TK-78K0/FF2+CL
Hardware Manual

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TESSERA TECHNOLOGY INC.

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1. TK-78K0/FF2+CL

TK-78K0/FF2+CL is the NEC Electronics 8 bit single chip microcomputer. The features and hardware specification of 78K0/Kx2 series evaluation board (TK-78K0/FF2+CL CPU board) are described.

1.1. Features

Features of the TK-78K0/FF2+CL CPU board are as follows.

- The evaluation board uses the NEC Electronics 8-bit single chip microcontroller (μPD78F0893).
  All of ROM,RAM and circumference circuit are efficiently built in one chip on a single board.
- TK-78K0/FF2+CL has a CAN Driver and Lin Driver for CAN, LIN evaluation or development tool.
- 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.
- 35 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. (W75mm×H80mm)

1.2. Attached goods list

- TK-78K0/FF2+CL CPU board
- Development tool／Manual CD-ROM
- USB cable(MINI B←→A)
- LIN cable (separate cable with clip)
- CAN cable (D-Sub 9Pin connector)
- AC adaptor (DC12V output)

1.3. Hardware specification

CPU	μPD78F0893GK
Operation frequency	20MHzOperation (Sub-clock:32.768KHz)
Interface	USB(MINI B connector) Connector for MINICUBE (2) LIN communication connector CAN communication connector Connector of board in surrounding 40pin Socket (Only solder pad)
Operation voltage	5V

1.4. Terminal list

It is a terminal table of J1 of TK-78K0/FF2+CL CPU board.

J1 connecter is not mounted.

J1 terminal list (FFC-40BMEP1[not mounted] by Honda Connectors)

CN1	Signal name	Terminal CPU name at connection destination	Notes
1	AVREF	AVREF	Connected VDD by the pad for solder-short
2	P44	P44	
3	VDD	VDD	
4	P43	P43	
5	P42	P42	
6	P41	P41	
7	P40	P40	
8	P33	P33/TI51/TO51/INTP4	
9	P76	P76/SCK11	
10	P75	P75/SI11	
11	P74	P74/SO11	
12	P73	P73/BUZ/INTP7	
13	P72	P72/PCL/INTP6	
14	P06	P06/TI011/TO01	
15	P05	P05/SSI11/TI001	
16	P17	P17/TI50/TO50	

17	P16	P16/TOH1/INTP5	
18	P15	P15/TOH0	
19	P97	P97/ANI15	
20	P96	P96/ANI14	
21	P95	P95/ANI13	
22	P94	P94/ANI12	
23	P93	P93/ANI11	
24	P92	P92/ANI10	
25	P91	P91/ANI9	
26	P90	P90/ANI8	
27	P87	P87/ANI7	
28	P86	P86/ANI6	
29	P85	P85/ANI5	
30	P84	P84/ANI4	
31	P83	P83/ANI3	
32	P82	P82/ANI2	
33	P81	P81/ANI1	
34	P80	P80/ANI0	
35	P01	P01/TI010/TO00	
36	P00	P00/TI000	
37	VSS	VSS	
38	P132	P132/TI013/TO03	
39	VSS	VSS	
40	N.C.	N.C.	

2. Switch, LED

2.1. SW1、SW4

Mode setting of bit1-5 of SW1. Bit6-8 is Dip switch for the general-purpose input port connected to 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 OCD 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 OCD Side

2.1.3. Please change to the following settings when writing it in the flash memory with built-in CPU by using PG-FPL3. (The hardware of PG-FPL3 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(2).

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 connected with GND by turning on.

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

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

SW1

Bit 6	P45
Bit 7	P46
Bit 8	P47

2.1.6. Function of SW4 Writer side(central position)

It is used to extend functions in the future.

2.2. SW2

It is connected to the terminal P120/INTP0/EXLVI of CPU. It becomes “Low” if the switch is pushed, and it becomes “Open” if it separates. Please turn on pull-up resistor (PU120) in CPU when using it.

2.3. SW3

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 (PU30) with built-in CPU when using it.

2.4. SW5

SW5 is the reset switch.

CPU can be reset by pushing.

