



ALPHA & OMEGA
SEMICONDUCTOR

AO3414

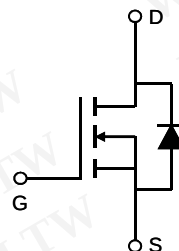
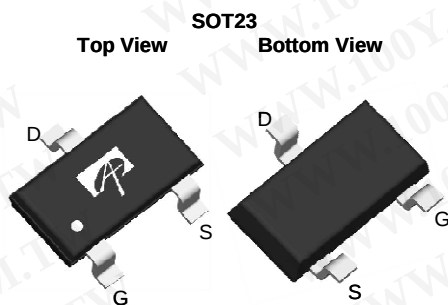
20V N-Channel MOSFET

General Description

The AO3414 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

Features

$V_{DS} = 20V$
 $I_D = 3A$ ($V_{GS} = 4.5V$)
 $R_{DS(ON)} < 62m\Omega$ ($V_{GS} = 4.5V$)
 $R_{DS(ON)} < 70m\Omega$ ($V_{GS} = 2.5V$)
 $R_{DS(ON)} < 85m\Omega$ ($V_{GS} = 1.8V$)



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 8	V
Continuous Drain Current ^A	I_D	3	A
		2.5	
Pulsed Drain Current ^B	I_{DM}	16	
Power Dissipation ^A	P_D	1.4	W
		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 ^A	$R_{\theta JA}$	70	90	$^\circ C/W$
Maximum Junction-to-Ambient ^A		100	125	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	63	80	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.4	0.7	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	16			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5\text{V}$, $I_D=3\text{A}$ $T_J=125^\circ\text{C}$		51 68	62 85	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=2.8\text{A}$		58	70	$\text{m}\Omega$
		$V_{GS}=1.8\text{V}$, $I_D=2.5\text{A}$		68	85	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=3\text{A}$		11		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				2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		260	320	pF
C_{oss}	Output Capacitance			48		pF
C_{rss}	Reverse Transfer Capacitance			27		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3	4.5	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=10\text{V}$, $I_D=3\text{A}$		2.9	3.8	nC
Q_{gs}	Gate Source Charge			0.4		nC
Q_{gd}	Gate Drain Charge			0.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=5\text{V}$, $V_{DS}=10\text{V}$, $R_L=3.3\Omega$, $R_{GEN}=6\Omega$		2.5		ns
t_r	Turn-On Rise Time			3.2		ns
$t_{D(off)}$	Turn-Off DelayTime			21		ns
t_f	Turn-Off Fall Time			3		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		14	19	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=3\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3.8		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² 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 $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

