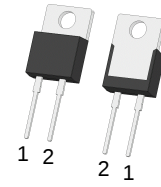


# Silicon Carbide (SiC) Diode – EliteSiC, TO220-2, 4 A, 650 V SiC Merged PiN-Schottky (MPS) Diode UJ3D06504TS



TO220-2  
CASE 340AZ

## Description

onsemi offers the 3<sup>rd</sup> generation of high performance SiC Merged-PiN-Schottky (MPS) diodes. With zero reverse recovery charge and 175 °C maximum junction temperature, these diodes are ideally suited for high frequency and high efficiency power systems with minimum cooling requirements.

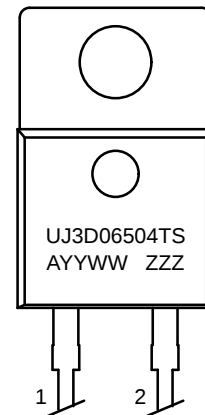
## Features

- 175 °C Maximum Operating Junction Temperature
- Easy Paralleling
- Extremely Fast Switching not Dependent on Temperature
- No Reverse or Forward Recovery
- Enhanced Surge Current Capability, MPS Structure
- Excellent Thermal Performance, Ag Sintered
- 100% UIS Tested
- This Device is Pb-Free, Halogen Free and is ROHS Compliant

## Typical Applications

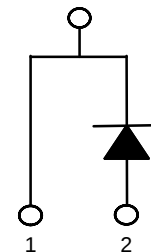
- Power Converters
- Industrial Motor Drives
- Switch-mode Power Supplies
- Power Factor Correction Modules

## MARKING DIAGRAM



UJ3D06504TS = Specific Device Code  
A = Assembly Location  
YY = Year  
WW = Work Week  
ZZZ = Lot ID

## PIN CONNECTIONS



## ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

## MAXIMUM RATINGS

| Parameter                                                           | Symbol         | Test Conditions                                                     | Value      | Unit                 |
|---------------------------------------------------------------------|----------------|---------------------------------------------------------------------|------------|----------------------|
| DC Blocking Voltage                                                 | $V_R$          |                                                                     | 650        | V                    |
| Repetitive Peak Reverse Voltage, $T_J = 25\text{ }^{\circ}\text{C}$ | $V_{RRM}$      |                                                                     | 650        | V                    |
| Surge Peak Reverse Voltage                                          | $V_{RSM}$      |                                                                     | 650        | V                    |
| Maximum DC Forward Current                                          | $I_F$          | $T_C = 156\text{ }^{\circ}\text{C}$                                 | 4          | A                    |
| Non-repetitive Forward Surge Current Sine Halfwave                  | $I_{FSM}$      | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 29         | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 26         |                      |
| Repetitive Forward Surge Current Sine Halfwave, $D = 0.1$           | $I_{FRM}$      | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 23.2       | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 13.6       |                      |
| Non-repetitive Peak Forward Current                                 | $I_{F,max}$    | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$  | 260        | A                    |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ | 260        |                      |
| $i^2t$ Value                                                        | $\int i^2 dt$  | $T_C = 25\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$           | 4.2        | $\text{A}^2\text{s}$ |
|                                                                     |                | $T_C = 110\text{ }^{\circ}\text{C}$ , $t_p = 10\text{ ms}$          | 3.4        |                      |
| Power Dissipation                                                   | $P_{Tot}$      | $T_C = 25\text{ }^{\circ}\text{C}$                                  | 71.4       | W                    |
|                                                                     |                | $T_C = 156\text{ }^{\circ}\text{C}$                                 | 9          |                      |
| Maximum Junction Temperature                                        | $T_{J,max}$    |                                                                     | 175        | $^{\circ}\text{C}$   |
| Operating and Storage Temperature                                   | $T_J, T_{STG}$ |                                                                     | -55 to 175 | $^{\circ}\text{C}$   |
| Soldering Temperatures, Wavesoldering only Allowed at Leads         | $T_{sold}$     | 1.6 mm from case for 10 s                                           | 260        | $^{\circ}\text{C}$   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## ELECTRICAL CHARACTERISTICS ( $T_J = +25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| Parameter                        | Symbol | Test Conditions                                            | Min | Typ  | Max  | Unit          |
|----------------------------------|--------|------------------------------------------------------------|-----|------|------|---------------|
| Forward Voltage                  | $V_F$  | $I_F = 4\text{ A}$ , $T_J = 25\text{ }^{\circ}\text{C}$    | –   | 1.5  | 1.7  | V             |
|                                  |        | $I_F = 4\text{ A}$ , $T_J = 150\text{ }^{\circ}\text{C}$   | –   | 1.9  | 2.1  |               |
|                                  |        | $I_F = 4\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$   | –   | 2.05 | 2.25 |               |
| Reverse Current                  | $I_R$  | $V_R = 650\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$  | –   | 0.7  | 25   | $\mu\text{A}$ |
|                                  |        | $V_R = 650\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$ | –   | 5    | –    |               |
| Total Capacitive Charge (Note 1) | $Q_C$  | $V_R = 400\text{ V}$                                       | –   | 9.3  | –    | nC            |
| Total Capacitance                | $C$    | $V_R = 1\text{ V}$ , $f = 1\text{ MHz}$                    | –   | 118  | –    | pF            |
|                                  |        | $V_R = 300\text{ V}$ , $f = 1\text{ MHz}$                  | –   | 16   | –    |               |
|                                  |        | $V_R = 600\text{ V}$ , $f = 1\text{ MHz}$                  | –   | 15   | –    |               |
| Capacitance Stored Energy        | $E_C$  | $V_R = 400\text{ V}$                                       | –   | 1.4  | –    | $\mu\text{J}$ |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1.  $Q_C$  is independent on  $T_J$ ,  $di_F/dt$ , and  $I_F$  as shown in the application note [AND90316/D](#)

