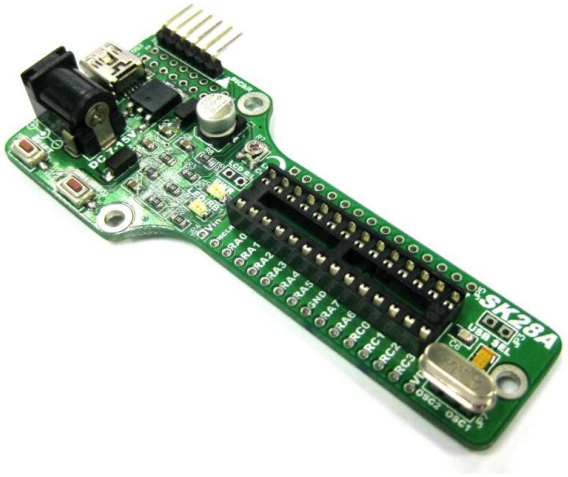
SK28A
28 Pin PIC Starter Kit



User's Manual

V1.0

May 2012

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1.0 INTRODUCTION

SK28A is new starter kit designed for 28 pin PIC which support all 5V operate 8-bit PDIP PIC Microcontroller. This board comes with basic electronic components for user to begin project development. It offer plug and use features:

- Industrial grade PCB
- Every board is being tested before is shipped to customer
- Compact platform
- DC Adapter socket, 7-15V DC input
- Reset button ready
- Power indicator LED ready
- 5V, 1A voltage regulator
- Suitable for student, researchers, trainer, hobbyists and amateurs
- Save development and soldering time
- No extra components required for PIC to function
- All I/O pins nicely labeled to avoid mis-connection by users
- PICkit pin ready for loading program via ICSP, using PICkit 2, PICkit 3 or UIC00B

SK28A comes with add-ons of:

- 1 x Programmable switch
- 1 x Programmable LED indicator
- Turn pin for crystal, changeable Crystal
- Ready pad for 2x8 parallel LCD display (soldering and extra header socket is requiredl)
- Mini USB socket on board

This kit comes WITHOUT PIC microcontroller to provide the freedom for user to choose PIC type.

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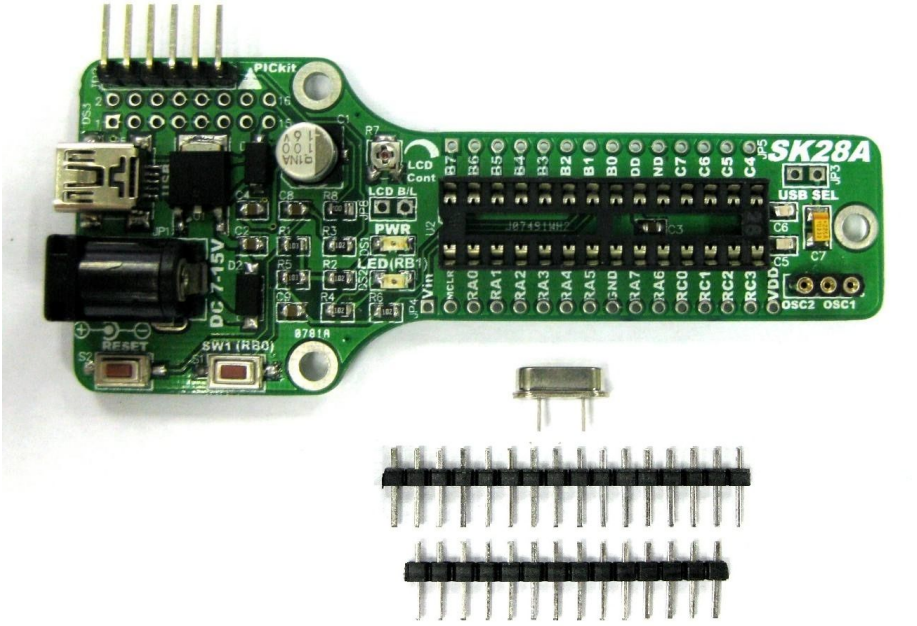
2.0 PACKING LIST

Please check the parts and components according to the packing list. If there are any parts missing, please contact us at sales@cytron.com.my immediately.



1. 1 x SK28A board with all components shown soldered
2. 1 x 20M Hz Crystal
3. 1 x header pin 14 ways
4. 1 x header pin 16 ways
5. PIC MCU - Not included, please purchase separately from Cytron website
6. USB Cable - Not included, please purchase separately from Cytron website
7. Programmer - Not included, please purchase separately from Cytron website
8. User Manual - Not included, please download from Cytron website

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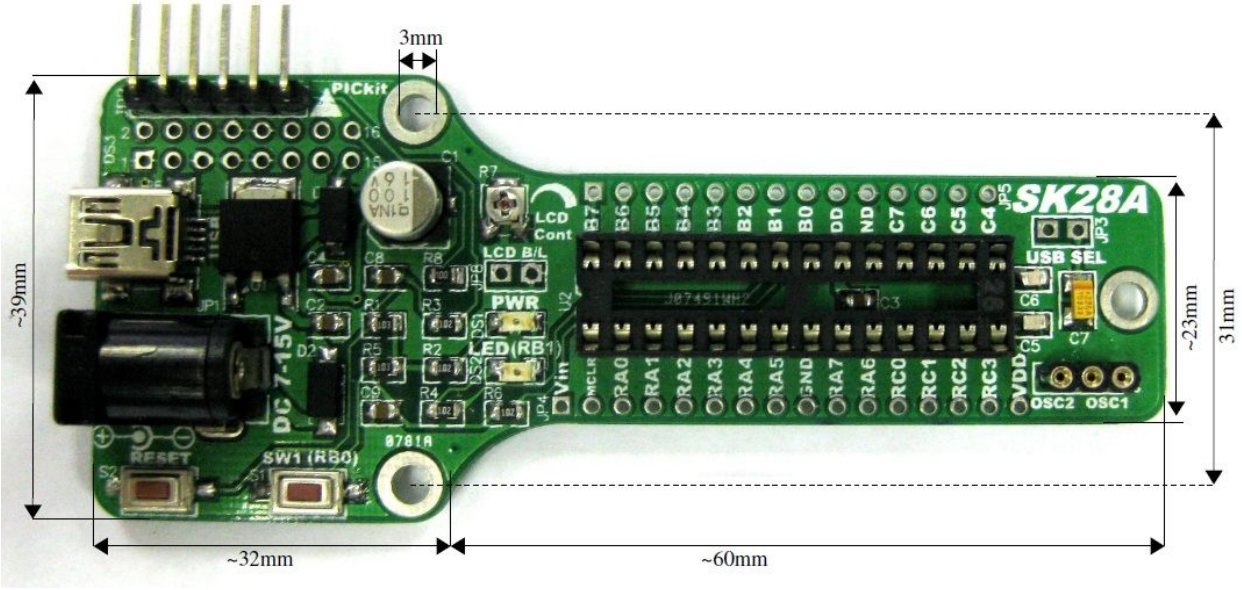
3.0 DIMENSION



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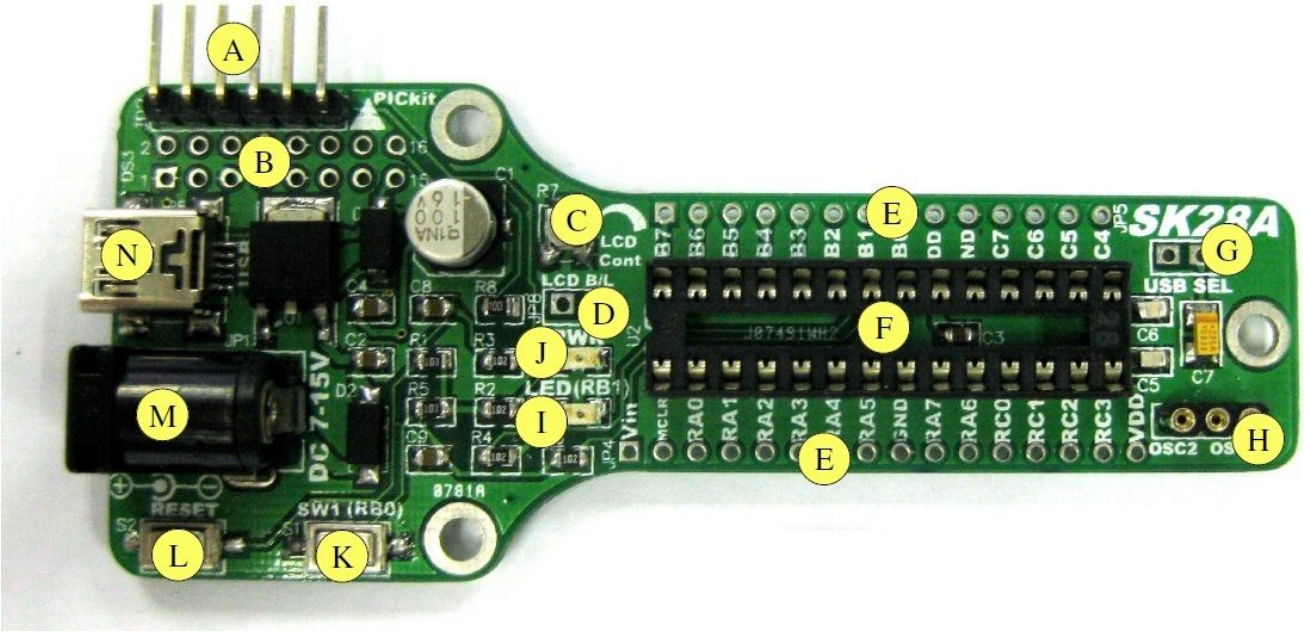
4.0 BOARD LAYOUT



