



AO6405

P-Channel Enhancement Mode Field Effect Transistor



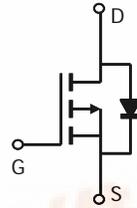
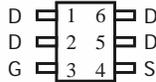
General Description

The AO6405 uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO6405 is Pb-free (meets ROHS & Sony 259 specifications). AO6405L is a Green Product ordering option. AO6405 and AO6405L are electrically identical.*

Features

- $V_{DS} (V) = -30V$
- $I_D = -5 A (V_{GS} = -10V)$
- $R_{DS(ON)} < 52m\Omega (V_{GS} = -10V)$
- $R_{DS(ON)} < 87m\Omega (V_{GS} = -4.5V)$

TSOP6
Top View



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}	± 20	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ C$	-5
		$T_A=70^\circ C$	-4.2
Pulsed Drain Current ^B	I_{DM}	-20	A
Power Dissipation ^A	P_D	$T_A=25^\circ C$	2
		$T_A=70^\circ C$	1.4
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	$R_{\theta JA}$	$t \leq 10s$	47.5	62.5
Maximum Junction-to-Ambient ^A		Steady-State	74	110
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	37	50	$^\circ C/W$



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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	$V_{DS}=-24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1	μA
					-5	
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1	-1.8	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-20			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=5.0\text{A}$ $T_J=125^\circ\text{C}$		39	52	m Ω
				54	70	
			$V_{GS}=-4.5\text{V}$, $I_D=-4\text{A}$	67	87	
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-5\text{A}$	6	8.6		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.77	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.8	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		700	840	pF
C_{oss}	Output Capacitance			120		pF
C_{rss}	Reverse Transfer Capacitance			75		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		10	15	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-5\text{A}$		14.7	18	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			7.6	9.5	nC
Q_{gs}	Gate Source Charge			2		nC
Q_{gd}	Gate Drain Charge			3.8		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=3\Omega$, $R_{GEN}=3\Omega$		8.3		ns
t_r	Turn-On Rise Time			5		ns
$t_{D(off)}$	Turn-Off Delay Time			29		ns
t_f	Turn-Off Fall Time			14		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		23.5	30	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		13.4		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² 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 $R_{\theta JA}$ 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, 12, 14 are obtained using 80 μs 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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

