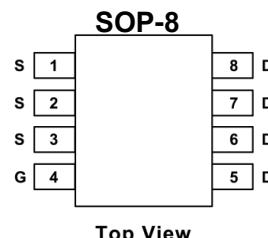


## AO4413-HX P-Channel 30-V (D-S) MOSFET

## PRODUCT SUMMARY

VDS (V)	RDS(on)	ID
-30	< 6.2mΩ at V <sub>GS</sub> = -20 V	-17A V <sub>GS</sub> = -20 V
	< 7.2mΩ at V <sub>GS</sub> = -10 V	



## FEATURES

- TrenchFET® Power MOSFET
- 100 % R<sub>g</sub> Tested
- 100 % UIS Tested

## APPLICATIONS

- Load Switch
- Notebook Adaptor Switch

Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V <sub>DS</sub>	-30	V
Gate-Source Voltage	V <sub>GS</sub>	±25	V
Continuous Drain Current <sup>AF</sup>	I <sub>D</sub>	-17	A
		-14	
Pulsed Drain Current <sup>B</sup>	I <sub>DM</sub>	-182	
Power Dissipation <sup>A</sup>	P <sub>D</sub>	3.1	W
		2	
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to 150	°C

## Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>AF</sup>	R <sub>θJA</sub>	26	40	°C/W
Maximum Junction-to-Ambient <sup>A</sup>		50	75	°C/W
Maximum Junction-to-Lead <sup>C</sup>	R <sub>θJL</sub>	14	24	°C/W

Electrical Characteristics ( $T_J=25^\circ\text{C}$ unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$ , $V_{\text{GS}}=0\text{V}$	-30			V
$\text{Id}_{\text{SS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}}=-30\text{V}$ , $V_{\text{GS}}=0\text{V}$		-1		$\mu\text{A}$
		$T_J=55^\circ\text{C}$		-5		
$\text{I}_{\text{GSS}}$	Gate-Body leakage current	$V_{\text{DS}}=0\text{V}$ , $V_{\text{GS}}=\pm20\text{V}$		$\pm 1$		$\mu\text{A}$
		$V_{\text{DS}}=0\text{V}$ , $V_{\text{GS}}=\pm25\text{V}$		$\pm 10$		
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$ $I_D=-250\mu\text{A}$	-1.5	-2.1	-2.6	V
$\text{R}_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance	$V_{\text{GS}}=-20\text{V}$ , $I_D=-15\text{A}$		5	6.2	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		7.2	9	
		$V_{\text{GS}}=-10\text{V}$ , $I_D=-15\text{A}$		5.7	7.2	$\text{m}\Omega$
$\text{g}_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}}=-5\text{V}$ , $I_D=-15\text{A}$		48		S
		$V_{\text{SD}}$	$I_{\text{S}}=-1\text{A}$ , $V_{\text{GS}}=0\text{V}$	-0.7	-1	V
$\text{I}_{\text{S}}$	Maximum Body-Diode Continuous Current				-4.2	A
<b>DYNAMIC PARAMETERS</b>						
$\text{C}_{\text{iss}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=-15\text{V}$ , $f=1\text{MHz}$		2823	3400	pF
$\text{C}_{\text{oss}}$	Output Capacitance			574		pF
$\text{C}_{\text{rss}}$	Reverse Transfer Capacitance			424	600	pF
$\text{R}_g$	Gate resistance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=0\text{V}$ , $f=1\text{MHz}$	2.1	4.0	6.4	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$\text{Q}_g$	Total Gate Charge	$V_{\text{GS}}=-10\text{V}$ , $V_{\text{DS}}=-15\text{V}$ , $I_D=-15\text{A}$		54	76	nC
$\text{Q}_{\text{gs}}$	Gate Source Charge			9		nC
$\text{Q}_{\text{gd}}$	Gate Drain Charge			16		nC
$\text{t}_{\text{D}(\text{on})}$	Turn-On Delay Time	$V_{\text{GS}}=-10\text{V}$ , $V_{\text{DS}}=-15\text{V}$ , $R_L=1.0\Omega$ , $R_{\text{GEN}}=3\Omega$		12.5		ns
$\text{t}_r$	Turn-On Rise Time			12.5		ns
$\text{t}_{\text{D}(\text{off})}$	Turn-Off Delay Time			49		ns
$\text{t}_f$	Turn-Off Fall Time			109		ns
$\text{t}_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=-15\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		22.3	32	ns
$\text{Q}_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=-15\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		8.8		nC

**Notes**

A. The value of  $\text{R}_{\text{0JA}}$  is measured 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 value in any 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  $\text{R}_{\text{0JA}}$  is the sum of the thermal impedance from junction to lead  $\text{R}_{\text{0JL}}$  and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using

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  $T_A=25^\circ\text{C}$ .

