

### General Description

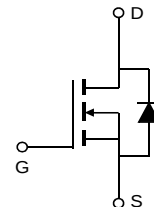
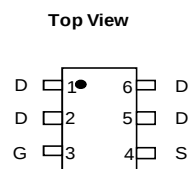
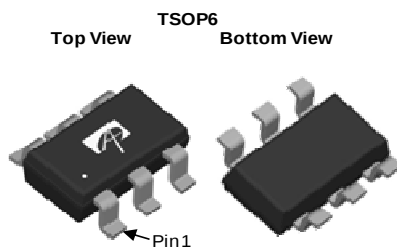
- Latest Trench Power MOSFET technology
- Very Low  $R_{DS(ON)}$  at 4.5V  $V_{GS}$
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

### Application

- System/Load Switch

### Product Summary

|                                  |                |
|----------------------------------|----------------|
| $V_{DS}$                         | 30V            |
| $I_D$ (at $V_{GS}=10V$ )         | 6.5A           |
| $R_{DS(ON)}$ (at $V_{GS}=10V$ )  | < 35m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=4.5V$ ) | < 48m $\Omega$ |



| Orderable Part Number | Package Type | Form        | Minimum Order Quantity |
|-----------------------|--------------|-------------|------------------------|
| AO6424A               | TSOP-6       | Tape & Reel | 3000                   |

### 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               | $I_D$                  | 6.5        | A                |
|                                        | $T_A=70^\circ\text{C}$ | 5          |                  |
| Pulsed Drain Current <sup>C</sup>      | $I_{DM}$               | 27         |                  |
| Power Dissipation <sup>B</sup>         | $P_D$                  | 2.5        | W                |
|                                        | $T_A=70^\circ\text{C}$ | 1.5        |                  |
| 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>    | $R_{\theta JA}$ | 42  | 50  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A, D</sup> |                 | 68  | 85  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead                    | $R_{\theta JL}$ | 23  | 30  | $^\circ\text{C/W}$ |

**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       | $V_{DS}=30\text{V}$ , $V_{GS}=0\text{V}$<br>$T_J=55^\circ\text{C}$               |     |      | 1<br>5    | $\mu\text{A}$ |
| $I_{GSS}$                   | Gate-Body leakage current             | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$                                     |     |      | $\pm 100$ | nA            |
| $V_{GS(th)}$                | Gate Threshold Voltage                | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$                                           | 1.2 | 1.8  | 2.4       | V             |
| $R_{DS(on)}$                | Static Drain-Source On-Resistance     | $V_{GS}=10\text{V}$ , $I_D=5\text{A}$                                            |     | 29   | 35        | m $\Omega$    |
|                             |                                       | $T_J=125^\circ\text{C}$                                                          |     | 44   | 53        |               |
|                             |                                       | $V_{GS}=4.5\text{V}$ , $I_D=4\text{A}$                                           |     | 38   | 48        | m $\Omega$    |
| $g_{FS}$                    | Forward Transconductance              | $V_{DS}=5\text{V}$ , $I_D=5\text{A}$                                             |     | 8    |           | S             |
| $V_{SD}$                    | Diode Forward Voltage                 | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$                                             |     | 0.76 | 1         | V             |
| $I_S$                       | Maximum Body-Diode Continuous Current |                                                                                  |     |      | 3         | A             |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                  |     |      |           |               |
| $C_{iss}$                   | Input Capacitance                     | $V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$                       |     | 270  |           | pF            |
| $C_{oss}$                   | Output Capacitance                    |                                                                                  |     | 50   |           | pF            |
| $C_{rss}$                   | Reverse Transfer Capacitance          |                                                                                  |     | 35   |           | pF            |
| $R_g$                       | Gate resistance                       | $f=1\text{MHz}$                                                                  | 1.4 | 2.8  | 4.2       | $\Omega$      |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                  |     |      |           |               |
| $Q_g(10\text{V})$           | Total Gate Charge                     | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=5\text{A}$                      |     | 6.3  | 12        | nC            |
| $Q_g(4.5\text{V})$          | Total Gate Charge                     |                                                                                  |     | 3.2  | 8         | nC            |
| $Q_{gs}$                    | Gate Source Charge                    |                                                                                  |     | 0.65 |           | nC            |
| $Q_{gd}$                    | Gate Drain Charge                     |                                                                                  |     | 1.75 |           | nC            |
| $t_{D(on)}$                 | Turn-On DelayTime                     | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=3\Omega$ ,<br>$R_{GEN}=3\Omega$ |     | 3    |           | ns            |
| $t_r$                       | Turn-On Rise Time                     |                                                                                  |     | 2.5  |           | ns            |
| $t_{D(off)}$                | Turn-Off DelayTime                    |                                                                                  |     | 17.5 |           | ns            |
| $t_f$                       | Turn-Off Fall Time                    |                                                                                  |     | 2.5  |           | ns            |
| $t_{rr}$                    | Body Diode Reverse Recovery Time      | $I_F=5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                                |     | 10   |           | ns            |
| $Q_{rr}$                    | Body Diode Reverse Recovery Charge    | $I_F=5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                                |     | 2.3  |           | 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.

B. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^\circ\text{C}$ , using  $\leq 10\text{s}$  junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

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

E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  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  $T_{J(MAX)}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

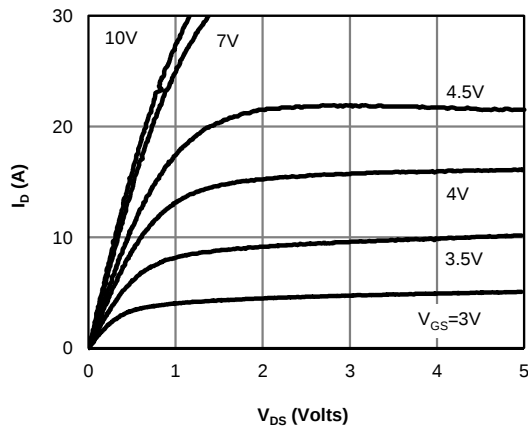


Figure 1: On-Region Characteristics (Note E)

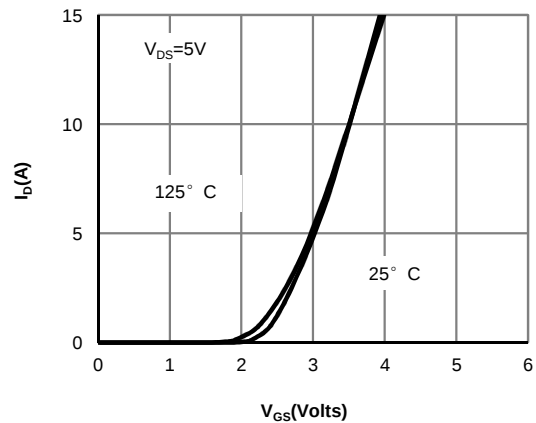


Figure 2: Transfer Characteristics (Note E)

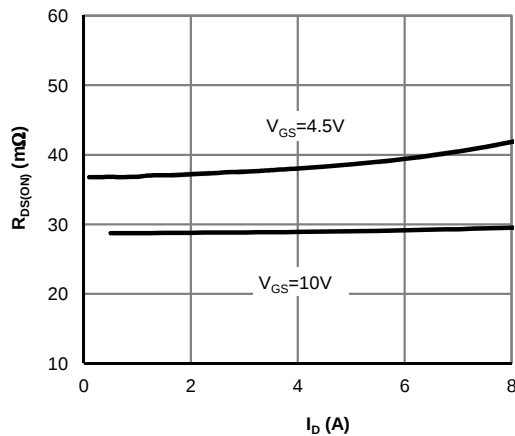


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

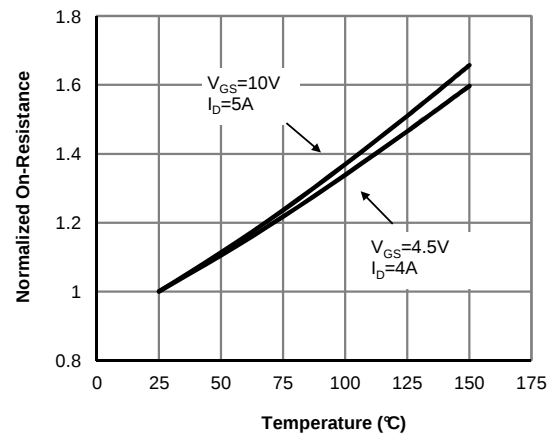


Figure 4: On-Resistance vs. Junction Temperature (Note E)

