Report No. MCR-22-0507
July 15,2022

# RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/G12

DEVICE : R5F103XXX

APPLICATION : Consumer / Industry

Quality Assurance Div.
Renesas Electronics Corporation

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## Table. Reliability test results (QFN)

| 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 (SOP)**

| 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 .

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= 3.8 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 |
| | 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 |
|---|---|---|---|
| 1 | RL78/G12 | R5F10366ASM | PTSP0020J* |
| 2 | RL78/G12 | R5F10366ASP | PLSP0020J* |
| 3 | RL78/G12 | R5F10366DSP | PLSP0020J* |
| 4 | RL78/G12 | R5F10367ASM | PTSP0020J* |
| 5 | RL78/G12 | R5F10367ASP | PLSP0020J* |
| 6 | RL78/G12 | R5F10367DSP | PLSP0020J* |
| 7 | RL78/G12 | R5F10368ASM | PTSP0020J* |
| 8 | RL78/G12 | R5F10368ASP | PLSP0020J* |
| 9 | RL78/G12 | R5F10368DSP | PLSP0020J* |
| 10 | RL78/G12 | R5F10369ASM | PTSP0020J* |
| 11 | RL78/G12 | R5F10369ASP | PLSP0020J* |
| 12 | RL78/G12 | R5F10369DSP | PLSP0020J* |
| 13 | RL78/G12 | R5F1036AASM | PTSP0020J* |
| 14 | RL78/G12 | R5F1036AASP | PLSP0020J* |
| 15 | RL78/G12 | R5F1036ADSP | PLSP0020J* |
| 16 | RL78/G12 | R5F10377ANA | PWQN0024K* |
| 17 | RL78/G12 | R5F10377DNA | PWQN0024K* |
| 18 | RL78/G12 | R5F10378ANA | PWQN0024K* |
| 19 | RL78/G12 | R5F10378DNA | PWQN0024K* |
| 20 | RL78/G12 | R5F10379ANA | PWQN0024K* |
| 21 | RL78/G12 | R5F10379DNA | PWQN0024K* |
| 22 | RL78/G12 | R5F1037AANA | PWQN0024K* |
| 23 | RL78/G12 | R5F1037ADNA | PWQN0024K* |
| 24 | RL78/G12 | R5F103A7ASP | PLSP0030J* |
| 25 | RL78/G12 | R5F103A7DSP | PLSP0030J* |
| 26 | RL78/G12 | R5F103A8ASP | PLSP0030J* |
| 27 | RL78/G12 | R5F103A8DSP | PLSP0030J* |
| 28 | RL78/G12 | R5F103A9ASP | PLSP0030J* |
| 29 | RL78/G12 | R5F103A9DSP | PLSP0030J* |
| 30 | RL78/G12 | R5F103AAASP | PLSP0030J* |
| 31 | RL78/G12 | R5F103AADSP | PLSP0030J* |
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| No | Group | Product part number | Package code |
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