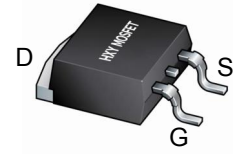




Description

The AOD413A uses advanced trench technology to provide excellent $R_{DS(ON)}$, 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.

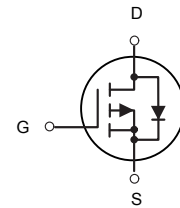


TO252-2L

General Features

$V_{DS} = -40V$ $I_D = -25A$

$R_{DS(ON)} < 44 m\Omega @ V_{GS}=10V$



P-Channel MOSFET

Application

Battery protection

Load switch

Uninterruptible power supply

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AOD413A	TO252-2L	25P04 XXX YYYY	2500

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V _{DS}	Drain-Source Voltage	-40	V
V _{GS}	Gate-Source Voltage	± 25	V
I _D @T _C =25°C	Continuous Drain Current, V _{GS} @ 10V ¹	-25	A
I _D @T _C =100°C	Continuous Drain Current, V _{GS} @ 10V ¹	-12	A
IDM	Pulsed Drain Current ²	-40	A
P _D @T _C =25°C	Total Power Dissipation ⁴	8	W
TSTG	Storage Temperature Range	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	°C
R _{θJA}	Thermal Resistance Junction-ambient ¹	62	°C/W
R _{θJC}	Thermal Resistance Junction-Case ¹	18.8	°C/W



Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=-10V, I_D=-8A$	-	31	44	m Ω
		$V_{GS}=-4.5V, I_D=-5A$	-	44	60	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V,$ $f=1.0MHz$	-	1034	-	pF
C_{oss}	Output Capacitance		-	107	-	pF
C_{rss}	Reverse Transfer Capacitance		-	79.5	-	pF
Q_g	Total Gate Charge	$V_{DS}=-20V, I_D=-5A,$ $V_{GS}=-10V$	-	20	-	nC
Q_{gs}	Gate-Source Charge		-	3.5	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	4.2	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=-20V, I_D=-5A,$ $V_{GS}=-10V, R_{GEN}=2.5\Omega$	-	8	-	ns
t_r	Turn-on Rise Time		-	15	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	23	-	ns
t_f	Turn-off Fall Time		-	9	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-23	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-40	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=-10A$	-	-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_S=-5A,$ $di/dt=100A/\mu s$	-	29	-	ns
Q_{rr}	Reverse Recovery Charge		-	20	-	nC

