

### General Description

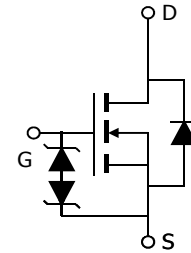
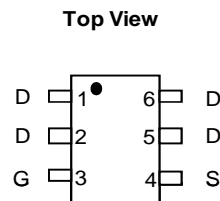
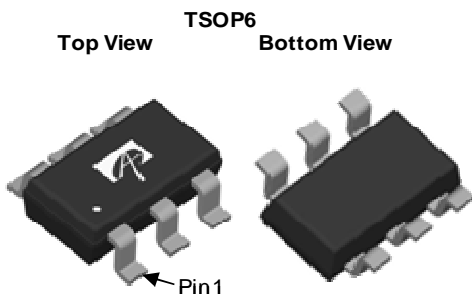
- The AO6404 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V  $V_{GS(MAX)}$  rating.
- RoHS and Halogen-Free Compliant

### Product Summary

$V_{DS} (V) = 20V$   
 $I_D = 8.6A (V_{GS} = 10V)$   
 $R_{DS(ON)} < 17m\Omega (V_{GS} = 10V)$   
 $R_{DS(ON)} < 18m\Omega (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 24m\Omega (V_{GS} = 2.5V)$   
 $R_{DS(ON)} < 33m\Omega (V_{GS} = 1.8V)$

ESD Rating: 2000V HBM

ESD Protected  
 100% UIS Tested  
 100% Rg Tested



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AO6404	TSOP6	Tape & Reel	3000

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	8.6	A
	$T_A=70^\circ\text{C}$	6.8	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	30	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	2	W
	$T_A=70^\circ\text{C}$	1.28	
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>	$R_{\theta JA}$	45	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	70	110
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	33	50	$^\circ\text{C/W}$

**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	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			10 25	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			10	μA
BV <sub>GSO</sub>	Gate-Source Breakdown Voltage	V <sub>DS</sub> =0V, I <sub>G</sub> =±250μA	±12			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.5	0.75	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	30			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =8.5A T <sub>J</sub> =125°C		13.4	17	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A		14.8	18	
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =4A		18.8	24	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =3A		25.5	33	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =8A		36		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.73	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2.9	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		1810	2200	pF
C <sub>oss</sub>	Output Capacitance			232		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			200		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.6	2.2	Ω
<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> =8.5A		17.9	22	nC
Q <sub>gs</sub>	Gate Source Charge			1.5		nC
Q <sub>gd</sub>	Gate Drain Charge			4.7		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.2Ω, R <sub>GEN</sub> =3Ω		2.5		ns
t <sub>r</sub>	Turn-On Rise Time			7.2		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			49		ns
t <sub>f</sub>	Turn-Off Fall Time			10.8		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =8.5A, di/dt=100A/μs		22	27	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =8.5A, di/dt=100A/μs		9.8		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 80 μs 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