2.5. LED1～8

Multipurpose use LED

LED is activated when the Following port output “LOW”.

LED	Terminal CPU name	LED	Terminal CPU name
LED1	P50	LED5	P54
LED2	P51	LED6	P55
LED3	P52	LED7	P56
LED4	P53	LED8	P57

2.6. LED9

`Power LED’. LED9 is activated when the power supply is turned on.

2.7. JP1

It is power supply selector of CPU.

1-2 Short	USB connected to the USB1 connector supplies the power.
3-4Short	Power supplies from AC adaptor connected to CN1 ,or 1Pin of CN2 (Battery Supply).
5-6 Short	MINICUBE (2) connected to the OCD1 connector supplies the power.
OPEN	The power supply is supplied from the outside.

2.8. OCD1 Connector

It is a connector for the MINICUBE (2)

Please do the following setting when you connect MINICUBE(2).

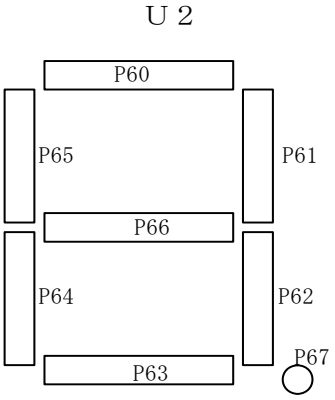
- The resonator that the socket is mounted on Y1 is pulled out.
- SW4 is adjusted to the UART side when the terminal UART6 (P13/TXD60,P14/RXD61) is connected with RXD# and TXD# terminal of FT232BM and it communicates with the personal computer.
- Bit1,2, 3, 4, and 5 of SW1 are turned off.

※Please connect MINICUBE(2) noting 1pin position.

2.9. U2（7seg LED）

7seg LED of U2 can be lit with P60-P67.

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 P6 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

2.10. J2

It is used to extend functions in the future.

3. LIN Driver

TK-78K0/FF2+CL has a LIN driver (TLE6259-2G made by Infineon), that makes LIN communication from CN2.
It is possible to connect to Lin bus with LIN cable.
Connection of CN2 to LIN cable is below.

CN2	LIN cable color	Signal name	Notes
1pin	Red	Battery Supply	Connected to Battery Supply line
2pin	Black	GND	
3pin	Yellow	LIN Bus	Connected to LIN Bus line

In case of do not use a LIN cable for connecting to CN2,
IL-3S-S3L-(N) (JAE) can use for connecting as socket housing, and IL-C2-10000(JAE) as socket contact.

3.1. LIN communication jumper pin setting

- JP2

  If JP2 is short, Battery Supply line of CN2 is supplied power from AC adapter connected to CN1 of TK-78K0/FF2+CL.
  Power is not supplied when JP2 is open.

- JP3

  TK-78K0/FF2+CL will be LIN MASTER, when JP3 is short.
  It becomes slave if JP3 is open.

3.2. Interface of between LIN driver and CPU

Connection of CPU to LIN driver (TLE6259-2G) is below.

LIN driver terminal name	CPU terminal name	notes
EN	P130	Make high level when access to LIN driver.
RxD	P11/SI10/RxD61	Receive data output from LIN driver.
TxD	P10/SCK10/TxD61	Transmit data output to LIN driver.

※ Please refer to Infineon Technologies AG TLE6259-2G datasheet about detail of LIN driver.

4. CAN driver

TK-78K0/FF2+CL has a CAN driver (TJA1050 PHILIPS), that make CAN communication from DSUB1 connecter.

DSUB1 is mounted a CAN communication connecter (D-Sub 9Pin female). And pin interface function is below.

1pin	N.C.	6pin	N.C.
2pin	CANL	7pin	CANH
3pin	GND	8pin	N.C.
4pin	N.C.	9pin	N.C.
5pin	Shield	Shell	N.C.

TK-78K0/FF2+CL can connect other CAN communication instrument with attached CAN cable.

4.1. CAN communication jumper pin setting

- JP5,JP6

If JP5 is short, CANH terminal of CAN driver is connected DSUB1 connector.
It will be separate when JP5 is open.
If JP6 is short, CANL terminal of CAN driver is connected DSUB1 connector.
It will be separate when JP6 is open.

