

General Description

- Trench Power MV MOSFET technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- Optimized for fast-switching applications

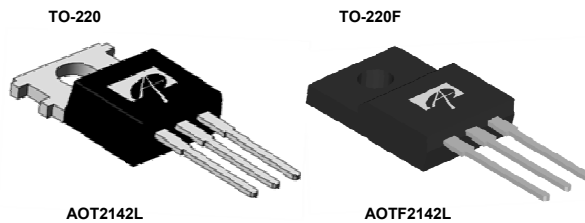
Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

Product Summary

V_{DS}	40V
I_D (at $V_{GS}=10V$)	120A / 112A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 1.9m Ω
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 2.5m Ω

100% UIS Tested
 100% Rg Tested


Top View


Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOT2142L	TO-220	Tube	1000
AOTF2142L	TO-220F	Tube	1000

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

Parameter	Symbol	AOT2142L(Max)	AOTF2142L(Max)	Units
Drain-Source Voltage	V_{DS}	40		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current	I_D	$T_C=25^\circ\text{C}$	120 ^G	112
		$T_C=100^\circ\text{C}$	120 ^G	78
Pulsed Drain Current ^C	I_{DM}	600		A
Continuous Drain Current	I_{DSM}	$T_A=25^\circ\text{C}$	50	
		$T_A=70^\circ\text{C}$	40	
Avalanche Current ^C	I_{AS}	60		A
Avalanche energy L=0.3mH ^C	E_{AS}	540		mJ
V_{DS} Spike	V_{SPIKE}	48		V
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	312	41
		$T_C=100^\circ\text{C}$	156	20
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	8.3	
		$T_A=70^\circ\text{C}$	5.3	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	AOT2142L(Max)	AOTF2142L(Max)	Units
Maximum Junction-to-Ambient ^A $t \leq 10s$	$R_{\theta JA}$	15	15	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient ^{A,D} Steady-State		60	60	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Case Steady-State	$R_{\theta JC}$	0.48	3.6	$^\circ\text{C}/\text{W}$

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	40			V	
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V T _J =55°C			1 5	μA	
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	1.3	1.8	2.3	V	
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A T _J =125°C		1.55	1.9	mΩ	
		V _{GS} =4.5V, I _D =20A		2.25	2.8		
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =20A		100		S	
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.66	1	V	
I _S	Maximum Body-Diode Continuous Current ^G	(AOT2142L)			120	A	
I _S	Maximum Body-Diode Continuous Current	(AOTF2142L)			50	A	
DYNAMIC PARAMETERS							
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =20V, f=1MHz		8320		pF	
C _{oss}	Output Capacitance				1438		pF
C _{riss}	Reverse Transfer Capacitance				85		pF
R _g	Gate resistance	f=1MHz	0.5	1.15	1.8	Ω	
SWITCHING PARAMETERS							
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =20V, I _D =20A		100		nC	
Q _{g(4.5V)}	Total Gate Charge			45		nC	
Q _{gs}	Gate Source Charge			25		nC	
Q _{gd}	Gate Drain Charge			7		nC	
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =20V, R _L =1.0Ω, R _{GEN} =3Ω		19		ns	
t _r	Turn-On Rise Time			7		ns	
t _{D(off)}	Turn-Off DelayTime			69		ns	
t _f	Turn-Off Fall Time			10		ns	
t _{rr}	Body Diode Reverse Recovery Time	I _F =20A, dI/dt=400A/μs		26		ns	
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =20A, dI/dt=400A/μs		83		nC	

A. The value of R_{θJA} 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_{θJA} ≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.

B. The power dissipation P_D is based on T_{J(MAX)}=175° 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)}=175° C.

D. The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} 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)}=175° 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.

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

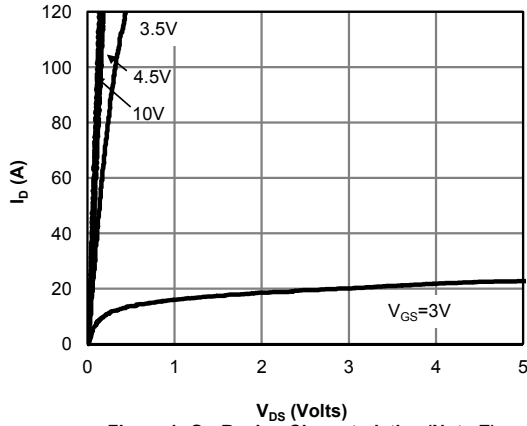


Figure 1: On-Region Characteristics (Note E)

