Table 4 CAPACITOR DERATING REQUIREMENTS

Voltage derating is accomplished by multiplying the maximum operating voltage by the appropriate derating factor appearing in the chart below.

Type	Military Style	Voltage Derating Factor 1/	Maximum Ambient Temperature
Ceramic	CCR, CKS, CKR, CDR **2/**	0.60	110 °C
Glass	CYR	0.50	110 °C
Plastic Film	CRH, CHS	0.60	85 °C
Tantalum, Foil	CLR25, CLR27, CLR35, CLR3	0.5	70 °C
Tantalum, Wet Slug	CLR79, CLR81	0.60 0.40 **3/**	70 °C 110 °C
Tantalum, Solid (Note 4)	CSR, CSS, CWR	0.50 0.30 **4/**	70 °C 110 °C

Notes:

1/ The derating factor applies to the sum of peak AC ripple and DC polarizing voltage.

2/ For low-voltage applications (<10 Vdc), parts shall be rated at least 100 Vdc for styles CCR, CKR, CDR.

3/ Derate voltage linearly from 70 °C to 110 °C.

4/ The effective series resistance shall be at least 0.1 ohms per volt or 1 ohm, whichever is greater, for Grade 2 applications, and at least 0.3 ohms per volt or 1 ohm whichever is greater, for Grade 1 applications.

Table 5 CONNECTOR DERATING REQUIREMENTS

Connectors of all types/styles are derated by limiting the voltage stress placed on the dielectric material, and by limiting the current flow and consequent temperature rise due to the effects of resistive heating across mated contacts within the dielectric insert.

The following table establishes minimum derating for connectors.

Parameter	Derating Factor
Operating Voltage	25% of the connector Dielectric Withstanding test Voltage (at sea level, unconditioned) - or - 75% of the connector rated operating (working) voltage (at sea level), whichever is lower. **1/**
Contact Current	Less than or equal the values listed in Wire Derating (Table 4A of Section N) for the conductor size selected for use with the contact. **2/**
Temperature	Rated maximum temperature, less 25°C

Notes:

1/ Example: MIL-DTL-38999 series I connectors have a DWV test voltage of 1300VAC. They also have a suggested operating (working) voltage of 400VAC at sea level. Derated voltage would be 25% of 1300VAC (325VAC) or 75% of 400VAC (300VAC). Either value is acceptable.

2/ For printed circuit connectors, apply derating based on the contact size vs. the equivalent wire size in section W1, table 4A, for bundled cable. Example, as a minimum, a size 20 contact shall be derated the same as a 20 AWG wire used in a bundled cable assembly.

Table 4 CRYSTAL DERATING REQUIREMENTS

Derating of crystals is accomplished by multiplying the stress parameter by the appropriate derating factors specified below.

Critical Stress Parameters 1/	Derating Factor
Maximum Rated Current	0.5
Maximum Rated Power	0.25

Notes:

1/ Choose either current or power to derate, but do not derate both. These deratings apply over the manufacturer's recommended operating temperature range.

Table 4 CRYSTAL OSCILLATOR DERATING REQUIREMENTS

Derating of crystal oscillators is accomplished by multiplying the parameters by the appropriate derating factor specified below.

Stress Parameter	Derating Factor for Circuit Implementation By Part Type	
	Digital Parts	**Linear Parts**
Maximum Supply Voltage/Input Voltage (Note 1)	0.9	0.8
Maximum Specified Operating Junction Temperature (Note 2)	0.8	0.75
Maximum Output Current	0.8	0.8

Notes:

1/ Use manufacturer's recommended operating conditions but do not exceed 90% of maximum supply voltage. For voltage regulators, derate $V_{IN} – V_{OUT}$ to 0.9.

2/ Do not exceed Tj = 110 °C, or 40 °C below the manufacturer's maximum rating, whichever is lower or less.

