



# AOL1420

## N-Channel Enhancement Mode Field Effect Transistor



### General Description

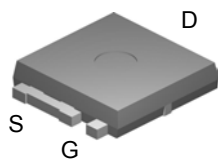
The AOL1420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. This device is ideally suited for use as a low side switch in CPU core power conversion. *Standard Product AOL1420 is Pb-free (meets ROHS & Sony 259 specifications). AOL1420L is a Green Product ordering option. AOL1420 and AOL1420L are electrically identical.*

### Features

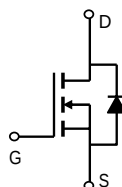
$V_{DS} (V) = 30V$   
 $I_D = 85A (V_{GS} = 10V)$   
 $R_{DS(ON)} < 3.7m\Omega (V_{GS} = 10V)$   
 $R_{DS(ON)} < 5.5m\Omega (V_{GS} = 4.5V)$

Ultra SO-8™ Top View

**Fits SOIC8 footprint !**



Bottom tab connected to drain



### Absolute Maximum Ratings $T_A=25^\circ C$ 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>            | $I_D$          | 85         | A          |
| $T_C=25^\circ C$ <sup>G</sup>                      |                | 63         |            |
| $T_C=100^\circ C$ <sup>B</sup>                     | $I_{DM}$       | 150        |            |
| Pulsed Drain Current                               |                |            |            |
| Continuous Drain Current <sup>G</sup>              | $I_{DSM}$      | 18         | A          |
| $T_A=25^\circ C$                                   |                | 14         |            |
| $T_A=70^\circ C$                                   |                |            |            |
| 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>                     | $P_D$          | 100        | W          |
| $T_C=25^\circ C$                                   |                | 50         |            |
| $T_C=100^\circ C$                                  |                |            |            |
| Power Dissipation <sup>A</sup>                     | $P_{DSM}$      | 2.1        | W          |
| $T_A=25^\circ C$                                   |                | 1.3        |            |
| $T_A=70^\circ C$                                   |                |            |            |
| Junction and Storage Temperature Range             | $T_J, T_{STG}$ | -55 to 175 | $^\circ C$ |

### Thermal Characteristics

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

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<br>T <sub>J</sub> =55°C                          |     |            | 1<br>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<br>T <sub>J</sub> =125°C                         |     | 2.9<br>4.4 | 3.7<br>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                                          |     | 3200       | 3840       | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                            |     | 590        |            | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                            |     | 414        |            | 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,<br>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>qJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25°C.

B: The power dissipation PD is based on T<sub>J</sub>(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: Repetitive rating, pulse width limited by junction temperature T<sub>J</sub>(MAX)=175°C.

D: The R<sub>qJA</sub> is the sum of the thermal impedance from junction to case R<sub>qJC</sub> and case to ambient.

E: The static characteristics in Figures 1 to 6 are obtained using <300 ms 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</sub>(MAX)=175°C.

G: The maximum current rating is limited by bond-wires.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