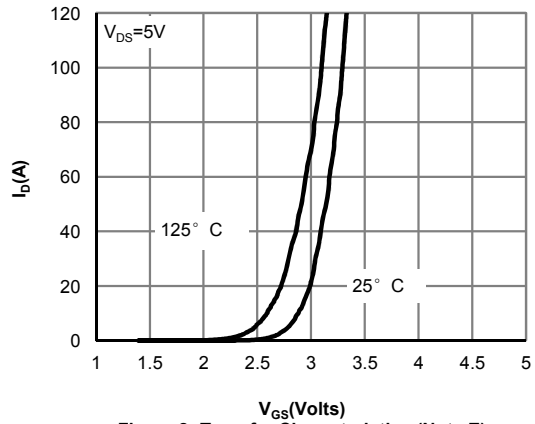


Figure 2: Transfer Characteristics (Note E)

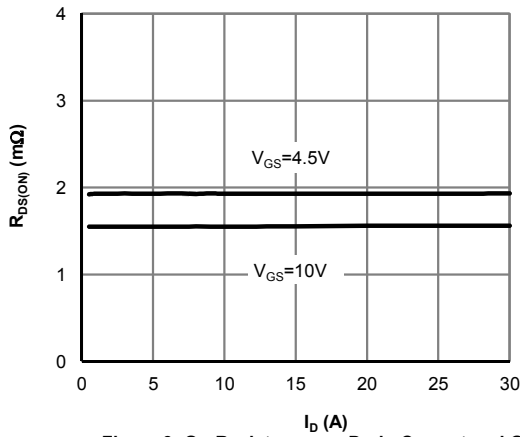


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

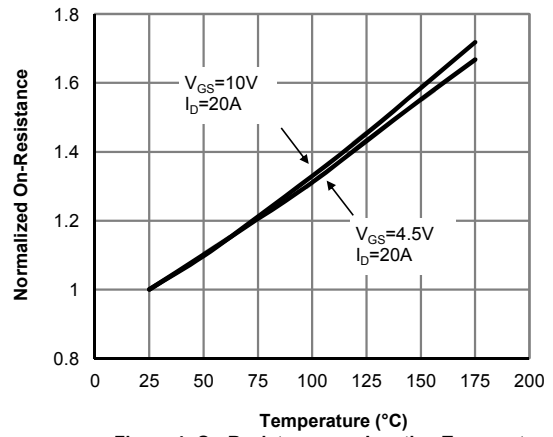


Figure 4: On-Resistance vs. Junction Temperature (Note E)