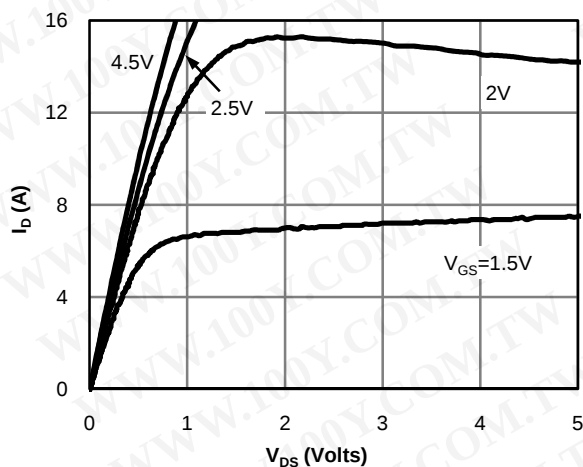


Figure 1: On-Region Characteristics

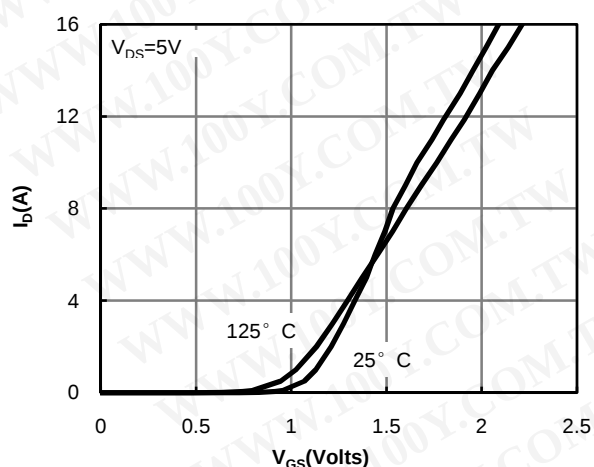


Figure 2: Transfer Characteristics

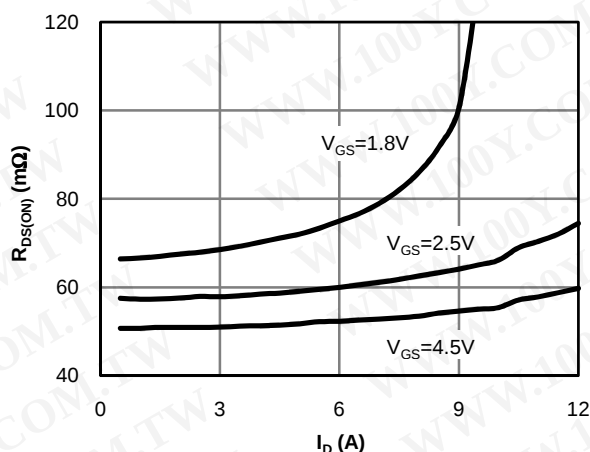


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

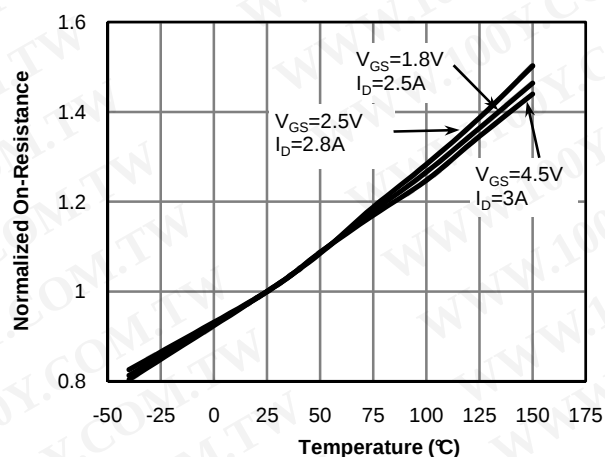


Figure 4: On-Resistance vs. Junction Temperature

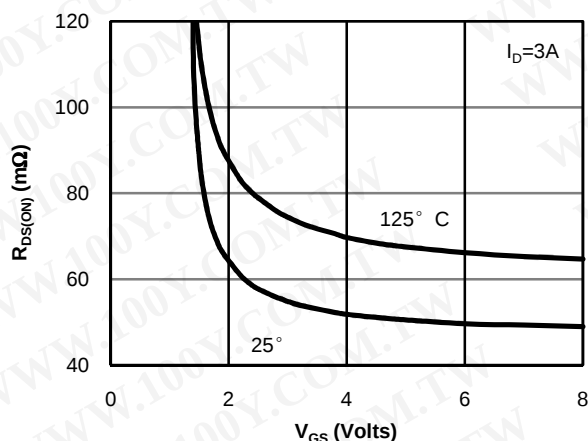


Figure 5: On-Resistance vs. Gate-Source Voltage

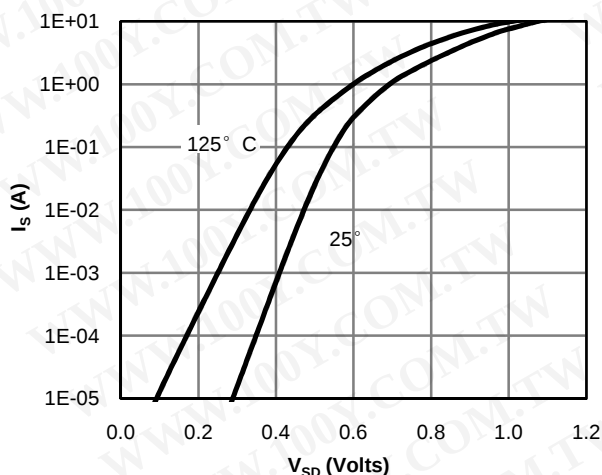
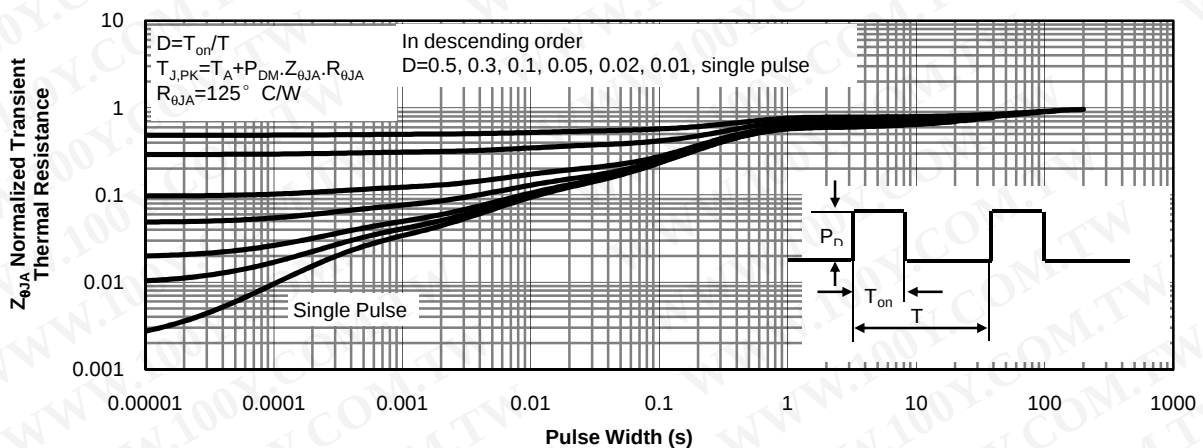
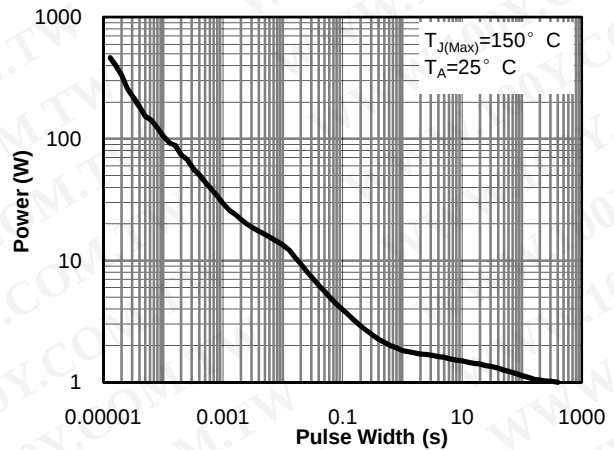
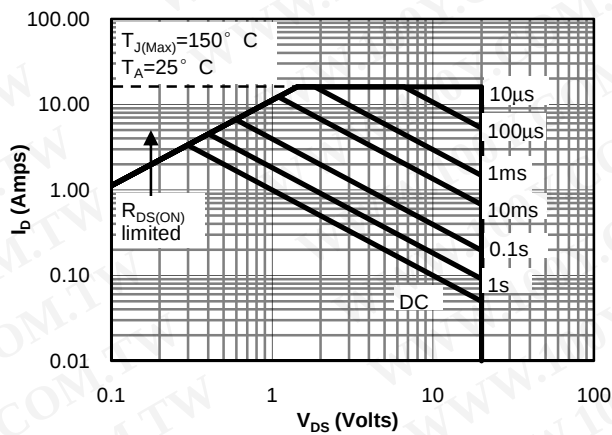
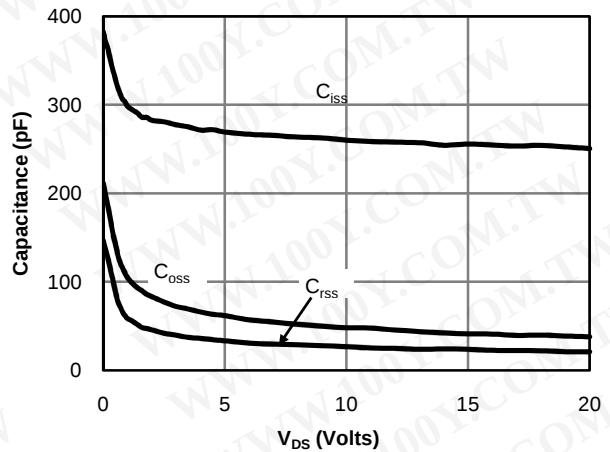
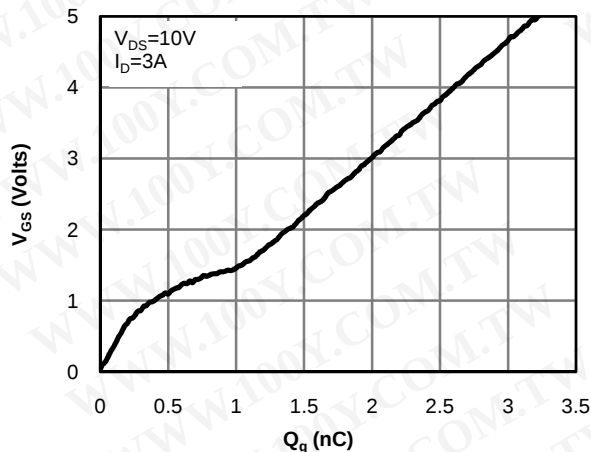


