# Solid Tantalum Surface Mount Chip Capacitors, Molded Case, Ultra Flat Low Profile

## FEATURES

- Small size, low profile
- Terminations: 100 % matte tin
- MSL level: 1 (UA case size), 3 (UB case size)
- Compatible with "high volume" automatic pick and place equipment
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

HALOGEN FREE Available

GREEN (5-2008) Available

## PERFORMANCE / ELECTRICAL CHARACTERISTICS

**Operating Temperature:** -55 °C to +125 °C (above 85 °C, voltage derating is required)

**Capacitance Range:** 0.1 μF to 220 μF

**Capacitance Tolerance:** ± 10 %, ± 20 %

**Voltage Rating:** 2.5 $V_{DC}$ to 35 $V_{DC}$

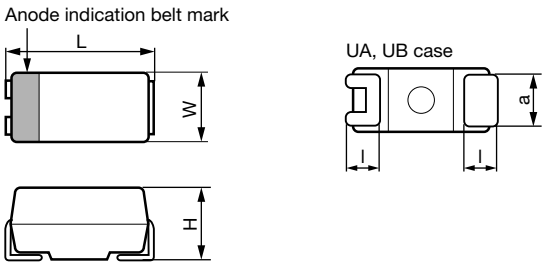
## APPLICATIONS

- Industrial
- General purpose

## ORDERING INFORMATION

| TMCU | A | 1G | 107 | M | TR | (2) | F |
|---|---|---|---|---|---|---|---|
| TYPE | CASE CODE | DC VOLTAGE RATING AT +85 °C | CAPACITANCE (μF) | CAPACITANCE TOLERANCE | PACKAGING POLARITY | (OPTIONAL) | TERMINAL CODE |
| | See Ratings and Case Codes table. | 0E = 2.5 V<br>0G = 4 V<br>0J = 6.3 V (7 V)<br>1A = 10 V<br>1C = 16 V<br>1D = 20 V<br>1E = 25 V<br>1V = 35 V | This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow. | K = ± 10 %<br>M = ± 20 % | TR = 7" reel, cathodes close to perforation side | Halogen-free (special order) | F = lead (Pb)-free terminations |

## DIMENSIONS in inches [millimeters]




| CASE CODE | EIA SIZE | L | W | H | l | a |
|---|---|---|---|---|---|---|
| UA | 3216-12 | 0.126 ± 0.008<br>[3.2 ± 0.2] | 0.063 ± 0.008<br>[1.6 ± 0.2] | 0.047 max.<br>[1.2 max.] | 0.030 ± 0.012<br>[0.8 ± 0.3] | 0.047 ± 0.008<br>[1.2 ± 0.2] |
| UB | 3528-12 | 0.138 ± 0.008<br>[3.5 ± 0.2] | 0.110 ± 0.008<br>[2.8 ± 0.2] | 0.047 max.<br>[1.2 max.] | 0.030 ± 0.012<br>[0.8 ± 0.3] | 0.071 ± 0.008<br>[1.8 ± 0.2] |



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| RATINGS AND CASE CODES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| µF | 2.5 V | 4 V | 6.3 V (7 V) | 10 V | 16 V | 20 V | 25 V | 35 V |
| 0.10 | | | | | | | | UA |
| 0.15 | | | | | | | | UA |
| 0.22 | | | | | | | | UA |
| 0.33 | | | | | | | UA | |
| 0.47 | | | | | | | UA | |
| 0.68 | | | | | | UA | UA | |
| 1.0 | | | | | | UA / UB | UA | UA / UB |
| 1.5 | | | | | UA | UA / UB | UB | UB |
| 2.2 | | | | | UA / UB | UA / UB | UB | UB |
| 3.3 | | | | | UA / UB | UA / UB | UB | |
| 4.7 | | | | UA | UA / UB | UB | UB | |
| 6.8 | | | | UA | UA / UB | UB | | |
| 10 | | | UA | UA | UA / UB | | | |
| 15 | UA | UA | UA | UA / UB | UB | | | |
| 22 | UA | UA | UA / UB | UA / UB | UB | | | |
| 33 | UA / UB | UA / UB | UA / UB | UB | | | | |
| 47 | UA / UB | UA / UB | UA / UB | UB | | | | |
| 68 | UB | UA / UB | UB | | | | | |
| 100 | UB | UA / UB | UB | | | | | |
| 150 | UB | UB | | | | | | |
| 220 | UB | UB | | | | | | |