## THERMAL CHARACTERISTICS

| Parameter                         | Symbol          | Test Conditions | Min | Typ | Max | Unit                 |
|-----------------------------------|-----------------|-----------------|-----|-----|-----|----------------------|
| Thermal Resistance, Junction-Case | $R_{\theta JC}$ |                 | –   | 1.6 | 2.1 | $^{\circ}\text{C/W}$ |

TYPICAL PERFORMANCE

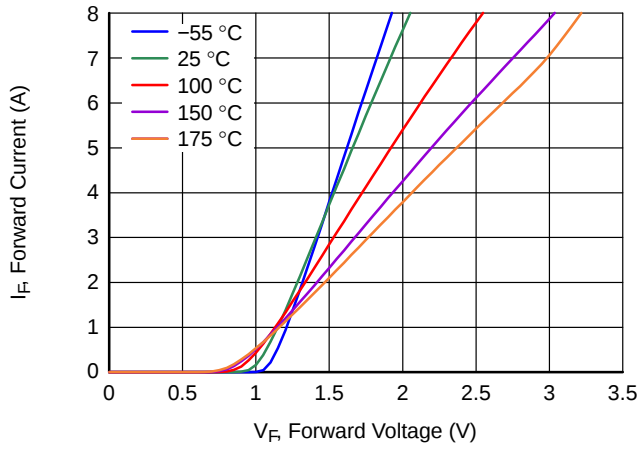


Figure 1. Typical Forward Characteristics

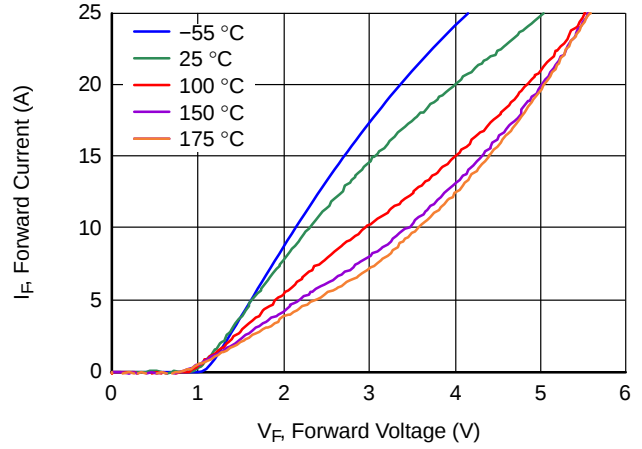


