

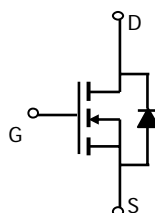
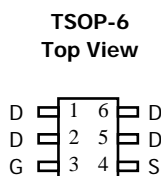
AO6414
N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO6414 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. It offers operation over a wide gate drive range from 2.5V to 12V. This device is suitable for use as a load switch. Standard product AO6414 is Pb-free (meets ROHS & Sony 259 specifications). AO6414L is a Green Product ordering option. AO6414 and AO6414L are electrically identical.

Features

V_{DS} (V) = 55V
 I_D = 2.4A (V_{GS} = 4.5V)
 $R_{DS(ON)}$ < 160m Ω (V_{GS} = 4.5V)
 $R_{DS(ON)}$ < 200m Ω (V_{GS} = 2.5V)


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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	55	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	2.3	A
	$T_A=70^\circ\text{C}$	1.9	
Pulsed Drain Current ^B	I_{DM}	9	
Power Dissipation	$T_A=25^\circ\text{C}$	1.56	W
	$T_A=70^\circ\text{C}$	1.1	
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 ^A	$R_{\theta JA}$	58	80	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	94	120
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	37	50	$^\circ\text{C/W}$

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	$I_D=10\text{mA}$, $V_{GS}=0\text{V}$	55			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=44\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		0.002	1 5	μA
I_{GSS}	Gate-Source leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.6	1.3	2	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5\text{V}$, $I_D=2.4\text{A}$ $T_J=125^\circ\text{C}$		125 175	160 210	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=1.5\text{A}$		157	200	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=2.4\text{A}$		11		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$		0.78	1	V
I_S	Maximum Body-Diode Continuous Current				1.9	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$, $f=1\text{MHz}$		214	300	pF
C_{oss}	Output Capacitance			31		pF
C_{rss}	Reverse Transfer Capacitance			12.6		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.3	3	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=25\text{V}$, $I_D=2.4\text{A}$		2.6	3.3	nC
Q_{gs}	Gate Source Charge			0.6		nC
Q_{gd}	Gate Drain Charge			0.8		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=25\text{V}$, $R_L=10.4\Omega$, $R_{GEN}=3\Omega$		2.3		ns
t_r	Turn-On Rise Time			2.4		ns
$t_{D(off)}$	Turn-Off DelayTime			16.5		ns
t_f	Turn-Off Fall Time			2		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=2.4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		20	30	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=2.4\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		17		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 80 μs 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

