

# **AO3401**

## **DATASHEET**

### **Specification Revision History:**

| <b>Version</b> | <b>Date</b> | <b>Description</b>                                   |
|----------------|-------------|------------------------------------------------------|
| V1.0           | 2022/05     | New                                                  |
| V1.1           | 2023/01     | Modify Ordering Information                          |
| V1.2           | 2024/02     | Modify Ordering Information                          |
| V1.3           | 2025/05     | Add application precautions and overall typesetting. |

## Description

The AO3401 uses advanced Trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

※  $V_{DS} = -30V$   $I_D = -4.5A$

※  $R_{DS(ON)} < 45m\Omega$  @  $V_{GS} = 10V$

## Applications

※ Battery protection

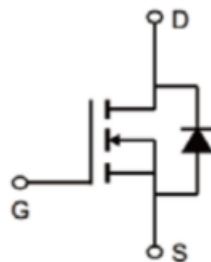
※ Load switch

※ Uninterruptible power supply

## The appearance of the product



SOT-23



Equivalent Circuit

## Ordering Information

| Product Model | Package Type | Marking | Packing | Packing Qty  |
|---------------|--------------|---------|---------|--------------|
| AO3401        | SOT-23       | A19T    | REEL    | 3000PCS/REEL |

**Absolute Maximum Ratings** (TA=25°C unless otherwise noted)

| Symbol                                | Parameter                                                     | Rating      | Units |
|---------------------------------------|---------------------------------------------------------------|-------------|-------|
| V <sub>DS</sub>                       | Drain-Source Voltage                                          | -30         | V     |
| V <sub>GS</sub>                       | Gate-Source Voltage                                           | ±12         | V     |
| I <sub>D</sub> @T <sub>A</sub> =25°C  | Continuous Drain Current, V <sub>GS</sub> @ -10V <sub>i</sub> | -4.5        | A     |
| I <sub>D</sub> @T <sub>A</sub> =100°C | Continuous Drain Current, V <sub>GS</sub> @ -10V <sub>i</sub> | -3.3        | A     |
| I <sub>DM</sub>                       | Pulsed Drain Current <sup>2</sup>                             | -20.4       | A     |
| P <sub>D</sub> @T <sub>A</sub> =25°C  | Total Power Dissipation <sup>3</sup>                          | 2.15        | W     |
| T <sub>STG</sub>                      | Storage Temperature Range                                     | -55 to +150 | °C    |
| T <sub>J</sub>                        | Operating Junction Temperature Range                          | -55 to +150 | °C    |
| R <sub>θJA</sub>                      | Thermal Resistance Junction-ambient 1                         | 125         | °C/W  |
| R <sub>θJC</sub>                      | Thermal Resistance Junction-Case <sup>1</sup>                 | 104         | °C/W  |

