



**ALPHA & OMEGA**  
SEMICONDUCTOR



## AOT404

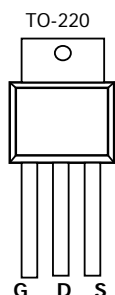
### N-Channel Enhancement Mode Field Effect Transistor

#### General Description

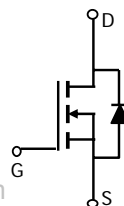
The AOT404 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in high voltage synchronous rectification, load switching and general purpose applications. *Standard Product AOT404 is Pb-free (meets ROHS & Sony 259 specifications). AOT404L is a Green Product ordering option. AOT404 and AOT404L are electrically identical.*

#### Features

$V_{DS}$  (V) = 105V  
 $I_D$  = 40 A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 28 \text{ m}\Omega$  ( $V_{GS}$  = 10V) @ 20A  
 $R_{DS(ON)} < 31 \text{ m}\Omega$  ( $V_{GS}$  = 6V)



Top View  
Drain Connected  
to Tab



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	105	V
Gate-Source Voltage	$V_{GS}$	$\pm 25$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	A
		$T_C=100^\circ\text{C}$	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	100	A
Avalanche Current <sup>C</sup>	$I_{AR}$	20	A
Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AR}$	200	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	W
		$T_C=100^\circ\text{C}$	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	$^\circ\text{C}$

#### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	50	60	$^\circ\text{C/W}$
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	1	1.5	$^\circ\text{C/W}$

## AOT404

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	$I_D=10\text{mA}$ , $V_{GS}=0\text{V}$	105			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=84\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	$\mu\text{A}$
					5	
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 25\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	2.5	3.2	4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=20\text{A}$ $T_J=125^\circ\text{C}$		21.5	28	m $\Omega$
				44	53	
					24	31
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=20\text{A}$		50		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.73	1	V
$I_S$	Maximum Body-Diode Continuous Current				55	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=25\text{V}$ , $f=1\text{MHz}$		2038	2445	pF
$C_{oss}$	Output Capacitance			204		pF
$C_{riss}$	Reverse Transfer Capacitance			85		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		1.3	1.56	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=50\text{V}$ , $I_D=30\text{A}$		38.5	46	nC
$Q_{gs}$	Gate Source Charge			7.7		nC
$Q_{gd}$	Gate Drain Charge			13.4		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$ , $V_{DS}=50\text{V}$ , $R_L=2.7\Omega$ , $R_{GEN}=3\Omega$		12.7		ns
$t_r$	Turn-On Rise Time			8.2		ns
$t_{D(off)}$	Turn-Off Delay Time			31.5		ns
$t_f$	Turn-Off Fall Time			11.2		ns
$t_{rr}$	Body Diode Reverse Recovery Time		$I_F=30\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		61.6	74
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=30\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		172.4		nC

A: The value of  $R_{\theta JA}$  is measured with the device in a still air environment with  $T_A=25^\circ\text{C}$ .

B: The power dissipation  $P_D$  is based on  $T_{J(MAX)}=175^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=175^\circ\text{C}$ .

D: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)}=175^\circ\text{C}$ .

G: The maximum current rating is limited by bond-wires.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