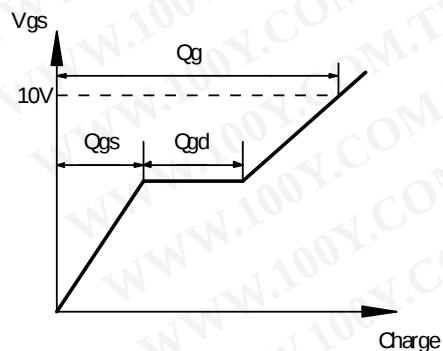
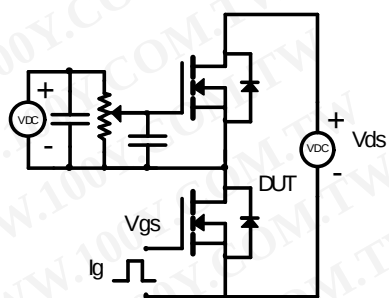
Figure 6: Body-Diode Characteristics



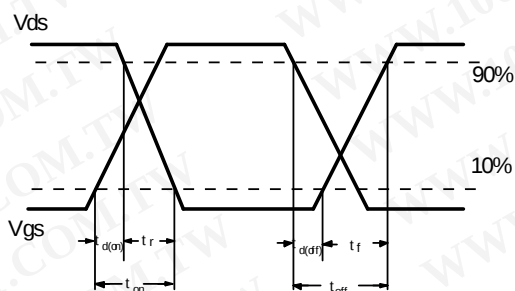
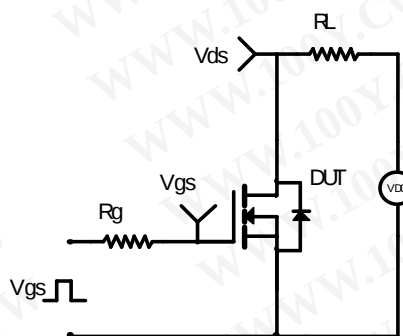
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



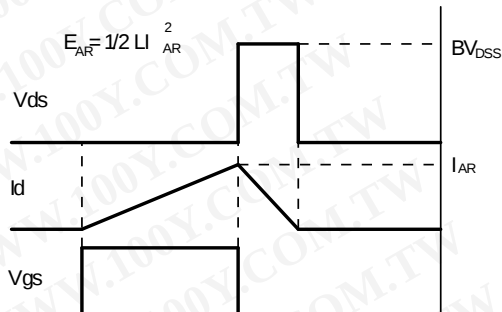
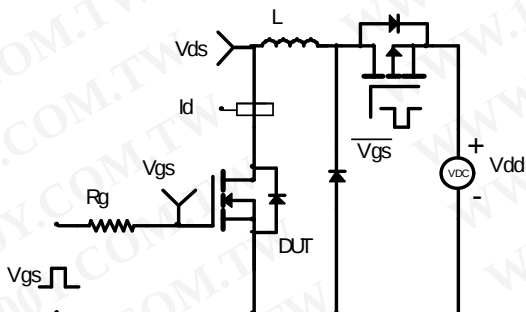
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