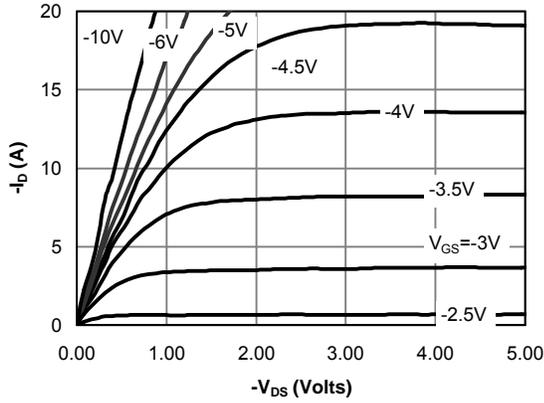


Figure 1: On-Region Characteristics

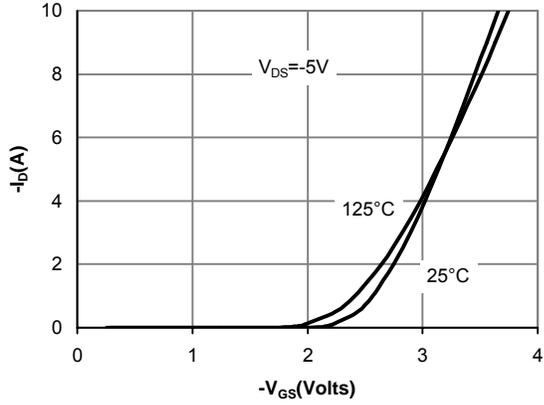


Figure 2: Transfer Characteristics

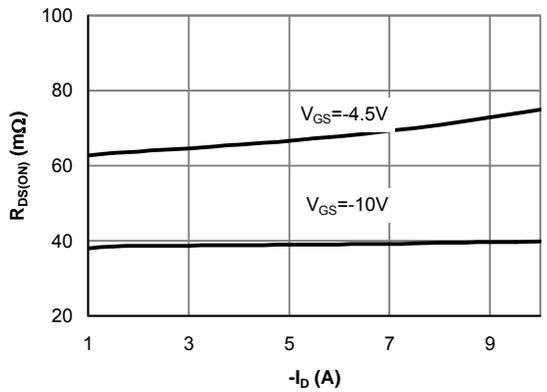


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

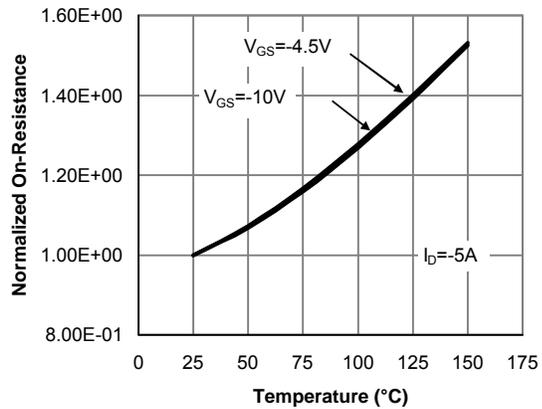


Figure 4: On-Resistance vs. Junction Temperature

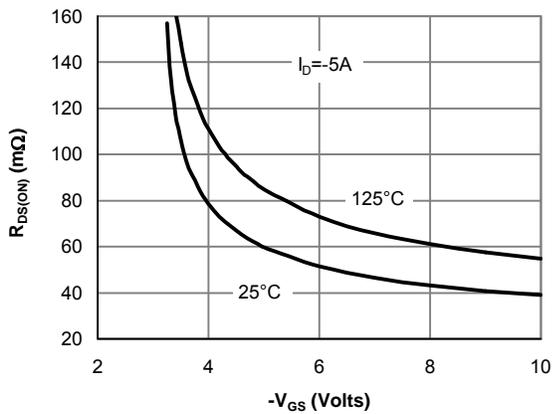


Figure 5: On-Resistance vs. Gate-Source Voltage

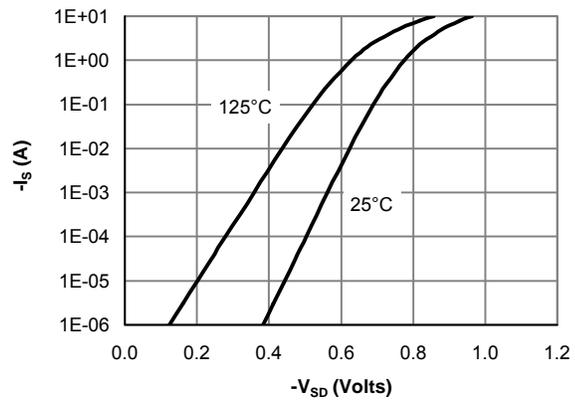


Figure 6: Body-Diode Characteristics

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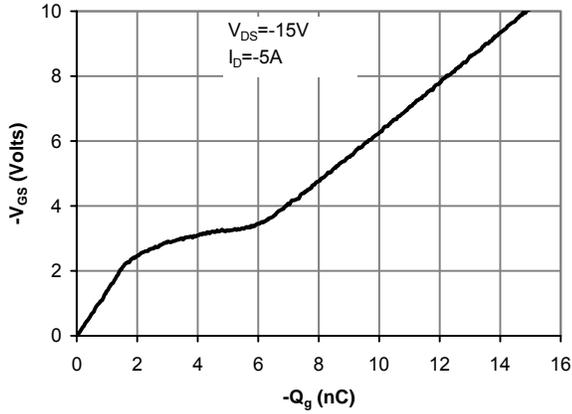


