



AO4421

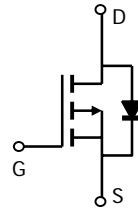
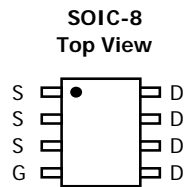
P-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4421 uses advanced trench technology to provide excellent $R_{DS(ON)}$, and ultra-low low gate charge. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO4412 is Pb-free (meets ROHS & Sony 259 specifications). AO4421L is a Green Product ordering option. AO4421 and AO4421L are electrically identical.*

Features

- $V_{DS} (V) = -60V$
- $I_D = -6.2 A (V_{GS} = -10V)$
- $R_{DS(ON)} < 40m\Omega (V_{GS} = -10V)$
- $R_{DS(ON)} < 50m\Omega (V_{GS} = -4.5V)$



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ C$	-6.2	A
	$T_A=70^\circ C$	-5	
Pulsed Drain Current ^B	I_{DM}	-40	
Power Dissipation ^A	$T_A=25^\circ C$	3.1	W
	$T_A=70^\circ C$	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 ^A	$R_{\theta JA}$	24	40	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	54	75
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	21	30	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-60			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-48V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±20V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-1	-2	-3	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	-40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6.2A T _J =125°C		32 53	40 70	mΩ
		V _{GS} =-4.5V, I _D =-5A		40	50	
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-6.2A		18		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.74	-1	V
I _S	Maximum Body-Diode Continuous Current				-4.2	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-30V, f=1MHz		2417	2900	pF
C _{oss}	Output Capacitance			179		pF
C _{rss}	Reverse Transfer Capacitance			120		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		1.9	2.3	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge (10V)	V _{GS} =-10V, V _{DS} =-30V, I _D =-6.2A		46.5	55	nC
Q _g (4.5V)	Total Gate Charge (4.5V)			22.7		nC
Q _{gs}	Gate Source Charge			9.1		nC
Q _{gd}	Gate Drain Charge			9.2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-30V, R _L =4.7Ω, R _{GEN} =3Ω		9.8		ns
t _r	Turn-On Rise Time			6.1		ns
t _{D(off)}	Turn-Off DelayTime			44		ns
t _f	Turn-Off Fall Time			12.7		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-6.2A, dI/dt=100A/μs		34	42	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-6.2A, dI/dt=100A/μs		47		nC

A: The value of R_{θJA} is measured with the device mounted on 1in² 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. The current rating is based on the t_s ≤ 10s thermal resistance rating.

