ALPHA & OMEGA SEMICONDUCTOR

AO3160E

600V,0.04A N-Channel MOSFET

General Description

- Logic Level Driving 4.5V
- ESD Protection
- RoHS and Halogen Free Compliant

Applications

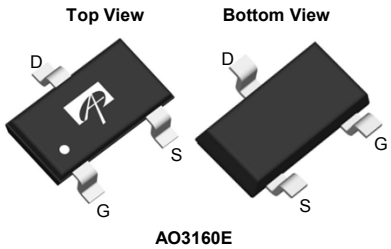
- Load Switch

Product Summary

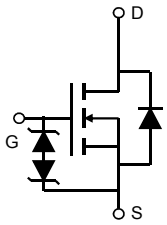
V_{DS} @ $T_{j,max}$	700V
I_D (at V_{GS}=10V)	0.04A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 500Ω
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 600Ω

Typical ESD protection **HBM Class 2**

Green Product



AO3160E



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AO3160E	SOT23A	Tape & Reel	3000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [A,F]	T_A=25°C	I_D	0.04	A
	T_A=70°C		0.03	
Pulsed Drain Current [B]		I_{DM}	0.12	
Peak diode recovery dv/dt		dv/dt	5	V/ns
Power Dissipation [A]	T_A=25°C	P_D	1.39	W
	T_A=70°C		0.89	W/°C
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		T_L	300	°C

Thermal Characteristics

Parameter		Symbol	Typical	Maximum	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, T_J=25°C	600	-	-	V
		I_D=250µA, V_{GS}=0V, T_J=150°C	-	700	-	
BV_{DSS} /ΔTJ	Breakdown Voltage Temperature Cofficient	I_D=250µA, V_{GS}=0V	-	0.68	-	V/ °C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=600V, V_{GS}=0V	-	-	1	µA
		V_{DS}=480V, T_J=125°C	-	-	10	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±20V	-	-	±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=5V, I_D=8µA	1.4	2	3.2	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=0.016A	-	176	500	Ω
		V_{GS}=4.5V, I_D=0.016A	-	178	600	Ω
g_{FS}	Forward Transconductance	V_{DS}=40V, I_D=0.016A	-	0.125	-	S
V_{SD}	Diode Forward Voltage	I_S=0.016A,V_{GS}=0V	-	0.76	1	V
I_S	Maximum Body-Diode Continuous Current		-	-	0.04	A
I_{SM}	Maximum Body-Diode Pulsed Current [C]		-	-	0.12	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	9.5	-	pF
C_{oss}	Output Capacitance		-	1.7	-	pF
C_{rss}	Reverse Transfer Capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	0.6	-	pF
R_g	Gate resistance	f=1MHz	-	20	-	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=10V, V_{DS}=400V, I_D=0.01A	-	0.9	-	nC
Q_{gs}	Gate Source Charge		-	0.09	-	nC
Q_{gd}	Gate Drain Charge		-	0.49	-	nC
$T_{d(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=300V, I_D=0.01A, R_G=6Ω	-	4	-	ns
T_r	Turn-On Rise Time		-	5	-	ns
$T_{d(off)}$	Turn-Off DelayTime		-	13	-	ns
T_f	Turn-Off Fall Time		-	55	-	ns
T_{rr}	Body Diode Reverse Recovery Time	I_F=0.016A, dI/dt=100A/µs, V_{DS}=300V	-	105	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	9.5	-	nC

A. The value of R_{qJA} 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 value in any given application depends on the user's specific board design.
B. Repetitive rating, pulse width limited by junction temperature.
C. The R_{qJA} is the sum of the thermal impedence from junction to lead R_{qJL} and lead to ambient.
D. The static characteristics in Figures 1 to 6 are obtained using <300 ms pulses, 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.
F. The current rating is based on the t ≤ 10s thermal resistance rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