Figure 2. Typical Forward Characteristics in Surge Current

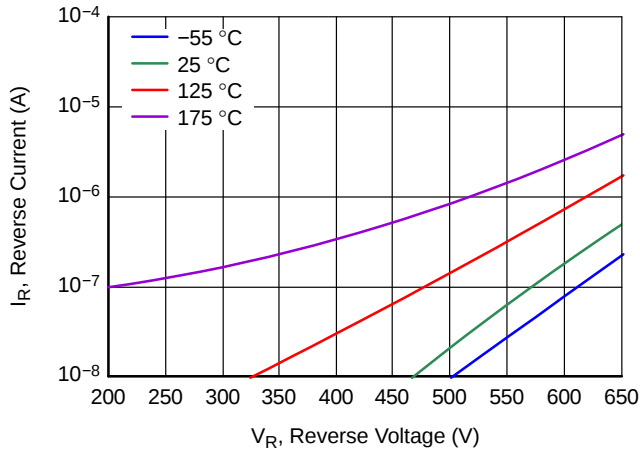


Figure 3. Typical Reverse Characteristics

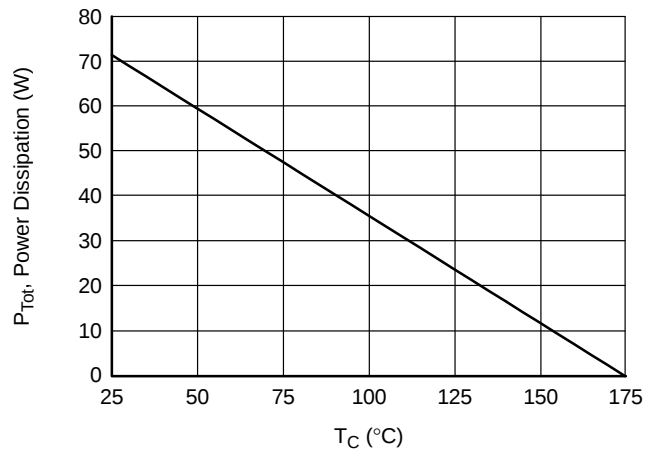


Figure 4. Power Dissipation

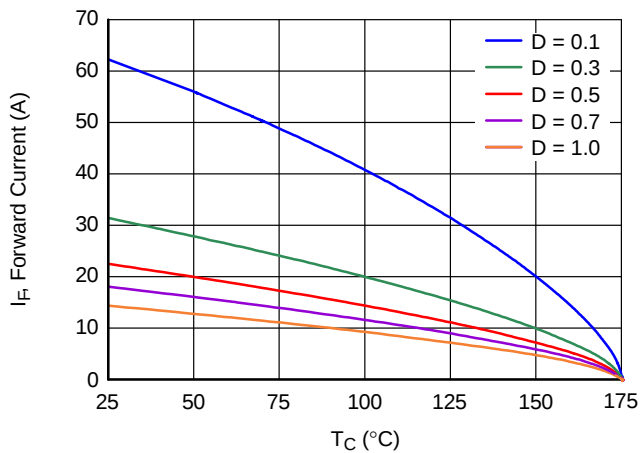


Figure 5. Diode Forward Current

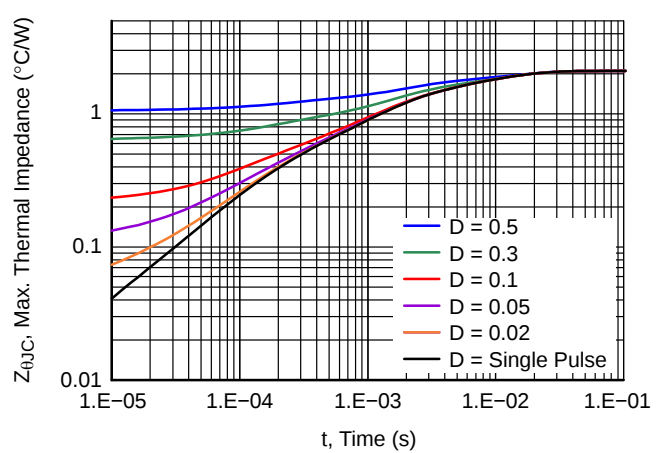


Figure 6. Maximum Transient Thermal Impedance

TYPICAL PERFORMANCE (CONTINUED)

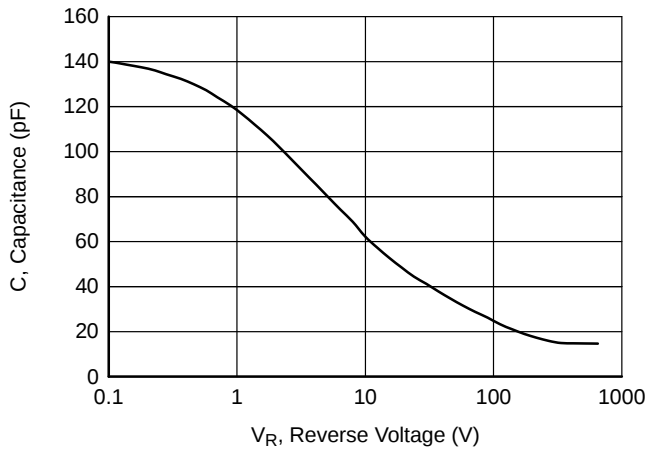


Figure 7. Capacitance vs. Reverse Voltage at 1 MHz

