



AO4701

P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The AO4701 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch.

Features

V_{DS} (V) = -30V

I_D = -5A

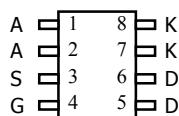
$R_{DS(ON)} < 49m\Omega$ ($V_{GS} = 10V$)

$R_{DS(ON)} < 64m\Omega$ ($V_{GS} = 4.5V$)

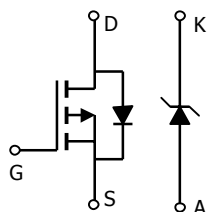
$R_{DS(ON)} < 120m\Omega$ ($V_{GS} = 2.5V$)

SCHOTTKY

V_{DS} (V) = 30V, $I_F = 3A$, $V_F = 0.5V@1A$



SOIC-8



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

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	V_{DS}	-30		V
Gate-Source Voltage	V_{GS}	± 12		V
Continuous Drain Current ^A	$T_A = 25^\circ C$	-5		A
	$T_A = 70^\circ C$	-4.2		
Pulsed Drain Current ^B	I_{DM}	-30		
Schottky reverse voltage	V_{KA}		30	V
Continuous Forward Current ^A	$T_A = 25^\circ C$		4.4	A
	$T_A = 70^\circ C$		3.2	
Pulsed Forward Current ^B	I_{FM}		30	
Power Dissipation	$T_A = 25^\circ C$	2	2	W
	$T_A = 70^\circ C$	1.44	1.44	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	48	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	35	40	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	49	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		72	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	37	42	

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	-0.7	-1	-1.3	V
I _{D(ON)}	On state drain current	V _{GS} =-4.5V, V _{DS} =-5V	-25			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-5A T _J =125°C		42.5	49	mΩ
		V _{GS} =-4.5V, I _D =-4A		54	64	mΩ
		V _{GS} =-2.5V, I _D =-1A		83	120	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-5A	7	11		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.75	-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		952		pF
C _{oss}	Output Capacitance			103		pF
C _{rss}	Reverse Transfer Capacitance			77		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		5.9		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-15V, I _D =-4A		9.5		nC
Q _{gs}	Gate Source Charge			2		nC
Q _{gd}	Gate Drain Charge			3.1		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =3.6Ω, R _{GEN} =6Ω		12		ns
t _r	Turn-On Rise Time			4		ns
t _{D(off)}	Turn-Off DelayTime			37		ns
t _f	Turn-Off Fall Time			12		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-5A, dI/dt=100A/μs		21		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-5A, dI/dt=100A/μs		13		nC
SCHOTTKY PARAMETERS						
V _F	Forward Voltage Drop	I _F =1.0A		0.45	0.5	V
I _{rm}	Maximum reverse leakage current	V _R =30V		0.007	0.05	mA
		V _R =30V, T _J =125°C		3.2	10	
		V _R =30V, T _J =150°C		12	20	
C _T	Junction Capacitance	V _R =15V		37		pF

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≤ 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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

