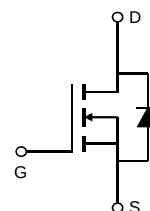
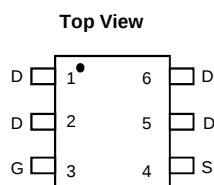
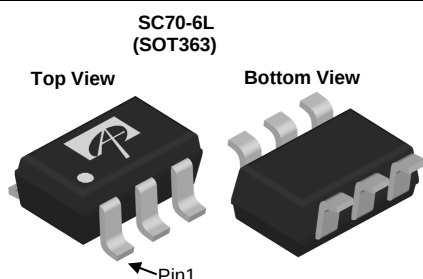


### General Description

The AO7412 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V, in the small SOT323 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters.

### Product Summary

|                                  |                |
|----------------------------------|----------------|
| $V_{DS}$                         | 30V            |
| $I_D$ (at $V_{GS}=10V$ )         | 1.7A           |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | < 55m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | < 65m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=2.5V$ ) | < 85m $\Omega$ |



### 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                    | $V_{GS}$       | $\pm 12$   | V                |
| Continuous Drain Current               | $I_D$          | 1.7        | A                |
|                                        |                | 1.3        |                  |
| Pulsed Drain Current <sup>C</sup>      | $I_{DM}$       | 15         |                  |
| Power Dissipation <sup>B</sup>         | $P_D$          | 0.35       | W                |
|                                        |                | 0.22       |                  |
| 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>   | $R_{\theta JA}$ | 300 | 360 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A,D</sup> |                 | 340 | 425 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead                   | $R_{\theta JL}$ | 280 | 320 | $^\circ\text{C/W}$ |

**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> =30V, 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> =±12V                                              |     |          | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                | 0.5 | 1        | 1.5      | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                               | 15  |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =1.7A<br>T <sub>j</sub> =125°C                     |     | 45<br>70 | 55<br>84 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =1.5A                                             |     | 50       | 65       | mΩ    |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =1A                                               |     | 61       | 85       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =1.7A                                               |     | 14       |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                 |     | 0.75     | 1        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                         |     |          | 1.5      | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                         |     |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                                       | 185 | 235      | 285      | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                         | 25  | 35       | 45       | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                         | 10  | 18       | 25       | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                        | 2.1 | 4.3      | 6.5      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                         |     |          |          |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =1.7A                        |     | 10       | 12       | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |                                                                                         |     | 4.7      |          | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                         |     | 0.95     |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                         |     | 1.6      |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =8Ω,<br>R <sub>GEN</sub> =3Ω |     | 3.5      |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                         |     | 1.5      |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                         |     | 17.5     |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                         |     | 2.5      |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =1.7A, di/dt=100A/μs                                                     |     | 8.5      | 11       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =1.7A, di/dt=100A/μs                                                     |     | 2.6      | 3.5      | 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 value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

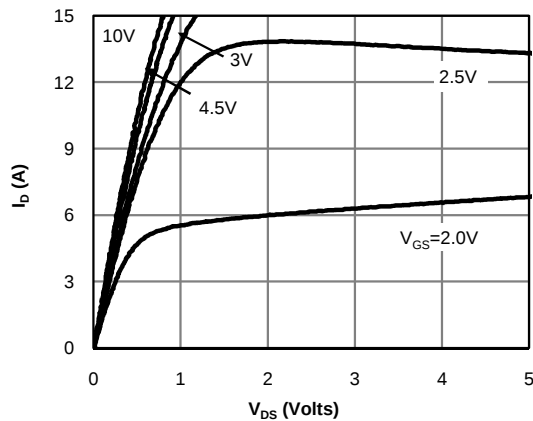
D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

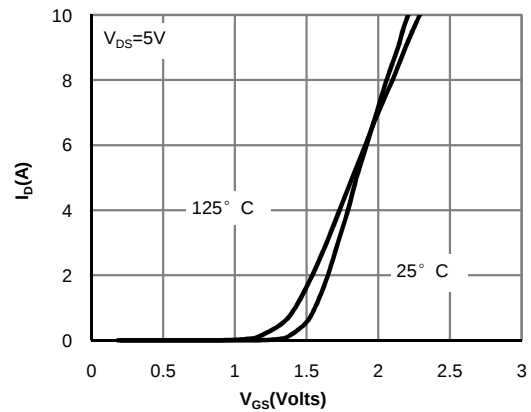
F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

