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ALPHA & OMEGA
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AON6405

30V P-Channel MOSFET

General Description

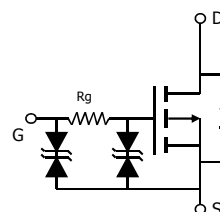
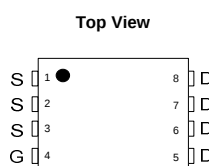
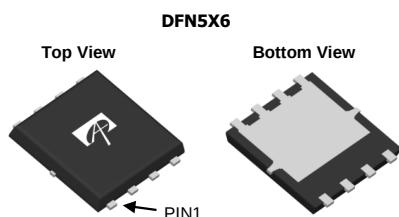
The AON6405 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

Product Summary

V_{DS}	-30
I_D (at $V_{GS} = -10V$)	-30A
$R_{DS(ON)}$ (at $V_{GS} = -10V$)	< 7mΩ
$R_{DS(ON)}$ (at $V_{GS} = -4.5V$)	< 8mΩ

ESD Protected

100% UIS Tested



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^G	I_D	-30	A
$T_C = 25^\circ\text{C}$		-23	
$T_C = 100^\circ\text{C}$			
Pulsed Drain Current ^C	I_{DM}	-160	A
Continuous Drain Current	I_{DSM}	-15	A
$T_A = 25^\circ\text{C}$		-12	
$T_A = 70^\circ\text{C}$			
Avalanche Current ^C	I_{AS}	-54	A
Avalanche energy $L = 0.1\text{mH}$ ^C	E_{AS}	146	mJ
Power Dissipation ^B	P_D	83	W
$T_C = 25^\circ\text{C}$		33	
$T_C = 100^\circ\text{C}$			
Power Dissipation ^A	P_{DSM}	2.5	W
$T_A = 25^\circ\text{C}$		1.6	
$T_A = 70^\circ\text{C}$			
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	$R_{\theta JA}$	14.2	17	$^\circ\text{C/W}$
$t \leq 10\text{s}$				
Maximum Junction-to-Ambient ^{A, D}	$R_{\theta JA}$	42	50	$^\circ\text{C/W}$
Steady-State				
Maximum Junction-to-Case	$R_{\theta JC}$	1.2	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	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-30V, V _{GS} =0V T _j =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±16V			±10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-0.8	-1.2	-1.6	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	-160			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-20A T _j =125°C		5.5 7	7 8.5	mΩ
		V _{GS} =-4.5V, I _D =-20A		6.1	8	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-20A		70		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.65	-1	V
I _S	Maximum Body-Diode Continuous Current ^G				-30	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		4580	5500	pF
C _{oss}	Output Capacitance			755		pF
C _{rss}	Reverse Transfer Capacitance			564		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		160	210	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-20A		87	105	nC
Q _{g(4.5V)}	Total Gate Charge			41		nC
Q _{gs}	Gate Source Charge			12.8		nC
Q _{gd}	Gate Drain Charge			17		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =0.75Ω, R _{GEN} =3Ω		180		ns
t _r	Turn-On Rise Time			260		ns
t _{D(off)}	Turn-Off DelayTime			1.2		μs
t _f	Turn-Off Fall Time			9.7		μs
t _{rr}	Body Diode Reverse Recovery Time	I _F =-20A, dI/dt=300A/μs		32	40	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-20A, dI/dt=300A/μs		77		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} and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150° C may be used if the PCB allows it.

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. Maximum UIS current limited by test equipment.

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

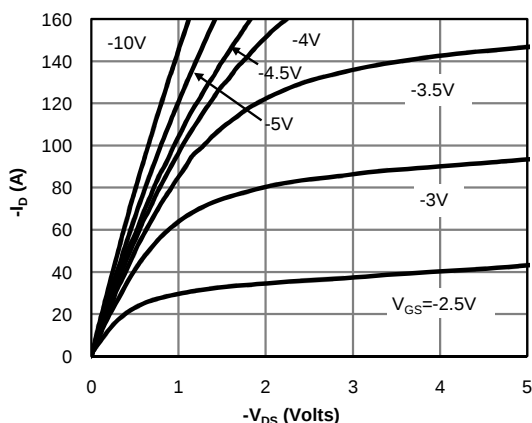


Fig 1: On-Region Characteristics (Note E)

