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[AON7421](#)

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ALPHA & OMEGA
SEMICONDUCTOR

AON7421

20V P-Channel MOSFET

General Description

The AON7421 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.

Product Summary

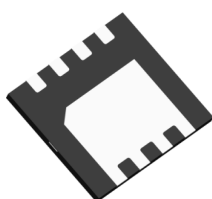
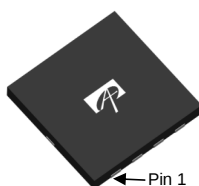
V_{DS}	-20V
I_D (at $V_{GS}=-10V$)	-50A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 4.6m Ω
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 5.8m Ω
$R_{DS(ON)}$ (at $V_{GS}=-2.5V$)	< 9.0m Ω

100% UIS Tested

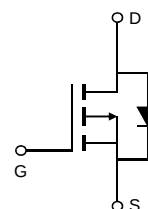
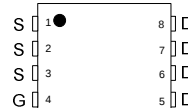
100% R_g Tested



DFN 3.3x3.3 EP
Top View Bottom View



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 ^G	I_D	-50	A
$T_C=25^\circ\text{C}$		-39	
Pulsed Drain Current ^C	I_{DM}	-200	A
Continuous Drain Current	I_{DSM}	-30	A
$T_A=25^\circ\text{C}$		-24.5	
Avalanche Current ^C	I_{AS}	50	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}	125	mJ
Power Dissipation ^B	P_D	83	W
$T_C=25^\circ\text{C}$		33	
Power Dissipation ^A	P_{DSM}	6.2	W
$T_A=25^\circ\text{C}$		4	
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	$R_{\theta JA}$	16	20	$^\circ\text{C/W}$
$t \leq 10\text{s}$		45	55	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,B}	$R_{\theta JC}$	1.1	1.5	$^\circ\text{C/W}$
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} =-20V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-0.5	-0.8	-1.2	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	-200			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-20A T _J =125°C		3.7 5	4.6 6.2	mΩ
		V _{GS} =-4.5V, I _D =-20A		4.5	5.8	mΩ
		V _{GS} =-2.5V, I _D =-20A		6.3	9	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-20A		90		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.58	-1	V
I _S	Maximum Body-Diode Continuous Current ^G				-50	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-10V, f=1MHz		4550		pF
C _{oss}	Output Capacitance			823		pF
C _{rss}	Reverse Transfer Capacitance			563		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.1	4.2	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =-10V, V _{DS} =-10V, I _D =-20A		95	135	nC
Q _{g(4.5V)}	Total Gate Charge			44	62	nC
Q _{gs}	Gate Source Charge			6.5		nC
Q _{gd}	Gate Drain Charge			14		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-10V, R _L =0.5Ω, R _{GEN} =3Ω		7		ns
t _r	Turn-On Rise Time			12		ns
t _{D(off)}	Turn-Off DelayTime			134		ns
t _f	Turn-Off Fall Time			45		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-20A, dI/dt=500A/μs		30		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-20A, dI/dt=500A/μs		75		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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

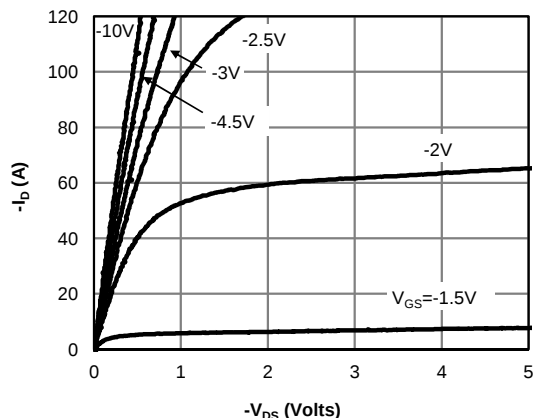


Fig 1: On-Region Characteristics (Note E)