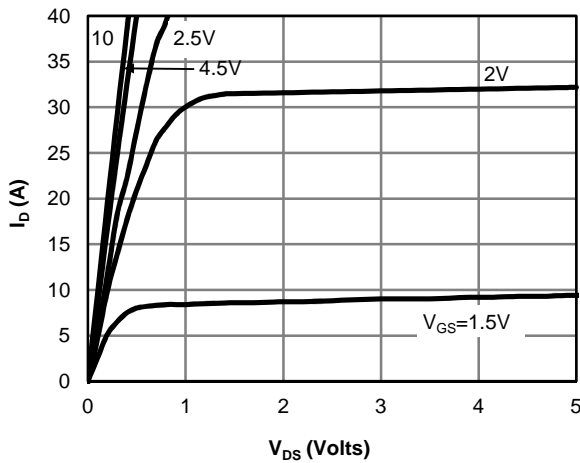


Fig 1: On-Region Characteristics

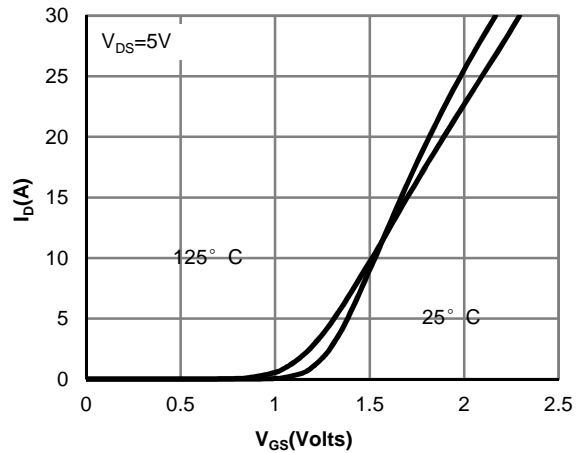


Figure 2: Transfer Characteristics

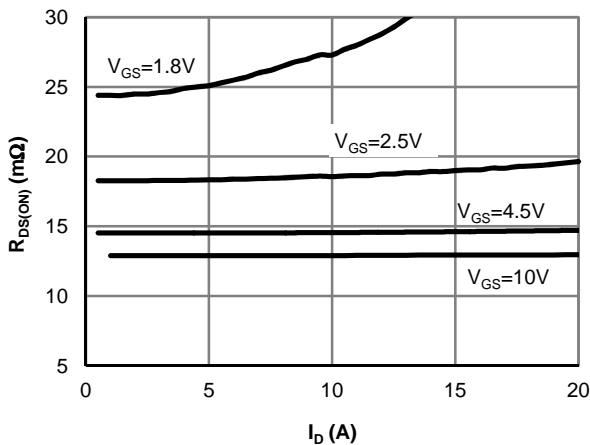


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

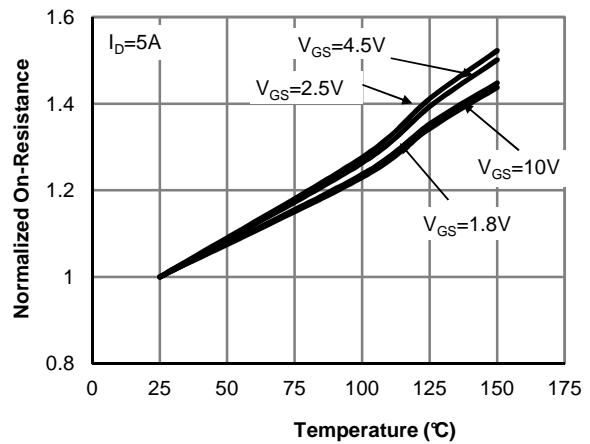


Figure 4: On-Resistance vs. Junction Temperature

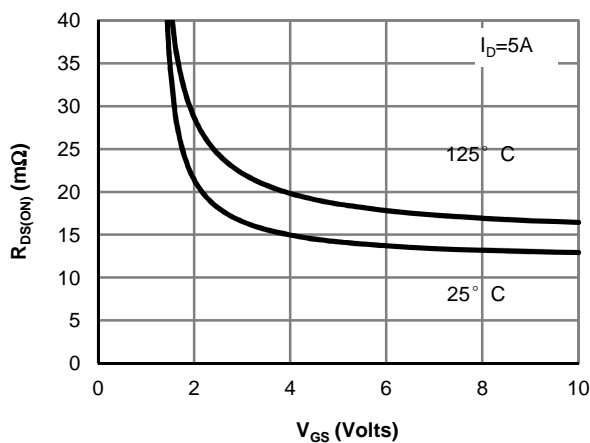


Figure 5: On-Resistance vs. Gate-Source Voltage

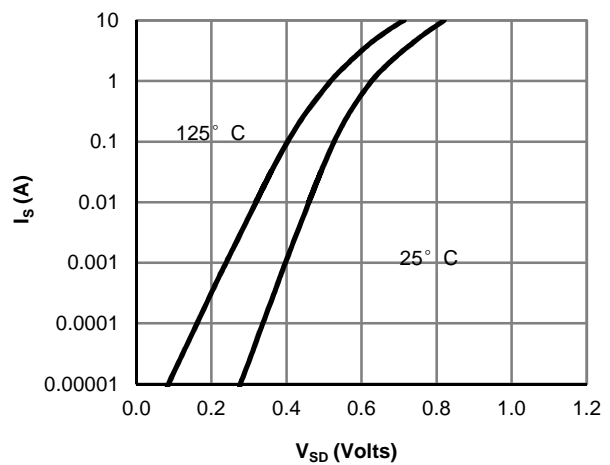


