

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX64M

DEVICE : R5F564MXXX

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 Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 °C, RH=85 %, Vccmax, 264 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	0/25	
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 °C, RH=85 %, Vccmax, 264 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	0/25	
Temperature Humidity bias (HAST) (*1)	JESD22-A110	Ta=110 °C, RH=85 %, Vccmax, 264 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)
 $\lambda b= 0.004 \text{ FIT}$
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	R5F564MFCDBG	PLBG0176G*	MSL3	51	R5F564MFDDFC	PLQP0176K*	MSL3
2	R5F564MFDDBG	PLBG0176G*	MSL3	52	R5F564MFDGFC	PLQP0176K*	MSL3
3	R5F564MFGDBG	PLBG0176G*	MSL3	53	R5F564MFGDFC	PLQP0176K*	MSL3
4	R5F564MFHDBG	PLBG0176G*	MSL3	54	R5F564MFGGFC	PLQP0176K*	MSL3
5	R5F564MGCDDBG	PLBG0176G*	MSL3	55	R5F564MFHDFC	PLQP0176K*	MSL3
6	R5F564MGDDDBG	PLBG0176G*	MSL3	56	R5F564MFHGFC	PLQP0176K*	MSL3
7	R5F564MGGDBG	PLBG0176G*	MSL3	57	R5F564MGCDFC	PLQP0176K*	MSL3
8	R5F564MGHDBG	PLBG0176G*	MSL3	58	R5F564MGCGFC	PLQP0176K*	MSL3
9	R5F564MJCDBG	PLBG0176G*	MSL3	59	R5F564MGDDFC	PLQP0176K*	MSL3
10	R5F564MJDDBG	PLBG0176G*	MSL3	60	R5F564MGDGFC	PLQP0176K*	MSL3
11	R5F564MJGDBG	PLBG0176G*	MSL3	61	R5F564MGGDFC	PLQP0176K*	MSL3
12	R5F564MJHDBG	PLBG0176G*	MSL3	62	R5F564MGGGFC	PLQP0176K*	MSL3
13	R5F564MLCDBG	PLBG0176G*	MSL3	63	R5F564MGHDFC	PLQP0176K*	MSL3
14	R5F564MLDDBG	PLBG0176G*	MSL3	64	R5F564MGHGFC	PLQP0176K*	MSL3
15	R5F564MLGDBG	PLBG0176G*	MSL3	65	R5F564MJCDFC	PLQP0176K*	MSL3
16	R5F564MLHDBG	PLBG0176G*	MSL3	66	R5F564MJCGFC	PLQP0176K*	MSL3
17	R5F564MFCDFB	PLQP0144K*	MSL3	67	R5F564MJDDFC	PLQP0176K*	MSL3
18	R5F564MFCGFB	PLQP0144K*	MSL3	68	R5F564MJDGFC	PLQP0176K*	MSL3
19	R5F564MFDDFB	PLQP0144K*	MSL3	69	R5F564MJGDFC	PLQP0176K*	MSL3
20	R5F564MFDGFB	PLQP0144K*	MSL3	70	R5F564MJGGFC	PLQP0176K*	MSL3
21	R5F564MFGDFB	PLQP0144K*	MSL3	71	R5F564MJHDFC	PLQP0176K*	MSL3
22	R5F564MFGGFB	PLQP0144K*	MSL3	72	R5F564MJHGFC	PLQP0176K*	MSL3
23	R5F564MFHDFB	PLQP0144K*	MSL3	73	R5F564MLCDFC	PLQP0176K*	MSL3
24	R5F564MFHGFB	PLQP0144K*	MSL3	74	R5F564MLCGFC	PLQP0176K*	MSL3
25	R5F564MGCDFB	PLQP0144K*	MSL3	75	R5F564MLDDFC	PLQP0176K*	MSL3
26	R5F564MGCGFB	PLQP0144K*	MSL3	76	R5F564MLDGFC	PLQP0176K*	MSL3
27	R5F564MGDDFB	PLQP0144K*	MSL3	77	R5F564MLGDFC	PLQP0176K*	MSL3
28	R5F564MGDGB	PLQP0144K*	MSL3	78	R5F564MLGGFC	PLQP0176K*	MSL3
29	R5F564MGDFB	PLQP0144K*	MSL3	79	R5F564MLHDFC	PLQP0176K*	MSL3
30	R5F564MGGB	PLQP0144K*	MSL3	80	R5F564MLHGFC	PLQP0176K*	MSL3
31	R5F564MGHDFB	PLQP0144K*	MSL3	81	R5F564MFCDFP	PLQP0100K*	MSL3
32	R5F564MGHGFB	PLQP0144K*	MSL3	82	R5F564MFCGFP	PLQP0100K*	MSL3
33	R5F564MJCDFB	PLQP0144K*	MSL3	83	R5F564MFDDFP	PLQP0100K*	MSL3
34	R5F564MJCGFB	PLQP0144K*	MSL3	84	R5F564MFDGFP	PLQP0100K*	MSL3
35	R5F564MJDDFB	PLQP0144K*	MSL3	85	R5F564MFGDFP	PLQP0100K*	MSL3
36	R5F564MJDGFB	PLQP0144K*	MSL3	86	R5F564MFGGFP	PLQP0100K*	MSL3
37	R5F564MJGDFB	PLQP0144K*	MSL3	87	R5F564MFHDFP	PLQP0100K*	MSL3
38	R5F564MJGGB	PLQP0144K*	MSL3	88	R5F564MFHGFP	PLQP0100K*	MSL3
39	R5F564MJHDFB	PLQP0144K*	MSL3	89	R5F564MGCDFP	PLQP0100K*	MSL3
40	R5F564MJHGFB	PLQP0144K*	MSL3	90	R5F564MGCGFP	PLQP0100K*	MSL3
41	R5F564MLCDFB	PLQP0144K*	MSL3	91	R5F564MGDDFP	PLQP0100K*	MSL3
42	R5F564MLCGFB	PLQP0144K*	MSL3	92	R5F564MGDGFP	PLQP0100K*	MSL3
43	R5F564MLDDFB	PLQP0144K*	MSL3	93	R5F564MGGDFP	PLQP0100K*	MSL3
44	R5F564MLDGFB	PLQP0144K*	MSL3	94	R5F564MGGGFP	PLQP0100K*	MSL3
45	R5F564MLGDFB	PLQP0144K*	MSL3	95	R5F564MGHDFP	PLQP0100K*	MSL3
46	R5F564MLGGFB	PLQP0144K*	MSL3	96	R5F564MGHGFP	PLQP0100K*	MSL3
47	R5F564MLHDFB	PLQP0144K*	MSL3	97	R5F564MJCDFP	PLQP0100K*	MSL3
48	R5F564MLHGFB	PLQP0144K*	MSL3	98	R5F564MJCGFP	PLQP0100K*	MSL3
49	R5F564MFCDFC	PLQP0176K*	MSL3	99	R5F564MJDDFP	PLQP0100K*	MSL3
50	R5F564MFCGFC	PLQP0176K*	MSL3	100	R5F564MJDGFP	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	R5F564MJGDFP	PLQP0100K*	MSL3	161			
102	R5F564MJGGFP	PLQP0100K*	MSL3	162			
103	R5F564MJHDFP	PLQP0100K*	MSL3	163			
104	R5F564MJHGFP	PLQP0100K*	MSL3	164			
105	R5F564MLCDFP	PLQP0100K*	MSL3	165			
106	R5F564MLCGFP	PLQP0100K*	MSL3	166			
107	R5F564MLDDFP	PLQP0100K*	MSL3	167			
108	R5F564MLDGFP	PLQP0100K*	MSL3	168			
109	R5F564MLGDFP	PLQP0100K*	MSL3	169			
110	R5F564MLGGFP	PLQP0100K*	MSL3	170			
111	R5F564MLHDFP	PLQP0100K*	MSL3	171			
112	R5F564MLHGFP	PLQP0100K*	MSL3	172			
113	R5F564MFC DLC	PTLG0177K*	MSL3	173			
114	R5F564MFDDLC	PTLG0177K*	MSL3	174			
115	R5F564MFGDLC	PTLG0177K*	MSL3	175			
116	R5F564MFHDLC	PTLG0177K*	MSL3	176			
117	R5F564MGCDLC	PTLG0177K*	MSL3	177			
118	R5F564MGDDLC	PTLG0177K*	MSL3	178			
119	R5F564MGGDLC	PTLG0177K*	MSL3	179			
120	R5F564MGHDLC	PTLG0177K*	MSL3	180			
121	R5F564MJCDLC	PTLG0177K*	MSL3	181			
122	R5F564MJDDLC	PTLG0177K*	MSL3	182			
123	R5F564MJGDLC	PTLG0177K*	MSL3	183			
124	R5F564MJHDLC	PTLG0177K*	MSL3	184			
125	R5F564MLCDLC	PTLG0177K*	MSL3	185			
126	R5F564MLDDLC	PTLG0177K*	MSL3	186			
127	R5F564MLGDLC	PTLG0177K*	MSL3	187			
128	R5F564MLHDLC	PTLG0177K*	MSL3	188			
129	R5F564MFC DLJ	PTLG0100J*	MSL3	189			
130	R5F564MFDDLJ	PTLG0100J*	MSL3	190			
131	R5F564MFGDLJ	PTLG0100J*	MSL3	191			
132	R5F564MFHDJLJ	PTLG0100J*	MSL3	192			
133	R5F564MGCDLJ	PTLG0100J*	MSL3	193			
134	R5F564MGDDLJ	PTLG0100J*	MSL3	194			
135	R5F564MGGDJLJ	PTLG0100J*	MSL3	195			
136	R5F564MGHDLJ	PTLG0100J*	MSL3	196			
137	R5F564MJCDLJ	PTLG0100J*	MSL3	197			
138	R5F564MJDDLJ	PTLG0100J*	MSL3	198			
139	R5F564MJGDLJ	PTLG0100J*	MSL3	199			
140	R5F564MJHDLJ	PTLG0100J*	MSL3	200			
141	R5F564MLCDLJ	PTLG0100J*	MSL3	201			
142	R5F564MLDDLJ	PTLG0100J*	MSL3	202			
143	R5F564MLGDLJ	PTLG0100J*	MSL3	203			
144	R5F564MLHDLJ	PTLG0100J*	MSL3	204			
145	R5F564MFC DLK	PTLG0145K*	MSL3	205			
146	R5F564MFDDLK	PTLG0145K*	MSL3	206			
147	R5F564MFGDLK	PTLG0145K*	MSL3	207			
148	R5F564MFHDLK	PTLG0145K*	MSL3	208			
149	R5F564MGCDLK	PTLG0145K*	MSL3	209			
150	R5F564MGDDLK	PTLG0145K*	MSL3	210			
151	R5F564MGGDJLJ	PTLG0145K*	MSL3	211			
152	R5F564MGHDLK	PTLG0145K*	MSL3	212			
153	R5F564MJCDLK	PTLG0145K*	MSL3	213			
154	R5F564MJDDLK	PTLG0145K*	MSL3	214			
155	R5F564MJGDLK	PTLG0145K*	MSL3	215			
156	R5F564MJHDLK	PTLG0145K*	MSL3	216			
157	R5F564MLCDLK	PTLG0145K*	MSL3	217			
158	R5F564MLDDLK	PTLG0145K*	MSL3	218			
159	R5F564MLGDLK	PTLG0145K*	MSL3	219			
160	R5F564MLHDLK	PTLG0145K*	MSL3	220			

Note: MSL stands for Moisture Sensitivity Level.