

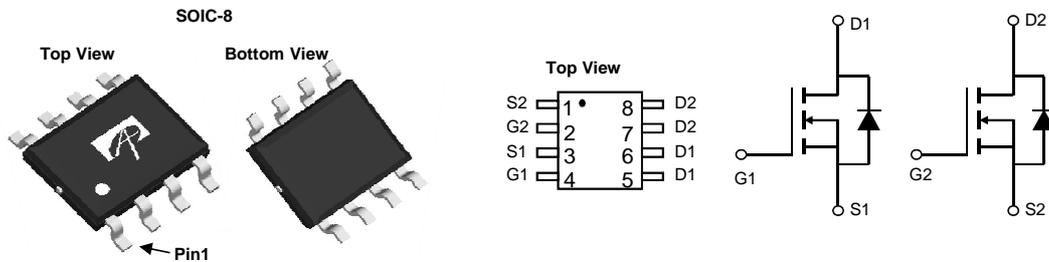
General Description

The AO4800B uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in buck converters.

Product Summary

| | |
|------------------------------------|----------------|
| V_{DS} | 30V |
| I_D (at $V_{GS}=10V$) | 6.9A |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 27m Ω |
| $R_{DS(ON)}$ (at $V_{GS} = 4.5V$) | < 32m Ω |
| $R_{DS(ON)}$ (at $V_{GS} = 2.5V$) | < 50m Ω |

100% UIS Tested
 100% R_g Tested



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 | $T_A=25^\circ C$ | 6.9 |
| | | $T_A=70^\circ C$ | 5.8 |
| Pulsed Drain Current ^C | I_{DM} | 30 | A |
| Avalanche Current ^C | I_{AS}, I_{AR} | 14 | A |
| Avalanche energy $L=0.1mH$ ^C | E_{AS}, E_{AR} | 10 | mJ |
| Power Dissipation ^B | P_D | $T_A=25^\circ C$ | 2 |
| | | $T_A=70^\circ C$ | 1.3 |
| 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 | $R_{\theta JA}$ | 48 | 62.5 | $^\circ C/W$ |
| Maximum Junction-to-Ambient ^{A,D} | | Steady-State | 74 | 90 |
| Maximum Junction-to-Lead | $R_{\theta JL}$ | 32 | 40 | $^\circ C/W$ |

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 | 0.7 | 1.1 | 1.5 | V |
| I _{D(ON)} | On state drain current | V _{GS} =4.5V, V _{DS} =5V | 30 | | | A |
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =10V, I _D =6.9A T _J =125°C | | 17.8 28 | 27 40 | mΩ |
| | | V _{GS} =4.5V, I _D =6A | | 19 | 32 | |
| | | V _{GS} =2.5V, I _D =5A | | 24 | 50 | |
| g _{FS} | Forward Transconductance | V _{DS} =5V, I _D =5A | | 33 | | S |
| V _{SD} | Diode Forward Voltage | I _S =1A, V _{GS} =0V | | 0.7 | 1 | V |
| I _S | Maximum Body-Diode Continuous Current | | | | 2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C _{iss} | Input Capacitance | V _{GS} =0V, V _{DS} =15V, f=1MHz | | 630 | | pF |
| C _{oss} | Output Capacitance | | | 75 | | pF |
| C _{rss} | Reverse Transfer Capacitance | | | 50 | | pF |
| R _g | Gate resistance | V _{GS} =0V, V _{DS} =0V, f=1MHz | 1.5 | 3 | 4.5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| Q _g | Total Gate Charge | V _{GS} =4.5V, V _{DS} =15V, I _D =6.9A | | 6 | 7 | nC |
| Q _{gs} | Gate Source Charge | | | 1.3 | | nC |
| Q _{gd} | Gate Drain Charge | | | 1.8 | | nC |
| t _{D(on)} | Turn-On DelayTime | V _{GS} =10V, V _{DS} =15V, R _L =2.2Ω, R _{GEN} =3Ω | | 3 | | ns |
| t _r | Turn-On Rise Time | | | 2.5 | | ns |
| t _{D(off)} | Turn-Off DelayTime | | | 25 | | ns |
| t _f | Turn-Off Fall Time | | | 4 | | ns |
| t _{rr} | Body Diode Reverse Recovery Time | I _F =6.9A, di/dt=100A/μs | | 8.5 | | ns |
| Q _{rr} | Body Diode Reverse Recovery Charge | I _F =6.9A, di/dt=100A/μs | | 2.6 | | 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.

