

# RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : RX64M  
DEVICE : R5F564MXXX  
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)      | JEITA ED-4701/302      | +/-1000V,1time                       | 0/3                  | Class: Equivalent to C2b |
| 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 (BGA)**

| 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=-55 °C to 125 °C , 500 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)      | JEITA ED-4701/302      | +/-1000V,1time                       | 0/3                  | Class: Equivalent to C2b |
| 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 (LGA)**

| 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=-55 °C to 125 °C , 500 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)      | JEITA ED-4701/302      | +/-1000V,1time                       | 0/3                  | Class: Equivalent to C2b |
| 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 ( $\lambda_b$ )

$$\lambda_b = 0.04 \text{ FIT}$$

Unique failure rate at  $T_a = 55^\circ\text{C}$  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 |
| 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  | RX64M | R5F564MFCDBG        | PLBG0176G*   | 51  | RX64M | R5F564MFDDFC        | PLQP0176K*   |
| 2  | RX64M | R5F564MFDDBG        | PLBG0176G*   | 52  | RX64M | R5F564MFDGFC        | PLQP0176K*   |
| 3  | RX64M | R5F564MFGDBG        | PLBG0176G*   | 53  | RX64M | R5F564MFGDFC        | PLQP0176K*   |
| 4  | RX64M | R5F564MFHDBG        | PLBG0176G*   | 54  | RX64M | R5F564MFGGFC        | PLQP0176K*   |
| 5  | RX64M | R5F564MGCDBG        | PLBG0176G*   | 55  | RX64M | R5F564MFHDFC        | PLQP0176K*   |
| 6  | RX64M | R5F564MGDDBG        | PLBG0176G*   | 56  | RX64M | R5F564MFHGFC        | PLQP0176K*   |
| 7  | RX64M | R5F564MGGDBG        | PLBG0176G*   | 57  | RX64M | R5F564MGCDFC        | PLQP0176K*   |
| 8  | RX64M | R5F564MGHDBG        | PLBG0176G*   | 58  | RX64M | R5F564MGCDFC        | PLQP0176K*   |
| 9  | RX64M | R5F564MJCDBG        | PLBG0176G*   | 59  | RX64M | R5F564MGDDFC        | PLQP0176K*   |
| 10 | RX64M | R5F564MJDDBG        | PLBG0176G*   | 60  | RX64M | R5F564MGDGFC        | PLQP0176K*   |
| 11 | RX64M | R5F564MJGDBG        | PLBG0176G*   | 61  | RX64M | R5F564MGGDFC        | PLQP0176K*   |
| 12 | RX64M | R5F564MJHDBG        | PLBG0176G*   | 62  | RX64M | R5F564MGGGFC        | PLQP0176K*   |
| 13 | RX64M | R5F564MLCDBG        | PLBG0176G*   | 63  | RX64M | R5F564MGHDFC        | PLQP0176K*   |
| 14 | RX64M | R5F564MLDDBG        | PLBG0176G*   | 64  | RX64M | R5F564MGHGFC        | PLQP0176K*   |
| 15 | RX64M | R5F564MLGDBG        | PLBG0176G*   | 65  | RX64M | R5F564MJCDFC        | PLQP0176K*   |
| 16 | RX64M | R5F564MLHDBG        | PLBG0176G*   | 66  | RX64M | R5F564MJCGFC        | PLQP0176K*   |
| 17 | RX64M | R5F564MFCDFB        | PLQP0144K*   | 67  | RX64M | R5F564MJDDFC        | PLQP0176K*   |
| 18 | RX64M | R5F564MFCGFB        | PLQP0144K*   | 68  | RX64M | R5F564MJDGFC        | PLQP0176K*   |
| 19 | RX64M | R5F564MFDDFB        | PLQP0144K*   | 69  | RX64M | R5F564MJGDFC        | PLQP0176K*   |
