ALPHA & OMEGA
SEMICONDUCTOR

AON6414A

30V N-Channel MOSFET

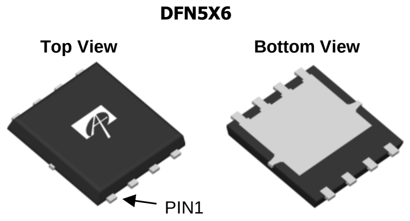
General Description

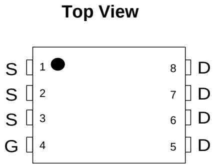
The AON6414A uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge.This device is suitable for use as a high side switch in SMPS and general purpose applications.

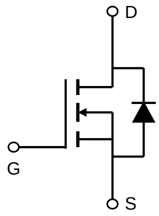
Product Summary

V_{DS}	30V
I_D (at V_{GS}=10V)	30A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 8mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 10.5mΩ

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}	±20	V
Continuous Drain Current	T_C=25°C[G]	I_D	30	A
	T_C=25°C[I]		50	
	T_C=100°C		30	
Pulsed Drain Current [C]		I_{DM}	140	
Continuous Drain Current	T_A=25°C	I_{DSM}	13	A
	T_A=70°C		10	
Avalanche Current [C]		I_{AS}, I_{AR}	35	A
Avalanche energy L=0.05mH [C]		E_{AS}, E_{AR}	31	mJ
V_{DS} Spike	100ns	V_{SPIKE}	36	V
Power Dissipation [B]	T_C=25°C	P_D	31	W
	T_C=100°C		12.5	
Power Dissipation [A]	T_A=25°C	P_{DSM}	2.3	W
	T_A=70°C		1.5	
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	$R_{\theta JA}$	17	21	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		44	53	°C/W
Maximum Junction-to-Case	Steady-State	$R_{\theta JC}$	3.4	4	°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}= ±20V				100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.5	1.95	2.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		140			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=20A			6.6	8	mΩ
			T_J=125°C		9.5	11.4	
		V_{GS}=4.5V, I_D=20A			8.2	10.5	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=20A			55		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.72	1	V
I_S	Maximum Body-Diode Continuous Current					35	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		920	1150	1380	pF
C_{oss}	Output Capacitance			125	180	235	pF
C_{rss}	Reverse Transfer Capacitance			60	105	150	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.55	1.1	1.65	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=20A		16	20	24	nC
Q_g(4.5V)	Total Gate Charge			7.6	9.5	11.4	nC
Q_{gs}	Gate Source Charge			2	2.7	3.2	nC
Q_{gd}	Gate Drain Charge			3	5	7	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=0.75Ω, R_{GEN}=3Ω			6.5		ns
t_r	Turn-On Rise Time				2		ns
$t_{D(off)}$	Turn-Off DelayTime				17		ns
t_f	Turn-Off Fall Time				3.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=20A, dI/dt=500A/µs		7	8.7	10.5	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=20A, dI/dt=500A/µs		11	13.5	16	nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 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 $_{\theta JA}$ 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 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

I. The maximum current rating is limited by silicon

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

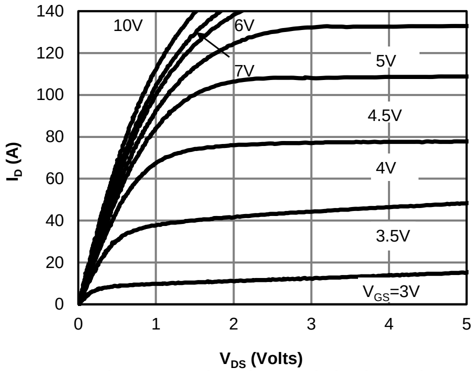


Fig 1: On-Region Characteristics (Note E)

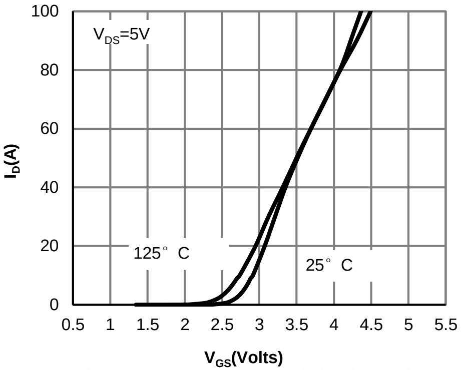


Figure 2: Transfer Characteristics (Note E)

