

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX63N

DEVICE : R5F563NXXX

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 $Ta=55 \text{ }^{\circ}\text{C}$ 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 ($^{\circ}\text{C}$)

πT simplified chart as $Ea=0.7 \text{ eV}$												
Ta ($^{\circ}\text{C}$)	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	R5F563NACDBG	PLBG0176G*	MSL3	51	R5F563NKDDFC	PLQP0176K*	MSL3
2	R5F563NADDBG	PLBG0176G*	MSL3	52	R5F563NKDGFC	PLQP0176K*	MSL3
3	R5F563NBCDBG	PLBG0176G*	MSL3	53	R5F563NWDDFC	PLQP0176K*	MSL3
4	R5F563NBDDBG	PLBG0176G*	MSL3	54	R5F563NWDGFC	PLQP0176K*	MSL3
5	R5F563NDCDBG	PLBG0176G*	MSL3	55	R5F563NWHDFC	PLQP0176K*	MSL3
6	R5F563NDDDBG	PLBG0176G*	MSL3	56	R5F563NWHGFC	PLQP0176K*	MSL3
7	R5F563NECDBG	PLBG0176G*	MSL3	57	R5F563NYDDFC	PLQP0176K*	MSL3
8	R5F563NEDDBG	PLBG0176G*	MSL3	58	R5F563NYDGFC	PLQP0176K*	MSL3
9	R5F563NACDFB	PLQP0144K*	MSL3	59	R5F563NYHDFC	PLQP0176K*	MSL3
10	R5F563NADDFB	PLQP0144K*	MSL3	60	R5F563NYHGFC	PLQP0176K*	MSL3
11	R5F563NADGFB	PLQP0144K*	MSL3	61	R5F563NACDFP	PLQP0100K*	MSL3
12	R5F563NBCDFB	PLQP0144K*	MSL3	62	R5F563NADDFP	PLQP0100K*	MSL3
13	R5F563NBDDFB	PLQP0144K*	MSL3	63	R5F563NADGFP	PLQP0100K*	MSL3
14	R5F563NBDGFB	PLQP0144K*	MSL3	64	R5F563NBCDFP	PLQP0100K*	MSL3
15	R5F563NDCDFB	PLQP0144K*	MSL3	65	R5F563NBDDFP	PLQP0100K*	MSL3
16	R5F563NDDDFB	PLQP0144K*	MSL3	66	R5F563NBDGFP	PLQP0100K*	MSL3
17	R5F563NDDGFB	PLQP0144K*	MSL3	67	R5F563NDCDFP	PLQP0100K*	MSL3
18	R5F563NECDFB	PLQP0144K*	MSL3	68	R5F563NDDDFP	PLQP0100K*	MSL3
19	R5F563NEDDFB	PLQP0144K*	MSL3	69	R5F563NDDGFP	PLQP0100K*	MSL3
20	R5F563NEDGFB	PLQP0144K*	MSL3	70	R5F563NECDFP	PLQP0100K*	MSL3
21	R5F563NFDDFB	PLQP0144K*	MSL3	71	R5F563NEDDFP	PLQP0100K*	MSL3
22	R5F563NFDGFB	PLQP0144K*	MSL3	72	R5F563NEDGFP	PLQP0100K*	MSL3
23	R5F563NFHDFB	PLQP0144K*	MSL3	73	R5F563NFDDFP	PLQP0100K*	MSL3
24	R5F563NFHGFB	PLQP0144K*	MSL3	74	R5F563NFDGFP	PLQP0100K*	MSL3
25	R5F563NKDDFB	PLQP0144K*	MSL3	75	R5F563NFHDFP	PLQP0100K*	MSL3
26	R5F563NKDGFB	PLQP0144K*	MSL3	76	R5F563NFHGFP	PLQP0100K*	MSL3
27	R5F563NWDDFB	PLQP0144K*	MSL3	77	R5F563NKDDFP	PLQP0100K*	MSL3
28	R5F563NWDGFB	PLQP0144K*	MSL3	78	R5F563NKDGFP	PLQP0100K*	MSL3
29	R5F563NWHDFB	PLQP0144K*	MSL3	79	R5F563NWDDFP	PLQP0100K*	MSL3
30	R5F563NWHGFB	PLQP0144K*	MSL3	80	R5F563NWDGFP	PLQP0100K*	MSL3
31	R5F563NYDDFB	PLQP0144K*	MSL3	81	R5F563NWHDFP	PLQP0100K*	MSL3
32	R5F563NYDGFB	PLQP0144K*	MSL3	82	R5F563NWHGFP	PLQP0100K*	MSL3
33	R5F563NYHDFB	PLQP0144K*	MSL3	83	R5F563NYDDFP	PLQP0100K*	MSL3
34	R5F563NYHGFB	PLQP0144K*	MSL3	84	R5F563NYDGFP	PLQP0100K*	MSL3
35	R5F563NACDFC	PLQP0176K*	MSL3	85	R5F563NYHDFP	PLQP0100K*	MSL3
36	R5F563NADDFC	PLQP0176K*	MSL3	86	R5F563NYHGFP	PLQP0100K*	MSL3
37	R5F563NADGFC	PLQP0176K*	MSL3	87	R5F563NACDFR	PLQP0176L*	MSL3
38	R5F563NBCDFC	PLQP0176K*	MSL3	88	R5F563NADDFR	PLQP0176L*	MSL3
39	R5F563NBDDFC	PLQP0176K*	MSL3	89	R5F563NADGFR	PLQP0176L*	MSL3
40	R5F563NBDGFC	PLQP0176K*	MSL3	90	R5F563NBCDFR	PLQP0176L*	MSL3
41	R5F563NDCDFC	PLQP0176K*	MSL3	91	R5F563NBDDFR	PLQP0176L*	MSL3
42	R5F563NDDDFC	PLQP0176K*	MSL3	92	R5F563NBDGFR	PLQP0176L*	MSL3
43	R5F563NDDGFC	PLQP0176K*	MSL3	93	R5F563NDCDFR	PLQP0176L*	MSL3
44	R5F563NECDFC	PLQP0176K*	MSL3	94	R5F563NDDDFR	PLQP0176L*	MSL3
45	R5F563NEDDFC	PLQP0176K*	MSL3	95	R5F563NDDGFR	PLQP0176L*	MSL3
46	R5F563NEDGFC	PLQP0176K*	MSL3	96	R5F563NECDFR	PLQP0176L*	MSL3
47	R5F563NFDDFC	PLQP0176K*	MSL3	97	R5F563NEDDFR	PLQP0176L*	MSL3
48	R5F563NFDGFC	PLQP0176K*	MSL3	98	R5F563NEDGFR	PLQP0176L*	MSL3
49	R5F563NFHDFC	PLQP0176K*	MSL3	99	R5F563NACDLC	PTLG0177K*	MSL3
50	R5F563NFHGFC	PLQP0176K*	MSL3	100	R5F563NADDLC	PTLG0177K*	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	R5F563NBCDLC	PTLG0177K*	MSL3	161			
102	R5F563NBDDLCL	PTLG0177K*	MSL3	162			
103	R5F563NDCDLC	PTLG0177K*	MSL3	163			
104	R5F563NDDDLCL	PTLG0177K*	MSL3	164			
105	R5F563NECDLC	PTLG0177K*	MSL3	165			
106	R5F563NEDDLCL	PTLG0177K*	MSL3	166			
107	R5F563NACDLE	PTLG0145J*	MSL3	167			
108	R5F563NADDLE	PTLG0145J*	MSL3	168			
109	R5F563NBCDLE	PTLG0145J*	MSL3	169			
110	R5F563NBDDLE	PTLG0145J*	MSL3	170			
111	R5F563NDCDLE	PTLG0145J*	MSL3	171			
112	R5F563NDDDLLE	PTLG0145J*	MSL3	172			
113	R5F563NECDLE	PTLG0145J*	MSL3	173			
114	R5F563NEDDLLE	PTLG0145J*	MSL3	174			
115	R5F563NACDLJ	PTLG0100J*	MSL3	175			
116	R5F563NADDLJ	PTLG0100J*	MSL3	176			
117	R5F563NBCDLJ	PTLG0100J*	MSL3	177			
118	R5F563NBDDLJ	PTLG0100J*	MSL3	178			
119	R5F563NDCDLJ	PTLG0100J*	MSL3	179			
120	R5F563NDDDLJ	PTLG0100J*	MSL3	180			
121	R5F563NECDLJ	PTLG0100J*	MSL3	181			
122	R5F563NEDDLJ	PTLG0100J*	MSL3	182			
123	R5F563NACDLK	PTLG0145K*	MSL3	183			
124	R5F563NADDLK	PTLG0145K*	MSL3	184			
125	R5F563NBCDLK	PTLG0145K*	MSL3	185			
126	R5F563NBDDLK	PTLG0145K*	MSL3	186			
127	R5F563NDCDLK	PTLG0145K*	MSL3	187			
128	R5F563NDDDLK	PTLG0145K*	MSL3	188			
129	R5F563NECDLK	PTLG0145K*	MSL3	189			
130	R5F563NEDDLK	PTLG0145K*	MSL3	190			
131				191			
132				192			
133				193			
134				194			
135				195			
136				196			
137				197			
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Note: MSL stands for Moisture Sensitivity Level.