

## General Description

The AO6402 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. This device may be used as a load switch or in PWM applications. AO6402L ( Green Product ) is offered in a lead-free package.

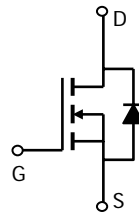
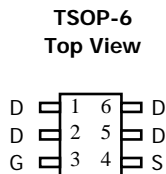
## Features

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

$$I_D = 6.9A$$

$$R_{DS(ON)} < 28m\Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 42m\Omega (V_{GS} = 4.5V)$$



### 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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	6.9
		$T_A=70^\circ C$	5.8
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	20	A
Power Dissipation	$P_D$	$T_A=25^\circ C$	2
		$T_A=70^\circ C$	1.44
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>	$R_{\theta JA}$	$t \leq 10s$	48	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	74	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	35	40	$^\circ C/W$

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	$V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	$\mu\text{A}$
					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	1.9	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	$V_{GS}=10\text{V}$ , $I_D=6.9\text{A}$ $T_J=125^\circ\text{C}$		22.5	28	m $\Omega$
				31.3	38	
		$V_{GS}=4.5\text{V}$ , $I_D=5.0\text{A}$		34.5	42	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=6.9\text{A}$	10	15.4		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$		0.76	1	V
$I_S$	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$		680	820	pF
$C_{oss}$	Output Capacitance			102		pF
$C_{riss}$	Reverse Transfer Capacitance			77		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		3	3.6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=6.9\text{A}$		13.84	16.7	nC
$Q_g(4.5\text{V})$	Total Gate Charge			6.74	8.1	nC
$Q_{gs}$	Gate Source Charge			1.82		nC
$Q_{gd}$	Gate Drain Charge			3.2		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=2.2\Omega$ , $R_{GEN}=3\Omega$		4.6		ns
$t_r$	Turn-On Rise Time			4.1		ns
$t_{D(off)}$	Turn-Off DelayTime			20.6		ns
$t_f$	Turn-Off Fall Time			5.2		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=6.9\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$		16.5	20	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=6.9\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$		7.8		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

