

INCH-POUND

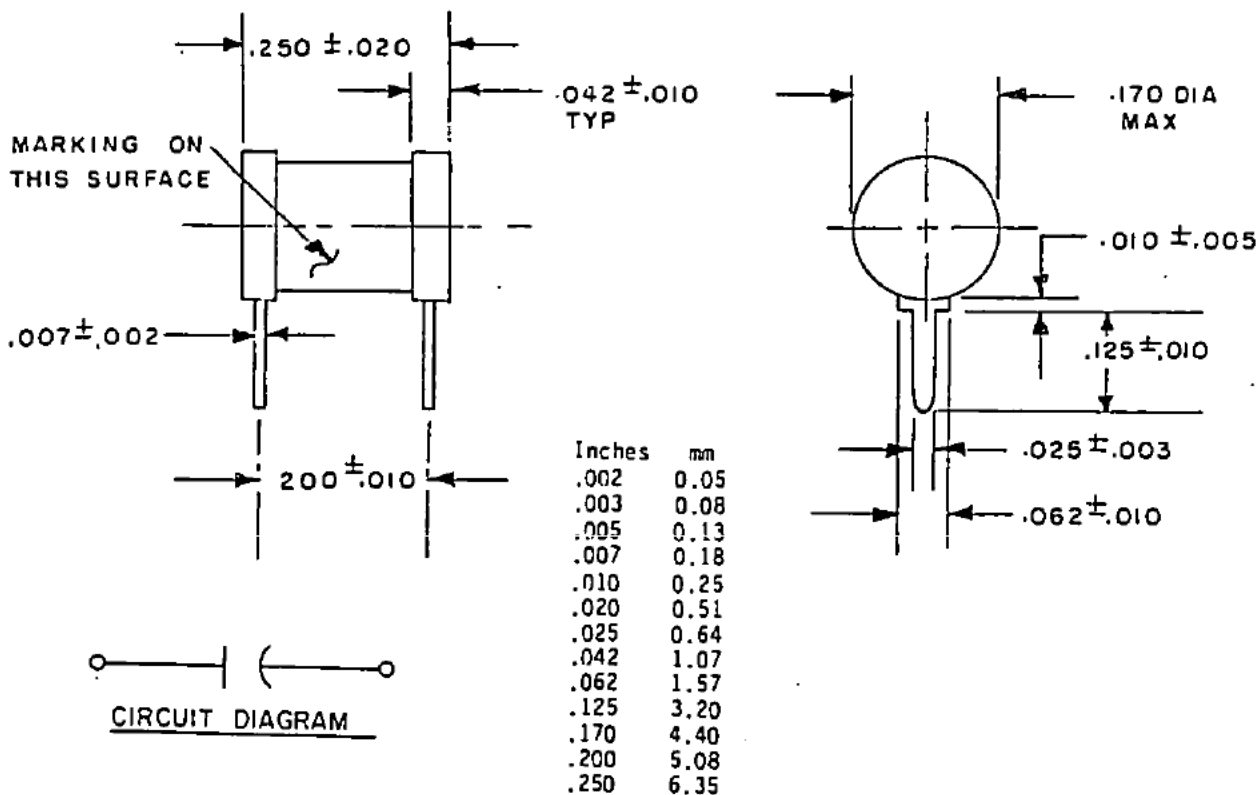
MIL-C-83421/5  
28 August 1989

## MILITARY SPECIFICATION SHEET

CAPACITORS, FIXED, SUPERMETALLIZED PLASTIC FILM DIELECTRIC,  
(DC, AC, OR DC AND AC), HERMETICALLY SEALED IN CERAMIC CASES,  
ESTABLISHED RELIABILITY,  
STYLES CRH21, CRH22, CRH23, CRH24, AND CRH25

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and the issue of the following specification listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation: MIL-C-83421.



## NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses and are general information only.
3. Marking shall be applied to the capacitor case.

FIGURE 1. Capacitor configuration.

## MIL-C-83421/5

## REQUIREMENTS:

## Design and construction:

Dimensions and configuration: See figure 1.

Dielectric: Polyphenylene sulfide, metallized.

Case material: Ceramic.

Capacitance (cap) value: See table I.

DC rated voltage: 50 V dc, 100 V dc, 200 V dc, 300 V dc, and 400 V dc.

Operating temperature:  $-65^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

AC current ratings: See table I.

Failure rate (FR) levels: M (1.0 percent), P (0.1 percent), R (0.01 percent), and S (0.001 percent).