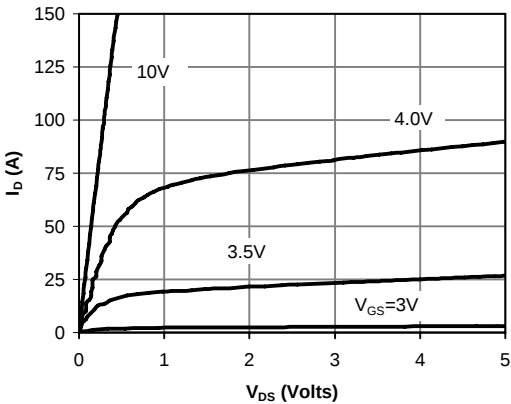


Fig 1: On-Region Characteristics

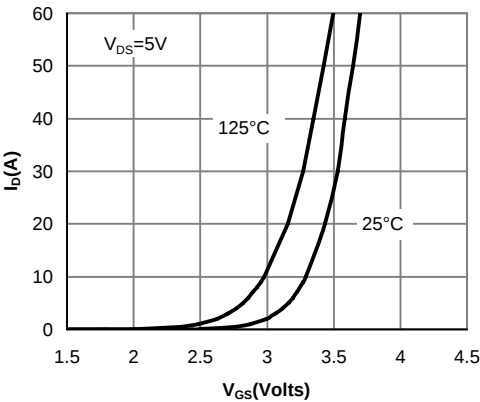


Figure 2: Transfer Characteristics

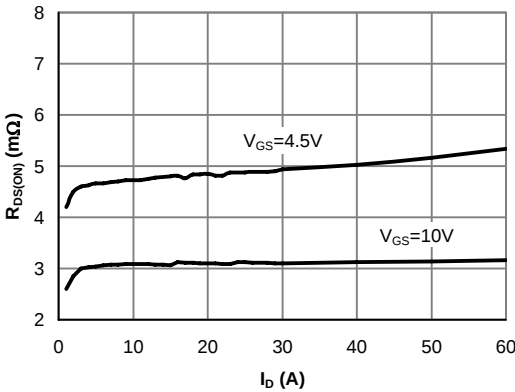


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

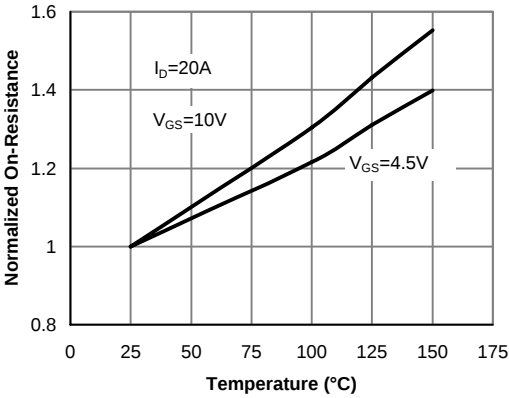


Figure 4: On-Resistance vs. Junction Temperature

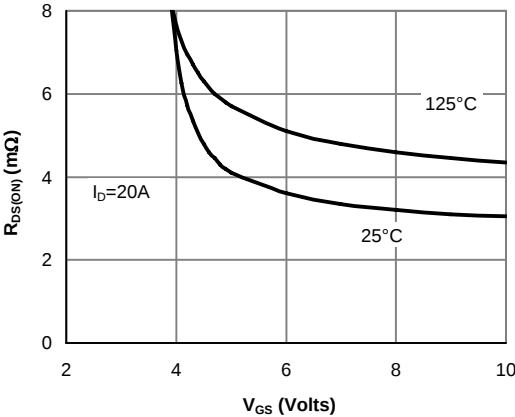


Figure 5: On-Resistance vs. Gate-Source Voltage

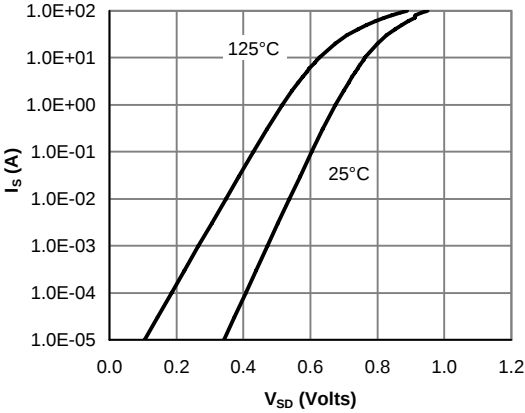


