

## 1. General description

EEPP™ - Efficiency Enhanced Pt Planar rectifier in a SOD59 (2-lead TO-220AC) plastic package.

## 2. Features and benefits

- Fast switching
- Reduces switching losses with improved lower reverse recovery charge
- Soft recovery characteristics
- Low thermal resistance
- Low leakage current
- Planar termination structure
- High operating temperature capability ( $T_{j(max)} = 175^{\circ}\text{C}$ )
- Higher  $I_{FSM}$  capability

## 3. Applications

- Switched-Mode Power Supplies
- Power factor correction diode
- Uninterrupted Power Supply

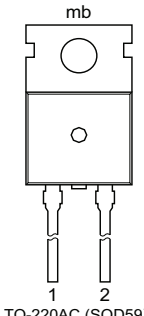
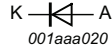
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                           | Conditions                                                                                                                                          | Values |     |     | Unit |
|--------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----|-----|------|
| <b>Absolute maximum rating</b> |                                     |                                                                                                                                                     |        |     |     |      |
| $V_{RRM}$                      | repetitive peak reverse voltage     |                                                                                                                                                     | 1200   |     |     | V    |
| $I_{F(AV)}$                    | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 120^{\circ}\text{C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 15     |     |     | A    |
| $I_{FRM}$                      | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25 \mu\text{s}$ ; $T_{mb} \leq 120^{\circ}\text{C}$ ;<br>square-wave pulse                                                  | 30     |     |     | A    |
| $I_{FSM}$                      | non-repetitive peak forward current | $t_p = 10 \text{ ms}$ ; $T_{j(init)} = 25^{\circ}\text{C}$ ; sine-wave pulse;<br><a href="#">Fig. 4</a>                                             | 180    |     |     | A    |
|                                |                                     | $t_p = 8.3 \text{ ms}$ ; $T_{j(init)} = 25^{\circ}\text{C}$ ; sine-wave pulse;                                                                      | 200    |     |     | A    |
| Symbol                         | Parameter                           | Conditions                                                                                                                                          | Min    | Typ | Max | Unit |
| <b>Static characteristics</b>  |                                     |                                                                                                                                                     |        |     |     |      |
| $V_F$                          | forward voltage                     | $I_F = 15 \text{ A}$ ; $T_j = 25^{\circ}\text{C}$ ; <a href="#">Fig. 6</a>                                                                          | -      | 2.5 | 3.2 | V    |
|                                |                                     | $I_F = 15 \text{ A}$ ; $T_j = 150^{\circ}\text{C}$ ; <a href="#">Fig. 6</a>                                                                         | -      | 2.0 | -   | V    |
| <b>Dynamic characteristics</b> |                                     |                                                                                                                                                     |        |     |     |      |
| $t_{rr}$                       | reverse recovery time               | $I_F = 1 \text{ A}$ ; $V_R = 30 \text{ V}$ ; $di_F/dt = 100 \text{ A}/\mu\text{s}$ ;<br>$T_j = 25^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>         | -      | 45  | -   | ns   |
| <b>Avalanche energy</b>        |                                     |                                                                                                                                                     |        |     |     |      |
| $E_{AS}$                       | non-repetitive avalanche energy     | $T_{j(init)} = 25^{\circ}\text{C}$                                                                                                                  | 20     | -   | -   | mJ   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline                                                                 | Graphic symbol                                                                      |
|-----|--------|-------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | K      | cathode                             |  |  |
| 2   | A      | anode                               |                                                                                    |                                                                                     |
| mb  | mb     | mounting base; connected to cathode |                                                                                    |                                                                                     |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |                                                                                  | Version |
|-------------|----------|----------------------------------------------------------------------------------|---------|
|             | Name     | Description                                                                      |         |
| BYC15-1200P | TO-220AC | Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59   |

## 7. Marking

Table 4. Marking codes

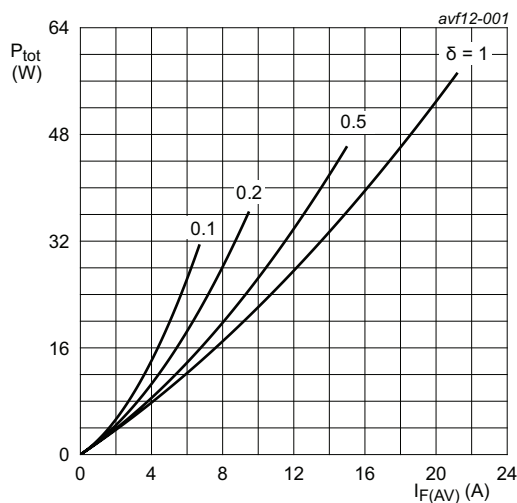
| Type number | Marking codes |
|-------------|---------------|
| BYC15-1200P | BYC15-1200P   |

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

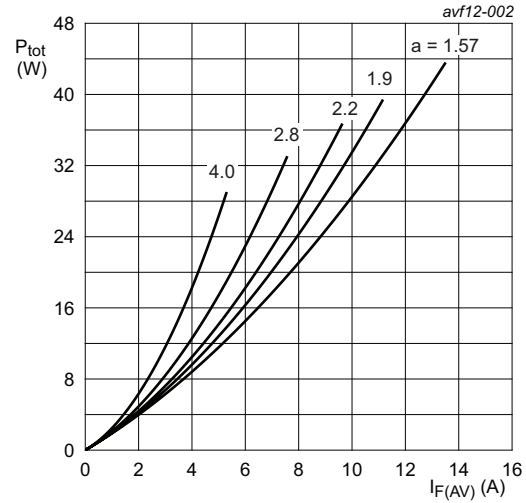
| Symbol      | Parameter                           | Conditions                                                                                                                                                | Values     | Unit             |
|-------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                                                           | 1200       | V                |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                                                           | 1200       | V                |
| $V_R$       | reverse voltage                     | DC                                                                                                                                                        | 1200       | V                |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 120\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 15         | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 120\text{ }^\circ\text{C}$ ;<br>square-wave pulse                                           | 30         | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse;<br><a href="#">Fig. 4</a>                                       | 180        | A                |
|             |                                     | $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse;                                                                | 200        | A                |
| $T_{stg}$   | storage temperature                 |                                                                                                                                                           | -65 to 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                                                           | 175        | $^\circ\text{C}$ |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 1.775\text{ V}; R_s = 0.0436\text{ }\Omega$$

**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

$$V_o = 1.775\text{ V}; R_s = 0.0436\text{ }\Omega$$

**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

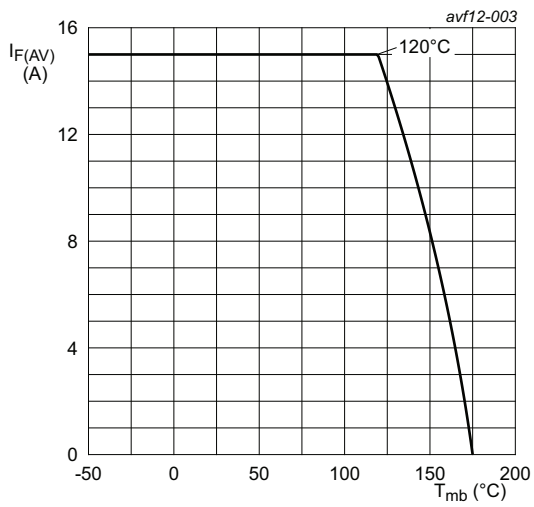


Fig. 3. Forward current as a function of mounting base temperature; maximum values

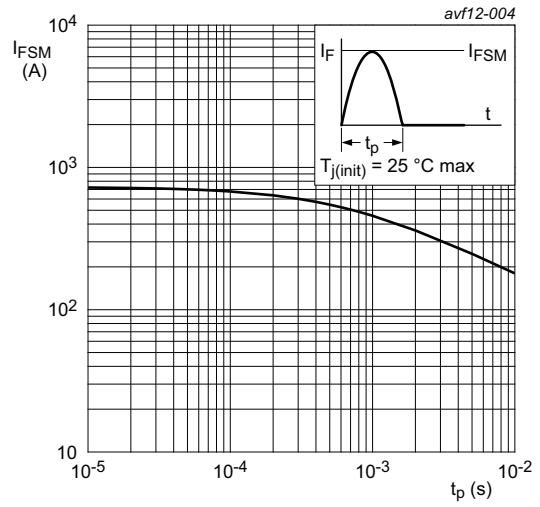


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

### 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                            | Conditions             | Min | Typ | Max | Unit |
|----------------|------------------------------------------------------|------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | <a href="#">Fig. 5</a> | -   | -   | 1.2 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air            | -   | 60  | -   | K/W  |

