



**ALPHA & OMEGA**  
SEMICONDUCTOR



**AOL1420**

**N-Channel Enhancement Mode Field Effect Transistor**

**General Description**

The AOL1420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. This device is ideally suited for use as a low side switch in CPU core power conversion.

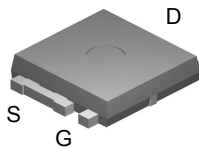
- RoHS Compliant
- Halogen and Antimony Free Green Device\*

**Features**

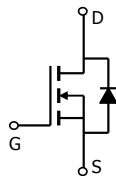
$V_{DS}$  (V) = 30V  
 $I_D$  = 85A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 3.7m\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 5.5m\Omega$  ( $V_{GS}$  = 4.5V)

UIS Tested  
 Rg,Ciss,Coss,Crss Tested

Ultra SO-8™ Top View



Bottom tab  
connected to  
drain



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>B,G</sup>	$I_D$	$T_C=25^\circ\text{C}$ <sup>G</sup>	85
		$T_C=100^\circ\text{C}$ <sup>B</sup>	63
Pulsed Drain Current	$I_{DM}$	150	A
Continuous Drain Current <sup>G</sup>	$I_{DSM}$	$T_A=25^\circ\text{C}$	19
		$T_A=70^\circ\text{C}$	15
Avalanche Current <sup>C</sup>	$I_{AR}$	30	A
Repetitive avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AR}$	112	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	100
		$T_C=100^\circ\text{C}$	50
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ\text{C}$	2.08
		$T_A=70^\circ\text{C}$	1.3
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	19.6	25
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	50	60
Maximum Junction-to-Case <sup>C</sup>	$R_{\theta JC}$	0.9	1.5	$^\circ\text{C/W}$

**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	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, 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	1.8	3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	85			A
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		2.9 4.4	3.7 5.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		4.4	5.5	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		106		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.72	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				85	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		3700	4400	pF
C <sub>oss</sub>	Output Capacitance			700		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			390		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.54	0.7	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub> (10V)	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A		63	76	nC
Q <sub>g</sub> (4.5V)	Total Gate Charge			33	40	nC
Q <sub>gs</sub>	Gate Source Charge			8.6		nC
Q <sub>gd</sub>	Gate Drain Charge			17.6		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω		12		ns
t <sub>r</sub>	Turn-On Rise Time			15.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			40		ns
t <sub>f</sub>	Turn-Off Fall Time			14		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=100A/μs		34	41	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=100A/μs		30		nC

A: The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub> =25°C.  
 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: Repetitive rating, 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 <300 μs 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.  
 G: The maximum current rating is limited by bond-wires.  
 \* This device is guaranteed green after date code 8P11 (June 1<sup>ST</sup> 2008)  
 Rev3: Jun 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

