

Wet Tantalum Capacitors, Extended Capacitance, Military Established Reliability Military MIL-PRF-M39006/33 Qualified, Style CLR93 Series



FEATURES

- Hermetically sealed
- Tantalum cased
- Axial lead
- Tubular

PERFORMANCE CHARACTERISTICS

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

Capacitance Range: 220 µF to 680 µF

Capacitance Tolerance: ± 10 %, ± 20 %

Voltage Rating: 50 V_{DC} to 100 V_{DC}

DESCRIPTION

Established reliability tantalum capacitors to military specification MIL-PRF-39006: In accordance with the military specification MIL-PRF-39006 all capacitors are marked with the military part number (M39006/xx-xxxx) rather than the older style designation (CLR93) and should be ordered as such.

For information on the performance characteristics of these capacitors, please refer to the latest issue of the military specification. MIL-PRF-39006 establishes 1000 h failure

STYLE, MILITARY SPECIFICATION SHEET

Style CLR93, M39006/33 MIL-PRF-39006/33

rate levels of 1 %, 0.1 %, and 0.01 %. When ordering these parts, care must be exercised that the correct part number expressing the appropriate failure level be specified.

Each order for military style capacitors requiring government inspection must state whether inspection is to be at the destination or at the Vishay plant. Orders requiring source inspection cannot be shipped until this has been accomplished.

| ORDERING INFORMATION | | |
|---|---|---|
| <p>M39006</p> <p>BASIC DOCUMENT NUMBER</p> | <p>/33</p> <p>SLASH SHEET</p> | <p>-0030</p> <p>DASH NUMBER</p> |
| <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Indicates the basic specification; in this case MIL-PRF-39006</div> | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Indicates the specification sheet of the basic military specification</div> | <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;">Taken from Standard Ratings table</div> |

| DIMENSIONS in inches [millimeters] | | | | | | |
|--|--------------------------------|--|------------------------|------------------|---------------------------------|-----------------------------|
| <div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> <p>Style CLR93</p> </div> <div style="flex: 0.5; text-align: center;"> <p>Case circuit diagram</p> </div> </div> | | | | | | |
| CASE CODE | BARE CASE | | WITH INSULATING SLEEVE | | E LEAD LENGTH | WEIGHT (oz./g) (Max.) |
| | D | L | D (Max.) | L (Max.) | | |
| T4 | 0.375 ± 0.016 [9.52 ± 0.41] | 1.062 + 0.031/- 0.016 [26.97 + 0.79/- 0.41] | 0.406 [10.31] | 1.126 [28.60] | 2.250 ± 0.250 [57.15 ± 6.35] | 0.62 [17.7] |



| RATINGS AND CASE CODES | | | | |
|------------------------|------|------|------|-------|
| μF | 50 V | 60 V | 75 V | 100 V |
| 220 | | | | T4 |
| 470 | | | T4 | |
| 560 | | T4 | | |
| 680 | T4 | | | |

| STANDARD RATINGS | | | | | | | | | | | | | | |
|--|-----------|-----------------|--|-----|------|------------------|----------------|----------------------|-------------------------------|-------------------------|--------------------------------|--------|---------|---|
| CAPACITANCE (μF) | CASE CODE | CAP. TOL. (± %) | PART NO. M39006/33-FAILURE RATE LEVEL (%/1000 h) | | | MAX. DCL (μA) AT | | MAX. DF AT 25 °C (%) | MAX. ESR AT +25 °C 120 Hz (Ω) | MAX. IMP. AT -55 °C (Ω) | MAX. CAPACITANCE CHANGE (%) AT | | | MAX. (1) RIPPLE CURRENT AT +85 °C 40 kHz (mA) |
| | | | M | P | R | +25 °C | +85 °C +125 °C | | | | -55 °C | +85 °C | +125 °C | |
| | | | 1.0 | 0.1 | 0.01 | | | | | | | | | |
| 50 V _{DC} AT +85 °C; 30 V _{DC} AT +125 °C | | | | | | | | | | | | | | |
| 680 | T4 | 20 | 0029 | | | 5 | 40 | 43.1 | 0.7 | 10 | -58 | 10 | 20 | 2750 |
| 680 | T4 | 10 | 0030 | | | 5 | 40 | 43.1 | 0.7 | 10 | -58 | 10 | 20 | 2750 |
| 60 V _{DC} AT +85 °C; 40 V _{DC} AT +125 °C | | | | | | | | | | | | | | |
| 560 | T4 | 20 | 0039 | | | 5 | 40 | 40.5 | 0.8 | 10 | -58 | 8 | 15 | 2750 |
| 560 | T4 | 10 | 0040 | | | 5 | 40 | 40.5 | 0.8 | 10 | -58 | 8 | 15 | 2750 |
| 75 V _{DC} AT +85 °C; 50 V _{DC} AT +125 °C | | | | | | | | | | | | | | |
| 470 | T4 | 20 | 0049 | | | 5 | 50 | 38.3 | 0.9 | 12 | -55 | 8 | 12 | 2750 |
| 470 | T4 | 10 | 0050 | | | 5 | 50 | 38.3 | 0.9 | 12 | -55 | 8 | 12 | 2750 |
| 100 V _{DC} AT +85 °C; 65 V _{DC} AT +125 °C | | | | | | | | | | | | | | |
| 220 | T4 | 20 | 0059 | | | 5 | 50 | 23.9 | 1.2 | 15 | -40 | 6 | 12 | 2750 |
| 220 | T4 | 10 | 0060 | | | 5 | 50 | 23.9 | 1.2 | 15 | -40 | 6 | 12 | 2750 |

Note

(1) For ripple current limits at various temperatures, voltages, and frequencies, see “Ripple Current” table.

| CLR93 RIPPLE CURRENT MULTIPLIERS VS. FREQUENCY, TEMPERATURE AND APPLIED PEAK VOLTAGE | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|---------|------|------|------|
| FREQUENCY OF APPLIED RIPPLE CURRENT | | 120 Hz | | | | 800 Hz | | | | 1 kHz | | | | 10 kHz | | | | 40 kHz | | | | 100 kHz | | | |
| AMBIENT STILL AIR | | TEMP °C | | | | TEMP °C | | | | TEMP °C | | | | TEMP °C | | | | TEMP °C | | | | | | | |
| | | ≤ 55 | 85 | 105 | 125 | ≤ 55 | 85 | 105 | 125 | ≤ 55 | 85 | 105 | 125 | ≤ 55 | 85 | 105 | 125 | ≤ 55 | 85 | 105 | 125 | ≤ 55 | 85 | 105 | 125 |
| % OF APPLIED VOLTAGE | 100 % | 0.60 | 0.39 | - | - | 0.71 | 0.43 | - | - | 0.72 | 0.46 | - | - | 0.88 | 0.55 | - | - | 1.0 | 0.63 | - | - | 1.1 | 0.69 | - | - |
| | 90 % | 0.60 | 0.46 | - | - | 0.71 | 0.55 | - | - | 0.72 | 0.55 | - | - | 0.88 | 0.67 | - | - | 1.0 | 0.77 | - | - | 1.1 | 0.85 | - | - |
| | 80 % | 0.60 | 0.52 | 0.35 | - | 0.71 | 0.62 | 0.42 | - | 0.72 | 0.62 | 0.42 | - | 0.88 | 0.76 | 0.52 | - | 1.0 | 0.87 | 0.59 | - | 1.1 | 0.96 | 0.65 | - |
| | 70 % | 0.60 | 0.58 | 0.44 | - | 0.71 | 0.69 | 0.52 | - | 0.72 | 0.70 | 0.52 | - | 0.88 | 0.85 | 0.64 | - | 1.0 | 0.97 | 0.73 | - | 1.1 | 1.07 | 0.80 | - |
| | 66 2/3 % | 0.60 | 0.60 | 0.46 | 0.27 | 0.71 | 0.71 | 0.55 | 0.32 | 0.72 | 0.72 | 0.55 | 0.32 | 0.88 | 0.88 | 0.68 | 0.40 | 1.0 | 1.0 | 0.77 | 0.45 | 1.1 | 1.1 | 0.85 | 0.50 |

Notes

- At +125 °C the rated voltage of the capacitors decreases to 66 2/3 % of the +85 °C rated voltage.
- The peak of the applied AC ripple voltage plus the applied DC voltage must not exceed the DC voltage rating of the capacitor either forward or reverse.
- The ripple current listed represents a rating calculated using a maximum internal temperature rise (ΔT) of +50 °C at 40 kHz at +85 °C ambient with a maximum peak rated voltage of 66 2/3 % of the +85 °C peak voltage rating.
- The maximum allowable internal temperature rise (ΔT) decreases linearly to a calculated +10 °C rise at +125 °C ambient.
- The internal temperature rise is directly proportional to the equivalent series resistance of the capacitor and equivalent series resistance increases with decreasing frequency.