



**AO4602**

**Complementary Enhancement Mode Field Effect Transistor**

**General Description**

The AO4602 uses advanced trench technology MOSFETs to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

**Features**

n-channel	p-channel
$V_{DS} (V) = 30V$	-30V
$I_D = 4.7A$	-8A
$R_{DS(ON)}$	$R_{DS(ON)}$
$< 55m\Omega (V_{GS}=10V)$	$< 18m\Omega (V_{GS} = 20V)$
$< 70m\Omega (V_{GS}=4.5V)$	$< 19m\Omega (V_{GS} = 10V)$
$< 110m\Omega (V_{GS} = 2.5V)$	



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

Parameter	Symbol	Max n-channel	Max p-channel	Units	
Drain-Source Voltage	$V_{DS}$	30	-30	V	
Gate-Source Voltage	$V_{GS}$	$\pm 12$	$\pm 25$	V	
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	4.7	-8	A
		$T_A=70^\circ C$	4	-6.9	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	30	-50		
Power Dissipation	$P_D$	$T_A=25^\circ C$	2	2	W
		$T_A=70^\circ C$	1.44	1.44	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$	

**Thermal Characteristics: n-channel and p-channel**

Parameter	Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	n-ch		62.5	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		n-ch		110	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	n-ch		50	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	p-ch		62.5	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		p-ch		110	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	p-ch		35	$^\circ C/W$

n-channel MOSFET 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	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	$\mu\text{A}$	
					5		
$I_{GSS}$	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	1.4	V	
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}, V_{DS}=5\text{V}$	10			A	
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=4\text{A}$ $T_J=125^\circ\text{C}$		45	55	$\text{m}\Omega$	
			$V_{GS}=4.5\text{V}, I_D=3\text{A}$		55		70
			$V_{GS}=2.5\text{V}, I_D=2\text{A}$		83		110
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=4\text{A}$		8		S	
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.8	1	V	
$I_S$	Maximum Body-Diode Continuous Current				2.5	A	
<b>DYNAMIC PARAMETERS</b>							
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		390		pF	
$C_{oss}$	Output Capacitance			54.5		pF	
$C_{rss}$	Reverse Transfer Capacitance			41		pF	
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		3		$\Omega$	
<b>SWITCHING PARAMETERS</b>							
$Q_g$	Total Gate Charge	$V_{GS}=4.5\text{V}, V_{DS}=15\text{V}, I_D=4\text{A}$		0.6		nC	
$Q_{gs}$	Gate Source Charge			1.38		nC	
$Q_{gd}$	Gate Drain Charge			4.34		nC	
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=3.75\Omega,$ $R_{GEN}=6\Omega$		3.3		ns	
$t_r$	Turn-On Rise Time			1		ns	
$t_{D(off)}$	Turn-Off Delay Time			21.7		ns	
$t_f$	Turn-Off Fall Time			2.1		ns	
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=4\text{A}, dI/dt=100\text{A}/\mu\text{s}$		12		ns	
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=4\text{A}, dI/dt=100\text{A}/\mu\text{s}$		6.3		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.

p-channel MOSFET 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	$V_{DS}=-24\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 25\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-1.7	-2.5	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$ , $V_{DS}=-5\text{V}$	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$ , $I_D=-8\text{A}$ $T_J=125^\circ\text{C}$		15	19	$\text{m}\Omega$
		$V_{GS}=-20\text{V}$ , $I_D=-8\text{A}$		14	18	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$ , $I_D=-8\text{A}$		28		$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}$ , $I_D=-8\text{A}$				S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		-0.75	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-2.6	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=-15\text{V}$ , $f=1\text{MHz}$		2076		pF
$C_{oss}$	Output Capacitance			503		pF
$C_{rss}$	Reverse Transfer Capacitance			302		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		2		$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-10\text{V}$ , $V_{DS}=-15\text{V}$ , $I_D=-12\text{A}$		37.2		nC
$Q_{gs}$	Gate Source Charge			7		nC
$Q_{gd}$	Gate Drain Charge			10.4		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$ , $V_{DS}=-15\text{V}$ , $R_L=1.25\Omega$ , $R_{GEN}=3\Omega$		12.4		ns
$t_r$	Turn-On Rise Time			8.2		ns
$t_{D(off)}$	Turn-Off DelayTime			25.6		ns
$t_f$	Turn-Off Fall Time			12		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		33		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-12\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		23		nC

A: The value of  $R_{\theta JA}$  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 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 6,12,14 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.