

## General Description

The AO5404E uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

-RoHS compliant

## Features

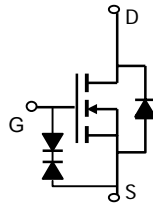
$V_{DS} = 20V$

$I_D = 0.5 A (V_{GS} = 4.5V)$

$R_{DS(ON)} < 0.55 \Omega (V_{GS} = 4.5V)$

$R_{DS(ON)} < 0.68 \Omega (V_{GS} = 2.5V)$

$R_{DS(ON)} < 0.80 \Omega (V_{GS} = 1.8V)$



### Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	$V_{DS}$	20		V
Gate-Source Voltage	$V_{GS}$	$\pm 8$		V
Continuous Drain Current <sup>A, F</sup>	$I_D$	$T_A=25^\circ C$	0.5	A
		$T_A=70^\circ C$	0.45	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	3		
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	0.38	W
		$T_A=70^\circ C$	0.24	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150		$^\circ C$

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	275	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	360	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	300	350	$^\circ C/W$

**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	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±4.5V			±1	μA
		V <sub>DS</sub> =0V, V <sub>GS</sub> =±8V			±100	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.45	0.6	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	3			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A T <sub>J</sub> =125°C		0.395 0.6	0.55 0.85	Ω
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =0.5A		0.479	0.68	Ω
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.3A		0.578	0.8	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =0.5A		1.5		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =0.1A, V <sub>GS</sub> =0V		0.65	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				0.4	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		35	45	pF
C <sub>oss</sub>	Output Capacitance		8		pF	
C <sub>rss</sub>	Reverse Transfer Capacitance		6		pF	
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =0.5A		0.63	1	nC
Q <sub>gs</sub>	Gate Source Charge		0.08		nC	
Q <sub>gd</sub>	Gate Drain Charge		0.16		nC	
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =50Ω, R <sub>GEN</sub> =3Ω		4.5		ns
t <sub>r</sub>	Turn-On Rise Time		3.3		ns	
t <sub>D(off)</sub>	Turn-Off Delay Time		78		ns	
t <sub>f</sub>	Turn-Off Fall Time		32		ns	
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =0.5A, dI/dt=100A/μs		8	10	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =0.5A, dI/dt=100A/μs		2		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. The current rating is based on the t ≤ 10s thermal resistance rating.

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

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

D: The static characteristics in Figures 1 to 6,12,14 are obtained using <300μs 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<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

