ALPHA & OMEGA SEMICONDUCTOR

AON7409

30V P-Channel MOSFET

General Description

• The AON7409 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

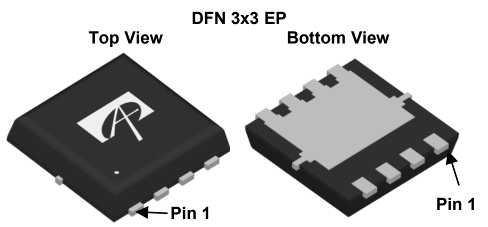
• RoHS and Halogen-Free Compliant.

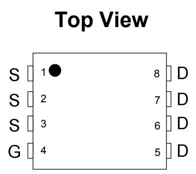
Product Summary

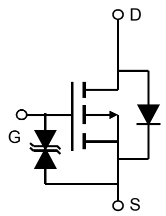
V_{DS}	-30V
I_D (at V_{GS}=-10V)	-32A
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 8.5mΩ
$R_{DS(ON)}$ (at V_{GS} =-4.5V)	< 17mΩ

Typical ESD protection **HBM Class 3A**

100% UIS Tested
100% R_g Tested







Absolute Maximum Ratings T_A=25°C 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°C	I_D	-32	A
	T_C=100°C		-25	
Pulsed Drain Current [C]		I_{DM}	-128	
Continuous Drain Current	T_A=25°C	I_{DSM}	-16	A
	T_A=70°C		-12.5	
Avalanche Current [C]		I_{AS}	40	A
Avalanche energy L=0.1mH [C]		E_{AS}	80	mJ
Power Dissipation [B]	T_C=25°C	P_D	96	W
	T_C=100°C		38.5	
Power Dissipation [A]	T_A=25°C	P_{DSM}	3.1	W
	T_A=70°C		2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	30	40	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		60	75	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	1	1.3	°C/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				±10	uA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250µA		-1.6	-2.1	-2.7	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V		-128			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-16A			6.8	8.5	mΩ
			T_J=125°C		9.6	11.5	
		V_{GS}=-4.5V, I_D=-10A			12.8	17	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-16A			-43		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V			-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current [G]					-32	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz			2142		pF
C_{oss}	Output Capacitance				474		pF
C_{rss}	Reverse Transfer Capacitance				363		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			2.3	4.6	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-16A			41	58	nC
Q_g(4.5V)	Total Gate Charge				18.5	27	nC
Q_{gs}	Gate Source Charge				15		nC
Q_{gd}	Gate Drain Charge				6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=0.9Ω, R_{GEN}=3Ω			13		ns
t_r	Turn-On Rise Time				12		ns
$t_{D(off)}$	Turn-Off DelayTime				34		ns
t_f	Turn-Off Fall Time				18.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-16A, dI/dt=500A/µs			17.5		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-16A, dI/dt=500A/µs			44.5		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 Power dissipation P_{DSM} is based on R $_{θJA}$ 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 $R_{θJA}$ is the sum of the thermal impedance from junction to case $R_{θJC}$ 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 impedance 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 package limited.
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

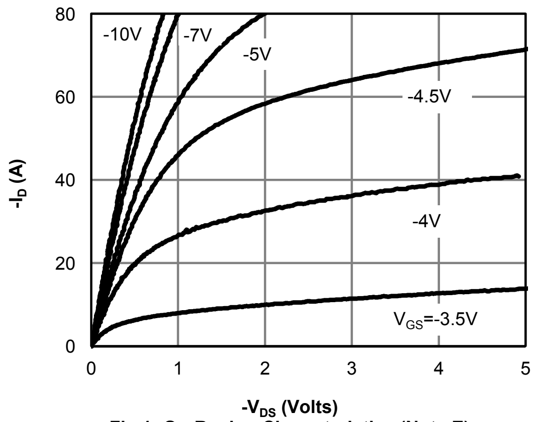


Fig 1: On-Region Characteristics (Note E)

