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[Alpha & Omega Semiconductor Inc.](#)
[AO7401](#)

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AO7401

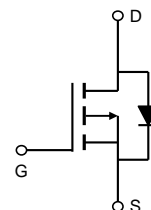
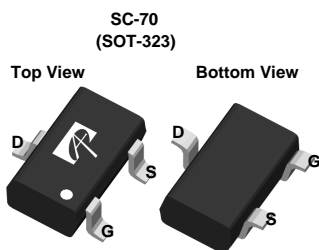
30V P-Channel MOSFET

General Description

The AO7401 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 SOT363 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 $V_{GS}=-10V$)	-1.4A
$R_{DS(ON)}$ (at $V_{GS}=-10V$)	< 115mΩ
$R_{DS(ON)}$ (at $V_{GS}=-4.5V$)	< 140mΩ
$R_{DS(ON)}$ (at $V_{GS}=-2.5V$)	< 200mΩ



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	I_D	$T_A=25^\circ C$	-1.4
		$T_A=70^\circ C$	-1.0
Pulsed Drain Current ^C	I_{DM}	-10	A
Power Dissipation ^B	P_D	$T_A=25^\circ C$	0.35
		$T_A=70^\circ C$	0.22
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 ^A	$R_{\theta JA}$	300	360	$^\circ C/W$
Maximum Junction-to-Ambient ^{A,D}				
Maximum Junction-to-Lead	$R_{\theta JL}$	280	320	$^\circ C/W$

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =-250μA, V _{GS} =0V	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-30V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±12V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-0.6	-1	-1.4	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	-10			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-1.4A T _J =125°C		92.5 130	115 160	mΩ
		V _{GS} =-4.5V, I _D =-1.2A		110	140	mΩ
		V _{GS} =-2.5V, I _D =-1A		150	200	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-1.4A		6		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.78	-1	V
I _S	Maximum Body-Diode Continuous Current				-0.5	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		260	315	pF
C _{oss}	Output Capacitance			37		pF
C _{rss}	Reverse Transfer Capacitance			20		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	4	8	12	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-1.4A		5.9	7.2	nC
Q _{g(4.5V)}	Total Gate Charge			2.8	3.5	nC
Q _{gs}	Gate Source Charge			0.7		nC
Q _{gd}	Gate Drain Charge			1		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =10Ω, R _{GEN} =3Ω		6		ns
t _r	Turn-On Rise Time			3.5		ns
t _{D(off)}	Turn-Off DelayTime			20		ns
t _f	Turn-Off Fall Time			5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-1.4A, di/dt=100A/μs		11.5	15	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-1.4A, di/dt=100A/μs		4.5		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 initial T_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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

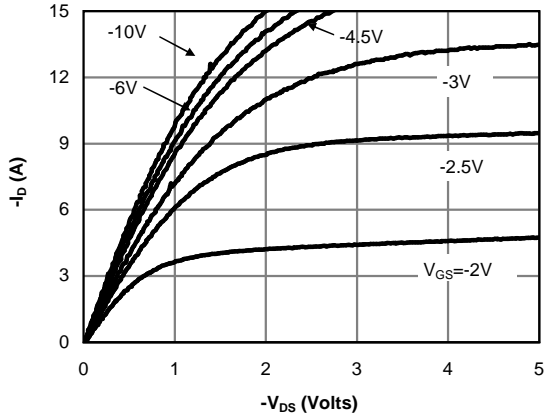


Figure 1: On-Region Characteristics (Note E)

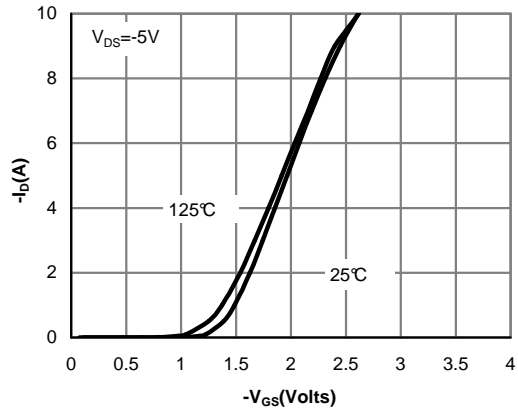


Figure 2: Transfer Characteristics (Note E)

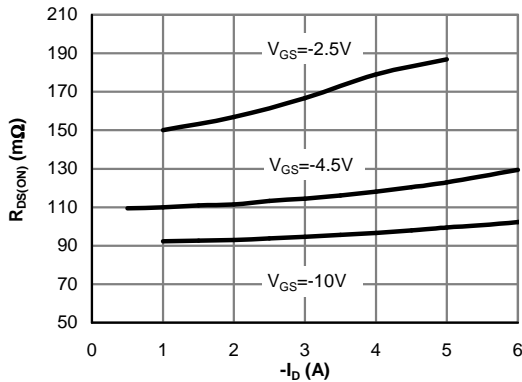


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

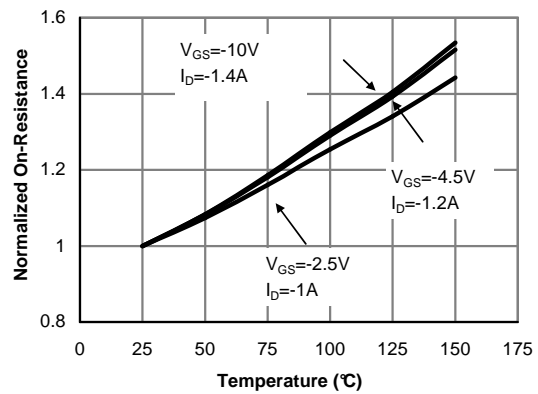


Figure 4: On-Resistance vs. Junction Temperature (Note E)

