

General Description

- Trench Power AlphaSGT™ technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- RoHS and Halogen-Free Compliant

Applications

- Synchronous Rectification for AC/DC Quick Charger

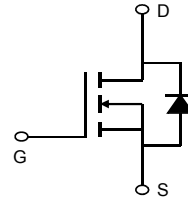
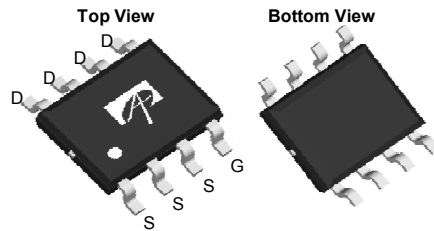
Product Summary

V_{DS}	100V
I_D (at $V_{GS}=10V$)	13.5A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 8.3mΩ
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 10.6mΩ

100% UIS Tested
100% Rg Tested



SOIC-8



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AO4296	SO-8	Tape & Reel	3000

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	13.5	A
	$T_A=70^\circ\text{C}$	10.5	
Pulsed Drain Current ^C	I_{DM}	55	A
Avalanche Current ^C	I_{AS}	33	A
Avalanche energy $L=0.1\text{mH}$ ^C	E_{AS}	54	mJ
V_{DS} Spike	V_{SPIKE}	120	V
Power Dissipation ^B	P_D	3.1	W
	$T_A=70^\circ\text{C}$	2.0	
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	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^{A,D}		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	100			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=100\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1.3	1.75	2.3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=13.5\text{A}$ $T_J=125^{\circ}\text{C}$		6.8 12.2	8.3 14.8	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=11.5\text{A}$		8.0	10.6	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=13.5\text{A}$		75		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				4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=50\text{V}$, $f=1\text{MHz}$		3130		pF
C_{oss}	Output Capacitance			245		pF
C_{rss}	Reverse Transfer Capacitance			12.5		pF
R_g	Gate resistance	$f=1\text{MHz}$	0.7	1.4	2.1	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=50\text{V}$, $I_D=13.5\text{A}$		42	60	nC
$Q_g(4.5\text{V})$	Total Gate Charge			18.5	28	nC
Q_{gs}	Gate Source Charge			7.5		nC
Q_{gd}	Gate Drain Charge			4.5		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=50\text{V}$, $R_L=3.70\Omega$, $R_{GEN}=3\Omega$		8		ns
t_r	Turn-On Rise Time			5		ns
$t_{D(off)}$	Turn-Off DelayTime			41		ns
t_f	Turn-Off Fall Time			7		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=13.5\text{A}$, $di/dt=500\text{A}/\mu\text{s}$		28		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=13.5\text{A}$, $di/dt=500\text{A}/\mu\text{s}$		130		nC

A. The value of $R_{\theta JA}$ 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 value in any given application depends on the user's specific board design.

B. The power dissipation P_D is based on $T_{J(MAX)}=150^{\circ}\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^{\circ}\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^{\circ}\text{C}$.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

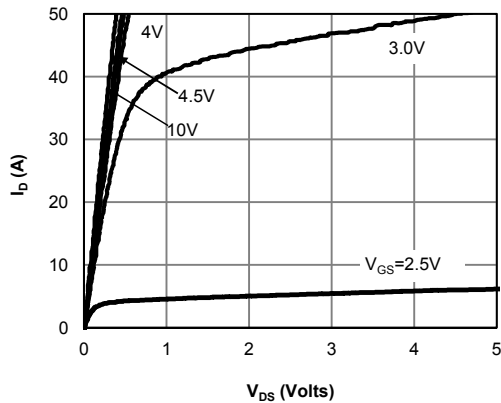


Figure 1: On-Region Characteristics (Note E)

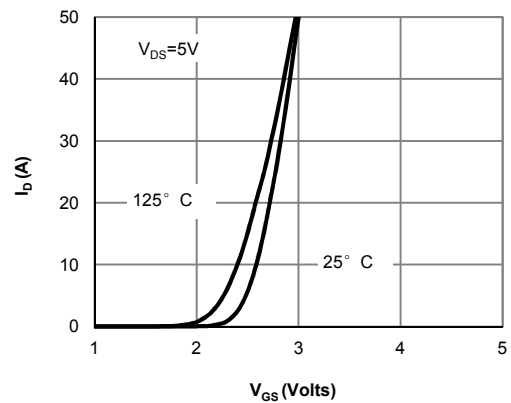


Figure 2: Transfer Characteristics (Note E)