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

2. EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=-20V$, $V_G=-10V$, $L=0.5mH$, $R_G=25\Omega$, $I_{AS}=-10.5A$

3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$



Typical Performance Characteristics

Figure 1: Output Characteristics

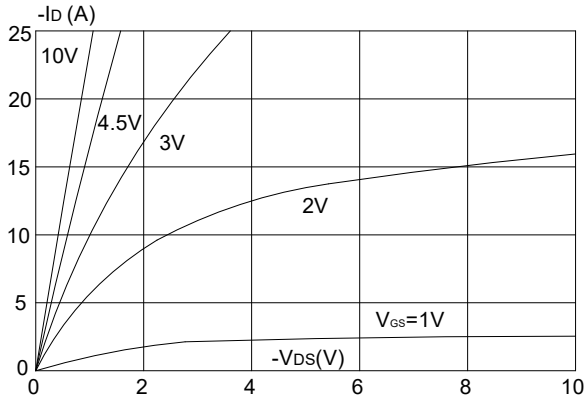


Figure 2: Typical Transfer Characteristics

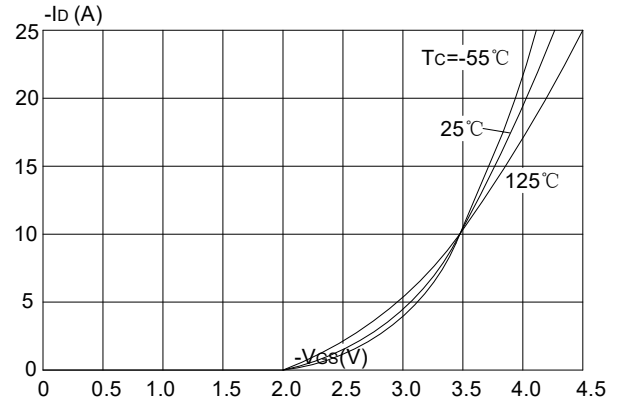


Figure 3: On-resistance vs. Drain Current

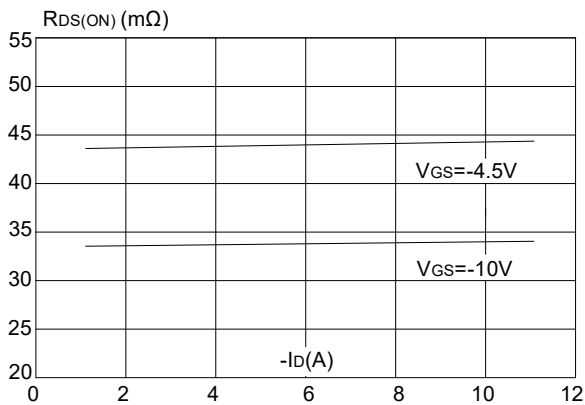


Figure 4: Body Diode Characteristics

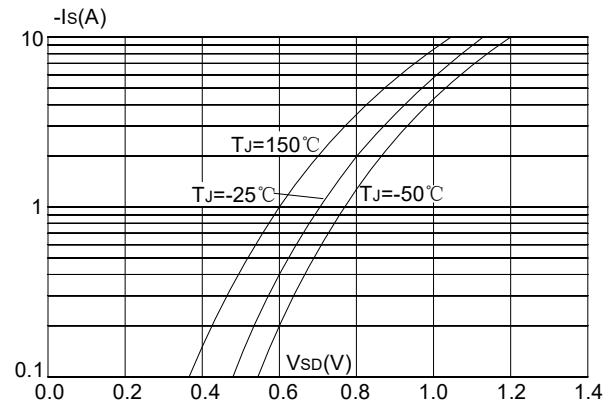


