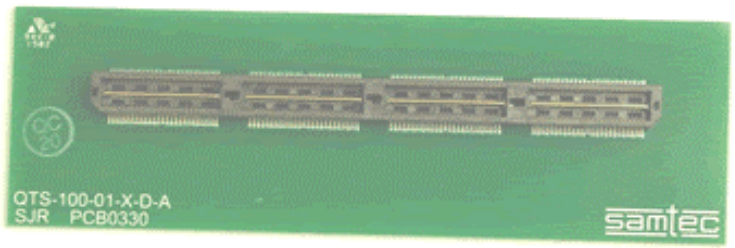
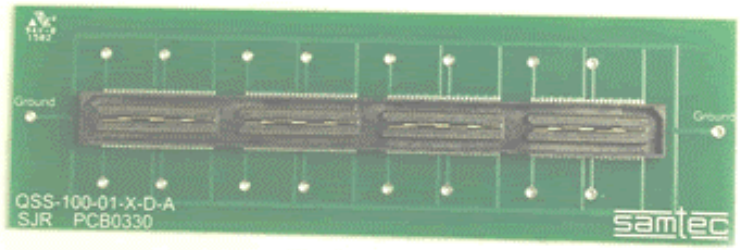
Project Number: NA	Tracking Code: 0218--0678		
Requested by: Brian Vicich	Date: 4/30/02	Product Rev: A	
Part #: QTS-100-01-L-D-A / QSS-100-01-L-D-A	Lot #: 1/02/02	Tech: Troy Cook	Eng: John Tozier
Part description: 0.635 Double Row HI Speed Connector Set			Qty to test: 2
Test Start: 05/13/02	Test Completed: 7/22/02		

.





Solder Joint Reliability Report

PART DESCRIPTION

0.635 DOUBLE ROW HI SPEED CONNECTOR SET

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: Thermal Cycling to Detect Solder Joint Events and Failures for life calculations.

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences

ATTRIBUTE DEFINITION

THERMAL CYCLING:

1) Thermal Limits: Low Temperature = 0° C ± 2° C; High Temperature = 100° C ± 2° C
2) Dwell Time at Thermal Limits: Five (5) minutes
3) Ramp Time to Thermal Limits: Ten (10) minutes

EVENT DETECTION:

1) Connectors are mated
   a) Signal Interruptions exceeding about 300 Ω lasting for greater than 200 nanoseconds

FAILURE CRITERIA:

1) Fifteen (15) EVENTS within 100 thermal cycles of one another.
   a) The FIRST EVENT is considered the FAILURE Cycle (Time)
2) Terminate Thermal Cycling when approximately 62% of the product fails

STATISTICAL ANALYSIS

1) Use Weibull 2P, optimized on X, (CYCLES) to determine Alpha, α, and Beta, β
2) Plot, $\ln\left[\ln\left\langle\frac{1}{1-Fw(t)}\right\rangle\right]$ vs. $\ln(Cycles)$
   a) Fw(t)= 1- $e^{-\left(\frac{t}{\alpha}\right)^{\beta}}$
   b) Perform Linear Regression
      i) $\ln\left[\ln\left\langle\frac{1}{1-Fw(t)}\right\rangle\right]$ = βln(t) - βln(α)
         (1) Beta, β, corresponds to the slope
         (2) βln(α) corresponds to the intercept
         (3) Where Alpha is calculated, $\alpha=e^{-\left(\frac{Intercept}{\beta}\right)}$
   c) Use Benard's Median Rank, MR
   d) MR=$\frac{(i-0.3)}{(N+0.4)}$
      i) i = Item Number (e.g. 1,2,3, etc)
      ii) N = Total Number of Items

LIFE CALCULATIONS (Based on Samtec Test Conditions)

1) Use the modified Coffin-Manson Equation (Norris-Landzberg) and Alpha, α, and Beta, β
   a) Calculate the Acceleration Factor, AF, from laboratory conditions to field conditions
      i) Lab Temperature Extremes (e.g. 100 C°)
      ii) Field Temperature Extremes (Power ON to Power OFF, 15C°, Estimated)
      iii) Field Solder Joint Temperature, Estimated at 45° C or 318° K
      iv) Lab Solder Joint Temperature, 100° C or 373° K
      v) In Use Cyclic Frequency per day … 6
      vi) Lab Cyclic Frequency per day … 48

RESULTS

Failure Percentage% (30 signal channels): 13%				
Failure	**Channel**	**Cycle**	**Before Test**	**After Test**
# 1	**35**	1676	1.2 Ohms	>10 Meg Ohms
# 2	**42**	2709	1.2 Ohms	>10 Meg Ohms
# 3	**27**	2878	1.2 Ohms	43.5 Ohms
# 4	**51**	2986	1.2 Ohms	>10 Meg Ohms

See page 3 for calculations:

