Report No. MCR-22-0317
April 26,2022

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX65N

DEVICE : R5F565NXXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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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 .

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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 .

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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 .

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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= 0.08 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
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	RX65N	R5F565NCDDBG	PLBG0176G*
2	RX65N	R5F565NCDGBG	PLBG0176G*
3	RX65N	R5F565NCHDBG	PLBG0176G*
4	RX65N	R5F565NCHGBG	PLBG0176G*
5	RX65N	R5F565NEDDBG	PLBG0176G*
6	RX65N	R5F565NEDGBG	PLBG0176G*
7	RX65N	R5F565NEHDBG	PLBG0176G*
8	RX65N	R5F565NEHGBG	PLBG0176G*
9	RX65N	R5F565N4ADFB	PLQP0144K*
10	RX65N	R5F565N4AGFB	PLQP0144K*
11	RX65N	R5F565N4BDFB	PLQP0144K*
12	RX65N	R5F565N4BGFB	PLQP0144K*
13	RX65N	R5F565N4EDFB	PLQP0144K*
14	RX65N	R5F565N4EGFB	PLQP0144K*
15	RX65N	R5F565N4FDFB	PLQP0144K*
16	RX65N	R5F565N4FGFB	PLQP0144K*
17	RX65N	R5F565N7ADFB	PLQP0144K*
18	RX65N	R5F565N7AGFB	PLQP0144K*
19	RX65N	R5F565N7BDFB	PLQP0144K*
20	RX65N	R5F565N7BGFB	PLQP0144K*
21	RX65N	R5F565N7EDFB	PLQP0144K*
22	RX65N	R5F565N7EGFB	PLQP0144K*
23	RX65N	R5F565N7FDFB	PLQP0144K*
24	RX65N	R5F565N7FGFB	PLQP0144K*
25	RX65N	R5F565N9ADFB	PLQP0144K*
26	RX65N	R5F565N9AGFB	PLQP0144K*
27	RX65N	R5F565N9BDFB	PLQP0144K*
28	RX65N	R5F565N9BGFB	PLQP0144K*
29	RX65N	R5F565N9EDFB	PLQP0144K*
30	RX65N	R5F565N9EGFB	PLQP0144K*
31	RX65N	R5F565N9FDFB	PLQP0144K*
32	RX65N	R5F565N9FGFB	PLQP0144K*
33	RX65N	R5F565NCDDFB	PLQP0144K*
34	RX65N	R5F565NCDGFB	PLQP0144K*
35	RX65N	R5F565NCHDFB	PLQP0144K*
36	RX65N	R5F565NCHGFB	PLQP0144K*
37	RX65N	R5F565NEDDFB	PLQP0144K*
38	RX65N	R5F565NEDGFB	PLQP0144K*
39	RX65N	R5F565NEHDFB	PLQP0144K*
40	RX65N	R5F565NEHGFB	PLQP0144K*
41	RX65N	R5F565NCDDFC	PLQP0176K*
42	RX65N	R5F565NCDGFC	PLQP0176K*
43	RX65N	R5F565NCHDFC	PLQP0176K*
44	RX65N	R5F565NCHGFC	PLQP0176K*
45	RX65N	R5F565NEDDFC	PLQP0176K*
46	RX65N	R5F565NEDGFC	PLQP0176K*
47	RX65N	R5F565NEHDFC	PLQP0176K*
48	RX65N	R5F565NEHGFC	PLQP0176K*
49	RX65N	R5F565N4ADFP	PLQP0100K*
50	RX65N	R5F565N4AGFP	PLQP0100K*
51	RX65N	R5F565N4BDFP	PLQP0100K*
52	RX65N	R5F565N4BGFP	PLQP0100K*
53	RX65N	R5F565N4EDFP	PLQP0100K*
54	RX65N	R5F565N4EGFP	PLQP0100K*
55	RX65N	R5F565N4FDFP	PLQP0100K*
56	RX65N	R5F565N4FGFP	PLQP0100K*
57	RX65N	R5F565N7ADFP	PLQP0100K*
58	RX65N	R5F565N7AGFP	PLQP0100K*
59	RX65N	R5F565N7BDFP	PLQP0100K*
60	RX65N	R5F565N7BGFP	PLQP0100K*
61	RX65N	R5F565N7EDFP	PLQP0100K*
62	RX65N	R5F565N7EGFP	PLQP0100K*
63	RX65N	R5F565N7FDFP	PLQP0100K*
64	RX65N	R5F565N7FGFP	PLQP0100K*
65	RX65N	R5F565N9ADFP	PLQP0100K*
66	RX65N	R5F565N9AGFP	PLQP0100K*
67	RX65N	R5F565N9BDFP	PLQP0100K*
68	RX65N	R5F565N9BGFP	PLQP0100K*
69	RX65N	R5F565N9EDFP	PLQP0100K*
70	RX65N	R5F565N9EGFP	PLQP0100K*
71	RX65N	R5F565N9FDFP	PLQP0100K*
72	RX65N	R5F565N9FGFP	PLQP0100K*
73	RX65N	R5F565NCDDFP	PLQP0100K*
74	RX65N	R5F565NCDGFP	PLQP0100K*
75	RX65N	R5F565NCHDFP	PLQP0100K*
76	RX65N	R5F565NCHGFP	PLQP0100K*
77	RX65N	R5F565NEDDFP	PLQP0100K*
78	RX65N	R5F565NEDGFP	PLQP0100K*
79	RX65N	R5F565NEHDFP	PLQP0100K*
80	RX65N	R5F565NEHGFP	PLQP0100K*
81	RX65N	R5F565NCDDLC	PTLG0177K*
82	RX65N	R5F565NCDGLC	PTLG0177K*
83	RX65N	R5F565NCHDLC	PTLG0177K*
84	RX65N	R5F565NCHGLC	PTLG0177K*
85	RX65N	R5F565NEDDLC	PTLG0177K*
86	RX65N	R5F565NEDGLC	PTLG0177K*
87	RX65N	R5F565NEHDLC	PTLG0177K*
88	RX65N	R5F565NEHGLC	PTLG0177K*
89	RX65N	R5F565N4ADLJ	PTLG0100J*
90	RX65N	R5F565N4AGLJ	PTLG0100J*
91	RX65N	R5F565N4BDLJ	PTLG0100J*
92	RX65N	R5F565N4BGLJ	PTLG0100J*
93	RX65N	R5F565N4EDLJ	PTLG0100J*
94	RX65N	R5F565N4EGLJ	PTLG0100J*
95	RX65N	R5F565N4FDLJ	PTLG0100J*
96	RX65N	R5F565N4FGLJ	PTLG0100J*
97	RX65N	R5F565N7ADLJ	PTLG0100J*
98	RX65N	R5F565N7AGLJ	PTLG0100J*
99	RX65N	R5F565N7BDLJ	PTLG0100J*
100	RX65N	R5F565N7BGLJ	PTLG0100J*

