

General Description

The AO4421 is the high cell density trench P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The AO4421 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

100% EAS Guaranteed

Features

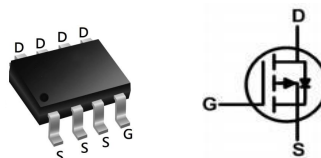
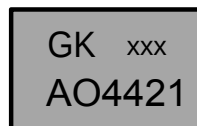
Green Device Available

Super Low Gate Charge

Excellent CdV/dt effect decline

Advanced high cell density Trench technology

V_{DS} -60 V
 I_D -7.0 A
 $R_{DS(ON)}$ 25 m Ω



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-7.0	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-7.0	A
I_{DM}	Pulsed Drain Current ²	-16.2	A
EAS	Single Pulse Avalanche Energy ³	69.7	mJ
I_{AS}	Avalanche Current	44.4	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ⁴	6.1	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	85	$^\circ C / W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	36	$^\circ C / W$

Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-60	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.03	---	V/ °C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-3A	---	25	30	mΩ
		V _{GS} =-4.5V, I _D =-2A	---	30	40	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1	---	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.56	---	mV/ °C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-48V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} = ±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-3A	---	8.7	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	15	---	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-48V, V _{GS} =-4.5V, I _D =-3A	---	11.8	---	nC
Q _{gs}	Gate-Source Charge		---	1.9	---	
Q _{gd}	Gate-Drain Charge		---	6.5	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A	---	8.8	---	ns
T _r	Rise Time		---	19.6	---	
T _{d(off)}	Turn-Off Delay Time		---	47.2	---	
T _f	Fall Time		---	9.6	---	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	1080	---	pF
C _{oss}	Output Capacitance		---	73	---	
C _{rss}	Reverse Transfer Capacitance		---	50	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	-7.0	A
I _{SM}	Pulsed Source Current ^{2,5}		---	---	-16.2	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V

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 ≤ 300us, duty cycle ≤ 2%

3.The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0. 1mH, I_{AS}=-24.4A

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.