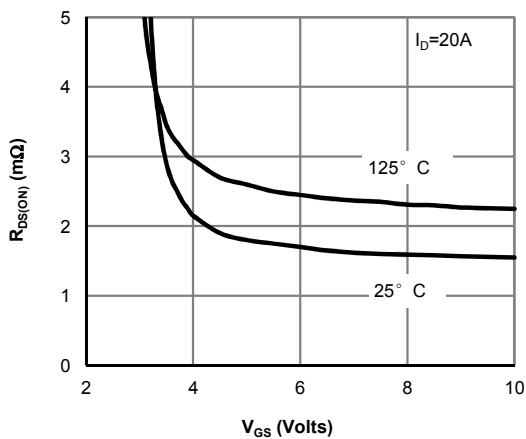


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

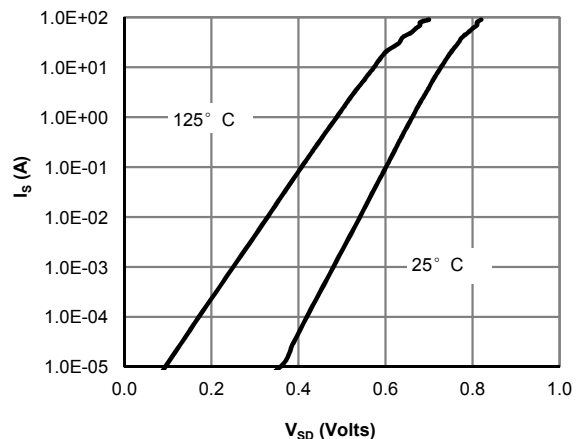


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

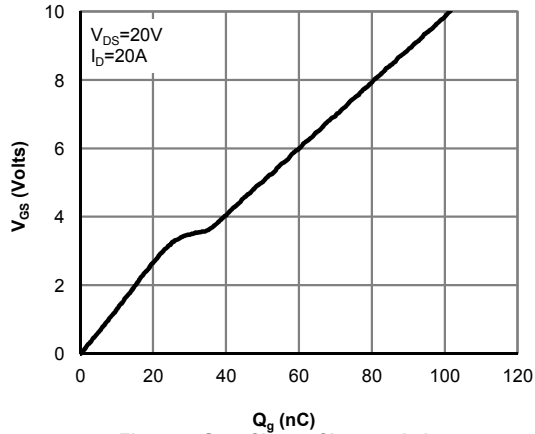


Figure 7: Gate-Charge Characteristics

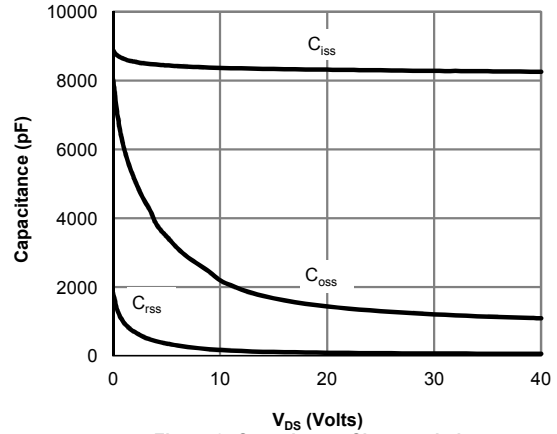


Figure 8: Capacitance Characteristics

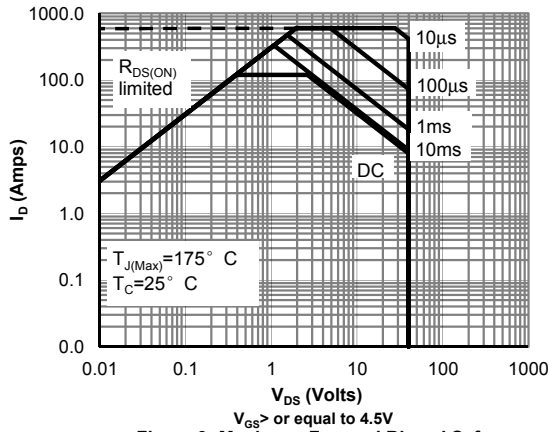


Figure 9: Maximum Forward Biased Safe Operating Area for AOT2142L (Note F)

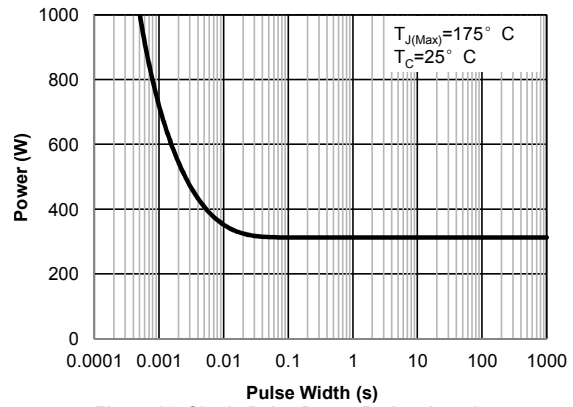


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT2142L (Note F)

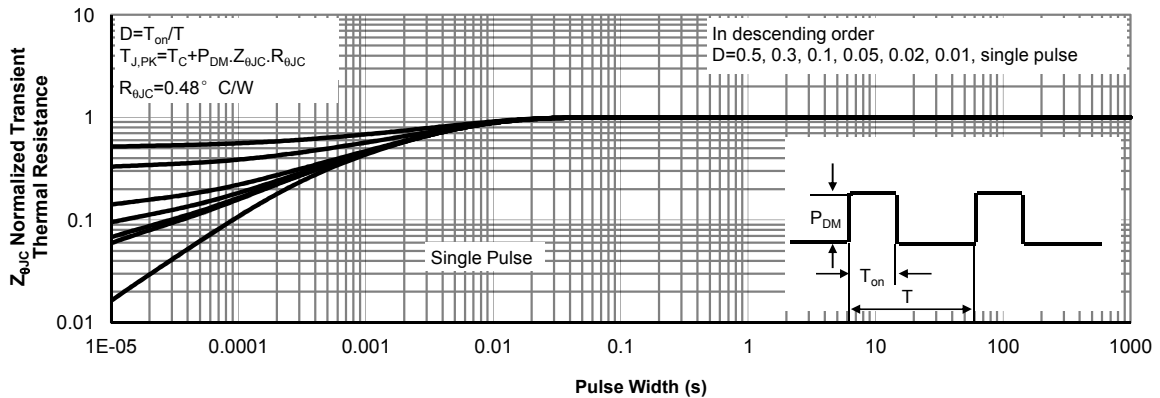


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT2142L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