Burn-in: 48 hours minimum at  $125^{\circ}\text{C}$  at 140 percent dc rated voltage.

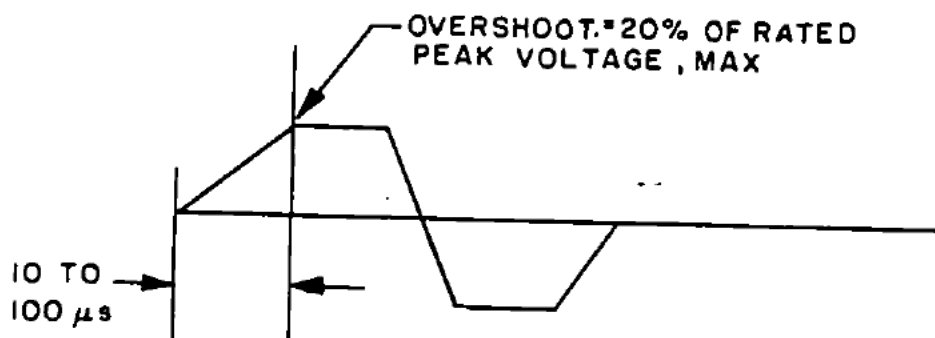
Thermal aging: In accordance with MIL-C-83421, 10 cycles.

Thermal shock: Method 107 of MIL-STD-202, condition B,  $-65^{\circ}\text{C}$ ,  $+125^{\circ}\text{C}$ , 10 cycles.

Seal: Method 112 of MIL-STD-202, test condition C, procedure IIIa, followed by test condition B. Leakage rate sensitivity  $10^{-6}$  atm  $\text{cm}^3/\text{s}$ .

Dielectric withstanding voltage (DWV): Method 301 of MIL-STD-202, terminal to terminal.

AC: 100 Hz  $\pm 10$  Hz square wave, peak-to-peak voltage, three times dc rated voltage for 60 to 90 seconds, not to exceed 800 Vp/p.



DC: 200 percent of dc rated voltage for 60 seconds minimum.

## MIL-C-83421/5

TABLE I. Electrical characteristics and dash numbers.