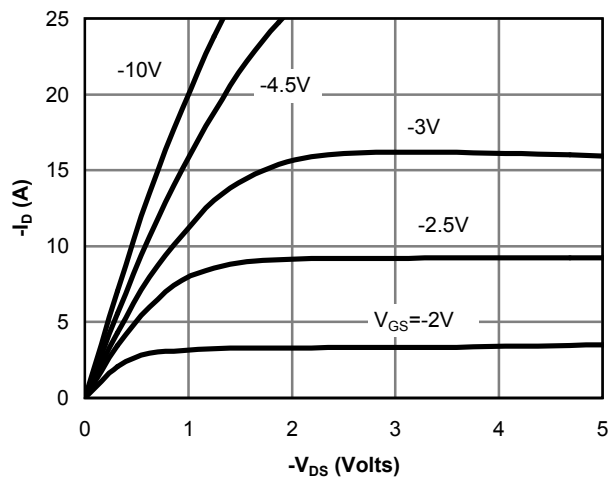


Fig 1: On-Region Characteristics

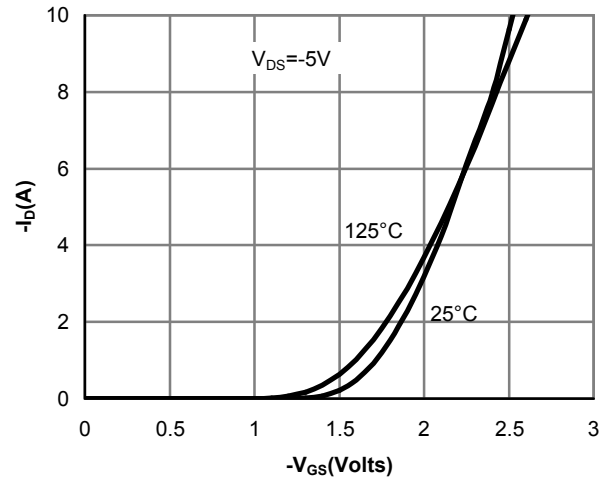


Figure 2: Transfer Characteristics

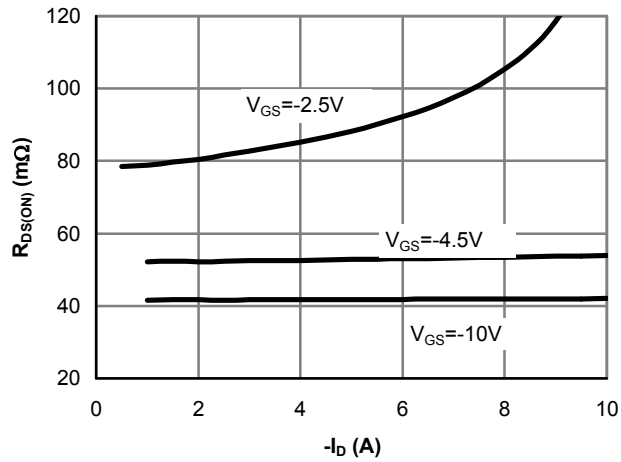


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

