

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX621

DEVICE : R5F5621XXX

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	R5F56216BDBG	PLBG0176G*	MSL3	51			
2	R5F56216BNBG	PLBG0176G*	MSL3	52			
3	R5F56217BDBG	PLBG0176G*	MSL3	53			
4	R5F56217BNBG	PLBG0176G*	MSL3	54			
5	R5F56218BDBG	PLBG0176G*	MSL3	55			
6	R5F56218BNBG	PLBG0176G*	MSL3	56			
7	R5F56216BDFB	PLQP0144K*	MSL3	57			
8	R5F56216BNFB	PLQP0144K*	MSL3	58			
9	R5F56217BDFB	PLQP0144K*	MSL3	59			
10	R5F56217BNFB	PLQP0144K*	MSL3	60			
11	R5F56218BDFB	PLQP0144K*	MSL3	61			
12	R5F56218BNFB	PLQP0144K*	MSL3	62			
13	R5F56216BDFP	PLQP0100K*	MSL3	63			
14	R5F56216BNFP	PLQP0100K*	MSL3	64			
15	R5F56217BDFP	PLQP0100K*	MSL3	65			
16	R5F56217BNFP	PLQP0100K*	MSL3	66			
17	R5F56218BDFP	PLQP0100K*	MSL3	67			
18	R5F56218BNFP	PLQP0100K*	MSL3	68			
19	R5F56216BDLD	PTLG0085J*	MSL3	69			
20	R5F56216BNLD	PTLG0085J*	MSL3	70			
21	R5F56217BDLD	PTLG0085J*	MSL3	71			
22	R5F56217BNLD	PTLG0085J*	MSL3	72			
23	R5F56218BDLD	PTLG0085J*	MSL3	73			
24	R5F56218BNLD	PTLG0085J*	MSL3	74			
25	R5F56216BDLE	PTLG0145J*	MSL3	75			
26	R5F56216BNLE	PTLG0145J*	MSL3	76			
27	R5F56217BDLE	PTLG0145J*	MSL3	77			
28	R5F56217BNLE	PTLG0145J*	MSL3	78			
29	R5F56218BDLE	PTLG0145J*	MSL3	79			
30	R5F56218BNLE	PTLG0145J*	MSL3	80			
31				81			
32				82			
33				83			
34				84			
35				85			
36				86			
37				87			
38				88			
39				89			
40				90			
41				91			
42				92			
43				93			
44				94			
45				95			
46				96			
47				97			
48				98			
49				99			
50				100			

Note: MSL stands for Moisture Sensitivity Level.