# AON7544

## 30V N-Channel AlphaMOS

### General Description

- Latest Trench Power AlphaMOS (αMOS LV) technology
- Very Low RDS(on) at 4.5$V_{GS}$
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

### Application

- DC/DC Converters in Computing, Servers, and POL
- Isolated DC/DC Converters in Telecom and Industrial

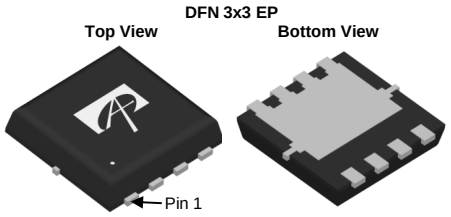
### Product Summary

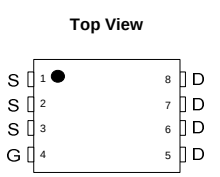
| | |
|---|---|
| $V_{DS}$ | 30V |
| $I_D$ (at $V_{GS}$=10V) | 30A |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | < 5mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$ = 4.5V) | < 8.5mΩ |

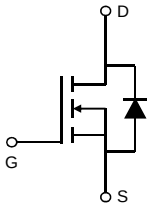
100% UIS Tested
100% $R_g$ Tested

Green Product

DFN 3x3 EP




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current[G] | $T_C$=25°C | $I_D$ | 30 | A |
| | $T_C$=100°C | | 23 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 120 | |
| Continuous Drain Current | $T_A$=25°C | $I_{DSM}$ | 20 | A |
| | $T_A$=70°C | | 16 | |
| Avalanche Current [C] | | $I_{AS}$ | 32 | A |
| Avalanche energy L=0.05mH [C] | | $E_{AS}$ | 26 | mJ |
| $V_{DS}$ Spike | 100ns | $V_{SPIKE}$ | 36 | V |
| Power Dissipation [B] | $T_C$=25°C | $P_D$ | 23 | W |
| | $T_C$=100°C | | 9 | |
| Power Dissipation [A] | $T_A$=25°C | $P_{DSM}$ | 3 | W |
| | $T_A$=70°C | | 2 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | °C |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 30 | 40 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 60 | 75 | °C/W |
| Maximum Junction-to-Case | Steady-State | $R_{\theta JC}$ | 4.5 | 5.4 | °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 | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$= ±20V | | | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250µA | 1.2 | 1.8 | 2.2 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | | 4.1 | 5 | mΩ |
| | | $T_J$=125°C | | 5.6 | 6.8 | |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 6.7 | 8.5 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=20A | | 91 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.7 | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 28 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 951 | | pF |
| $C_{oss}$ | Output Capacitance | | | 373 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 62 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 1.5 | | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=20A | | 15.7 | 22.5 | nC |
| $Q_g$(4.5V) | Total Gate Charge | | | 7.5 | 10.5 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 2.8 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 3.2 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=0.75Ω, $R_{GEN}$=3Ω | | 6.25 | | ns |
| $t_r$ | Turn-On Rise Time | | | 2.5 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 18.5 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 4 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=20A, dI/dt=500A/µs | | 10.2 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=20A, dI/dt=500A/µs | | 13.6 | | nC |

A. The value of $R_{\theta JA}$ 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 Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150° 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 junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature $T_{J(MAX)}$=150° C.

D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case 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-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. 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.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

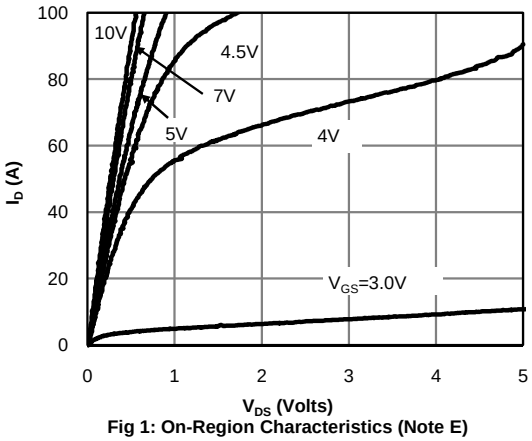



Fig 1: On-Region Characteristics (Note E)

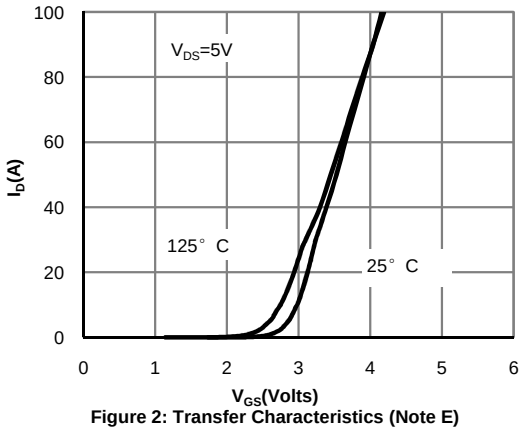



Figure 2: Transfer Characteristics (Note E)

