



ALPHA & OMEGA
SEMICONDUCTOR, INC.

Nov 2002

AO7401

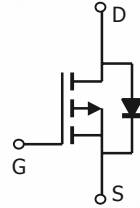
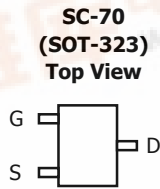
P-Channel Enhancement Mode Field Effect Transistor

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 SOT323 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters.

Features

- $V_{DS} (V) = -30V$
- $I_D = -1.2A$
- $R_{DS(ON)} < 150m\Omega (V_{GS} = -10V)$
- $R_{DS(ON)} < 200m\Omega (V_{GS} = -4.5V)$
- $R_{DS(ON)} < 280m\Omega (V_{GS} = -2.5V)$



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	$T_A=25^\circ C$	-1.2
		$T_A=70^\circ C$	-1.0
Pulsed Drain Current ^B	I_{DM}	-10	A
Power Dissipation ^A	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		Steady-State	350	425
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	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} =-24V, 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} =-4.5V, V _{DS} =-5V	-10			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-1.2A T _J =125°C		122 173	150 220	mΩ
		V _{GS} =-4.5V, I _D =-1.2A		147	200	mΩ
		V _{GS} =-2.5V, I _D =-1A		207	280	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-1.2A	3	4.5		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.85	-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		409		pF
C _{oss}	Output Capacitance			55		pF
C _{rss}	Reverse Transfer Capacitance			42		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-15V, I _D =-1A		5.06		nC
Q _{gs}	Gate Source Charge			0.72		nC
Q _{gd}	Gate Drain Charge			1.58		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =15Ω, R _{GEN} =3Ω		6.2		ns
t _r	Turn-On Rise Time			3.2		ns
t _{D(off)}	Turn-Off DelayTime			41.2		ns
t _f	Turn-Off Fall Time			14.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-1A, dI/dt=100A/μs		13.2		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-1A, dI/dt=100A/μs		5.4		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 a given application depends on the user's specific board design. The current rating is based on the t_s ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80μs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

