

AO5404E
N-Channel Enhancement Mode Field Effect Transistor
General Description

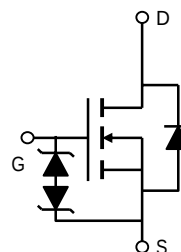
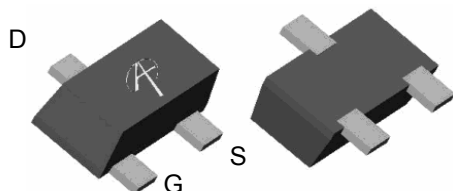
The AO5404E/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. AO5404E and AO5404EL are electrically identical.

- RoHS compliant
- AO5404EL is Halogen Free

Features

$V_{DS} (V) = 20V$
 $I_D = 0.5 A (V_{GS} = 4.5V)$
 $R_{DS(ON)} < 0.55 \Omega (V_{GS} = 4.5V)$
 $R_{DS(ON)} < 0.68 \Omega (V_{GS} = 2.5V)$
 $R_{DS(ON)} < 0.80 \Omega (V_{GS} = 1.8V)$

ESD PROTECTED!

SC89-3L

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}	± 8		V
Continuous Drain Current ^{A, F}	$T_A=25^\circ C$	0.5	0.5	A
	$T_A=70^\circ C$	0.5	0.45	
Pulsed Drain Current ^B	I_{DM}	3		
Power Dissipation ^A	$T_A=25^\circ C$	0.38	0.28	W
	$T_A=70^\circ C$	0.24	0.18	
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 ^A	$R_{\theta JA}$	275	330	$^\circ C/W$
Maximum Junction-to-Ambient ^A		360	450	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	300	350	$^\circ C/W$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =20V, V _{GS} =0V			1	μA
		T _J =55°C			5	
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±4.5V			±1	μA
		V _{DS} =0V, V _{GS} =±8V			±100	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	0.45	0.6	1	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	3			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =4.5V, I _D =0.5A		0.395	0.55	Ω
		T _J =125°C		0.6	0.85	
		V _{GS} =2.5V, I _D =0.5A		0.479	0.68	Ω
		V _{GS} =1.8V, I _D =0.3A		0.578	0.8	Ω
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =0.5A		1.5		S
V _{SD}	Diode Forward Voltage	I _S =0.1A,V _{GS} =0V		0.65	1	V
I _S	Maximum Body-Diode Continuous Current				0.4	A
DYNAMIC PARAMETERS						
C _{iSS}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, f=1MHz		35	45	pF
C _{oss}	Output Capacitance			8		pF
C _{rSS}	Reverse Transfer Capacitance			6		pF
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =0.5A		0.63	1	nC
Q _{gs}	Gate Source Charge			0.08		nC
Q _{gd}	Gate Drain Charge			0.16		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =5V, V _{DS} =10V, R _L =50Ω, R _{GEN} =3Ω		4.5		ns
t _r	Turn-On Rise Time			3.3		ns
t _{D(off)}	Turn-Off DelayTime			78		ns
t _f	Turn-Off Fall Time			32		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =0.5A, dI/dt=100A/μs		8	10	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =0.5A, dI/dt=100A/μs		2		nC

A: The value of R_{θJA} is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=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_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using <300 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=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

