



**ALPHA & OMEGA**  
SEMICONDUCTOR, LTD.

Rev 2: Oct 2004

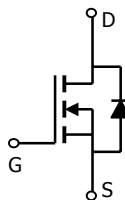
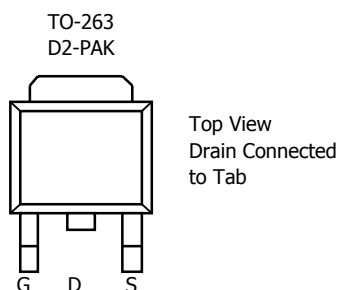
## AOB420, AOB420L (Green Product) N-Channel Enhancement Mode Field Effect Transistor

### General Description

The AOB420 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. This device is ideally suited for use as a high side switch in CPU core power conversion. AOB420L (Green Product) is offered in a Lead Free package.

### Features

$V_{DS}$  (V) = 30V  
 $I_D$  = 110A  
 $R_{DS(ON)} < 6.5m\Omega$  ( $V_{GS} = 10V$ )  
 $R_{DS(ON)} < 10.0m\Omega$  ( $V_{GS} = 4.5V$ )



### 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                                       | $V_{GS}$       | $\pm 20$   | V                |
| Continuous Drain Current <sup>B,G</sup>                   | $I_D$          | 110        | A                |
| $T_C=25^\circ\text{C}$ <sup>G</sup>                       |                |            |                  |
| $T_C=100^\circ\text{C}$ <sup>B</sup>                      | $I_D$          | 65         | A                |
| Pulsed Drain Current                                      | $I_{DM}$       | 200        |                  |
| Avalanche Current <sup>C</sup>                            | $I_{AR}$       | 30         | A                |
| Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AR}$       | 120        | mJ               |
| Power Dissipation <sup>B</sup>                            | $P_D$          | 100        | W                |
| $T_C=25^\circ\text{C}$                                    |                |            |                  |
| $T_C=100^\circ\text{C}$                                   | $P_D$          | 50         | W                |
| Power Dissipation <sup>A</sup>                            | $P_{DSM}$      | 3.1        | W                |
| $T_A=25^\circ\text{C}$                                    |                |            |                  |
| $T_A=70^\circ\text{C}$                                    | $P_{DSM}$      | 2          | W                |
| Junction and Storage Temperature Range                    | $T_J, T_{STG}$ | -55 to 175 | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                | Symbol          | Typ | Max | Units              |
|------------------------------------------|-----------------|-----|-----|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 8.1 | 12  | $^\circ\text{C/W}$ |
| $t \leq 10\text{s}$                      |                 |     |     |                    |
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 33  | 40  | $^\circ\text{C/W}$ |
| Steady-State                             |                 |     |     |                    |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 1   | 1.5 | $^\circ\text{C/W}$ |
| Steady-State                             |                 |     |     |                    |

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

| Symbol                      | Parameter                             | Conditions                                                                                | Min | Typ         | Max       | Units |
|-----------------------------|---------------------------------------|-------------------------------------------------------------------------------------------|-----|-------------|-----------|-------|
| <b>STATIC PARAMETERS</b>    |                                       |                                                                                           |     |             |           |       |
| BV <sub>DSS</sub>           | Drain-Source Breakdown Voltage        | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V                                                | 30  |             |           | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                         |     |             | 1<br>5    | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                               |     |             | 100       | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 1.5 | 2.15        | 2.5       | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                 | 110 |             |           | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =30A<br>T <sub>J</sub> =125°C                        |     | 5.05<br>7.7 | 6.5<br>11 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =30A                                                |     | 8.2         | 10        | mΩ    |
|                             |                                       |                                                                                           |     |             |           |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =30A                                                  |     | 60          |           | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V                                                   |     | 0.72        | 1         | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                           |     |             | 110       | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                           |     |             |           |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz                                         |     | 1320        |           | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                           |     | 533         |           | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                           |     | 154         |           | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                          |     | 0.95        |           | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                           |     |             |           |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge                     | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =30A                          |     | 25.5        |           | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge                     |                                                                                           |     | 13.3        |           | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                           |     | 3.2         |           | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                           |     | 6.7         |           | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.5Ω,<br>R <sub>GEN</sub> =3Ω |     | 7.7         |           | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                           |     | 28          |           | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                           |     | 22.2        |           | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                           |     | 20.7        |           | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =30A, dI/dt=100A/μs                                                        |     | 30.7        |           | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =30A, dI/dt=100A/μs                                                        |     | 21.8        |           | nC    |

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on steady-state R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C. The value in any a given application depends on the user's specific board design, and the maximum temperature fo 175°C may be used if the PCB or heatsink allows it.

