



**AO4472**

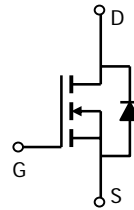
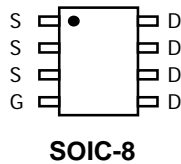
**N-Channel Enhancement Mode Field Effect Transistor**

**General Description**

The AO4472 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , shoot-through immunity, body diode characteristics and ultra-low gate resistance. This device is ideally suited for use as a low side switch in Notebook CPU core power conversion. *Standard Product AO4472 is Pb-free (meets ROHS & Sony 259 specifications). AO4472L is a Green Product ordering option. AO4472 and AO4472L are electrically identical.*

**Features**

- $V_{DS}$  (V) = 30V
- $I_D$  = 19A ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 5.2m $\Omega$  ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 7.2m $\Omega$  ( $V_{GS}$  = 4.5V)



**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>A</sup>  | $T_A=25^\circ\text{C}$ | 19         | A                |
|  | $T_A=70^\circ\text{C}$ | 16         |                  |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$               | 80         |                  |
| Power Dissipation                      | $T_A=25^\circ\text{C}$ | 3          | W                |
|  | $T_A=70^\circ\text{C}$ | 2.1        |                  |
| Junction and Storage Temperature Range | $T_J, T_{STG}$         | -55 to 150 | $^\circ\text{C}$ |

**Thermal Characteristics**

| Parameter                                | Symbol          | Typ          | Max | Units              |
|--|-----------------|--------------|-----|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 31           | 40  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 59  |                    |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 16           | 24  | $^\circ\text{C/W}$ |

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

| Symbol                      | Parameter                             | Conditions   | Min | Typ        | Max        | Units            |
|-----------------------------|---------------------------------------|--|-----|------------|------------|------------------|
| <b>STATIC PARAMETERS</b>    |                                       |  |     |            |            |                  |
| $BV_{DSS}$                  | Drain-Source Breakdown Voltage        | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$  | 30  |            |            | V                |
| $I_{DSS}$                   | Zero Gate Voltage Drain Current       | $V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$<br>$T_J=55^\circ\text{C}$                 |     |            | 1<br>5     | $\mu\text{A}$    |
| $I_{GSS}$                   | 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   | 1.9        | 2.5        | V                |
| $I_{D(ON)}$                 | On state drain current                | $V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$   | 80  |            |            | A                |
| $R_{DS(ON)}$                | Static Drain-Source On-Resistance     | $V_{GS}=10\text{V}$ , $I_D=19\text{A}$<br>$T_J=125^\circ\text{C}$                  |     | 4.3<br>6.1 | 5.2<br>7.5 | $\text{m}\Omega$ |
|                             |                                       | $V_{GS}=4.5\text{V}$ , $I_D=15\text{A}$  |     | 6          | 7.2        | $\text{m}\Omega$ |
| $g_{FS}$                    | Forward Transconductance              | $V_{DS}=5\text{V}$ , $I_D=19\text{A}$  |     | 82         |            | S                |
| $V_{SD}$                    | Diode Forward Voltage                 | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$   |     | 0.7        | 1          | V                |
| $I_S$                       | Maximum Body-Diode Continuous Current |  |     |            | 4.5        | A                |
| <b>DYNAMIC PARAMETERS</b>   |                                       |  |     |            |            |                  |
| $C_{iss}$                   | Input Capacitance                     |  |     | 6060       | 7270       | pF               |
| $C_{oss}$                   | Output Capacitance                    | $V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$                         |     | 638        | 960        | pF               |
| $C_{rss}$                   | Reverse Transfer Capacitance          |  |     | 355        | 530        | pF               |
| $R_g$                       | Gate resistance                       | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$                          |     | 0.45       | 0.9        | $\Omega$         |
| <b>SWITCHING PARAMETERS</b> |                                       |  |     |            |            |                  |
| $Q_g(10\text{V})$           | Total Gate Charge                     | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=19\text{A}$                       | 80  | 103        | 124        | nC               |
| $Q_g(4.5\text{V})$          | Total Gate Charge                     |  | 37  | 48         | 58         | nC               |
| $Q_{gs}$                    | Gate Source Charge                    |  |     | 18         |            | nC               |
| $Q_{gd}$                    | Gate Drain Charge                     |  |     | 15         |            | nC               |
| $t_{D(on)}$                 | Turn-On Delay Time                    | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=0.8\Omega$ ,<br>$R_{GEN}=3\Omega$ |     | 12         | 16         | ns               |
| $t_r$                       | Turn-On Rise Time                     |  |     | 8          | 12         | ns               |
| $t_{D(off)}$                | Turn-Off Delay Time                   |  |     | 51.5       | 70         | ns               |
| $t_f$                       | Turn-Off Fall Time                    |  |     | 8.8        | 14         | ns               |
| $t_{rr}$                    | Body Diode Reverse Recovery Time      | $I_F=19\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                                 |     | 33.5       | 44         | ns               |
| $Q_{rr}$                    | Body Diode Reverse Recovery Charge    | $I_F=19\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                                 |     | 22         | 30         | nC               |