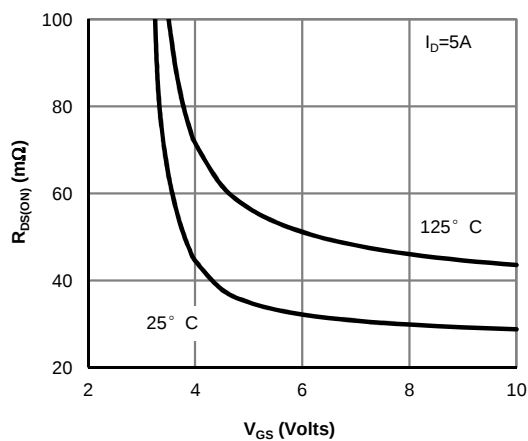


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

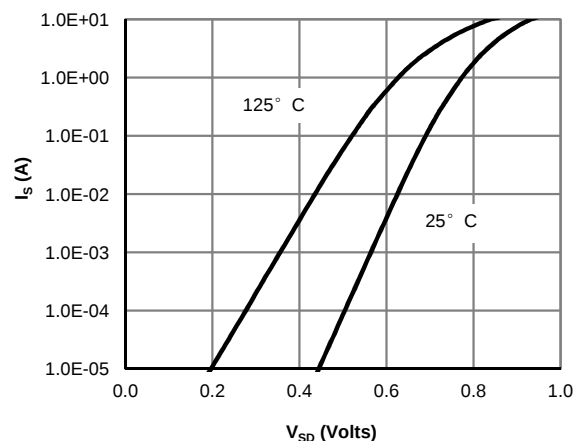


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

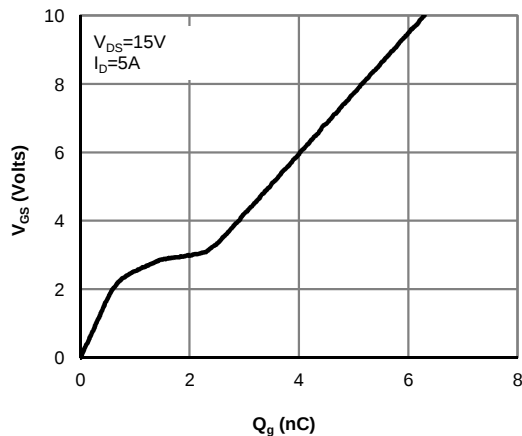


Figure 7: Gate-Charge Characteristics

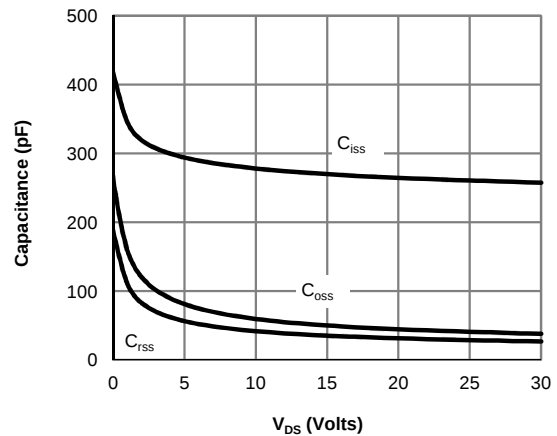


Figure 8: Capacitance Characteristics

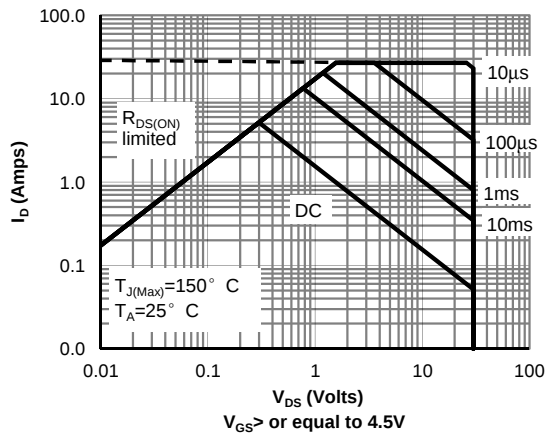


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

