

MTBF

Report of Apacer products, SATA SSD Series

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Version 2.5



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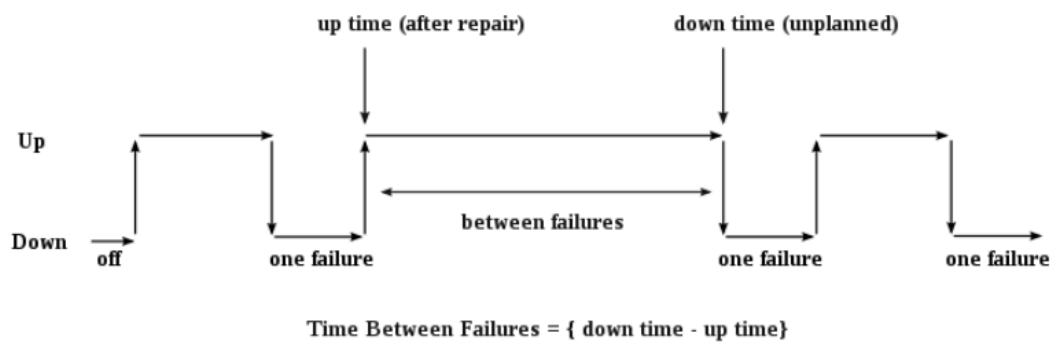
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MTBF

OVERVIEW

MTBF, stands for mean time between failures, is the average time between failures of hardware modules. It is the average time a manufacturer estimates before a failure occurs in a hardware module.



*This figure depicts the background of MTBF calculation and is granted by its author to anyone using this work for any purpose. For further detail, refer to http://en.wikipedia.org/wiki/File:Time_between_failures.svg

In above figure, downtime is the momentary period it went down uptime. The difference of downtime subtracts by uptime is the amount of time between the two events, which is the time between failures.

MTBF plays an important role in the development of products. Engineers of reliability and design engineers often utilize reliability applications to figure out a product's MTBF according to various methods/standards and to put efforts on the yield rate in the production.

MTBF PREDICTION

Apacer's MTBF prediction adopts and complies with Bellcore analysis method 1. Assuming device failure rate can be generated by the sum of failure rates in each component, then, a steady state failure rate can be expressed as below equation.

$$\lambda_{ss} = \pi_E \sum_{i=1}^m (N_i \lambda_{SSi})$$

m : number of component types

λ_{ss} : device failure rate at steady state

N_i : quantity of i type component

λ_{SSi} : failure rate for i type component at steady state

π_E : device environment factor

PROCEDURE OF MTBF CALCULATION

1. Collect characteristic information of the product.
2. Prepare bill of material (BOM) and component specifications.
3. Analyze BOM and produce component parameters.
4. Determine calculation equation for every component.
5. Calculate failure rates of each component.
6. Generate product failure rate and MTBF.

CALCULATED MTBF (HOURS) BY PRODUCTS

No.	Project	MTBF
1	SDM	$\geq 2.16 \times 10^6$ (hrs)
2	SAFD25P(-M)	$\geq 1.34 \times 10^6$ (hrs)
3	SAFD18P-M	$\geq 1.56 \times 10^6$ (hrs)
4	SAFD25M4(-M)	$\geq 1.73 \times 10^6$ (hrs)
5	SDM4(-M)	$\geq 1.86 \times 10^6$ (hrs)
6	SDC4	$\geq 2.15 \times 10^6$ (hrs)
7	SAFD18S4(-M)	$\geq 1.82 \times 10^6$ (hrs)
8	mSATA(-M)	$\geq 2.55 \times 10^6$ (hrs)
9	mSATA mini M4(-M)	$\geq 2.78 \times 10^6$ (hrs)
10	SFD25A-M	$\geq 1.07 \times 10^6$ (hrs)
11	mSATA A1-M	$\geq 1.91 \times 10^6$ (hrs)
12	mSATA A1	$\geq 2.29 \times 10^6$ (hrs)
13	mSATA H1 (-M)	$\geq 3.24 \times 10^6$ (hrs)
14	mSATA mini H1 (-M)	$\geq 3.69 \times 10^6$ (hrs)

REVISION HISTORY

<u>Revision</u>	<u>Date</u>	<u>Description</u>	<u>Issuer</u>
0.1	Aug 11, 2009	Preliminary release	Sheng-Wei Yu
1.0	Aug 20, 2009	Formal version release	Sheng-Wei Yu
1.1	Aug 29, 2009	Update MTBF for SDMI	Sheng-Wei Yu
1.2	Aug 31, 2009	Update MTBF for SAFD18S, SAFD181	Sheng-Wei Yu
1.3	Dec 09, 2009	Update references source	Sheng-Wei Yu
1.4	Jul 22, 2011	Update MTBF for SAFD255, SAFD25M3, SDM3, SAFD18S3	Sheng-Wei Yu
1.5	Nov 04, 2011	Update MTBF for SAFD25P, SAFD25P-M	Sheng-Wei Yu
1.6	Nov 25, 2011	Update MTBF for SAFD18P-M, SAFD25M4, SDM4, SDC4, SAFD18S4-M, SAFD18S4	Sheng-Wei Yu
1.7	Nov 29, 2011	Update MTBF for SAFD25M4-M	Sheng-Wei Yu
1.8	Feb 13, 2012	Update MTBF for mSATA M4, mSATA M4-M	Sheng-Wei Yu

<u>Revision</u>	<u>Date</u>	<u>Description</u>	<u>Issuer</u>
1.9	Jun 27, 2012	Update MTBF for SAFD254, 8/16/32(GB), commercial	Sheng-Wei Yu
2.0	Nov 14, 2012	Update MTBF for SAFD18S5-M/mSATA S1-M	Sheng-Wei Yu
2.1	Jul 06, 2013	Update MTBF for mSATA minin M4(-M) Combine MTFB for SLC/MLC	Sheng-Wei Yu
2.2	Jul 07, 2013	Delete MTBF for SAFD25M2(-M)/SAFD254(-M)/SDCII SDMII(-M)/SAFD18S(-M)/SAFD181(-M)/SAFD255/ SAFD25M3/SDM3/SAFD18S3/SAFD18S5-M/mSATA S1-M	Sheng-Wei Yu
2.3	Oct 7, 2013	Update MTBF for SFD25A-M	Sheng-Wei Yu
2.4	Jan 14, 2015	Update MTBF for mSATA A1-M/mSATA A1	Sheng-Wei Yu
2.5	May 26, 2015	Update MTBF for mSATA H1 (-M)/ mSATA mini H1 (-M)	Sheng-Wei Yu

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