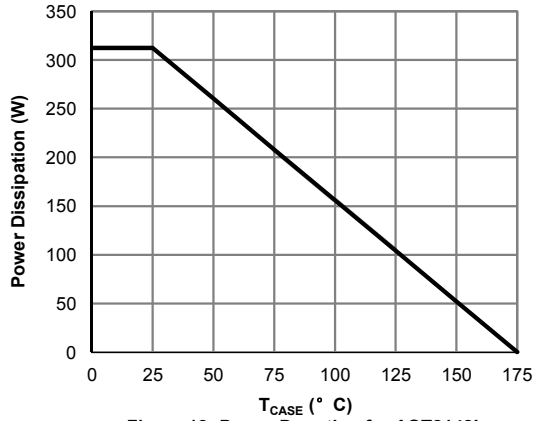


Figure 12: Power De-rating for AOT2142L (Note F)

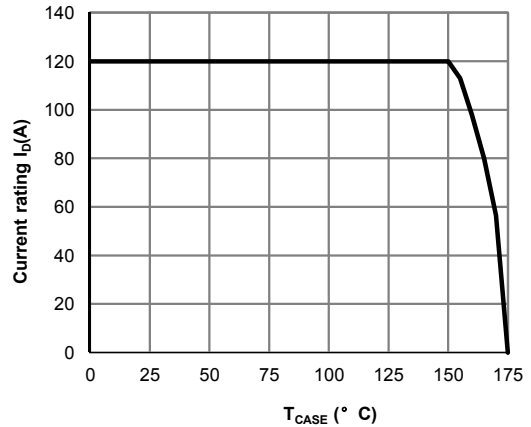


Figure 13: Current De-rating for AOT2142L (Note F)

