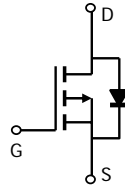
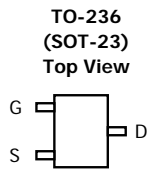


TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

<p><b>General Description</b></p> <p>The AO3401 uses advanced trench technology to provide excellent <math>R_{DS(ON)}</math>, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. <i>Standard product AO3401 is Pb-free (meets ROHS &amp; Sony 259 specifications). AO3401L is a Green Product ordering option. AO3401 and AO3401L are electrically identical.</i></p>	<p><b>Features</b></p> <p><math>V_{DS} (V) = -30V</math>  <math>I_D = -4.2 A (V_{GS} = -10V)</math>  <math>R_{DS(ON)} &lt; 50m\Omega (V_{GS} = -10V)</math>  <math>R_{DS(ON)} &lt; 65m\Omega (V_{GS} = -4.5V)</math>  <math>R_{DS(ON)} &lt; 120m\Omega (V_{GS} = -2.5V)</math></p>
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Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	-4.2	A
	$T_A=70^\circ C$	-3.5	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-30	
Power Dissipation <sup>A</sup>	$T_A=25^\circ C$	1.4	W
	$T_A=70^\circ C$	1	
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>	$t \leq 10s$	$R_{\theta JA}$	65	90	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		85	125	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	$R_{\theta JL}$	43	60	$^\circ C/W$

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=-250\mu A, V_{GS}=0V$	-30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-24V, V_{GS}=0V$ $T_J=55^\circ C$			-1 -5	$\mu A$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0V, V_{GS}=\pm 12V$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-0.7	-1	-1.3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5V, V_{DS}=-5V$	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-4.2A$ $T_J=125^\circ C$		42	50	m $\Omega$
		$V_{GS}=-4.5V, I_D=-4A$		53	65	
		$V_{GS}=-2.5V, I_D=-1A$		80	120	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5V, I_D=-5A$	7	11		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1A, V_{GS}=0V$		-0.75	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-2.2	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0V, V_{DS}=-15V, f=1MHz$		954		pF
$C_{oss}$	Output Capacitance			115		pF
$C_{riss}$	Reverse Transfer Capacitance			77		pF
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1MHz$		6		$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-4.5V, V_{DS}=-15V, I_D=-4A$		9.4		nC
$Q_{gs}$	Gate Source Charge			2		nC
$Q_{gd}$	Gate Drain Charge			3		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10V, V_{DS}=-15V, R_L=3.6\Omega,$ $R_{GEN}=6\Omega$		6.3		ns
$t_r$	Turn-On Rise Time			3.2		ns
$t_{D(off)}$	Turn-Off DelayTime			38.2		ns
$t_f$	Turn-Off Fall Time			12		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-4A, dI/dt=100A/\mu s$		20.2		ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-4A, dI/dt=100A/\mu s$		11.2		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  $T_A=25^\circ C$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t \leq 10s$  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 $\mu s$  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  $T_A=25^\circ C$ . The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

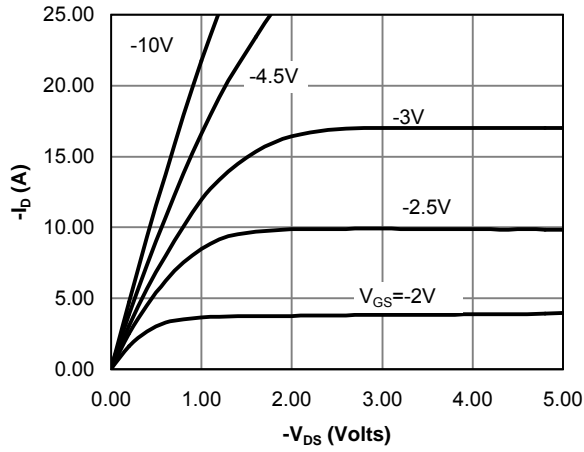


Fig 1: On-Region Characteristics

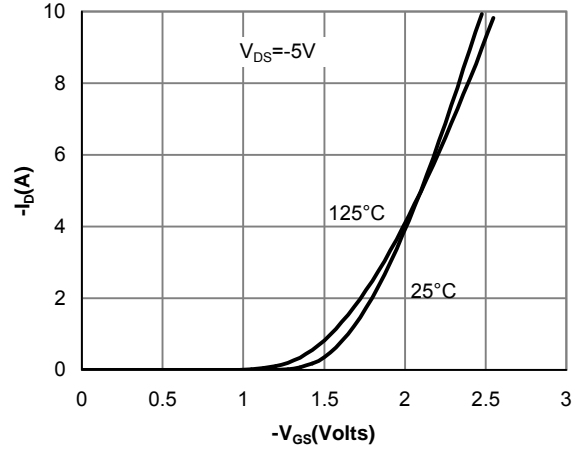


Figure 2: Transfer Characteristics

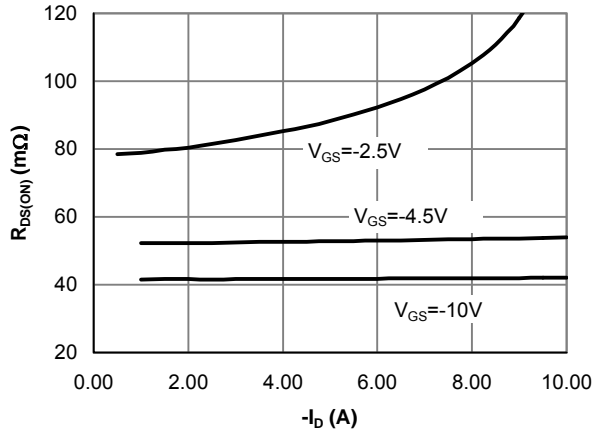


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

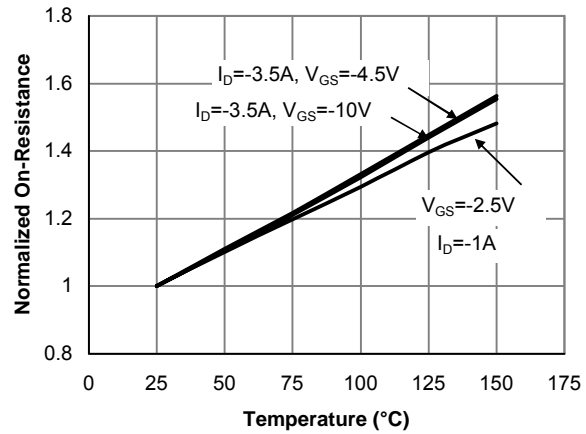


Figure 4: On-Resistance vs. Junction Temperature

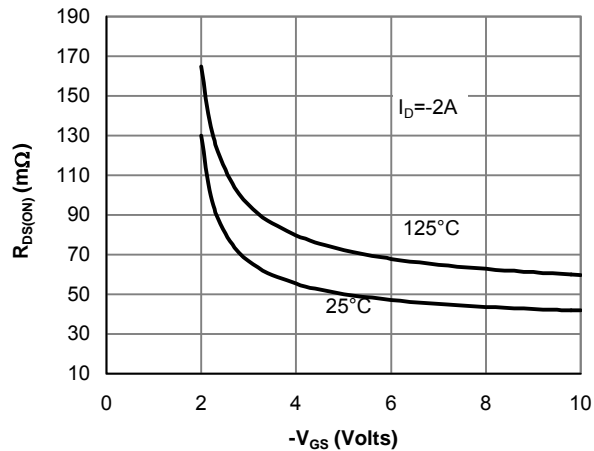


Figure 5: On-Resistance vs. Gate-Source Voltage

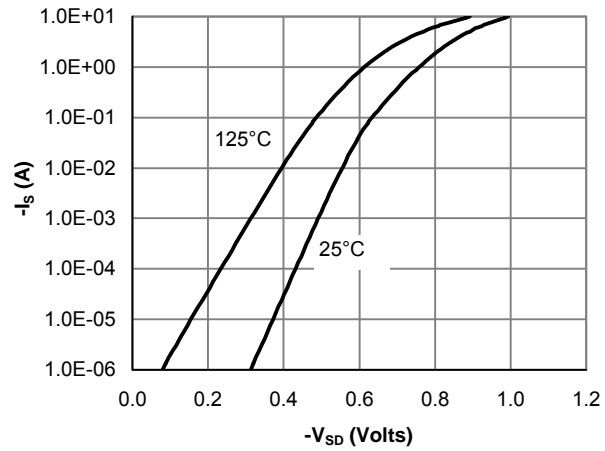


