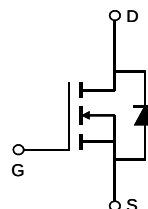


General Description

The AO4404B uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device makes an excellent high side switch for notebook CPU core DGDC conversion.

Features

V_{DS}	30V
I_D (at $V_{GS}=10V$)	8.5A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 24m Ω
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	< 30m Ω
$R_{DS(ON)}$ (at $V_{GS} = 2.5V$)	< 48m Ω



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}	± 12	V
Continuous Drain Current	I_D	8.5	A
		7.1	
Pulsed Drain Current ^C	I_{DM}	60	
Avalanche Current ^C	I_{AS}, I_{AR}	14	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}, E_{AR}	10	mJ
Power Dissipation ^B	P_D	3.1	W
		2	
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 ^A	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A D}		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	$V_{DS}=30\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.65	1.05	1.45	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=8.5\text{A}$ $T_J=125^\circ\text{C}$		17.7 28	24 34	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=8.5\text{A}$		19	30	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=5\text{A}$		24	48	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=8.5\text{A}$		37		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	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		630		pF
C_{oss}	Output Capacitance			75		pF
C_{rss}	Reverse Transfer Capacitance			50		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$	1.5	3	4.5	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=15\text{V}$, $I_D=8.5\text{A}$		6	7	nC
Q_{gs}	Gate Source Charge			1.3		nC
Q_{gd}	Gate Drain Charge			1.8		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.8\Omega$, $R_{GEN}=3\Omega$		3		ns
t_r	Turn-On Rise Time			2.5		ns
$t_{D(off)}$	Turn-Off DelayTime			25		ns
t_f	Turn-Off Fall Time			4		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=8.5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		8.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=8.5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		2.6		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 1in² 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

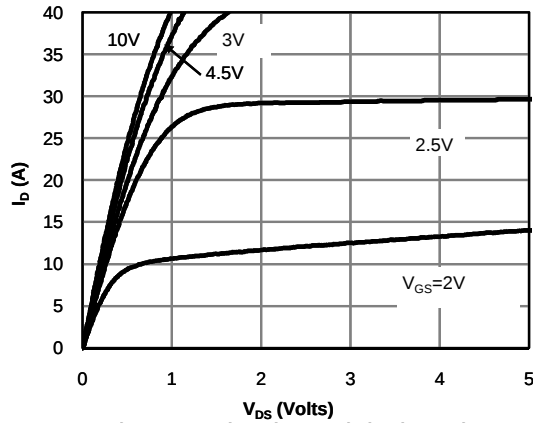


Fig 1: On-Region Characteristics (Note E)

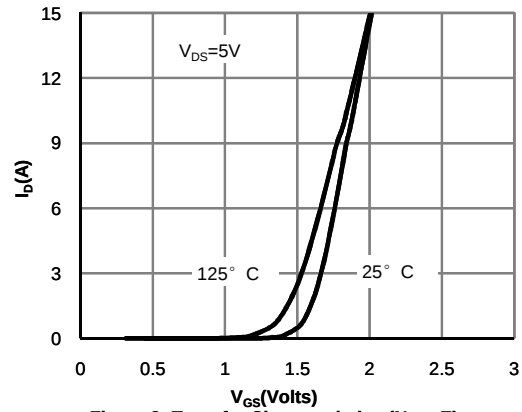


Figure 2: Transfer Characteristics (Note E)

