



**AO6414**

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

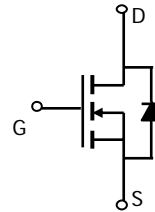
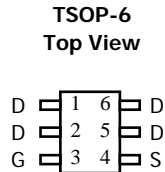


**General Description**

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



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

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

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =10mA, V <sub>GS</sub> =0V	55			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =44V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.002	1 5	μA
I <sub>GSS</sub>	Gate-Source leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.6	1.3	2	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	10			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =2.4A T <sub>J</sub> =125°C		125 175	160 210	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =1.5A		157	200	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =2.4A		11		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A		0.78	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				1.9	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz		214	300	pF
C <sub>oss</sub>	Output Capacitance			31		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			12.6		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.3	3	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =25V, I <sub>D</sub> =2.4A		2.6	3.3	nC
Q <sub>gs</sub>	Gate Source Charge			0.6		nC
Q <sub>gd</sub>	Gate Drain Charge			0.8		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =25V, R <sub>L</sub> =10.4Ω, R <sub>GEN</sub> =3Ω		2.3		ns
t <sub>r</sub>	Turn-On Rise Time			2.4		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			16.5		ns
t <sub>f</sub>	Turn-Off Fall Time			2		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =2.4A, dI/dt=100A/μs		20	30	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =2.4A, dI/dt=100A/μs		17		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

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

C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs 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<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