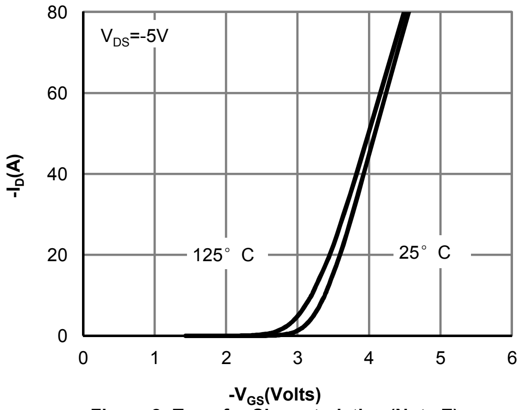


Figure 2: Transfer Characteristics (Note E)

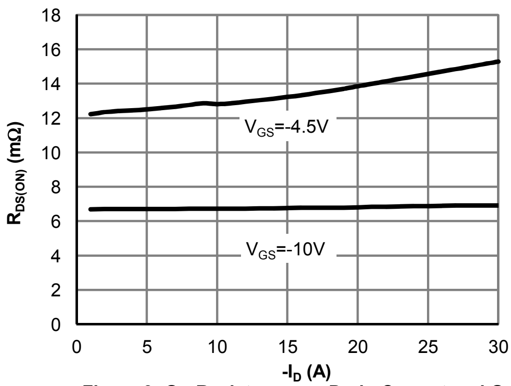


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

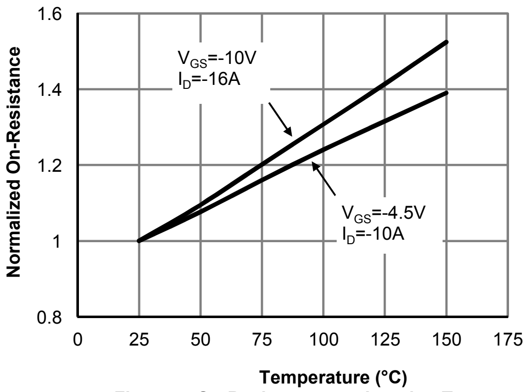


Figure 4: On-Resistance vs. Junction Temperature (Note E)