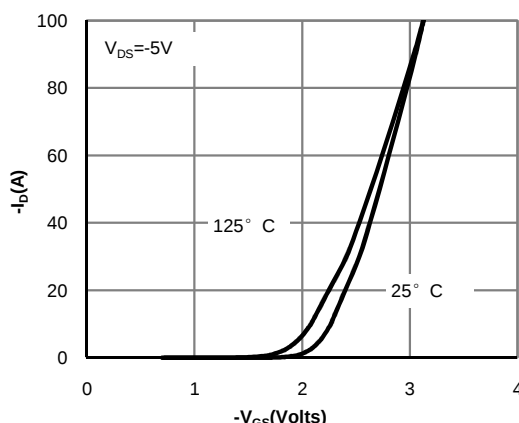


Figure 2: Transfer Characteristics (Note E)

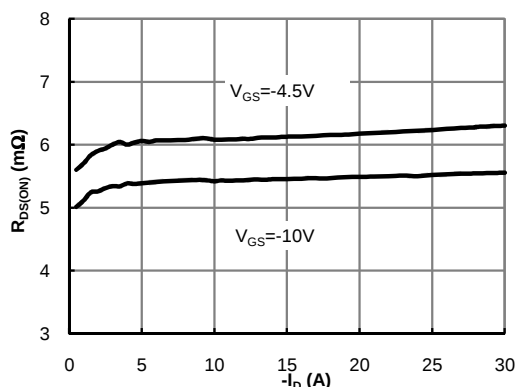


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

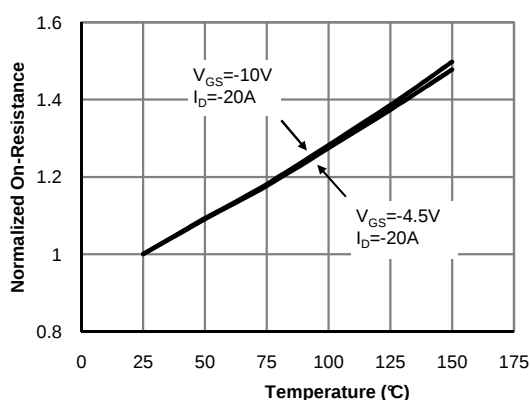


Figure 4: On-Resistance vs. Junction Temperature (Note E)

