

# Product Specification

XBLW AOD409

P-Channel Enhancement Mode MOSFET

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## Description

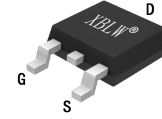
The AOD409 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and Doperation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

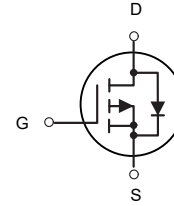
- $V_{DS} = -60V$   $I_D = -50A$
- $R_{DS(ON)} < 24\ m\Omega$  @  $V_{GS} = 10V$

## Application

- Battery protection
- Load switch
- Uninterruptible power supply



TO-252-2L



P-Channel MOSFET

## Package Marking and Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW AOD409	TO-252-2L	AOD409	Tape	2500Pcs/Reel

## Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-50	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-27	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-70	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation <sup>4</sup>	52.1	W
TSTG	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	2.4	$^\circ C/W$

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.035	---	V/°C
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-18A	---	20	24	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-12A	---	25	30	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.0	---	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	4.28	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-18A	---	23	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	7	---	Ω
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-12A	---	25	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	6.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	5.5	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-1A	---	38	---	ns
T <sub>r</sub>	Rise Time		---	23.6	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	100	---	
T <sub>f</sub>	Fall Time		---	6.8	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	3635	---	pF
C <sub>oss</sub>	Output Capacitance		---	224	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	141	---	

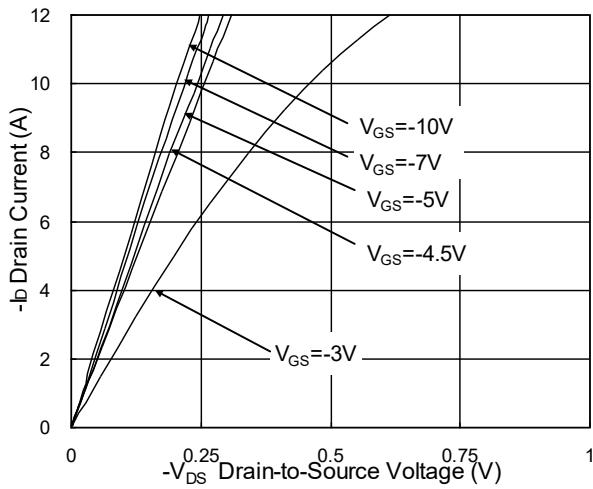
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-45	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,5</sup>		---	---	-70	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V

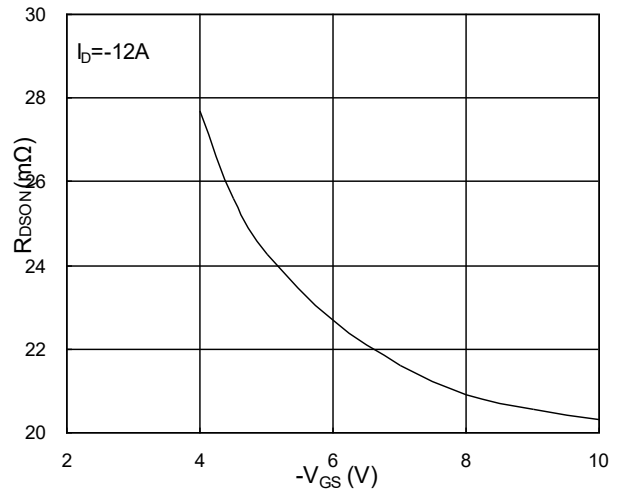
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=-25V, V<sub>GS</sub>=-10V, L=0.1mH, I<sub>AS</sub>=-47.6A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