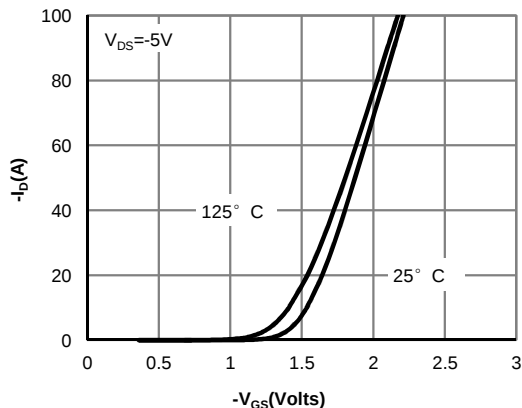


Figure 2: Transfer Characteristics (Note E)

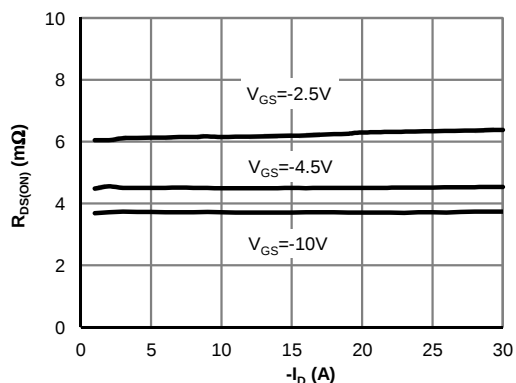


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

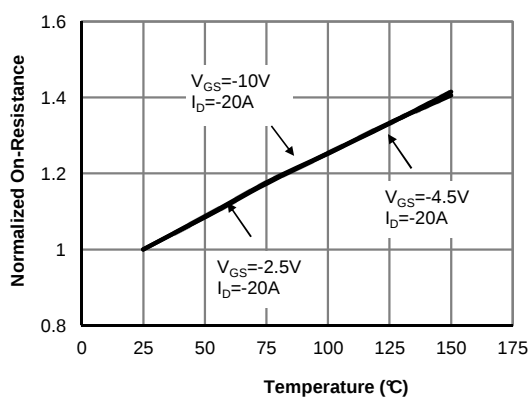


Figure 4: On-Resistance vs. Junction Temperature (Note E)

