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ALPHA & OMEGA SEMICONDUCTOR

AON1611

20V P-Channel MOSFET

General Description

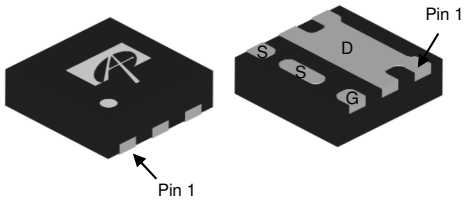
The AON1611 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

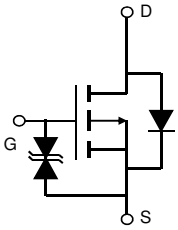
Product Summary

V_{DS}	-20V
I_D (at V_{GS}=-4.5V)	-4A
$R_{DS(ON)}$ (at V_{GS} =-4.5V)	< 58mΩ
$R_{DS(ON)}$ (at V_{GS} =-2.5V)	< 76mΩ
$R_{DS(ON)}$ (at V_{GS} =-1.8V)	< 98mΩ
$R_{DS(ON)}$ (at V_{GS} =-1.5V)	< 120mΩ
Typical ESD protection	**HBM Class 2**

Green Product

DFN 1.6x1.6A





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	±8	V
Continuous Drain Current [G]	T_A=25°C	I_D	-4	A
	T_A=70°C		-3	
Pulsed Drain Current [C]		I_{DM}	-16	
Power Dissipation [A]	T_A=25°C	P_D	1.8	W
	T_A=70°C		1.15	
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	$R_{\theta JA}$	56	70	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		88	110	°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			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=-250µA	-0.3	-0.6	-0.9	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	-16			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-4A		46	58	mΩ
		T_J=125°C		64.5	80	
		V_{GS}=-2.5V, I_D=-3A		58	76	mΩ
		V_{GS}=-1.8V, I_D=-2A		74	98	mΩ
		V_{GS}=-1.5V, I_D=-1A		88	120	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-4A		15		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.66	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		550		pF
C_{oss}	Output Capacitance			93		pF
C_{rss}	Reverse Transfer Capacitance			64		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
$Q_{g(4.5V)}$	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-4A		7	10	nC
Q_{gs}	Gate Source Charge			1		nC
Q_{gd}	Gate Drain Charge			1.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=2.5Ω, R_{GEN}=3Ω		15		ns
t_r	Turn-On Rise Time			33		ns
$t_{D(off)}$	Turn-Off DelayTime			50		ns
t_f	Turn-Off Fall Time			43		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-4A, dI/dt=100A/µs		16		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-4A, dI/dt=100A/µs		6.5		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° C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t ≤ 10s value 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 impedance 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 impedance 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 package limited.
H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25° C.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

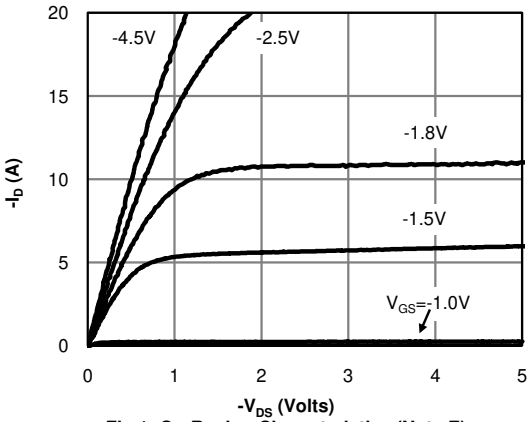


Fig 1: On-Region Characteristics (Note E)

