ALPHA & OMEGA SEMICONDUCTOR

AO3435

20V P-Channel MOSFET

General Description

The AO3435 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.5V. This device is suitable for use in buck convertor applications.

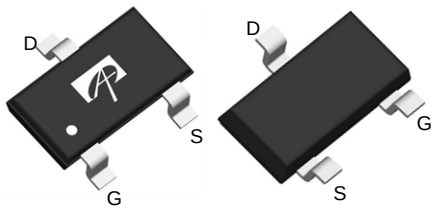
Product Summary

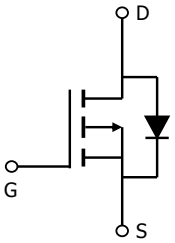
V_{DS} = -20V
I_D = -3.5A (V_{GS} = -4.5V)
$R_{DS(ON)}$ < 70mΩ (V_{GS} =- 4.5V)
$R_{DS(ON)}$ < 90mΩ (V_{GS} = -2.5V)
$R_{DS(ON)}$ < 110mΩ (V_{GS} = -1.8V)
$R_{DS(ON)}$ < 130mΩ (V_{GS} = -1.5V)

Green Product

SOT23

Top View **Bottom View**





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	10 Sec	Steady State	Units
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±8		V
Continuous Drain Current [A]	T_A=25°C	I_D	-3.5	-2.9	A
	T_A=70°C		-2.7	-2.3	
Pulsed Drain Current [B]		I_{DM}	-25		
Power Dissipation [A]	T_A=25°C	P_D	1.4	1	W
	T_A=70°C		0.9	0.6	
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	$R_{\theta JA}$	70	90	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		100	125	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	63	80	°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	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-20V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.5	-0.65	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.5A		56	70	mΩ
		T_J=125°C		80	100	
		V_{GS}=-2.5V, I_D=-3.0A		70	90	mΩ
		V_{GS}=-1.8V, I_D=-2.0A		85	110	mΩ
		V_{GS}=-1.5V, I_D=-0.5A		100	130	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.5A		15		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		510	745	pF
C_{oss}	Output Capacitance			70		pF
C_{rss}	Reverse Transfer Capacitance			52		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		18	23	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.5A		5.6	11	nC
Q_{gs}	Gate Source Charge			0.6		nC
Q_{gd}	Gate Drain Charge			1.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=3Ω, R_{GEN}=6Ω		11		ns
t_r	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off DelayTime			60		ns
t_f	Turn-Off Fall Time			30		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.5A, dI/dt=100A/µs		17	49	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.5A, dI/dt=100A/µs		4		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in ^{2} FR-4 board with 2oz. copper, in a still air environment with T_A=25° C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤10s thermal resistance rating.
B: Repetitive rating, pulse width limited by junction temperature.
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using 300µs pulse width, duty cycle 0.5% max.
E. 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. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

