

# Failure rate (MTBF(MTTF))

Device: RTC

It is reported failure rate as follows. This is based on JIS-C5003.

# Reliability result of High temperature bias test.

$$T_a = 125^{\circ}\text{C}$$

$$t = 1000\text{h}$$

$$n = 160\text{pcs.}$$

$$R = 0\text{pc.}$$

$$\text{Device Hours} = 160 \times 1000 = 160000 \text{ (h)}$$

# Case1: Operating temperature  $T_a = 40^{\circ}\text{C}$

(Activation energy;  $E_a=0.7\text{eV}$ , Confidence level=60%)

Temperature acceleration factor from  $(40+273)\text{K}$  to  $(125+273)\text{K} = 0.0039$

Equivalent time =  $160000/0.0039 = 0.408\text{E}8 \text{ (h)}$

Failure rate ( $\lambda$ ) =  $0.917/(0.408\text{E}8) = 22\text{E}(-9) = \mathbf{22 \text{ FIT}}$

MTBF = MTTF =  $\mathbf{4.45\text{E}7 \text{ (h)}}$

# Case2: Operating temperature  $T_a = 55^{\circ}\text{C}$

(Activation energy;  $E_a=0.7\text{eV}$ , Confidence level=60%)

Temperature acceleration factor from  $(55+273)\text{K}$  to  $(125+273)\text{K} = 0.0128$

Equivalent time =  $160000/0.0128 = 0.125\text{E}8 \text{ (h)}$

Failure rate ( $\lambda$ ) =  $0.917/(0.125\text{E}8) = 74\text{E}(-9) = \mathbf{74 \text{ FIT}}$

MTBF = MTTF =  $\mathbf{1.36\text{E}7 \text{ (h)}}$

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