

## General Description

The AO4420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  shoot-through immunity and body diode characteristics. This device is suitable for use as a synchronous switch in PWM applications. AO4420L is offered in a lead-free package. AO4420L (Green Product) is offered in a lead-free package.

## Features

$$V_{DS} (V) = 30V$$

$$I_D = 13.7A$$

$$R_{DS(ON)} < 10.5m\Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 12m\Omega (V_{GS} = 4.5V)$$



### Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	13.7
		$T_A=70^\circ C$	9.7
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	60	A
Power Dissipation	$P_D$	$T_A=25^\circ C$	3.1
		$T_A=70^\circ C$	2
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ C$

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	28	40	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	54	75
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	21	30	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		0.004	1	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 12\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	0.6	1.1	2	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$ , $V_{DS}=5\text{V}$	40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=13.7\text{A}$ $T_J=125^\circ\text{C}$		8.3	10.5	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$ , $I_D=12.7\text{A}$		12.5	15	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=13.7\text{A}$	30	37		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.76	1	V
$I_S$	Maximum Body-Diode Continuous Current				5	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$		3656	4050	pF
$C_{oss}$	Output Capacitance			256		pF
$C_{rss}$	Reverse Transfer Capacitance			168		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		0.86	1.1	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(4.5\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=13.7\text{A}$		30.5	36	nC
$Q_{gs}$	Gate Source Charge			4.6		nC
$Q_{gd}$	Gate Drain Charge			8.6		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=1.1\Omega$ , $R_{GEN}=0\Omega$		5.5	9	ns
$t_r$	Turn-On Rise Time			3.4	7	ns
$t_{D(off)}$	Turn-Off Delay Time			49.8	75	ns
$t_f$	Turn-Off Fall Time			5.9	11	ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=13.7\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		22.5	28	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=13.7\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		12.5	16	nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any a given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

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

D: The static characteristics in Figures 1 to 6 are obtained using 80 $\mu\text{s}$  pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in<sup>2</sup> 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

