

RENESAS SEMICONDUCTOR RELIABILITY REPORT

GROUP : 78K0RKG3
DEVICE : Refer to Product List
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 .

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)

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

①Unique failure rate (λ_b)

$$\lambda_b = 8.19 \text{ FIT}$$

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

②Temperature 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 | 78K0RKG3 | UPD78F1162AGF(R)-XXX-GAS-AX | PLQP0100* | 51 | 78K0RKG3 | UPD78F1162AGC(R)-XXX-UEU-AX | PLQP0100* |
| 2 | 78K0RKG3 | UPD78F1162AGF(S)-GAS-AX | PLQP0100* | 52 | 78K0RKG3 | UPD78F1162AGC(S)-UEU-AX | PLQP0100* |
| 3 | 78K0RKG3 | UPD78F1162AGF(S)-XXX-GAS-AX | PLQP0100* | 53 | 78K0RKG3 | UPD78F1162AGC(S)-XXX-UEU-AX | PLQP0100* |
| 4 | 78K0RKG3 | UPD78F1162AGF-GAS-AX | PLQP0100* | 54 | 78K0RKG3 | UPD78F1162AGC-UEU-AX | PLQP0100* |
| 5 | 78K0RKG3 | UPD78F1162AGF-XXX-GAS-AX | PLQP0100* | 55 | 78K0RKG3 | UPD78F1162AGC-XXX-UEU-AX | PLQP0100* |
| 6 | 78K0RKG3 | UPD78F1163AGF(R)-XXX-GAS-AX | PLQP0100* | 56 | 78K0RKG3 | UPD78F1163AGC(R)-UEU-AX | PLQP0100* |
| 7 | 78K0RKG3 | UPD78F1163AGF(S)-GAS-AX | PLQP0100* | 57 | 78K0RKG3 | UPD78F1163AGC(R)-XXX-UEU-AX | PLQP0100* |
| 8 | 78K0RKG3 | UPD78F1163AGF(S)-XXX-GAS-AX | PLQP0100* | 58 | 78K0RKG3 | UPD78F1163AGC(S)-UEU-AX | PLQP0100* |
| 9 | 78K0RKG3 | UPD78F1163AGF-GAS-AX | PLQP0100* | 59 | 78K0RKG3 | UPD78F1163AGC(S)-XXX-UEU-AX | PLQP0100* |
| 10 | 78K0RKG3 | UPD78F1163AGF-XXX-GAS-AX | PLQP0100* | 60 | 78K0RKG3 | UPD78F1163AGC-UEU-AX | PLQP0100* |
| 11 | 78K0RKG3 | UPD78F1164AGF(R)-GAS-AX | PLQP0100* | 61 | 78K0RKG3 | UPD78F1163AGC-XXX-UEU-AX | PLQP0100* |
| 12 | 78K0RKG3 | UPD78F1164AGF(R)-XXX-GAS-AX | PLQP0100* | 62 | 78K0RKG3 | UPD78F1164AGC(R)-UEU-AX | PLQP0100* |
| 13 | 78K0RKG3 | UPD78F1164AGF(S)-GAS-AX | PLQP0100* | 63 | 78K0RKG3 | UPD78F1164AGC(R)-XXX-UEU-AX | PLQP0100* |
| 14 | 78K0RKG3 | UPD78F1164AGF(S)-XXX-GAS-AX | PLQP0100* | 64 | 78K0RKG3 | UPD78F1164AGC(S)-UEU-AX | PLQP0100* |
| 15 | 78K0RKG3 | UPD78F1164AGF-GAS-AX | PLQP0100* | 65 | 78K0RKG3 | UPD78F1164AGC(S)-XXX-UEU-AX | PLQP0100* |
| 16 | 78K0RKG3 | UPD78F1164AGF-XXX-GAS-AX | PLQP0100* | 66 | 78K0RKG3 | UPD78F1164AGC-UEU-AX | PLQP0100* |
| 17 | 78K0RKG3 | UPD78F1165AGF(R)-GAS-AX | PLQP0100* | 67 | 78K0RKG3 | UPD78F1164AGC-XXX-UEU-AX | PLQP0100* |
| 18 | 78K0RKG3 | UPD78F1165AGF(R)-XXX-GAS-AX | PLQP0100* | 68 | 78K0RKG3 | UPD78F1165AGC(R)-UEU-AX | PLQP0100* |
| 19 | 78K0RKG3 | UPD78F1165AGF(S)-GAS-AX | PLQP0100* | 69 | 78K0RKG3 | UPD78F1165AGC(R)-XXX-UEU-AX | PLQP0100* |
| 20 | 78K0RKG3 | UPD78F1165AGF(S)-XXX-GAS-AX | PLQP0100* | 70 | 78K0RKG3 | UPD78F1165AGC(S)-UEU-AX | PLQP0100* |
| 21 | 78K0RKG3 | UPD78F1165AGF-GAS-AX | PLQP0100* | 71 | 78K0RKG3 | UPD78F1165AGC(S)-XXX-UEU-AX | PLQP0100* |
| 22 | 78K0RKG3 | UPD78F1165AGF-XXX-GAS-AX | PLQP0100* | 72 | 78K0RKG3 | UPD78F1165AGC-UEU-AX | PLQP0100* |
| 23 | 78K0RKG3 | UPD78F1166AGF(R)-GAS-AX | PLQP0100* | 73 | 78K0RKG3 | UPD78F1165AGC-XXX-UEU-AX | PLQP0100* |
| 24 | 78K0RKG3 | UPD78F1166AGF(R)-XXX-GAS-AX | PLQP0100* | 74 | 78K0RKG3 | UPD78F1166AGC(R)-UEU-AX | PLQP0100* |
| 25 | 78K0RKG3 | UPD78F1166AGF(S)-GAS-AX | PLQP0100* | 75 | 78K0RKG3 | UPD78F1166AGC(R)-XXX-UEU-AX | PLQP0100* |
| 26 | 78K0RKG3 | UPD78F1166AGF(S)-XXX-GAS-AX | PLQP0100* | 76 | 78K0RKG3 | UPD78F1166AGC(S)-UEU-AX | PLQP0100* |
| 27 | 78K0RKG3 | UPD78F1166AGF-GAS-AX | PLQP0100* | 77 | 78K0RKG3 | UPD78F1166AGC(S)-XXX-UEU-AX | PLQP0100* |
| 28 | 78K0RKG3 | UPD78F1166AGF-XXX-GAS-AX | PLQP0100* | 78 | 78K0RKG3 | UPD78F1166AGC-UEU-AX | PLQP0100* |
| 29 | 78K0RKG3 | UPD78F1167AGF(R)-GAS-AX | PLQP0100* | 79 | 78K0RKG3 | UPD78F1166AGC-XXX-UEU-AX | PLQP0100* |
| 30 | 78K0RKG3 | UPD78F1167AGF(R)-XXX-GAS-AX | PLQP0100* | 80 | 78K0RKG3 | UPD78F1167AGC(R)-UEU-AX | PLQP0100* |
| 31 | 78K0RKG3 | UPD78F1167AGF(S)-GAS-AX | PLQP0100* | 81 | 78K0RKG3 | UPD78F1167AGC(R)-XXX-UEU-AX | PLQP0100* |
| 32 | 78K0RKG3 | UPD78F1167AGF(S)-XXX-GAS-AX | PLQP0100* | 82 | 78K0RKG3 | UPD78F1167AGC(S)-UEU-AX | PLQP0100* |
| 33 | 78K0RKG3 | UPD78F1167AGF-GAS-AX | PLQP0100* | 83 | 78K0RKG3 | UPD78F1167AGC(S)-XXX-UEU-AX | PLQP0100* |
| 34 | 78K0RKG3 | UPD78F1167AGF-XXX-GAS-AX | PLQP0100* | 84 | 78K0RKG3 | UPD78F1167AGC-UEU-AX | PLQP0100* |
| 35 | 78K0RKG3 | UPD78F1168AGF(R)-GAS-AX | PLQP0100* | 85 | 78K0RKG3 | UPD78F1167AGC-XXX-UEU-AX | PLQP0100* |
| 36 | 78K0RKG3 | UPD78F1168AGF(R)-XXX-GAS-AX | PLQP0100* | 86 | 78K0RKG3 | UPD78F1168AGC(R)-UEU-AX | PLQP0100* |
| 37 | 78K0RKG3 | UPD78F1168AGF(S)-GAS-AX | PLQP0100* | 87 | 78K0RKG3 | UPD78F1168AGC(R)-XXX-UEU-AX | PLQP0100* |
| 38 | 78K0RKG3 | UPD78F1168AGF(S)-XXX-GAS-AX | PLQP0100* | 88 | 78K0RKG3 | UPD78F1168AGC(S)-UEU-AX | PLQP0100* |
| 39 | 78K0RKG3 | UPD78F1168AGF-GAS-AX | PLQP0100* | 89 | 78K0RKG3 | UPD78F1168AGC(S)-XXX-UEU-AX | PLQP0100* |
| 40 | 78K0RKG3 | UPD78F1168AGF-XXX-GAS-AX | PLQP0100* | 90 | 78K0RKG3 | UPD78F1168AGC-UEU-AX | PLQP0100* |
| 41 | 78K0RKG3 | UPD78F1164GF(R)-GAS-AX | PLQP0100* | 91 | 78K0RKG3 | UPD78F1168AGC-UEU-E2-AX | PLQP0100* |
| 42 | 78K0RKG3 | UPD78F1164GF(S)-GAS-AX | PLQP0100* | 92 | 78K0RKG3 | UPD78F1168AGC-XXX-UEU-AX | PLQP0100* |
| 43 | 78K0RKG3 | UPD78F1164GF(S)-XXX-GAS-AX | PLQP0100* | 93 | 78K0RKG3 | UPD78F1168AGC-XXX-UEU-E2-AX | PLQP0100* |
| 44 | 78K0RKG3 | UPD78F1164GF-GAS-AX | PLQP0100* | 94 | 78K0RKG3 | UPD78F1162GC(S)-UEU-AX | PLQP0100* |
| 45 | 78K0RKG3 | UPD78F1165GF(R)-GAS-AX | PLQP0100* | 95 | 78K0RKG3 | UPD78F1162GC(S)-XXX-UEU-AX | PLQP0100* |
| 46 | 78K0RKG3 | UPD78F1165GF(S)-GAS-AX | PLQP0100* | 96 | 78K0RKG3 | UPD78F1162GC-UEU-AX | PLQP0100* |
| 47 | 78K0RKG3 | UPD78F1165GF(S)-XXX-GAS-AX | PLQP0100* | 97 | 78K0RKG3 | UPD78F1163GC(R)-UEU-AX | PLQP0100* |
| 48 | 78K0RKG3 | UPD78F1166GF(S)-GAS-AX | PLQP0100* | 98 | 78K0RKG3 | UPD78F1164GC(R)-UEU-AX | PLQP0100* |
| 49 | 78K0RKG3 | UPD78F1166GF-GAS-AX | PLQP0100* | 99 | 78K0RKG3 | UPD78F1164GC(S)-UEU-AX | PLQP0100* |
| 50 | 78K0RKG3 | UPD78F1162AGC(R)-UEU-AX | PLQP0100* | 100 | 78K0RKG3 | UPD78F1165GC(R)-UEU-AX | PLQP0100* |

Table. Product list

MCR-22-0666

| No | Group | Product part number | Package code | No | Group | Product part number | Package code |
|-----|----------|----------------------------|--------------|-----|-------|---------------------|--------------|
| 101 | 78K0RKG3 | UPD78F1165GC(R)-XXX-UEU-AX | PLQP0100* | 161 | | | |
| 102 | 78K0RKG3 | UPD78F1165GC(S)-UEU-AX | PLQP0100* | 162 | | | |
| 103 | 78K0RKG3 | UPD78F1165GC-UEU-AX | PLQP0100* | 163 | | | |
| 104 | 78K0RKG3 | UPD78F1166GC(R)-UEU-AX | PLQP0100* | 164 | | | |
| 105 | 78K0RKG3 | UPD78F1166GC(S)-UEU-AX | PLQP0100* | 165 | | | |
| 106 | 78K0RKG3 | UPD78F1166GC-UEU-AX | PLQP0100* | 166 | | | |
| 107 | 78K0RKG3 | UPD78F1166GC-XXX-UEU-AX | PLQP0100* | 167 | | | |
| 108 | 78K0RKG3 | UPD78F1167GC(R)-UEU-AX | PLQP0100* | 168 | | | |
| 109 | 78K0RKG3 | UPD78F1167GC(S)-UEU-AX | PLQP0100* | 169 | | | |
| 110 | 78K0RKG3 | UPD78F1167GC-UEU-AX | PLQP0100* | 170 | | | |
| 111 | 78K0RKG3 | UPD78F1168GC(R)-UEU-AX | PLQP0100* | 171 | | | |
| 112 | 78K0RKG3 | UPD78F1168GC(S)-UEU-AX | PLQP0100* | 172 | | | |
| 113 | 78K0RKG3 | UPD78F1168GC-UEU-AX | PLQP0100* | 173 | | | |
| 114 | 78K0RKG3 | UPD78F1168GC-UEU-E2-AX | PLQP0100* | 174 | | | |
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