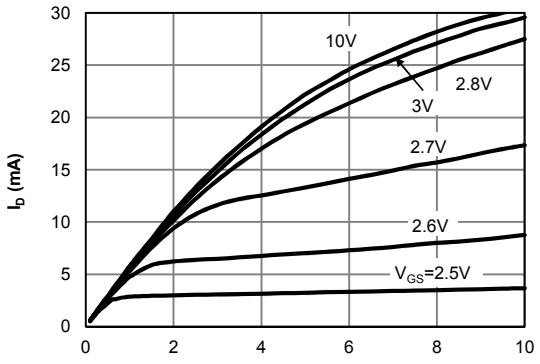


Figure 1: On-Region Characteristics

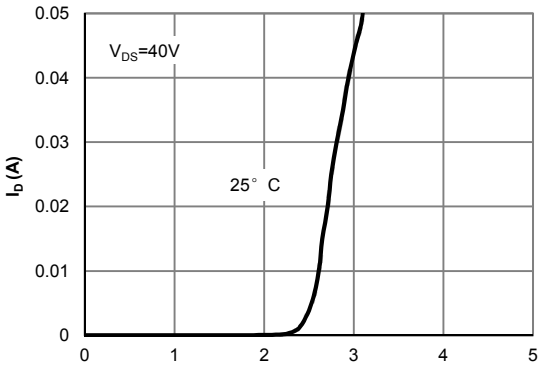


Figure 2: Transfer Characteristics

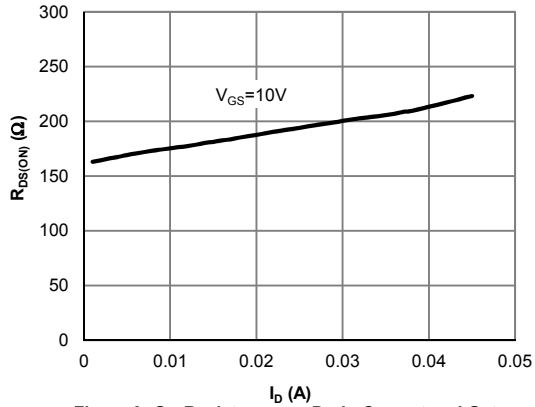


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

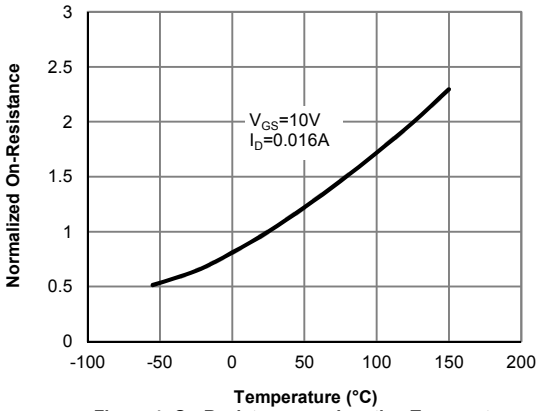


Figure 4: On-Resistance vs. Junction Temperature

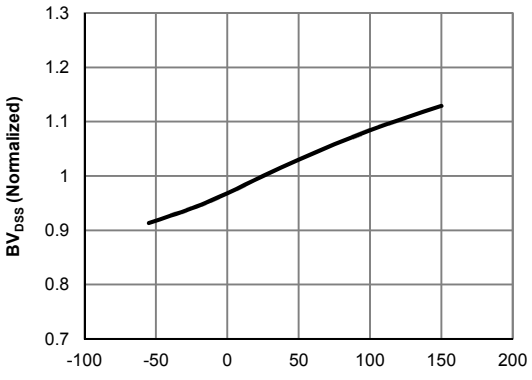


Figure 5: Break Down vs. Junction Temperature