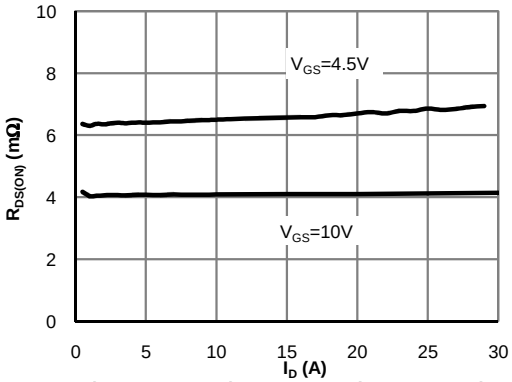



Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

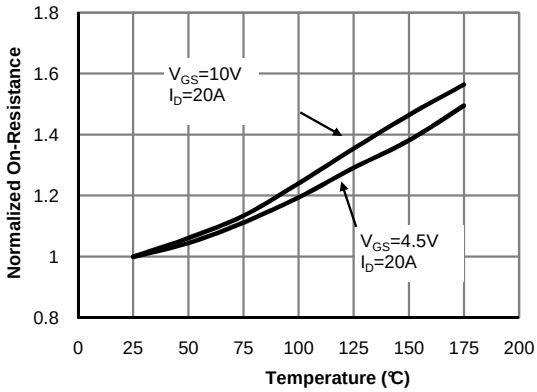



Figure 4: On-Resistance vs. Junction Temperature (Note E)

