



# THE DATASHEET OF AO3160E



### General Description

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

### Applications

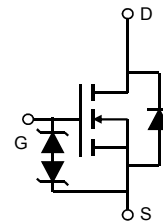
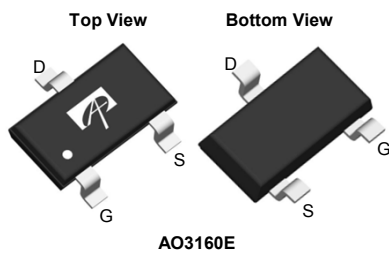
- Load Switch

### 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



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

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

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

### Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	70	90	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	100	125
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	63	80	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	600	-	-	V
		I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C	-	700	-	
BV <sub>DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	-	0.68	-	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =600V, V <sub>GS</sub> =0V	-	-	1	μA
		V <sub>DS</sub> =480V, T <sub>J</sub> =125°C	-	-	10	
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =5V, I <sub>D</sub> =8μA	1.4	2	3.2	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =0.016A	-	176	500	Ω
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.016A	-	178	600	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =40V, I <sub>D</sub> =0.016A	-	0.125	-	S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =0.016A, V <sub>GS</sub> =0V	-	0.76	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current		-	-	0.04	A
I <sub>SM</sub>	Maximum Body-Diode Pulsed Current <sup>C</sup>		-	-	0.12	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	-	9.5	-	pF
C <sub>oss</sub>	Output Capacitance		-	1.7	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz	-	0.6	-	pF
R <sub>g</sub>	Gate resistance	f=1MHz	-	20	-	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =400V, I <sub>D</sub> =0.01A	-	0.9	-	nC
Q <sub>gs</sub>	Gate Source Charge		-	0.09	-	nC
Q <sub>gd</sub>	Gate Drain Charge		-	0.49	-	nC
T <sub>d(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =300V, I <sub>D</sub> =0.01A, R <sub>G</sub> =6Ω	-	4	-	ns
T <sub>r</sub>	Turn-On Rise Time		-	5	-	ns
T <sub>d(off)</sub>	Turn-Off DelayTime		-	13	-	ns
T <sub>f</sub>	Turn-Off Fall Time		-	55	-	ns
T <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =0.016A, dI/dt=100A/μs,	-	105	-
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	V <sub>DS</sub> =300V	-	9.5	-	nC

A. The value of R<sub>qJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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<sub>qJA</sub> is the sum of the thermal impedance from junction to lead R<sub>qJL</sub> and lead to ambient.

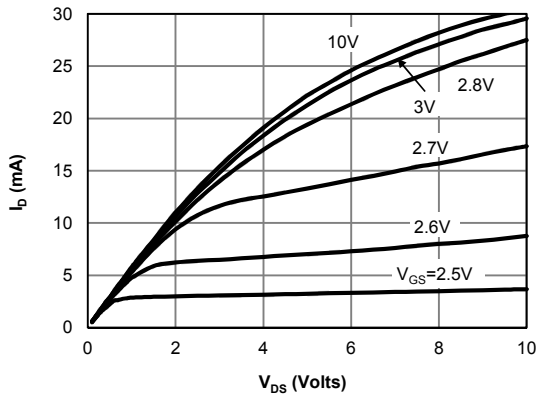
D. The static characteristics in Figures 1 to 6 are obtained using <300 ms pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The SOA curve provides a single pulse rating.

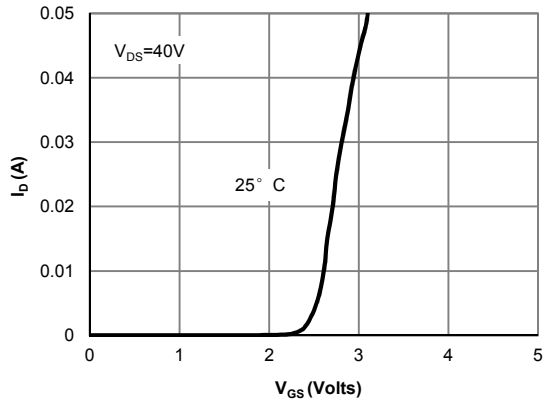
F. The current rating is based on the t ≤ 10s thermal resistance rating.

