ALPHA & OMEGA SEMICONDUCTOR

AONR36368
30V N-Channel MOSFET

General Description

• Trench Power LV MOSFET technology
• Low $R_{DS(ON)}$
• Low Gate Charge
• High Current Capability
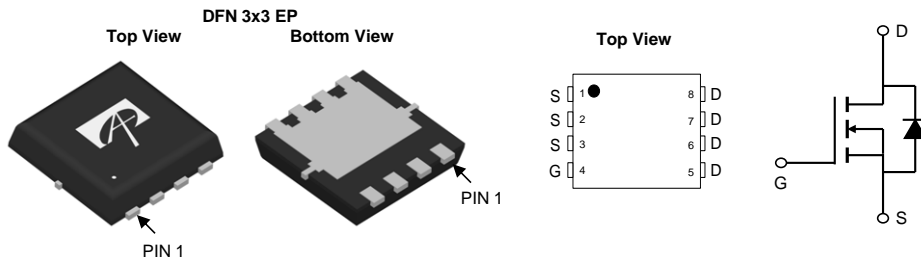• RoHS and Halogen-Free Compliant

Applications

• DC/DC Converters in Computing
• Isolated DC/DC Converters in Telecom and Industrial
• See Note I

Product Summary

V_{DS}	30V
I_D (at V_{GS}=10V)	32A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 5mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 7.5mΩ

100% UIS Tested
100% Rg Tested

Green Product

DFN 3x3 EP

Top View   Bottom View

PIN 1

PIN 1

Top View

S	1		8	D
S	2		7	D
S	3		6	D
G	4		5	D

Orderable Part Number	Package Type	Form	Minimum Order Quantity
AONR36368	DFN 3x3 EP	Tape & Reel	5000

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [G]	T_C=25°C	I_D	32	A
	T_C=100°C		32	
Pulsed Drain Current [C]		I_{DM}	128	
Continuous Drain Current	T_A=25°C	I_{DSM}	23	A
	T_A=70°C		18.5	
Avalanche Current [C]		I_{AS}	60	A
Avalanche energy L=0.01mH [C]		E_{AS}	18	mJ
Power Dissipation [B]	T_C=25°C	P_D	24	W
	T_C=100°C		9.6	
Power Dissipation [A]	T_A=25°C	P_{DSM}	4.1	W
	T_A=70°C		2.6	
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	$R_{θJA}$	24	30	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		45	55	°C/W
Maximum Junction-to-Case	Steady-State	$R_{θJC}$	4.2	5.2	°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		30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=30V, V$_{GS}$=0V				1	µA
			T$_J$=55°C			5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$=±20V				±100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS,}$ I$_D$=250µA		1.3	1.7	2.1	V
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=20A			4.1	5	mΩ
			T$_J$=125°C		6	7.3	
		V$_{GS}$=4.5V, I$_D$=18A			6	7.5	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=20A			77		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A, V$_{GS}$=0V			0.7	1	V
I$_S$	Maximum Body-Diode Continuous Current					30	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz			1305		pF
C$_{oss}$	Output Capacitance				340		pF
C$_{rss}$	Reverse Transfer Capacitance				33		pF
R$_g$	Gate resistance	f=1MHz		0.8	1.7	2.6	Ω
SWITCHING PARAMETERS							
Q$_{g(10V)}$	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=15V, I$_D$=20A			17	25	nC
Q$_{g(4.5V)}$	Total Gate Charge				7.5	12	nC
Q$_{gs}$	Gate Source Charge				3.6		nC
Q$_{gd}$	Gate Drain Charge				2.2		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=0.75Ω, R$_{GEN}$=3Ω			6		ns
t$_r$	Turn-On Rise Time				3		ns
t$_{D(off)}$	Turn-Off DelayTime				22		ns
t$_f$	Turn-Off Fall Time				3		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=20A, di/dt=500A/µs			11		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=20A, di/dt=500A/µs			18		nC

A. The value of R$_{θJA}$ 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$_{θJA}$ t≦ 10s 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. Single pulse width limited by junction temperature T$_{J(MAX)}$=150° C.
D. The R$_{θJA}$ is the sum of the thermal impedance from junction to case R$_{θJC}$ 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.
I. For application requiring slow >1ms turn-on/turn-off, please consult AOS FAE for proper product selection.