THIS PRODUCT HAS BEEN DESIGNED AND QUALIFIED FOR THE CONSUMER MARKET. APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO IMPROVE PRODUCT DESIGN, FUNCTIONS AND RELIABILITY WITHOUT NOTICE.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

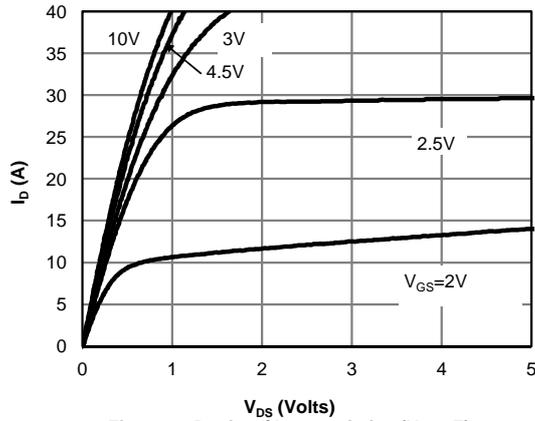


Fig 1: On-Region Characteristics (Note E)

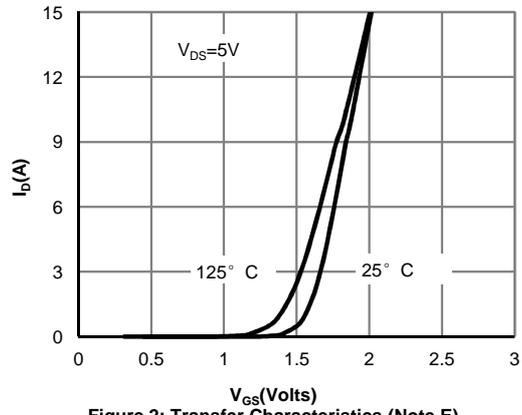


Figure 2: Transfer Characteristics (Note E)

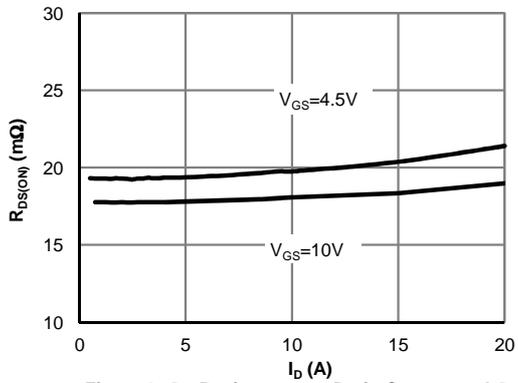


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

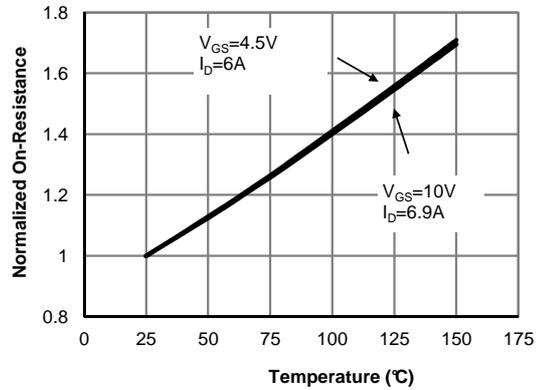


Figure 4: On-Resistance vs. Junction Temperature (Note E)