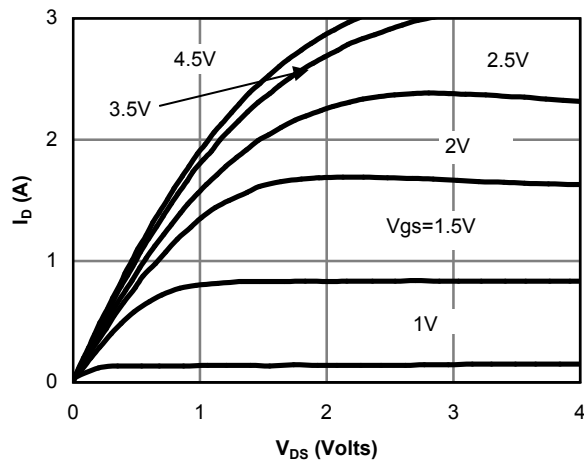


Figure 1: On-Region Characteristics

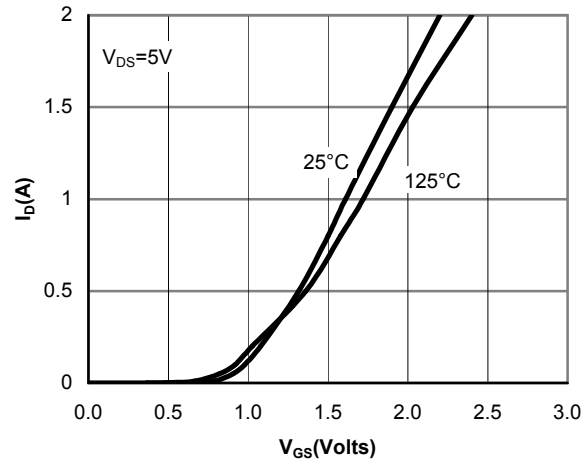


Figure 2: Transfer Characteristics

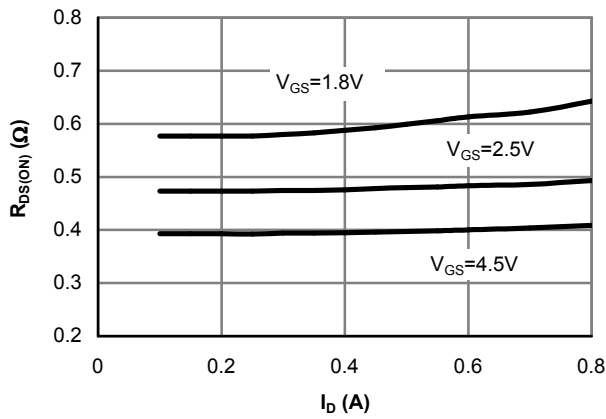


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

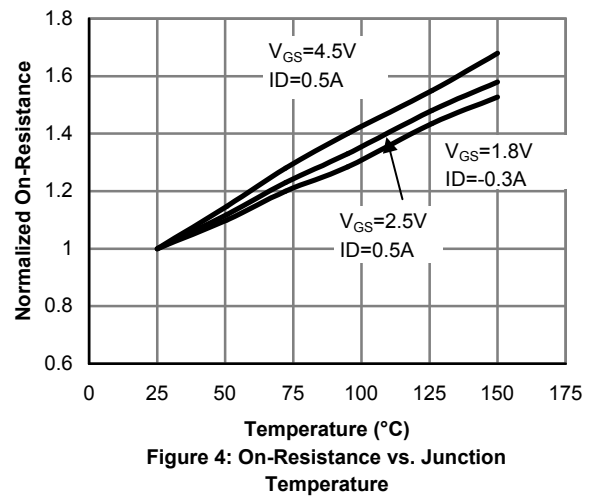


Figure 4: On-Resistance vs. Junction Temperature

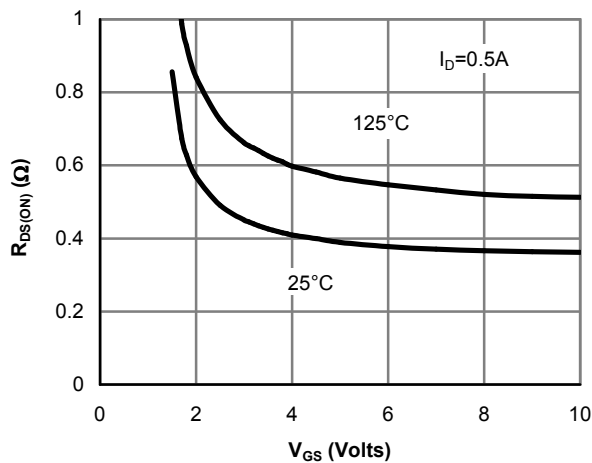