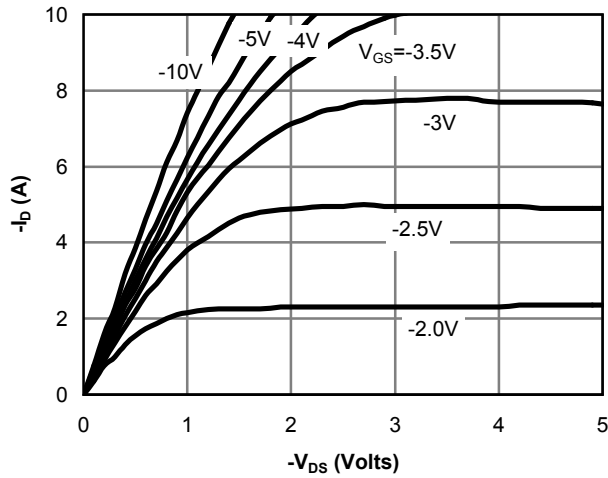


Fig 1: On-Region Characteristics

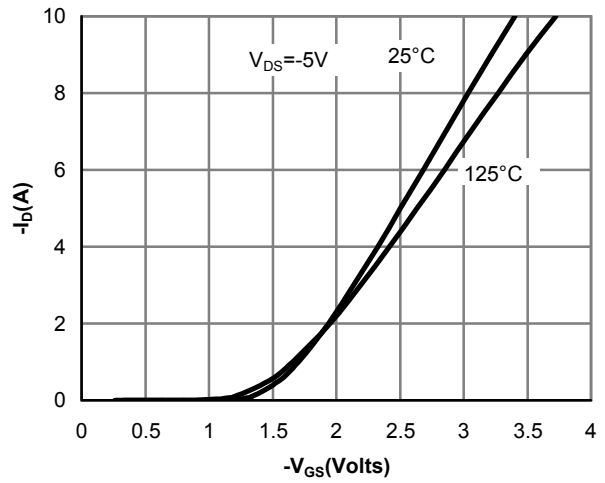


Figure 2: Transfer Characteristics

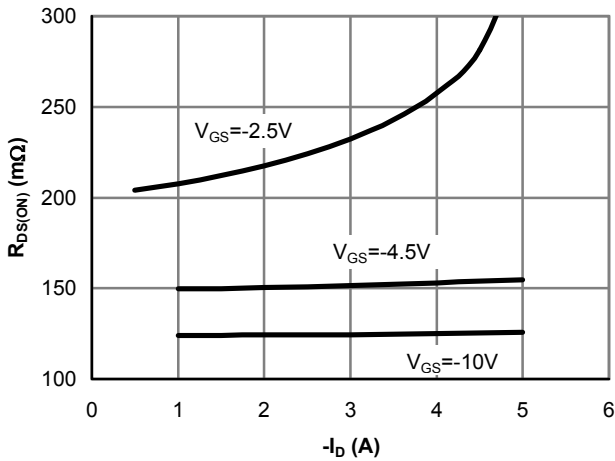


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

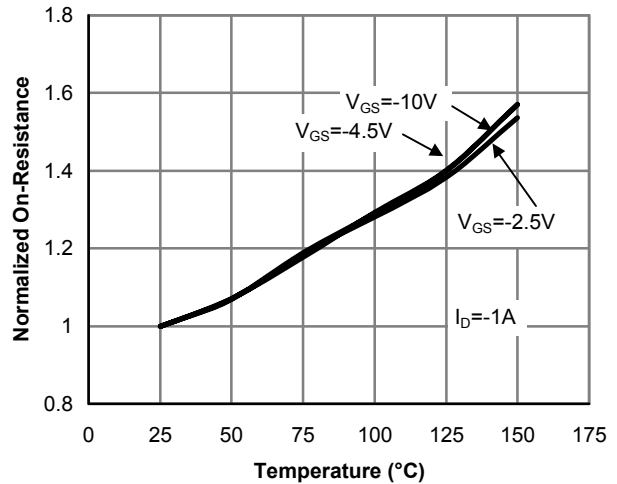


Figure 4: On-Resistance vs. Junction Temperature

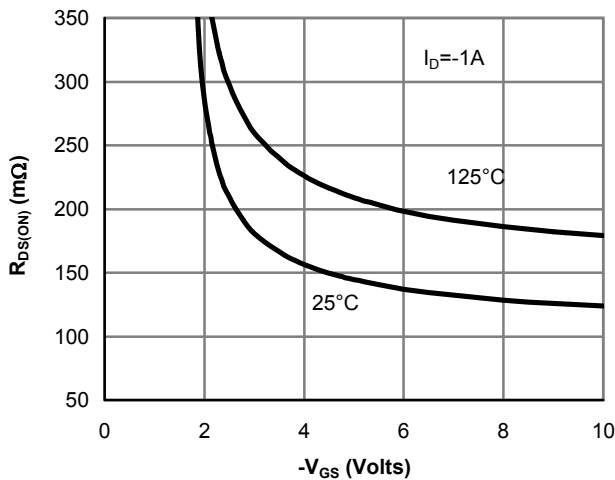


Figure 5: On-Resistance vs. Gate-Source Voltage

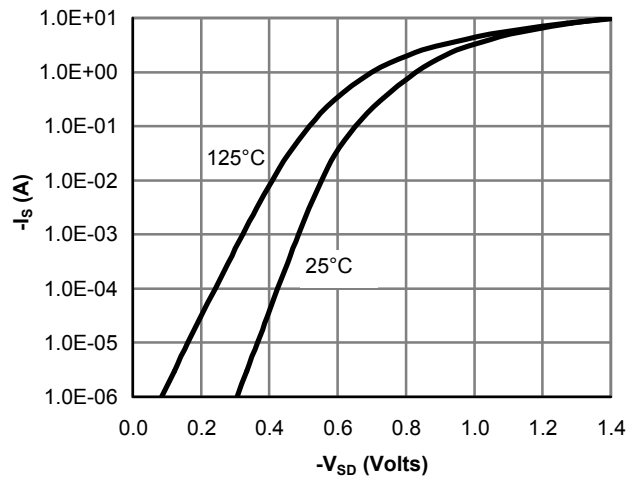


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