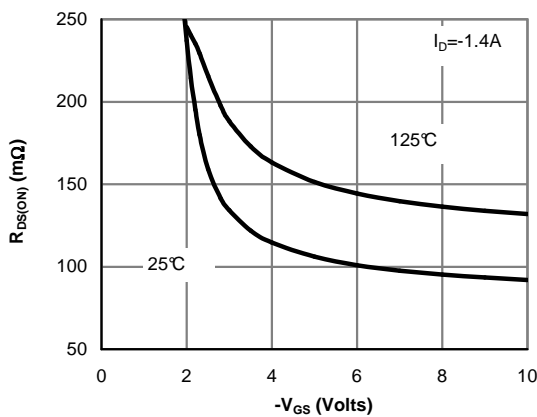


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

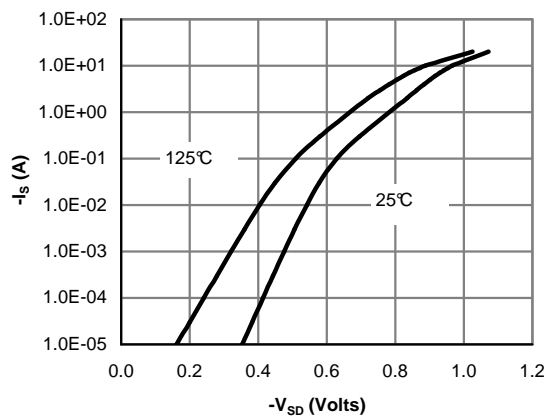


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

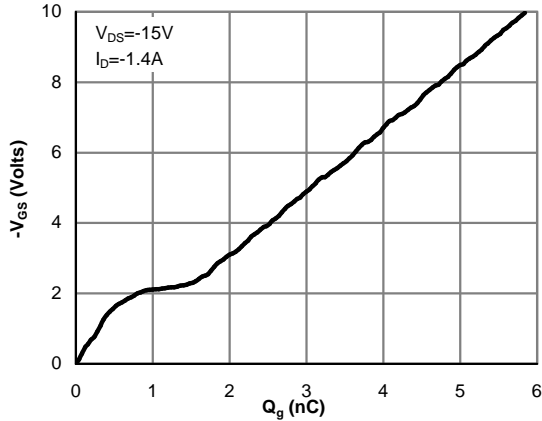


Figure 7: Gate-Charge Characteristics

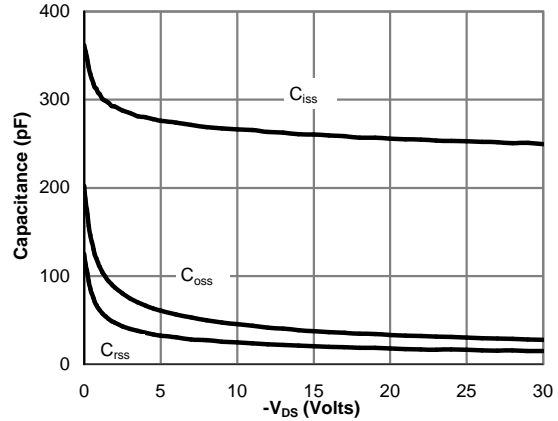


Figure 8: Capacitance Characteristics

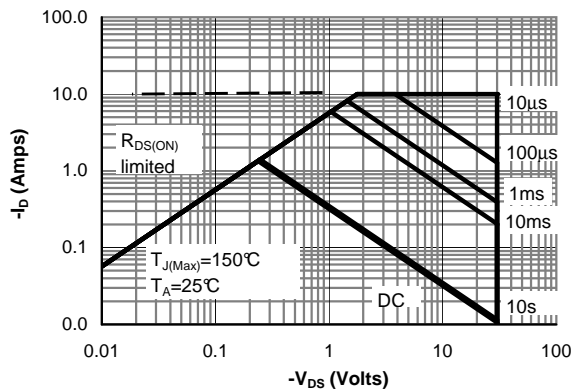


