



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AO4485**  
40V P-Channel MOSFET

### General Description

The AO4485 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use as a DC-DC converter application.

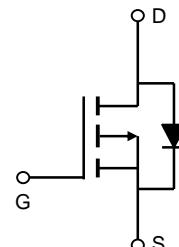
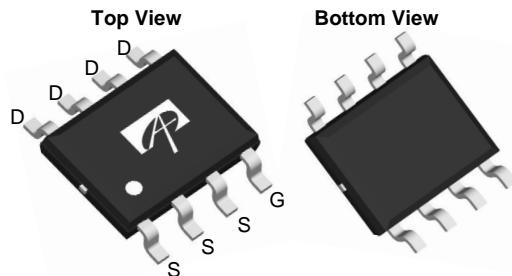
### Product Summary

$V_{DS}$  (V) = -40V  
 $I_D$  = -10A  $(V_{GS} = -10V)$   
 $R_{DS(ON)} < 15m\Omega$   $(V_{GS} = -10V)$   
 $R_{DS(ON)} < 20m\Omega$   $(V_{GS} = -4.5V)$

100% UIS Tested  
100%  $R_g$  Tested



SOIC-8



### Absolute Maximum Ratings $T_j=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	$V_{DS}$	-40		V
Gate-Source Voltage	$V_{GS}$	+20		V
Continuous Drain Current <sup>A</sup>	$I_D$	-12	-10	A
$T_A=70^\circ\text{C}$		-9	-8	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-120		
Avalanche Current <sup>G</sup>	$I_{AR}$	-28		
Repetitive avalanche energy $L=0.3\text{mH}$ <sup>G</sup>	$E_{AR}$	118		mJ
Power Dissipation <sup>A</sup>	$P_D$	3.1	1.7	W
$T_A=70^\circ\text{C}$		2.0	1.1	
Junction and Storage Temperature Range	$T_j, T_{STG}$	-55 to 150		°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	31	40	°C/W
Steady State		59	75	°C/W
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	16	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	$I_D = -250\mu\text{A}$ , $V_{\text{GS}} = 0\text{V}$	-40			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = -40\text{V}$ , $V_{\text{GS}} = 0\text{V}$			-1	$\mu\text{A}$
		$T_J = 55^\circ\text{C}$			-5	
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{\text{DS}} = 0\text{V}$ , $V_{\text{GS}} = \pm 20\text{V}$			$\pm 100$	nA
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ , $I_D = -250\mu\text{A}$	-1.7	-1.9	-2.5	V
$I_{\text{D}(\text{ON})}$	On state drain current	$V_{\text{GS}} = -10\text{V}$ , $V_{\text{DS}} = -5\text{V}$	-120			A
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = -10\text{V}$ , $I_D = -10\text{A}$		12.5	15	$\text{m}\Omega$
		$T_J = 125^\circ\text{C}$		19	23	
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}} = -5\text{V}$ , $I_D = -10\text{A}$		25		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S = -1\text{A}$ , $V_{\text{GS}} = 0\text{V}$		-0.7	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-3	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=-20\text{V}$ , $f=1\text{MHz}$		2500	3000	pF
$C_{\text{oss}}$	Output Capacitance			260		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			180		pF
$R_g$	Gate resistance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=0\text{V}$ , $f=1\text{MHz}$	2.5	4	6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{\text{GS}}=-10\text{V}$ , $V_{\text{DS}}=-20\text{V}$ , $I_D=-10\text{A}$		42	55	nC
$Q_g(4.5\text{V})$	Total Gate Charge			18.6		nC
$Q_{\text{gs}}$	Gate Source Charge			7		nC
$Q_{\text{gd}}$	Gate Drain Charge			8.6		nC
$t_{\text{D}(\text{on})}$	Turn-On DelayTime	$V_{\text{GS}}=-10\text{V}$ , $V_{\text{DS}}=-20\text{V}$ , $R_L = 2\Omega$ , $R_{\text{GEN}}=3\Omega$		9.4		ns
$t_r$	Turn-On Rise Time			20		ns
$t_{\text{D}(\text{off})}$	Turn-Off DelayTime			55		ns
$t_f$	Turn-Off Fall Time			30		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=-10\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$		38	49	ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=-10\text{A}$ , $di/dt=100\text{A}/\mu\text{s}$		47		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 given application depends on the user's specific board design.

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  $t \leq 300\mu\text{s}$  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.

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

G.  $E_{\text{AR}}$  and  $I_{\text{AR}}$  ratings are based on low frequency and duty cycles to keep  $T_J=25^\circ\text{C}$ .

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

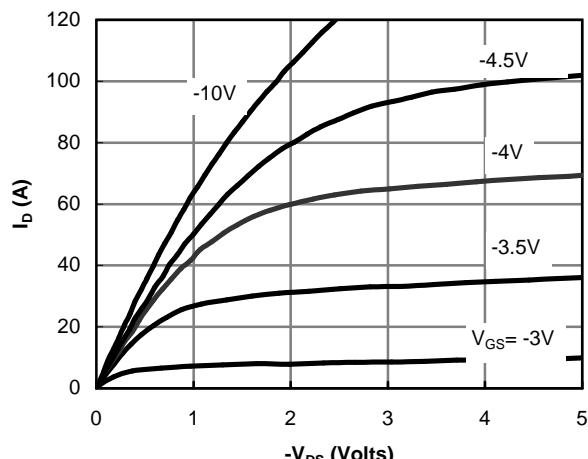


Figure 1: On-Region Characteristics

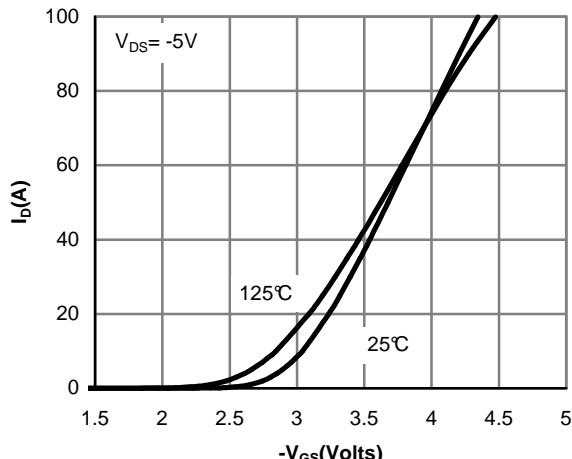
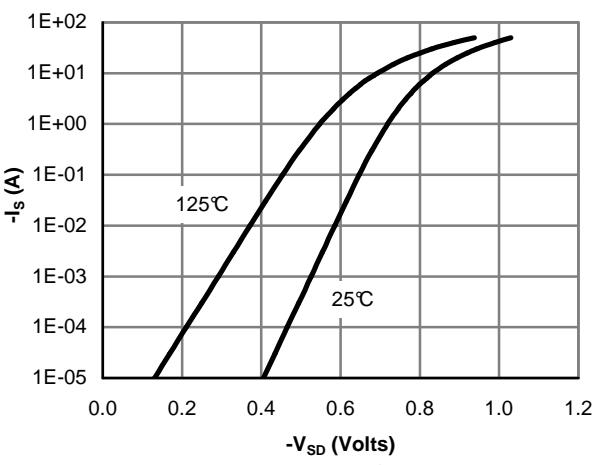
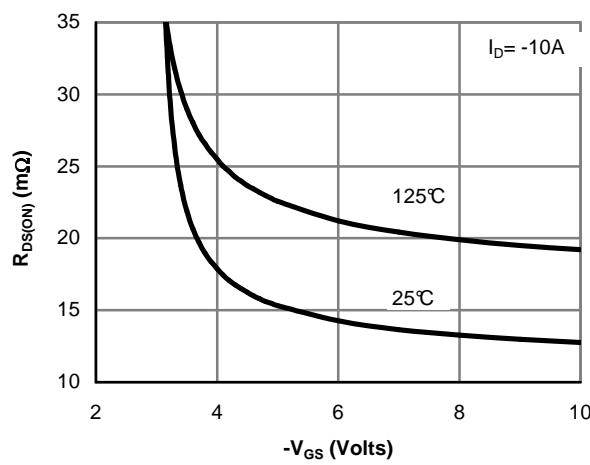
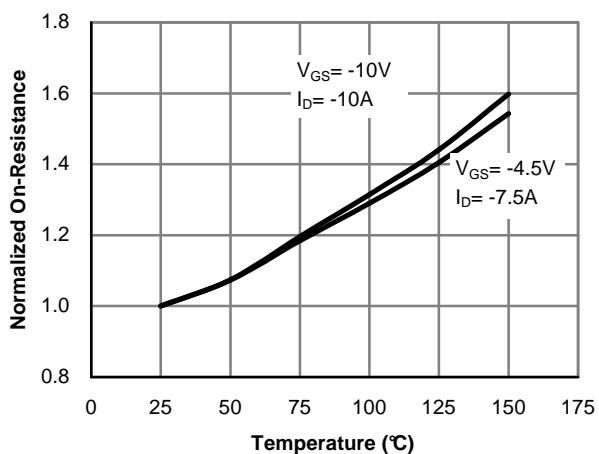
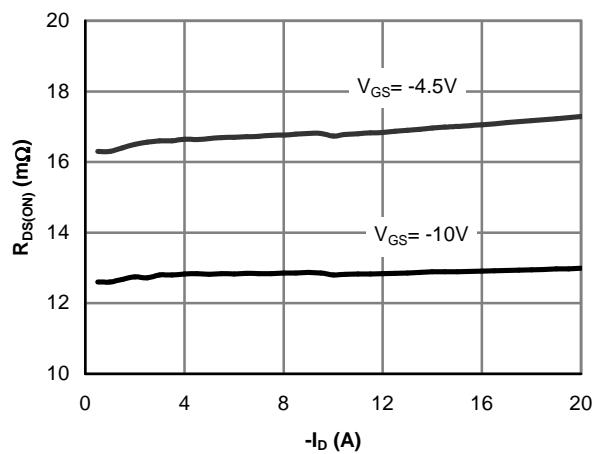


