

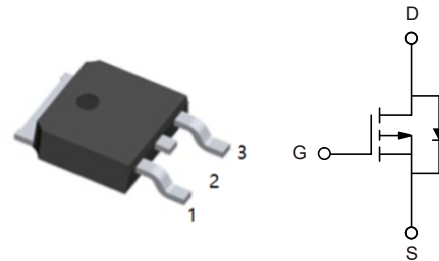
1.Description

The AOD409 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. With the excellent thermal resistance of the TO-252 package, this device is well suited for high current load applications.

3.Pinning information

Pin	Symbol	Description
1	G	GATE
3	S	SOURCE
2	D	DRAIN

TO-252(DPAK)
top view



4.Absolute Maximum Ratings $T_A = 25^\circ\text{C}$

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	-60	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current ^G	$T_C = 25^\circ\text{C}$	I_D	-26	A
	$T_C = 100^\circ\text{C}$		-18	
Pulsed Drain Current ^c		I_{DM}	-60	
Avalanche Current ^c		I_{AR}	-26	
Repetitive avalanche energy $L=0.1\text{mH}$ ^c		E_{AR}	33.8	mJ
Power Dissipation ^B	$T_C = 25^\circ\text{C}$	P_D	60	W
	$T_C = 100^\circ\text{C}$		30	
Power Dissipation ^A	$T_A = 25^\circ\text{C}$	P_{DSM}	2.5	
	$T_A = 70^\circ\text{C}$		1.6	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	$^\circ\text{C}$



5.Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	16.7	25	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		40	50	°C/W
Maximum Junction-to-Case ^B	Steady-State	R _{θJC}	1.9	2.5	°C/W



6. Electrical Characteristic (T_J=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-Source Breakdown Voltage	BV _{DSS}	I _D =-250μA, V _{GS} =0V	-60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-48V, V _{GS} =0V		-0.003	-1	μA
		T _J =55°C			-5	μA
Gate-Body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-1.2	-1.9	-2.4	V
On state drain current	I _{D(ON)}	V _{GS} =-10V, V _{DS} =-5V	-60			A
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =-10V, I _D =-20A		32	48	mΩ
		V _{GS} =-4.5V, I _D =-20A		43	55	mΩ
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-20A		32		S
Diode Forward Voltage	V _{SD}	I _S =-1A, V _{GS} =0V		-0.73	-1	V
Maximum Body-Diode Continuous Current ^G	I _S				-30	A
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =-30V, f=1MHz		2977	3600	pF
Output Capacitance	C _{oss}			241		pF
Reverse Transfer Capacitance	C _{rss}			153		pF
Gate resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz		2	2.4	Ω
Total Gate Charge	Q _g (10V)	V _{GS} =-10V, V _{DS} =-30V I _D =-20A		44	54	nC
Total Gate Charge	Q _g (4.5V)			22.2	28	nC
Gate Source Charge	Q _{gs}			9		nC
Gate Drain Charge	Q _{gd}			10		nC
Turn-On DelayTime	t _{D(on)}	V _{GS} =-10V, V _{DS} =-30V R _L =1.5Ω, R _{GEN} =3Ω		12		ns
Turn-On Rise Time	t _r			14.5		ns
Turn-Off DelayTime	t _{D(off)}			38		ns
Turn-Off Fall Time	t _f			15		ns
Body Diode Reverse Recovery Time	t _{rr}	I _F =-20A, dI/dt=100A/μs		40	50	ns
Body Diode Reverse Recovery Charge	Q _{rr}	I _F =-20A, dI/dt=100A/μs		59		nC



- A. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.
- 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.
- H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$. The SOA curve provides a single pulse rating.