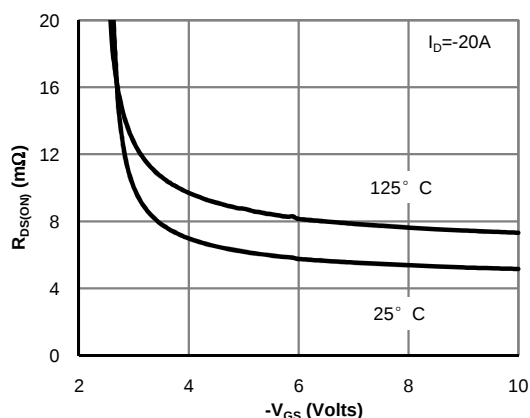


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

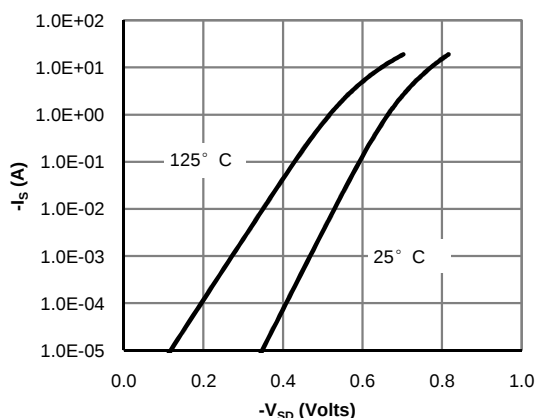


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

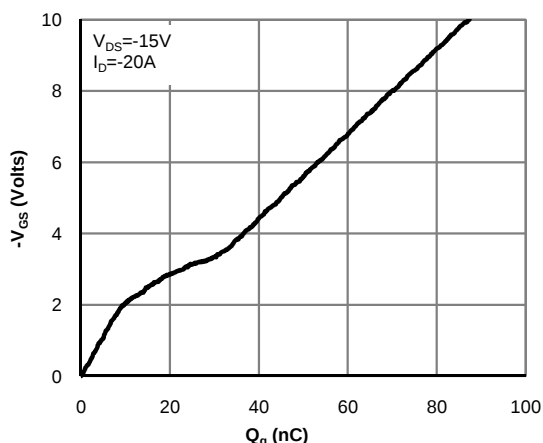


Figure 7: Gate-Charge Characteristics

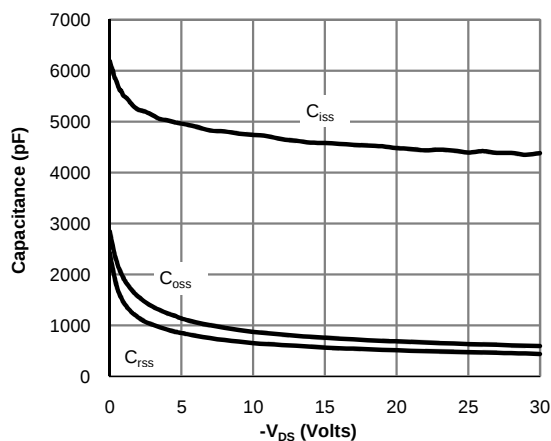


Figure 8: Capacitance Characteristics

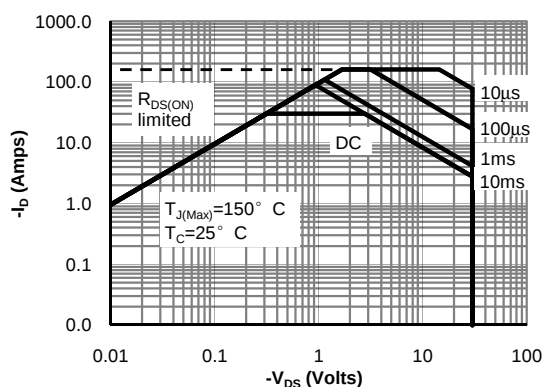


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

