

Solid Tantalum Chip Capacitors, TANTAMOUNT[®], Conformal Coated, Maximum CV, Low ESR



FEATURES

- Large capacitance rating range
- Mounting: Surface mount
- Lowest ESR for a surface mount tantalum chip capacitor
- Terminations: 100 % tin (2) standard; tin/lead available
- 8 mm, 12 mm tape and reel packaging available per EIA 481 and reeling per IEC 60286-3. 7" [178 mm] standard. 13" [330 mm] available.
- Case code compatibility with EIA 535BAAC and CECC 30801 molded chips
- Compliant to RoHS Directive 2002/95/EC


RoHS*
COMPLIANT

Note

* Pb containing terminations are not RoHS compliant, exemptions may apply

PERFORMANCE CHARACTERISTICS

www.vishay.com/doc?40088

Operating Temperature: - 55 °C to + 85 °C
(to + 125 °C with voltage derating)

Capacitance Range: 1.0 µF to 1500 µF

Capacitance Tolerance: ± 10 %, ± 20 % standard

Voltage Rating: 4 V_{DC} to 50 V_{DC}

Equivalent Series Resistance: ESR readings measured at 100 kHz, + 25 °C from 3500 mΩ to 30 mΩ

| ORDERING INFORMATION | | | | | | |
|----------------------|--|--|--|---------------------------------|---|--|
| 594D | 477 | X0 | 004 | R | 2 | T |
| TYPE | CAPACITANCE | CAPACITANCE TOLERANCE | DC VOLTAGE RATING AT + 85 °C | CASE CODE | TERMINATION | REEL SIZE AND PACKAGING |
| | This is expressed in pF. The first two digits are the significant figures. The third is the number of zeros to follow. | X0 = ± 20 % X9 = ± 10 % | This is expressed in V. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V). | See Ratings and Case Code table | 2 = 100 % tin 4 = Gold plated 8 = Solder plated (60/40) Special order | Tape and reel T = 7" [178 mm] reel W = 13" [330 mm] reel |

Note

- Preferred tolerances and reel sizes are in bold. We reserve the right to supply higher voltage ratings and tighter capacitance tolerance capacitors in the same case size. Voltage substitutions will be marked with the higher voltage rating.

| DIMENSIONS in inches [millimeters] | | | | | | | |
|------------------------------------|-------------------|--|--|------------------------------|------------------------------|-------------------|---|
| | | | | | | | Tantalum wire nib identifies anode (+) terminal |
| CASE CODE | L _{MAX.} | W | H | A | B | D _{REF.} | J _{MAX.} |
| B | 0.157 [4.0] | 0.110 + 0.012/- 0.016 [2.8 + 0.3/- 0.4] | 0.075 + 0.012/- 0.024 [1.9 + 0.3/- 0.6] | 0.031 ± 0.012 [0.8 ± 0.3] | 0.098 ± 0.016 [2.5 ± 0.4] | 0.138 [3.5] | 0.004 [0.1] |
| C | 0.280 [7.1] | 0.126 ± 0.012 [3.2 ± 0.3] | 0.098 ± 0.012 [2.5 ± 0.3] | 0.051 ± 0.012 [1.3 ± 0.3] | 0.181 ± 0.024 [4.6 ± 0.6] | 0.236 [6.0] | 0.004 [0.1] |
| D | 0.295 [7.5] | 0.169 + 0.012/- 0.024 [4.3 + 0.3/- 0.6] | 0.110 ± 0.012 [2.8 ± 0.3] | 0.051 ± 0.012 [1.3 ± 0.3] | 0.181 ± 0.024 [4.6 ± 0.6] | 0.252 [6.4] | 0.004 [0.1] |
| R | 0.283 [7.2] | 0.236 + 0.012/- 0.024 [6.0 + 0.3/- 0.6] | 0.138 + 0.012/- 0.016 [3.5 + 0.3/- 0.4] | 0.051 ± 0.012 [1.3 ± 0.3] | 0.181 ± 0.024 [4.6 ± 0.6] | 0.244 [6.2] | 0.004 [0.1] |