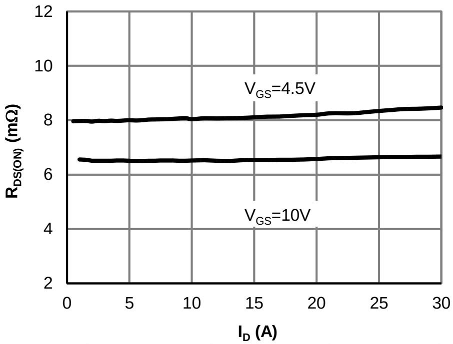


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

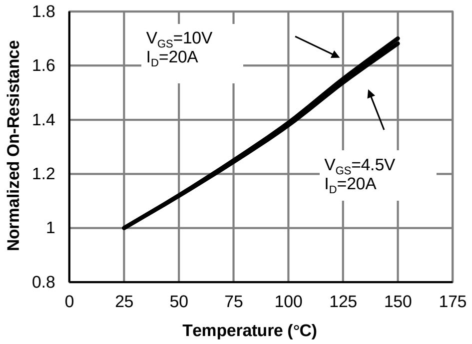


Figure 4: On-Resistance vs. Junction Temperature (Note E)

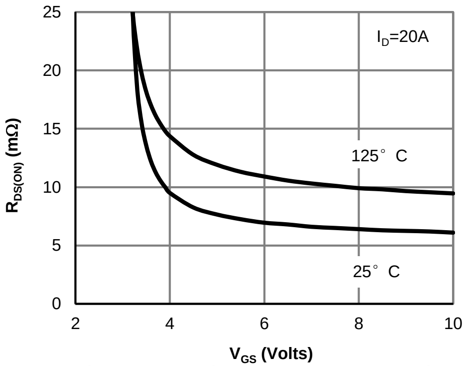


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

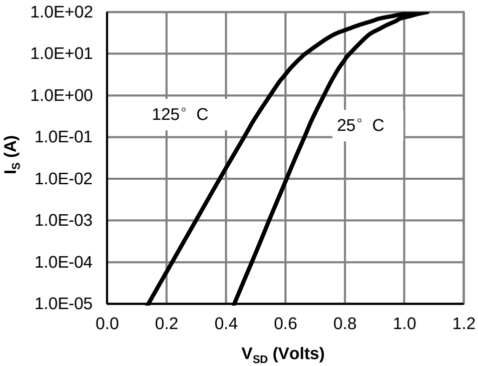


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

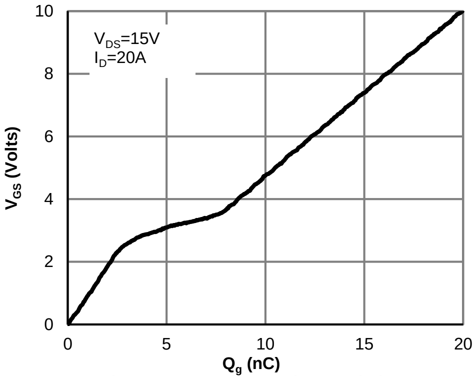


Figure 7: Gate-Charge Characteristics

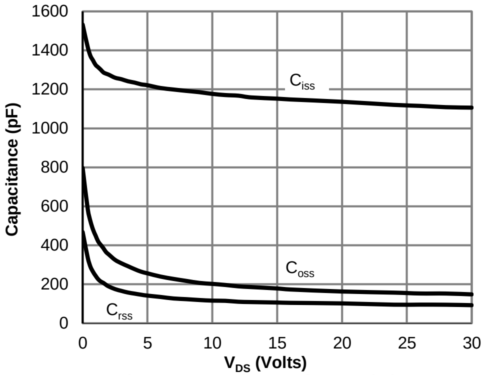


Figure 8: Capacitance Characteristics