F. The current rating is based on the  $t \leq 10\text{s}$  junction to ambient thermal resistance rating.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

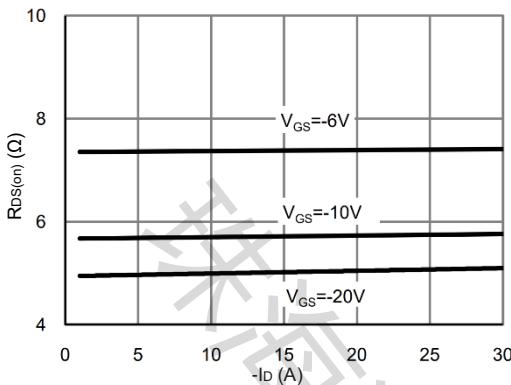


Fig 1. On-Resistance vs. Drain Current and Gate Voltage

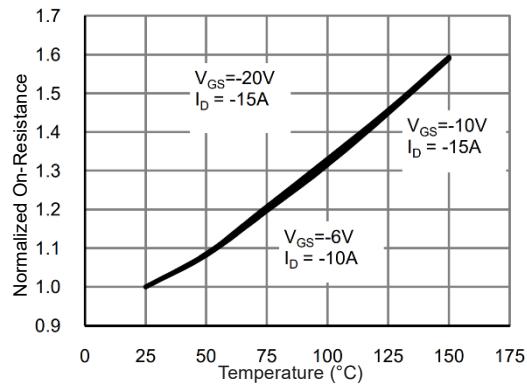


Fig 2. On-Resistance vs. Junction Temperature

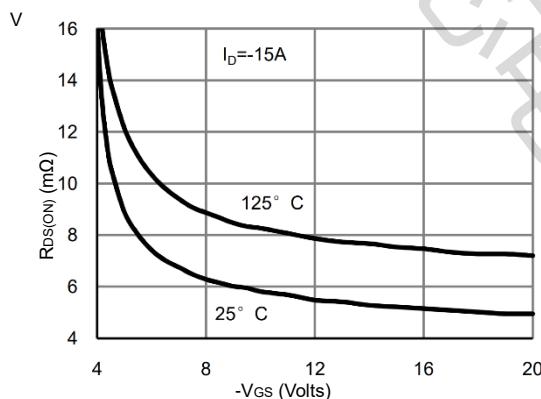


Fig 3. On-Resistance vs. Gate-Source Voltage

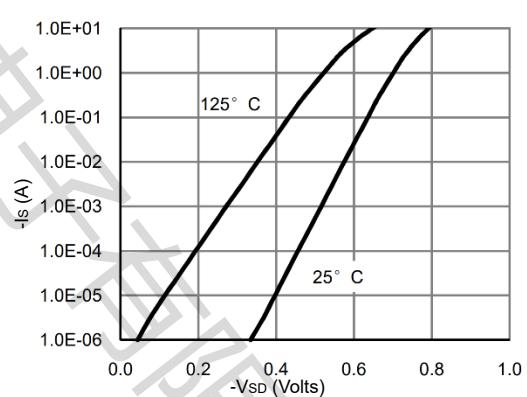


Fig 4. Body-Diode Characteristics

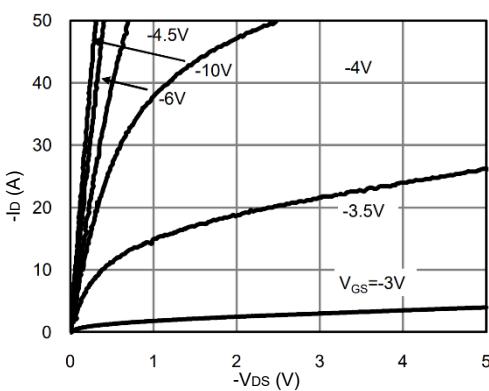


Fig 5. On-Region Characteristics

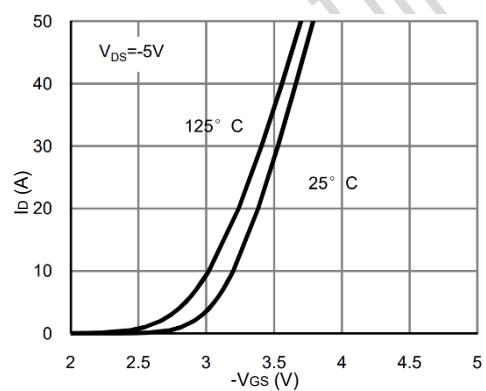


Fig 6. Transfer Characteristics

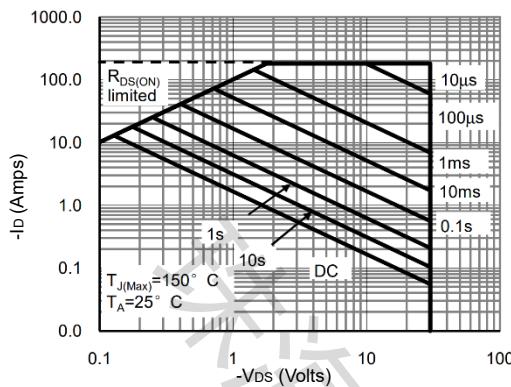


Fig 7. Maximum Forward Biased Safe

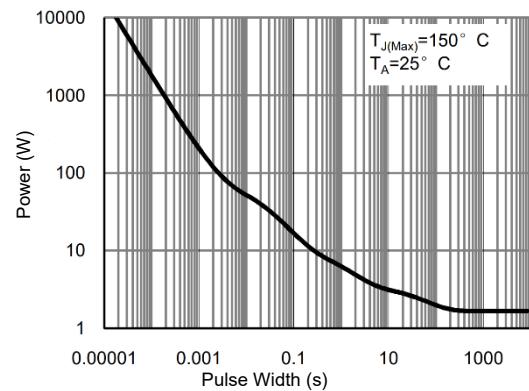


Fig 8. Single Pulse Power Rating Junction-to-Ambient (Note E)

