

# Product Specification

XBLW AOD413A

P-Channel Enhancement Mode MOSFET

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## Description

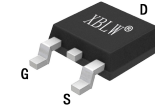
The AOD413A uses advanced trench technology to provide excellent RDS(ON), low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

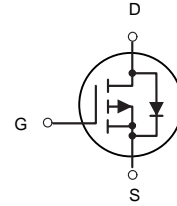
- VDS = -40V ID = -25A
- RDS(ON) < 44 mΩ@VGS=10V

## 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 AOD413A	TO-252-2L	AOD413A	Tape	2500Pcs/Reel

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

Symbol	Parameter	Rating	Units
VDS	Drain-Source Voltage	-40	V
VGS	Gate-Source Voltage	±25	V
ID@TC=25°C	Continuous Drain Current, VGS @ 10V <sup>1</sup>	-25	A
ID@TC=100°C	Continuous Drain Current, VGS @ 10V <sup>1</sup>	-12	A
IDM	Pulsed Drain Current <sup>2</sup>	-40	A
PD@TC=25°C	Total Power Dissipation <sup>4</sup>	8	W
TSTG	Storage Temperature Range	-55 to 150	°C
TJ	Operating Junction Temperature Range	-55 to 150	°C
ReJA	Thermal Resistance Junction-ambient <sup>1</sup>	62	°C/W
ReJC	Thermal Resistance Junction-Case <sup>1</sup>	18.8	°C/W

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-40	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -40V, V <sub>GS</sub> =0V	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.0	-1.6	-2.5	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note3</small>	V <sub>GS</sub> = -10V, I <sub>D</sub> = -8A	-	31	44	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A	-	44	60	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V, f=1.0MHz	-	1034	-	pF
C <sub>oss</sub>	Output Capacitance		-	107	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	79.5	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -20V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V	-	20	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	3.5	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	4.2	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = -20V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V, R <sub>GEN</sub> =2.5Ω	-	8	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	15	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	23	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	9	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	-23	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-40	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -10A	-	-0.8	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =-5A,	-	29	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs	-	20	-	nC

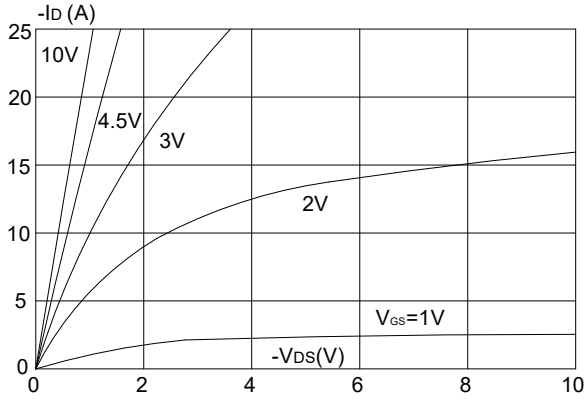
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

 2. EAS condition: T<sub>J</sub>= 25°C, V<sub>DD</sub>= -20V, V<sub>G</sub>= -10V, L=0.5mH, R<sub>G</sub>= 25Ω, I<sub>AS</sub>= -10.5A

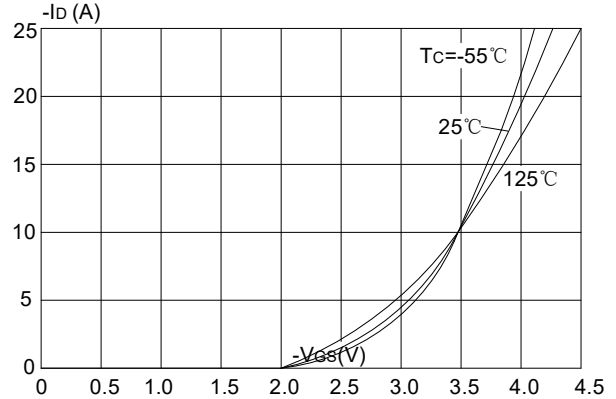
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