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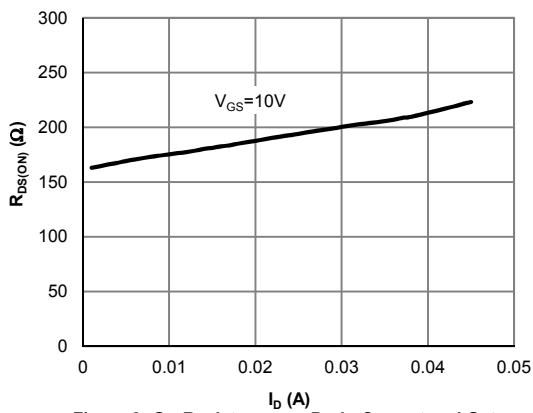
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



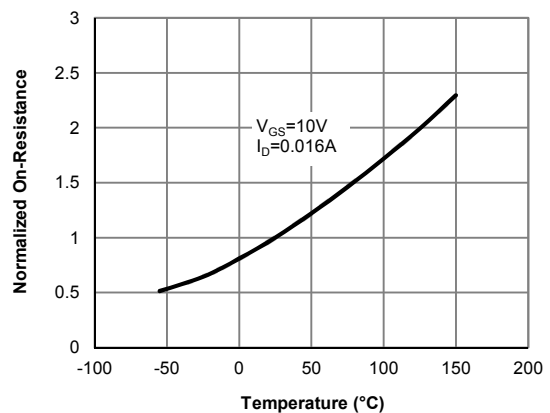
**Figure 1: On-Region Characteristics**



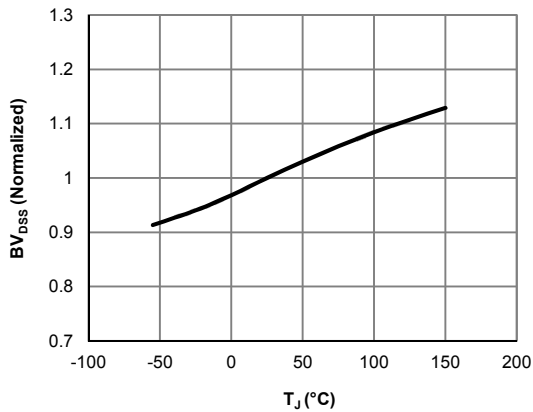
**Figure 2: Transfer Characteristics**



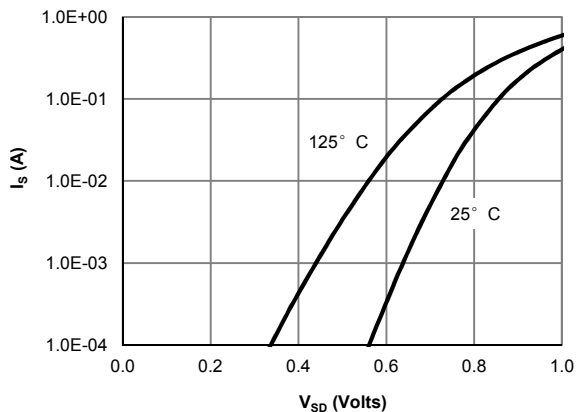
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

