Report No. MCR-22-0606
September 01,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/G1A

DEVICE : R5F10EXXX

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, +/-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 ℃, 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, +/-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 ℃, 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, +/-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 .

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, +/-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)

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

①Unique failure rate (λb)

λb= 3.8 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
	SOP	PxSP
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	RL78/G1A	R5F10E8AALA	PWLG0025K*
2	RL78/G1A	R5F10E8AGLA	PWLG0025K*
3	RL78/G1A	R5F10E8CALA	PWLG0025K*
4	RL78/G1A	R5F10E8CGLA	PWLG0025K*
5	RL78/G1A	R5F10E8DALA	PWLG0025K*
6	RL78/G1A	R5F10E8DGLA	PWLG0025K*
7	RL78/G1A	R5F10E8EALA	PWLG0025K*
8	RL78/G1A	R5F10E8EGLA	PWLG0025K*
9	RL78/G1A	R5F10EBAANA	PWQN0032K*
10	RL78/G1A	R5F10EBAGNA	PWQN0032K*
11	RL78/G1A	R5F10EBCANA	PWQN0032K*
12	RL78/G1A	R5F10EBCGNA	PWQN0032K*
13	RL78/G1A	R5F10EBDANA	PWQN0032K*
14	RL78/G1A	R5F10EBDGNA	PWQN0032K*
15	RL78/G1A	R5F10EBEANA	PWQN0032K*
16	RL78/G1A	R5F10EBEGNA	PWQN0032K*
17	RL78/G1A	R5F10EGAAFB	PLQP0048K*
18	RL78/G1A	R5F10EGAANA	PWQN0048K*
19	RL78/G1A	R5F10EGAGFB	PLQP0048K*
20	RL78/G1A	R5F10EGAGNA	PWQN0048K*
21	RL78/G1A	R5F10EGCAFB	PLQP0048K*
22	RL78/G1A	R5F10EGCANA	PWQN0048K*
23	RL78/G1A	R5F10EGCGFB	PLQP0048K*
24	RL78/G1A	R5F10EGCGNA	PWQN0048K*
25	RL78/G1A	R5F10EGDAFB	PLQP0048K*
26	RL78/G1A	R5F10EGDANA	PWQN0048K*
27	RL78/G1A	R5F10EGDGFB	PLQP0048K*
28	RL78/G1A	R5F10EGDGNA	PWQN0048K*
29	RL78/G1A	R5F10EGEAFB	PLQP0048K*
30	RL78/G1A	R5F10EGEANA	PWQN0048K*
31	RL78/G1A	R5F10EGEGFB	PLQP0048K*
32	RL78/G1A	R5F10EGEGNA	PWQN0048K*
33	RL78/G1A	R5F10ELCABG	PVBG0064L*
34	RL78/G1A	R5F10ELCAFB	PLQP0064K*
35	RL78/G1A	R5F10ELCGBG	PVBG0064L*
36	RL78/G1A	R5F10ELCGFB	PLQP0064K*
37	RL78/G1A	R5F10ELDABG	PVBG0064L*
38	RL78/G1A	R5F10ELDAFB	PLQP0064K*
39	RL78/G1A	R5F10ELDGBG	PVBG0064L*
40	RL78/G1A	R5F10ELDGFB	PLQP0064K*
41	RL78/G1A	R5F10ELEABG	PVBG0064L*
42	RL78/G1A	R5F10ELEAFB	PLQP0064K*
43	RL78/G1A	R5F10ELEGBG	PVBG0064L*
44	RL78/G1A	R5F10ELEGFB	PLQP0064K*
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No	Group	Product part number	Package code
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