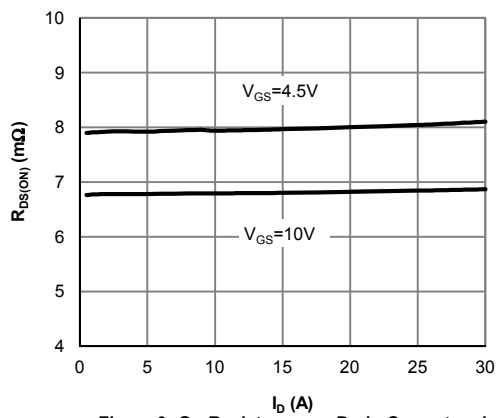


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

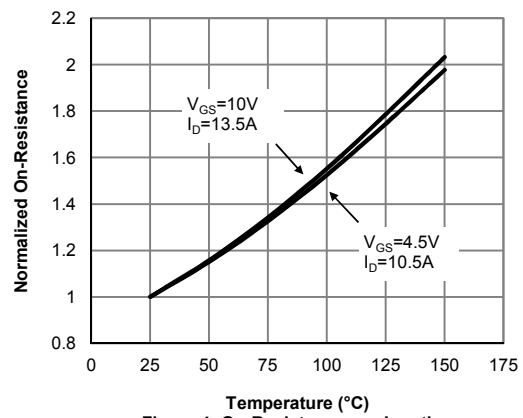


Figure 4: On-Resistance vs. Junction Temperature (Note E)