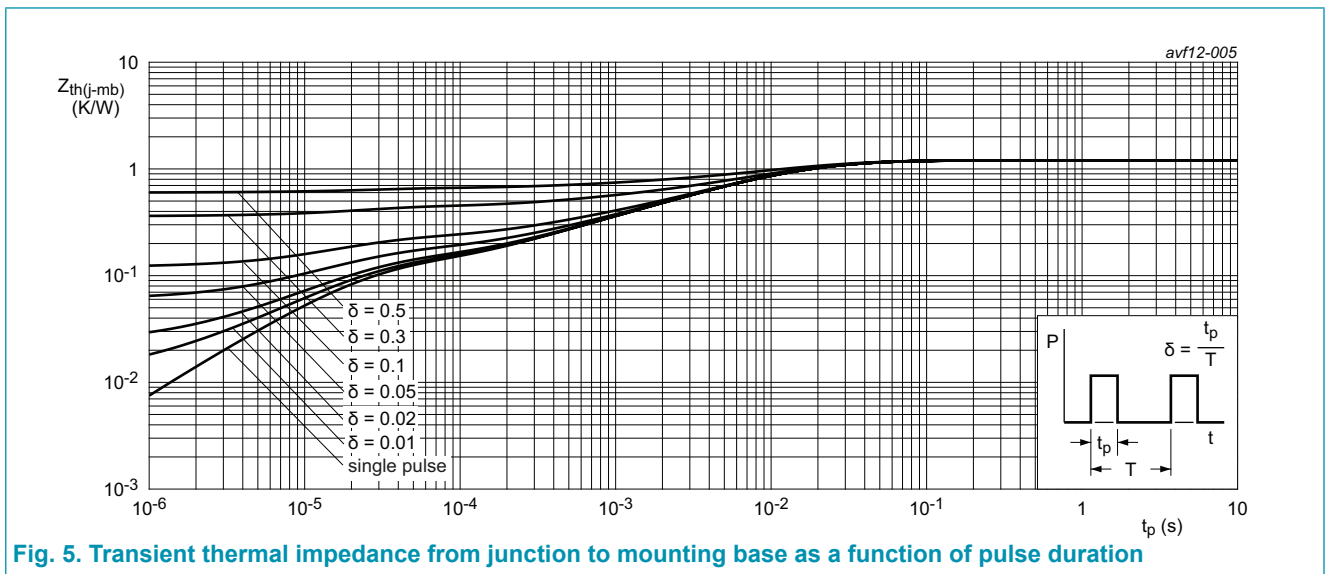
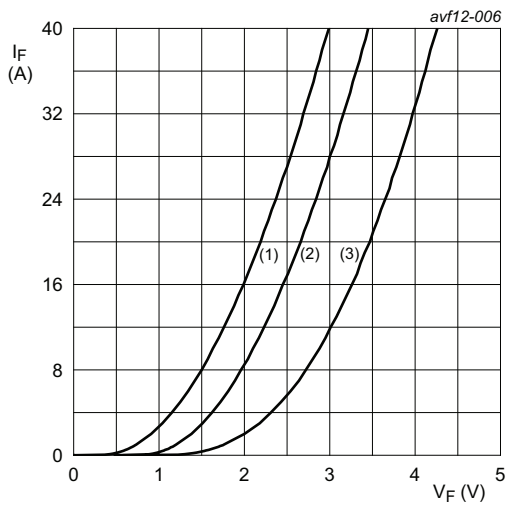


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                       | Conditions                                                                                                                       | Min | Typ  | Max | Unit          |
|--------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| <b>Static characteristics</b>  |                                 |                                                                                                                                  |     |      |     |               |
| $V_F$                          | forward current                 | $I_F = 15 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$                                                            | -   | 2.5  | 3.2 | V             |
|                                |                                 | $I_F = 15 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 6}$                                                           | -   | 2.0  | -   | V             |
| $I_R$                          | reverse current                 | $V_R = 1200 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$                                                                          | -   | -    | 100 | $\mu\text{A}$ |
|                                |                                 | $V_R = 1200 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$                                                                         | -   | -    | 500 | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                                 |                                                                                                                                  |     |      |     |               |
| $Q_r$                          | reverse charge                  | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$  | -   | 394  | -   | nC            |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 1003 | -   | nC            |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 1143 | -   | nC            |
| $t_{rr}$                       | reverse recovery time           | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; di_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$    | -   | 45   | -   | ns            |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$  | -   | 61   | -   | ns            |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 120  | -   | ns            |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 128  | -   | ns            |
| $I_{RM}$                       | peak reverse recovery current   | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$  | -   | 12.6 | -   | A             |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 16.7 | -   | A             |
|                                |                                 | $I_F = 15 \text{ A}; V_R = 400 \text{ V}; di_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 17.8 | -   | A             |
| <b>Avalanche energy</b>        |                                 |                                                                                                                                  |     |      |     |               |
| $E_{AS}$                       | non-repetitive avalanche energy | $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$                                                                                 | 20  | -    | -   | mJ            |



$V_o = 1.775 \text{ V}; R_s = 0.0436 \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