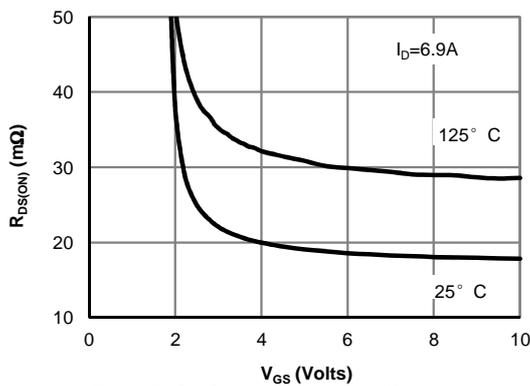


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

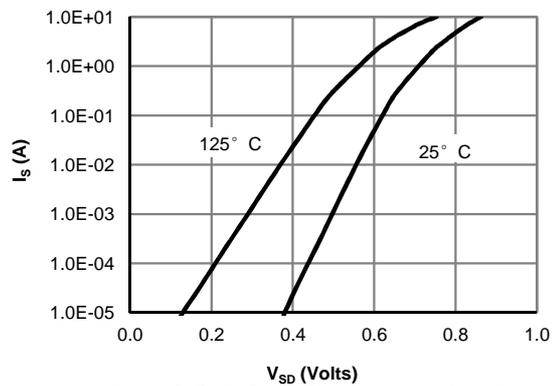


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

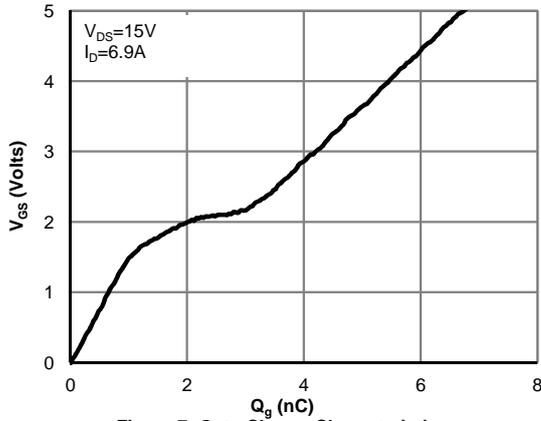


Figure 7: Gate-Charge Characteristics

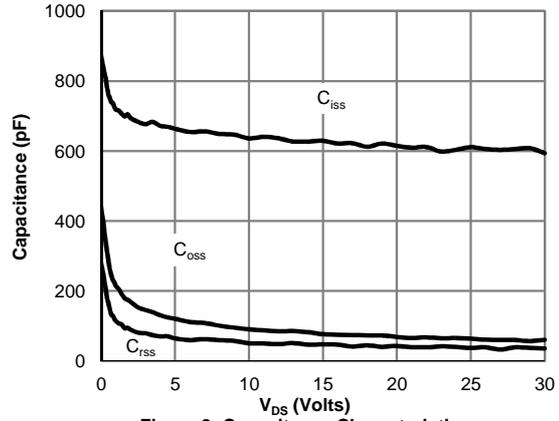


Figure 8: Capacitance Characteristics

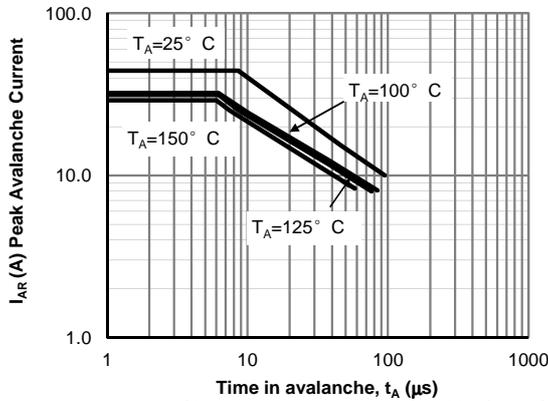


Figure 9: Single Pulse Avalanche capability (Note C)

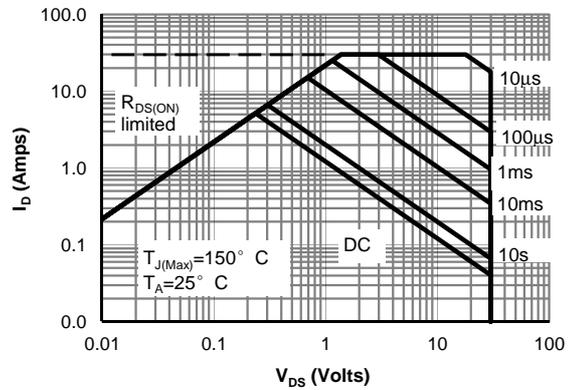


Figure 10: Maximum Forward Biased Safe Operating Area (Note F)

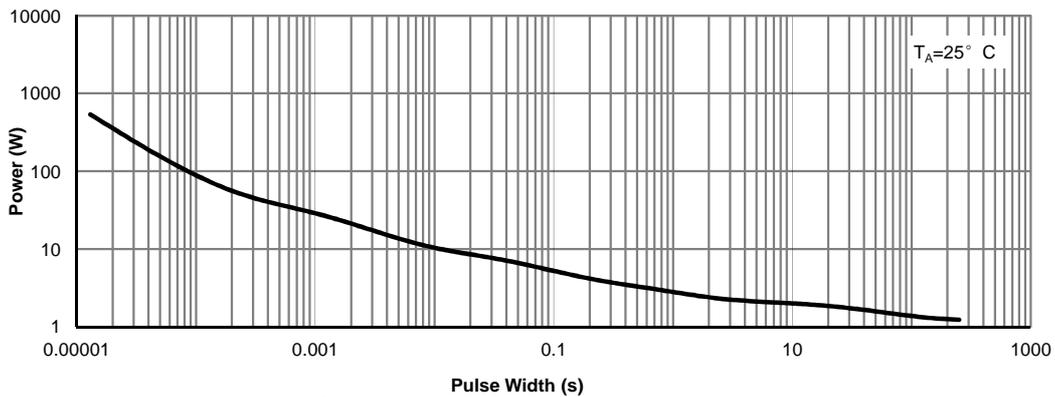
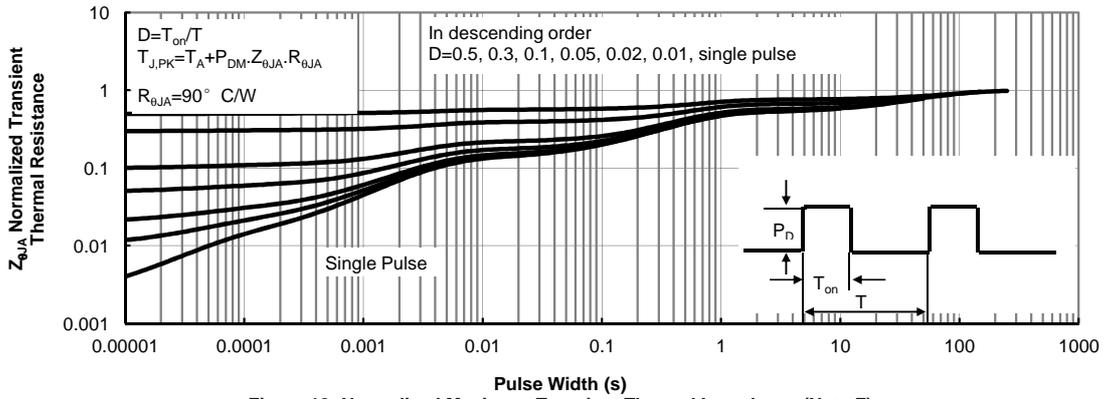
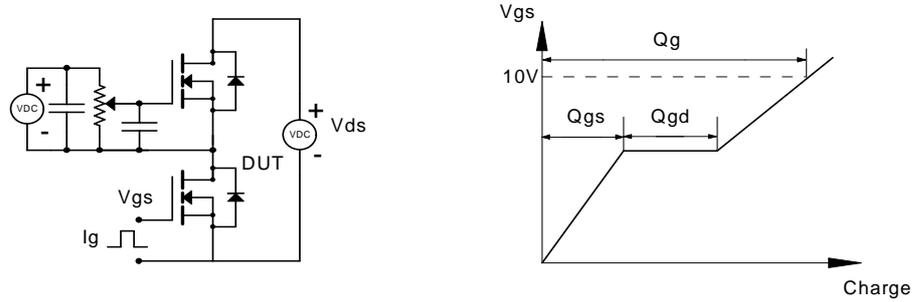


