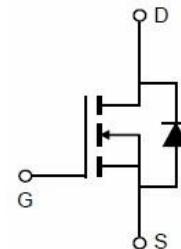


Description

The AO4406A 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.



General Features

$V_{DS} = 30V$ $I_D = 12 A$

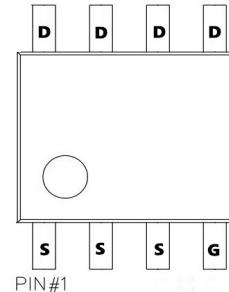
$R_{DS(ON)} < 13m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

Load switch

Uninterruptible power supply



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	12	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	8	A
I_{DM}	Pulsed Drain Current ²	30	A
EAS	Single Pulse Avalanche Energy ³	20	mJ
I_{AS}	Avalanche Current	22	A
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	4.5	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	50	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	30	°C/W

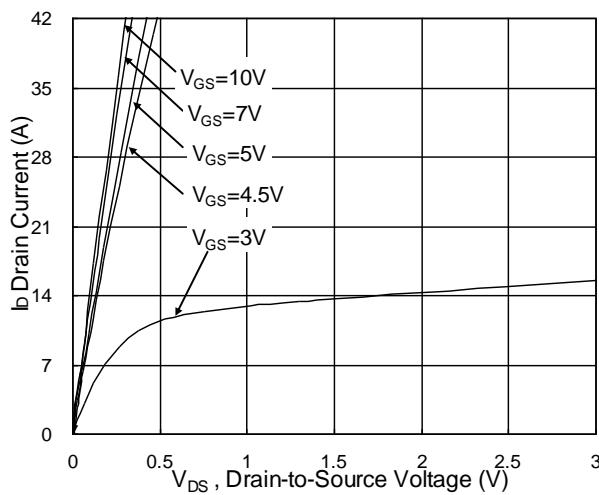
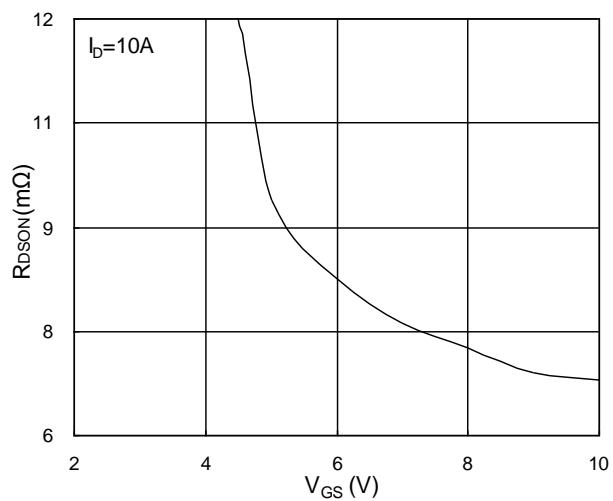
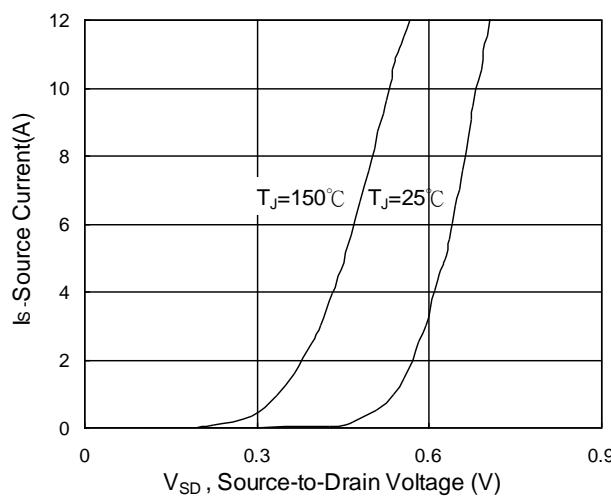
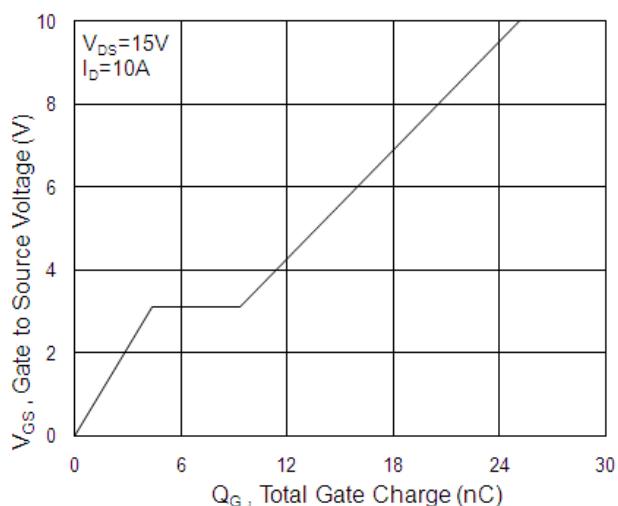
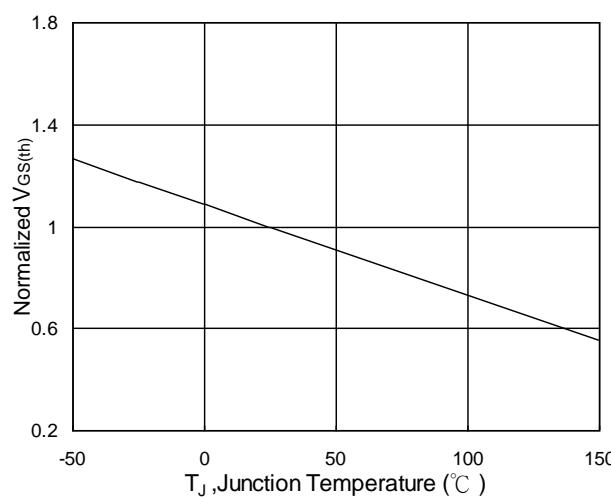
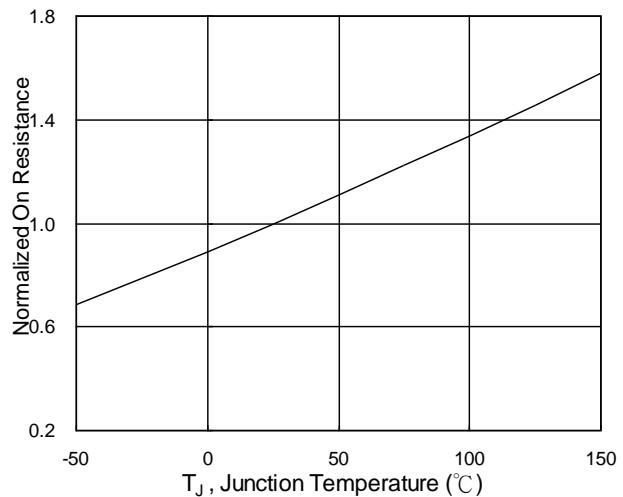
30V N-Channel Enhancement Mode MOSFET

