

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/I1D
DEVICE : R5F117XXX
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 °C, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 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 °C, 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 (QFN)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 °C, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 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 °C, 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 (SOP)

Test Items	Reference	Test Conditions	Results Failure/Size	Comment
High Temperature Operating Life (HTOL)	JESD22-A108	Ta=125 °C, Vccmax, 1000 hrs	0/22	
High Temperature Storage Life (HTSL)	JESD22-A103	Ta=150 °C, 1000 hrs	0/22	
Temperature Humidity bias (THB) (*1)	JESD22-A101	Ta=85 °C, RH=85 %, Vccmax, 1000 hrs	0/22	
Temperature Cycling (TC) (*1)	JESD22-A104	Ta=-65 °C to 150 °C , 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 °C, 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 .

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)

$$\lambda = \lambda_b \times \pi T \text{ (FIT)}$$

① Unique failure rate (λ_b)

$$\lambda_b = 3.8 \text{ FIT}$$

Unique failure rate at $T_a = 55 \text{ }^\circ\text{C}$ using 60 % confidence level.

② Temperature 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

*1. First four digit

Table. Product list

No	Group	Product part number	Package code	No	Group	Product part number	Package code
1	RL78/I1D	R5F11768GSM	PTSP0020J*	51			
2	RL78/I1D	R5F11768GSP	PLSP0020J*	52			
3	RL78/I1D	R5F1176AGSM	PTSP0020J*	53			
4	RL78/I1D	R5F1176AGSP	PLSP0020J*	54			
5	RL78/I1D	R5F11778GNA	PWQN0024K*	55			
6	RL78/I1D	R5F1177AGNA	PWQN0024K*	56			
7	RL78/I1D	R5F117A8GSP	PLSP0030J*	57			
8	RL78/I1D	R5F117AAGSP	PLSP0030J*	58			
9	RL78/I1D	R5F117ACGSP	PLSP0030J*	59			
10	RL78/I1D	R5F117BAGFP	PLQP0032G*	60			
11	RL78/I1D	R5F117BAGNA	PVQN0032K*	61			
12	RL78/I1D	R5F117BCGFP	PLQP0032G*	62			
13	RL78/I1D	R5F117BCGNA	PVQN0032K*	63			
14	RL78/I1D	R5F117GAGFB	PLQP0048K*	64			
15	RL78/I1D	R5F117GCGFB	PLQP0048K*	65			
16				66			
17				67			
18				68			
19				69			
20				70			
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48				98			
49				99			
50				100			