| 20 | RX64M | R5F564MFDGFB        | PLQP0144K*   | 70  | RX64M | R5F564MJGGFC        | PLQP0176K*   |
| 21 | RX64M | R5F564MFGDFB        | PLQP0144K*   | 71  | RX64M | R5F564MJHDFC        | PLQP0176K*   |
| 22 | RX64M | R5F564MFGGFB        | PLQP0144K*   | 72  | RX64M | R5F564MJHGFC        | PLQP0176K*   |
| 23 | RX64M | R5F564MFHDFB        | PLQP0144K*   | 73  | RX64M | R5F564MLCDFC        | PLQP0176K*   |
| 24 | RX64M | R5F564MFHGFB        | PLQP0144K*   | 74  | RX64M | R5F564MLCGFC        | PLQP0176K*   |
| 25 | RX64M | R5F564MGCDFB        | PLQP0144K*   | 75  | RX64M | R5F564MLDDFC        | PLQP0176K*   |
| 26 | RX64M | R5F564MGCDFB        | PLQP0144K*   | 76  | RX64M | R5F564MLDGFC        | PLQP0176K*   |
| 27 | RX64M | R5F564MGDDFB        | PLQP0144K*   | 77  | RX64M | R5F564MLGDFC        | PLQP0176K*   |
| 28 | RX64M | R5F564MGDGFB        | PLQP0144K*   | 78  | RX64M | R5F564MLGGFC        | PLQP0176K*   |
| 29 | RX64M | R5F564MGGDFB        | PLQP0144K*   | 79  | RX64M | R5F564MLHDFC        | PLQP0176K*   |
| 30 | RX64M | R5F564MGGGFB        | PLQP0144K*   | 80  | RX64M | R5F564MLHGFC        | PLQP0176K*   |
| 31 | RX64M | R5F564MGHDFB        | PLQP0144K*   | 81  | RX64M | R5F564MFCDFP        | PLQP0100K*   |
| 32 | RX64M | R5F564MGHGFB        | PLQP0144K*   | 82  | RX64M | R5F564MFCGFP        | PLQP0100K*   |
| 33 | RX64M | R5F564MJCDFB        | PLQP0144K*   | 83  | RX64M | R5F564MFDDFP        | PLQP0100K*   |
| 34 | RX64M | R5F564MJCGFB        | PLQP0144K*   | 84  | RX64M | R5F564MFDGFP        | PLQP0100K*   |
| 35 | RX64M | R5F564MJDDFB        | PLQP0144K*   | 85  | RX64M | R5F564MFGDFP        | PLQP0100K*   |
| 36 | RX64M | R5F564MJDGFB        | PLQP0144K*   | 86  | RX64M | R5F564MFGGFP        | PLQP0100K*   |
| 37 | RX64M | R5F564MJGDFB        | PLQP0144K*   | 87  | RX64M | R5F564MFHDFP        | PLQP0100K*   |
| 38 | RX64M | R5F564MJGDFB        | PLQP0144K*   | 88  | RX64M | R5F564MFHGFP        | PLQP0100K*   |
| 39 | RX64M | R5F564MJHDFB        | PLQP0144K*   | 89  | RX64M | R5F564MGCDFP        | PLQP0100K*   |
| 40 | RX64M | R5F564MJHGFB        | PLQP0144K*   | 90  | RX64M | R5F564MGCDFP        | PLQP0100K*   |
| 41 | RX64M | R5F564MLCDFB        | PLQP0144K*   | 91  | RX64M | R5F564MGDDFP        | PLQP0100K*   |
| 42 | RX64M | R5F564MLCGFB        | PLQP0144K*   | 92  | RX64M | R5F564MGDGFP        | PLQP0100K*   |
| 43 | RX64M | R5F564MLDDFB        | PLQP0144K*   | 93  | RX64M | R5F564MGGDFP        | PLQP0100K*   |
| 44 | RX64M | R5F564MLDGFB        | PLQP0144K*   | 94  | RX64M | R5F564MGGGFP        | PLQP0100K*   |
| 45 | RX64M | R5F564MLGDFB        | PLQP0144K*   | 95  | RX64M | R5F564MGHDFP        | PLQP0100K*   |
| 46 | RX64M | R5F564MLGGFB        | PLQP0144K*   | 96  | RX64M | R5F564MGHGFP        | PLQP0100K*   |
| 47 | RX64M | R5F564MLHDFB        | PLQP0144K*   | 97  | RX64M | R5F564MJCDFP        | PLQP0100K*   |
| 48 | RX64M | R5F564MLHGFB        | PLQP0144K*   | 98  | RX64M | R5F564MJCGFP        | PLQP0100K*   |
| 49 | RX64M | R5F564MFCDFC        | PLQP0176K*   | 99  | RX64M | R5F564MJDDFP        | PLQP0100K*   |
| 50 | RX64M | R5F564MFCGFC        | PLQP0176K*   | 100 | RX64M | R5F564MJDGFP        | PLQP0100K*   |

Table. Product list

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| No  | Group | Product part number | Package code | No  | Group | Product part number | Package code |
|-----|-------|---------------------|--------------|-----|-------|---------------------|--------------|
| 101 | RX64M | R5F564MJGDFP        | PLQP0100K*   | 161 |       |                     |              |
| 102 | RX64M | R5F564MJGGFP        | PLQP0100K*   | 162 |       |                     |              |
| 103 | RX64M | R5F564MJHDFP        | PLQP0100K*   | 163 |       |                     |              |
| 104 | RX64M | R5F564MJHGFP        | PLQP0100K*   | 164 |       |                     |              |
| 105 | RX64M | R5F564MLCDFP        | PLQP0100K*   | 165 |       |                     |              |
| 106 | RX64M | R5F564MLCGFP        | PLQP0100K*   | 166 |       |                     |              |
| 107 | RX64M | R5F564MLDDFP        | PLQP0100K*   | 167 |       |                     |              |
| 108 | RX64M | R5F564MLDGFP        | PLQP0100K*   | 168 |       |                     |              |
| 109 | RX64M | R5F564MLGDFP        | PLQP0100K*   | 169 |       |                     |              |
| 110 | RX64M | R5F564MLGGFP        | PLQP0100K*   | 170 |       |                     |              |
| 111 | RX64M | R5F564MLHDFP        | PLQP0100K*   | 171 |       |                     |              |
| 112 | RX64M | R5F564MLHGFP        | PLQP0100K*   | 172 |       |                     |              |
| 113 | RX64M | R5F564MFC DLC       | PTLG0177K*   | 173 |       |                     |              |
| 114 | RX64M | R5F564MFDDLC        | PTLG0177K*   | 174 |       |                     |              |
| 115 | RX64M | R5F564MFGDLC        | PTLG0177K*   | 175 |       |                     |              |
| 116 | RX64M | R5F564MFHDLC        | PTLG0177K*   | 176 |       |                     |              |
| 117 | RX64M | R5F564MGCDLC        | PTLG0177K*   | 177 |       |                     |              |
| 118 | RX64M | R5F564MGDDLDC       | PTLG0177K*   | 178 |       |                     |              |
| 119 | RX64M | R5F564MGGDLC        | PTLG0177K*   | 179 |       |                     |              |
| 120 | RX64M | R5F564MGHDLC        | PTLG0177K*   | 180 |       |                     |              |
| 121 | RX64M | R5F564MJCDLC        | PTLG0177K*   | 181 |       |                     |              |
| 122 | RX64M | R5F564MJDDLDC       | PTLG0177K*   | 182 |       |                     |              |
| 123 | RX64M | R5F564MJGDLC        | PTLG0177K*   | 183 |       |                     |              |
| 124 | RX64M | R5F564MJHDLC        | PTLG0177K*   | 184 |       |                     |              |
| 125 | RX64M | R5F564MLCDLC        | PTLG0177K*   | 185 |       |                     |              |
| 126 | RX64M | R5F564MLDDLDC       | PTLG0177K*   | 186 |       |                     |              |
| 127 | RX64M | R5F564MLGDLC        | PTLG0177K*   | 187 |       |                     |              |
| 128 | RX64M | R5F564MLHDLC        | PTLG0177K*   | 188 |       |                     |              |
| 129 | RX64M | R5F564MFCDLJ        | PTLG0100J*   | 189 |       |                     |              |
| 130 | RX64M | R5F564MFDDLJ        | PTLG0100J*   | 190 |       |                     |              |
| 131 | RX64M | R5F564MFGDLJ        | PTLG0100J*   | 191 |       |                     |              |
| 132 | RX64M | R5F564MFHDLJ        | PTLG0100J*   | 192 |       |                     |              |
| 133 | RX64M | R5F564MGCDLJ        | PTLG0100J*   | 193 |       |                     |              |
| 134 | RX64M | R5F564MGDDLJ        | PTLG0100J*   | 194 |       |                     |              |
| 135 | RX64M | R5F564MGGDLJ        | PTLG0100J*   | 195 |       |                     |              |
| 136 | RX64M | R5F564MGHDLJ        | PTLG0100J*   | 196 |       |                     |              |
| 137 | RX64M | R5F564MJCDLJ        | PTLG0100J*   | 197 |       |                     |              |
| 138 | RX64M | R5F564MJDDLJ        | PTLG0100J*   | 198 |       |                     |              |
| 139 | RX64M | R5F564MJGDLJ        | PTLG0100J*   | 199 |       |                     |              |
| 140 | RX64M | R5F564MJHDLJ        | PTLG0100J*   | 200 |       |                     |              |
| 141 | RX64M | R5F564MLCDLJ        | PTLG0100J*   | 201 |       |                     |              |
| 142 | RX64M | R5F564MLDDLJ        | PTLG0100J*   | 202 |       |                     |              |
| 143 | RX64M | R5F564MLGDLJ        | PTLG0100J*   | 203 |       |                     |              |
| 144 | RX64M | R5F564MLHDLJ        | PTLG0100J*   | 204 |       |                     |              |
| 145 | RX64M | R5F564MFCDLK        | PTLG0145K*   | 205 |       |                     |              |
| 146 | RX64M | R5F564MFDDLK        | PTLG0145K*   | 206 |       |                     |              |
| 147 | RX64M | R5F564MFGDLK        | PTLG0145K*   | 207 |       |                     |              |
| 148 | RX64M | R5F564MFHDLK        | PTLG0145K*   | 208 |       |                     |              |
| 149 | RX64M | R5F564MGCDLK        | PTLG0145K*   | 209 |       |                     |              |
| 150 | RX64M | R5F564MGDDLK        | PTLG0145K*   | 210 |       |                     |              |
| 151 | RX64M | R5F564MGGDLK        | PTLG0145K*   | 211 |       |                     |              |
| 152 | RX64M | R5F564MGHDLK        | PTLG0145K*   | 212 |       |                     |              |
| 153 | RX64M | R5F564MJCDLK        | PTLG0145K*   | 213 |       |                     |              |
| 154 | RX64M | R5F564MJDDLK        | PTLG0145K*   | 214 |       |                     |              |
| 155 | RX64M | R5F564MJGDLK        | PTLG0145K*   | 215 |       |                     |              |
| 156 | RX64M | R5F564MJHDLK        | PTLG0145K*   | 216 |       |                     |              |
| 157 | RX64M | R5F564MLCDLK        | PTLG0145K*   | 217 |       |                     |              |
| 158 | RX64M | R5F564MLDDLK        | PTLG0145K*   | 218 |       |                     |              |
| 159 | RX64M | R5F564MLGDLK        | PTLG0145K*   | 219 |       |                     |              |
| 160 | RX64M | R5F564MLHDLK        | PTLG0145K*   | 220 |       |                     |              |