

Military Tantalum Chip Product



MIL-PRF-55365 Product Guide

KEYWORDS

- **CWR06 to CWR09 Conversion.**
- **Molded Replacement of Conformal.**
- **CWR10 Alternatives.**

The general military specification, MIL-PRF-55365, continues to be the source document for all military qualification and conformance tests for tantalum chip capacitors. However, the number of associated slash sheets, each with their own particular styles and dimensions, often require research to enable successful cross-referencing to a given QPL (Qualified Parts List) manufacturer's part number.

The main difficulties arise when molded and conformal styles are listed on the same slash sheet. While of common outline dimensions, the difference in their appearance can lead to confusion.

This guide is intended to explain the main features of each of these slash sheets and provide AVX QPL (Qualified Parts List) or alternate AVX solutions where molded product is preferred over conformal.

NOTES ON MOLDED VS CONFORMAL STYLES

Both styles utilize a solid electrolyte sintered tantalum capacitor element; this technology is common to all surface mount tantalum product, both military and commercial. The constructional differences arise in the method of encapsulation and termination of the part for surface mount applications.

Some confusion has arisen over the term "conformal", as this term is also used to describe post-assembly coating materials applied to pcbs (printed circuit boards) or hybrids. In this context, conformal means an epoxy coating applied to the body to cover the internal capacitor element. This coating follows the natural contours of the underlying body. The molded body offers more substantial protection, with tighter dimensional control. This is the standard adopted by CWR09 and CWR11 styles. The advantages can be summarized as follows:

- Compliant termination construction: this effectively decouples the component body from any thermal mismatch with any substrate material.
- Regular, flat top surface allowing part to be fully marked for capacitance and voltage.
- Regular outline compatible with high-speed pick and place operations, also allowing for more accurate placement.
- Fully compatible with all topside and bottom side SMT processes, including IR, Convection or Vapor Phase reflow, Wave Solder and solvent/water wash, epoxy or wire bonding.
- Tight dimensional control.

MIL-PRF-55365/4 – CWR06 & CWR09

This slash sheet is probably the most important; the CWR06 - CWR09 styles have the most applications in military programs due to their volumetric efficiency, number of case size options, and low profile design.

There are two basic styles for the CWR06 and one for the CWR09; AVX manufactures the CWR09 style only.



CWR06 Styles

CWR09 Style

The first conformal style comprises a coated body with separate termination "caps" bonded onto the anode and cathode ends of the capacitor. This gives an exposed termination area on all five faces, with the internal tantalum riser wire causing a protrusion at one end. This feature is used to denote polarity.

Additional applications for the first style includes modules and wire bond attachment - both of these can also be serviced by the molded option.

The second conformal style has a slightly different termination method, with a three-face configuration, or termination "clip". In this case, the positive terminal has additional coating over the top surface of the positive electrode to denote polarity.

Both styles can be mounted normally on pcb or alumina substrate, however, the terminations are rigid, so care must be taken to avoid thermal mis-match or mechanical stress (e.g. pcb flexure during connector attach or other PTH operations), both of which can lead to cracking.

Additional care must be taken with the layout if using the first style, as the overhanging electrodes may short to adjacent components.

Neither style carries marking for polarity, capacitance or voltage.

Within the molded style, there are two minor variants. The standard construction method for molded parts is center-line configuration, where the leadframe entry point is in the mid-point of the body configuration (as represented in MIL-PRF-55365). This optimizes the strength of the molded package and ensures a sturdy bond between leadframe and molded



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body. This is the configuration manufactured by AVX. Many advantages of the molded style, as highlighted on the first page, are readily understood. It is less widely known that these parts can also be successfully wire bonded or supplied in modular configuration.

Wire Bonding:

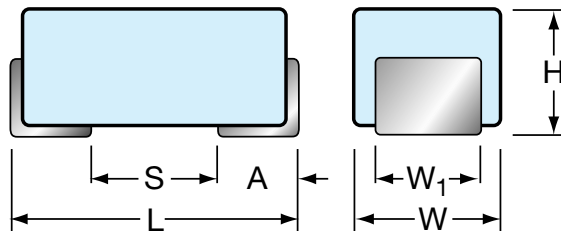
Due to their flat top surface, parts can be readily mounted upside down, allowing wire bonding to the terminations. The flat leadframe termination, supplied gold plated (Military termination option B) is ideal for such bonding purposes. Parts are typically supplied in waffle pack, correctly oriented for the application, with the option of an additional polarity marking on the underside of the body.

Module Configuration:

The extremely regular, flat surfaces of these parts is ideal for the manufacture of custom modules, enabling extremely high packaging density and real estate reduction.