Figure 5: On-Resistance vs. Gate-Source Voltage

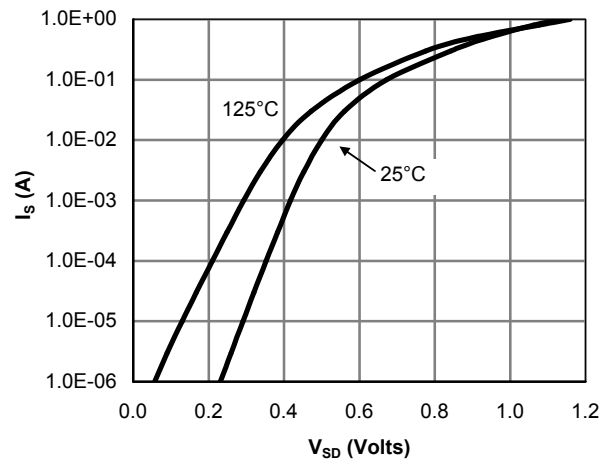


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

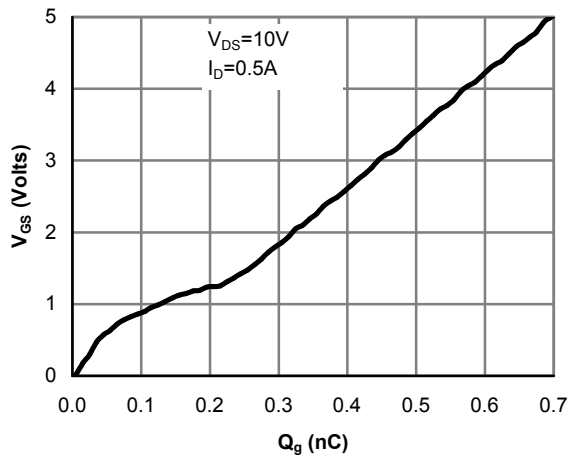


Figure 7: Gate-Charge Characteristics

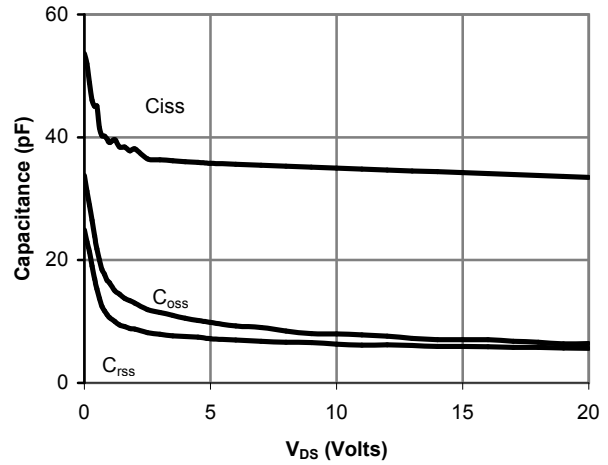


Figure 8: Capacitance Characteristics

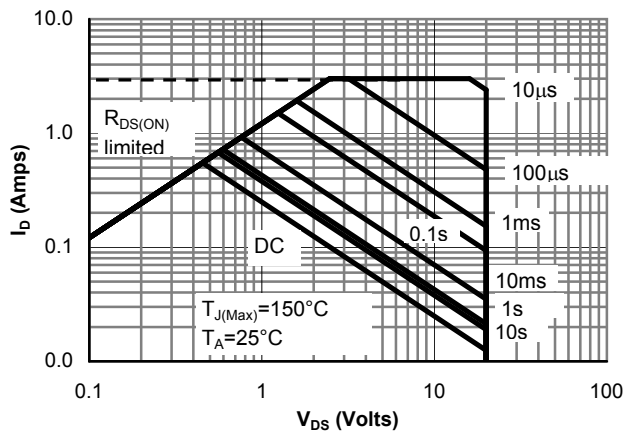


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