Note

- The anode termination (D less B) will be a minimum of 0.012" [0.3 mm]



| RATINGS AND CASE CODES | | | | | | | | |
|------------------------|-----|-------|-------|------|------|------|------|------|
| μF | 4 V | 6.3 V | 10 V | 16 V | 20 V | 25 V | 35 V | 50 V |
| 1.0 | | | | | | | | B |
| 2.2 | | | | | | | B | |
| 3.3 | | | | | | B | | |
| 4.7 | | | | | B | | B | C |
| 6.8 | | | | | B | | C | D |
| 10 | | | | | B | B | | |
| 15 | | | B | B | | C | C/D | R |
| 22 | | B | B | B | B/C | C | D/R | |
| 33 | B | | B | B/C | | D | R | |
| 47 | | | B | B/C | C/D | D/R | R | |
| 68 | | B | B/C | C/D | D | D/R | | |
| 100 | B | B | B/C | C/D | D | R | | |
| 120 | | C | C | R | R | | | |
| 150 | B/C | | C/D | D | | | | |
| 180 | | | D | R | | | | |
| 220 | | C/D | C/D/R | R | | | | |
| 270 | D | | | | | | | |
| 330 | C | C/D | D/R | R | | | | |
| 390 | | R | | | | | | |
| 470 | C/R | D/R | R | | | | | |
| 680 | D | R | R | | | | | |
| 1000 | | R | | | | | | |
| 1500 | R | | | | | | | |

| STANDARD RATINGS | | | | | | |
|--|-----------|----------------------|--------------------------------|--|--|---|
| CAPACITANCE (μF) | CASE CODE | PART NUMBER | MAX. DCL AT + 25 °C (μA) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I _{RMS} (A) |
| 4 V_{DC} AT + 85 °C, 2.7 V_{DC} AT + 125 °C | | | | | | |
| 33 | B | 594D336(1)004B(2)(3) | 1.30 | 6 | 0.380 | 0.47 |
| 100 | B | 594D107(1)004B(2)(3) | 4.00 | 8 | 0.300 | 0.53 |
| 150 | B | 594D157(1)004B(2)(3) | 6.00 | 8 | 0.250 | 0.58 |
| 150 | C | 594D157(1)004C(2)(3) | 6.00 | 8 | 0.080 | 1.17 |
| 270 | D | 594D277(1)004D(2)(3) | 10.80 | 8 | 0.060 | 1.58 |
| 330 | C | 594D337(1)004C(2)(3) | 13.20 | 8 | 0.080 | 1.17 |
| 470 | C | 594D477(1)004C(2)(3) | 18.80 | 10 | 0.075 | 1.21 |
| 470 | R | 594D477(1)004R(2)(3) | 18.80 | 10 | 0.045 | 2.36 |
| 680 | D | 594D687(1)004D(2)(3) | 27.20 | 12 | 0.060 | 1.58 |
| 1500 | R | 594D158(1)004R(2)(3) | 60.00 | 20 | 0.030 | 2.89 |
| 6.3 V_{DC} AT + 85 °C, 4 V_{DC} AT + 125 °C | | | | | | |
| 22 | B | 594D226(1)6R3B(2)(3) | 1.40 | 6 | 0.380 | 0.47 |
| 68 | B | 594D686(1)6R3B(2)(3) | 4.30 | 6 | 0.319 | 0.52 |
| 100 | B | 594D107(1)6R3B(2)(3) | 6.30 | 8 | 0.250 | 0.58 |

Note

- Part number definitions:
 - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
 - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
 - Packaging code: For 7" reels specify "T", for 13" reels specify "W".