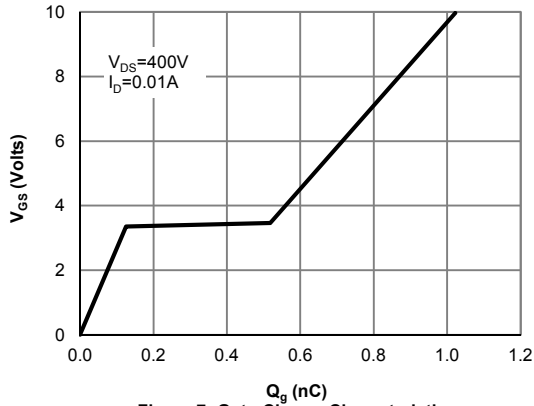


**Figure 5: Break Down vs. Junction Temperature**

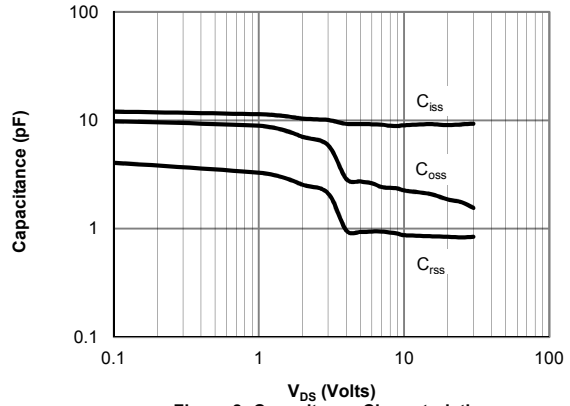


**Figure 6: Body-Diode Characteristics**

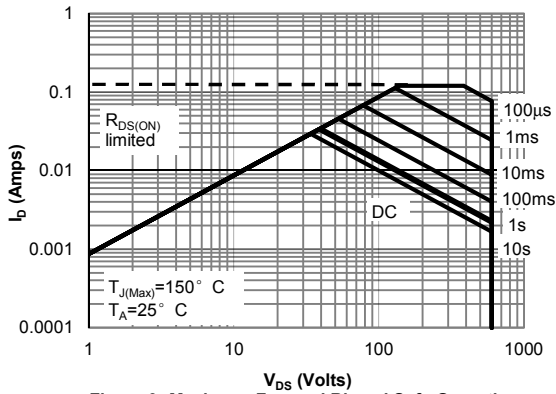
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



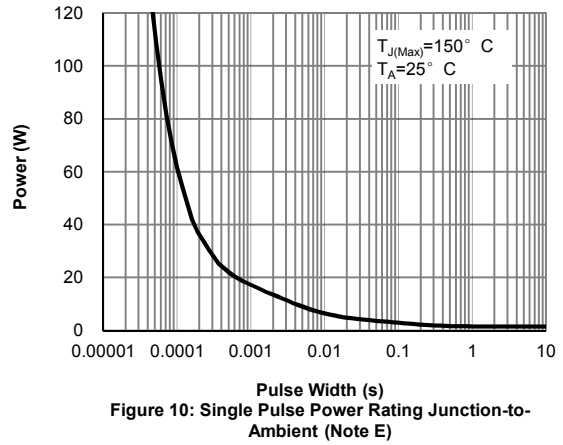
**Figure 7: Gate-Charge Characteristics**



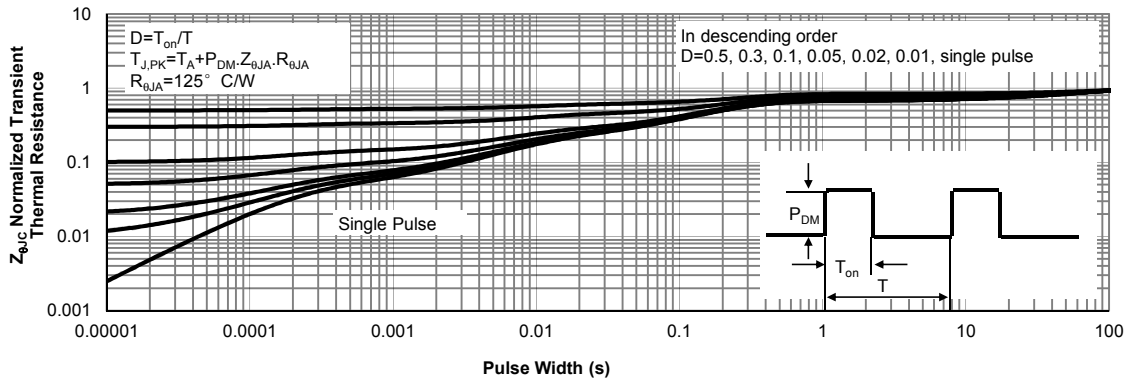
**Figure 8: Capacitance Characteristics**