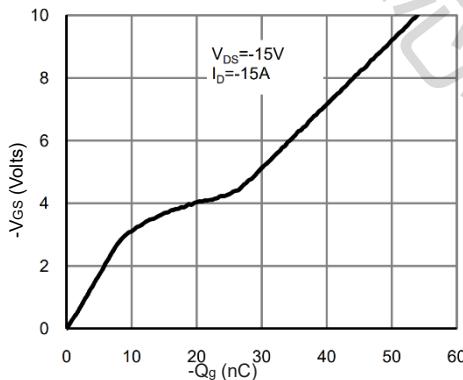


Fig 9. Gate-Charge Characteristics

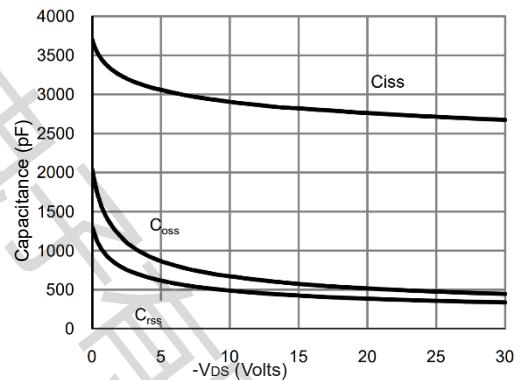


Fig 10. Capacitance Characteristics

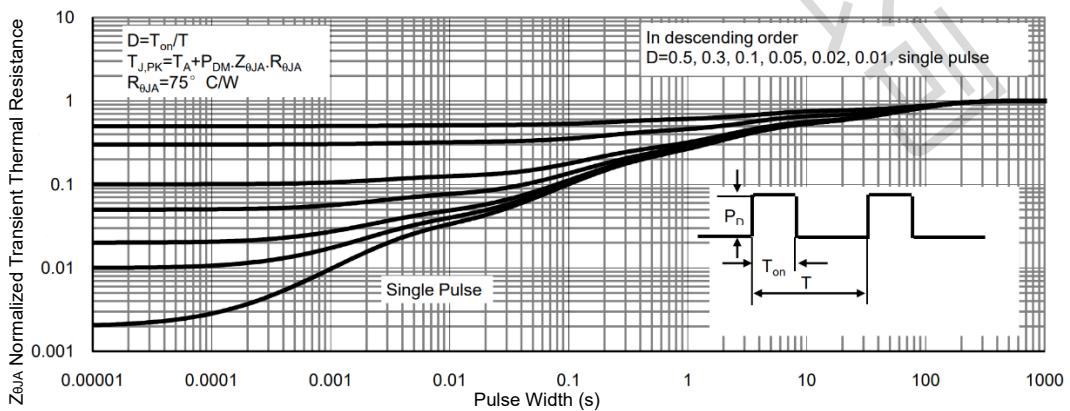
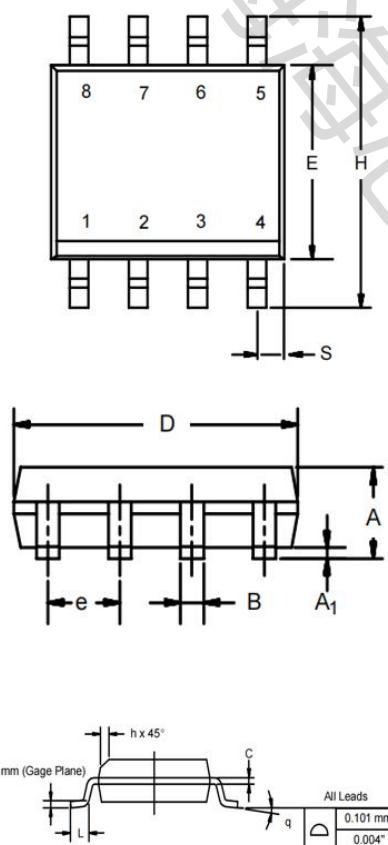