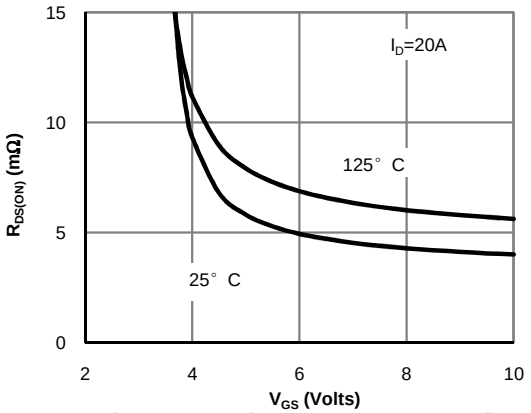



Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

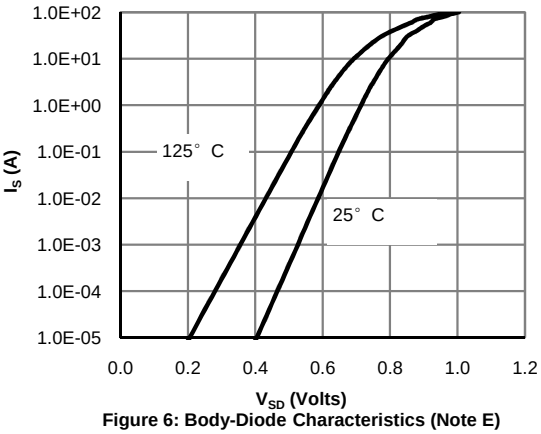



Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

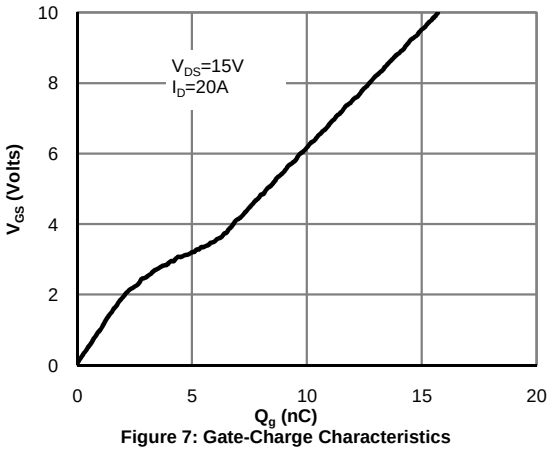



Figure 7: Gate-Charge Characteristics

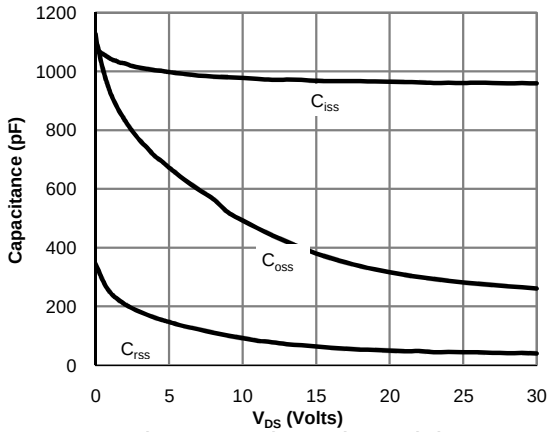



Figure 8: Capacitance Characteristics

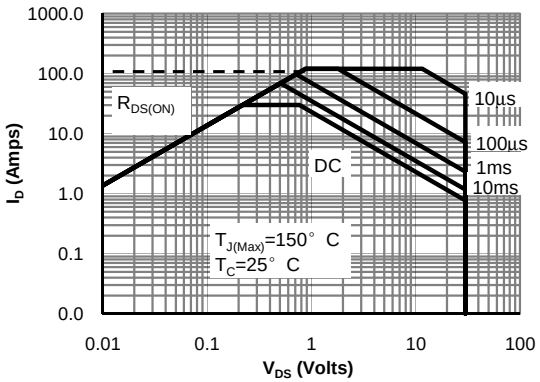



Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

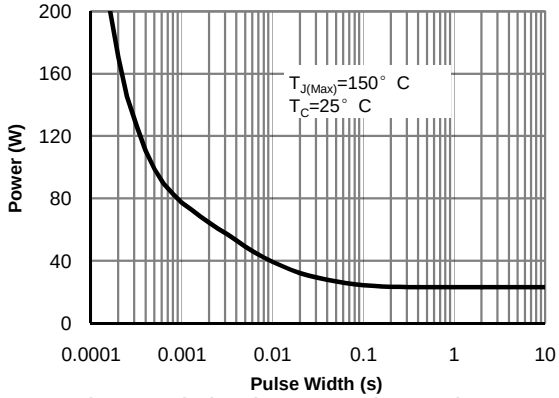



Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

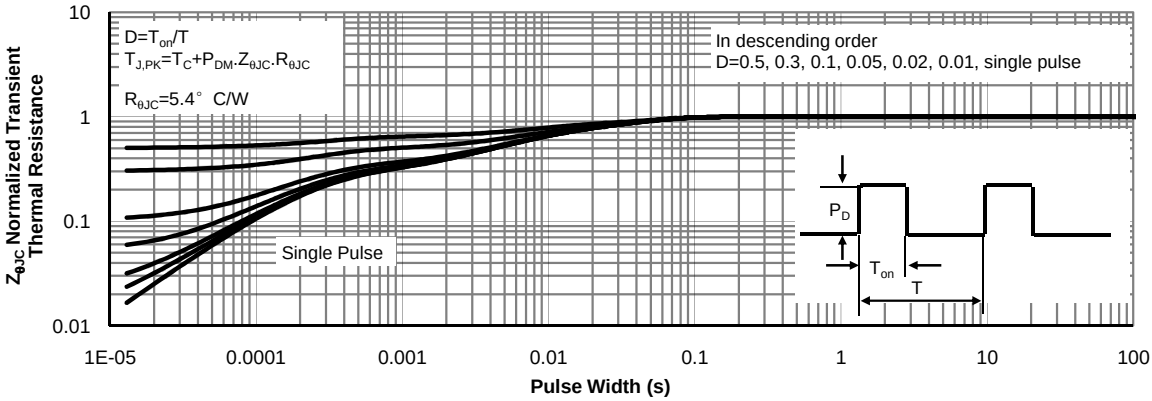



Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

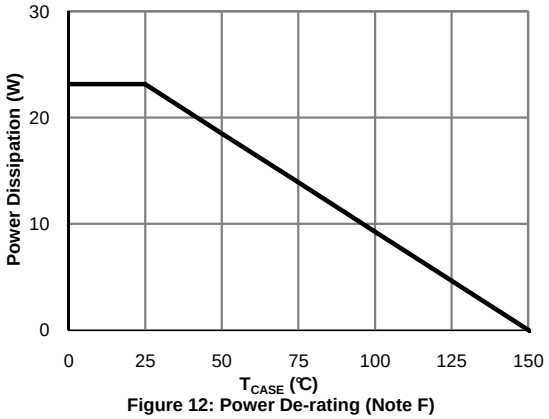



Figure 12: Power De-rating (Note F)

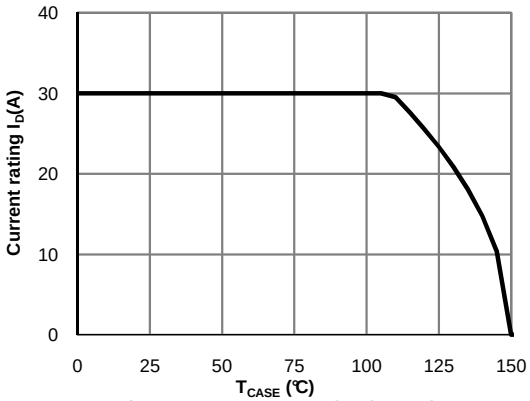



Figure 13: Current De-rating (Note F)