7.1Typical characteristic

Fig 1: On-Region Characteristics	Figure 2: Transfer Characteristics
Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)	Figure 4: On-Resistance vs. Junction Temperature
Figure 5: On-Resistance vs. Gate-Source Voltage	Figure 6: Body-Diode Characteristics



7.2 Typical characteristic

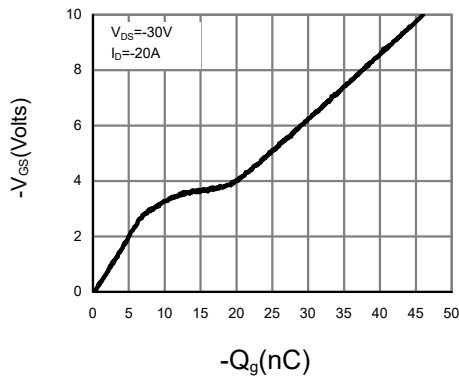


Figure 7: Gate-Charge Characteristics

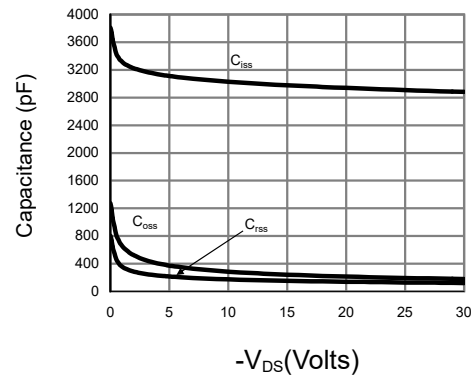


Figure 8: Capacitance Characteristics

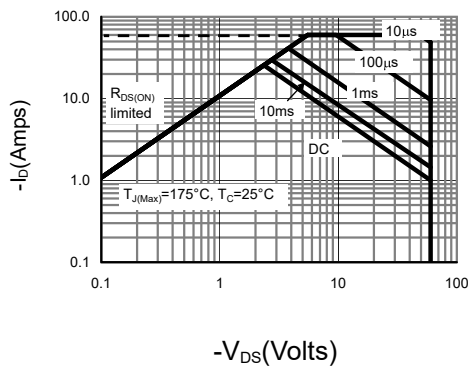


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

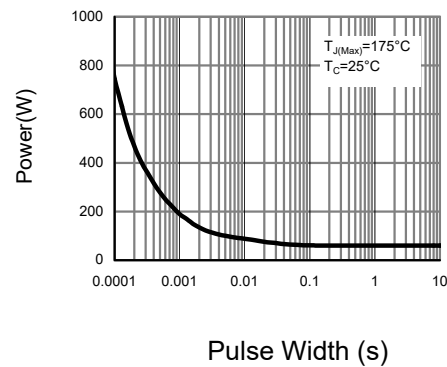


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

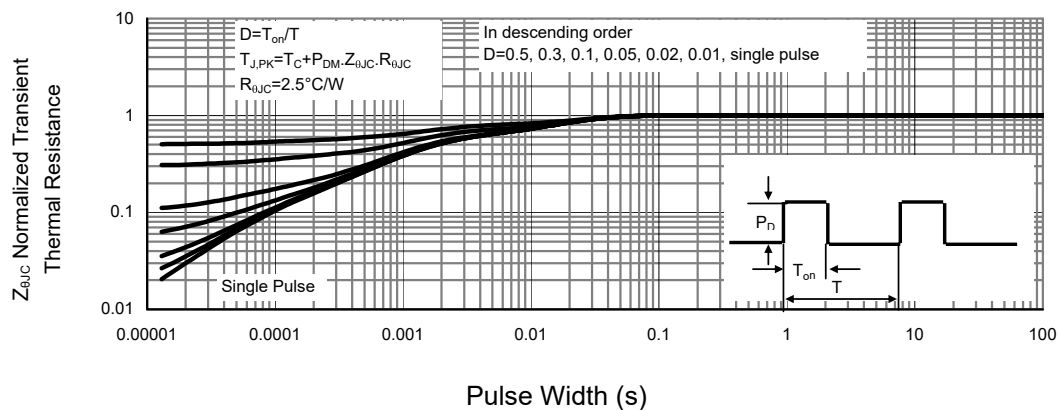


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)



