

ENGINEERING PRACTICE STUDY

TITLE: [MIL-PRF-32535](#) DISSIPATION FACTOR REQUIREMENTS

31 October 2025

FINAL REPORT

Study Conducted by DLA Land and Maritime

Project Number: 5910-2025-034

Prepared by:

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John A. Bonitatibus
Electronics Engineer
Electronic Components Branch

Approved by:

//Signature on file//

Mark A. Rush
Chief (Acting)
Electronic Components Branch

I. OBJECTIVE: An engineering practices study has been conducted to solicit feedback from ceramic capacitor manufacturers and users regarding the dissipation factor (DF) requirement in MIL-PRF-32535 (Capacitor, Chip, Fixed, Ceramic Dielectric (Temperature Stable and General Purpose), Extended Range, High Reliability and Standard Reliability, General Specification for).

II. BACKGROUND: A qualified manufacturer requested a change to the DF requirement in MIL-PRF-32535. The current DF requirement in MIL-PRF-32535 is specified in paragraph 3.11 and table VII as follows:

3.11 Dissipation factor (DF). When determined in accordance with 4.6.7, the dissipation factor shall not exceed the value specified in table VII.

TABLE VII. *Dissipation factor limits.*

Characteristic	Maximum allowable DF (%)					
	Rated Voltage (V_{dc})					
	4	6.3	10	16	25	≥ 50
<i>Class II</i>	7.5	7.5	5.0	3.5	3.5	2.5
<i>BP, COG (≥ 10 pf)</i>	0.15	0.15	0.15	0.15	0.15	0.15
<i>BP, COG (< 10 pf)</i>	0.25	0.25	0.25	0.25	0.25	0.25
<i>BG (≥ 10 pf)</i>	0.05	0.05	0.05	0.05	0.05	0.05
<i>BG (< 10 pf)</i>	0.15	0.15	0.15	0.15	0.15	0.15

The manufacturer proposed the addition of a column for ≥ 100 volt rated parts and increasing the DF limit for class II 16, 25, 50, and ≥ 100 volt rated capacitors to 5.0, 5.0, 3.5, and 3.0 percent, respectively. The revised table VII would appear as follows:

Characteristic	Maximum allowable DF (%)						
	Rated Voltage (V_{dc})						
	4	6.3	10	16	25	50	≥ 100
<i>Class II</i>	7.5	7.5	5.0	5.0	5.0	3.5	3.0
<i>BP, COG (≥ 10 pf)</i>	0.15	0.15	0.15	0.15	0.15	0.15	0.15
<i>BP, COG (< 10 pf)</i>	0.25	0.25	0.25	0.25	0.25	0.25	0.25
<i>BG (≥ 10 pf)</i>	0.05	0.05	0.05	0.05	0.05	0.05	0.05
<i>BG (< 10 pf)</i>	0.15	0.15	0.15	0.15	0.15	0.15	0.15

The manufacturer believes that relaxing the current DF limits in MIL-PRF-32535 would allow for the development of capacitors with improved volumetric efficiency, a desirable feature for users. The manufacturer suggests that the current limits are overly stringent compared to equivalent automotive-grade or commercial parts and that increasing these limits would not compromise the capacitor's ability to meet the overall requirements of MIL-PRF-32535.

III. RESULTS: Recipients of this study were asked to provide concurrence, objection, or comments regarding the proposal to change the DF requirement in MIL-PRF-32535. The Air Force custodian concurs with the proposal. The following comments were also received:

1. MIL-PRF-32535 qualified manufacturer:

We see no issues with this change and concur with the other manufacturer

2. OEM:

I don't think DF (especially at these levels) really drives the usability of the SMT ceramic caps in the way that circuit designs are often most concerned with, has been my experience. So, I concur.

3. Missile Defense Agency (MDA):

A low DF indicates a highly efficient capacitor, while a high DF signifies significant energy loss and potential degradation of the capacitor's insulation. Based on this scientific fact, increasing the DF will be counter intuitive.

Also, the proposed DF relaxation is higher than the equivalent [AEC-Q200](#) and commercial offerings. A [MIL-PRF-32535](#) QPL part should not have poorer performance specifications than an equivalent [AEC-Q200](#)/Commercial offering.

[AEC-Q200](#) and commercial specifications typically have a dual DF specification based on a range of capacitance values. The higher value range would have a higher DF specification limit. We recommend doing the same with the [MIL-PRF-32535](#) specification. This method would allow the volumetric efficiency requested, while still holding the current DF specifications on existing QPL parts.

IV. CONCLUSIONS: Respondents generally agreed with the proposal to raise the DF limits for some class II capacitors. However, a recommendation has been made to consider the specific capacitance value when setting these limits.

V. RECOMMENDATIONS: Based on the feedback from this study, DLA Land and Maritime will amend [MIL-PRF-32535](#) to raise the DF limits for some class II capacitors. We will request additional input regarding the correlation between capacitance value and the associated DF limits.