

# RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RL78/G1C  
DEVICE : R5F10JXXX  
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 .

The failure rate of the device in an actual use condition can be estimated by the below procedure.

**•Equation for the failure rate estimation ( $\lambda$ )**

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

① Unique failure rate ( $\lambda_b$ )

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

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

② Temperature term ( $\pi T$ )

$$\pi T = \exp\{11600 \times E_a \times (1/(273+55) - 1/(273+T_a))\}$$

$E_a$  : Activation energy (eV)

$T_a$  : Ambient temperature ( $^\circ\text{C}$ )

| $\pi T$ simplified chart as $E_a = 0.7 \text{ eV}$ |      |      |    |      |      |      |      |      |      |       |       |       |
|--|------|------|----|------|------|------|------|------|------|-------|-------|-------|
| $T_a$<br>( $^\circ\text{C}$ )                      | 40   | 50   | 55 | 60   | 65   | 70   | 75   | 80   | 85   | 90    | 100   | 110   |
| $\pi T$  | 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/G1C | R5F10JBCAFP         | PLQP0032G*   | 51  |       |                     |              |
| 2  | RL78/G1C | R5F10JBCANA         | PWQN0032K*   | 52  |       |                     |              |
| 3  | RL78/G1C | R5F10JBCGFP         | PLQP0032G*   | 53  |       |                     |              |
| 4  | RL78/G1C | R5F10JBCGNA         | PWQN0032K*   | 54  |       |                     |              |
| 5  | RL78/G1C | R5F10JGCAFB         | PLQP0048K*   | 55  |       |                     |              |
| 6  | RL78/G1C | R5F10JGCANA         | PWQN0048K*   | 56  |       |                     |              |
| 7  | RL78/G1C | R5F10JGCGFB         | PLQP0048K*   | 57  |       |                     |              |
| 8  | RL78/G1C | R5F10JGCGNA         | PWQN0048K*   | 58  |       |                     |              |
| 9  |          |                     |              | 59  |       |                     |              |
| 10 |          |                     |              | 60  |       |                     |              |
| 11 |          |                     |              | 61  |       |                     |              |
| 12 |          |                     |              | 62  |       |                     |              |
| 13 |          |                     |              | 63  |       |                     |              |
| 14 |          |                     |              | 64  |       |                     |              |
| 15 |          |                     |              | 65  |       |                     |              |
| 16 |          |                     |              | 66  |       |                     |              |
| 17 |          |                     |              | 67  |       |                     |              |
| 18 |          |                     |              | 68  |       |                     |              |
| 19 |          |                     |              | 69  |       |                     |              |
| 20 |          |                     |              | 70  |       |                     |              |
| 21 |          |                     |              | 71  |       |                     |              |
| 22 |          |                     |              | 72  |       |                     |              |
| 23 |          |                     |              | 73  |       |                     |              |
| 24 |          |                     |              | 74  |       |                     |              |
| 25 |          |                     |              | 75  |       |                     |              |
| 26 |          |                     |              | 76  |       |                     |              |
| 27 |          |                     |              | 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 |       |                     |              |