B: The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

C: Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=175°C.

D: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> 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 tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

G: The maximum current rating is limited by the package current capability.

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

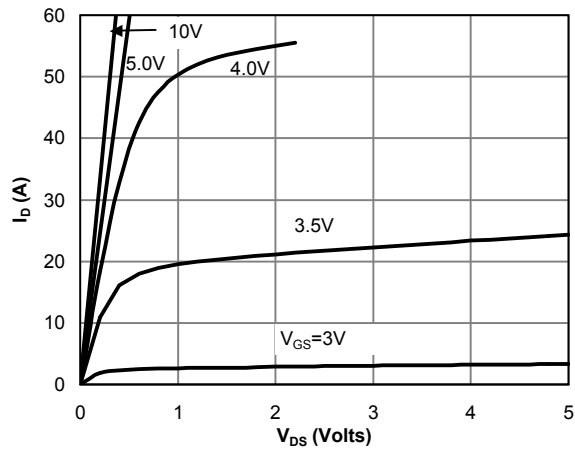


Fig 1: On-Region Characteristics

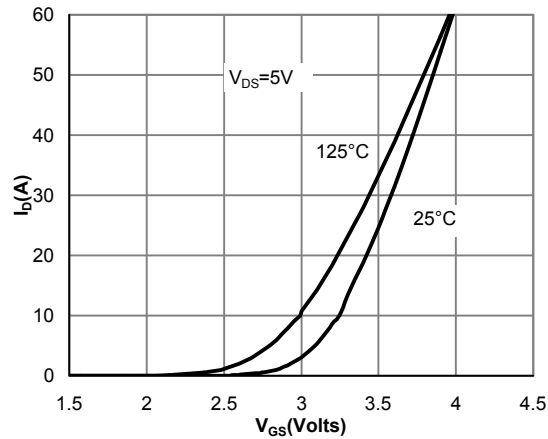