## Typical Performance Characteristics

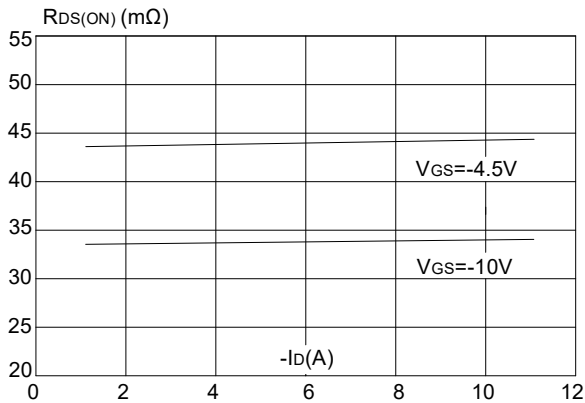
**Figure 1: Output Characteristics**



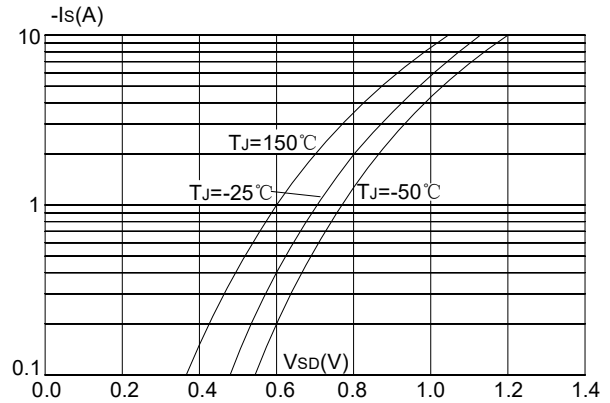
**Figure 2: Typical Transfer Characteristics**



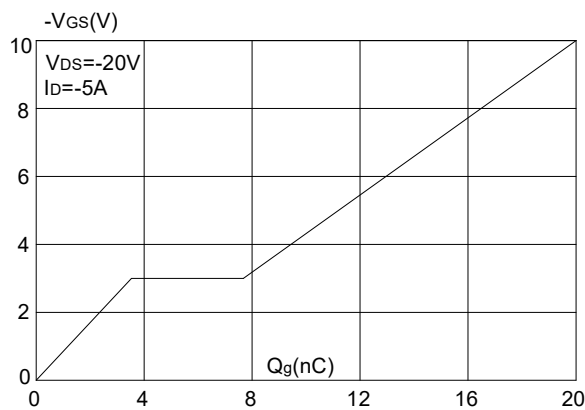
**Figure 3: On-resistance vs. Drain Current**



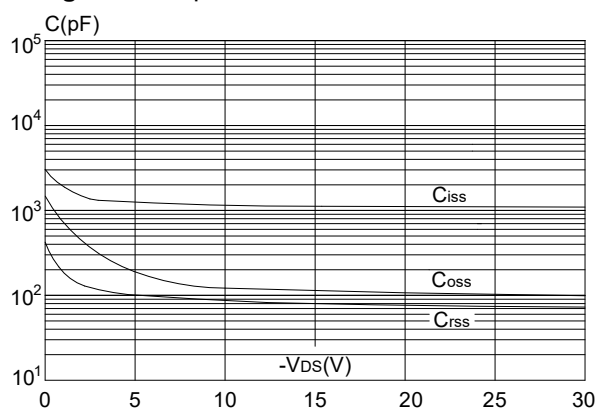
**Figure 4: Body Diode Characteristics**



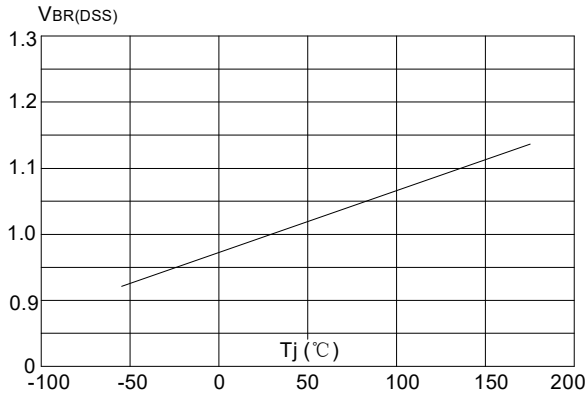
**Figure 5: Gate Charge Characteristics**