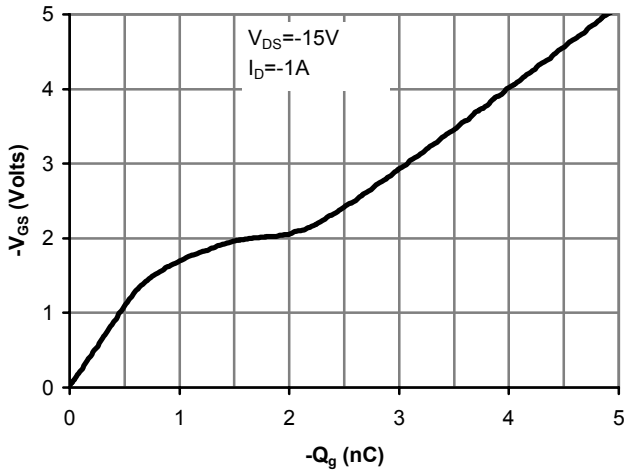


Figure 7: Gate-Charge Characteristics

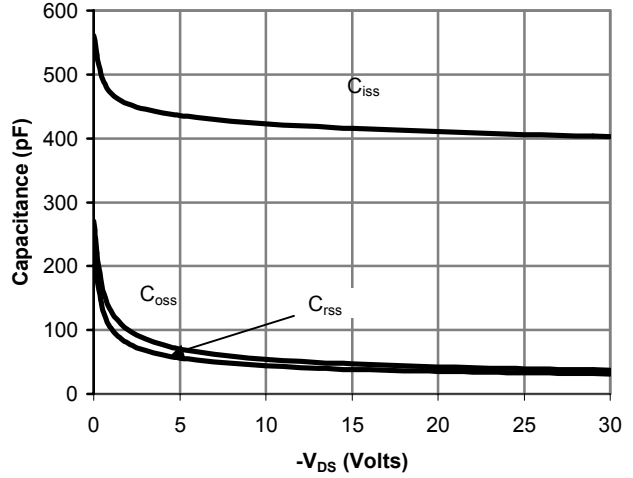


Figure 8: Capacitance Characteristics

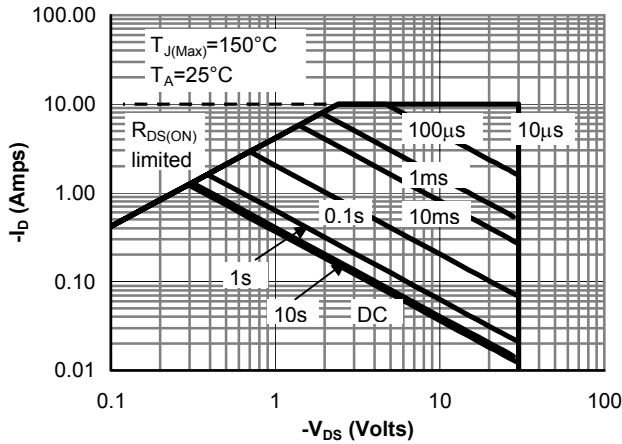


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

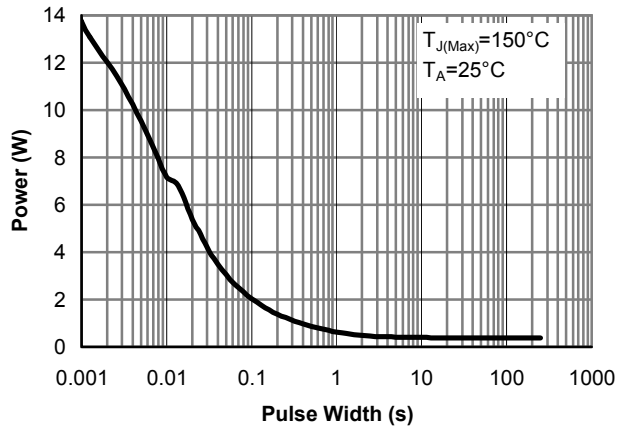


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

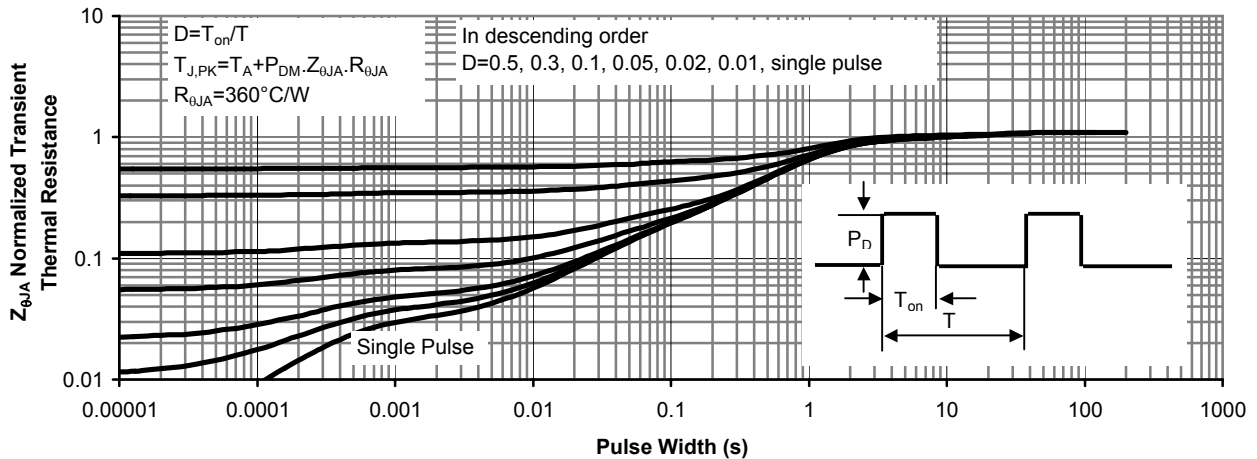
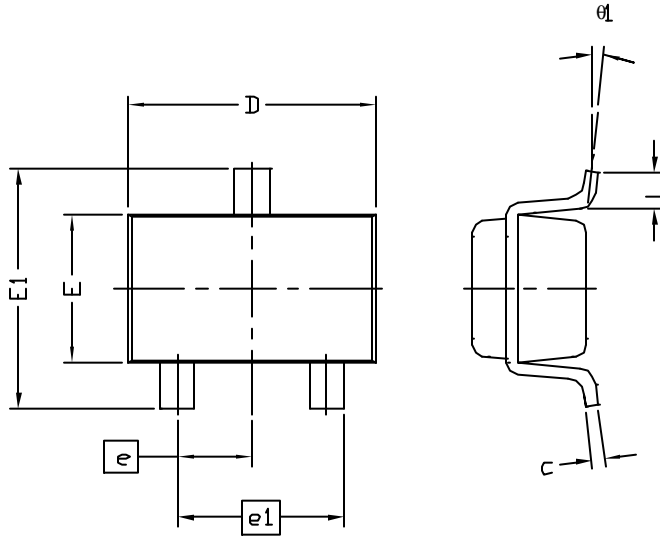


Figure 11: Normalized Maximum Transient Thermal Impedance



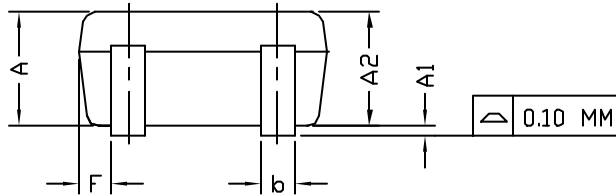
ALPHA & OMEGA
SEMICONDUCTOR, INC.

SC-70 3L Package Data



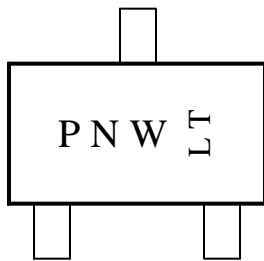
SYMBOLS	DIMENSIONS IN MILLIMETERS	
	MIN	MAX
A	0.90	1.10
A1	0.00	0.10
A2	0.90	1.00
b	0.25	0.40
C	0.10	0.20
D	1.80	2.20
E	1.15	1.35
E1	2.00	2.20
F	0.30	0.40
e	0.65 BSC	
e1	1.30 BSC	
L	0.10	0.30
θ1	1°	8°

- NOTE:
 1. LEAD FINISH: 150 MICRONS (3.8 um) MIN.
 THICKNESS OF Tin/Lead (SOLDER) PLATED ON LEAD
 2. TOLERANCE ±0.10 mm (4 mil) UNLESS OTHERWISE SPECIFIED
 3. COPLANARITY : 0.10 mm
 4. OTHER NAME OF THIS PACKAGE IS CALLED SOT-323



