

### 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

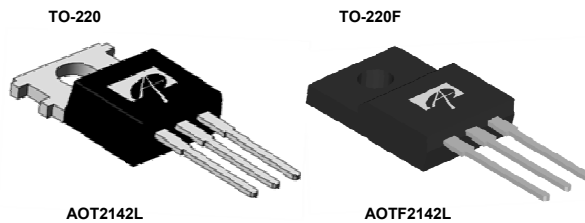
### Product Summary

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

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	$V_{GS}$	$\pm 20$		V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	120 <sup>G</sup>	112
		$T_C=100^\circ\text{C}$	120 <sup>G</sup>	78
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	600		A
Continuous Drain Current	$I_{DSM}$	$T_A=25^\circ\text{C}$	50	
		$T_A=70^\circ\text{C}$	40	
Avalanche Current <sup>C</sup>	$I_{AS}$	60		A
Avalanche energy $L=0.3\text{mH}$ <sup>C</sup>	$E_{AS}$	540		mJ
$V_{DS}$ Spike	$V_{SPIKE}$	48		V
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	312	41
		$T_C=100^\circ\text{C}$	156	20
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	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 <sup>A</sup> $t \leq 10\text{s}$	$R_{\theta JA}$	15	15	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient <sup>A,D</sup> 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<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	40			V	
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =40V, 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	
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		1.55	1.9	mΩ	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		1.95	2.5		
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		100		S	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.66	1	V	
I <sub>S</sub>	Maximum Body-Diode Continuous Current <sup>G</sup>	(AOT2142L)			120	A	
I <sub>S</sub>	Maximum Body-Diode Continuous Current	(AOTF2142L)			50	A	
<b>DYNAMIC PARAMETERS</b>							
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1MHz		8320		pF	
C <sub>oss</sub>	Output Capacitance				1438		pF
C <sub>riss</sub>	Reverse Transfer Capacitance				85		pF
R <sub>g</sub>	Gate resistance	f=1MHz	0.5	1.15	1.8	Ω	
<b>SWITCHING PARAMETERS</b>							
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, I <sub>D</sub> =20A		100		nC	
Q <sub>g(4.5V)</sub>	Total Gate Charge			45		nC	
Q <sub>gs</sub>	Gate Source Charge			25		nC	
Q <sub>gd</sub>	Gate Drain Charge			7		nC	
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, R <sub>L</sub> =1.0Ω, R <sub>GEN</sub> =3Ω		19		ns	
t <sub>r</sub>	Turn-On Rise Time			7		ns	
t <sub>D(off)</sub>	Turn-Off DelayTime			69		ns	
t <sub>f</sub>	Turn-Off Fall Time			10		ns	
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=400A/μs		26		ns	
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=400A/μs		83		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> ≤ 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<sub>D</sub> is based on T<sub>J(MAX)</sub>=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<sub>J(MAX)</sub>=175° 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.

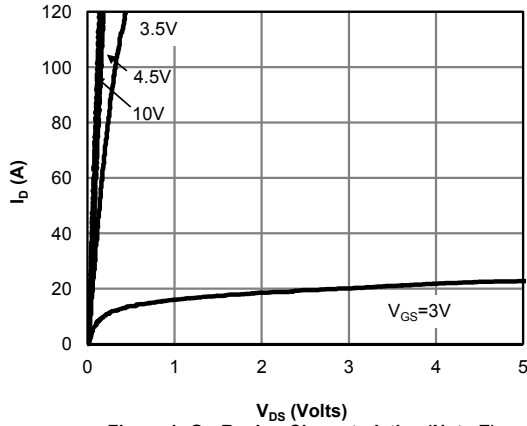
F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=175° C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

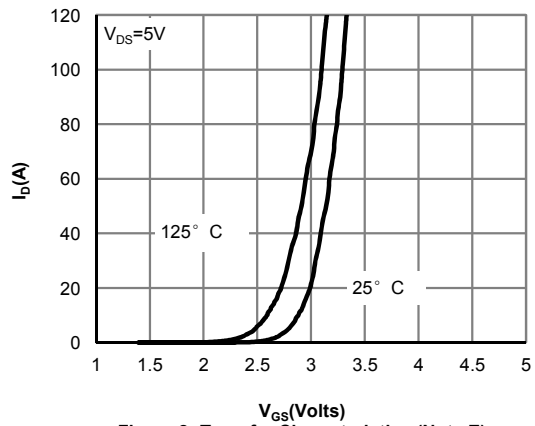
H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

