



**AOU404, AOU404L (Green Product)**  
**N-Channel Enhancement Mode Field Effect Transistor**

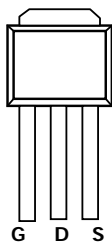
**General Description**

The AOU404 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. AOU404L (Green Product) is offered in a lead-free package.

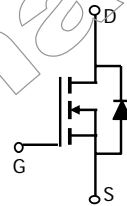
**Features**

- $V_{DS}$  (V) = 75V
- $I_D$  = 10 A
- $R_{DS(ON)} < 130 \text{ m}\Omega$  ( $V_{GS} = 20V$ ) @ 5A
- $R_{DS(ON)} < 140 \text{ m}\Omega$  ( $V_{GS} = 10V$ )
- $R_{DS(ON)} < 165 \text{ m}\Omega$  ( $V_{GS} = 4.5V$ )

TO-251



Top View  
Drain Connected  
to Tab



**Absolute Maximum Ratings  $T_A=25^\circ\text{C}$  unless otherwise noted**

| Parameter   | Symbol         | Maximum                 | Units            |
|---|----------------|-------------------------|------------------|
| Drain-Source Voltage                                      | $V_{DS}$       | 75                      | V                |
| Gate-Source Voltage                                       | $V_{GS}$       | $\pm 25$                | V                |
| Continuous Drain Current <sup>G</sup>                     | $I_D$          | $T_C=25^\circ\text{C}$  | A                |
|   |                | $T_C=100^\circ\text{C}$ |                  |
| Pulsed Drain Current <sup>C</sup>                         | $I_{DM}$       | 20                      |                  |
| Avalanche Current <sup>C</sup>                            | $I_{AR}$       | 10                      | A                |
| Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup> | $E_{AR}$       | 15                      | mJ               |
| Power Dissipation <sup>B</sup>                            | $P_D$          | $T_C=25^\circ\text{C}$  | W                |
|   |                | $T_C=100^\circ\text{C}$ |                  |
| 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> | $R_{\theta JA}$ | 115 | 140 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case <sup>B</sup>    | $R_{\theta JC}$ | 4.5 | 7.5 | $^\circ\text{C/W}$ |

**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> =10mA, V <sub>GS</sub> =0V   | 75  |            |            | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =60V, 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   | 2.4        | 3          | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V   | 20  |            |            | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =20V, I <sub>D</sub> =5A<br>T <sub>J</sub> =125°C                           |     | 100<br>180 | 130<br>220 | mΩ    |
|                             |                                       | V <sub>GS</sub> =10V, I <sub>D</sub> =5A  |     | 105        | 140        | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A   |     | 120        | 165        | mΩ    |
|                             |                                       |   |     |            |            |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =10A  |     | 9          |            | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V   |     | 0.79       | 1          | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |   |     |            | 10         | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |            |            |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =30V, f=1MHz   |     | 293        | 350        | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   |     | 51         |            | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |   |     | 20         |            | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  |     | 2.2        | 3          | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |   |     |            |            |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =37.5V, I <sub>D</sub> =5A                            |     | 5.2        | 6.5        | nC    |
| Q <sub>g(4.5V)</sub>        | Total Gate Charge                     |   |     | 2.46       | 3.5        | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   |     | 1          |            | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 1.34       |            | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =37.5V, R <sub>L</sub> =7.5Ω,<br>R <sub>GEN</sub> =3Ω |     | 4.6        |            | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |     | 2.3        |            | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |     | 14.7       |            | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 1.7        |            | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =5A, di/dt=100A/μs   |     | 25         | 30         | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =5A, di/dt=100A/μs   |     | 27         |            | nC    |

- A: The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25°C.
- 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.
- 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 <300 μs 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<sub>J(MAX)</sub>=175°C.
- G: The maximum current rating is limited by bond-wires.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

