ALPHA & OMEGA SEMICONDUCTOR

AO6424A
30V N-Channel MOSFET
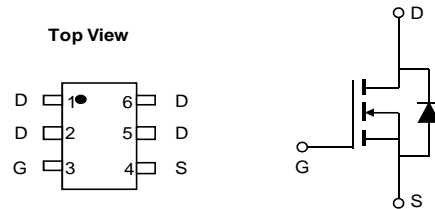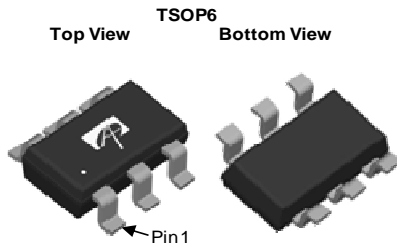
General Description

• Latest Trench Power MOSFET technology
• Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
• Low Gate Charge
• High Current Capability
• RoHS and Halogen-Free Compliant

Application

• System/Load Switch

Product Summary

V_{DS}	30V
I_D (at V_{GS}=10V)	6.5A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 35mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 48mΩ

Green Product

TSOP6

Top View   Bottom View

Top View

D □ 1● 6 □ D
D □ 2 5 □ D
G □ 3 4 □ S

Pin 1

Orderable Part Number	Package Type	Form	Minimum Order Quantity
AO6424A	TSOP-6	Tape & Reel	3000

Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	30	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_A=25℃	I_D	6.5	A
	T_A=70℃		5	
Pulsed Drain Current [C]		I_{DM}	27	
Power Dissipation [B]	T_A=25℃	P_D	2.5	W
	T_A=70℃		1.5	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	42	50	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		68	85	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	23	30	℃/W

Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	ID=250µA, VGS=0V		30			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=30V, V$_{GS}$=0V				1	µA
			T$_J$=55℃			5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$=±20V				±100	nA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS,}$ I$_D$=250µA		1.2	1.8	2.4	V
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=5A			29	35	mΩ
			T$_J$=125℃		44	53	
		V$_{GS}$=4.5V, I$_D$=4A			38	48	mΩ
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=5A			8		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.76	1	V
I$_S$	Maximum Body-Diode Continuous Current					3	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz			270		pF
C$_{oss}$	Output Capacitance				50		pF
C$_{rss}$	Reverse Transfer Capacitance				35		pF
R$_g$	Gate resistance	f=1MHz		1.4	2.8	4.2	Ω
SWITCHING PARAMETERS							
Q$_g$(10V)	Total Gate Charge	V$_{GS}$=10V, V$_{DS}$=15V, I$_D$=5A			6.3	12	nC
Q$_g$(4.5V)	Total Gate Charge				3.2	8	nC
Q$_{gs}$	Gate Source Charge				0.65		nC
Q$_{gd}$	Gate Drain Charge				1.75		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=3Ω, R$_{GEN}$=3Ω			3		ns
t$_r$	Turn-On Rise Time				2.5		ns
t$_{D(off)}$	Turn-Off DelayTime				17.5		ns
t$_f$	Turn-Off Fall Time				2.5		ns
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=5A, dI/dt=100A/µs			10		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=5A, dI/dt=100A/µs			2.3		nC

A. The value of R$_{θJA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T$_A$ =25° C. The value in any given application depends on the user's specific board design.
B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150° C, using ⩽ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25° C.
D. The R$_{θJA}$ is the sum of the thermal impedance from junction to lead R$_{θJL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T$_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

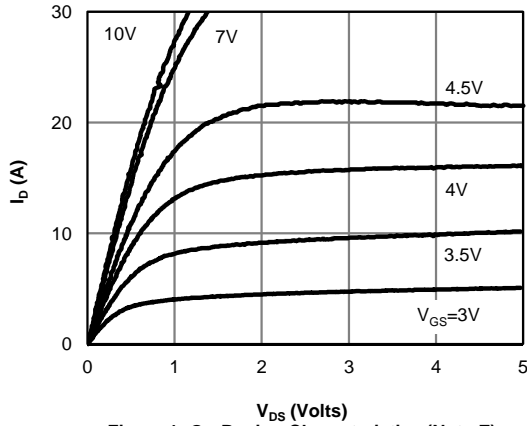## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

