

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX231
DEVICE : R5F5231XXX
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	RX231	R5F52315ADFL	PLQP0048K*	51	RX231	R5F52316ADLA	PTLG0100K*
2	RX231	R5F52315AGFL	PLQP0048K*	52	RX231	R5F52316CDLA	PTLG0100K*
3	RX231	R5F52315CDFL	PLQP0048K*	53	RX231	R5F52317ADLA	PTLG0100K*
4	RX231	R5F52315CGFL	PLQP0048K*	54	RX231	R5F52317BDLA	PTLG0100K*
5	RX231	R5F52316ADFL	PLQP0048K*	55	RX231	R5F52318ADLA	PTLG0100K*
6	RX231	R5F52316AGFL	PLQP0048K*	56	RX231	R5F52318BDLA	PTLG0100K*
7	RX231	R5F52316CDFL	PLQP0048K*	57	RX231	R5F52315CDLF	PWLG0064K*
8	RX231	R5F52316CGFL	PLQP0048K*	58	RX231	R5F52316CDLF	PWLG0064K*
9	RX231	R5F52317ADFL	PLQP0048K*	59	RX231	R5F52315ADND	PWQN0064K*
10	RX231	R5F52317AGFL	PLQP0048K*	60	RX231	R5F52315AGND	PWQN0064K*
11	RX231	R5F52317BDFL	PLQP0048K*	61	RX231	R5F52315CDND	PWQN0064K*
12	RX231	R5F52317BGFL	PLQP0048K*	62	RX231	R5F52315CGND	PWQN0064K*
13	RX231	R5F52318ADFL	PLQP0048K*	63	RX231	R5F52316ADND	PWQN0064K*
14	RX231	R5F52318AGFL	PLQP0048K*	64	RX231	R5F52316AGND	PWQN0064K*
15	RX231	R5F52318BDFL	PLQP0048K*	65	RX231	R5F52316CDND	PWQN0064K*
16	RX231	R5F52318BGFL	PLQP0048K*	66	RX231	R5F52316CGND	PWQN0064K*
17	RX231	R5F52315ADFM	PLQP0064K*	67	RX231	R5F52317ADND	PWQN0064K*
18	RX231	R5F52315AGFM	PLQP0064K*	68	RX231	R5F52317AGND	PWQN0064K*
19	RX231	R5F52315CDFM	PLQP0064K*	69	RX231	R5F52317BDND	PWQN0064K*
20	RX231	R5F52315CGFM	PLQP0064K*	70	RX231	R5F52317BGND	PWQN0064K*
21	RX231	R5F52316ADFM	PLQP0064K*	71	RX231	R5F52318ADND	PWQN0064K*
22	RX231	R5F52316AGFM	PLQP0064K*	72	RX231	R5F52318AGND	PWQN0064K*
23	RX231	R5F52316CDFM	PLQP0064K*	73	RX231	R5F52318BDND	PWQN0064K*
24	RX231	R5F52316CGFM	PLQP0064K*	74	RX231	R5F52318BGND	PWQN0064K*
25	RX231	R5F52317ADFM	PLQP0064K*	75	RX231	R5F52315ADNE	PWQN0048K*
26	RX231	R5F52317AGFM	PLQP0064K*	76	RX231	R5F52315AGNE	PWQN0048K*
27	RX231	R5F52317BDFM	PLQP0064K*	77	RX231	R5F52315CDNE	PWQN0048K*
28	RX231	R5F52317BGFM	PLQP0064K*	78	RX231	R5F52315CGNE	PWQN0048K*
29	RX231	R5F52318ADFM	PLQP0064K*	79	RX231	R5F52316ADNE	PWQN0048K*
30	RX231	R5F52318AGFM	PLQP0064K*	80	RX231	R5F52316AGNE	PWQN0048K*
31	RX231	R5F52318BDFM	PLQP0064K*	81	RX231	R5F52316CDNE	PWQN0048K*
32	RX231	R5F52318BGFM	PLQP0064K*	82	RX231	R5F52316CGNE	PWQN0048K*
33	RX231	R5F52315ADFP	PLQP0100K*	83	RX231	R5F52317ADNE	PWQN0048K*
34	RX231	R5F52315AGFP	PLQP0100K*	84	RX231	R5F52317AGNE	PWQN0048K*
35	RX231	R5F52315CDFP	PLQP0100K*	85	RX231	R5F52317BDNE	PWQN0048K*
36	RX231	R5F52315CGFP	PLQP0100K*	86	RX231	R5F52317BGNE	PWQN0048K*
37	RX231	R5F52316ADFP	PLQP0100K*	87	RX231	R5F52318ADNE	PWQN0048K*
38	RX231	R5F52316AGFP	PLQP0100K*	88	RX231	R5F52318AGNE	PWQN0048K*
39	RX231	R5F52316CDFP	PLQP0100K*	89	RX231	R5F52318BDNE	PWQN0048K*
40	RX231	R5F52316CGFP	PLQP0100K*	90	RX231	R5F52318BGNE	PWQN0048K*
41	RX231	R5F52317ADFP	PLQP0100K*	91			
42	RX231	R5F52317AGFP	PLQP0100K*	92			
43	RX231	R5F52317BDFP	PLQP0100K*	93			
44	RX231	R5F52317BGFP	PLQP0100K*	94			
45	RX231	R5F52318ADFP	PLQP0100K*	95			
46	RX231	R5F52318AGFP	PLQP0100K*	96			
47	RX231	R5F52318BDFP	PLQP0100K*	97			
48	RX231	R5F52318BGFP	PLQP0100K*	98			
49	RX231	R5F52315ADLA	PTLG0100K*	99			
50	RX231	R5F52315CDLA	PTLG0100K*	100			