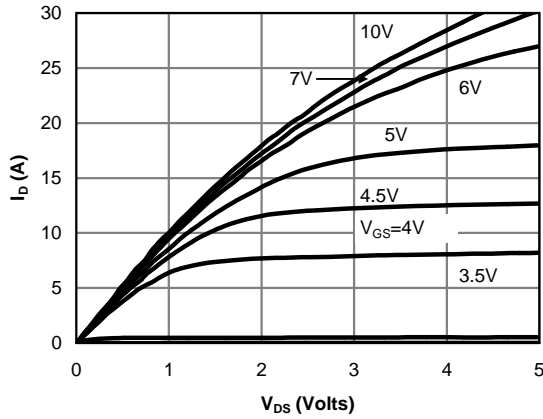


Fig 1: On-Region Characteristics

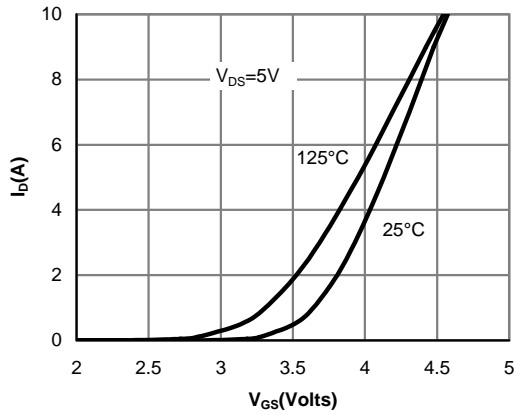


Figure 2: Transfer Characteristics

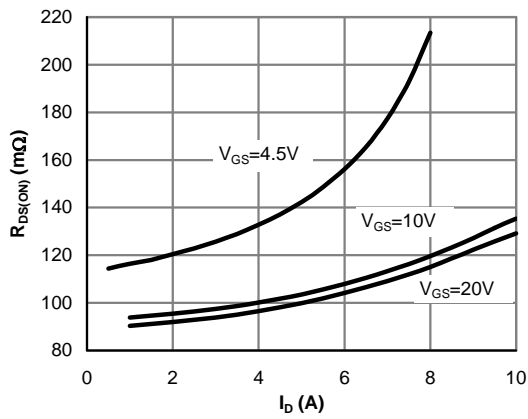


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

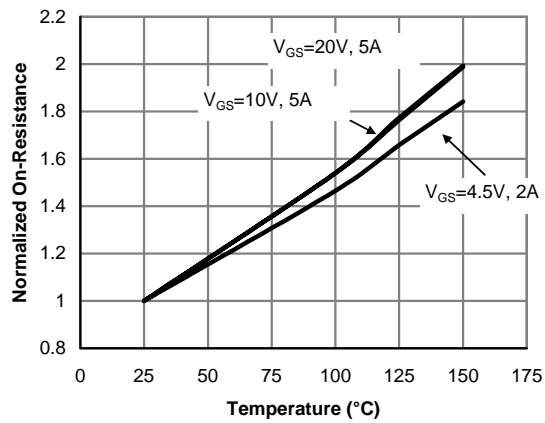


Figure 4: On-Resistance vs. Junction Temperature

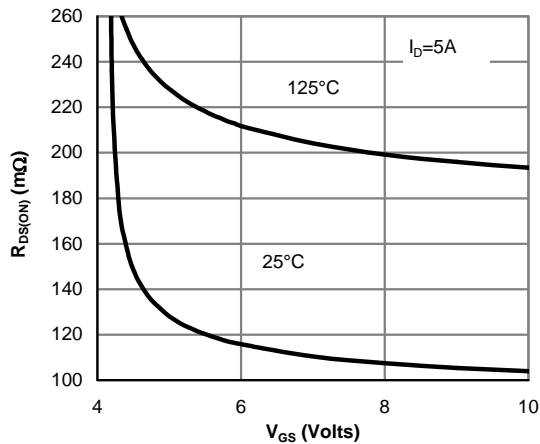


Figure 5: On-Resistance vs. Gate-Source Voltage

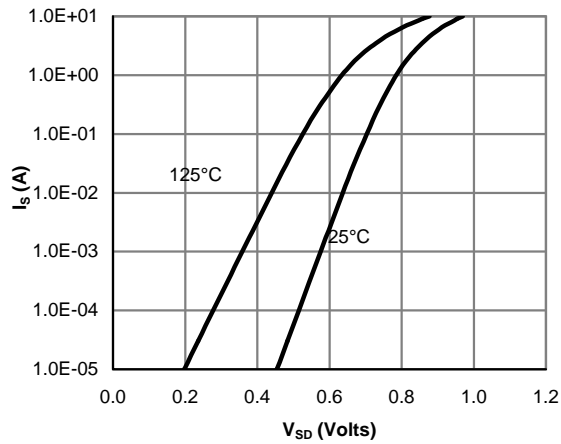


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

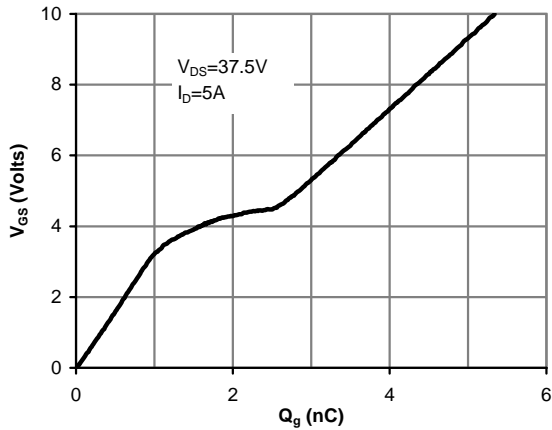


Figure 7: Gate-Charge Characteristics

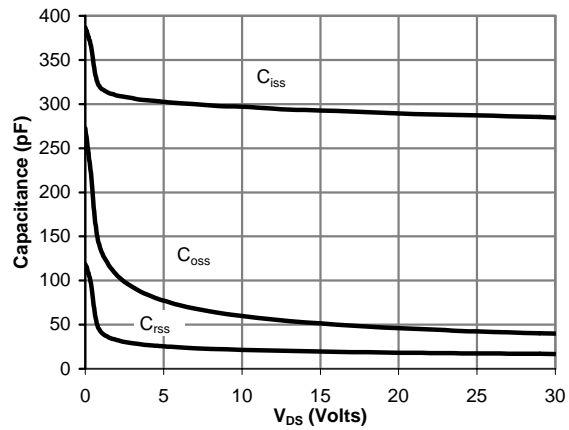


Figure 8: Capacitance Characteristics

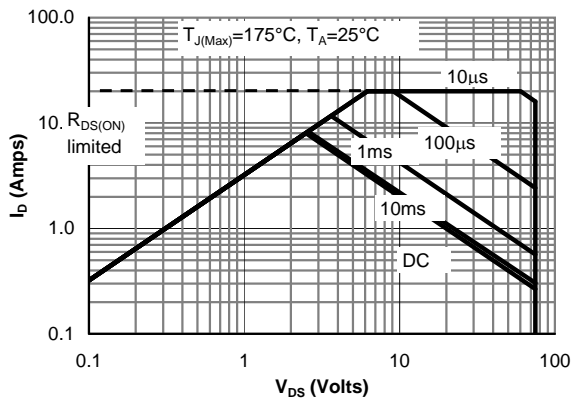


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