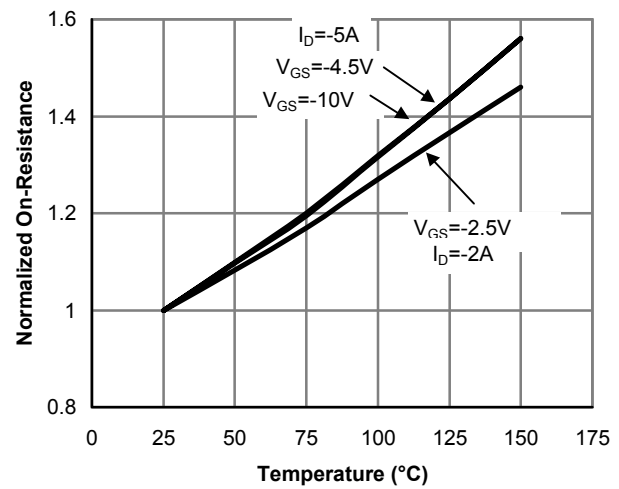


Figure 4: On-Resistance vs. Junction Temperature

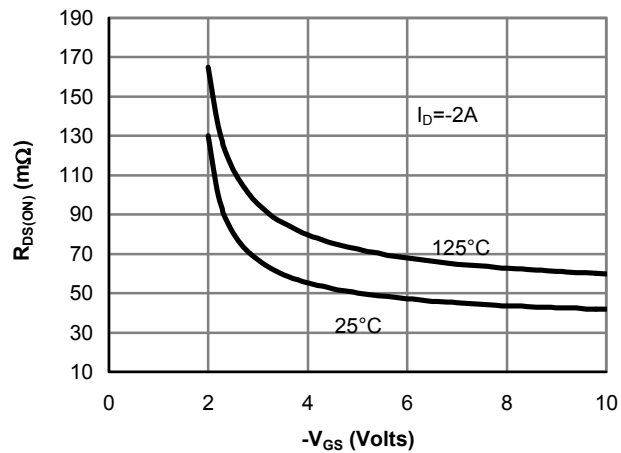


Figure 5: On-Resistance vs. Gate-Source Voltage

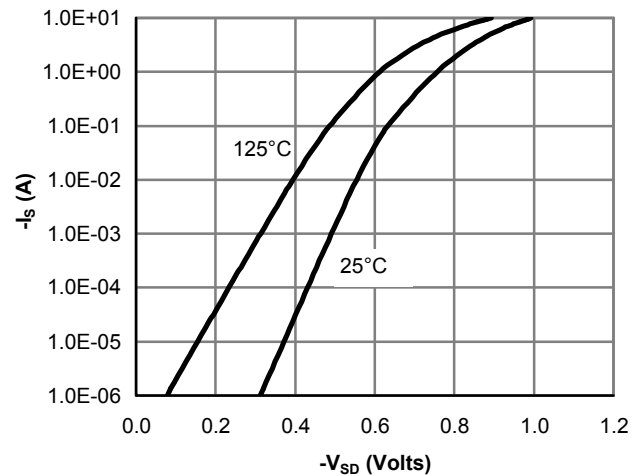
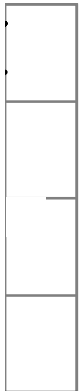


