

# TK-78K0/KF2

## Hardware Manual

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## 1. TK-78K0/KF2

TK-78K0/KF2 is the NEC Electronics 8 bit single chip microcomputer. The features and hardware specification of an evaluation board (TK-78K0/KF2 CPU board) of 78K0/KF2 series are described.

### 1.1. Features

Features of the TK-78K0/KF2 CPU board are as follows.

- The evaluation board uses the NEC Electronics 8-bit single chip microcontroller ( $\mu$ PD78F0547D).  
All of ROM, RAM and circumference circuit are efficiently built in one chip on a single board.
- High-speed operation has been achieved with 20MHz clock.
- Sub-clock 32.768KHz standard equipment
- 128-Kbyte flash memory is built into CPU chip.  
A high-speed RAM:1024 byte and enhancing RAM:6144 byte is built into.
- 71 I/O ports are equipped at the maximum.
- Debugging using on-chip debug function can be done.
- The board itself is quite and easy to handle; about the size of business card. (89mm  $\times$  52mm)

### 1.2. Attached goods list

- TK-78K0/KF2 CPU board
- Development tool / Manual CD-ROM
- USB cable (MINI B  $\leftrightarrow$  A)

### 1.3. Hardware specification

CPU	$\mu$ PD78F0547D
Operation frequency	20MHz Operation (Sub-clock:32.768KHz)
Interface	USB(MINI B connector) Connector for MINICUBE (Only solder pad) Connector of board in surrounding 50pin Socket $\times$ 2 (Only solder pad)
Operation voltage	5V

#### 1.4. Terminal list

It is a terminal table of CN1 and CN2 of TK-78K0/KF2 CPU board.

CN1, CN2 are not mounted.

CN1 terminal list (HIF-3H-50DA-2.54DSA[not mounted] by Hirose)

CN1	Signal name	Terminal CPU name at connection destination	Notes
1	AVREF	AVREF	Connected VDD by the pad for solder-short
2	VSS	VSS, AVSS, EVSS	
3	P33	P33/T151/T051/INTP4	
4	P16	P16/TOH1/INTP5	
5	VDD	VDD	
6	P130	P130	
7			
8	FLMD0	FLMD0	10K $\Omega$ Pull-Down,SW1-1
9	VDD	VDD	
10	+12V		Connect it with CN3, J1
11	VSS	VSS, AVSS, EVSS	
12	+12V		Connect it with CN3, J1
13	VDD	VDD	
14	RESET0		Connect it with the reset circuit etc.
15	VDD	VDD	
16	+12V		Connect it with CN3, J1
17	P124	P124/XT2/EXCLKS	It is possible to connect it with the pad for short solder.
18	P30	P30/INTP1	SW2
19	P31	P31/INTP2	1M $\Omega$ Pull-Down,SW1-14
20	P32	P32/INTP3	SW1-13
21	P141	P141/BUZ/BUSY0/INTP7	
22	P11	P11/SI10/RXD0	
23	P12	P12/S010	It is possible to connect it with FLMD0 with the pad for short solder.
24	P10	P10/SCK10/TXD0	

25	RXD	P13/TXD6	SW4
26	TXD	P14/RXD6	SW4
27	P123	P123/XT1	It is possible to connect it with the pad for short solder.
28	P15	P15/TOH0	
29	P06	P06/T1011/T001	
30	P140	P140/PCL/INTP6	
31	P60	P60/SCL0	
32	P61	P61/SDA0	
33	VSS	VSS, AVSS, EVSS	
34	EVDD	EVDD	Connected VDD by the pad for solder-short
35	P62	P62/EXSCL0	
36	P63	P63	
37	P70	P70/KR0	
38	P71	P71/KR1	
39	P72	P72/KR2	
40	P73	P73/KR3	
41	P74	P74/KR4	
42	P75	P75/KR5	
43	P76	P76/KR6	
44	P77	P77/KR7	
45	P121	P121/X1	It is possible to connect it with the pad for short solder.
46	P122	P122/X2/EXCLK	It is possible to connect it with the pad for short solder.
47	P142	P142/SCKA0	
48	P143	P143/SIA0	
49	P144	P144/SOA0	
50	P145	P145/STB0	

CN2 terminal list (HIF-3H-50DA-2.54DSA[not mounted by Hirose ])

CN2	Signal name	Terminal CPU name at connection destination	Notes
1	P00	P00/T1000	
2	P01	P01/T1010/T000	
3	P02	P02/S011	
4	P03	P03/S111	
5	P04	P04/SCK11	
6	P05	P05/T1001/SS111	
7	P17	P17/T150/T050	
8	P120	P120/INTP0/EXLVI	SW3
9	P50	P50	Connected 7seg by the pad for solder-short
10	P51	P51	Connected 7seg by the pad for solder-short
11	P52	P52	Connected 7seg by the pad for solder-short
12	P53	P53	Connected 7seg by the pad for solder-short
13	P54	P54	Connected 7seg by the pad for solder-short
14	P55	P55	Connected 7seg by the pad for solder-short
15	P56	P56	Connected 7seg by the pad for solder-short
16	P57	P57	Connected 7seg by the pad for solder-short
17			
18			
19	VSS	VSS, AVSS, EVSS	
20	EVDD	EVDD	Connected VDD by the pad for solder-short
21	P40	P40	
22	P41	P41	
23	P42	P42	
24	P43	P43	
25	P44	P44	
26	P45	P45	SW1-6
27	P46	P46	SW1-7
28	P47	P47	SW1-8
29			
30			

31			
32			
33			
34			
35			
36			
37	P64	P64	
38	P65	P65	
39	P66	P66	
40	P67	P67	
41			
42			
43	P27	P27/AN17	
44	P26	P26/AN16	
45	P25	P25/AN15	
46	P24	P24/AN14	
47	P23	P23/AN13	
48	P22	P22/AN12	
49	P21	P21/AN11	
50	P20	P20/AN10	



## 2. Switches and LED

### 2.1. SW1、SW4

Mode setting of bit1-5 of SW1.Bit6-8 is Dip switch for the general-purpose input port connected with P45-P47. SW4 is a slide switch for the mode setting.

2.1.1. Please change to the following settings when you use ID78K0-TK of this Product attachment.

SW1

Bit 1	ON
Bit 2	ON
Bit 3	ON
Bit 4	ON
Bit 5	ON

SW4  side

- ※1 After ID78K0-TK samples it, the reset signal inputs reset to CPU. Therefore, about several 100mSec is generated for reset from the outside at the time lag. The reset mask function of ID78K0-TK doesn't operate though this time lag can be lost by turning OFF Bit 2.
- ※2 **When ID78K0-TK is used, these terminals cannot be used because it communicates with the host machine by using and the terminal P31 and P32.**

2.1.2. Please change to the following settings and reset it once when you execute the program written in the flash memory with built-in CPU without using ID78K0-TK.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW4  side

2.1.3. Please change to the following settings when writing it in the flash memory with built-in CPU by using PG-FPL. (The hardware of PG-FPL is built into TK-78K0.)

SW1

Bit 1	ON
Bit 2	ON
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW4 UART side

2.1.4. Please change to the following settings when you connect MINICUBE.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW4 UART side or OCD side

2.1.5. Bit6-8 of SW1 is connected with the following terminals CPU.

It connects it with GND by turning on.

It becomes "Low" if the switch turning on. and it becomes "High" if the switch turning on.

Please Turn on Pull-up resistor (PU4) with built-in CPU when using it.

SW1

Bit 6	P45
Bit 7	P46
Bit 8	P47

2.1.6. Working of SW4 Writer side(central position)

It is used to extend functions in the future.

## 2.2. SW2

It is connected with the terminal P30/INTP1 of CPU. It becomes “Low” if the switch is pushed, and it becomes “Open” if it separates. Please turn on pull-up resistor (PU3) with built-in CPU when using it.

## 2.3. SW3

It is connected with the terminal P120/INTP of CPU. It becomes “Low” if the switch is pushed, and it becomes “Open” if it separates. Please turn on pull-up resistor (PU12) with built-in CPU when using it.

## 2.4. SW5

SW5 is the reset switch.

CPU can be reset by pushing.

## 2.5. LED1

‘Power LED’. LED1 is activated when the power supply is turned on.

## 2.6. JP1

It is power supply of CPU former specification.

1-2 Short	USB connected with the USB1 connector supplies the power supply.
2-3 Short	MINICUBE connected with the OCD1 connector supplies the power supply.
Open	The power supply is supplied from the outside.

## 2.7. OCD1,OCD2 Connector

It is a connector for the MINICUBE

OCD1 can connect to MINICUBE by installing a connector.

(A1-10PA-2.54-DSA[not mounted] by Hirose)

Also, OCD2 can connect to MINICUBE by installing a connector (SICA2P20S[not mounted] by Tokyo Eletech) and going through a conversion adapter(SICA10I2P by Tokyo Eletech).

Please do the following setting when you connect MINICUBE.

- The departure pendulum that the socket is mounted on Y1 is pulled out.
- SW4 is adjusted to the UART side when the terminal UART6 (P13/TXD6,P14/RXD6) is connected with RXD# and TXD# terminal of

FT232BM and it communicates with the personal computer.

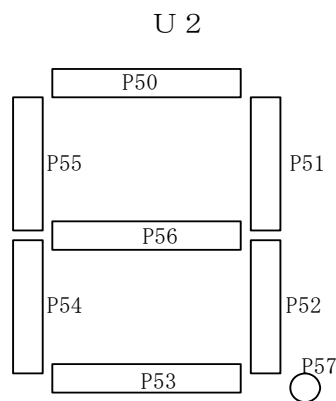
- Bit1,2, 3, 4, and 5 of SW1 are turned off.

※Please connect MINICUBE noting 1pin position.

## 2.8. U2 (7seg LED) ,

7seg LED of U2 can be lit with P50-P57.

Please set the port mode to the output and output “Low” signal from the port.



The figure of 0-9 can be displayed by writing the following values in P5 register.

Example of displayed figure and set data.

0	0xC0	5	0x92
1	0xF9	6	0x83
2	0xA4	7	0xf8
3	0xB0	8	0x80
4	0x99	9	0x98

## 2.9. J2

It is used to extend functions in the future.

### 3. Connector Pin Termination Note

#### 3.1. solder-short pad label

When using a circumference board connector (CN1,CN2) without using a circuit on board, in order to separate a circuit on board, the terminal of CPU can be customized by making the pad for solder short opening.

Pad for solder-short has shape like the figure below.

Please absorb solder with a soldering iron etc. when opening.

Solder-short pad  
(opened shape)



Solder-short pad  
selectable type



Solder-short pad name	State when shipping it	Connection
P50~P57	Short	7SegLED ----- Open when using it for other usages
P12	Open	Terminal FLMD0 of CPU ----- Short when built-in flash memory is rewritten by self
P121,P122	Open	CN1 ----- Short when X1,X2 connects to CN1 as ports.
P123,P124	△□Short	△:Sub Clock、 □:CN1 ----- △Open and □Short when XT1,XT2 connects to CN1 as ports.
AVREF	Short	VDD ----- Open when AVREF is driven by other voltages.
EVDD	Short	VDD ----- Open when EVDD is driven by other voltages.
DCVDD1,DCVDD2	Open	External power supply ----- Short When VDD is supplied from CN3 or J1.

### 3.2. Operation by external power supply

The power supply of the AC adaptor connected with CN3 is connected only with the power supply terminal of the connector of the board in the surrounding (10, 12, and 16pin of CN1). However, not to tie to USB this board and to operate with the unit, the AC adaptor can be made a power supply by the connection of the AC adaptor of 5V to CN3 and the short-circuit of solder short pad (DCVDD1,2).

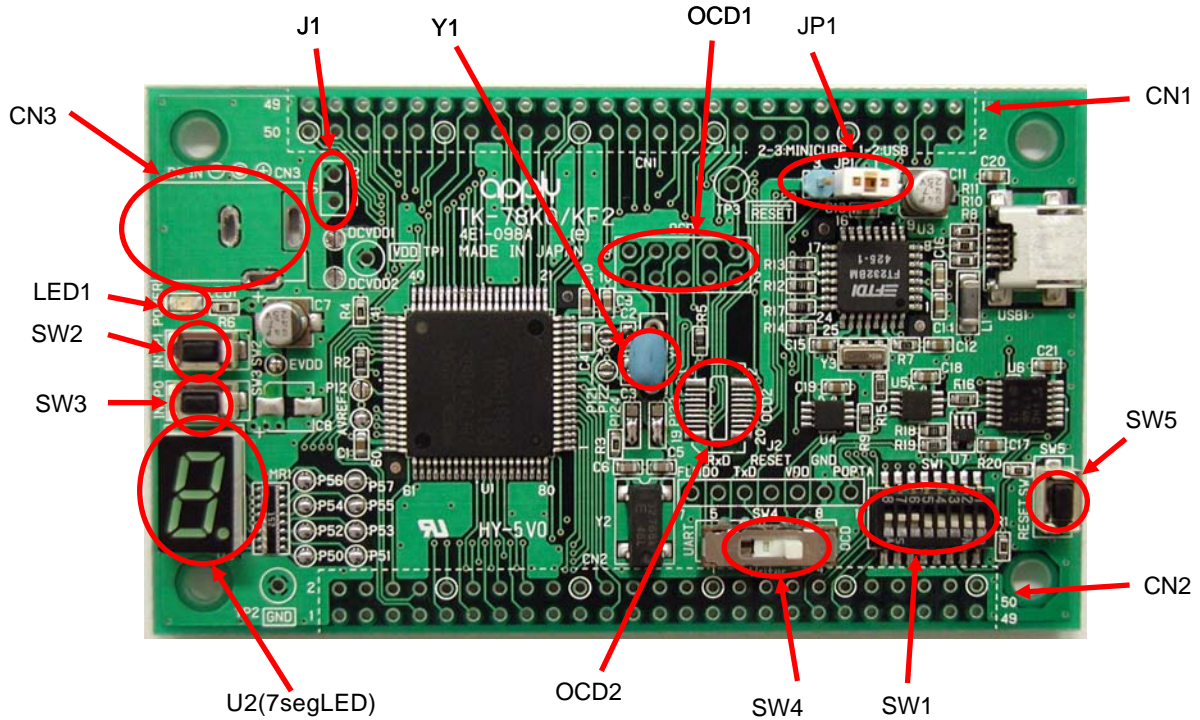
Moreover, it is also possible to connect the stabilizing supply etc. in the lead line instead of the AC adaptor because CN3 is connected with J1 of a through hole.

- Acceptable jack (CN3) : HEC0470-01-630 by Hosiden Corp(not mounted)
- Acceptable plug : 2.1mm DC jack(center plus)
- Current capacity : 100mA or more
  
- J1-1pin : plus
- J1-2pin : minus

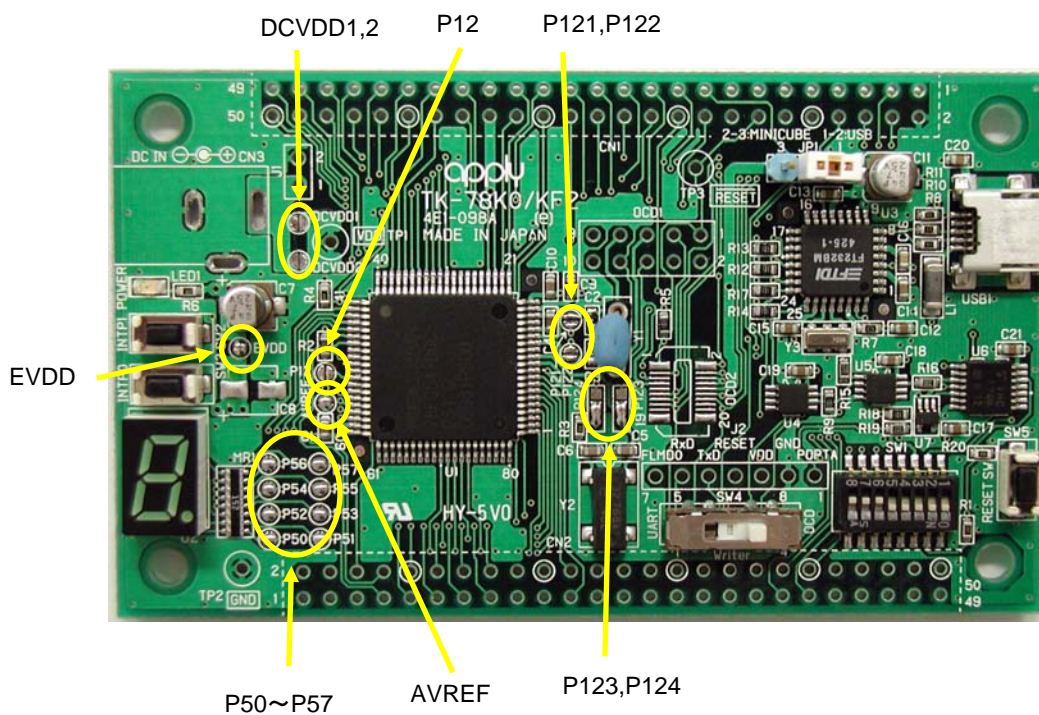
Attention : Please make JP1 Open when operating in an external power supply

## 4.TK-78K0/KF2 Data

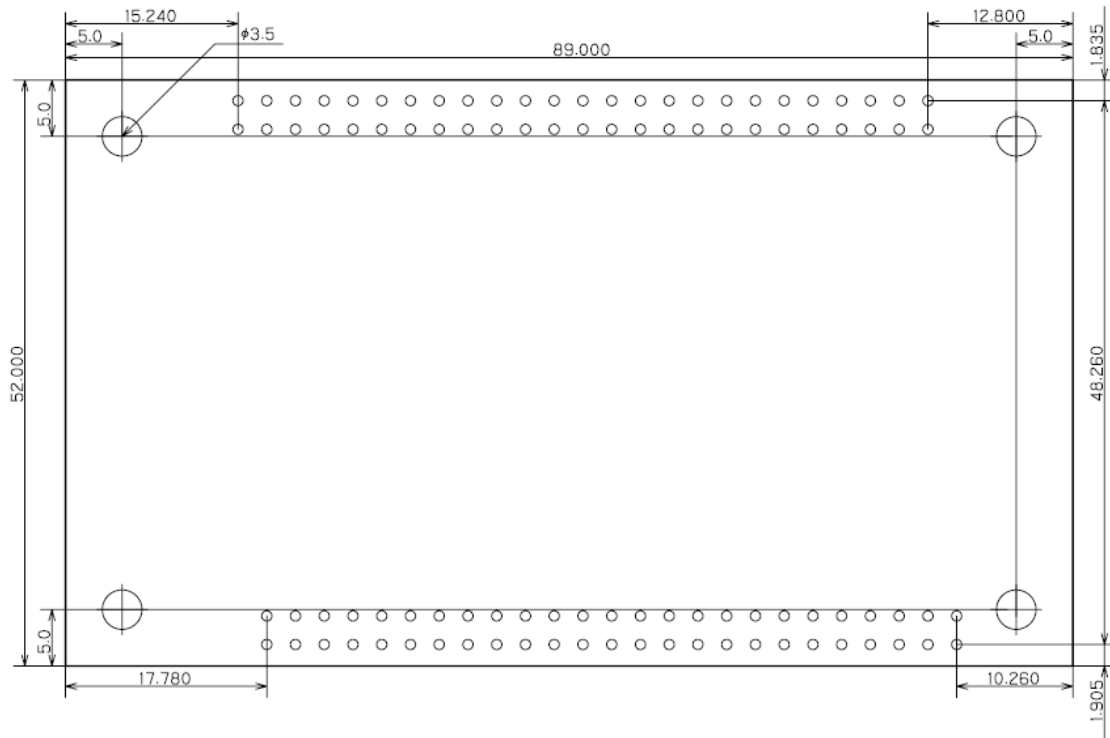
### 4.1. Parts arrangement plane



### 4.2. Solder-short pad arrangement plane



### 4.3. Measure plane of PWB





### 4.4. Circuit chart

