

AO7415
P-Channel Enhancement Mode Field Effect Transistor

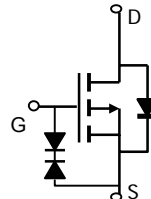
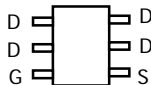
General Description

The AO7415 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge, and operation with gate voltages as low as 2.5V, in the small SOT363 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected to 2KV HBM. *Standard product AO7415 is Pb-free (meets ROHS & Sony 259 specifications). AO7415L is a Green Product ordering option. AO7415 and AO7415L are electrically identical.*

Features

$V_{DS} (V) = -20V$
 $I_D = -2A (V_{GS} = -10V)$
 $R_{DS(ON)} < 100m\Omega (V_{GS} = -10V)$
 $R_{DS(ON)} < 125m\Omega (V_{GS} = -4.5V)$
 $R_{DS(ON)} < 170m\Omega (V_{GS} = -2.5V)$

SC-70-6
(SOT-363)
Top View


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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ C$	-2
		$T_A=70^\circ C$	-1.6
Pulsed Drain Current ^B	I_{DM}	-8	A
Power Dissipation ^A	P_D	$T_A=25^\circ C$	0.625
		$T_A=70^\circ C$	0.4
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	$R_{\theta JA}$	160	200	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State	180	220
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	130	160	$^\circ C/W$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-0.5 -2.5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 10\text{V}$ $V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			± 1 ± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.7	-0.9	-1.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-2\text{A}$		80	100	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		115		
		$V_{GS}=-4.5\text{V}$, $I_D=-1.3\text{A}$		98	125	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-1.0\text{A}$		130	170	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-2\text{A}$		5		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.84	-0.95	V
I_S	Maximum Body-Diode Continuous Current				0.6	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		512	620	pF
C_{oss}	Output Capacitance			77		pF
C_{rss}	Reverse Transfer Capacitance			62		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		9.2	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-2\text{A}$		4.9	6	nC
Q_{gs}	Gate Source Charge			3.5		nC
Q_{gd}	Gate Drain Charge			3.7		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=5\Omega$, $R_{GEN}=3\Omega$		11	13	ns
t_r	Turn-On Rise Time			8	10	ns
$t_{D(off)}$	Turn-Off DelayTime			34	41	ns
t_f	Turn-Off Fall Time			12	15	ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-2\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		13	17	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-2\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		4	6	nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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.

Rev2: August 2005

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

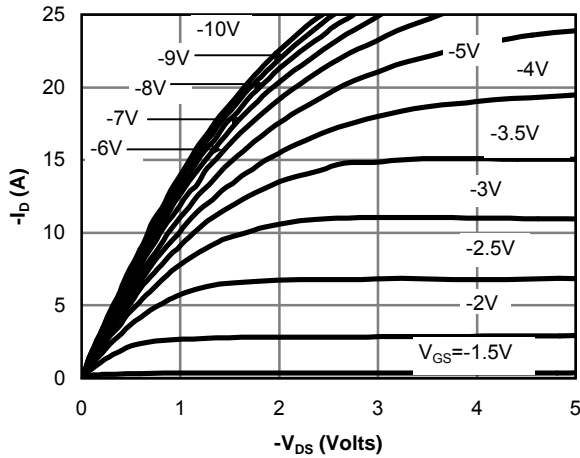


Fig 1: On-Region Characteristics

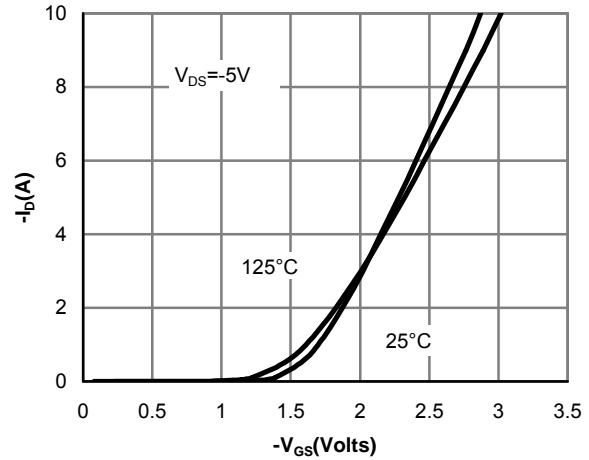


Figure 2: Transfer Characteristics

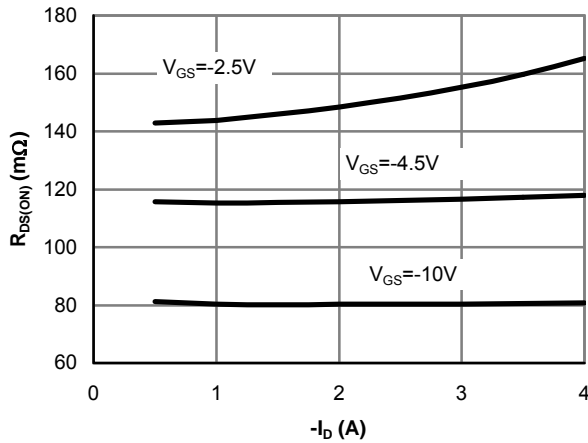


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

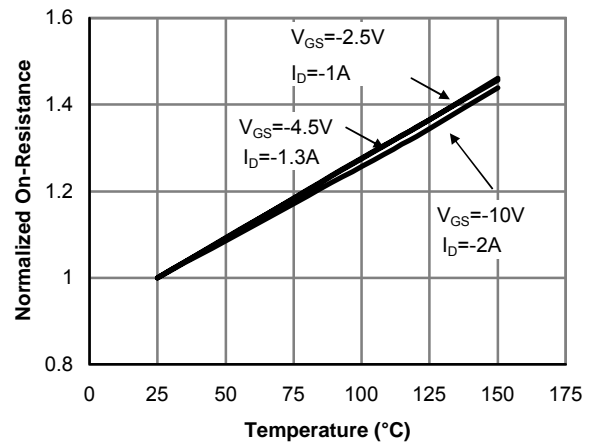


Figure 4: On-Resistance vs. Junction Temperature

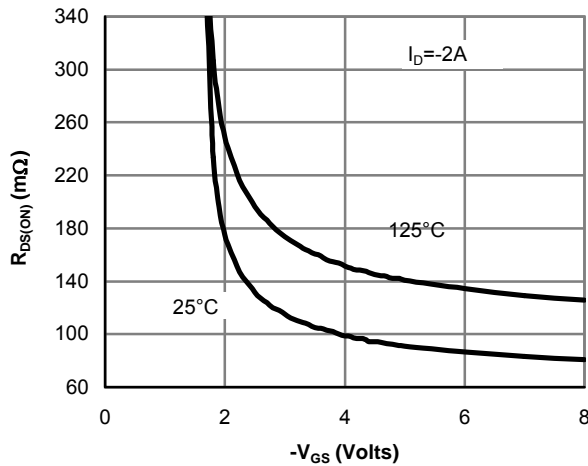


Figure 5: On-Resistance vs. Gate-Source Voltage

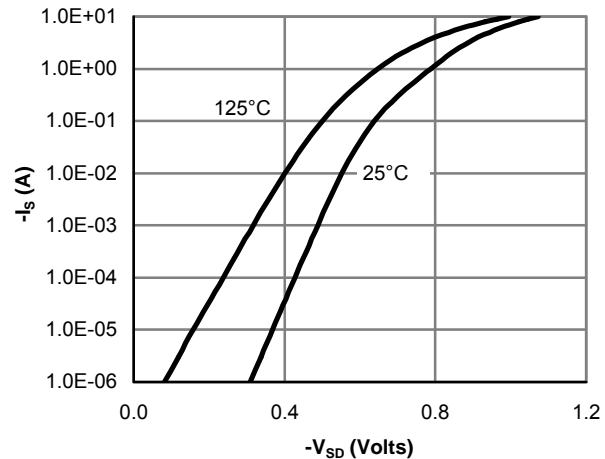