Figure 6: Body-Diode Characteristics



i 3



50 175

perature



1.0 1.2

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

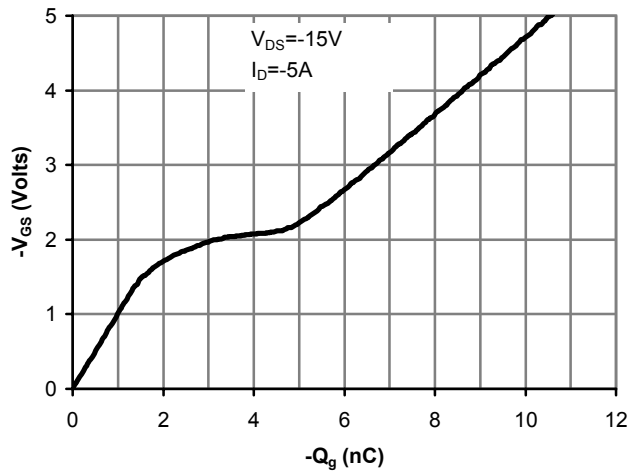


Figure 7: Gate-Charge Characteristics

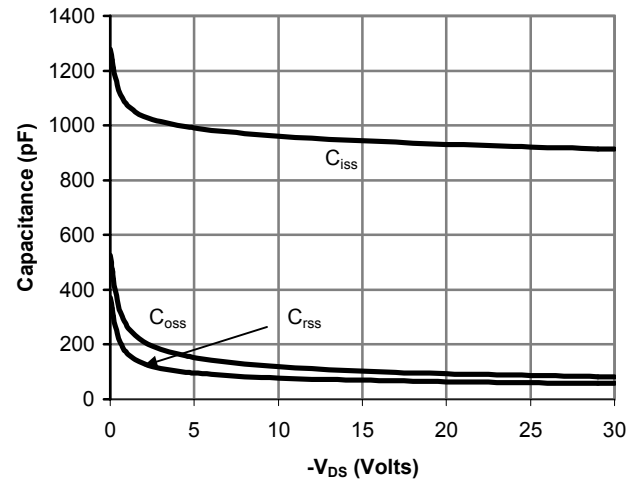


Figure 8: Capacitance Characteristics

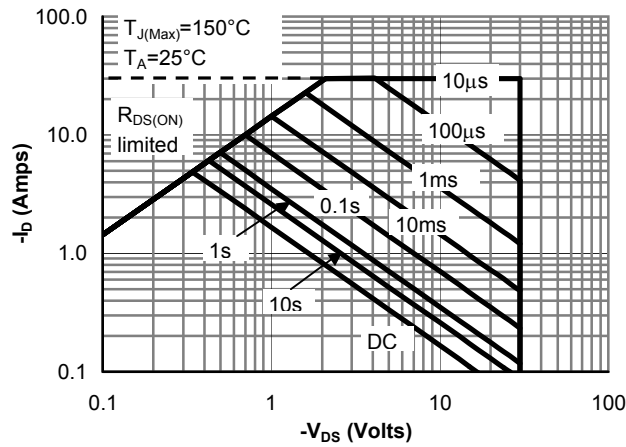


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

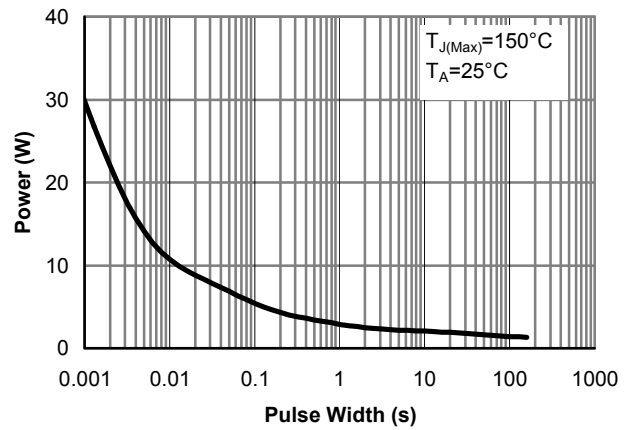


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

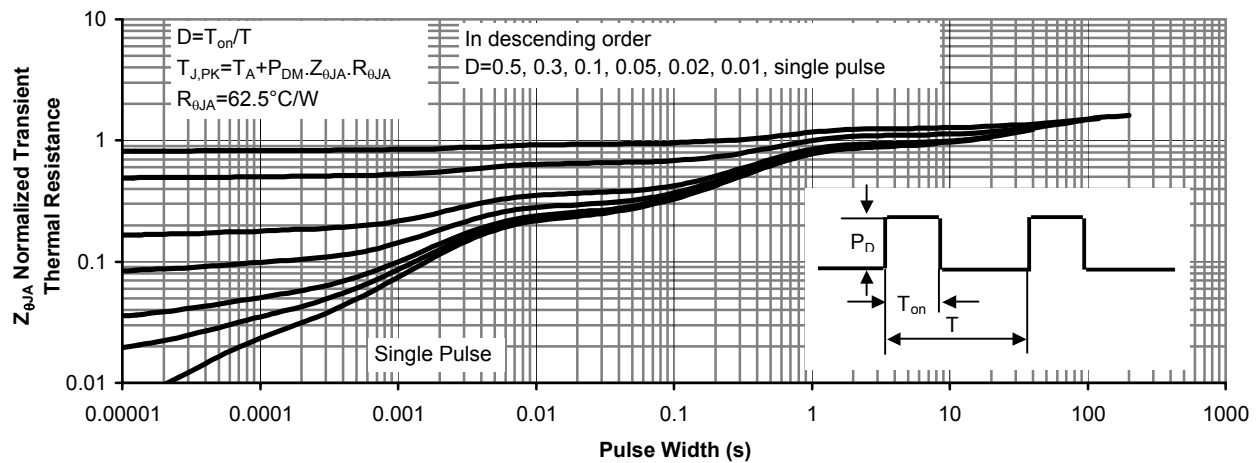


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