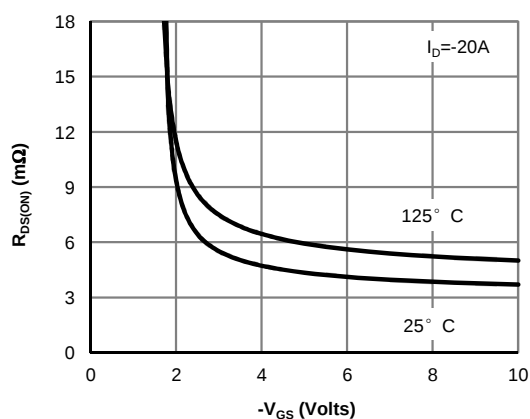


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

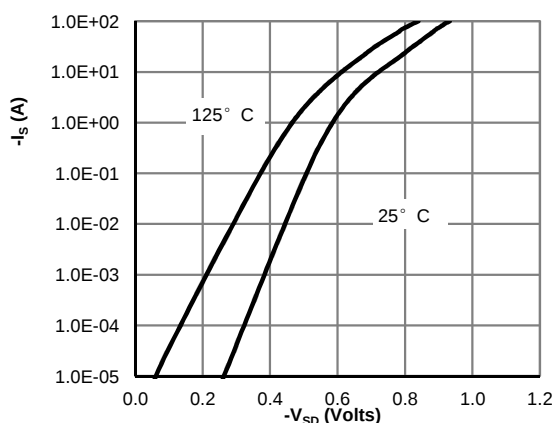


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

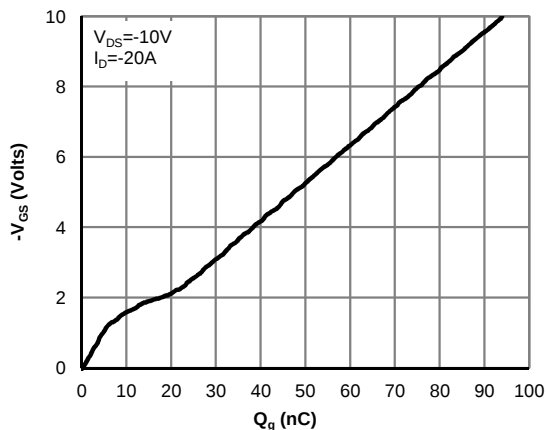


Figure 7: Gate-Charge Characteristics

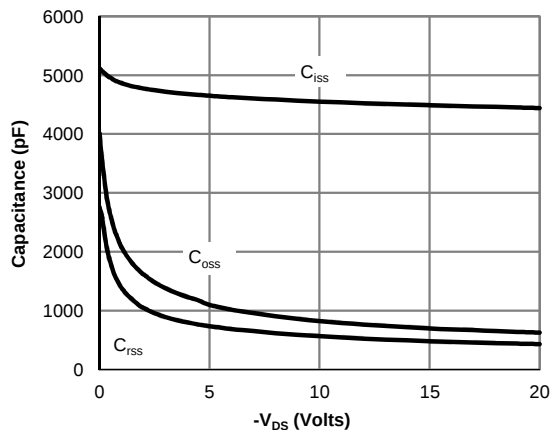


Figure 8: Capacitance Characteristics

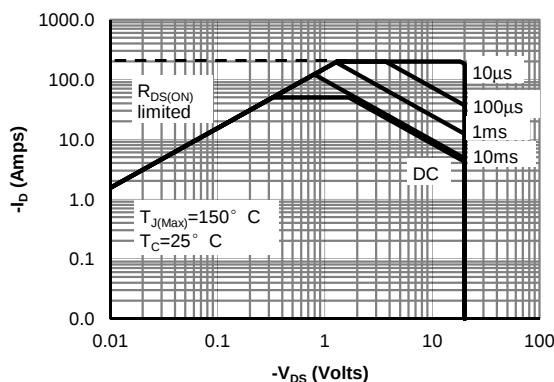


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

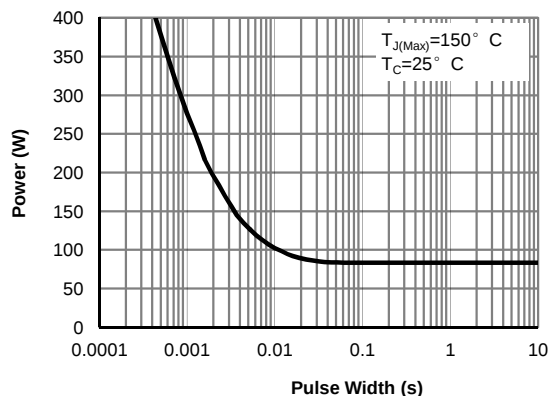


Figure 10: Single Pulse Power Rating Junction-to-Ca (Note F)

