



ALPHA & OMEGA
SEMICONDUCTOR

AO7412

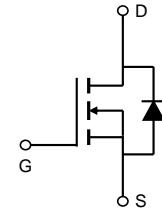
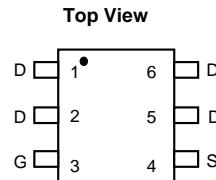
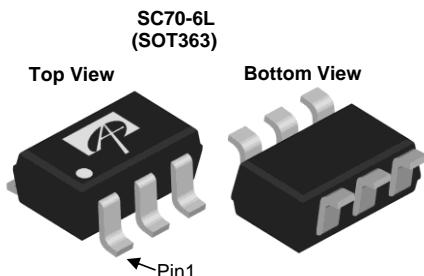
30V N-Channel MOSFET

General Description

The AO7412 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V, in the small SOT323 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters.

Product Summary

V_{DS}	30V
I_D (at $V_{GS}=10V$)	1.7A
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 55mΩ
$R_{DS(ON)}$ (at $V_{GS} = 4.5V$)	< 65mΩ
$R_{DS(ON)}$ (at $V_{GS} = 2.5V$)	< 85mΩ



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^A	I_D	1.7	A
$T_A=70^\circ C$		1.3	
Pulsed Drain Current ^C	I_{DM}	15	
$T_A=25^\circ C$	P_D	0.35	W
$T_A=70^\circ C$		0.22	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A $t \leq 10s$	$R_{\theta JA}$	300	360	°C/W
Maximum Junction-to-Ambient ^{A,D} Steady-State		340	425	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	280	320

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	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$			± 100	nA
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	0.5	1	1.5	V
$I_{D(\text{ON})}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	15			A
$R_{DS(\text{ON})}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=1.7\text{A}$ $T_J=125^\circ\text{C}$	45	55		$\text{m}\Omega$
		$V_{GS}=4.5\text{V}, I_D=1.5\text{A}$	70	84		
		$V_{GS}=2.5\text{V}, I_D=1\text{A}$	50	65		
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}, I_D=3.6\text{A}$	61	85		$\text{m}\Omega$
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$	14			S
I_S	Maximum Body-Diode Continuous Current		0.75	1	1.5	V
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$	185	235	285	pF
C_{oss}	Output Capacitance		25	35	45	pF
C_{rss}	Reverse Transfer Capacitance		10	18	25	pF
R_g	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	2.1	4.3	6.5	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=4\text{A}$		10	12	nC
$Q_g(4.5\text{V})$	Total Gate Charge			4.7		nC
Q_{gs}	Gate Source Charge			0.95		nC
Q_{gd}	Gate Drain Charge			1.6		nC
$t_{D(\text{on})}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=3.75\Omega, R_{\text{GEN}}=3\Omega$		3.5		ns
t_r	Turn-On Rise Time			1.5		ns
$t_{D(\text{off})}$	Turn-Off Delay Time			17.5		ns
t_f	Turn-Off Fall Time			2.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=4\text{A}, dI/dt=100\text{A}/\mu\text{s}$		8.5	11	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=4\text{A}, dI/dt=100\text{A}/\mu\text{s}$		2.6	3.5	nC

A. The value of R_{JJA} 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.

B. The power dissipation P_D is based on $T_{J(\text{MAX})}=150^\circ\text{C}$, using $\leq 10\text{s}$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(\text{MAX})}=150^\circ\text{C}$. Ratings are based on low frequency and duty cycles to keep initial $T_J=25^\circ\text{C}$.