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

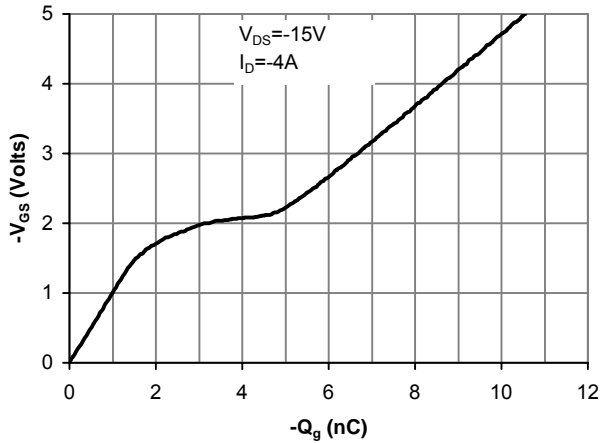


Figure 7: Gate-Charge Characteristics

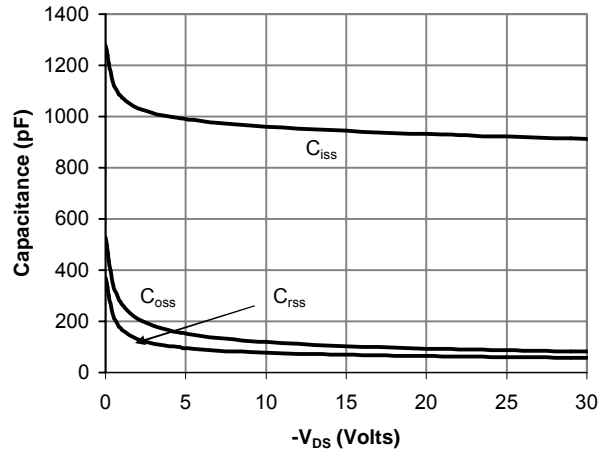


Figure 8: Capacitance Characteristics

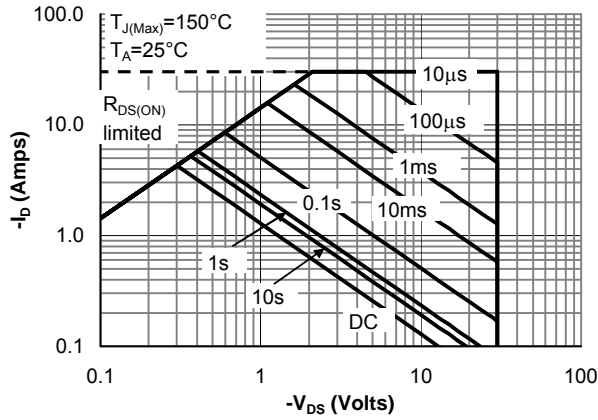


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

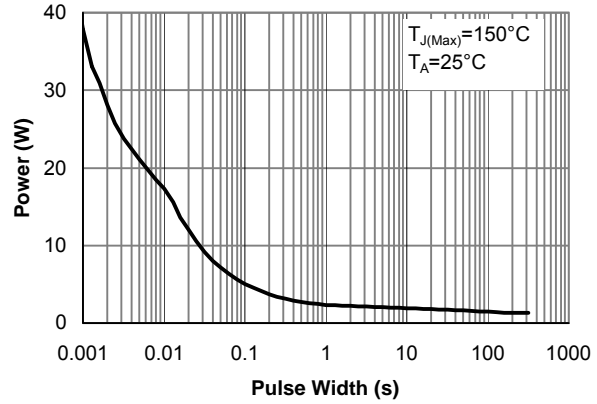


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

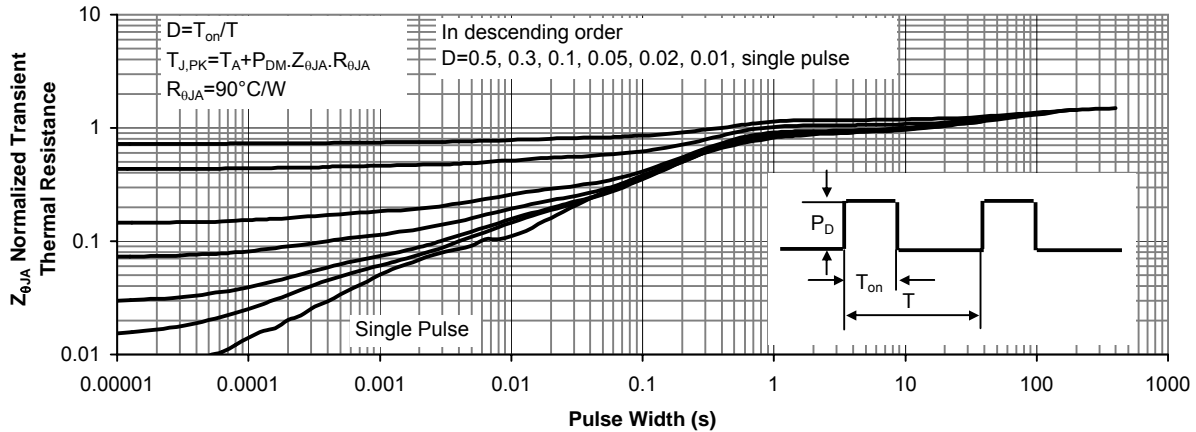


Figure 11: Normalized Maximum Transient Thermal Impedance