



## Powermite Low Noise 1 Watt Zener Diodes

### DESCRIPTION

This Microsemi Powermite surface mount low noise Zener package series provides a higher power handling capability that are also RoHS compliant. In addition to its size advantages, Powermite package features include a full-metallic bottom that eliminates the possibility of solder flux entrapment during assembly, and a unique locking tab acts as an efficient heat path from die to mounting plane for external heat sinking with very low thermal resistance junction to case (bottom). Its innovative design makes this device ideal for use with automatic insertion equipment.

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### FEATURES

- Surface mount equivalent to JEDEC registered 1N4099 through 1N4135 and 1N4614 through 1N4627 series except with additional power capability.
- Extensive selection from 1.8 to 100 volts.
- Regulates voltage over a broad operating current and temperature range.
- Low  $R_{\theta JC}$  for cooler operation and better voltage regulation.
- Low noise density (1-3 kHz) at test current.
- Low reverse leakage current.
- RoHS compliant by design.

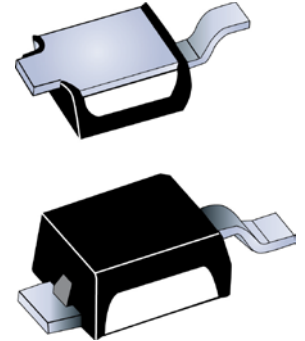
### APPLICATIONS / BENEFITS

- Tight tolerances available in plus or minus 2%.
- Moisture classification Level 1 per IPC/JEDEC J-STD-020B with no dry pack required.
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Compatible with automatic insertion equipment.
- Full metallic bottom eliminates flux entrapment.

### MAXIMUM RATINGS


| Parameters/Test Conditions                            | Symbol              | Value       | Unit          |
|---|---------------------|-------------|---------------|
| Junction and Storage Temperature                      | $T_J$ and $T_{STG}$ | -55 to +150 | $^{\circ}C$   |
| Thermal Resistance Junction-to-Ambient <sup>(1)</sup> | $R_{\theta JA}$     | 240         | $^{\circ}C/W$ |
| Thermal Resistance Junction-to-Case                   | $R_{\theta JC}$     | 30          | $^{\circ}C/W$ |
| Steady-State Power Dissipation <sup>(2)</sup>         | $P_D$               | 1.0         | W             |
| Forward Voltage @ 200 mA                              | $V_F$               | 1.1         | V             |
| Solder Temperature @ 10 s                             | $T_{SP}$            | 260         | $^{\circ}C$   |


- Notes:**
1. On FR4 PC board (1 oz copper) with recommended footprint (see [last page](#)).
  2. At  $T_C \leq 120^{\circ}C$  where  $T_C$  is case bottom temperature at mounting plane, or 0.5 watts at  $T_A = 30^{\circ}C$  (ambient temperature) when mounted on FR4 PC board as described for  $R_{\theta JA}$  (also see power deratings in [figure 2](#)).



### DO-216 Package

Also available in:

 **DO-35 package**  
(axial-leaded)  
[1N4099 – 1N4135 and 1N4614 – 1N4627](#)

 **DO-213AA package**  
(surface mount)  
[1N4099UR – 1N4135UR and 1N4614UR – 1N4627UR](#)

#### MSC – Lawrence

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#### MSC – Ireland

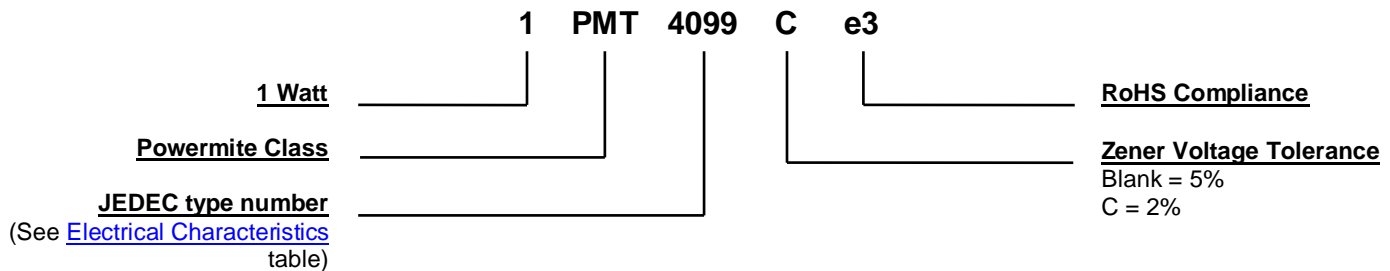
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**MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy compound meeting UL94V-0.
- FINISH: Annealed matte-tin plating over copper and readily solderable per MIL-STD-750 method 2026. (Consult factory for tin-lead plating. NOTE: Tin-lead plated product is not RoHS compliant.)
- POLARITY: Cathode designated by Tab 1 (bottom).
- TAPE AND REEL option: Standard per EIA-481-B (consult factory for quantities).
- MARKING: Three numerical digits of P/N and a dot (see [electrical characteristics](#)).
- WEIGHT: Approximately 0.016 grams.
- See [package dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

| Symbol                | Definition  |
|-----------------------|---|
| $I_R$                 | Reverse Current: The maximum reverse (leakage) current that will flow at the specified voltage and temperature.   |
| $I_Z, I_{ZT}, I_{ZK}$ | Regulator Current: The dc regulator current ( $I_Z$ ), at a specified test point ( $I_{ZT}$ , near breakdown knee ( $I_{ZK}$ ).   |
| $I_{ZM}$              | Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating.   |
| $N_D$                 | Noise Density: The noise generated over a specified frequency bandwidth usually specified in terms of mV/ $\sqrt{\text{Hz}}$ .  |
| $V_R$                 | Reverse Voltage: The reverse voltage dc value, no alternating component.  |
| $V_Z$                 | Zener Voltage: The Zener voltage the device will exhibit at a specified current ( $I_Z$ ) in its breakdown region.  |
| $Z_{ZT}$ or $Z_{ZK}$  | Dynamic Impedance: The small signal impedance of the diode when biased to operate in its breakdown region at a specified rms current modulation (typically 10% of $I_{ZT}$ or $I_{ZK}$ ) and superimposed on $I_{ZT}$ or $I_{ZK}$ respectively. |

ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated

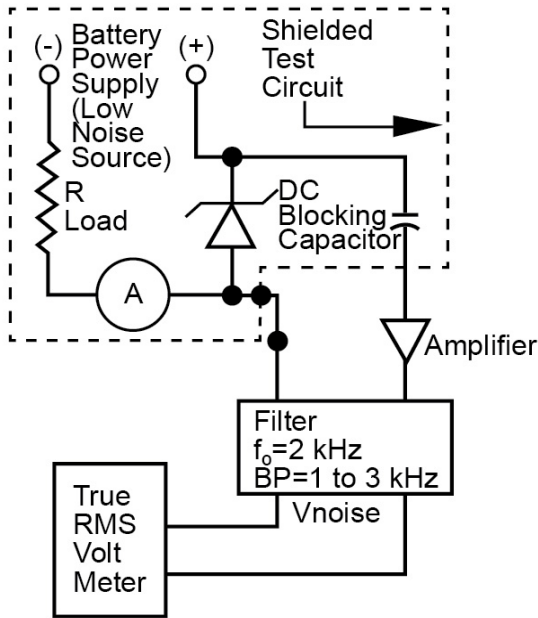
| PART NUMBER (Note 4) | DEVICE MARKING | NOMINAL ZENER VOLTAGE (Note 1)<br>$V_Z @ I_{ZT}$ | ZENER TEST CURRENT<br>$I_{ZT}$ | MAXIMUM ZENER IMPEDANCE (Note 2)<br>$Z_{ZT}$ | MAXIMUM REVERSE CURRENT<br>$I_R @ V_R$ |       | MAXIMUM NOISE DENSITY<br>$N_D @ I_{ZT}$ | MAXIMUM ZENER CURRENT (Note 3)<br>$I_{ZM}$ | MAXIMUM TEMPERATURE COEFFICIENT OF ZENER VOLTAGE<br>$\alpha_{VZ}$ |
|----------------------|----------------|--|--------------------------------|--|--|-------|---|--|---|
|                      |                | Volts  | $\mu A$                        | Ohms   | $\mu A$                                | Volts | $\mu V/\sqrt{HZ}$                       | mA   | %/°C  |
| 1PMT4614             | 614•           | 1.8  | 250                            | 1200   | 10                                     | 1.0   | 1                                       | 262.4                                      | -0.075  |
| 1PMT4615             | 615•           | 2.0  | 250                            | 1250   | 5.0                                    | 1.0   | 1                                       | 240.6                                      | -0.075  |
| 1PMT4616             | 616•           | 2.2  | 250                            | 1300   | 4.0                                    | 1.0   | 1                                       | 218.7                                      | -0.075  |
| 1PMT4617             | 617•           | 2.4  | 250                            | 1400   | 2.0                                    | 1.0   | 1                                       | 207.8                                      | -0.075  |
| 1PMT4618             | 618•           | 2.7  | 250                            | 1500   | 1.0                                    | 1.0   | 1                                       | 196.8                                      | -0.075  |
| 1PMT4619             | 619•           | 3.0  | 250                            | 1600   | 0.8                                    | 1.0   | 1                                       | 190.3                                      | -0.075  |
| 1PMT4620             | 620•           | 3.3  | 250                            | 1650   | 7.5                                    | 1.5   | 1                                       | 185.9                                      | -0.075  |
| 1PMT4621             | 621•           | 3.6  | 250                            | 1700   | 7.5                                    | 2.0   | 1                                       | 181.5                                      | -0.065  |
| 1PMT4622             | 622•           | 3.9  | 250                            | 1650   | 5.0                                    | 2.0   | 1                                       | 174.9                                      | -0.060  |
| 1PMT4623             | 623•           | 4.3  | 250                            | 1650   | 4.0                                    | 2.0   | 1                                       | 168.4                                      | -0.050  |
| 1PMT4624             | 624•           | 4.7  | 250                            | 1600   | 10                                     | 3.0   | 1                                       | 164.0                                      | -0.040 +0.020   |
| 1PMT4625             | 625•           | 5.1  | 250                            | 1500   | 10                                     | 3.0   | 2                                       | 153.1                                      | -0.045 +0.030   |
| 1PMT4626             | 626•           | 5.6  | 250                            | 1400   | 10                                     | 4.0   | 4                                       | 142.2                                      | -0.020 +0.040   |
| 1PMT4627             | 627•           | 6.2  | 250                            | 1200   | 10                                     | 5.0   | 5                                       | 133.4                                      | -0.010 +0.050   |
| 1PMT4099             | 099•           | 6.8  | 250                            | 200  | 10                                     | 5.17  | 40                                      | 122.5                                      | 0.040   |
| 1PMT4100             | 100•           | 7.5  | 250                            | 200  | 10                                     | 5.70  | 40                                      | 111.5                                      | 0.045   |
| 1PMT4101             | 101•           | 8.2  | 250                            | 200  | 1                                      | 6.24  | 40                                      | 100.6                                      | 0.048   |
| 1PMT4102             | 102•           | 8.7  | 250                            | 200  | 1                                      | 6.61  | 40                                      | 96.2                                       | 0.049   |
| 1PMT4103             | 103•           | 9.1  | 250                            | 200  | 1                                      | 6.92  | 40                                      | 91.9                                       | 0.050   |
| 1PMT4104             | 104•           | 10   | 250                            | 200  | 1                                      | 7.60  | 40                                      | 83.1                                       | 0.055   |
| 1PMT4105             | 105•           | 11   | 250                            | 200  | .05                                    | 8.44  | 40                                      | 76.5                                       | 0.060   |
| 1PMT4106             | 106•           | 12   | 250                            | 200  | .05                                    | 9.12  | 40                                      | 69.9                                       | 0.065   |
| 1PMT4107             | 107•           | 13   | 250                            | 200  | .05                                    | 9.87  | 40                                      | 63.4                                       | 0.065   |