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}}=0\text{V}$, $I_D=250\mu\text{A}$	30	---	---	V
$\Delta \text{BV}_{\text{DSS}}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	0.027	---	$\text{V}/^\circ\text{C}$
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance ²	$V_{\text{GS}}=10\text{V}$, $I_D=10\text{A}$	---	10	13	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}$, $I_D=8\text{A}$	---	12	16	
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage		1.2	1.5	2.5	V
$\Delta V_{\text{GS}(\text{th})}$	$V_{\text{GS}(\text{th})}$ Temperature Coefficient	$V_{\text{GS}}=V_{\text{DS}}$, $I_D=250\mu\text{A}$	---	-5.8	---	$\text{mV}/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{\text{DS}}=24\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=25^\circ\text{C}$	---	---	1	uA
		$V_{\text{DS}}=24\text{V}$, $V_{\text{GS}}=0\text{V}$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{\text{GS}}=\pm 20\text{V}$, $V_{\text{DS}}=0\text{V}$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{\text{DS}}=5\text{V}$, $I_D=10\text{A}$	---	5.8	---	S
R_g	Gate Resistance	$V_{\text{DS}}=0\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	2.2	3.8	
Q_g	Total Gate Charge (4.5V)	$V_{\text{DS}}=15\text{V}$, $V_{\text{GS}}=4.5\text{V}$, $I_D=10\text{A}$	---	12.6	17.6	nC
Q_{gs}	Gate-Source Charge		---	4.2	5.9	
Q_{gd}	Gate-Drain Charge		---	5.1	7.1	
$T_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}}=15\text{V}$, $V_{\text{GS}}=10\text{V}$, $R_g=3.3$ $I_D=10\text{A}$	---	6.2	12.4	ns
T_r	Rise Time		---	59	106	
$T_{\text{d(off)}}$	Turn-Off Delay Time		---	27.6	55	
T_f	Fall Time		---	8.4	16.8	
C_{iss}	Input Capacitance	$V_{\text{DS}}=15\text{V}$, $V_{\text{GS}}=0\text{V}$, $f=1\text{MHz}$	---	960	---	pF
C_{oss}	Output Capacitance		---	139	---	
C_{rss}	Reverse Transfer Capacitance		---	87	---	
I_s	Continuous Source Current ^{1,5}	$V_G=V_D=0\text{V}$, Force Current	---	---	10.3	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	42	A
V_{SD}	Diode Forward Voltage ²	$V_{\text{GS}}=0\text{V}$, $I_s=1\text{A}$, $T_J=25^\circ\text{C}$	---	---	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=10\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ $T_J=25^\circ\text{C}$	---	12.5	---	nS
Q_{rr}	Reverse Recovery Charge		---	5	---	nC

Note :

- 1 .The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$
- 3 .The EAS data shows Max. rating . The test condition is $V_{\text{DD}}=25\text{V}$, $V_{\text{GS}}=10\text{V}$, $L=0.1\text{mH}$, $I_{\text{AS}}=35\text{A}$
- 4.The power dissipation is limited by 150°C junction temperature 5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics**Fig.1 Typical Output Characteristics****Fig.2 On-Resistance vs. Gate-Source****Fig.3 Forward Characteristics of reverse****Fig.4 Gate-Charge Characteristics****Fig.5 Normalized $V_{GS(th)}$ vs. T_J** **Fig.6 Normalized $R_{DS(on)}$ vs. T_J**

30V N-Channel Enhancement Mode MOSFET

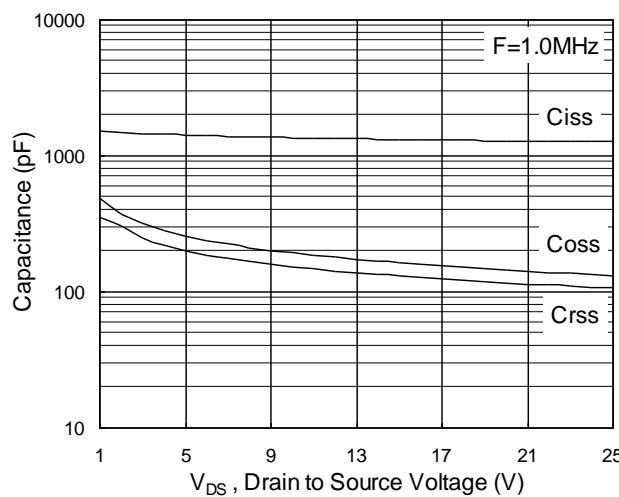


Fig.7 Capacitance

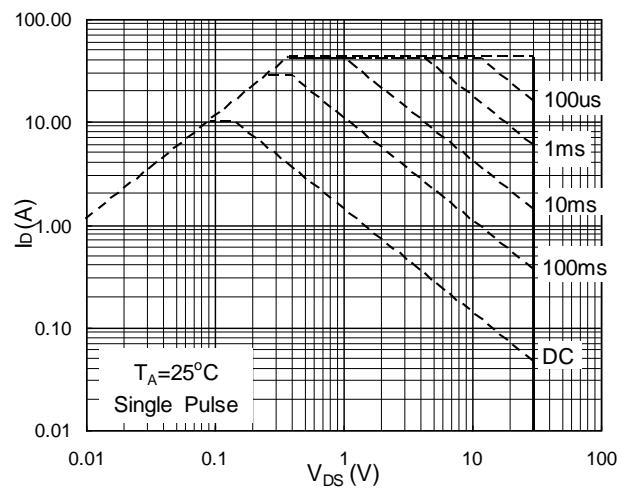


Fig.8 Safe Operating Area

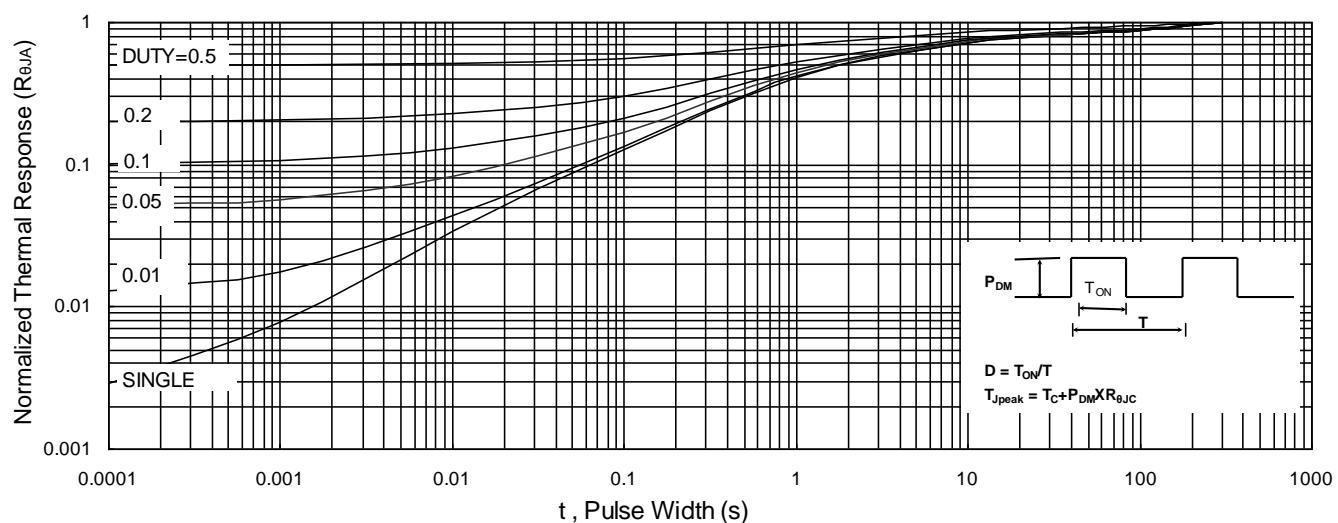


Fig.9 Normalized Maximum Transient Thermal Impedance

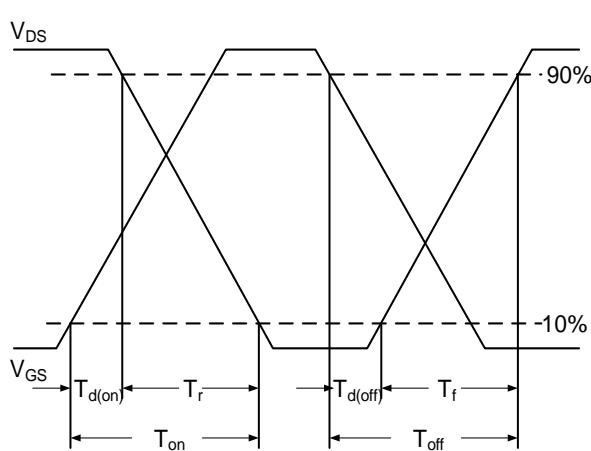


Fig.10 Switching Time Waveform

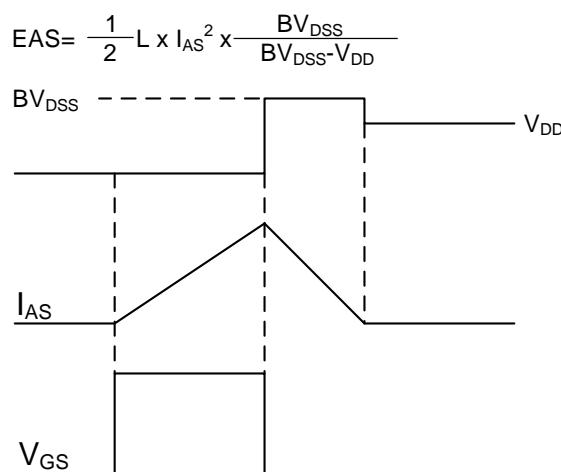
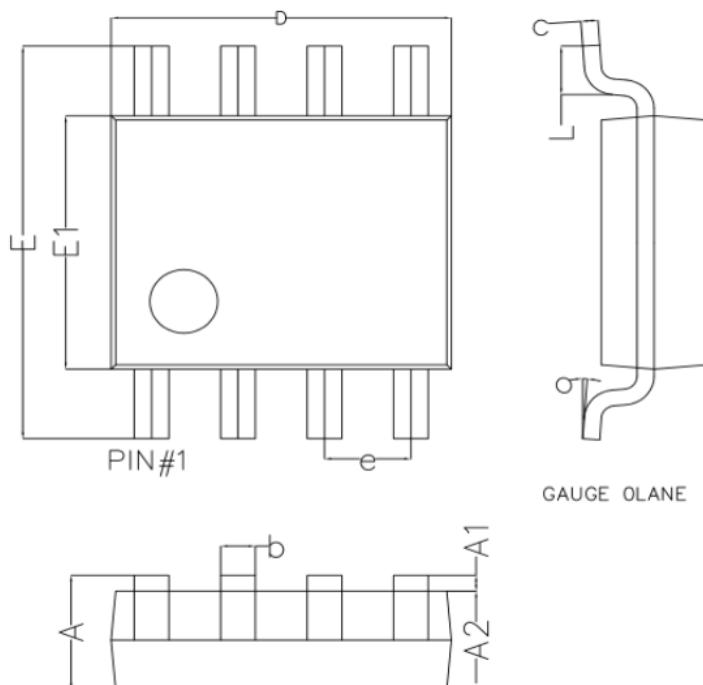


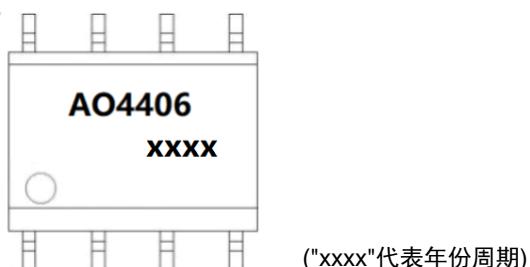
Fig.11 Unclamped Inductive Switching Waveform

SOP8 Package outline



Symbol	Dim in mm		
	Min	Nor	Max
A	1.350	1.550	1.750
A1	0.100	0.175	0.250
A2	1.350	1.450	1.550
b	0.330	0.420	0.510
c	0.170	0.210	0.250
D	4.800	4.900	5.000
e	1.270 (BSC)		
E	5.800	6.000	6.200
E1	3.800	3.900	4.000
L	0.400	0.835	1.2700
o	0°	4°	8°

Marking



("xxxx"代表年份周期)