PACKAGE MARKING DESCRIPTION

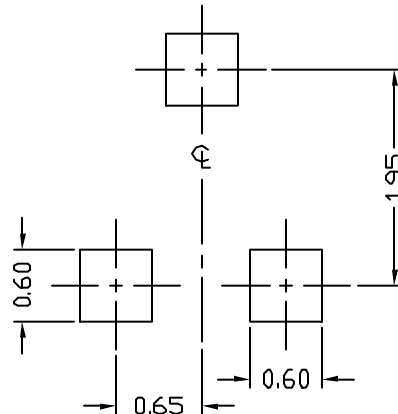
RECOMMENDATION OF LAND PATTERN



SC-70 3L PART NO. CODE

PART NO.	CODE
AO7401	1

- NOTE:
 P - PART NUMBER CODE.
 N - FOUNDRY AND ASSEMBLY LOCATION CODE
 W - YAER AND WEEK CODE.
 L T - ASSEMBLY LOT CODE.

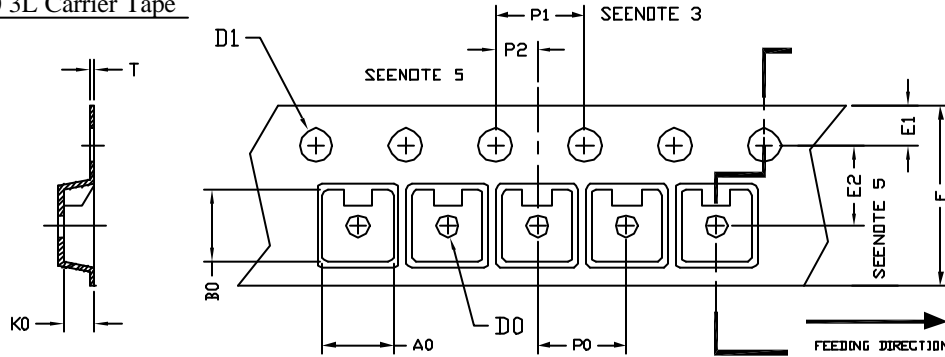




ALPHA & OMEGA
SEMICONDUCTOR, INC.

SC-70 3L Tape and Reel Data

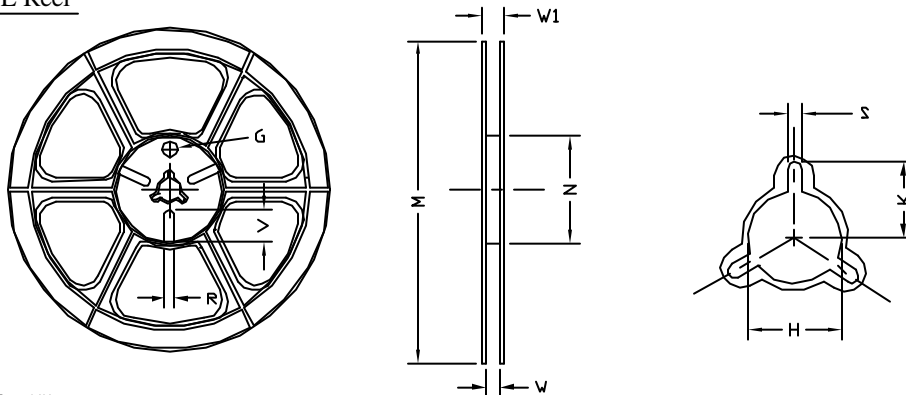
SC-70 3L Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SC-70, 3L (B mm)	2.40 ±0.10	2.40 ±0.10	1.19 ±0.10	1.00 MIN	1.55 ±0.05	8.00 ±0.30	1.75 ±0.10	3.50 ±0.05	4.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

SC-70 3L Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
8 mm	Ø180	Ø180.00 ±0.50	Ø60.50	9.00 ±0.30	11.40 ±1.00	Ø13.00 +0.50 -0.20	10.60	2.00 ±0.50	Ø9.00	5.00	18.00

SC-70 3L Tape

Leader / Trailer
& Orientation