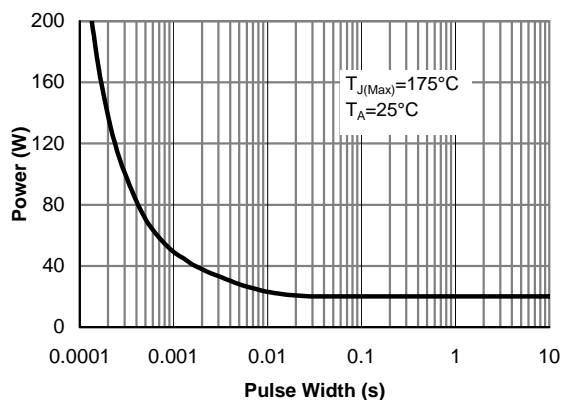


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

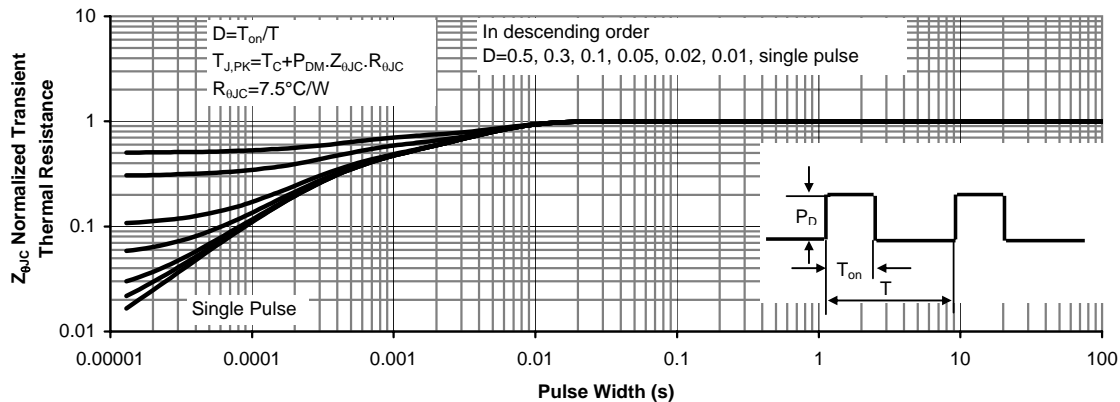


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

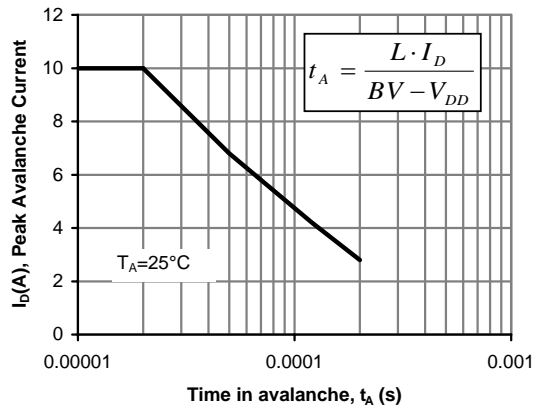


Figure 12: Single Pulse Avalanche capability

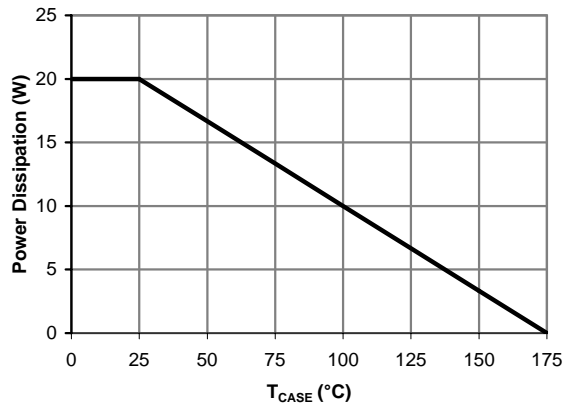


Figure 13: Power De-rating (Note B)

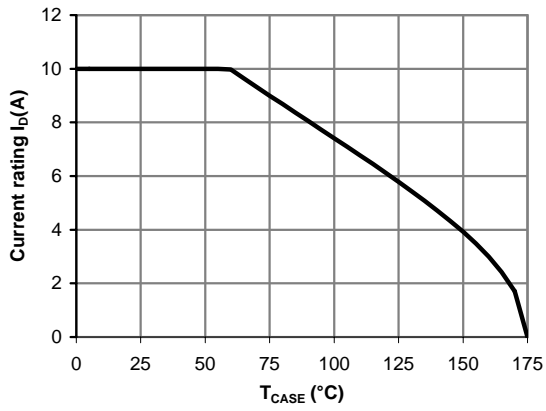
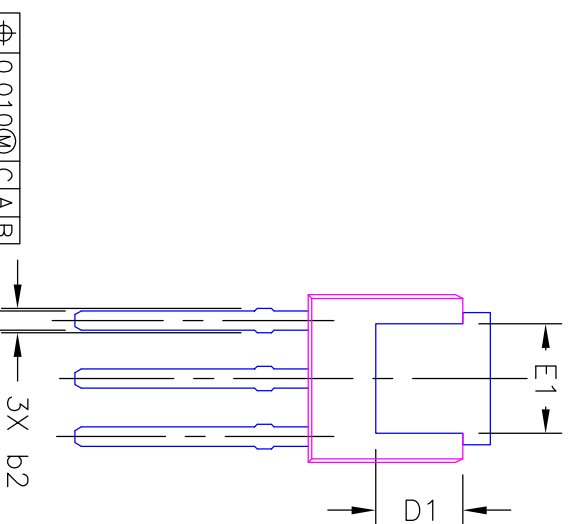
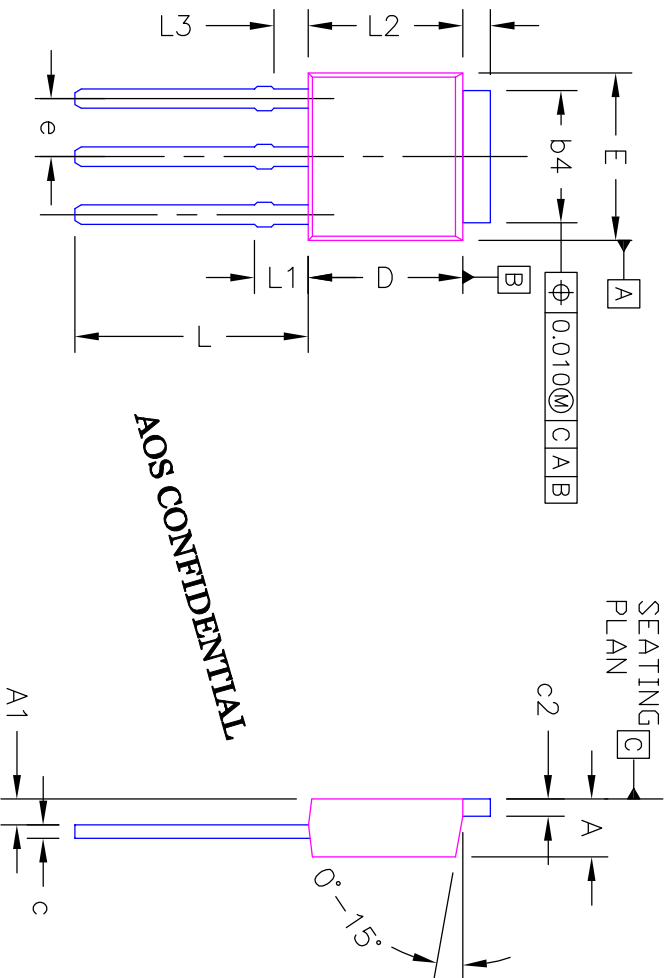


Figure 14: Current De-rating (Note B)

