

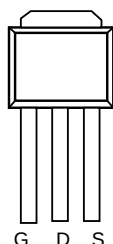
**AOU402**
**N-Channel Enhancement Mode Field Effect Transistor**
**General Description**

The AOU402 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. *Standard Product AOU402 is Pb-free (meets ROHS & Sony 259 specifications). AOU402L is a Green Product ordering option. AOU402 and AOU402L are electrically identical.*

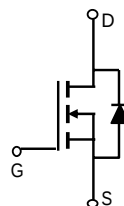
**Features**

$V_{DS}$  (V) = 60V  
 $I_D$  = 12 A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 60 m $\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 85 m $\Omega$  ( $V_{GS}$  = 4.5V)

TO-251



Top View  
Drain Connected  
to Tab


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

| Parameter                                                 | Symbol                  | Maximum    | Units            |
|-----------------------------------------------------------|-------------------------|------------|------------------|
| Drain-Source Voltage                                      | $V_{DS}$                | 60         | V                |
| Gate-Source Voltage                                       | $V_{GS}$                | $\pm 20$   | V                |
| Continuous Drain Current <sup>G</sup>                     | $T_C=25^\circ\text{C}$  | 12         | A                |
|                                                           | $T_C=100^\circ\text{C}$ | 8.5        |                  |
| Pulsed Drain Current <sup>C</sup>                         | $I_{DM}$                | 30         |                  |
| Avalanche Current <sup>C</sup>                            | $I_{AR}$                | 12         | A                |
| Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AR}$                | 23         | mJ               |
| Power Dissipation <sup>B</sup>                            | $T_C=25^\circ\text{C}$  | 20         | W                |
|                                                           | $T_C=100^\circ\text{C}$ | 10         |                  |
| 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> | Steady-State | $R_{\theta JA}$ | 100 | 125 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case <sup>B</sup>    | Steady-State | $R_{\theta JC}$ | 4   | 7.5 | $^\circ\text{C/W}$ |

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> =10mA, V <sub>GS</sub> =0V                                                 | 60  |          |        | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =48V, 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   | 2.4      | 3      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                 | 30  |          |        | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =12A<br>T <sub>J</sub> =125°C                        |     | 47<br>85 | 60     | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A                                                 |     | 67       | 85     | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =12A                                                  |     | 14       |        | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                   |     | 0.74     | 1      | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                           |     |          | 12     | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                           |     |          |        |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz                                         |     | 385      | 540    | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                           |     | 55       |        | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                           |     | 20       |        | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                          |     | 1.35     | 2      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                           |     |          |        |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, I <sub>D</sub> =12A                           |     | 7.5      | 10     | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge                     |                                                                                           |     | 3.8      | 5      | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                           |     | 1.2      |        | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                           |     | 1.9      |        | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     |                                                                                           |     | 4.2      |        | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =30V, R <sub>L</sub> =2.5Ω,<br>R <sub>GEN</sub> =3Ω |     | 3.4      |        | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                           |     | 16       |        | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                           |     | 2        |        | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =12A, dI/dt=100A/μs                                                        |     | 27.6     | 35     | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =12A, 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