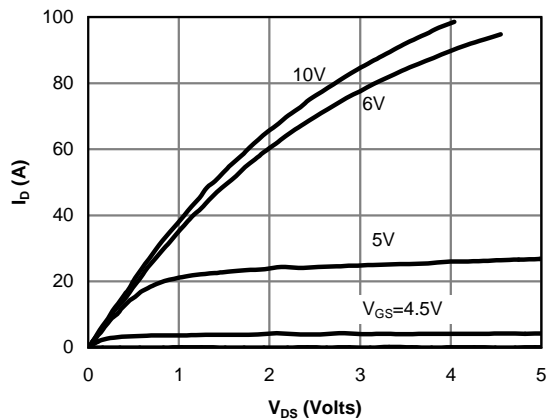


Fig 1: On-Region Characteristics

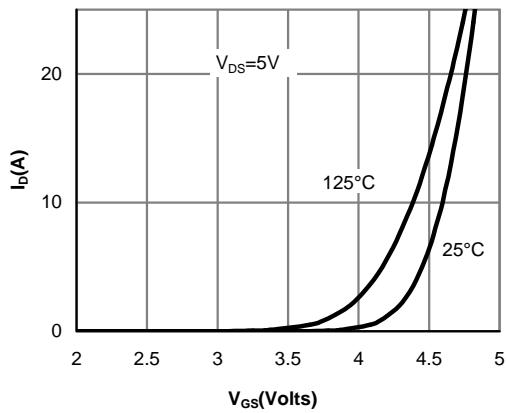


Figure 2: Transfer Characteristics

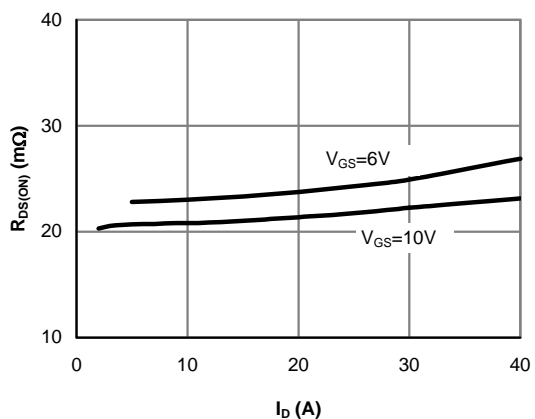


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

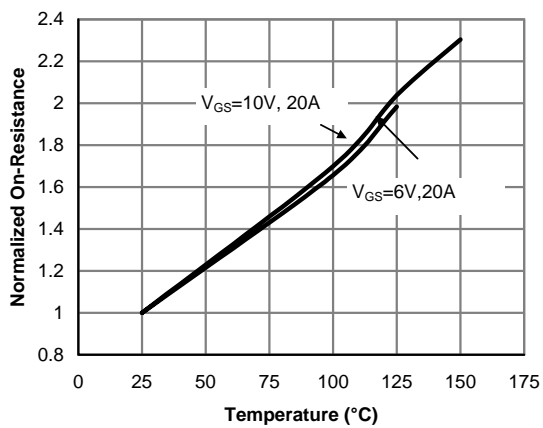


Figure 4: On-Resistance vs. Junction Temperature

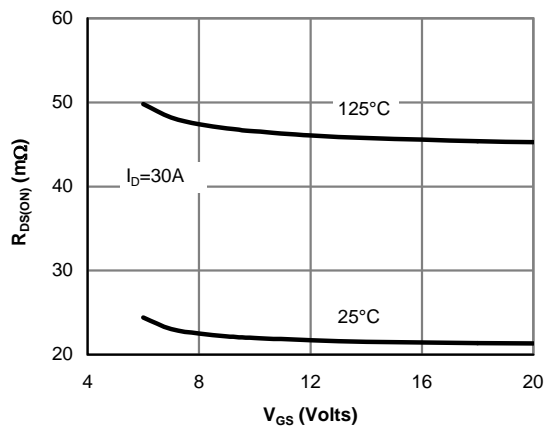


Figure 5: On-Resistance vs. Gate-Source Voltage

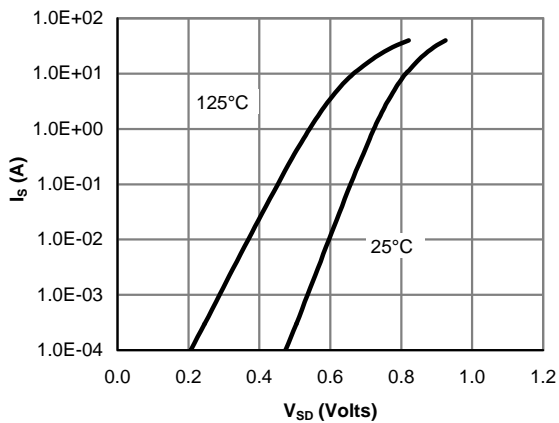


Figure 6: Body-Diode Characteristics

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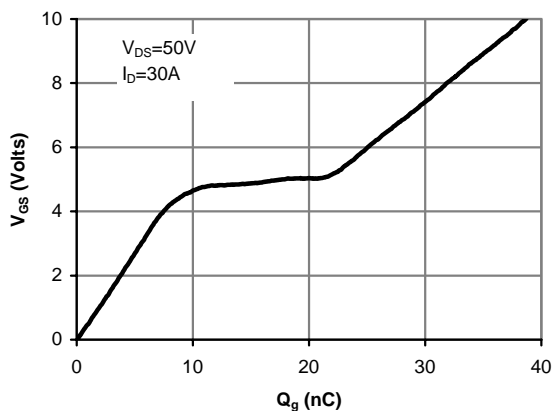