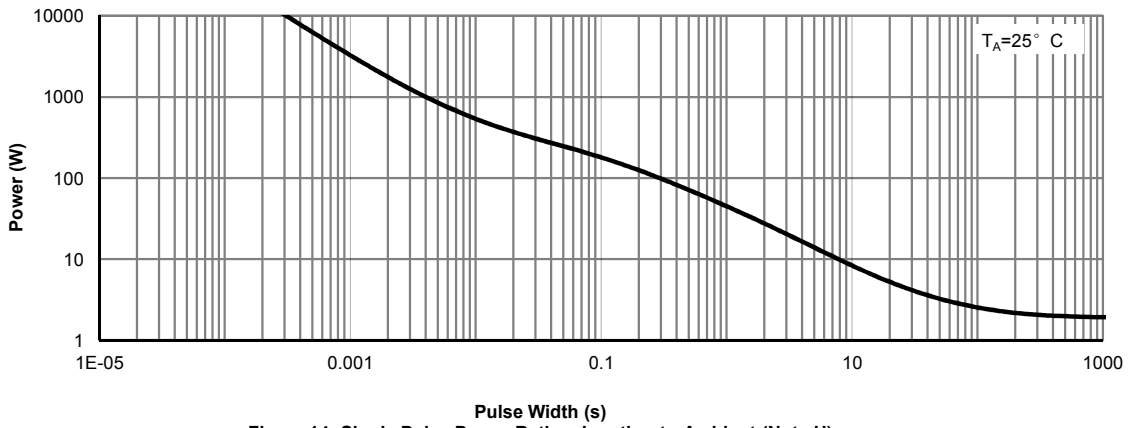


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

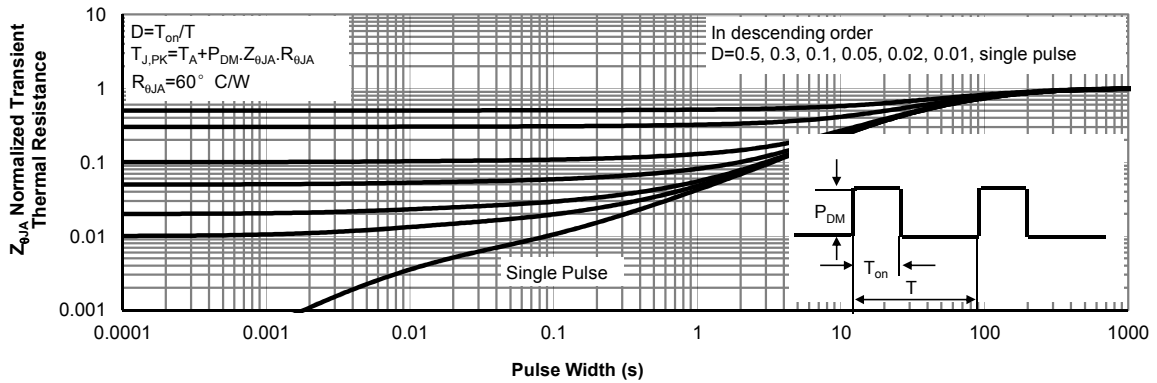


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

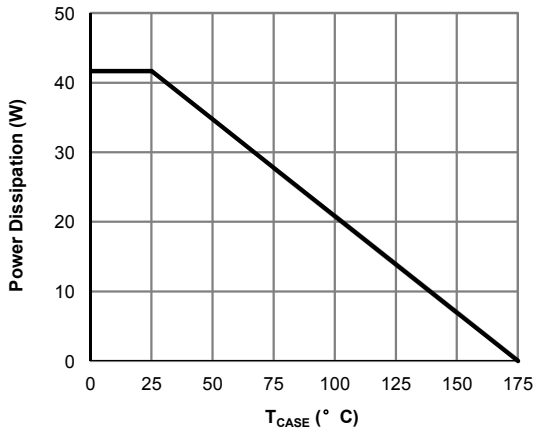


Figure 16: Power De-rating for AOTF2142L (Note F)

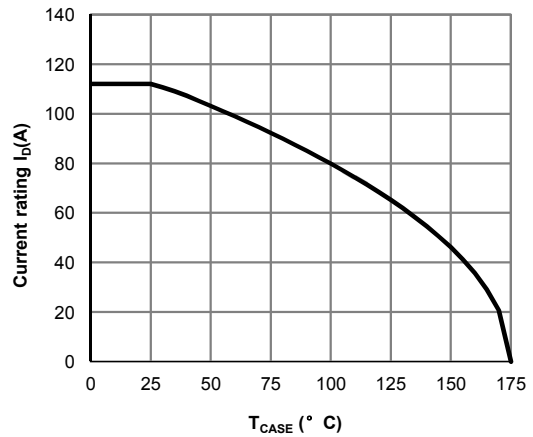


Figure 17: Current De-rating for AOTF2142L (Note F)

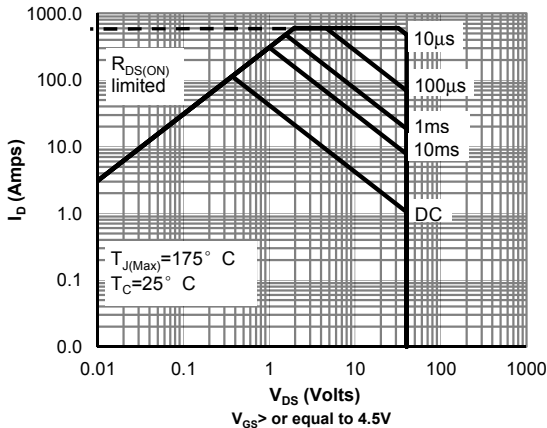


Figure 18: Maximum Forward Biased Safe Operating Area for AOTF2142L (Note F)

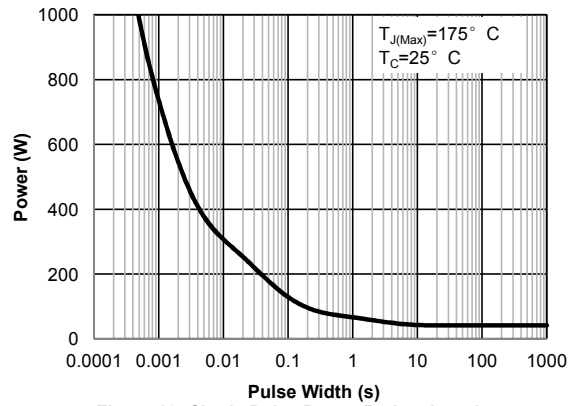


Figure 19: Single Pulse Power Rating Junction-to-Case for AOTF2142L (Note F)