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

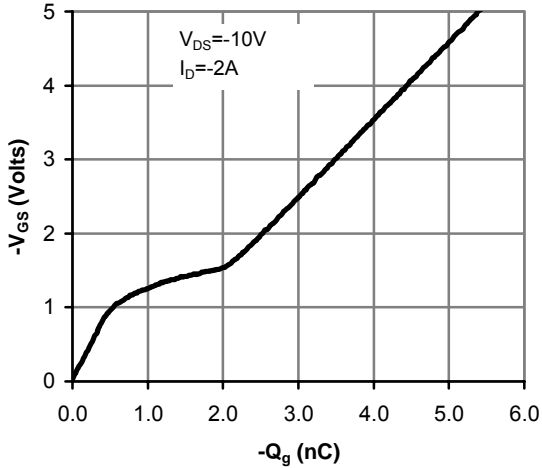


Figure 7: Gate-Charge Characteristics

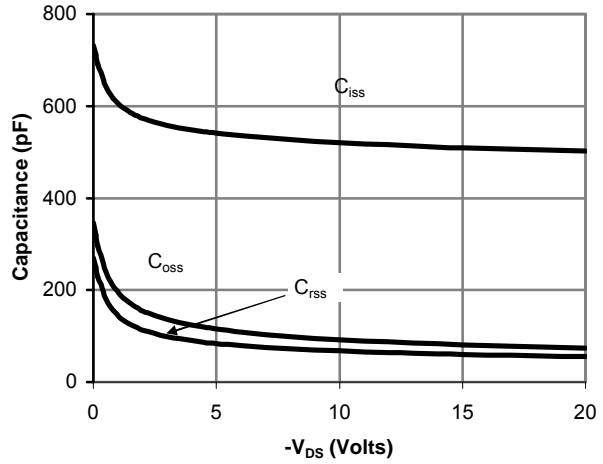


Figure 8: Capacitance Characteristics

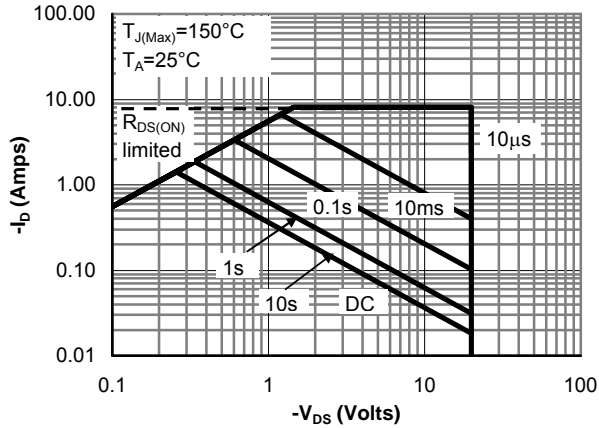


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

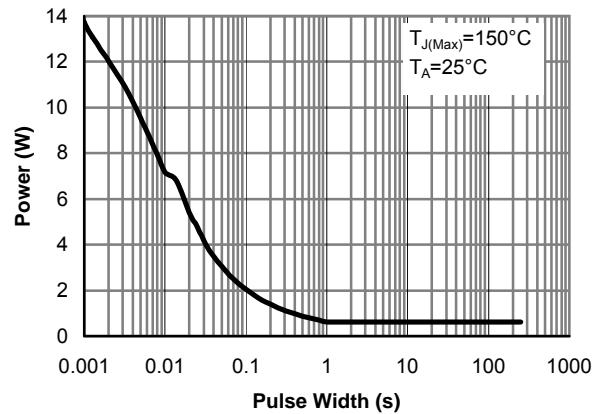


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

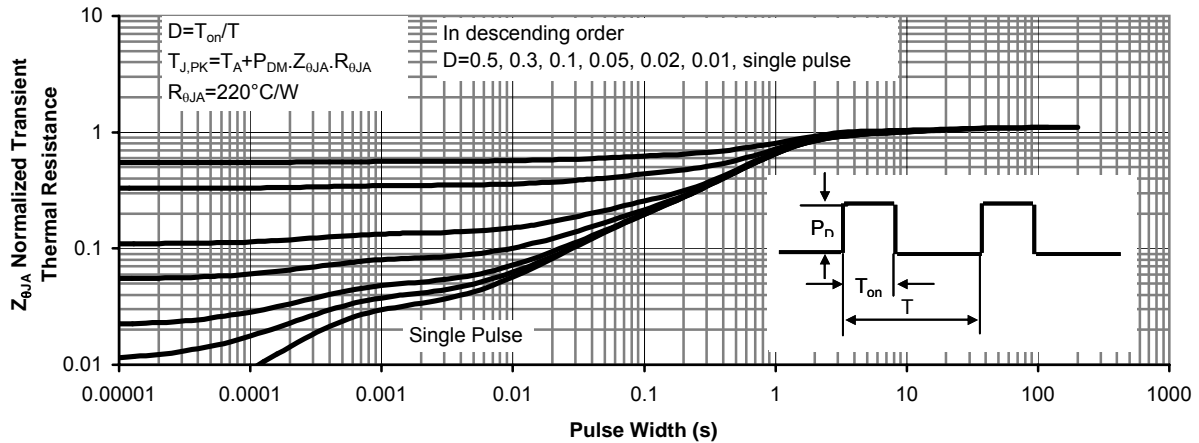


Figure 11: Normalized Maximum Transient Thermal Impedance