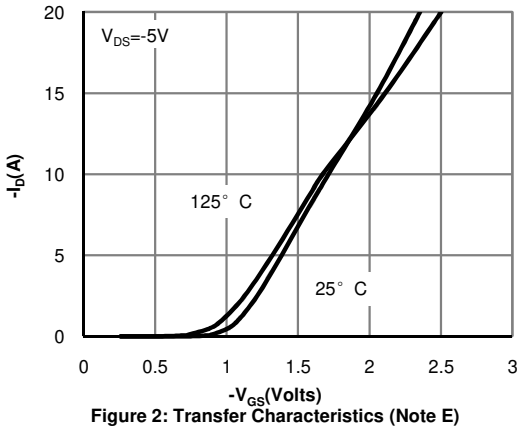


Figure 2: Transfer Characteristics (Note E)

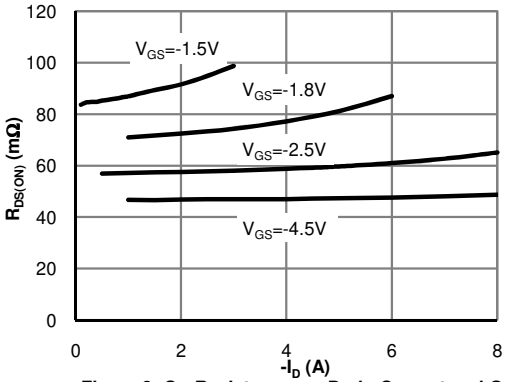


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

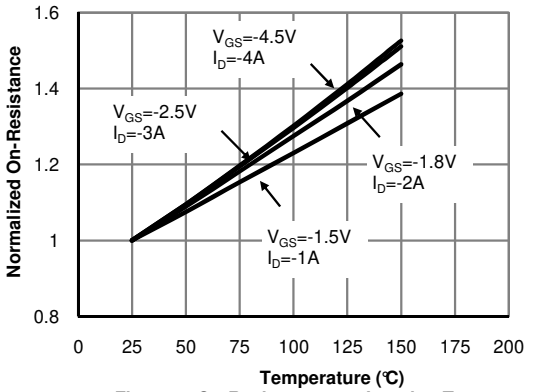


Figure 4: On-Resistance vs. Junction Temperature (Note E)