Table 4 FILTER DERATING REQUIREMENTS

Class	Stress Parameter (Note 1)	Derating Factor
All	Rated current	0.50
	Rated voltage	0.50
	Maximum ambient temperature	85 °C or 30 °C less than maximum rated temperature, whichever is less

Notes:

1/ Applies to rated operating current or voltage, not the absolute maximum.

Table 4 FUSE DERATING REQUIREMENTS FOR CARTRIDGE STYLE (Notes 1-6)

Fuses are derated by multiplying the rated amperes by the appropriate derating factor listed below.

<table>
<tr><th>Fuse Current Rating (Amperes) @ 25 °C</th><th>Current Derating Factor</th><th>Temperature Derating Factor</th><th>Remarks</th></tr>
<tr><td>2, 2-1/2, 3, 4, 5, 7, 10, 15</td><td>50%</td><td rowspan="4">There is an additional derating of 0.2%/°C for an increase in the temperature of fuse body above 25 °C.</td><td rowspan="3"></td></tr>
<tr><td>1, 1-1/2</td><td>45%</td></tr>
<tr><td>3/4</td><td>40%</td></tr>
<tr><td>1/2
3/8
1/4
1/8</td><td>40%
35%
30%
25%</td><td>The flight use of fuses rated 1/2 ampere or less requires application approval by the project office.</td></tr>
</table>

Notes:

1/ Fuses are specified to interrupt within a maximum of 5 seconds when driven at 200% of their rated current for nominal ratings up to and including 10 amperes. A fuse with a nominal rating of 15 amperes is specified to interrupt within a maximum of 10 seconds when driven at 200% of its rated current. The power supply shall be capable of delivering appropriate levels of current to achieve short fusing times.

2/ In a space environment, the possible escape of air from inside the fuses reduces the filament cooling mechanism (heat transfer by conduction). This lowers the blow current rating and decreases current capacity with time, making it necessary to derate current ratings on fuses used in space applications.

3/ Fuses rated at 1/2 ampere or below are especially affected by loss of air; thus, their derating factors are larger.

4/ Current derating factors are based on data from fuses mounted on printed circuit boards and conformally coated. Other types of mountings require project office approval. It should be noted that the lifetime of the fuses is controlled by two factors: cold resistance of the fuse and the heat sinking provided by the installer. The thermal resistance of the fuse to the thermal ground is very important, as is the case with power transistors and power diodes mounted on circuit boards.

5/ Recent studies have shown the occurrence of enduring arcs in fuses rated at 125 volts when the applied voltage is greater than 50 volts. Therefore, the voltages on these fuses should be derated to 50 volts or less.

6/ Electrical transients produce thermal cycling and mechanical fatigue that could affect the life of the fuse. For each application, the capability of the fuse to withstand the expected pulse conditions should be established by considering the pulse cycle withstanding capability for nominal I^2t (energy let through the fuse) specified by the manufacturer.

Table 4 HEATER DERATING REQUIREMENTS

Class	Stress Parameter (Note 1)	Derating Factor
All	Rated Current	Use within manufacturer's recommended operating current.
	Rated Voltage	Use within manufacturer's recommended operating voltage.
	Maximum Ambient Temperature	85 °C or 30 °C less than maximum rated temperature, whichever is less.

Notes:

1/ Applies to rated operating current or voltage, not the absolute maximum.

Table 4 MAGNETICS DERATING REQUIREMENTS

Insulation Class			Stress Parameter	Minimum Derating
MIL-PRF-27	MIL-PRF-39010	MIL-PRF-15305/ MIL-T-55631	Maximum Operating Temperature 1/, 2/	Derated Operating Temperature
Q	—	O	+85 °C	+65 °C
R	A	A	+105 °C	+85 °C
S	—	—	+130 °C	110 °C
—	B	B	+125 °C	+105 °C
—	C	C	> +125 °C	Max. Temp. -20 °C
—	F	—	+150 °C	+130 °C
All Part Types			Operating Voltage	Derate to 50% of the rated Dielectric Withstanding Voltage