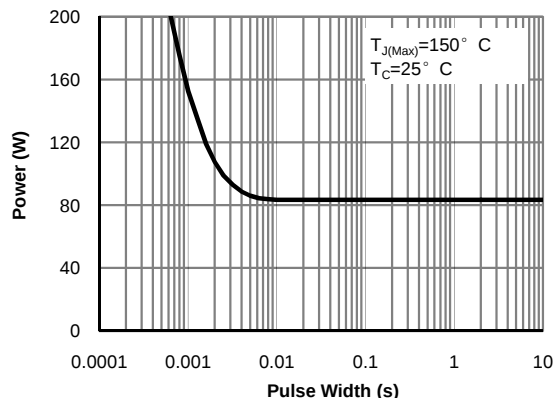


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

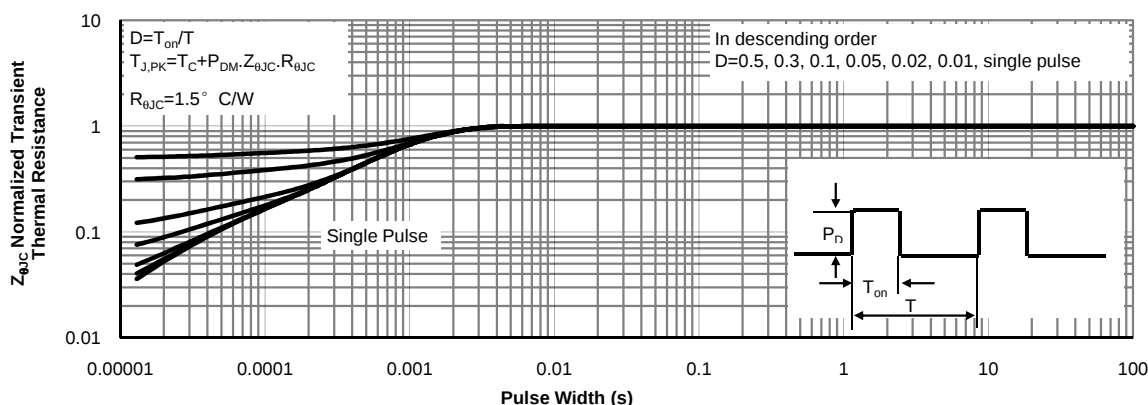


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

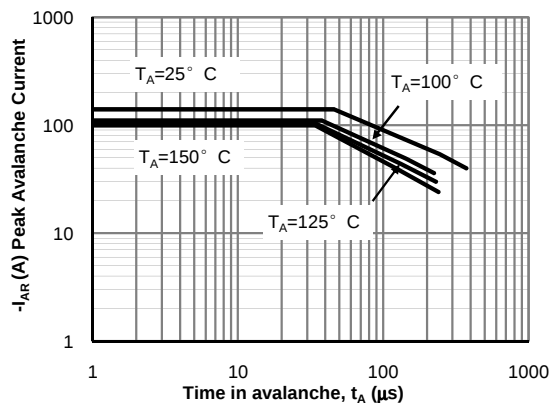


Figure 12: Single Pulse Avalanche capability (Note C)

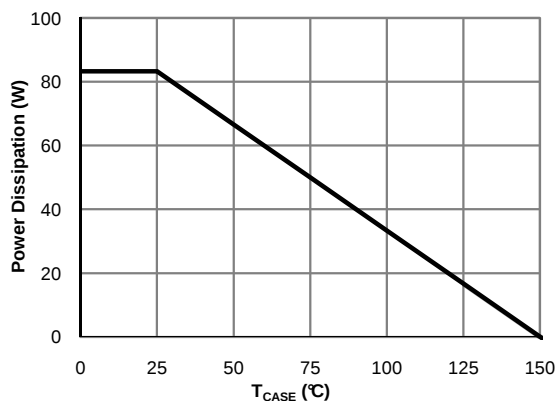


Figure 13: Power De-rating (Note F)

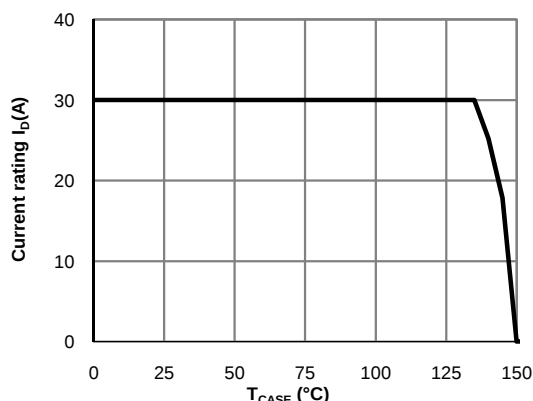


Figure 14: Current De-rating (Note F)