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

C. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

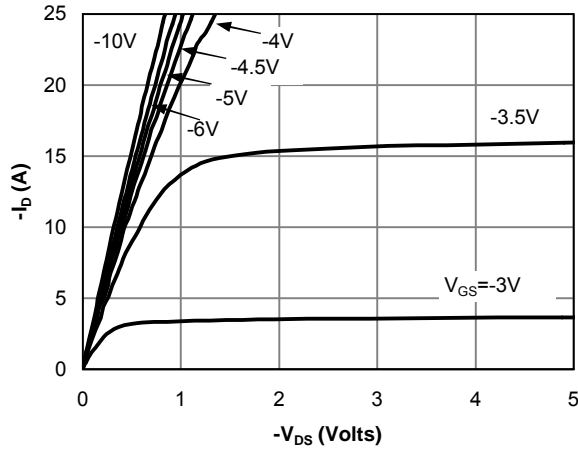


Fig 1: On-Region Characteristics

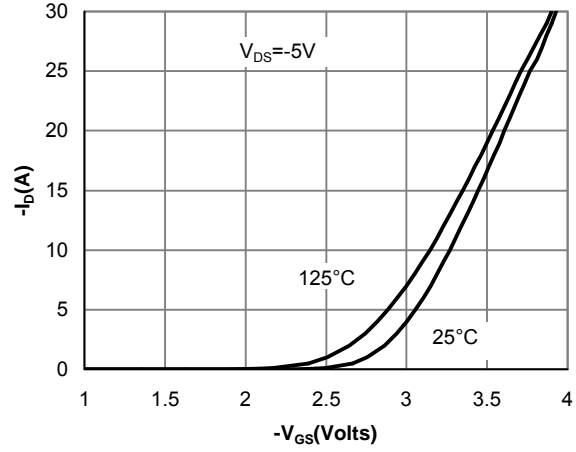


Figure 2: Transfer Characteristics

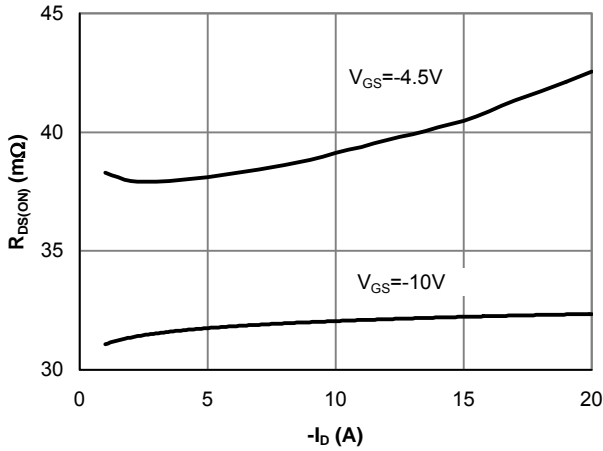


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

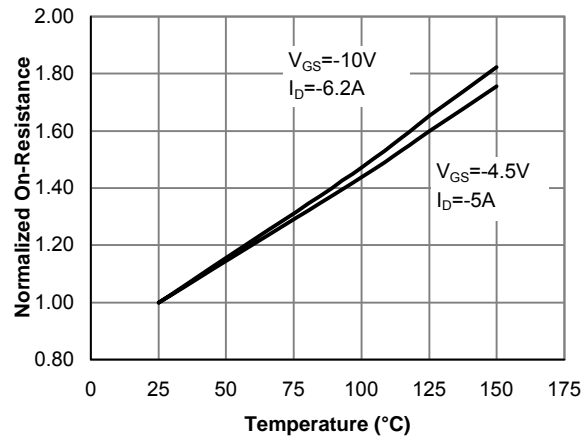


Figure 4: On-Resistance vs. Junction Temperature

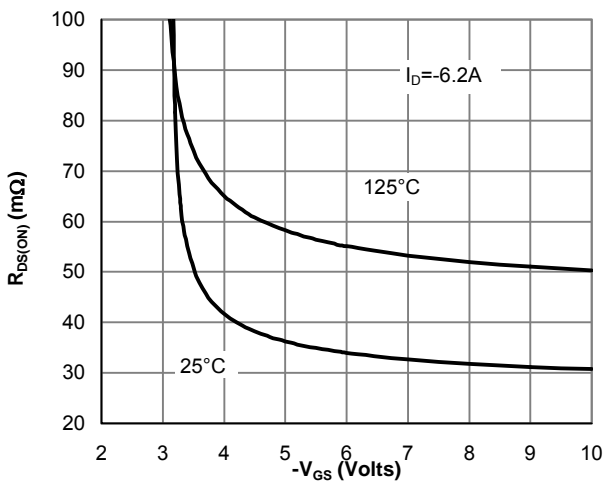


Figure 5: On-Resistance vs. Gate-Source Voltage