| STANDARD RATINGS | | | | | | |
|--|-----------|----------------------|--------------------------------------|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DCL AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 6.3 V_{DC} AT + 85 °C, 4 V_{DC} AT + 125 °C | | | | | | |
| 120 | C | 594D127(1)6R3C(2)(3) | 7.60 | 8 | 0.085 | 1.14 |
| 220 | C | 594D227(1)6R3C(2)(3) | 13.90 | 8 | 0.080 | 1.17 |
| 220 | D | 594D227(1)6R3D(2)(3) | 13.90 | 8 | 0.065 | 1.52 |
| 330 | C | 594D337(1)6R3C(2)(3) | 20.80 | 8 | 0.080 | 1.17 |
| 330 | D | 594D337(1)6R3D(2)(3) | 20.80 | 8 | 0.060 | 1.58 |
| 390 | R | 594D397(1)6R3R(2)(3) | 24.60 | 8 | 0.045 | 2.36 |
| 470 | D | 594D477(1)6R3D(2)(3) | 29.60 | 8 | 0.060 | 1.58 |
| 470 | R | 594D477(1)6R3R(2)(3) | 29.60 | 10 | 0.050 | 2.24 |
| 680 | R | 594D687(1)6R3R(2)(3) | 42.80 | 10 | 0.045 | 2.36 |
| 1000 | R | 594D108(1)6R3R(2)(3) | 63.00 | 16 | 0.030 | 2.89 |
| 10 V_{DC} AT + 85 °C, 7 V_{DC} AT + 125 °C | | | | | | |
| 15 | B | 594D156(1)010B(2)(3) | 1.50 | 6 | 0.500 | 0.41 |
| 22 | B | 594D226(1)010B(2)(3) | 2.20 | 6 | 0.500 | 0.41 |
| 33 | B | 594D336(1)010B(2)(3) | 3.30 | 6 | 0.500 | 0.41 |
| 47 | B | 594D476(1)010B(2)(3) | 4.70 | 6 | 0.400 | 0.46 |
| 68 | B | 594D686(1)010B(2)(3) | 6.80 | 6 | 0.350 | 0.49 |
| 68 | C | 594D686(1)010C(2)(3) | 6.80 | 6 | 0.100 | 1.05 |
| 100 | B | 594D107(1)010B(2)(3) | 10.00 | 12 | 0.250 | 0.58 |
| 100 | C | 594D107(1)010C(2)(3) | 10.00 | 8.0 | 0.095 | 1.08 |
| 120 | C | 594D127(1)010C(2)(3) | 12.00 | 7.0 | 0.095 | 1.08 |
| 150 | C | 594D157(1)010C(2)(3) | 15.00 | 8.0 | 0.090 | 1.11 |
| 150 | D | 594D157(1)010D(2)(3) | 15.00 | 8 | 0.075 | 1.41 |
| 180 | D | 594D187(1)010D(2)(3) | 18.00 | 7 | 0.090 | 1.29 |
| 220 | C | 594D227(1)010C(2)(3) | 22.00 | 8 | 0.100 | 1.05 |
| 220 | D | 594D227(1)010D(2)(3) | 22.00 | 8 | 0.065 | 1.52 |
| 220 | R | 594D227(1)010R(2)(3) | 22.00 | 8 | 0.065 | 1.96 |
| 330 | D | 594D337(1)010D(2)(3) | 33.00 | 8 | 0.065 | 1.52 |
| 330 | R | 594D337(1)010R(2)(3) | 33.00 | 8 | 0.045 | 2.36 |
| 470 | R | 594D477(1)010R(2)(3) | 47.00 | 8 | 0.045 | 2.36 |
| 680 | R | 594D687(1)010R(2)(3) | 68.00 | 14 | 0.045 | 2.36 |
| 16 V_{DC} AT + 85 °C, 10 V_{DC} AT + 125 °C | | | | | | |
| 15 | B | 594D156(1)016B(2)(3) | 2.40 | 6 | 0.550 | 0.39 |
| 22 | B | 594D226(1)016B(2)(3) | 3.50 | 6 | 0.500 | 0.41 |
| 33 | B | 594D336(1)016B(2)(3) | 5.30 | 6 | 0.500 | 0.41 |
| 33 | C | 594D336(1)016C(2)(3) | 5.30 | 6 | 0.150 | 0.86 |
| 47 | B | 594D476(1)016B(2)(3) | 7.50 | 6 | 0.720 | 0.34 |
| 47 | C | 594D476(1)016C(2)(3) | 7.50 | 6 | 0.110 | 1.00 |
| 68 | C | 594D686(1)016C(2)(3) | 10.90 | 6 | 0.123 | 0.95 |
| 68 | D | 594D686(1)016D(2)(3) | 10.90 | 6 | 0.095 | 1.26 |
| 100 | C | 594D107(1)016C(2)(3) | 16.00 | 8 | 0.080 | 1.17 |
| 100 | D | 594D107(1)016D(2)(3) | 16.00 | 8 | 0.075 | 1.41 |
| 120 | R | 594D127(1)016R(2)(3) | 19.20 | 8 | 0.080 | 1.77 |
| 150 | D | 594D157(1)016D(2)(3) | 24.00 | 8 | 0.085 | 1.33 |
| 180 | R | 594D187(1)016R(2)(3) | 28.80 | 8 | 0.055 | 2.13 |
| 220 | R | 594D227(1)016R(2)(3) | 35.20 | 8 | 0.055 | 2.13 |
| 330 | R | 594D337(1)016R(2)(3) | 52.80 | 14 | 0.055 | 2.13 |

