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# AO6414

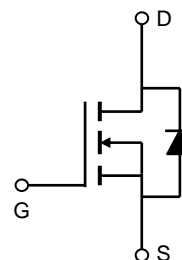
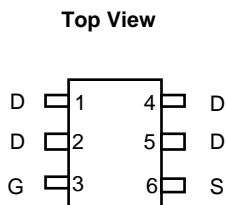
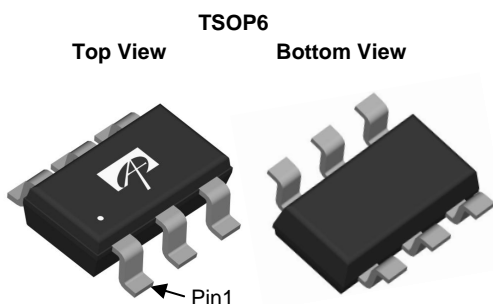
## 55V N-Channel MOSFET

### 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.

### Product Summary

$V_{DS}$  (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 $T_A=25^\circ\text{C}$ 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>	$I_D$	$T_A=25^\circ\text{C}$	2.3
		$T_A=70^\circ\text{C}$	1.9
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	9	A
Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	1.56
		$T_A=70^\circ\text{C}$	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 <sup>A</sup>	$R_{\theta JA}$	$t \leq 10\text{s}$	58	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	94	$^\circ\text{C/W}$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	37	50	$^\circ\text{C/W}$

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**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>riss</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 1 in<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 80 μs pulses, duty cycle 0.5% max.

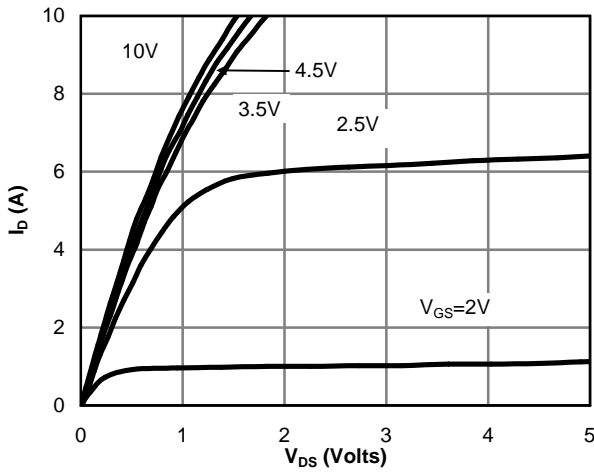
E. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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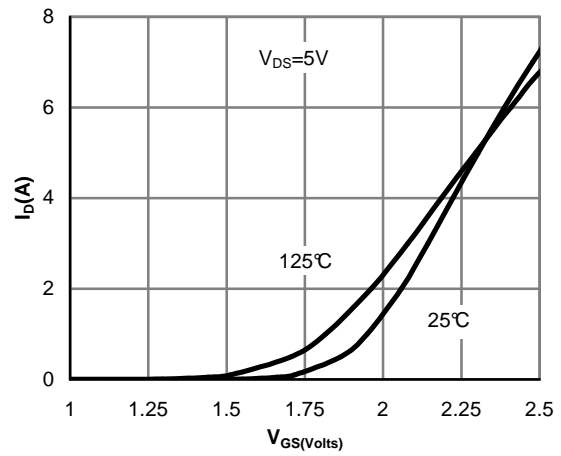
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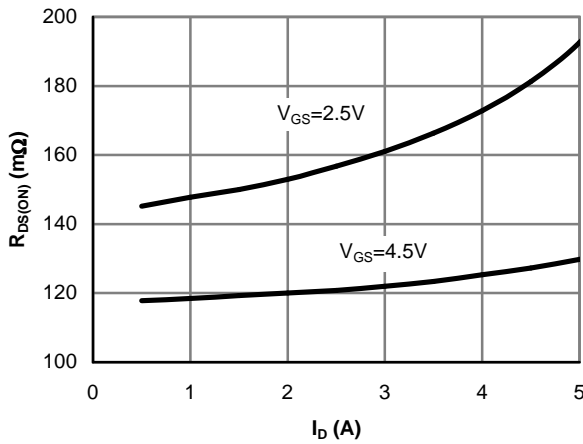
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