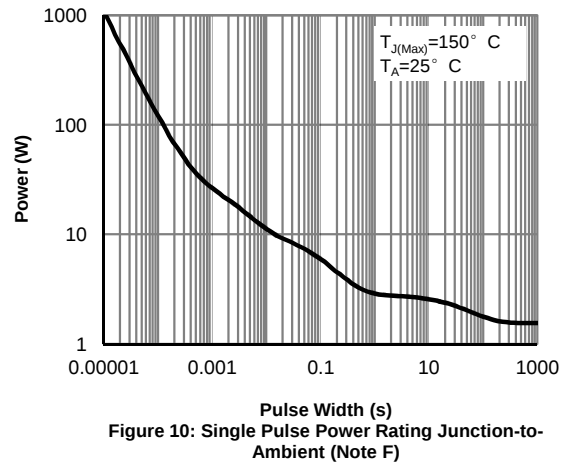


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

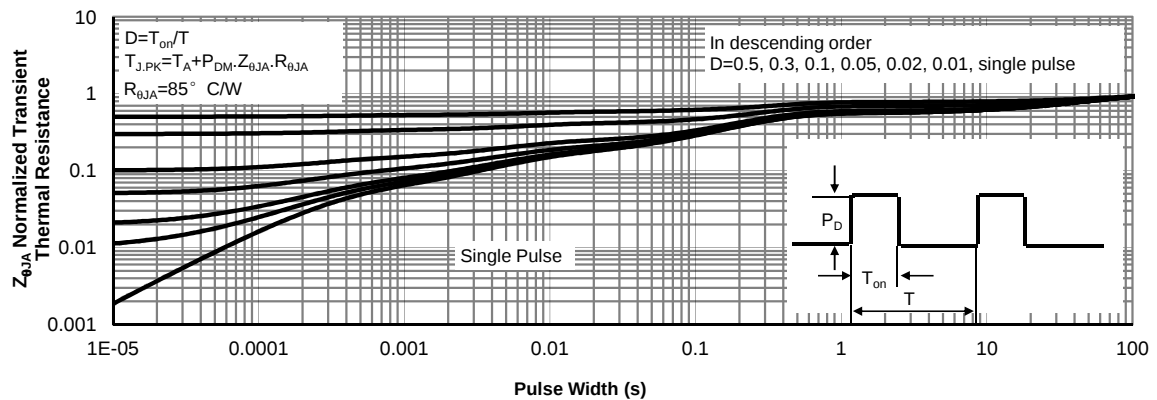
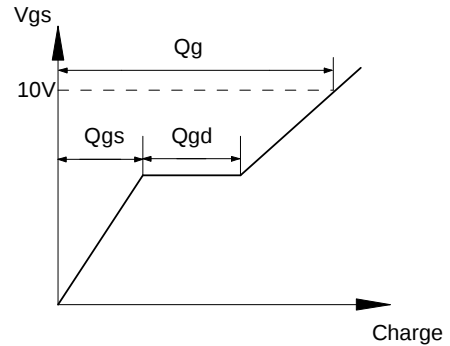
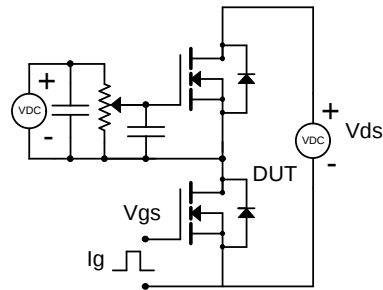
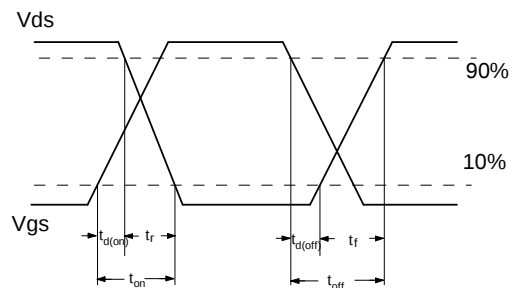
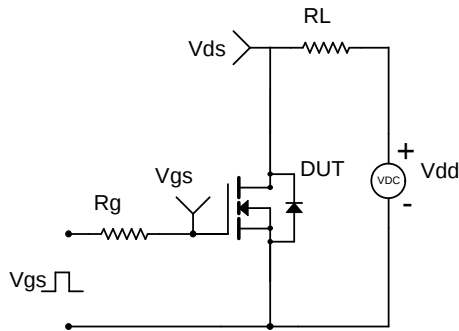


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

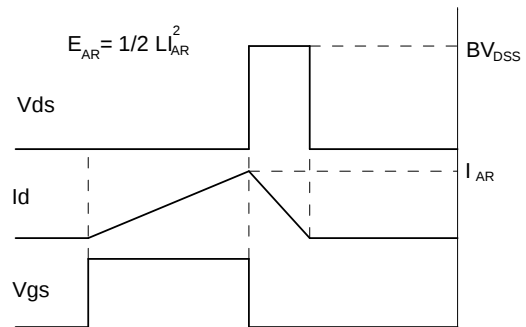
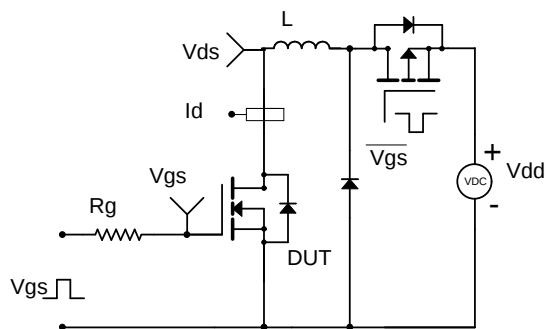
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

