ALPHA & OMEGA
SEMICONDUCTOR

AOT404
N-Channel Enhancement Mode Field Effect Transistor

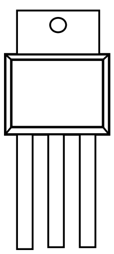
General Description

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

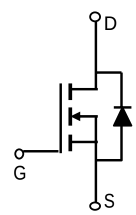
V_{DS} (V) = 105V
I_D = 40 A (V_{GS} =10V)
$R_{DS(ON)}$ < 28 mΩ (V_{GS} =10V) @ 20A
$R_{DS(ON)}$ < 31 mΩ (V_{GS} = 6V)

TO-220



G D S

Top View
Drain Connected
to Tab



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	105	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current	T_C=25°C	I_D	40	A
	T_C=100°C		28	
Pulsed Drain Current [C]		I_{DM}	100	
Avalanche Current [C]		I_{AR}	20	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}	200	mJ
Power Dissipation [B]	T_C=25°C	P_D	100	W
	T_C=100°C		50	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	Steady-State	$R_{\theta JA}$	50	60	°C/W
Maximum Junction-to-Case [B]	Steady-State	$R_{\theta JC}$	1	1.5	°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=10mA, V_{GS}=0V		105			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=84V, V_{GS}=0V				1	µA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±25V				100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=250µA		2.5	3.2	4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			21.5	28	mΩ
			T_J=125°C		44	53	
		V_{GS}=6V, I_D=20A			24	31	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			50		S
V_{SD}	Diode Forward Voltage	I_S=1A, V_{GS}=0V			0.73	1	V
I_S	Maximum Body-Diode Continuous Current					55	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz			2038	2445	pF
C_{oss}	Output Capacitance				204		pF
C_{rss}	Reverse Transfer Capacitance				85		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			1.3	1.56	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=50V, I_D=30A			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 DelayTime	V_{GS}=10V, V_{DS}=50V, R_L=2.7Ω, R_{GEN}=3Ω			12.7		ns
t_r	Turn-On Rise Time				8.2		ns
$t_{D(off)}$	Turn-Off DelayTime				31.5		ns
t_f	Turn-Off Fall Time				11.2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=30A, dI/dt=100A/µs			61.6	74	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=30A, dI/dt=100A/µs			172.4		nC

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A =25°C.
B. The power dissipation P_D is based on $T_{J(MAX)}$=175°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°C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.
G. The maximum current rating is limited by bond-wires.

Rev2: August 2005

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

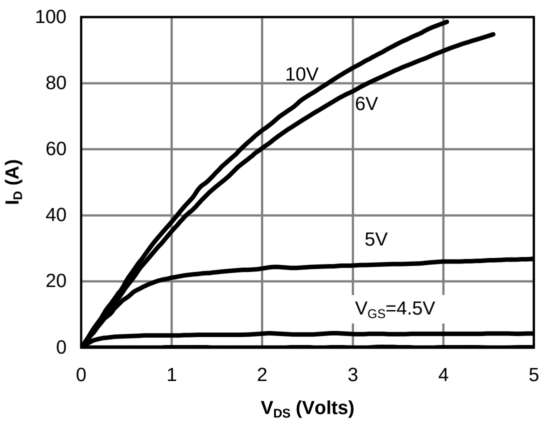


Fig 1: On-Region Characteristics

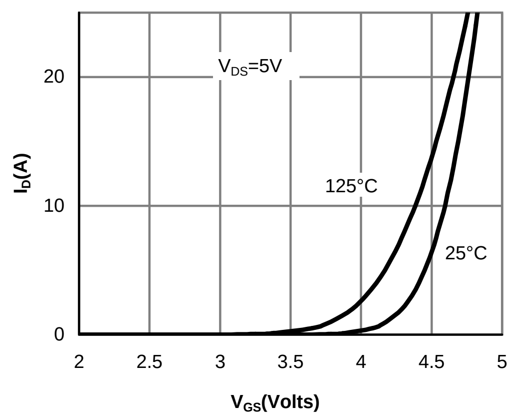


Figure 2: Transfer Characteristics

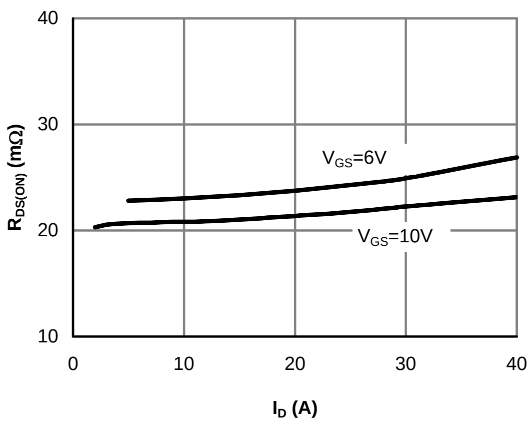


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

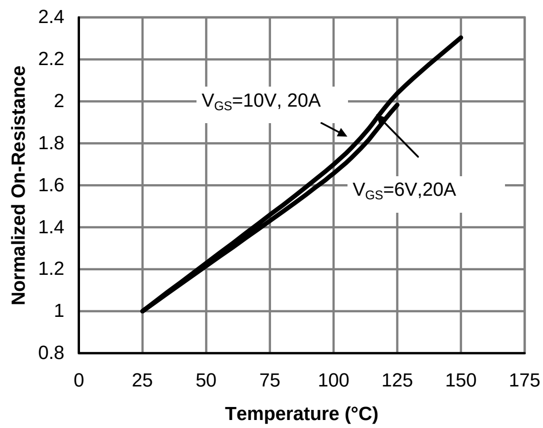


Figure 4: On-Resistance vs. Junction Temperature

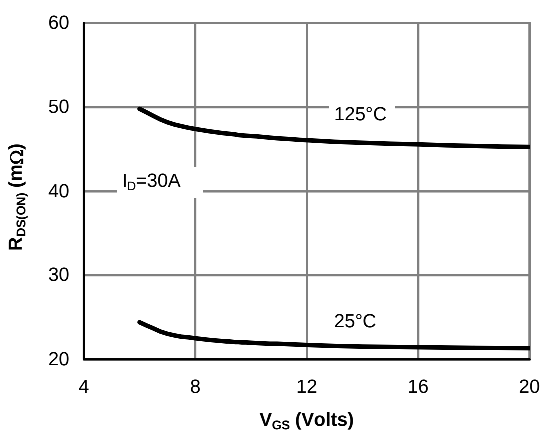


Figure 5: On-Resistance vs. Gate-Source Voltage

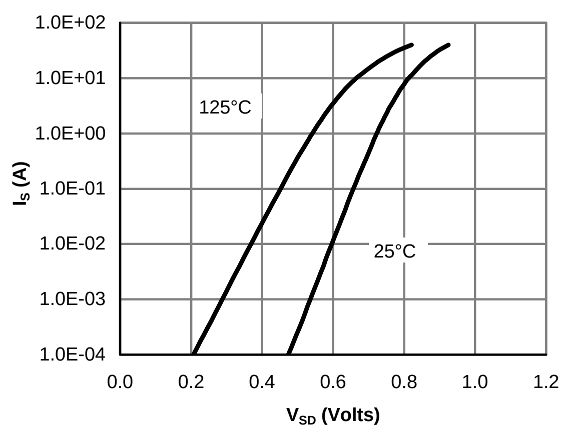


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

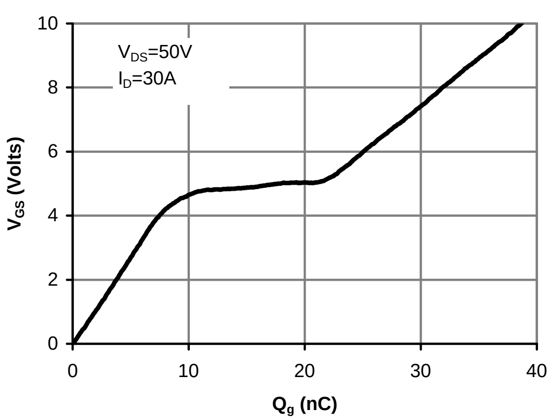