Figure 2: Transfer Characteristics

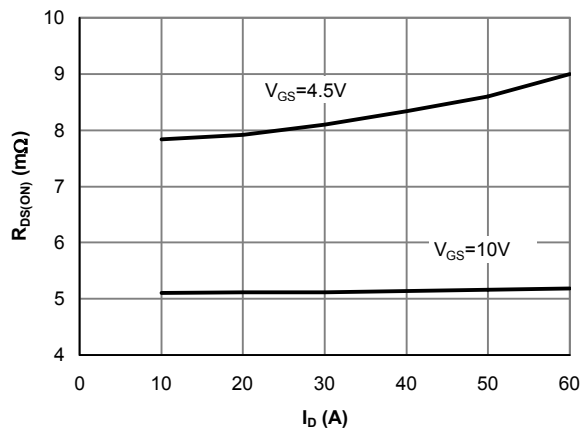


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

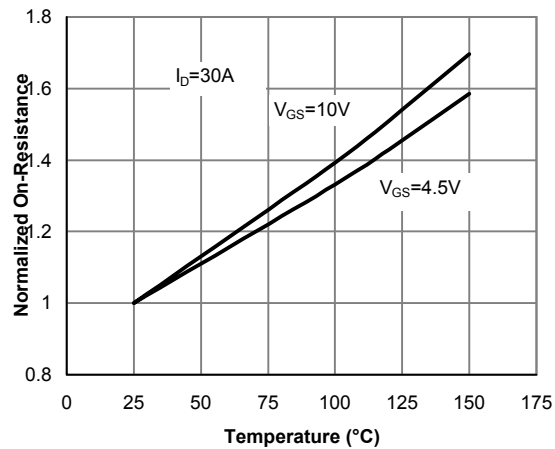


Figure 4: On-Resistance vs. Junction Temperature

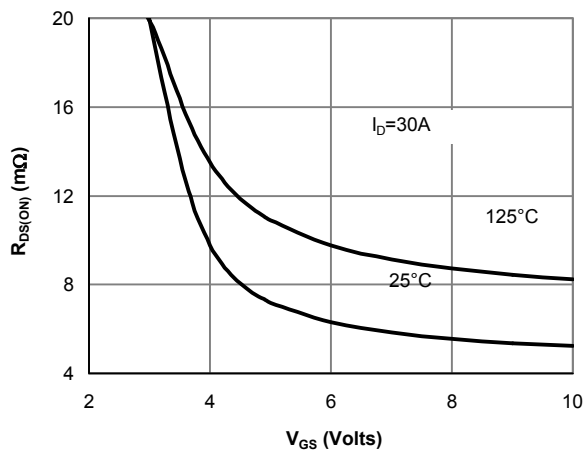


Figure 5: On-Resistance vs. Gate-Source Voltage

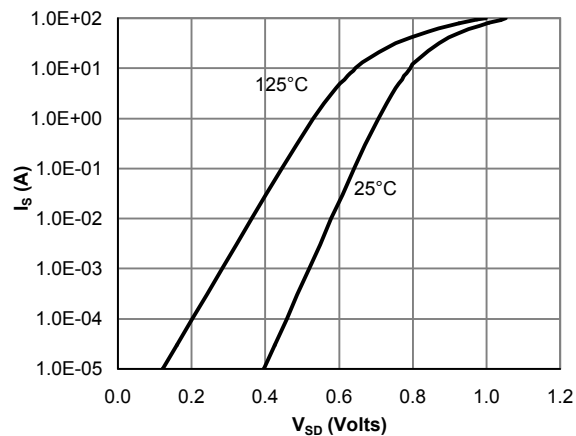


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

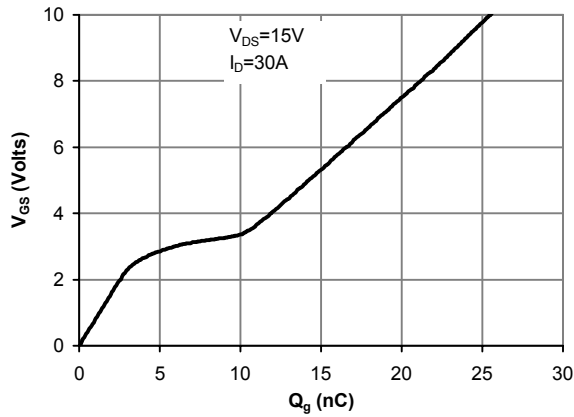


Figure 7: Gate-Charge Characteristics

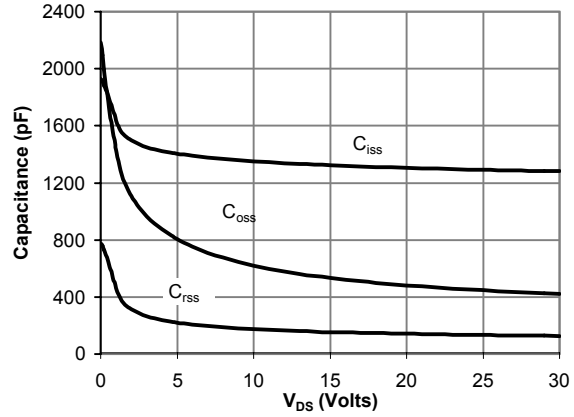


Figure 8: Capacitance Characteristics

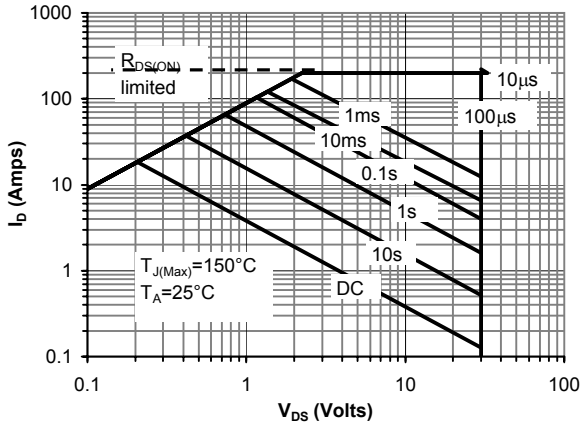


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

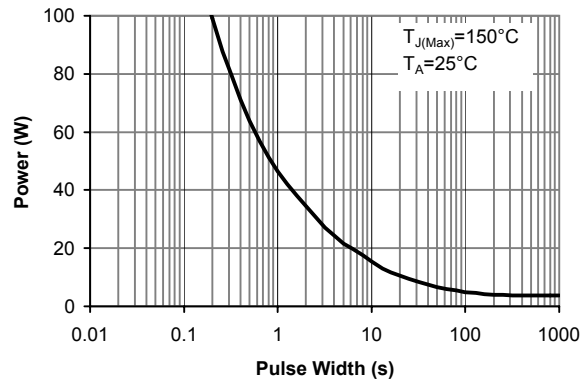


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

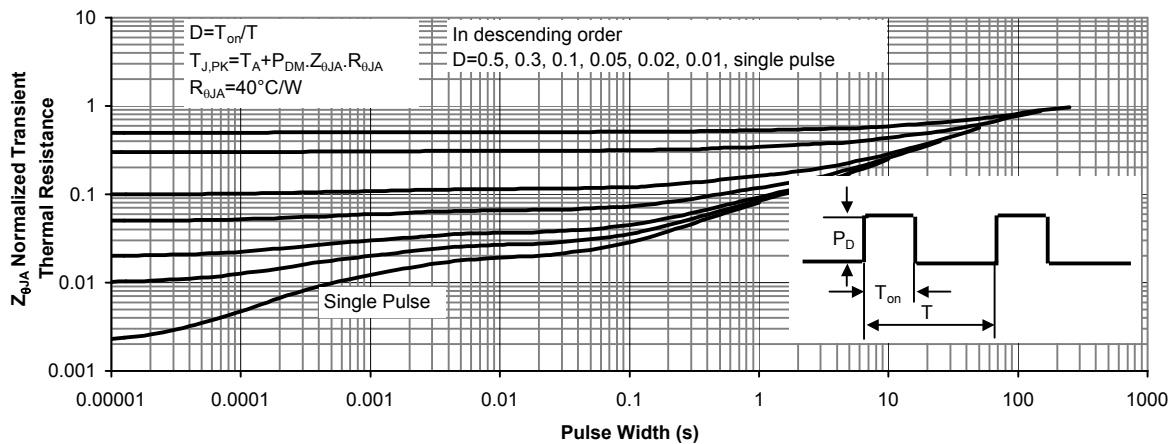


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

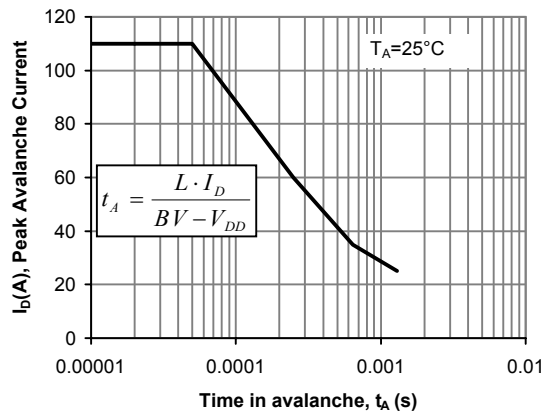


Figure 12: Single Pulse Avalanche capability

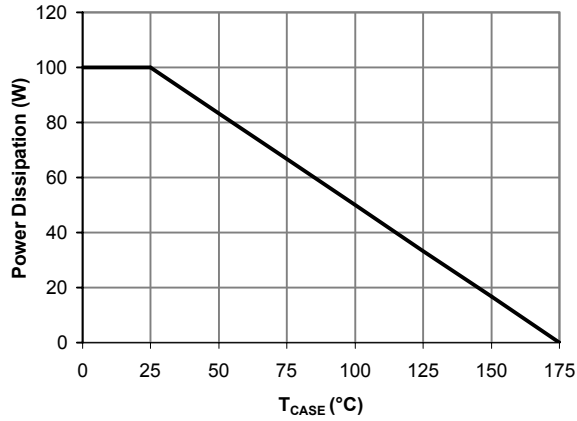


Figure 13: Power De-rating (Note B)

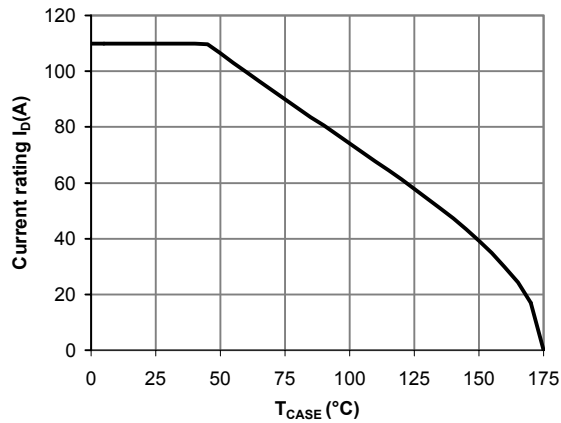


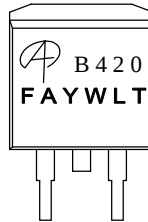
Figure 14: Current De-rating (Note B)



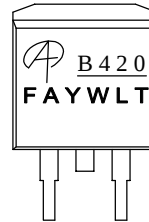
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|              |                            |
|--------------|----------------------------|
| Document No. | PD-00081                   |
| Version      | rev C                      |
| Title        | AOB420 Marking Description |

#### D2PAK PACKAGE MARKING DESCRIPTION



Standard product



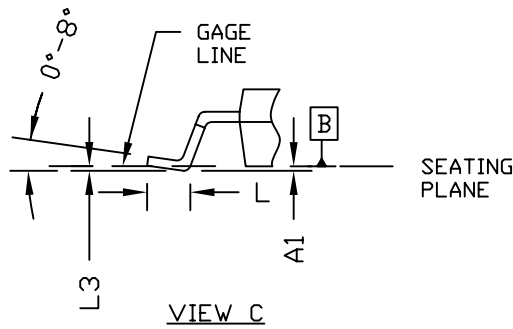
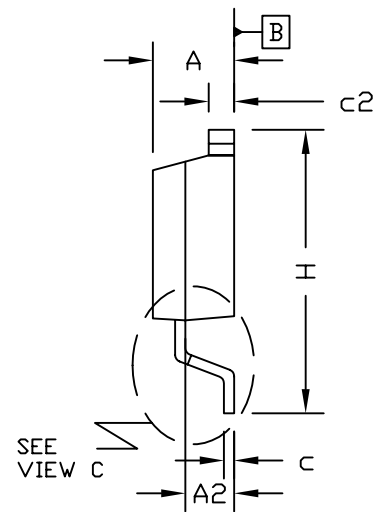
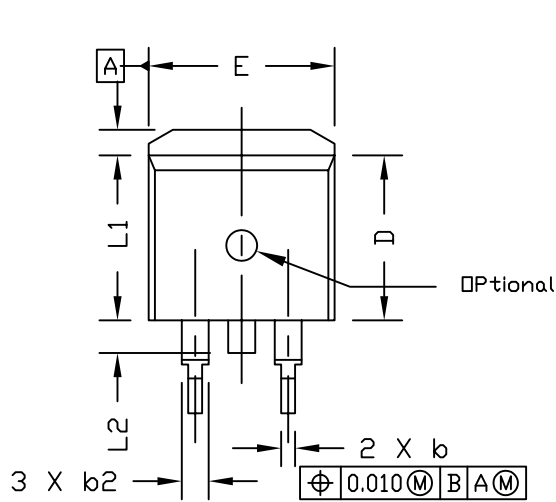
Green product