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using 80  $\mu\text{s}$  pulses, duty cycle 0.5% max.

E. 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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

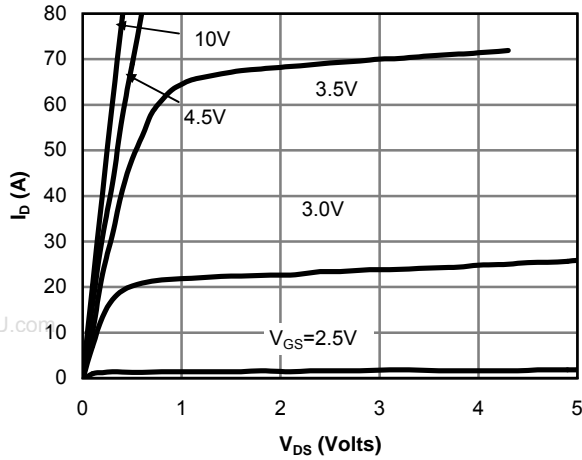


Fig 1: On-Region Characteristics

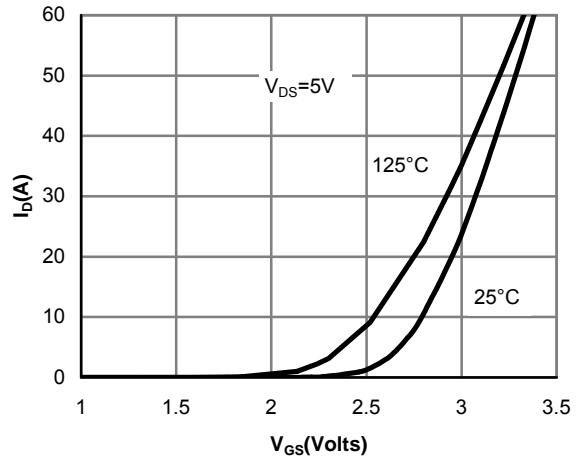


Figure 2: Transfer Characteristics

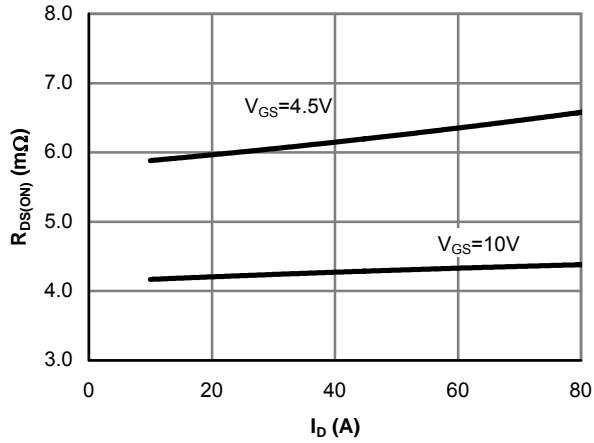