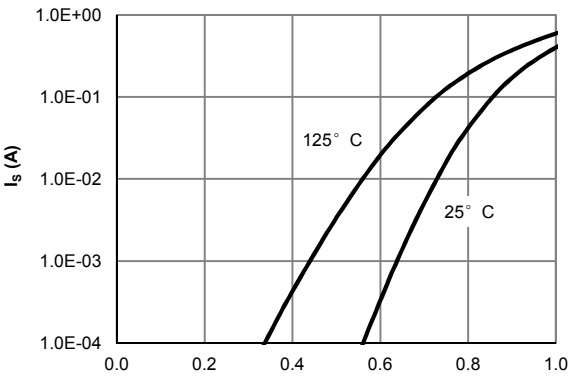


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

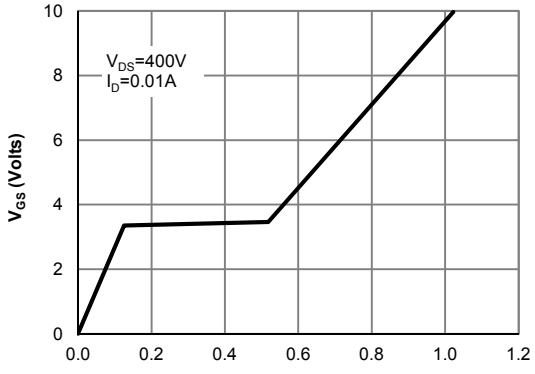


Figure 7: Gate-Charge Characteristics

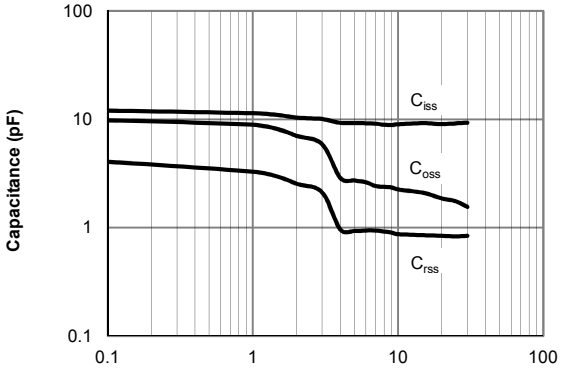


Figure 8: Capacitance Characteristics

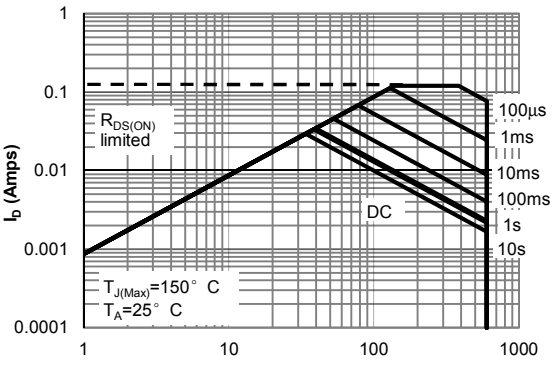


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

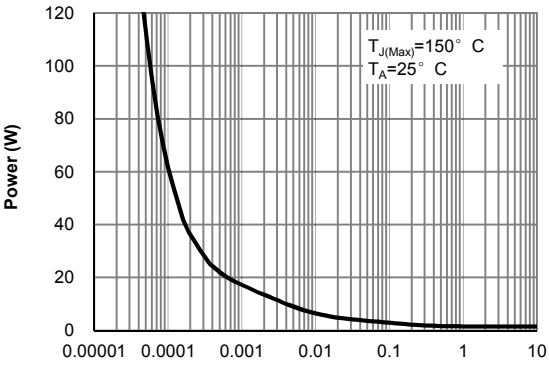


