Moog Electrical Stress Analysis Template / Guidelines

Items in Red indicate derating guidelines

Resistor	Max Power Rating Vendor Data	Ave Pwr & Stress Ratio Calculation **< 50%**	Max Pwr Calculation **< 75% long transient**	Max Voltage Rating Vendor Data	Max Voltage Calculation **<50%**	Short duration lightning pulse Value > 10K PWR > 0.2W	Temp		
Capacitor	Max ripple current Rating Vendor Data	Max ripple current Calculation **< 50%**		Max Voltage Rating Vendor Data	Max Voltage Calculation **< 50%**				
Diodes / Rectifiers	Max Power Rating Vendor Data	Ave Pwr & Stress Ratio Calculation **< 50%**	Max Pwr Calculation **< 75% transient**	Max Reverse Voltage Rating Vendor Data	Max Reverse Voltage Calculation **< 50%**	Surge current			
Zener Diodes	Max Power Rating Vendor Data	Ave Pwr & Stress Ratio Calculation **< 50%** **< 50% - EMB**	Max Pwr Calculation **< 50%**	**< 50% - EMB**	Temp < 0.8 EMB				
Transorbs	Max Power Rating Vendor Data	Ave Pwr & Stress Ratio Calculation **< 0% not conducting**	Max Pwr Calculation **< 75% transient**						
Bipolar Transistors	Max Junction Temp Rating Vendor Data	Ave JCT Temp **< 100C**	Max Temp Calculation **< 125C transient**	Max Vce Rating Vendor Data	Max Vce Calculation **< 50%**	Max Ic Rating Vendor Data	Max Ic Calculation **< 50%**	Max Veb Rating Vendor Data	Max Veb Calculation **< 20%**
HexFets	Max Junction Temp Rating Vendor Data	Ave JCT Temp **< 100C**	Max Temp Calculation **< 125C transient**	Max Vds Rating Vendor Data	Max Vds Calculation **< 50%**	Max Idrain Rating Vendor Data	Max Idrain Calculation **< 50%**	Max Vgs Rating Vendor Data	Max Vgs Calculation **< 80%**
Op Amps	Max Supply Voltage Rating Vendor Data	Max Supply Voltage Calculation **< 90% Max limits**	Max Load Rqmt Rating Vendor Data	Max Load Calculation **< 90% Max limit**	Max Common Mode Input Rating Vendor Data	Max Common Mode Input Calculation **< 90% Max limits**	Capacitive Load Rqmt Rating Assume < 2000pf	Capacitive Load Stable under all loads > 20 phase	
Logic Devices	Max Supply Voltage Rating Vendor Data	Max Supply Voltage Calculation **< 90 %Max limits**	Max Load Rating Vendor Data	Max Load Calculation **< 90% Max limits**	Max Input current Rating Vendor Data	Max Input current Calculation **< 10% of I limit or < V rating**	Max Junct Temp Rating Vendor Data	Max Junct Temp calculation < 100C	
Inductors / Transformers	Max Temp Rating Vendor Data	Max T**emp** Calculated **< 125C** **< 80 V**	Max Flux Rating V Max T**emp** Calculated	Max Flux Calculation < 50%	Max Current Rating Vendor Data or wire size	Max Current & Stress Ratio Calculation **< 50%**			

			< 125C < 80 V endor Data						
Transformers	Flux Density Rating @ Temp Vendor Data	Operating Flux Density & Stress Ratio Calculation < 50%	Max Current Rating/ Wire size Wire tables	Max Current Calculation < 50%	Max Temp Rating Vendor Data	Max Temp Calculated < 125C			
Crystal Oscillators		Max V 0.8							

Stress Derating Criteria (SD18 derating for temperature

Each Computer or Electronic Controller Module/Unit shall be designed using electronic components with a Temperature Range greater than or equal to the one selected in the table below:

Selected Grade	Temperature Grade			Temperature Range	
	Commercial	0°C to 85°C		Industrial	-40°C to 100°C
	Industrial	-40°C to 100°C	x	Automotive	-40°C to 125°C
x	**Automotive**	-40°C to 125°C		Military	-55°C to 125°C
	Military	-55°C to 125°C			

Connector (per RAC derating) :

–Temp = Tmax - 50˚C

Capacitors:

Derating Factor (K_{derate})

Ceramic	Maximum Peak Voltage	0.60	Glass	Not Allowed	Not Allowed		
Glass	Not Allowed	Not Allowed	Plastic Film	Maximum Peak Voltage	0.60		
Plastic Film	Maximum Peak Voltage	0.60	Tantalum, Foil	Maximum Peak Voltage	0.50		
Tantalum, Foil	Maximum Peak Voltage	0.50	Tantalum, Wet Slug	Maximum Peak Voltage	0.40		
Tantalum, Wet Slug	Maximum Peak Voltage	0.40	Tantalum Solid	Maximum Peak Voltage	0.30		
Tantalum Solid	Maximum Peak Voltage	0.30					

•Film
- Temp = Tmax - 10˚C

•Ceramic
- Temp = Tmax - 10˚C

•Tantalum
- Temp = Tmax - 10˚C

Resistors :

•Film – not defined

•Wirewound (high power) – not defined

Magnetics:

Derating Factor (K_{derate}) Maximum Operating Temperature Equation 1

Maximum Operating Temperature Equation 1 Nominal Voltage 0.50

•Transformer

– Temp (hot spot) = Tmax -30˚C

•Inductor

• Temp (hot spot) = Tmax -30˚C

Discrete Semiconductors

Derating Factor (K_{derate}) General Purpose, Rectifier, Switching, Schottky and Thyristors

PIV 0.70

General Purpose, Rectifier, Switching, Schottky and Thyristors

PIV 0.70 Surge Current 0.50

Surge Current 0.50 Forward Current 0.50

Forward Current 0.50 Maximum Junction Temperature 0.80

Maximum Junction Temperature 0.80 Voltage Regulator Power 0.50

(assume SD-18 “Normal” Environment)

•Rectifier

Voltage Regulator

Power 0.50

Zener Current 0.75

Maximum Junction Temperature 0.80 Transient Voltage Suppressor Power Dissipation 0.50

Transient Voltage Suppressor Power Dissipation 0.50 Maximum Junction Temperature 0.80

Maximum Junction Temperature 0.80

FET Current Regulator

Peak Operating Voltage 0.80

– Junction Temp = Tjmax - 40˚C

•Zener

– Junction Temp = Tjmax -40˚C

•Transient Suppressor

– Junction Temp = Tjmax -40˚C

•Bipolar Transistor

– Junction Temp = Tjmax -40˚C

•MOSFET

– Junction Temp = Tjmax -40˚C

Integrated Circuits

Derating Factor (K_{derate})	Maximum Supply Voltage	0.80	
Maximum Supply Voltage	0.80	Maximum Junction Temperature	0.75
Maximum Junction Temperature	0.75		
Maximum Output Current	0.80		
Power Dissipation	0.75		
Clock Frequency	0.80		

(assume SD-18 “Normal” Environment) :

- Linear IC’s
  - Junction Temp = Tjmax -40˚C
- Digital IC’s
  - Junction Temp = Tjmax -40˚C

Connectors

Stress Parameter ($\sigma_{Parameter}$)	**Derating Factor (K_{derate})**		
Operating Voltage	0.75	Contact Current	See Table 2
Contact Current	See Table 2		

Wire Size (Amperes)	**Derated Current**		
30	0.7	28	1.0
28	1.0		
26	1.4		
24	2.0		
22	2.5		