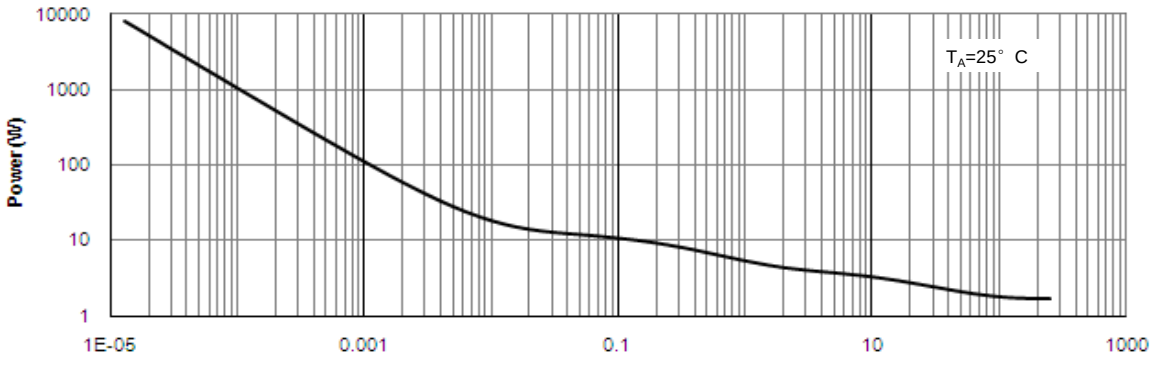



Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

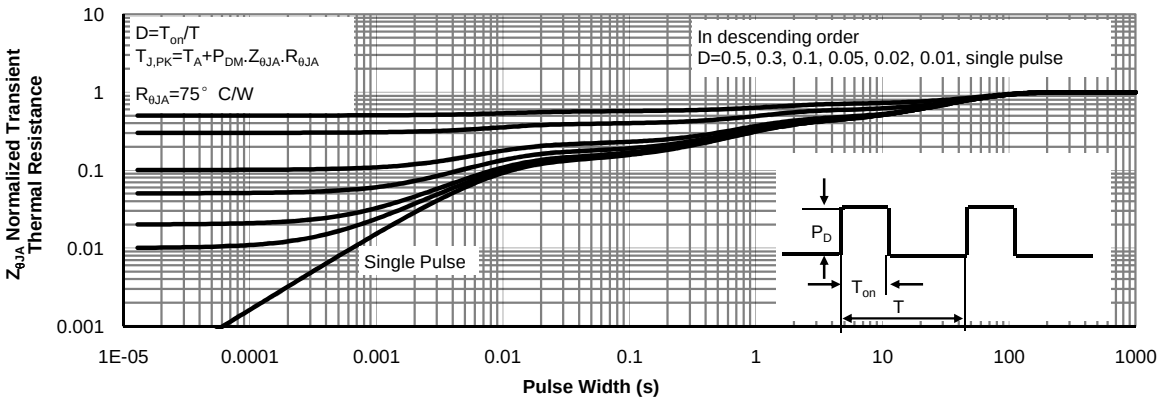
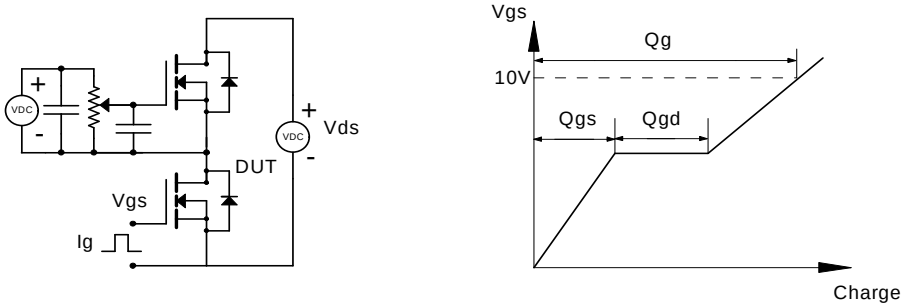
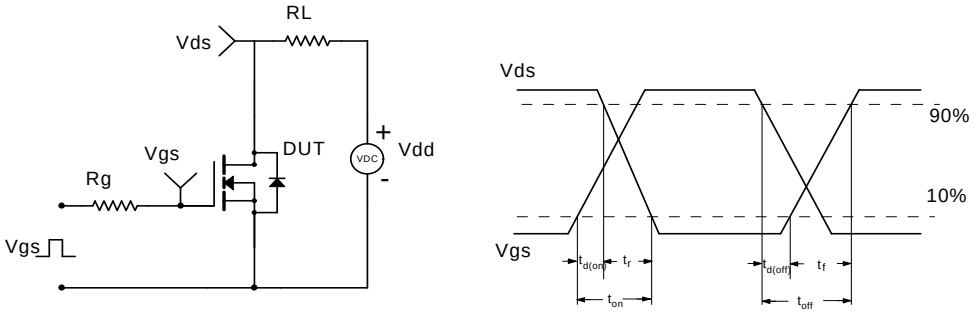



Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

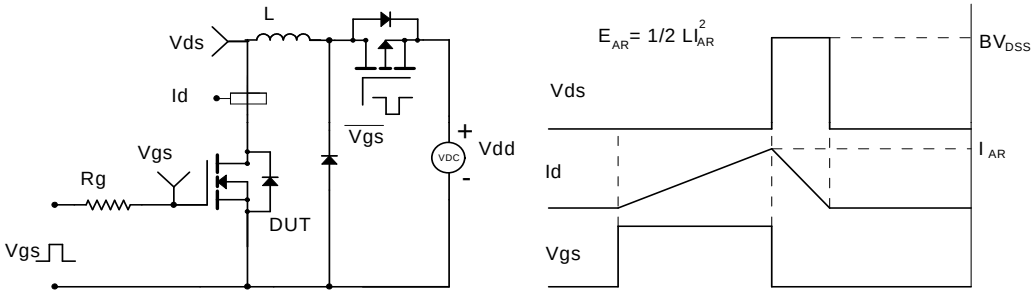
## Gate Charge Test Circuit & Waveform



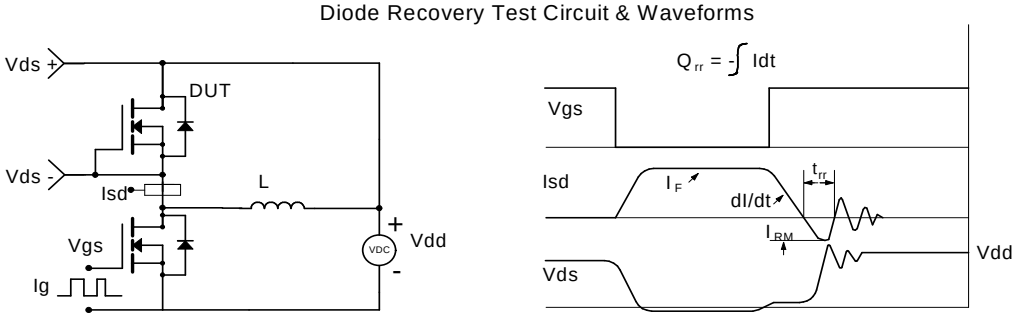

## Resistive Switching Test Circuit & Waveforms




## Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



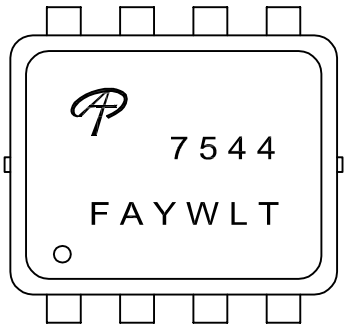

## Diode Recovery Test Circuit & Waveforms



ALPHA & OMEGA SEMICONDUCTOR

| Document No. | PD-01863 |
|---|---|
| Version | A |
| Title | AON7544 Marking Description |

# DFN3X3 PACKAGE MARKING DESCRIPTION




Green product

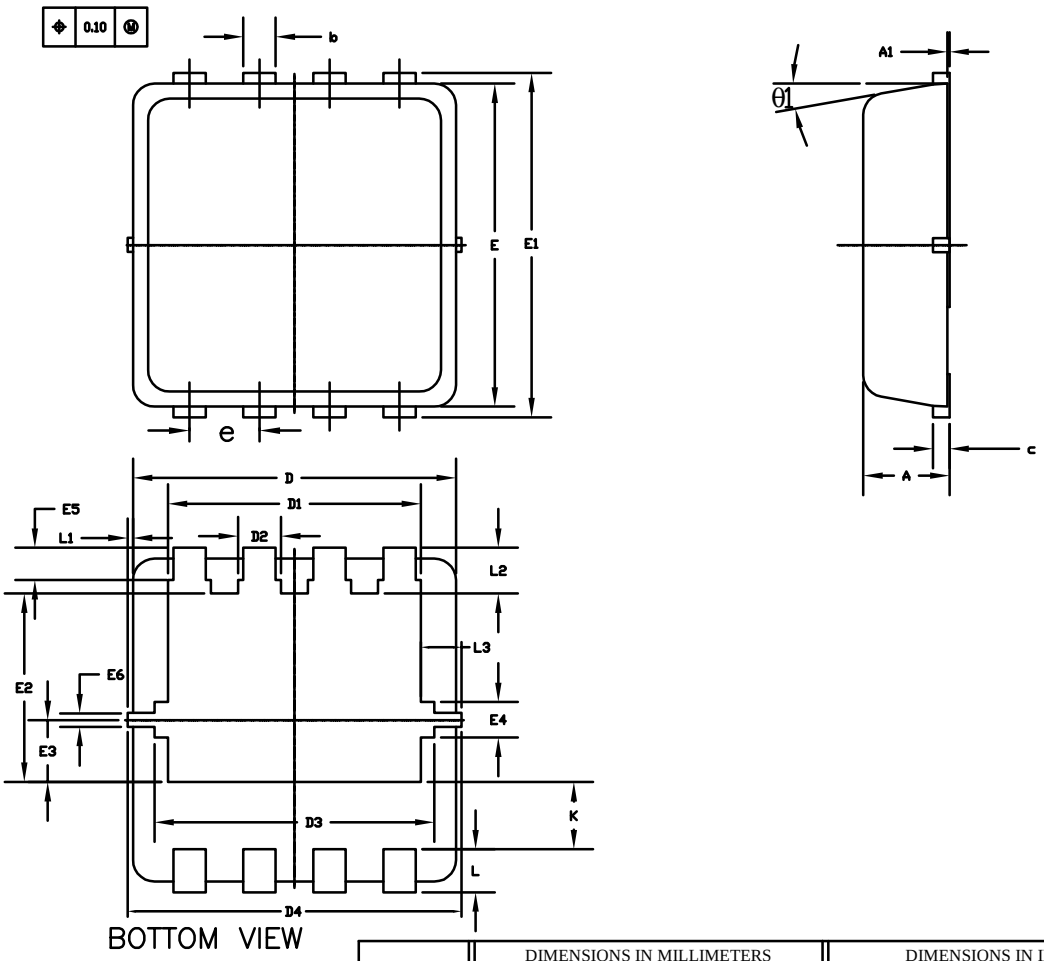
NOTE:
LOGO - AOS Logo
7544 - Part number code
F - Fab code
A - Assembly location code
Y - Year code
W - Week code
L&T - Assembly lot code