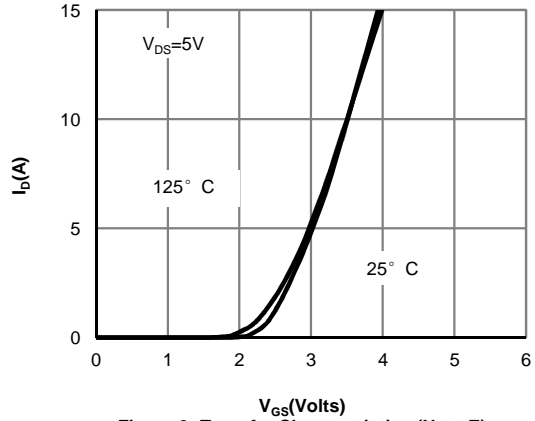

Figure 1: On-Region Characteristics (Note E)

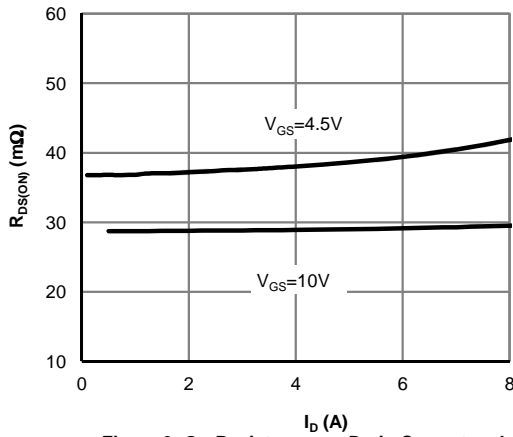Figure 2: Transfer Characteristics (Note E)

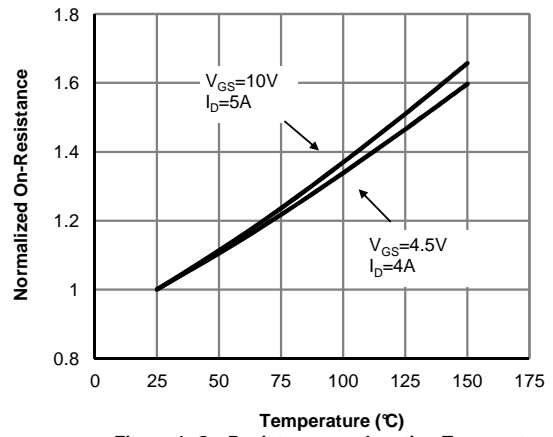Figure 3: On-Resistance vs. Drain Current and Gate
Voltage (Note E)

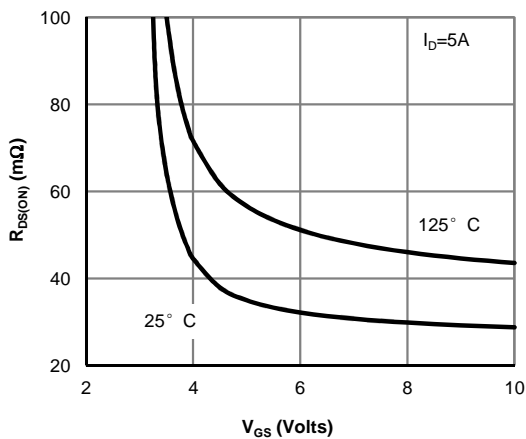Figure 4: On-Resistance vs. Junction Temperature
(Note E)

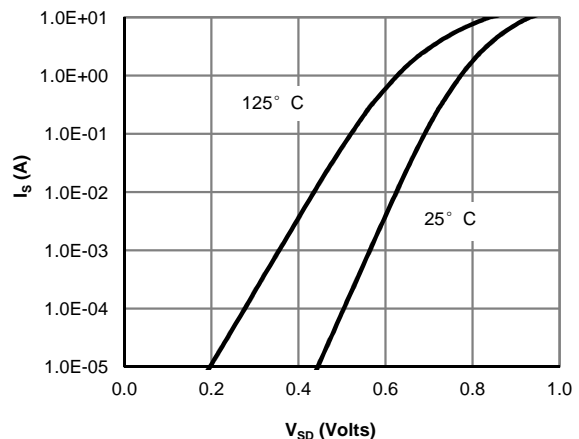Figure 5: On-Resistance vs. Gate-Source Voltage
(Note E)