Figure 5: Gate Charge Characteristics

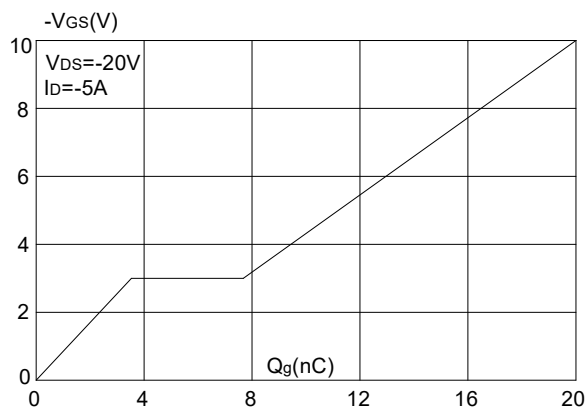


Figure 6: Capacitance Characteristics

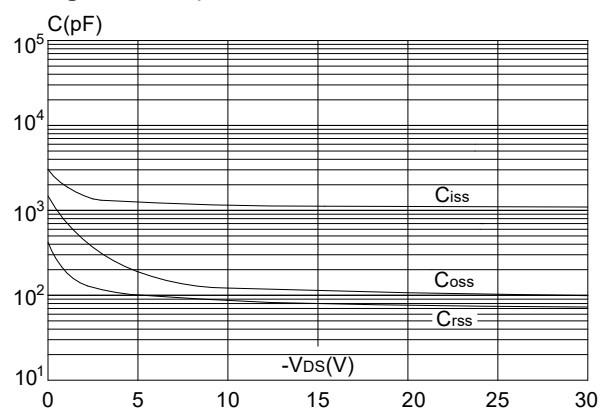




Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

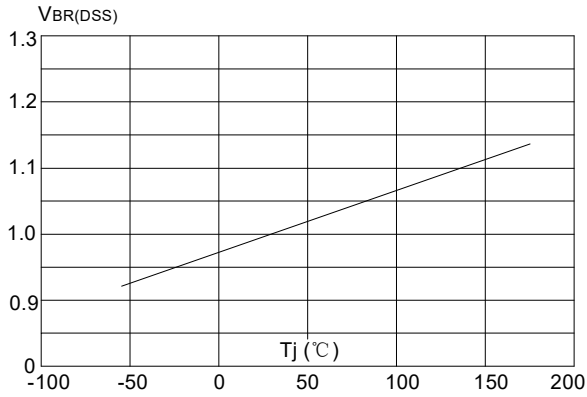


Figure 8: Normalized on Resistance vs. Junction Temperature

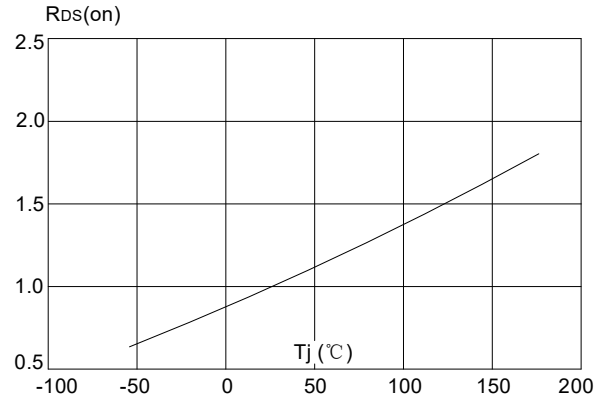


Figure 9: Maximum Safe Operating Area

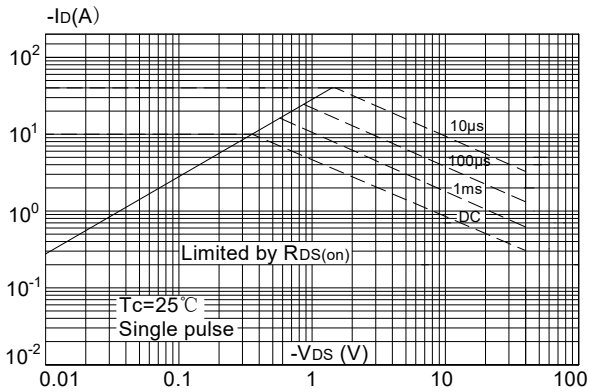


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

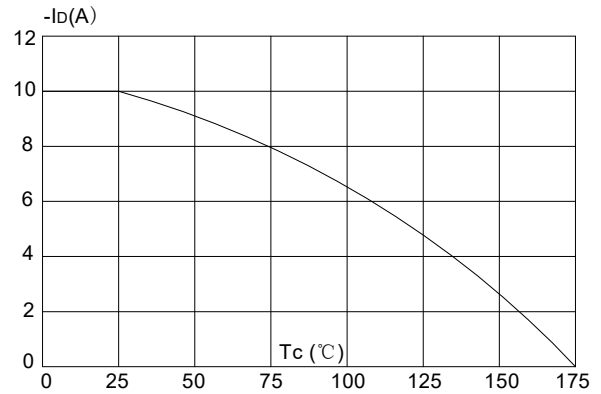
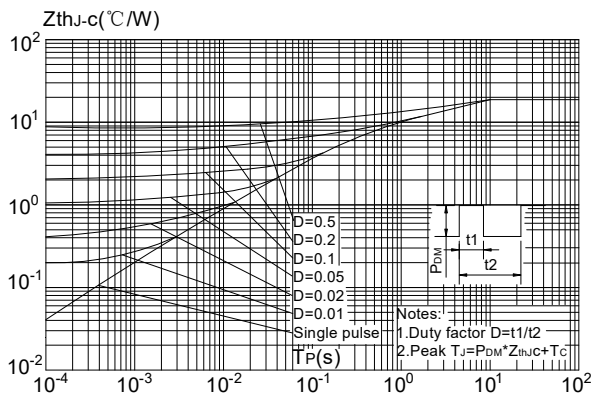