Figure 11: Single Pulse Power Rating Junction-to-Ambient (Note F)

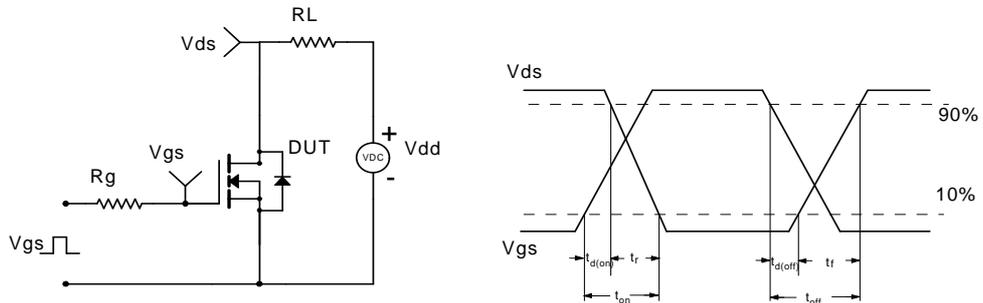
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



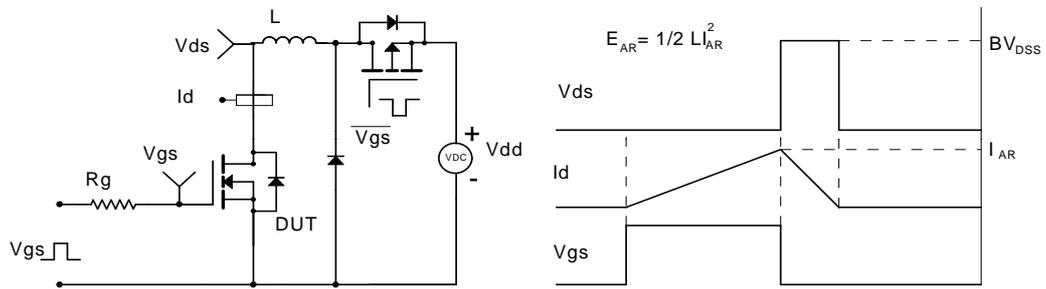
Gate Charge Test Circuit & Waveform



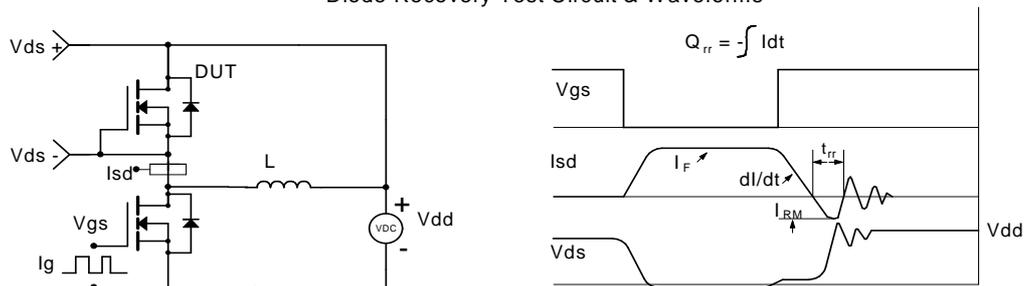
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



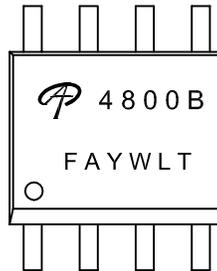
Diode Recovery Test Circuit & Waveforms





| | |
|--------------|-----------------------------|
| Document No. | PD-00655 |
| Version | D |
| Title | AO4800B Marking Description |

SO8 PACKAGE MARKING DESCRIPTION



Green product

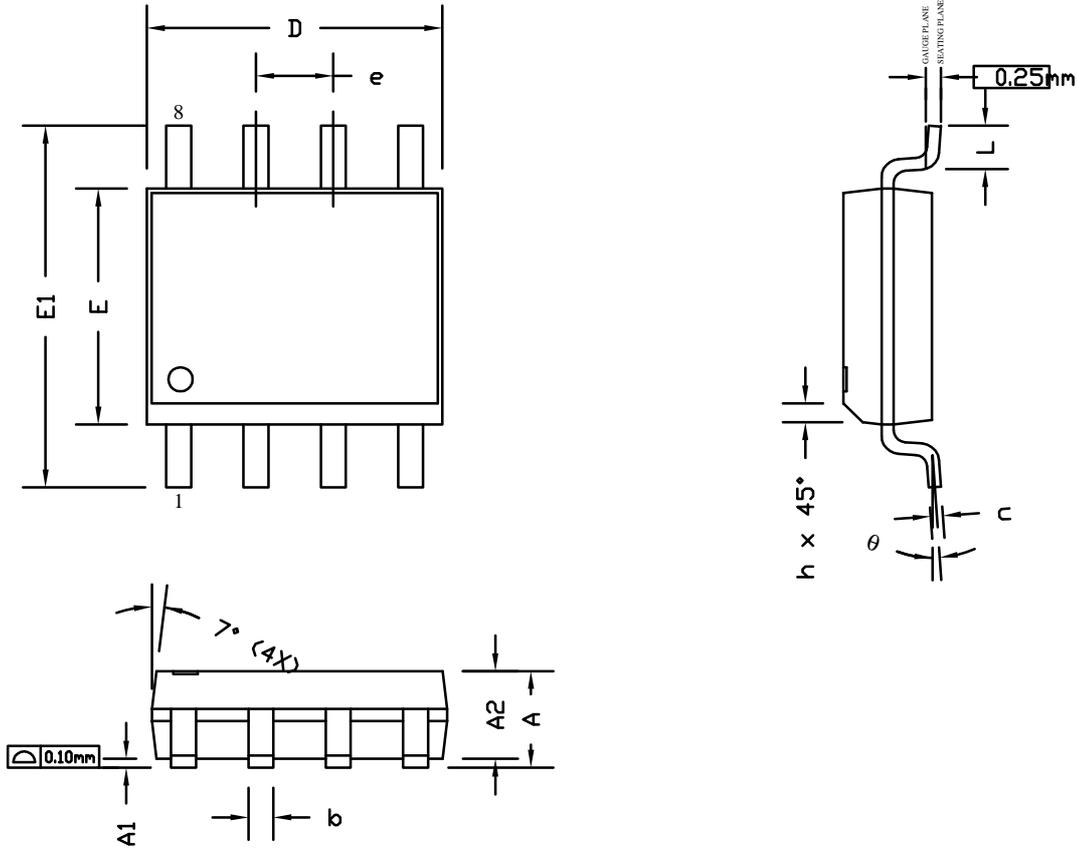
| | |
|-------|--------------------------|
| NOTE: | |
| LOGO | - AOS Logo |
| 4800B | - Part number code |
| F | - Fab code |
| A | - Assembly location code |
| Y | - Year code |
| W | - Week code |
| L&T | - Assembly lot code |

| PART NO. | DESCRIPTION | CODE |
|----------|---------------|-------|
| AO4800B | Green product | 4800B |
| AO4800BL | Green product | 4800B |

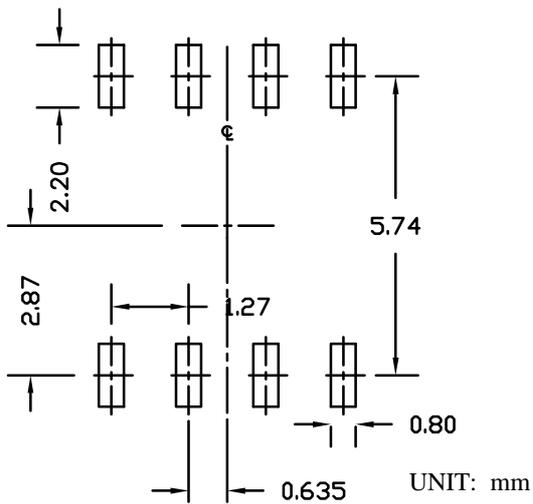


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|--------------|----------|
| Document No. | PO-00004 |
| Version | I |

S08 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



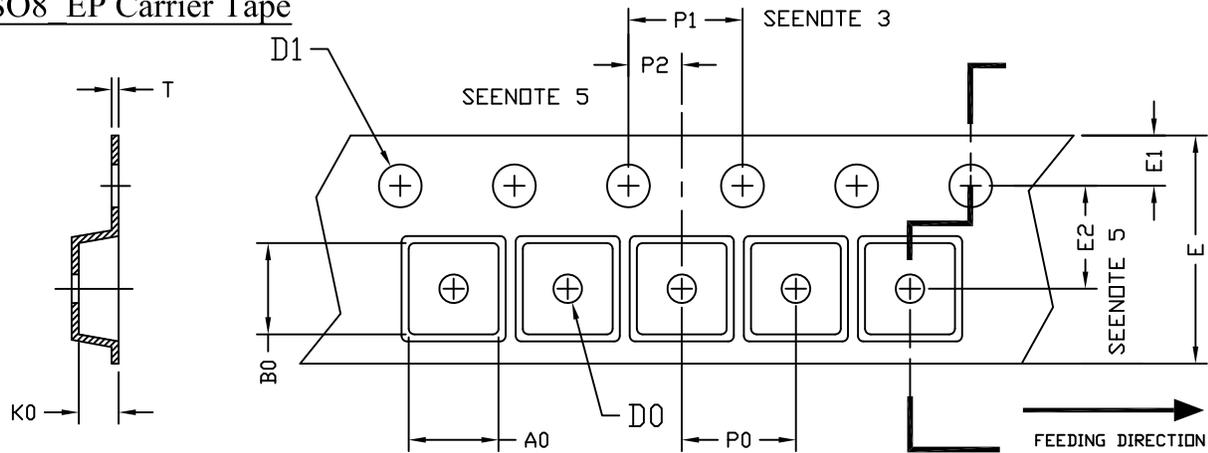
| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---------|---------------------------|------|------|----------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.35 | 1.65 | 1.75 | 0.053 | 0.065 | 0.069 |
| A1 | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 |
| A2 | 1.25 | 1.50 | 1.65 | 0.049 | 0.059 | 0.065 |
| b | 0.31 | 0.41 | 0.51 | 0.012 | 0.016 | 0.020 |
| c | 0.17 | 0.20 | 0.25 | 0.007 | 0.008 | 0.010 |
| D | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| E | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| E1 | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| h | 0.25 | 0.30 | 0.50 | 0.010 | 0.012 | 0.020 |
| L | 0.40 | 0.69 | 1.27 | 0.016 | 0.027 | 0.050 |
| θ | 0° | 4° | 8° | 0° | 4° | 8° |

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
4. DIMENSION L IS MEASURED IN GAUGE PLANE.
5. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.



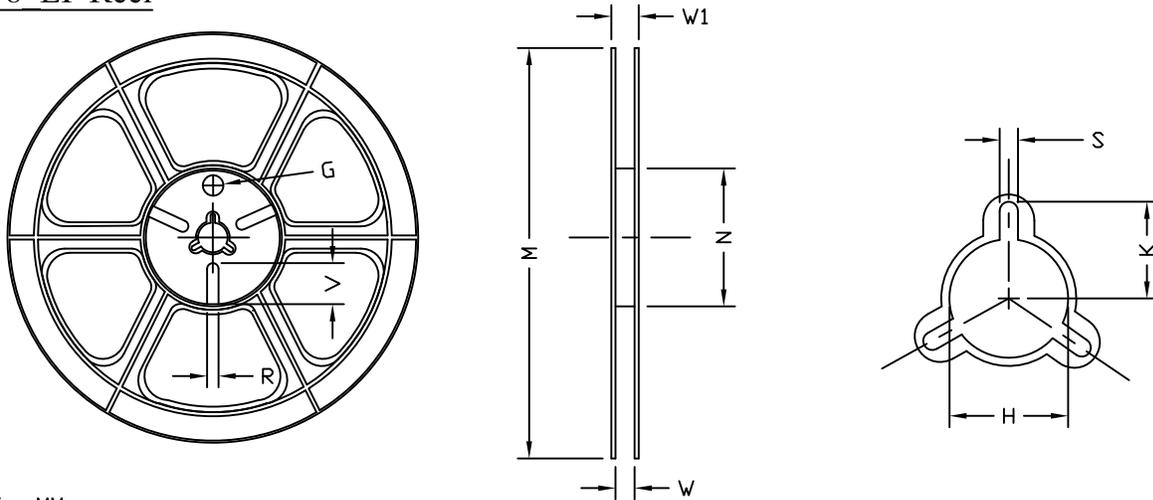
SO8/SO8 EP Carrier Tape



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 | 1.50 +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 |

