Report No. MCR-22-0507
July 15,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/G12

DEVICE : R5F103XXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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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 .

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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 .

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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)

$$MTTF = 1/\lambda$$

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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/G12	R5F10366ASM	PTSP0020J*
2	RL78/G12	R5F10366ASP	PLSP0020J*
3	RL78/G12	R5F10366DSP	PLSP0020J*
4	RL78/G12	R5F10367ASM	PTSP0020J*
5	RL78/G12	R5F10367ASP	PLSP0020J*
6	RL78/G12	R5F10367DSP	PLSP0020J*
7	RL78/G12	R5F10368ASM	PTSP0020J*
8	RL78/G12	R5F10368ASP	PLSP0020J*
9	RL78/G12	R5F10368DSP	PLSP0020J*
10	RL78/G12	R5F10369ASM	PTSP0020J*
11	RL78/G12	R5F10369ASP	PLSP0020J*
12	RL78/G12	R5F10369DSP	PLSP0020J*
13	RL78/G12	R5F1036AASM	PTSP0020J*
14	RL78/G12	R5F1036AASP	PLSP0020J*
15	RL78/G12	R5F1036ADSP	PLSP0020J*
16	RL78/G12	R5F10377ANA	PWQN0024K*
17	RL78/G12	R5F10377DNA	PWQN0024K*
18	RL78/G12	R5F10378ANA	PWQN0024K*
19	RL78/G12	R5F10378DNA	PWQN0024K*
20	RL78/G12	R5F10379ANA	PWQN0024K*
21	RL78/G12	R5F10379DNA	PWQN0024K*
22	RL78/G12	R5F1037AANA	PWQN0024K*
23	RL78/G12	R5F1037ADNA	PWQN0024K*
24	RL78/G12	R5F103A7ASP	PLSP0030J*
25	RL78/G12	R5F103A7DSP	PLSP0030J*
26	RL78/G12	R5F103A8ASP	PLSP0030J*
27	RL78/G12	R5F103A8DSP	PLSP0030J*
28	RL78/G12	R5F103A9ASP	PLSP0030J*
29	RL78/G12	R5F103A9DSP	PLSP0030J*
30	RL78/G12	R5F103AAASP	PLSP0030J*
31	RL78/G12	R5F103AADSP	PLSP0030J*
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No	Group	Product part number	Package code
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