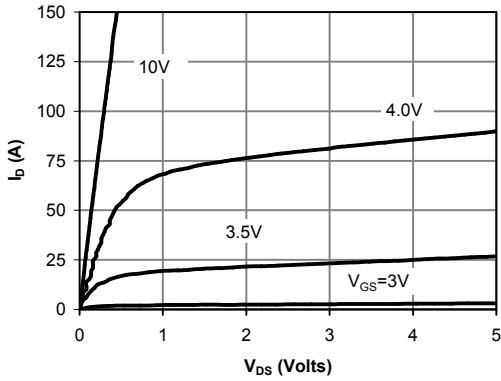


Fig 1: On-Region Characteristics

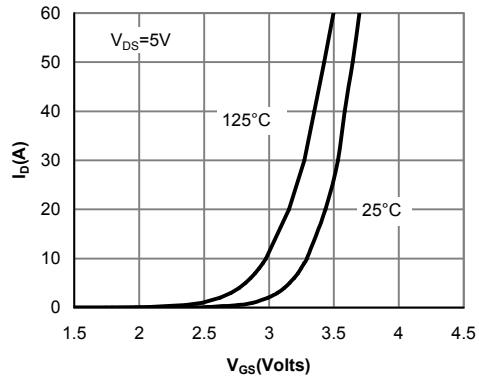


Figure 2: Transfer Characteristics

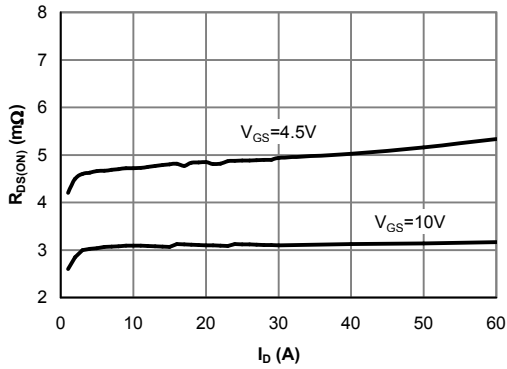


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

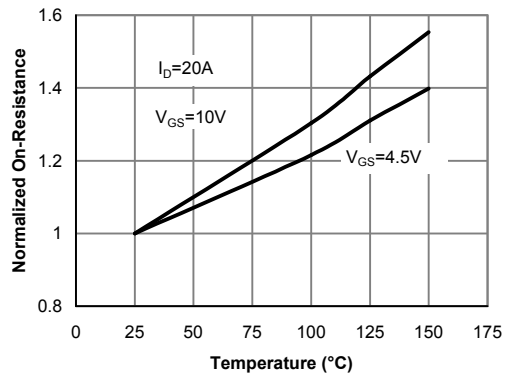


Figure 4: On-Resistance vs. Junction Temperature

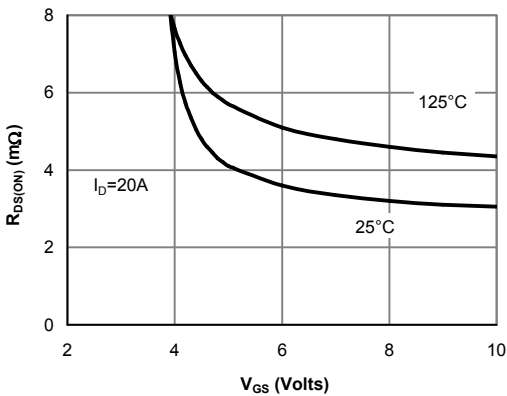


Figure 5: On-Resistance vs. Gate-Source Voltage

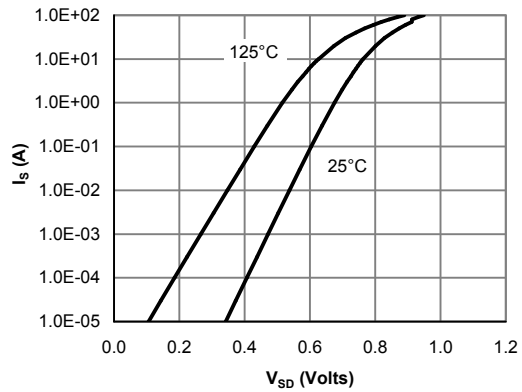


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

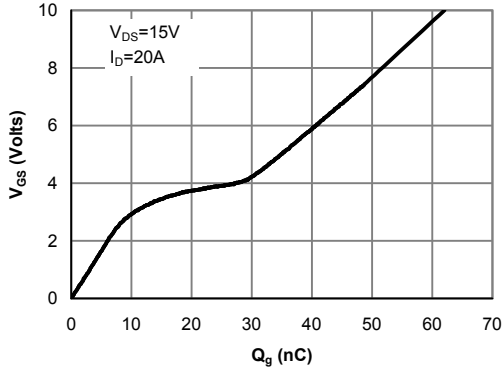


Figure 7: Gate-Charge Characteristics

