ALPHA & OMEGA SEMICONDUCTOR

AON7405

30V P-Channel MOSFET

General Description

The AON7405 uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge.
This device is ideal for load switch and battery protection applications.

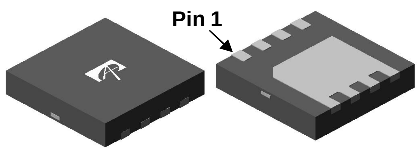
• RoHS and Halogen-Free Compliant

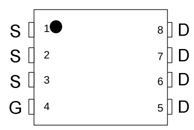
Product Summary

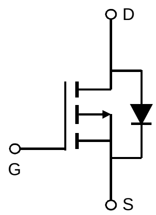
V_{DS}	-30V
I_D (at V_{GS}= -10V)	-50A
$R_{DS(ON)}$ (at V_{GS}= -10V)	< 6.2mΩ
$R_{DS(ON)}$ (at V_{GS} = -6V)	< 8.9mΩ

100% UIS Tested
100% R_g Tested

DFN 3.3x3.3 EP







Absolute Maximum Ratings T_A=25℃ unless otherwise noted				
Parameter		**Symbol**	**Maximum**	**Units**
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{GS}	±25	V
Continuous Drain Current[G]	T_C=25℃	I_D	-50	A
	T_C=100℃		-39	
Pulsed Drain Current [C]		I_{DM}	-210	
Continuous Drain Current	T_A=25℃	I_{DSM}	-25	A
	T_A=70℃		-20	
Avalanche Current [C]		I_{AR}, I_{AS}	-44	A
Repetitive avalanche energy L=0.1mH [C]		E_{AR}, E_{AS}	97	mJ
Power Dissipation [B]	T_C=25℃	P_D	83	W
	T_C=100℃		33	
Power Dissipation [A]	T_A=25℃	P_{DSM}	6.25	W
	T_A=70℃		4	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	16	20	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		45	55	℃/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1.1	1.5	℃/W

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		-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-30V, V_{GS}=0V				-1	µA
			T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±25V				±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA		-1.7	-2.2	-2.8	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V		-210			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-20A			5.1	6.2	mΩ
			T_J=125°C		7.6	9.2	
		V_{GS}=-6V, ID=-20A			7.1	8.9	mΩ
		V_{GS}=-4.5V, I_D=-10A			10.7		mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-20A			46		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V			-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current[G]					-50	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		1960	2450	2940	pF
C_{oss}	Output Capacitance			380	550	720	pF
C_{rss}	Reverse Transfer Capacitance			220	370	520	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		7	14	28	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-20A		33	42	51	nC
Q_g(4.5V)	Total Gate Charge			16	21	26	nC
Q_{gs}	Gate Source Charge			5.5	7	8.5	nC
Q_{gd}	Gate Drain Charge			7	12	17	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=0.75Ω, R_{GEN}=3Ω			9.5		ns
t_r	Turn-On Rise Time				10		ns
$t_{D(off)}$	Turn-Off DelayTime				104		ns
t_f	Turn-Off Fall Time				78		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-20A, dI/dt=500A/µs		20	25	30	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-20A, dI/dt=500A/µs		37	47	57	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°C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t ≤ 10s value and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial T_J =25°C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.
G. The maximum current rating is limited by package.
H. 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.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

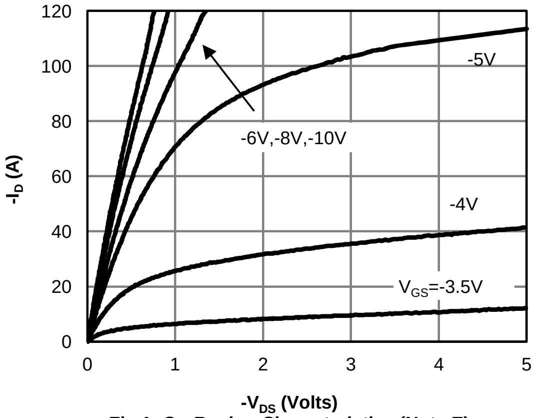


Fig 1: On-Region Characteristics (Note E)

