Report No. MCR-22-0262-A
March 14,2023

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RA6M4

DEVICE : R7FA6M4XXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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Table. Reliability test results (QFP)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 ℃ to 150 ℃ , 300 cycles	0/22	
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	+/-500V,1time	0/3	Class: C2
Solderability (SD)	J-STD-002	245 ℃, 5 s, Solder coverage ≥95 %	0/5	
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

*1) With preconditioning per JESD22-A113, MSL 3
・It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :
Basically qualification tests were performed using a representative product with the same wafer process and the same package structure .

Table. Reliability test results (BGA)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 ℃, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 ℃, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-55 ℃ to 125 ℃ , 500 cycles	0/22	
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	+/-500V,1time	0/3	Class: C2
Resistance to Soldering Heat (PC)	JESD22-A113, J-STD-020	MSL3(Moisture Sensitivity Level 3)	0/22	

*1) With preconditioning per JESD22-A113, MSL 3
・It is tested to confirm that all the samples are satisfied with an individual product specification.

Note :
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)

$$\lambda = \lambda b \times \pi T \quad (FIT)$$

①Unique failure rate (λb)

λb= 0.08 FIT

Unique failure rate at Ta=55 ℃ 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 (℃)

πT simplified chart as Ea=0.7 eV												
Ta (℃)	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
Non-lead type plastic package	QFN	PxQN
Grid array type plastic package	BGA	PxBG
	LGA	PxLG

*1. First four digit

Table. Product list

No	Group	Product part number	Package code	No	Group	Product part number	Package code
1	RA6M4	R7FA6M4AD2CBM	PLBG0144K*	51			
2	RA6M4	R7FA6M4AD3CBM	PLBG0144K*	52			
3	RA6M4	R7FA6M4AE2CBM	PLBG0144K*	53			
4	RA6M4	R7FA6M4AE3CBM	PLBG0144K*	54			
5	RA6M4	R7FA6M4AF2CBM	PLBG0144K*	55			
6	RA6M4	R7FA6M4AF3CBM	PLBG0144K*	56			
7	RA6M4	R7FA6M4AD2CBQ	PLBG0064J*	57			
8	RA6M4	R7FA6M4AD3CBQ	PLBG0064J*	58			
9	RA6M4	R7FA6M4AE2CBQ	PLBG0064J*	59			
10	RA6M4	R7FA6M4AE3CBQ	PLBG0064J*	60			
11	RA6M4	R7FA6M4AF2CBQ	PLBG0064J*	61			
12	RA6M4	R7FA6M4AF3CBQ	PLBG0064J*	62			
13	RA6M4	R7FA6M4AD3CFB	PLQP0144K*	63			
14	RA6M4	R7FA6M4AE3CFB	PLQP0144K*	64			
15	RA6M4	R7FA6M4AF3CFB	PLQP0144K*	65			
16	RA6M4	R7FA6M4AD3CFM	PLQP0064K*	66			
17	RA6M4	R7FA6M4AE3CFM	PLQP0064K*	67			
18	RA6M4	R7FA6M4AF3CFM	PLQP0064K*	68			
19	RA6M4	R7FA6M4AD3CFP	PLQP0100K*	69			
20	RA6M4	R7FA6M4AE3CFP	PLQP0100K*	70			
21	RA6M4	R7FA6M4AF3CFP	PLQP0100K*	71			
22				72			
23				73			
24				74			
25				75			
26				76			
27				77			
28				78			
29				79			
30				80			
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