Label	Function	Label	Function
A	PICkit pin for loading program via ICSP	H	Turn pin for crystal
B	Reserved for 2x8 Parallel LCD	I	Programmable LED Indicator, Connected to RB1 of PIC, active high
C	LCD contrast control potentiometer	J	Power Indicator LED, Green color
D	JP8 for LCD's Backlight	K	Programmable Push Button, Connected to RB0 of PIC
E	JP4 and JP5 reserved for header pin, extension from PIC microcontroller pin	L	Reset Button
F	28 pin IC socket, support 8-bit, 28-pin PDIP, 5V operate PIC Microcontroller.	M	DC Power Adaptor Socket
G	JP3 for USB, jumper to connect Vusb(pin 14) to capacitor, needed for PIC with USB peripheral	N	USB Mini Socket

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PICkit pin at "A" is for programmer. User may directly use PICkit (PICkit 2 or PICkit 3) to load program or use UIC00B programmer with UIC-A to load program..

"B" is reserved for 2x8 parallel LCD. 2x5 female header and Straight Pin Header is needed. This is optional to user.

5K of trimmer at "C" is to adjust LCD's contrast.

JP8 at "D" is provided for LCD Backlight. LCD backlight is activated if these pins are connected.

JP4 and JP5 at "E" is PIC Microcontroller pins extension and is reserved for header pin. User may extend SK28A to breadboard or donut board with header pins provided.

"F" is 28pin IC socket for user to plug in any 28 pin PDIP PIC MCU (8 bit). Please ensure the first pin is at the top right side.

JP3 at "G" is provided for USB. User need to connect these pins if USB function is needed. One example is to use PIC18F2550 for USB device development.

Turn pin at "H" is provided for external crystal. 20M Hz is default crystal provided is SK28A. However, the 20M Hz crystal can be removed and replace with other crystal. Just remove the crystal and put other crystal on turn pin without soldering.

A LED at "I" as active High output for PIC MCU. This LED is controllable from PIC MCU and it is connected to RB1.

PWR LED at "J" is Power indicator LED for on board. It will light ON as long as the input power is correctly connected.

A push button at "K" is connected to RB0 of PIC Microcontroller. This is extra input button for user. It can be programmed as input switch.

"L" is a push button with function of Reset for PIC MCU.

"M" is DC power adaptor socket for user to plug in DC adaptor. The input voltage should be ranged from 7 to 15VDC.

USB Mini connector at "N" is for connection using USB cable between SK28A to a USB host controller (usually personal computer). This function is only valid for certain model of PIC microcontroller. Please refer to USB interface section. The power LED at "J" will light ON when the USB cable with power is connected.

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Table below shows pin connection for 'Label B' (8x2 LCD Display)

Pin	Name	Pin function	Description
1	VSS	Negative supply for LCD	GND
2	VDD	Positive supply for LCD	5V
3	VEE	Contrast adjust	Connected to 5K preset
4	RS	Register Select, instruction or data	RB2 pin of PIC MCU
5	R/W	Start data read or write	GND
6	E	Enable signal	RB3 pin of PIC MCU
7	DB0	LCD Data bus pin	GND
8	DB1	LCD Data bus pin	GND
9	DB2	LCD Data bus pin	GND
10	DB3	LCD Data bus pin	GND
11	DB4	LCD Data bus pin	RB4 pin of PIC MCU
12	DB5	LCD Data bus pin	RB5 pin of PIC MCU
13	DB6	LCD Data bus pin	RB6 pin of PIC MCU
14	DB7	LCD Data bus pin	RB7 pin of PIC MCU
15	LED+	Backlight positive input	5V
16	LED-	Backlight negative input	Connect to JP8

Table below shows pin connection for 'Label H' (Turn pin for crystal)

Name	Pin function	Connection
OSC1	Crystal	Turn pin (JP7), Connect to Pin 9 of PIC Microcontroller
OSC2	Crystal	Turn pin (JP7), Connect to pin 10 of PIC Microcontroller

Figure below shown pin connection for 'Label K' (Programmable Push Button)

Name	Pin function	Connection
SW1	Digital Input Pin	RB0 pin of PIC MCU

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5.0 PRODUCT SPECIFICATION

SK28A is designed to offer starting up platform for development, the specification of PIC MCU used should be referred.

Absolute Maximum Rating

Symbol	Parameter	Min	Max	Unit
V_{in}	Input Voltage via DC Power Adaptor Socket	7	15	V
I_{max}	Maximum input current from on-board 5V Voltage regulator	-	1.0	A

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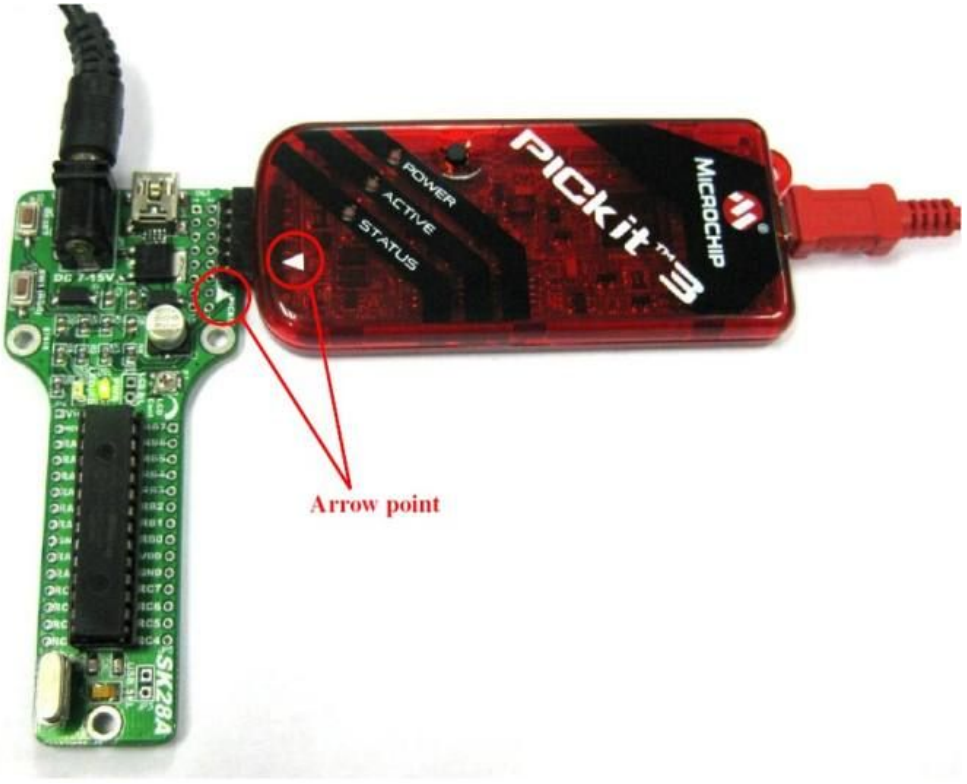
6.0 INSTALLATION (HARDWARE)

SK28A comes with PICkit pin to offer simple way for downloading program. Downloading program into PIC is either using PICkit programmer or ICSP programmer (UIC00B). If UIC00B used, user need UIC-A to convert from PICkit programmer standard to ICSP programmer standard.

6.1 Loading program using PICkit Programmer

After plug in 28 pin PIC MCU(**make sure the orientation is correct**), SK28A should be powered by DC adaptor, Battery or even USB's power . To load program, one must have the hex code. Hex code sometime called machine. It is result after compilation. Connect PICkit programmer shown as figure below. Figure below is using PICkit 3 from Microchip to load program into SK28A. Make sure the arrow at PICkit pin of SK28A is same side with arrow at PICkit 3 programmer.



RB6 and RB7 have been connected to LCD display and PICkit pin. User is advice not to use these pin as input. Even when using as output, RB6 and RB7 pin are recommended to be used in controlling non critical device such as LED, LCD, 7 segments or buzzer. It is recommended to isolated PICkit signals from application circuit by using series resistor (range 220 ohm and above). Furthermore, NO capacitance component (capacitor) should be connected to these 2 pins.