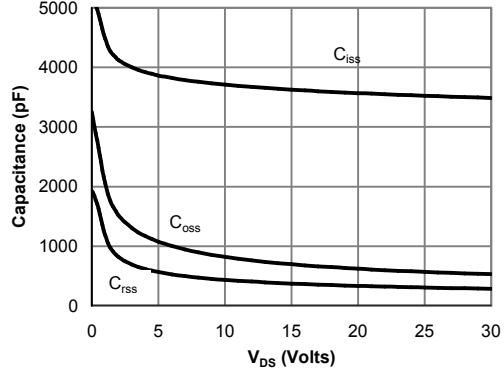


Figure 8: Capacitance Characteristics

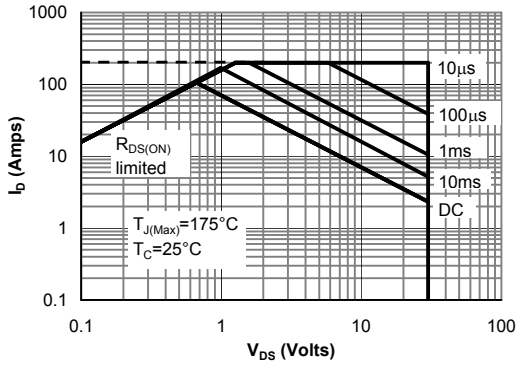


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

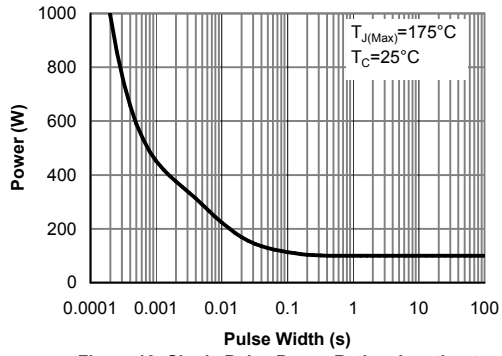


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

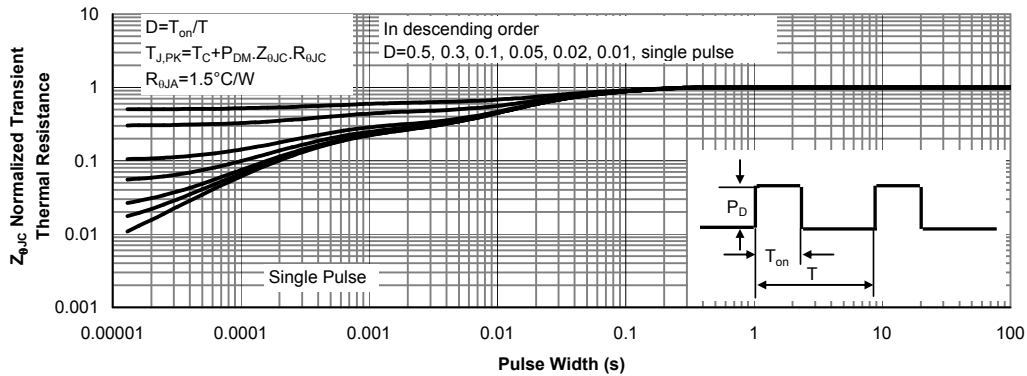


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

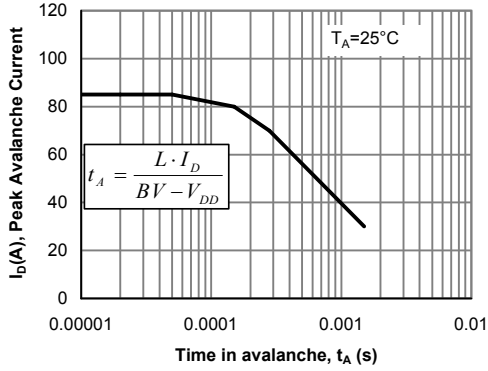


Figure 12: Single Pulse Avalanche capability

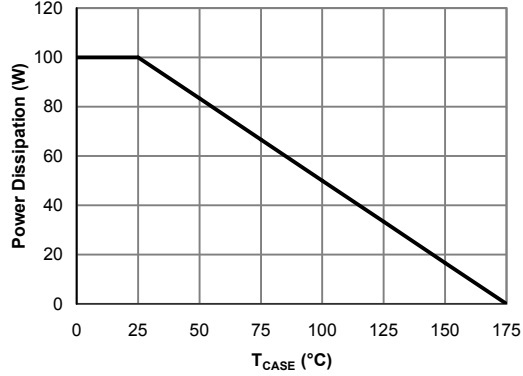


Figure 13: Power De-rating (Note B)

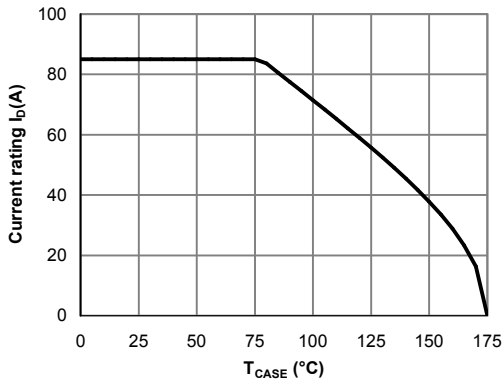


Figure 14: Current De-rating (Note B)