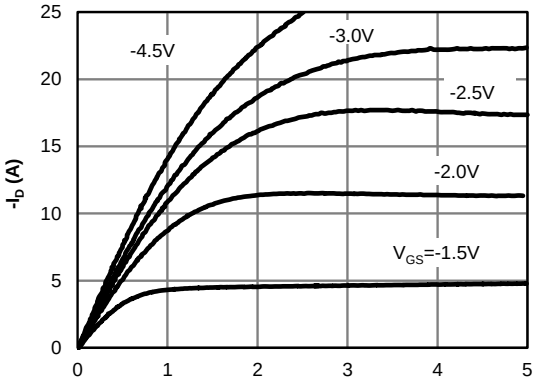


Figure 1: On-Region Characteristics

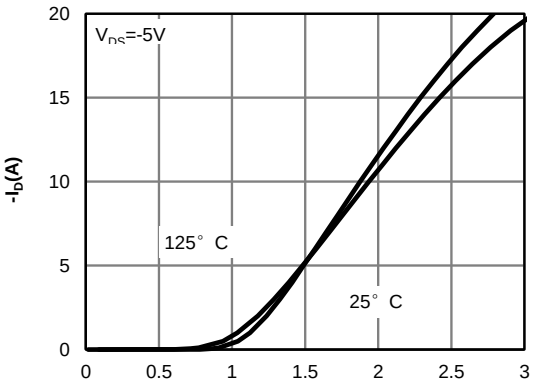


Figure 2: Transfer Characteristics

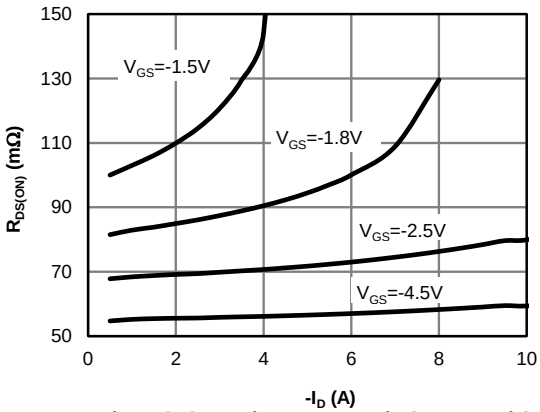


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

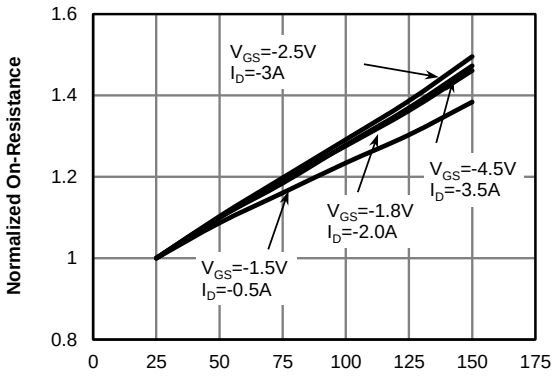


Figure 4: On-Resistance vs. Junction Temperature

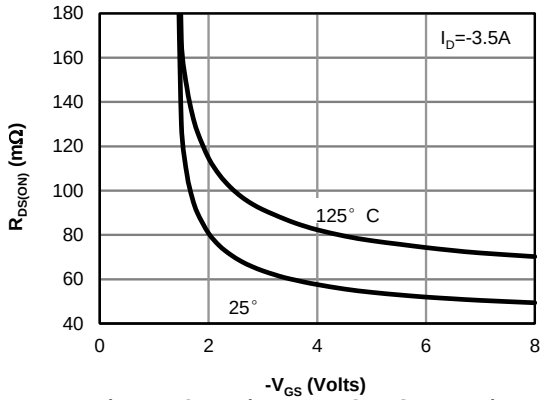


Figure 5: On-Resistance vs. Gate-Source Voltage

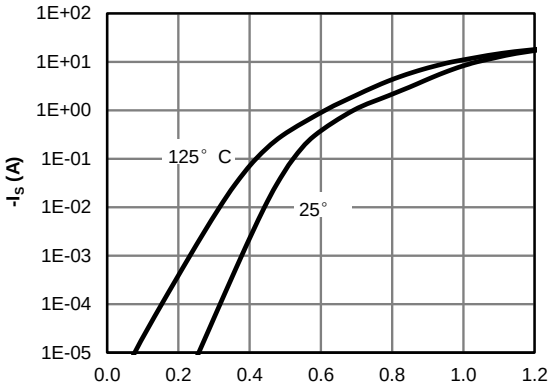


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

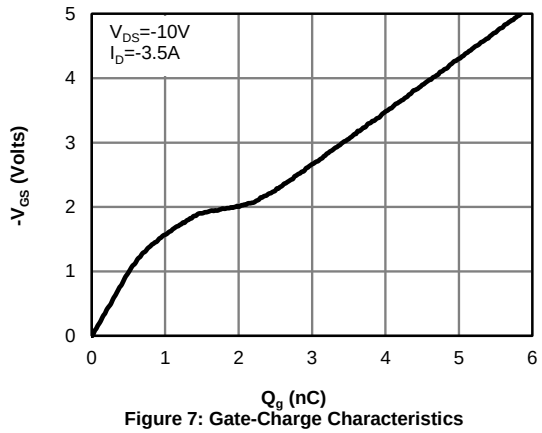


Figure 7: Gate-Charge Characteristics