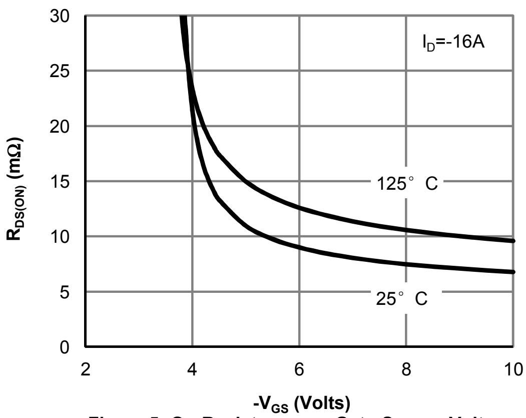


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

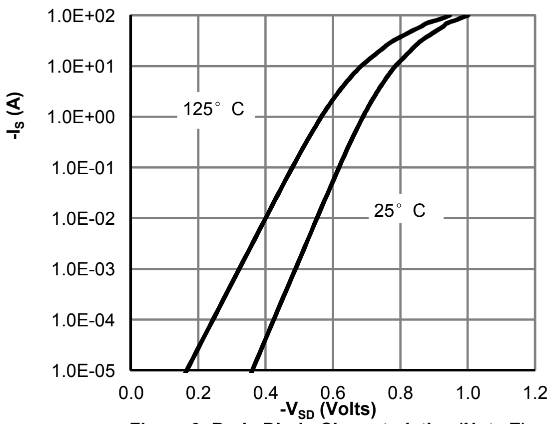


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

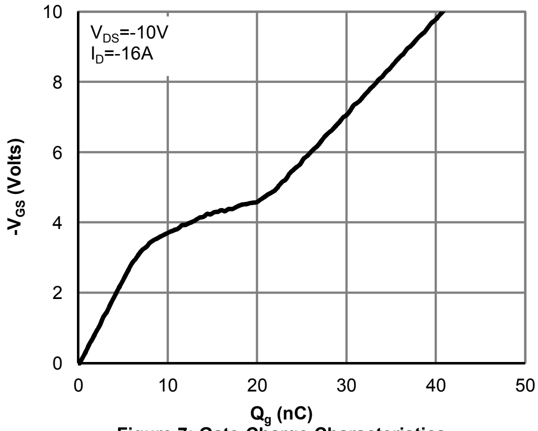


Figure 7: Gate-Charge Characteristics

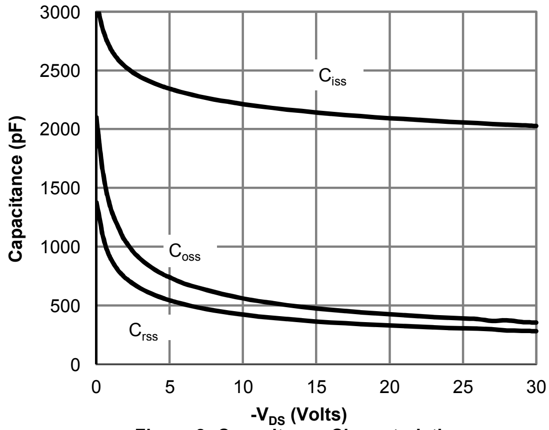


Figure 8: Capacitance Characteristics

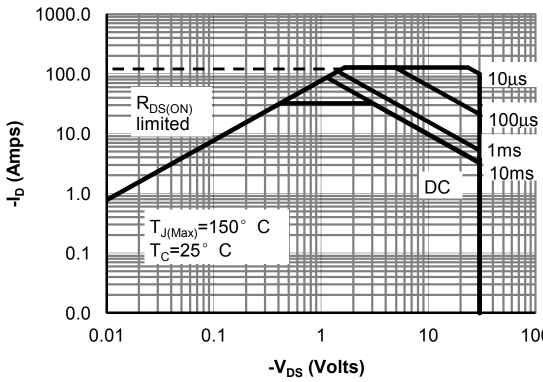


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

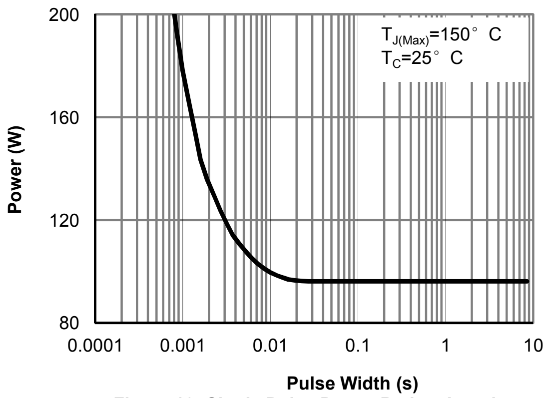


Figure 10: Single Pulse Power Rating Junction-to-Ca (Note F)

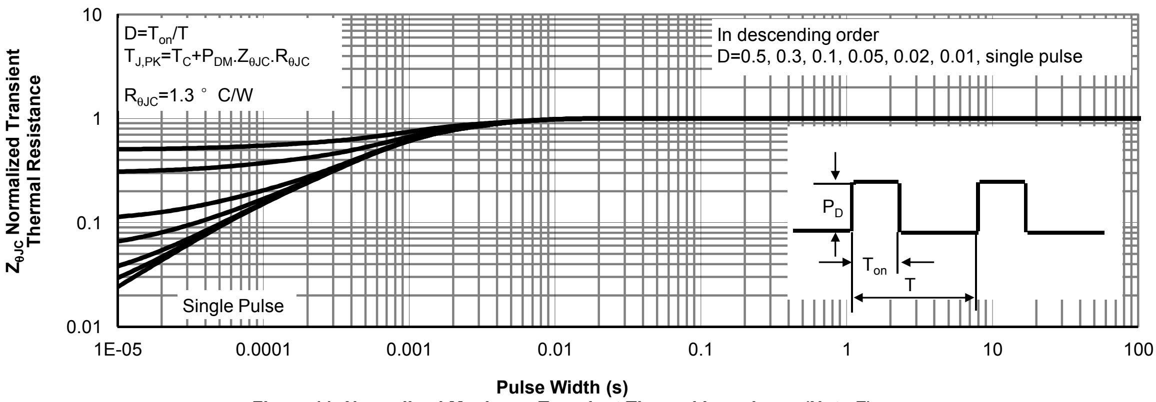
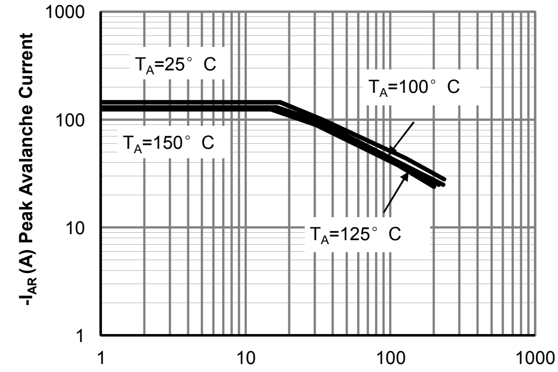
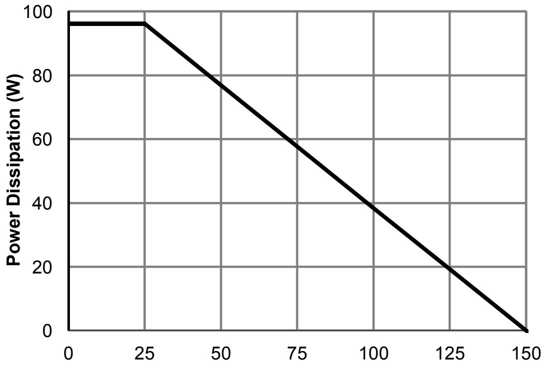


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

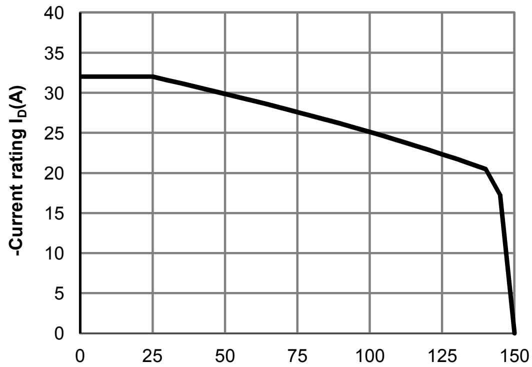
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



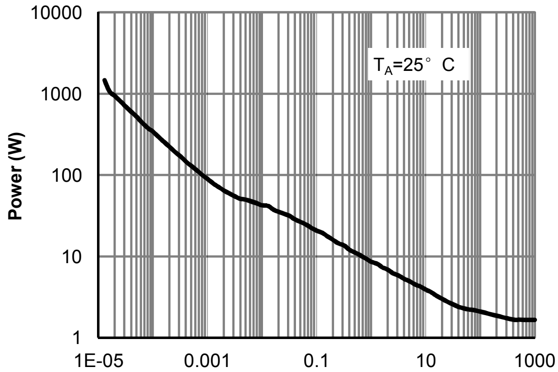
Time in avalanche, t_A (μs)
Figure 12: Single Pulse Avalanche capability (Note C)



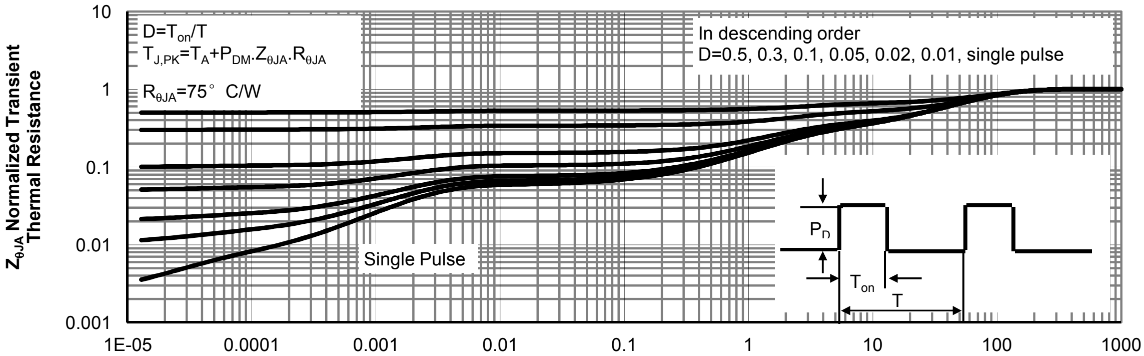
T_{CASE} (°C)
Figure 13: Power De-rating (Note F)