APPLICATIONS OR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN,FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

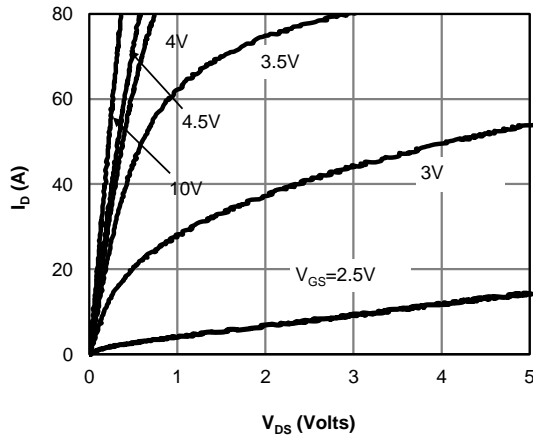**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

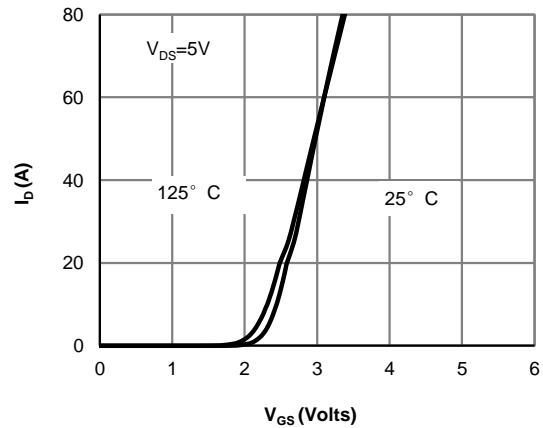Figure 1: On-Region Characteristics (Note E)

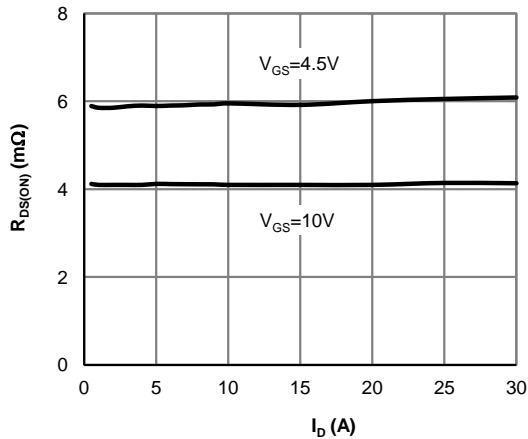Figure 2: Transfer Characteristics (Note E)

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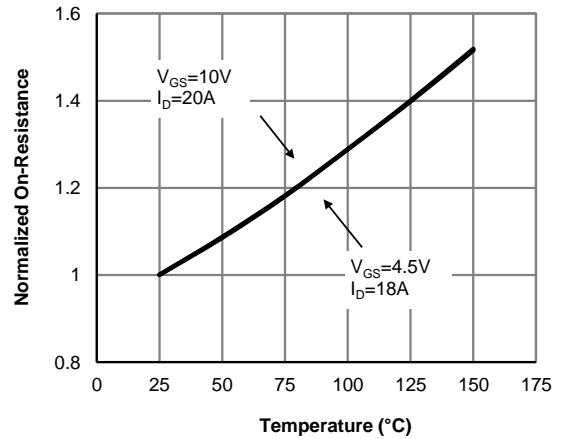

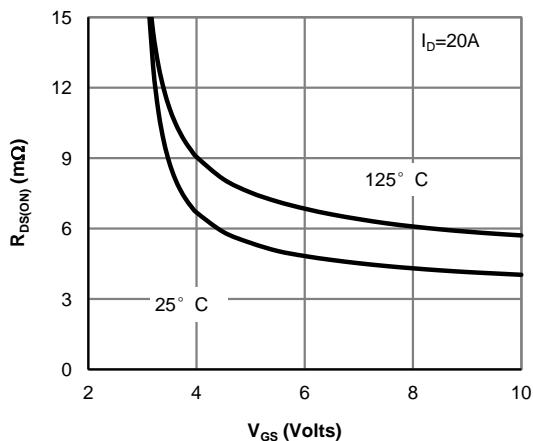Figure 4: On-Resistance vs. Junction Temperature (Note E)

