

# RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RA4E1  
DEVICE : R7FA4E1XXX  
APPLICATION : Consumer / Industry

Quality Assurance Div.  
Renesas Electronics Corporation

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**Table. Reliability test results (QFP)**

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 °C, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 300 cycles	0/22	
Latch-Up (LU)	JESD78	Pulse Current Injection, I=+/-150 mA	0/3	
Electrostatic discharge (ESD-HBM)	JS-001	1.5 kΩ, 100 pF, +/-2000 V, 1 time	0/3	Class: 2
Electrostatic discharge (ESD-CDM)	JESD22-C101	+/-500V,1time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 °C, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

\*1) With preconditioning per JESD22-A113, MSL 3

·It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :

Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

**Table. Reliability test results (QFN)**

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 °C, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 300 cycles	0/22	
Latch-Up (LU)	JESD78	Pulse Current Injection, I=+/-150 mA	0/3	
Electrostatic discharge (ESD-HBM)	JS-001	1.5 kΩ, 100 pF, +/-2000 V, 1 time	0/3	Class: 2
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Note :

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The failure rate of the device in an actual use condition can be estimated by the below procedure.

**•Equation for the failure rate estimation ( $\lambda$ )**

$$\lambda = \lambda_b \times \pi T \text{ (FIT)}$$

① Unique failure rate ( $\lambda_b$ )

$$\lambda_b = 0.08 \text{ FIT}$$

Unique failure rate at  $T_a = 55^\circ\text{C}$  using 60 % confidence level.

② Temperature term ( $\pi T$ )

$$\pi T = \exp\{11600 \times E_a \times (1/(273+55) - 1/(273+T_a))\}$$

$E_a$  : Activation energy (eV)

$T_a$  : Ambient temperature ( $^\circ\text{C}$ )

$\pi T$ simplified chart as $E_a = 0.7 \text{ eV}$												
$T_a$ ( $^\circ\text{C}$ )	40	50	55	60	65	70	75	80	85	90	100	110
$\pi T$	0.31	0.68	1	1.45	2.08	2.95	4.15	5.77	7.96	10.88	19.82	34.99

**•MTTF ( Mean Time To Failure )**

$$MTTF = 1/\lambda$$

## Reference about Renesas package code

Package type		Package code *1
Lead type plastic package	QFP	PxQP
Non-lead type plastic package	QFN	PxQN
Grid array type plastic package	BGA	PxBG
	LGA	PxLG

\*1. First four digit

Table. Product list

No	Group	Product part number	Package code	No	Group	Product part number	Package code
1	RA4E1	R7FA4E10B2CFM	PLQP0064K*	51			
2	RA4E1	R7FA4E10D2CFM	PLQP0064K*	52			
3	RA4E1	R7FA4E10B2CNE	PWQN0048K*	53			
4	RA4E1	R7FA4E10D2CNE	PWQN0048K*	54			
5				55			
6				56			
7				57			
8				58			
9				59			
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49				99			
50				100			