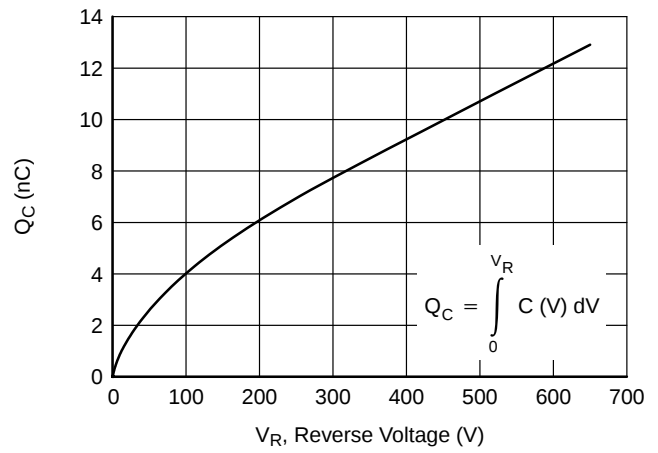


Figure 8. Typical Capacitive Charge vs. Reverse Voltage

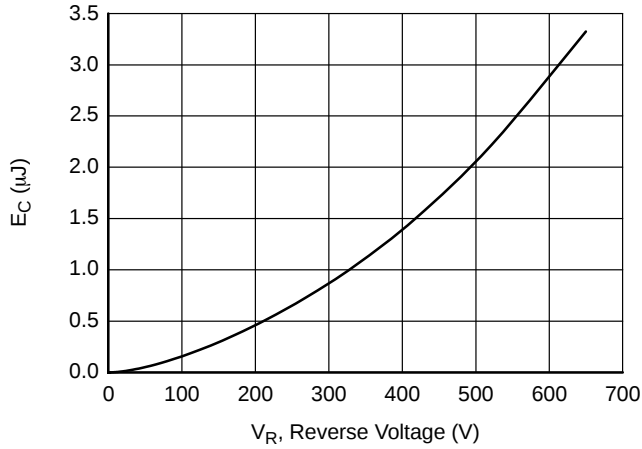


Figure 9. Typical Capacitance Stored Energy vs. Reverse Voltage

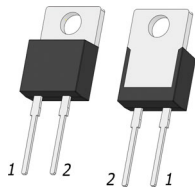
ORDERING INFORMATION

| Part Number | Marking     | Package                            | Shipping    |
|-------------|-------------|------------------------------------|-------------|
| UJ3D06504TS | UJ3D06504TS | TO220-2<br>(Pb-Free, Halogen Free) | 1000 / Tube |

