

MTBF

***Report of Apacer products, SATA SSD Series***

**Dec, 2009**

*Version 1.3*



***Apacer Technology Inc.***

4<sup>th</sup> Fl., 75 Xintai 5<sup>th</sup> Rd., Sec.1, Hsichih, Taipei Hsien 221, Taiwan, R.O.C

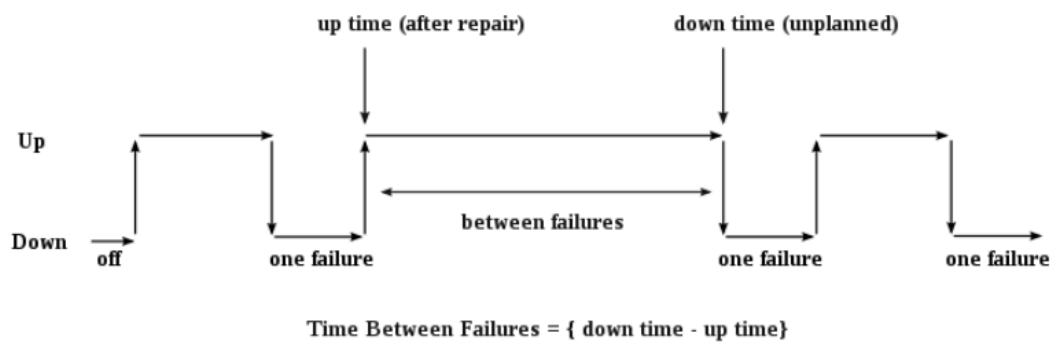
Tel:+886-2-2698-2888

Fax:+886-2-2698-2889

## 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](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
- $\lambda_{SS}$ : device failure rate at steady state
- $N_i$ : quantity of  $i$  type component
- $\lambda_{SSi}$ : failure rate for  $i$  type component at steady state
- $\pi_E$ : 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

<b>Project</b>	<b>MTBF</b>	<b>NAND</b>
<i>SAFD25M2</i>	$\geq 2,060,509$	SLC
<i>SAFD25M2-M</i>	$\geq 1,257,361$	MLC
<i>SAFD254</i>	$\geq 2,298,684$	SLC
<i>SAFD254-M</i>	$\geq 1,281,999$	MLC
<i>SDC II</i>	$\geq 2,087,194$	SLC
<i>SDM</i>	$\geq 2,160,883$	SLC
<i>SDMII</i>	$\geq 2,084,259$	SLC
<i>SDMII-M</i>	$\geq 1,196,568$	MLC
<i>SAFD18S</i>	$\geq 2,139,755$	SLC
<i>SAFD18S-M</i>	$\geq 1,286,433$	MLC
<i>SAFD181</i>	$\geq 2,227,015$	SLC
<i>SAFD181-M</i>	$\geq 1,326,205$	MLC

## REVISION HISTORY

Revision	Date	Description	Remark
0.1	Aug 11, 2009	Preliminary release	
1.0	Aug 20, 2009	Formal version release	
1.1	Aug 29, 2009	Update MTBF for SDMII	
1.2	Aug 31, 2009	Update MTBF for SAFD18S, SAFD181	
1.3	Dec 09, 2009	Update references source	

**Apacer Technology Inc.**

4<sup>th</sup> Fl., 75 Xintai 5<sup>th</sup> Rd. Sec.1  
Hsichih, Taipei County 221, Taiwan  
Tel: +886-2-2698-2888 Fax: +886-2-2698-2889  
[www.apacer.com](http://www.apacer.com)

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