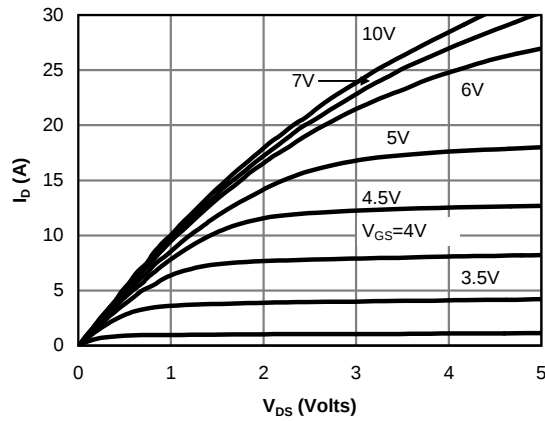


Fig 1: On-Region Characteristics

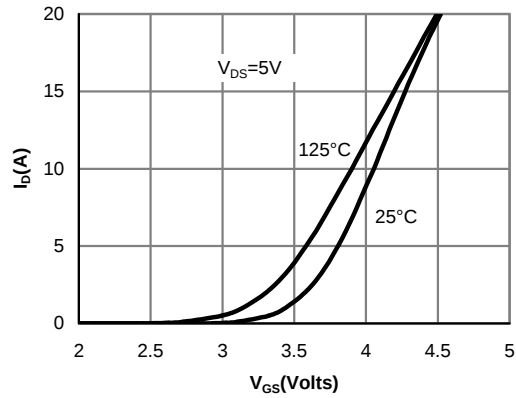


Figure 2: Transfer Characteristics

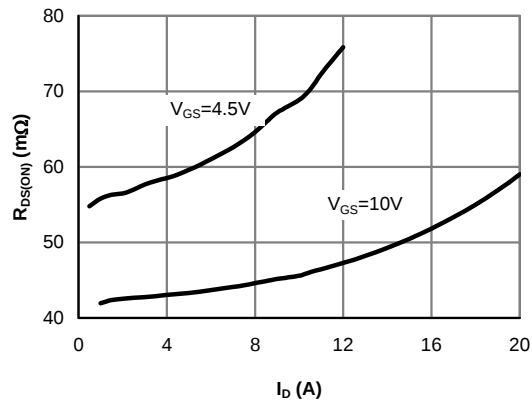


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

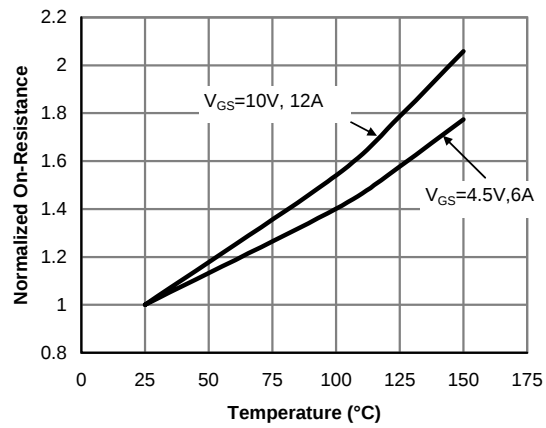


Figure 4: On-Resistance vs. Junction Temperature

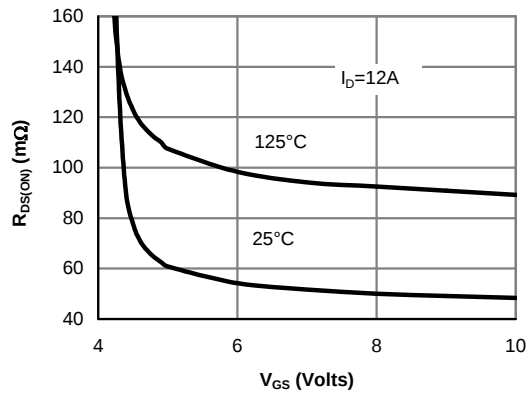


Figure 5: On-Resistance vs. Gate-Source Voltage

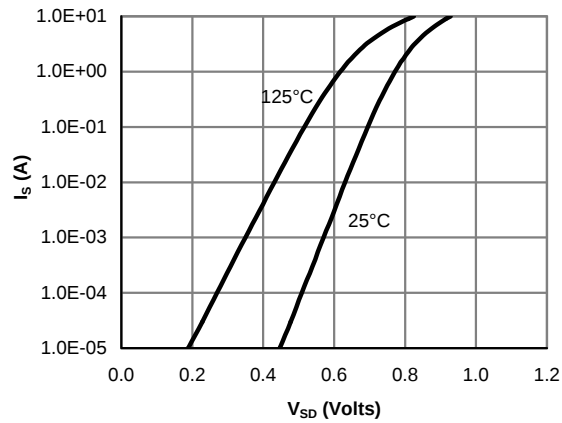


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

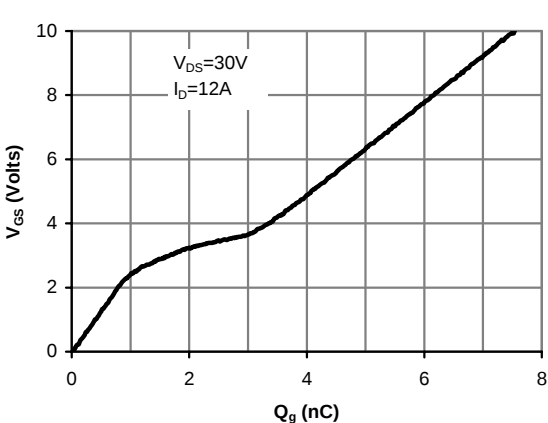


Figure 7: Gate-Charge Characteristics