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

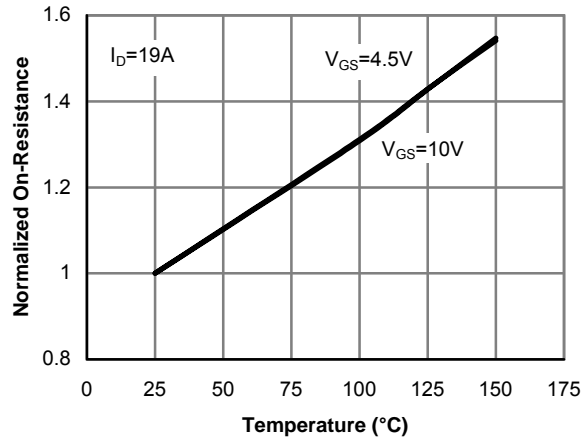


Figure 4: On-Resistance vs. Junction Temperature

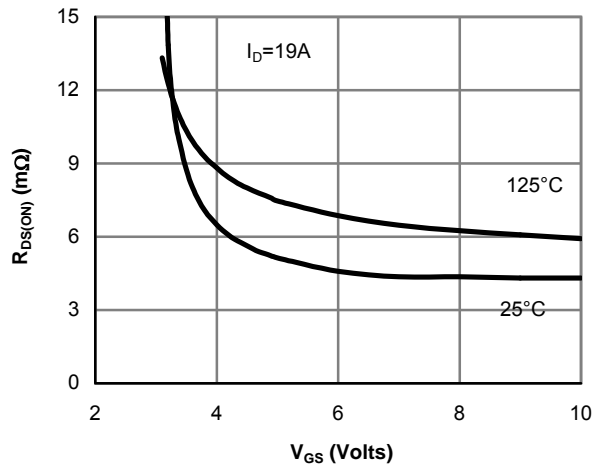


Figure 5: On-Resistance vs. Gate-Source Voltage

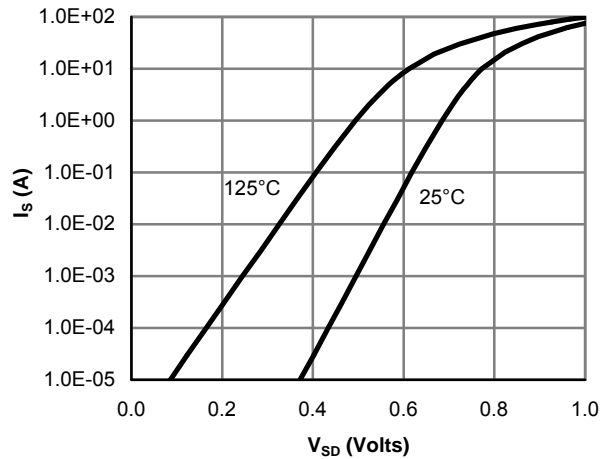


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

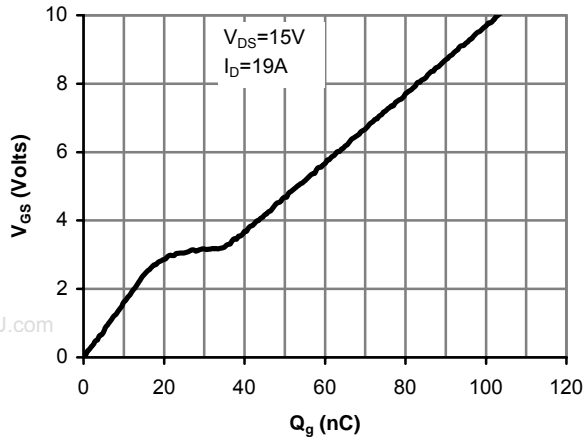