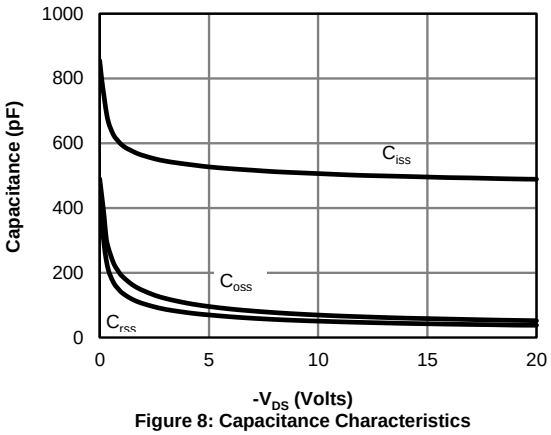


Figure 8: Capacitance Characteristics

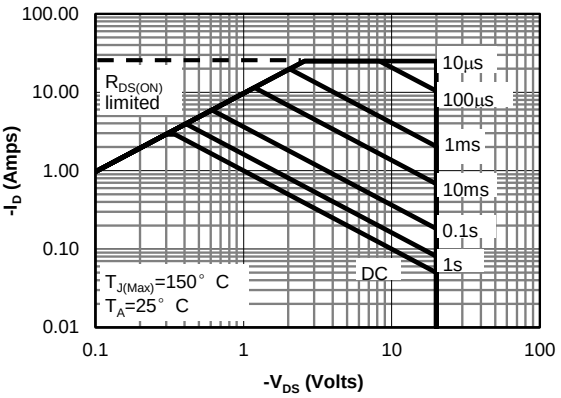


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

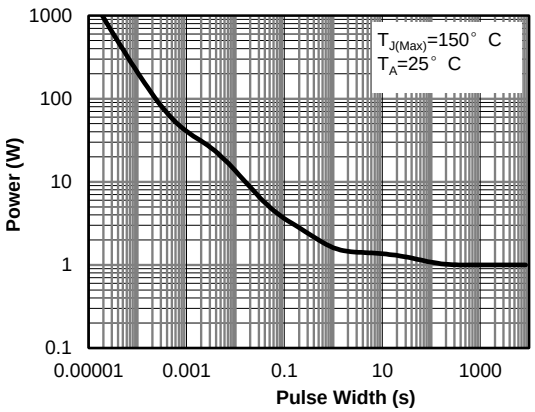


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

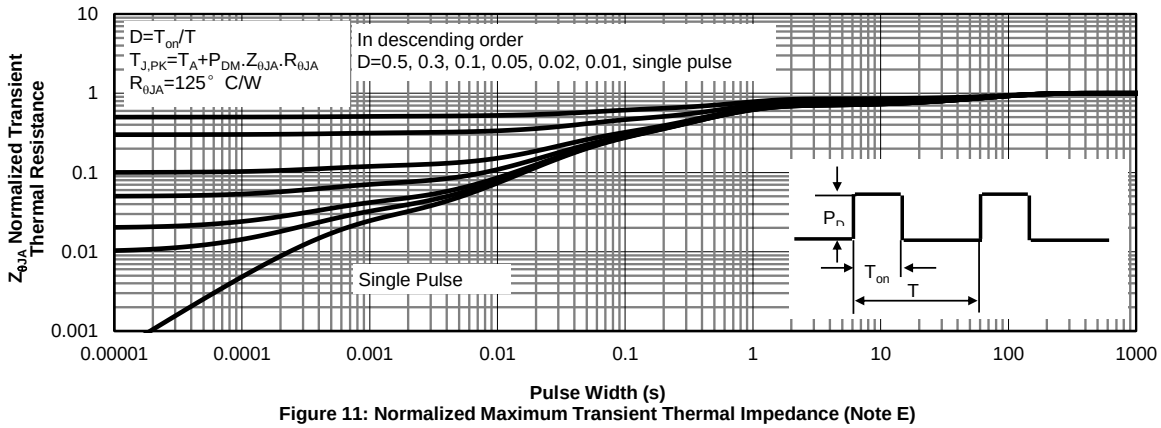
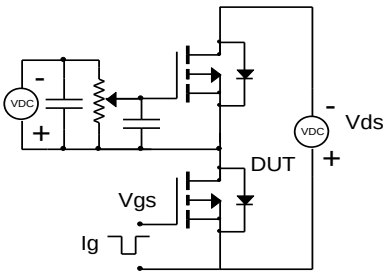
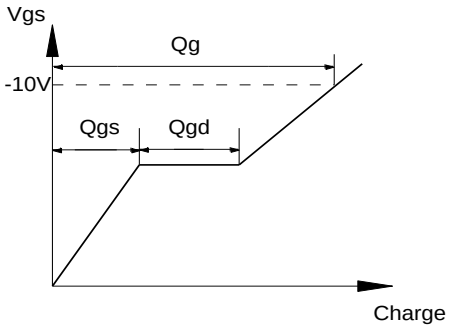


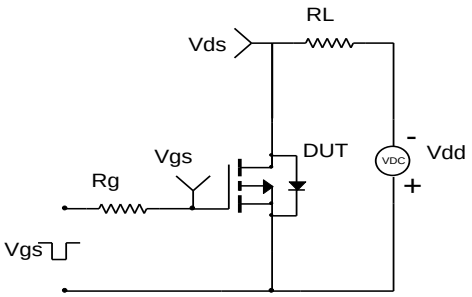
Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

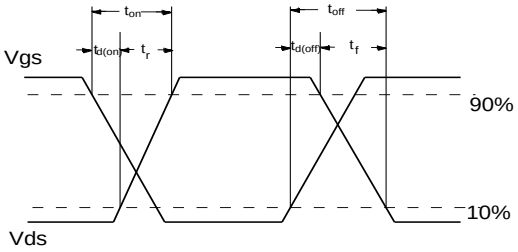
Gate Charge Test Circuit & Waveform





Resistive Switching Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms