

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX111
DEVICE : R5F5111XXX
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	RX111	R5F51111ADFK	PLQP0064G*	51	RX111	R5F51114ADLF	PWLG0064K*
2	RX111	R5F51111AGFK	PLQP0064G*	52	RX111	R5F51115ADLF	PWLG0064K*
3	RX111	R5F51113ADFK	PLQP0064G*	53	RX111	R5F51116ADLF	PWLG0064K*
4	RX111	R5F51113AGFK	PLQP0064G*	54	RX111	R5F51117ADLF	PWLG0064K*
5	RX111	R5F51114ADFK	PLQP0064G*	55	RX111	R5F51118ADLF	PWLG0064K*
6	RX111	R5F51114AGFK	PLQP0064G*	56	RX111	R5F5111JADLF	PWLG0064K*
7	RX111	R5F51115ADFK	PLQP0064G*	57	RX111	R5F51111ADLM	PWLG0036K*
8	RX111	R5F51115AGFK	PLQP0064G*	58	RX111	R5F51113ADLM	PWLG0036K*
9	RX111	R5F51116ADFK	PLQP0064G*	59	RX111	R5F5111JADLM	PWLG0036K*
10	RX111	R5F51116AGFK	PLQP0064G*	60	RX111	R5F51111ADNE	PWQN0048K*
11	RX111	R5F51117ADFK	PLQP0064G*	61	RX111	R5F51111AGNE	PWQN0048K*
12	RX111	R5F51117AGFK	PLQP0064G*	62	RX111	R5F51113ADNE	PWQN0048K*
13	RX111	R5F51118ADFK	PLQP0064G*	63	RX111	R5F51113AGNE	PWQN0048K*
14	RX111	R5F51118AGFK	PLQP0064G*	64	RX111	R5F51114ADNE	PWQN0048K*
15	RX111	R5F5111JADFK	PLQP0064G*	65	RX111	R5F51114AGNE	PWQN0048K*
16	RX111	R5F5111JAGFK	PLQP0064G*	66	RX111	R5F51115ADNE	PWQN0048K*
17	RX111	R5F51111ADFL	PLQP0048K*	67	RX111	R5F51115AGNE	PWQN0048K*
18	RX111	R5F51111AGFL	PLQP0048K*	68	RX111	R5F51116ADNE	PWQN0048K*
19	RX111	R5F51113ADFL	PLQP0048K*	69	RX111	R5F51116AGNE	PWQN0048K*
20	RX111	R5F51113AGFL	PLQP0048K*	70	RX111	R5F51117ADNE	PWQN0048K*
21	RX111	R5F51114ADFL	PLQP0048K*	71	RX111	R5F51117AGNE	PWQN0048K*
22	RX111	R5F51114AGFL	PLQP0048K*	72	RX111	R5F51118ADNE	PWQN0048K*
23	RX111	R5F51115ADFL	PLQP0048K*	73	RX111	R5F51118AGNE	PWQN0048K*
24	RX111	R5F51115AGFL	PLQP0048K*	74	RX111	R5F5111JADNE	PWQN0048K*
25	RX111	R5F51116ADFL	PLQP0048K*	75	RX111	R5F5111JAGNE	PWQN0048K*
26	RX111	R5F51116AGFL	PLQP0048K*	76	RX111	R5F51111ADNF	PWQN0040K*
27	RX111	R5F51117ADFL	PLQP0048K*	77	RX111	R5F51111AGNF	PWQN0040K*
28	RX111	R5F51117AGFL	PLQP0048K*	78	RX111	R5F51113ADNF	PWQN0040K*
29	RX111	R5F51118ADFL	PLQP0048K*	79	RX111	R5F51113AGNF	PWQN0040K*
30	RX111	R5F51118AGFL	PLQP0048K*	80	RX111	R5F5111JADNF	PWQN0040K*
31	RX111	R5F5111JADFL	PLQP0048K*	81	RX111	R5F5111JAGNF	PWQN0040K*
32	RX111	R5F5111JAGFL	PLQP0048K*	82			
33	RX111	R5F51111ADFM	PLQP0064K*	83			
34	RX111	R5F51111AGFM	PLQP0064K*	84			
35	RX111	R5F51113ADFM	PLQP0064K*	85			
36	RX111	R5F51113AGFM	PLQP0064K*	86			
37	RX111	R5F51114ADFM	PLQP0064K*	87			
38	RX111	R5F51114AGFM	PLQP0064K*	88			
39	RX111	R5F51115ADFM	PLQP0064K*	89			
40	RX111	R5F51115AGFM	PLQP0064K*	90			
41	RX111	R5F51116ADFM	PLQP0064K*	91			
42	RX111	R5F51116AGFM	PLQP0064K*	92			
43	RX111	R5F51117ADFM	PLQP0064K*	93			
44	RX111	R5F51117AGFM	PLQP0064K*	94			
45	RX111	R5F51118ADFM	PLQP0064K*	95			
46	RX111	R5F51118AGFM	PLQP0064K*	96			
47	RX111	R5F5111JADFM	PLQP0064K*	97			
48	RX111	R5F5111JAGFM	PLQP0064K*	98			
49	RX111	R5F51111ADLF	PWLG0064K*	99			
50	RX111	R5F51113ADLF	PWLG0064K*	100			