- JP4

CAN bus (between CANH and CANL) terminal register is changed by JP4 jumper pin connecting.
Please set terminal register by connection state of CAN communication instrument.

JP4	State of terminal register
1-2 short	120Ω is connected between CANH-CANL
3-4 short	120Ω is connected between CANH-CANL
1-2,3-4 short	Two paralleled 120Ω are connected between CANH-CANL
Open	Terminal register is not connected

4.2. Interface of between CAN driver and CPU

Connection of CPU to CAN driver (TJA1050T) is below.

CAN driver terminal name	CPU terminal name	notes
S	P131/TI003	Selector of High-speed mode or Silent mode
RXD	P71/CRxD	Receive data output from CAN driver
TXD	P70/CTxD	Transmit data output to CAN driver

※ Please refer to PHILIPS TJA1050T datasheet about detail of CAN driver.

5. Connector Pin Termination Note

5.1. Solder-short pad label

This board has solder short pads below.

The usage of TK-78K0/FF2+CL can be customized by making the pad for solder short or opening.

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

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

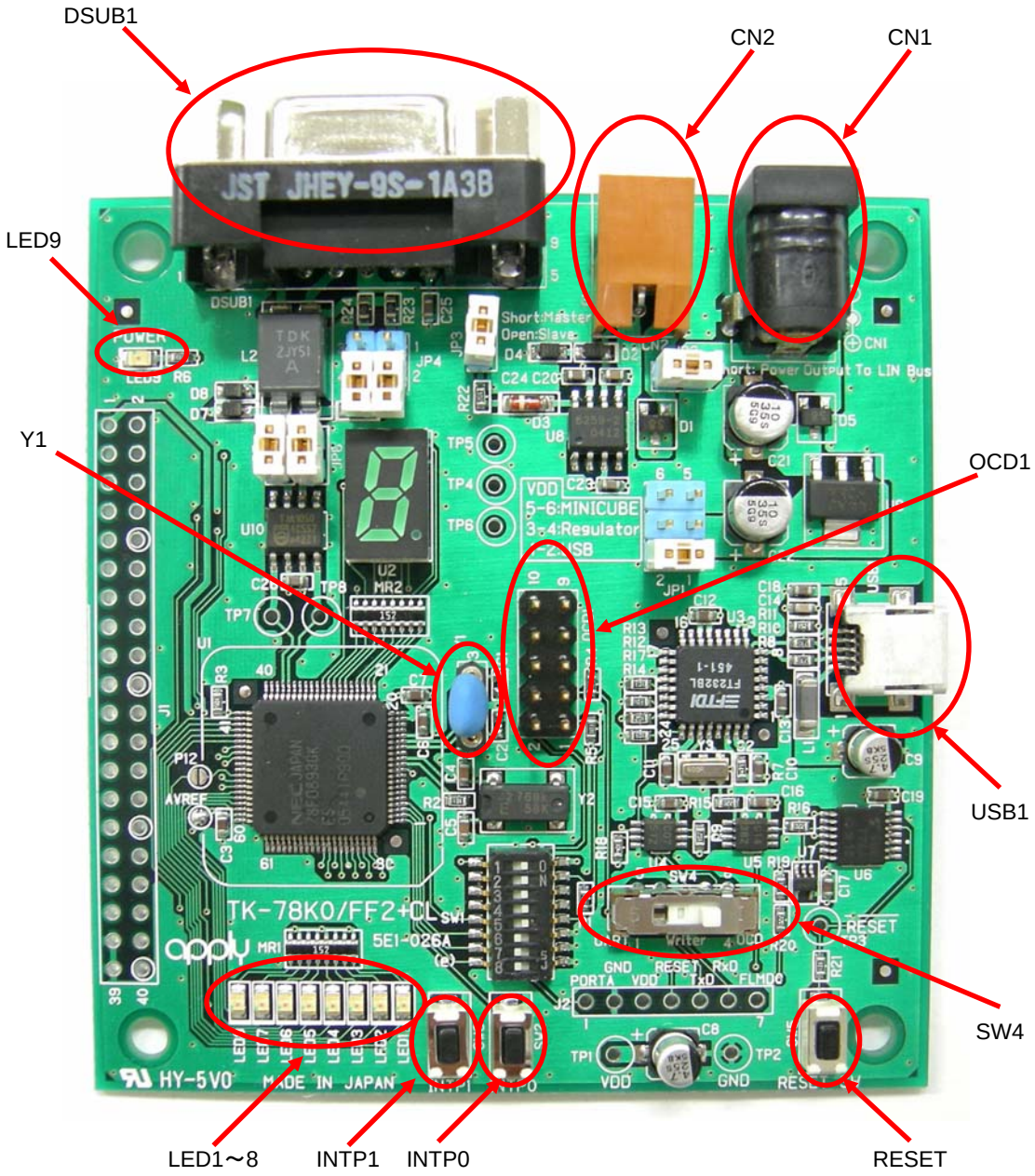
Solder-short pad

(opened shape)

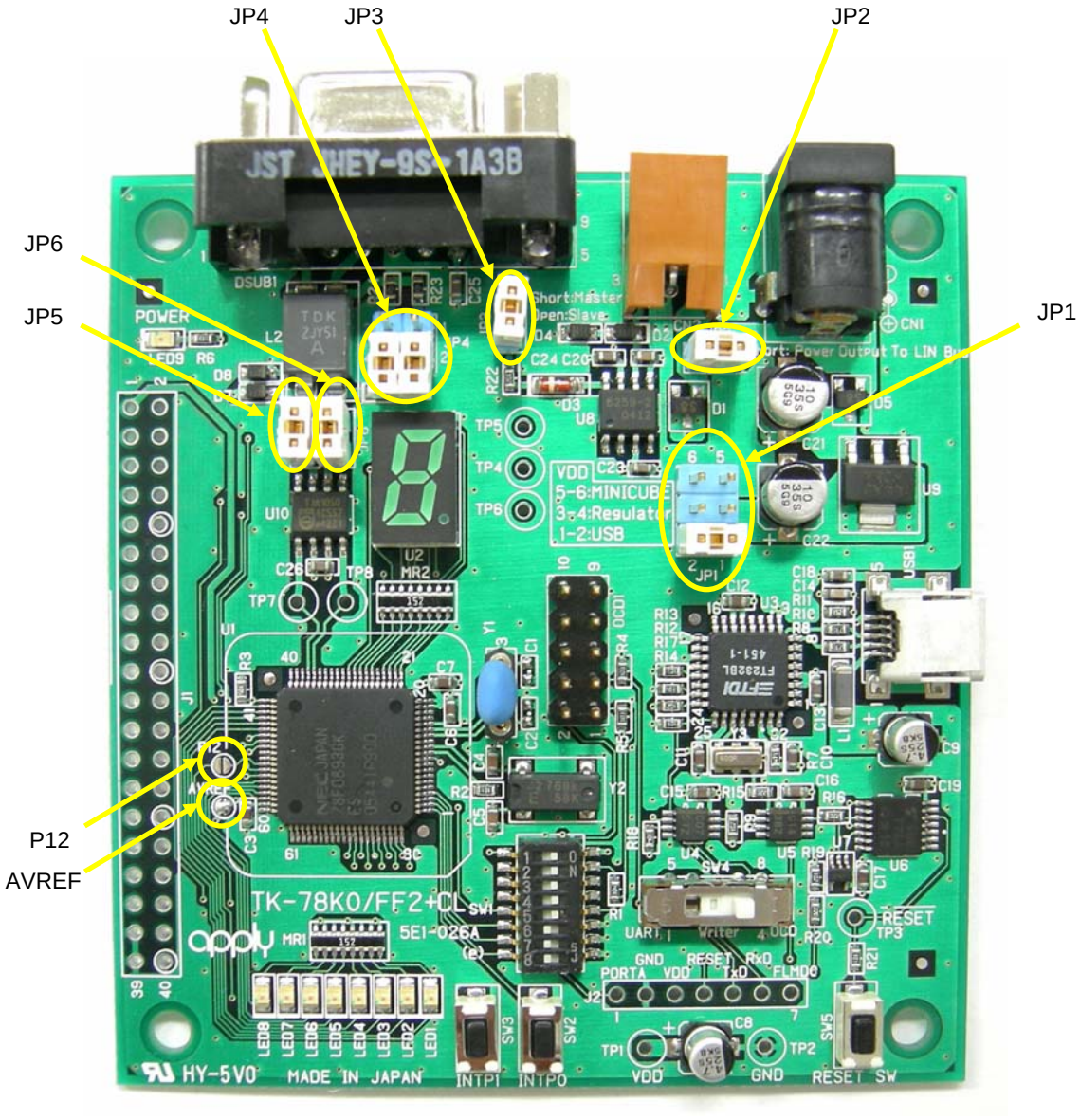
Solder-short pad name	State when shipping it	Connection
P12	Open	Terminal FLMD0 of CPU Short when built-in flash memory is rewritten by self
AVREF	Short	VDD Open when AVREF is driven by other voltages.