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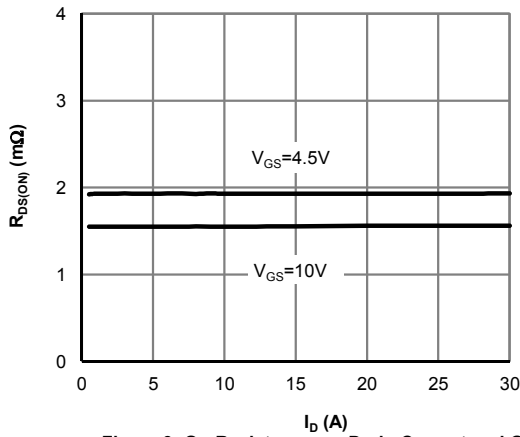
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



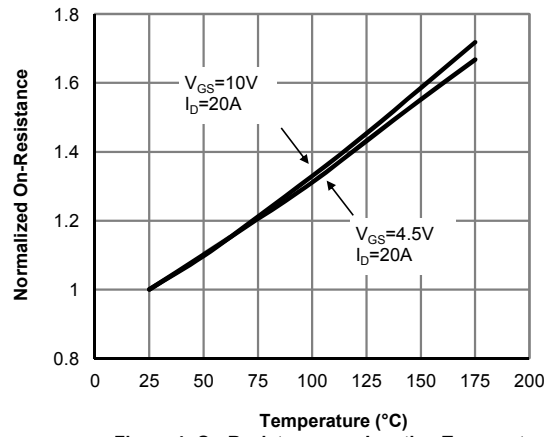
**Figure 1: On-Region Characteristics (Note E)**



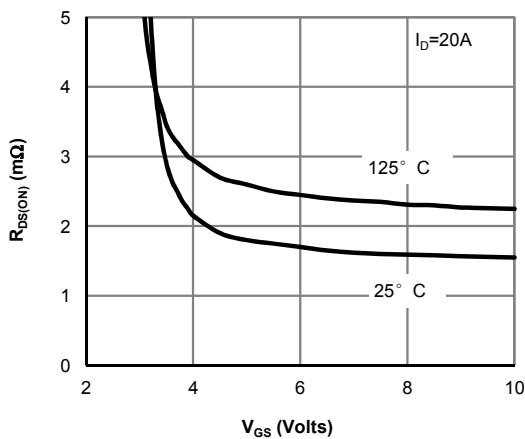
**Figure 2: Transfer Characteristics (Note E)**



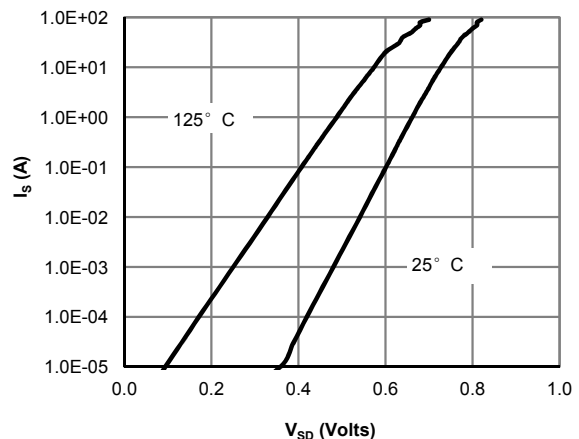
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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