Note

- Part number definitions:
 - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
 - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
 - Packaging code: For 7" reels specify "T", for 13" reels specify "W".



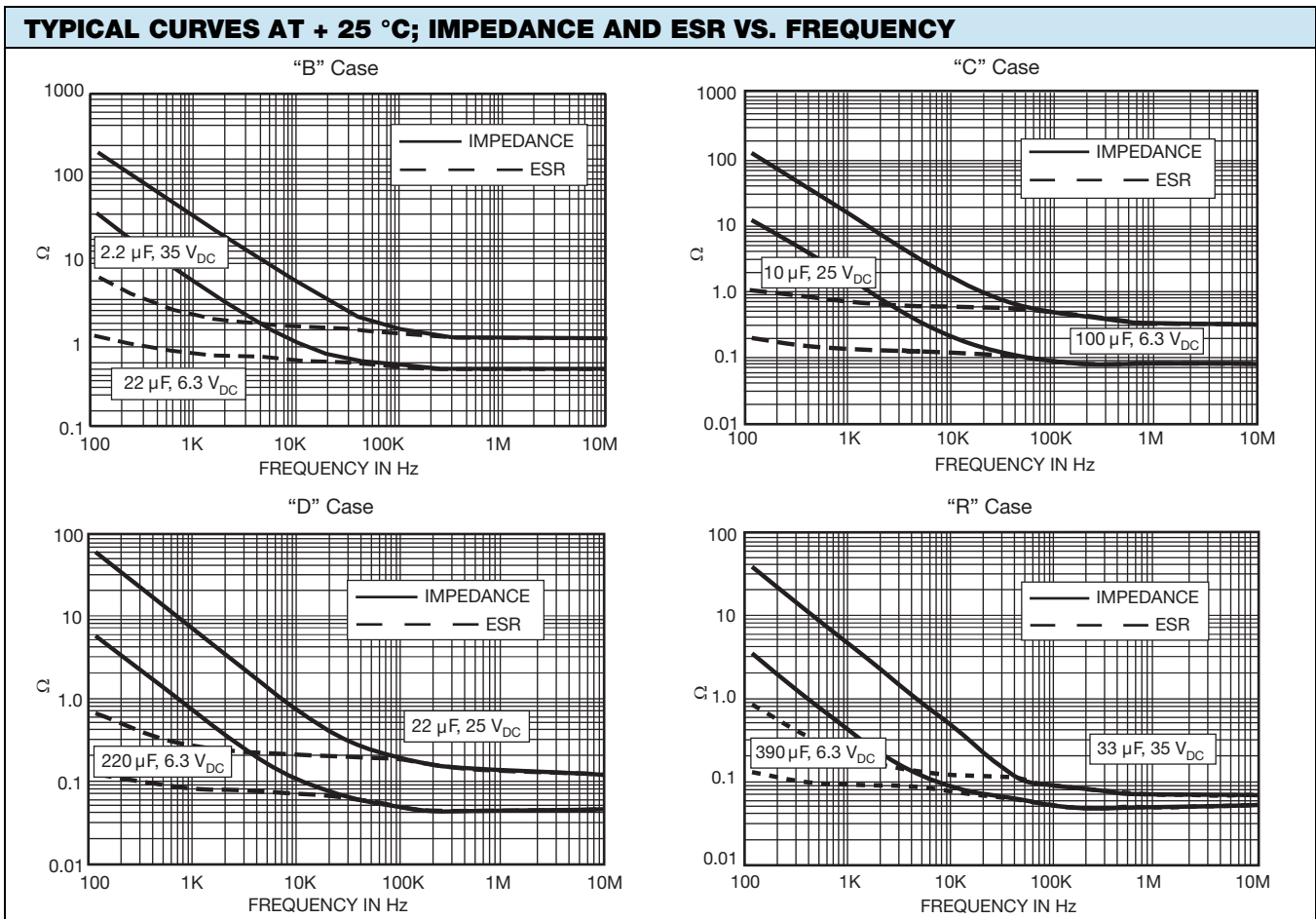
| STANDARD RATINGS | | | | | | |
|--|-----------|----------------------|--------------------------------------|--|---|--|
| CAPACITANCE (μ F) | CASE CODE | PART NUMBER | MAX. DCL AT + 25 °C (μ A) | MAX. DF AT + 25 °C 120 Hz (%) | MAX. ESR AT + 25 °C 100 kHz (Ω) | MAX. RIPPLE 100 kHz I_{RMS} (A) |
| 20 V_{DC} AT + 85 °C, 13 V_{DC} AT + 125 °C | | | | | | |
| 4.7 | B | 594D475(1)020B(2)(3) | 0.90 | 6 | 0.900 | 0.31 |
| 6.8 | B | 594D685(1)020B(2)(3) | 1.40 | 6 | 0.900 | 0.31 |
| 10 | B | 594D106(1)020B(2)(3) | 2.00 | 6 | 0.850 | 0.32 |
| 22 | B | 594D226(1)020B(2)(3) | 4.40 | 6 | 0.600 | 0.38 |
| 22 | C | 594D226(1)020C(2)(3) | 4.40 | 6 | 0.150 | 0.86 |
| 47 | C | 594D476(1)020C(2)(3) | 9.40 | 6 | 0.140 | 0.89 |
| 47 | D | 594D476(1)020D(2)(3) | 9.40 | 6 | 0.095 | 1.26 |
| 68 | D | 594D686(1)020D(2)(3) | 13.60 | 6 | 0.132 | 1.07 |
| 100 | D | 594D107(1)020D(2)(3) | 20.00 | 8 | 0.085 | 1.33 |
| 120 | R | 594D127(1)020R(2)(3) | 24.00 | 8 | 0.080 | 1.77 |
| 25 V_{DC} AT + 85 °C, 17 V_{DC} AT + 125 °C | | | | | | |
| 3.3 | B | 594D335(1)025B(2)(3) | 0.80 | 6 | 1.500 | 0.24 |
| 10 | B | 594D106(1)025B(2)(3) | 2.50 | 6 | 0.900 | 0.31 |