6. TK-78K0/FF2+CL Data

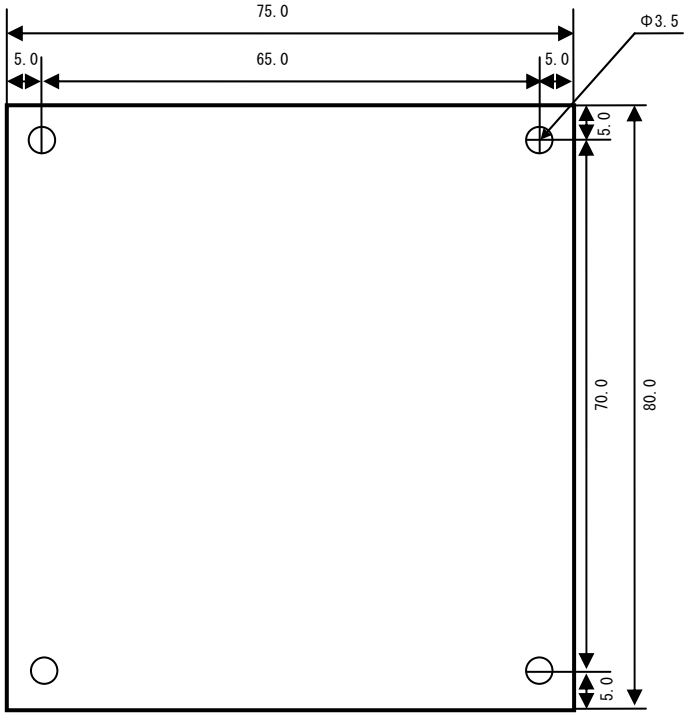
6.1. Parts arrangement plane