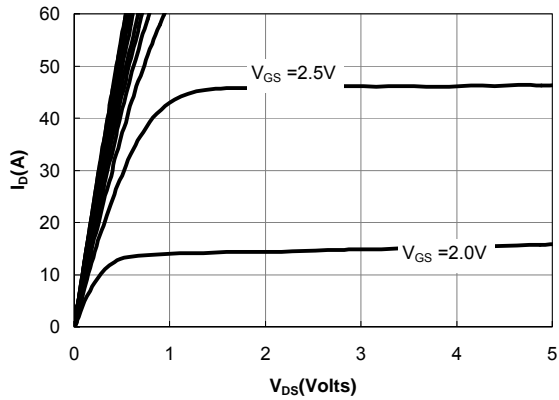


Figure 1: On-Regions Characteristics

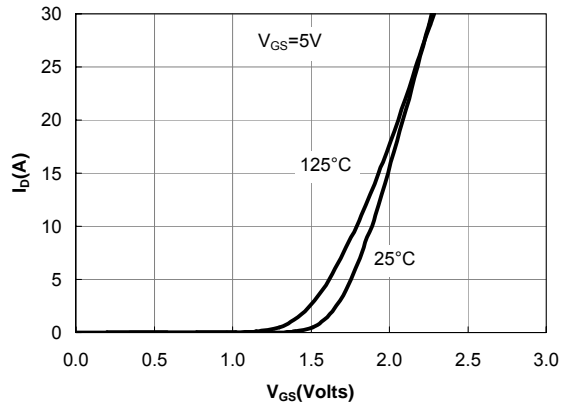


Figure 2: Transfer Characteristics

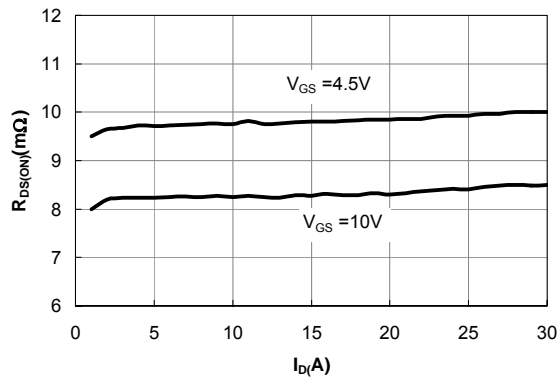


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

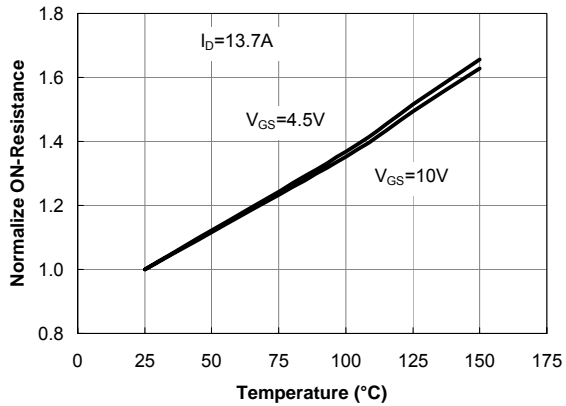


Figure 4: On-Resistance vs. Junction Temperature

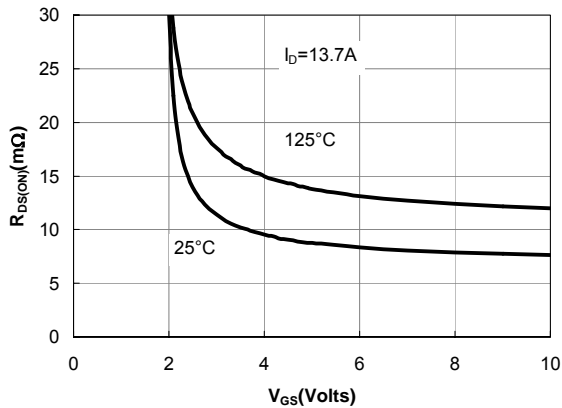


Figure 5: On-Resistance vs. Gate-Source Voltage

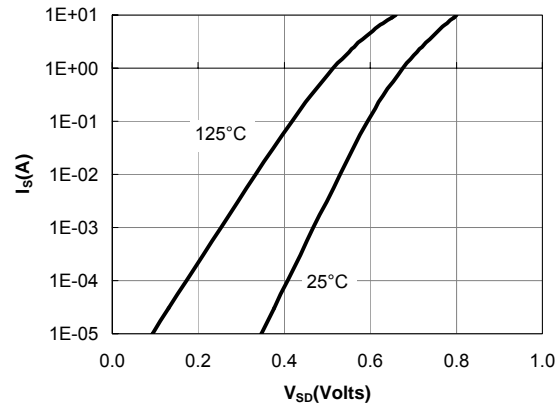


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

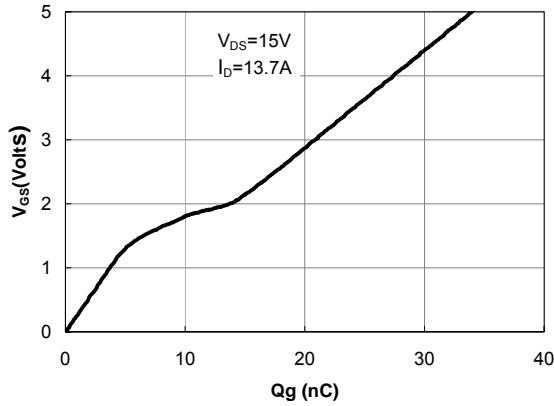


Figure 7: Gate-Charge Characteristics

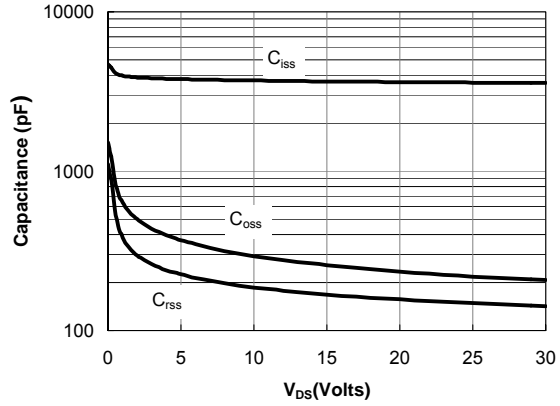


Figure 8: Capacitance Characteristics