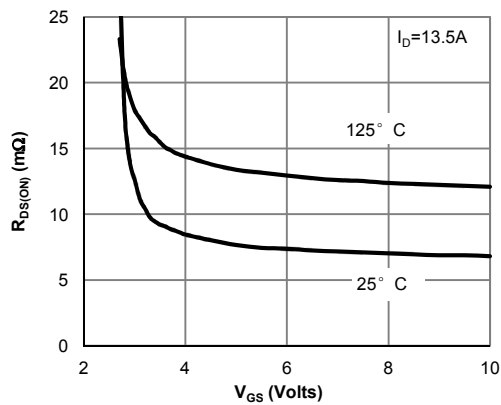


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

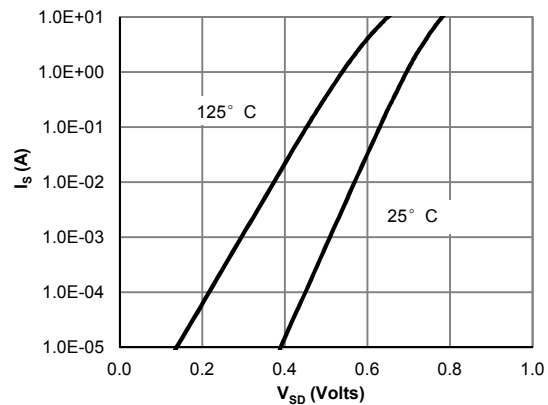


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

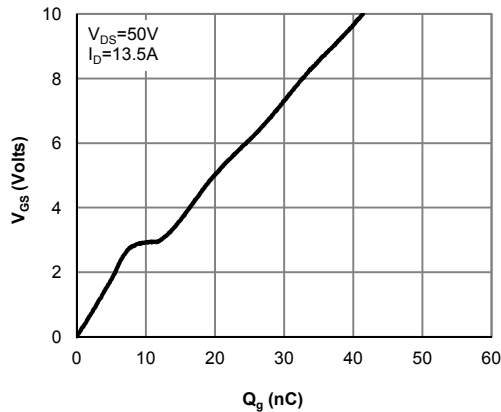


Figure 7: Gate-Charge Characteristics

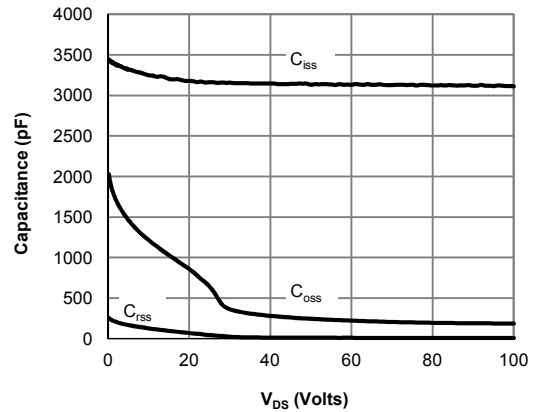


Figure 8: Capacitance Characteristics

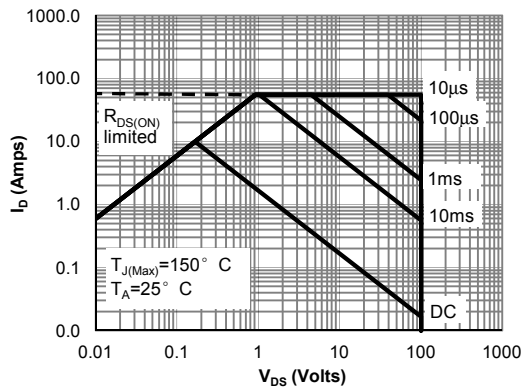


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

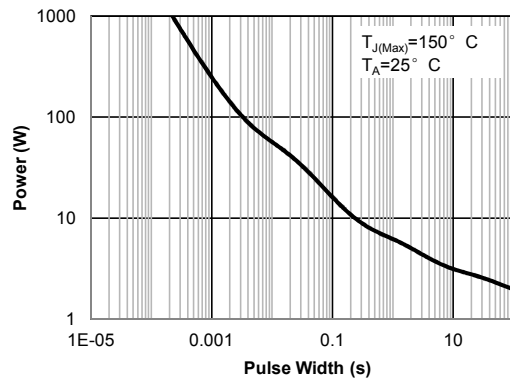


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

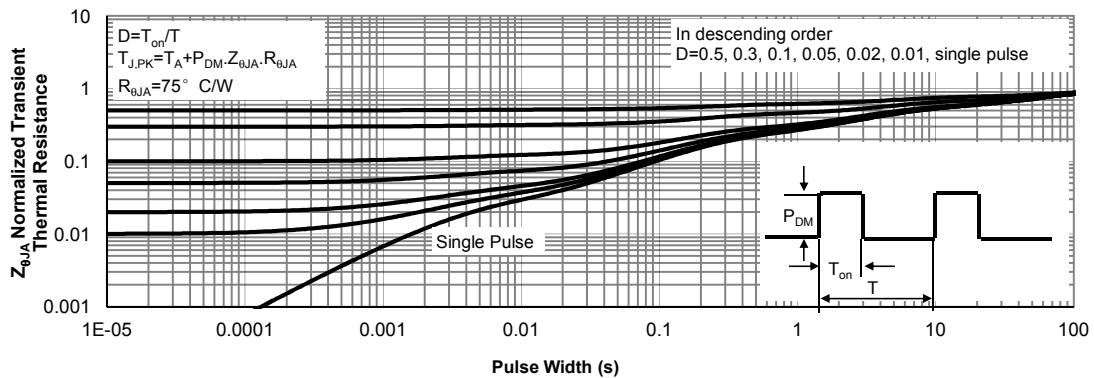


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Figure A: Gate Charge Test Circuit & Waveforms

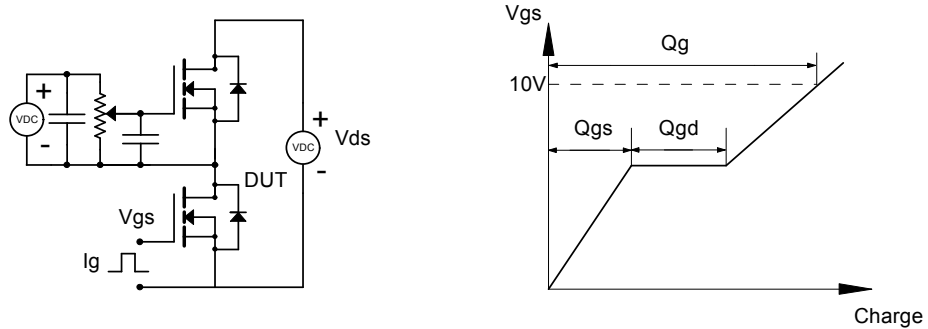


Figure B: Resistive Switching Test Circuit & Waveforms

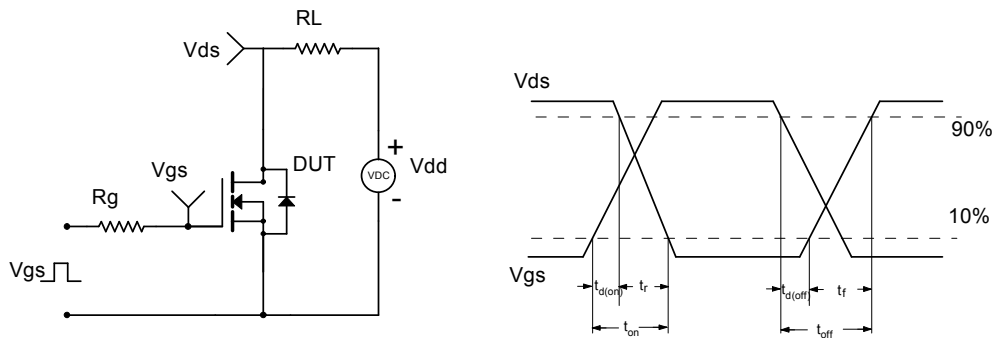


Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

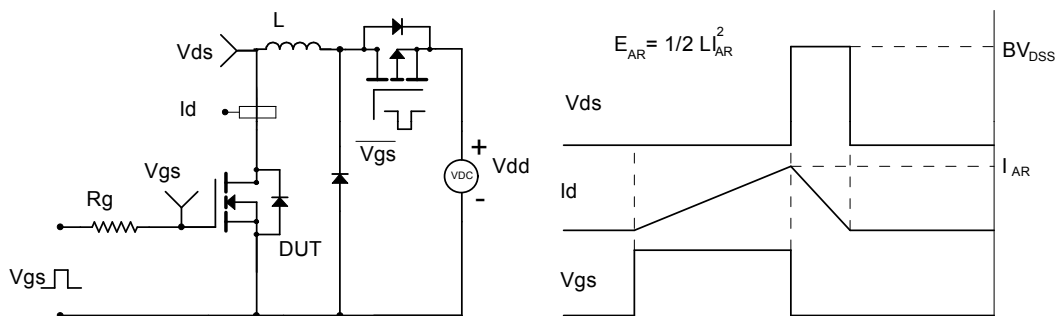


Figure D: Diode Recovery Test Circuit & Waveforms