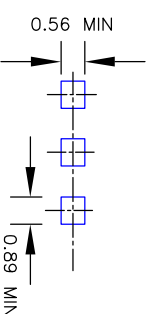


AOS CONFIDENTIAL

| SYMBOLS | DIMENSIONS IN MILLIMETERS |      |      | DIMENSIONS IN INCHES |       |       |
|---------|---------------------------|------|------|----------------------|-------|-------|
|         | MIN                       | NOM  | MAX  | MIN                  | NOM   | MAX   |
| A       | 2.24                      | 2.29 | 2.39 | 0.088                | 0.090 | 0.094 |
| A1      | 0.89                      | ---  | 1.14 | 0.035                | ---   | 0.045 |
| b       | 0.69                      | 0.76 | 0.89 | 0.027                | 0.030 | 0.035 |
| b2      | 0.89                      | ---  | 1.14 | 0.035                | ---   | 0.045 |
| b4      | 5.21                      | ---  | 5.46 | 0.205                | ---   | 0.215 |
| c       | 0.46                      | 0.51 | 0.56 | 0.018                | 0.020 | 0.022 |
| c2      | 0.48                      | ---  | 0.58 | 0.019                | ---   | 0.023 |
| D       | 5.97                      | 6.10 | 6.22 | 0.235                | 0.240 | 0.245 |
| D1      | 4.32                      | ---  | ---  | 0.170                | ---   | ---   |
| E       | 6.48                      | 6.60 | 6.73 | 0.255                | 0.260 | 0.265 |
| E1      | 4.32                      | ---  | 5.33 | 0.170                | ---   | 0.210 |
| e       | 2.29 BSC.                 |      |      | 0.090 BSC.           |       |       |
| L       | 8.89                      | 9.19 | 9.65 | 0.350                | 0.362 | 0.380 |
| L1      | 1.91                      | 2.11 | 2.29 | 0.075                | 0.083 | 0.090 |
| L2      | 0.89                      | ---  | 1.27 | 0.035                | ---   | 0.050 |
| L3      | 1.14                      | 1.35 | 1.52 | 0.045                | 0.053 | 0.060 |

- NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
  2. TOLERANCE 0.100 MILLIMETERS UNLESS OTHERWISE SPECIFIED.
  3. CONTROLLING DIMENSION IS MILLILITER, CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.
  4. REFER TO JEDEC TO-251D AA.

UNIT: mm



RECOMMENDATION OF HOLE PATTERN



Document No. PD-00016

Version rev B

UNLESS OTHERWISE SPECIFIED  
DIMENSIONS ARE IN INCHES

DECIMAL  
XX ±  
XXX ±  
XXXX ±

ANGULAR  
±

INTERPRET DIM AND TOL PER  
ASME Y14.5M - 1994

PRINTING IS SCALED TO FIT  
DO NOT SCALE DRAWING

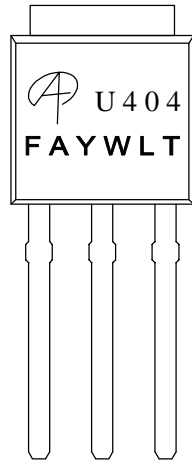
Title TO-251 PACKAGE OUTLINE



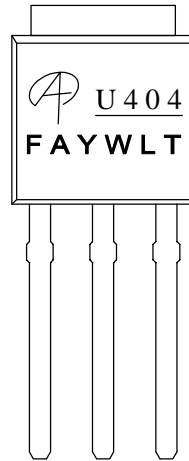
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|              |                            |
|--------------|----------------------------|
| Document No. | PD-00266                   |
| Version      | rev A                      |
| Title        | AOU404 Marking Description |

DPAK(TO-251) PACKAGE MARKING DESCRIPTION



Standard product



Green product

NOTE:  
LOGO - AOS LOGO  
U404 - PART NUMBER CODE.  
F&A - FOUNDRY AND ASSEMBLY LOCATION  
Y - YEAR CODE  
W - WEEK CODE.  
L T - ASSEMBLY LOT CODE

| PART NO. | DESCRIPTION      | CODE        |
|----------|------------------|-------------|
| AOU404   | Standard product | U404        |
| AOU404L  | Green product    | <u>U404</u> |