



## AO3435

### P-Channel Enhancement Mode Field Effect Transistor

#### General Description

The AO3435/L uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.5V. This device is suitable for use in buck convertor applications.

AO3435 and AO3435L are electrically identical.

-RoHS Compliant

-AO3435L is Halogen Free

#### Features

$V_{DS} = -20V$

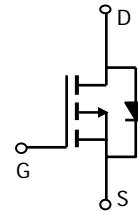
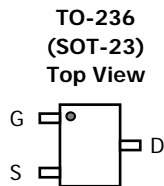
$I_D = -3.5A$  ( $V_{GS} = -4.5V$ )

$R_{DS(ON)} < 70m\Omega$  ( $V_{GS} = -4.5V$ )

$R_{DS(ON)} < 90m\Omega$  ( $V_{GS} = -2.5V$ )

$R_{DS(ON)} < 110m\Omega$  ( $V_{GS} = -1.8V$ )

$R_{DS(ON)} < 130m\Omega$  ( $V_{GS} = -1.5V$ )



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

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	$V_{DS}$		-20	V
Gate-Source Voltage	$V_{GS}$		$\pm 8$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	-3.5	A
		$T_A=70^\circ C$	-2.7	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$		-25	
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	1.4	W
		$T_A=70^\circ C$	0.9	
Junction and Storage Temperature Range	$T_J, T_{STG}$		-55 to 150	$^\circ C$

#### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	70	90	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup> Steady-State		100	125	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup> Steady-State	$R_{\theta JL}$	63	80	$^\circ C/W$

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	$V_{DS}=-20\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 8\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-0.5	-0.65	-1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-5\text{V}$	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$ , $I_D=-3.5\text{A}$ $T_J=125^\circ\text{C}$		56 80	70 100	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$ , $I_D=-3.0\text{A}$		70	90	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$ , $I_D=-2.0\text{A}$		85	110	$\text{m}\Omega$
		$V_{GS}=-1.5\text{V}$ , $I_D=-0.5\text{A}$		100	130	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}$ , $I_D=-3.5\text{A}$		15		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1\text{A}$ , $V_{GS}=0\text{V}$		-0.7	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-1.4	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=-10\text{V}$ , $f=1\text{MHz}$		560	745	pF
$C_{oss}$	Output Capacitance			80		pF
$C_{rss}$	Reverse Transfer Capacitance			70		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		15	23	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-10\text{V}$ , $I_D=-3.5\text{A}$		8.5	11	nC
$Q_{gs}$	Gate Source Charge			1.2		nC
$Q_{gd}$	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-10\text{V}$ , $R_L=3\Omega$ , $R_{GEN}=6\Omega$		7.2		ns
$t_r$	Turn-On Rise Time			36		ns
$t_{D(off)}$	Turn-Off Delay Time			53		ns
$t_f$	Turn-Off Fall Time			56		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-3.5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		37	49	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-3.5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		27		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any 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 are obtained using 300 $\mu\text{s}$  pulse width, 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

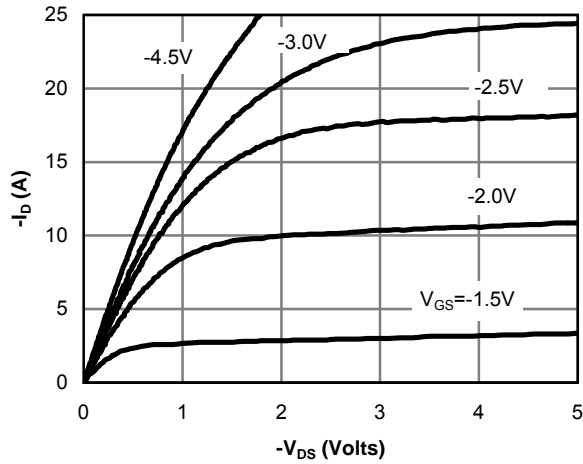


Figure 1: On-Region Characteristics

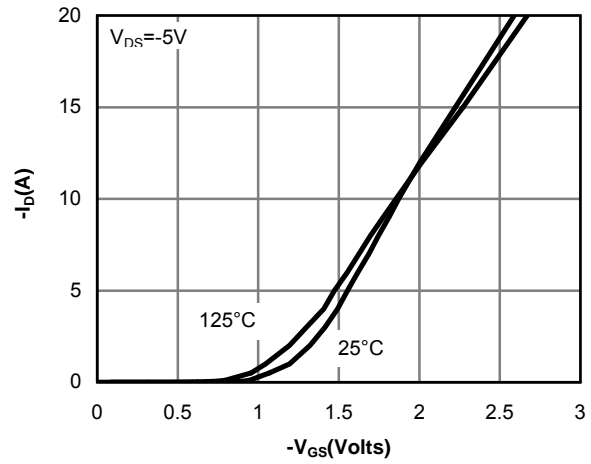


Figure 2: Transfer Characteristics

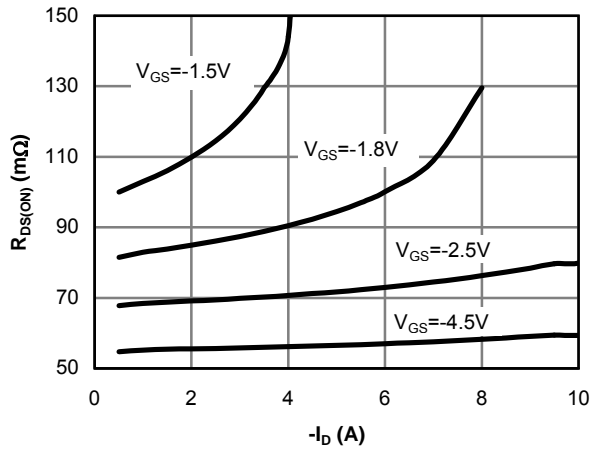


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

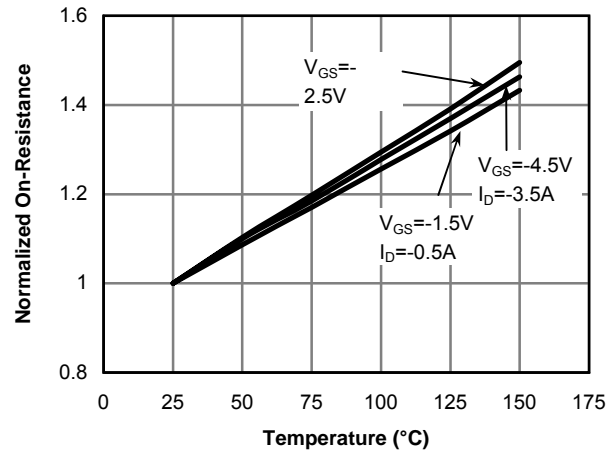


Figure 4: On-Resistance vs. Junction Temperature

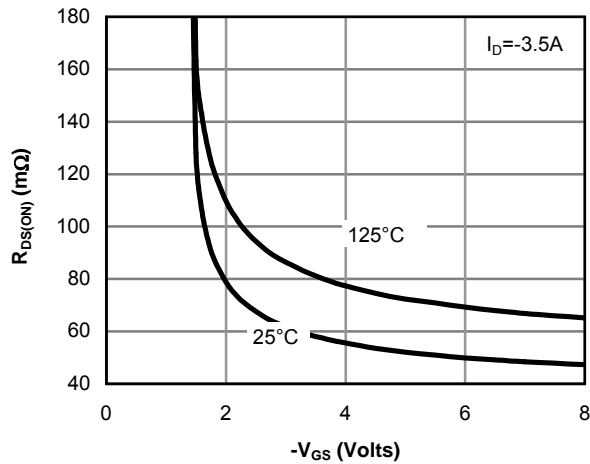


Figure 5: On-Resistance vs. Gate-Source Voltage

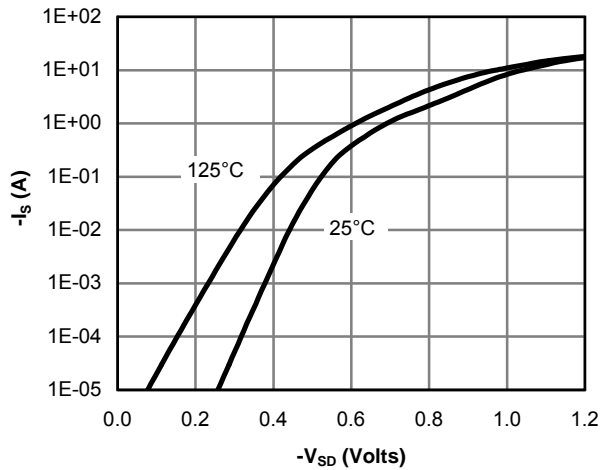