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

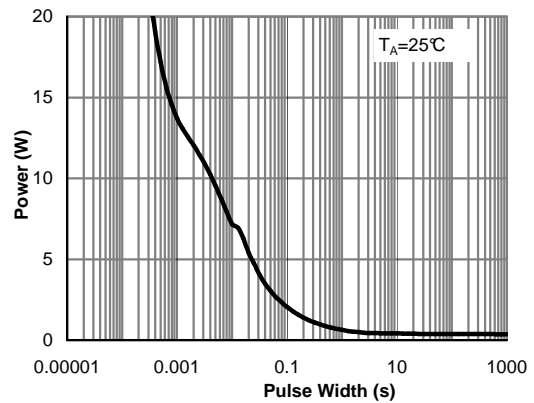


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

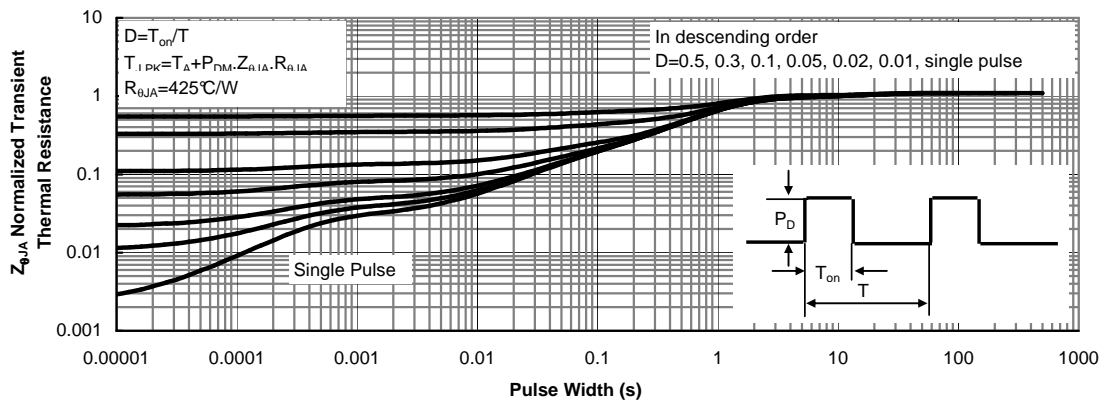
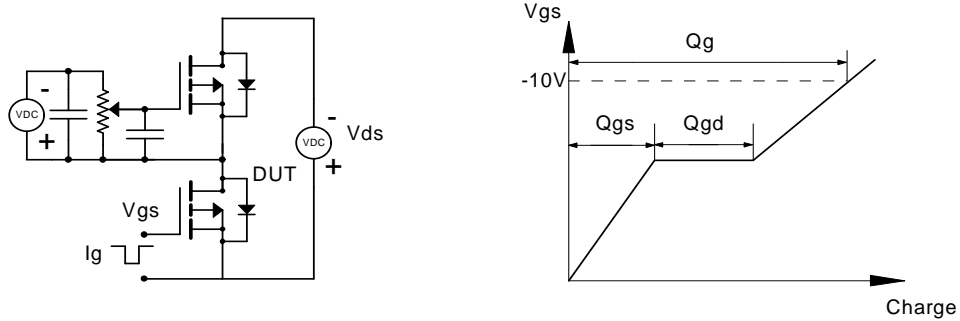
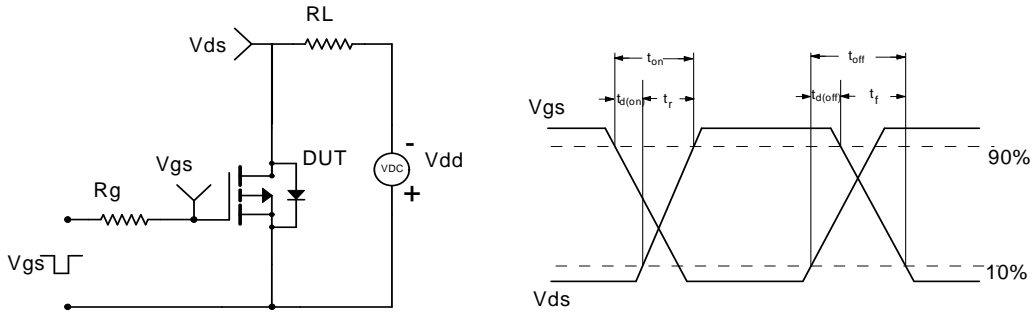


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

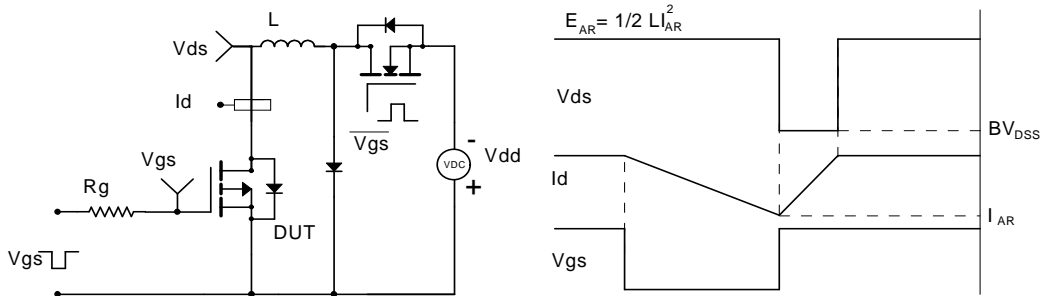
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