F: The maximum current rating is limited by bond-wires

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

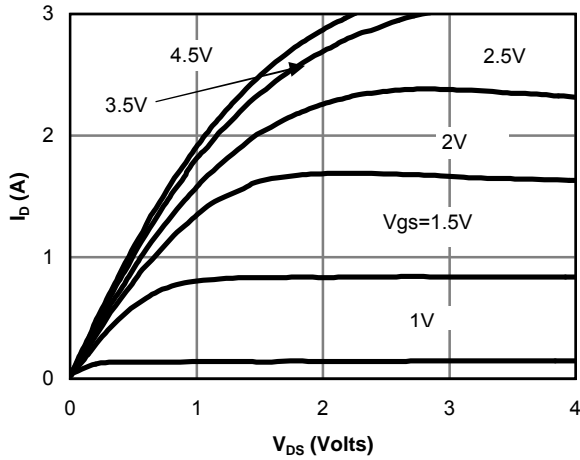


Figure 1: On-Region Characteristics

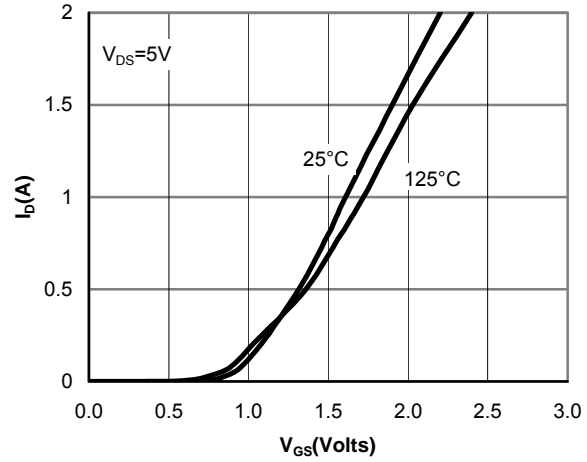


Figure 2: Transfer Characteristics

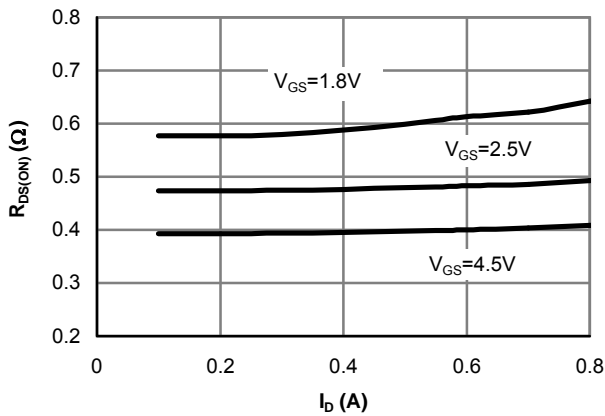


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

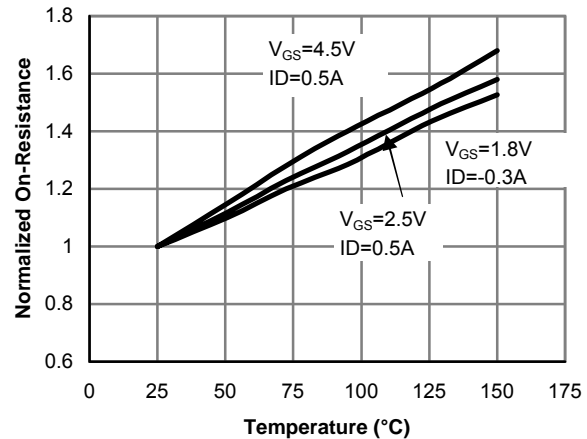


Figure 4: On-Resistance vs. Junction Temperature

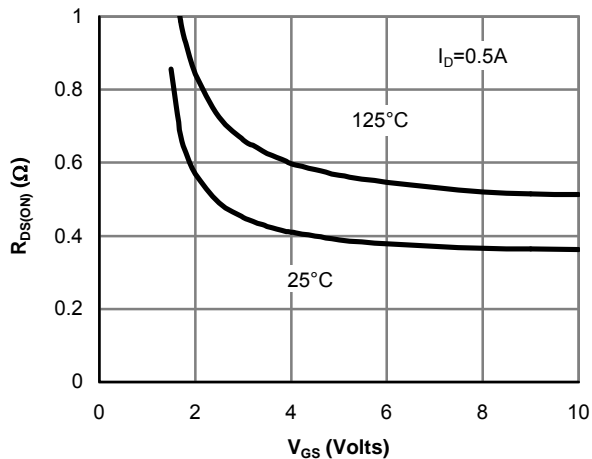


Figure 5: On-Resistance vs. Gate-Source Voltage

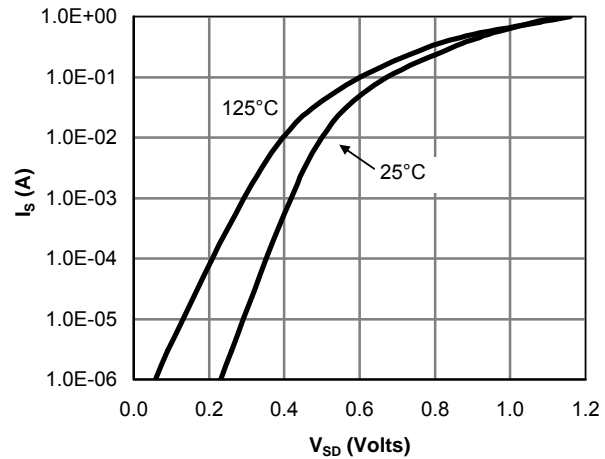


Figure 6: Body-Diode Characteristics

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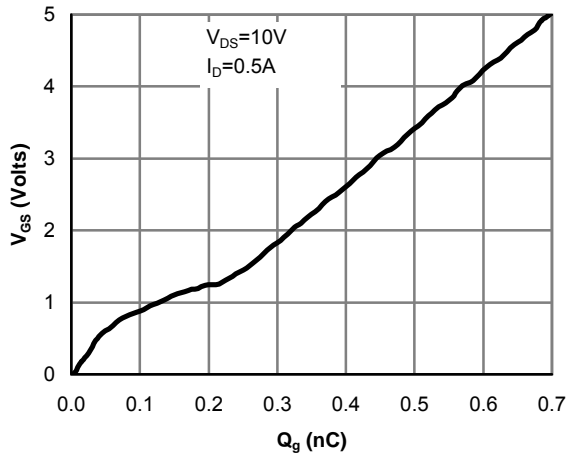