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

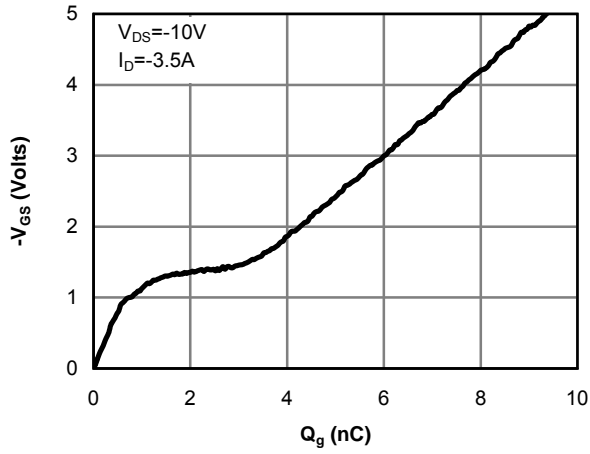


Figure 7: Gate-Charge Characteristics

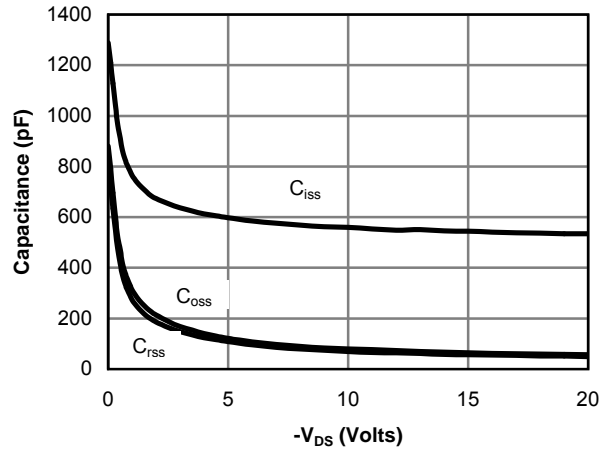


Figure 8: Capacitance Characteristics

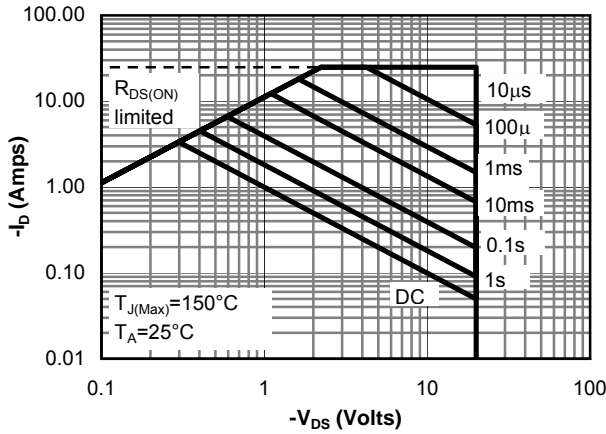


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

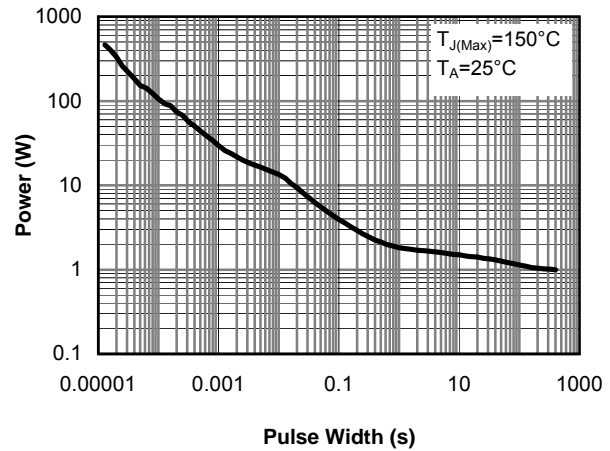


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

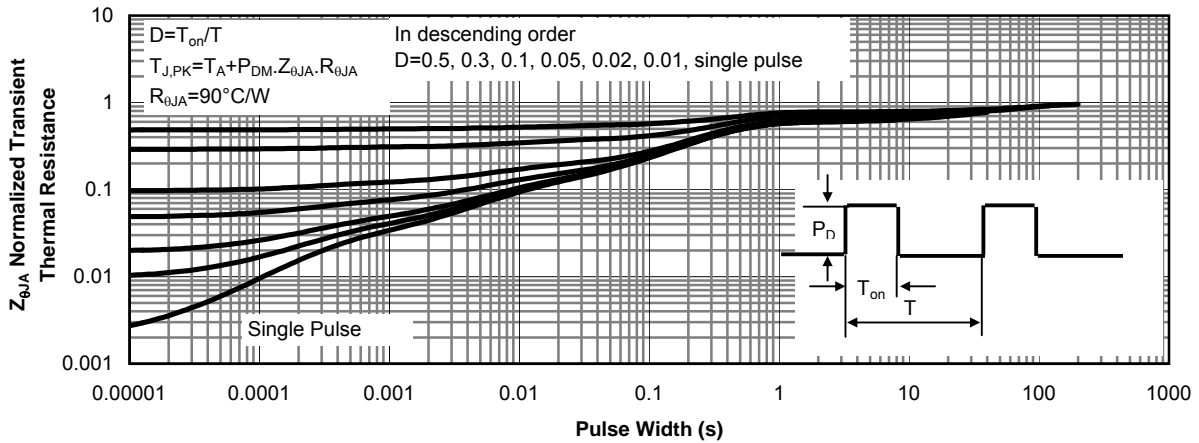


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)