



AO6415

P-Channel Enhancement Mode Field Effect Transistor



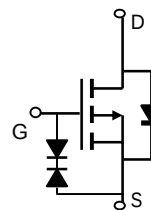
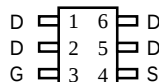
General Description

The AO6415 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected. *Standard Product AO6415 is Pb-free (meets ROHS & Sony 259 specifications). AO6415L is a Green Product ordering option. AO6415 and AO6415L are electrically identical.*

Features

V_{DS} (V) = -20V
 I_D = -3.3A (V_{GS} = -10V)
 $R_{DS(ON)} < 75m\Omega$ (V_{GS} = -10V)
 $R_{DS(ON)} < 100m\Omega$ (V_{GS} = -4.5V)
 $R_{DS(ON)} < 150m\Omega$ (V_{GS} = -2.5V)
ESD Rating: 2000V HBM

TSOP6
Top View



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	-3.3	A
$T_A=25^\circ\text{C}$		-2.7	
$T_A=70^\circ\text{C}$			
Pulsed Drain Current ^B	I_{DM}	-14	
Power Dissipation ^A	P_D	1.25	W
		0.8	
$T_A=25^\circ\text{C}$			
$T_A=70^\circ\text{C}$			
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	82	100	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	111	140	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	56	70	$^\circ\text{C/W}$
Steady-State				

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-16V, V _{GS} =0V T _J =55°C		-0.003	-0.5 -2.5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±10V			±1	μA
		V _{DS} =0V, V _{GS} =±12V			±10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-0.6	-0.9	-1.4	
I _{D(ON)}	On state drain current	V _{GS} =-4.5V, V _{DS} =-5V	-20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-3.3A T _J =125°C		62 84	75 105	mΩ
		V _{GS} =-4.5V, I _D =-2A		80	100	mΩ
		V _{GS} =-2.5V, I _D =-1A		115	150	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-3.3A		7		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V	-0.65	-0.82	-1	V
I _S	Maximum Body-Diode Continuous Current				-1.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-10V, f=1MHz		512	620	pF
C _{oss}	Output Capacitance			77		pF
C _{rss}	Reverse Transfer Capacitance			62		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		9.2	13	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-10V, I _D =-2A		4.9	6	nC
Q _{gs}	Gate Source Charge			0.8		nC
Q _{gd}	Gate Drain Charge			1.2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-4.5V, V _{DS} =-10V, R _L =5Ω, R _{GEN} =3Ω		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 =-2A, dI/dt=100A/μs		13	17	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-2A, dI/dt=100A/μs		4	6	nC