Fig 11. Normalized Maximum Transient Thermal Impedance

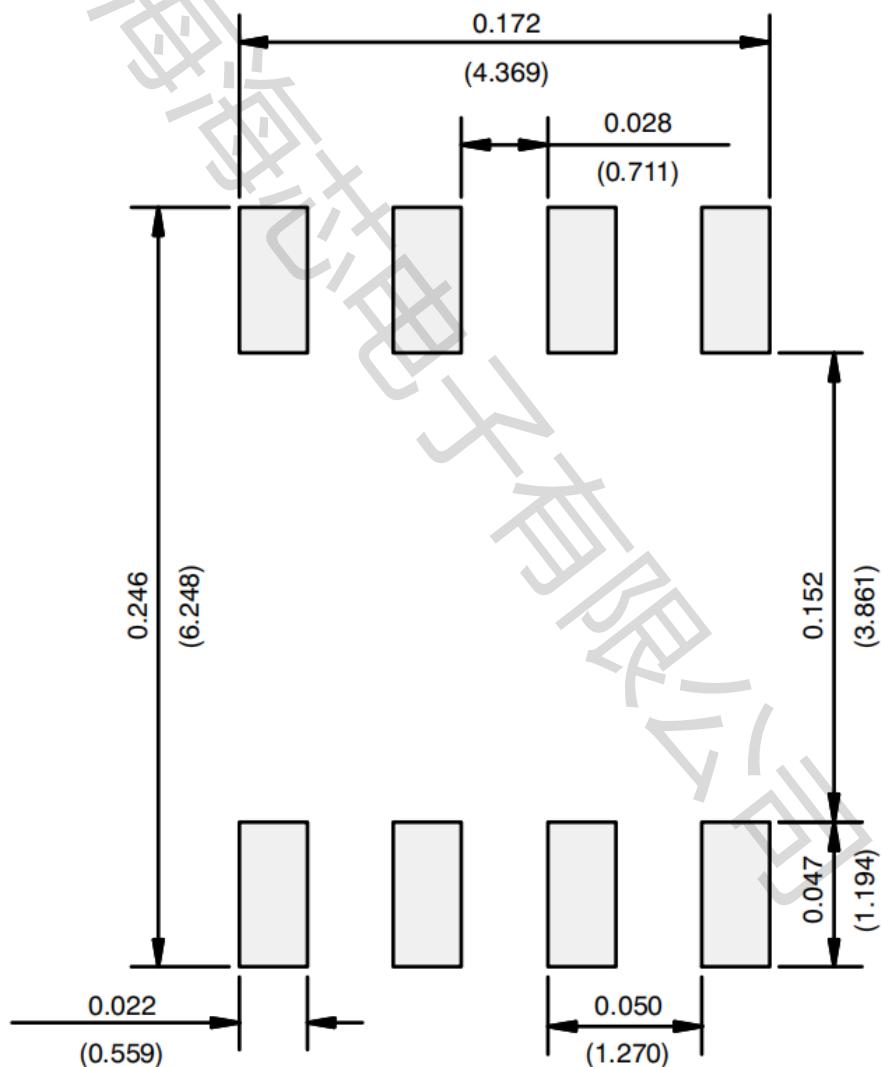
## SOP-8 Package Outline

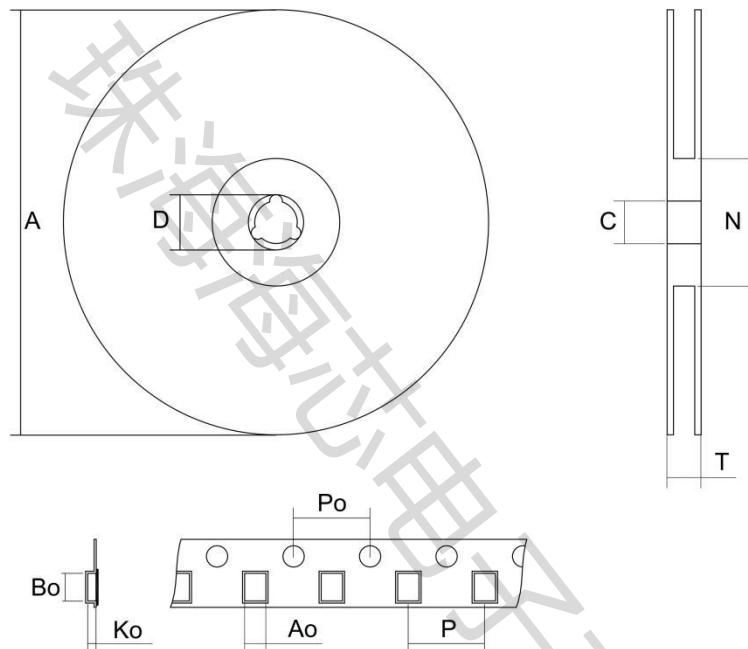
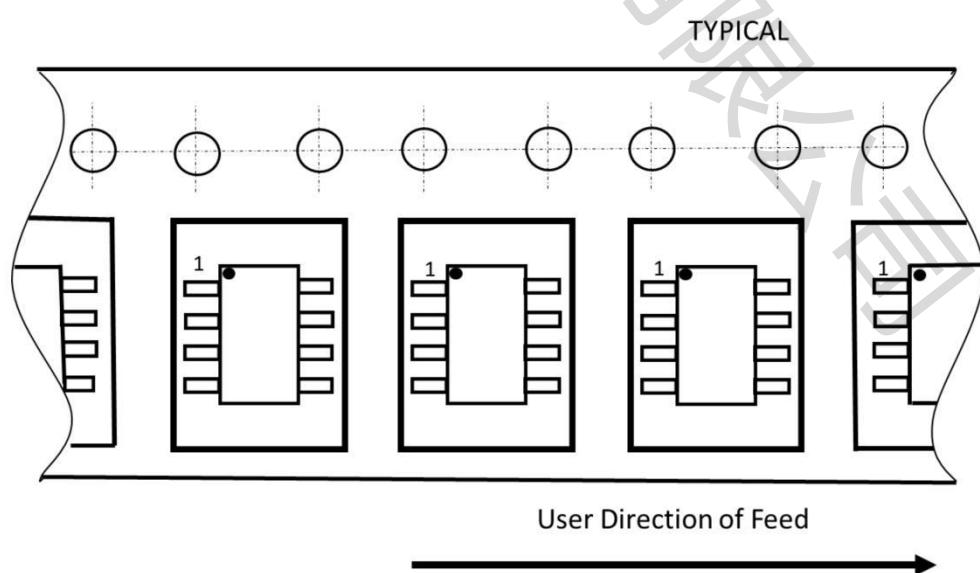
Dimensions are shown in millimeters (inches)



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	0.19	0.25	0.0075	0.010
D	4.80	5.00	0.189	0.196
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.020
L	0.50	0.93	0.020	0.037
q	0°	8°	0°	8°
S	0.44	0.64	0.018	0.026

## RECOMMENDED MINIMUM PADS FOR SOP-8



**SOP-8 packing information****SOP-8 tape and reel****Tape orientation**

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