UMW AOD413A

-40V P-Channel MOSFET

1.Description

The AOD413A uses advanced technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. With the excellent thermal resistance of the DPAK package, this device is well suited for high current load applications.

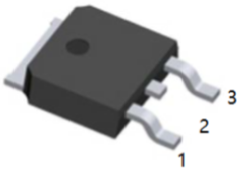
2.Features

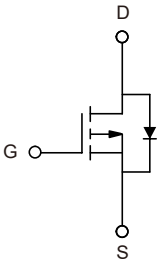
- $V_{DS\ (V)}$=-40V
- I_D=-12A(V_{GS}=10V)
- $R_{DS(ON)}$<40mΩ(V_{GS}=-10V)
- $R_{DS(ON)}$<50mΩ(V_{GS}=-4.5V)

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°C

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	-40	V
Gate-Source Voltage		V_{GS}	±20	
Continuous Drain Current [B,H]	T_C=25°C	I_D	-12	A
	T_C=100°C		-12	
Pulsed Drain Current [c]		I_{DM}	-30	
Avalanche Current [c]		I_{AR}	-20	
Repetitive avalanche energy L=0.1mH [c]		E_{AR}	20	mJ
Power Dissipation [B]	T_C=25°C	P_D	50	W
	T_C=100°C		25	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.5	
	T_A=70°C		1.6	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

5.Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	16.7	25	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		40	50	°C/W
Maximum Junction-to-Case [D]	Steady-State	$R_{\theta JC}$	2.5	3	°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	-40			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-40V, V_{GS}=0V			-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	-1.7	-2	-3	V
On state drain current	$I_{D(ON)}$	V_{GS}=-10V, V_{DS}=-5V	-30			A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-12A		36	40	mΩ
		V_{GS}=-4.5V, I_D=-8A		40	50	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V, I_D=-12A		22		S
Diode Forward Voltage	V_{SD}	I_S=-1A, V_{GS}=0V		-0.76	-1	V
Maximum Body-Diode Continuous Current	I_S				-12	A
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-20V, f=1MHz		900	1125	pF
Output Capacitance	C_{oss}			97		pF
Reverse Transfer Capacitance	C_{rss}			68		pF
Gate resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz		14		Ω
Total Gate Charge	Q_g(-10V)	V_{GS}=-10V, V_{DS}=-20V, I_D=-12A		16.2	21	nC
Total Gate Charge	Q_g(-4.5V)			7.2	9.4	nC
Gate Source Charge	Q_{gs}			3.8		nC
Gate Drain Charge	Q_{gd}			3.5		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS}=-10V, V_{DS}=-20V, R_L=1.6Ω, R_{GEN}=3Ω		6.2		ns
Turn-On Rise Time	t_r			8.4		ns
Turn-Off DelayTime	$t_{D(off)}$			44.8		ns
Turn-Off Fall Time	t_f			41.2		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F=-12A, dI/dt=100A/μs		21.2		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F=-12A, dI/dt=100A/μs		13.8		nC

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with T_A =25°C. The power dissipation P_{DSM} and current rating I_{DSM} are based on $T_{J(MAX)}$=150°C, using t ≤ 10s junction-to-ambient thermal resistance.

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. The SOA curve provides a single pulse rating.

G. These tests are performed with the device mounted on 1 in ^{2} FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.