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case





Test Circuit

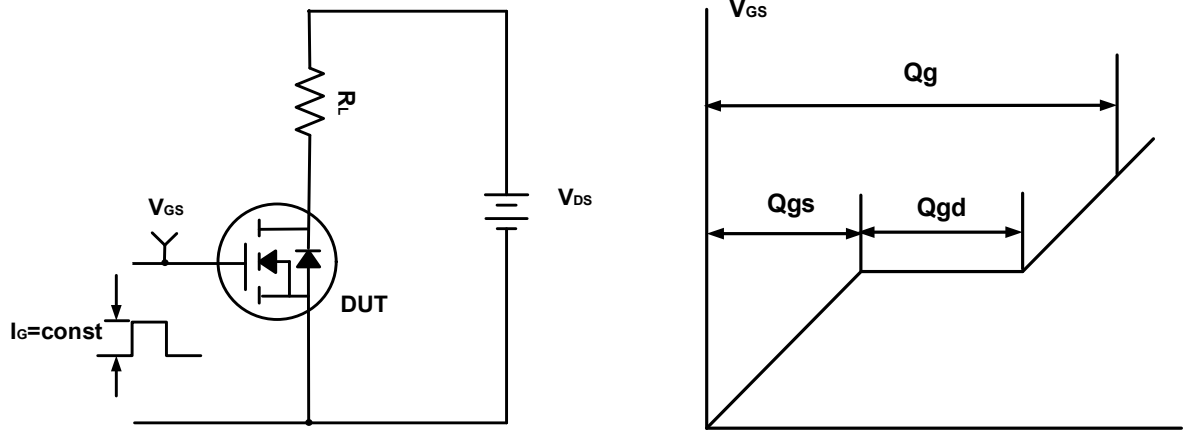


Figure A. Gate Charge Test Circuit & Waveforms

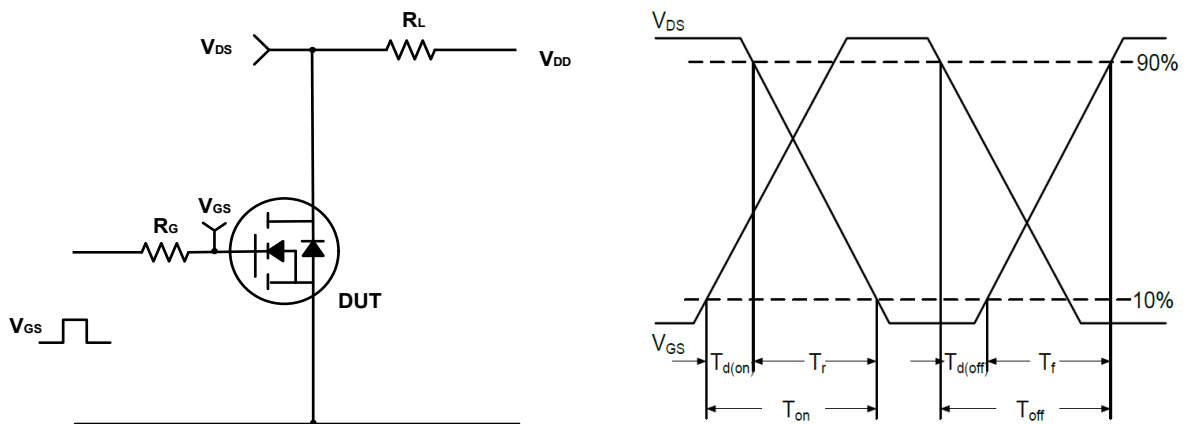


Figure B. Switching Test Circuit & Waveforms

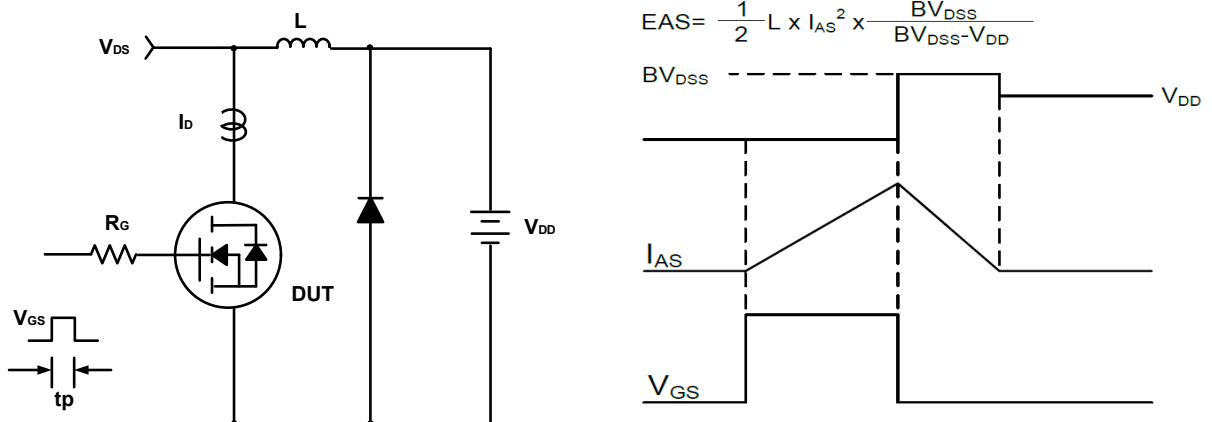