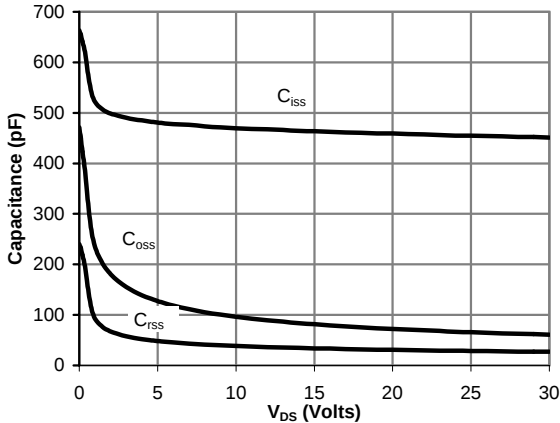


Figure 8: Capacitance Characteristics

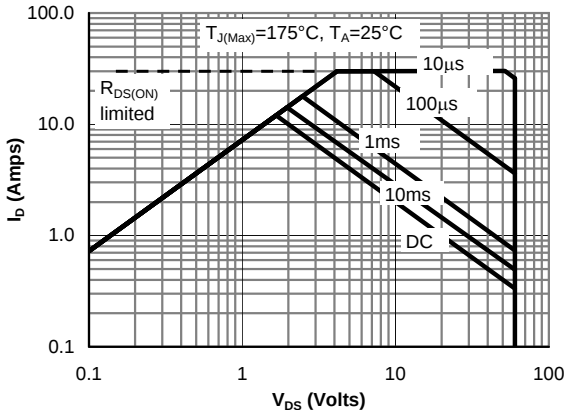


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

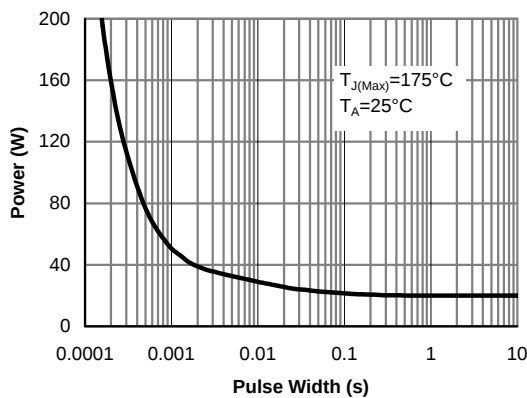


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

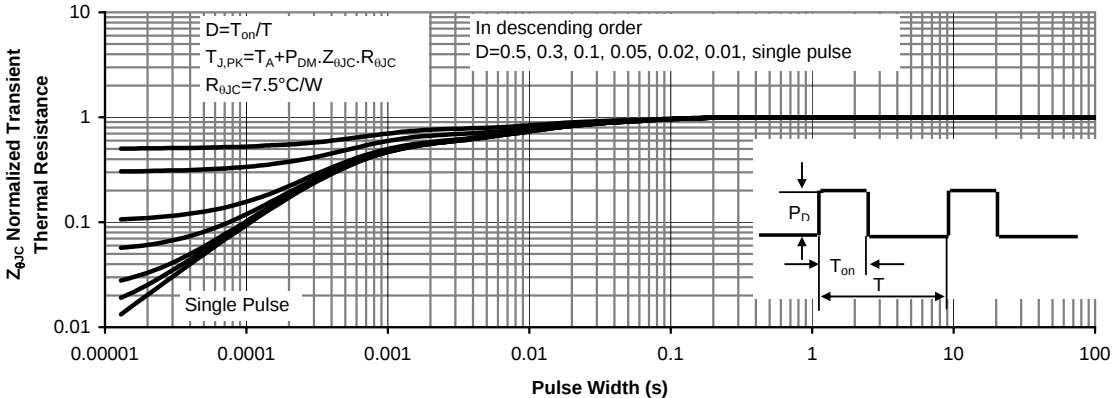


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

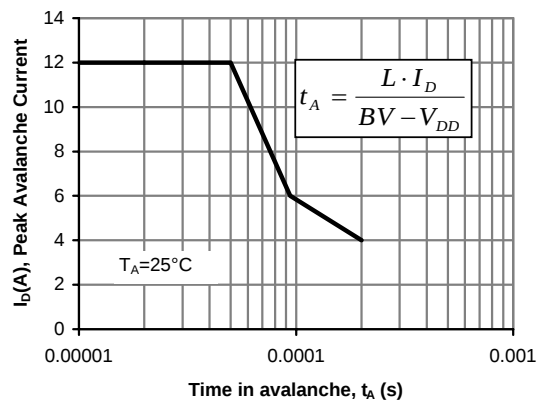


Figure 12: Single Pulse Avalanche capability

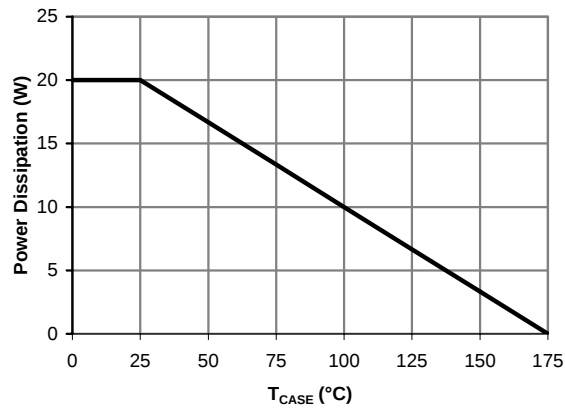


Figure 13: Power De-rating (Note B)

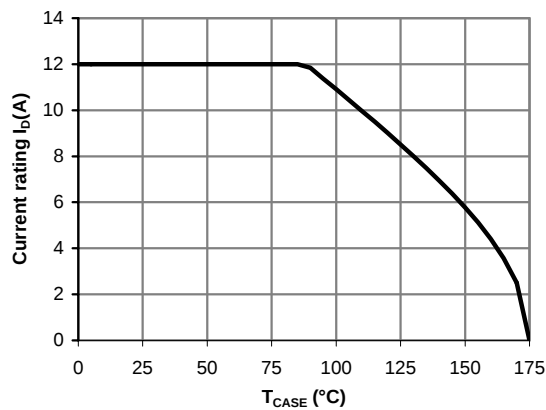


Figure 14: Current De-rating (Note B)