**Electrical Characteristics** (TA=25°C, unless otherwise noted)

| Symbol                                                 | Parameter                                                | Conditions                                                                                  | Min. | Typ. | Max.  | Unit |
|--------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------|------|------|-------|------|
| On/Off States                                          |                                                          |                                                                                             |      |      |       |      |
| B <sub>VDS</sub>                                       | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V , I <sub>D</sub> =-250μA                                                | -30  | -34  | ---   | V    |
| R <sub>DS(ON)</sub>                                    | Static Drain-Source On-Resistance <sup>2</sup>           | V <sub>GS</sub> =-10V , I <sub>D</sub> =-5A                                                 | ---  | 45   | 50    | mΩ   |
|                                                        |                                                          | V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-4A                                                | ---  | 45   | 55    |      |
|                                                        |                                                          | V <sub>GS</sub> =-2.5V , I <sub>D</sub> =-1A                                                | ---  | 55   | 80    |      |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                   | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250μA                                   | -0.5 | -1.0 | -1.5  | V    |
| I <sub>DSS</sub>                                       | Drain-Source Leakage Current                             | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V,                                               | ---  | ---  | -1    | μA   |
| I <sub>GSS</sub>                                       | Gate-Source Leakage Current                              | V <sub>GS</sub> =±12V , V <sub>DS</sub> =0V                                                 | ---  | ---  | ±100  | nA   |
| Dynamic Characteristics                                |                                                          |                                                                                             |      |      |       |      |
| C <sub>iss</sub>                                       | Input Capacitance                                        | V <sub>DS</sub> = -15V, V <sub>GS</sub> = 0V,f= 1.0MHz                                      | ---  | 745  | ---   | pF   |
| C <sub>oss</sub>                                       | Output Capacitance                                       |                                                                                             | ---  | 70   | ---   |      |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                             |                                                                                             | ---  | 57   | ---   |      |
| Q <sub>g</sub>                                         | Total Gate Charge (4.5V)                                 | V <sub>DS</sub> = -15V, I <sub>D</sub> = -5.1A,V <sub>GS</sub> = -10V                       | ---  | 8    | ---   | nC   |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                       |                                                                                             | ---  | 1.8  | ---   |      |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                                        |                                                                                             | ---  | 2.7  | ---   |      |
| Switching Characteristics                              |                                                          |                                                                                             |      |      |       |      |
| T <sub>d(on)</sub>                                     | Turn-On Delay Time                                       | V <sub>DD</sub> = -15V, I <sub>D</sub> = -1A, V <sub>GS</sub> =-10V, R <sub>GEN</sub> =2.5Ω | ---  | 7    | ---   | ns   |
| T <sub>r</sub>                                         | Rise Time                                                |                                                                                             | ---  | 3    | ---   |      |
| T <sub>d(off)</sub>                                    | Turn-Off Delay Time                                      |                                                                                             | ---  | 30   | ---   |      |
| T <sub>f</sub>                                         | Fall Time                                                |                                                                                             | ---  | 12   | ---   |      |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                          |                                                                                             |      |      |       |      |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current |                                                                                             | ---  | ---  | -4.5  | A    |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                             | ---  | ---  | -16.4 | A    |
| V <sub>SD</sub>                                        | Diode Forward Voltage <sup>2</sup>                       | V <sub>GS</sub> =0V , I <sub>S</sub> =-5.1A                                                 | ---  | -0.8 | -1.2  | V    |

Note :

- 1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 20Z copper.
- 2、The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3、The power dissipation is limited by 150°C junction temperature
- 4、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

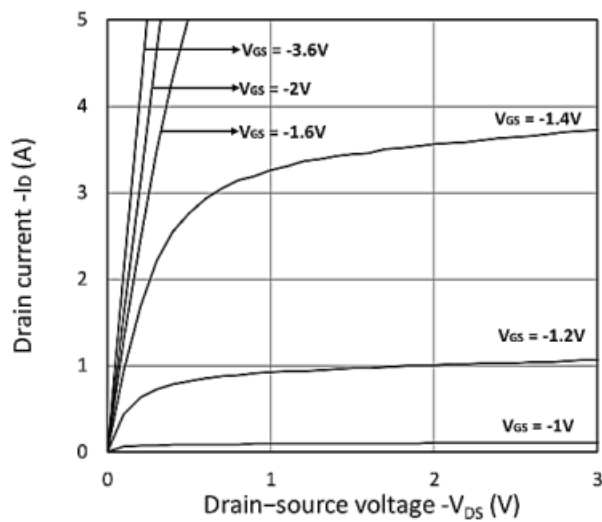


Figure 1. Output Characteristics

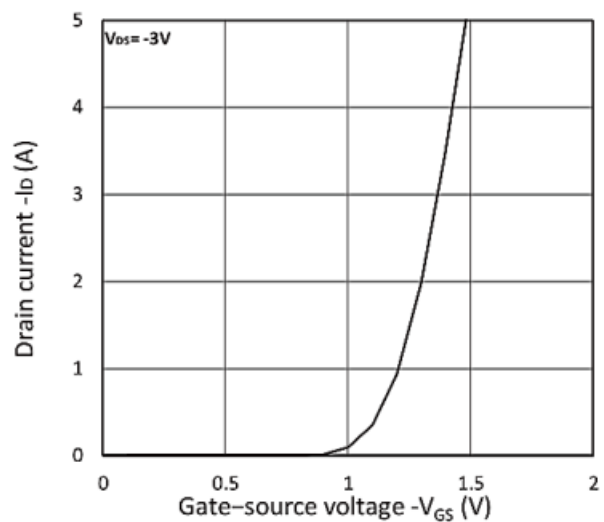


Figure 2. Transfer Characteristics

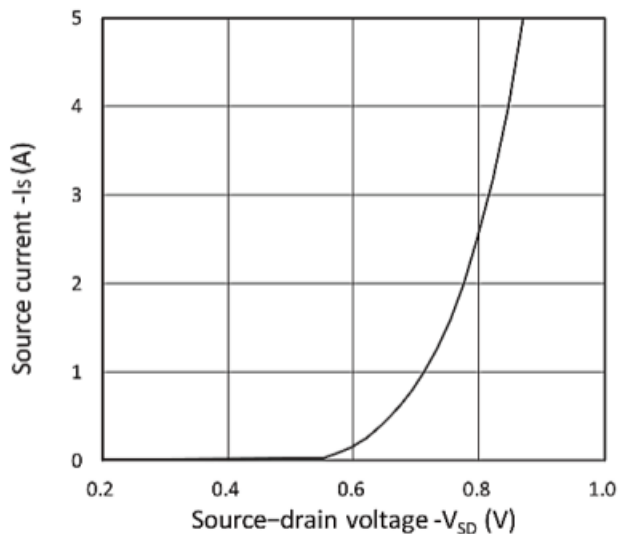


Figure 3. Forward Characteristics of Reverse

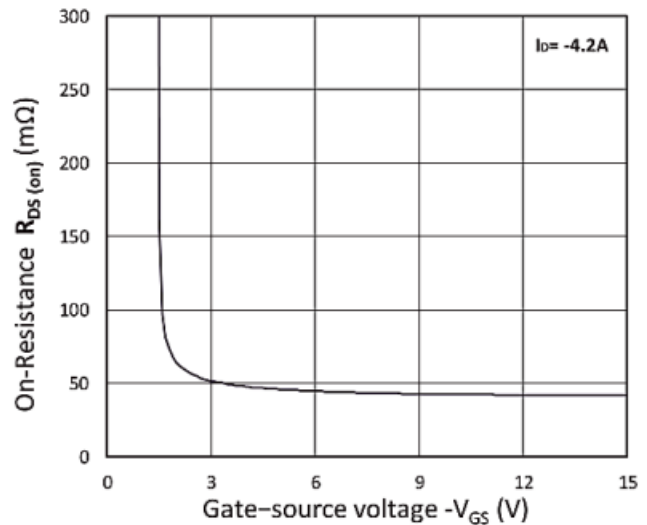


Figure 4. R\_DS(ON) vs. V\_GS

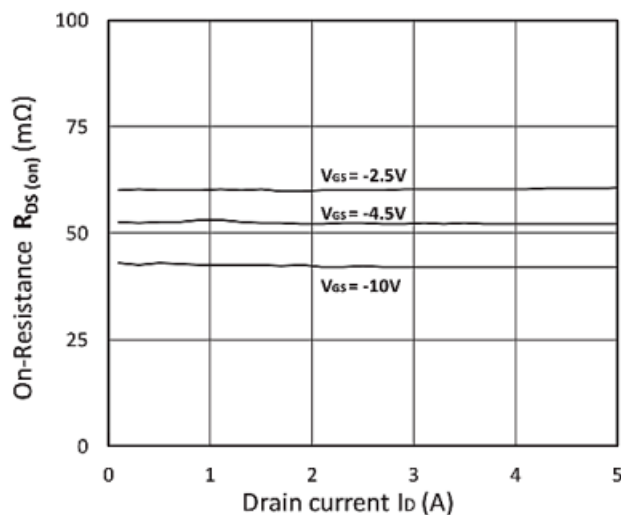


Figure 5. R\_DS(ON) vs. I\_D

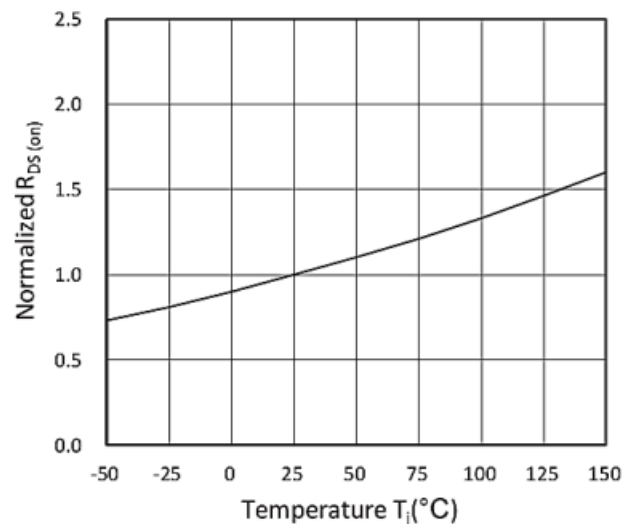


Figure 6. Normalized R\_DS(on)  
vs. Temperature

## Typical Characteristics

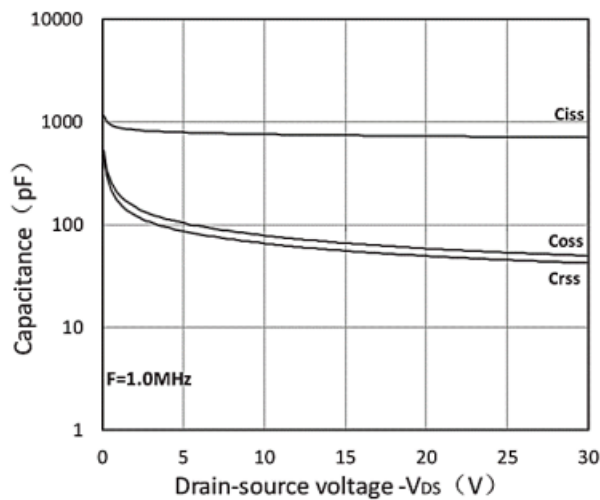


Figure 7. Capacitance Characteristics

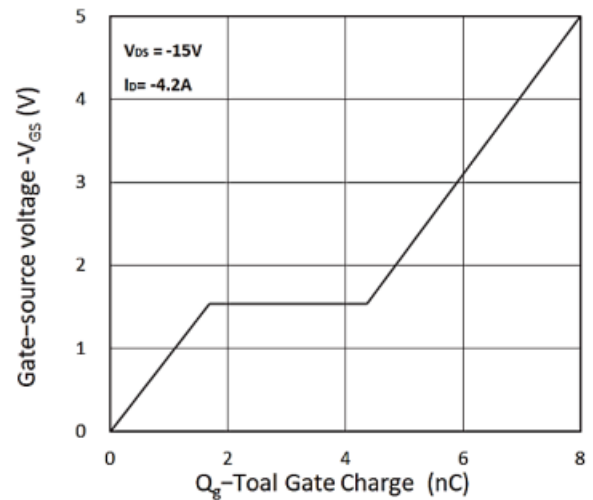


Figure 8. Gate Charge Characteristics

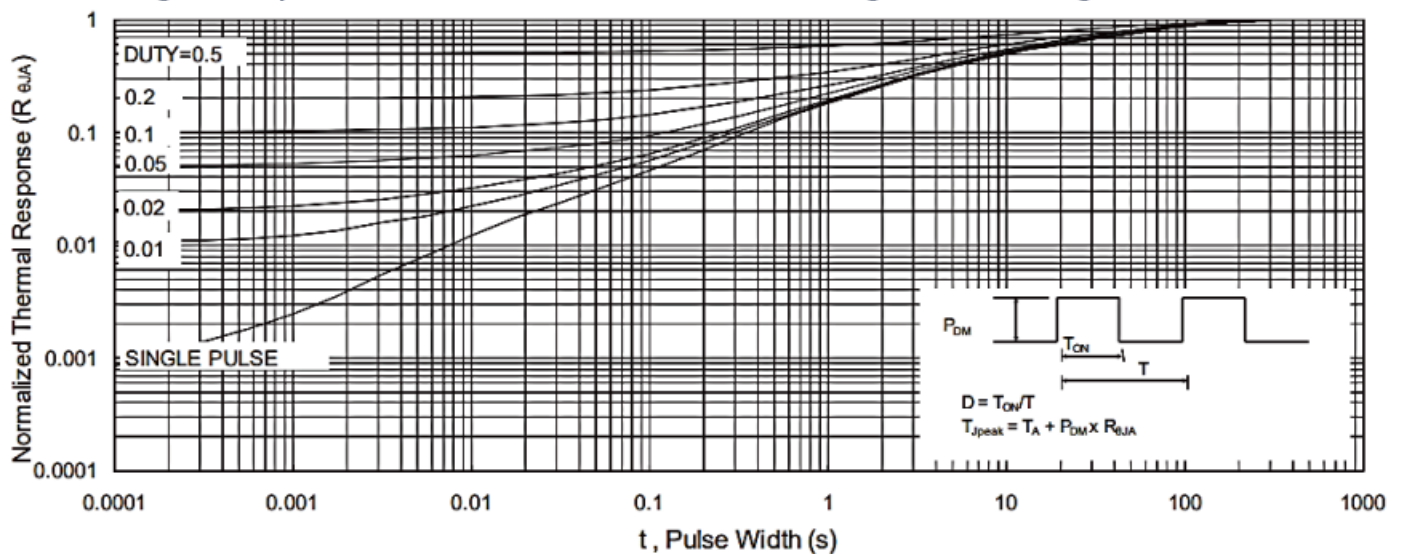


Figure 9 Normalized Maximum Transient Thermal Impedance

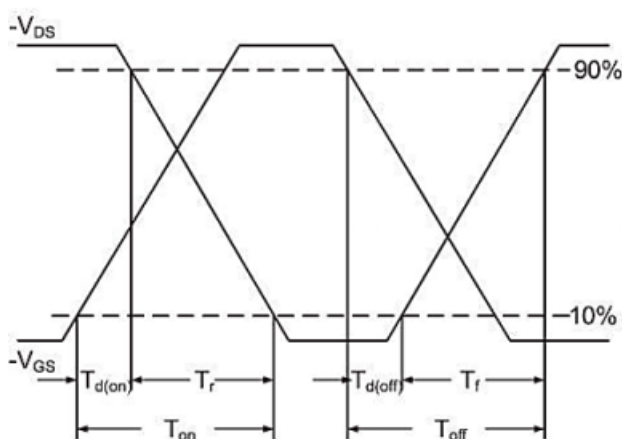


Figure.10 Switching Time Waveform

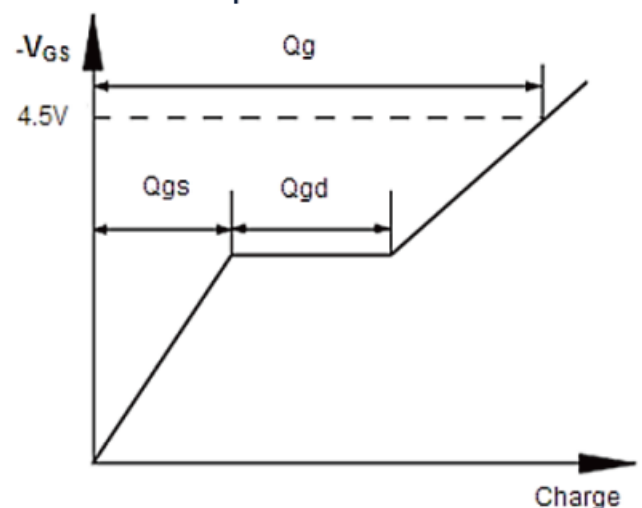
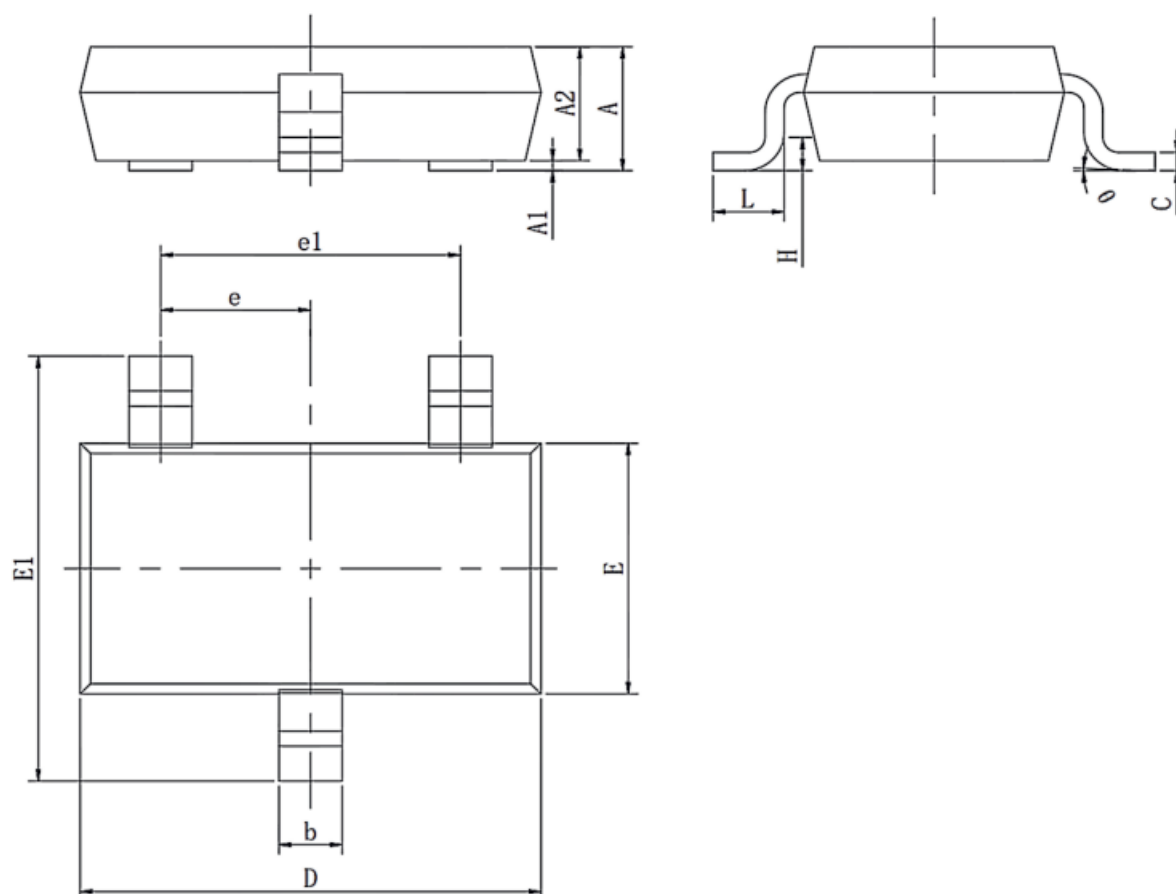


Figure.11 Gate Charge Waveform

## Outline Dimensions

**SOT-23**
**Unit : mm**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.050 | 0.035                | 0.041 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| C      | 0.080                     | 0.200 | 0.003                | 0.008 |
| D      | 2.800                     | 3.020 | 0.110                | 0.119 |
| E      | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                     | 2.550 | 0.089                | 0.100 |
| e      | 0.95 (BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.90 (BSC)                |       | 0.075(BSC)           |       |
| L      | 0.300                     | 0.500 | 0.012                | 0.020 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

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