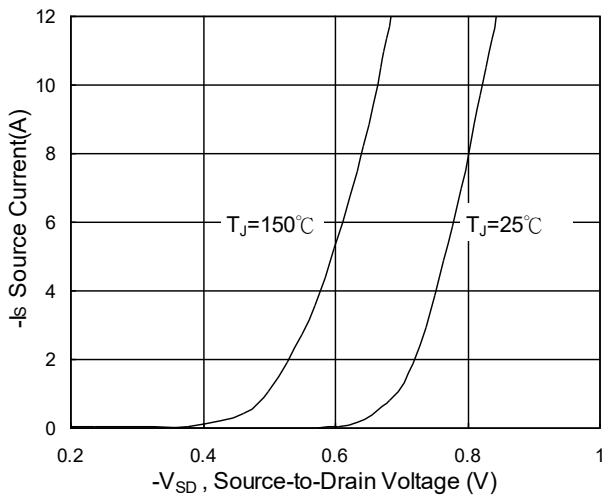
## Typical Characteristics



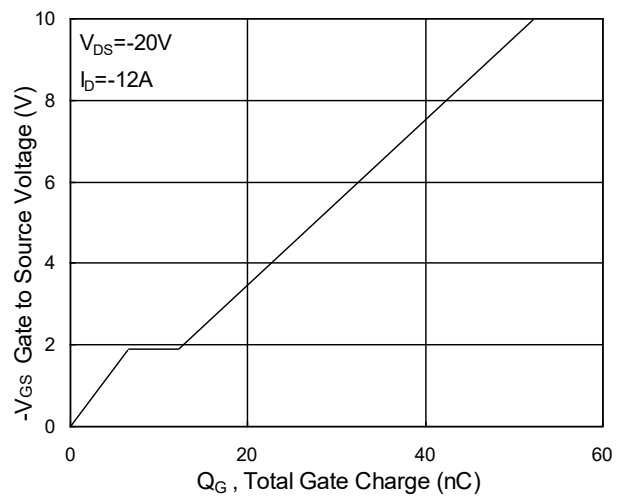
**Fig.1 Typical Output Characteristics**



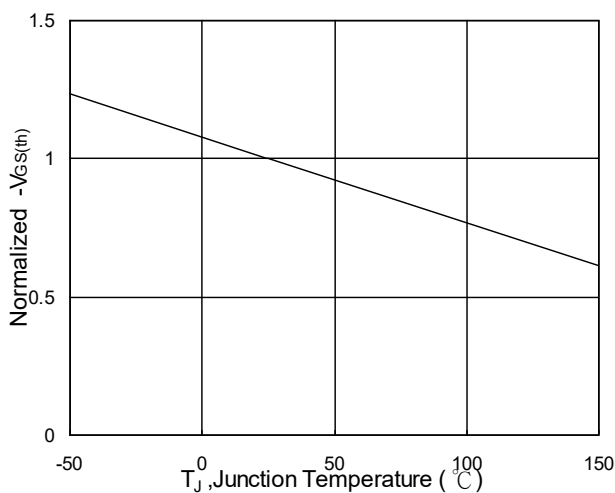
**Fig.2 On-Resistance v.s Gate-Source**



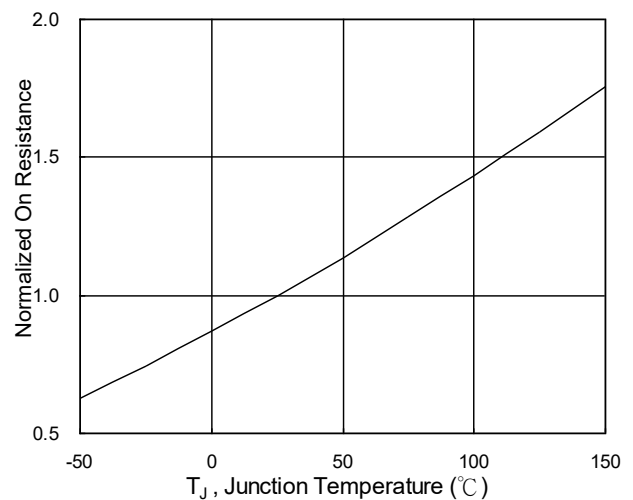
**Fig.3 Forward Characteristics Of Reverse**