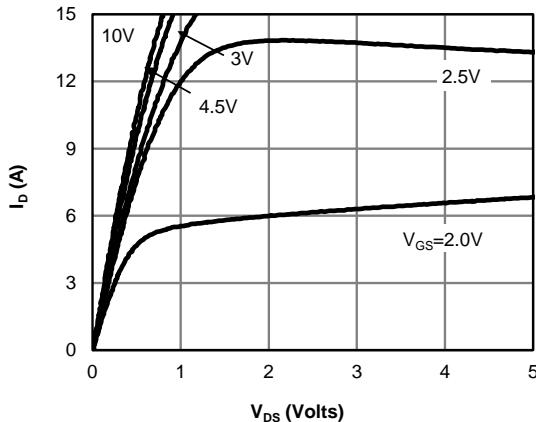
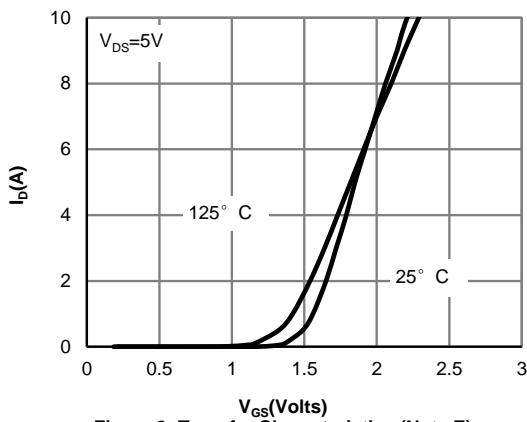
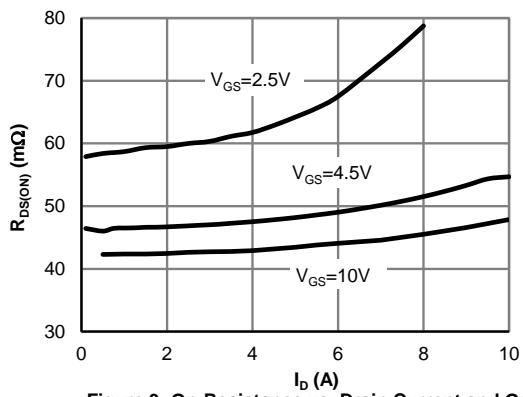
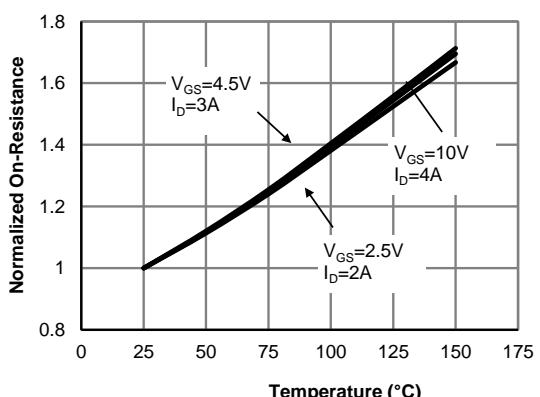
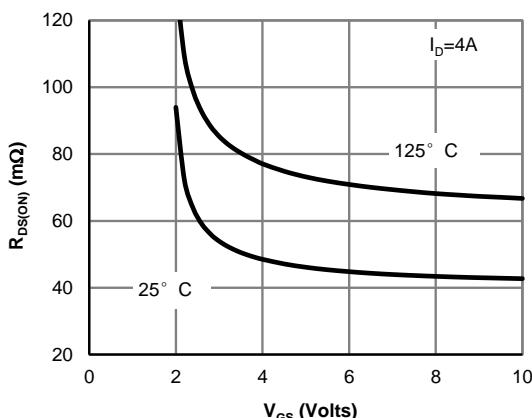
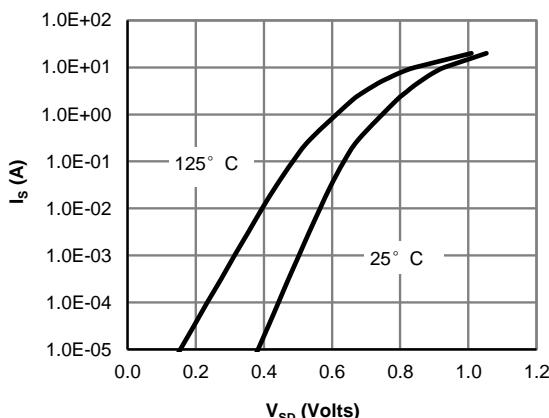
D. The R_{JJA} is the sum of the thermal impedance from junction to lead R_{JL} and lead to ambient.

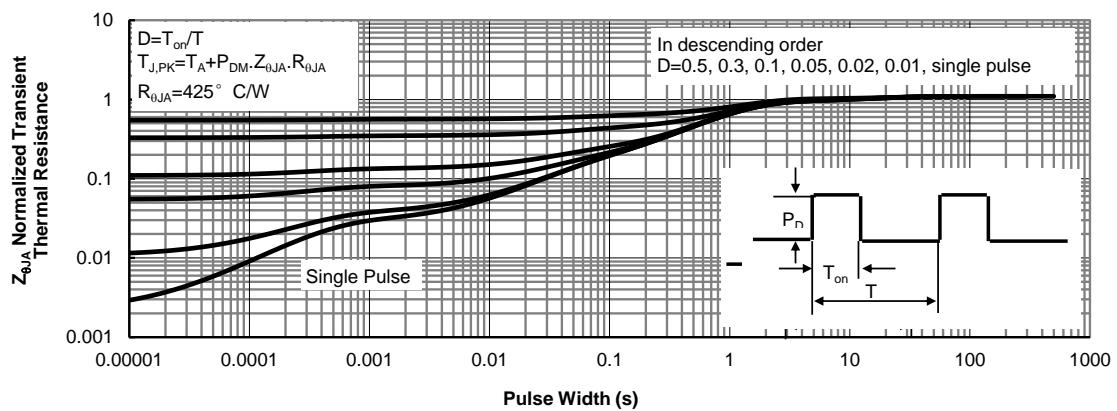
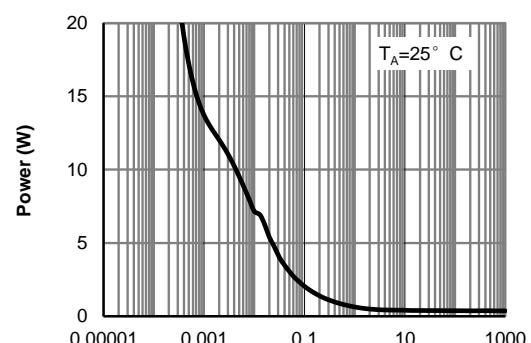
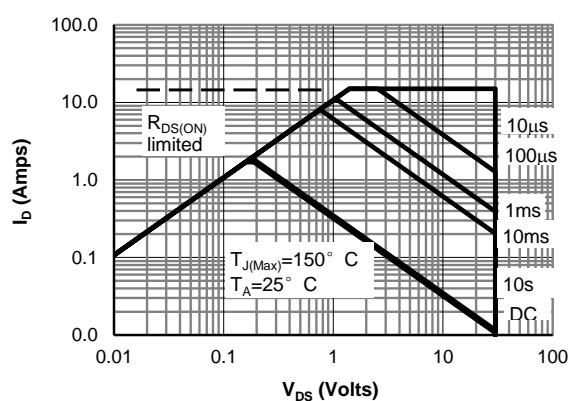
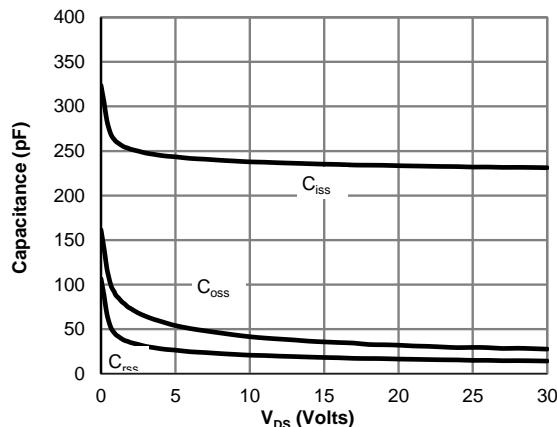
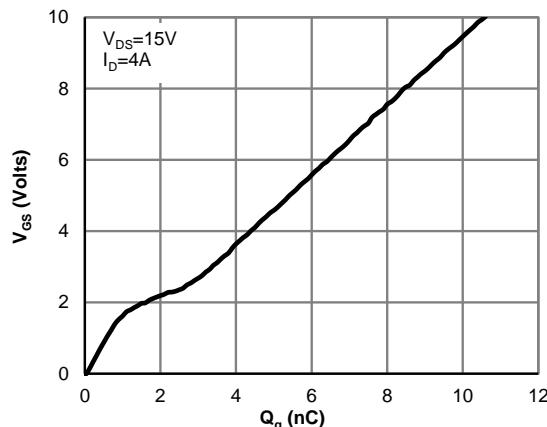
E. The static characteristics in Figures 1 to 6 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

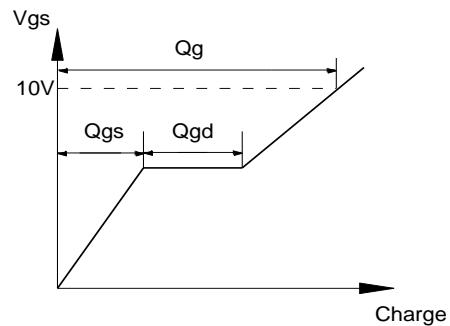
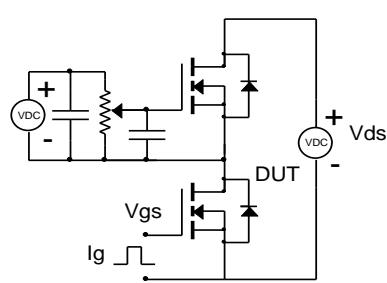
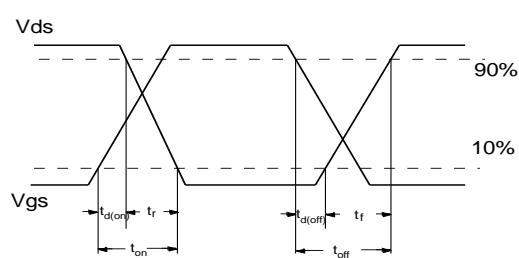
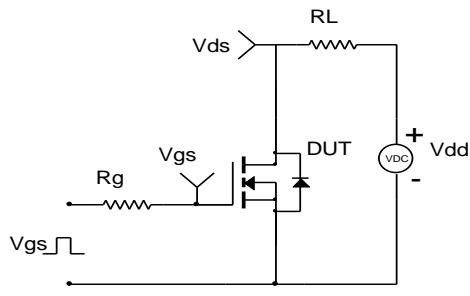
F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(\text{MAX})}=150^\circ\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Fig 1: On-Region Characteristics (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


Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Diode Recovery Test Circuit & Waveforms