7.3 Typical characteristic

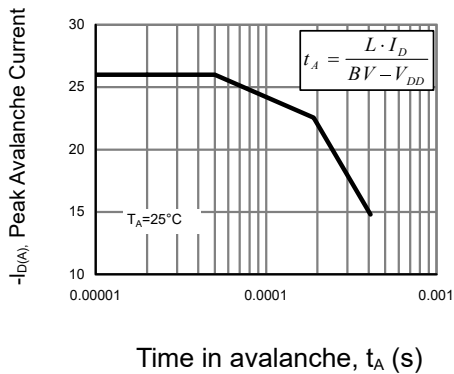


Figure 12: Single Pulse Avalanche capability

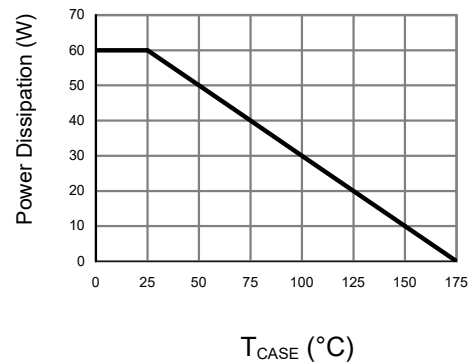


Figure 13: Power De-rating (Note B)

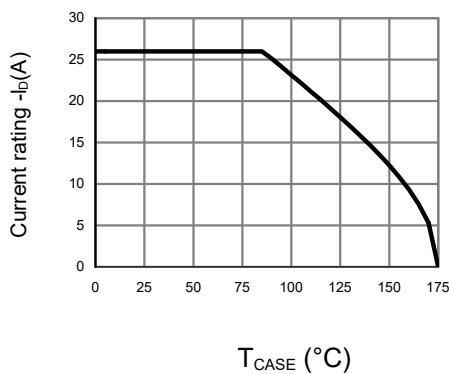


Figure 14: Current De-rating (Note B)

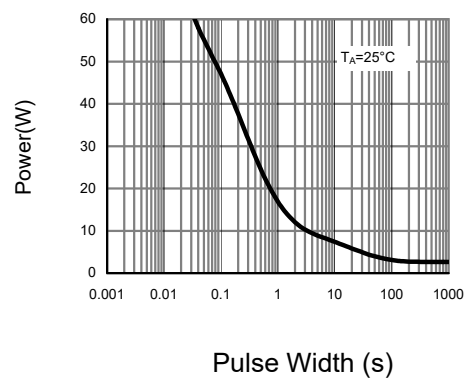


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

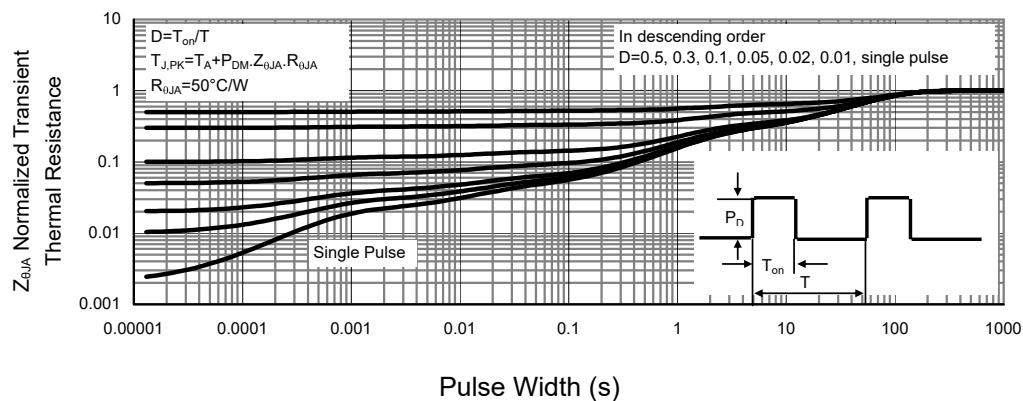
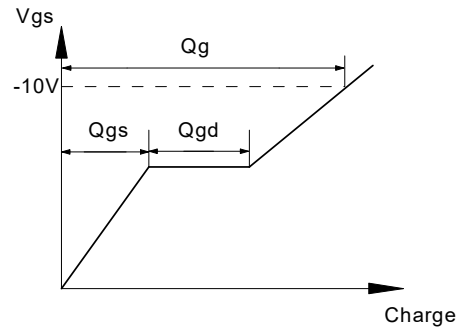
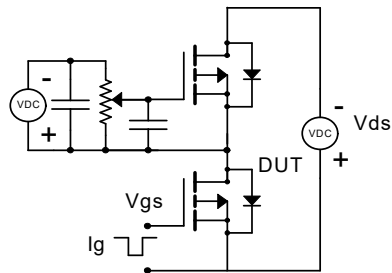