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

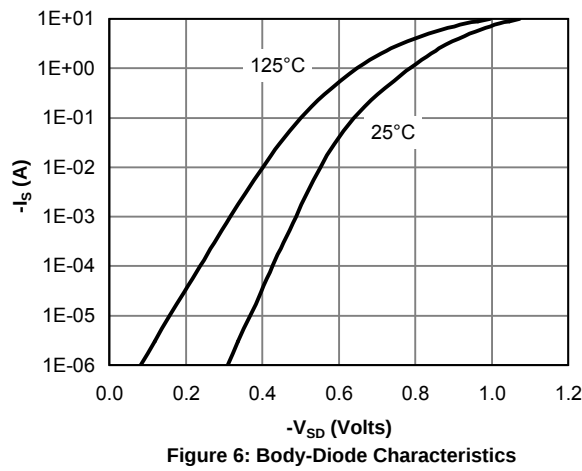
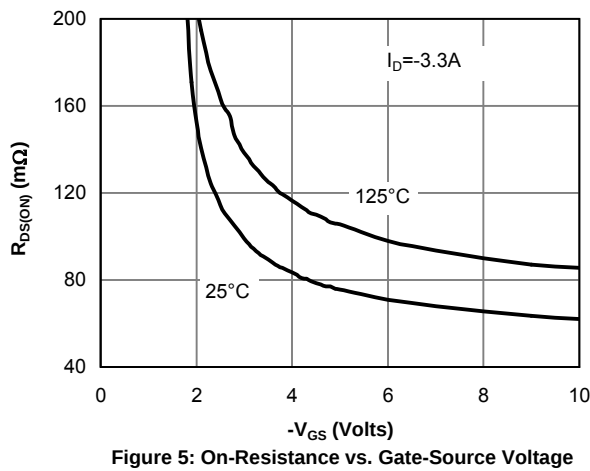
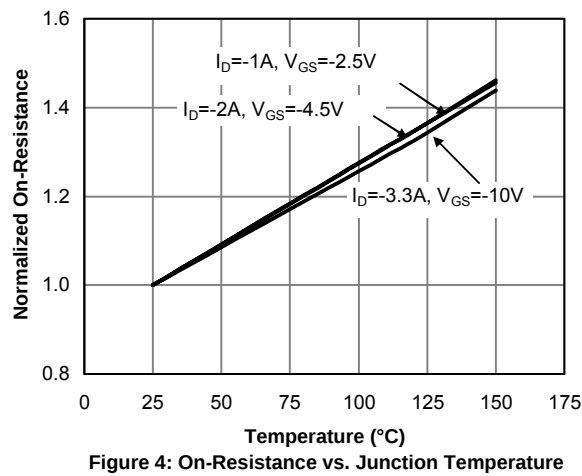
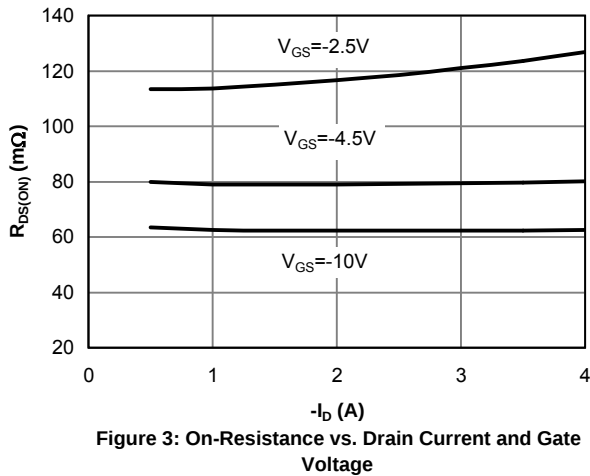
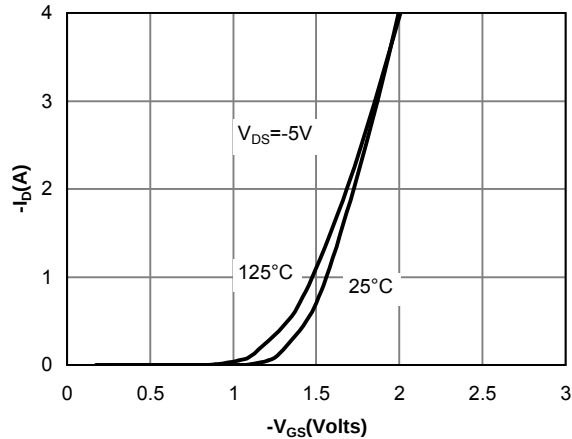
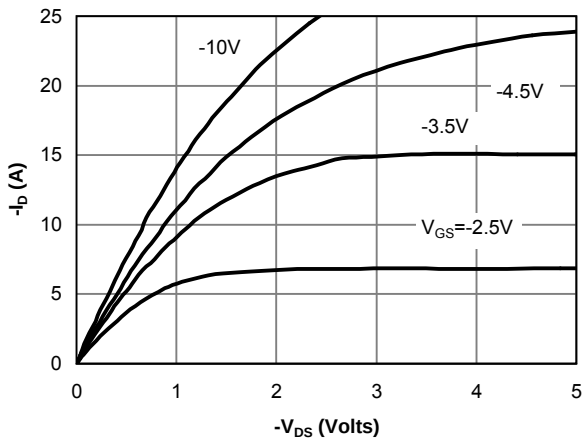
D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

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°C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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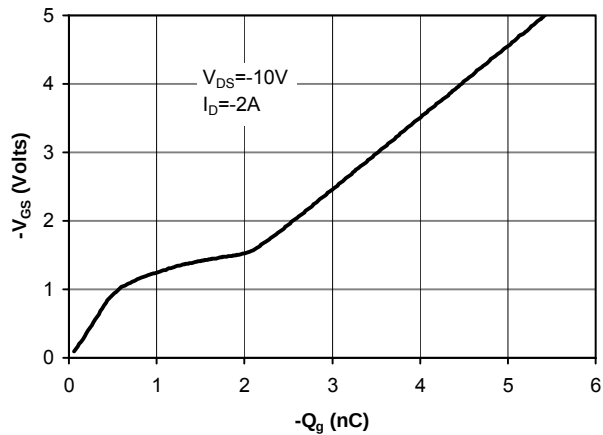