**Fig.4 Gate-Charge Characteristics**



**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**

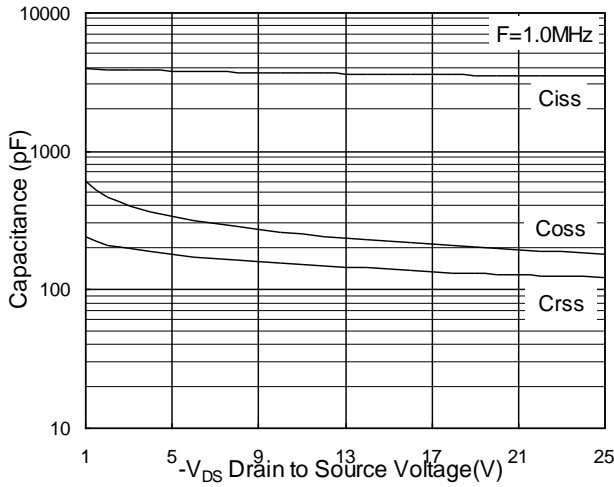


Fig.7 Capacitance

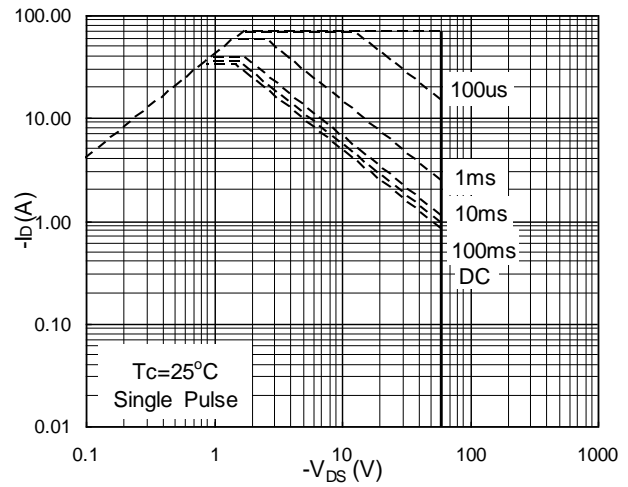


Fig.8 Safe Operating Area

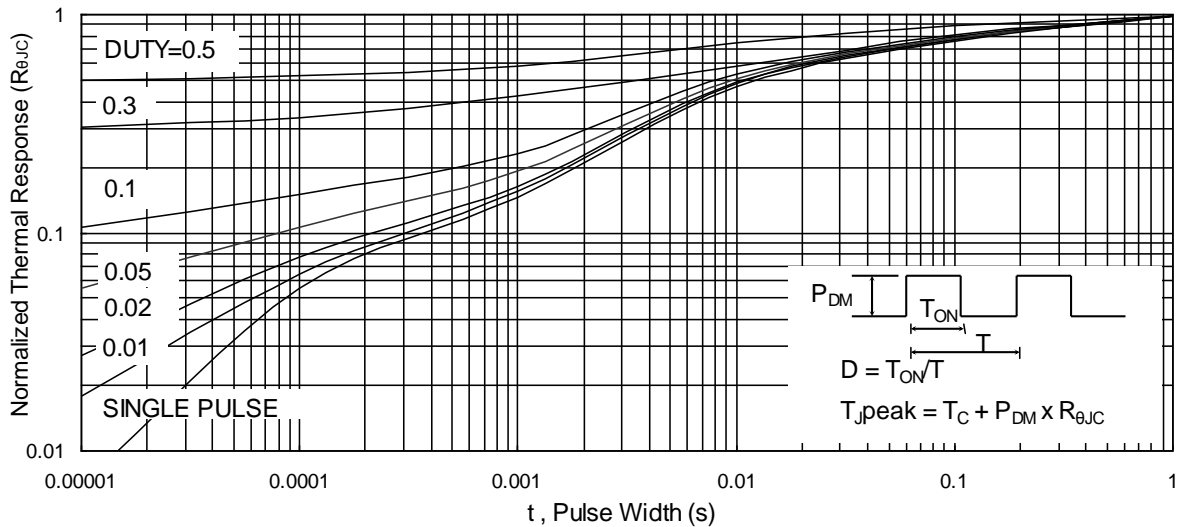


Fig.9 Normalized Maximum Transient Thermal Impedance

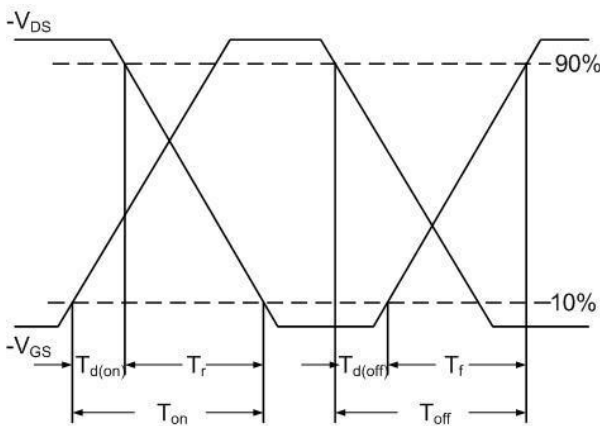


Fig.10 Switching Time Waveform

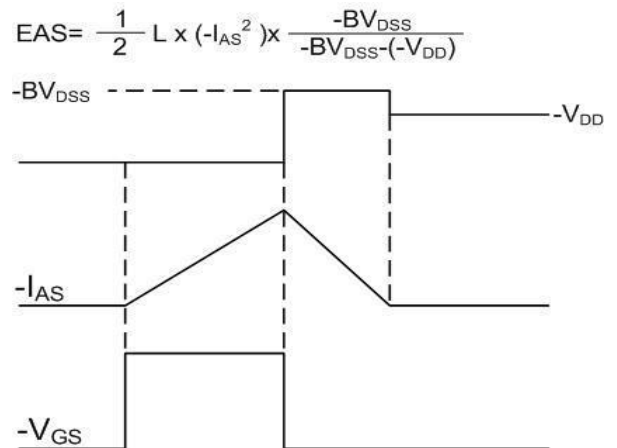


Fig.11 Unclamped Inductive Waveform



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