Figure 6: Body-Diode Characteristics (Note E)
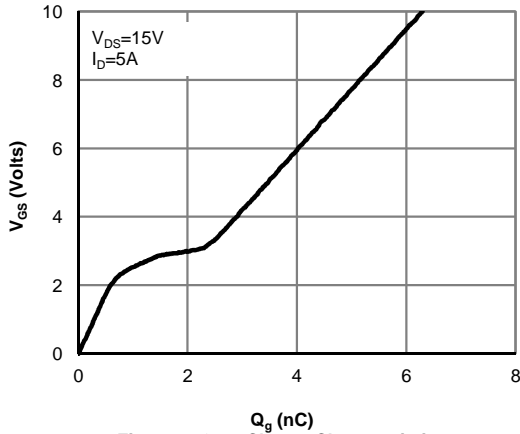
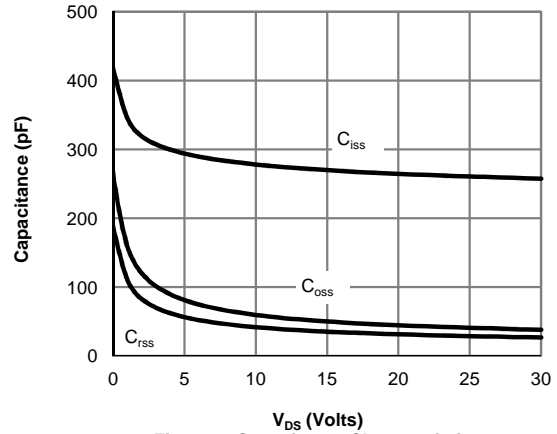## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics
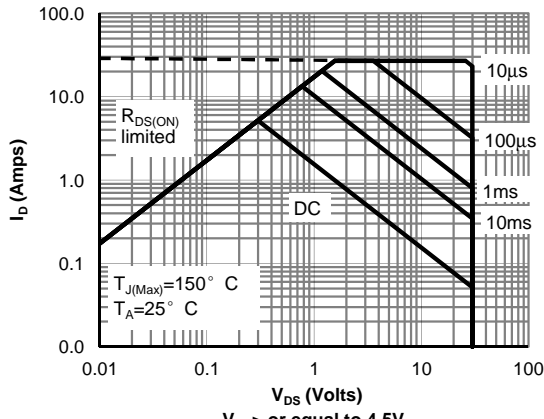
V_{GS}> or equal to 4.5V
Figure 9: Maximum Forward Biased Safe
Operating Area (Note F)
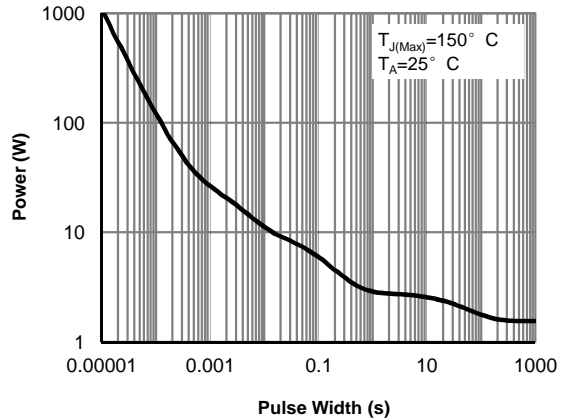
Figure 10: Single Pulse Power Rating Junction-to-
Ambient (Note F)
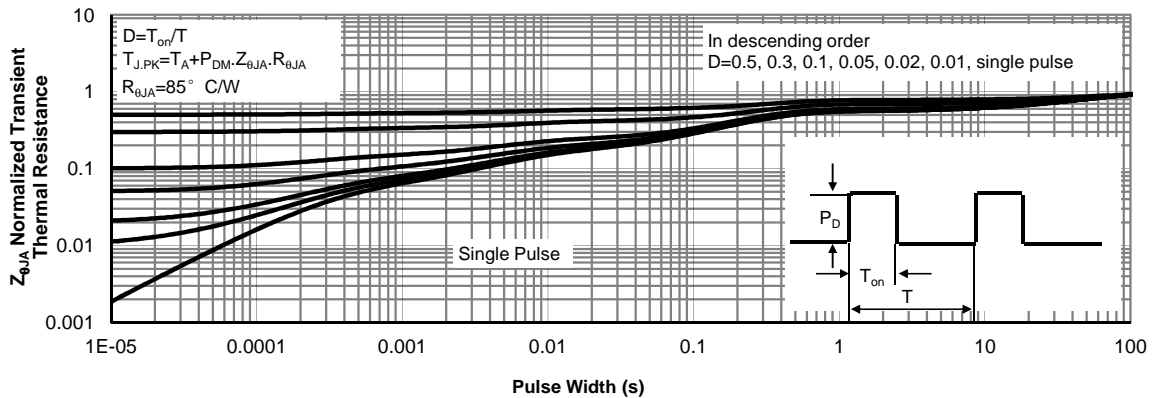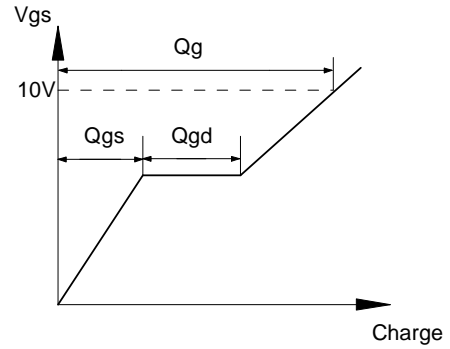