| 1PMT4108             | 108•           | 14   | 250                            | 200  | .05                                    | 10.65 | 40                                      | 59.0                                       | 0.070   |
| 1PMT4109             | 109•           | 15   | 250                            | 100  | .05                                    | 11.40 | 40                                      | 54.8                                       | 0.070   |
| 1PMT4110             | 110•           | 16   | 250                            | 100  | .05                                    | 12.15 | 40                                      | 52.5                                       | 0.070   |
| 1PMT4111             | 111•           | 17   | 250                            | 100  | .05                                    | 12.92 | 40                                      | 48.1                                       | 0.075   |
| 1PMT4112             | 112•           | 18   | 250                            | 100  | .05                                    | 13.37 | 40                                      | 45.9                                       | 0.075   |
| 1PMT4113             | 113•           | 19   | 250                            | 150  | .05                                    | 14.44 | 40                                      | 43.7                                       | 0.075   |
| 1PMT4114             | 114•           | 20   | 250                            | 150  | .01                                    | 15.20 | 40                                      | 41.6                                       | 0.075   |
| 1PMT4115             | 115•           | 22   | 250                            | 150  | .01                                    | 16.72 | 40                                      | 37.2                                       | 0.080   |
| 1PMT4116             | 116•           | 24   | 250                            | 150  | .01                                    | 18.25 | 40                                      | 34.9                                       | 0.080   |
| 1PMT4117             | 117•           | 25   | 250                            | 150  | .01                                    | 19.00 | 40                                      | 32.8                                       | 0.080   |
| 1PMT4118             | 118•           | 27   | 250                            | 150  | .01                                    | 20.45 | 40                                      | 30.6                                       | 0.085   |
| 1PMT4119             | 119•           | 28   | 250                            | 200  | .01                                    | 21.28 | 40                                      | 30.6                                       | 0.085   |
| 1PMT4120             | 120•           | 30   | 250                            | 200  | .01                                    | 22.80 | 40                                      | 28.4                                       | 0.085   |
| 1PMT4121             | 121•           | 33   | 250                            | 200  | .01                                    | 25.08 | 40                                      | 26.2                                       | 0.085   |
| 1PMT4122             | 122•           | 36   | 250                            | 200  | .01                                    | 27.38 | 40                                      | 24.0                                       | 0.090   |
| 1PMT4123             | 123•           | 39   | 250                            | 200  | .01                                    | 29.65 | 40                                      | 21.4                                       | 0.090   |
| 1PMT4124             | 124•           | 43   | 250                            | 250  | .01                                    | 32.65 | 40                                      | 19.5                                       | 0.090   |
| 1PMT4125             | 125•           | 47   | 250                            | 250  | .01                                    | 35.75 | 40                                      | 17.7                                       | 0.090   |
| 1PMT4126             | 126•           | 51   | 250                            | 300  | .01                                    | 38.76 | 40                                      | 16.4                                       | 0.090   |
| 1PMT4127             | 127•           | 56   | 250                            | 300  | .01                                    | 42.60 | 40                                      | 14.7                                       | 0.090   |
| 1PMT4128             | 128•           | 60   | 250                            | 400  | .01                                    | 45.60 | 40                                      | 13.9                                       | 0.090   |
| 1PMT4129             | 129•           | 62   | 250                            | 500  | .01                                    | 47.10 | 40                                      | 13.3                                       | 0.090   |
| 1PMT4130             | 130•           | 68   | 250                            | 700  | .01                                    | 51.68 | 40                                      | 12.2                                       | 0.095   |
| 1PMT4131             | 131•           | 75   | 250                            | 700  | .01                                    | 57.00 | 40                                      | 11.2                                       | 0.095   |
| 1PMT4132             | 132•           | 82   | 250                            | 800  | .01                                    | 62.32 | 40                                      | 10.1                                       | 0.095   |
| 1PMT4133             | 133•           | 87   | 250                            | 1000   | .01                                    | 66.12 | 40                                      | 9.6  | 0.095   |
| 1PMT4134             | 134•           | 91   | 250                            | 1200   | .01                                    | 69.16 | 40                                      | 9.2  | 0.095   |
| 1PMT4135             | 135•           | 100  | 250                            | 1500   | .01                                    | 76.00 | 40                                      | 8.3  | 0.095   |