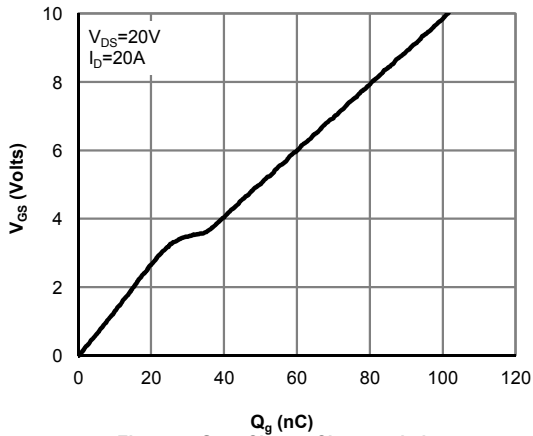


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

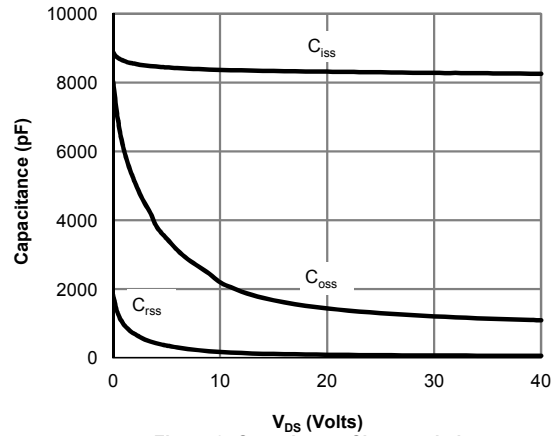


**Figure 6: Body-Diode Characteristics (Note E)**

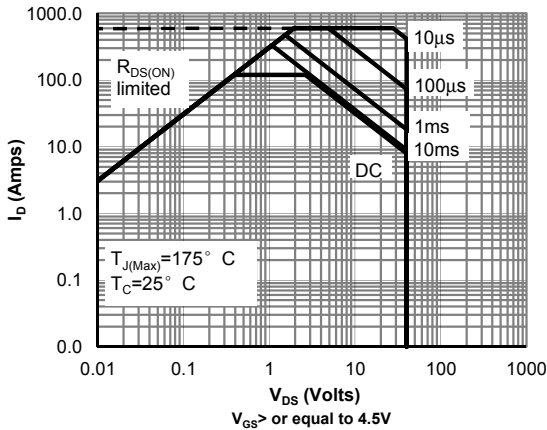
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



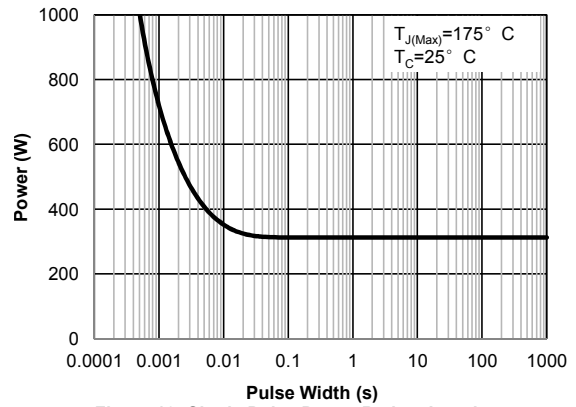
**Figure 7: Gate-Charge Characteristics**



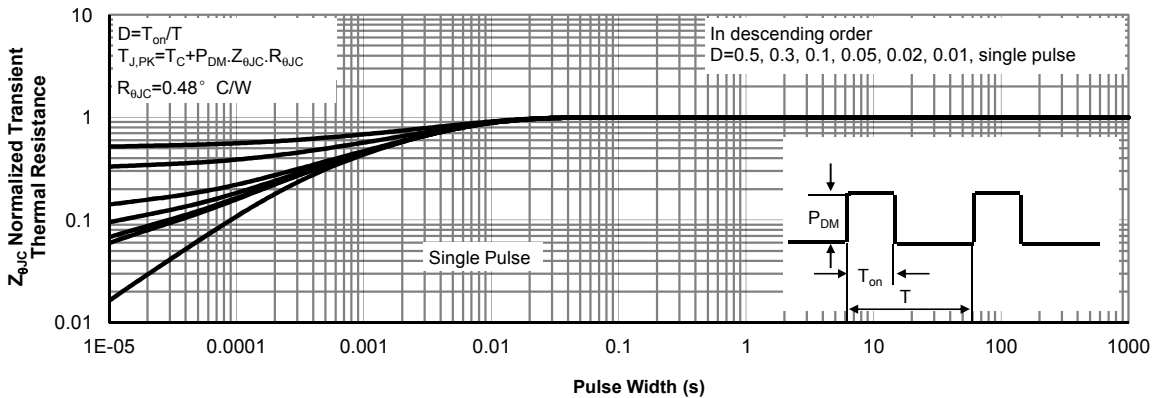
**Figure 8: Capacitance Characteristics**