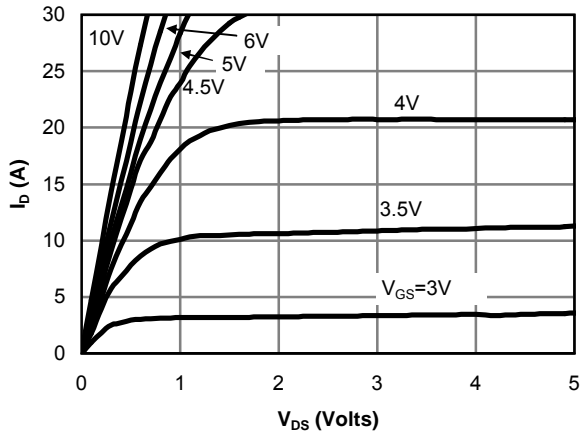


Fig 1: On-Region Characteristics

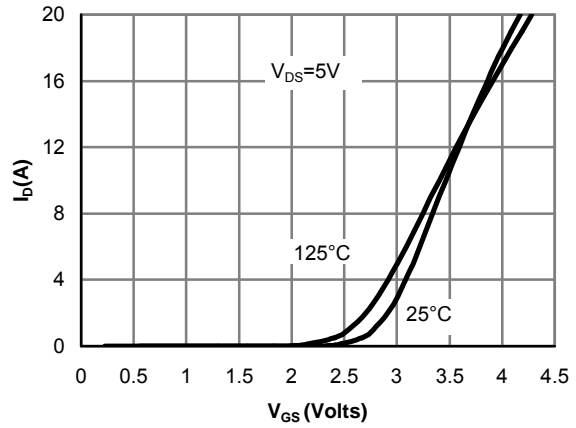


Figure 2: Transfer Characteristics

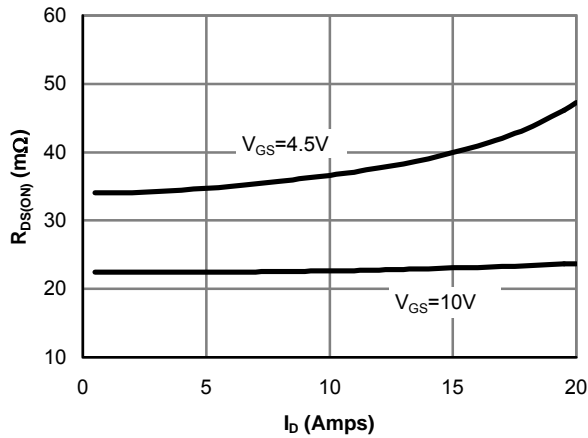


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

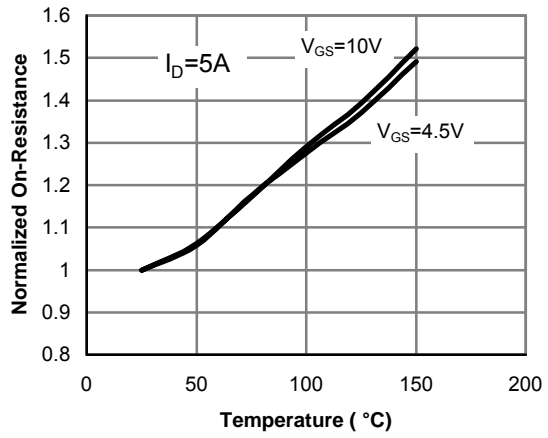


Figure 4: On-Resistance vs. Junction Temperature

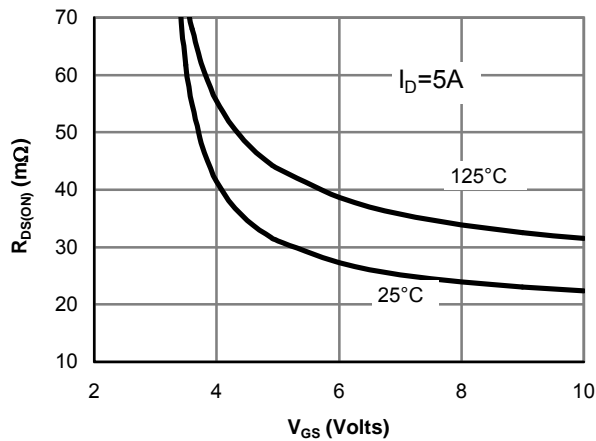


Figure 5: On-Resistance vs. Gate-Source Voltage

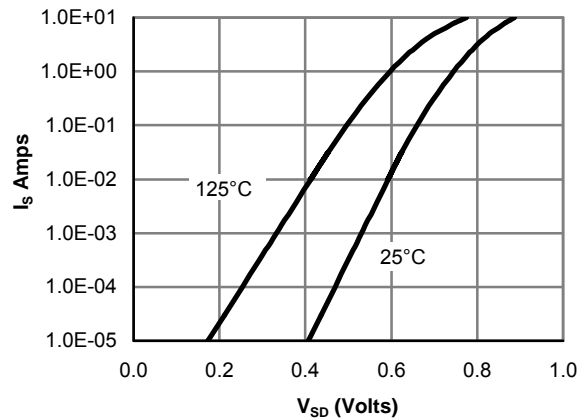


Figure 6: Body diode characteristics

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

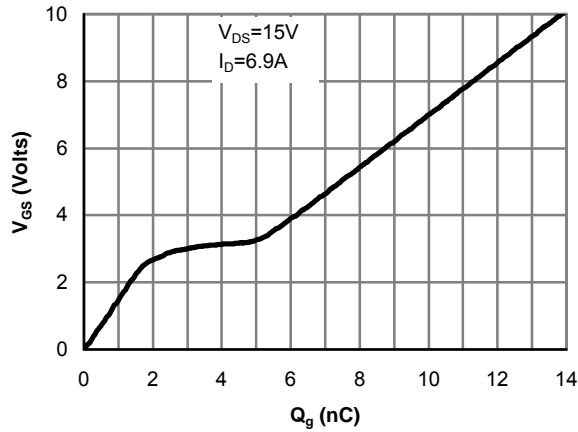


Figure 7: Gate-Charge characteristics

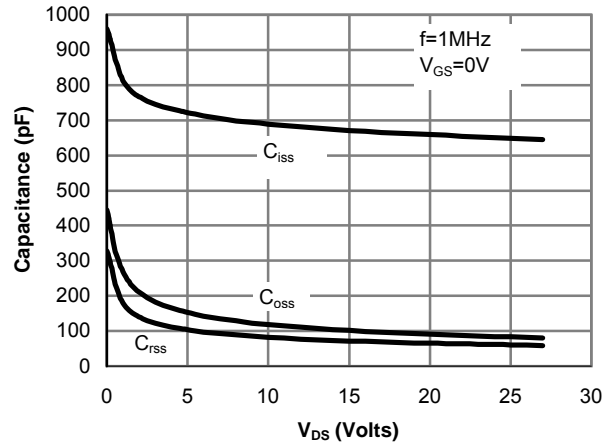


Figure 8: Capacitance Characteristics

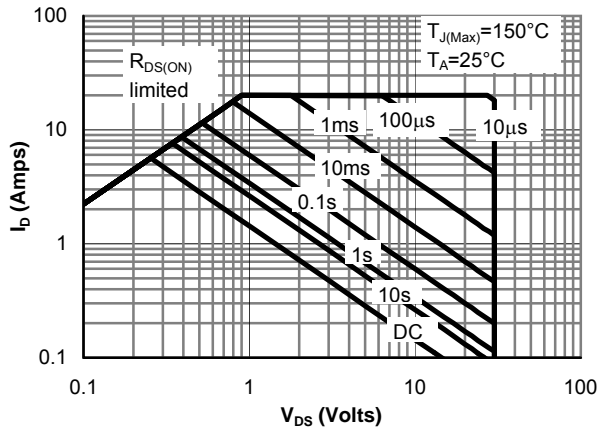


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

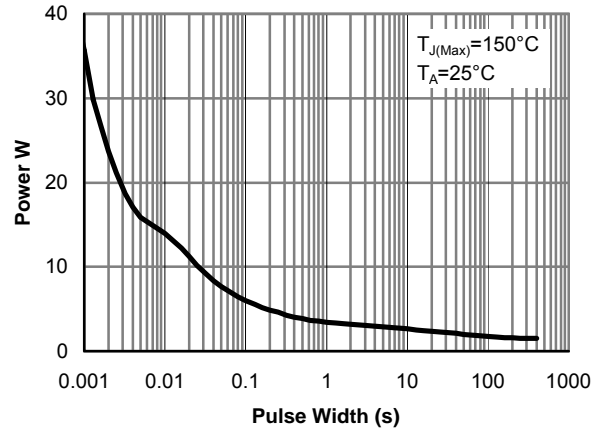


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

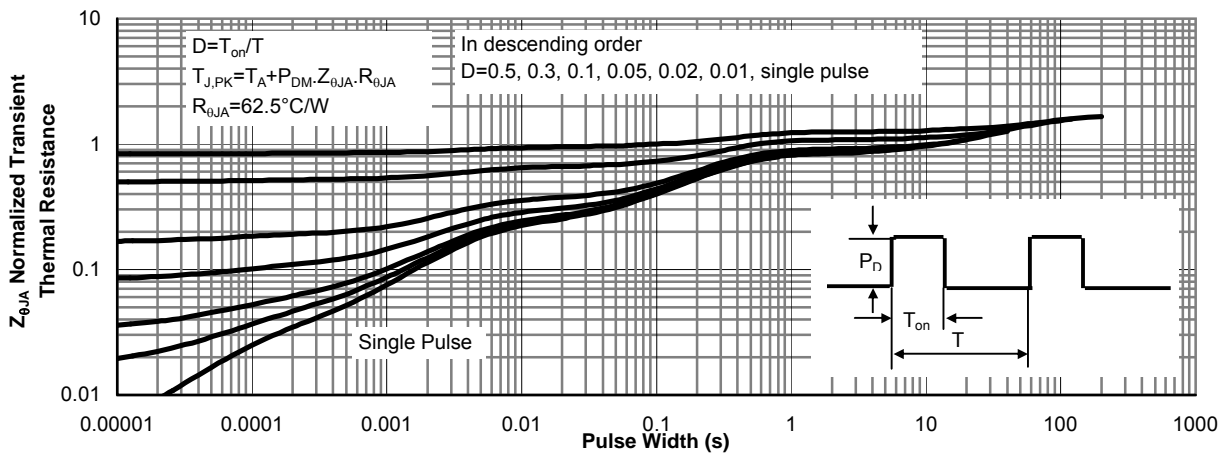


Figure 11: Normalized Maximum Transient Thermal Impedance