Figure 7: Gate-Charge Characteristics

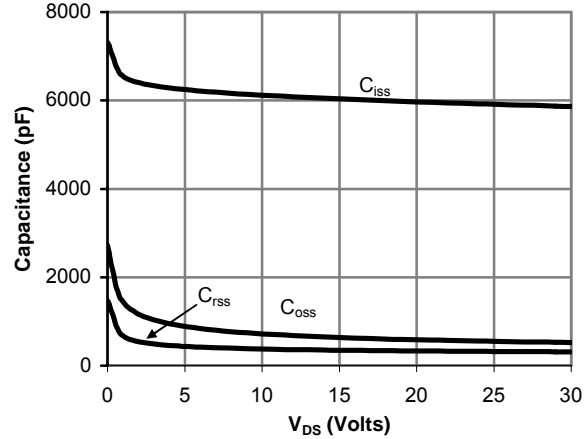


Figure 8: Capacitance Characteristics

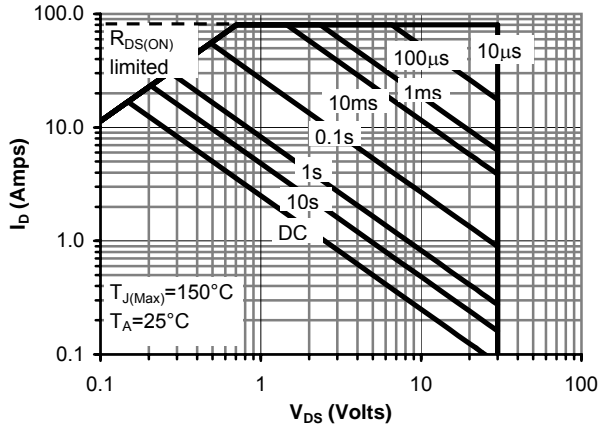


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

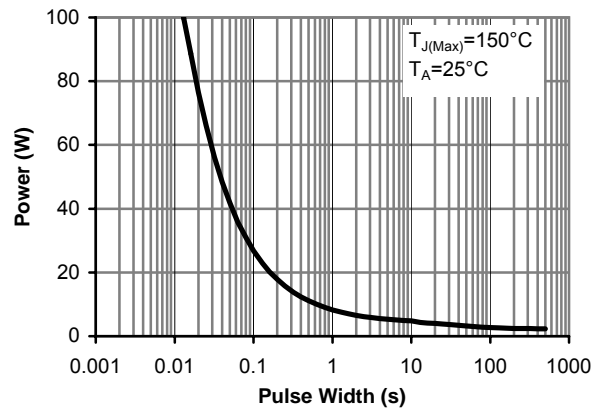


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

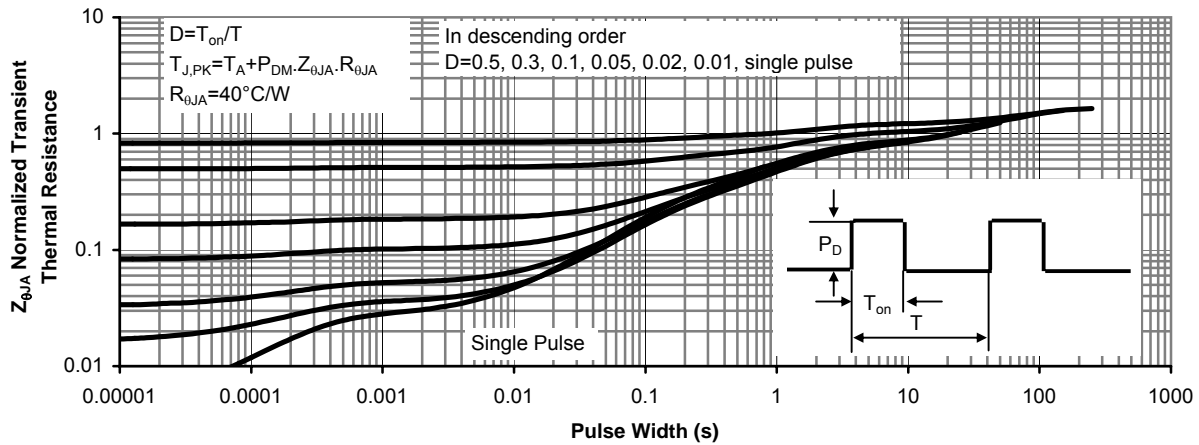


Figure 11: Normalized Maximum Transient Thermal Impedance