Notes:

1/ a. Maximum operating temperature equals ambient temperature plus temperature rise plus 10 °C allowance for hot spots. The temperature rise may be calculated in accordance with MIL-PRF-27, paragraph 4.7.13. The formula is:

$$\Delta T = \frac{R - r}{r}(t + 234.5) - (T - t)$$

Where:

ΔT = Temperature rise (in °C) above specified maximum ambient temperature
R = Resistance of winding (in ohms) at temperature (T+ΔT)
r = Resistance of winding (in ohms) at temperature (t)
t = Specified initial ambient temperature in °C)
T = maximum ambient temperature (in °C) at time of power shutoff. (T) shall not differ from (t) by more than 5°C.

b. The insulation classes of MIL-style inductive parts generally have maximum operating temperature ratings based on a life expectancy of 10,000 hours. The derated operating temperatures are selected to extend the life expectancy to 50,000 hours at rated voltage.

c. Custom made inductive devices shall be evaluated on a materials basis to determine the maximum operating temperature. Devices with temperature ratings different from the military insulation classes shall be derated to 0.75 times maximum operating temperature.

2/ MIL-PRF-21038 has a maximum operating temperature range of 130 °C. For MIL-PRF-83446, refer to the detailed specification sheet for the maximum operating temperature.

Hybrid Microcircuit Derating Requirements

For hybrid devices, derating guidelines are divided into two categories: derating of components used in hybrid design and manufacture, and derating for applications in which the part is used. These guidelines are provided as follows:

1. Derating of components used in hybrid design and manufacture:

- Derating analysis for existing hybrid devices that are qualified to MIL-PRF-38534 is not required.
- Custom hybrids shall be designed such that all internal components comply with the electrical and temperature derating requirements set forth in this document for the specific commodity device types (i.e., diodes, capacitors, etc.). Derating analysis shall be reviewed and approved by the project PCB.

2. Application derating for hybrids:

A. General requirements for all applications and all device types:

- Specific electrical parameter derating shall be based on the requirements set forth for similar microcircuit device types.
- Case temperature derating shall be 75% of the maximum rated case temperature specified by the manufacturer or 80 °C, whichever is lower.

B. Special requirements for high temperature applications and high power hybrids (ex: DC-DC converters):

Additional derating beyond the general requirements stated above may be required in order to prevent localized device overheating within the hybrid, and shall be tailored on a case-by-case basis to account for the application temperature and power dissipation needs. Such derating analysis is required and shall be submitted to PCB for review and approval.

Table 4 MICROCIRCUIT DERATING REQUIREMENTS (Note 1)

Derating of microcircuits is accomplished by multiplying the stress parameter by the appropriate derating factor specified below.

Stress Parameter	Derating Factor	
	Digital	**Linear**
Maximum Supply Voltage/Input Voltage **(Note 1)**	0.9	0.8
Power Dissipation	0.8	0.75
Maximum Specified Operating Junction Temperature **(Note 2)**	0.8	0.75
Maximum Output Current	0.8	0.8
Clock Frequency	0.8	0.8
Radiation Effects Note **3/**	Check with project radiation engineer.	

Notes:

1/ Use manufacturer's recommended operating conditions but do not exceed 90% of maximum supply voltage for digital devices and 80% of maximum supply voltage for linear devices. For voltage regulators, derate V_{IN} - V_{OUT} to 0.9.

1.1/ For low voltage (< 5V) devices, use manufacturer's recommended operating conditions.

2/ Do not exceed Tj = 110 °C or 40 °C below the manufacturer's maximum rating, whichever is lower.

3/ Consult the project radiation engineer to determine derating guidelines that account for radiation induced degradation (total ionizing dose, single event effects, and displacement damage) in parts over the lifetime of each mission.

DERATING REQUIREMENTS

Derating requirements for PEMs are listed in Table 4. Taking a conservative approach, derating requirements for PEMs should be more stringent than the requirements for their high-reliability equivalents. In addition to the requirements in Table 4, derating specific to some PEMs may be required based on design and technology of the part intended for special application. All part-specific derating shall be approved by the project and GSFC Code 562.