RATING AND CHARACTERISTIC CURVES

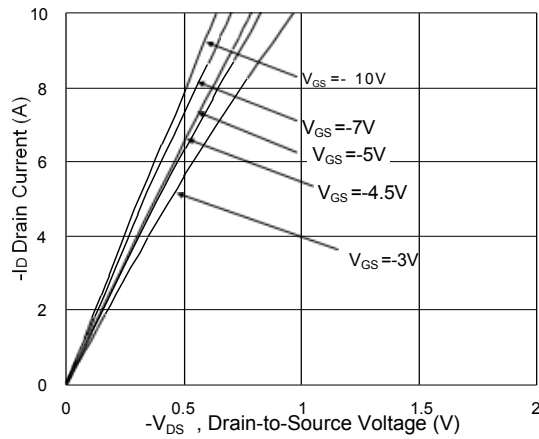


Fig. 1 Typical Output Characteristics

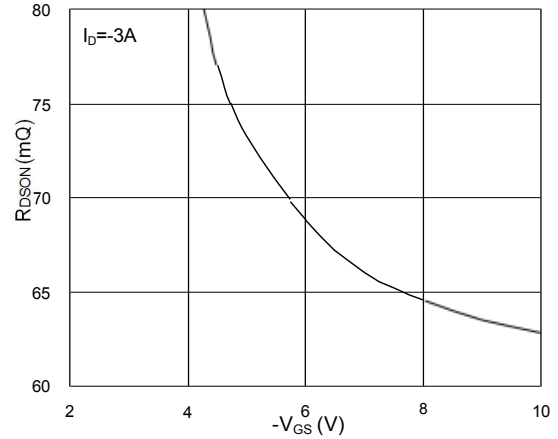


Fig. 2 On-Resistance v.s Gate-Source

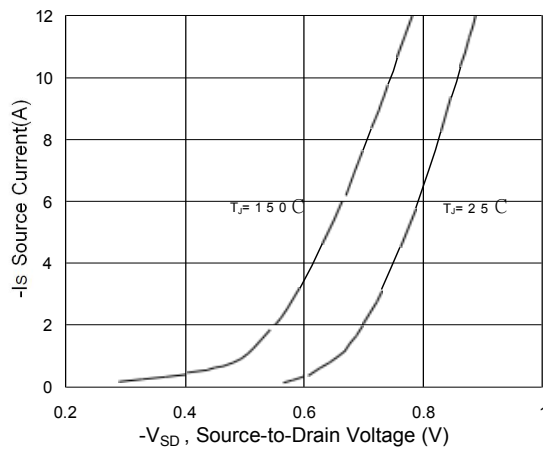


Fig. 3 Forward Characteristics of Reverse

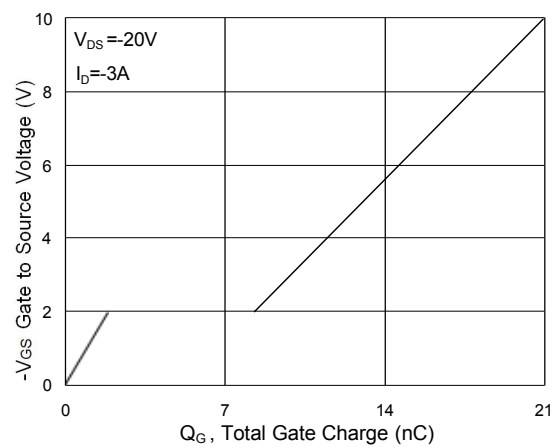


Fig. 4 Gate-Charge Characteristics

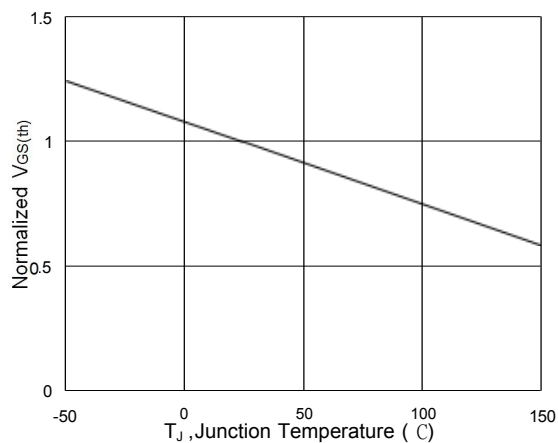


Fig. 5 Normalized $V_{GS(th)}$ vs. T_J

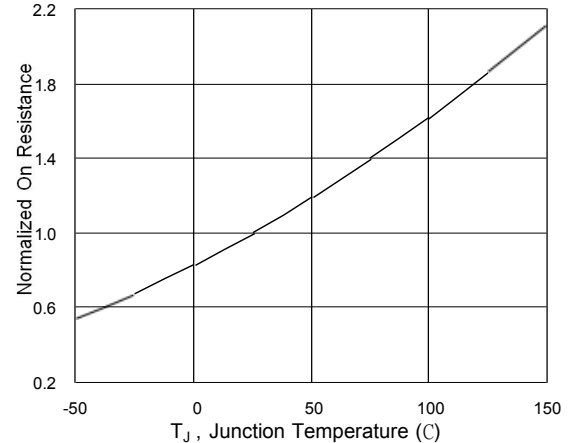