Figure 7: Gate-Charge Characteristics

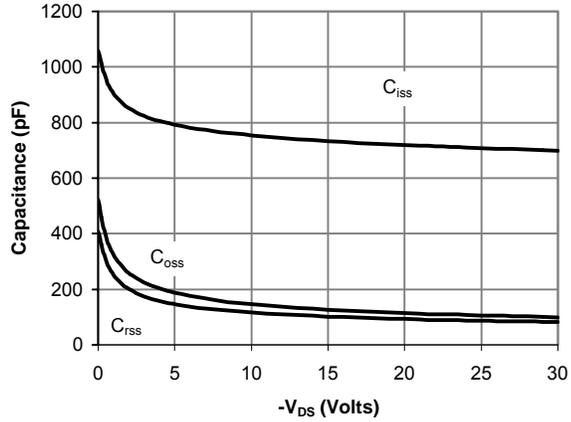


Figure 8: Capacitance Characteristics

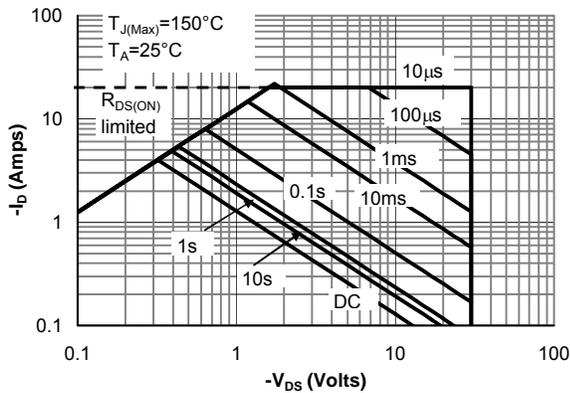


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

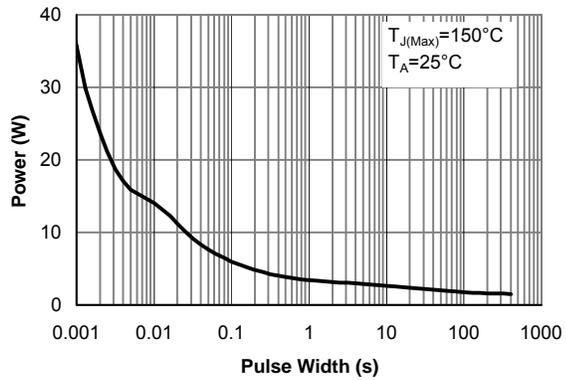


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

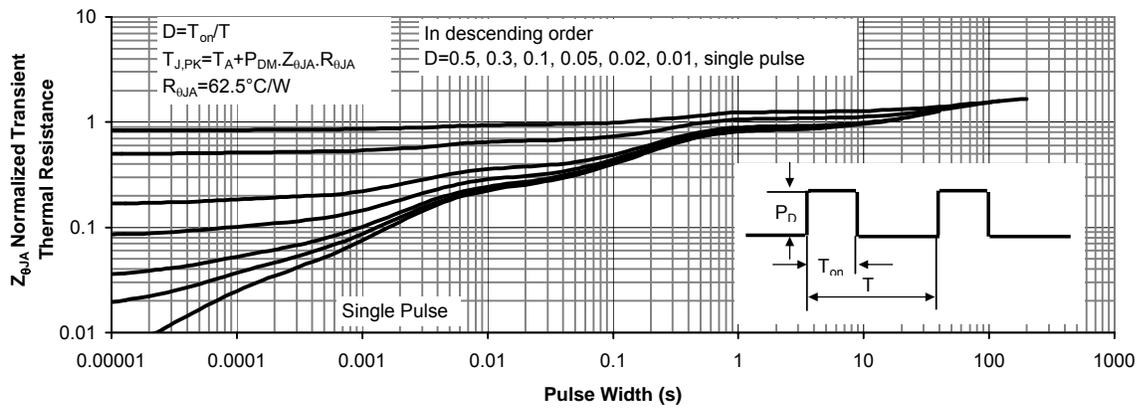


Figure 11: Normalized Maximum Transient Thermal Impedance