Table 4 DERATING REQUIREMENTS FOR PEMs

Stress Parameter	Derating Equation/Factor	
	Digital	**Linear /Mixed Signal**
Maximum Supply Voltage 1/	$V_{n.r.}+0.5*(V_{max.r.}-V_{n.r.})$	$V_{n.r.}+0.8*(V_{max.r.}-V_{n.r.})$
Maximum Input Voltage	-	0.8
Maximum Operating Junction Temperature 2/	0.8 or 95 °C (whichever is lesser)	0.7 or 85 °C (whichever is lesser)
Maximum Output Current	0.8	0.7
Maximum Operating Frequency	0.8	0.7

Notes:

1/ $V_{n.r.}$ is the nominal rated power supply voltage; $V_{max.r.}$ is the maximum rated power supply voltage.

2/ For power devices, do not exceed 110 °C or 40 °C below the manufacturer's rating, whichever is lower.

Table 4 RELAY DERATING REQUIREMENTS (Note 1)

Style		**Make, Break, and/or Carry Load Currents**		**Transient Current Surges (Note 3)**	
All		Select the appropriate factors for T, R, and L from the subtables: $I_{derated} = I_{rated} \times T \times R \times L$ **(Note 2)**		For $t \leq 10\mu s$, $I_{max} \leq 4 \times I_{rated}$ For $t > 10\ \mu s$, $(I_{max})^2 \times t \leq 16 \times (I_{rated})^2 \times 10^{-5}$ (A^2s)	
Subtable L		**Subtable R**		**Subtable T**	
Load Application	**Factor**	**Cycle Rate Per Hour**	**Factor**	**Temperature Range**	**Factor**
Make, break, and/or carry loads with an on-time duration of 0 to 500 ms. Off-time is equal to or greater than on-time.	1	>10	0.85	+85 °C to +125 °C	0.7
Carry-only loads. Relay does not make or break the load. Maximum on-time is 5 minutes. Off-time is equal to or greater than on-time.	1.5	1 to 10	0.9	+40 °C to +84 °C	0.85
All other load conditions.	0.8	<1	0.85	-20 °C to +39 °C	0.9
				-65 °C to –21 °C	0.85

Notes:

1/ Warning: *Do not* derate coil voltage or current. Operating a relay at less than nominal coil rating can result in either switching failures or increased switching times. The latter condition induces contact damage because of the longer arcing time, thus reducing relay reliability.

2/ $I_{derated}$ = derated contact current carrying capacity
I_{rated} = rated contact current

3/ If during switching, transient current surges exceed the *derated* contact current, the following applies, where:

t = period of time that transient current exceeds rated contact current (I_{rated})
I_{max} = maximum permitted surge current
I_{rated} = rated contact current

Table 4 RESISTOR DERATING REQUIREMENTS

Style	Description	Derating Factors (Note 1) Power	Derating Factors (Note 2) Voltage	Derating Temperatures (°C) T1	Derating Temperatures (°C) T2	Zero Power Temp. (°C) T3
G311P672	Fixed, High Voltage	0.6	0.8	70	94	110
G311P683	Fixed, Precision, High Voltage	0.6	0.8	125	185	225
G311P742	Fixed, Low TC, Precision	0.6	0.8	125	155	175
RBR	Fixed, Wirewound (Accurate), ER					
1%		0.6	0.8	125	137	145
0.5%		0.35	0.8	125	132	145
0.1%		0.25	0.8	125	130	145
RWR	Fixed, Wirewound (Power Type), ER	0.6	0.8	25	160	250
RCR	Fixed, Composition (Insulated), ER	0.6	0.8	70	**(Note 3)**	**(Note 3)**
RER	Fixed, Wirewound (Power Type), Chassis Mounted, ER	0.6	0.8	25	160	250
RTR	Variable, Wirewound (Lead Screw Actuated), ER	0.6	0.8	85	124	150
RLR	Fixed, Film (Insulated), ER					
100ppm		0.6	0.8	70	118	150
350ppm		0.6	0.8	70	103	125
RNX	Fixed, Film, ER	0.6	0.8	125	155	175
RM	Fixed, Film, Chip, ER	0.6	0.8	70	118	150
RZ	Fixed, Film, Networks	0.6	0.8	70	103	125
Others	Various	0.5	0.8	**(Note 4)**	**(Note 4)**	**(Note 4)**

