

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX110
DEVICE : R5F5110XXX
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)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
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
Electrostatic discharge (ESD-CDM)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
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 (LGA)

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=-55 °C to 125 °C , 500 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)	JEITA ED-4701/302	+/-1000V,1time	0/3	Class: Equivalent to C2b
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 .

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

• **Equation for the failure rate estimation (λ)**

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

① Unique failure rate (λ_b)

$$\lambda_b = 3.8 \text{ FIT}$$

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

② Temperature term (πT)

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

E_a : Activation energy (eV)

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

πT 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
πT	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	RX110	R5F51101ADFK	PLQP0064G*	51	RX110	R5F51101AGNF	PWQN0040K*
2	RX110	R5F51101AGFK	PLQP0064G*	52	RX110	R5F51103ADNF	PWQN0040K*
3	RX110	R5F51103ADFK	PLQP0064G*	53	RX110	R5F51103AGNF	PWQN0040K*
4	RX110	R5F51103AGFK	PLQP0064G*	54	RX110	R5F5110HADNF	PWQN0040K*
5	RX110	R5F51104ADFK	PLQP0064G*	55	RX110	R5F5110HAGNF	PWQN0040K*
6	RX110	R5F51104AGFK	PLQP0064G*	56	RX110	R5F5110JADNF	PWQN0040K*
7	RX110	R5F51105ADFK	PLQP0064G*	57	RX110	R5F5110JAGNF	PWQN0040K*
8	RX110	R5F51105AGFK	PLQP0064G*	58			
9	RX110	R5F5110JADFK	PLQP0064G*	59			
10	RX110	R5F5110JAGFK	PLQP0064G*	60			
11	RX110	R5F51101ADFL	PLQP0048K*	61			
12	RX110	R5F51101AGFL	PLQP0048K*	62			
13	RX110	R5F51103ADFL	PLQP0048K*	63			
14	RX110	R5F51103AGFL	PLQP0048K*	64			
15	RX110	R5F51104ADFL	PLQP0048K*	65			
16	RX110	R5F51104AGFL	PLQP0048K*	66			
17	RX110	R5F51105ADFL	PLQP0048K*	67			
18	RX110	R5F51105AGFL	PLQP0048K*	68			
19	RX110	R5F5110JADFL	PLQP0048K*	69			
20	RX110	R5F5110JAGFL	PLQP0048K*	70			
21	RX110	R5F51101ADFM	PLQP0064K*	71			
22	RX110	R5F51101AGFM	PLQP0064K*	72			
23	RX110	R5F51103ADFM	PLQP0064K*	73			
24	RX110	R5F51103AGFM	PLQP0064K*	74			
25	RX110	R5F51104ADFM	PLQP0064K*	75			
26	RX110	R5F51104AGFM	PLQP0064K*	76			
27	RX110	R5F51105ADFM	PLQP0064K*	77			
28	RX110	R5F51105AGFM	PLQP0064K*	78			
29	RX110	R5F5110JADFM	PLQP0064K*	79			
30	RX110	R5F5110JAGFM	PLQP0064K*	80			
31	RX110	R5F51101ADLF	PWLG0064K*	81			
32	RX110	R5F51103ADLF	PWLG0064K*	82			
33	RX110	R5F51104ADLF	PWLG0064K*	83			
34	RX110	R5F51105ADLF	PWLG0064K*	84			
35	RX110	R5F5110JADLF	PWLG0064K*	85			
36	RX110	R5F51101ADLM	PWLG0036K*	86			
37	RX110	R5F51103ADLM	PWLG0036K*	87			
38	RX110	R5F5110HADLM	PWLG0036K*	88			
39	RX110	R5F5110JADLM	PWLG0036K*	89			
40	RX110	R5F51101ADNE	PWQN0048K*	90			
41	RX110	R5F51101AGNE	PWQN0048K*	91			
42	RX110	R5F51103ADNE	PWQN0048K*	92			
43	RX110	R5F51103AGNE	PWQN0048K*	93			
44	RX110	R5F51104ADNE	PWQN0048K*	94			
45	RX110	R5F51104AGNE	PWQN0048K*	95			
46	RX110	R5F51105ADNE	PWQN0048K*	96			
47	RX110	R5F51105AGNE	PWQN0048K*	97			
48	RX110	R5F5110JADNE	PWQN0048K*	98			
49	RX110	R5F5110JAGNE	PWQN0048K*	99			
50	RX110	R5F51101ADNF	PWQN0040K*	100			