UMW AO6401A

-30V P-Channel MOSFET

1.Description

The AO6401A uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

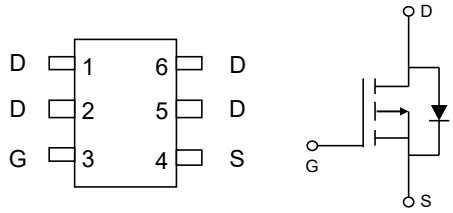
2.Features

- $V_{DS\ (V)}$=-30V
- I_D=-5A(V_{GS}=-10V)
- $R_{DS(ON)}$<47mΩ(V_{GS}=-10V)
- $R_{DS(ON)}$<64mΩ(V_{GS}=-4.5V)
- $R_{DS(ON)}$<85mΩ(V_{GS}=-2.5V)

3.Pinning information

Pin	Symbol	Description
3	G	GATE
4	S	SOURCE
1,2,5,6	D	DRAIN

SOT23-6



4.Absolute Maximum Ratings T_A= 25°C

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current	T_A=25°C	I_D	-5	A
	T_A=70°C		-4	
Pulsed Drain Current [C]		I_{DM}	-28	
Power Dissipation [B]	T_A=25°C	P_D	2	W
	T_A=70°C		1.3	W
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	t ≤ 10s	$R_{\theta JA}$	47.5	62.5	°C/W
Maximum Junction-to-Ambient	Steady-State		74	110	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	37	50	°C/W

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	BV_{DSS}	I_D=-250μA, V_{GS}=0V	-30			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-30V, V_{GS}=0V			-1	μA
Gate-Body leakage current	I_{GSS}	V_{DS}=0V, V_{GS}=±12V			±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=-250μA	-0.5	-0.9	-1.3	V
On state drain current	$I_{D(ON)}$	V_{GS}=-10V, V_{DS}=-5V	-28			A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-5A		39	47	mΩ
		V_{GS}=-4.5V, I_D=-4A		45	64	mΩ
		V_{GS}=-2.5V, I_D=-5A		59	85	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V, I_D=-5A		18		S
Diode Forward Voltage	V_{SD}	I_S=-1A, V_{GS}=0V		-0.7	-1	V
Maximum Body-Diode Continuous Current	I_S				-2.5	A
DYNAMIC PARAMETERS						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=-15V, f=1MHz		645	780	pF
Output Capacitance	C_{oss}			80		pF
Reverse Transfer Capacitance	C_{rss}			55	80	pF
Gate resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz	4	7.8	12	Ω
SWITCHING PARAMETERS						
Total Gate Charge	Q_g(10V)	V_{GS}=-10V, V_{DS}=-15V, I_D=-5A		14	17	nC
Total Gate Charge	Q_g(4.5V)			7	8.5	nC
Gate Source Charge	Q_{gs}			1.5		nC
Gate Drain Charge	Q_{gd}			2.5		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS}=-10V, V_{DS}=-15V, R_L=3Ω,R_{GEN}=3Ω		6.5		ns
Turn-On Rise Time	t_r			3.5		ns
Turn-Off DelayTime	$t_{D(off)}$			41		ns
Turn-Off Fall Time	t_f			9		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F=-5A, dI/dt=100A/μs		11	13.5	ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F=-5A, dI/dt=100A/μs		3.5		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in ^{2} FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial T_J=25°C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in ^{2} FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

7.1Typical characteristic

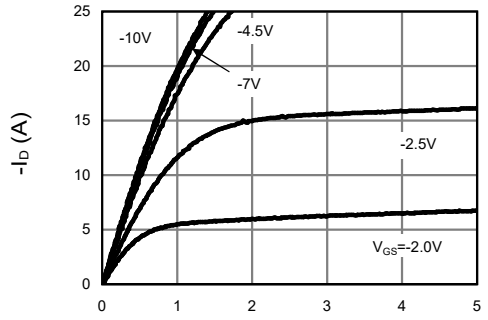


Figure 1: On-Region Characteristics (Note E)

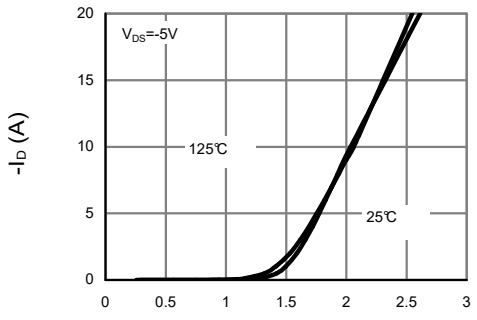


Figure 2: Transfer Characteristics (Note E)