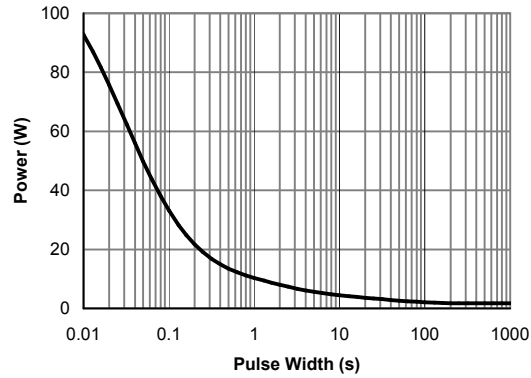


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

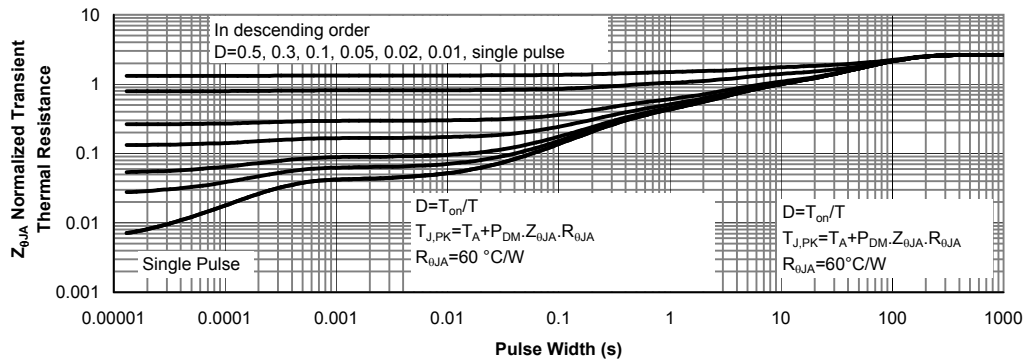
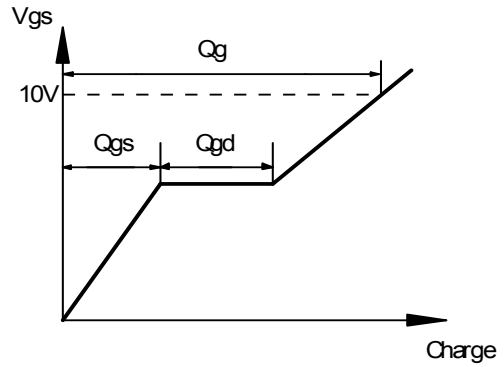
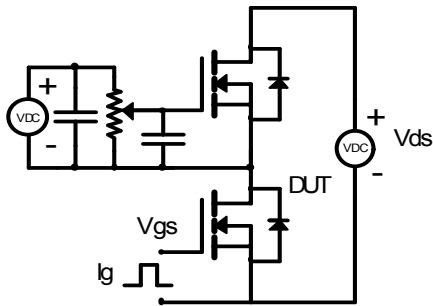
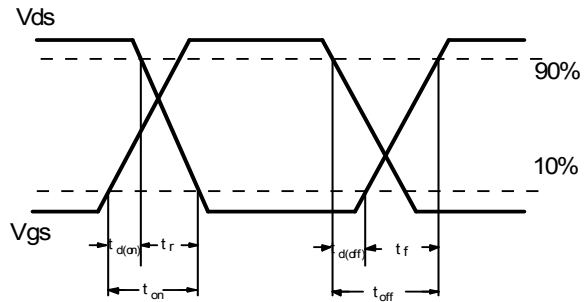
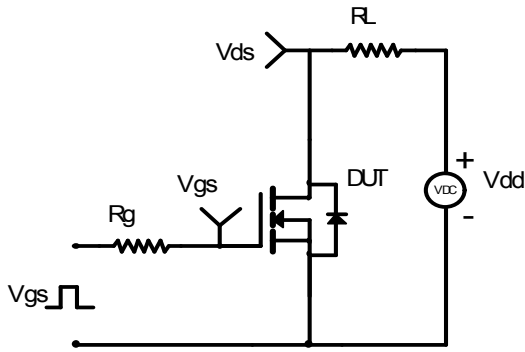


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

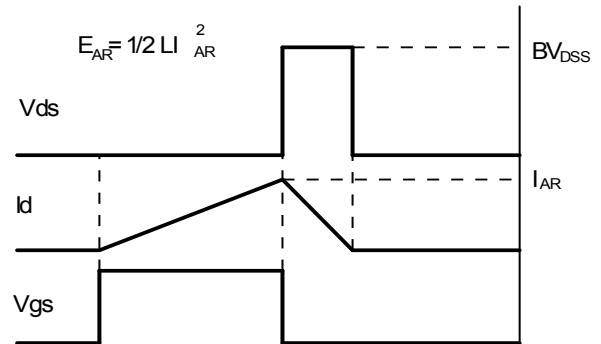
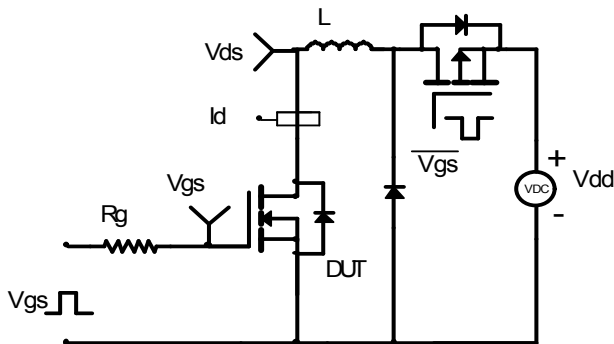
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