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

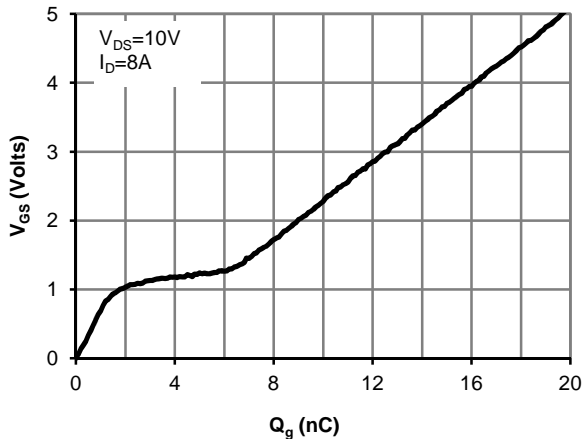


Figure 7: Gate-Charge Characteristics

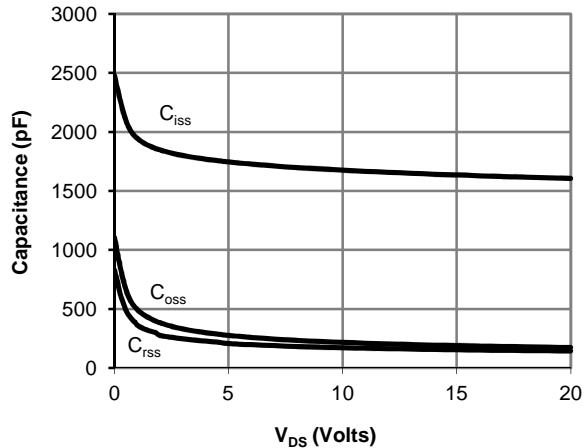


Figure 8: Capacitance Characteristics

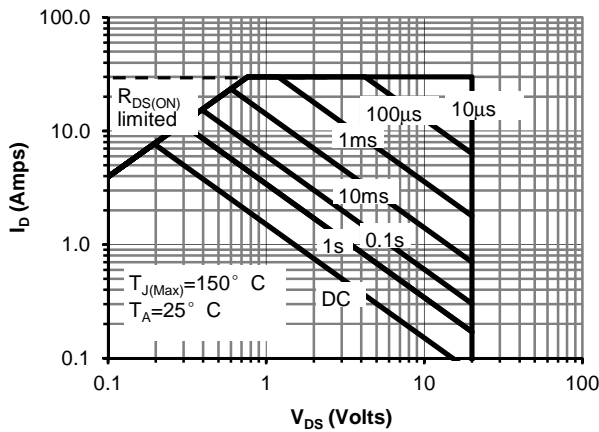


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

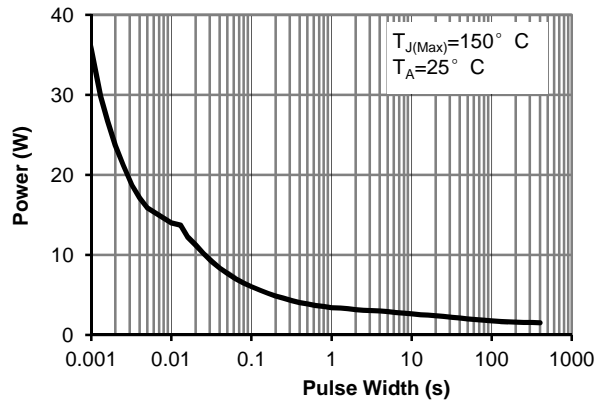


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

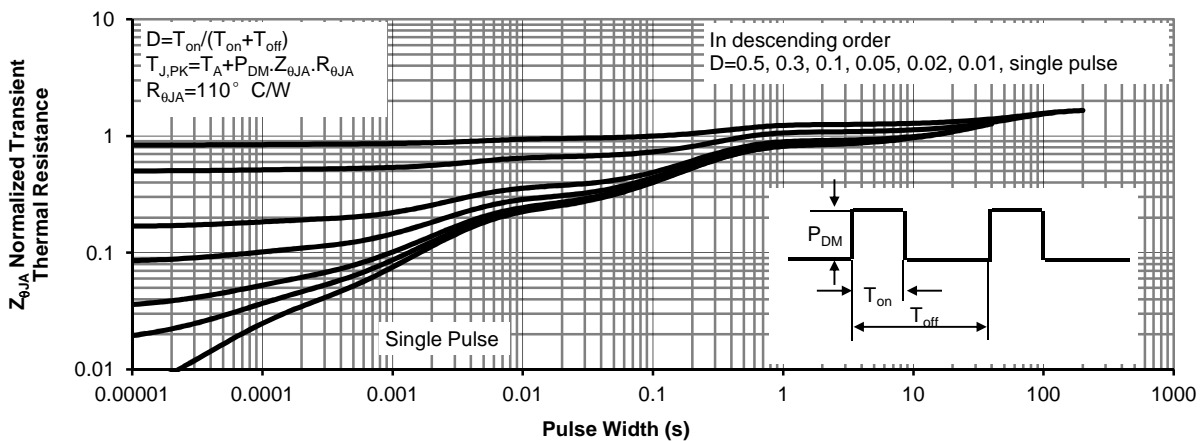


