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# RELIABILITY REPORT

GROUP : RX72M

DEVICE : R5F572MXXX

QUALITY GRADE : Standard

Quality Assurance Div.
Renesas Electronics Corporation

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Summary of Reliability Test Results for QFP Package (MSL3)

| Test Item | Reference | Test Conditions | Results Failure/Size | Comment |
|---|---|---|---|---|
| High Temperature Operating Life (HTOL) | JESD22-A108 | Ta=125 ℃, Vccmax, 1000 hrs | 0/231 | 3 lots or more |
| High Temperature Storage Life (HTSL) | JESD22-A103 | Ta=150 ℃, 1000 hrs | 0/75 | 3 lots or more |
| Temperature Humidity bias (THB) (*1) | JESD22-A101 | Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs | 0/75 | 3 lots or more |
| Temperature Humidity bias (HAST) (*1) | JESD22-A110 | Ta=110 ℃, RH=85 %, Vccmax, 264 hrs | 0/75 | 3 lots or more |
| Temperature Cycling (TC) (*1) | JESD22-A104 | Ta=-65 ℃ to 150 ℃ , 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 ℃, 5 s, Solder coverage ≥95 % | 0/5 | |
| Resistance to Soldering Heat (MSL3) | JESD22-A113, J-STD-020 | MSL3(Moisture Sensitivity Level 3)<br>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 .

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Summary of Reliability Test Results for BGA Package (MSL3)

| Test Item | Reference | Test Conditions | Results Failure/Size | Comment |
|---|---|---|---|---|
| High Temperature Operating Life (HTOL) | JESD22-A108 | Ta=125 ℃, Vccmax, 1000 hrs | 0/231 | 3 lots or more |
| High Temperature Storage Life (HTSL) | JESD22-A103 | Ta=150 ℃, 1000 hrs | 0/75 | 3 lots or more |
| Temperature Humidity bias (THB) (*1) | JESD22-A101 | Ta=85 ℃, RH=85 %, Vccmax, 1000 hrs | 0/25 | |
| Temperature Humidity bias (HAST) (*1) | JESD22-A110 | Ta=110 ℃, RH=85 %, Vccmax, 264 hrs | 0/75 | 3 lots or more |
| Temperature Cycling (TC) (*1) | JESD22-A104 | Ta=-55 ℃ to 125 ℃ , 700 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 (MSL3) | JESD22-A113, J-STD-020 | MSL3(Moisture Sensitivity Level 3)<br>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 .

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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)**

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

①Unique failure rate (λb)

λb= 0.007 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 )**

$MTTF = 1/\lambda$

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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 | R5F572MDDDBD | PLBG0224G* | MSL3 | 51 | | | |
| 2 | R5F572MDDGBD | PLBG0224G* | MSL3 | 52 | | | |
| 3 | R5F572MDHDBD | PLBG0224G* | MSL3 | 53 | | | |
| 4 | R5F572MDHGBD | PLBG0224G* | MSL3 | 54 | | | |
| 5 | R5F572MNDDBD | PLBG0224G* | MSL3 | 55 | | | |
| 6 | R5F572MNDGBD | PLBG0224G* | MSL3 | 56 | | | |
| 7 | R5F572MNHDBD | PLBG0224G* | MSL3 | 57 | | | |
| 8 | R5F572MNHGBD | PLBG0224G* | MSL3 | 58 | | | |
| 9 | R5F572MDDDBG | PLBG0176G* | MSL3 | 59 | | | |
| 10 | R5F572MDDGBG | PLBG0176G* | MSL3 | 60 | | | |
| 11 | R5F572MDHDBG | PLBG0176G* | MSL3 | 61 | | | |
| 12 | R5F572MDHGBG | PLBG0176G* | MSL3 | 62 | | | |
| 13 | R5F572MNDDBG | PLBG0176G* | MSL3 | 63 | | | |
| 14 | R5F572MNDGBG | PLBG0176G* | MSL3 | 64 | | | |
| 15 | R5F572MNHDBG | PLBG0176G* | MSL3 | 65 | | | |
| 16 | R5F572MNHGBG | PLBG0176G* | MSL3 | 66 | | | |
| 17 | R5F572MDDDFB | PLQP0144K* | MSL3 | 67 | | | |
| 18 | R5F572MDDGFB | PLQP0144K* | MSL3 | 68 | | | |
| 19 | R5F572MDHDFB | PLQP0144K* | MSL3 | 69 | | | |
| 20 | R5F572MDHGFB | PLQP0144K* | MSL3 | 70 | | | |
| 21 | R5F572MDYDFB | PLQP0144K* | MSL3 | 71 | | | |
| 22 | R5F572MDYGFB | PLQP0144K* | MSL3 | 72 | | | |
| 23 | R5F572MDZDFB | PLQP0144K* | MSL3 | 73 | | | |
| 24 | R5F572MDZGFB | PLQP0144K* | MSL3 | 74 | | | |
| 25 | R5F572MNDDFB | PLQP0144K* | MSL3 | 75 | | | |
| 26 | R5F572MNDGFB | PLQP0144K* | MSL3 | 76 | | | |
| 27 | R5F572MNHDFB | PLQP0144K* | MSL3 | 77 | | | |
| 28 | R5F572MNHGFB | PLQP0144K* | MSL3 | 78 | | | |
| 29 | R5F572MDDDFC | PLQP0176K* | MSL3 | 79 | | | |
| 30 | R5F572MDDGFC | PLQP0176K* | MSL3 | 80 | | | |
| 31 | R5F572MDHDFC | PLQP0176K* | MSL3 | 81 | | | |
| 32 | R5F572MDHGFC | PLQP0176K* | MSL3 | 82 | | | |
| 33 | R5F572MNDDFC | PLQP0176K* | MSL3 | 83 | | | |
| 34 | R5F572MNDGFC | PLQP0176K* | MSL3 | 84 | | | |
| 35 | R5F572MNHDFC | PLQP0176K* | MSL3 | 85 | | | |
| 36 | R5F572MNHGFC | PLQP0176K* | MSL3 | 86 | | | |
| 37 | R5F572MDDDFP | PLQP0100K* | MSL3 | 87 | | | |
| 38 | R5F572MDDGFP | PLQP0100K* | MSL3 | 88 | | | |
| 39 | R5F572MDHDFP | PLQP0100K* | MSL3 | 89 | | | |
| 40 | R5F572MDHGFP | PLQP0100K* | MSL3 | 90 | | | |
| 41 | R5F572MNDDFP | PLQP0100K* | MSL3 | 91 | | | |
| 42 | R5F572MNDGFP | PLQP0100K* | MSL3 | 92 | | | |
| 43 | R5F572MNHDFP | PLQP0100K* | MSL3 | 93 | | | |
| 44 | R5F572MNHGFP | PLQP0100K* | MSL3 | 94 | | | |
| 45 | | | | 95 | | | |
| 46 | | | | 96 | | | |
| 47 | | | | 97 | | | |
| 48 | | | | 98 | | | |
| 49 | | | | 99 | | | |
| 50 | | | | 100 | | | |

Note: MSL stands for Moisture Sensitivity Level.

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