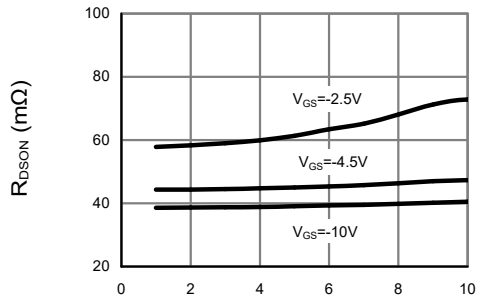


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

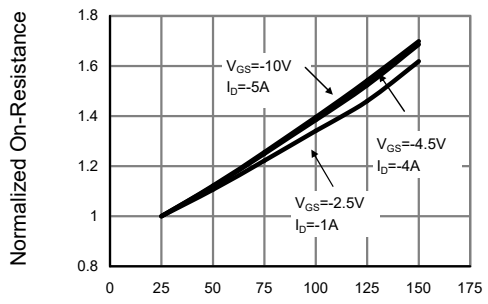


Figure 4: On-Resistance vs. Junction Temperature (Note E)

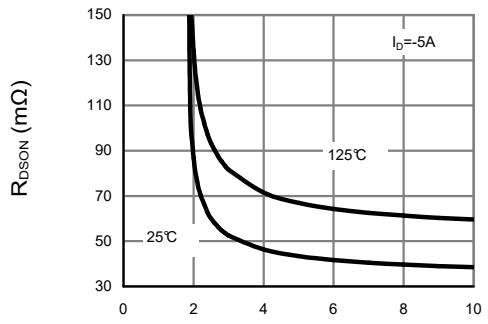


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

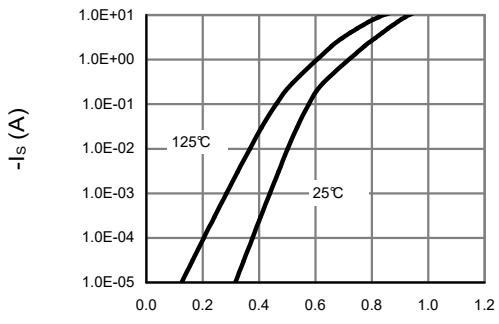


Figure 6: Body-Diode Characteristics (Note E)