Figure 11: Normalized Maximum Transient Thermal Impedance

Figure A: Gate Charge Test Circuit & Waveforms

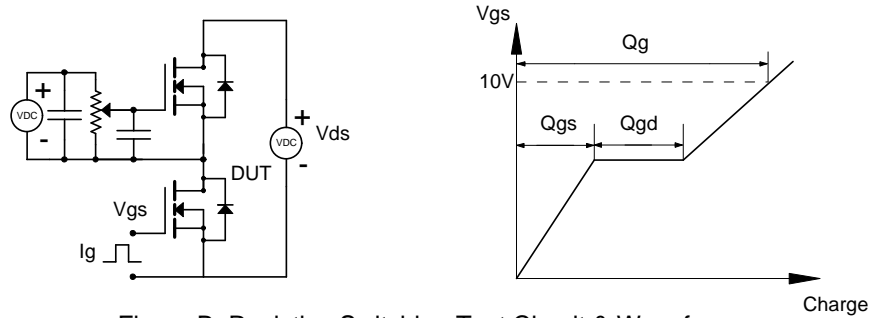


Figure B: Resistive Switching Test Circuit & Waveforms

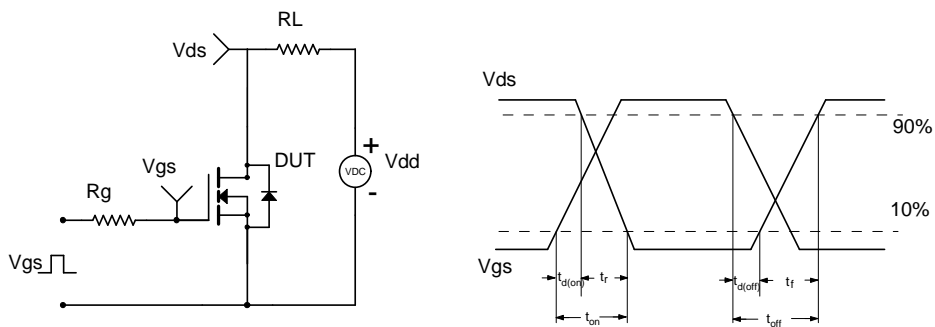


Figure C: Unclamped Inductive Switching (UIS) Test Circuit &

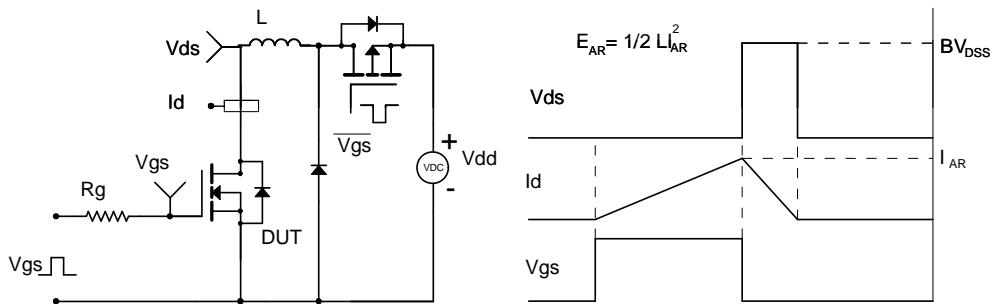
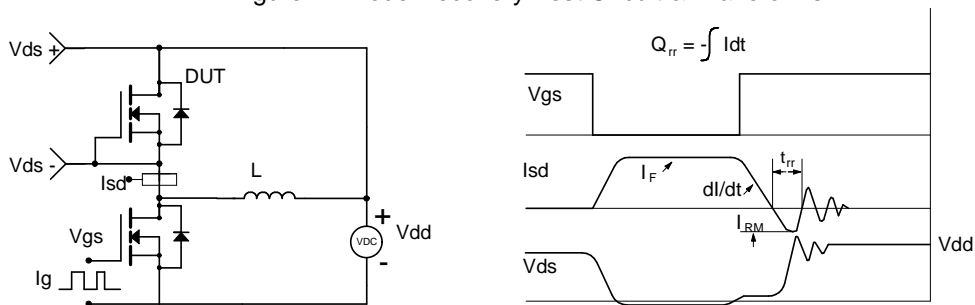


Figure D: Diode Recovery Test Circuit & Waveforms



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