Figure 2: Transfer Characteristics



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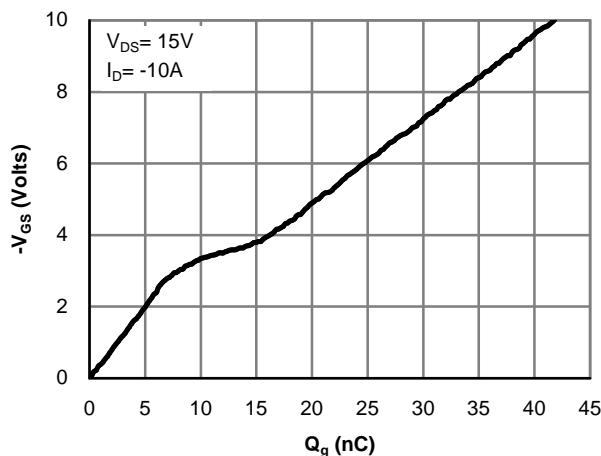


Figure 7: Gate-Charge Characteristics

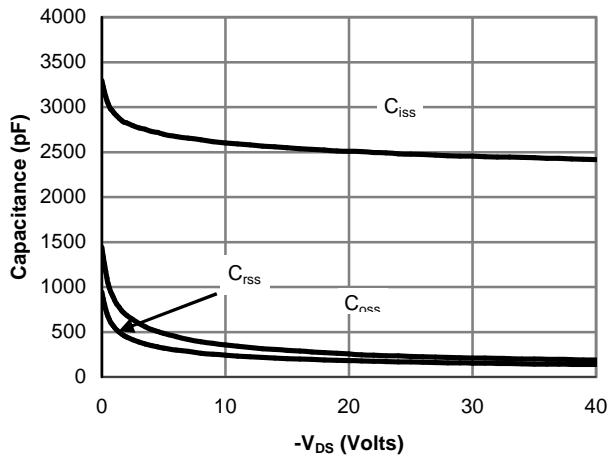


Figure 8: Capacitance Characteristics

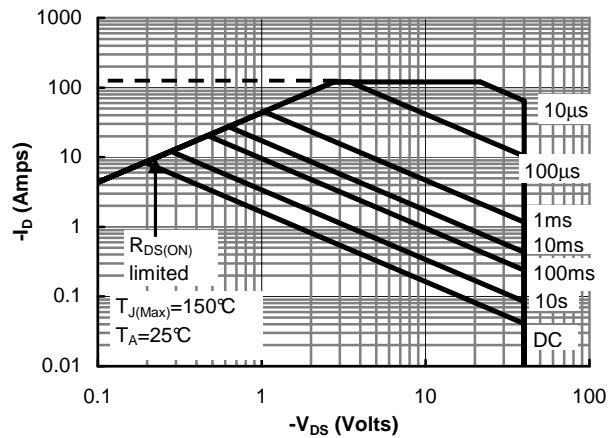


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

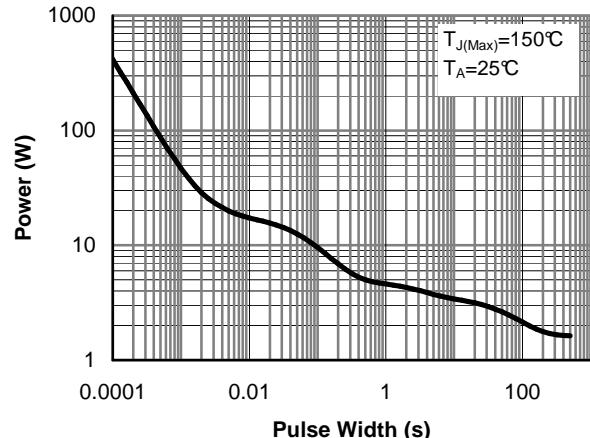


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

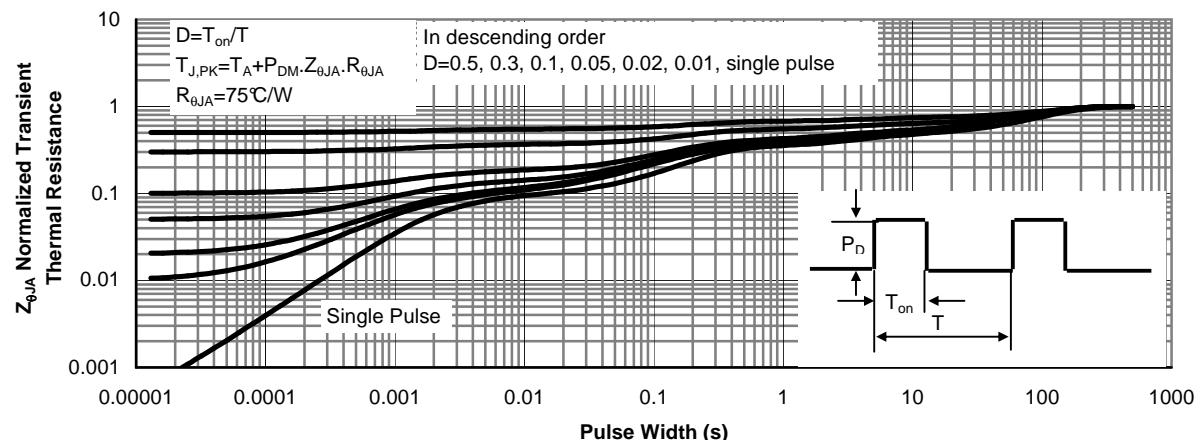


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)