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

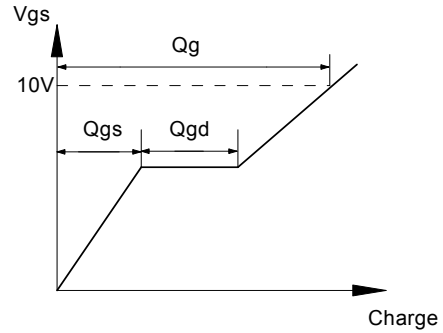
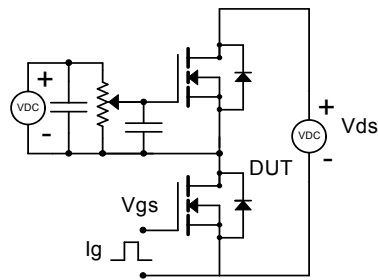


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

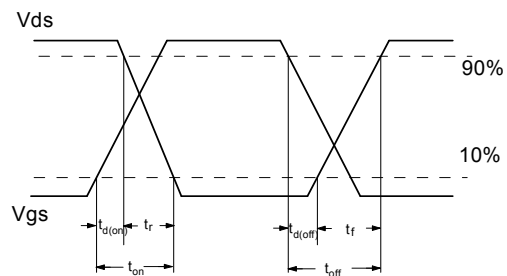
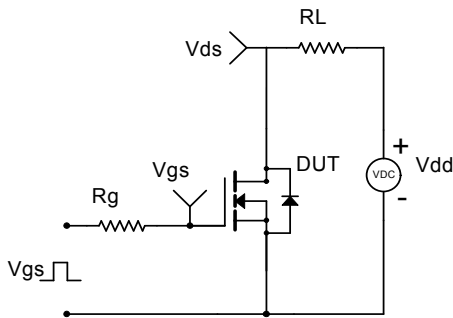


**Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)**

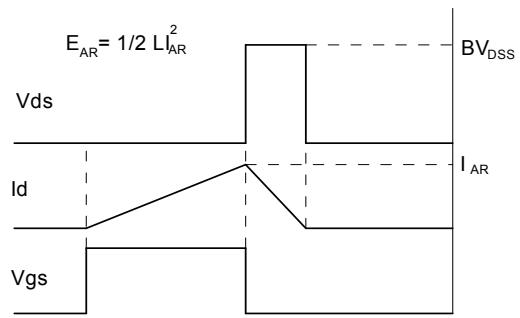
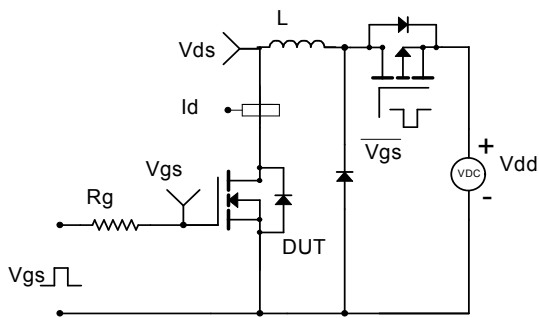
Gate Charge Test Circuit & Waveform



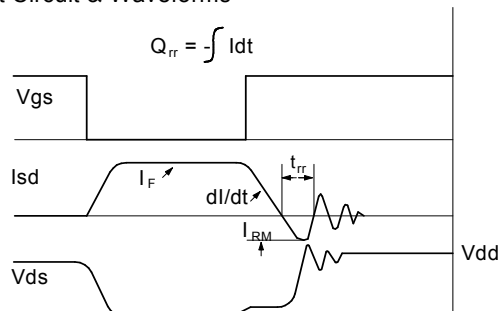
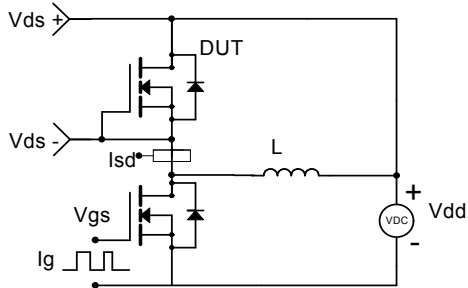
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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