

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



## 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:** 15 µF to 680 µF

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

**Voltage Rating:** 50 V<sub>DC</sub> to 100 V<sub>DC</sub>

## 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

**M39006**  
BASIC DOCUMENT NUMBER

Indicates the basic specification;  
in this case MIL-PRF-39006

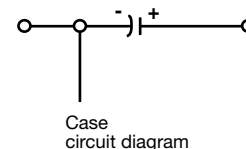
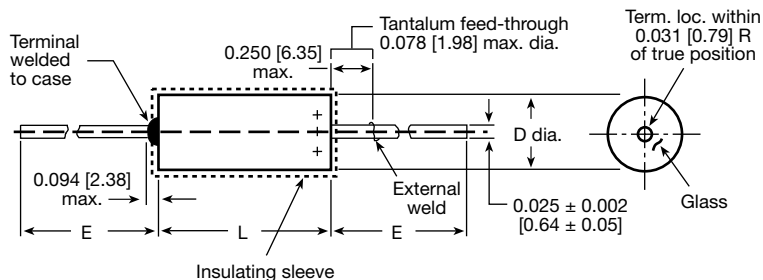
**/33**  
SLASH SHEET

Indicates the specification sheet  
of the basic military specification

**-0030**  
DASH NUMBER

Taken from Standard Ratings table

**DIMENSIONS** in inches [millimeters]

**Style CLR93**


CASE CODE	BARE CASE		WITH INSULATING SLEEVE		E LEAD LENGTH	WEIGHT (oz./g) (Max.)
	D	L	D (MAX.)	L <sup>(1)</sup>		
T1	0.188 ± 0.016 [4.78 ± 0.41]	0.453 + 0.031 / - 0.016 [11.51 + 0.79 / - 0.41]	0.219 [5.56]	0.565 [14.35]	1.500 ± 0.250 [38.10 ± 6.35]	0.10 [2.6]
T2	0.281 ± 0.016 [7.14 ± 0.41]	0.641 + 0.031 / - 0.016 [16.28 + 0.79 / - 0.41]	0.312 [7.92]	0.785 [19.94]	2.250 ± 0.250 [57.15 ± 6.35]	0.24 [6.2]
T3	0.375 ± 0.016 [9.52 ± 0.41]	0.766 + 0.031 / - 0.016 [19.46 + 0.79 / - 0.41]	0.406 [10.31]	0.95 [24.13]	2.250 ± 0.250 [57.15 ± 6.35]	0.46 [11.6]
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]	1.31 [33.27]	2.250 ± 0.250 [57.15 ± 6.35]	0.62 [17.7]

**Note**
<sup>(1)</sup> Typical length, for reference only

**RATINGS AND CASE CODES**

μF	50 V	60 V	75 V	100 V
15				T1
33			T1	
47		T1		
68	T1			T2
110			T2	
150		T2		T3
220	T2			T4
330			T3	
390		T3		
470	T3		T4	
560		T4		
680	T4			

**STANDARD RATINGS - CLR93, M39006/33-XXXX**

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 1.0	P 0.1				R 0.01	+25 °C	+85 °C +125 °C		-55 °C	+85 °C
				50 V <sub>DC</sub> AT +85 °C; 30 V <sub>DC</sub> AT +125 °C										
68	T1	20	0021			1	5	9.2	1.5	35	-25	8	15	1050
68	T1	10	0022			1	5	9.2	1.5	35	-25	8	15	1050
220	T2	20	0023			2	10	17.9	0.9	17.5	-50	8	15	1800
220	T2	10	0024			2	10	17.9	0.9	17.5	-50	8	15	1800
470	T3	20	0027			3	25	31.9	0.75	10	-50	8	15	2100
470	T3	10	0028			3	25	31.9	0.75	10	-50	8	15	2100
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 <sub>DC</sub> AT +85 °C; 40 V <sub>DC</sub> AT +125 °C														
47	T1	20	0031			1	5	8.5	2.0	44	-25	8	12	1050
47	T1	10	0032			1	5	8.5	2.0	44	-25	8	12	1050
150	T2	20	0033			2	10	14.9	1.1	20	-40	8	15	1650
150	T2	10	0034			2	10	14.9	1.1	20	-40	8	15	1650
390	T3	20	0037			3	25	31.8	0.9	15	-60	8	15	2100
390	T3	10	0038			3	25	31.8	0.9	15	-60	8	15	2100
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 <sub>DC</sub> AT +85 °C; 50 V <sub>DC</sub> AT +125 °C														
33	T1	20	0041			1	5	7.5	2.5	66	-25	5	9	1050
33	T1	10	0042			1	5	7.5	2.5	66	-25	5	9	1050
110	T2	20	0043			2	10	12.9	1.3	24	-35	6	10	1650
110	T2	10	0044			2	10	12.9	1.3	24	-35	6	10	1650
330	T3	20	0047			3	30	29.9	1.0	12	-45	6	10	2100
330	T3	10	0048			3	30	29.9	1.0	12	-45	6	10	2100
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 <sub>DC</sub> AT +85 °C; 65 V <sub>DC</sub> AT +125 °C														
15	T1	20	0051			1	5	4.8	3.5	125	-18	3	10	1050
15	T1	10	0052			1	5	4.8	3.5	125	-18	3	10	1050
68	T2	20	0053			2	10	12.9	2.1	37	-30	4	12	1650
68	T2	10	0054			2	10	12.9	2.1	37	-30	4	12	1650
150	T3	20	0057			3	25	21.7	1.6	22	-35	6	12	2100
150	T3	10	0058			3	25	21.7	1.6	22	-35	6	12	2100
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				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**

1. At +125 °C the rated voltage of the capacitors decreases to 66 2/3 % of the +85 °C rated voltage
2. 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
3. The ripple current listed represents a rating calculated using a maximum internal temperature rise ( $\Delta T$ ) 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
4. The maximum allowable internal temperature rise ( $\Delta T$ ) decreases linearly to a calculated +10 °C rise at +125 °C ambient
5. The internal temperature rise is directly proportional to the equivalent series resistance of the capacitor and equivalent series resistance increases with decreasing frequency



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.