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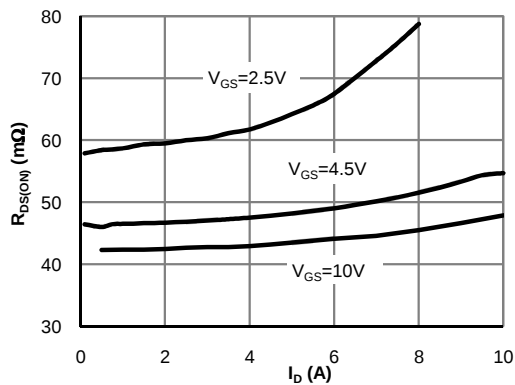
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



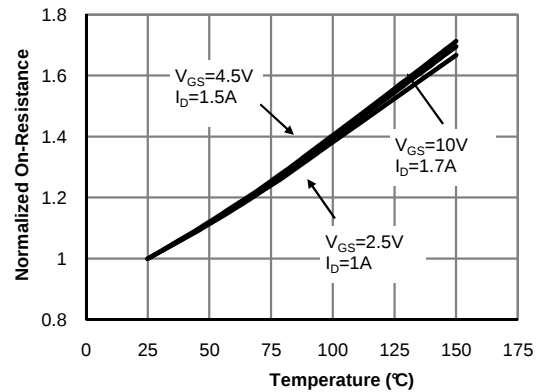
**Fig 1: On-Region Characteristics (Note E)**



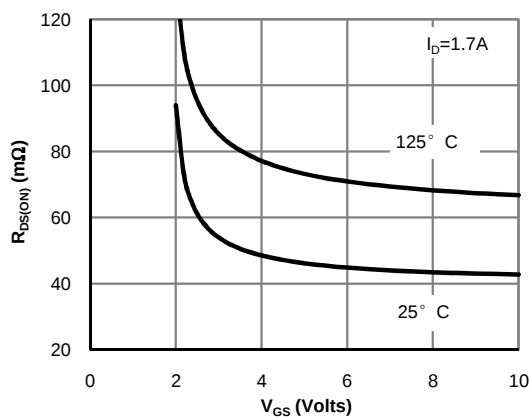
**Figure 2: Transfer Characteristics (Note E)**



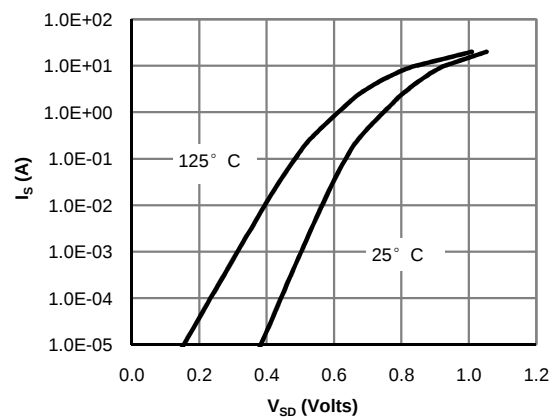
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



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

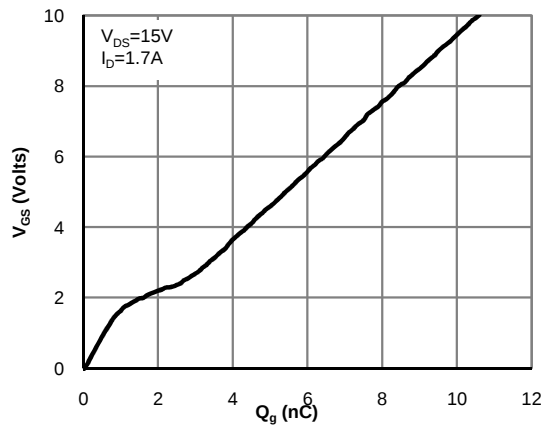


**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

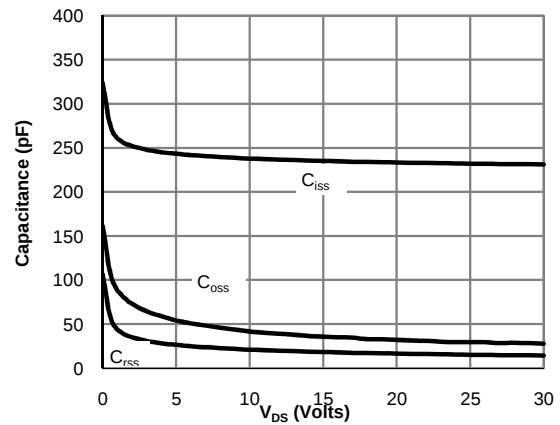


**Figure 6: Body-Diode Characteristics (Note E)**

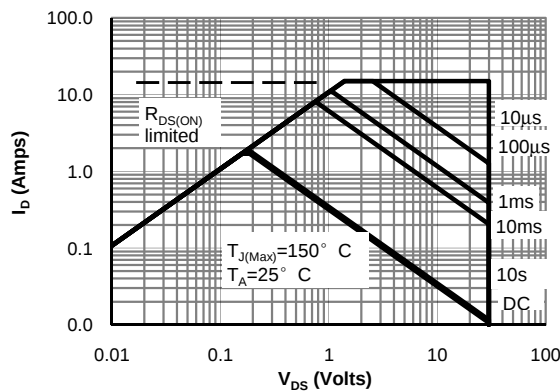
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