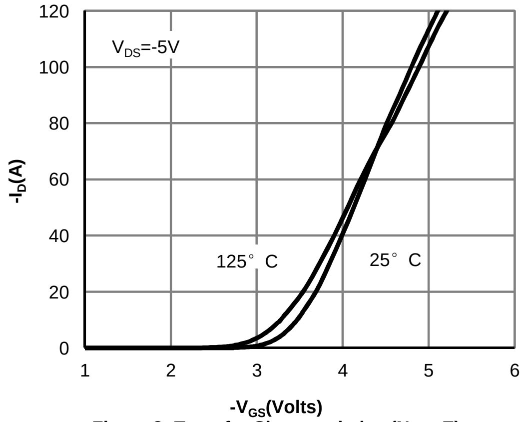


Figure 2: Transfer Characteristics (Note E)

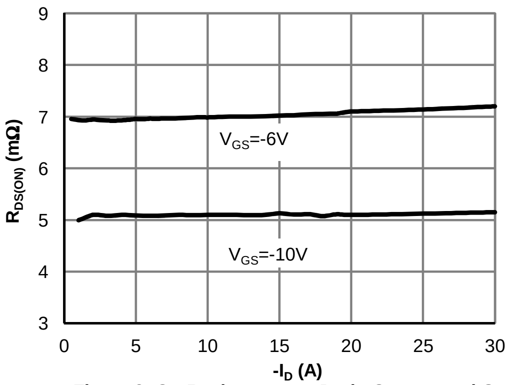


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

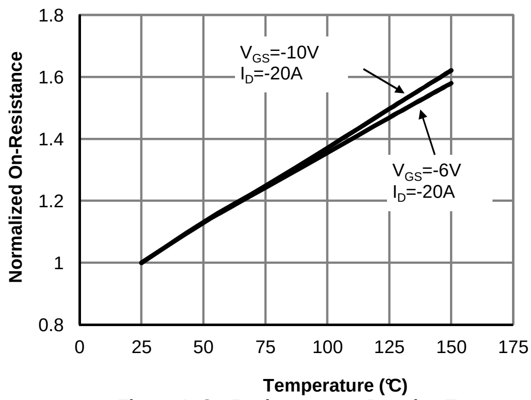


Figure 4: On-Resistance vs. Junction Temperature (Note E)

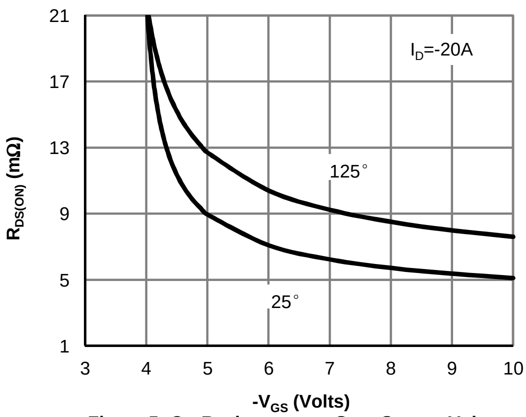


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

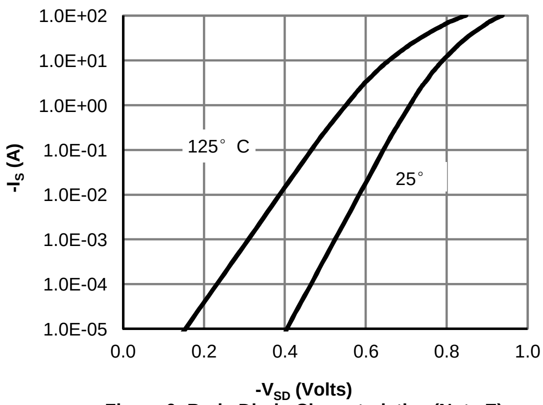


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

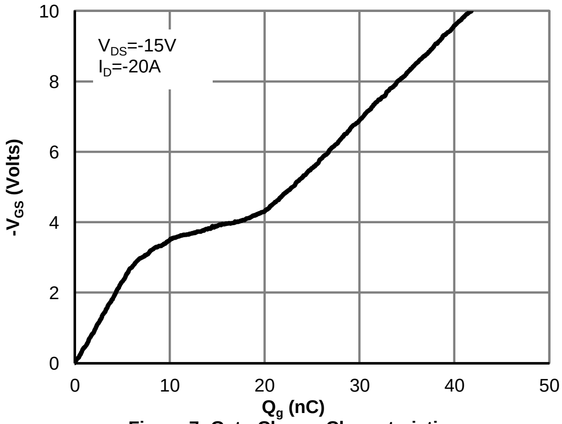


Figure 7: Gate-Charge Characteristics

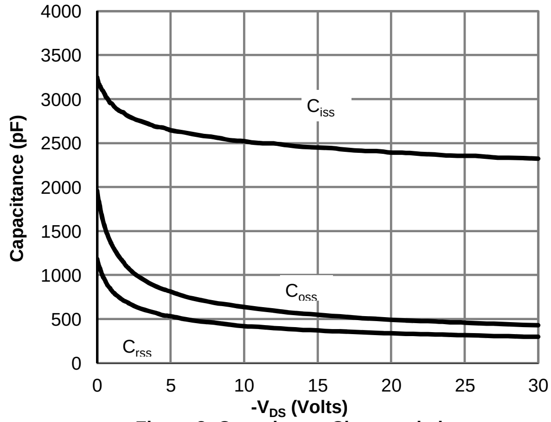


Figure 8: Capacitance Characteristics

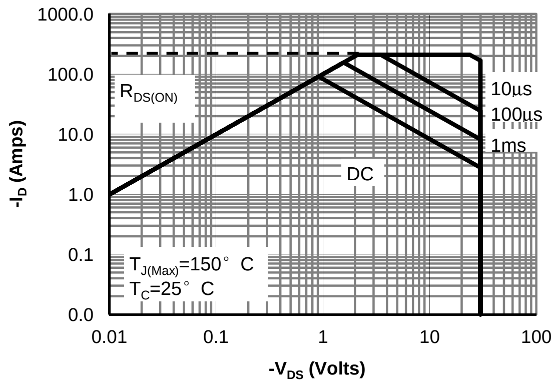


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

