

Failure rate (MTBF(MTTF))

Device: **Power Management ICs**

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

Reliability result of High temperature bias test.

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

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

$$n = 320\text{pcs.}$$

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

$$\text{Device Hours} = 320 \times 1000 = 320000 \text{ (h)}$$

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 = $320000/0.0039 = 0.816\text{E}8 \text{ (h)}$

Failure rate (λ) = $0.917/(0.816\text{E}8) = 11\text{E}(-9) = \mathbf{11 \text{ FIT}}$

MTBF = MTTF = **8.9E7 (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 = $320000/0.0128 = 0.249\text{E}8 \text{ (h)}$

Failure rate (λ) = $0.917/(0.249\text{E}8) = 37\text{E}(-9) = \mathbf{37 \text{ FIT}}$

MTBF = MTTF = **2.72E7 (h)**