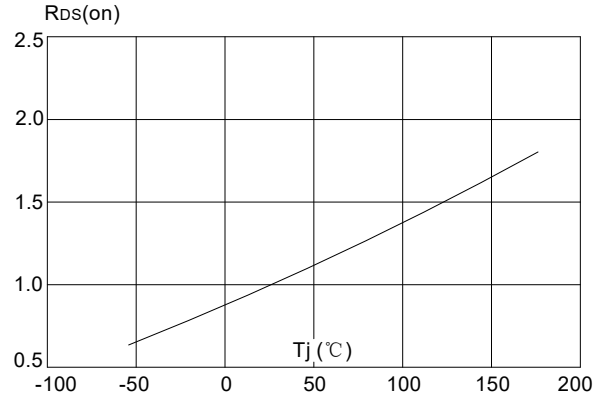
**Figure 6: Capacitance Characteristics**



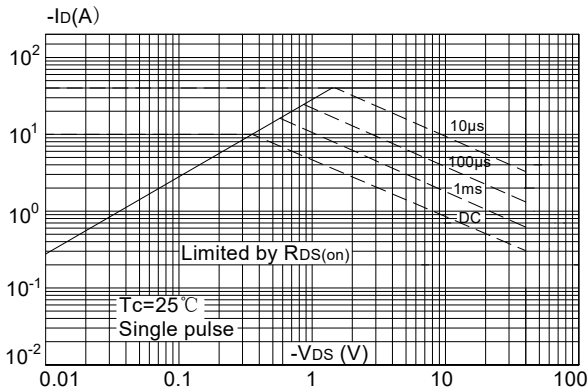
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



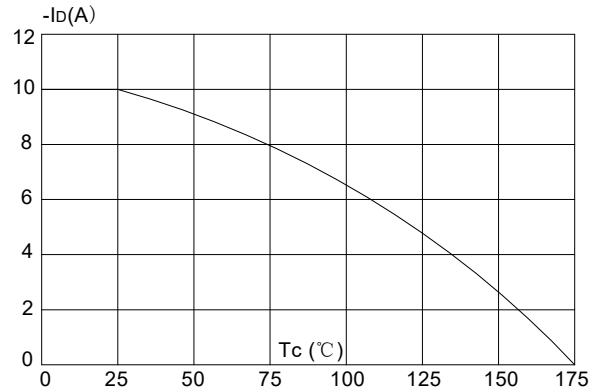
**Figure 8:** Normalized on Resistance vs. Junction Temperature



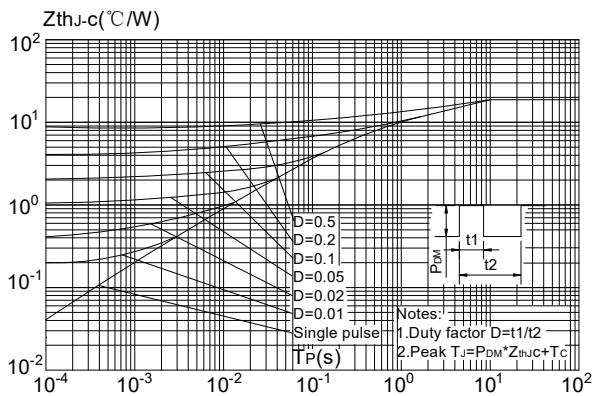
**Figure 9:** Maximum Safe Operating Area