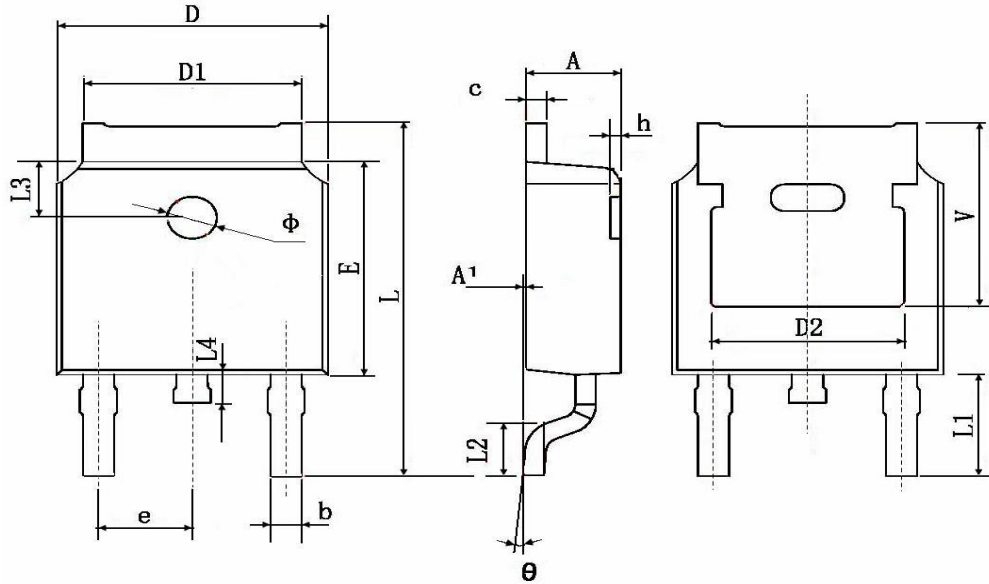


Figure C. Unclamped Inductive Switching Circuit & Waveforms



TO252-2L Package Information



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
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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