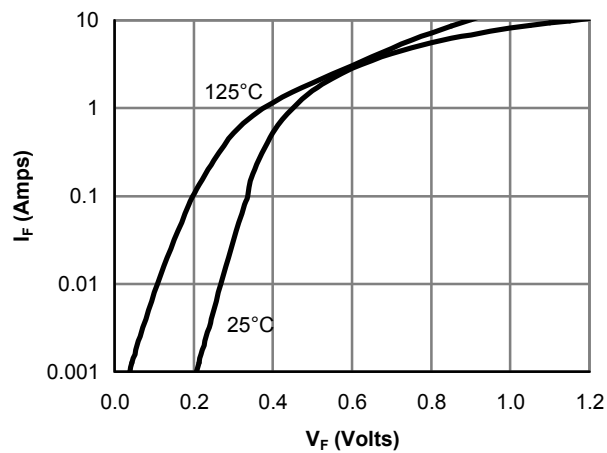


Figure 12: Schottky Forward Characteristics

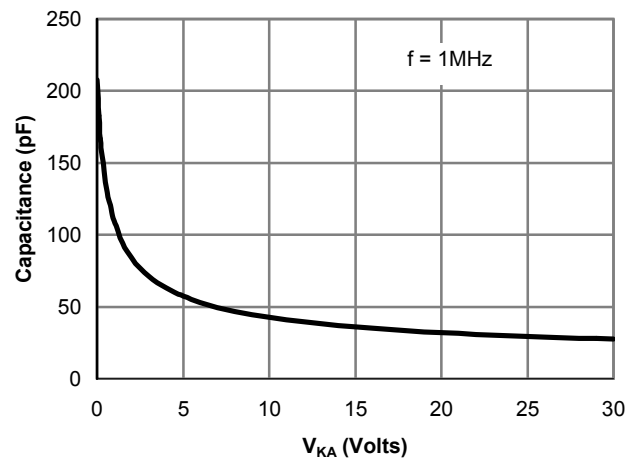


Figure 13: Schottky Capacitance Characteristics

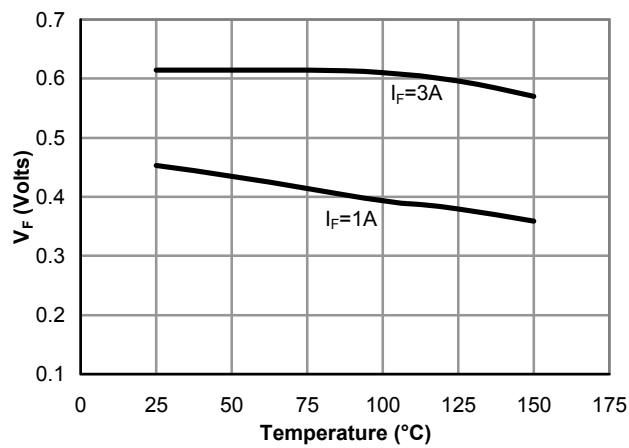


Figure 14: Schottky Forward Drop vs. Junction Temperature

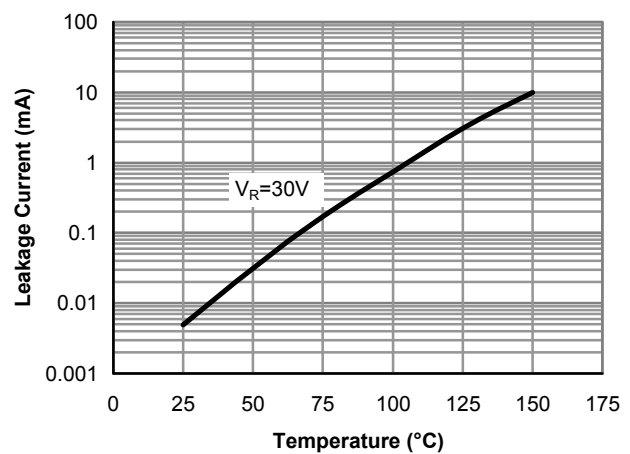


Figure 15: Schottky Leakage current vs. Junction Temperature

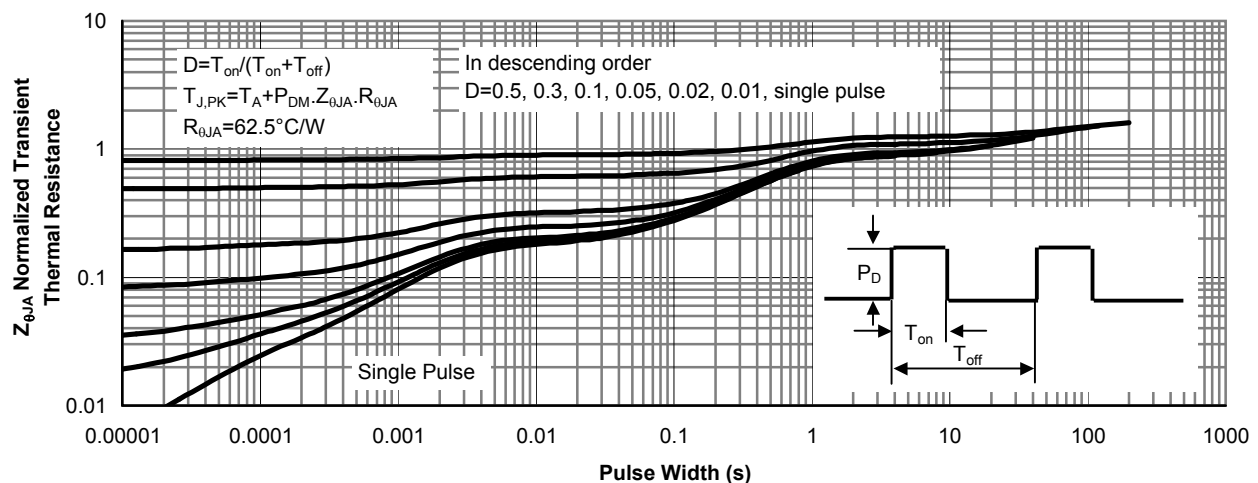
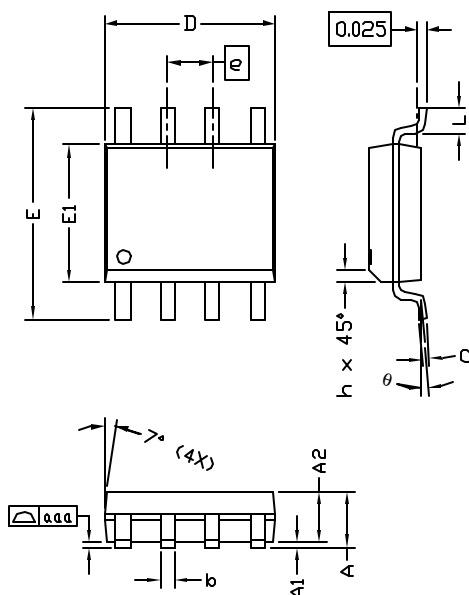


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance



ALPHA & OMEGA SEMICONDUCTOR, INC.

SO-8 Package Data

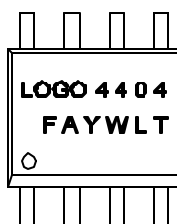


SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.45	1.50	1.55	0.057	0.059	0.061
A1	0.00	—	0.10	0.000	—	0.004
A2	—	1.45	—	—	0.057	—
b	0.33	—	0.51	0.013	—	0.020
c	0.19	—	0.25	0.007	—	0.010
D	4.80	—	5.00	0.189	—	0.197
E1	3.80	—	4.00	0.150	—	0.157
e	1.27 BSC			0.050 BSC		
E	5.80	—	6.20	0.228	—	0.244
h	0.25	—	0.50	0.010	—	0.020
L	0.40	—	1.27	0.016	—	0.050
aaa	—	—	0.10	—	—	0.004
θ	0°	—	8°	0°	—	8°

NOTE:

1. LEAD FINISH: 150 MICROINCHES (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. DIMENSION L IS MEASURED IN GAGE PLANE