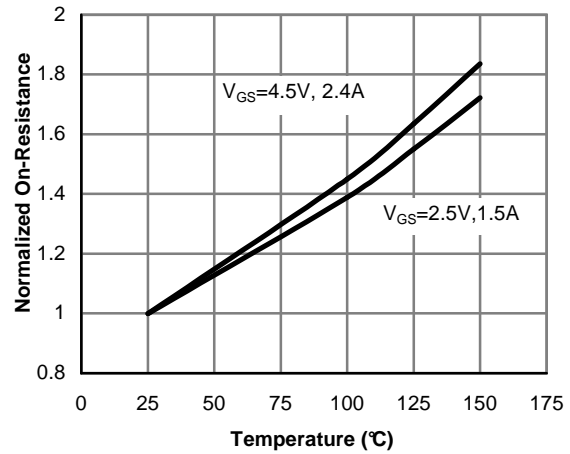
**Fig 1: On-Region Characteristics**



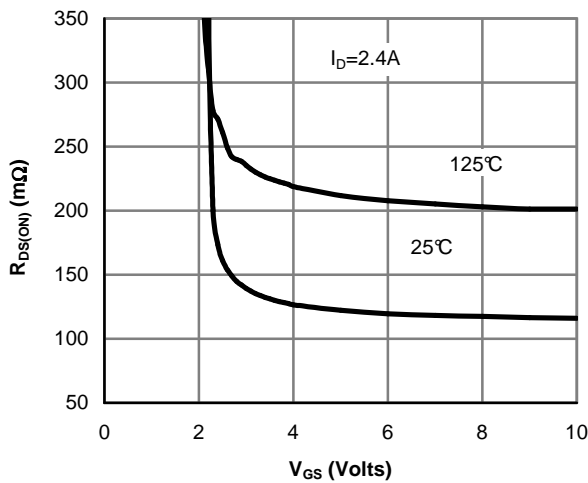
**Figure 2: Transfer Characteristics**



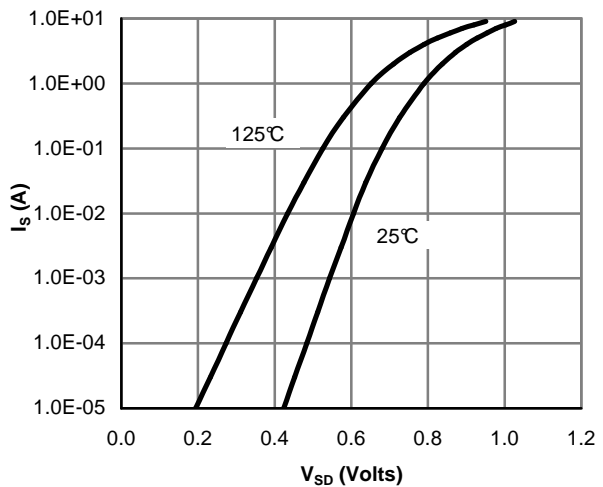
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**



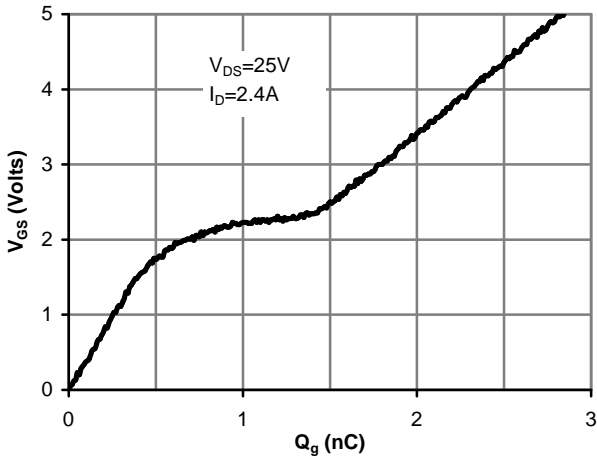
**Figure 5: On-Resistance vs. Gate-Source Voltage**