Fig. 6. Forward current as a function of forward voltage

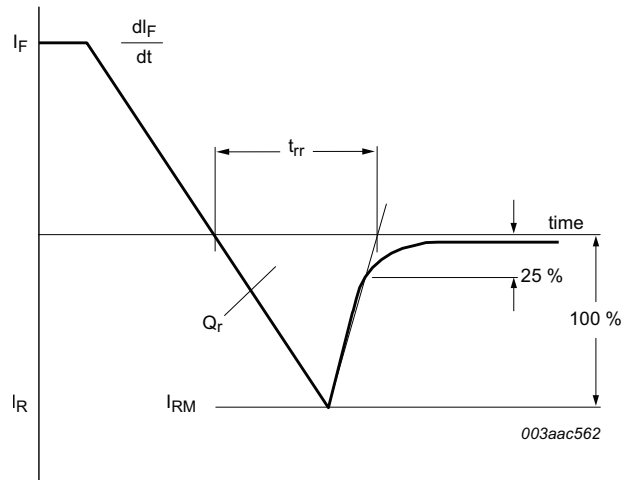
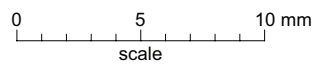
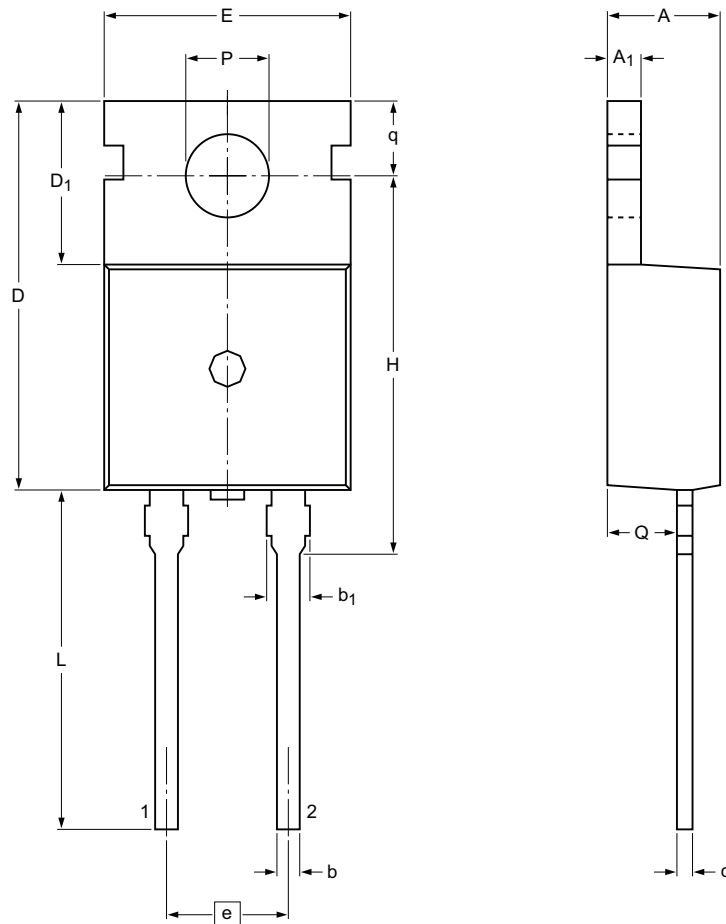


Fig. 7. Reverse recovery definitions; ramp recovery

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59



Dimensions

| Unit | A   | A <sub>1</sub> | b    | b <sub>1</sub> ( <sup>1</sup> ) | c    | D    | D <sub>1</sub> | E     | e     | H     | L    | P    | Q   | q   |
|------|-----|----------------|------|---------------------------------|------|------|----------------|-------|-------|-------|------|------|-----|-----|
| max  | 4.7 | 1.40           | 0.95 | 1.7                             | 0.65 | 15.8 | 6.8            | 10.30 | 5.08  | 16.25 | 15.0 | 3.80 | 2.6 | 2.9 |
| nom  |     |                |      |                                 |      |      |                |       | (REF) |       |      |      |     |     |
| min  | 4.3 | 1.15           | 0.70 | 1.3                             | 0.45 | 15.6 | 6.4            | 9.65  |       | 15.70 | 12.5 | 3.65 | 2.2 | 2.7 |

Note

1. Protruded dambar are included in the dimension.

sod059\_po

| Outline version | References      |       |       | European projection | Issue date                      |
|-----------------|-----------------|-------|-------|---------------------|---------------------------------|
|                 | IEC             | JEDEC | JEITA |                     |                                 |
| SOD59           | 2-lead TO-220AC |       |       |                     | <del>09-08-25</del><br>12-11-27 |



## 12. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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