H. The maximum current rating is limited by bond-wires.

7.1Typical characteristic

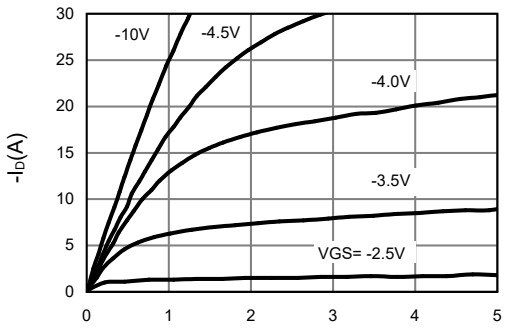


Figure 1: On-Region Characteristics

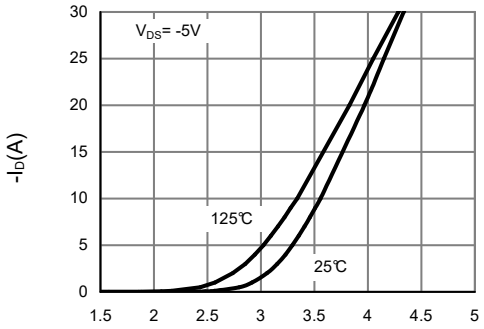


Figure 2: Transfer Characteristics

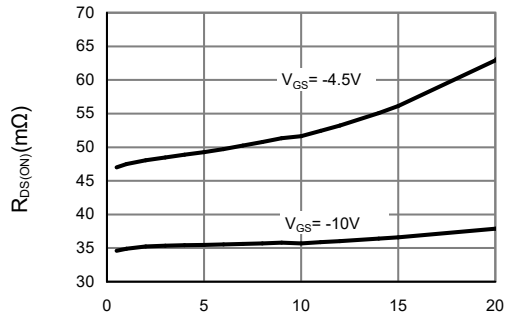


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

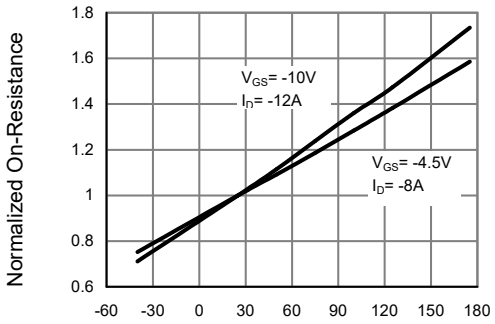


Figure 4: On-Resistance vs. Junction Temperature

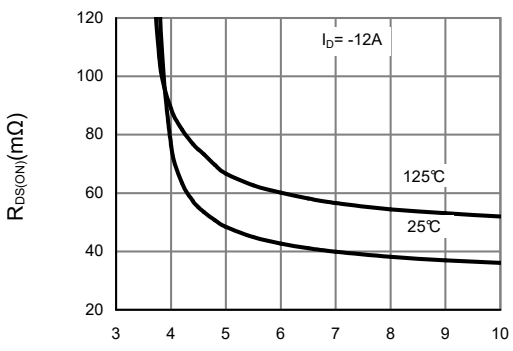


Figure 5: On-Resistance vs. Gate-Source Voltage

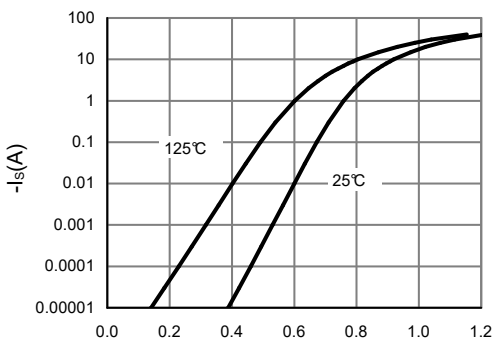


Figure 6: Body-Diode Characteristics

7.2Typical characteristic

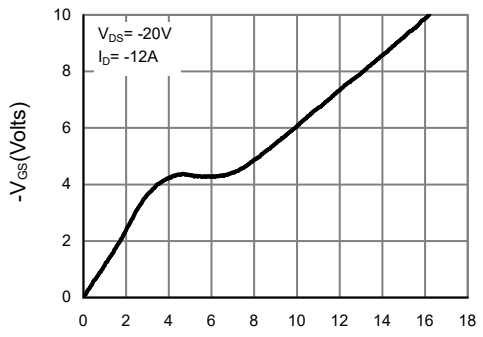


Figure 7: Gate-Charge Characteristics

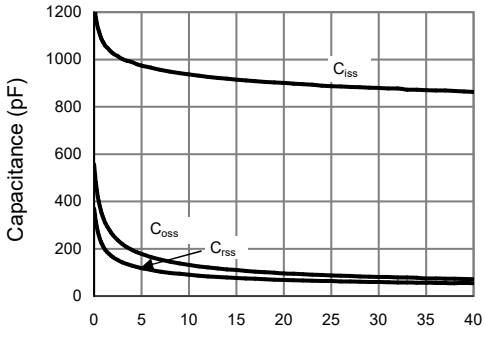


Figure 8: Capacitance Characteristics

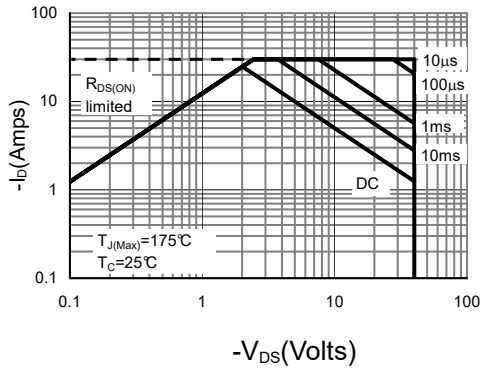


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

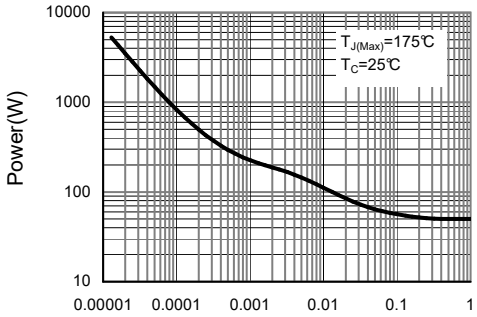


Figure 10: Single Pulse Power Rating Junction-to Case (Note F)

