AFBR-79E4Z-D

4 Channels Quad Small Form Factor
Pluggable Parallel Optics Transceiver

Reliability Data Sheet

Description

The Avago Technologies AFBR-79E4Z-D are 10G, 4 channel Quad Small Form Factor, Pluggable Parallel Optics Transceiver, utilizing Avago's 850nm VCSEL.

FIT Rate Summary

FIT rate for AFBR-79E4Z-D is calculated as 197.42. Computation was done at 40°C based on Telcordia SR- 332 (Issue 2), Part Count Method. The details of the calculation are included in this report.

Random Failure Rate (FIT) Calculation

Failure in time rate, or FIT, is defined as the number of failures per billion device hours. In the product useful life region, the random failure rate is considered as a constant failure rate. In this region MTTF, Mean Time to Failure, is defined as MTTF = 1/FIT.

FIT Prediction Based on Telcordia SR-332 Parts Count Procedure

The Telcordia parts count method assumes that the module failure rate is equal to the sum of the device component failure rates. Modifiers are included to take into consideration variations in module operation environments, device quality requirements, temperature, and stress. The tables that follow show the FIT for the components used in the modules and the total FIT which have been calculated for an operating ambient temperature of 40oC.

Random Failure Rate (FIT) Calculation

Failure in time rate, or FIT, is defined as the number of failures per billion device hours. In the product useful life region, the random failure rate is considered as a constant failure rate. In this region MTTF, Mean Time to Failure, is defined as MTTF = 1/FIT.

FITs Prediction Based on Telcordia SR-332 Part Count Procedure

The Telcordia parts count method assumes that the module failure rate is equal to the sum of the device component failure rates. Modifiers are included to take into consideration variations in module operation environments, device quality requirements, temperature, and stress. The following table shows the FITs for the components used in the module and the total FITs which has been calculated for a case temperature of 40°C.

Table 1. FIT Rate Calculations for AFBR-79E4Z-D

Reliability Prediction Based on Telcordia SR-332 (Issue 2) Parts Count Method				Stress Factor at 50%		1.0
				Environmental Factors		1.0
Component	**Telcordia Information / Data Source**	**Quantity**	**Component Base Rate (FITs)**	**Quality Factor**	**Temperature Factor @ 40°C**	**Total Component Failure Rate (FITs) @ 40°C**
VCSEL	Avago Data	4	6	0.8	1.0	19.2
Monitor PIN IC	Photodiode	4	7.7	0.8	1.0	24.6
PIN	Photodiode	4	7.7	0.8	1.0	24.6
Capacitors	Fixed Ceramic	49	0.2	1.0	1.0	9.8
Resistors	Fixed Film	57	0.5	1.0	1.0	28.5
Ferrite Chip (Inductor)	Power Filter	5	2.3	1.0	1.0	11.5
MOSFET	Supplier Info	2	4.0	1.0	1.0	8.0
OR Gate	Supplier Info	1	4.3	1.0	1.0	4.3
Nand Gate	Supplier Info	1	4.3	1.0	1.0	4.3
QSFP IC	Avago Data	1	11.0	1.0	1.0	11.0
MicroController	Supplier Info	1	28.0	1.0	1.0	28.0
Voltage Regulator	Telcordia Information / Data Source	2	9.3	1.0	1.0	18.6
Connectors	PCB, Edge (20 pin)	38	0.13	1.0	1.0	4.9
					Total AFBR-79E4Z-D Transceiver Failure at 40°C (FITs)	197.4
					MTTF @ 40°C (hours)	5.07E+06

FITs at other temperatures can be derived following the procedure of Telcordia SR-332, assuming activation energy, Ea, of 0.35eV to determine the component temperature factor T. The following table shows FITs at different temperature for the transceiver.

Table 2. FIT rates at different operation case temperatures, following the Telcordia Parts Count Method

Tcase (°C)	AFBR-79E4Z-D
40	197.4
50	296.1
60	434.3
70	612.0

The limitations of the FIT prediction based on the Parts Count method include the fact that the piece part failure rates are mostly obtained from Telcordia database, which may not be exhaustive for state-of-the-art piece parts, and that the results are independent of true module environmental stress tests. Nevertheless, the information obtained from the Parts Count method is a useful reference during design-in and evaluation. Whenever possible, Avago substitutes internal data for the FIT rates of individual components, and predictions will be updated as more current data becomes available.

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AV02-2738EN - November 18, 2010