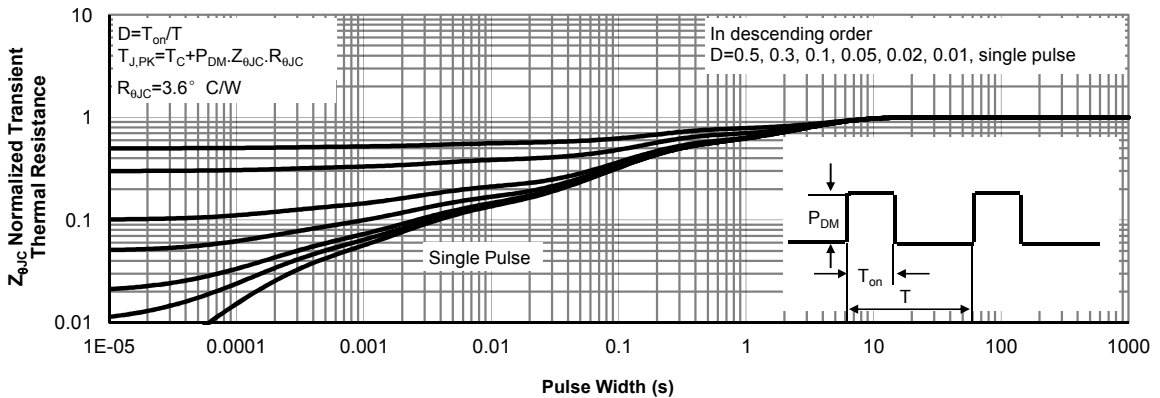
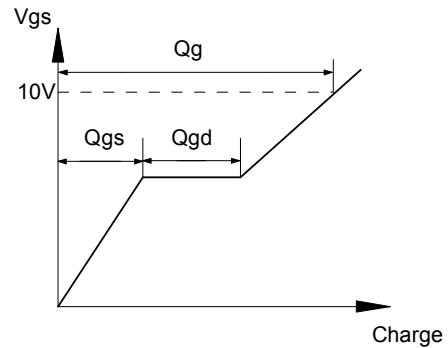
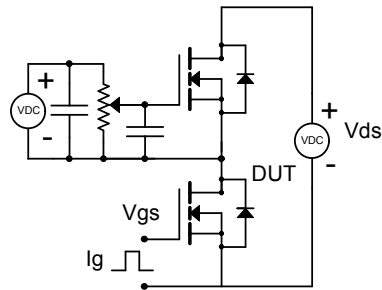
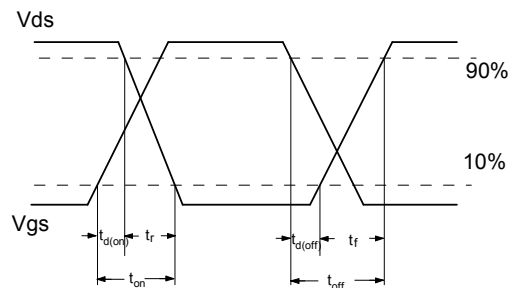
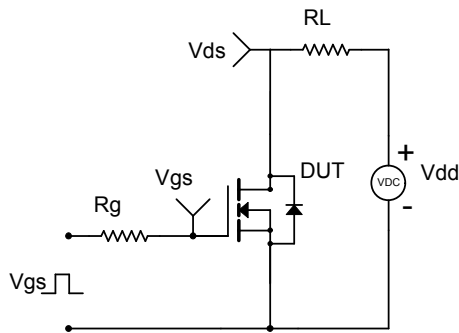


Figure 20: Normalized Maximum Transient Thermal Impedance for AOTF2142L (Note F)

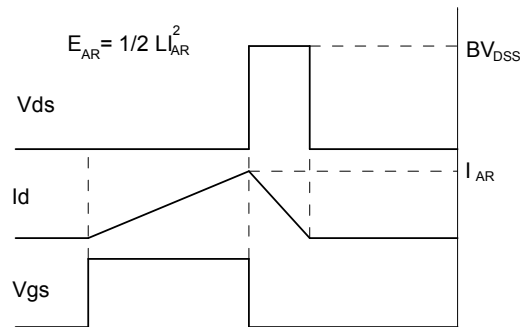
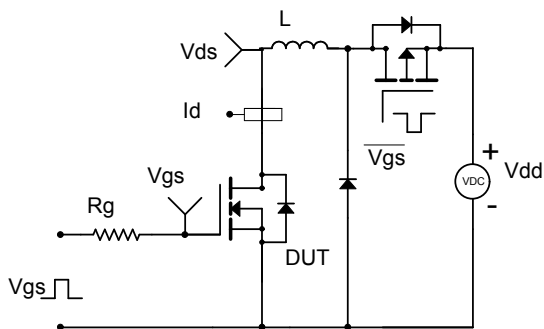
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