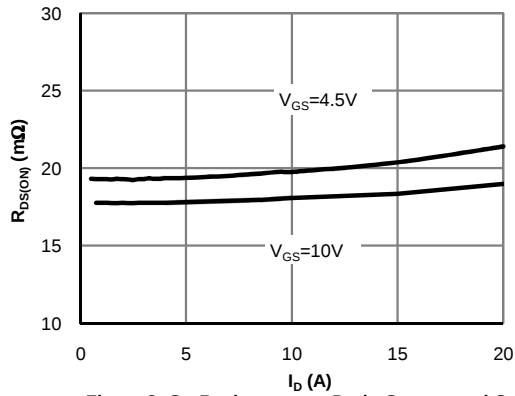


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

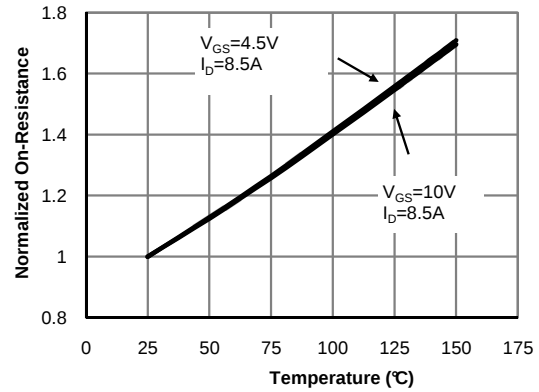


Figure 4: On-Resistance vs. Junction Temperature (Note E)

