

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RA2E2

DEVICE : R7FA2E2XXX

QUALITY GRADE : Standard

Quality Assurance Div.
Renesas Electronics Corporation

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(Rev.5.0-2 October 2020)

Summary of Reliability Test Results for QFN 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=-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 WLCSP Package (MSL1)

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 (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
Resistance to Soldering Heat (MSL1)	JESD22-A113, J-STD-020	MSL1(Moisture Sensitivity Level 1) Peak Reflow Temp=260 °C	Pass	Verified after MSL preconditioning; applied to applicable reliability tests (*1).

Note :

- (*1) With preconditioning per JESD22-A113, MSL 1
- 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)

$\lambda b= 4.1 \text{ FIT}$

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	R7FA2E2A32DBY	SUBG0016L*	MSL1	51			
2	R7FA2E2A33CBY	SUBG0016L*	MSL1	52			
3	R7FA2E2A34CBY	SUBG0016L*	MSL1	53			
4	R7FA2E2A52DBY	SUBG0016L*	MSL1	54			
5	R7FA2E2A53CBY	SUBG0016L*	MSL1	55			
6	R7FA2E2A54CBY	SUBG0016L*	MSL1	56			
7	R7FA2E2A72DBY	SUBG0016L*	MSL1	57			
8	R7FA2E2A73CBY	SUBG0016L*	MSL1	58			
9	R7FA2E2A74CBY	SUBG0016L*	MSL1	59			
10	R7FA2E2A32DNJ	PWQN0020K*	MSL3	60			
11	R7FA2E2A33CNJ	PWQN0020K*	MSL3	61			
12	R7FA2E2A34CNJ	PWQN0020K*	MSL3	62			
13	R7FA2E2A52DNJ	PWQN0020K*	MSL3	63			
14	R7FA2E2A53CNJ	PWQN0020K*	MSL3	64			
15	R7FA2E2A54CNJ	PWQN0020K*	MSL3	65			
16	R7FA2E2A72DNJ	PWQN0020K*	MSL3	66			
17	R7FA2E2A73CNJ	PWQN0020K*	MSL3	67			
18	R7FA2E2A74CNJ	PWQN0020K*	MSL3	68			
19	R7FA2E2A32DNK	PWQN0024K*	MSL3	69			
20	R7FA2E2A33CNK	PWQN0024K*	MSL3	70			
21	R7FA2E2A34CNK	PWQN0024K*	MSL3	71			
22	R7FA2E2A52DNK	PWQN0024K*	MSL3	72			
23	R7FA2E2A53CNK	PWQN0024K*	MSL3	73			
24	R7FA2E2A54CNK	PWQN0024K*	MSL3	74			
25	R7FA2E2A72DNK	PWQN0024K*	MSL3	75			
26	R7FA2E2A73CNK	PWQN0024K*	MSL3	76			
27	R7FA2E2A74CNK	PWQN0024K*	MSL3	77			
28				78			
29				79			
30				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.