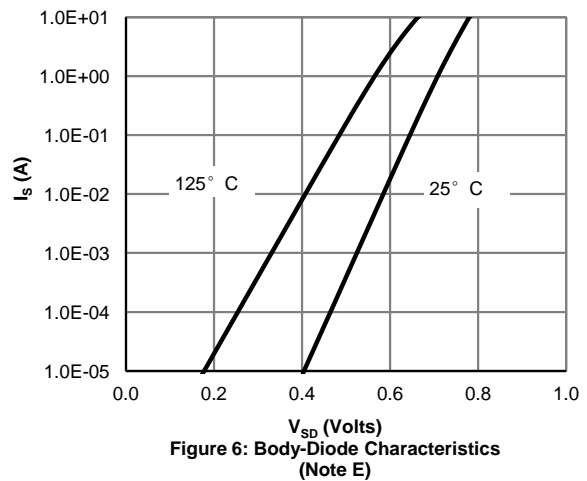Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

Figure 6: Body-Diode Characteristics (Note E)
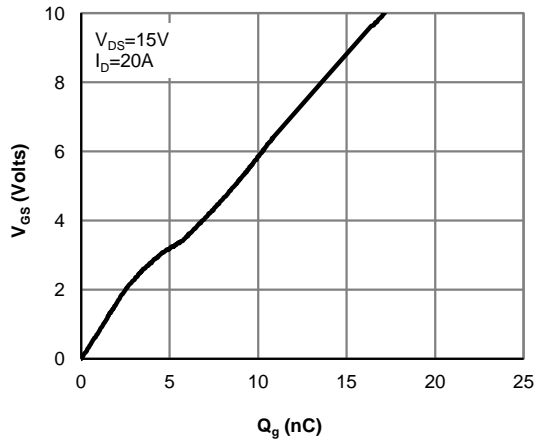
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
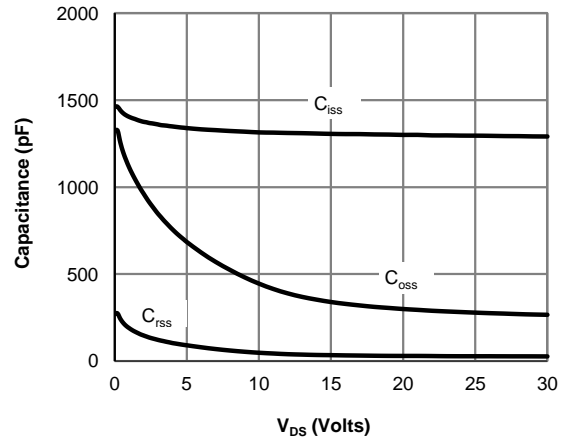

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

V_{GS}> or equal to 4.5V
Figure 9: Maximum Forward Biased
Safe Operating Area (Note F)