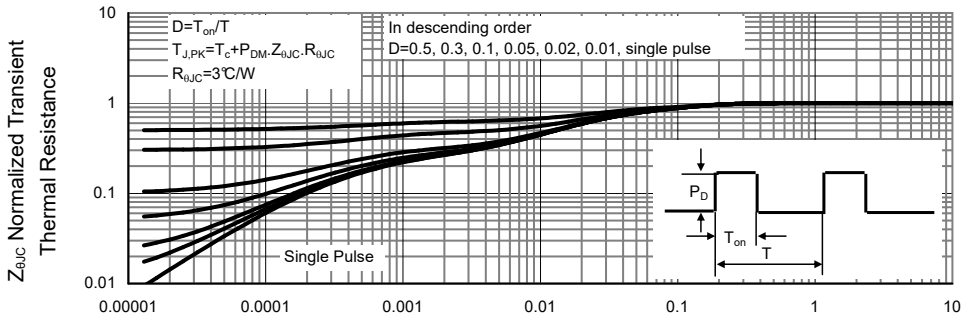


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

7.3Typical characteristic

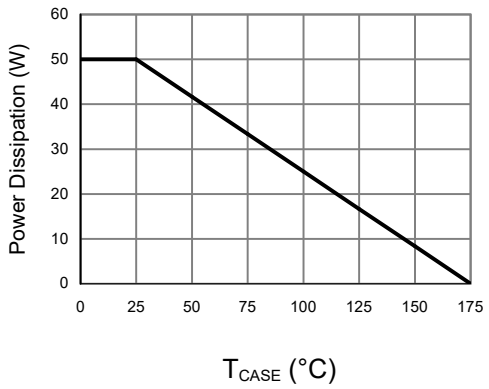


Figure 12: Power De-rating (Note B)

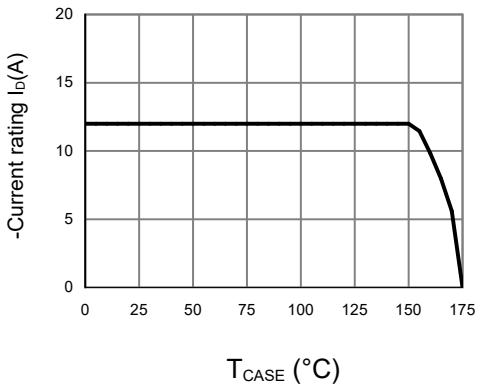


Figure 13: Current De-rating (Note B)

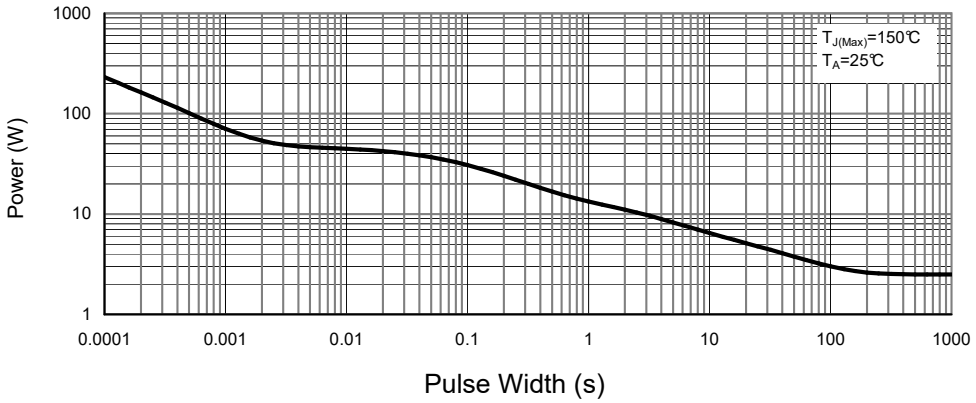


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

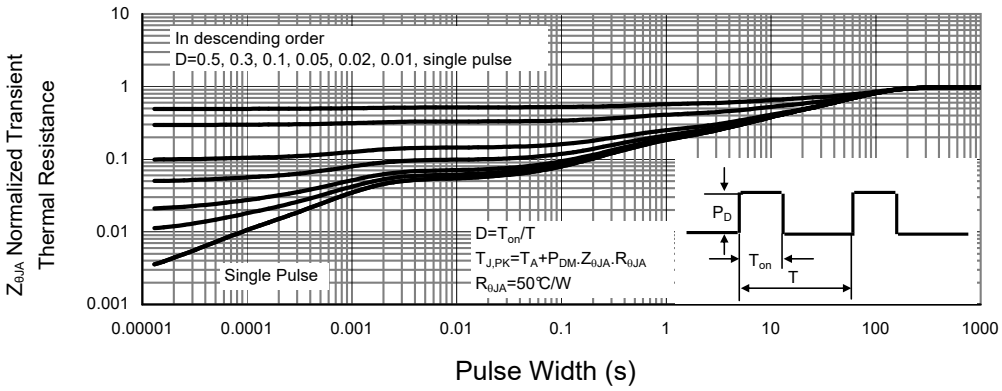
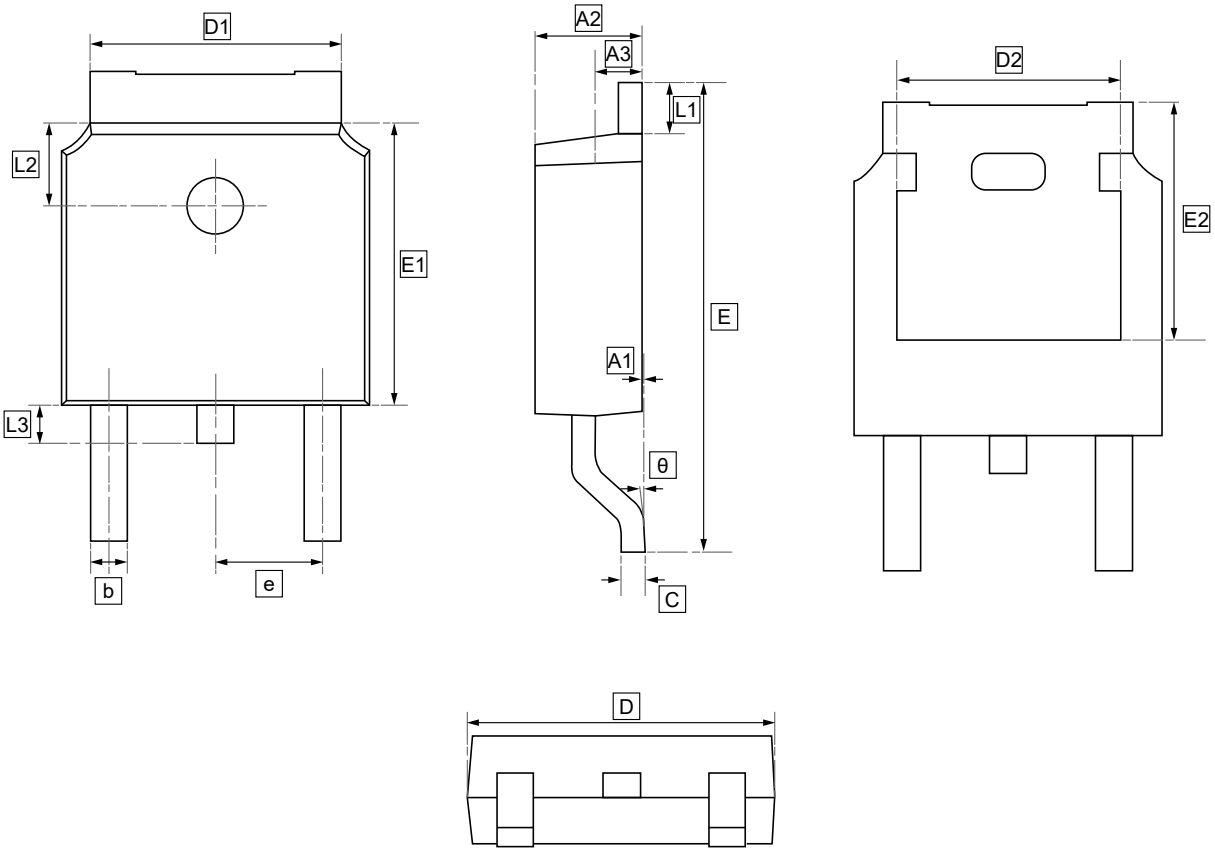


Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

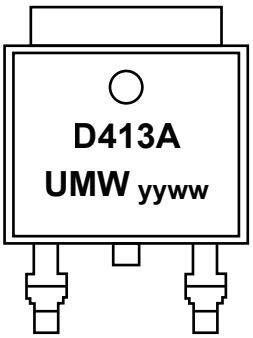
8.TO-252 Package Outline Dimensions



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	BSC	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 AOD413A	TO-252	2500	Tape and reel

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