



**ALPHA & OMEGA**  
SEMICONDUCTOR, LTD

**AON3402**

**N-Channel Enhancement Mode Field Effect Transistor**

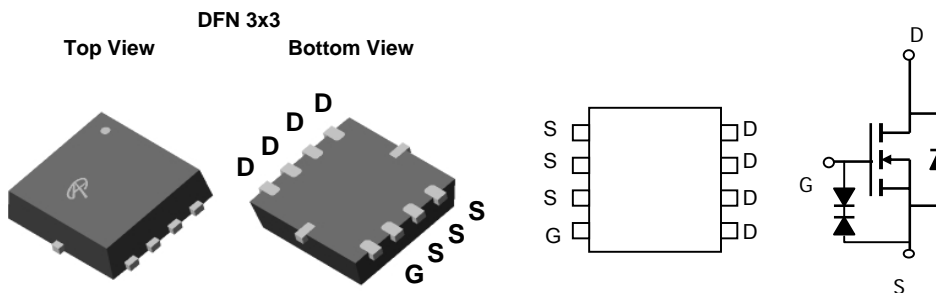


**General Description**

The AON3402 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V  $V_{GS(MAX)}$  rating. It is ESD protected. This device is suitable for use as a uni-directional or bi-directional load switch, facilitated by its common-drain configuration. *Standard Product AON3402 is Pb-free (meets ROHS & Sony 259 specifications). AON3402L is a Green Product ordering option. AON3402 and AON3402L are electrically identical.*

**Features**

- $V_{DS}$  (V) = 20V
- $I_D$  = 12A ( $V_{GS}$  = 4.5V)
- $R_{DS(ON)} < 13m\Omega$  ( $V_{GS}$  = 4.5V)
- $R_{DS(ON)} < 17m\Omega$  ( $V_{GS}$  = 2.5V)
- $R_{DS(ON)} < 26m\Omega$  ( $V_{GS}$  = 1.8V)
- ESD Rating: 2000V HBM



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	12	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	40	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	3	W
		$T_A=70^\circ\text{C}$	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	32	42	$^\circ\text{C/W}$
		Steady-State	65	100	$^\circ\text{C/W}$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	25	35	$^\circ\text{C/W}$	

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	20			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			10 25	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 10\text{V}$			10	$\mu\text{A}$
$BV_{GSO}$	Gate-Source Breakdown Voltage	$V_{DS}=0\text{V}$ , $I_G=\pm 250\mu\text{A}$	$\pm 12$			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	0.5	0.78	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$ , $V_{DS}=5\text{V}$	40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5\text{V}$ , $I_D=12\text{A}$ $T_J=125^\circ\text{C}$		10.3 14.4	13 18	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$ , $I_D=10.5\text{A}$		14.3	17	$\text{m}\Omega$
		$V_{GS}=1.8\text{V}$ , $I_D=8.5\text{A}$		21.7	26	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=9.8\text{A}$		37		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.73	1	V
$I_S$	Maximum Body-Diode Continuous Current				4.8	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=10\text{V}$ , $f=1\text{MHz}$		1810		pF
$C_{oss}$	Output Capacitance			232		pF
$C_{riss}$	Reverse Transfer Capacitance			200		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		1.6		$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=4.5\text{V}$ , $V_{DS}=10\text{V}$ , $I_D=9.8\text{A}$		17.9		nC
$Q_{gs}$	Gate Source Charge			1.5		nC
$Q_{gd}$	Gate Drain Charge			4.7		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$ , $V_{DS}=10\text{V}$ , $R_L=1.0\Omega$ , $R_{GEN}=3\Omega$		2.5		ns
$t_r$	Turn-On Rise Time			7.2		ns
$t_{D(off)}$	Turn-Off Delay Time			49		ns
$t_f$	Turn-Off Fall Time			10.8		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=9.8\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		20.2		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=9.8\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		8		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any a given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

D: The static characteristics in Figures 1 to 6,12,14 are obtained using 80 $\mu\text{s}$  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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

Rev 0: April 2006

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES 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