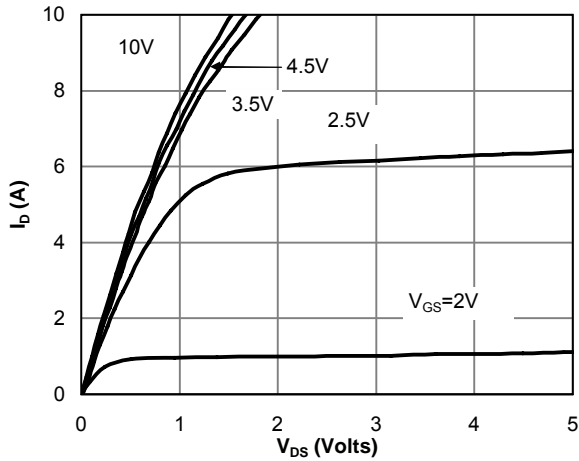


Fig 1: On-Region Characteristics

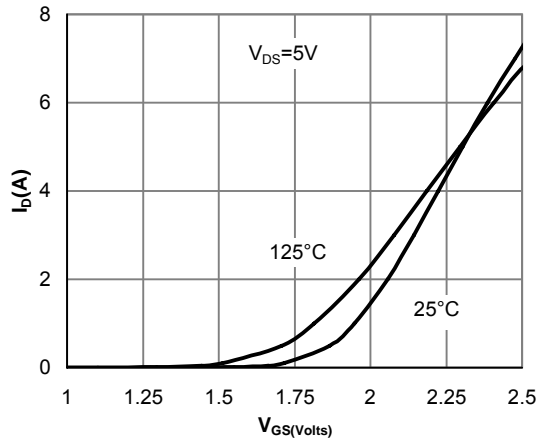


Figure 2: Transfer Characteristics

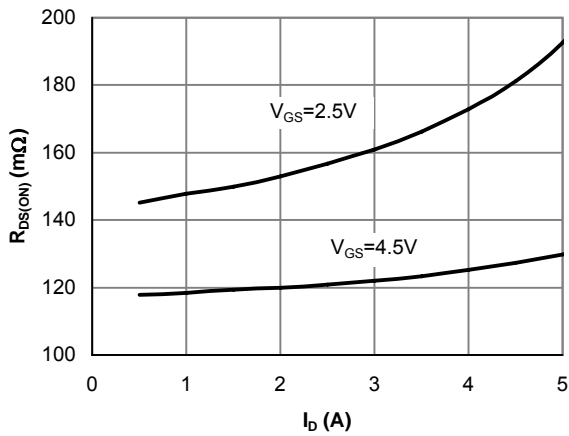


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

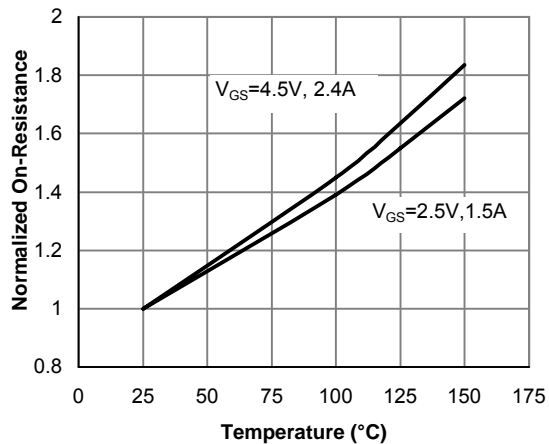


Figure 4: On-Resistance vs. Junction Temperature

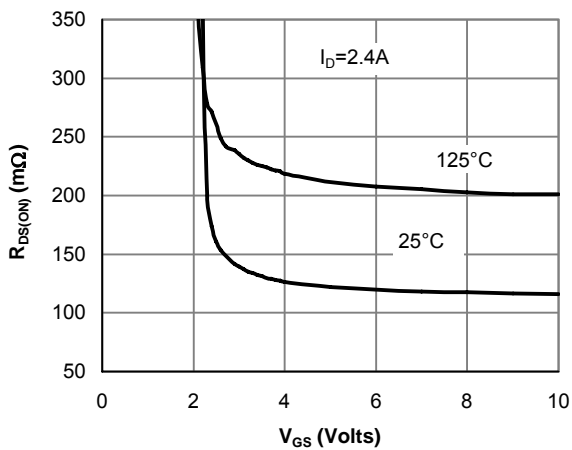


Figure 5: On-Resistance vs. Gate-Source Voltage

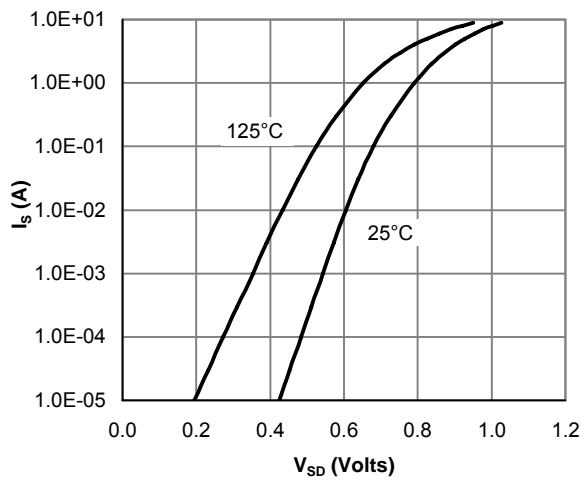


