



ALPHA & OMEGA
SEMICONDUCTOR

AON6504

30V N-Channel AlphaMOS

General Description

- Latest Trench Power AlphaMOS (αMOS LV) technology
- Very Low RDS(on) at 4.5V_{GS}
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

Product Summary

V _{DS}	30V
I _D (at V _{GS} =10V)	85A
R _{DS(ON)} (at V _{GS} =10V)	< 2.1mΩ
R _{DS(ON)} (at V _{GS} = 4.5V)	< 3.2mΩ

Application

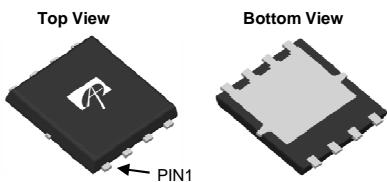
- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

100% UIS Tested

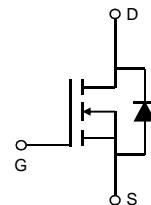
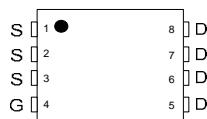
100% R_g Tested



DFN5x6



Top View



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}	±20	V
Continuous Drain Current ^G	I _D T _C =25°C	85	A
	I _D T _C =100°C	66	
Pulsed Drain Current ^C	I _{DM}	322	
Continuous Drain Current	I _{DSM} T _A =25°C	51	A
	I _{DSM} T _A =70°C	41	
Avalanche Current ^C	I _{AS}	60	A
Avalanche energy L=0.05mH ^C	E _{AS}	90	mJ
V _{DS} Spike	V _{SPIKE}	36	V
Power Dissipation ^B	P _D T _C =25°C	83	W
	P _D T _C =100°C	33	
Power Dissipation ^A	P _{DSM} T _A =25°C	7.3	W
	P _{DSM} T _A =70°C	4.7	
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	R _{θJA}	14	17	°C/W
Maximum Junction-to-Ambient ^{A,D}		40	55	°C/W
Maximum Junction-to-Case	R _{θJC}	1.1	1.5	°C/W

Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		1	5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}= \pm 20\text{V}$		100		nA
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.3	1.7	2.1	V
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$		1.75	2.1	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=20\text{A}$ $T_J=125^\circ\text{C}$		2.55	3.15	
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		120		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.7	1	V
I_S	Maximum Body-Diode Continuous Current ^G			85		A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		2719		pF
C_{oss}	Output Capacitance			1204		pF
C_{rss}	Reverse Transfer Capacitance			169		pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.9	2.0	3	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		44	60	nC
$Q_g(4.5\text{V})$	Total Gate Charge			21	28	nC
Q_{gs}	Gate Source Charge			9		nC
Q_{gd}	Gate Drain Charge			7		nC
Q_{gs}	Gate Source Charge	$V_{GS}=4.5\text{V}, V_{DS}=15\text{V}, I_D=20\text{A}$		9		nC
Q_{gd}	Gate Drain Charge			7		nC
$t_{\text{D(on)}}$	Turn-On DelayTime	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=0.75\Omega, R_{\text{GEN}}=3\Omega$		9.7		ns
t_r	Turn-On Rise Time			5.2		ns
$t_{\text{D(off)}}$	Turn-Off DelayTime			32.5		ns
t_f	Turn-Off Fall Time			10.3		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		19.6		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=500\text{A}/\mu\text{s}$		42.7		nC

A. The value of R_{thJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The Power dissipation P_{DSM} is based on R_{thJA} 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 $T_{J(\text{MAX})}=150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature $T_{J(\text{MAX})}=150^\circ\text{C}$.

D. The R_{thJA} is the sum of the thermal impedance from junction to case R_{thJC} 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 $T_{J(\text{MAX})}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