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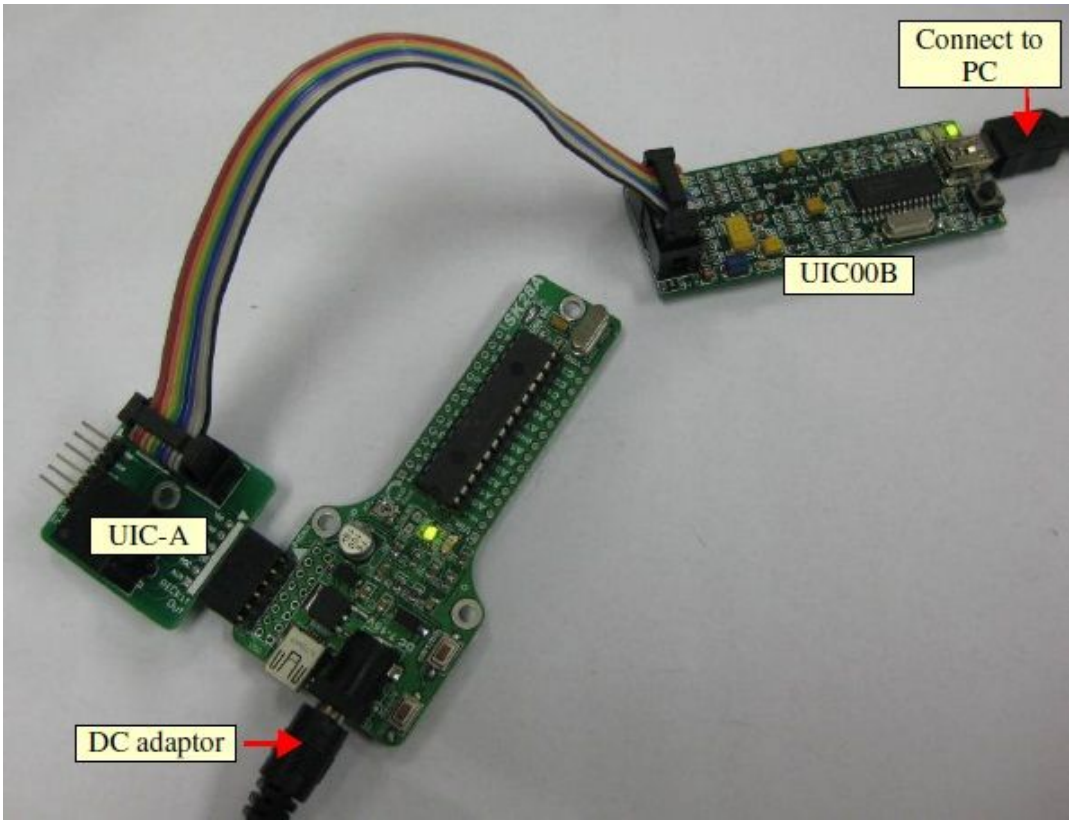
6.2 Loading program using UIC00B Programmer

UIC-A is needed to convert UIC00B connection to PICkit programmer standard. For further details about UIC-A, user may refer UIC-A User's Manual.

1. Connect SK28A, UIC-A and UIC00B shown as figure below.



2. Refer UIC00B User's Manual to load program inti PIC microcontroller.

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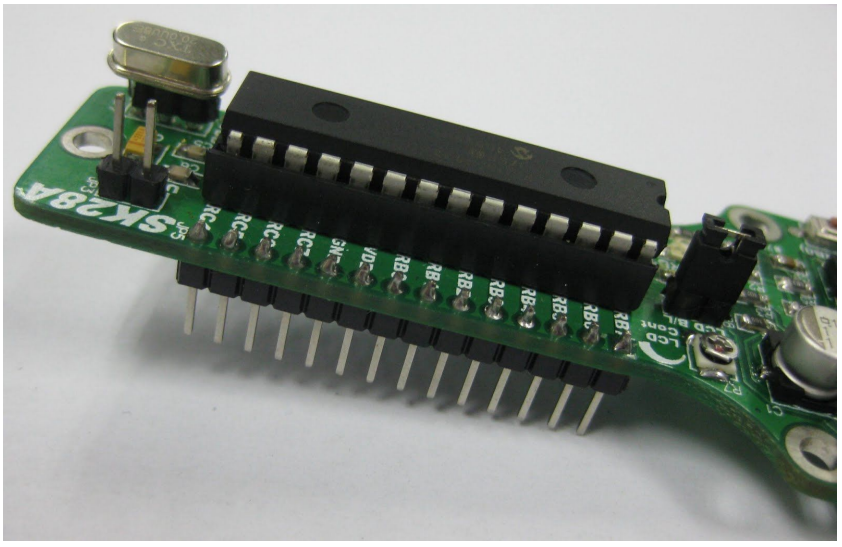
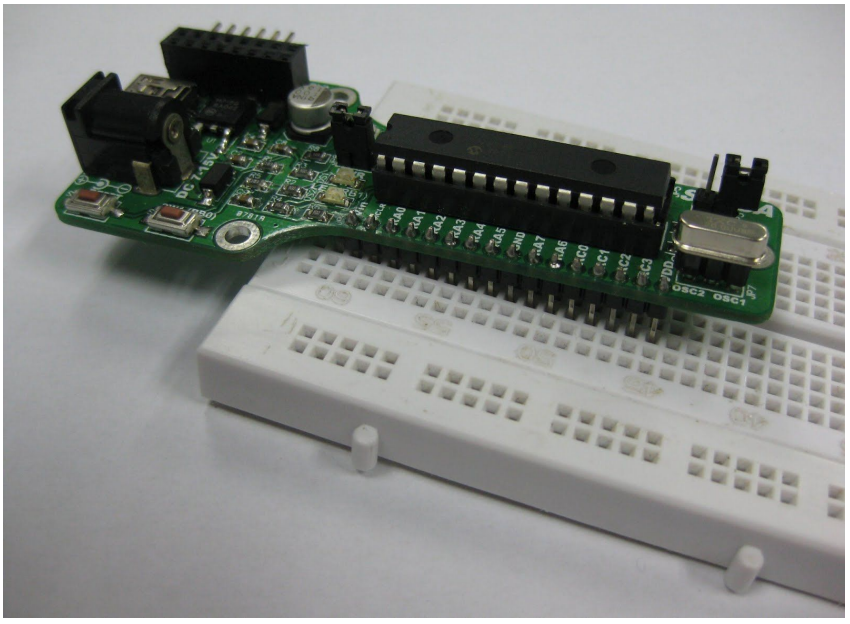
6.3 Using SK28A IO pins

The I/O pin of PIC microntroller on SK28A can be extended onto donut board/breadboard with JP4 and JP5. 1x14 and 1x16 ways of header pin is soldered at JP4 and JP5. Figure below shows example SK28A with header pin and SK28A is extend to breadboard.





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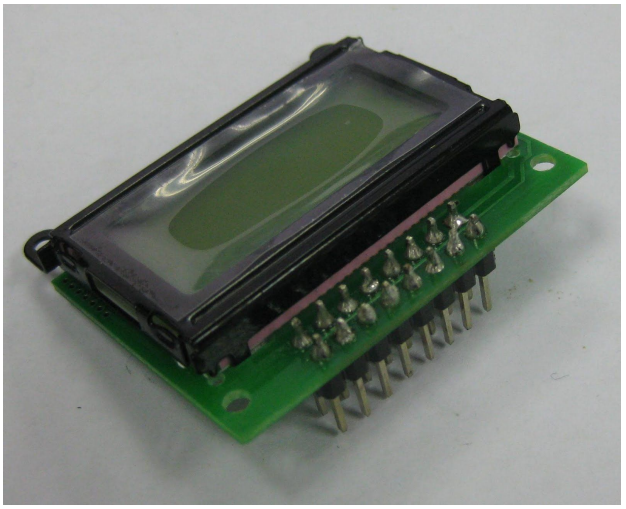
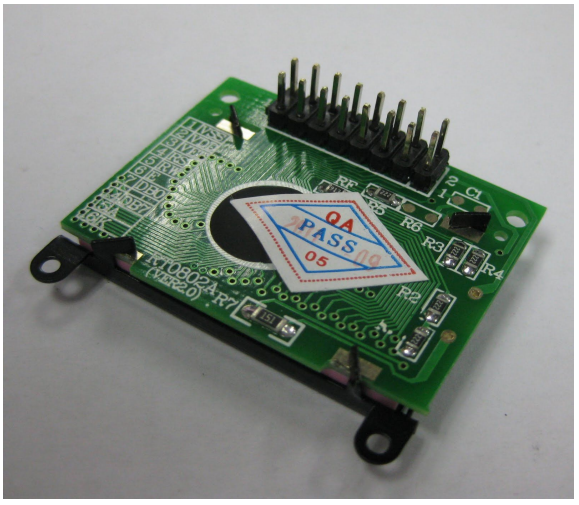
6.4 2x8 LCD Display

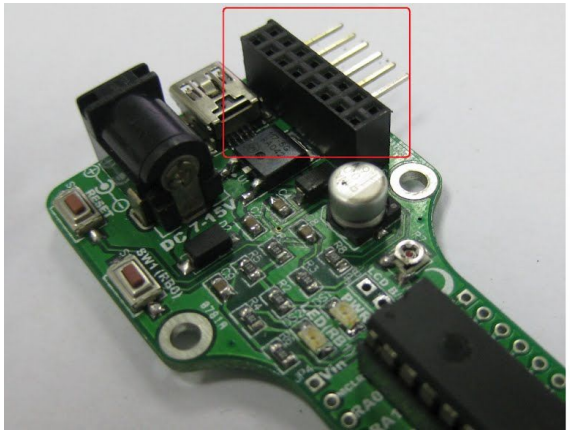
The 2x8 character LCD offer character display for embedded system. It can be used to display numerical information, text message and also special symbol. 2x8 LCD Display, female header and header pin are not included in SK28A packing list. User need to get it separately.

a. To use LCD, cut Straight Pin Header (Male) 2x40 Ways to 2x8 ways. Solder the header pin to the LCD shown as figure below.





b. Cut Straight Female Header 2x10 Ways to 2x8 ways. The female header also must soldered at DS3, and plug in the 2x8 LCD when it is ready.



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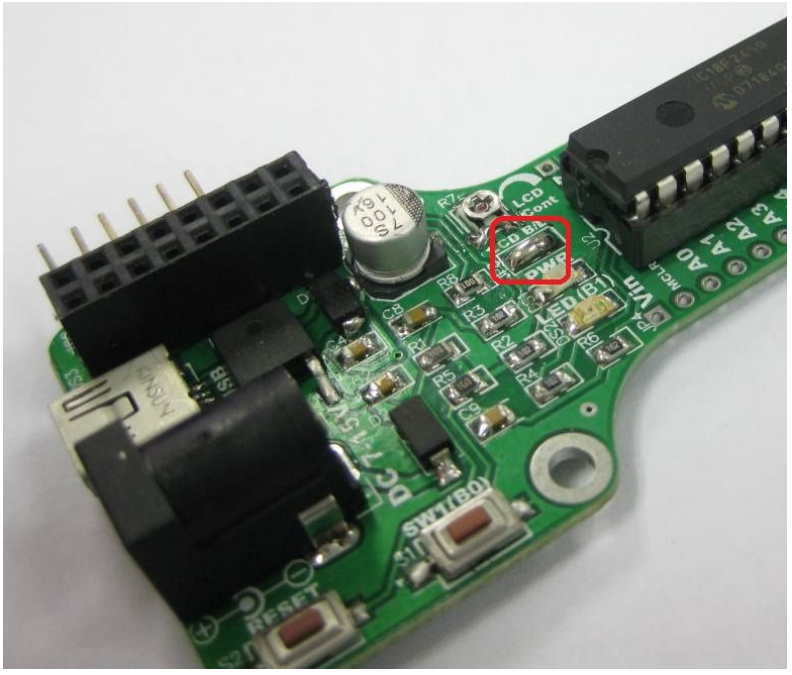
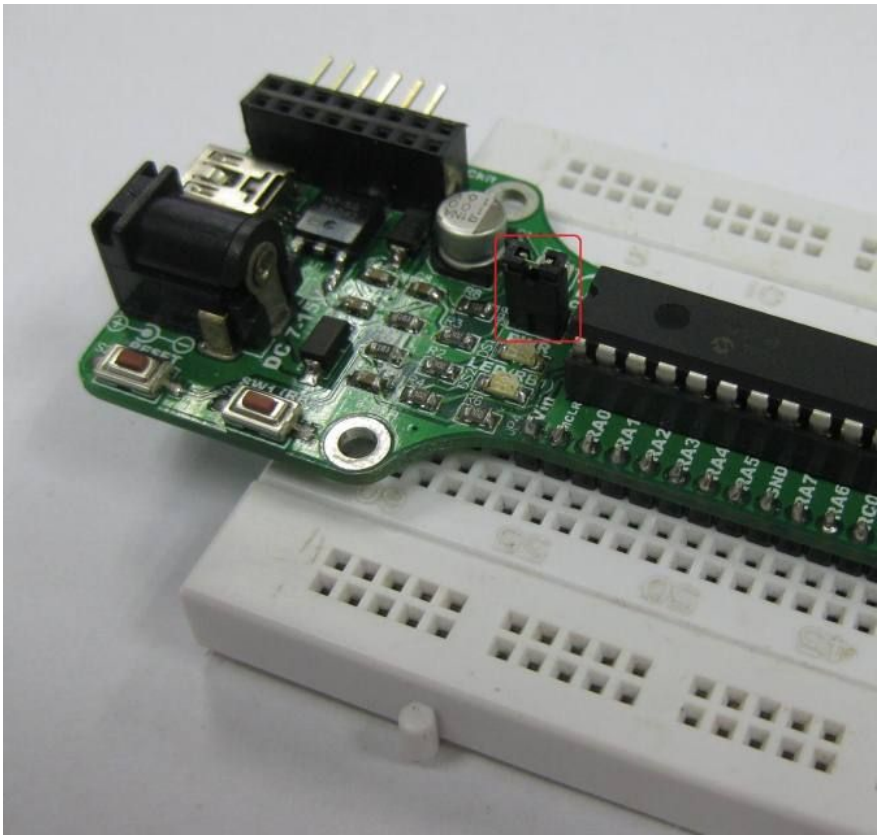
c. To get the LCD backlight (optional), connect JP8.