7.2Typical characteristic

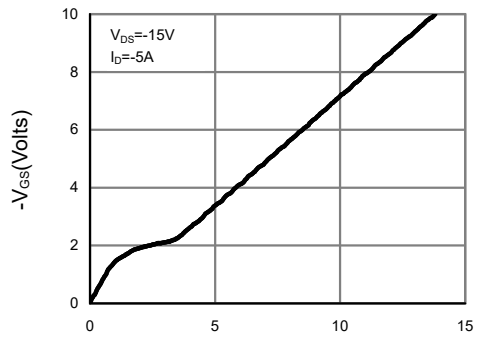


Figure 7: Gate-Charge Characteristics

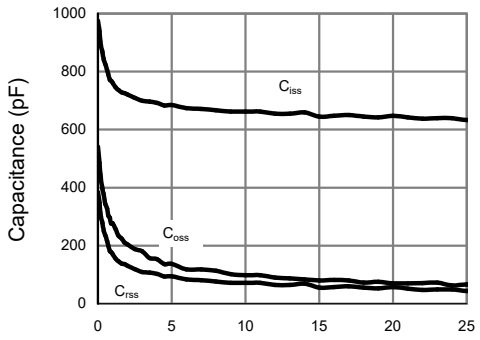


Figure 8: Capacitance Characteristics

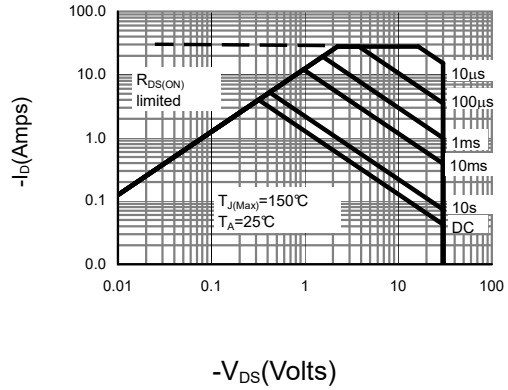


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

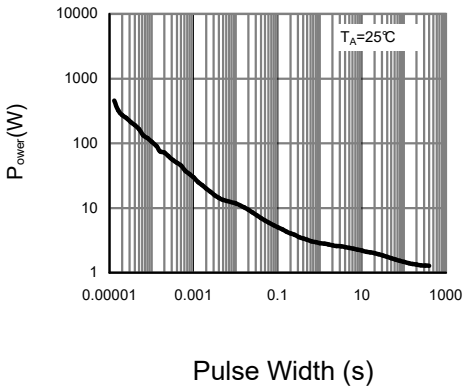


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

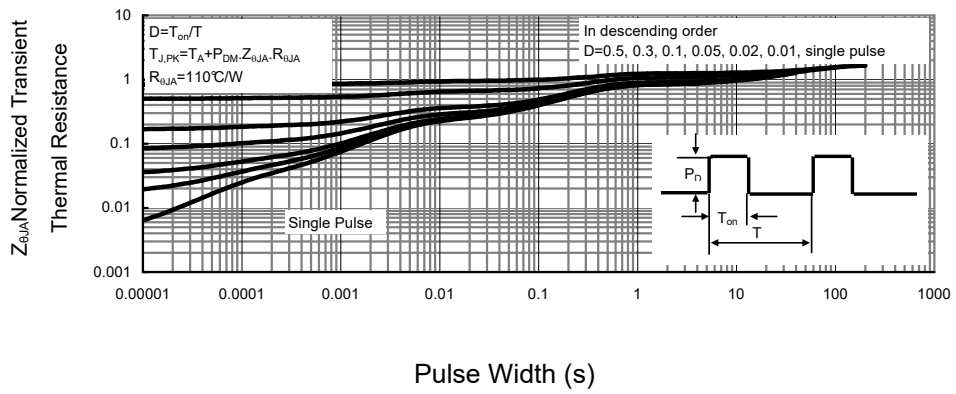
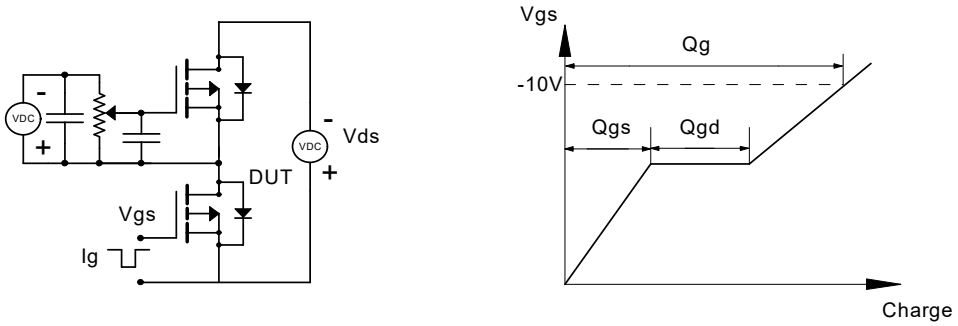
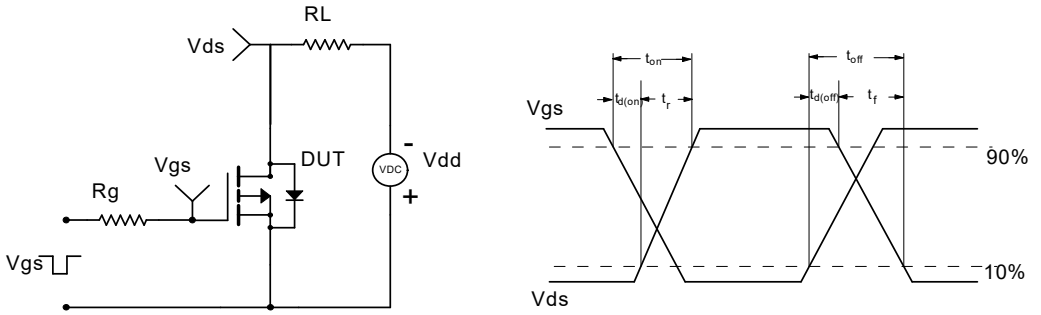