Notes:

1/ Compute the resistor's derated power level by multiplying its nominal power rating by the appropriate derating factor for ambient temperatures $\leq$ T1. If the resistor is operated above T1, derate linearly from the T1 power level to the zero power level at T2. Exposing the resistor to temperatures exceeding T3, even under no load conditions, may result in permanent degradation.

2/ The maximum applied voltage shall not exceed the lesser of the following: (1) 80% of the specified maximum voltage rating, or (2) $\sqrt{PR}$

where
P = Derated power (Watts)
R = Resistance of that portion of the element actually active in the circuit.

This voltage derating applies to dc and regular ac waveform applications. For pulse and other irregular waveform applications, consult the manufacturer.

3/ Determine the zero power temperature (T3) from the applicable detail specification. Compute the derated zero power temperature (T2) from the following formula:

$$T2 = D_F(T3-T1) + T1$$

where:
T2 = Derated zero power temperature
D_F = Derating factor
T3 = Zero power temperature
T1 = Rated power temperature

4/ Determine the rated power, the rated power temperature (T1), and the zero power temperature (T3) from the manufacturer's specification. Calculate the derated zero power temperature (T2) as per the previous note.

Table 4 DIODE DERATING REQUIREMENTS

Derating for diodes is accomplished by multiplying the stress parameter by the appropriate derating factor.

Diode Type	Stress Parameter	Derating Factor
General Purpose, Rectifier, Switching, Pin/Schottky, and Thyristors	PIV	0.70
	Surge Current	0.50
	Forward Current	0.50
	Maximum Junction Temperature **1/**	0.80
Varactor	Power	0.50
	Reverse Voltage	0.75
	Forward Current	0.75
	Maximum Junction Temperature **1/**	0.80
Voltage Regulator	Power	0.50
	Zener Current	0.75
	Maximum Junction Temperature **1/**	0.80
Voltage Reference	Zener Current	N/A
	Maximum Junction Temperature **1/**	0.80
Zener Voltage Suppressor	Power Dissipation	0.50
	Maximum Junction Temperature **1/**	0.80
Bidirectional Voltage Suppressor	Power Dissipation	0.50
	Maximum Junction Temperature	0.80
FET Current Regulator	Peak Operating Voltage	0.80
	Maximum Junction Temperature **1/**	0.80

Notes:

1/ Do not exceed T_j = 125 °C or 40 °C below the manufacturer's maximum rating, whichever is lower.

Table 4 TRANSISTOR DERATING REQUIREMENTS

Derating for transistors is accomplished by multiplying the stress parameter by the appropriate derating factor.

Type	Stress Parameter	Derating Factor
All **(Note 2)**	Power	0.60
	Current	0.75
	Voltage **(Note 1)**	0.75
	Junction Temperature **2/**	0.80
Power MOSFETs	Gate to Source Voltage	0.60
	Source to Drain Voltage	0.75
	Junction Temperature **2/**	0.80

Notes:

1/ Worst-case combination of DC, AC, and transient voltage should be no greater than the derated limit.

2/ Do not exceed T_j = 125 °C or 40 °C below the manufacturer's maximum rating, whichever is lower or less.

3/ Power MOSFET devices under certain conditions are very susceptible to catastrophic failure mechanisms, such as Single Event Burn-out (SEB) and Single Event Gate Rupture (SEGR), resulting from heavy ion impact. Consult the project radiation engineer for further information and applicable derating criteria.