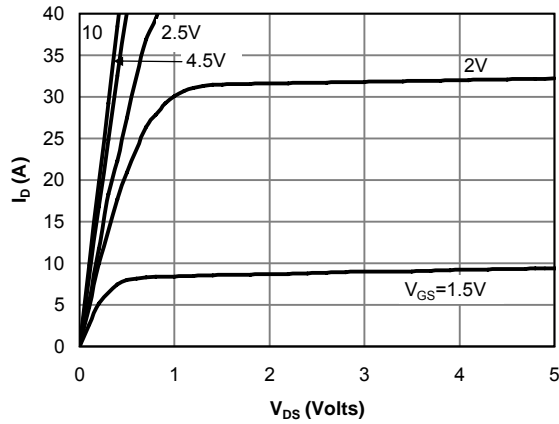


Fig 1: On-Region Characteristics

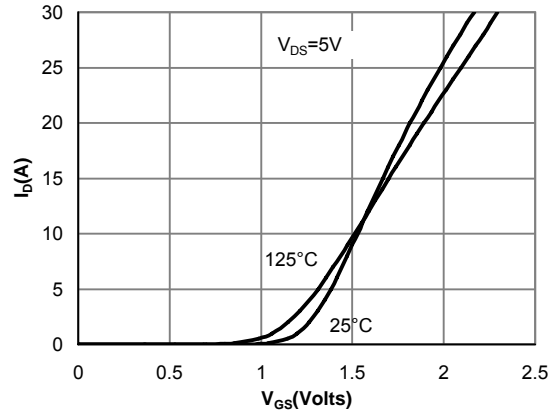


Figure 2: Transfer Characteristics

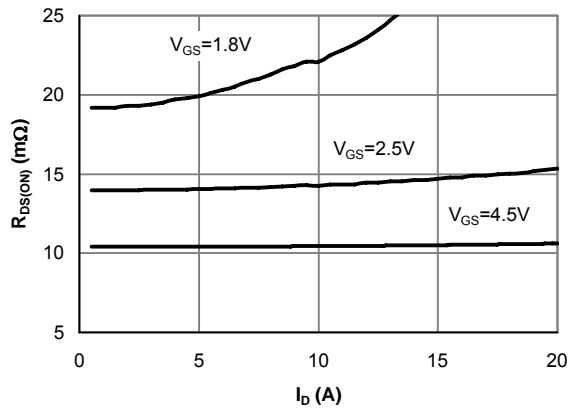


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

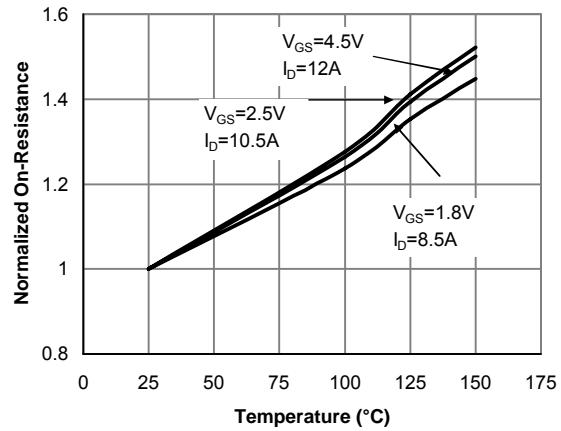


Figure 4: On-Resistance vs. Junction Temperature

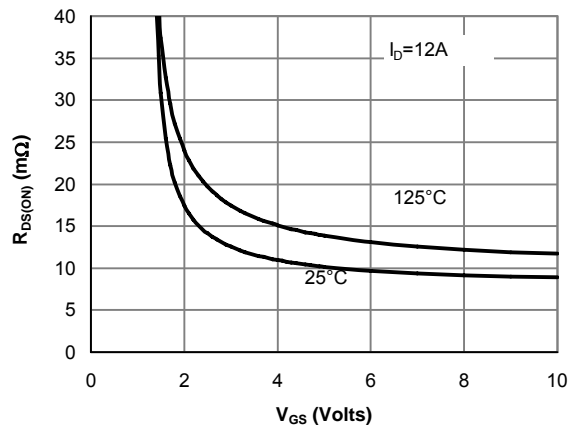


Figure 5: On-Resistance vs. Gate-Source Voltage

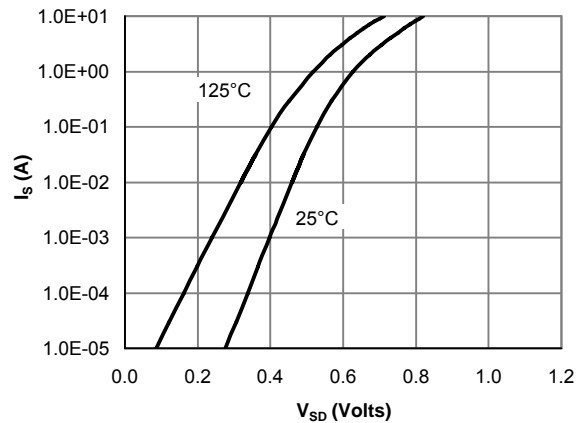


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

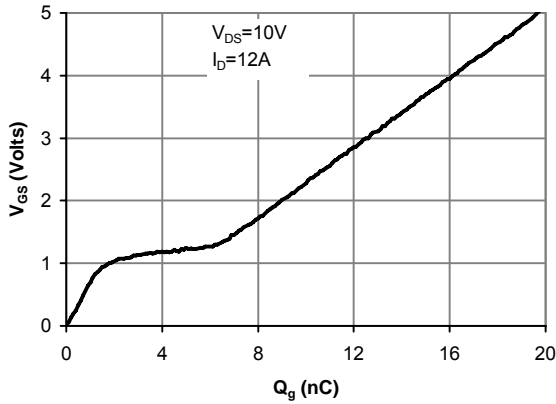


Figure 7: Gate-Charge Characteristics

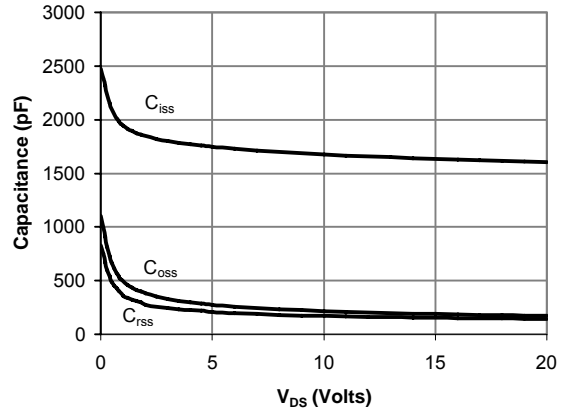


Figure 8: Capacitance Characteristics

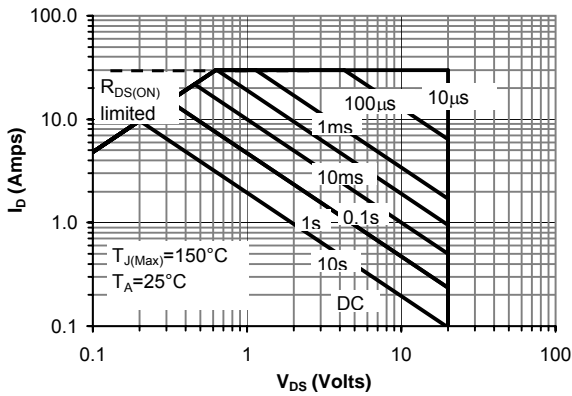


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

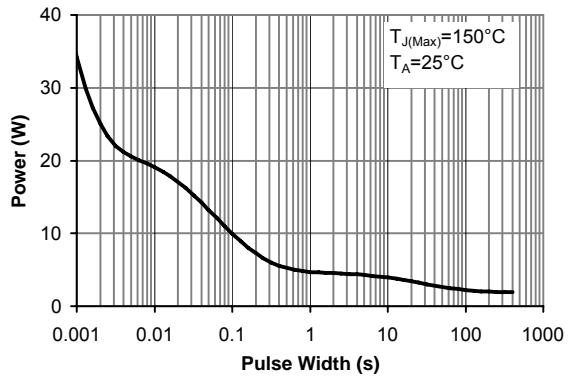


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

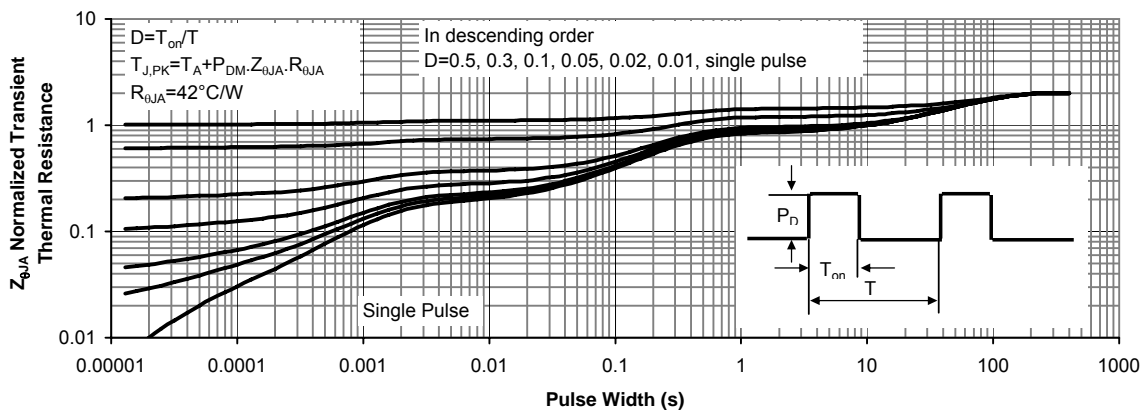


Figure 11: Normalized Maximum Transient Thermal Impedance