| Capacitance<br>value (nom)<br>( $\mu$ F) | Dash number <sup>1/</sup>          |       |       |       |       |       | AC voltage<br>rating rms<br>400 Hz | Maximum<br>rms<br>amperes |
|--|------------------------------------|-------|-------|-------|-------|-------|------------------------------------|---------------------------|
|  | Capacitance tolerance value (in %) |       |       |       |       |       |                                    |                           |
|  | *0.25                              | *0.5  | *1.0  | *2.0  | *5.0  | *10.0 |                                    |                           |
| CRH21 - 50 volts (dc rating)             |                                    |       |       |       |       |       |                                    |                           |
| .02                                      | 1001-                              | 1002- | 1003- | 1004- | 1005- | 1006- | 36                                 | 0.05                      |
| .022                                     | 1007-                              | 1008- | 1009- | 1010- | 1011- | 1012- | "                                  | "                         |
| .027                                     | 1013-                              | 1014- | 1015- | 1016- | 1017- | 1018- | "                                  | "                         |
| .033                                     | 1019-                              | 1020- | 1021- | 1022- | 1023- | 1024- | "                                  | "                         |
| .039                                     | 1025-                              | 1026- | 1027- | 1028- | 1029- | 1030- | "                                  | "                         |
| .047                                     | 1031-                              | 1032- | 1033- | 1034- | 1035- | 1036- | "                                  | "                         |
| .05                                      | 1037-                              | 1038- | 1039- | 1040- | 1041- | 1042- | "                                  | "                         |
| .056                                     | 1043-                              | 1044- | 1045- | 1046- | 1047- | 1048- | "                                  | "                         |
| CRH22 - 100 volts (dc rating)            |                                    |       |       |       |       |       |                                    |                           |
| .0068                                    | 2001-                              | 2002- | 2003- | 2004- | 2005- | 2006- | 60                                 | 0.05                      |
| .0082                                    | 2007-                              | 2008- | 2009- | 2010- | 2011- | 2012- | "                                  | "                         |
| .01                                      | 2013-                              | 2014- | 2015- | 2016- | 2017- | 2018- | "                                  | "                         |
| .012                                     | 2019-                              | 2020- | 2021- | 2022- | 2023- | 2024- | "                                  | "                         |
| .015                                     | 2025-                              | 2026- | 2027- | 2028- | 2029- | 2030- | "                                  | "                         |
| .018                                     | 2031-                              | 2032- | 2033- | 2034- | 2035- | 2036- | "                                  | "                         |
| CRH23 - 200 volts (dc rating)            |                                    |       |       |       |       |       |                                    |                           |
| .0033                                    | 3001-                              | 3002- | 3003- | 3004- | 3005- | 3006- | 120                                | 0.05                      |
| .0039                                    | 3007-                              | 3008- | 3009- | 3010- | 3011- | 3012- | "                                  | "                         |
| .0047                                    | 3013-                              | 3014- | 3015- | 3016- | 3017- | 3018- | "                                  | "                         |
| .005                                     | 3019-                              | 3020- | 3021- | 3022- | 3023- | 3024- | "                                  | "                         |
| .0056                                    | 3025-                              | 3026- | 3027- | 3028- | 3029- | 3030- | "                                  | "                         |
| CRH24 - 300 volts (dc rating)            |                                    |       |       |       |       |       |                                    |                           |
| .0018                                    | 4001-                              | 4002- | 4003- | 4004- | 4005- | 4006- | 180                                | 0.05                      |
| .002                                     | 4007-                              | 4008- | 4009- | 4010- | 4011- | 4012- | "                                  | "                         |
| .0022                                    | 4013-                              | 4014- | 4015- | 4016- | 4017- | 4018- | "                                  | "                         |
| .0027                                    | 4019-                              | 4020- | 4021- | 4022- | 4023- | 4024- | "                                  | "                         |
| CRH25 - 400 volts (dc rating)            |                                    |       |       |       |       |       |                                    |                           |
| .0005                                    | 5001-                              | 5002- | 5003- | 5004- | 5005- | 5006- | 240                                | 0.05                      |
| .00056                                   | 5007-                              | 5008- | 5009- | 5010- | 5011- | 5012- | "                                  | "                         |
| .00068                                   | 5013-                              | 5014- | 5015- | 5016- | 5017- | 5018- | "                                  | "                         |
| .00082                                   | 5019-                              | 5020- | 5021- | 5022- | 5023- | 5024- | "                                  | "                         |
| .001                                     | 5025-                              | 5026- | 5027- | 5028- | 5029- | 5030- | "                                  | "                         |
| .0012                                    | 5031-                              | 5032- | 5033- | 5034- | 5035- | 5036- | "                                  | "                         |
| .0015                                    | 5037-                              | 5038- | 5039- | 5040- | 5041- | 5042- | "                                  | "                         |

<sup>1/</sup> The complete dash number will include the applicable letter completing the FR level symbol (M<sub>u</sub>M, P=P, etc.).

## MIL-C-83421/5

Insulation resistance (IR): Method 302 of MIL-STD-202. Charge to rated voltage, 5 minutes maximum; however, for capacitance values greater than 1.0  $\mu$ F, an additional one minute for each  $\mu$ F is permitted.

Terminal to terminal:

1,000,000 megohms minimum at +25°C.  
50,000 megohms minimum at +100°C.  
10,000 megohms minimum at +125°C.

Dissipation factor (DF): 0.15 percent maximum at 1 kHz.

Vibration and shock: Mounting of specimens shall be rigidly mounted by the body to the vibration test apparatus; terminals shall be soldered to a printed wiring board in their normal mounting means.

Barometric pressure (reduced): Not applicable.

Dielectric absorption: 0.1 percent maximum.

Immersion: Method 104 of MIL-STD-202, condition C.

DWV:

Terminal to terminal: 200 percent of dc rated voltage.

IR:

Terminal to terminal: Not less than 50 percent of initial requirement.

$\Delta$ Cap: Maximum of  $\pm 0.25$  percent.

DF: 0.15 percent.

Moisture resistance: Method 106 of MIL-STD-202.

DWV, IR, Cap, and DF: Same as for immersion.

Low temperature life: In accordance with MIL-C-83421, except measurements shall be made at the following temperatures:

t<sub>1</sub> = +25°C: Record initial capacitance dissipation factor and insulation resistance.

t<sub>2</sub> = +65°C: 48 hours rated dc voltage applied.

t<sub>3</sub> = Maximum operating temperature: Two hours rated dc voltage applied.

t<sub>4</sub> = +25°C: Record capacitance, dissipation factor, and insulation resistance. Limits of change shall be as specified in table II.