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

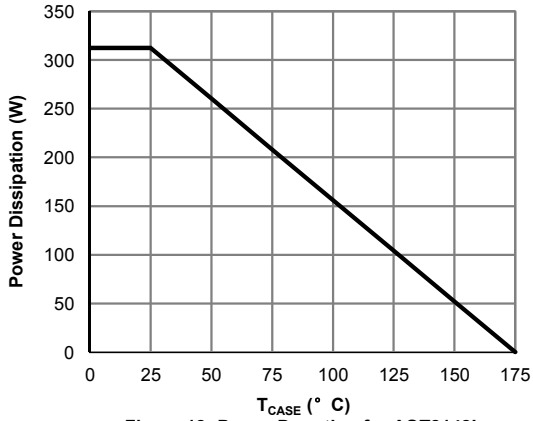


**Figure 10: Single Pulse Power Rating Junction-to-Case for AOT2142L (Note F)**

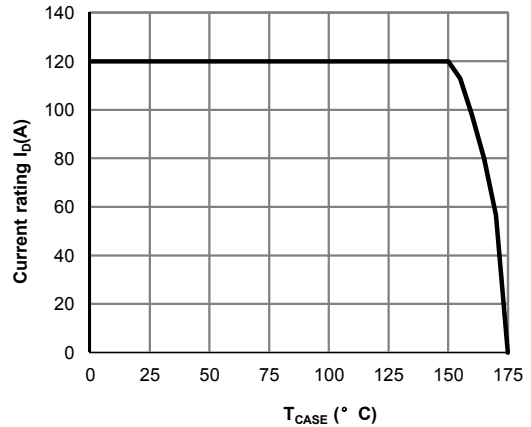


**Figure 11: Normalized Maximum Transient Thermal Impedance for AOT2142L (Note F)**

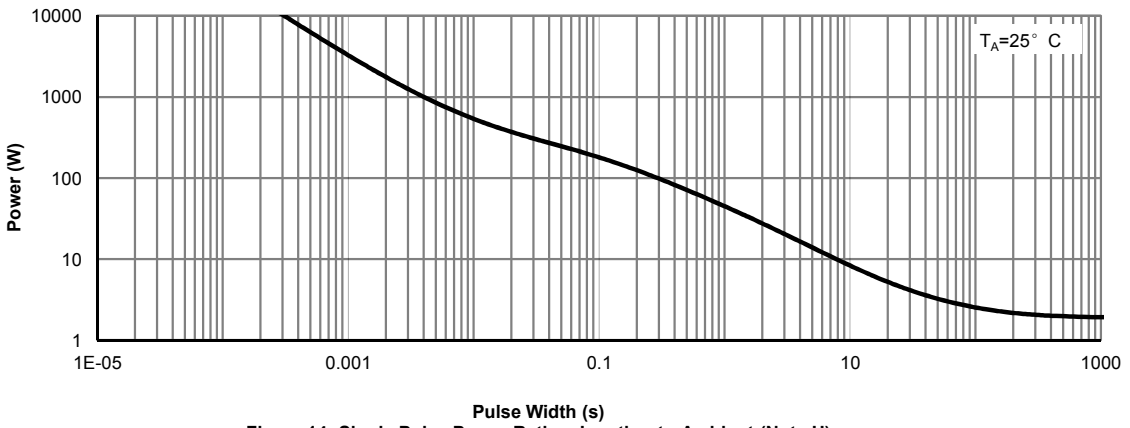
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



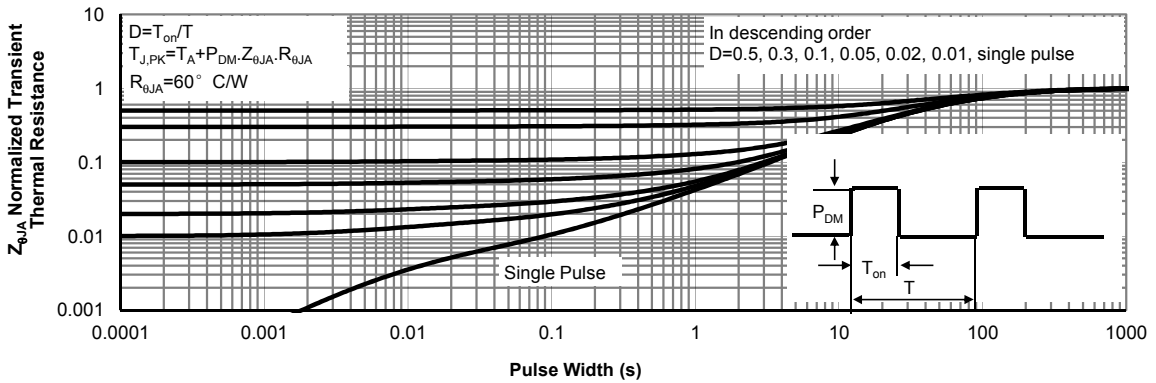
**Figure 12: Power De-rating for AOT2142L (Note F)**



