AN704: SCM7B

Application Note: Failure Rate Calculation and Prediction

Failure rate calculations for the SCM7B modules are derived from 1.) the MIL-HDBK-217 (Reliability Prediction of Electronic Equipment), and 2.) Demonstrated Performance.

MIL-HDBK-217 RELIABILITY PREDICTION

The "Part Stress Analysis" method was used at a ground benign environment, +35°C temperature, and quality level B-2 to D-1 depending on component. The failure rates presented apply to modules under normal operating conditions.

DEMONSTRATED RELIABILITY

All SCM7B's undergo a 48 hour powered and under bias burn-in at +85°C before final calibration and shipment. This "preconditioning" serves to minimize field failures by stabilizing components and causing "infant failures", if any, to occur.

In addition, Dataforth's quality system includes an ongoing SCM7B reliability program which continuously generates accelerated life test data for reliability prediction. The reliability prediction model used is based upon the exponential failure rate, which assumes constant failure rate in time and no failure mechanism change between stress and use conditions. The Chi-squared prediction method is used to qualify this assumption (using actual data for the Bartlett statistic), as indicated by the confidence level. Coupled with the Arrhenius temperature equation (using 1eV activation energy), temperature derating is performed to determine the MTBF and FIT at various operating temperatures.

Model	Fit	MTBF (hours)
SCM7B21	1416	706,000
SCM7B22	1808	553,000
SCM7B30	1375	727,000
SCM7B31	1373	728,000
SCM7B32	1448	691,000
SCM7B33	1375	727,000
SCM7B34	1479	676,000
SCM7B35	1647	607,000
SCM7B36	1464	683,000
SCM7B37	1434	697,000
SCM7B39	1623	609,000
SCM7B40	1375	727,000
SCM7B41	1373	728,000
SCM7B47	1852	540,000
SCM7BP01 (-DIN)	92	10,834,000
SCM7BP02 (-DIN)	154	6,477,000
SCM7BP04 (-DIN)	278	3,594,000
SCM7BP08 (-DIN)	465	2,150,000
SCM7BP16 (-DIN)	829	1,206,000

* FIT = Estimated failures per 1 billion device hours