T_{CASE} (°C)
Figure 14: Current De-rating (Note F)

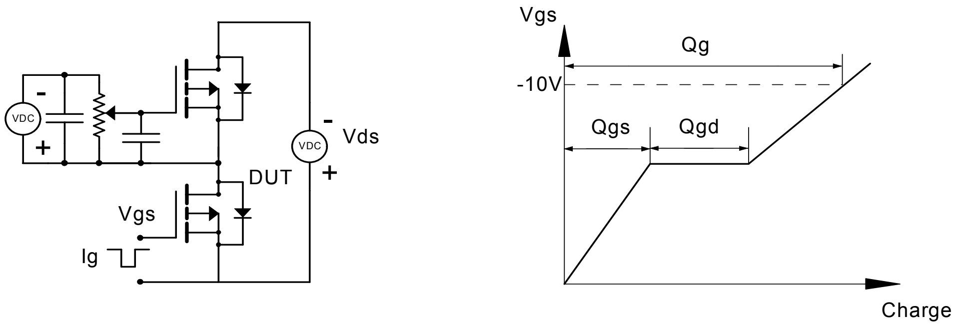


Pulse Width (s)
Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

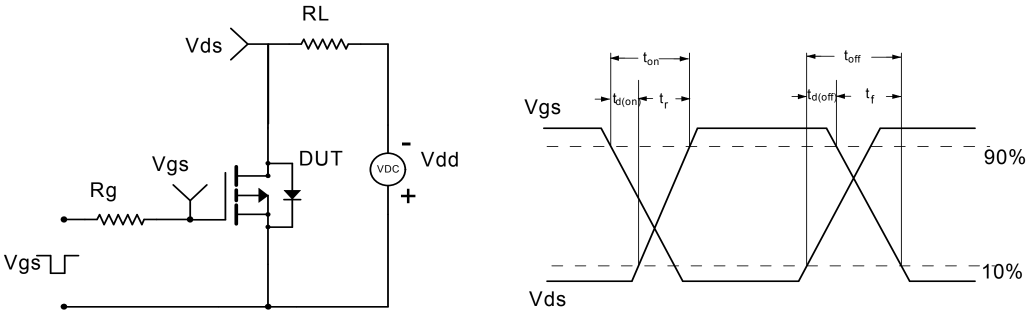


Pulse Width (s)
Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

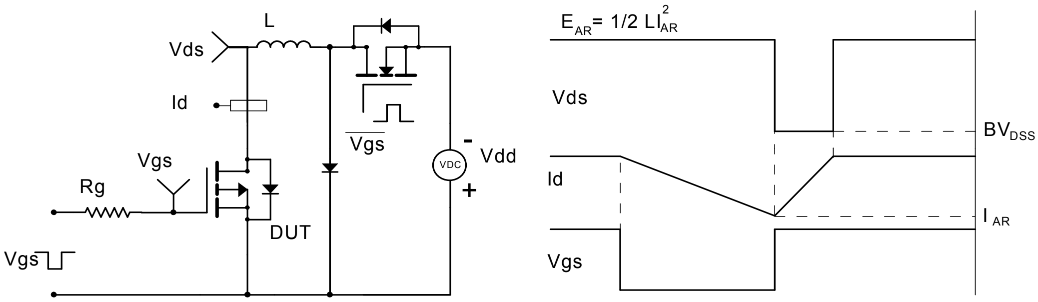
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms