



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AO7410**

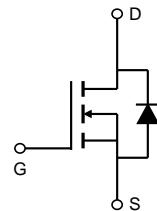
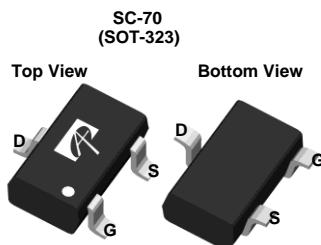
**30V N-Channel MOSFET**

### General Description

The AO7410 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , very low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications.

### 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	$V_{GS}$	$\pm 12$	V
Continuous Drain Current	$I_D$	1.7	A
$T_A=70^\circ C$		1.3	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	15	
Power Dissipation <sup>B</sup>	$P_D$	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 <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	300	360	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup> 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
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	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	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$			$\pm 100$	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
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	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	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	0.9	1.8	2.7	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	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  $R_{\text{on,JA}}$  is measured with the device mounted on 1in<sup>2</sup> 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  $T_J=25^\circ\text{C}$ .

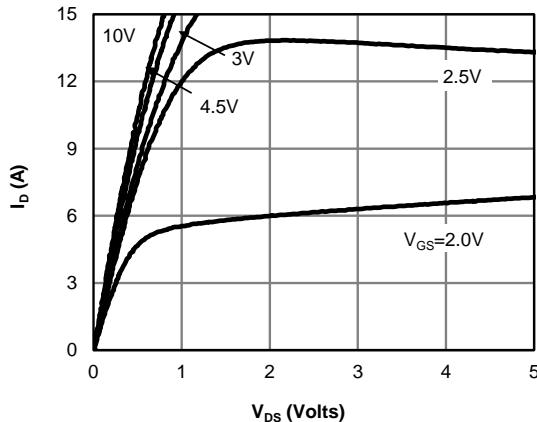
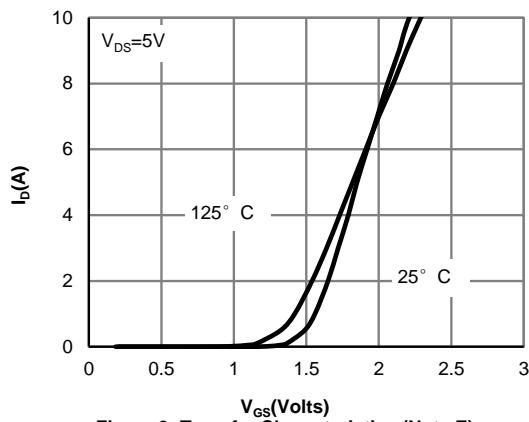
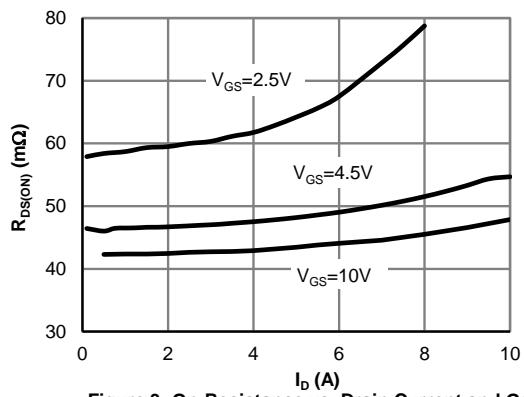
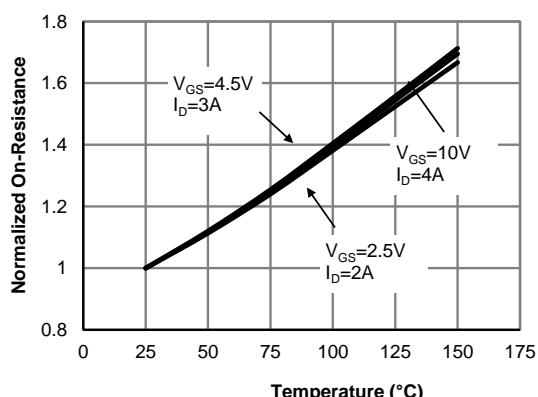
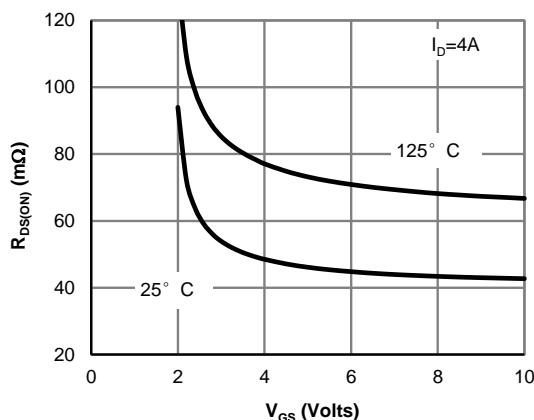
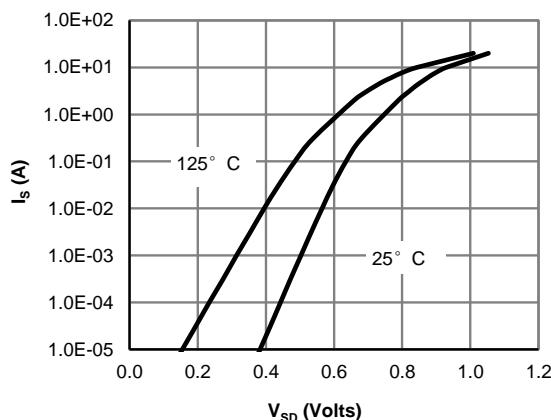
D. The  $R_{\text{on,JA}}$  is the sum of the thermal impedance from junction to lead  $R_{\text{on,UL}}$  and lead to ambient.

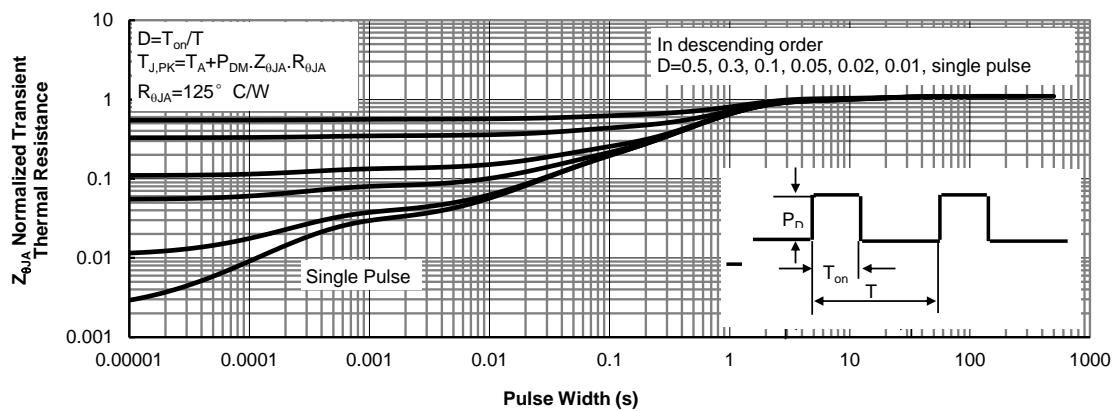
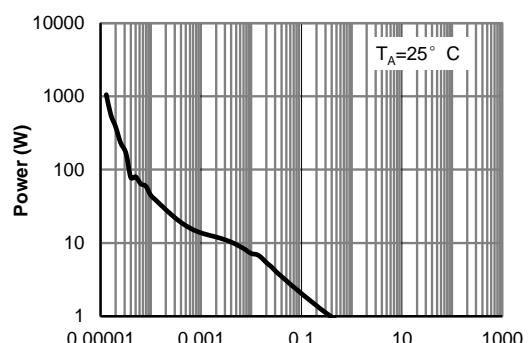
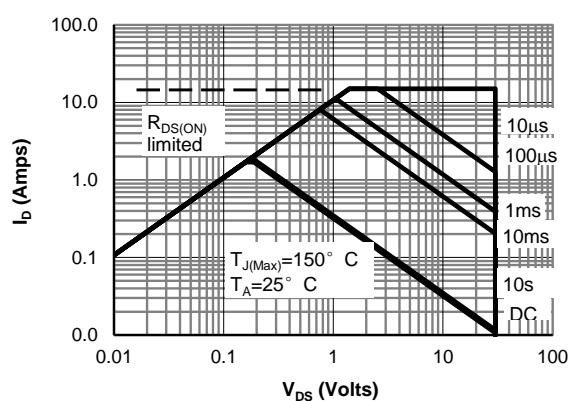
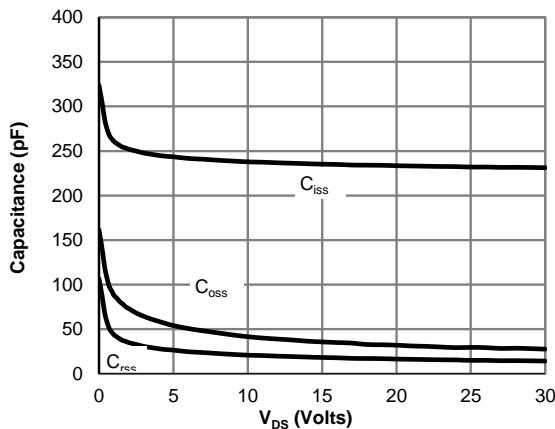
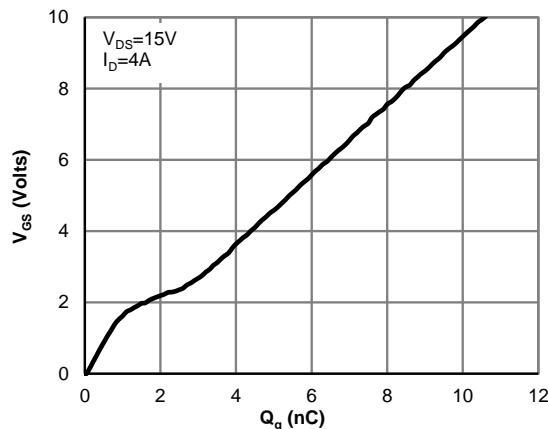
E. The static characteristics in Figures 1 to 6 are obtained using  $<300\mu\text{s}$  pulses, duty cycle 0.5% max.

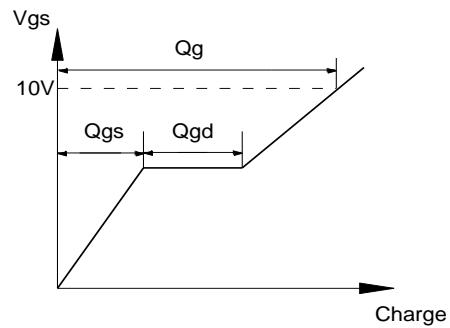
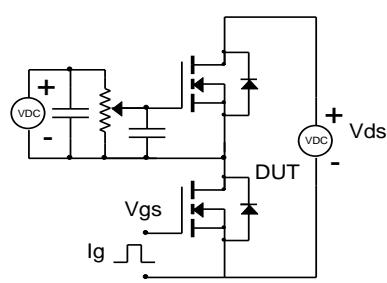
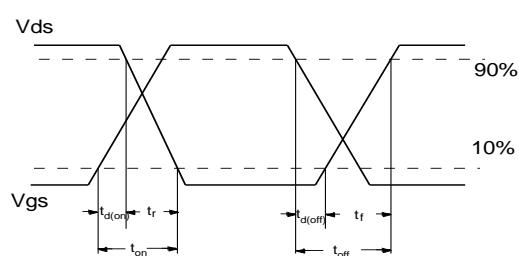
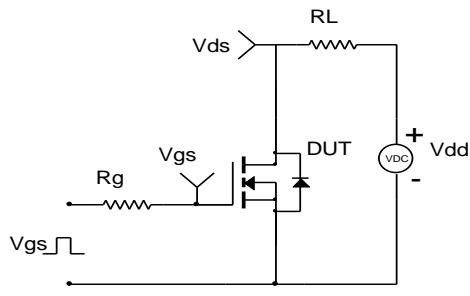
F. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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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**