Figure 7: Gate-Charge Characteristics

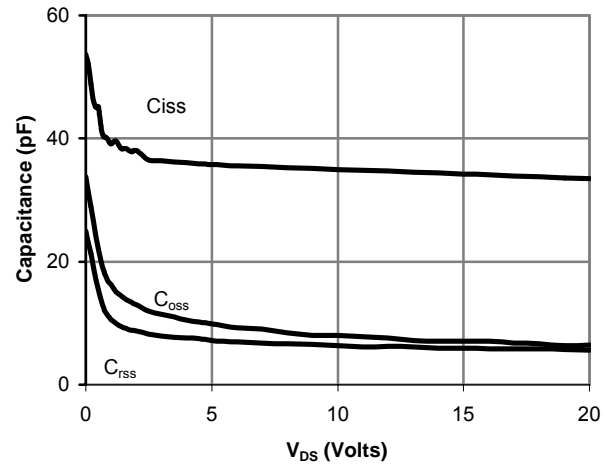


Figure 8: Capacitance Characteristics

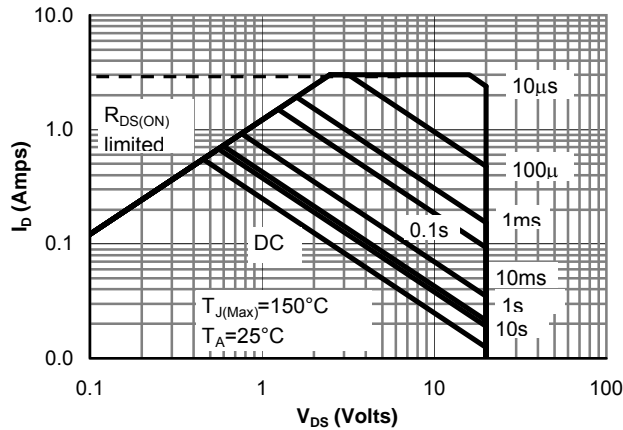


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

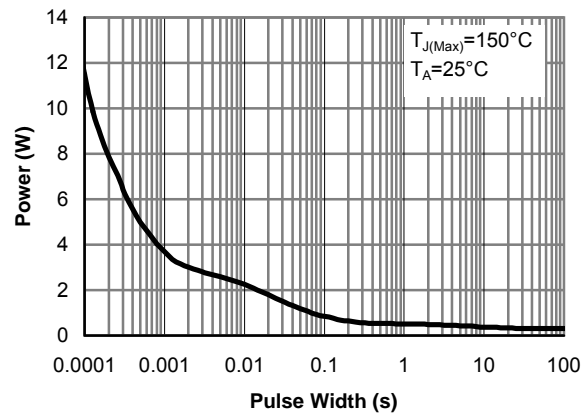


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

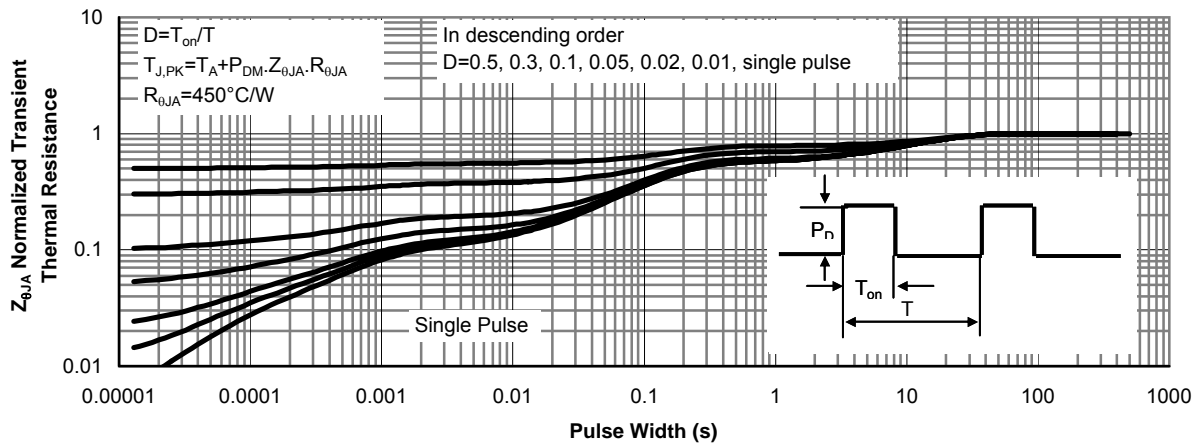


Figure 11: Normalized Maximum Transient Thermal Impedance