

MTBF Model

The calculation is based on Bellcore TR-332 Issue 6 Method I Case 1 Part Counts Reliability. The prediction were performed with the power supply operating in a Ground Benign (Gb) controlled environment. The Component operating temperature is 40 degree C, Electrical Stress is 50% and PI-Q = 1 (Quality Level II).

Bell Core

$$MTBF = \frac{1}{\lambda_{\text{equip}}} = \frac{1}{\sum_{i=1}^n N_i (\lambda_G) I(\pi_Q) i} \times 10^9$$

Where :

λ_G : Generic Failure Rate for the 'ith (Failures / 10⁹ Hours)
 λ_{equip} : Total Equipment Failure Rate (Failures / 10⁹ Hours)
 N_i : Quantity of the 'ith Generic Part

 π_Q : Quality Factor π_T : Temperature Factor

n : Number of different Generic Part categories

Part Type	λ_G	π_Q	Temp.	π_T	N_i	λ_{equip}	Remark
Resistor, Fixed, Film (Carbon, Oxide, Metal)	3	1	60	1.3	74	288.6	
Capacitors discrete, Fixed, Aluminum <400uf	15	1	60	2.4	13	468	
Capacitors discrete, Fixed, Aluminum 400uf - 12000uf	25	1	60	2.4	0	0	
Capacitors discrete, Fixed, Ceramic	1	1	60	1.1	33	36.3	Including of EMI Y Cap.
Capacitors discrete, Fixed, Plastic	10	1	60	1.3	5	65	Including of EMI X Cap.
Varistor, Silicom Carbide or Metal Oxide	10	1	40	1	0	0	
Thermistor Disk	10	1	40	1	1	10	
Thermistor Rod	15	1	40	1	0	0	
Polymetric Positive Temp. Coefficient Device	10	1	40	1	2	20	
Diodes, Silicon, General Purpose < 1A	12	1	40	1	12	144	
Diodes, Silicon, General Purpose 1 - 20A	30	1	90	3.07	12	1105.2	Including of Bridge Diode
Diodes, Silicon, General Purpose > 20A	120	1	90	3.07	0	0	Output Rectifiers
Voltage Regulator <= 0.5W	3	1	40	1	9	27	TL431/Zener Diode
Voltage Regulator 0.6-1.5W	6	1	40	1	0	0	
Transistors, NPN/PNP <= 0.6W	4	1	40	1	3	12	
Transistors, Field Effect, Switch	20	1	90	3.07	6	368.4	
Diodes, Thyristor > 1A	25	1	40	1	1	25	
Integrated Circuits Analog, 200 Transistors	52	1	40	1	2	104	PWM IC
Single Isolators, Phototransistor Detector	15	1	40	1	3	45	Optocouplers
Resistors, Variable, Non-Wirewound, Trimmer < 200K Ohm	25	1	40	1	1	25	
Inductive Devices, Transformer, Power	19	1	90	2.15	4	163.4	Transformer
Inductive Devices, Coil, Power Filter	19	1	90	2.15	5	204.25	Line Filter
Miscellaneous Devices, Fuse < 30A	5	1	40	1	2	10	
Rotating Devices, Fan Assembly < 6" Diameter	100	1	40	1	1	100	
Switches, Toggle, Push-button, Rocker or Slide(Add 5 per Contact Pair)	10	1	40	1	1	10	
Connectors, General Purpose, Power (Per Pin)	5	1	40	1	16	80	Input & Output Connector

Total Equipment Failure Rate (Failures / 10⁹ Hours)

3311.15

MTBF =302,010 **Hours**