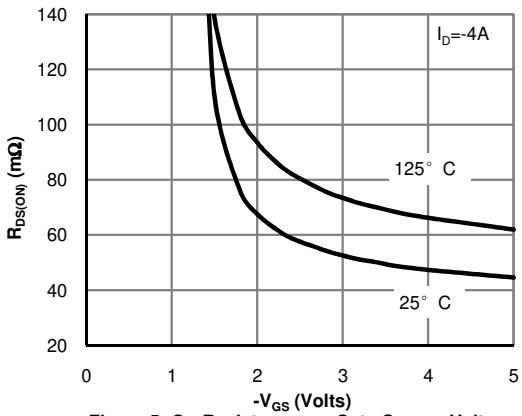


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

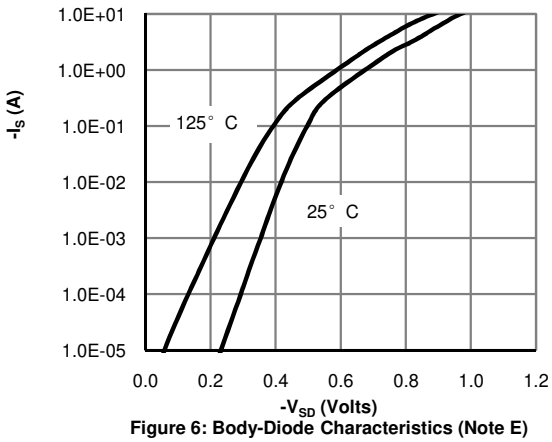


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

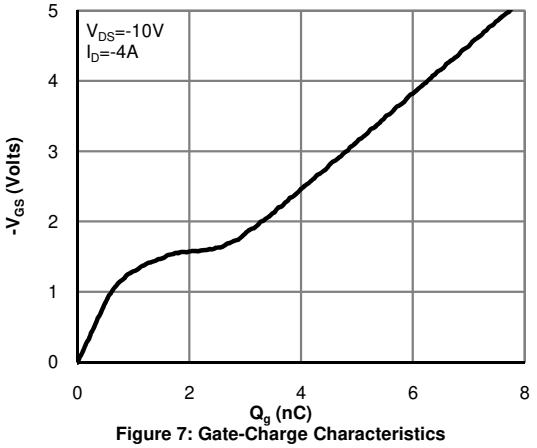


Figure 7: Gate-Charge Characteristics

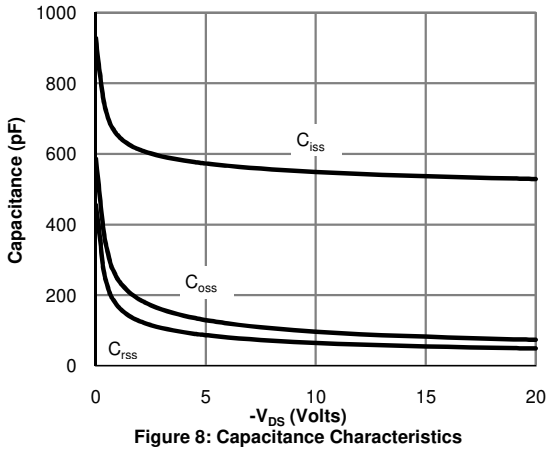


Figure 8: Capacitance Characteristics

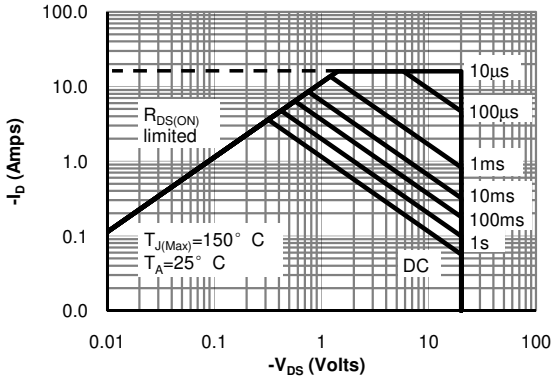


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

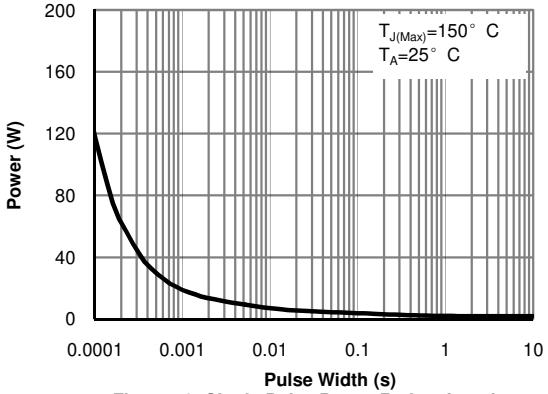


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note H)