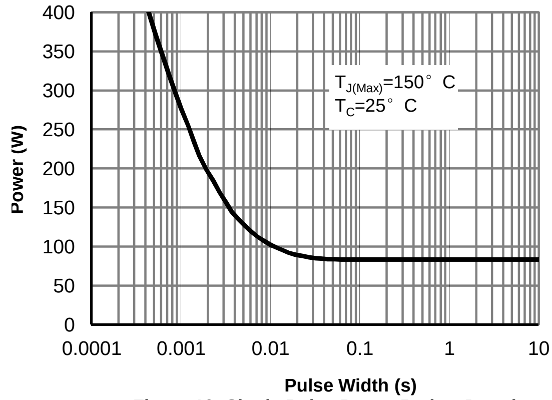


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

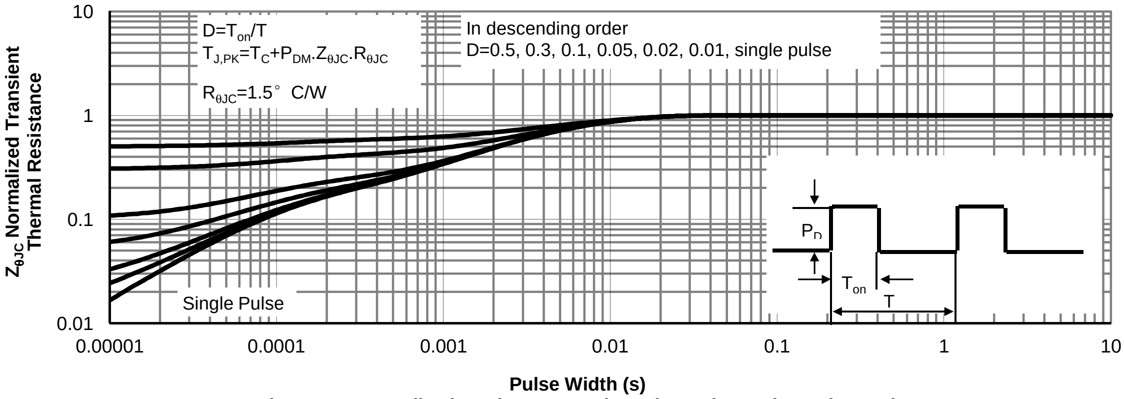


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

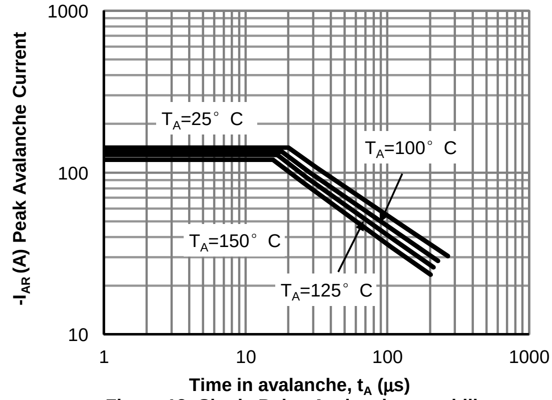


Figure 12: Single Pulse Avalanche capability (Note C)

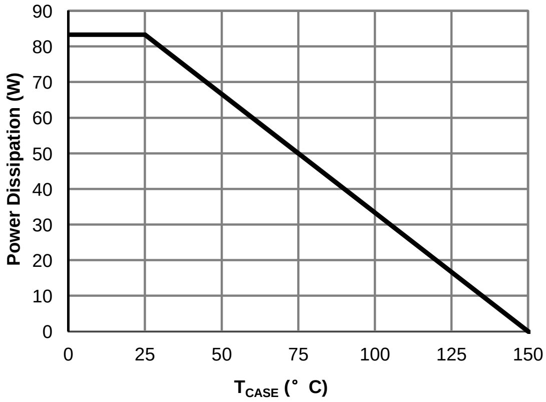


Figure 13: Power De-rating (Note F)

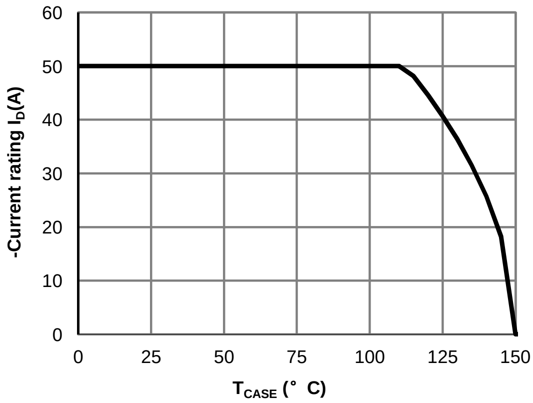


Figure 14: Current De-rating (Note F)