**NOTE 1:** Product shown has a standard tolerance of  $\pm 5\%$  on the nominal Zener voltage.  $V_Z$  is measured at  $I_{ZT}$  with  $T_c$  (TAB 1) at 30 °C.

**NOTE 2:** Zener impedance is derived by superimposing on  $I_{ZT}$  a 60 Hz rms ac current equal to 10% of  $I_{ZT}$  (25  $\mu A$  ac).

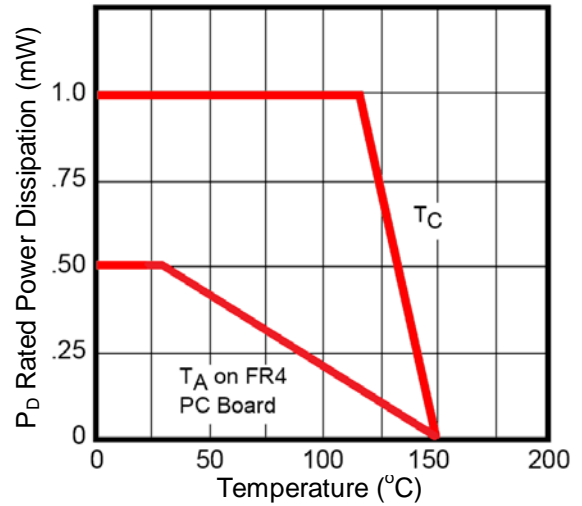
**NOTE 3:** Based on 1 W maximum power dissipation before any derating. Allowance has been made for higher voltage with operation at higher currents and temperature. For determination of voltage change with current deviations from  $I_{ZT}$  see [MicroNote 202](#).