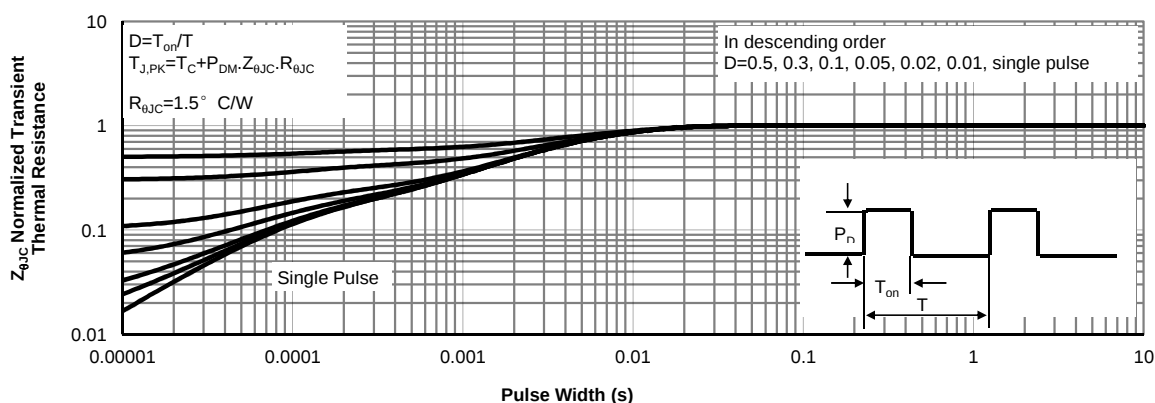


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

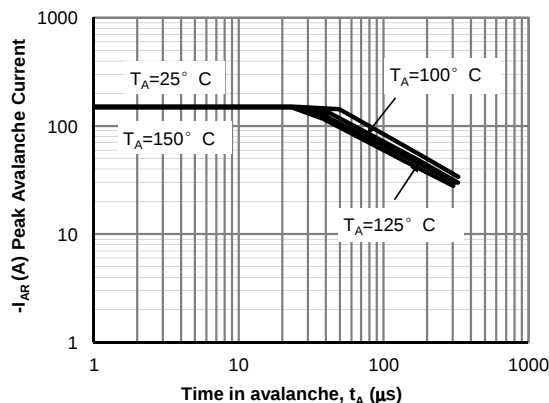


Figure 12: Single Pulse Avalanche capability (Note C)

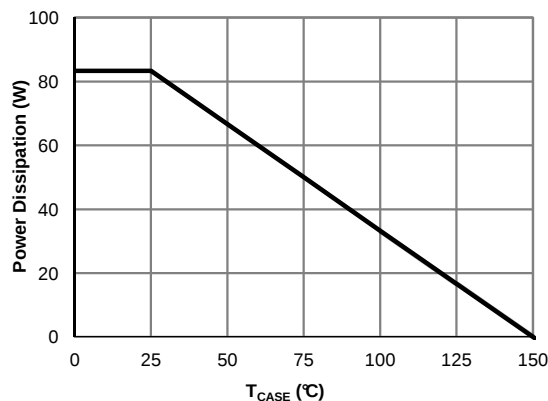


Figure 13: Power De-rating (Note F)

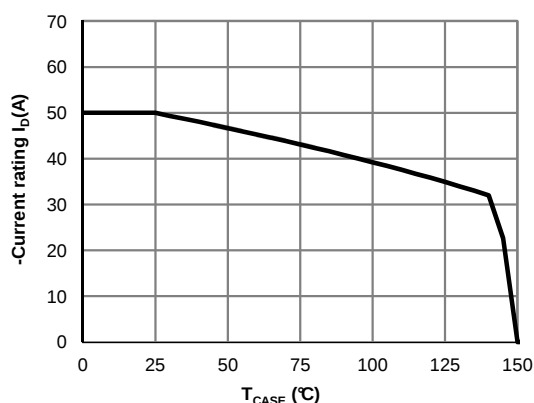


Figure 14: Current De-rating (Note F)