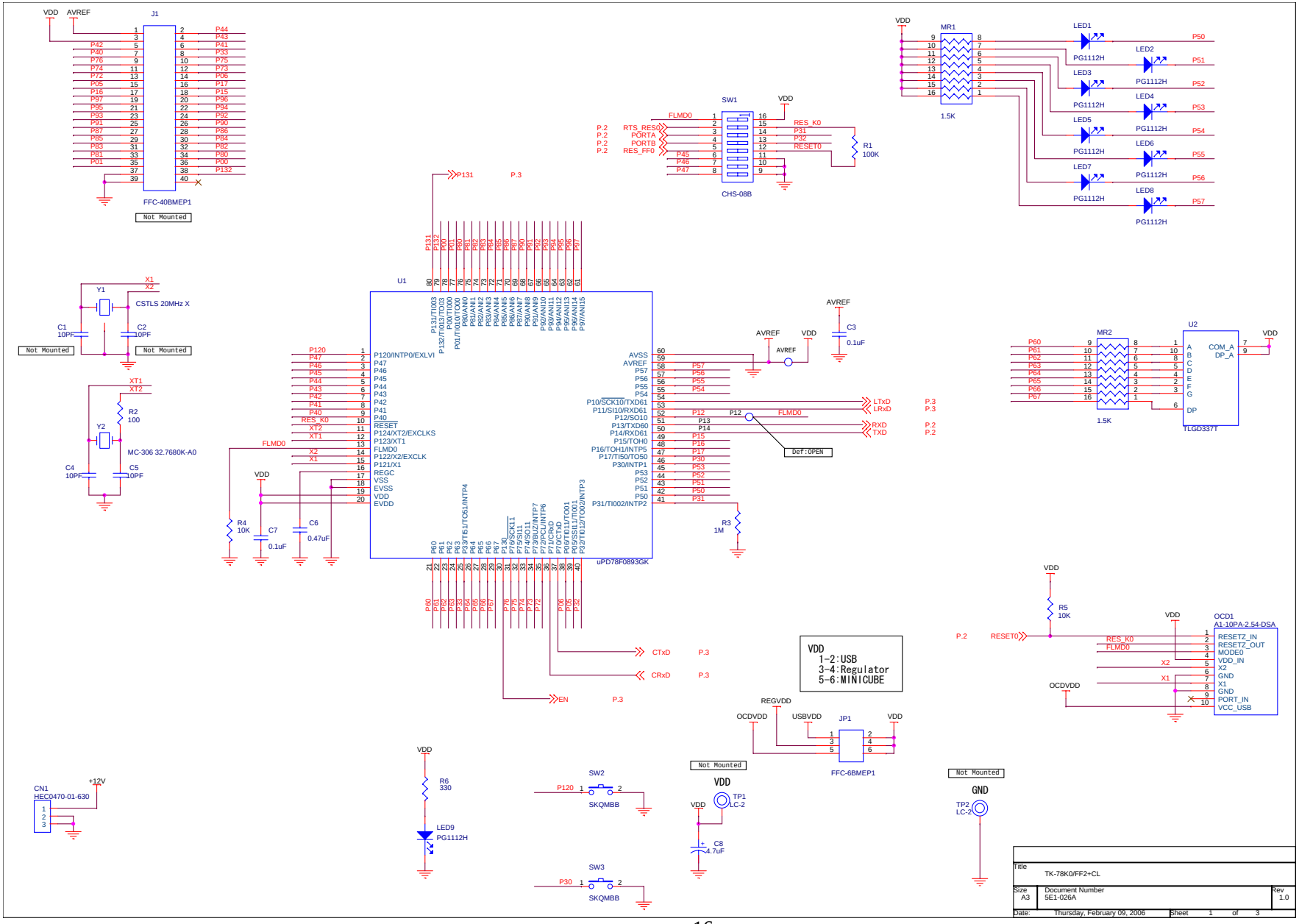
6.2. Jumper pin and Solder-short pad arrangement plane

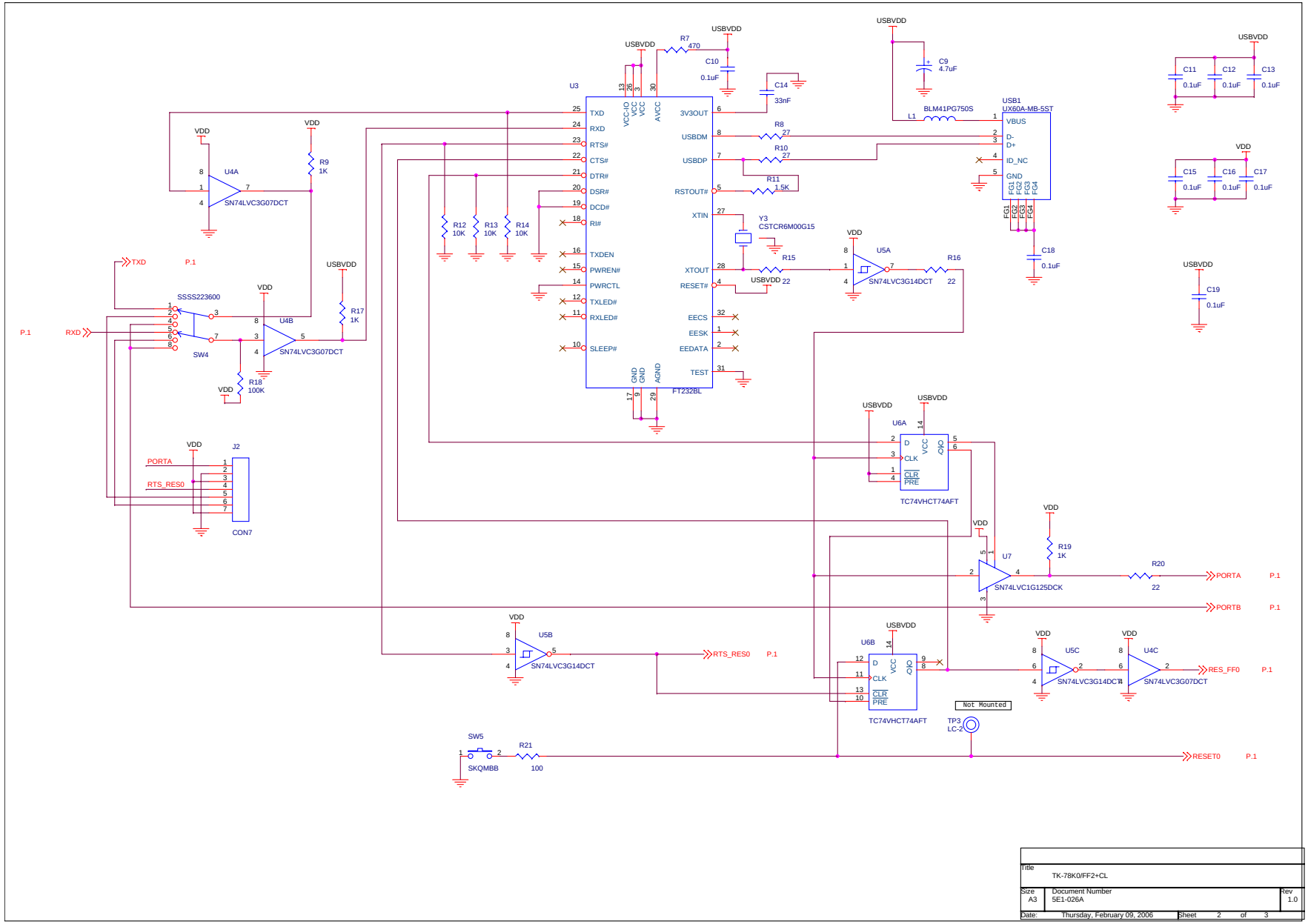


6.3. Measure plane of PWB



6.4. Circuit chart




U3
FT232BL
TXD
RXD
RTS#
CTS#
DTR#
DSR#
DCD#
RI#
TXDEN
PWREN#
PWRCTL
TXLED#
RXLED#
SLEEP#
3V3OUT
USBDM
USBDP
RSTOUT#
XTIN
XTOUT
RESET#
EECS
EESK
EEDATA
TEST
VCC-IO
VCC
AVCC
GND
AGND
R7 470
C10 0.1uF
C14 33nF
C9 4.7uF
L1 BLM41PG750S
USB1 UX60A-MB-5ST
VBUS
D-
D+
ID_NC
GND
R8 27
R10 27
R11 1.5K
R12 10K
R13 10K
R14 10K
Y3 CSTCR6M00G15
R15 22
R16 22
C18 0.1uF
C11 0.1uF
C12 0.1uF
C13 0.1uF
C15 0.1uF
C16 0.1uF
C17 0.1uF
C19 0.1uF