PACKAGE MARKING DESCRIPTION

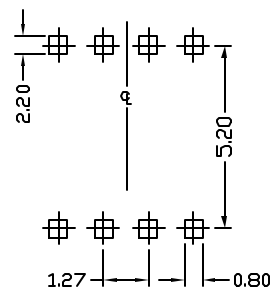


NOTE:
LOGO - AOS LOGO
4701 - PART NUMBER CODE.
F - FAB LOCATION
A - ASSEMBLY LOCATION
Y - YEAR CODE
W - WEEK CODE
L N - ASSEMBLY LOT CODE

SO-8 PART NO. CODE

PART NO.	CODE
AO4701	4701

RECOMMENDED LAND PATTERN



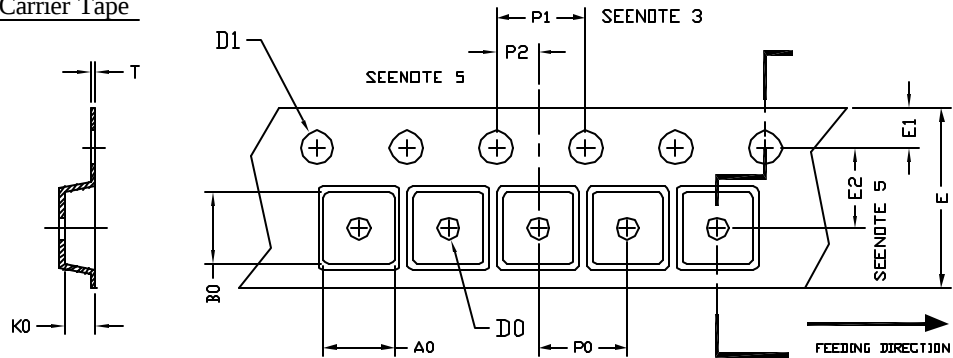
UNIT: mm



ALPHA & OMEGA
SEMICONDUCTOR, INC.

SO-8 Tape and Reel Data

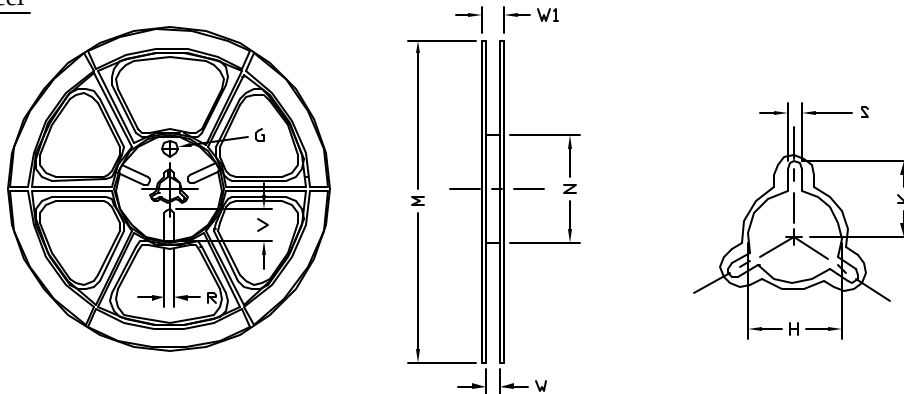
SO-8 Carrier Tape



UNIT: MM

PACKAGE	A0	B0	K0	D0	D1	E	E1	E2	P0	P1	P2	T
SO-8 (12 mm)	6.40 ±0.10	5.20 ±0.10	2.10 ±0.10	1.60 ±0.10	1.30 ±0.10	12.00 ±0.30	1.75 ±0.10	5.50 ±0.05	8.00 ±0.10	4.00 ±0.10	2.00 ±0.05	0.25 ±0.05

SO-8 Reel



UNIT: MM

TAPE SIZE	REEL SIZE	M	N	W	W1	H	K	S	G	R	V
12 mm	φ330	φ330.00 ±0.50	φ97.00 ±0.10	13.00 ±0.30	17.40 ±1.00	φ13.00 +0.50 -0.20	10.60	2.00 ±0.50	---	---	---

SO-8 Tape

Leader / Trailer
& Orientation