Figure 7: Gate-Charge Characteristics

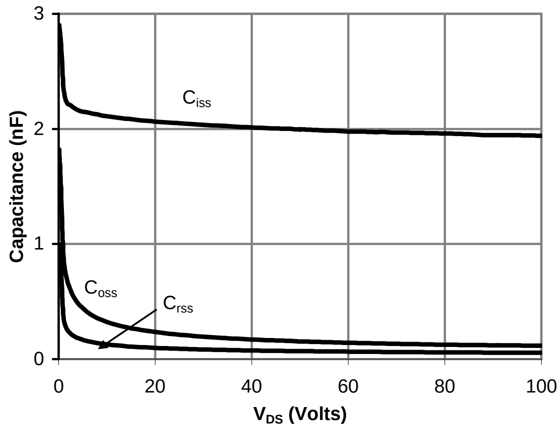


Figure 8: Capacitance Characteristics

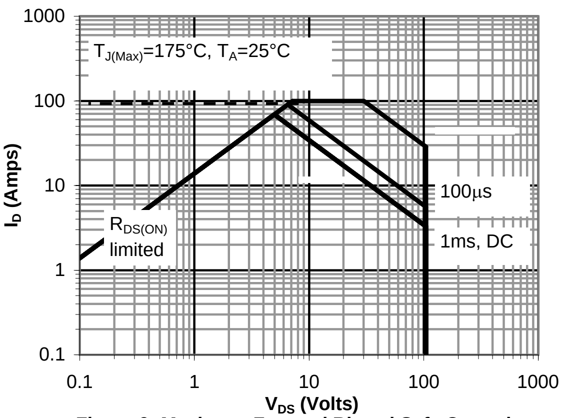


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

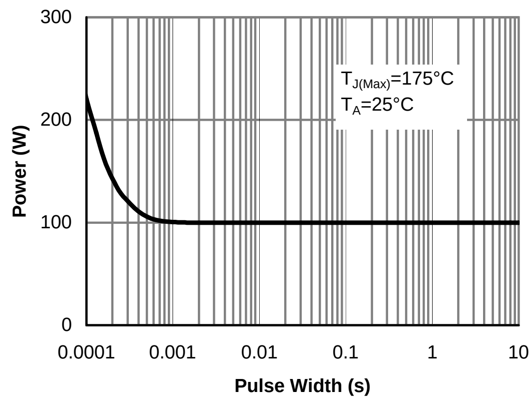


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

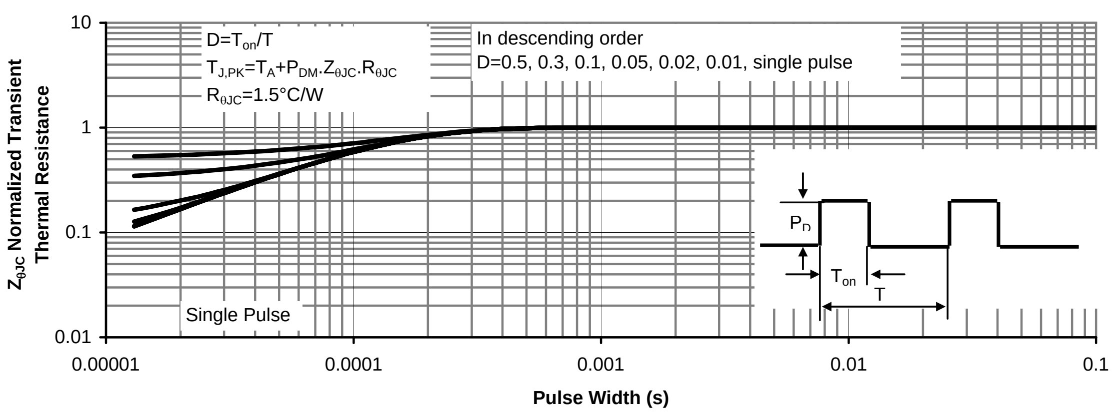


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

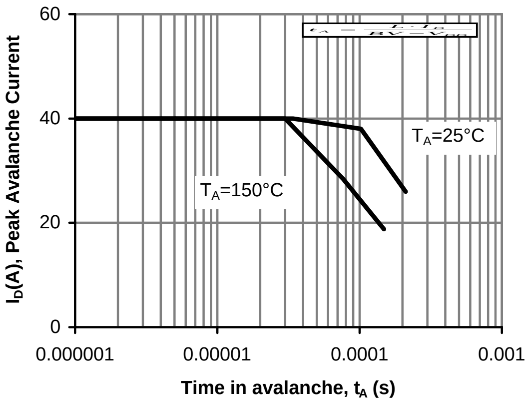


Figure 12: Single Pulse Avalanche capability

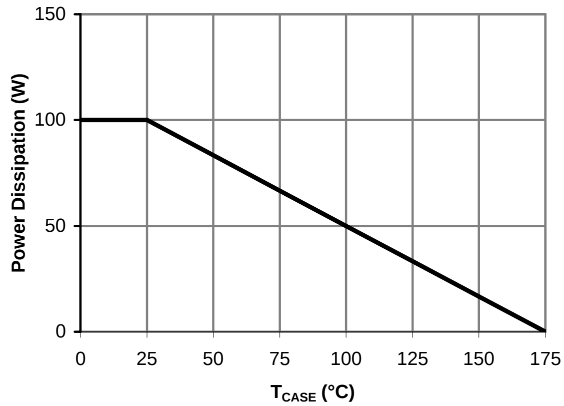


Figure 13: Power De-rating (Note B)

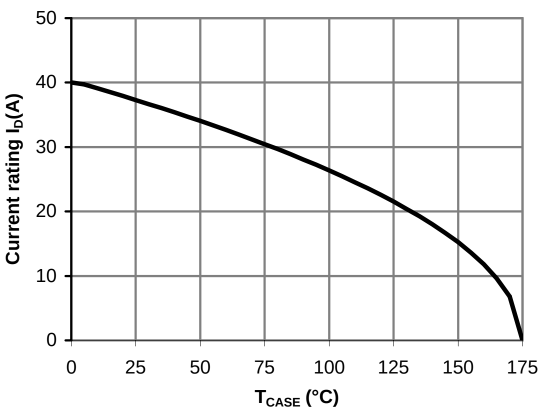


Figure 14: Current De-rating (Note B)