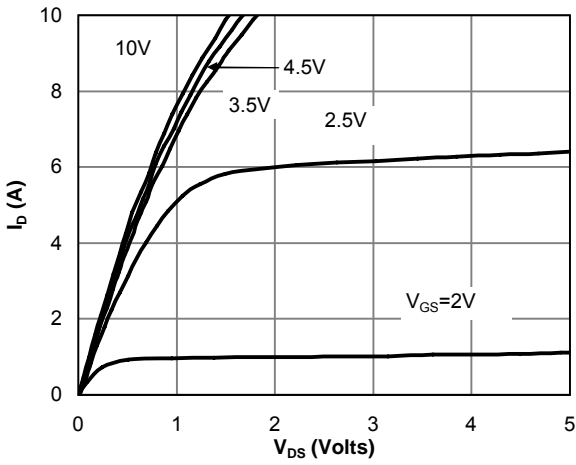


Fig 1: On-Region Characteristics

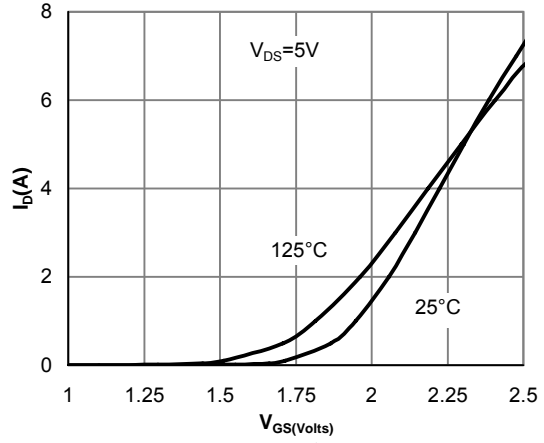


Figure 2: Transfer Characteristics

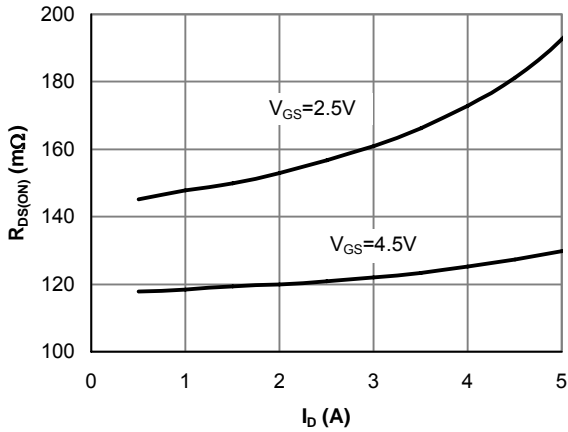


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

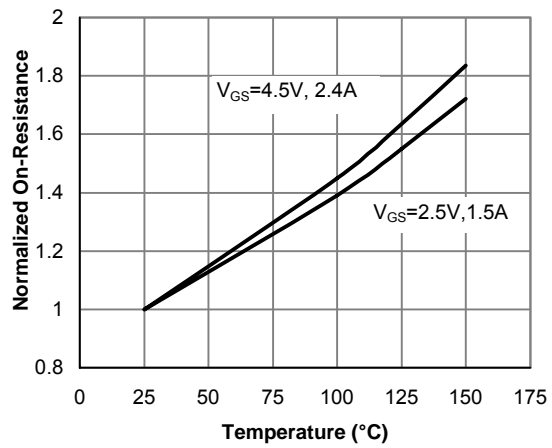


Figure 4: On-Resistance vs. Junction Temperature

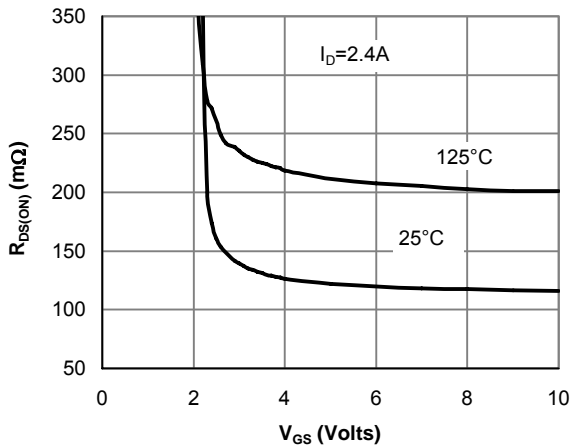


Figure 5: On-Resistance vs. Gate-Source Voltage

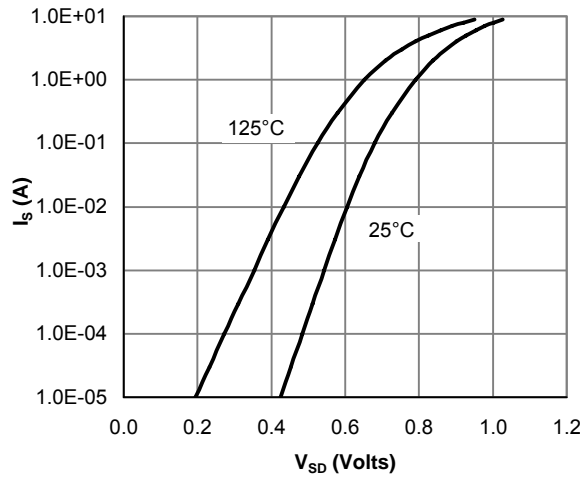


