

AFCT-57D5ATPZ

Digital Diagnostic SFP, 10 km, 1310 nm DFB,
8.5/4.5/2.125 GBd Fibre Channel RoHS-Compliant Optical Transceiver



Reliability Data Sheet

Introduction

Avago Technologies Quality System includes an ongoing Reliability Monitoring program to generate a database from which this reliability datasheet is published.

Description

Avago Technologies' AFCT-57D5ATPZ optical transceiver supports high-speed serial links over single-mode optical fiber at signaling rates up to 8.5 Gbd.

The AFCT-57D5ATPZ is a multi-rate 1310 nm DFB Small Form Pluggable (SFP), which ensures compliance to 8.5/4.25/2.125 GBd Fibre Channel specifications without the need for Rate Select.

Reliability Qualification

The transceiver has completed qualification in accordance with the requirements of Telcordia Document GR-468-CORE. Reliability predictions follow the method of Telcordia SR-332.

Stress Test Pass Criteria

Product failure has occurred when the unit fails to respond properly to a functional test. The functional test condition should not exceed the data sheet limits.

FIT Rate Summary

FIT rate for the SFP+ LW 8.5 GBd module is calculated as 158 FIT at 40 °C. This corresponds to a mean time to failure (MTTF) of 6.34E6 hours.

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. Table 1 shows the FITs for the components used in the module and the total FIT that has been calculated for a case temperature of 40 °C.

Table 1. FIT Rate Calculations for AFCT-57D5ATPZ

Reliability Prediction Based On Telcordia SR-332 Issue 2 - Parts Count Method		Temperature Factor @ 40°C	1		
		Stress Factor at 50%	1		
		Environmental Factor	1		
Component	Telcordia Information/ Data Source	Quantity	Component Base Rate (FITs)	Quality Factor	Total Component Failure Rate (FITs)
DFB Laser	Avago Data @ 40 °C	1	20.0	0.8	16.0
Monitor PIN	Photodiode	1	7.7	0.8	6.2
10G PIN	Photodiode	1	7.7	0.8	6.2
Capacitors	Fixed Ceramic	27	0.2	1	5.4
Resistor	Thick Film	21	0.51	1	10.7
Thermistor	Thermistor	1	2.10	1	2.1
Ferrite Chip (Inductor)	Power Filter	14	2.30	1	32.2
MOSFET	Supplier Info: On Semiconductor	1	4.00	1	4.0
EEPROM	2 Kbit CMOS	1	6.40	1	6.4
DAC	Supplier Info: National Semiconductor	1	6.00	1	6.0
Post-Amp IC, Gennum 16QFN	Assume: (91 - 170 Transistor)	1	23.00	1	23.0
Laser Driver IC	Supplier Info: Vitesse	1	6.4	1	6.4
μProcessor	Supplier Info: Atmel	1	28.0	1	28.0
Connector	PCB, Edge / Multi-Pin	20	0.130	1	2.6
Total Module Failure Rate @ 40 °C (FITs)					157.70
MTBF @ 40 °C (Hours)					6.34E+06

FITs at other temperatures can be derived following the procedure of Telcordia SR-332, assuming activation energy, E_a , of 0.35 eV to determine the component temperature factor π_T . Table 2 shows FITs at different temperatures for the transceiver.

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

T_{case} (°C)	FITs	MTBF (Hours)
25	82	1.22E+07
40	158	6.34E+06
50	236	4.24E+06
60	344	2.91E+06
70	490	2.04E+06
85	807	1.24E+06

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.

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

Avago, Avago Technologies, and the A logo are trademarks of Avago Technologies in the United States and other countries. Data subject to change. Copyright © 2005-2013 Avago Technologies. All rights reserved. AV02-3983EN - July 23, 2013