Figure 7: Gate-Charge Characteristics

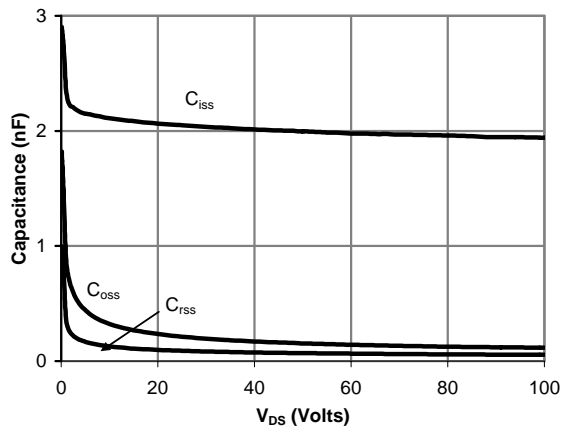


Figure 8: Capacitance Characteristics

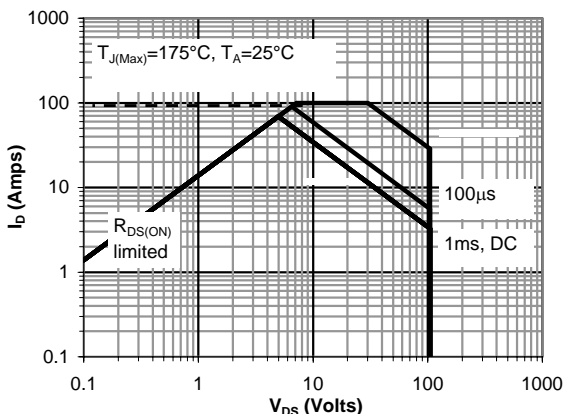


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

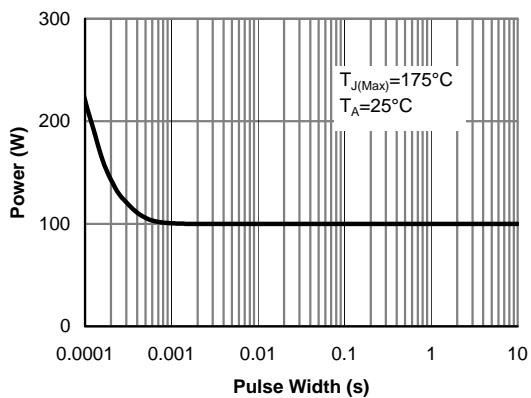


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

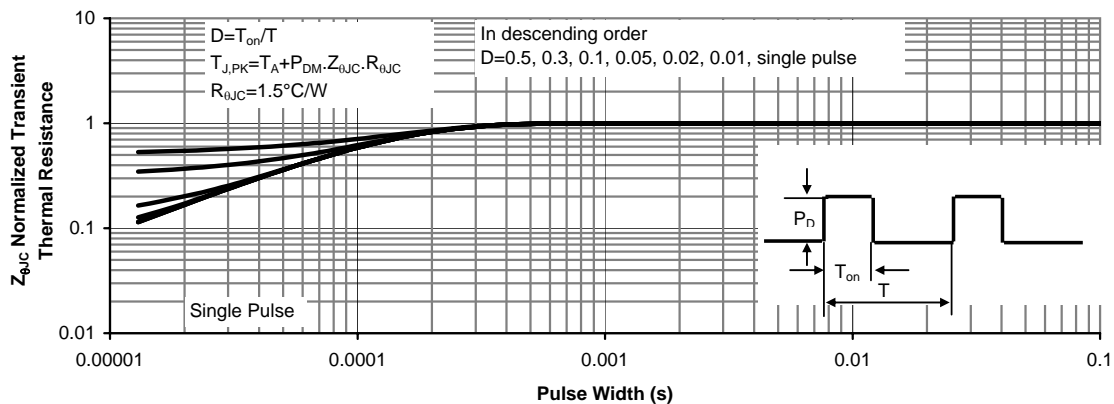


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

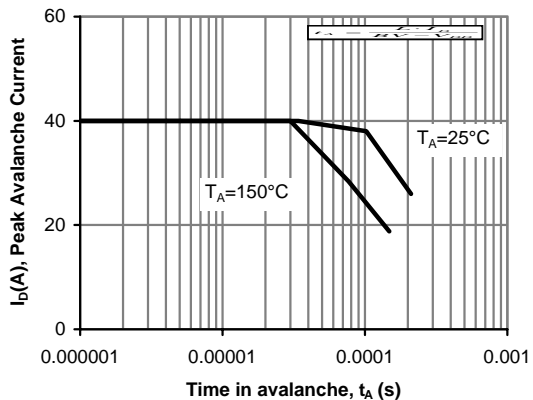


Figure 12: Single Pulse Avalanche capability

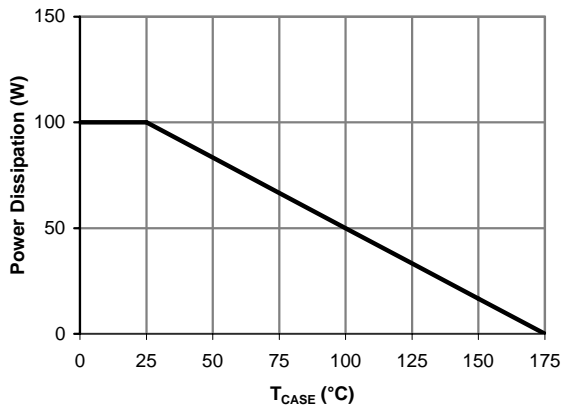


Figure 13: Power De-rating (Note B)

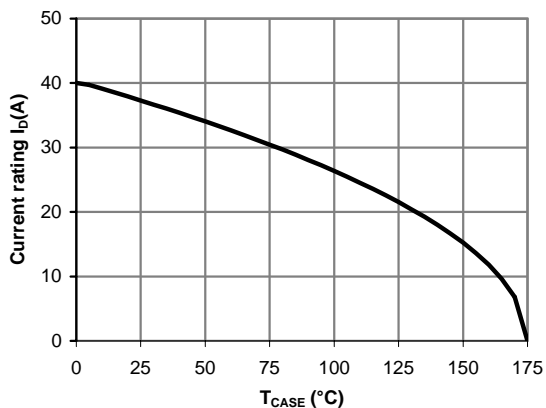


Figure 14: Current De-rating (Note B)

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