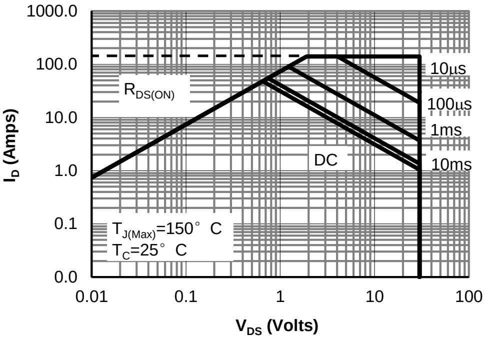


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

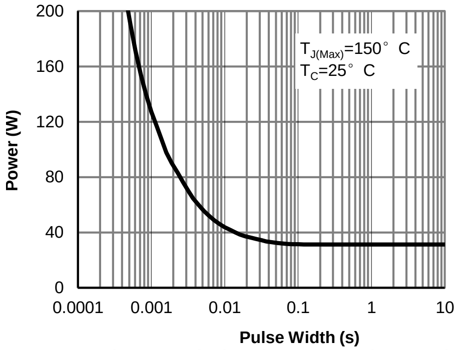


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

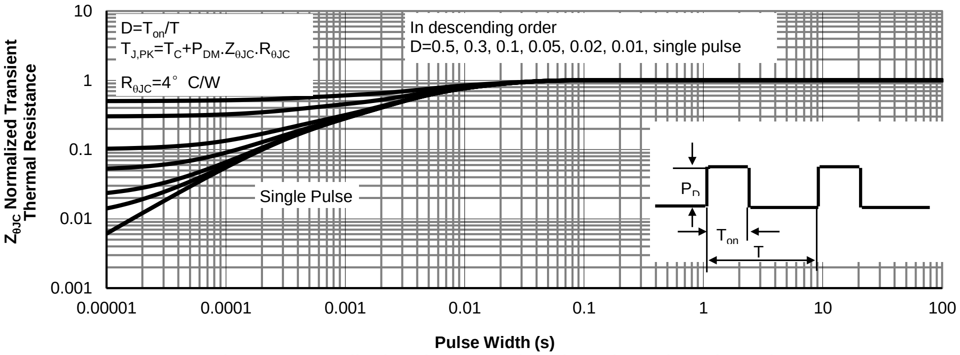


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

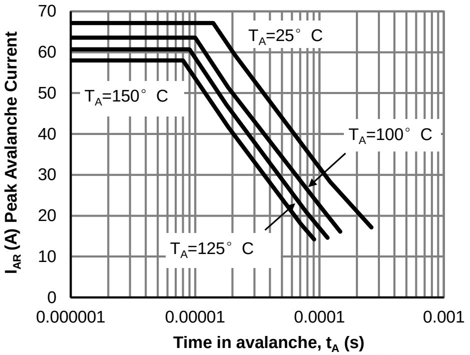


Figure 12: Single Pulse Avalanche capability (Note C)

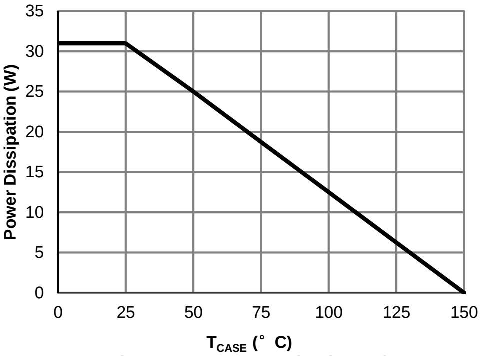


Figure 13: Power De-rating (Note F)

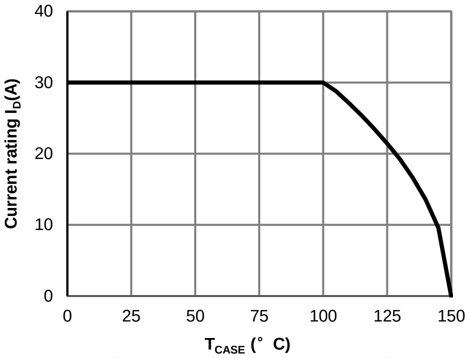


Figure 14: Current De-rating (Note F)