Alpha = 2806.4 **Beta = 4.095**

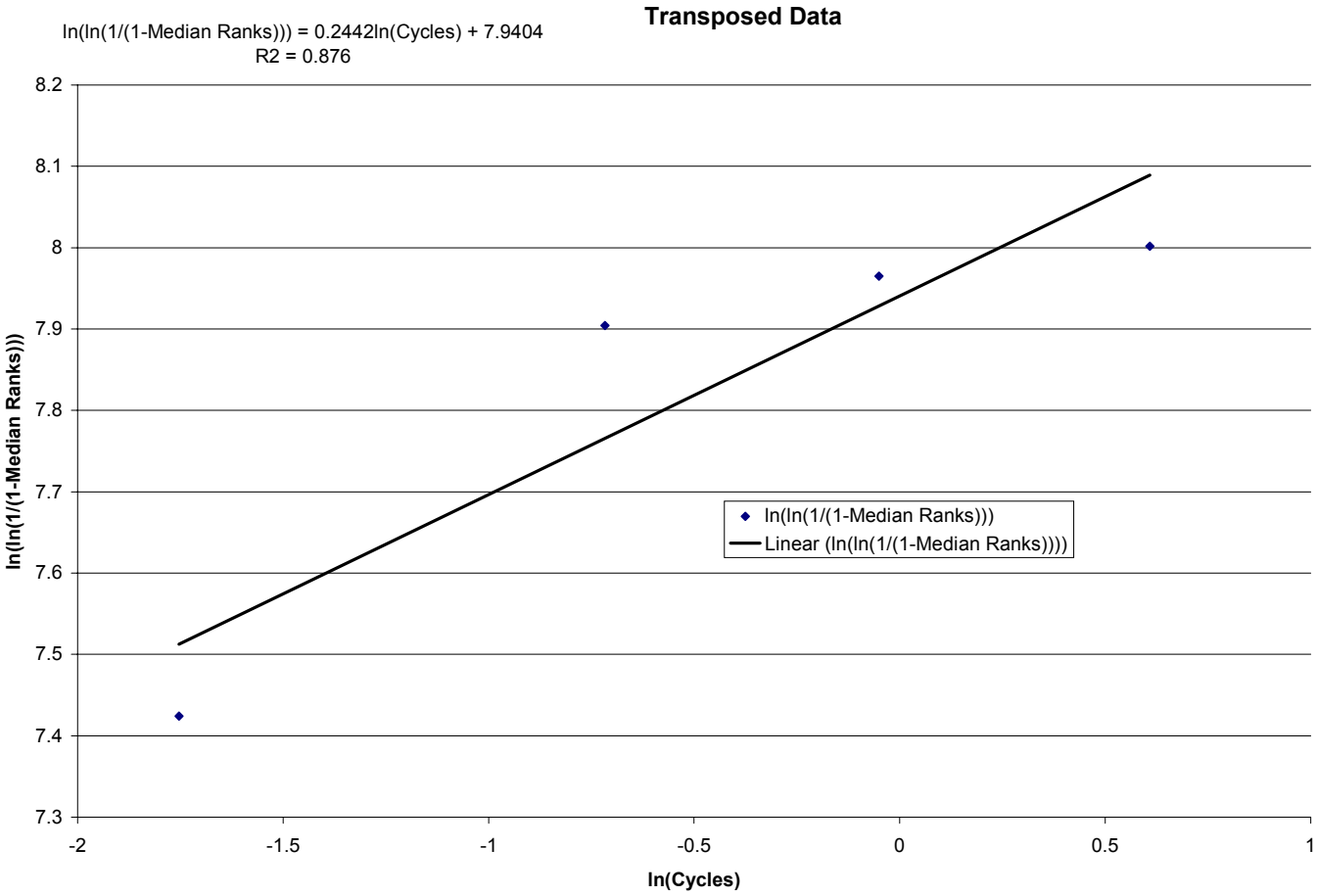
Acceleration Factor using constants in ATTRIBUTES: 35.4

Predicted Life using 1000-Parts Per Million Failure Rate: 28.7 years
Exceeded the twenty (20) year expectancy

BENARD MEDIAN RANK

Cycles	Number Failures	Calculated Item Rank	Calculated Median Ranks
1676	1	1	0.159091
2709	1	2	0.386364
2878	1	3	0.613636
2986	1	4	0.840909

LINEAR GRAPH (transposed for regression on X and intercept calculations)



EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: 25
Description: Temperature/Humidity Chamber
Manufacturer: Thermotron
Model: SE-1000-6-6
Serial #: 31808
Accuracy: See Manual
… Last Cal: 8/15/02, Next Cal: 8/15/03

Equipment #: 23
Description: STD Series Event Detector
Manufacturer: Analysis Tech
Model: 256
Serial #: 1010425
Accuracy: See manual
… Last Cal: 8/1/02, Next Cal: 8/1/03

Equipment #: 10
Description: True RMS Multimeter
Manufacturer: Fluke
Model: 87 III
Serial #: 74660176
Accuracy: See Manual
… Last Cal: 6/25/02, Next Cal: 6/25/03

Equipment #: 28
Description: 6"x6" Video Measuring Machine
Manufacturer: Micro-Vu
Model: M301
Serial #: V6815
Accuracy: See Manual
… Last Cal: 4/3/02, Next Cal: 4/3/03