| PART NO. | DESCRIPTION | CODE |
|---|---|---|
| AON7544 | Green product | 7544 |
| AON7544L | Green product | 7544 |

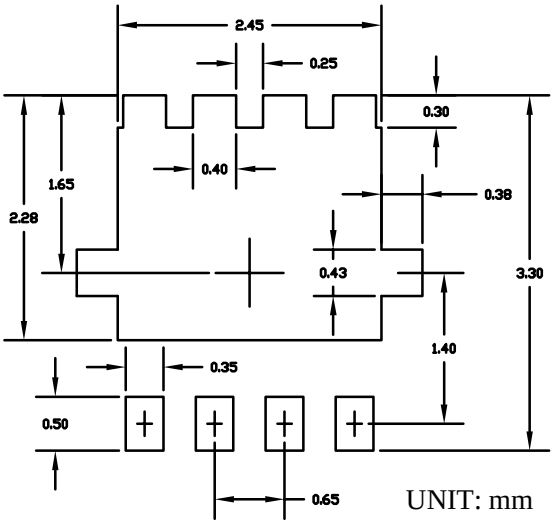
**ALPHA & OMEGA SEMICONDUCTOR**

| Document No. | PO-00047 |
|---|---|
| Version | G |

# DFN3x3A_8L_EP1_P PACKAGE OUTLINE




RECOMMENDED LAND PATTERN




UNIT: mm

| SYMBOLS | DIMENSIONS IN MILLIMETERS | | | DIMENSIONS IN INCHES | | |
|---|---|---|---|---|---|---|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.70 | 0.80 | 0.90 | 0.028 | 0.031 | 0.035 |
| A1 | 0.00 | 0.025 | 0.05 | 0.000 | 0.001 | 0.002 |
| b | 0.24 | 0.30 | 0.35 | 0.009 | 0.012 | 0.014 |
| c | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.010 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| D1 | 2.25 | 2.35 | 2.45 | 0.089 | 0.093 | 0.097 |
| D2 | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| D3 | 2.50 | 2.60 | 2.70 | 0.098 | 0.102 | 0.106 |
| D4 | 3.00 | 3.10 | 3.20 | 0.118 | 0.122 | 0.126 |
| E | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E1 | 3.10 | 3.20 | 3.30 | 0.122 | 0.126 | 0.130 |
| E2 | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| E3 | 0.48 | 0.58 | 0.68 | 0.019 | 0.023 | 0.027 |
| E4 | 0.23 | 0.33 | 0.43 | 0.009 | 0.013 | 0.017 |
| E5 | 0.20 | 0.30 | 0.40 | 0.008 | 0.012 | 0.016 |
| E6 | 0.075 | 0.125 | 0.175 | 0.003 | 0.005 | 0.007 |
| e | 0.60 | 0.65 | 0.70 | 0.024 | 0.026 | 0.028 |
| K | 0.52 | 0.62 | 0.72 | 0.020 | 0.024 | 0.028 |
| L | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| L1 | 0 | 0.05 | 0.10 | 0 | 0.002 | 0.004 |
| L2 | 0.33 | 0.43 | 0.53 | 0.013 | 0.017 | 0.021 |
| L3 | 0.275 | 0.375 | 0.475 | 0.011 | 0.015 | 0.019 |
| θ1 | 0° | 10° | 12° | 0° | 10° | 12° |