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

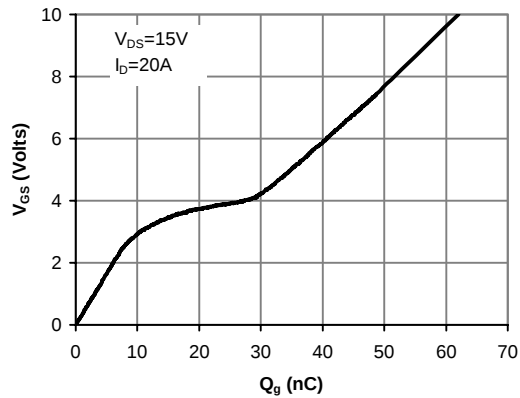


Figure 7: Gate-Charge Characteristics

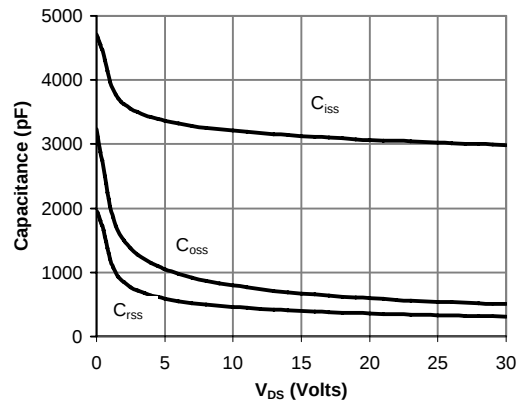


Figure 8: Capacitance Characteristics

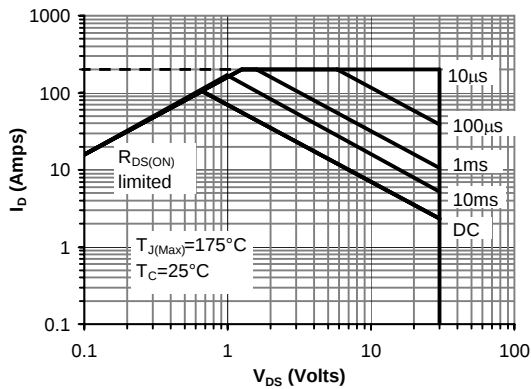


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

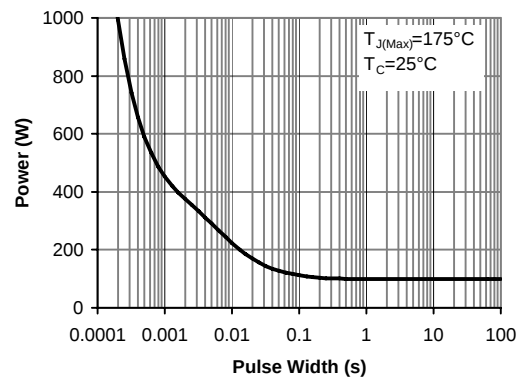


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

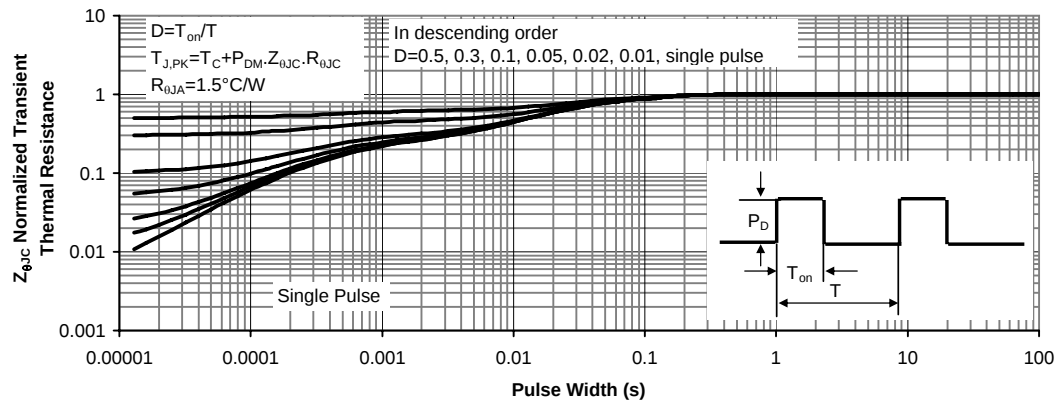


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