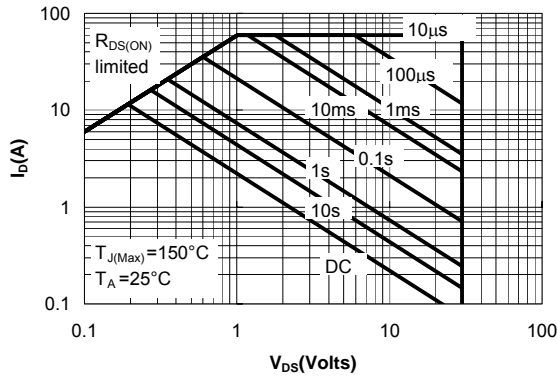


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

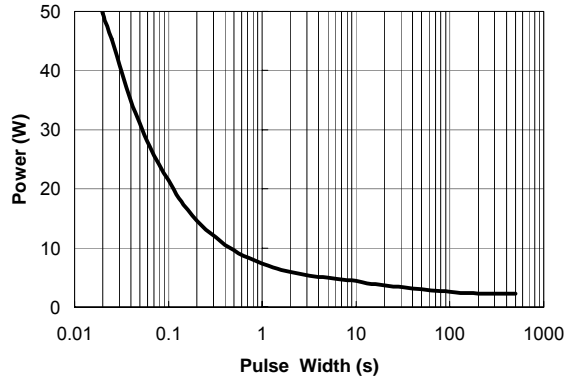


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

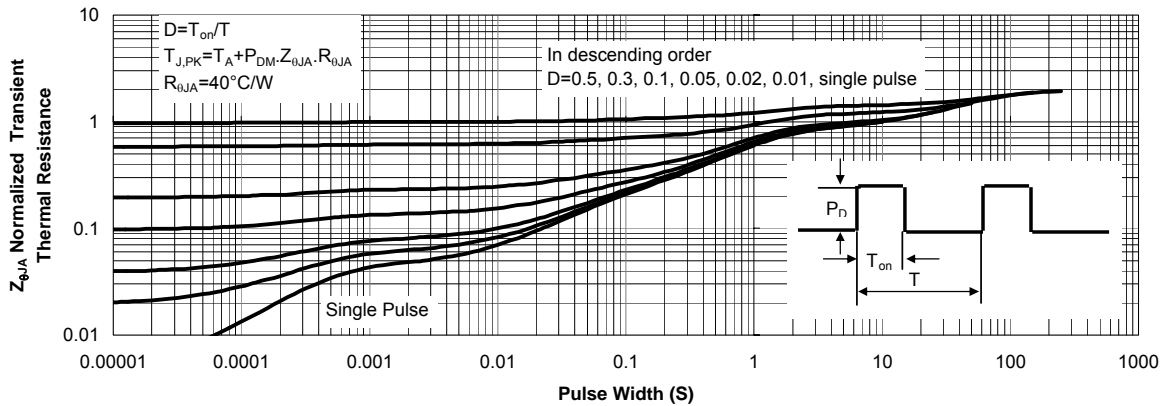
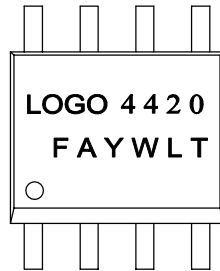


Figure 11: Normalized Maximum Transient Thermal Impedance

### SO-8 PACKAGE MARKING DESCRIPTION



Standard product

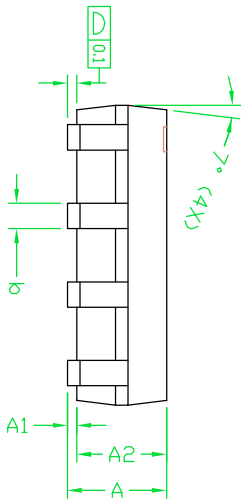
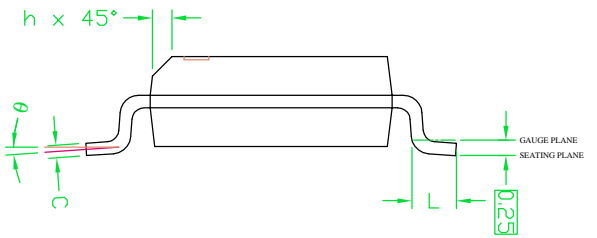
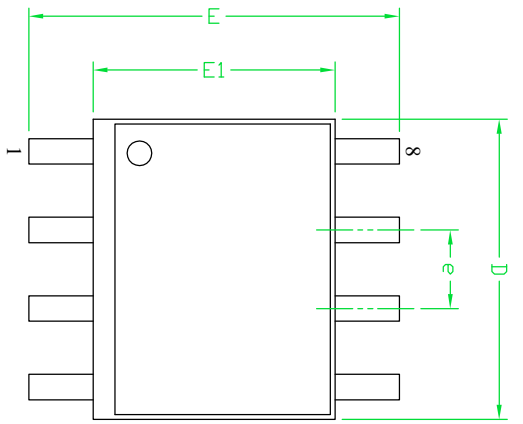


Green product

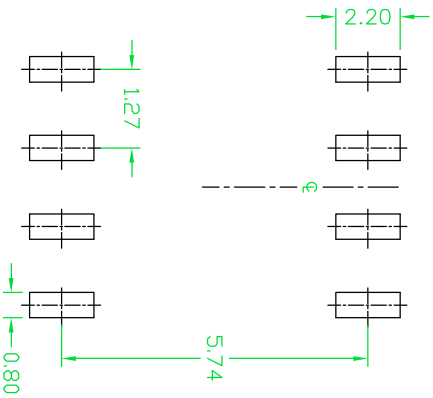
**NOTE:**

LOGO - AOS LOGO  
 4420 - PART NUMBER CODE.  
 F&A - FOUNDRY AND ASSEMBLY LOCATION  
 Y - YEAR CODE  
 W - WEEK CODE.  
 L T - ASSEMBLY LOT CODE