## UJ3D06504TS

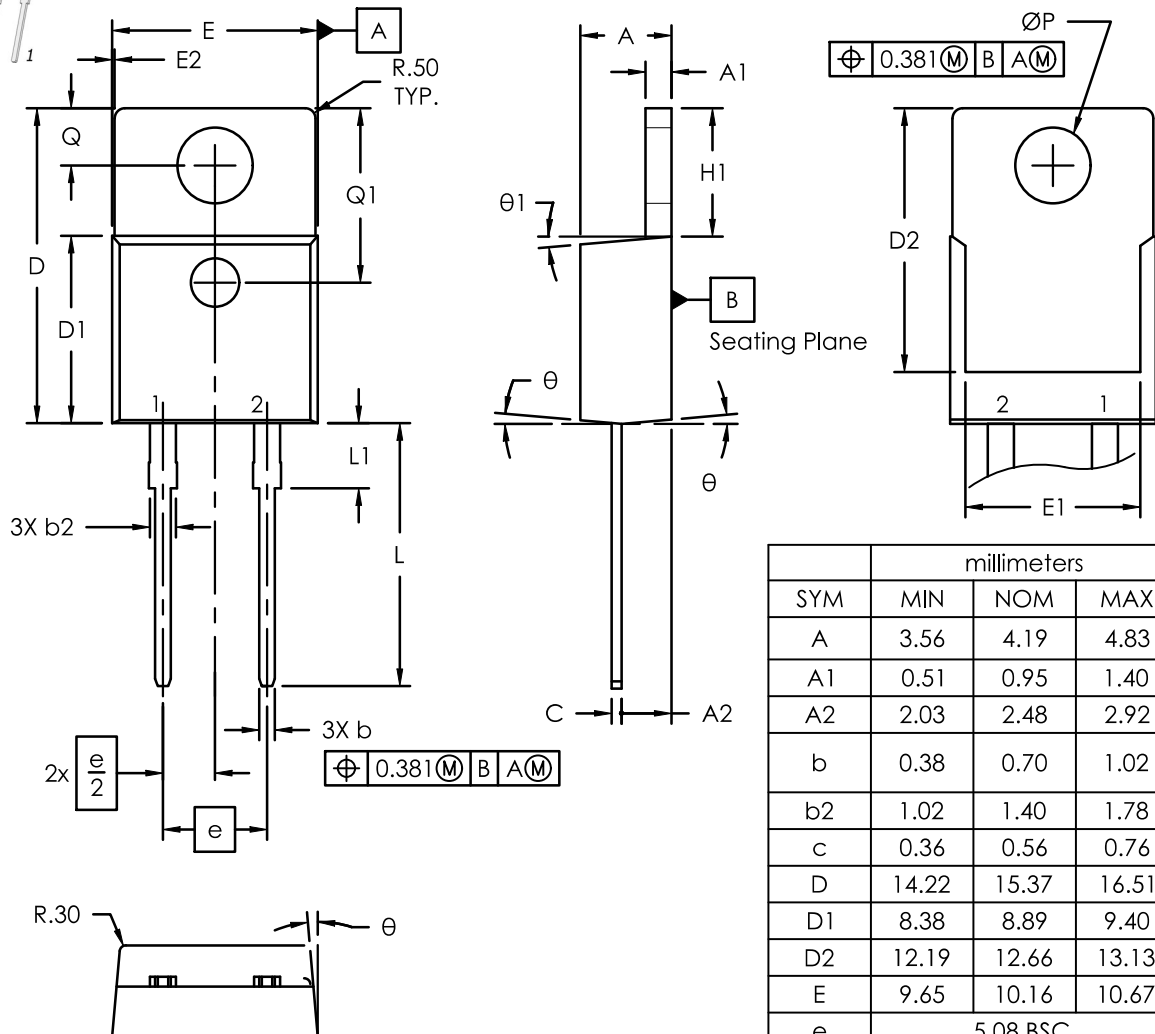
### REVISION HISTORY

| Revision | Description of Changes                                                                                                                            | Date      |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| D        | Acquired the original Qorvo JFET Division Data Sheet and updated the main document title to comply with <b>onsemi</b> standards for SiC products. | 1/15/2025 |
| 4        | Converted the Data Sheet to <b>onsemi</b> format.                                                                                                 | 4/30/2025 |



**TO220-2 10.16x15.37x4.19, 5.08P**  
**CASE 340AZ**  
**ISSUE B**

DATE 23 APR 2025



**NOTES:**

1. Dimensioning and Tolerancing as per ASME Y14.5M, 2018.
2. Controlling Dimension : Millimeters
3. Dimensions D and E does not include Mold Flash. These dimensions are measure at the outermost extreme of the plastic body.
4. Through hole diameter value = End Hole Diameter
5. PCB through hole pattern as per IPC-2222

|            | millimeters |       |       |
|------------|-------------|-------|-------|
| SYM        | MIN         | NOM   | MAX   |
| A          | 3.56        | 4.19  | 4.83  |
| A1         | 0.51        | 0.95  | 1.40  |
| A2         | 2.03        | 2.48  | 2.92  |
| b          | 0.38        | 0.70  | 1.02  |