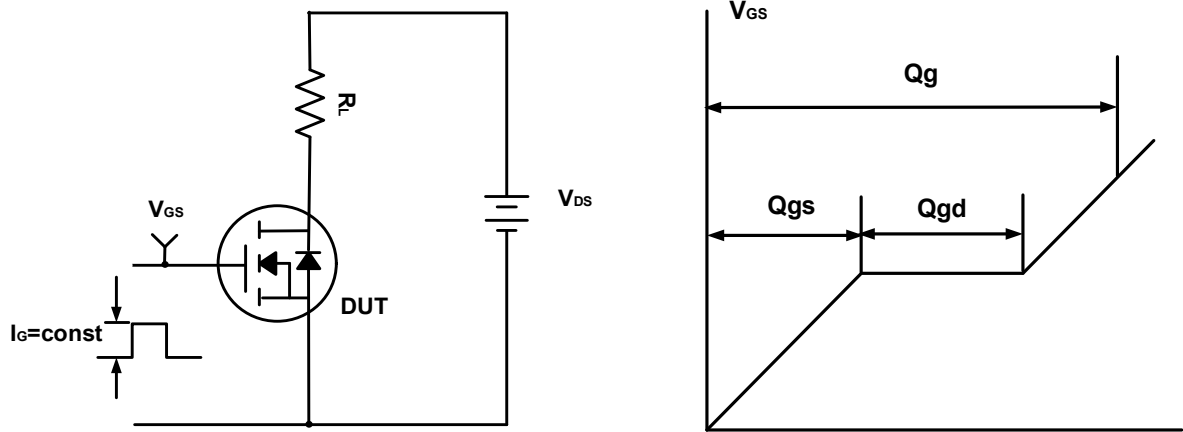
**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



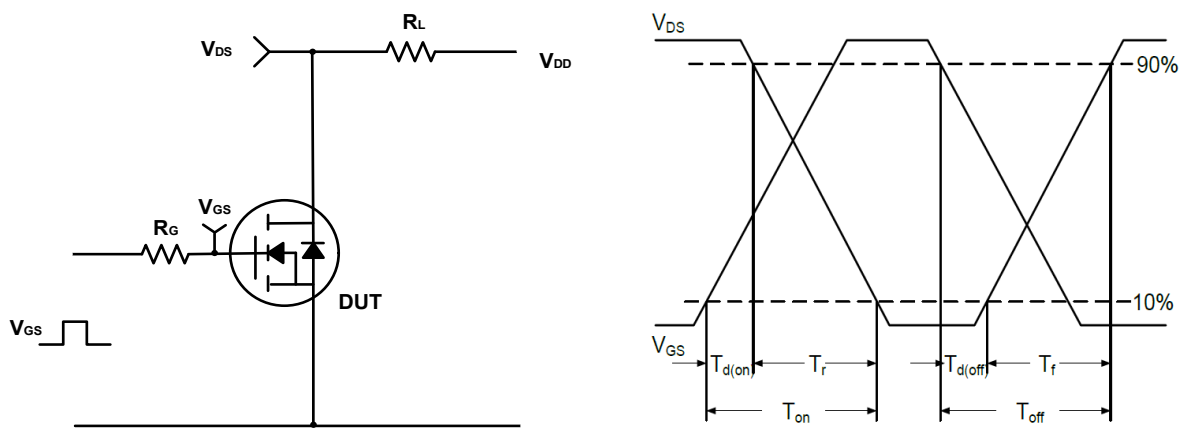
**Figure 11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



