HFBR-5760L/AL and HFBR-5764AP
Multimode OC-3, Fast Ethernet, FDDI LC SFP Transceiver

Reliability Data Sheet

Description

This reliability data sheet describes a 1300 nm LED-based, SFP LC optical transceiver for multimode OC-3, Fast Ethernet and FDDI applications. The transceiver is offered in a standard industrial package that meets Small Form Pluggable (SFP) requirements utilizing an integral LC–Duplex optical interface connector.

Life Test

The demonstrated data shown in Table 1 represents information based upon the High Temperature Operating Life test to date on:

i. 1300 nm SFF MT-RJ optical transceiver for multimode FDDI, 100 Mb/s ATM, Fast Ethernet and SBCON applications

ii. 1300 nm SFP LC optical transceiver for multimode OC-3, Fast Ethernet and FDDI applications

iii. 1300 nm SFF LC optical transceiver for multimode SBCON, OC-3, Fast Ethernet and FDDI applications based on the similarity of key optical and electrical components: LED, PIN, Pre-Amp, Quantizer and Driver used in these three product families.

Definition of Failure

Product failure occurred when the units failed to respond properly to a dc/ac functional test condition. The functional test condition did not exceed the absolute maximum data sheet limits for the product.

Failure Rate Prediction

The reliability prediction model used is based upon the exponential failure distribution coupled with the Arrhenius temperature derating equation (assuming a 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 other performance conditions but the amount of temperature acceleration is constrained by the product device ratings.

For confidence intervals, the chi-squared prediction method was used.

The acceleration factors used in this data sheet are derived from the Arrhenius equation with an activation energy of 0.35 eV as recommended in Telcordia. This is the most pessimistic value available in the literature.

Failure-In-Time rate or FIT is defined as the number of failures per billion device hours and is calculated by 1/MTTF. If no failures have occurred, one failure is assumed and would represent a conservative estimate.

Table 1. Life Tests - Demonstrated Performance

Test Name	Stress Test Condition	Total Units Tested	Total Device Hours	No. of Failed Units	Demonstrated MTTF at Ambient Temperature, T_A = +85 °C	Demonstrated FIT at Ambient Temperature, T_A = +85 °C
High Temperature Operating Life	V_{CC} = 3.3 V dc T_A = +85 °C	248	248,000	0	248000	4032

Failure Rate Prediction

Case Temperature T_C (°C)	90% confidence limit		60% confidence limit	
	MTTF (hours)	FIT	MTTF (hours)	FIT
85	107700	9300	270700	3700
80	131200	7600	329700	3000
75	160700	6200	403700	2500
70	198000	5100	497500	2000
65	245400	4100	616700	1600
60	306200	3300	769500	1300
55	384700	2600	966600	1000
50	486600	2100	1222900	900
45	620200	1600	1558600	600
40	796600	1300	2001900	500
35	1031500	1000	2592100	400
30	1347200	700	3385300	300
25	1775200	600	4461000	200

Table 2. Environmental Tests

Test	Condition	Duration	Sample Size	Failure
Temperature Cycle	-40 °C / +100 °C15 min. dwell,5 min. transfer	1000 cycles	22 HFBR-5760L 11 HFBR-5984L (Note 2)	0
Biased 85/85	MIL-STD-202 Method 103 T_A = +85 °C/RH = 85% V_{CC} = 3.3 V	1000 hrs	11 HFBR-5984L (Note 2)	0
Power/Humidity/ Temperature Cycle (Moisture Resistance)	MIL-STD-883 Method 1004.7 -10 °C/+65 °C, 95% RH, Power on/off 30/30 min V_{CC} = 3.3 V	20 cycles	11 HFBR-5984L (Note 2)	0
Thermal Shock	-40 °C/+100 °C 5 min/10 sec air/air	1000 cycles	11 HFBR-5984L (Note 2)	0
High Temperature Storage	T_A = +100 °C	1000 hrs	11 HFBR-5984L (Note 2)	0
Low Temperature Operating Life	T_A=-40 °CV_{CC} = 3.3 V	1000 hrs	11 HFBR-5760L	0
Mechanical Shock	MIL-STD-883 Method 2002B* 1500 g, 0.5 ms 5 shocks/axis	5 shocks/axis	5 HFBR-5760L	0
Mechanical Vibration	MIL-STD-883 Method 2007A 20 - 2000 Hz, 20 G 4 min/cycle, 4 cycles/axis	4 min/cycle, 4 cycles/axis	5 HFBR-5760L	0

Table 3. Electrostatic Discharge Information

Test	Condition	Duration	Sample Size	Failure
ESD1 (Human contact)	JEDEC/EIAJESD22-A114-A (HBM)	2000 Volts	6 HFBR-5760L	0
ESD2 (in-field)	Variation of IEC 61000-4-2, Air-to-air Discharge Test, live traffic.	25 kV (by HBM probe)	3 HFBR-5760L	0
ESD3 (in-field)	Variation of IEC 61000-4-2, Contact Discharge Test, live traffic.	8 kV (by HBM probe)	3 HFBR-5760L	0
ESD4	JEDEC/EIAJESD22-C101 (CDM)	1000 Volts	3 HFBR-5984L (Note 2)	0

Notes:

1. Both the transmitter and receiver of each transceiver were connected by a loop-back connector cable in this test and operated in self oscillation mode.
2. Data from HFBR-5984L is used to leverage off HFBR-5760L/AL and HFBR-5765AP based on the similarity of key optical and electrical components: LED, PIN, Pre-Amp, Driver and Quantizer used in HFBR-5984L and HFBR-5760L/AL and HFBR-5764AP.

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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