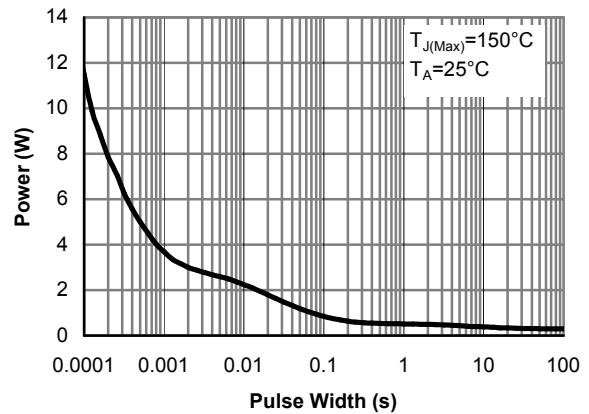


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

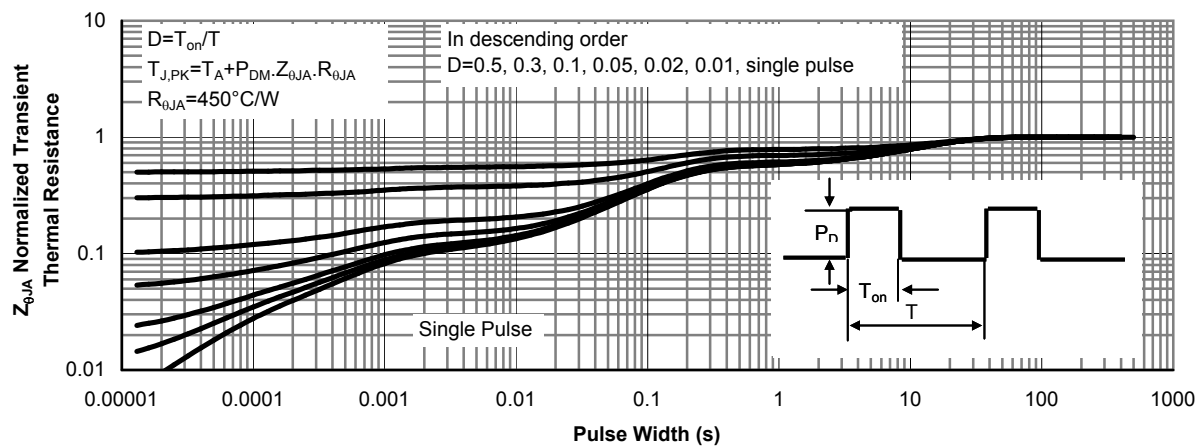
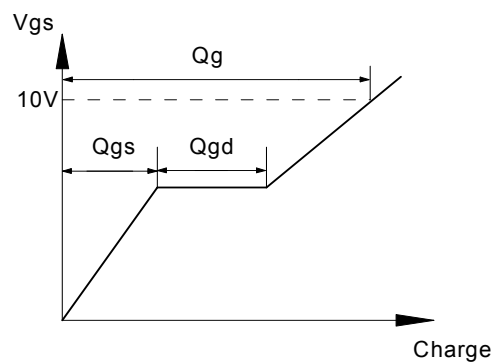
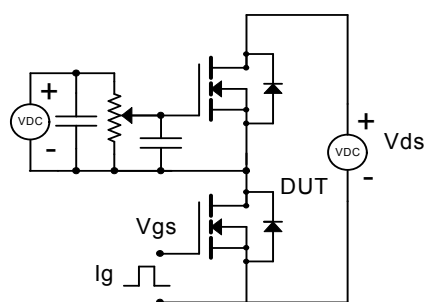
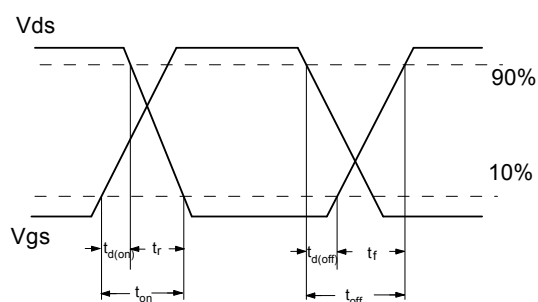
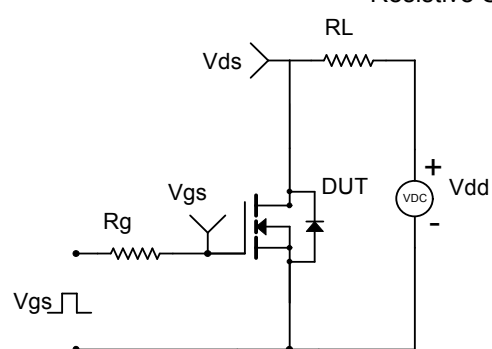


Figure 11: Normalized Maximum Transient Thermal Impedance

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