TABLE 4 SWITCH DERATING REQUIREMENTS

Switch contacts are usually provided with multiple ratings dependent on the type of load being switched. For lamp (filament), motor, inductive and capacitive loads, the inrush current at the instant the switch actuates, is several times higher than the nominal current flow. Switches are seldom rated for capacitive loads that are subject to similar inrush surge currents as lamp (filament) or inductive loads. Ratings for all of these types of loads are less than resistive loads.

Derating is applied by the table herein to the rated resistive, inductive and lamp ratings. Pressure and sensitive switches have additional derating applied for temperatures above 85 °C.

As a minimum, commercial switches have a resistive rating and may not be rated for inductive, motor, lamp or capacitive loads. When switches are not rated for these loads, they must be derated as a percentage of the rated resistive load.

The following table establishes derating for switches.

	Current Derating Factor @ Application Ambient Temperature			
	Military		**Commercial 1/**	
Load Type	0°C to 85°C	Above 85°C **2/**	0°C to 85°C	Above 85°C **2/**
Resistive	75% of rated Resistive load	60% of rated Resistive load	75% of rated Resistive load	60% of rated Resistive load
Inductive & Motor	75% of rated Inductive load	60% of rated Inductive load	40% of rated Resistive load	30% of rated Resistive load
Capacitive & Lamp	75% of rated Capacitive load	60% of rated Capacitive load	25% of rated Resistive load	20% of rated Resistive load

Notes:

1/ Applies mainly to relays that are rated with a resistive load current rating only.

2/ Temperature derating is not applicable to thermostatic switches.

Table 4 THERMISTOR DERATING REQUIREMENTS 1/

Type	Derating
Positive Temperature Coefficient	Derate to 50% of rated power.
Negative Temperature Coefficient	Derate to a power level that limits dissipation constant to a maximum increase of 50 times, or to a maximum case temperature of 100°C, whichever is less.

Notes:

1/ Derating is applicable to thermistors operating in the self-heating mode.

Table 4A WIRE AND CABLE DERATING REQUIREMENTS 1/, 2/

Wire Size (AWG)	Derated Current (Amperes)	
	Single Wire	Bundled Wire or Multi-conductor Cable
30	1.3	0.7
28	1.8	1.0
26	2.5	1.4
24	3.3	2.0
22	4.5	2.5
20	6.5	3.7
18	9.2	5.0
16	13.0	6.5
14	19.0	8.5
12	25.0	11.5
10	33.0	16.5
8	44.0	23.0
6	60.0	30.0
4	81.0	40.0
2	108.0	50.0
0	147.0	75.0
00	169.0	87.5

Notes:

1/ Derated current ratings are based on an ambient temperature of 70°C or less in a hard vacuum of 10^{-6} torr. For derating above 70°C ambient, consult project parts engineer.

2/ The derated current ratings are for 200°C rated wire, such as Teflon ™ insulated (Type PTFE) wire, in a hard vacuum of 1 x 10^{-6} torr.
   a. For 150°C wire, use 80% of values shown in Table 4A.
   b. For 135°C wire, use 70% of values shown in Table 4A.
   c. For 260°C wire, 115% of values shown in Table 4A may be used.

Table 4B MAGNET WIRE CURRENT DENSITIES FOR CUSTOM MAGNETIC DEVICES (REFER TO EXPLANATION, NEXT PAGE)

