To our customers,

## Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

Send any inquiries to http://www.renesas.com/inquiry.

# Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

   “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.

   “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

RENESAS

## Customer Notification

# μPD78F9222 Subseries™

## 8-Bit Single-Chip Microcontrollers

## Operating Precautions

---

## μPD78F9221
## μPD78F9222

Global Document No. U18105EE3V0IF00 (3rd edition)
Document No. TPS-LE-OP-F9222-3
Date Published March 2005

**DISCLAIMER**

The related documents in this customer notification may include preliminary versions. However, preliminary versions may not have been marked as such.

The information in this customer notification is current as of its date of publication. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC PRODUCT(S). Not all PRODUCT(S) and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.

No part of this customer notification may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this customer notification. NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC PRODUCT(S) listed in this customer notification or any other liability arising from the use of such PRODUCT(S).

No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others. Descriptions of circuits, software and other related information in this customer notification are provided for illustrative purposes of PRODUCT(S) operation and/or application examples only. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

While wherever feasible, NEC endeavors to enhance the quality, reliability and safe operation of PRODUCT(S) the customer agree and acknowledge that the possibility of defects and/or erroneous thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects and/or errors in PRODUCT(S) the customer must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.

The customer agrees to indemnify NEC against and hold NEC harmless from any and all consequences of any and all claims, suits, actions or demands asserted against NEC made by a third party for damages caused by one or more of the items listed in the enclosed table of content of this customer notification for PRODUCT(S) supplied after the date of publication.

**Applicable Law:**

The law of the Federal Republic of Germany applies to all information provided by NEC to the Customer under this Operating Precaution document without the possibility of recourse to the Conflicts Law or the law of 5th July 1989 relating to the UN Convention on Contracts for the International Sale of Goods (the Vienna CISG agreement).

Düsseldorf is the court of jurisdiction for all legal disputes arising directly or indirectly from this information. NEC is also entitled to make a claim against the Customer at his general court of jurisdiction.

If the supplied goods/information are subject to German, European and/or North American export controls, the Customer shall comply with the relevant export control regulations in the event that the goods are exported and/or re-exported. If deliveries are exported without payment of duty at the request of the Customer, the Customer accepts liability for any subsequent customs administration claims with respect to NEC.

**Notes**: (1) "**NEC**" as used in this statement means NEC Corporation and also includes its direct or indirect owned or controlled subsidiaries.

(2) "**PRODUCT(S)**" means 'NEC semiconductor products' *(NEC semiconductor products* means any semiconductor product developed or manufactured by or for NEC) and/or 'TOOLS' *(TOOLS* means 'hardware and/or software development tools' for NEC semiconductor products' developed, manufactured and supplied by 'NEC' and/or 'hardware and/or software development tools' supplied by NEC but developed and/or manufactured by independent 3rd Party vendors worldwide as their own product or on contract from NEC)

## Table of Contents



μPD78F9222 Subseries

Global Document No. U18105EE3V0IF00 (3rd edition)

## (A) Table of Operating Precautions

| No. | Outline | μPD78F9222 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Rev. Note | 1.0 | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | |
| | | Rank Note | | | | | K | E | P |
| 1 | Restriction for Flash Memory self-programming (Technical Limitation) | | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 | Restriction for WDT reset (Technical Limitation) | | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3 | Restriction for WDT count (Technical Limitation) | | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 | Restriction for Clock Generator (Technical Limitation) | | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | Restriction for LVI (Technical Limitation) | | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ |
| 6 | Restriction for INTP0 when LIN bus mode is used (Technical Limitation) | | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7 | ESD resistibility (Technical Limitation) | | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ |
| 8 | Restriction for STOP mode | | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ |

✓ : Not applicable
✗ : applicable

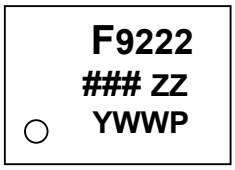
**Note**: The version is indicated by the in the lot number, marked on each product.
Pls refer to the below marking on each package

Marking for versions below V2.3


**xx: DS or ES**

**Y: Year Code**
**WW: Week Code**
**P: Rank**

Marking for versions V2.3 or later




**###: Code Number (only preprogrammed flash)**
**ZZ: Flash Grade**

**Y: Year Code**
**WW: Week Code**
**P: Rank**

**μPD78F9221/2**

| Revision | Marking |
|---|---|
| V 1.0 (DS) | 9222DS 411A<br>9222DS 416A |
| V 1.1 (ES) | 9222ES 422I |
| V 1.2 (DS) | 9222DS MMME |
| V 2.1 (ES) | 9222ES 441I<br>F9222ES 440K |
| V 2.1 | F9221 xxxK<br>F9222 xxxK |
| V 2.2 (ES) | F9222 V22ES 448K |
| V 2.3 | F9221 xxxE<br>F9222 xxxE |

Global Document No. U18105EE3V0IF00 (3rd edition)

## (B) Description of Operating Precautions

| No. 1 | Restriction for Flash Memory self-programming<br>(Technical Limitation) |
|---|---|
| | *Details*<br>If “Crystal/Ceramic oscillation” or “External clock input” is selected as clock generator by “Option byte”, Self-programming for Flash memory cannot be executed.<br>Self-programming for Flash memory can be executed only when “Internal High-speed Ring-osc” is selected by “Option byte”. |

| No. 2 | Restriction for WDT reset<br>(Technical Limitation) |
|---|---|
| | *Details*<br>If “Crystal/Ceramic oscillation” or “External clock input” is selected as clock generator by “Option byte”, Internal reset signal by WDT will not be generated.<br>WDT can be used only when “Internal High-speed Ring-osc” is selected by “Option byte”. |

| No. 3 | Restriction for WDT count<br>(Technical Limitation) |
|---|---|
| | *Details*<br>WDT counter will be incremented when write access for all SFR is executed.<br><br>*Workaround*<br>Shorten WDT counter clear interval, or Set WDT overflow time longer. |

Global Document No. U18105EE3V0IF00 (3rd edition)

| No. 4 | Restriction for Clock Generator<br>(Technical Limitation) |
|---|---|

*Restriction*

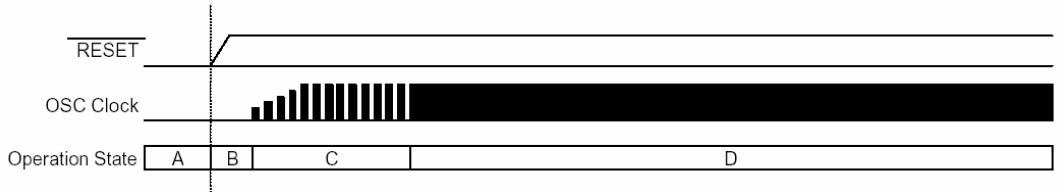
"Crystal/ Ceramic oscillation" cannot be used.
The system clock which can be used for Ver 1.1(ES) is only "Internal High-speed Ring-osc".

*Details*

During reset period, "Pull-down resistor" is connected with X1, X2 terminal for initialization (Figure 1-A). These pull-down resistors need to be cut when "Crystal/Ceramic oscillation" or "External clock input" is selected by "Option byte" (Figure 1-B). But, for Ver 1.0(DS) and Ver 1.1(ES), these pull-down resistors are connected until Program execution timing (Figure 1-D).
So, "Crystal/Ceramic oscillation" cannot operate correctly.

For Ver 1.0(DS), Internal High-speed Ring-osc is operating during oscillation stability period (Figure 1-C). Oscillation stability is counted by using this clock, and Clock change to "Crystal/Ceramic oscillation" or "External clock" which start oscillation at Program execution timing (Figure 1-D) can be executed correctly. So after that, CPU can operate by "Crystal/Ceramic oscillation" or "External clock" correctly.
But, for Ver 1.1(ES), Internal High-speed Ring-osc will stop if "Crystal/Ceramic oscillation" or "External clock" is selected by "Option byte". So CPU cannot operate because oscillation stability (Figure 1-C) cannot be counted.

Figure 1. Clock state after RESET




| Period | Normal Operation | DS1.0 | DS1.1 |
|---|---|---|---|
| A | Reset period | ← | ← |
| B | Reset is released, and Internal Ring-osc start, and "Option byte" setting is executed. | ← | ← |
| C | Oscillation stability period "External oscillation" will start, and CPU doesn't start operation. | X1/X2 is pull-downed, So "External oscillation" doesn't start. But oscillation stability is counted by Internal High-speed Ring-osc | X1/X2 is pull-downed, so "External oscillation" doesn't start. Oscillation stability cannot be counted. |
| D | Internal CPU reset is released CPU operates by oscillation clock. | Internal CPU reset is released. CPU operates by internal High-speed Ring-osc. And "External oscillation" will start, so 、after several instruction executed, clock source will be changed to "External oscillation" | Not operate. |

"External oscillation" : "Crystal/Ceramic oscillation" or "External clock input"

Global Document No. U18105EE3V0IF00 (3rd edition)

| No. 5 | Restriction for LVI<br>(Technical Limitation) |
|---|---|

*Details*
If a short pulse, but lower then the detection voltage (i.e caused by noise) is applied, the internal RESET generated by the LVI function might be not sufficient to initialize the CPU. Consequently, there is same risk for an incorrect operation of the CPU.

*Workaround*
There is no complete countermeasure. The influence of the noise can be reduced by adding a bypass capacitor between VDD and VSS.

| No. 6 | Restriction for INTP0 when LIN bus mode is used<br>(Technical Limitation) |
|---|---|

*Details*
When UART6 is used as LIN(Local Interconnect Network), and “RxD6” terminal is selected for input source of “INTP0” (ISC0=1), the interrupt operation of INTP0 will be as follows.

| **INTP0 input source (ISC0)** | **INTP0 valid edge (ES01,ES00)** | **Interrupt detect operation** |
|---|---|---|
| P30/INTP0 | Falling edge (ES01,ES00=0,0) | Correct operation |
| | Rising edge (ES01,ES00=0,1) | Correct operation |
| | Both edge (ES01,ES00=1,1) | Correct operation |
| P44/RxD6 | Falling edge (ES01,ES00=0,0) | Correct operation |
| | Rising edge (ES01,ES00=0,1) | **Rising edge for P44/RxD6 : interrupt cannot be detected**<br>**Rising edge for P30/INTP0 : interrupt will be detected** |
| | Both edge (ES01,ES00=1,1) | **【P44/RxD6】**<br>Falling edge input : interrupt can be detected<br>**Rising edge input : interrupt cannot be detected**<br>**【P30/INTP0】**<br>Falling edge input : interrupt will not be detected.<br>**Rising edge input : interrupt will be detected.** |

*Workaround*
When “RxD6” is selected as “INTP0” input source, it is recommended to set the valid edge to falling edge, or to set input source to “INTP0”.

| No. 7 | ESD resistibility<br>(Technical Limitation) |
|---|---|

*Details*
This product will not reach the NEC internal ESD guidelines.

| No. 8 | Restriction for STOP mode<br>(Technical Limitation) |
|---|---|

*Details*

When CPU execute STOP instruction with IE flag = 0(DI instruction executed) and IF flag = 1 that is not masked, STOP mode will not be released.
Then any other interrupts are occurred, STOP mode is not released, either.

Case 1 : When CPU execute STOP instruction with IE flag = 0 and IF flag = 1, MK flag = 0.

```
DI ; Interrupt is disabled
SET1 PIF0     ; Set interrupt request flag(INTP0)
CLR1 PMK0     ; Clear interrupt mask flag(INTP0)
SET1 P2.0     ; Set Port20 to “1”
STOP          ; Changing STOP mode
CLR1 P2.0     ; Clear Port20(Will not be executed)
```

When interrupt enabled and standby release signal is occurred, and CPU execute interrupt request pending instruction right before STOP instruction executing, then STOP mode will not be released.

Case2 : When CPU execute STOP instruction with IE flag = 1 and IF flag = 1, MK flag = 0.

```
EI            ; Interrupt is enabled
SET1 P2.0     ; Set Port20 to “1”
SET1 PIF0     ; Set interrupt request flag(INTP0)
CLR1 PMK0     ; Executing interrupt request pending instruction
STOP          ; Changing STOP mode
CLR1 P2.0     ; Clear Port20(Never executed)
```

Note : interrupt request pending instruction
Write access instruction for interrupt request flag register 0 (IF0)
Write access instruction for interrupt mask flag register 0 (MK0)

*Workaround*

Execute EI instruction before STOP instruction execution. Then do not execute Interrupt request pending instruction right before STOP execution.

Case3 : Executing EI instruction right before STOP instruction.

```
DI            ; Interrupt disabled
SET1 PIF0     ; Set interrupt request flag(INTP0)
CLR1 PMK0     ; Clear interrupt mask flag(INTP0)
SET1 P2.0     ; Set Port20 to “1”.
EI            ; Interrupt enabled
STOP          ; Changing STOP mode
CLR1 P2.0     ; Clear Port20(will execute)
```

Note:
If interrupt is occurred before executing STOP instruction, it’s necessary to generate interrupt for releasing from STOP mode because interrupt request flag is cleared before executing STOP instruction.

Global Document No. U18105EE3V0IF00 (3rd edition)

## (C) Valid Specification

| Item | Date published | Document No. | Document Title |
|---|---|---|---|
| 1 | November 2004 | U16898EJ… | User's Manual |
| | | | |
| | | | |
| | | | |

Global Document No. U18105EE3V0IF00 (3rd edition)

## (D) Revision History

| Item | Date published | Document No. | Comment |
|---|---|---|---|
| 1 | January 21, 2005 | TPS-LE-OP-F9222-1 | 1st Release |
| 2 | March 07, 2005 | TPS-LE-OP-F9222-2 | 2nd Release addition of version V 2.1 and later |
| 3 | March 22, 2006 | TPS-LE-OP-F9222-3 | 3rd Release addition of Rank “P” |
| | | | |

Global Document No. U18105EE3V0IF00 (3rd edition)