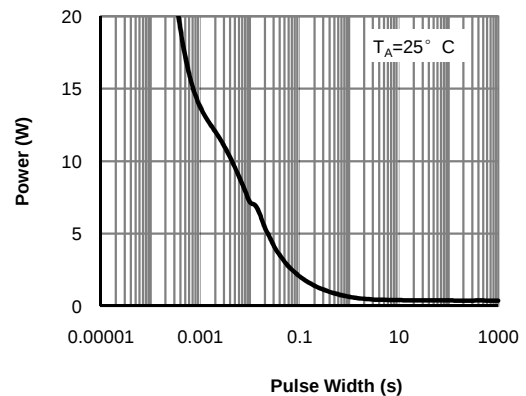
**Figure 7: Gate-Charge Characteristics**



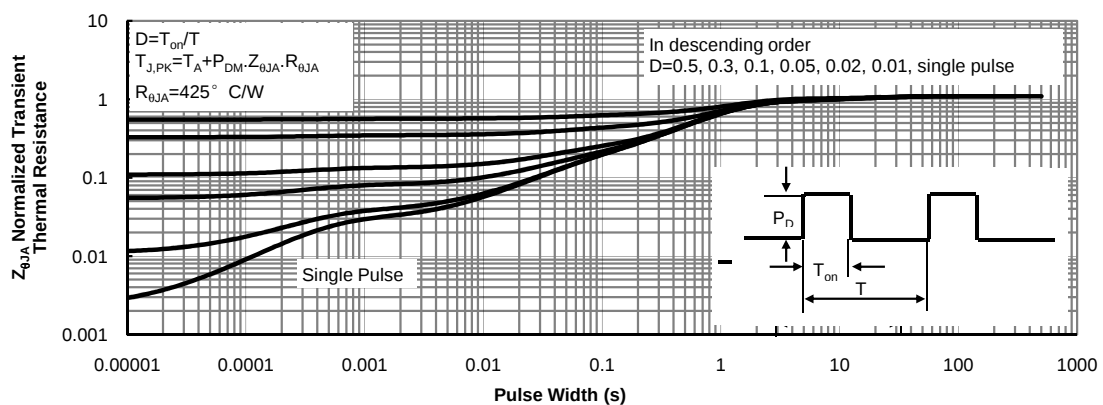
**Figure 8: Capacitance Characteristics**



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

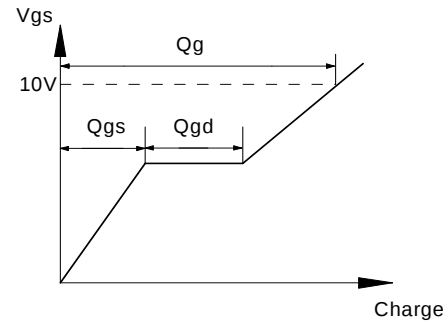
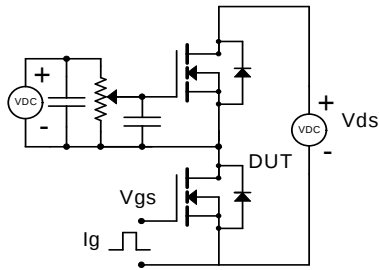


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)**

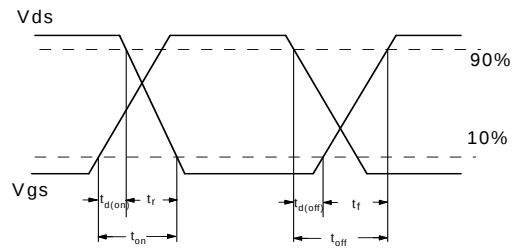
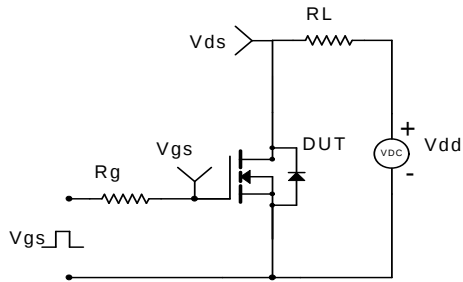


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