| b2         | 1.02        | 1.40  | 1.78  |
| c          | 0.36        | 0.56  | 0.76  |
| D          | 14.22       | 15.37 | 16.51 |
| D1         | 8.38        | 8.89  | 9.40  |
| D2         | 12.19       | 12.66 | 13.13 |
| E          | 9.65        | 10.16 | 10.67 |
| e          | 5.08 BSC.   |       |       |
| E1         | 6.86        | 7.87  | 8.89  |
| E2         | —           | —     | 0.76  |
| L          | 12.57       | 13.65 | 14.73 |
| L1         | —           | —     | 6.35  |
| $\phi P$   | 3.53        | 3.81  | 4.09  |
| H1         | 5.84        | 6.35  | 6.86  |
| Q          | 2.54        | 2.98  | 3.43  |
| Q1         | 8.38        | 8.51  | 8.64  |
| $\theta$   | 5°          |       |       |
| $\theta 1$ | 5°          |       |       |

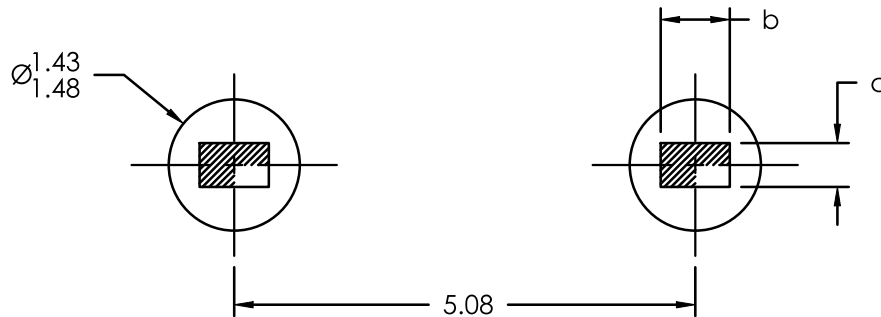
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TO220-2 10.16x15.37x4.19, 5.08P  
CASE 340AZ  
ISSUE B

DATE 23 APR 2025

RECOMMENDED PCB PATTERN



NOTE: LAND PATTERN AND THROUGH HOLE DIMENSIONS SERVE ONLY AS AN INITIAL GUIDE.  
END-USER PCB DESIGN RULES AND TOLERANCES SHOULD ALWAYS PREVAIL.

|                         |                                        |                                                                                                                                                                                     |
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