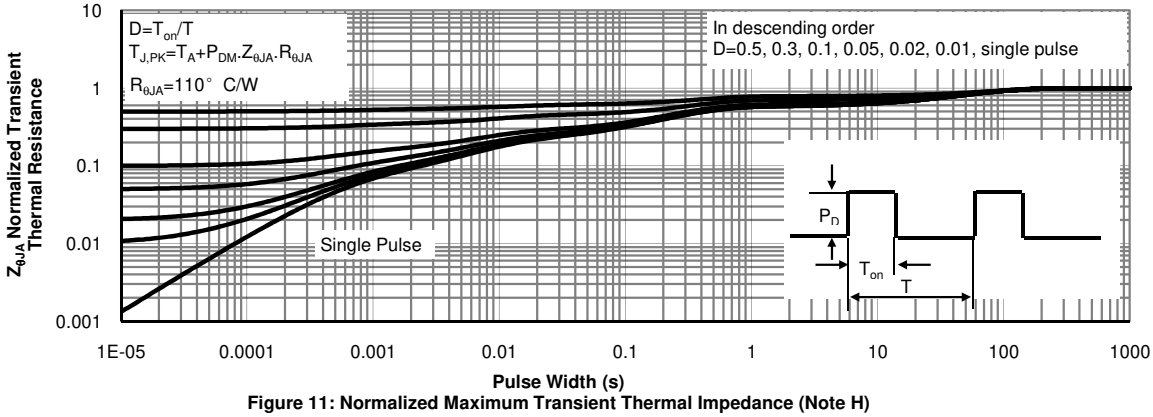
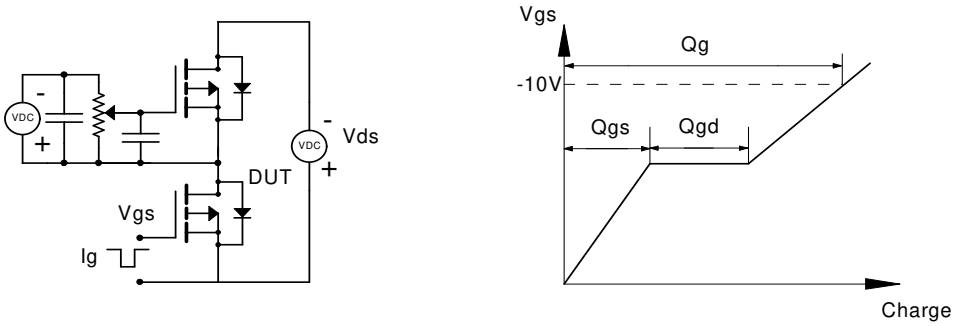
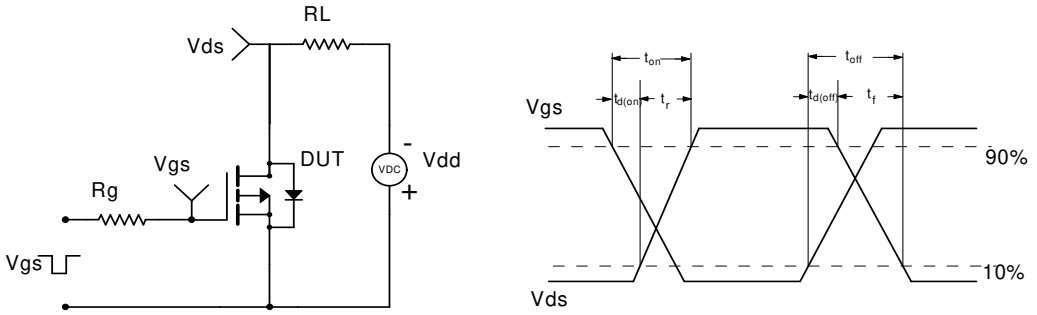


Figure 11: Normalized Maximum Transient Thermal Impedance (Note H)

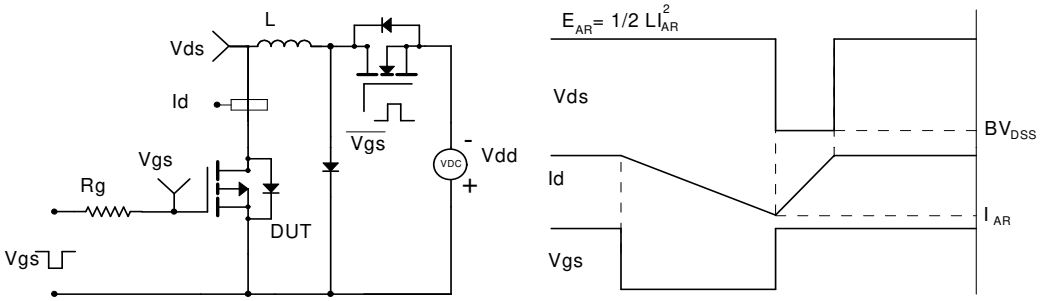
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms