

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RA6M5

DEVICE : R7FA6M5XXX

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)	JESD22-C101	+/-500 V, 1 time	0/3	Class: C2
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)	JESD22-C101	+/-500 V, 1 time	0/3	Class: C2
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)

$\lambda b= 0.007 \text{ FIT}$

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	R7FA6M5BF3CAG	PLBG0100K*	MSL3	51			
2	R7FA6M5BG3CAG	PLBG0100K*	MSL3	52			
3	R7FA6M5BH3CAG	PLBG0100K*	MSL3	53			
4	R7FA6M5AG2CBG	PLBG0176G*	MSL3	54			
5	R7FA6M5AH2CBG	PLBG0176G*	MSL3	55			
6	R7FA6M5BF2CBG	PLBG0176G*	MSL3	56			
7	R7FA6M5BG2CBG	PLBG0176G*	MSL3	57			
8	R7FA6M5BH2CBG	PLBG0176G*	MSL3	58			
9	R7FA6M5AG2CBM	PLBG0144K*	MSL3	59			
10	R7FA6M5AG3CBM	PLBG0144K*	MSL3	60			
11	R7FA6M5AH2CBM	PLBG0144K*	MSL3	61			
12	R7FA6M5AH3CBM	PLBG0144K*	MSL3	62			
13	R7FA6M5BF2CBM	PLBG0144K*	MSL3	63			
14	R7FA6M5BF3CBM	PLBG0144K*	MSL3	64			
15	R7FA6M5BG2CBM	PLBG0144K*	MSL3	65			
16	R7FA6M5BG3CBM	PLBG0144K*	MSL3	66			
17	R7FA6M5BH2CBM	PLBG0144K*	MSL3	67			
18	R7FA6M5BH3CBM	PLBG0144K*	MSL3	68			
19	R7FA6M5AG3CFB	PLQP0144K*	MSL3	69			
20	R7FA6M5AH3CFB	PLQP0144K*	MSL3	70			
21	R7FA6M5BF3CFB	PLQP0144K*	MSL3	71			
22	R7FA6M5BG3CFB	PLQP0144K*	MSL3	72			
23	R7FA6M5BH3CFB	PLQP0144K*	MSL3	73			
24	R7FA6M5ZH3CFB	PLQP0144K*	MSL3	74			
25	R7FA6M5AG3CFC	PLQP0176K*	MSL3	75			
26	R7FA6M5AH3CFC	PLQP0176K*	MSL3	76			
27	R7FA6M5BF3CFC	PLQP0176K*	MSL3	77			
28	R7FA6M5BG3CFC	PLQP0176K*	MSL3	78			
29	R7FA6M5BH3CFC	PLQP0176K*	MSL3	79			
30	R7FA6M5AG3CFP	PLQP0100K*	MSL3	80			
31	R7FA6M5AH3CFP	PLQP0100K*	MSL3	81			
32	R7FA6M5BF3CFP	PLQP0100K*	MSL3	82			
33	R7FA6M5BG3CFP	PLQP0100K*	MSL3	83			
34	R7FA6M5BH3CFP	PLQP0100K*	MSL3	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.