CWR06/09 DIMENSIONS

The outline dimensions are identical for both CWR06 – CWR09 styles and these are considered interchangeable for DSCC programs. In practice, the CWR09 is capable of much tighter dimensional tolerances. The CWR09 uses TAZ case sizes as shown below:



Polarity Stripe (+)

Capacitance Code
Rated Voltage

Case Code	Width W ±0.38 (0.015)	Length L ±0.38 (0.015)	Height H ±0.38 (0.015)	Term. Width W ₁	Term Length A ±.13 (.005)	S min
A	1.27 (0.050)	2.54 (0.100)	1.27 (0.050)	1.27±0.13 (0.05±0.005)	0.76 (0.030)	0.38 (0.015)
B	1.27 (0.050)	3.81 (0.150)	1.27 (0.050)	1.27±0.13 (0.05±0.005)	0.76 (0.030)	1.65 (0.065)
C	1.27 (0.050)	5.08 (0.200)	1.27 (0.050)	1.27±0.13 (0.05±0.005)	0.76 (0.030)	2.92 (0.115)
D	2.54 (0.100)	3.81 (0.150)	1.27 (0.050)	2.41+0.13/-0.25 (0.095+0.005/-0.01)	0.76 (0.030)	1.65 (0.065)
E	2.54 (0.100)	5.08 (0.200)	1.27 (0.050)	2.41+0.13/-0.25 (0.095+0.005/-0.01)	0.76 (0.030)	2.92 (0.115)
F	2.54 (0.100)	5.59 (0.220)	1.78 (0.070)	3.30±0.13 (0.13±0.005)	0.76 (0.030)	3.43 (0.135)
G	2.79 (0.110)	6.73 (0.265)	2.79 (0.110)	2.67±0.13 (0.105±0.005)	1.27 (0.050)	3.56 (0.140)
H	3.81 (0.150)	7.24 (0.285)	2.79 (0.110)	3.68+0.13/-0.51 (0.145+0.005/-0.02)	1.27 (0.050)	4.06 (0.160)

Case sizes are suited to hybrid or PCB assembly, with case sizes A to E offering a low profile (0.050" nom) configuration. The C case represents a special form-factor designed for historic hybrid use; while MIL qualification is maintained, it should not be used for new designs. C case capacitance ratings are available at equivalent or higher voltages in the D case.



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Cross Referencing:

The cross-referencing for these parts using the Military part numbering system is straightforward, as the electrical ratings for Capacitance, Dissipation Factor and DC Leakage are common. In the few cases where the maximum ESR rating is different, the molded CWR09 version is lower. These are shown clearly in MIL-PRF-55365/4. All that is required is that the CWR06 is changed to reference CWR09. For a complete listing of ratings, please refer to the AVX Tantalum Surface Mount catalog.

MIL-PRF-55365/7: CWR10



CWR10 Style

The CWR10 is a 3rd style of conformal, having the same body finish as the first, but with a dipped solder termination in place of the termination “caps” provided on the CWR06.

The part carries no markings, but has polarity identified by a protruding wire nib (non-solderable). The terminations are rigid, and may lead to cracking depending on any thermal mis-match, component size, etc. Molded parts offer the benefits discussed above but no direct QPL alternative exists on this slash sheet. However, similar case size options are available in the TAZ and TAJ series which can be supplied in accordance with military/aerospace test requirements as needed. Of special note is the CWR10 R case size, which has a direct molded equivalent (V case size) within the TAZ/TPS series.

As with all conformals, dimensional tolerances are wide, so often an AVX molded alternative can be found within the recommendations shown. In such cases, please do not hesitate to contact the plant so that optimum rating and reliability grade (Weibull, surge, ESR, etc.) for the application can be specified.

Beyond the QPL

For details of all available ratings BEYOND THE QPL in TAZ (CWR09 form factor) or TAJ/TBJ (CWR11 form factor) please see the companion brochure “AVX Military Tantalum Chip Capacitors”.

Case Code	Length L Nom (ins)	Width W Nom (ins)	Height H Nom (ins)	Term. Length A Nom (ins)	Recommended AVX Alternative	Other AVX Alternatives
C	0.079	0.045	0.045	0.018	TAJR	TAZA
S	0.138	0.072	0.048	0.020	TAZA	TAJA
V	0.138	0.104	0.051	0.020	TAZD	TAJB
X	0.275	0.104	0.051	0.040	TAZE	TAJB
Y	0.275	0.104	0.069	0.040	TAZF	TAJC
Z	0.275	0.104	0.104	0.040	TAZG	TAJC
R	0.273	0.235	0.136	0.040	TAZV	TAJE