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

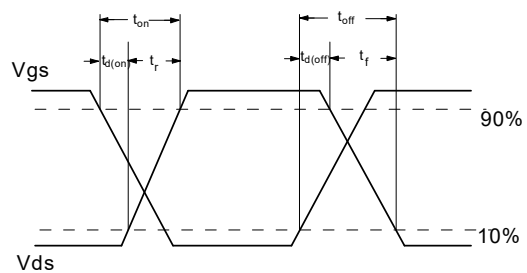
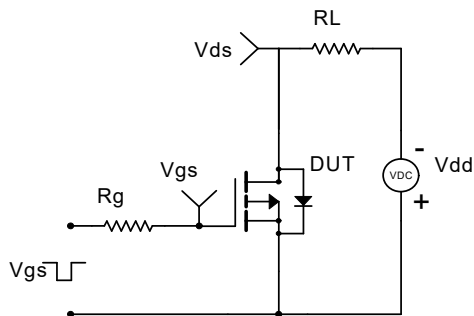


7.4 Typical characteristic

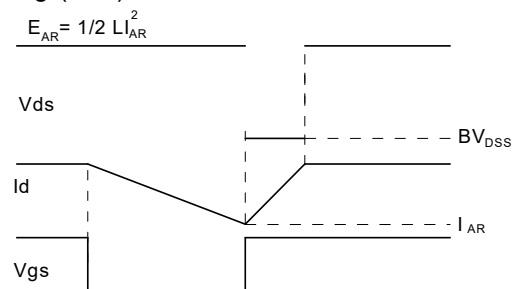
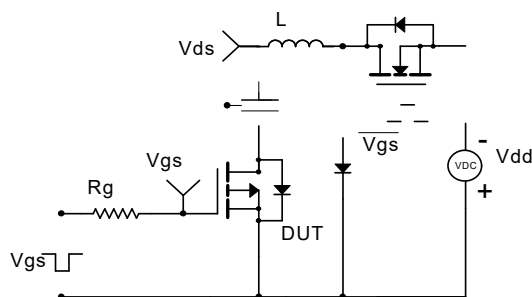
Gate Charge Test Circuit & Waveform



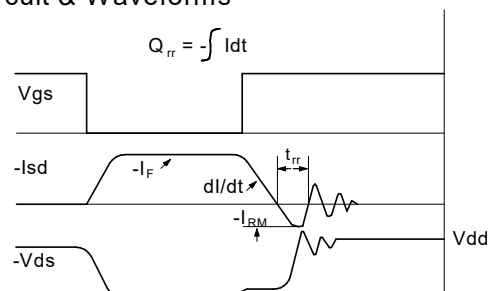
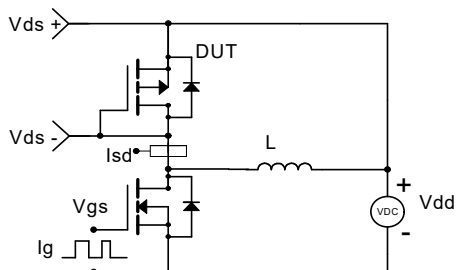
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