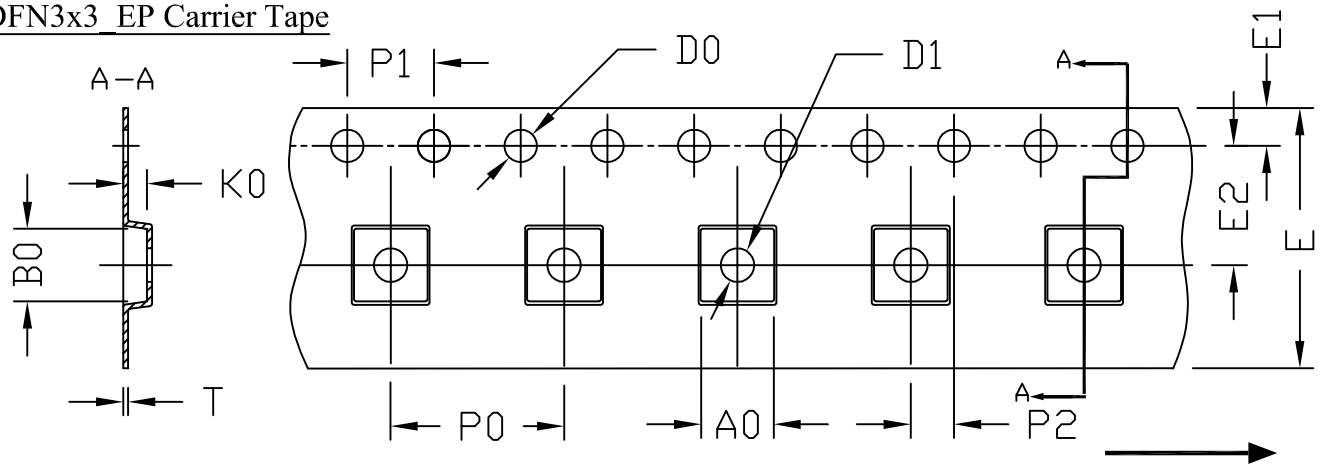
NOTE

1. PACKAGE DIMENSION IS EXCLUSIVE OF MOLD GATE BURR
2. PACKAGE DIMENSION IS EXCLUSIVE OF MOLD FLASH AND CUTTING BURR
3. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

**ALPHA & OMEGA**
*SEMICONDUCTOR, LTD.*

# DFN3x3_EP Tape and Reel Data

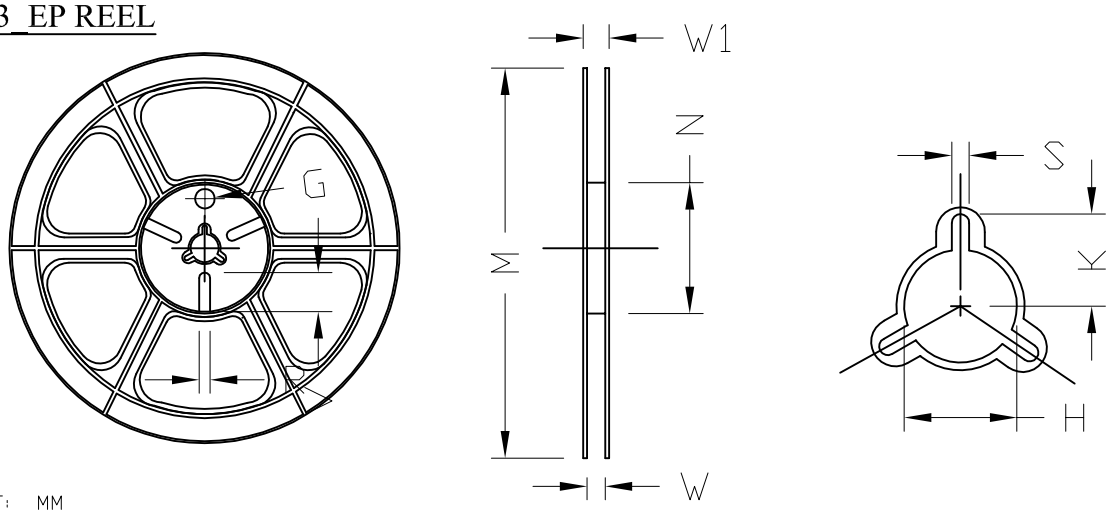
## DFN3x3_EP Carrier Tape




UNIT: MM

| PACKAGE | A0 | B0 | K0 | D0 | D1 | E | E1 | E2 | P0 | P1 | P2 | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DFN3x3_EP | 3.40 ±0.10 | 3.35 ±0.10 | 1.10 ±0.10 | 1.50 +0.10 −0 | 1.50 +0.10 −0 | 12.00 ±0.30 | 1.75 ±0.10 | 5.50 ±0.05 | 8.00 ±0.10 | 4.00 ±0.10 | 2.00 ±0.05 | 0.30 ±0.05 |

## DFN3x3_EP REEL




UNIT: MM

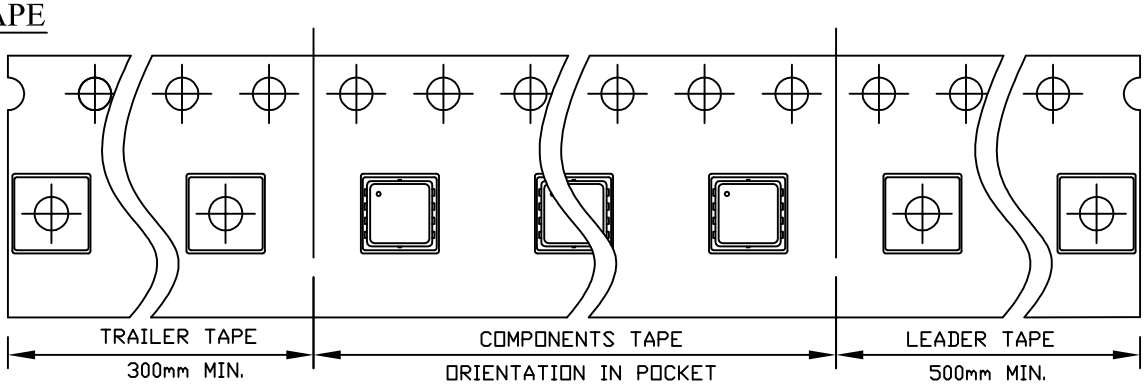
| TAPE SIZE | REEL SIZE | M | N | W | W1 | H | K | S | G | R | V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 mm | ø330 | ø330.00 ±0.50 | ø97.00 ±0.10 | 13.00 ±0.30 | 17.40 ±1.00 | ø13.00 +0.50 −0.20 | 10.60 | 2.00 ±0.50 | --- | --- | --- |