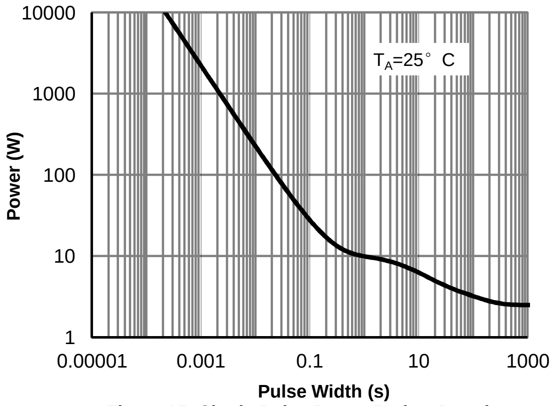


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

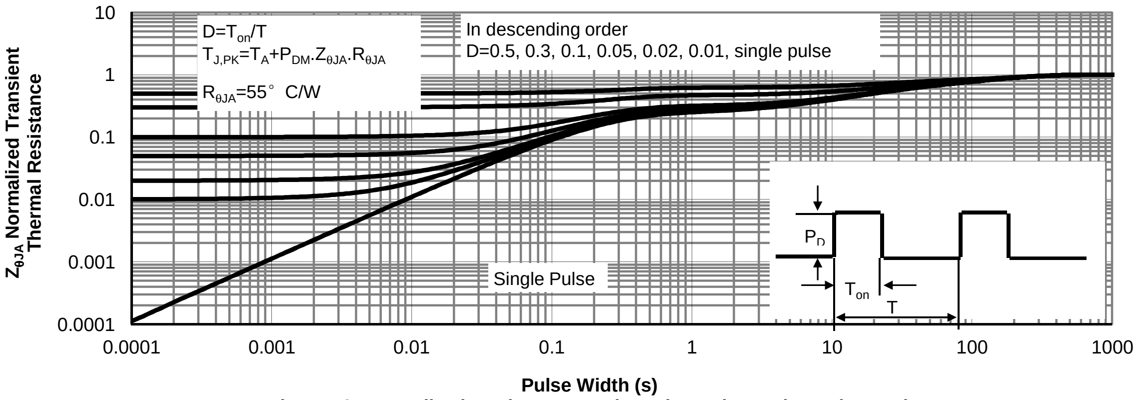
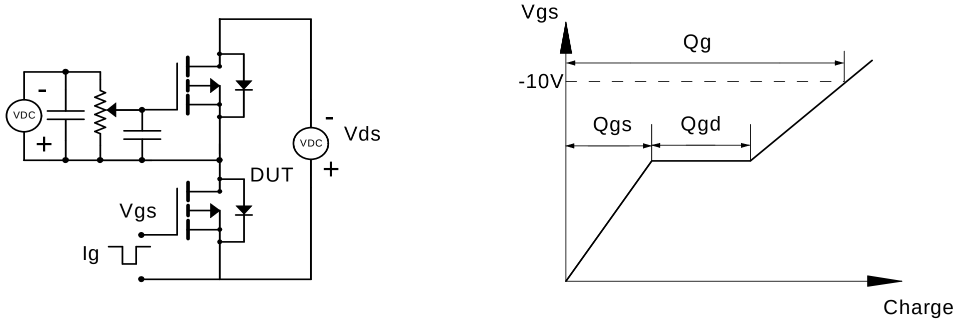
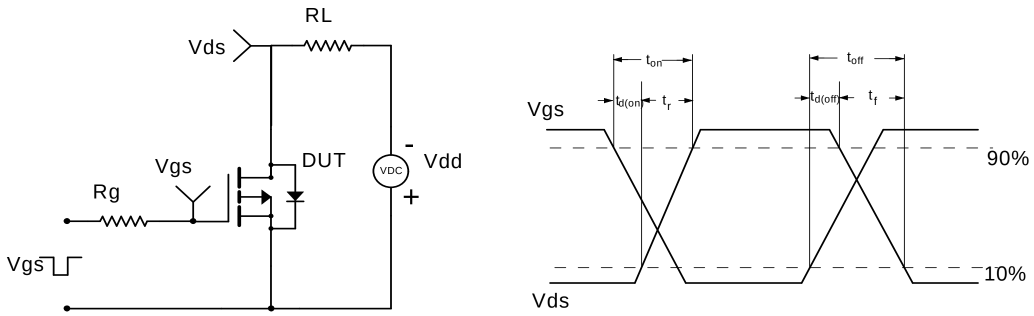


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

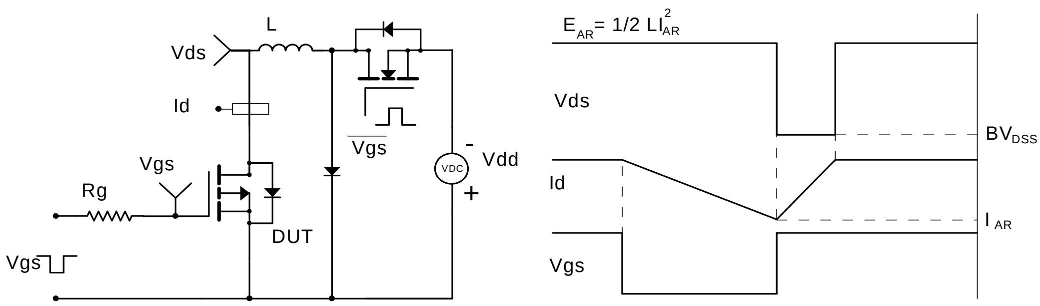
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms