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RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX660

DEVICE : R5F5660XXX

QUALITY GRADE : Standard

Quality Assurance Div.
Renesas Electronics Corporation

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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 .

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= 0.004 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	R5F56604ADFB	PLQP0144K*	MSL3
2	R5F56604AGFB	PLQP0144K*	MSL3
3	R5F56604BDFB	PLQP0144K*	MSL3
4	R5F56604BGFB	PLQP0144K*	MSL3
5	R5F56604CDFB	PLQP0144K*	MSL3
6	R5F56604CGFB	PLQP0144K*	MSL3
7	R5F56604DDFB	PLQP0144K*	MSL3
8	R5F56604DGFB	PLQP0144K*	MSL3
9	R5F56604EDFB	PLQP0144K*	MSL3
10	R5F56604EGFB	PLQP0144K*	MSL3
11	R5F56604FDFB	PLQP0144K*	MSL3
12	R5F56604FGFB	PLQP0144K*	MSL3
13	R5F56604GDFB	PLQP0144K*	MSL3
14	R5F56604GGFB	PLQP0144K*	MSL3
15	R5F56604HDFB	PLQP0144K*	MSL3
16	R5F56604HGFB	PLQP0144K*	MSL3
17	R5F56609ADFB	PLQP0144K*	MSL3
18	R5F56609AGFB	PLQP0144K*	MSL3
19	R5F56609BDFB	PLQP0144K*	MSL3
20	R5F56609BGFB	PLQP0144K*	MSL3
21	R5F56609CDFB	PLQP0144K*	MSL3
22	R5F56609CGFB	PLQP0144K*	MSL3
23	R5F56609DDFB	PLQP0144K*	MSL3
24	R5F56609DGFB	PLQP0144K*	MSL3
25	R5F56609EDFB	PLQP0144K*	MSL3
26	R5F56609EGFB	PLQP0144K*	MSL3
27	R5F56609FDFB	PLQP0144K*	MSL3
28	R5F56609FGFB	PLQP0144K*	MSL3
29	R5F56609GDFB	PLQP0144K*	MSL3
30	R5F56609GGFB	PLQP0144K*	MSL3
31	R5F56609HDFB	PLQP0144K*	MSL3
32	R5F56609HGFB	PLQP0144K*	MSL3
33	R5F56604ADFL	PLQP0048K*	MSL3
34	R5F56604AGFL	PLQP0048K*	MSL3
35	R5F56604BDFL	PLQP0048K*	MSL3
36	R5F56604BGFL	PLQP0048K*	MSL3
37	R5F56609ADFL	PLQP0048K*	MSL3
38	R5F56609AGFL	PLQP0048K*	MSL3
39	R5F56609BDFL	PLQP0048K*	MSL3
40	R5F56609BGFL	PLQP0048K*	MSL3
41	R5F56604ADFM	PLQP0064K*	MSL3
42	R5F56604AGFM	PLQP0064K*	MSL3
43	R5F56604BDFM	PLQP0064K*	MSL3
44	R5F56604BGFM	PLQP0064K*	MSL3
45	R5F56604CDFM	PLQP0064K*	MSL3
46	R5F56604CGFM	PLQP0064K*	MSL3
47	R5F56604DDFM	PLQP0064K*	MSL3
48	R5F56604DGFM	PLQP0064K*	MSL3
49	R5F56609ADFM	PLQP0064K*	MSL3
50	R5F56609AGFM	PLQP0064K*	MSL3

No	Product part number	Package code	MSL
51	R5F56609BDFM	PLQP0064K*	MSL3
52	R5F56609BGFM	PLQP0064K*	MSL3
53	R5F56609CDFM	PLQP0064K*	MSL3
54	R5F56609CGFM	PLQP0064K*	MSL3
55	R5F56609DDFM	PLQP0064K*	MSL3
56	R5F56609DGFM	PLQP0064K*	MSL3
57	R5F56604ADFN	PLQP0080K*	MSL3
58	R5F56604AGFN	PLQP0080K*	MSL3
59	R5F56604BDFN	PLQP0080K*	MSL3
60	R5F56604BGFN	PLQP0080K*	MSL3
61	R5F56604CDFN	PLQP0080K*	MSL3
62	R5F56604CGFN	PLQP0080K*	MSL3
63	R5F56604DDFN	PLQP0080K*	MSL3
64	R5F56604DGFN	PLQP0080K*	MSL3
65	R5F56609ADFN	PLQP0080K*	MSL3
66	R5F56609AGFN	PLQP0080K*	MSL3
67	R5F56609BDFN	PLQP0080K*	MSL3
68	R5F56609BGFN	PLQP0080K*	MSL3
69	R5F56609CDFN	PLQP0080K*	MSL3
70	R5F56609CGFN	PLQP0080K*	MSL3
71	R5F56609DDFN	PLQP0080K*	MSL3
72	R5F56609DGFN	PLQP0080K*	MSL3
73	R5F56604ADFP	PLQP0100K*	MSL3
74	R5F56604AGFP	PLQP0100K*	MSL3
75	R5F56604BDFP	PLQP0100K*	MSL3
76	R5F56604BGFP	PLQP0100K*	MSL3
77	R5F56604CDFP	PLQP0100K*	MSL3
78	R5F56604CGFP	PLQP0100K*	MSL3
79	R5F56604DDFP	PLQP0100K*	MSL3
80	R5F56604DGFP	PLQP0100K*	MSL3
81	R5F56604EDFP	PLQP0100K*	MSL3
82	R5F56604EGFP	PLQP0100K*	MSL3
83	R5F56604FDFP	PLQP0100K*	MSL3
84	R5F56604FGFP	PLQP0100K*	MSL3
85	R5F56604GDFP	PLQP0100K*	MSL3
86	R5F56604GGFP	PLQP0100K*	MSL3
87	R5F56604HDFP	PLQP0100K*	MSL3
88	R5F56604HGFP	PLQP0100K*	MSL3
89	R5F56609ADFP	PLQP0100K*	MSL3
90	R5F56609AGFP	PLQP0100K*	MSL3
91	R5F56609BDFP	PLQP0100K*	MSL3
92	R5F56609BGFP	PLQP0100K*	MSL3
93	R5F56609CDFP	PLQP0100K*	MSL3
94	R5F56609CGFP	PLQP0100K*	MSL3
95	R5F56609DDFP	PLQP0100K*	MSL3
96	R5F56609DGFP	PLQP0100K*	MSL3
97	R5F56609EDFP	PLQP0100K*	MSL3
98	R5F56609EGFP	PLQP0100K*	MSL3
99	R5F56609FDFP	PLQP0100K*	MSL3
100	R5F56609FGFP	PLQP0100K*	MSL3

Note: MSL stands for Moisture Sensitivity Level.

Table. Product list

No	Product part number	Package code	MSL	No	Product part number	Package code	MSL
101	R5F56609GDFP	PLQP0100K*	MSL3	161			
102	R5F56609GGFP	PLQP0100K*	MSL3	162			
103	R5F56609HDFP	PLQP0100K*	MSL3	163			
104	R5F56609HGFP	PLQP0100K*	MSL3	164			
105				165			
106				166			
107				167			
108				168			
109				169			
110				170			
111				171			
112				172			
113				173			
114				174			
115				175			
116				176			
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156				216			
157				217			
158				218			
159				219			
160				220			

Note: MSL stands for Moisture Sensitivity Level.