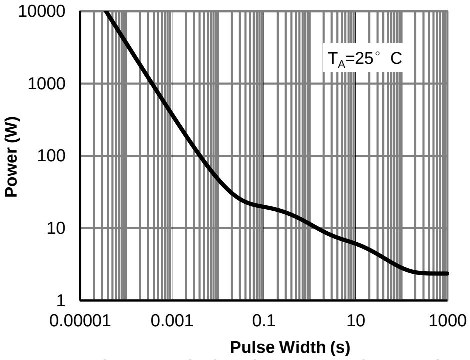


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

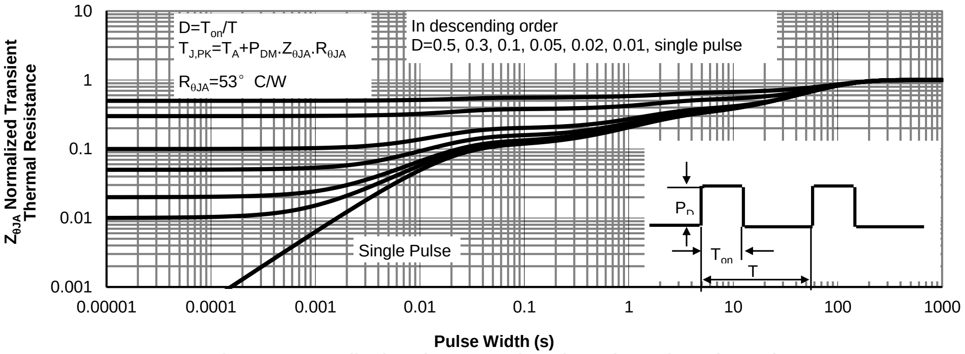
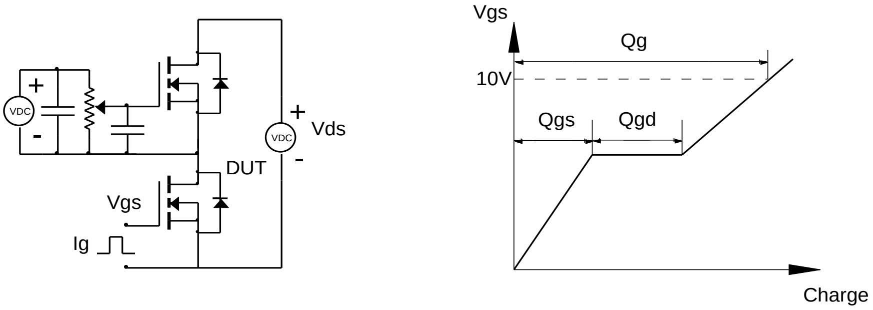
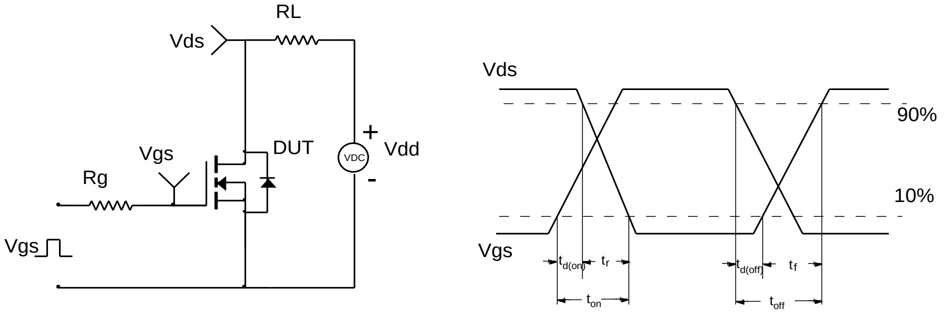


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

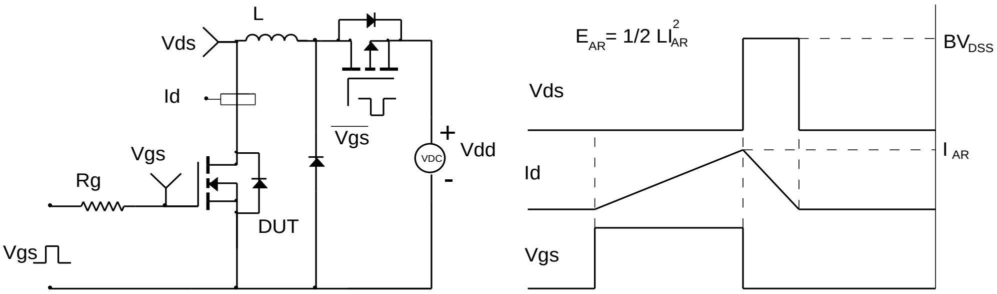
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms