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78K0S/Kx1+ Microcontrollers  Document Modification	Document No.	ZBG-CC-07-0012	1/2
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Related documents 78K0S/KU1+ User's Manual: U18172EJ1V0UD00 78K0S/KY1+ User's Manual: U16994EJ4V1UD00 U18372EJ1V0UD00 78K0S/KA1+ User's Manual: U16898EJ4V1UD00 78K0S/KB1+ User's Manual: U17446EJ3V1UD00	Notification classification		Usage restriction
			Upgrade
		√	Document modification
			Other notification

### 1. Affected products

78K0S/KU1+:  $\mu$ PD78F9200,  $\mu$ PD78F9201,  $\mu$ PD78F9202  
78K0S/KY1+:  $\mu$ PD78F9210,  $\mu$ PD78F9211,  $\mu$ PD78F9212  
 $\mu$ PD78F9510,  $\mu$ PD78F9511,  $\mu$ PD78F9512  
78K0S/KA1+:  $\mu$ PD78F9221,  $\mu$ PD78F9222  
78K0S/KB1+:  $\mu$ PD78F9232,  $\mu$ PD78F9234

### 2. Notification details

The errors found in the user's manual and corrections for them are described in the attachment.

[Corrected items]

78K0S/KU1+:  $\mu$ PD78F9200,  $\mu$ PD78F9201,  $\mu$ PD78F9202

Page	Chapter	Description
p. 277	Chapter 18 Electrical Specifications	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width

78K0S/KY1+:  $\mu$ PD78F9210,  $\mu$ PD78F9211,  $\mu$ PD78F9212

Page	Chapter	Description
p. 280	Chapter 18 Electrical Specifications (Standard	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 284	product, (A) grade product)	Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics
p. 293	Chapter 19 Electrical Specifications (Target	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 297	Values) ((A2) grade product)	Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics

78K0S/KY1+:  $\mu$ PD78F9510,  $\mu$ PD78F9511,  $\mu$ PD78F9512

Page	Chapter	Description
p. 259	Chapter 17 Electrical Specifications	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 263		Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics

78K0S/KA1+:  $\mu$ PD78F9221,  $\mu$ PD78F9222

Page	Chapter	Description
p. 333	Chapter 20 Electrical Specifications (Standard product, (A) grade product)	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 337		Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics
p. 346	Chapter 21 Electrical Specifications ((A2) grade product)	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 350		Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics

78K0S/KB1+:  $\mu$ PD78F9232,  $\mu$ PD78F9234

Page	Chapter	Description
p. 339	Chapter 21 Electrical Specifications (Standard product, (A) grade product)	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 343		Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics
p. 352	Chapter 22 Electrical Specifications (Target Values) ((A2) grade product)	Modification of Min. values for X1 oscillation frequency characteristics and Max. values for X1 input high-/low-level width
p. 356		Modification of setting ranges for $f_{CPU}$ and $f_{XP}$ to AC characteristics

## 3. Action

The modifications will be reflected in the next edition of the user's manual.

**Modification details**

- ◆ Modified items related to X1 oscillator characteristics

Common to all products (standard products, (A) grade products)

<Incorrect>

**X1 Oscillator Characteristics (T<sub>A</sub> = -40 to +85°C, V<sub>DD</sub> = 2.0 to 5.5 V<sup>Note 1</sup>, V<sub>SS</sub> = 0 V)**

Resonator	Recommended Circuit	Parameter	Conditions	MIN.	TYP.	MAX.	Unit
Ceramic resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		1		10.0	MHz
Crystal resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		1		10.0	MHz
External clock		X1 input frequency (f <sub>x</sub> ) <sup>Note 2</sup>	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	1		10.0	MHz
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	1		5.0	
		X1 input high-/low-level width (t <sub>xH</sub> , t <sub>xL</sub> )	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	0.045		0.5	μs
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	0.09		0.5	

**Notes 1.** Use this product in a voltage range of 2.2 to 5.5 V because the detection voltage (V<sub>POC</sub>) of the power-on clear (POC) circuit is 2.1 V ±0.1 V.

**2.** Indicates only oscillator characteristics. Refer to **AC Characteristics** for instruction execution time.

<Correct>

**X1 Oscillator Characteristics (T<sub>A</sub> = -40 to +85°C, V<sub>DD</sub> = 2.0 to 5.5 V<sup>Note 1</sup>, V<sub>SS</sub> = 0 V)**

Resonator	Recommended Circuit	Parameter	Conditions	MIN.	TYP.	MAX.	Unit
Ceramic resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		2		10.0	MHz
Crystal resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		2		10.0	MHz
External clock		X1 input frequency (f <sub>x</sub> ) <sup>Note 2</sup>	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	2		10.0	MHz
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	2		5.0	
		X1 input high-/low-level width (t <sub>xH</sub> , t <sub>xL</sub> )	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	0.045		0.25	μs
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	0.09		0.25	

**Notes 1.** Use this product in a voltage range of 2.2 to 5.5 V because the detection voltage (V<sub>POC</sub>) of the power-on clear (POC) circuit is 2.1 V ±0.1 V.

**2.** Indicates only oscillator characteristics. Refer to **AC Characteristics** for instruction execution time.

Common to all products ((A2) grade products)

<Incorrect>

**X1 Oscillator Characteristics (T<sub>A</sub> = -40 to +85°C, V<sub>DD</sub> = 2.0 to 5.5 V<sup>Note 1</sup>, V<sub>SS</sub> = 0 V)**

Resonator	Recommended Circuit	Parameter	Conditions	MIN.	TYP.	MAX.	Unit
Ceramic resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		1		8.0	MHz
Crystal resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		1		8.0	MHz
External clock		X1 input frequency (f <sub>x</sub> ) <sup>Note 2</sup>	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	1		8.0	MHz
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	1		5.0	
		X1 input high-/low-level width (t <sub>xH</sub> , t <sub>xL</sub> )	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	0.057		0.5	μs
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	0.09		0.5	

**Notes 1.** Use this product in a voltage range of 2.6 to 5.5 V because the detection voltage (V<sub>POC</sub>) of the power-on clear (POC) circuit is 2.26 V (MAX.).

**2.** Indicates only oscillator characteristics. Refer to **AC Characteristics** for instruction execution time.

<Correct>

**X1 Oscillator Characteristics (T<sub>A</sub> = -40 to +85°C, V<sub>DD</sub> = 2.0 to 5.5 V<sup>Note 1</sup>, V<sub>SS</sub> = 0 V)**

Resonator	Recommended Circuit	Parameter	Conditions	MIN.	TYP.	MAX.	Unit
Ceramic resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		2		8.0	MHz
Crystal resonator		Oscillation frequency (f <sub>x</sub> ) <sup>Note 2</sup>		2		8.0	MHz
External clock		X1 input frequency (f <sub>x</sub> ) <sup>Note 2</sup>	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	2		8.0	MHz
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	2		5.0	
		X1 input high-/low-level width (t <sub>xH</sub> , t <sub>xL</sub> )	2.7 V ≤ V <sub>DD</sub> ≤ 5.5 V	0.057		0.25	μs
			2.0 V ≤ V <sub>DD</sub> < 2.7 V	0.09		0.25	

**Notes 1.** Use this product in a voltage range of 2.6 to 5.5 V because the detection voltage (V<sub>POC</sub>) of the power-on clear (POC) circuit is 2.26 V (MAX.).

**2.** Indicates only oscillator characteristics. Refer to **AC Characteristics** for instruction execution time.

◆ Setting range table for  $f_{CPU}$  and  $f_{XP}$ 

Common to all products (standard products, (A) grade products)

&lt;Incorrect&gt;

Resonator	Conditions	CPU Clock ( $f_{CPU}$ )	Peripheral Clock ( $f_{XP}$ )
Ceramic resonator, crystal resonator, external clock	4.0 to 5.5 V	$125 \text{ kHz} \leq f_{CPU} \leq 10 \text{ MHz}$	$125 \text{ kHz} \leq f_{XP} \leq 10 \text{ MHz}$
	3.0 to 4.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 6 \text{ MHz}$	
	2.7 to 3.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 5 \text{ MHz}$	
	2.0 to 2.7 V <sup>Note</sup>	$125 \text{ kHz} \leq f_{CPU} \leq 2 \text{ MHz}$	$125 \text{ kHz} \leq f_{XP} \leq 5 \text{ MHz}$
High-speed internal oscillator	4.0 to 5.5V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 8 \text{ MHz (TYP.)}$	$500 \text{ kHz} \leq f_{XP} \leq 8 \text{ MHz (TYP.)}$
	2.7 to 4.0 V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 4 \text{ MHz (TYP.)}$	
	2.0 to 2.7 V <sup>Note</sup>	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 2 \text{ MHz (TYP.)}$	$500 \text{ kHz} \leq f_{XP} \leq 4 \text{ MHz (TYP.)}$

**Note** Use this product in a voltage range of 2.2 to 5.5 V because the detection voltage ( $V_{POC}$ ) of the power-on clear (POC) circuit is  $2.1 \text{ V} \pm 0.1 \text{ V}$ .

&lt;Correct&gt;

Resonator	Conditions	CPU Clock ( $f_{CPU}$ )	Peripheral Clock ( $f_{XP}$ )
Ceramic resonator, crystal resonator, external clock	4.0 to 5.5 V	$125 \text{ kHz} \leq f_{CPU} \leq 10 \text{ MHz}$	$500 \text{ kHz} \leq f_{XP} \leq 10 \text{ MHz}$
	3.0 to 4.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 6 \text{ MHz}$	
	2.7 to 3.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 5 \text{ MHz}$	
	2.0 to 2.7 V <sup>Note</sup>	$125 \text{ kHz} \leq f_{CPU} \leq 2 \text{ MHz}$	$500 \text{ kHz} \leq f_{XP} \leq 5 \text{ MHz}$
High-speed internal oscillator	4.0 to 5.5V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 8 \text{ MHz (TYP.)}$	$2 \text{ MHz} \leq f_{XP} \leq 8 \text{ MHz (TYP.)}$
	2.7 to 4.0 V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 4 \text{ MHz (TYP.)}$	
	2.0 to 2.7 V <sup>Note</sup>	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 2 \text{ MHz (TYP.)}$	$2 \text{ MHz} \leq f_{XP} \leq 4 \text{ MHz (TYP.)}$

**Note** Use this product in a voltage range of 2.2 to 5.5 V because the detection voltage ( $V_{POC}$ ) of the power-on clear (POC) circuit is  $2.1 \text{ V} \pm 0.1 \text{ V}$ .

Common to all products ((A2) grade products)

<Incorrect>

Resonator	Conditions	CPU Clock ( $f_{CPU}$ )	Peripheral Clock ( $f_{XP}$ )
Ceramic resonator, crystal resonator, external clock	4.0 to 5.5 V	$125 \text{ kHz} \leq f_{CPU} \leq 8 \text{ MHz}$	$125 \text{ kHz} \leq f_{XP} \leq 8 \text{ MHz}$
	3.0 to 4.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 6 \text{ MHz}$	
	2.7 to 3.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 5 \text{ MHz}$	$125 \text{ kHz} \leq f_{XP} \leq 5 \text{ MHz}$
	2.0 to 2.7 V <sup>Note</sup>	$125 \text{ kHz} \leq f_{CPU} \leq 2 \text{ MHz}$	
High-speed internal oscillator	4.0 to 5.5V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 8 \text{ MHz (TYP.)}$	$500 \text{ kHz} \leq f_{XP} \leq 8 \text{ MHz (TYP.)}$
	2.7 to 4.0 V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 4 \text{ MHz (TYP.)}$	$500 \text{ kHz} \leq f_{XP} \leq 4 \text{ MHz (TYP.)}$
	2.0 to 2.7 V <sup>Note</sup>	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 2 \text{ MHz (TYP.)}$	

**Note** Use this product in a voltage range of 2.26 to 5.5 V because the detection voltage ( $V_{POC}$ ) of the power-on clear (POC) circuit is 2.26 V (MAX.).

<Correct>

Resonator	Conditions	CPU Clock ( $f_{CPU}$ )	Peripheral Clock ( $f_{XP}$ )
Ceramic resonator, crystal resonator, external clock	4.0 to 5.5 V	$125 \text{ kHz} \leq f_{CPU} \leq 8 \text{ MHz}$	$500 \text{ kHz} \leq f_{XP} \leq 8 \text{ MHz}$
	3.0 to 4.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 6 \text{ MHz}$	
	2.7 to 3.0 V	$125 \text{ kHz} \leq f_{CPU} \leq 5 \text{ MHz}$	$500 \text{ kHz} \leq f_{XP} \leq 5 \text{ MHz}$
	2.0 to 2.7 V <sup>Note</sup>	$125 \text{ kHz} \leq f_{CPU} \leq 2 \text{ MHz}$	
High-speed internal oscillator	4.0 to 5.5V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 8 \text{ MHz (TYP.)}$	$2 \text{ MHz} \leq f_{XP} \leq 8 \text{ MHz (TYP.)}$
	2.7 to 4.0 V	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 4 \text{ MHz (TYP.)}$	$2 \text{ MHz} \leq f_{XP} \leq 4 \text{ MHz (TYP.)}$
	2.0 to 2.7 V <sup>Note</sup>	$500 \text{ kHz (TYP.)} \leq f_{CPU} \leq 2 \text{ MHz (TYP.)}$	

**Note** Use this product in a voltage range of 2.26 to 5.5 V because the detection voltage ( $V_{POC}$ ) of the power-on clear (POC) circuit is 2.26 V (MAX.).