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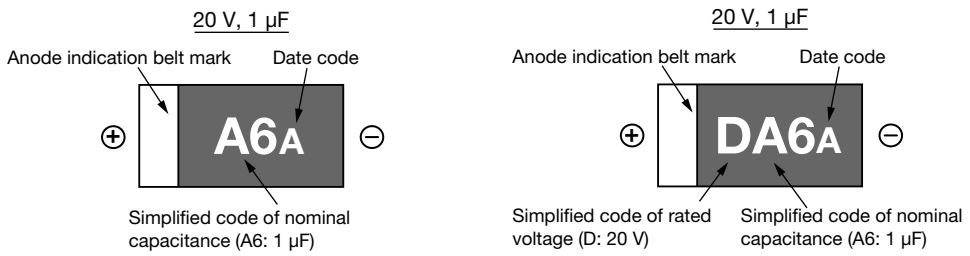
## MARKING




**CAPACITANCE AND VOLTAGE MARKING**

| µF | 2.5 V | 4 V | 6.3 V | 10 V | 16 V | 20 V | 25 V | 35 V |
|---|---|---|---|---|---|---|---|---|
| 0.10 | | | | | | | | VA5 |
| 0.15 | | | | | | | | VE5 |
| 0.22 | | | | | | | | VJ5 |
| 0.33 | | | | | | | EN5 | |
| 0.47 | | | | | | | ES5 | |
| 0.68 | | | | | | DW5 | EW5 | |
| 1.0 | | | | | | DA6 (1) / A6 (2) | EA6 | VA6 |
| 1.5 | | | | | CE6 | DE6 (1) / E6 (2) | EE6 | VE6 |
| 2.2 | | | | | CJ6 (1) / J6 (2) | DJ6 | EJ6 | VJ6 |
| 3.3 | | | | | CN6 | DN6 | EN6 | |
| 4.7 | | | | AS6 | CS6 | DS6 | ES6 | |
| 6.8 | | | | AW6 | CW6 | DW6 | | |
| 10 | | | JA7 | AA7 | CA7 | | | |
| 15 | eE7 | GE7 | JE7 | AE7 | CE7 | | | |
| 22 | eJ7 | GJ7 | JJ7 | AJ7 | CJ7 | | | |
| 33 | eN7 | GN7 | JN7 | AN7 | | | | |
| 47 | eS7 | GS7 | JS7 | AS7 | | | | |
| 68 | eW7 | GW7 | JW7 | | | | | |
| 100 | eA8 | GA8 | JA8 | | | | | |
| 220 | eE8 | GE8 | | | | | | |
| 330 | eJ8 | GJ8 | | | | | | |

**Notes**

(1) Marking on UA case

(2) Marking on UB case

## DATE CODE

| YEAR | MONTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2013 | A | B | C | D | E | F | G | H | J | K | L | M |
| 2014 | N | P | Q | R | S | T | U | V | W | X | Y | Z |
| 2015 | a | b | c | d | e | f | g | h | j | k | l | m |
| 2016 | n | p | q | r | s | t | u | v | w | x | y | z |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| 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) |
| 2.5 $V_{DC}$ AT +85 °C; 1.6 $V_{DC}$ AT +125 °C | | | | | | |
| 15 | UA | TMCUA0E156(1)TRF | 0.5 | 8 | 3.0 | 0.161 |
| 22 | UA | TMCUA0E226(1)TRF | 0.6 | 8 | 1.8 | 0.208 |
| 33 | UA | TMCUA0E336(1)TRF | 1.7 | 12 | 1.8 | 0.208 |
| 33 | UB | TMCUB0E336(1)TRF | 0.8 | 12 | 1.7 | 0.238 |
| 47 | UA | TMCUA0E476(1)TRF | 2.4 | 18 | 1.8 | 0.208 |
| 47 | UB | TMCUB0E476(1)TRF | 1.2 | 12 | 1.7 | 0.238 |
| 68 | UB | TMCUB0E686(1)TRF | 1.7 | 15 | 1.7 | 0.238 |
| 100 | UB | TMCUB0E107(1)TRF | 5.0 | 20 | 1.1 | 0.295 |
| 150 | UB | TMCUB0E157(1)TRF | 7.5 | 30 | 1.1 | 0.295 |
| 220 | UB | TMCUB0E227(1)TRF | 11.0 | 30 | 1.1 | 0.295 |
| 4 $V_{DC}$ AT +85 °C; 2.5 $V_{DC}$ AT +125 °C | | | | | | |
| 15 | UA | TMCUA0G156(1)TRF | 0.6 | 8 | 3.0 | 0.161 |
| 22 | UA | TMCUA0G226(1)TRF | 0.9 | 8 | 1.8 | 0.208 |
| 33 | UA | TMCUA0G336(1)TRF | 2.6 | 12 | 1.8 | 0.208 |
| 33 | UB | TMCUB0G336(1)TRF | 1.3 | 12 | 1.7 | 0.238 |
| 47 | UA | TMCUA0G476(1)TRF | 3.8 | 18 | 1.8 | 0.208 |
| 47 | UB | TMCUB0G476(1)TRF | 1.9 | 12 | 1.7 | 0.238 |
| 68 | UA | TMCUA0G686(1)TRF | 5.4 | 30 | 4.0 | 0.140 |
| 68 | UB | TMCUB0G686(1)TRF | 2.7 | 15 | 1.7 | 0.238 |
| 100 | UA | TMCUA0G107MTRF | 20.0 | 30 | 2.9 | 0.164 |
| 100 | UB | TMCUB0G107(1)TRF | 8.0 | 20 | 1.1 | 0.295 |
| 150 | UB | TMCUB0G157(1)TRF | 12.0 | 30 | 1.1 | 0.295 |
| 220 | UB | TMCUB0G227MTRF | 17.6 | 30 | 1.1 | 0.295 |
| 6.3 $V_{DC}$ (7 $V_{DC}$) AT +85 °C; 4 $V_{DC}$ AT +125 °C | | | | | | |
| 10 | UA | TMCUA0J106(1)TRF | 0.7 | 8 | 4.0 | 0.140 |
| 15 | UA | TMCUA0J156(1)TRF | 1.1 | 8 | 2.9 | 0.164 |
| 22 | UA | TMCUA0J226(1)TRF | 2.8 | 12 | 2.9 | 0.164 |
| 22 | UB | TMCUB0J226(1)TRF | 1.4 | 10 | 1.7 | 0.238 |
| 33 | UA | TMCUA0J336(1)TRF | 4.2 | 20 | 2.9 | 0.164 |
| 33 | UB | TMCUB0J336(1)TRF | 2.3 | 10 | 1.7 | 0.238 |
| 47 | UA | TMCUA0J476MTRF | 5.9 | 20 | 2.9 | 0.164 |
| 47 | UB | TMCUB0J476(1)TRF | 3.3 | 12 | 1.7 | 0.238 |
| 68 | UB | TMCUB0J686(1)TRF | 8.6 | 20 | 1.7 | 0.238 |
| 100 | UB | TMCUB0J107MTRF | 12.6 | 20 | 1.1 | 0.295 |
| 10 $V_{DC}$ AT +85 °C; 6.3 $V_{DC}$ AT +125 °C | | | | | | |
| 4.7 | UA | TMCUA1A475(1)TRF | 0.5 | 6 | 4.0 | 0.140 |
| 6.8 | UA | TMCUA1A685(1)TRF | 0.7 | 6 | 4.0 | 0.140 |
| 10 | UA | TMCUA1A106(1)TRF | 1.0 | 8 | 4.0 | 0.140 |
| 15 | UA | TMCUA1A156(1)TRF | 3.0 | 12 | 2.9 | 0.164 |
| 15 | UB | TMCUB1A156(1)TRF | 1.5 | 10 | 2.8 | 0.185 |
| 22 | UA | TMCUA1A226MTRF | 4.4 | 18 | 2.9 | 0.164 |
| 22 | UB | TMCUB1A226(1)TRF | 2.2 | 10 | 1.7 | 0.238 |
| 33 | UB | TMCUB1A336(1)TRF | 6.6 | 12 | 1.7 | 0.238 |
| 47 | UB | TMCUB1A476MTRF | 9.4 | 30 | 1.7 | 0.238 |
| 16 $V_{DC}$ AT +85 °C; 10 $V_{DC}$ AT +125 °C | | | | | | |
| 1.5 | UA | TMCUA1C155(1)TRF | 0.5 | 6 | 8.8 | 0.094 |
| 2.2 | UA | TMCUA1C225(1)TRF | 0.5 | 6 | 7.7 | 0.101 |
| 2.2 | UB | TMCUB1C225(1)TRF | 0.5 | 6 | 6.6 | 0.121 |
| 3.3 | UA | TMCUA1C335(1)TRF | 0.5 | 6 | 7.7 | 0.101 |
| 3.3 | UB | TMCUB1C335(1)TRF | 0.5 | 6 | 4.0 | 0.155 |
| 4.7 | UA | TMCUA1C475(1)TRF | 0.8 | 8 | 4.0 | 0.140 |
| 4.7 | UB | TMCUB1C475(1)TRF | 0.8 | 6 | 4.0 | 0.155 |

**Note**

- Part number definition:
  (1) Tolerance: For 10 % tolerance, specify “K”; for 20 % tolerance, change to “M”


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## 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) |
|---|---|---|---|---|---|---|
| **16 $V_{DC}$ AT +85 °C; 10 $V_{DC}$ AT +125 °C** | | | | | | |
| 6.8 | UA | TMCUA1C685(1)TRF | 1.1 | 12 | 4.0 | 0.140 |
| 6.8 | UB | TMCUB1C685(1)TRF | 1.1 | 6 | 4.0 | 0.155 |
| 10 | UA | TMCUA1C106MTRF | 1.6 | 18 | 3.3 | 0.154 |
| 10 | UB | TMCUB1C106(1)TRF | 1.6 | 8 | 2.8 | 0.185 |
| 15 | UB | TMCUB1C156(1)TRF | 4.8 | 12 | 2.8 | 0.185 |
| 22 | UB | TMCUB1C226MTRF | 7.0 | 18 | 1.7 | 0.238 |
| **20 $V_{DC}$ AT +85 °C; 13 $V_{DC}$ AT +125 °C** | | | | | | |
| 0.68 | UA | TMCUA1D684(1)TRF | 0.5 | 4 | 19.8 | 0.063 |
| 1.0 | UA | TMCUA1D105(1)TRF | 0.5 | 4 | 16.5 | 0.069 |
| 1.0 | UB | TMCUB1D105(1)TRF | 0.5 | 4 | 8.8 | 0.104 |
| 1.5 | UA | TMCUA1D155(1)TRF | 0.5 | 6 | 16.5 | 0.069 |
| 1.5 | UB | TMCUB1D155(1)TRF | 0.5 | 6 | 8.8 | 0.104 |
| 2.2 | UA | TMCUA1D225(1)TRF | 0.5 | 6 | 7.7 | 0.101 |
| 2.2 | UB | TMCUB1D225(1)TRF | 0.5 | 6 | 6.6 | 0.121 |
| 3.3 | UA | TMCUA1D335MTRF | 0.7 | 6 | 7.7 | 0.101 |
| 3.3 | UB | TMCUB1D335(1)TRF | 0.7 | 6 | 4.0 | 0.155 |
| 4.7 | UB | TMCUB1D475(1)TRF | 0.9 | 6 | 4.0 | 0.155 |
| 6.8 | UB | TMCUB1D685MTRF | 1.4 | 6 | 2.8 | 0.185 |
| **25 $V_{DC}$ AT +85 °C; 16 $V_{DC}$ AT +125 °C** | | | | | | |
| 0.33 | UA | TMCUA1E334(1)TRF | 0.5 | 4 | 26.4 | 0.054 |
| 0.47 | UA | TMCUA1E474(1)TRF | 0.5 | 4 | 22.0 | 0.060 |
| 0.68 | UA | TMCUA1E684(1)TRF | 0.5 | 8 | 19.8 | 0.063 |
| 1.0 | UA | TMCUA1E105(1)TRF | 0.5 | 8 | 16.5 | 0.069 |
| 1.5 | UB | TMCUB1E155(1)TRF | 0.5 | 6 | 8.8 | 0.104 |
| 2.2 | UB | TMCUB1E225(1)TRF | 0.6 | 6 | 6.6 | 0.121 |
| 3.3 | UB | TMCUB1E335(1)TRF | 0.8 | 6 | 4.0 | 0.155 |
| 4.7 | UB | TMCUB1E475MTRF | 1.2 | 6 | 4.0 | 0.155 |
| **35 $V_{DC}$ AT +85 °C; 22 $V_{DC}$ AT +125 °C** | | | | | | |
| 0.10 | UA | TMCUA1V104(1)TRF | 0.5 | 4 | 40.0 | 0.044 |
| 0.15 | UA | TMCUA1V154(1)TRF | 0.5 | 4 | 40.0 | 0.044 |
| 0.22 | UA | TMCUA1V224(1)TRF | 0.5 | 4 | 40.0 | 0.044 |
| 1.0 | UA | TMCUA1V105MTRF | 0.5 | 8 | 16.5 | 0.069 |
| 1.0 | UB | TMCUB1V105(1)TRF | 0.5 | 6 | 8.8 | 0.104 |
| 1.5 | UB | TMCUB1V155(1)TRF | 0.5 | 6 | 8.8 | 0.104 |
| 2.2 | UB | TMCUB1V225MTRF | 0.8 | 6 | 6.6 | 0.121 |