Fig. 6 Normalized $R_{DS(on)}$ vs. T_J

RATING AND CHARACTERISTIC CURVES

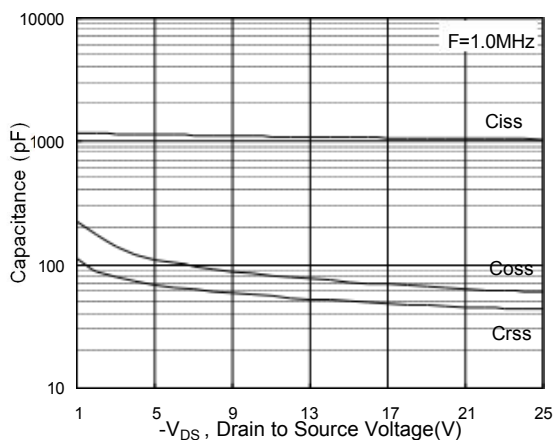


Fig.7 Capacitance

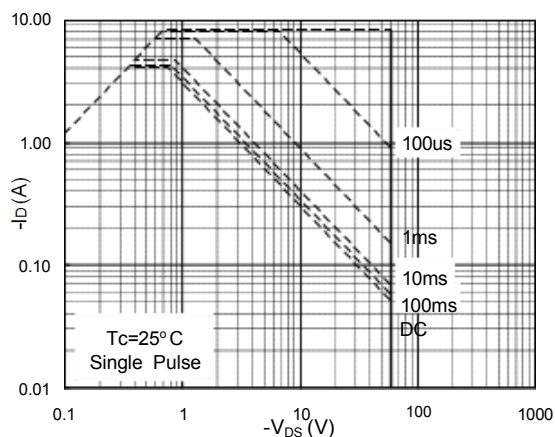


Fig.8 Safe Operating Area

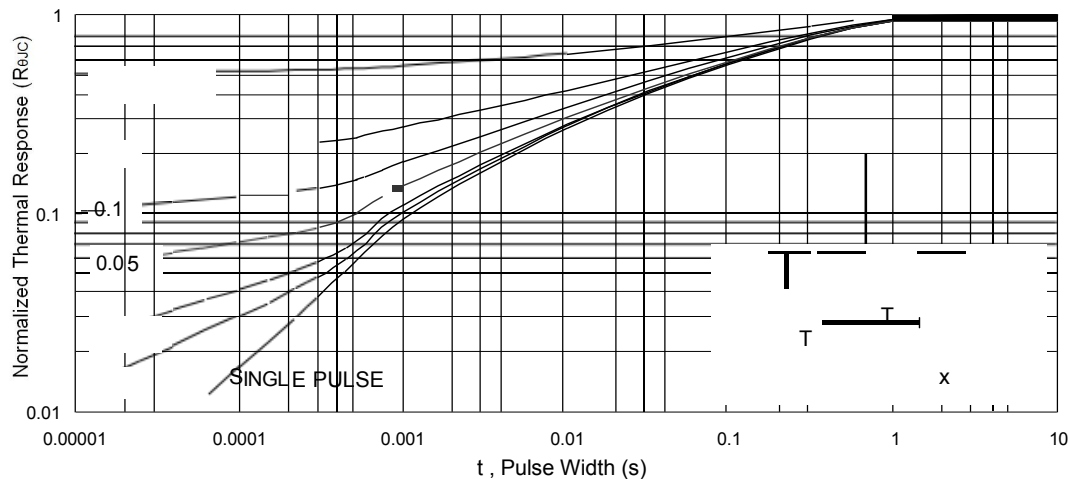


Fig.9 Normalized Maximum Transient Thermal Impedance

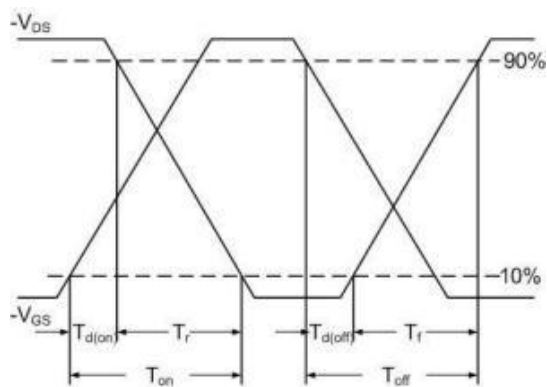


Fig.10 Switching Time Waveform

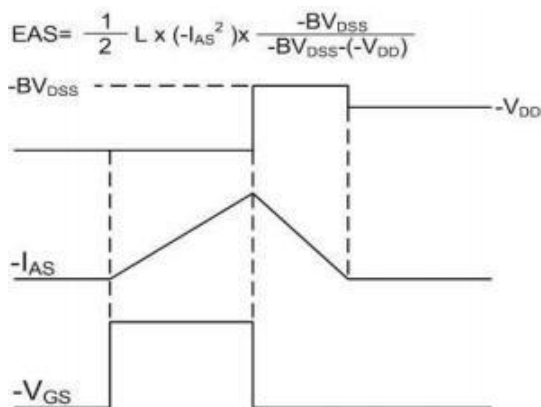
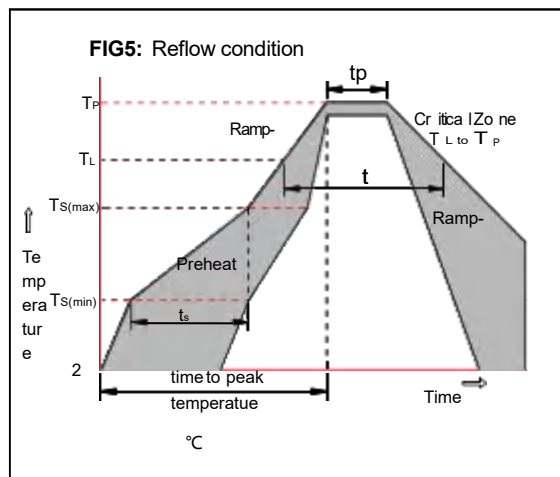


Fig.11 Unclamped Inductive Waveform

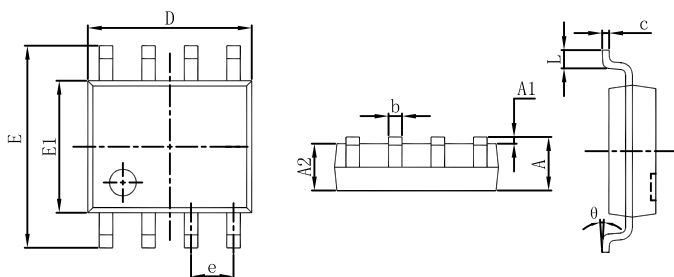
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150 °C
	-Temperature Max($T_{s(max)}$)	+200 °C
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3 °C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217 °C
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_P)		+260(+0/-5) °C
Time within 5 °C of actual Peak Temp (t_P)		30 secs. Max
Ramp-down Rate		6 °C/sec. Max
Time 25 °C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260 °C

