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RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/G24

DEVICE : R7F101GXXX

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 (SOP)

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 (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= 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
	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	No	Group	Product part number	Package code
1	RL78/G24	R7F101GAE2DSP	PLSP0030J*	51	RL78/G24	R7F101GLG2DFA	PLQP0064J*
2	RL78/G24	R7F101GAE3CSP	PLSP0030J*	52	RL78/G24	R7F101GLG3CFA	PLQP0064J*
3	RL78/G24	R7F101GAE4CSP	PLSP0030J*	53	RL78/G24	R7F101GFE2DFP	PLQP0044G*
4	RL78/G24	R7F101GAG2DSP	PLSP0030J*	54	RL78/G24	R7F101GFE3CFP	PLQP0044G*
5	RL78/G24	R7F101GAG3CSP	PLSP0030J*	55	RL78/G24	R7F101GFG2DFP	PLQP0044G*
6	RL78/G24	R7F101GAG4CSP	PLSP0030J*	56	RL78/G24	R7F101GFG3CFP	PLQP0044G*
7	RL78/G24	R7F101GLE2DFB	PLQP0064K*	57	RL78/G24	R7F101G7E2DNP	PWQN0024K*
8	RL78/G24	R7F101GLE3CFB	PLQP0064K*	58	RL78/G24	R7F101G7E3CNP	PWQN0024K*
9	RL78/G24	R7F101GLG2DFB	PLQP0064K*	59	RL78/G24	R7F101G7E4CNP	PWQN0024K*
10	RL78/G24	R7F101GLG3CFB	PLQP0064K*	60	RL78/G24	R7F101G7G2DNP	PWQN0024K*
11	RL78/G24	R7F101GGE2DNP	PWQN0048K*	61	RL78/G24	R7F101G7G3CNP	PWQN0024K*
12	RL78/G24	R7F101GGE3CNP	PWQN0048K*	62	RL78/G24	R7F101G7G4CNP	PWQN0024K*
13	RL78/G24	R7F101GGG2DNP	PWQN0048K*	63	RL78/G24	R7F101G8E2DLA	PWLG0025K*
14	RL78/G24	R7F101GGG3CNP	PWQN0048K*	64	RL78/G24	R7F101G8E3CLA	PWLG0025K*
15	RL78/G24	R7F101GBE2DNP	PWQN0032K*	65	RL78/G24	R7F101G8G2DLA	PWLG0025K*
16	RL78/G24	R7F101GBE3CNP	PWQN0032K*	66	RL78/G24	R7F101G8G3CLA	PWLG0025K*
17	RL78/G24	R7F101GBE4CNP	PWQN0032K*	67			
18	RL78/G24	R7F101GBG2DNP	PWQN0032K*	68			
19	RL78/G24	R7F101GBG3CNP	PWQN0032K*	69			
20	RL78/G24	R7F101GBG4CNP	PWQN0032K*	70			
21	RL78/G24	R7F101GEE2DNP	PWQN0040K*	71			
22	RL78/G24	R7F101GEE3CNP	PWQN0040K*	72			
23	RL78/G24	R7F101GEE4CNP	PWQN0040K*	73			
24	RL78/G24	R7F101GEG2DNP	PWQN0040K*	74			
25	RL78/G24	R7F101GEG3CNP	PWQN0040K*	75			
26	RL78/G24	R7F101GEG4CNP	PWQN0040K*	76			
27	RL78/G24	R7F101GJE2DFA	PLQP0052J*	77			
28	RL78/G24	R7F101GJE3CFA	PLQP0052J*	78			
29	RL78/G24	R7F101GJE4CFA	PLQP0052J*	79			
30	RL78/G24	R7F101GJG2DFA	PLQP0052J*	80			
31	RL78/G24	R7F101GJG3CFA	PLQP0052J*	81			
32	RL78/G24	R7F101GJG4CFA	PLQP0052J*	82			
33	RL78/G24	R7F101GGE2DFB	PLQP0048K*	83			
34	RL78/G24	R7F101GGE3CFB	PLQP0048K*	84			
35	RL78/G24	R7F101GGE4CFB	PLQP0048K*	85			
36	RL78/G24	R7F101GGG2DFB	PLQP0048K*	86			
37	RL78/G24	R7F101GGG3CFB	PLQP0048K*	87			
38	RL78/G24	R7F101GGG4CFB	PLQP0048K*	88			
39	RL78/G24	R7F101G6E2DSP	PLSP0020J*	89			
40	RL78/G24	R7F101G6E3CSP	PLSP0020J*	90			
41	RL78/G24	R7F101G6E4CSP	PLSP0020J*	91			
42	RL78/G24	R7F101G6G2DSP	PLSP0020J*	92			
43	RL78/G24	R7F101G6G3CSP	PLSP0020J*	93			
44	RL78/G24	R7F101G6G4CSP	PLSP0020J*	94			
45	RL78/G24	R7F101GBE2DFP	PLQP0032G*	95			
46	RL78/G24	R7F101GBE3CFP	PLQP0032G*	96			
47	RL78/G24	R7F101GBG2DFP	PLQP0032G*	97			
48	RL78/G24	R7F101GBG3CFP	PLQP0032G*	98			
49	RL78/G24	R7F101GLE2DFA	PLQP0064J*	99			
50	RL78/G24	R7F101GLE3CFA	PLQP0064J*	100			