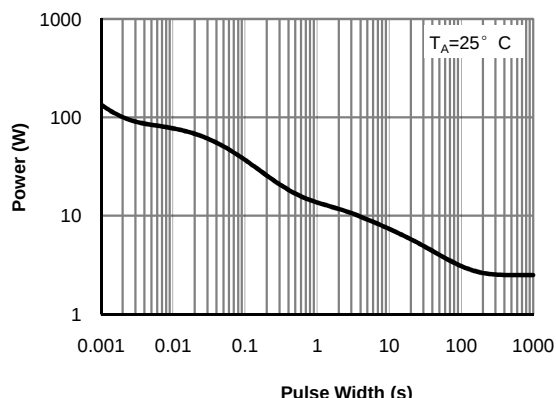


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

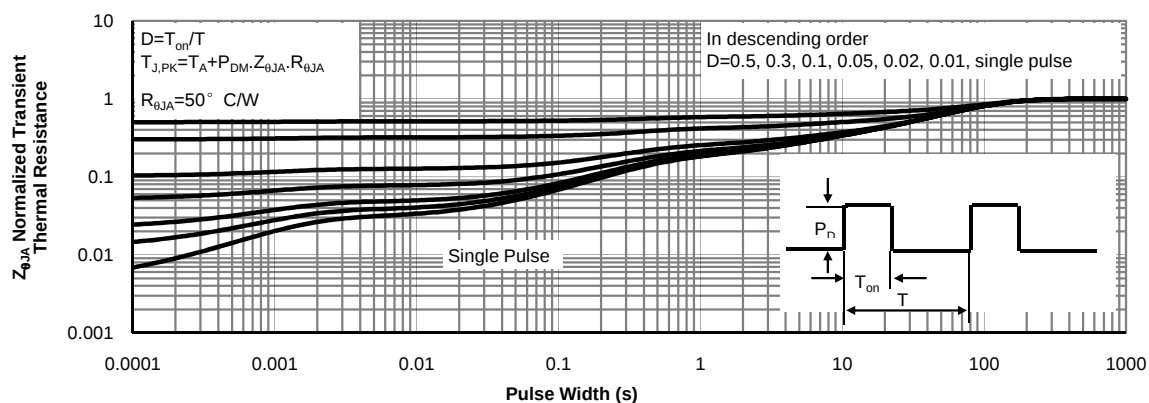
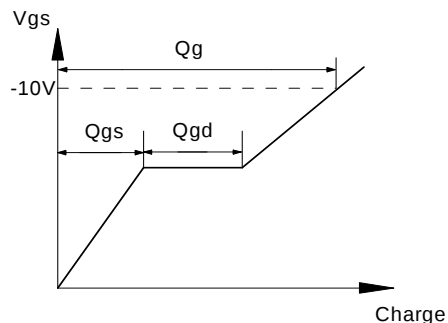
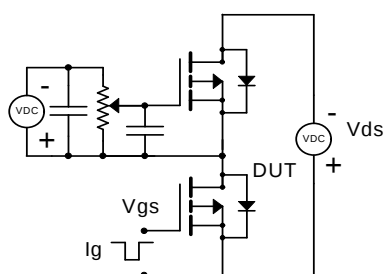
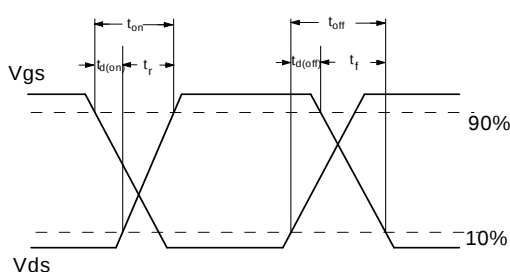
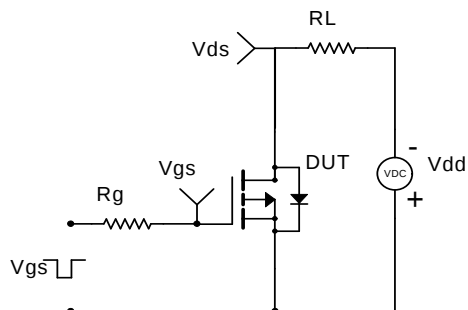


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

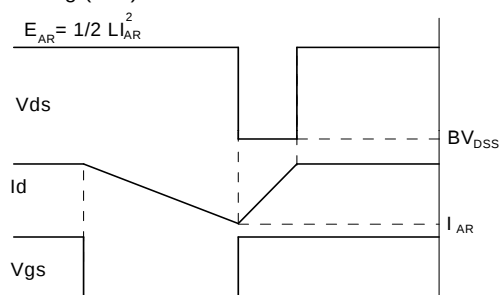
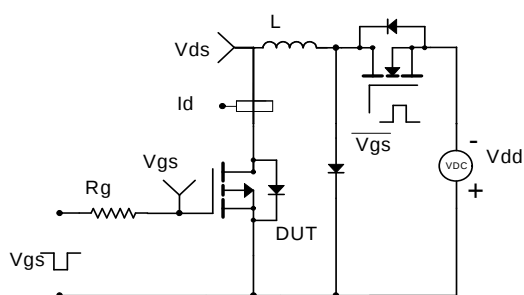
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