U4A SN74LVC3G07DCT
R9 1K
U4B SN74LVC3G07DCT
R17 1K
R18 100K
SW4 SSSS223600
U5A SN74LVC3G14DCT
U6A TC74VHCT74AFT
U7 SN74LVC1G125DCK
R19 1K
R20 22
U5B SN74LVC3G14DCT
U6B TC74VHCT74AFT
U5C SN74LVC3G14DCT
U4C SN74LVC3G07DCT
Not Mounted
TP3 LC-2
SW5 SKQMBB
R21 100
J2 CON7
TXD P.1
RXD P.1
PORTA
RTS_RES0
PORTA P.1
PORTB P.1
RTS_RES0 P.1
RES_FF0 P.1
RESET0 P.1
VDD
USBVDD
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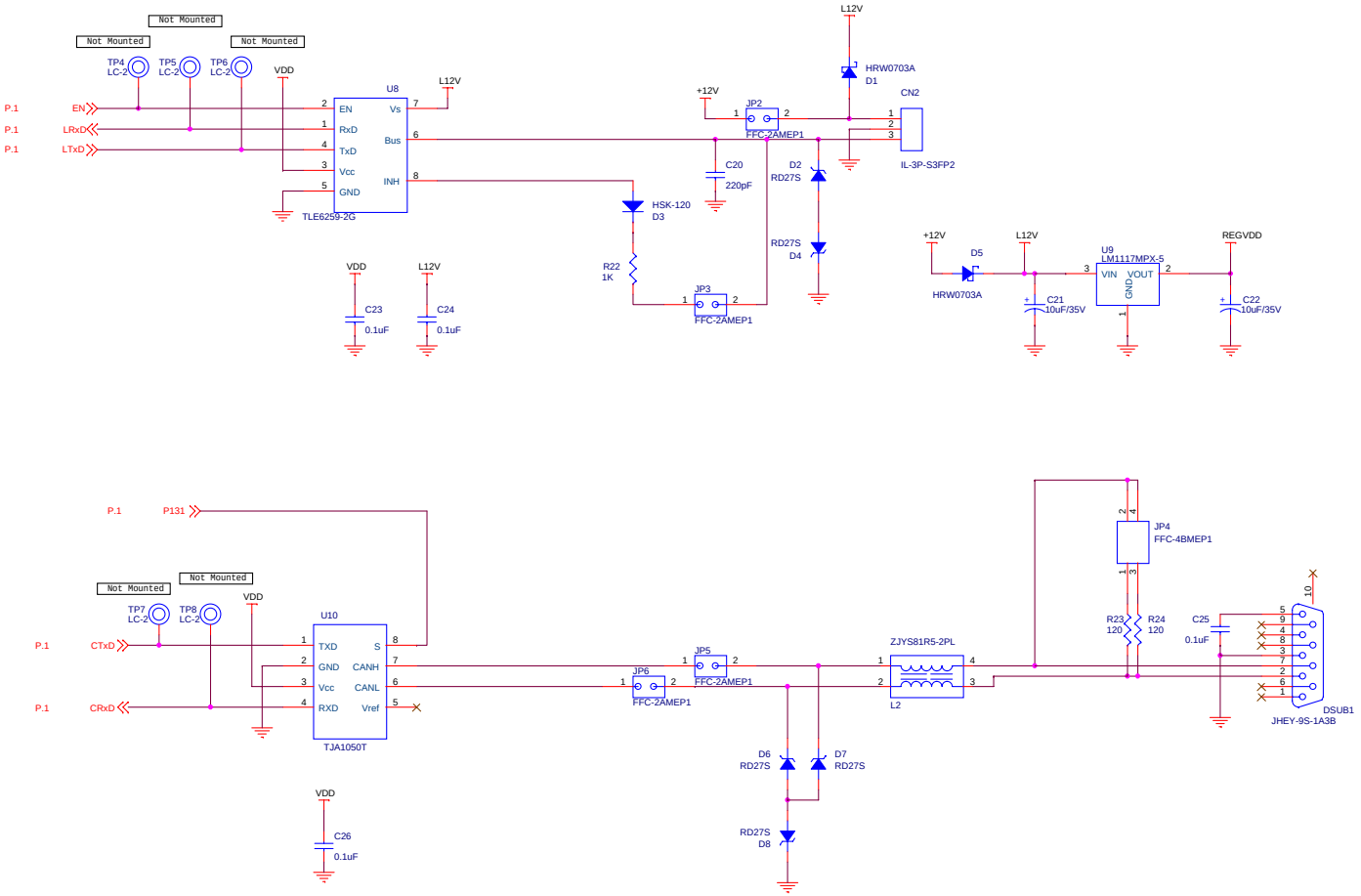

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