TABLE II. Post measurement limits.

|                                  |  |
|----------------------------------|--|
| t <sub>1</sub> to t <sub>4</sub> | Styles CRH21, CRH22, CRH23, CRH24, and CRH25 |
| Capacitance                      | $\pm 0.5$ percent                            |
| Dissipation factor               | 0.15 percent maximum                         |
| Insulation resistance            | Within initial requirement                   |

## MIL-C-83421/5

Resistance to soldering heat, method 210 of MIL-STD-202, condition B.

$\Delta$ Cap: Maximum of  $\pm 0.25$  percent

Temperature coefficient: In accordance with MIL-C-83421. Capacitance shall be measured at the temperatures specified in table III.

TABLE III. Temperature coefficient.

| Temperature <u>1/</u> | Styles CRH21, CRH22, CRH23, CRH24, and CRH25 |
|-----------------------|--|
| $t_3$ to $t_2$        | +1.50 percent maximum                        |
| $t_3$ to $t_4$        | $\pm 1.00$ percent maximum                   |
| $t_3$ to $t_1$        | $\pm 0.15$ percent maximum                   |

1/  $t_1 = +25^\circ\text{C} \pm 3^\circ\text{C}$ ,  $t_2 = +125^\circ\text{C} \pm 3^\circ\text{C}$ ,  $t_3 = +25^\circ\text{C} \pm 3^\circ\text{C}$ ,  
 $t_4 = -55^\circ\text{C} \pm 3^\circ\text{C}$ ,  $t_5 = +25^\circ\text{C} \pm 3^\circ\text{C}$ .

DC life (at  $+125^\circ\text{C}$ ): Method 108 of MIL-STD-202.

Accelerated condition: 140 percent of dc rated voltage.

Rated condition: 100 percent of dc rated voltage.

IR:

Terminal to terminal: Not less than 33.3 percent of initial requirement.

$\Delta$ Cap: Maximum of  $\pm 2.0$  percent.

DF (at  $+25^\circ\text{C}$ ) after life: Maximum of 0.25 percent.

AC conditioning: In accordance with MIL-C-83421 with the following exceptions: The ac performance shall be at rated ac ripple current at  $+125^\circ\text{C}$ , 40 kHz for 250 hours, +40, -0 hours (see table IV).

## MIL-C-83421/5

TABLE IV. AC test samples.

| DC rated voltage (volts) | Sample size                          |                             | Cap range for selection of sample $\mu$ F |
|--------------------------|--------------------------------------|-----------------------------|---|
|                          | Qualification                        | Quality conformance group B |   |
| 50                       | .02 $\mu$ F -4<br>.056 $\mu$ F -4    | 15                          | .02 to .056                               |
| 100                      | .018 $\mu$ F -4                      | 15                          | .0068 to .018                             |
| 200                      | .0033 $\mu$ F -4<br>.0056 $\mu$ F -4 | 15                          | .0033 to .0056                            |
| 300                      | .0018 $\mu$ F -4<br>.0027 $\mu$ F -4 | 15                          | .0018 to .0027                            |
| 400                      | .0005 $\mu$ F -4<br>.0015 $\mu$ F -4 | 15                          | .0005 to .0015                            |

Qualification inspection: Four each of the highest and lowest capacitance values in each voltage group (see table IV) is required.

Quality conformance inspection, group B: Fifteen units shall be selected which are representative of capacitor ratings produced during the current production period on a semi-annual basis and shall be representative of the ratings manufactured during the period (see table IV).

Marking: Marking shall be in accordance with MIL-C-83421.

Part or identifying Number (PIN): Consists of the letter M, the basic number of the specification sheet, and a dash number coded as shown in the following:

|   |            |   |     |   |
|---|------------|---|-----|---|
|   | M83421/05- | 1 | 001 | S |
| Specification sheet number _____  |            |   |     |   |
| Single digit designating style (i.e., 1 = CRH21;<br>2 = CRH22; 3 = CRH23; 4 = CRH24; and 5 = CRH25) _____ |            |   |     |   |
| Nonsignificant dash number from table I _____   |            |   |     |   |
| Single letter designating FR levels<br>(M, P, R, and S) _____   |            |   |     |   |

MIL-C-83421/5

Custodians:

Army - ER  
Navy - EC  
Air Force - 85  
NASA - NA

Review activities:

Army - AR  
Air Force - 17  
DLA - ES

User activities:

Navy - AS, CG, MC, OS, SH  
Air Force - 11, 19

Preparing activity:

Air Force - 85

Agent:

DLA - ES

(Project 5910-1605)