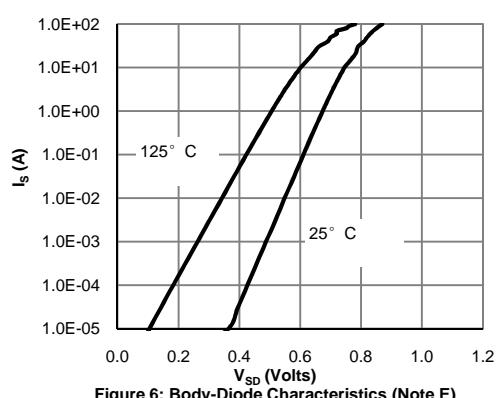
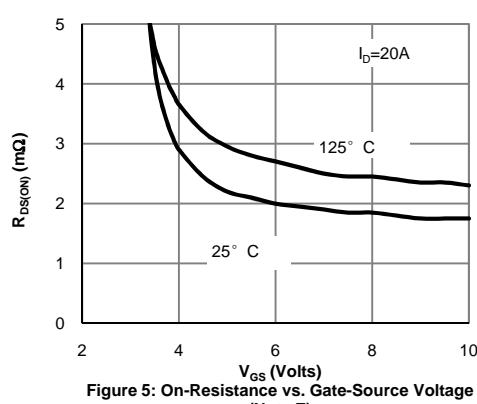
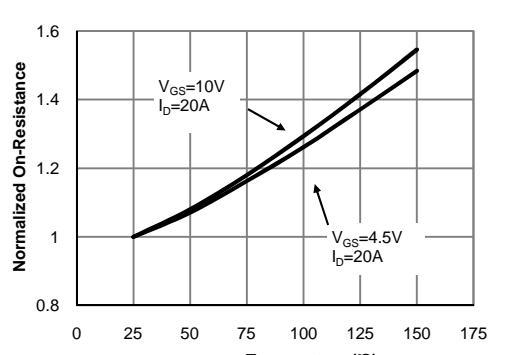
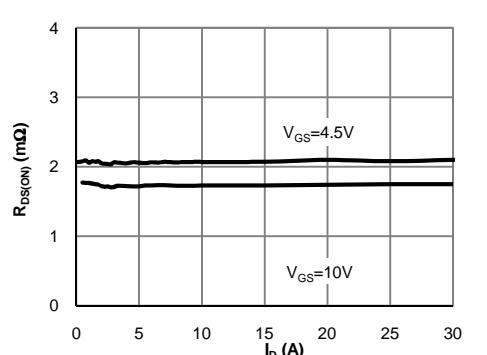
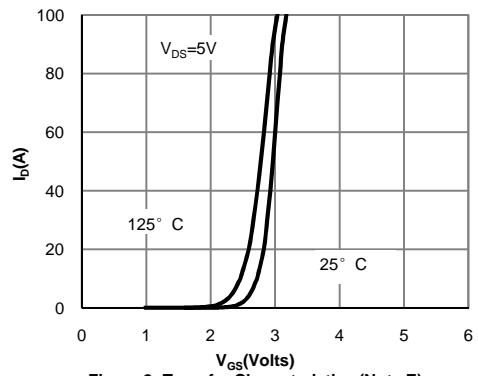
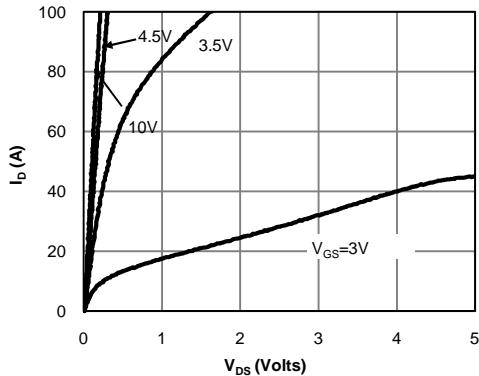
G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$.