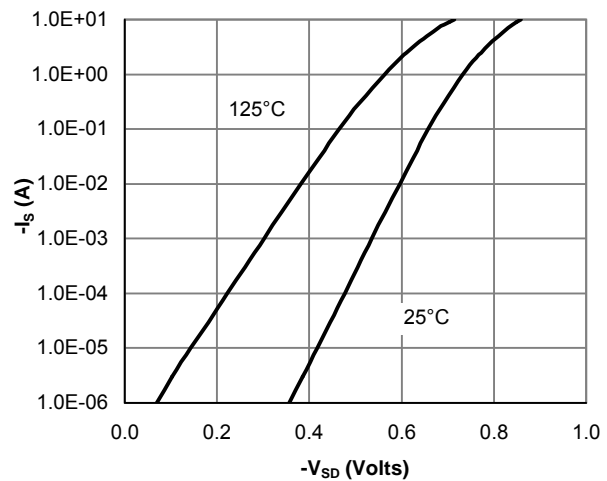


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

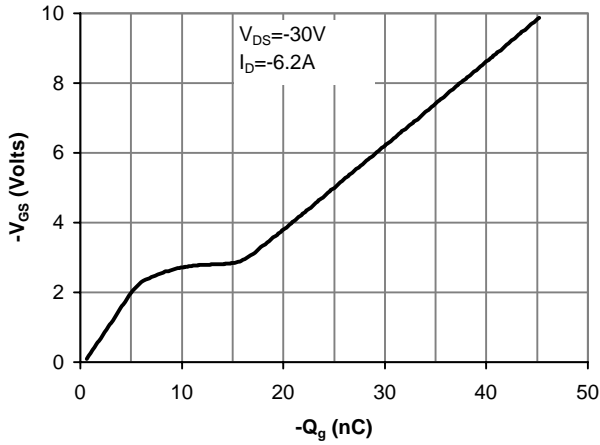


Figure 7: Gate-Charge Characteristics

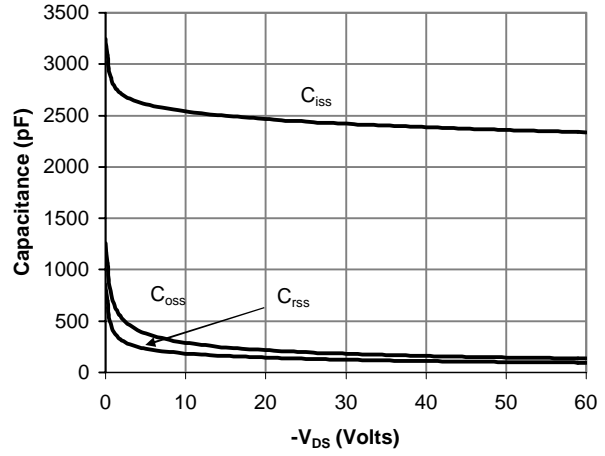


Figure 8: Capacitance Characteristics

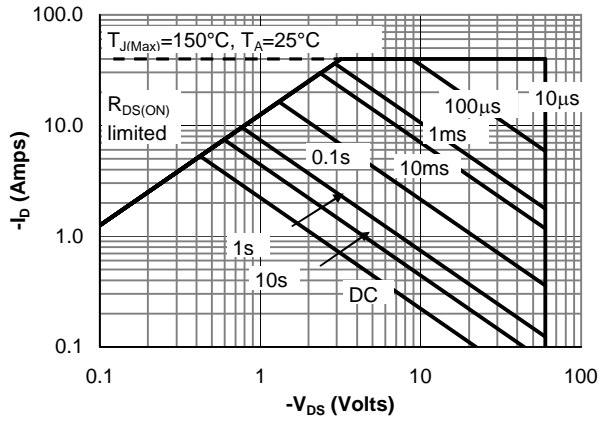


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

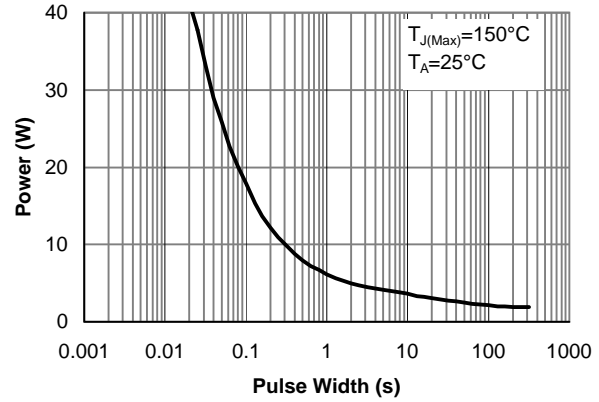


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

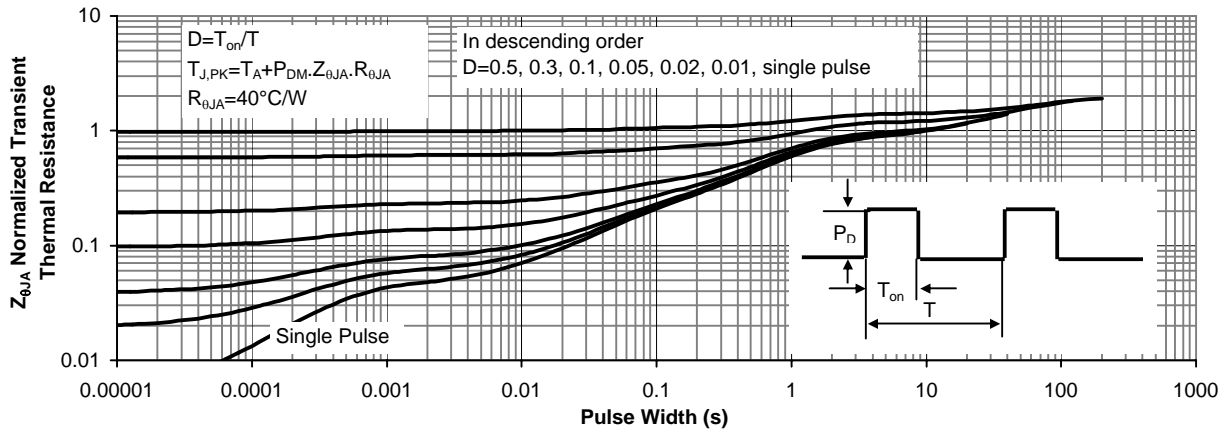


Figure 11: Normalized Maximum Transient Thermal Impedance