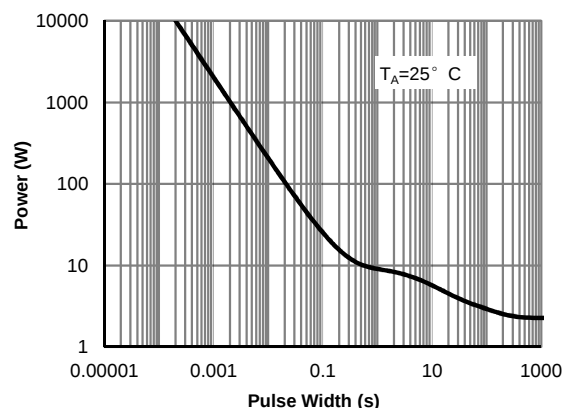


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

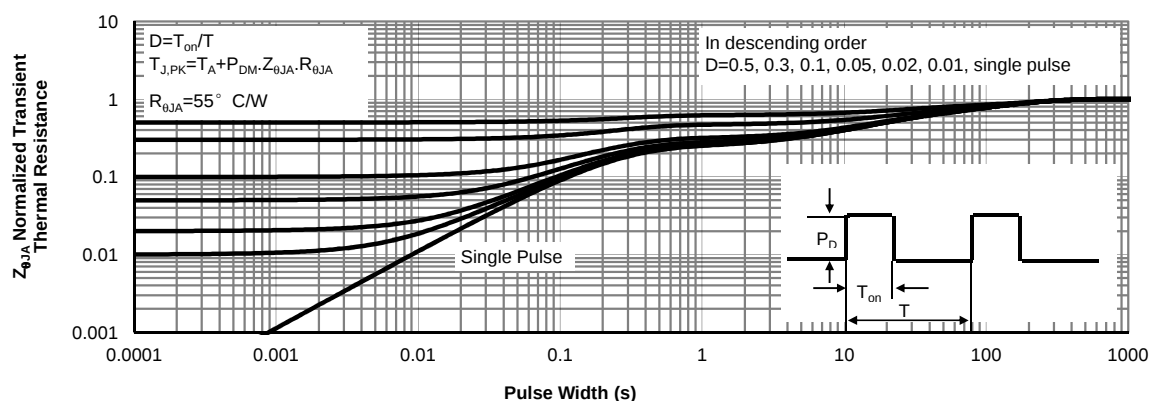
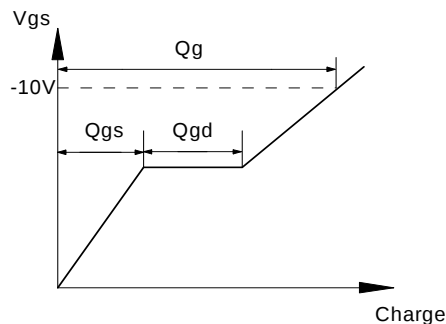
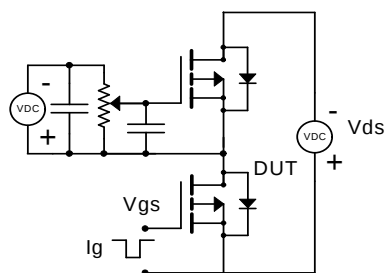
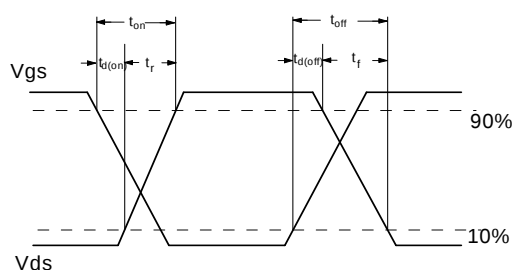
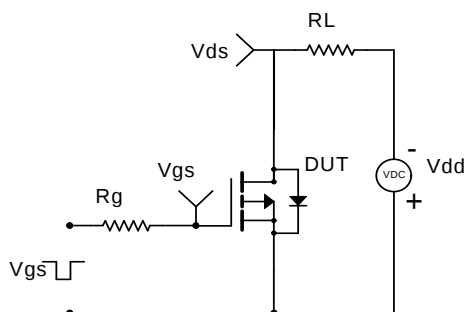


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

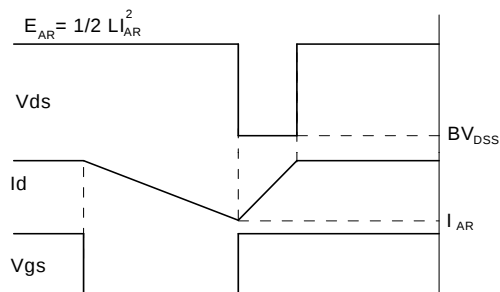
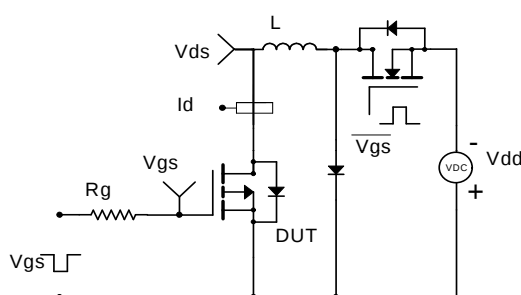
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