| 15 | C | 594D156(1)025C(2)(3) | 3.80 | 6 | 0.220 | 0.71 |
| 22 | C | 594D226(1)025C(2)(3) | 5.50 | 6 | 0.200 | 0.74 |
| 33 | D | 594D336(1)025D(2)(3) | 8.30 | 6 | 0.130 | 1.07 |
| 47 | D | 594D476(1)025D(2)(3) | 11.80 | 6 | 0.130 | 1.07 |
| 47 | R | 594D476(1)025R(2)(3) | 11.80 | 6 | 0.099 | 1.59 |
| 68 | D | 594D686(1)025D(2)(3) | 17.00 | 8 | 0.200 | 0.87 |
| 68 | R | 594D686(1)025R(2)(3) | 17.00 | 6 | 0.095 | 1.62 |
| 100 | R | 594D107(1)025R(2)(3) | 25.00 | 8 | 0.090 | 1.67 |
| 35 V_{DC} AT + 85 °C, 23 V_{DC} AT + 125 °C | | | | | | |
| 2.2 | B | 594D225(1)035B(2)(3) | 0.80 | 6 | 1.700 | 0.22 |
| 4.7 | B | 594D475(1)035B(2)(3) | 1.60 | 6 | 1.400 | 0.25 |
| 6.8 | C | 594D685(1)035C(2)(3) | 2.40 | 6 | 0.430 | 0.51 |
| 15 | C | 594D156(1)035C(2)(3) | 5.30 | 6 | 0.400 | 0.52 |
| 15 | D | 594D156(1)035D(2)(3) | 5.30 | 6 | 0.270 | 0.75 |
| 22 | D | 594D226(1)035D(2)(3) | 7.70 | 6 | 0.270 | 0.75 |
| 22 | R | 594D226(1)035R(2)(3) | 7.70 | 6 | 0.220 | 1.07 |
| 33 | R | 594D336(1)035R(2)(3) | 11.60 | 6 | 0.200 | 1.12 |
| 47 | R | 594D476(1)035R(2)(3) | 16.60 | 6 | 0.200 | 1.12 |
| 50 V_{DC} AT + 85 °C, 33 V_{DC} AT + 125 °C | | | | | | |
| 1.0 | B | 594D105(1)050B(2)(3) | 0.50 | 4 | 3.500 | 0.16 |
| 4.7 | C | 594D475(1)050C(2)(3) | 2.40 | 6 | 0.800 | 0.37 |
| 6.8 | D | 594D685(1)050D(2)(3) | 3.40 | 6 | 0.450 | 0.58 |
| 15 | R | 594D156(1)050R(2)(3) | 7.50 | 6 | 0.350 | 0.85 |

