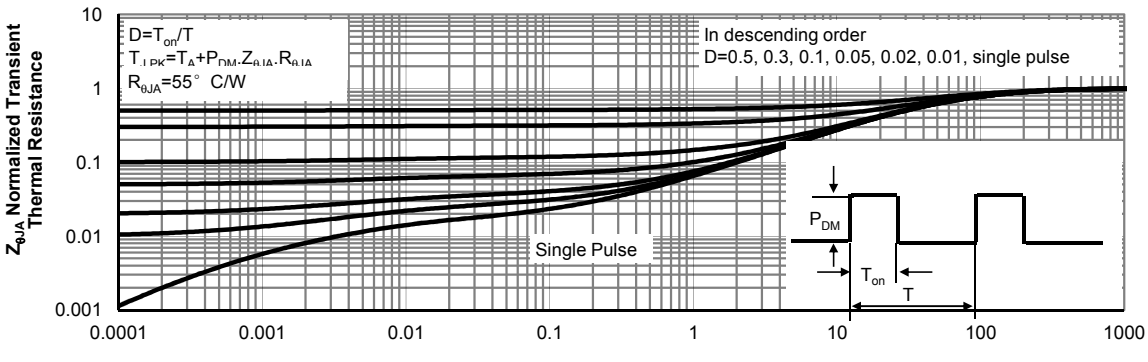

Figure 16: Normalized Maximum Transient Thermal Impedance (Note H) - AOWF296

Figure A: Gate Charge Test Circuit & Waveforms

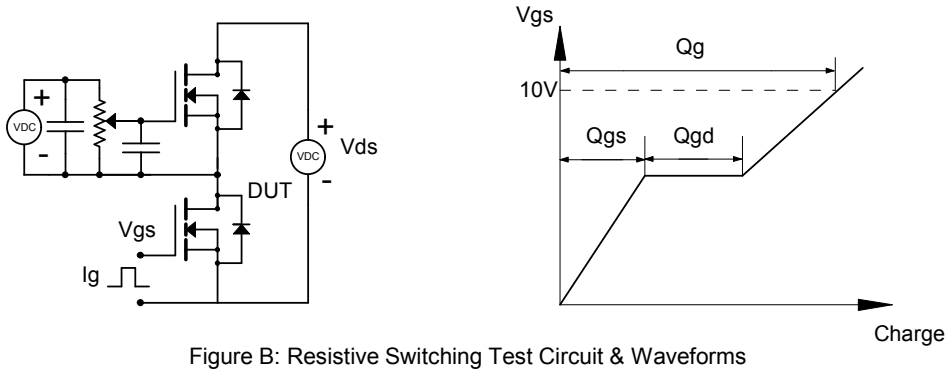

Figure B: Resistive Switching Test Circuit & Waveforms

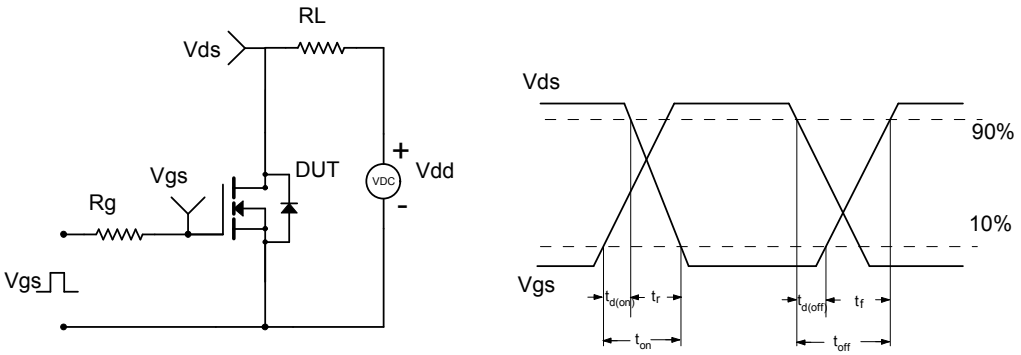

Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

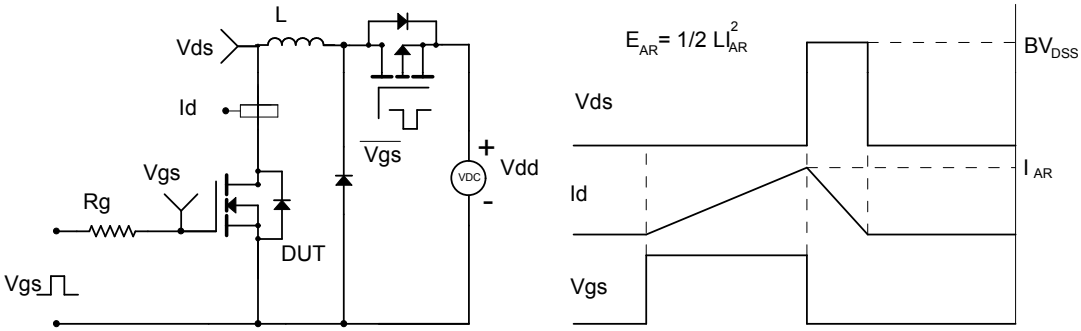

Figure D: Diode Recovery Test Circuit & Waveforms