PART NO.	DESCRIPTION	CODE
AO4420	Standard product	4420
AO4420L	Green product	<u>4420</u>



**RECOMMENDED LAND PATTERN**



**UNIT: mm**

- NOTE**
1. ALL DIMENSIONS ARE IN MILLIMETERS.
  2. DIMENSIONS ARE INCLUSIVE OF PLATING.
  3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
  4. DIMENSION L IS MEASURED IN GAUGE PLANE.
  5. CONTROLLING DIMENSION IS MILLIMETER, CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.35	1.65	1.75	0.053	0.065	0.069
A1	0.10	—	0.25	0.004	—	0.010
A2	1.25	1.50	1.65	0.049	0.059	0.065
b	0.31	—	0.51	0.012	—	0.020
c	0.17	—	0.25	0.007	—	0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E1	3.80	3.90	4.00	0.150	0.154	0.157
e	1.27 BSC			0.050 BSC		
E	5.80	6.00	6.20	0.228	0.236	0.244
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
θ	0°	—	8°	0°	—	8°

UNLESS OTHERWISE SPECIFIED  
DIMENSIONS ARE IN INCHES

DECIMAL                      ANGULAR  
XX ±                              ±  
XXX ±  
XXXX ±

INTERPRET DIM AND TOL PER  
ASME Y14.5M - 1994

PRINTING IS SCALED TO FIT  
DO NOT SCALE DRAWING



THIRD ANGLE  
PROJECTION

Document No.

PD-00004

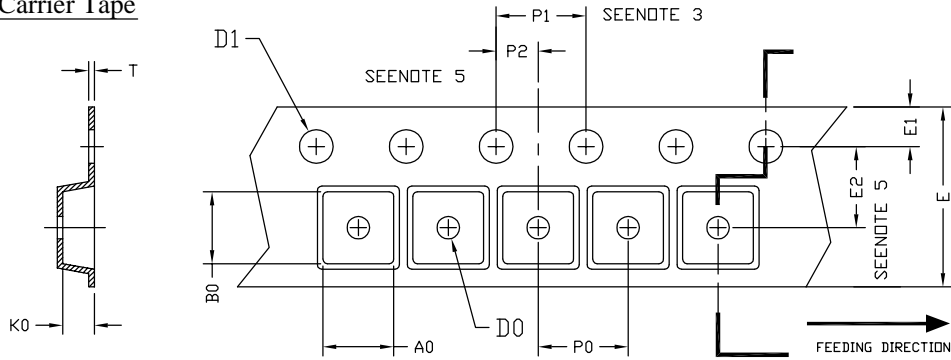
Version

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Title

SO-8 PACKAGE OUTLINE

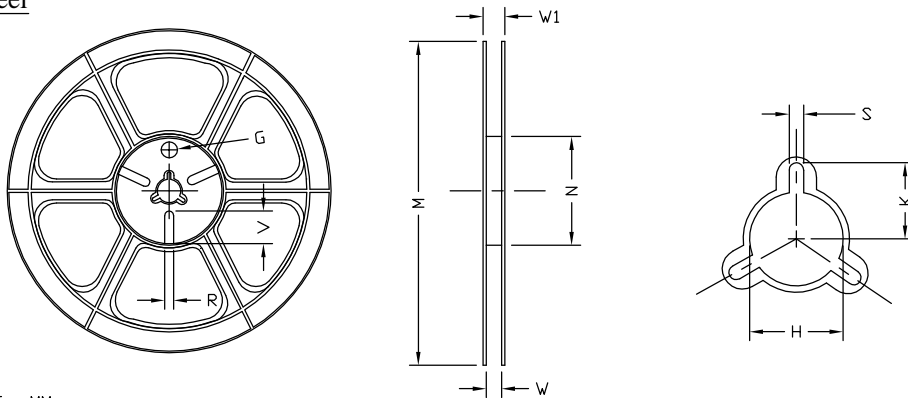
## SO-8 Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SD-8 (12 mm)	6.40 ±0.10	5.20 ±0.10	2.10 ±0.10	1.60 ±0.10	1.50 +0.10	12.00 ±0.30	1.75 ±0.10	5.50 ±0.05	8.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

## SO-8 Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
12 mm	ø330	ø330.00 ±0.50	ø97.00 ±0.10	13.00 ±0.30	17.40 ±1.00	ø13.00 +0.50 -0.20	10.60	2.00 ±0.50	---	---	---

## SO-8 Tape

Leader / Trailer & Orientation