SO8/SO8 EP Reel



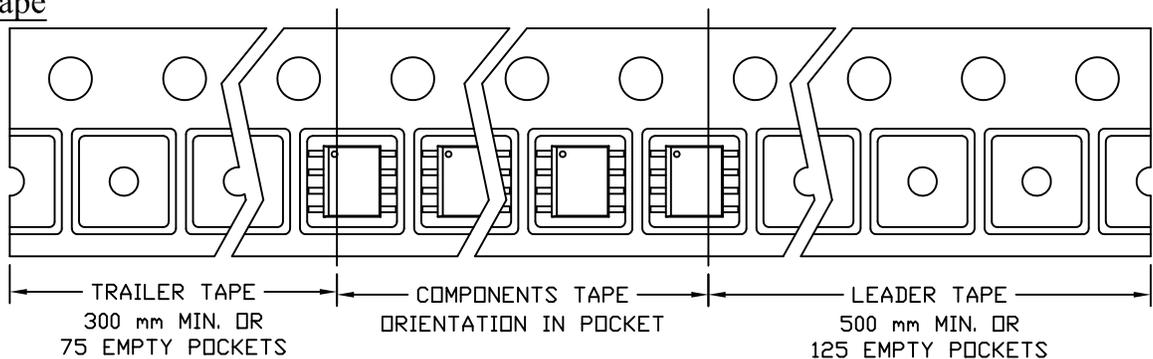
UNIT: MM

| TAPE SIZE | REEL SIZE | M | N | W | W1 | H | K | S | G | R | V |
|-----------|-----------|------------------|-----------------|----------------|----------------|--------------------------|-------|---------------|-----|-----|-----|
| 12 mm | ø330 | ø330.00 ±0.50 | ø97.00 ±0.10 | 13.00 ±0.30 | 17.40 ±1.00 | ø13.00 +0.50 -0.20 | 10.60 | 2.00 ±0.50 | --- | --- | --- |

SO8/SO8 EP Tape

Leader / Trailer
& Orientation

Unit Per Reel:
3000pcs





AOS Semiconductor Product Reliability Report

AO4800B/AO4800BL, rev A

Plastic Encapsulated Device

ALPHA & OMEGA Semiconductor, Inc

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Sunnyvale, CA 94085
U.S.**

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www.aosmd.com

Oct 15, 2007

This AOS product reliability report summarizes the qualification result for AO4800B. Accelerated environmental tests are performed on a specific sample size, and then followed by electrical test at end point. Review of final electrical test result confirms that AO4800B passes AOS quality and reliability requirements. The released product will be categorized by the process family and be monitored on a quarterly basis for continuously improving the product quality.

Table of Contents:

- I. Product Description
- II. Package and Die information
- III. Environmental Stress Test Summary and Result
- IV. Reliability Evaluation
- V. Quality Assurance Information

I. Product Description:

The AO4800B uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in buck converters. Standard Product AO4800B is Pb-free (meets ROHS & Sony 259 specifications).

| Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted | | | |
|--|------------------------|------------|------------------|
| Parameter | Symbol | Maximum | Units |
| Drain-Source Voltage | V_{DS} | 30 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Continuous Drain Current | $T_A=25^\circ\text{C}$ | 6.9 | A |
| | $T_A=70^\circ\text{C}$ | 5.8 | |
| Pulsed Drain Current | I_{DM} | 40 | |
| Power Dissipation | $T_A=25^\circ\text{C}$ | 1.9 | W |
| | $T_A=70^\circ\text{C}$ | 1.2 | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 150 | $^\circ\text{C}$ |

| Thermal Characteristics | | | | | |
|-----------------------------|---------------------|-----------------|-----|------|--------------------|
| Parameter | | Symbol | Typ | Max | Units |
| Maximum Junction-to-Ambient | $T \leq 10\text{s}$ | $R_{\theta JA}$ | 55 | 62.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient | Steady-State | | 90 | 110 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead | Steady-State | $R_{\theta JL}$ | 40 | 48 | $^\circ\text{C/W}$ |

II. Die / Package Information:

| | AO4800B | AO4800BL (Green Compound) |
|-----------------------------------|--|--|
| Process | Standard sub-micron Low voltage N channel process | Standard sub-micron Low voltage N channel process |
| Package Type | 8 leads SOIC | 8 leads SOIC |
| Lead Frame | Copper with Ag spot | Copper with Ag spot |
| Die Attach | Ag epoxy | Ag epoxy |
| Bond wire | S: Cu 2mils; G: Au 1.3mils | S: Cu 2mils; G: Au 1.3mils |
| Mold Material | Epoxy resin with silica filler | Epoxy resin with silica filler |
| Filler % (Spherical/Flake) | 90/10 | 100/0 |
| Flammability Rating | UL-94 V-0 | UL-94 V-0 |
| Backside Metallization | Ti / Ni / Ag | Ti / Ni / Ag |
| Moisture Level | Up to Level 1 * | Up to Level 1 * |

