Report No. MCR-22-0295
April 26,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX140

DEVICE : R5F5140XXX

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 .

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	RX140	R5F51403ADFJ	PLQP0032G*
2	RX140	R5F51403AGFJ	PLQP0032G*
3	RX140	R5F51403ADFK	PLQP0064G*
4	RX140	R5F51403AGFK	PLQP0064G*
5	RX140	R5F51405ADFK	PLQP0064G*
6	RX140	R5F51405AGFK	PLQP0064G*
7	RX140	R5F51405BDFK	PLQP0064G*
8	RX140	R5F51405BGFK	PLQP0064G*
9	RX140	R5F51406ADFK	PLQP0064G*
10	RX140	R5F51406AGFK	PLQP0064G*
11	RX140	R5F51406BDFK	PLQP0064G*
12	RX140	R5F51406BGFK	PLQP0064G*
13	RX140	R5F51403ADFL	PLQP0048K*
14	RX140	R5F51403AGFL	PLQP0048K*
15	RX140	R5F51405ADFL	PLQP0048K*
16	RX140	R5F51405AGFL	PLQP0048K*
17	RX140	R5F51405BDFL	PLQP0048K*
18	RX140	R5F51405BGFL	PLQP0048K*
19	RX140	R5F51406ADFL	PLQP0048K*
20	RX140	R5F51406AGFL	PLQP0048K*
21	RX140	R5F51406BDFL	PLQP0048K*
22	RX140	R5F51406BGFL	PLQP0048K*
23	RX140	R5F51403ADFM	PLQP0064K*
24	RX140	R5F51403AGFM	PLQP0064K*
25	RX140	R5F51405ADFM	PLQP0064K*
26	RX140	R5F51405AGFM	PLQP0064K*
27	RX140	R5F51405BDFM	PLQP0064K*
28	RX140	R5F51405BGFM	PLQP0064K*
29	RX140	R5F51406ADFM	PLQP0064K*
30	RX140	R5F51406AGFM	PLQP0064K*
31	RX140	R5F51406BDFM	PLQP0064K*
32	RX140	R5F51406BGFM	PLQP0064K*
33	RX140	R5F51405ADFN	PLQP0080K*
34	RX140	R5F51405AGFN	PLQP0080K*
35	RX140	R5F51405BDFN	PLQP0080K*
36	RX140	R5F51405BGFN	PLQP0080K*
37	RX140	R5F51406ADFN	PLQP0080K*
38	RX140	R5F51406AGFN	PLQP0080K*
39	RX140	R5F51406BDFN	PLQP0080K*
40	RX140	R5F51406BGFN	PLQP0080K*
41	RX140	R5F51403ADNE	PWQN0048K*
42	RX140	R5F51403AGNE	PWQN0048K*
43	RX140	R5F51405ADNE	PWQN0048K*
44	RX140	R5F51405AGNE	PWQN0048K*
45	RX140	R5F51405BDNE	PWQN0048K*
46	RX140	R5F51405BGNE	PWQN0048K*
47	RX140	R5F51406ADNE	PWQN0048K*
48	RX140	R5F51406AGNE	PWQN0048K*
49	RX140	R5F51406BDNE	PWQN0048K*
50	RX140	R5F51406BGNE	PWQN0048K*

No	Group	Product part number	Package code
51	RX140	R5F51403ADNH	PWQN0032K*
52	RX140	R5F51403AGNH	PWQN0032K*
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