

## **Customer Notification**

**Migration from all Flash 78K0/Kx1+  
to Mask ROM 78K0/Kx1  
Microcontrollers**

**8-Bit Single-Chip Microcontrollers**

**Operating Precaution – Direction of Use**

---

### **Target Devices**

**All 78K0/Kx1 Mask ROM Devices**

**All 78K0/Kx1+ Single Voltage Flash Devices**

**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 3<sup>rd</sup> Party vendors worldwide as their own product or on contract from NEC)

## Table of Contents

|     |                                   |    |
|-----|-----------------------------------|----|
| (A) | Description.....                  | 4  |
| (B) | Table of Device Differences ..... | 5  |
| (C) | Valid Specification.....          | 9  |
| (D) | Revision History .....            | 10 |

78K0/Kx1 and 78K0/Kx1+ Microcontrollers

## **(A) Description**

This document gives a short guideline for considerations, when adapting software and hardware from the 78K0/Kx1+ Single Voltage Flash devices to the dedicated 78K0/Kx1 mask ROM devices.

For more differences, especially for the different electrical specifications among the devices, please refer to the latest user documentation. ([www.eu.necel.com/docuweb/](http://www.eu.necel.com/docuweb/))

**(B) Table of Device Differences**

| Item             | Feature                     | 78K0/Kx1+ all Flash devices   | 78K0/Kx1 mask ROM devices   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
|------------------|-----------------------------|---|---|------------------------------------|-------|-------|--------------------------------|---|---|---|---|---------------------------------|---|---|---|---|----------------------------------|---|---|---|---|----------------------------------|---|---|---|---|----------------------------------|---|---|---|---|----------------------------------|---|---|---|---|-----------------------------------|---|---|---|---|-----------------------------------|---|---|---|---|------------------------------------|---|---|---|---|----------------------------------|---|---|---|---|-----------------------------------|------------------|--|--|--|--------------------|--|-------|-------|-------|-----------------|---|---|---|---------------------------------|---|---|---|----------------------------------|---|---|---|----------------------------------|---|---|---|----------------------------------|---|---|---|--|---|---|---|---|---|---|---|---|---|---|---|--|
| 1                | Option Byte                 | Available, fixed on Address 0x0080<br>Here you can select:<br>- Ring Osc. can be stopped or<br>Ring Osc. can not be stopped<br><br>- RC Osc. or Ceramic/Crystal Osc. <b>(Note 1)</b>  | Not available, but the data selected for KC1+ can be kept at 0x0080.<br>The option:<br>“Ring Osc. can be stopped” or<br>“Ring Osc. can not be stopped”<br>must be selected by mask option when ordering the mask ROM version  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 2                | Power On RESET (POC)        | Available, and the level is fixed to 2.1V (+/- 0.1V)  | Can be selected by mask option when ordering the mask ROM version.<br>Following selections are possible:<br>- No POC<br>(in this case, the user must ensure to generate a proper RESET by external hardware )<br>- POC included, fixed to 2.85V (+/- 0.15V)<br>- POC included, fixed to 3.5V (+/- 0.2V) |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 3                | Low Voltage Indicator (LVI) | <table border="1"> <thead> <tr> <th>LVIS3</th> <th>LVIS2</th> <th>LVIS1</th> <th>LVIS0</th> <th>Detection level<sup>***</sup></th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>0</td><td>V<sub>LVO</sub> (4.3 V ±0.2 V)</td></tr> <tr><td>0</td><td>0</td><td>0</td><td>1</td><td>V<sub>LVI1</sub> (4.1 V ±0.2 V)</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>0</td><td>V<sub>LVI2</sub> (3.9 V ±0.2 V)</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>1</td><td>V<sub>LVI3</sub> (3.7 V ±0.2 V)</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>0</td><td>V<sub>LVI4</sub> (3.5 V ±0.2 V)</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>1</td><td>V<sub>LVI5</sub> (3.3 V ±0.15 V)</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>0</td><td>V<sub>LVI6</sub> (3.1 V ±0.15 V)</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>1</td><td>V<sub>LVI7</sub> (2.85 V ±0.15 V)</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>0</td><td>V<sub>LVI8</sub> (2.6 V ±0.1 V)</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>1</td><td>V<sub>LVI9</sub> (2.35 V ±0.1 V)</td></tr> <tr><td colspan="4">Other than above</td><td>Setting prohibited</td></tr> </tbody> </table> | LVIS3   | LVIS2                              | LVIS1 | LVIS0 | Detection level <sup>***</sup> | 0 | 0 | 0 | 0 | V <sub>LVO</sub> (4.3 V ±0.2 V) | 0 | 0 | 0 | 1 | V <sub>LVI1</sub> (4.1 V ±0.2 V) | 0 | 0 | 1 | 0 | V <sub>LVI2</sub> (3.9 V ±0.2 V) | 0 | 0 | 1 | 1 | V <sub>LVI3</sub> (3.7 V ±0.2 V) | 0 | 1 | 0 | 0 | V <sub>LVI4</sub> (3.5 V ±0.2 V) | 0 | 1 | 0 | 1 | V <sub>LVI5</sub> (3.3 V ±0.15 V) | 0 | 1 | 1 | 0 | V <sub>LVI6</sub> (3.1 V ±0.15 V) | 0 | 1 | 1 | 1 | V <sub>LVI7</sub> (2.85 V ±0.15 V) | 1 | 0 | 0 | 0 | V <sub>LVI8</sub> (2.6 V ±0.1 V) | 1 | 0 | 0 | 1 | V <sub>LVI9</sub> (2.35 V ±0.1 V) | Other than above |  |  |  | Setting prohibited | <table border="1"> <thead> <tr> <th>LVIS2</th> <th>LVIS1</th> <th>LVIS0</th> <th>Detection level</th> </tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>V<sub>LVO</sub> (4.3 V ±0.2 V)</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>V<sub>LVI1</sub> (4.1 V ±0.2 V)</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>V<sub>LVI2</sub> (3.9 V ±0.2 V)</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>V<sub>LVI3</sub> (3.7 V ±0.2 V)</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>V<sub>LVI4</sub> (3.5 V ±0.2 V)<sup>***1</sup></td></tr> <tr><td>1</td><td>0</td><td>1</td><td>V<sub>LVI5</sub> (3.3 V ±0.15 V)<sup>***1,2</sup></td></tr> <tr><td>1</td><td>1</td><td>0</td><td>V<sub>LVI6</sub> (3.1 V ±0.15 V)<sup>***1,2</sup></td></tr> <tr><td>1</td><td>1</td><td>1</td><td>V<sub>LVI7</sub> (2.85 V ±0.15 V)<sup>***1,2,3</sup></td></tr> </tbody> </table> <p>LVIS3 must be “0”</p> | LVIS2 | LVIS1 | LVIS0 | Detection level | 0 | 0 | 0 | V <sub>LVO</sub> (4.3 V ±0.2 V) | 0 | 0 | 1 | V <sub>LVI1</sub> (4.1 V ±0.2 V) | 0 | 1 | 0 | V <sub>LVI2</sub> (3.9 V ±0.2 V) | 0 | 1 | 1 | V <sub>LVI3</sub> (3.7 V ±0.2 V) | 1 | 0 | 0 | V <sub>LVI4</sub> (3.5 V ±0.2 V) <sup>***1</sup> | 1 | 0 | 1 | V <sub>LVI5</sub> (3.3 V ±0.15 V) <sup>***1,2</sup> | 1 | 1 | 0 | V <sub>LVI6</sub> (3.1 V ±0.15 V) <sup>***1,2</sup> | 1 | 1 | 1 | V <sub>LVI7</sub> (2.85 V ±0.15 V) <sup>***1,2,3</sup> |
| LVIS3            | LVIS2                       | LVIS1   | LVIS0   | Detection level <sup>***</sup>     |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 0   | 0   | V <sub>LVO</sub> (4.3 V ±0.2 V)    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 0   | 1   | V <sub>LVI1</sub> (4.1 V ±0.2 V)   |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 1   | 0   | V <sub>LVI2</sub> (3.9 V ±0.2 V)   |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 1   | 1   | V <sub>LVI3</sub> (3.7 V ±0.2 V)   |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 0   | 0   | V <sub>LVI4</sub> (3.5 V ±0.2 V)   |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 0   | 1   | V <sub>LVI5</sub> (3.3 V ±0.15 V)  |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 1   | 0   | V <sub>LVI6</sub> (3.1 V ±0.15 V)  |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 1   | 1   | V <sub>LVI7</sub> (2.85 V ±0.15 V) |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 0                           | 0   | 0   | V <sub>LVI8</sub> (2.6 V ±0.1 V)   |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 0                           | 0   | 1   | V <sub>LVI9</sub> (2.35 V ±0.1 V)  |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| Other than above |                             |   |   | Setting prohibited                 |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| LVIS2            | LVIS1                       | LVIS0   | Detection level   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 0   | V <sub>LVO</sub> (4.3 V ±0.2 V)   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 0                           | 1   | V <sub>LVI1</sub> (4.1 V ±0.2 V)  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 0   | V <sub>LVI2</sub> (3.9 V ±0.2 V)  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 0                | 1                           | 1   | V <sub>LVI3</sub> (3.7 V ±0.2 V)  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 0                           | 0   | V <sub>LVI4</sub> (3.5 V ±0.2 V) <sup>***1</sup>  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 0                           | 1   | V <sub>LVI5</sub> (3.3 V ±0.15 V) <sup>***1,2</sup>   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 1                           | 0   | V <sub>LVI6</sub> (3.1 V ±0.15 V) <sup>***1,2</sup>   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 1                | 1                           | 1   | V <sub>LVI7</sub> (2.85 V ±0.15 V) <sup>***1,2,3</sup>  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 4                | Operating Voltage Range     | 2.0V to 5.5V  | 2.5V to 5.5V <b>(Note 2)</b>  |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |
| 5                | Operating Frequency Range   | 2 to 16MHz<br><b>Caution:</b><br>The maximum frequency for the peripherals operation is 10MHz. Pls refer to the corresponding notes in the related User’s Manual.   | 2 to 12MHz <b>(Note 2)</b><br><b>Caution:</b><br>The maximum frequency for the peripherals operation is 10MHz. Pls refer to the corresponding notes in the related User’s Manual.   |                                    |       |       |                                |   |   |   |   |                                 |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                  |   |   |   |   |                                   |   |   |   |   |                                   |   |   |   |   |                                    |   |   |   |   |                                  |   |   |   |   |                                   |                  |  |  |  |                    |  |       |       |       |                 |   |   |   |                                 |   |   |   |                                  |   |   |   |                                  |   |   |   |                                  |   |   |   |  |   |   |   |   |   |   |   |   |   |   |   |  |

Direction of Use - Migrate for 78K0/Kx1+ to 78K0/Kx1 mask ROM Devices

| Item | Feature                                   | 78K0/Kx1+ all Flash devices  | 78K0/Kx1 mask ROM devices  |
|------|---|--|--|
| 6    | UART6<br>LIN Master mode                  | Yes, can be supported  | No, please refer to the Customer Notification: 'TPS-LE-OP-Kx1-1.PDF'. This document is available on our Internet.  |
| 7    | FLMD0, IC pin                             | FLMD0 is available on all 78K0/Kx1+ products and must be connected to VSS directly, or via a pull-down resistor < 10K              | IC is available on all 78K0/Kx1 mask ROM versions and must be connected to VSS, directly.  |
| 8    | FLMD1 pin                                 | Available, shared with P17/TI50/TO50 pin. During programming FLMD1 must be pull-down.  | Not applicable (no Flash)  |
| 9    | Flash Memory                              | 78K0/Kx1+ are "Single Voltage Flash" devices and the self-programming feature is available.  | Not available (no Flash)   |
| 10   | VSWC register                             | Please keep the RESET value, which is 0x00   | Not available. Setting the VSWC register to 0x00 has no impact for the 78K0/Kx1 mask ROM devices   |
| 11   | External RC Oscillator<br><b>(Note 1)</b> | Yes, possible but not available on all products. For details, please refer to the "Option Byte" in the corresponding User's Manual | Not available  |
| 12   | REGC, NC pin<br><b>(Note 3)</b>           | On the corresponding 78K0/Kx1+ products this pin is called <b>NC</b> . Please leave this pin open.                                 | On the corresponding 78K0/Kx1 mask ROM products this pin is called REGC. You must connect this pin either to:<br><ul style="list-style-type: none"> <li>- VDD (valid for a frequency range up to 12MHz)</li> <li>- VDD <b>or</b> via a capacitor (1µF) to VSS (valid for a frequency range up to 8.38MHz)</li> </ul> |