Figure 7: Gate-Charge Characteristics

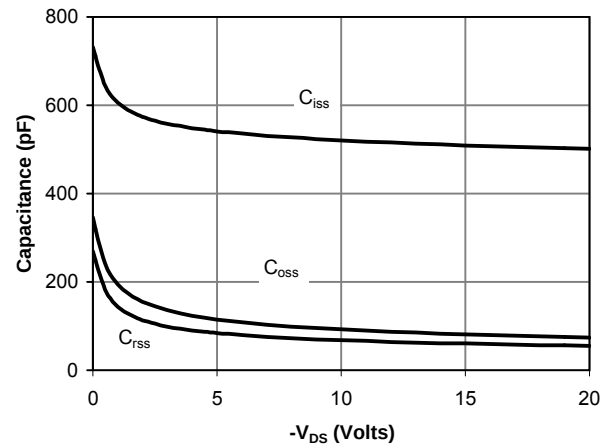


Figure 8: Capacitance Characteristics

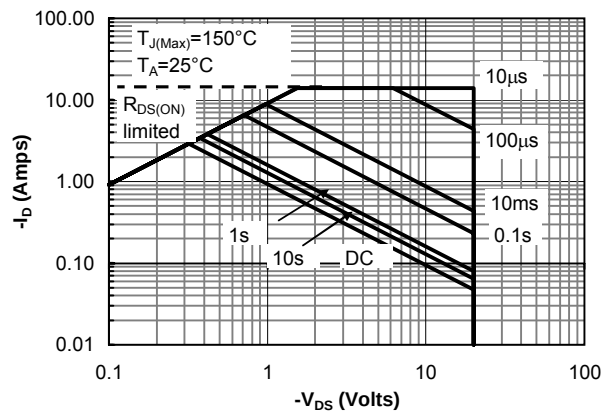


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

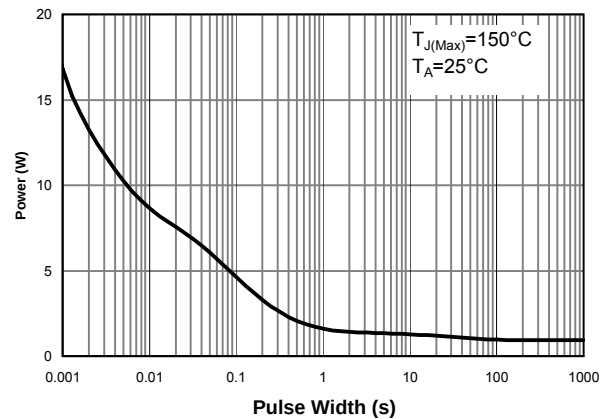


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

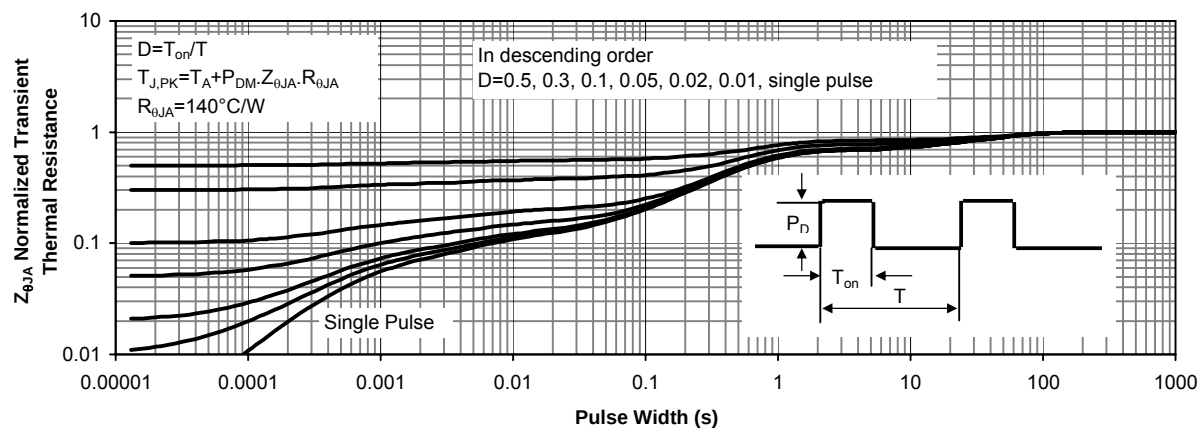


Figure 11: Normalized Maximum Transient Thermal Impedance