NOTE:  
LOGO - AOS LOGO  
B420 - PART NUMBER CODE.  
F&A - FOUNDRY AND ASSEMBLY LOCATION  
Y - YEAR CODE  
W - WEEK CODE.  
L T - ASSEMBLY LOT CODE

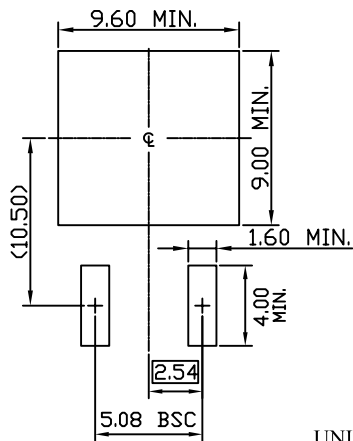
| PART NO. | DESCRIPTION      | CODE        |
|----------|------------------|-------------|
| AOB420   | Standard product | B420        |
| AOB420L  | Green product    | <u>B420</u> |



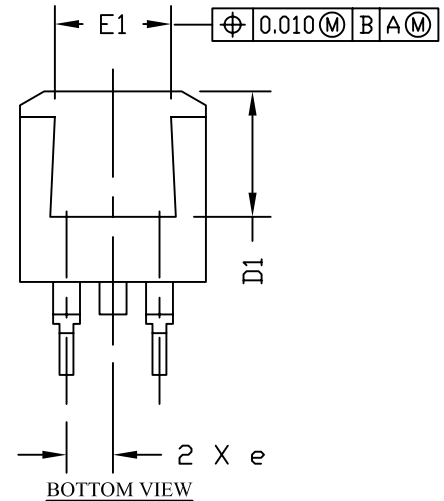
## D2PAK TO-263 PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



UNIT: mm



| SYMBOLS | DIMENSIONS IN MILLIMETERS |       |       | DIMENSIONS IN INCHES |       |       |
|---------|---------------------------|-------|-------|----------------------|-------|-------|
|         | MIN                       | NOM   | MAX   | MIN                  | NOM   | MAX   |
| A       | 4.24                      | 4.45  | 4.72  | 0.167                | 0.175 | 0.186 |
| A1      | 0.00                      | ---   | 0.30  | 0.000                | ---   | 0.012 |
| A2      | 2.52                      | 2.67  | 2.82  | 0.099                | 0.105 | 0.111 |
| b       | 0.69                      | 0.81  | 1.06  | 0.027                | 0.032 | 0.042 |
| b2      | 1.07                      | 1.27  | 1.47  | 0.042                | 0.050 | 0.058 |
| c       | 0.30                      | 0.38  | 0.56  | 0.012                | 0.015 | 0.022 |
| c2      | 1.15                      | 1.27  | 1.45  | 0.045                | 0.050 | 0.057 |
| D       | 8.30                      | 9.14  | 9.65  | 0.327                | 0.360 | 0.380 |
| D1      | ---                       | ---   | 6.93  | ---                  | ---   | 0.273 |
| e       | 2.54 BSC                  |       |       | 0.100 BSC.           |       |       |
| E       | 9.70                      | 10.03 | 10.54 | 0.382                | 0.395 | 0.415 |
| E1      | 6.22                      | ---   | ---   | 0.245                | ---   | ---   |
| H       | 14.20                     | 15.24 | 15.80 | 0.559                | 0.600 | 0.622 |
| L       | 2.29                      | 2.54  | 2.79  | 0.090                | 0.100 | 0.110 |
| L1      | 1.40 BSC                  |       |       | 0.055 BSC.           |       |       |
| L2      | 1.27                      | 1.52  | 1.78  | 0.50                 | 0.60  | 0.070 |
| L3      | 0.25 BSC                  |       |       | 0.010 BSC.           |       |       |

NOTE:

1. PACKAGE BODY SIDES EXCLUDE MOLD FLASH AND GATE BURRS.  
MOLD FLASH SHOULD BE LESS THAN 6 MILS.
2. TOLERANCE 0.10 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
3. DIMENSION L IS MEASURED IN GAGE LINE.
4. CONTROLLING DIMENSION IS MILLIMETER.  
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
5. REFER TO JEDEC TO-263 AB.