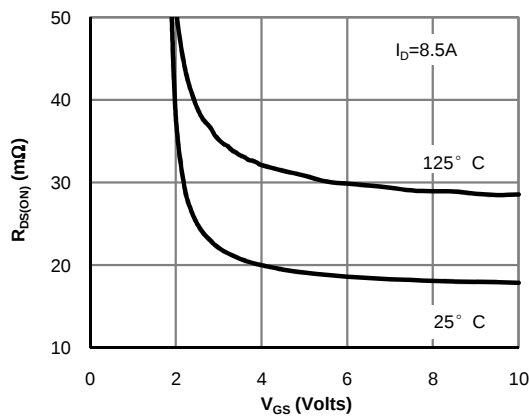


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

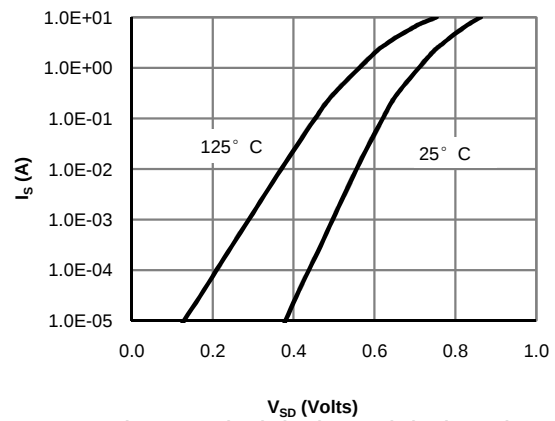


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

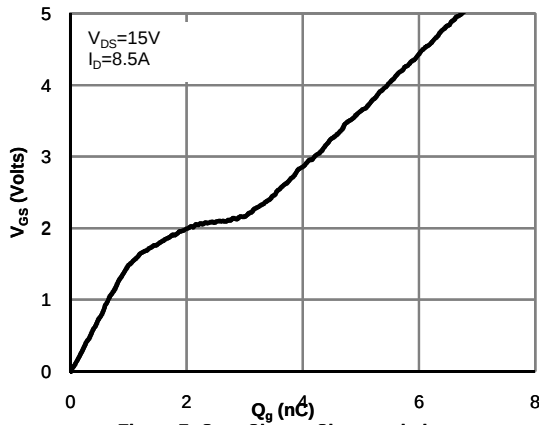


Figure 7: Gate-Charge Characteristics

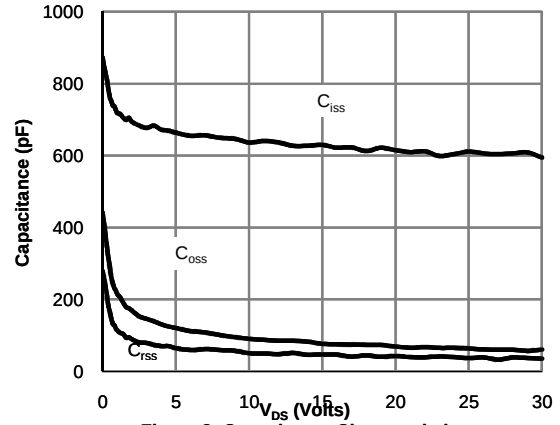


Figure 8: Capacitance Characteristics

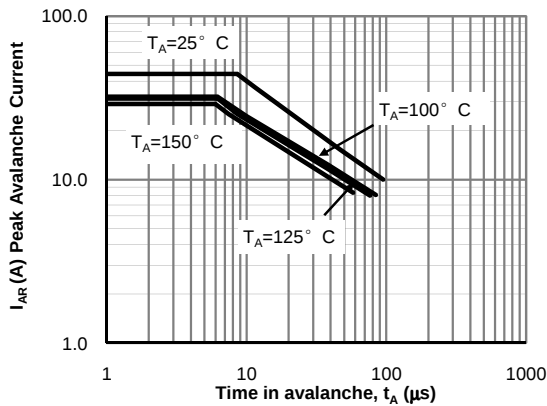


Figure 9: Single Pulse Avalanche capability (Note C)

