Agilent Technologies
Innovating the HP Way

1300 nm 1x9 Transceiver

Reliability Data

HFBR-5103/5105/5106/
5204/5205/5301/5302

HFBR-5103T/5105T/
5106T/5204T/5205T

This reliability data sheet describes newly released transceivers for ATM/SONET OC-3, FDDI, Fibre Channel, Fast Ethernet and 100 Base VG AnyLAN.

1. Life Test

The following demonstrated data represents information based upon the High Temperature Operating Life tests on HFBR-5103 FDDI transceiver.

Definition of Failure

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 absolute maximum data sheet limits for the product.

A. Demonstrated Performance

Test Name	Stress Test Conditions	Total Device Hrs.	Units Tested	Total Failed	Demonstrated MTBF @ T_A = 100°C	Demonstrated FITS @ T_A = 100°C
High Temperature Operating Life	V_{CC} = 5.0 Vdc T_A = 100°C See Note 1.	90,000 48,000 72,000 32,000 7,500	45 48 24 16 5	0 0 0 0 0	90,000 48,000 72,000 32,000 7,500	– – – – –
Total		249,500	138	0	249,500	4,008

Failure Rate Prediction

The Demonstrated Point MTBF given on this data sheet is on device performance at maximum allowed stress conditions. Temperature is an alterable stress. The failure rate will have a direct relationship to the life stress. MIL-HDBK-217 uses, for this type of product (hybrid packaging), a 0.43 electron volt activation energy which represents the most conservative temperature acceleration reported. Estimates for typical equipment use temperatures are as follows:

Ambient Temp. (°C)	Point Typical Performance		90% Confidence Level	
	MTBF	FITS	MTBF	FITS
100	249,000	4,000	108,000	9,220
95	299,000	3,340	129,000	7,690
90	360,000	2,770	156,000	6,380
85	437,000	2,280	189,000	5,260
80	532,000	1,870	231,000	4,320
75	652,000	1,530	283,000	3,520
70	803,000	1,240	349,000	2,860
65	997,000	1,000	433,000	2,300
60	1,240,000	803	540,000	1,850
55	1,560,000	640	679,000	1,470
50	1,970,000	500	859,000	1,160
45	2,520,000	390	1,090,000	910
40	3,240,000	300	1,400,000	710
35	4,190,000	240	1,820,000	550
30	5,480,000	180	2,380,000	420
25	7,230,000	140	3,140,000	320

2. Mechanical and Environmental Tests (Testing done on a constructional basis)

Test	Conditions	Duration	Sample Size (HFBR-5103)	Failure
Temp. Cycle 1	0°C to 100°C, 15 min. dwell 5 min. transfer	1000 cycles	21	0
Temp. Cycle 2	-40°C to 100°C, 15 min. dwell 5 min. transfer	1000 cycles	40	0
Temp. Cycle 3	-40°C to 150°C, 15 min. dwell 5 min. transfer	1000 cycles	4	0
85/85 Biased	T_A = 85°C, 85% RH, V_{cc} = +5 V. (See note 1)	1000 hours	59	0
85/85 Storage	T_A = 85°C, 85% RH, V_{cc} = 0 V	240 hours	44	0
Power Cycle, Temp. Cycle & Humidity	MIL-STD-883 Method 1004, Power On/Off @ 30 min./30 min. (See note 1)	1000 hours	40	0
LTOL	T_A = -40°C, V_{cc} = +5 V (See note 1)	2000 hours	11	0
High Temp Storage	T_A = 150°C, V_{cc} = 0	1000 hours	3	0
Thermal Shock	-40°C to 100°C, 5 min. dwell, 5 sec. transfer	100 cycles	11	0
Mechanical Shock	MIL-STD-883 Method 2002A, 500g 6 Directions		11	0
Mechanical Vibration	MIL-STD-883 Method 2007A 20-2000 Hz, 20g		11	0
Lead / Terminal Strength	MIL-STD-883, Method 2004.5 / 1 kg tensile pull, 10 sec./ 1 kg bending pull, 3 sec., 30 deg.	1 kg tensile pull applied to each lead for 10 sec., then bend lead 30° while under pull for 3 sec. 3 bendings each lead.	10	0
Wave Soldering	2 sec. on 260°C Solder; 5 min. Wash in 60-70°C DI water under 40 psi; 20 min. Bake @ 70°C	3 Times	193	0
Hand Soldering and Resistance to Solvents	315°C - 10 sec. Hand Soldering, followed by Resistance to Solvents per MIL- STD-883 Method 2015.7		4	0

2. Mechanical and Environmental Tests (Cont'd)

(Testing done on a constructional basis)

Test	Conditions	Duration	Sample Size (HFBR-5103)	Failure
Solder Post Pullout	Lift housing from PCB and measure "break" force		2 (Test done on HFBR-5103T package)	Min. force: 4 kg Max. force: >10 kg
Side Load (Snap Joint Strength)	Apply forces perpendicular to ports and measure "break" forces.		6 (Test done on HFBR-5103T package)	Side Pull: 10 kg Up Pull on Port: 5 - 7 kg Up Pull on Ports: 7.6 kg
500 Reconnects Port Wear Test 1	T_A = 25°C 500 connections performed on each transceiver paired with one each connectored cable.	Electrical and optical measurements on all transceivers at 100, 200, 300, 400 and 500 connections	4 transceivers paired with 4 connectored cables of different manufacturer.	"Pt Av" variation: -0.33 dBm max.; "Pr mid 4.0" variation. -0.06 dBm max.
500 Reconnects Port Wear Test 2	T_A = 25°C 500 connections performed on each transceiver paired with one each connectored cable. Live Monitor "Pt Av."	Electrical and optical measurements on all transceivers at 100, 200, 300, 400 and 500 connections.	4 transceivers paired with 2 connectored cables of different manufacturer; one cable paired with 2 transceivers	"Pt Av" variation: -0.19 dBm max.

3. Electrostatic Discharge Information

(Testing done on a constructional basis)

Test	Conditions	Duration	Sample Size (HFBR-5103)	Failure
ESD 1	MIL-STD-883 Method 3015.4 (Human Body Model)	2200 V (Class 2)	9	0
ESD 2	EIAJ#1988.3.2B, Version 2, C = 200 pF, R = 0 (Machine model)	Apply + then - voltage to each pin and GND once, 100 volts	5	0
ESD 3	IEC 801.2, 25 kV (Simulation of discharges from human body to D.U.T.)	10 single discharges min. applied repeatedly about the top, bottom, sides and front of receptacle. Repeat test with discharges applied to the top of entire module.	13	0

Note 1: Both the Transmitter and Receiver of each transceiver were connected by a loop-back connectored cable in this test and operated in a self-oscillation mode.

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Data subject to change.

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