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

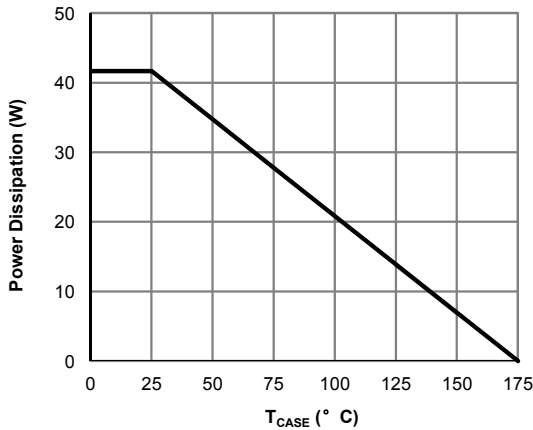


**Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)**

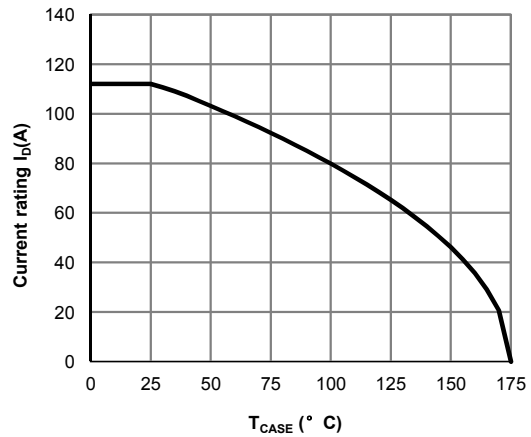


**Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)**

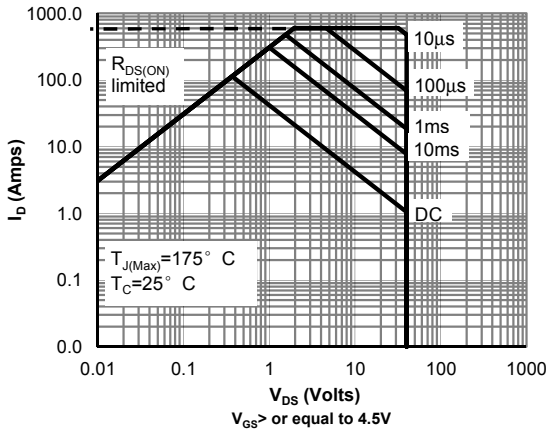
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



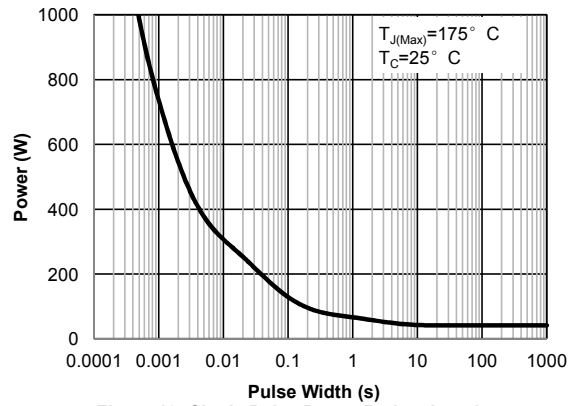
**Figure 16: Power De-rating for AOTF2142L (Note F)**