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

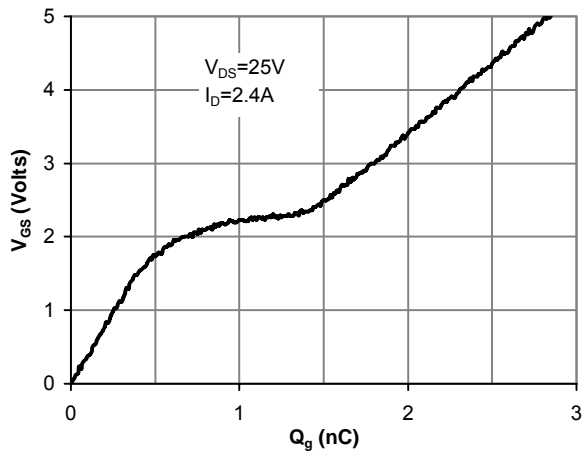


Figure 7: Gate-Charge Characteristics

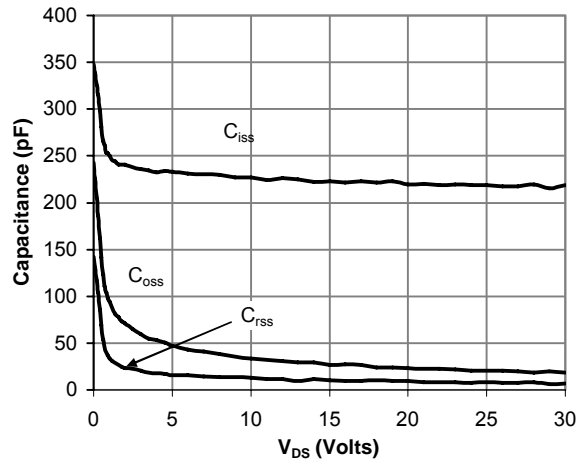


Figure 8: Capacitance Characteristics

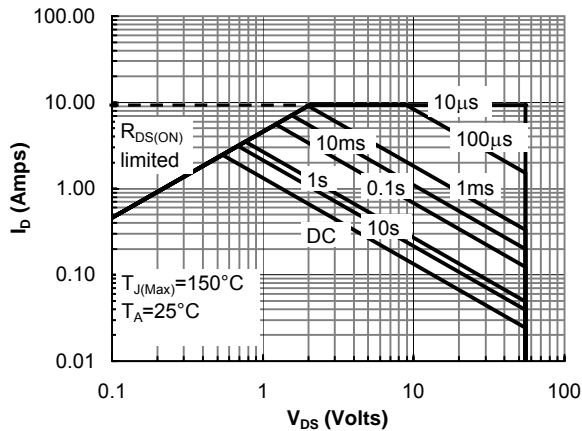


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

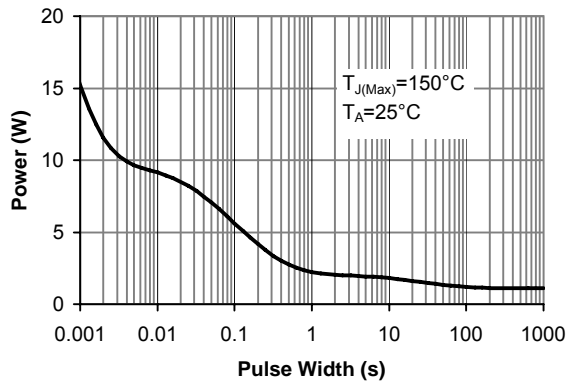


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

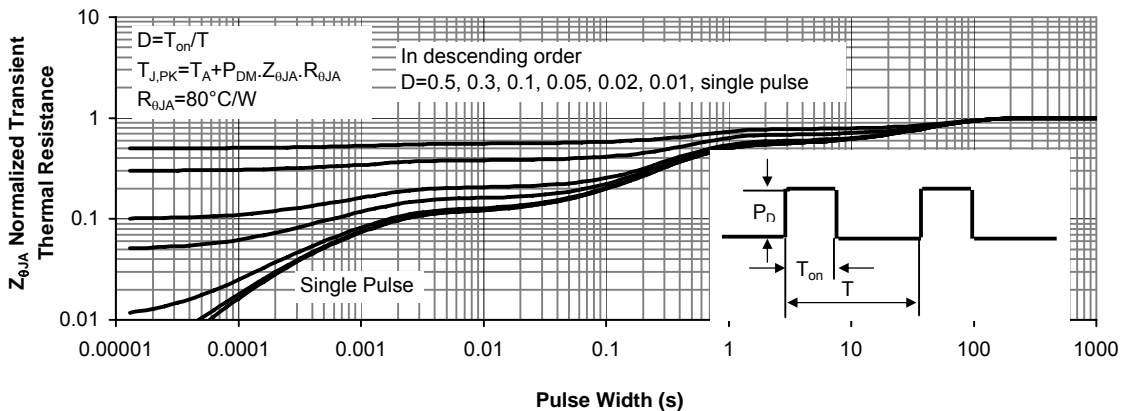


Figure 11: Normalized Maximum Transient Thermal Impedance