Table 01 Capacitor Derating Criteria

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	Maximum Ambient Temperature
Ceramic	CCR, CKS, CKR, CDR (Note 1)	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 (Note 2)	70°C 110°C
Tantalum, Solid (Note 3)	CSR, CSS, CWR	0.50 0.30 (Note 2)	70°C 110°C

Notes:

1. For low-voltage applications (<10 Vdc), rated voltage shall be at least 100 Vdc for Styles CCR, CKR, CDR.
2. Derate voltage linearly from 70°C to 110°C.
3. 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 for Grade 1 applications.

Table 02 Connector Derating Criteria

Type/Style	Voltage Derating Factor (Note 1)	Maximum Ambient Temperature
All	0.25	Rated temperature minus 25°C

Notes:

1. Voltage derating factor is given as a percentage of the sea level Dielectric Withstanding Voltage.

Table 03 Filter Derating Criteria

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 04 Fuse Derating Criteria (Notes 1-4)

Fuse Current Rating (Amperes)	Derate to the Following (%) of Rated Current	Remarks
15, 10, 7, 5, 4, 3, 2, 2-1/2, 2	50%	
1-1/2, 1	45%	
3/4	40%	
1/2 3/8 1/4 1/8	40% 35% 30% 25%	The flight use of fuses rated 1/2 ampere or less requires application approval by the cognizant GSFC project office.

Notes:

1. Fuses are specified to interrupt within a maximum of five 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 ten seconds when driven at 200% of its rated current.
2. Derating of fuses allows for possible loss of internal gases in a space environment which reduces heat transfer by conduction. This lowers the blow current rating and decreases current capability with time.
3. Additional derating of the lower current rated fuses allows for the smaller geometries which reduce heat transfer by conduction.
4. Derating factors are based on data from fuses mounted on printed circuit boards and conformally coated. Other type mountings require GSFC project office approval.

Table 05 Coil/Inductor Derating Criteria (Note 1)

Type Class Insulation	Stress Parameter	Minimum Derating
MIL-C-39010/15305	Rated operating temperature	
O	85°C	65°C
A	105°C	85°C
B	125°C	105°C
F	150°C	130°C
All	Rated operating voltage	50% of 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-T-27, paragraph 4.8.12.
   b. The insulation classes of MIL- style inductive parts generally have 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.

Table 06 Relay Derating Criteria (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 T

Temperature Range	Factor
+85°C to +125°C	0.7
+40°C to +84°C	0.85
-20°C to +39°C	0.9
-65°C to -21°C	0.85

Subtable R

Cycle Rate per Hour	Factor
>10	0.85
1 to 10	0.90
<1	0.85

Subtable L

Load Application	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
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
All other load conditions.	0.8

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 07 Resistor Derating Criteria

Style	Description	Derating Factors (Note 1)		Derating Temperatures (°C)		Zero Power Temp. (°C)
		Power	Voltage	T1	T2	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 ≤ 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 MIL-HDBK-978 or 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 08 Diode Derating Criteria

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	0.80
Varactor	Power	0.50
	Reverse voltage	0.75
	Forward current	0.75
	Maximum Junction Temperature	0.80
Voltage Regulator	Power	0.50
	Zener current	$0.5(I_z max + I_z nom)$
	Maximum Junction Temperature	0.80
Voltage reference	Zener current	N/A
	Maximum Junction Temperature	0.80
Zener Voltage Suppressor	Power dissipation	0.50
	Maximum Junction Temperature	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	0.80

Table 09 Transistor Derating Criteria

Type	Stress Parameter	Derating Factor
All (Note 2)	Power	0.60
	Current	0.75
	Voltage (Note 1)	0.75
	Junction Temperature	0.80

Notes:

1. Worst-case combination of DC, AC, and transient voltage should be no greater than the derated limit.
2. For power MOSFET devices, also derate the gate to source voltage (V_{GS}) to 60% of the maximum rated value.

Table 10 Microcircuit Derating Criteria (Note 1)

Stress Parameter	Derating Factor	
	Digital	Linear
Maximum Supply Voltage/Input Voltage (Note 1)	0.9	0.9
Power Dissipation	0.8	0.75
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 = 100°C for silicon digital microcircuits or Tj = 93.5°C for silicon linear microcircuits.

Table 14 Thermistor Derating Criteria (Note 1)

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

Notes:

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

Table 15 Transformer Derating Criteria (Note 1)

Type Class Insulation	Stress Parameter	Minimum Derating
MIL-T-27	Rated operating temperature	
Q	85°C	65°C
R	105°C	85°C
S	130°C	110°C
All	Rated operating voltage	50% of 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-T-27, paragraph 4.8.12.
   b. The insulation classes of MIL- style inductive parts generally have 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.

Table 16 Wire and Cable Derating Criteria (Note 1, 2, 3)

Wire Size (AWG)	Derated Current (Amperes)	
	Single Wire	Bundled Wire or 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.
2. The derated current ratings are for 200°C rated wire, such as Teflon ™ insulated (Type PTFE) wire, in a hard vacuum of 10^{-6} torr.
   a. For 150°C wire, use 80% of value shown in Table 16.
   b. For 135°C wire, use 70% of value shown in Table 16.
   c. For 105°C wire, use 50% of value shown in Table 16.
3. The current rating for bundles or cables are based on bundles of 15 or more wires. For smaller bundles, the allowable current shall be determined by $I_{BW} = I_{SW} \times (29-N)/28$ where N = number of wires, I_{BW} = current, bundled wire and I_{SW} = current, single wire.

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