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

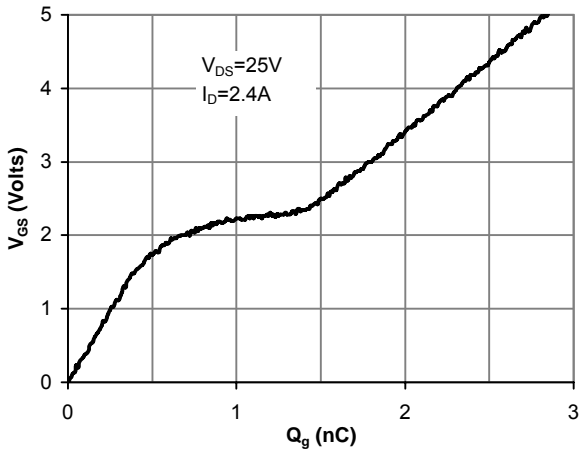


Figure 7: Gate-Charge Characteristics

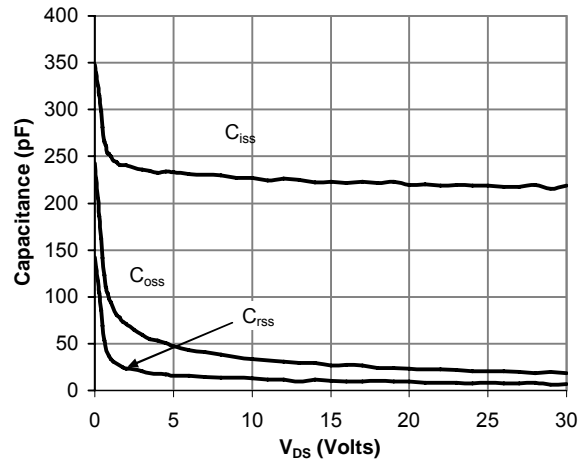


Figure 8: Capacitance Characteristics

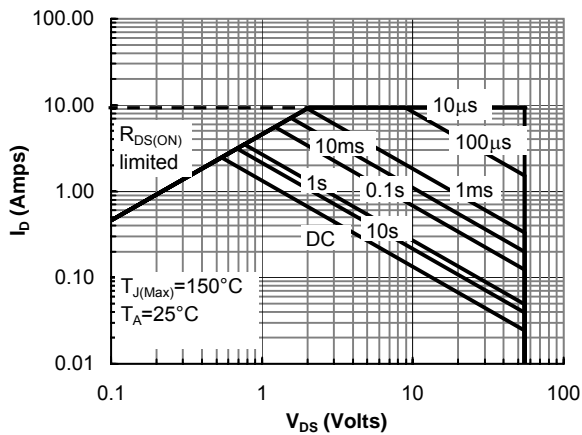


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

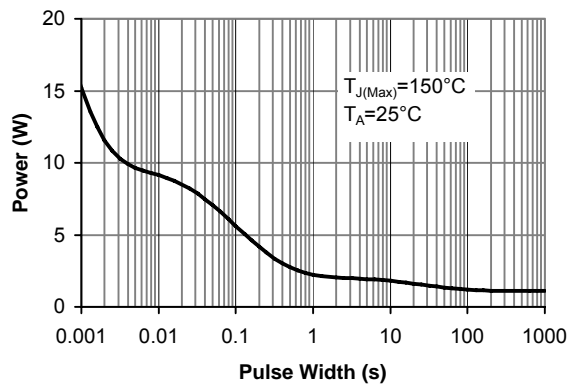


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

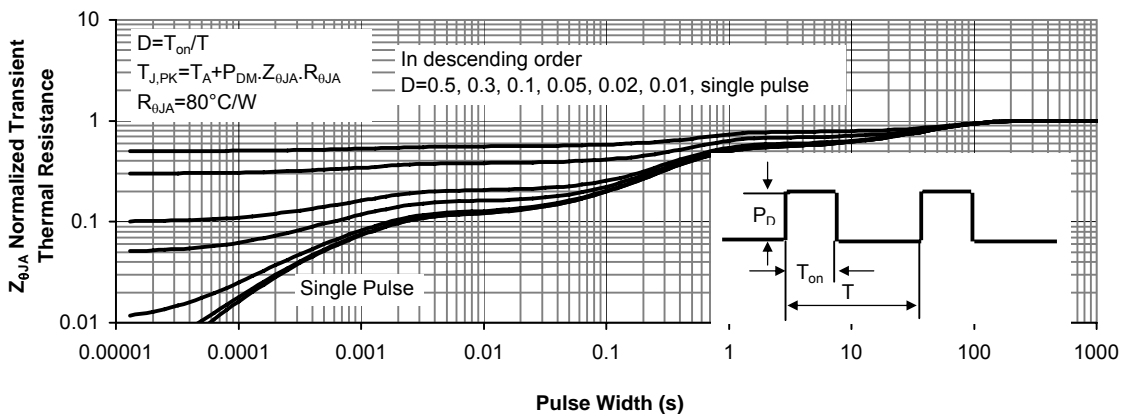


Figure 11: Normalized Maximum Transient Thermal Impedance