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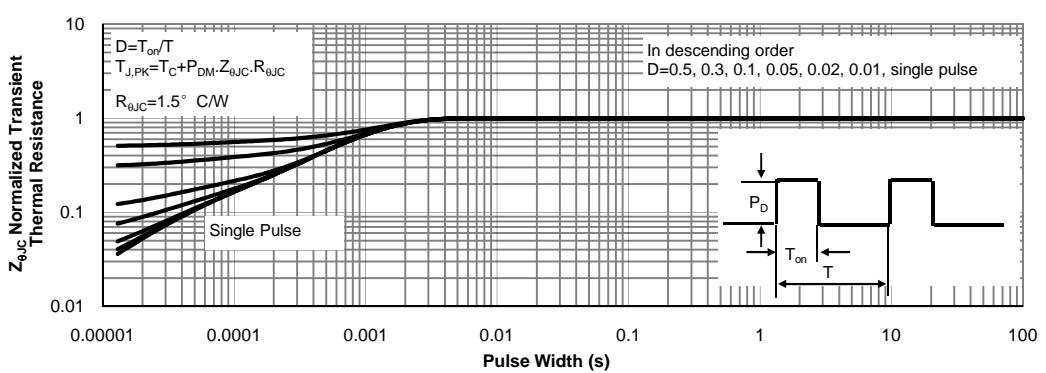
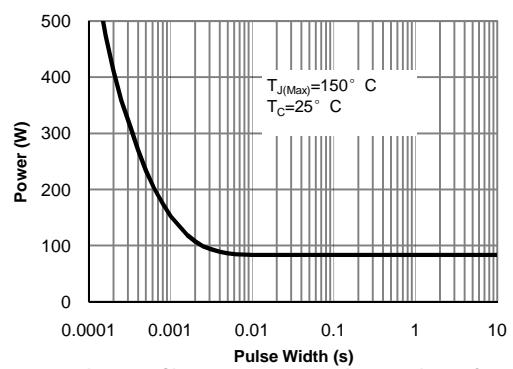
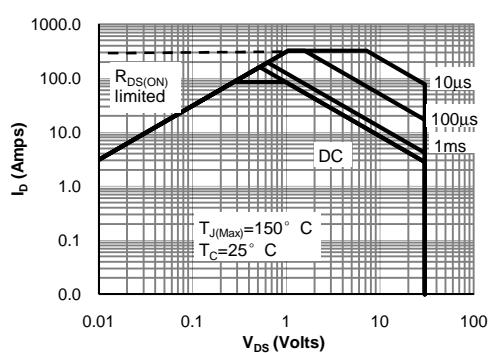
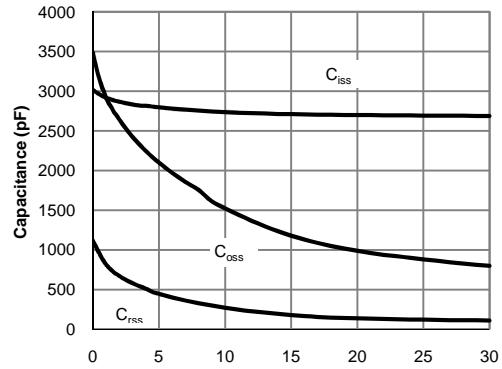
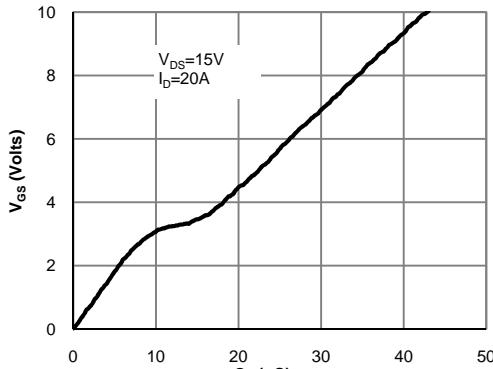


TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS





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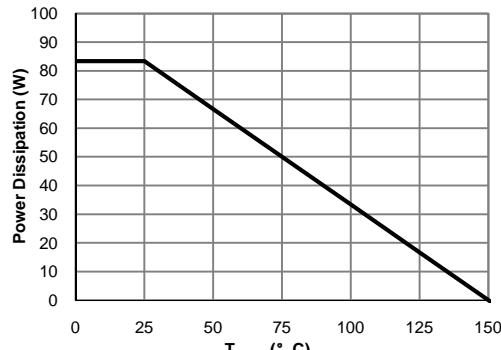


Figure 12: Power De-rating (Note F)

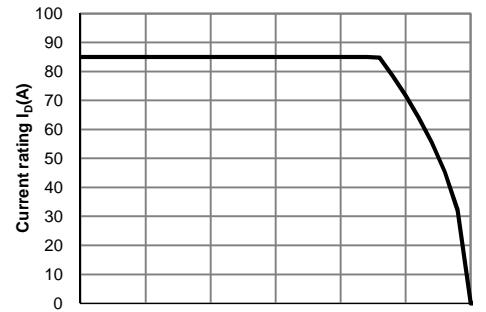


Figure 13: Current De-rating (Note F)