Note * based on info provided by assembler and mold compound supplier

III. Result of Reliability Stress for AO4800B (Standard) & AO4800BL (Green)

| Test Item | Test Condition | Time Point | Lot Attribution | Total Sample size | Number of Failures |
|-----------------------------------|--|-------------------------------|------------------------------------|-------------------------------|--------------------|
| Solder Reflow Precondition | Standard: 1hr PCT+3 cycle reflow@260°C Green: 168hr 85°C /85%RH +3 cycle reflow@260°C | 0hr | Standard: 7 lots | 770 pcs | 0 |
| HTGB | Temp = 150°C , Vgs=100% of Vgsmax | 168 / 500 hrs 1000 hrs | 1 lot (Note A*) | 82 pcs 77+5 pcs / lot | 0 |
| HTRB | Temp = 150°C , Vds=80% of Vdsmax | 168 / 500 hrs 1000 hrs | 1 lot (Note A*) | 82 pcs 77+5 pcs / lot | 0 |
| HAST | 130 +/- 2°C , 85%RH, 33.3 psi, Vgs = 80% of Vgs max | 100 hrs | Standard: 3 lots (Note B**) | 165 pcs 50+5 pcs / lot | 0 |
| Pressure Pot | 121°C , 29.7psi, 100%RH | 96 hrs | Standard: 4 lots (Note B**) | 220 pcs 50+5 pcs / lot | 0 |
| Temperature Cycle | -65°C to 150°C , air to air | 250 / 500 cycles | Standard: 7 lots (Note B**) | 385 pcs 50+5 pcs / lot | 0 |

III. Result of Reliability Stress for AO4800B (Standard) & AO4800BL (Green) Continues

| | | | | | |
|----------------|---|-----------------------|----------------|----------------------------------|---|
| DPA | Internal Vision Cross-section X-ray | NA | 5 5 5 | 5 5 5 | 0 |
| CSAM | | NA | 5 | 5 | 0 |
| Bond Integrity | Room Temp 150°C bake 150°C bake | 0hr 250hr 500hr | 40 40 40 | 40 wires 40 wires 40 wires | 0 |
| Solderability | 245°C | 5 sec | 15 | 15 leads | 0 |
| Die shear | 150°C | 0hr | 10 | 10 | 0 |

Note A: The HTGB and HTRB reliability data presents total of available AO4800B and AO4800BL burn-in data up to the published date.

Note B: The pressure pot, temperature cycle and HAST reliability data for AO4800B and AO4800BL comes from the AOS generic package qualification data.

IV. Reliability Evaluation

FIT rate (per billion):128

MTTF = 891years

In general, 500 hrs of HTGB, 150 deg C accelerated stress testing is equivalent to 15 years of lifetime at 55 deg C operating conditions (by applying the Arrhenius equation with an activation energy of 0.7eV and 60% of upper confidence level on the failure rate calculation). AOS reliability group also routinely monitors the product reliability up to 1000 hr at and performs the necessary failure analysis on the units failed for reliability test(s).

The presentation of FIT rate for the individual product reliability is restricted by the actual burn-in sample size of the selected product (AO4800B). Failure Rate Determination is based on JEDEC Standard JESD 85. FIT means one failure per billion hours.

$$\text{Failure Rate} = \text{Chi}^2 \times 10^9 / [2 (N) (H) (Af)] = 1.83 \times 10^9 / [2 (164) (168) (258)] = 128$$

$$\text{MTTF} = 10^9 / \text{FIT} = 7.81 \times 10^6 \text{hrs} = 891 \text{years}$$

Chi² = Chi Squared Distribution, determined by the number of failures and confidence interval

N = Total Number of units from HTRB and HTGB tests

H = Duration of HTRB/HTGB testing

Af = Acceleration Factor from Test to Use Conditions (Ea = 0.7eV and Tuse = 55°C)

Acceleration Factor [**Af**] = **Exp** [Ea / k (1/Tj u - 1/Tj s)]

Acceleration Factor ratio list:

| | 55 deg C | 70 deg C | 85 deg C | 100 deg C | 115 deg C | 130 deg C | 150 deg C |
|-----------|------------|-----------|-----------|-----------|-------------|-------------|-----------|
| Af | 258 | 87 | 32 | 13 | 5.64 | 2.59 | 1 |

Tj s = Stressed junction temperature in degree (Kelvin), K = C+273.16

Tj u =The use junction temperature in degree (Kelvin), K = C+273.16

k = Boltzmann's constant, 8.617164 X 10⁻⁵eV / K



V. Quality Assurance Information

Acceptable Quality Level for outgoing inspection: **0.1%** for electrical and visual.

Guaranteed Outgoing Defect Rate: **< 25 ppm**

Quality Sample Plan: conform to **Mil-Std-105D**