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Table. Product list

No	Group	Product part number	Package code
101	RX65N	R5F565N7EDLJ	PTLG0100J*
102	RX65N	R5F565N7EGLJ	PTLG0100J*
103	RX65N	R5F565N7FDLJ	PTLG0100J*
104	RX65N	R5F565N7FGLJ	PTLG0100J*
105	RX65N	R5F565N9ADLJ	PTLG0100J*
106	RX65N	R5F565N9AGLJ	PTLG0100J*
107	RX65N	R5F565N9BDLJ	PTLG0100J*
108	RX65N	R5F565N9BGLJ	PTLG0100J*
109	RX65N	R5F565N9EDLJ	PTLG0100J*
110	RX65N	R5F565N9EGLJ	PTLG0100J*
111	RX65N	R5F565N9FDLJ	PTLG0100J*
112	RX65N	R5F565N9FGLJ	PTLG0100J*
113	RX65N	R5F565NCDDLJ	PTLG0100J*
114	RX65N	R5F565NCDGLJ	PTLG0100J*
115	RX65N	R5F565NCHDLJ	PTLG0100J*
116	RX65N	R5F565NCHGLJ	PTLG0100J*
117	RX65N	R5F565NEDDLJ	PTLG0100J*
118	RX65N	R5F565NEDGLJ	PTLG0100J*
119	RX65N	R5F565NEHDLJ	PTLG0100J*
120	RX65N	R5F565NEHGLJ	PTLG0100J*
121	RX65N	R5F565N4ADLK	PTLG0145K*
122	RX65N	R5F565N4AGLK	PTLG0145K*
123	RX65N	R5F565N4BDLK	PTLG0145K*
124	RX65N	R5F565N4BGLK	PTLG0145K*
125	RX65N	R5F565N4EDLK	PTLG0145K*
126	RX65N	R5F565N4EGLK	PTLG0145K*
127	RX65N	R5F565N4FDLK	PTLG0145K*
128	RX65N	R5F565N4FGLK	PTLG0145K*
129	RX65N	R5F565N7ADLK	PTLG0145K*
130	RX65N	R5F565N7AGLK	PTLG0145K*
131	RX65N	R5F565N7BDLK	PTLG0145K*
132	RX65N	R5F565N7BGLK	PTLG0145K*
133	RX65N	R5F565N7EDLK	PTLG0145K*
134	RX65N	R5F565N7EGLK	PTLG0145K*
135	RX65N	R5F565N7FDLK	PTLG0145K*
136	RX65N	R5F565N7FGLK	PTLG0145K*
137	RX65N	R5F565N9ADLK	PTLG0145K*
138	RX65N	R5F565N9AGLK	PTLG0145K*
139	RX65N	R5F565N9BDLK	PTLG0145K*
140	RX65N	R5F565N9BGLK	PTLG0145K*
141	RX65N	R5F565N9EDLK	PTLG0145K*
142	RX65N	R5F565N9EGLK	PTLG0145K*
143	RX65N	R5F565N9FDLK	PTLG0145K*
144	RX65N	R5F565N9FGLK	PTLG0145K*
145	RX65N	R5F565NCDDLK	PTLG0145K*
146	RX65N	R5F565NCDGLK	PTLG0145K*
147	RX65N	R5F565NCHDLK	PTLG0145K*
148	RX65N	R5F565NCHGLK	PTLG0145K*
149	RX65N	R5F565NEDDLK	PTLG0145K*
150	RX65N	R5F565NEDGLK	PTLG0145K*
151	RX65N	R5F565NEHDLK	PTLG0145K*
152	RX65N	R5F565NEHGLK	PTLG0145K*
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No	Group	Product part number	Package code
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