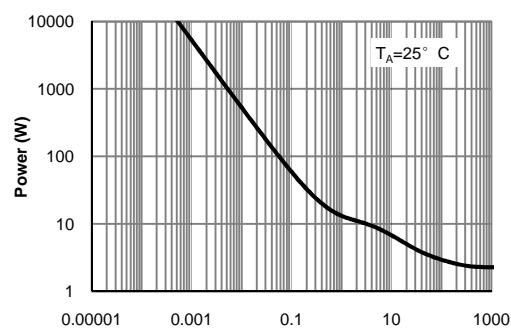


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

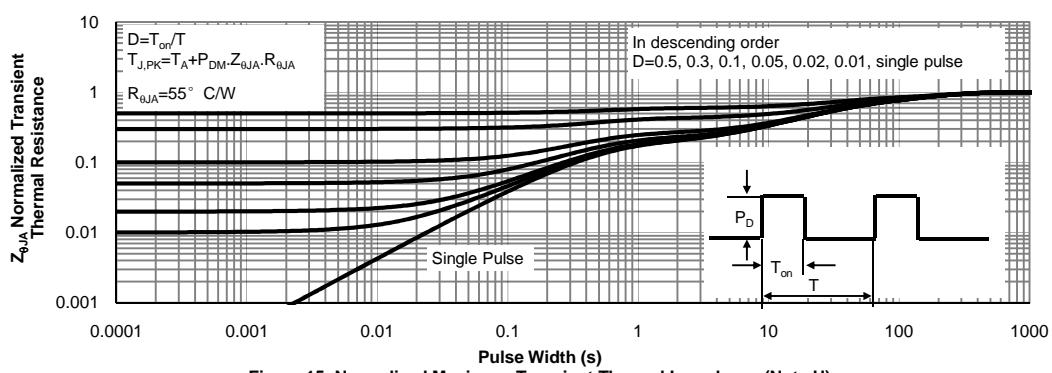
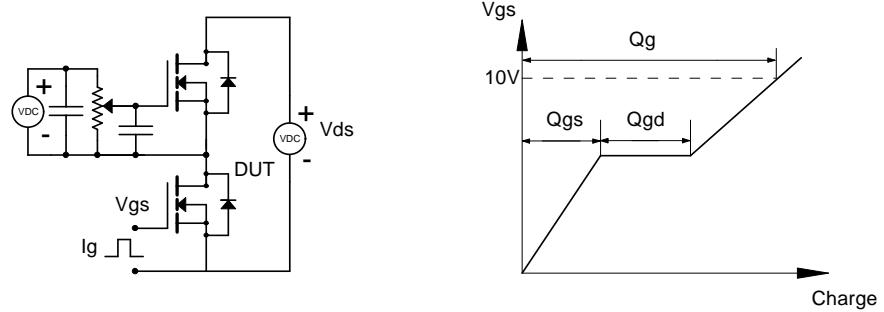


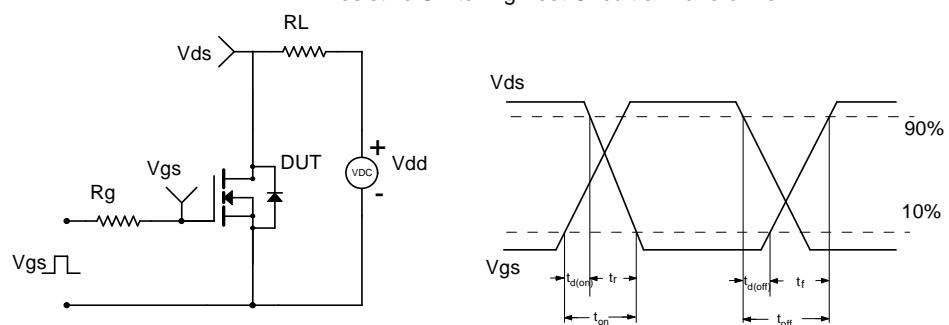
Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)



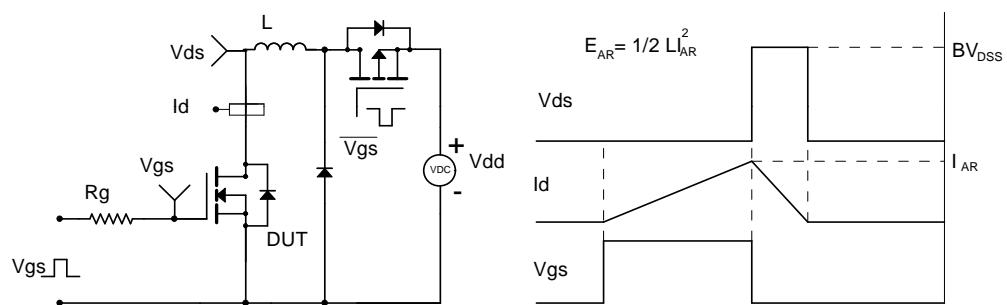
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

