

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX23E-B
DEVICE : R5F523EXXX (RX23E-B)
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
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 (BGA)

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)	JESD22-C101	+/-500V,1time	0/3	Class: C2
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	RX23E-B	R5F523E5LDBS	PTBG0100K*	51	RX23E-B	R5F523E6BDNF	PWQN0040K*
2	RX23E-B	R5F523E5LGBS	PTBG0100K*	52	RX23E-B	R5F523E6BGNF	PWQN0040K*
3	RX23E-B	R5F523E5NDBS	PTBG0100K*	53	RX23E-B	R5F523E6KDNF	PWQN0040K*
4	RX23E-B	R5F523E5NGBS	PTBG0100K*	54	RX23E-B	R5F523E6KGNF	PWQN0040K*
5	RX23E-B	R5F523E6LDBS	PTBG0100K*	55	RX23E-B	R5F523E6MDNF	PWQN0040K*
6	RX23E-B	R5F523E6LGBS	PTBG0100K*	56	RX23E-B	R5F523E6MGNF	PWQN0040K*
7	RX23E-B	R5F523E6NDBS	PTBG0100K*	57			
8	RX23E-B	R5F523E6NGBS	PTBG0100K*	58			
9	RX23E-B	R5F523E5BDFL	PLQP0048K*	59			
10	RX23E-B	R5F523E5BGFL	PLQP0048K*	60			
11	RX23E-B	R5F523E5MDFL	PLQP0048K*	61			
12	RX23E-B	R5F523E5MGFL	PLQP0048K*	62			
13	RX23E-B	R5F523E6BDFL	PLQP0048K*	63			
14	RX23E-B	R5F523E6BGFL	PLQP0048K*	64			
15	RX23E-B	R5F523E6MDFL	PLQP0048K*	65			
16	RX23E-B	R5F523E6MGFL	PLQP0048K*	66			
17	RX23E-B	R5F523E5BDFM	PLQP0064K*	67			
18	RX23E-B	R5F523E5BGFM	PLQP0064K*	68			
19	RX23E-B	R5F523E5KDFM	PLQP0064K*	69			
20	RX23E-B	R5F523E5KGFM	PLQP0064K*	70			
21	RX23E-B	R5F523E5MDFM	PLQP0064K*	71			
22	RX23E-B	R5F523E5MGFM	PLQP0064K*	72			
23	RX23E-B	R5F523E6BDFM	PLQP0064K*	73			
24	RX23E-B	R5F523E6BGFM	PLQP0064K*	74			
25	RX23E-B	R5F523E6KDFM	PLQP0064K*	75			
26	RX23E-B	R5F523E6KGFM	PLQP0064K*	76			
27	RX23E-B	R5F523E6MDFM	PLQP0064K*	77			
28	RX23E-B	R5F523E6MGFM	PLQP0064K*	78			
29	RX23E-B	R5F523E5JDFN	PLQP0080K*	79			
30	RX23E-B	R5F523E5JGFN	PLQP0080K*	80			
31	RX23E-B	R5F523E5NDFN	PLQP0080K*	81			
32	RX23E-B	R5F523E5NGFN	PLQP0080K*	82			
33	RX23E-B	R5F523E6JDFN	PLQP0080K*	83			
34	RX23E-B	R5F523E6JGFN	PLQP0080K*	84			
35	RX23E-B	R5F523E6NDFN	PLQP0080K*	85			
36	RX23E-B	R5F523E6NGFN	PLQP0080K*	86			
37	RX23E-B	R5F523E5LDFP	PLQP0100K*	87			
38	RX23E-B	R5F523E5LGFP	PLQP0100K*	88			
39	RX23E-B	R5F523E5NDFP	PLQP0100K*	89			
40	RX23E-B	R5F523E5NGFP	PLQP0100K*	90			
41	RX23E-B	R5F523E6LDFP	PLQP0100K*	91			
42	RX23E-B	R5F523E6LGFP	PLQP0100K*	92			
43	RX23E-B	R5F523E6NDFP	PLQP0100K*	93			
44	RX23E-B	R5F523E6NGFP	PLQP0100K*	94			
45	RX23E-B	R5F523E5BDNF	PWQN0040K*	95			
46	RX23E-B	R5F523E5BGNF	PWQN0040K*	96			
47	RX23E-B	R5F523E5KDNF	PWQN0040K*	97			
48	RX23E-B	R5F523E5KGNF	PWQN0040K*	98			
49	RX23E-B	R5F523E5MDNF	PWQN0040K*	99			
50	RX23E-B	R5F523E5MGNF	PWQN0040K*	100			