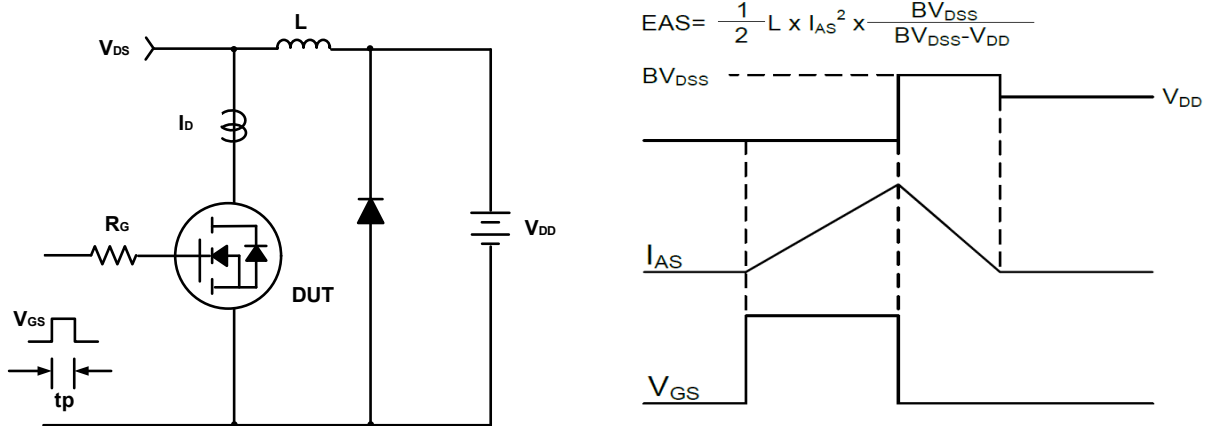
**Test Circuit**



**Figure A. Gate Charge Test Circuit & Waveforms**



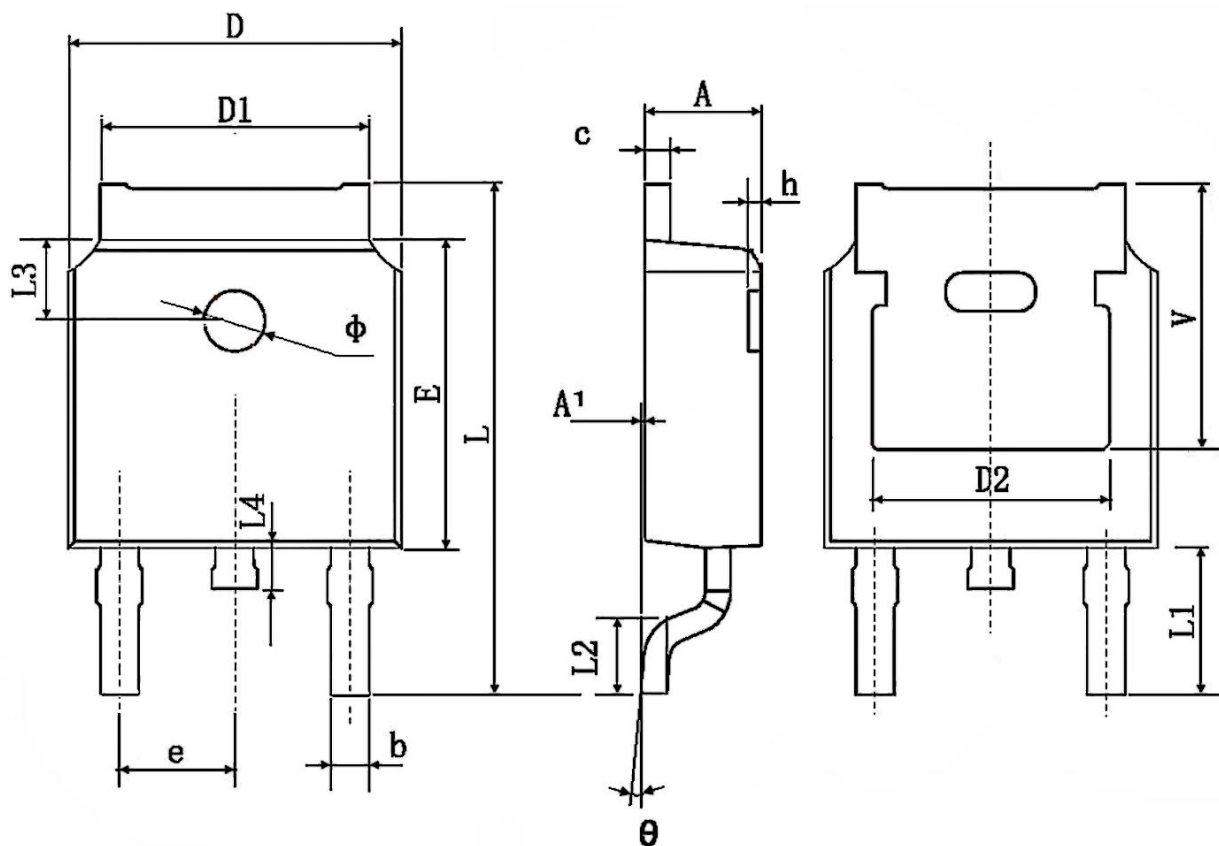
**Figure B. Switching Test Circuit & Waveforms**



**Figure C. Unclamped Inductive Switching Circuit & Waveforms**

**Package Information**

**T0252-2L**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
$\phi$	1.100	1.300	0.043	0.051
$\theta$	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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