**Note**

- Part number definition:
  (1) Tolerance: For 10 % tolerance, specify “K”; for 20 % tolerance, change to “M”

## RECOMMENDED VOLTAGE DERATING GUIDELINES (for temperature below +85 °C)

| CAPACITOR VOLTAGE RATING | OPERATING VOLTAGE |
|---|---|
| 2.5 | 1.2 |
| 4.0 | 2.0 |
| 6.3 (7.0) | 3.1 (3.5) |
| 10 | 5.0 |
| 16 | 8.0 |
| 20 | 10.0 |
| 25 | 12.5 |
| 35 | 17.5 |


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## POWER DISSIPATION

| CASE CODE | MAXIMUM PERMISSIBLE POWER DISSIPATION AT +25 °C (W) IN FREE AIR |
|---|---|
| UA | 0.078 |
| UB | 0.096 |

## STANDARD PACKAGING QUANTITY

| CASE CODE | UNITS PER 7" REEL |
|---|---|
| UA | 3000 |
| UB | 3000 |

## PERFORMANCE CHARACTERISTICS

| ITEM | CONDITION | POST TEST PERFORMANCE | | | | |
|---|---|---|---|---|---|---|
| Temperature characteristics | Measure the specified characteristics in each stage | | Specified initial value | -55 °C | +85 °C | +125 °C |
| | | Capacitance change | - | -12 % to 0 % | 0 % to 10 % | 0 % to 12 % |
| | | Dissipation factor (%), maximum | 4 | 5 | 4 | 5 |
| | | | 6 | 8 | 6 | 6 |
| | | | 8 | 12 | 10 | 12 |
| | | | 10 | 14 | 12 | 14 |
| | | | 12 | 16 | 14 | 16 |
| | | | 18 | 34 | 20 | 22 |
| | | | 20 | 38 | 22 | 24 |
| | | | 30 | 60 | 30 | 40 |
| | | Leakage current | Refer to Standard Ratings table | - | 1000 % specified initial value or less | 1250 % specified initial value or less |
| Solder heat resistance | Solder Dip<br>260 °C ± 5 °C, 10 s ± 1 s<br>Reflow<br>260 °C, 10 s ± 1 s | Capacitance change | Within ± 5 % of initial value | | | |
| | | Dissipation factor | Initial specified value or less | | | |
| | | Leakage current | Initial specified value or less | | | |
| Moisture resistance no load | Leave at 40 °C and 90 % to 95 % RH for 500 h | Capacitance change | Within ± 10 % of initial value | | | |
| | | Dissipation factor | Initial specified value or less | | | |
| | | Leakage current | Initial specified value or less | | | |
| High temperature load | 85 °C. The rated voltage is applied for 2000 h | Capacitance change | Within ± 10 % of initial value | | | |
| | | Dissipation factor | Initial specified value or less | | | |
| | | Leakage current | Shall not exceed 125 % of initial specified value | | | |
| Thermal shock | Leave at -55 °C, normal temperature, 125 °C, and normal temperature for 30 min., 3 min, 30 min, and 3 min. Repeat this operation 5 times running. | Capacitance change | Within ± 5 % of initial value | | | |
| | | Dissipation factor | Initial specified value or less | | | |
| | | Leakage current | Initial specified value or less | | | |
| Moisture resistance load | Leave at 40 °C and 90 % to 95 % RH. The rated voltage applied for 500 h | Capacitance change | Within ± 10 % of initial value | | | |
| | | Dissipation factor | Shall not exceed 150 % of initial specified value | | | |
| | | Leakage current | Shall not exceed 200 % of initial specified value | | | |
| Failure rate | 85 °C. The rated voltage is applied through a protective resistor of 1 Ω/V. | 1 % / 1000 h | | | | |

**Note**

- Test conditions per JIS C5101-1


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