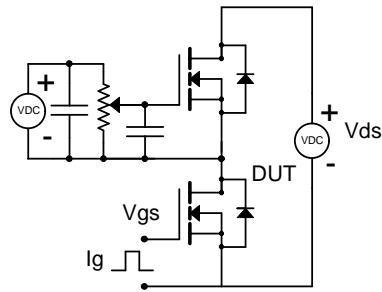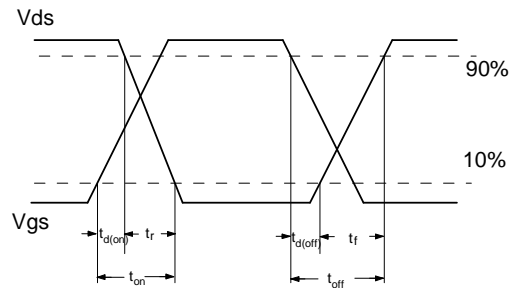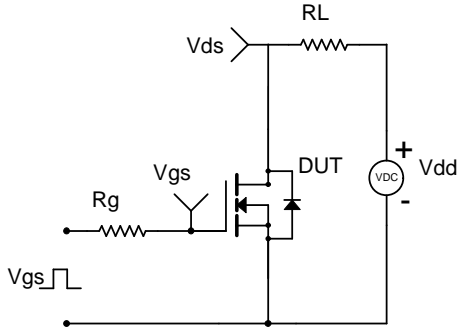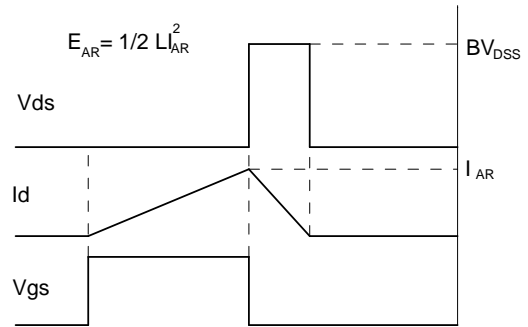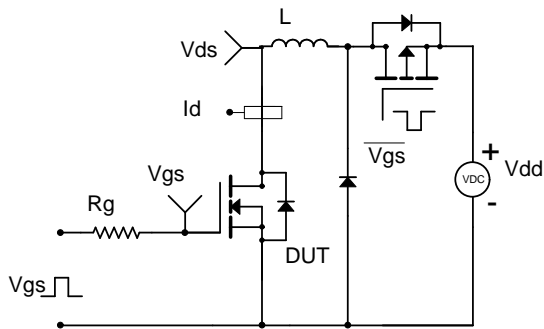

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)
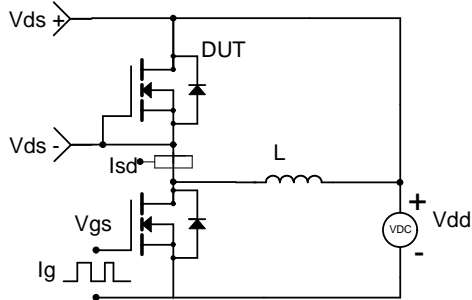
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$E_{AR} = 1/2 \ LI_{AR}^2$

Diode Recovery Test Circuit & Waveforms

$Q_{rr} = -\int Idt$
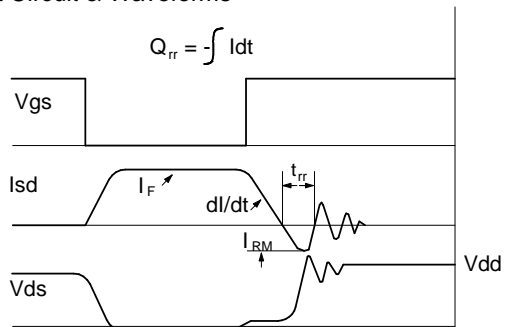
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