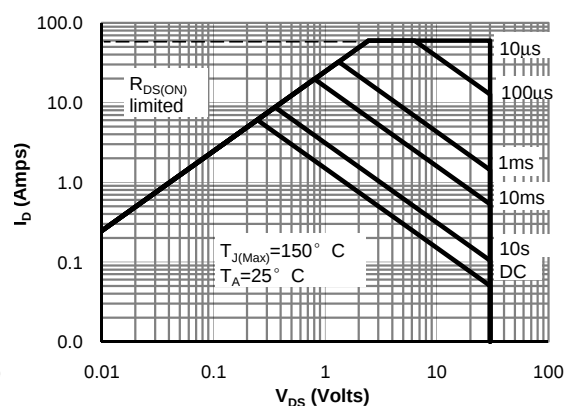


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

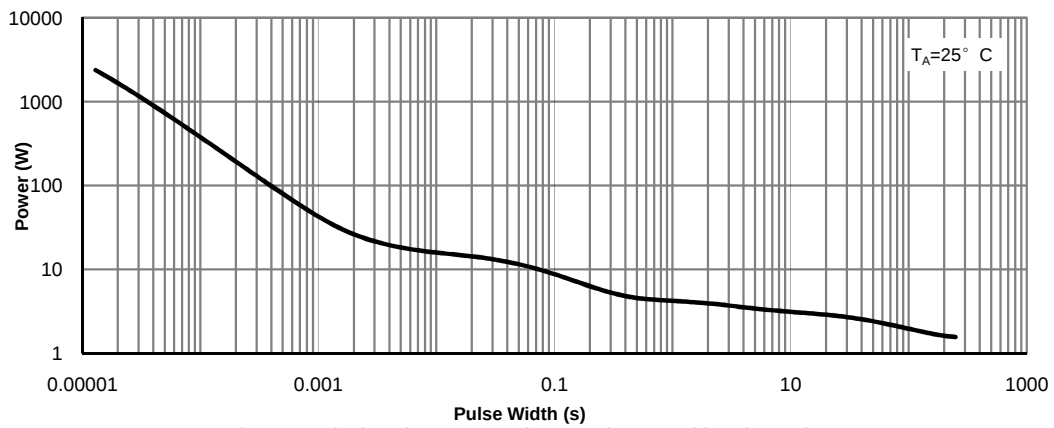
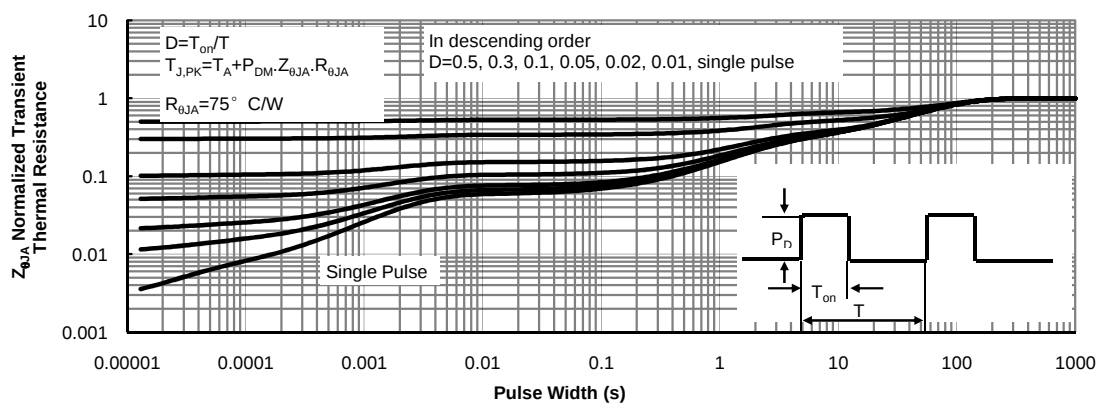
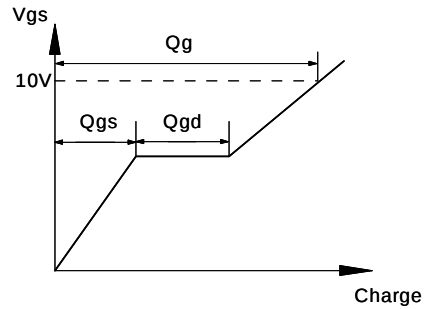
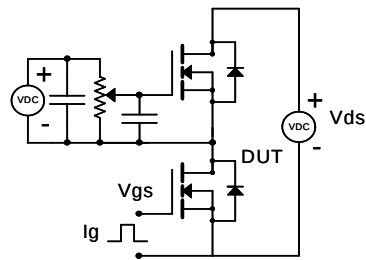


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

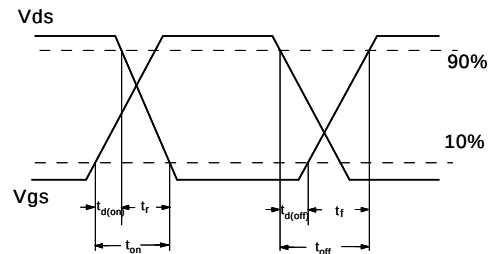
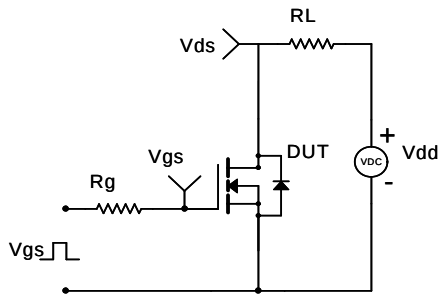
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



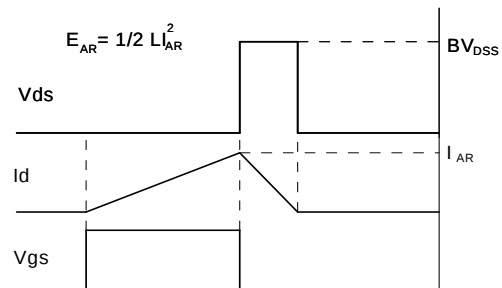
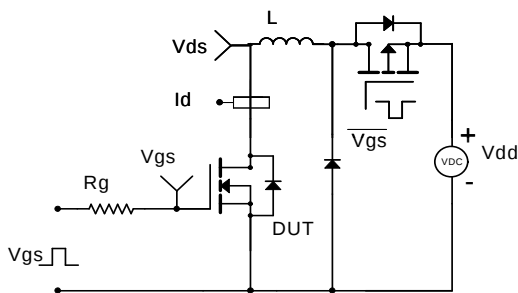
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

