Report No. MCR-22-0320-B
June 11,2026

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX671

DEVICE : R5F5671XXX

QUALITY GRADE : Standard

Quality Assurance Div.
Renesas Electronics Corporation

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(Rev.5.0-2 October 2020)

Summary of Reliability Test Results for QFP Package (MSL3)

Test Item	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 ℃, RH=85 %, Vccmax, 264 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 500 cycles	0/75	3 lots or more
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	+/-500 V,1 time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 ℃, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (MSL3)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3) Peak Reflow Temp=260 ℃	Pass	Verified after MSL preconditioning; applied to applicable reliability tests (*1).

Note :
- (*1) With preconditioning per JESD22-A113, MSL 3
- It is tested to confirm that all the samples are satisfied with an individual product specification.
- Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Summary of Reliability Test Results for QFN Package (MSL3)

Test Item	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/25	
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 ℃, RH=85 %, Vccmax, 264 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 500 cycles	0/75	3 lots or more
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	+/-500 V,1 time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 ℃, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (MSL3)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3) Peak Reflow Temp=260 ℃	Pass	Verified after MSL preconditioning; applied to applicable reliability tests (*1).

Note :
- (*1) With preconditioning per JESD22-A113, MSL 3
- It is tested to confirm that all the samples are satisfied with an individual product specification.
- Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Summary of Reliability Test Results for BGA Package (MSL3)

Test Item	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/25	
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 ℃, RH=85 %, Vccmax, 264 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 700 cycles	0/75	3 lots or more
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	+/-500 V,1 time	0/3	Class: C2
Resistance to Soldering Heat (MSL3)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3) Peak Reflow Temp=260 °C	Pass	Verified after MSL preconditioning; applied to applicable reliability tests (*1).

Note :
- (*1) With preconditioning per JESD22-A113, MSL 3
- It is tested to confirm that all the samples are satisfied with an individual product specification.
- Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Summary of Reliability Test Results for LGA Package (MSL3)

Test Item	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/25	
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 ℃, RH=85 %, Vccmax, 264 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 700 cycles	0/75	3 lots or more
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	+/-500 V,1 time	0/3	Class: C2
Resistance to Soldering Heat (MSL3)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3) Peak Reflow Temp=260 °C	Pass	Verified after MSL preconditioning; applied to applicable reliability tests (*1).

Note :
- (*1) With preconditioning per JESD22-A113, MSL 3
- It is tested to confirm that all the samples are satisfied with an individual product specification.
- 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)

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

①Unique failure rate (λb)

λb= 0.007 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
Wafer level chip scale package	WLCSP	SxBG