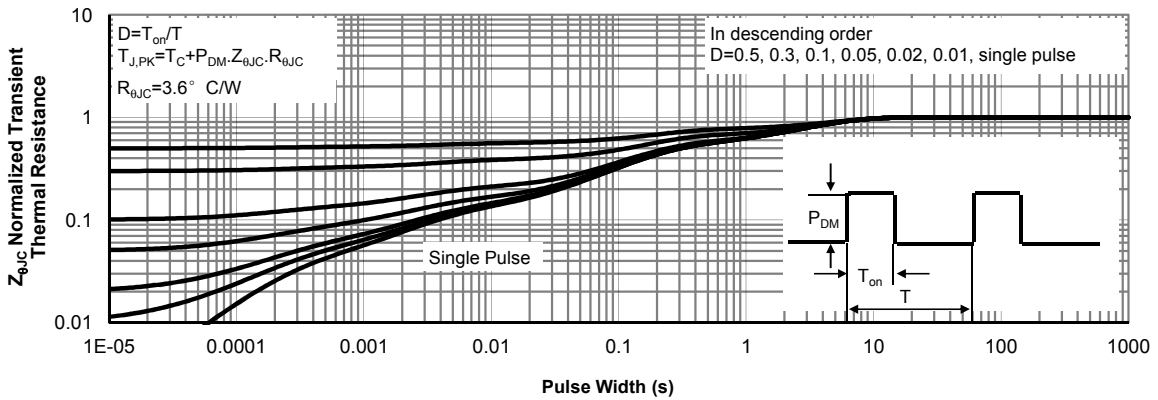
**Figure 17: Current De-rating for AOTF2142L (Note F)**



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

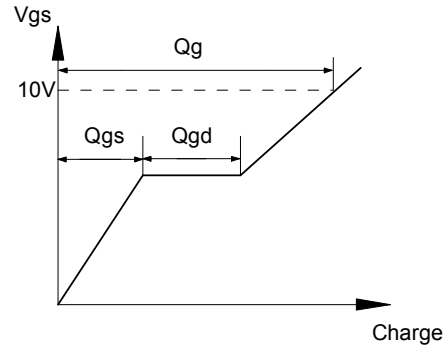
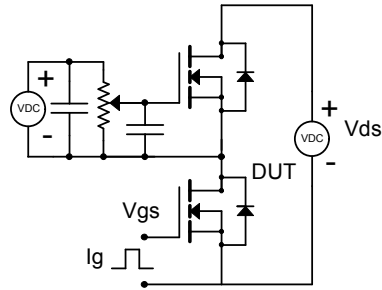


**Figure 19: Single Pulse Power Rating Junction-to-Case for AOTF2142L (Note F)**

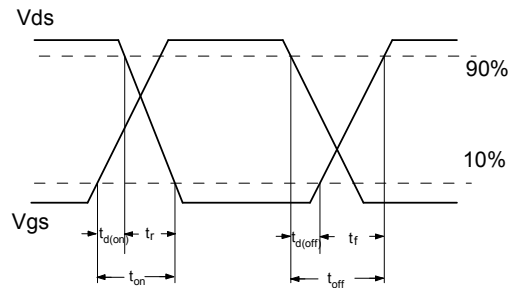
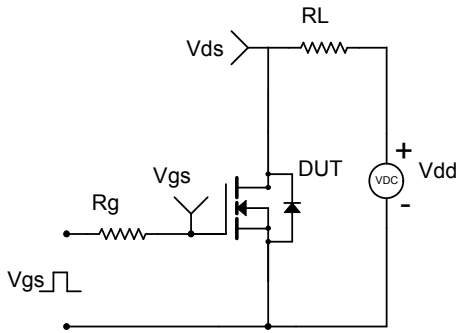


**Figure 20: Normalized Maximum Transient Thermal Impedance for AOTF2142L (Note F)**

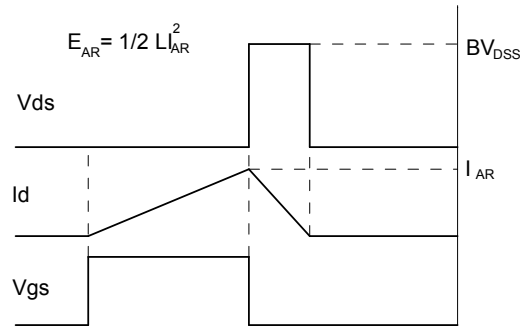
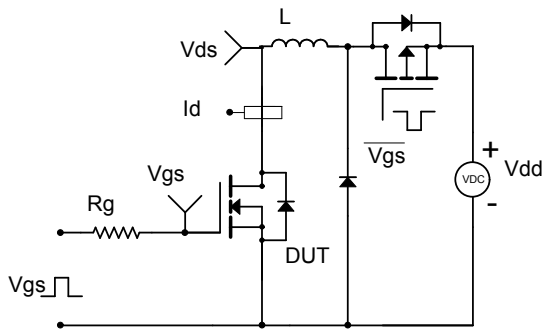
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