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

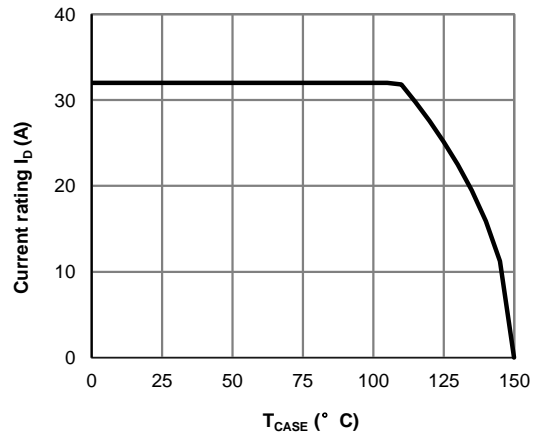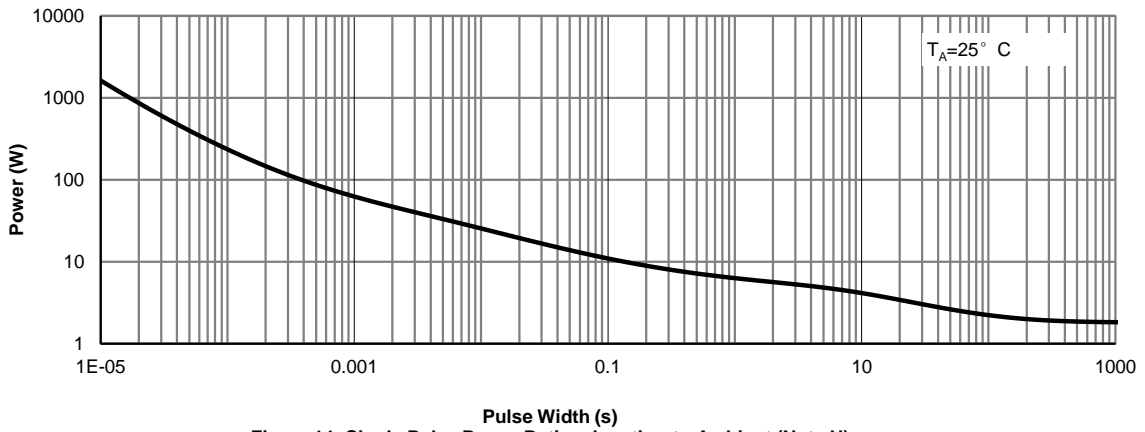Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 12: Power De-rating (Note F)

Figure 13: Current De-rating (Note F)

$T_A = 25°C$
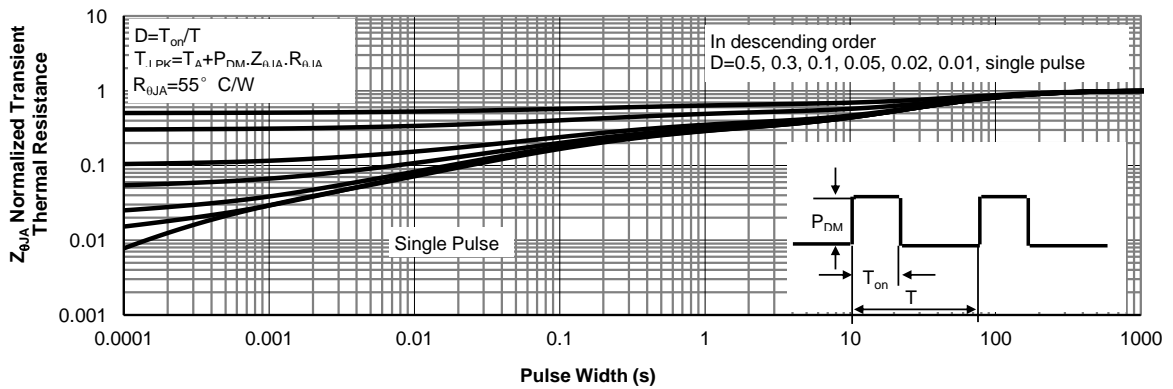**Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)**

$D=T_{on}/T$
$T_{J\,PK}=T_A+P_{DM} \cdot Z_{\theta JA} \cdot R_{\theta JA}$
$R_{\theta JA}=55°C/W$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

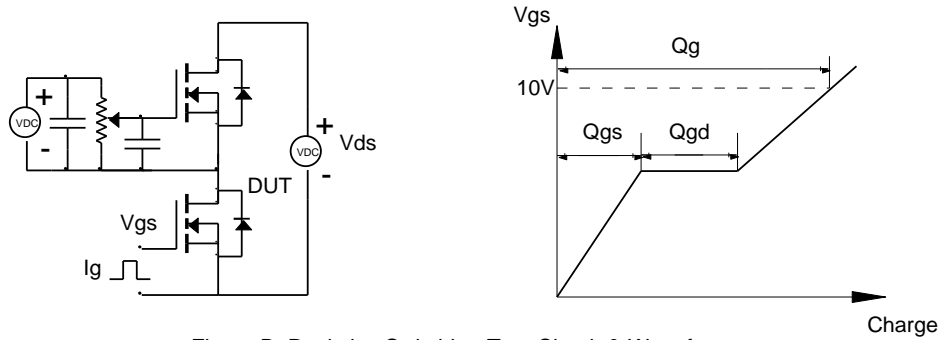Figure A: Gate Charge Test Circuit & Waveforms

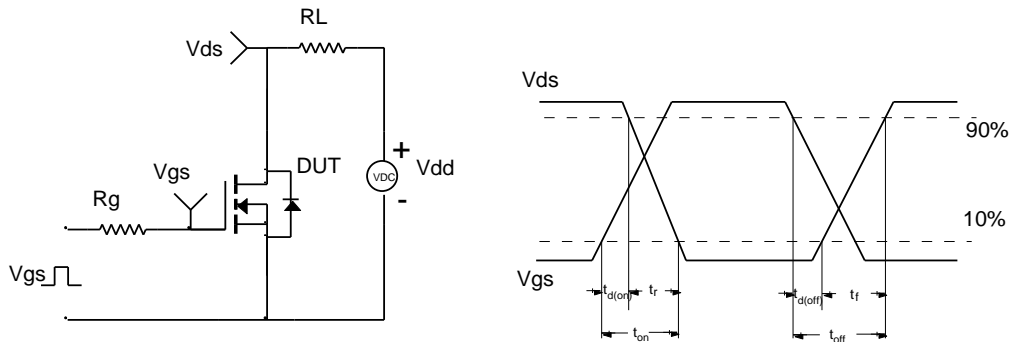
Figure B: Resistive Switching Test Circuit & Waveforms

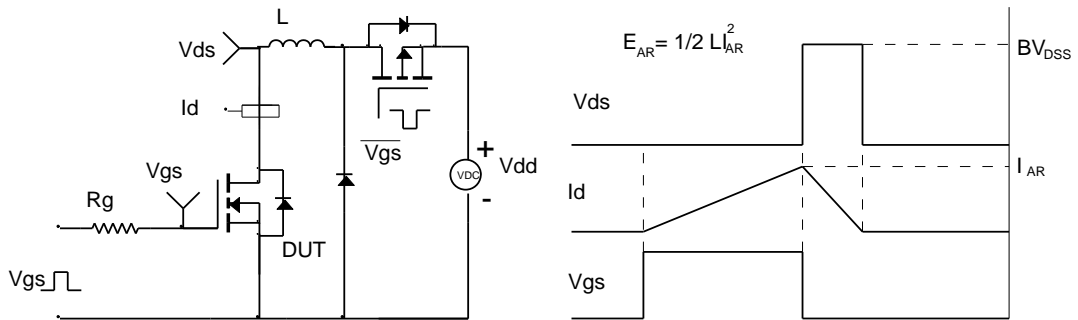Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, LI_{AR}^2$$
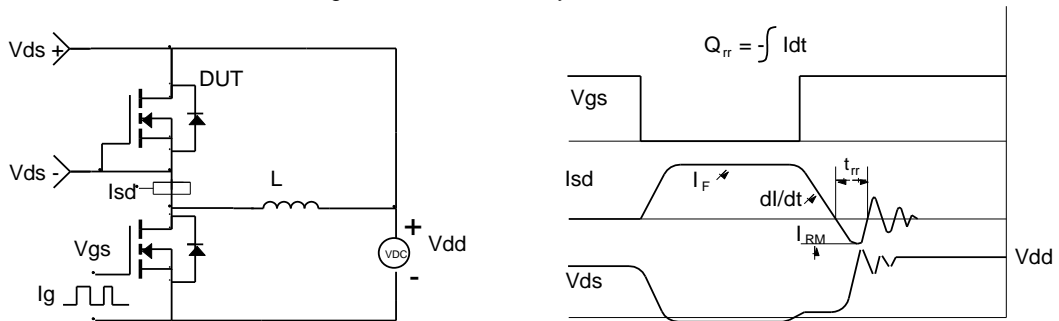

Figure D: Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = \int Idt$$

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