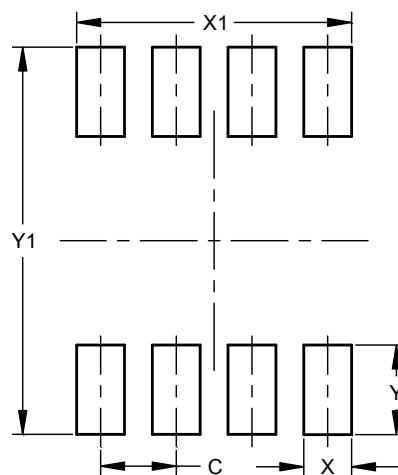


Package Dimensions & Suggested Pad Layout

SOP-8

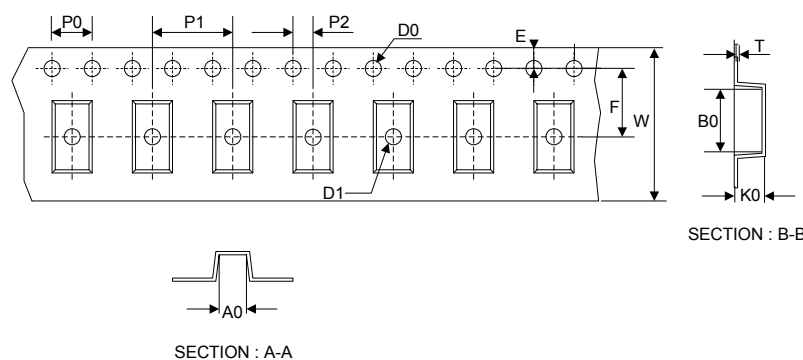
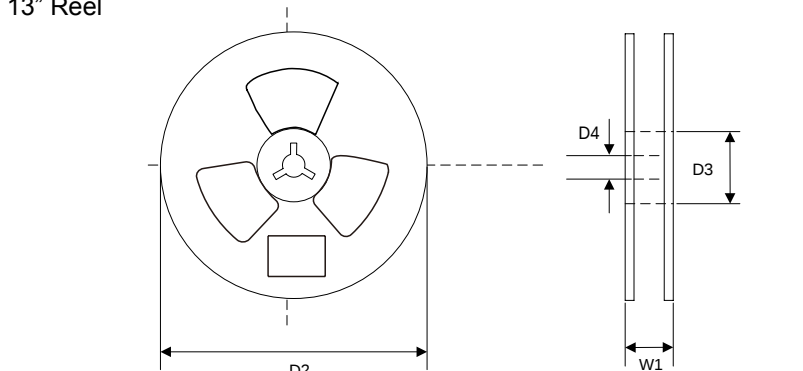
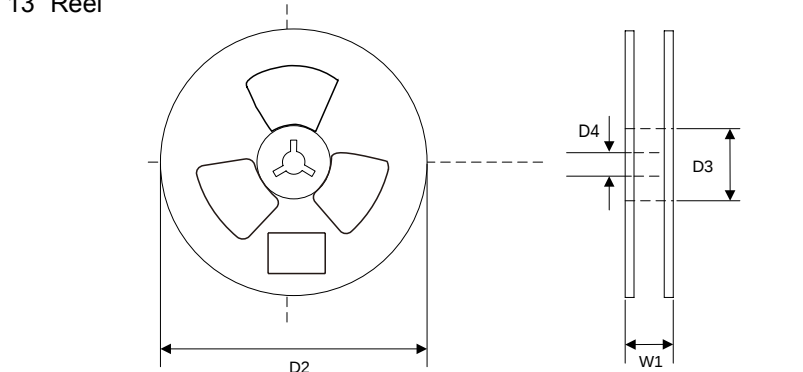


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Dimensions	Value (in mm)
C	1.27
X	0.70
X1	4.51
Y	2.00
Y1	7.00

Tape & reel specification

Tape  SECTION : A-A SECTION : B-B	<table> <tr> <th>Symbol</th><th>Dimension (mm)</th></tr> <tr><td>P0</td><td>4.00±0.20</td></tr> <tr><td>P1</td><td>8.00±0.20</td></tr> <tr><td>P2</td><td>2.00±0.20</td></tr> <tr><td>D0</td><td>1.55±0.20</td></tr> <tr><td>D1</td><td>1.55±0.20</td></tr> <tr><td>E</td><td>1.75±0.15</td></tr> <tr><td>F</td><td>5.50±0.20</td></tr> <tr><td>W</td><td>12.00±0.20</td></tr> <tr><td>A0</td><td>7.00±0.20</td></tr> <tr><td>B0</td><td>5.70±0.20</td></tr> <tr><td>K0</td><td>1.35±0.20</td></tr> <tr><td>T</td><td>0.23±0.20</td></tr> </table>	Symbol	Dimension (mm)	P0	4.00±0.20	P1	8.00±0.20	P2	2.00±0.20	D0	1.55±0.20	D1	1.55±0.20	E	1.75±0.15	F	5.50±0.20	W	12.00±0.20	A0	7.00±0.20	B0	5.70±0.20	K0	1.35±0.20	T	0.23±0.20
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