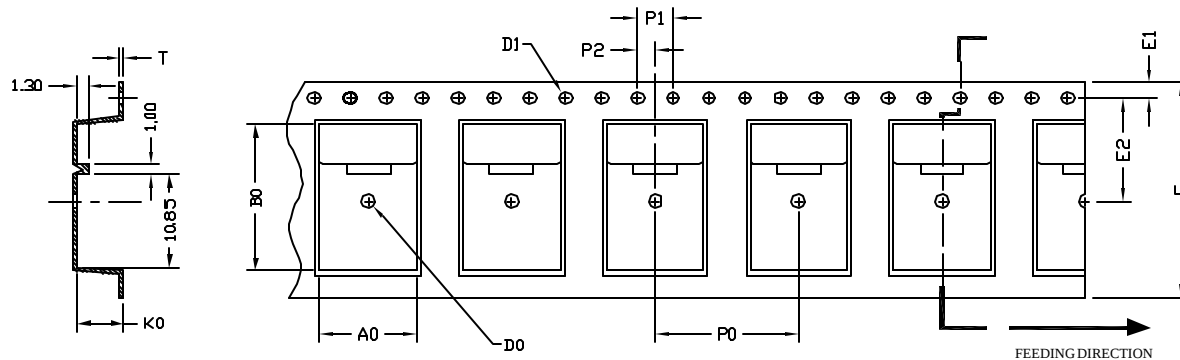
**ALPHA & OMEGA**

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**TO-263 (D2PAK)**

**Tape and Reel Data**

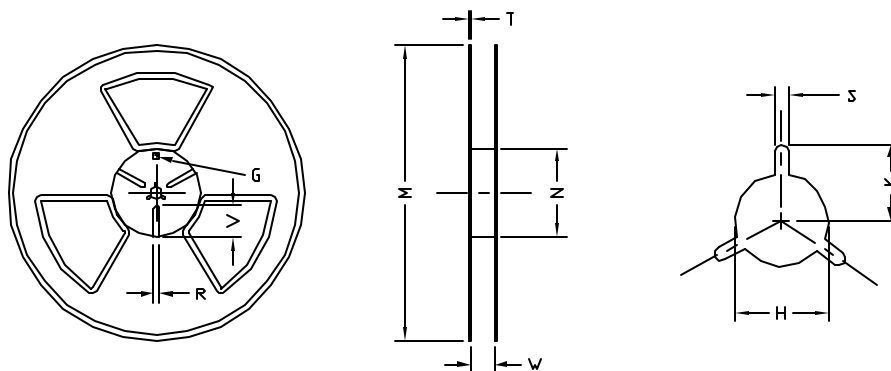
TO-263 (D2PAK) Carrier Tape



UNIT: MM

| PACKAGE                  | A0             | B0             | K0            | D0            | D1           | E              | E1            | E2             | P0             | P1            | P2            | T             |
|--------------------------|----------------|----------------|---------------|---------------|--------------|----------------|---------------|----------------|----------------|---------------|---------------|---------------|
| TO-263(D2PAK)<br>(24 mm) | 10.80<br>±0.10 | 16.30<br>±0.10 | 4.85<br>±0.10 | 1.50<br>±0.10 | 1.50<br>MIN. | 24.00<br>±0.30 | 1.75<br>±0.10 | 11.50<br>±0.10 | 16.00<br>±0.10 | 4.00<br>±0.10 | 2.00<br>±0.10 | 0.35<br>±0.05 |

TO-263 (D2PAK) Reel



UNIT: MM

| TAPE SIZE | REEL SIZE | M                | N               | W              | T    | H               | K     | S             | G   | R   | V   |
|-----------|-----------|------------------|-----------------|----------------|------|-----------------|-------|---------------|-----|-----|-----|
| 24 mm     | ø330      | ø330.00<br>±0.10 | ø99.50<br>±0.10 | 25.50<br>±0.50 | 2.30 | ø13.50<br>±0.10 | 10.60 | 2.50<br>±0.10 | --- | --- | --- |

TO-263 (D2PAK)

Leader / Trailer  
& Orientation