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

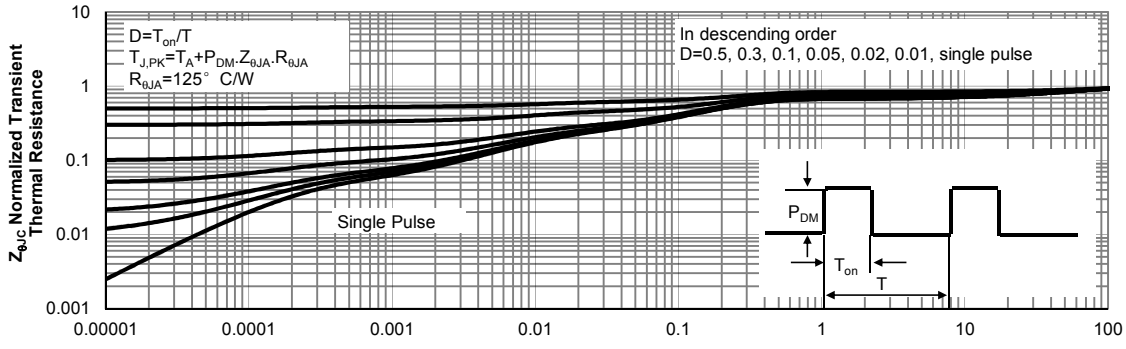
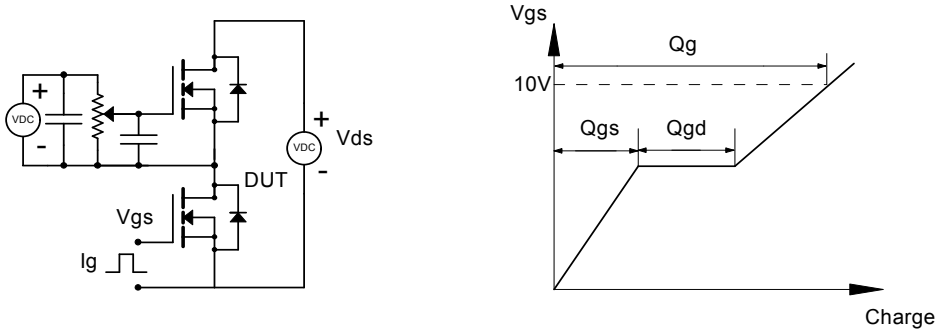
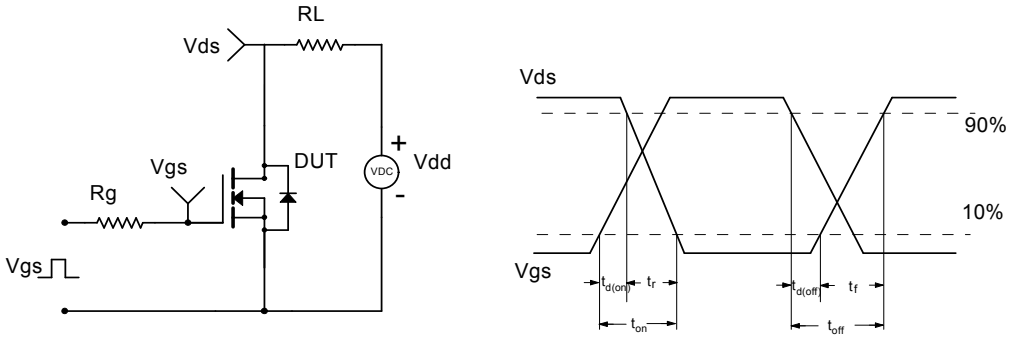


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

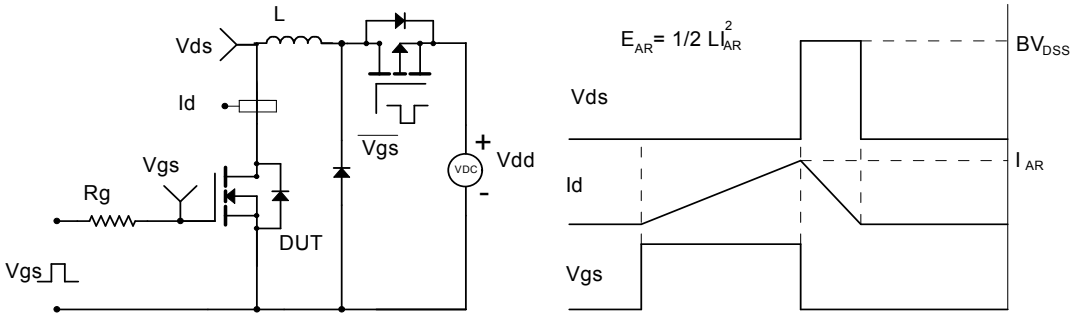
Gate Charge Test Circuit & Waveform



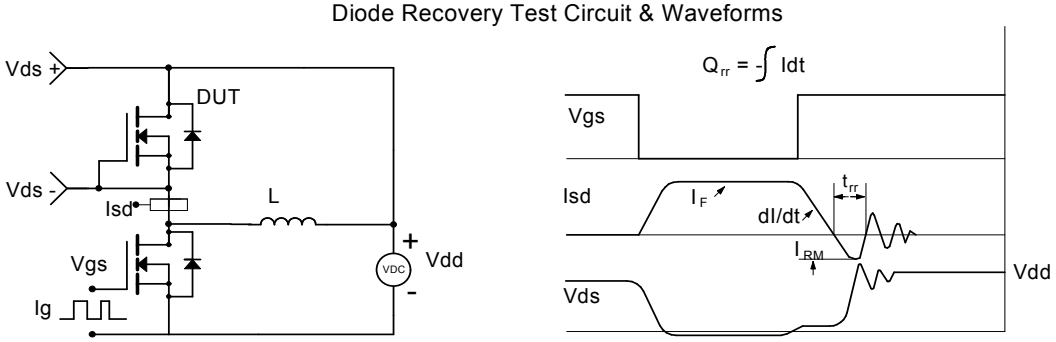
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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