

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

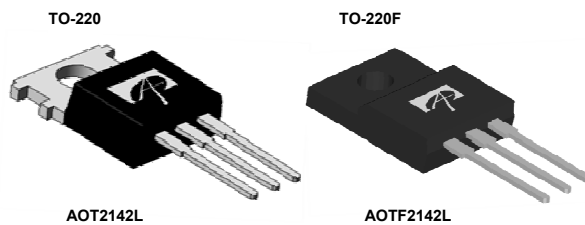
Product Summary

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	120 ^G	112	A
Pulsed Drain Current ^C	I_{DM}	480	445	A
Continuous Drain Current	I_{DSM}	50		A
Avalanche Current ^C	I_{AS}	60		A
Avalanche energy $L=0.3\text{mH}$ ^C	E_{AS}	540		mJ
V_{DS} Spike	V_{SPIKE}	48		V
Power Dissipation ^B	P_D	312	41	W
Power Dissipation ^A	P_{DSM}	8.3		W
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	$R_{\theta JA}$	15	15	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		60	60	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	0.48	3.6	$^\circ\text{C/W}$

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	40			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1.3	1.8	2.3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=20\text{A}$		1.55	1.9	m Ω
		$T_J=125^{\circ}\text{C}$		2.25	2.8	
		$V_{GS}=4.5\text{V}$, $I_D=20\text{A}$		1.95	2.5	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=20\text{A}$		100		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		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	$V_{GS}=0\text{V}$, $V_{DS}=20\text{V}$, $f=1\text{MHz}$		8320		pF
C_{oss}	Output Capacitance			1438		pF
C_{rss}	Reverse Transfer Capacitance			85		pF
R_g	Gate resistance	$f=1\text{MHz}$	0.5	1.15	1.8	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $I_D=20\text{A}$		100		nC
$Q_g(4.5\text{V})$	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	$V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $R_L=1.0\Omega$, $R_{GEN}=3\Omega$		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	$I_F=20\text{A}$, $dI/dt=400\text{A}/\mu\text{s}$		26		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$, $dI/dt=400\text{A}/\mu\text{s}$		83		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 $T_A=25^{\circ}\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ $t_s \leq 10\text{s}$ 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 $T_{J(MAX)}=175^{\circ}\text{C}$, 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 $T_{J(MAX)}=175^{\circ}\text{C}$.

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 $<300\mu\text{s}$ 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 $T_{J(MAX)}=175^{\circ}\text{C}$. 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 $T_A=25^{\circ}\text{C}$.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

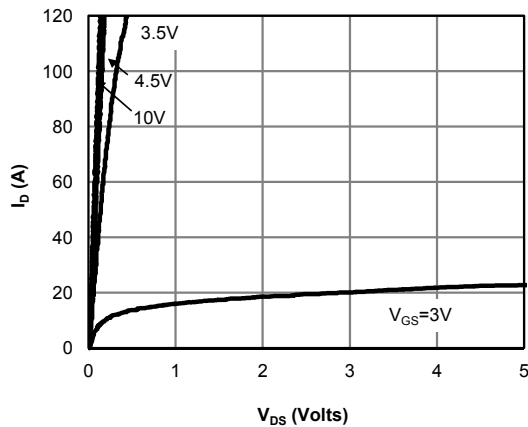


Figure 1: On-Region Characteristics (Note E)

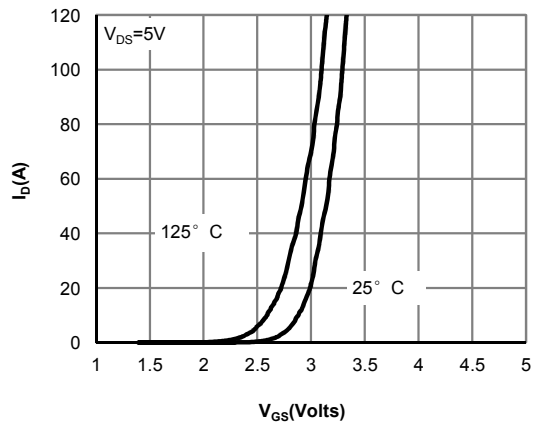


Figure 2: Transfer Characteristics (Note E)

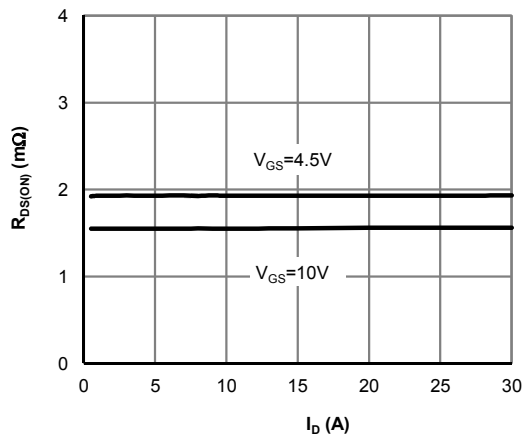


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

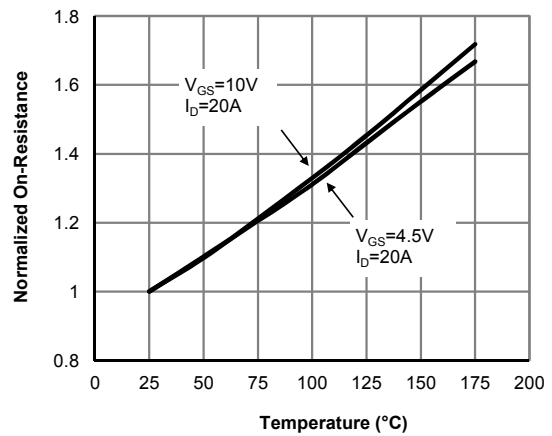


Figure 4: On-Resistance vs. Junction Temperature (Note E)

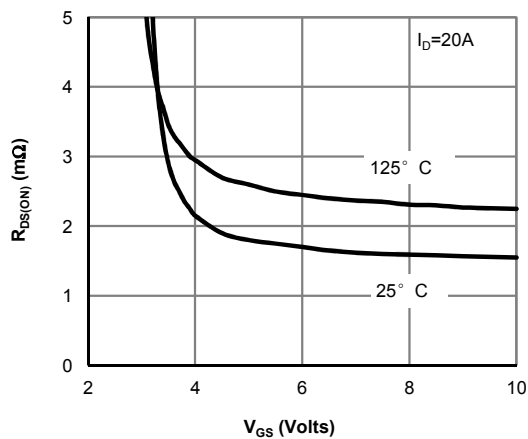


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

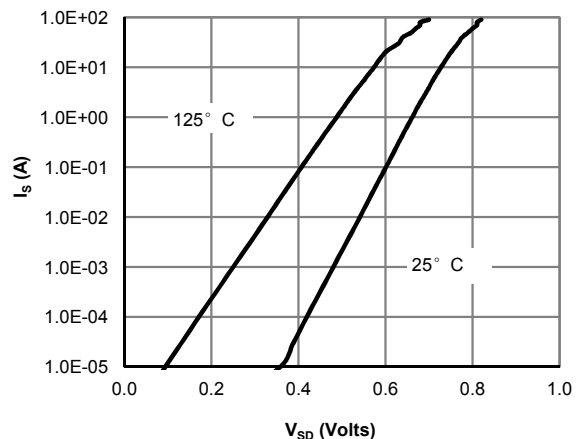


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

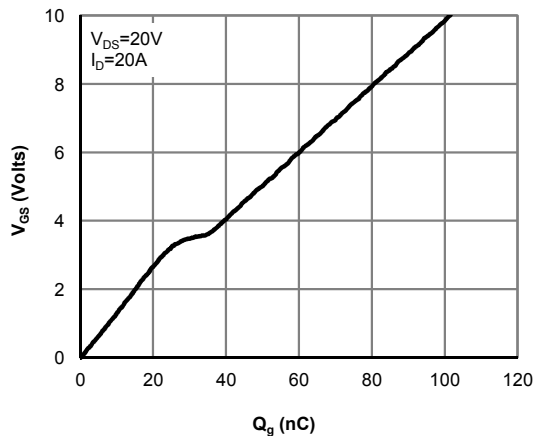


Figure 7: Gate-Charge Characteristics

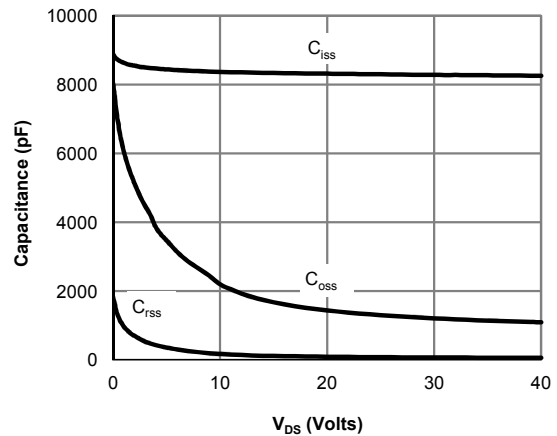


Figure 8: Capacitance Characteristics

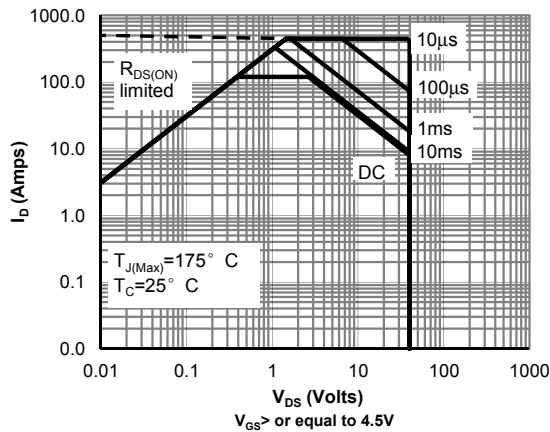


Figure 9: Maximum Forward Biased Safe Operating Area for AOT2142L (Note F)

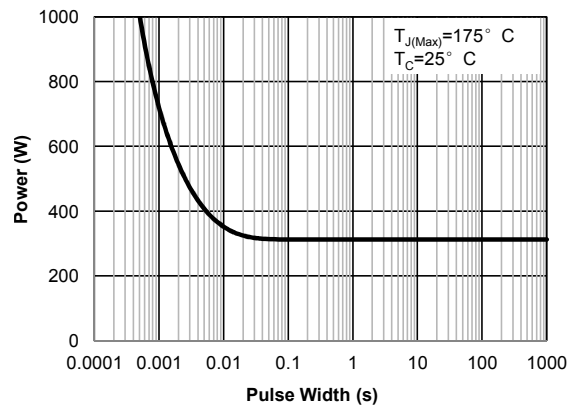


Figure 10: Single Pulse Power Rating Junction-to-Case for AOT2142L (Note F)

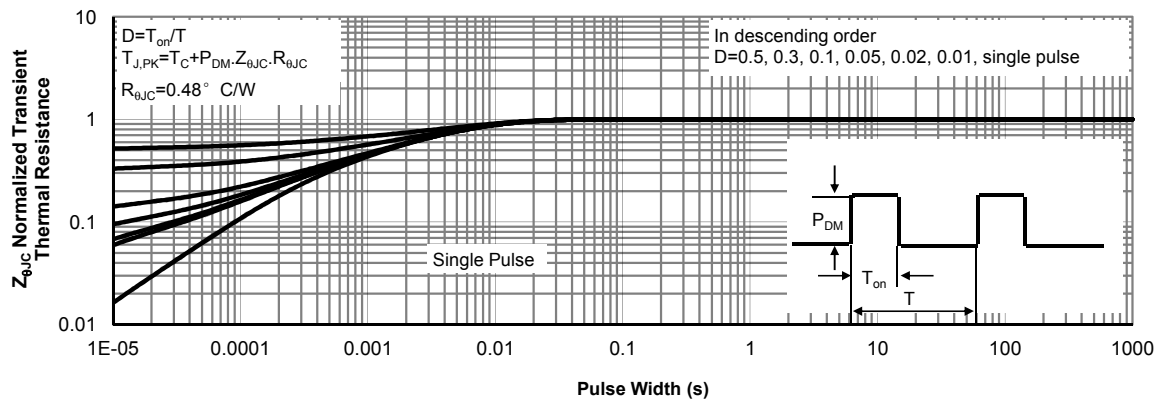


Figure 11: Normalized Maximum Transient Thermal Impedance for AOT2142L (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

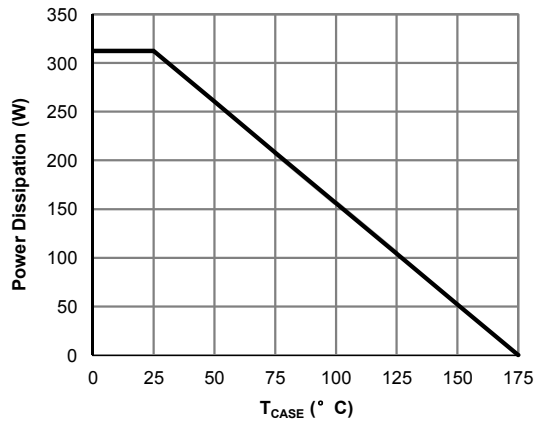


Figure 12: Power De-rating for AOT2142L
(Note F)

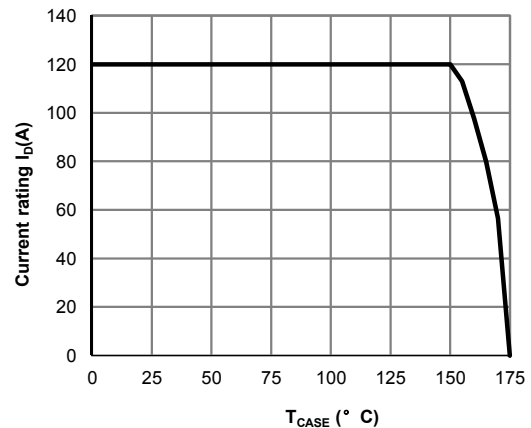


Figure 13: Current De-rating for AOT2142L
(Note F)

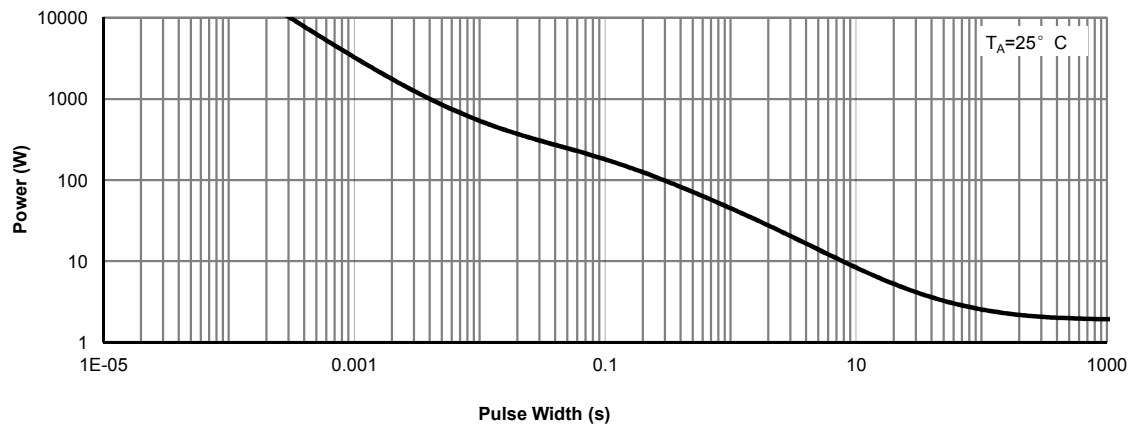


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

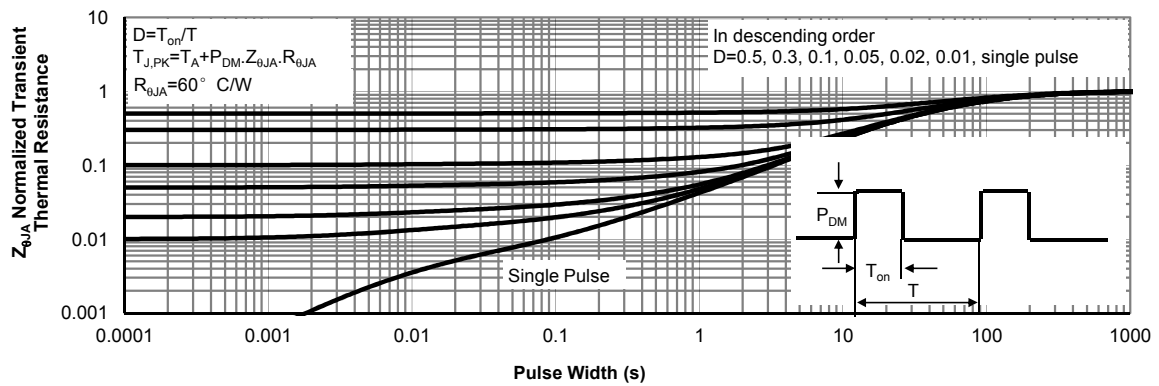


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

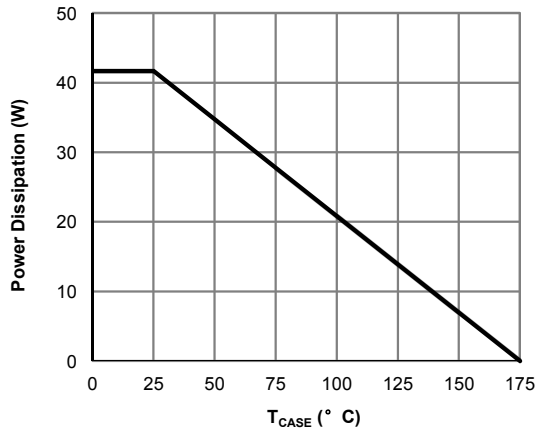


Figure 16: Power De-rating for AOTF2142L (Note F)

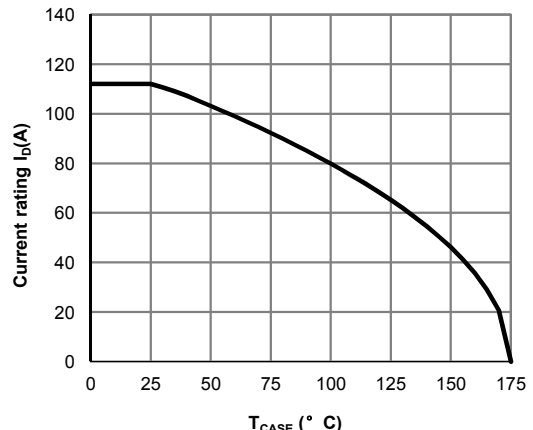


Figure 17: Current De-rating for AOTF2142L (Note F)

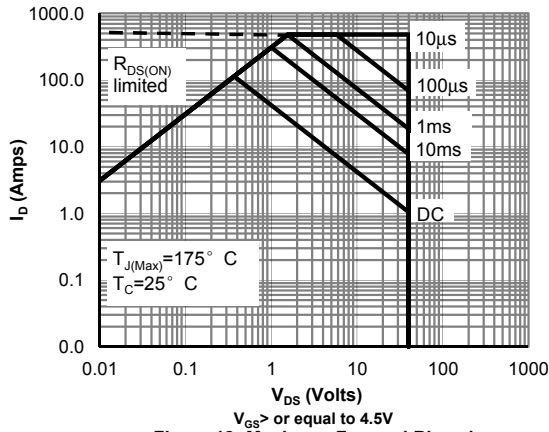


Figure 18: Maximum Forward Biased Safe Operating Area for AOTF2142L (Note F)

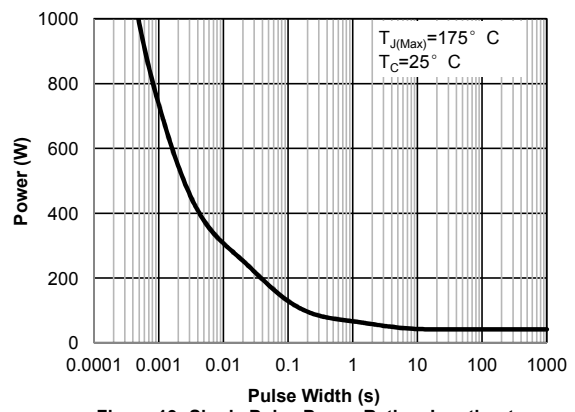


Figure 19: Single Pulse Power Rating Junction-to-Case for AOTF2142L (Note F)

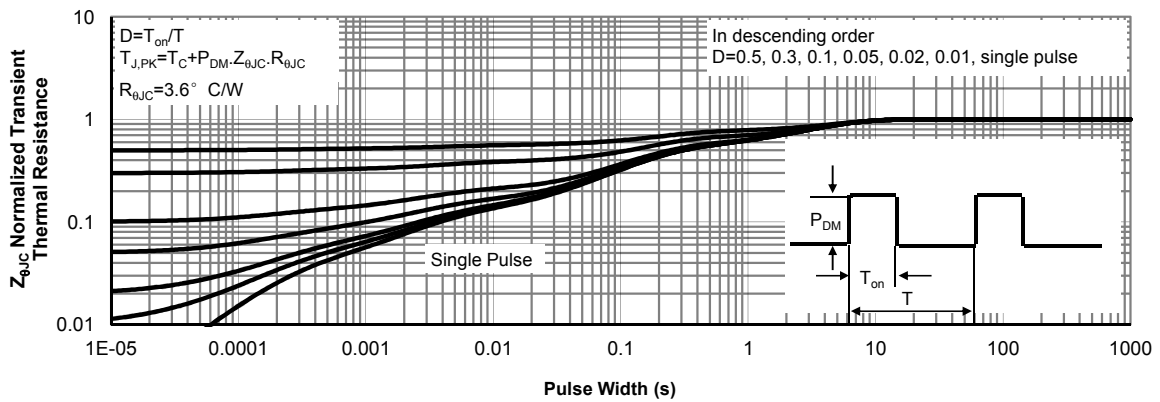
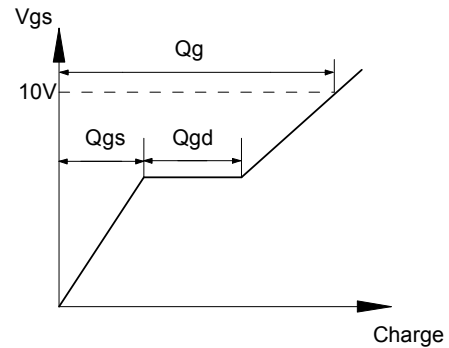
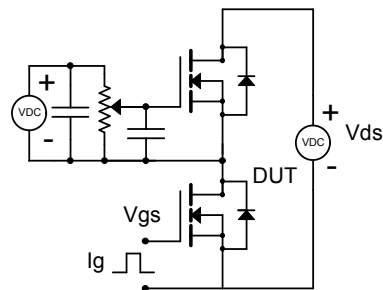
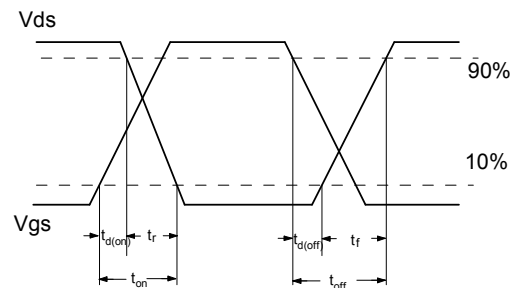
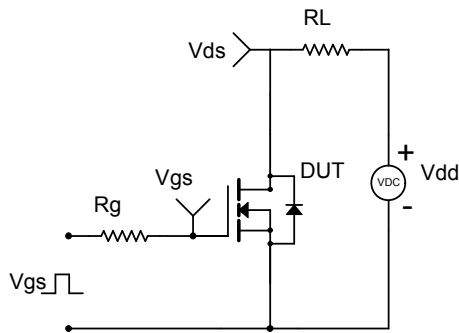


Figure 20: Normalized Maximum Transient Thermal Impedance for AOTF2142L (Note F)

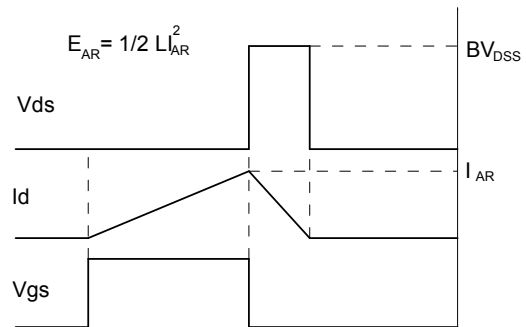
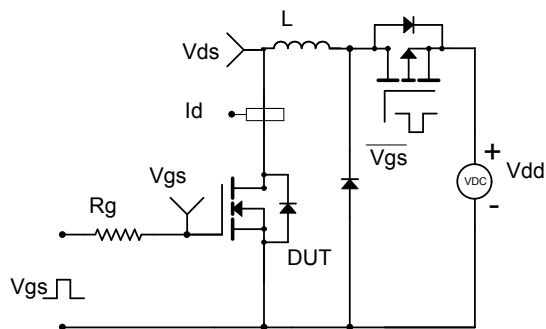
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