Wire Size (AWG)	**Current Capacity, Amperes (Current Density Level, Circular Mils per Ampere)**	
	(375 $\frac{\text{CIR MIL}}{\text{AMP}}$)	**(1000 $\frac{\text{CIR MIL}}{\text{AMP}}$)**
10	27.6	10.4
11	22.0	8.25
12	17.4	6.54
13	13.8	5.18
14	10.9	4.11
15	8.70	3.26
16	6.88	2.59
17	5.48	2.05
18	4.34	1.62
19	3.44	1.29
20	2.74	1.03
21	2.17	.810
22	1.71	.640
23	1.36	.510
24	1.08	.400
25	.854	.321
26	.674	.255
27	.538	.201
28	.424	.160
29	.340	.128
30	.266	.100
31	.211	.079
32	.171	.064
33	.134	.050
34	.106	.040
35	.084	.032
36	.067	.025
37	.054	.020
38	.043	.016
39	.033	.012
40	.026	.010
41	.021	.008
42	.017	.006
43	.013	.005
44	.011	.004
45	.008	.003
46	.007	.002

Notes on next page.

EXPLANATION FOR MAGNET WIRE CURRENT DENSITIES

Magnet wire is treated differently than hookup wire in that pre-set levels of current derating are not established. Rather than select magnet wire size from established current derating tables, wire size is selected in terms of current density (amperes per wire cross sectional area, specified in Circular MILs) that is required to meet performance in the application. Due to the variations in design that are required to meet performance, pre-established current limits (derating) for custom magnetic devices and motors is not feasible. Heat rise (heat accumulation) vs. performance are the prime factors that drive wire selection. For example, a pre-established current through a given size magnet wire could result in little heat rise in a simple device or unacceptably high heat rise within a complex multilayer device having hundreds of turns of wire. High current through small wire in complex multilayer devices can result in high performance, but can also result in excessive heat rise unless proper heat sinking/extraction techniques are used.

The table on the preceding page is offered for information only and is representative of current that can be expected through various sizes of soft annealed copper magnet wire for two levels of current density. Shown are 375 Circular MILs per ampere (higher current density) and 1000 Circular MILs per ampere (lower current density). Commonly used current density levels are 375, 500, 750 and 1000 CM/A. Impedance is not a factor in determining the currents.

Notes:

1/ Use of lower current density is recommended for complex devices, but is application and performance driven. Among the factors that must be considered for selection of wire size and current density in custom magnetic devices, are complexity of the magnetic device, determined by: 1) desired performance, magnetic field strength or flux density, which influences the number of windings, wire size and insulation coating thickness (single coating vs. heavy coating), and core geometry; 2) electrical requirements: applied voltage, duty cycle, and frequency; and 3) environmental requirements: ambient temperature, and heat rise above ambient temperature, determined by the ability to dissipate or extract heat from the magnetic device.

2/ Heavy coating is preferred from a dielectric strength and abrasion resistance need, but is also a thermal barrier that restricts heat dissipation in complex devices. Heavy coating also slightly reduces the magnet flux density of the device.

3/ High temperature magnet wire (180°C or greater) is preferred for complex multilayer custom magnetic devices.

4/ Other design requirements for custom magnetic devices are listed in MIL-STD-981.

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13. ABSTRACT *(Maximum 200 words)*

The purpose of this document (EEE-INST-002: Instructions for EEE Parts Selection, Screening, Qualification, and Derating) is to establish baseline criteria for selection, screening, qualification, and derating of EEE parts for use on NASA GSFC space flight projects. This document shall provide a mechanism to assure that appropriate parts are used in the fabrication of space hardware that will meet mission reliability objectives within budget constraints. This document provides instructions for meeting three reliability levels of EEE parts requirements based on mission needs. The terms "grade" and "level" are considered synonymous; i.e., a grade 1 part is consistent with reliability level 1. Levels of part reliability confidence decrease by reliability level, with level 1 being the highest reliability and level 3 the lowest. A reliability level 1 part has the highest level of manufacturing control and testing per military or DSCC specifications. Level 2 parts have reduced manufacturing control and testing. Level 3 Parts have no guaranteed reliability controls in the manufacturing process and no standardized testing requirements. The reliability of level 3 parts can vary significantly with each manufacturer, part type and LDC due to unreported and frequent changes in design, construction and materials. GSFC projects and contractors shall incorporate this guideline into their Project EEE Parts Program.

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