*1. First four digit

Table. Product list

No	Product part number	Package code	MSL
1	R5F56719DDBP	PTBG0064K*	MSL3
2	R5F56719DGBP	PTBG0064K*	MSL3
3	R5F56719HDBP	PTBG0064K*	MSL3
4	R5F56719HGBP	PTBG0064K*	MSL3
5	R5F5671CDDBP	PTBG0064K*	MSL3
6	R5F5671CDGBP	PTBG0064K*	MSL3
7	R5F5671CHDBP	PTBG0064K*	MSL3
8	R5F5671CHGBP	PTBG0064K*	MSL3
9	R5F5671EDDBP	PTBG0064K*	MSL3
10	R5F5671EDGBP	PTBG0064K*	MSL3
11	R5F5671EHDBP	PTBG0064K*	MSL3
12	R5F5671EHGBP	PTBG0064K*	MSL3
13	R5F56719DDFB	PLQP0144K*	MSL3
14	R5F56719DGFB	PLQP0144K*	MSL3
15	R5F56719HDFB	PLQP0144K*	MSL3
16	R5F56719HGFB	PLQP0144K*	MSL3
17	R5F5671CDDFB	PLQP0144K*	MSL3
18	R5F5671CDGFB	PLQP0144K*	MSL3
19	R5F5671CHDFB	PLQP0144K*	MSL3
20	R5F5671CHGFB	PLQP0144K*	MSL3
21	R5F5671EDDFB	PLQP0144K*	MSL3
22	R5F5671EDGFB	PLQP0144K*	MSL3
23	R5F5671EHDFB	PLQP0144K*	MSL3
24	R5F5671EHGFB	PLQP0144K*	MSL3
25	R5F56719DDFM	PLQP0064K*	MSL3
26	R5F56719DGFM	PLQP0064K*	MSL3
27	R5F56719HDFM	PLQP0064K*	MSL3
28	R5F56719HGFM	PLQP0064K*	MSL3
29	R5F5671CDDFM	PLQP0064K*	MSL3
30	R5F5671CDGFM	PLQP0064K*	MSL3
31	R5F5671CHDFM	PLQP0064K*	MSL3
32	R5F5671CHGFM	PLQP0064K*	MSL3
33	R5F5671EDDFM	PLQP0064K*	MSL3
34	R5F5671EDGFM	PLQP0064K*	MSL3
35	R5F5671EHDFM	PLQP0064K*	MSL3
36	R5F5671EHGFM	PLQP0064K*	MSL3
37	R5F56719DDFP	PLQP0100K*	MSL3
38	R5F56719DGFP	PLQP0100K*	MSL3
39	R5F56719HDFP	PLQP0100K*	MSL3
40	R5F56719HGFP	PLQP0100K*	MSL3
41	R5F5671CDDFP	PLQP0100K*	MSL3
42	R5F5671CDGFP	PLQP0100K*	MSL3
43	R5F5671CHDFP	PLQP0100K*	MSL3
44	R5F5671CHGFP	PLQP0100K*	MSL3
45	R5F5671EDDFP	PLQP0100K*	MSL3
46	R5F5671EDGFP	PLQP0100K*	MSL3
47	R5F5671EHDFP	PLQP0100K*	MSL3
48	R5F5671EHGFP	PLQP0100K*	MSL3
49	R5F56719DDLE	PTLG0145J*	MSL3
50	R5F56719DGLE	PTLG0145J*	MSL3
51	R5F56719HDLE	PTLG0145J*	MSL3
52	R5F56719HGLE	PTLG0145J*	MSL3
53	R5F5671CDDLE	PTLG0145J*	MSL3
54	R5F5671CDGLE	PTLG0145J*	MSL3
55	R5F5671CHDLE	PTLG0145J*	MSL3
56	R5F5671CHGLE	PTLG0145J*	MSL3
57	R5F5671EDDLE	PTLG0145J*	MSL3
58	R5F5671EDGLE	PTLG0145J*	MSL3
59	R5F5671EHDLE	PTLG0145J*	MSL3
60	R5F5671EHGLE	PTLG0145J*	MSL3
61	R5F56719DDLJ	PTLG0100J*	MSL3
62	R5F56719DGLJ	PTLG0100J*	MSL3
63	R5F56719HDLJ	PTLG0100J*	MSL3
64	R5F56719HGLJ	PTLG0100J*	MSL3
65	R5F5671CDDLJ	PTLG0100J*	MSL3
66	R5F5671CDGLJ	PTLG0100J*	MSL3
67	R5F5671CHDLJ	PTLG0100J*	MSL3
68	R5F5671CHGLJ	PTLG0100J*	MSL3
69	R5F5671EDDLJ	PTLG0100J*	MSL3
70	R5F5671EDGLJ	PTLG0100J*	MSL3
71	R5F5671EHDLJ	PTLG0100J*	MSL3
72	R5F5671EHGLJ	PTLG0100J*	MSL3
73	R5F56719DDLK	PTLG0145K*	MSL3
74	R5F56719DGLK	PTLG0145K*	MSL3
75	R5F56719HDLK	PTLG0145K*	MSL3
76	R5F56719HGLK	PTLG0145K*	MSL3
77	R5F5671CDDLK	PTLG0145K*	MSL3
78	R5F5671CDGLK	PTLG0145K*	MSL3
79	R5F5671CHDLK	PTLG0145K*	MSL3
80	R5F5671CHGLK	PTLG0145K*	MSL3
81	R5F5671EDDLK	PTLG0145K*	MSL3
82	R5F5671EDGLK	PTLG0145K*	MSL3
83	R5F5671EHDLK	PTLG0145K*	MSL3
84	R5F5671EHGLK	PTLG0145K*	MSL3
85	R5F56719DDNE	PWQN0048K*	MSL3
86	R5F56719DGNE	PWQN0048K*	MSL3
87	R5F56719HDNE	PWQN0048K*	MSL3
88	R5F56719HGNE	PWQN0048K*	MSL3
89	R5F5671CDDNE	PWQN0048K*	MSL3
90	R5F5671CDGNE	PWQN0048K*	MSL3
91	R5F5671CHDNE	PWQN0048K*	MSL3
92	R5F5671CHGNE	PWQN0048K*	MSL3
93	R5F5671EDDNE	PWQN0048K*	MSL3
94	R5F5671EDGNE	PWQN0048K*	MSL3
95	R5F5671EHDNE	PWQN0048K*	MSL3
96	R5F5671EHGNE	PWQN0048K*	MSL3
97			
98			
99			
100			

Note: MSL stands for Moisture Sensitivity Level.