Note

- Part number definitions:
 - Tolerance: For 10 % tolerance, specify "X9"; for 20 % tolerance, change to "X0"
 - Termination: For 100 % tin specify "2", for gold plated specify "4", for solder plated 60/40 specify "8"
 - Packaging code: For 7" reels specify "T", for 13" reels specify "W".



| RECOMMENDED VOLTAGE DERATING GUIDELINES (for temperature below + 85 °C) | |
|---|-------------------|
| STANDARD CONDITIONS. FOR EXAMPLE: OUTPUT FILTERS | |
| Capacitor Voltage Rating | Operating Voltage |
| 4.0 | 2.5 |
| 6.3 | 3.6 |
| 10 | 6.0 |
| 16 | 10 |
| 20 | 12 |
| 25 | 15 |
| 35 | 24 |
| 50 | 28 |
| SEVERE CONDITIONS. FOR EXAMPLE: INPUT FILTERS | |
| Capacitor Voltage Rating | Operating Voltage |
| 4.0 | 2.5 |
| 6.3 | 3.3 |
| 10 | 5.0 |
| 16 | 8.0 |
| 20 | 10 |
| 25 | 12 |
| 35 | 15 |
| 50 | 24 |





| POWER DISSIPATION | |
|-------------------|--|
| CASE CODE | MAXIMUM PERMISSIBLE POWER DISSIPATION AT + 25 °C (W) IN FREE AIR |
| B | 0.085 |
| C | 0.110 |
| D | 0.150 |
| R | 0.250 |

| STANDARD PACKAGING QUANTITY | | |
|-----------------------------|----------------|----------|
| CASE CODE | UNITS PER REEL | |
| | 7" REEL | 13" REEL |
| B | 2000 | 8000 |
| C | 500 | 3000 |
| D | 500 | 3000 |
| R | 600 | n/a |

| PRODUCT INFORMATION | |
|--------------------------------|--|
| Conformal Coated Guide | www.vishay.com/doc?40150 |
| Moisture Sensitivity | www.vishay.com/doc?40135 |
| SELECTOR GUIDES | |
| Solid Tantalum Selector Guide | www.vishay.com/doc?49053 |
| Solid Tantalum Chip Capacitors | www.vishay.com/doc?40091 |
| FAQ | |
| Frequently Asked Questions | www.vishay.com/doc?40110 |



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