Report No. MCR-22-0250
April 19,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RA2E1

DEVICE : R7FA2E1XXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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(Rev.5.0-2 October 2020)

Table. Reliability test results (QFP)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 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, +/-1000 V, 1 time	0/3	Class: 1C
Electrostatic discharge (ESD-CDM)	JESD22-C101	+/-500V,1time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 ℃, 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 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 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, +/-1000 V, 1 time	0/3	Class: 1C
Electrostatic discharge (ESD-CDM)	JESD22-C101	+/-500V,1time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 ℃, 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 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 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, +/-1000 V, 1 time	0/3	Class: 1C
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 .

Table. Reliability test results (LGA)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 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, +/-1000 V, 1 time	0/3	Class: 1C
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)

$$\lambda = \lambda b \times \pi T \quad (FIT)$$

①Unique failure rate (λb)

λb= 4.1 FIT

Unique failure rate at Ta=55 ℃ using 60 % confidence level.

②Temperature term (πT)

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

Ea : Activation energy (eV)
Ta : Ambient temperature (℃)

πT simplified chart as Ea=0.7 eV												
Ta (℃)	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
1	RA2E1	R7FA2E1A72DBU	PVBG0064L*
2	RA2E1	R7FA2E1A73CBU	PVBG0064L*
3	RA2E1	R7FA2E1A92DBU	PVBG0064L*
4	RA2E1	R7FA2E1A93CBU	PVBG0064L*
5	RA2E1	R7FA2E1A52DFJ	PLQP0032G*
6	RA2E1	R7FA2E1A53CFJ	PLQP0032G*
7	RA2E1	R7FA2E1A72DFJ	PLQP0032G*
8	RA2E1	R7FA2E1A73CFJ	PLQP0032G*
9	RA2E1	R7FA2E1A92DFJ	PLQP0032G*
10	RA2E1	R7FA2E1A93CFJ	PLQP0032G*
11	RA2E1	R7FA2E1A72DFK	PLQP0064G*
12	RA2E1	R7FA2E1A73CFK	PLQP0064G*
13	RA2E1	R7FA2E1A92DFK	PLQP0064G*
14	RA2E1	R7FA2E1A93CFK	PLQP0064G*
15	RA2E1	R7FA2E1A52DFL	PLQP0048K*
16	RA2E1	R7FA2E1A53CFL	PLQP0048K*
17	RA2E1	R7FA2E1A72DFL	PLQP0048K*
18	RA2E1	R7FA2E1A73CFL	PLQP0048K*
19	RA2E1	R7FA2E1A92DFL	PLQP0048K*
20	RA2E1	R7FA2E1A93CFL	PLQP0048K*
21	RA2E1	R7FA2E1A72DFM	PLQP0064K*
22	RA2E1	R7FA2E1A73CFM	PLQP0064K*
23	RA2E1	R7FA2E1A92DFM	PLQP0064K*
24	RA2E1	R7FA2E1A93CFM	PLQP0064K*
25	RA2E1	R7FA2E1A52DLM	PWLG0036K*
26	RA2E1	R7FA2E1A53CLM	PWLG0036K*
27	RA2E1	R7FA2E1A72DLM	PWLG0036K*
28	RA2E1	R7FA2E1A73CLM	PWLG0036K*
29	RA2E1	R7FA2E1A92DLM	PWLG0036K*
30	RA2E1	R7FA2E1A93CLM	PWLG0036K*
31	RA2E1	R7FA2E1A52DNE	PWQN0048K*
32	RA2E1	R7FA2E1A53CNE	PWQN0048K*
33	RA2E1	R7FA2E1A72DNE	PWQN0048K*
34	RA2E1	R7FA2E1A73CNE	PWQN0048K*
35	RA2E1	R7FA2E1A92DNE	PWQN0048K*
36	RA2E1	R7FA2E1A93CNE	PWQN0048K*
37	RA2E1	R7FA2E1A52DNH	PWQN0032K*
38	RA2E1	R7FA2E1A53CNH	PWQN0032K*
39	RA2E1	R7FA2E1A72DNH	PWQN0032K*
40	RA2E1	R7FA2E1A73CNH	PWQN0032K*
41	RA2E1	R7FA2E1A92DNH	PWQN0032K*
42	RA2E1	R7FA2E1A93CNH	PWQN0032K*
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No	Group	Product part number	Package code
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