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

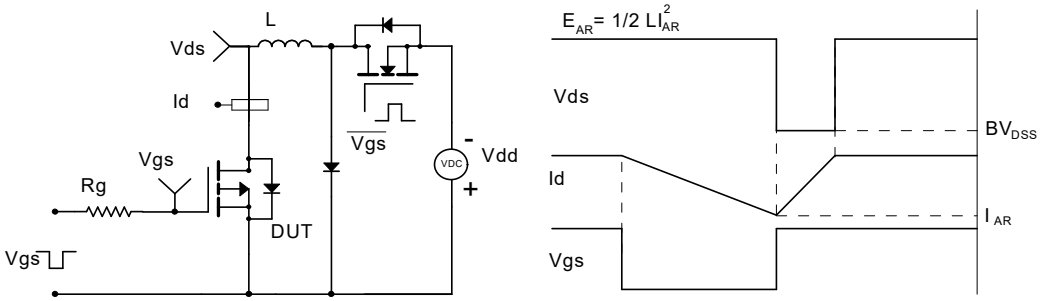
7.3Typical characteristic



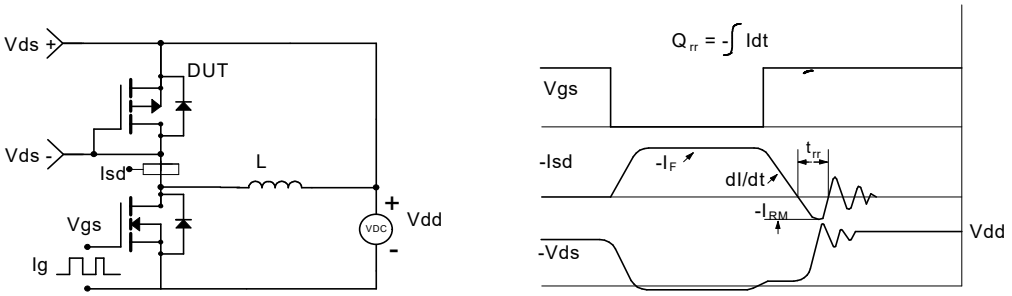
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

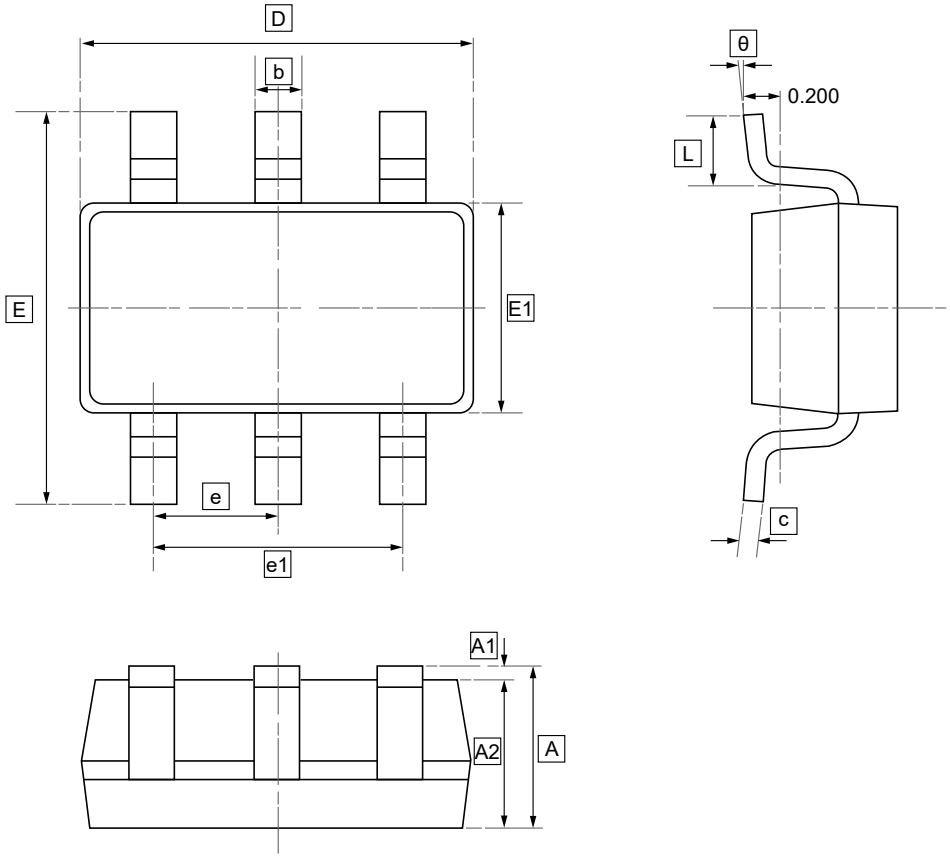


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

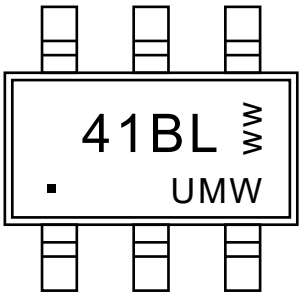
8.SOT23-6 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E1	E	e	e1	L	θ
Min	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950	1.800	0.300	0°
Max	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950	BSC	2.000	0.600	8°

9.Ordering information



ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW AO6401A	SOT23-6	3000	Tape and reel

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