Agilent AFBR-5601Z Multi Mode 850nm Optical GBIC Transceivers

Reliability Data Sheet

Description

The AFBR-5601Z is 850nm optical GBIC transceivers from Agilent Technologies are designed for use in multimode Gigabit Fiber Channel, Ethernet and General Purpose applications.

The AFBR-5601Z has been successfully qualified in accordance with the requirements of Bellcore Document GR-468-CORE under the supervision of Agilent Quality and Reliability Engineering.

This report summarizes the testing performed on the AFBR-5601Z over the high temperature operating life test.

Predicted Reliability Performance

The reliability prediction model used is based upon the exponential failure distribution coupled with the Arrhenius temperature de-rating equation (assuming constant failure rate in time and no failure mechanism change between stress and use conditions). The high temperature results allow acceleration factors to be used to predict performance at other use conditions but the amount of temperature acceleration is constrained by the product device ratings. For confidence intervals, the chi-squared prediction method is used. The acceleration factors used in this datasheet are derived from the Arrhenius equation with activation energy of 0.35 electron volts (eV). Activation energies of 0.60 – 1.20 eV are typically observed in the main components, making the predictions quite conservative.

Point MTTF is the total number of device hours divided by the number of failures. If no failures have occurred, one failure is assumed and would represent a conservative estimate. The confidence intervals are based on the statistics of the assumed distribution of failures. It takes into account the fact that the "point" data have a predictable uncertainty that can be bounded with a quantified confidence interval. For the exponential failure distribution model assumed here, the lower bound is given by device hours divided by [chi-squared/2], evaluated with parameter "alpha" given by [1-(confidence level % / 100)] & parameter "degree of freedom" given by [2 (number of failures + 1)]. This expression, unlike the point estimate, is not indeterminate for 0 failures. Instead the 60% and 90% confidence level lower bound equals device hours divided by 0.92 and 2.3, respectively. Failures-in-Time rate, or FITs, is defined as the number of failures per billion device hours and is calculated by 1 / MTTF.

Table 1. High Temperature Operation Life Test

Test Name	Stress Test Conditions	Total Units Tested	Total Device Hours	No. of Failed Units (Note 1)
High Temperature Operating Life	V_{CC} = 5.25 Vdc T_A = 75°C	25	50000	0

Notes:
1. Product failure has occurred when the unit fails to respond properly to a dc/ac functional test condition. The functional test condition shall not exceed the maximum data sheet limits for the product.

Table 2. Failure Rate and MTTF Prediction

Ambient Temp (°C) (Note 2)	Point Typical Performance MTBF (yrs)	Point Typical Performance FITS	60% Confidence MTBF (yrs)	90% Confidence MTBF (yrs)	60% Confidence FITS	90% Confidence FITS
75	5.7	20000	6.2	2.5	18326	46052
70	6.8	16872	7.4	2.9	15460	38849
65	8.06	14,161.64	8.80	3.50	12,976.18	32,608.38
60	9.65	11,824.39	10.54	4.19	10,834.58	27,226.67
55	11.63	9,818.74	12.69	5.05	8,996.82	22,608.49
50	14.08	8,106.51	15.37	6.12	7,427.92	18,665.93
45	17.16	6,652.65	18.73	7.45	6,095.76	15,318.29
40	21.04	5,425.17	22.96	9.14	4,971.03	12,491.91
35	25.97	4,394.96	28.35	11.28	4,027.07	10,119.78
30	32.29	3,535.73	35.24	14.02	3,239.76	8,141.32
25	40.43	2,823.79	44.12	17.56	2,587.42	6,502.03

Note

2. The corresponding case temperature is approximately 10 degrees above the ambient temperature.
3. The MTBFs is low and FITs are high due to low device hours. The MTBFs and FITs will improve significantly after there are sufficient device hours for the parts.

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