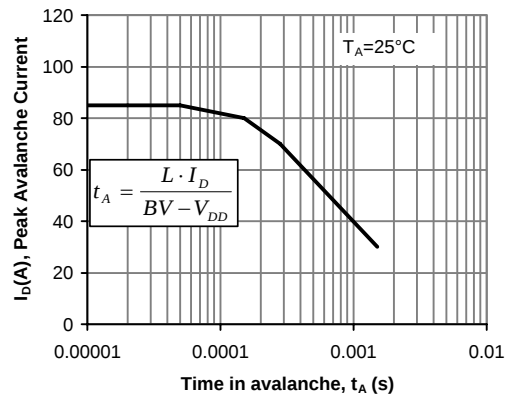


Figure 12: Single Pulse Avalanche capability

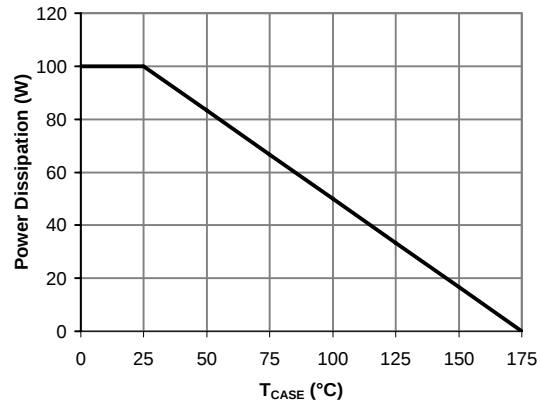


Figure 13: Power De-rating (Note B)

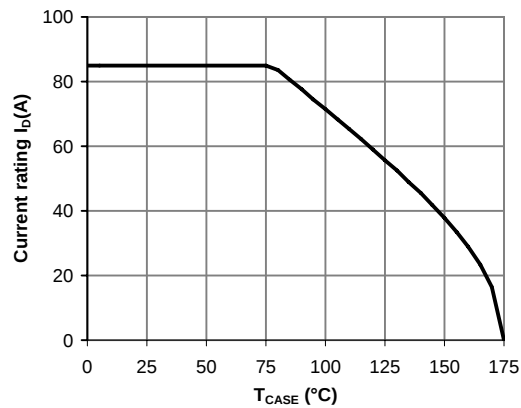


Figure 14: Current De-rating (Note B)

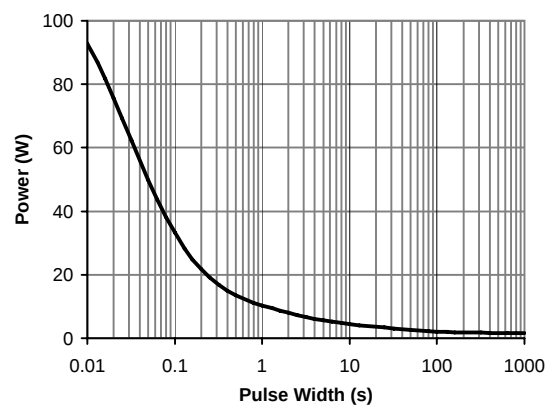


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

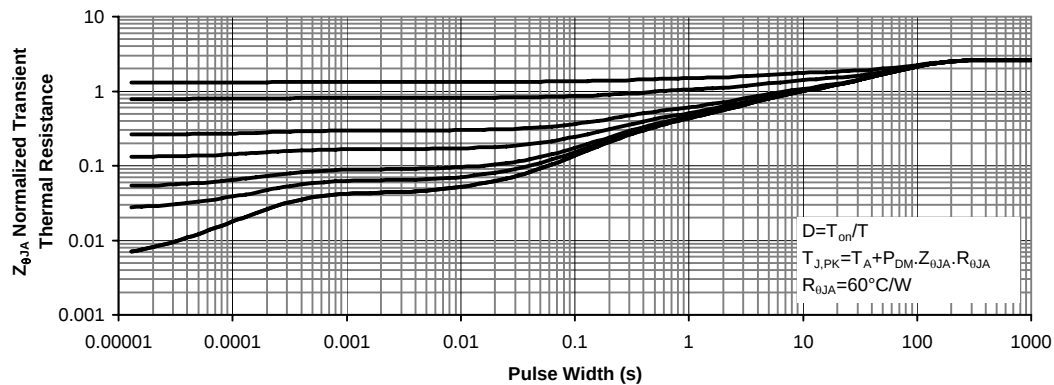


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)



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