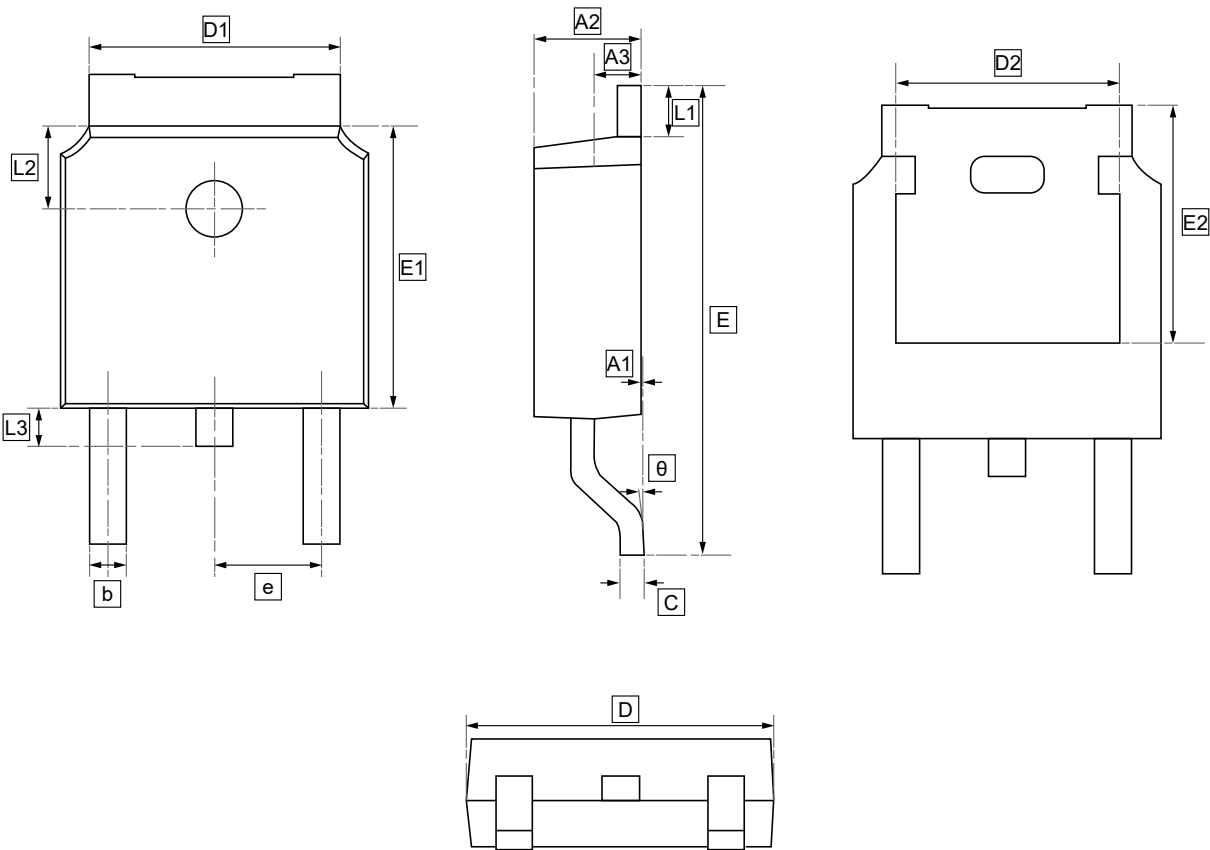


Diode Recovery Test Circuit & Waveforms





8.TO-252 Package Outline Dimensions

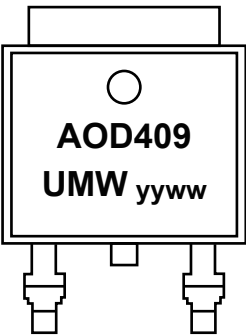


DIMENSIONS (mm are the original dimensions)

Symbol	A1	A2	A3	b	c	D	D1	D2	E	E1	E2	e	L1	L2	L3	θ
Min	0.00	2.18	0.90	0.65	0.46	6.35	4.95	4.32	9.40	5.97	5.21	2.286	0.89	1.70	0.60	0.00
Max	0.13	2.39	1.10	0.85	0.61	6.73	5.46	4.90	10.41	6.22	5.38		1.27	1.90	1.00	8.00



9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW AOD409	TO-252	2500	Tape and reel



10.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

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