GRAPHS

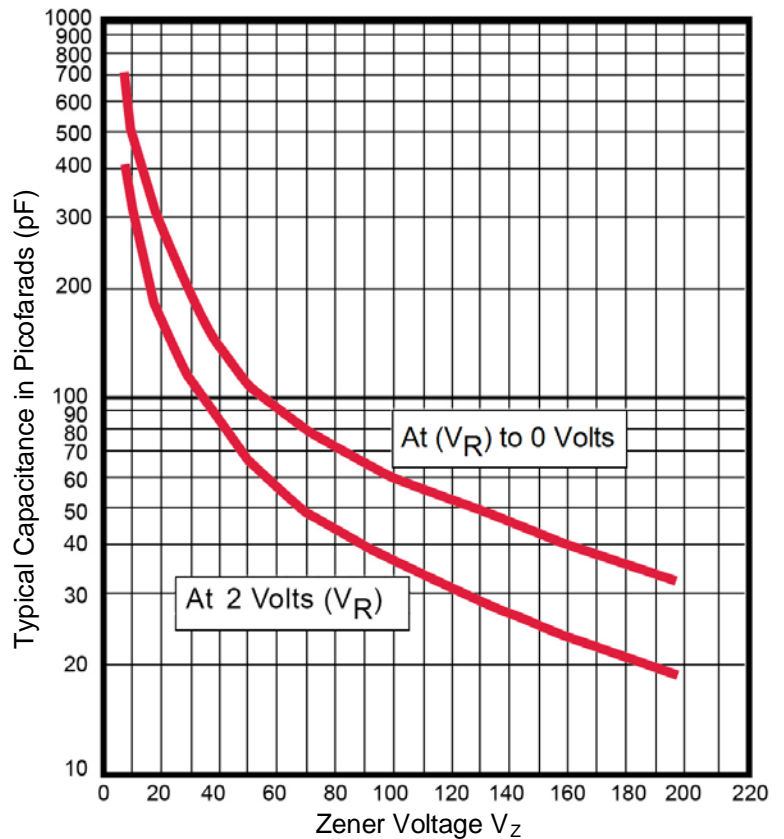


**FIGURE 1 – Noise Density Measurement Circuit**

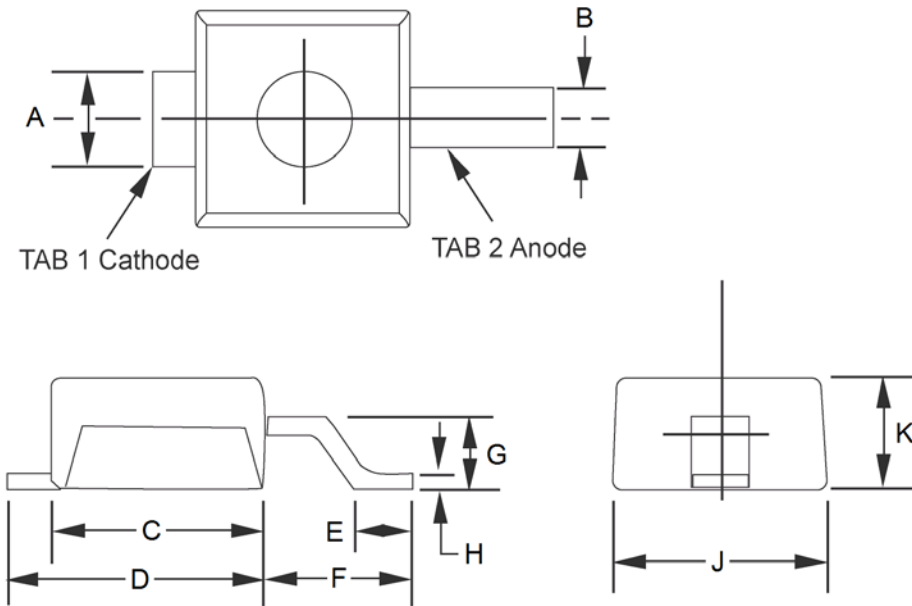
Noise density, ( $N_D$ ) is specified in microvolt-rms per square-root-hertz. Actual measurement is performed using a 1 kHz to 3 kHz frequency bandpass filter at a constant Zener test current ( $I_{ZT}$ ) at 25 °C ambient temperature.  $N_D$  is calculated from the formula.



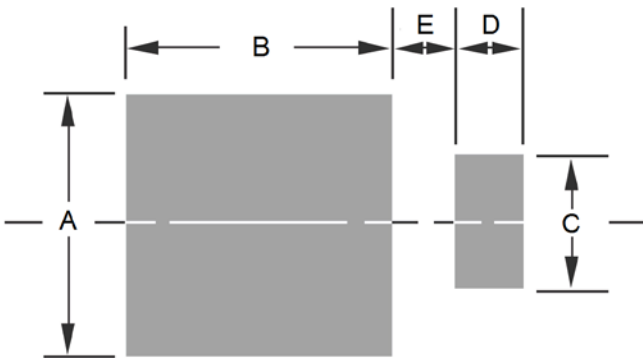
**FIGURE 2 - Power Derating Curve**  
Where T<sub>C</sub> is case (bottom) temperature and T<sub>A</sub> is Ambient Temperature on FR4 PC board.



**FIGURE 3 – Capacitance vs. Zener Voltage (Typical)**

**PACKAGE DIMENSIONS**


| Ltr      | Dimensions |       |             |      |
|----------|------------|-------|-------------|------|
|          | Inch       |       | Millimeters |      |
|          | Min        | Max   | Min         | Max  |
| <b>A</b> | 0.029      | 0.039 | 0.73        | 0.99 |
| <b>B</b> | 0.016      | 0.026 | 0.40        | 0.66 |
| <b>C</b> | 0.070      | 0.080 | 1.77        | 2.03 |
| <b>D</b> | 0.087      | 0.097 | 2.21        | 2.46 |
| <b>E</b> | 0.020      | 0.030 | 0.50        | 0.76 |
| <b>F</b> | 0.051      | 0.061 | 1.29        | 1.54 |
| <b>G</b> | 0.021      | 0.031 | 0.53        | 0.78 |
| <b>H</b> | 0.004      | 0.008 | 0.10        | 0.20 |
| <b>J</b> | 0.070      | 0.080 | 1.77        | 2.03 |
| <b>K</b> | 0.035      | 0.045 | 0.89        | 1.14 |

**PAD LAYOUT**


| Ltr      | Dimensions |             |
|----------|------------|-------------|
|          | Inch       | Millimeters |
| <b>A</b> | 0.100      | 2.54        |
| <b>B</b> | 0.105      | 2.67        |
| <b>C</b> | 0.050      | 1.27        |
| <b>D</b> | 0.030      | 0.76        |
| <b>E</b> | 0.025      | 0.64        |

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