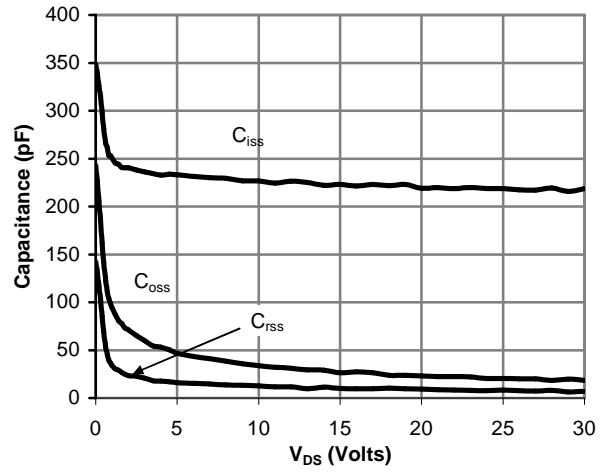
**Figure 6: Body-Diode Characteristics**

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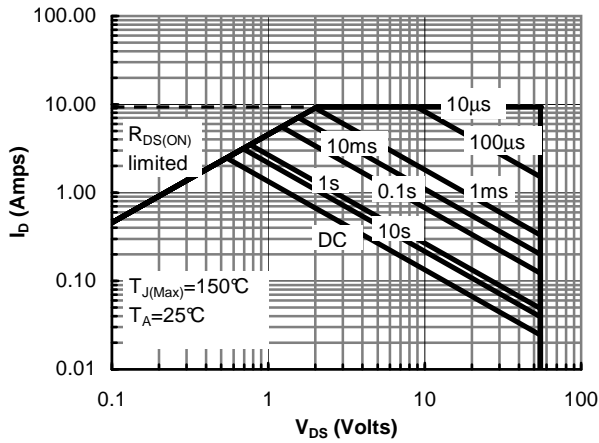
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



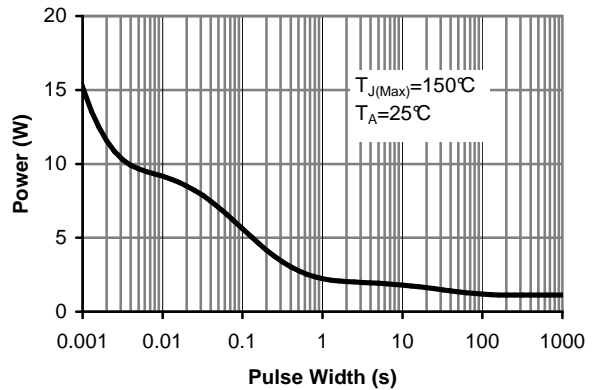
**Figure 7: Gate-Charge Characteristics**



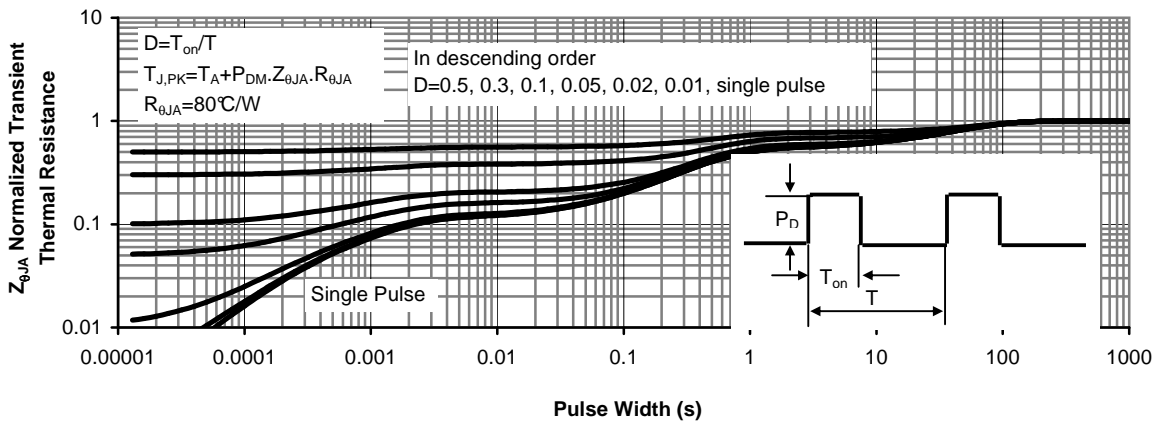
**Figure 8: Capacitance Characteristics**



**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**