Direction of Use - Migrate for 78K0/Kx1+ to 78K0/Kx1 mask ROM Devices

| Item                                 | Feature                                 | 78K0/Kx1+ all Flash devices  | 78K0/Kx1 mask ROM devices |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
|--------------------------------------|---|--|---------------------------|--------------------------------------|--|-------------|---|-----------|-----|-------------|-----------|-----|-------------|-----------|-----|-------------|-----------|-----|-------------|-----------|-----|------------------------|-----------|-----|
| 13                                   | IMS register setting                    | <p>The IMS register must be set in accordance to the target mask ROM device.<br/>                     An example for the different IMS values are given here:<br/> <b>Example:</b> 78K0/KE1+ and 78K0/KE1</p> <p style="text-align: center;"><b>Table 26-2. Internal Memory Size Switching Register Settings</b></p> <table border="1" data-bbox="722 469 1440 748"> <thead> <tr> <th data-bbox="722 469 1003 534">Flash Memory Versions<br/>(78K0/KE1+)</th> <th data-bbox="1003 469 1276 534">Target Mask ROM Versions<br/>(78K0/KE1)</th> <th data-bbox="1276 469 1440 534">IMS Setting</th> </tr> </thead> <tbody> <tr> <td data-bbox="722 534 1003 570">–</td> <td data-bbox="1003 534 1276 570">μPD780131</td> <td data-bbox="1276 534 1440 570">42H</td> </tr> <tr> <td data-bbox="722 570 1003 605">μPD78F0132H</td> <td data-bbox="1003 570 1276 605">μPD780132</td> <td data-bbox="1276 570 1440 605">44H</td> </tr> <tr> <td data-bbox="722 605 1003 641">μPD78F0133H</td> <td data-bbox="1003 605 1276 641">μPD780133</td> <td data-bbox="1276 605 1440 641">C6H</td> </tr> <tr> <td data-bbox="722 641 1003 677">μPD78F0134H</td> <td data-bbox="1003 641 1276 677">μPD780134</td> <td data-bbox="1276 641 1440 677">C8H</td> </tr> <tr> <td data-bbox="722 677 1003 712">μPD78F0136H</td> <td data-bbox="1003 677 1276 712">μPD780136</td> <td data-bbox="1276 677 1440 712">CCH</td> </tr> <tr> <td data-bbox="722 712 1003 748">μPD78F0138H, 78F0138HD</td> <td data-bbox="1003 712 1276 748">μPD780138</td> <td data-bbox="1276 712 1440 748">CFH</td> </tr> </tbody> </table>  |                           | Flash Memory Versions<br>(78K0/KE1+) | Target Mask ROM Versions<br>(78K0/KE1) | IMS Setting | – | μPD780131 | 42H | μPD78F0132H | μPD780132 | 44H | μPD78F0133H | μPD780133 | C6H | μPD78F0134H | μPD780134 | C8H | μPD78F0136H | μPD780136 | CCH | μPD78F0138H, 78F0138HD | μPD780138 | CFH |
| Flash Memory Versions<br>(78K0/KE1+) | Target Mask ROM Versions<br>(78K0/KE1)  | IMS Setting  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| –                                    | μPD780131                               | 42H  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0132H                          | μPD780132                               | 44H  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0133H                          | μPD780133                               | C6H  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0134H                          | μPD780134                               | C8H  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0136H                          | μPD780136                               | CCH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0138H, 78F0138HD               | μPD780138                               | CFH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| 14                                   | IXS register setting<br><b>(Note 4)</b> | <p>The IXS register must be set in accordance to the target mask ROM device.<br/>                     An example for the different IXS values are given here:<br/> <b>Example:</b> 78K0/KE1+ and 78K0/KE1</p> <p style="text-align: center;"><b>Table 26-3. Internal Expansion RAM Size Switching Register Settings</b></p> <table border="1" data-bbox="730 902 1444 1182"> <thead> <tr> <th data-bbox="730 902 1012 967">Flash Memory Versions<br/>(78K0/KE1+)</th> <th data-bbox="1012 902 1285 967">Target Mask ROM Versions<br/>(78K0/KE1)</th> <th data-bbox="1285 902 1444 967">IXS Setting</th> </tr> </thead> <tbody> <tr> <td data-bbox="730 967 1012 1003">–</td> <td data-bbox="1012 967 1285 1003">μPD780131</td> <td data-bbox="1285 967 1444 1003">0CH</td> </tr> <tr> <td data-bbox="730 1003 1012 1039">μPD78F0132H</td> <td data-bbox="1012 1003 1285 1039">μPD780132</td> <td data-bbox="1285 1003 1444 1039">0CH</td> </tr> <tr> <td data-bbox="730 1039 1012 1075">μPD78F0133H</td> <td data-bbox="1012 1039 1285 1075">μPD780133</td> <td data-bbox="1285 1039 1444 1075">0CH</td> </tr> <tr> <td data-bbox="730 1075 1012 1110">μPD78F0134H</td> <td data-bbox="1012 1075 1285 1110">μPD780134</td> <td data-bbox="1285 1075 1444 1110">0CH</td> </tr> <tr> <td data-bbox="730 1110 1012 1146">μPD78F0136H</td> <td data-bbox="1012 1110 1285 1146">μPD780136</td> <td data-bbox="1285 1110 1444 1146">0AH</td> </tr> <tr> <td data-bbox="730 1146 1012 1182">μPD78F0138H, 78F0138HD</td> <td data-bbox="1012 1146 1285 1182">μPD780138</td> <td data-bbox="1285 1146 1444 1182">0AH</td> </tr> </tbody> </table> |                           | Flash Memory Versions<br>(78K0/KE1+) | Target Mask ROM Versions<br>(78K0/KE1) | IXS Setting | – | μPD780131 | 0CH | μPD78F0132H | μPD780132 | 0CH | μPD78F0133H | μPD780133 | 0CH | μPD78F0134H | μPD780134 | 0CH | μPD78F0136H | μPD780136 | 0AH | μPD78F0138H, 78F0138HD | μPD780138 | 0AH |
| Flash Memory Versions<br>(78K0/KE1+) | Target Mask ROM Versions<br>(78K0/KE1)  | IXS Setting  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| –                                    | μPD780131                               | 0CH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0132H                          | μPD780132                               | 0CH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0133H                          | μPD780133                               | 0CH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0134H                          | μPD780134                               | 0CH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0136H                          | μPD780136                               | 0AH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |
| μPD78F0138H, 78F0138HD               | μPD780138                               | 0AH  |                           |                                      |  |             |   |           |     |             |           |     |             |           |     |             |           |     |             |           |     |                        |           |     |

Direction of Use - Migrate for 78K0/Kx1+ to 78K0/Kx1 mask ROM Devices

| Item | Feature      | 78K0/Kx1+ all Flash devices | 78K0/Kx1 mask ROM devices   |
|------|--------------|-----------------------------|---|
| 15   | Mask Options | None                        | When ordering the mask devices the following mask options <b>must be</b> selected:<br>a) Ring Oscillator operation:<br>- Ring Osc. can be stopped by software<br>- Ring Osc. can not be stopped by software<br>b) POC function:<br>- No POC function inside<br>- POC included and fixed to 2.85V (+/- 0.15V)<br>- POC included and fixed to 3.5V (+/- 0.2V)<br>c) Pull-up resistors for Port 6 (P60 to P63)<br>- Included<br>- Not included |

**Note 1:** The RC Oscillator option is available on the 78K0/KB1+ and 78K0/KC1+ devices, only.

**Note 2:** The specified **Operating Voltage Range** and **Operating Frequency Range** will depend on the specified temperature range.  
 For details, please refer to the corresponding data in the User's Manual

**Note 3:** The NC pin is available on the 78K0/KD1+, 78K0/KE1+ and 78K0/KF1+ devices, only.

The REGC pin is available on the 78K0/KD1, 78K0/KE1 and 78K0/KF1 devices, only

**Note 4:** The IXS register is available on the 78K0/KE1, 78K0/KE1+, 78K0/KF1 and 78K0/KF1+ devices, only.

**Remark:**

As the 78K0/Kx1 Dual Voltage Flash devices were tailored for the 78K0/Kx1 mask ROM devices, we recommend to check the correct function of your software and hardware by using the concerning Dual Voltage Flash devices.

For example:  $\mu\text{PD78F0148M}_x$  ( $x = 1$  to 6, depends on the mask option setting for POC level and Ring Osc. Stop).

**(C) Valid Specification**

| Item | Date published   | Document No. | Document Title |
|------|--|--------------|----------------|
| 1    | <a href="http://www.eu.necel.com/docuweb/">www.eu.necel.com/docuweb/</a><br>Search Tip:<br>Write Kx1 (x = B, C, D, E, F) as a keyword and find all relevant documentations for the dedicated Kx1 and Kx1+ microcontrollers |              |                |
|      |  |              |                |

**(D) Revision History**

| <b>Item</b> | <b>Date published</b> | <b>Document No.</b>  | <b>Comment</b>          |
|-------------|-----------------------|----------------------|-------------------------|
| 1           | October 11, 2005      | TPS-LE-OP-DoUK0Kx1-1 | 1 <sup>st</sup> Release |
|             |                       |                      |                         |
|             |                       |                      |                         |