

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX630

DEVICE : R5F5630XXX

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 °C, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 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)	JEITA ED-4701/302	+/-1000 V, 1 time	0/3	Class: Equivalent to C2b
Solderability (SD)	J-STD-002	245 °C, 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 °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 BGA Package (MSL3)

Test Item	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 °C, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 °C to 125 °C , 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)	JEITA ED-4701/302	+/-1000 V, 1 time	0/3	Class: Equivalent to C2b
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 °C, Vccmax, 1000 hrs	0/231	3 lots or more
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/75	3 lots or more
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/75	3 lots or more
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 °C to 125 °C , 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)	JEITA ED-4701/302	+/-1000 V, 1 time	0/3	Class: Equivalent to C2b
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)

$$\lambda = \lambda b \times \pi T \text{ (FIT)}$$

①Unique failure rate (λb)

$\lambda b = 0.006 \text{ FIT}$

Unique failure rate at $T_a = 55 \text{ }^\circ\text{C}$ using 60 % confidence level.

②Temperature term (πT)

$$\pi T = \exp\{11600 \times E_a \times (1/(273+55) - 1/(273+T_a))\}$$

E_a : Activation energy (eV)

T_a : Ambient temperature ($^\circ\text{C}$)

πT simplified chart as $E_a = 0.7 \text{ eV}$												
T_a ($^\circ\text{C}$)	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	No	Product part number	Package code	MSL
1	R5F56308CDBG	PLBG0176G*	MSL3	51	R5F56306CDFN	PLQP0080K*	MSL3
2	R5F56308DDBG	PLBG0176G*	MSL3	52	R5F56306DDFN	PLQP0080K*	MSL3
3	R5F5630ACDBG	PLBG0176G*	MSL3	53	R5F56307CDFN	PLQP0080K*	MSL3
4	R5F5630ADDBG	PLBG0176G*	MSL3	54	R5F56307DDFN	PLQP0080K*	MSL3
5	R5F5630BCDBG	PLBG0176G*	MSL3	55	R5F56307DGFN	PLQP0080K*	MSL3
6	R5F5630BDDBG	PLBG0176G*	MSL3	56	R5F56308CDFN	PLQP0080K*	MSL3
7	R5F5630DCDBG	PLBG0176G*	MSL3	57	R5F56308DDFN	PLQP0080K*	MSL3
8	R5F5630DDDBG	PLBG0176G*	MSL3	58	R5F56308DGFN	PLQP0080K*	MSL3
9	R5F5630ECDBG	PLBG0176G*	MSL3	59	R5F56303CDFP	PLQP0100K*	MSL3
10	R5F5630EDDBG	PLBG0176G*	MSL3	60	R5F56303DDFP	PLQP0100K*	MSL3
11	R5F56306CDFB	PLQP0144K*	MSL3	61	R5F56305CDFP	PLQP0100K*	MSL3
12	R5F56306DDFB	PLQP0144K*	MSL3	62	R5F56305DDFP	PLQP0100K*	MSL3
13	R5F56307CDFB	PLQP0144K*	MSL3	63	R5F56306CDFP	PLQP0100K*	MSL3
14	R5F56307DDFB	PLQP0144K*	MSL3	64	R5F56306DDFP	PLQP0100K*	MSL3
15	R5F56308CDFB	PLQP0144K*	MSL3	65	R5F56307CDFP	PLQP0100K*	MSL3
16	R5F56308DDFB	PLQP0144K*	MSL3	66	R5F56307DDFP	PLQP0100K*	MSL3
17	R5F56308JDFB	PLQP0144K*	MSL3	67	R5F56307DGFP	PLQP0100K*	MSL3
18	R5F5630ACDFB	PLQP0144K*	MSL3	68	R5F56308CDFP	PLQP0100K*	MSL3
19	R5F5630ADDFB	PLQP0144K*	MSL3	69	R5F56308DDFP	PLQP0100K*	MSL3
20	R5F5630ADGFB	PLQP0144K*	MSL3	70	R5F56308DGFP	PLQP0100K*	MSL3
21	R5F5630BCDFB	PLQP0144K*	MSL3	71	R5F56308JDFP	PLQP0100K*	MSL3
22	R5F5630BDDFB	PLQP0144K*	MSL3	72	R5F56308MDFP	PLQP0100K*	MSL3
23	R5F5630BDGFB	PLQP0144K*	MSL3	73	R5F5630ACDFP	PLQP0100K*	MSL3
24	R5F5630DCDFB	PLQP0144K*	MSL3	74	R5F5630ADDFP	PLQP0100K*	MSL3
25	R5F5630DDDFB	PLQP0144K*	MSL3	75	R5F5630ADGFP	PLQP0100K*	MSL3
26	R5F5630DJDFB	PLQP0144K*	MSL3	76	R5F5630BCDFP	PLQP0100K*	MSL3
27	R5F5630ECDFB	PLQP0144K*	MSL3	77	R5F5630BDDFP	PLQP0100K*	MSL3
28	R5F5630EDDFB	PLQP0144K*	MSL3	78	R5F5630BDGFP	PLQP0100K*	MSL3
29	R5F5630KCDFB	PLQP0144K*	MSL3	79	R5F5630DCDFP	PLQP0100K*	MSL3
30	R5F5630KDDFB	PLQP0144K*	MSL3	80	R5F5630DDDFP	PLQP0100K*	MSL3
31	R5F5630NJDFB	PLQP0144K*	MSL3	81	R5F5630ECDFP	PLQP0100K*	MSL3
32	R5F5630QJDFB	PLQP0144K*	MSL3	82	R5F5630EDDFP	PLQP0100K*	MSL3
33	R5F5630SDDFB	PLQP0144K*	MSL3	83	R5F5630LJDFP	PLQP0100K*	MSL3
34	R5F5630SJDFB	PLQP0144K*	MSL3	84	R5F5630NJDFP	PLQP0100K*	MSL3
35	R5F5630TJDFB	PLQP0144K*	MSL3	85	R5F5630QJDFP	PLQP0100K*	MSL3
36	R5F56308CDFC	PLQP0176K*	MSL3	86	R5F5630ACDFR	PLQP0176L*	MSL3
37	R5F56308DDFC	PLQP0176K*	MSL3	87	R5F5630ADDFR	PLQP0176L*	MSL3
38	R5F5630ACDFC	PLQP0176K*	MSL3	88	R5F5630BCDFR	PLQP0176L*	MSL3
39	R5F5630ADDFC	PLQP0176K*	MSL3	89	R5F5630BDDFR	PLQP0176L*	MSL3
40	R5F5630BCDFC	PLQP0176K*	MSL3	90	R5F5630DCDFR	PLQP0176L*	MSL3
41	R5F5630BDDFC	PLQP0176K*	MSL3	91	R5F5630DDDFR	PLQP0176L*	MSL3
42	R5F5630DCDFC	PLQP0176K*	MSL3	92	R5F5630ECDFR	PLQP0176L*	MSL3
43	R5F5630DDDFC	PLQP0176K*	MSL3	93	R5F5630EDDFR	PLQP0176L*	MSL3
44	R5F5630ECDFC	PLQP0176K*	MSL3	94	R5F56303CDLA	PTLG0100K*	MSL3
45	R5F5630EDDFC	PLQP0176K*	MSL3	95	R5F56303DDLA	PTLG0100K*	MSL3
46	R5F5630TJDFC	PLQP0176K*	MSL3	96	R5F56305CDLA	PTLG0100K*	MSL3
47	R5F56303CDFN	PLQP0080K*	MSL3	97	R5F56305DDLA	PTLG0100K*	MSL3
48	R5F56303DDFN	PLQP0080K*	MSL3	98	R5F56306CDLA	PTLG0100K*	MSL3
49	R5F56305CDFN	PLQP0080K*	MSL3	99	R5F56306DDLA	PTLG0100K*	MSL3
50	R5F56305DDFN	PLQP0080K*	MSL3	100	R5F56307CDLA	PTLG0100K*	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	R5F56307DDLA	PTLG0100K*	MSL3	161			
102	R5F56308CDLA	PTLG0100K*	MSL3	162			
103	R5F56308DDLA	PTLG0100K*	MSL3	163			
104	R5F56308CDLC	PTLG0177K*	MSL3	164			
105	R5F56308DDLC	PTLG0177K*	MSL3	165			
106	R5F5630ACDLC	PTLG0177K*	MSL3	166			
107	R5F5630ADDLC	PTLG0177K*	MSL3	167			
108	R5F5630BCDLC	PTLG0177K*	MSL3	168			
109	R5F5630BDDLC	PTLG0177K*	MSL3	169			
110	R5F5630DCDLC	PTLG0177K*	MSL3	170			
111	R5F5630DDDL	PTLG0177K*	MSL3	171			
112	R5F5630ECDLC	PTLG0177K*	MSL3	172			
113	R5F5630EDDL	PTLG0177K*	MSL3	173			
114	R5F56306CDLE	PTLG0145J*	MSL3	174			
115	R5F56306DDLE	PTLG0145J*	MSL3	175			
116	R5F56307CDLE	PTLG0145J*	MSL3	176			
117	R5F56307DDLE	PTLG0145J*	MSL3	177			
118	R5F56308CDLE	PTLG0145J*	MSL3	178			
119	R5F56308DDLE	PTLG0145J*	MSL3	179			
120	R5F5630ACDLE	PTLG0145J*	MSL3	180			
121	R5F5630ADDLE	PTLG0145J*	MSL3	181			
122	R5F5630BCDLE	PTLG0145J*	MSL3	182			
123	R5F5630BDDLE	PTLG0145J*	MSL3	183			
124	R5F5630DCDLE	PTLG0145J*	MSL3	184			
125	R5F5630DDDL	PTLG0145J*	MSL3	185			
126	R5F5630ECDLE	PTLG0145J*	MSL3	186			
127	R5F5630EDDL	PTLG0145J*	MSL3	187			
128	R5F56303CDLJ	PTLG0100J*	MSL3	188			
129	R5F56303DDLJ	PTLG0100J*	MSL3	189			
130	R5F56305CDLJ	PTLG0100J*	MSL3	190			
131	R5F56305DDLJ	PTLG0100J*	MSL3	191			
132	R5F56306CDLJ	PTLG0100J*	MSL3	192			
133	R5F56306DDLJ	PTLG0100J*	MSL3	193			
134	R5F56307CDLJ	PTLG0100J*	MSL3	194			
135	R5F56307DDLJ	PTLG0100J*	MSL3	195			
136	R5F56308CDLJ	PTLG0100J*	MSL3	196			
137	R5F56308DDLJ	PTLG0100J*	MSL3	197			
138	R5F5630ACDLJ	PTLG0100J*	MSL3	198			
139	R5F5630ADDLJ	PTLG0100J*	MSL3	199			
140	R5F5630BCDLJ	PTLG0100J*	MSL3	200			
141	R5F5630BDDLJ	PTLG0100J*	MSL3	201			
142	R5F5630DCDLJ	PTLG0100J*	MSL3	202			
143	R5F5630DDDLJ	PTLG0100J*	MSL3	203			
144	R5F5630ECDLJ	PTLG0100J*	MSL3	204			
145	R5F5630EDDLJ	PTLG0100J*	MSL3	205			
146	R5F56306CDLK	PTLG0145K*	MSL3	206			
147	R5F56306DDLK	PTLG0145K*	MSL3	207			
148	R5F56307CDLK	PTLG0145K*	MSL3	208			
149	R5F56307DDLK	PTLG0145K*	MSL3	209			
150	R5F56308CDLK	PTLG0145K*	MSL3	210			
151	R5F56308DDLK	PTLG0145K*	MSL3	211			
152	R5F5630ACDLK	PTLG0145K*	MSL3	212			
153	R5F5630ADDLK	PTLG0145K*	MSL3	213			
154	R5F5630BCDLK	PTLG0145K*	MSL3	214			
155	R5F5630BDDLK	PTLG0145K*	MSL3	215			
156	R5F5630DCDLK	PTLG0145K*	MSL3	216			
157	R5F5630DDDLK	PTLG0145K*	MSL3	217			
158	R5F5630ECDLK	PTLG0145K*	MSL3	218			
159	R5F5630EDDLK	PTLG0145K*	MSL3	219			
160				220			

Note: MSL stands for Moisture Sensitivity Level.