## DFN3x3_EP TAPE

Leader / Trailer
& Orientation

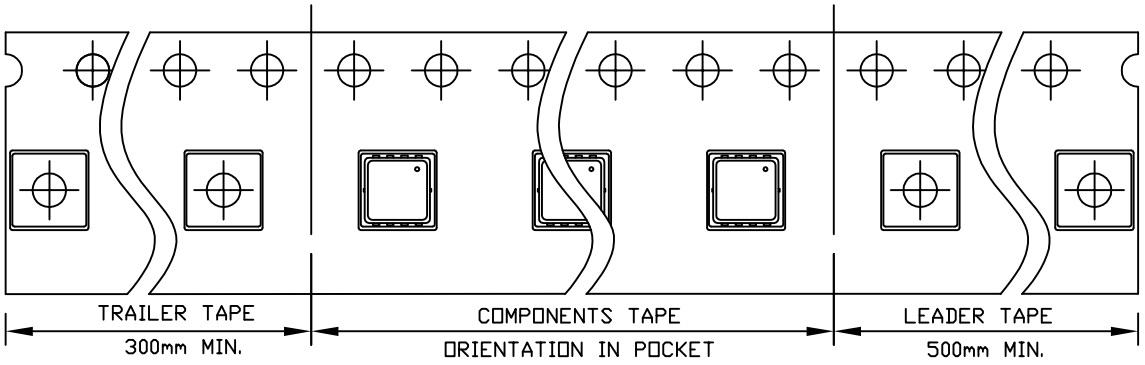
### MOS

Unit Per Reel:
5000pcs




### PIC

Unit Per Reel:
5000pcs



# *AOS Semiconductor*
# *Product Reliability Report*

## AON7544, rev A

**Plastic Encapsulated Device**

**ALPHA & OMEGA Semiconductor, Inc**

**www.aosmd.com**

This AOS product reliability report summarizes the qualification result for AON7544. 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 AON7544 passes AOS quality and reliability requirements. The released product will be categorized by the process family and be routine monitored for continuously improving the product quality.

## I. Reliability Stress Test Summary and Results

| Test Item | Test Condition | Time Point | Total Sample Size | Number of Failures | Reference Standard |
|---|---|---|---|---|---|
| **HTGB** | **Temp = 150°C , Vgs=100% of Vgsmax** | **168 / 500 / 1000 hours** | **924 pcs** | **0** | **JESD22-A108** |
| **HTRB** | **Temp = 150°C , Vds=100% of Vdsmax** | **168 / 500 / 1000 hours** | **924 pcs** | **0** | **JESD22-A108** |
| **Precondition (Note A)** | **168hr 85°C / 85%RH + 3 cycle reflow@260°C (MSL 1)** | **-** | **4620 pcs** | **0** | **JESD22-A113** |
| **HAST** | **130°C , 85%RH, 33.3 psia, Vds = 80% of Vdsmax** | **96 hours** | **924 pcs** | **0** | **JESD22-A110** |
| **H3TRB** | **85°C , 85%RH, Vds = 80% of Vdsmax** | **1000 hours** | **462 pcs** | **0** | **JESD22-A101** |
| **Autoclave** | **121°C , 29.7psia, RH=100%** | **96 hours** | **924 pcs** | **0** | **JESD22-A102** |
| **Temperature Cycle** | **-65°C to 150°C , air to air,** | **1000 cycles** | **924 pcs** | **0** | **JESD22-A104** |
| **HTSL** | **Temp = 150°C** | **1000 hours** | **924 pcs** | **0** | **JESD22-A103** |
| **Power Cycling** | **$\Delta$ Tj = 100°C** | **15000 cycles** | **462 pcs** | **0** | **AEC Q101** |

**Note:** The reliability data presents total of available generic data up to the published date.
Note A: MSL (Moisture Sensitivity Level) 1 based on J-STD-020

## II. Reliability Evaluation

## FIT rate (per billion): 1.91
## MTTF = 59839 years

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

**Failure Rate** = $Chi^2 \times 10^9$ **/ [**2 (N) (H) (Af)**] =** 1.91
**MTTF =** $10^9$ / FIT = 59839 years

**Chi²** = Chi Squared Distribution, determined by the number of failures and confidence interval
**N** = Total Number of units from burn-in tests
**H** = Duration of burn-in 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** | **259** | **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 $10^{-5}$eV / K