d. Besides soldering JP8, user also may use 1x2 header pin and mini jumper to connect LCD B/L. Header pin and mini jumper is not provided in SK28A packing list. User need to get it separately.



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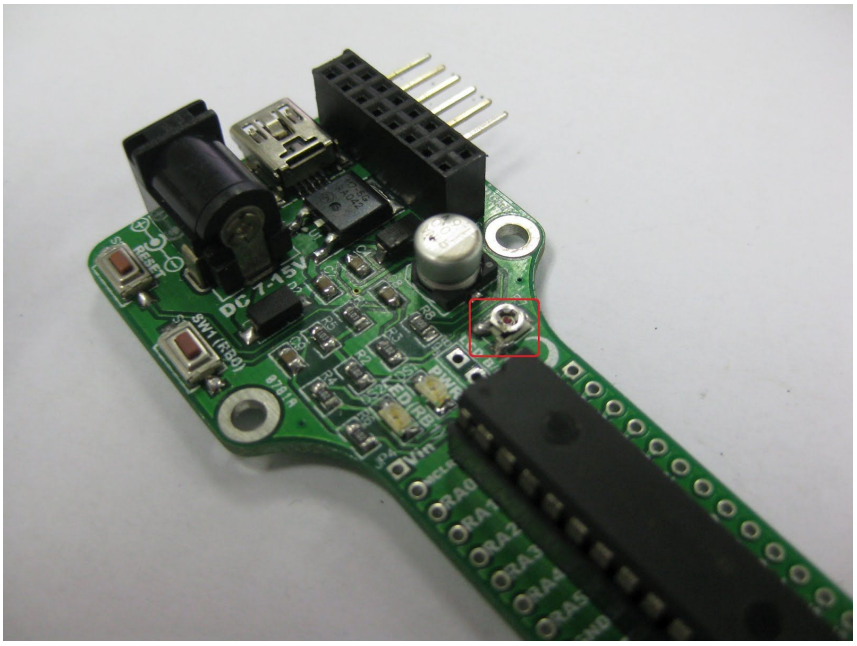
e. Preset/Potentiometer is used to adjust the contrast of LCD display. Turn left or right to adjust the contrast.



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6.5 USB Interface

USB is one of possible serial communication between microcontroller and computer offered on SK28A. Again this is optional to user.

USB data pins (pin 15 (D-) and pin 16 (D+)) are connected to a mini USB socket on SK28A for USB development ussage. Microchip has five USB 8-bit microcontrollers in 28-pin PDIP package (as the time this manual is written) which include PIC18F2450, PIC18F2458, PIC18F2455, PIC18F2550 and PIC18F2553. Microchip has USB Framework and Sample code to support USB development on 8-bit, 16-bit and 32-bit MCUs. These codes are royalty free source code which called MCHPFSUSB Framewowrk and it also include some example projects. Download the appropriate USB stack for the target PIC microcontroller. Each includes USB firmware for the microcontroller as well as a USB device driver for the PC which allows the PC to treat the microcontroller as a USB device. Classes supported include HID, CDC, MSD and generic. For more information, please do visit the official Microchip USB site.

User can download MCHPFUSB Framework (MicrochipApplication Libraries) from Cytron's website under "Useful Documents" of SK28A. Unzip it and install it after finish download. "Microchip Solutions" folder will be created at your C Drive. All free framework and example projects are inside the folder. For SK28A user, only the project with this name "PICDEM FSUSB.mcp" is suitable for your project but user need do some modification on "HardwareProfile - PICDEM FSUSB.h" because the SK28A's switch and LED are connected to different I/O pin if compare to the PICDEM FUSB Demo Board. User may download the PICDEM FSUSB Demo Board User's Guide at Cytron website under "Useful Document" of SK28A which has the schematic diagram for reference.

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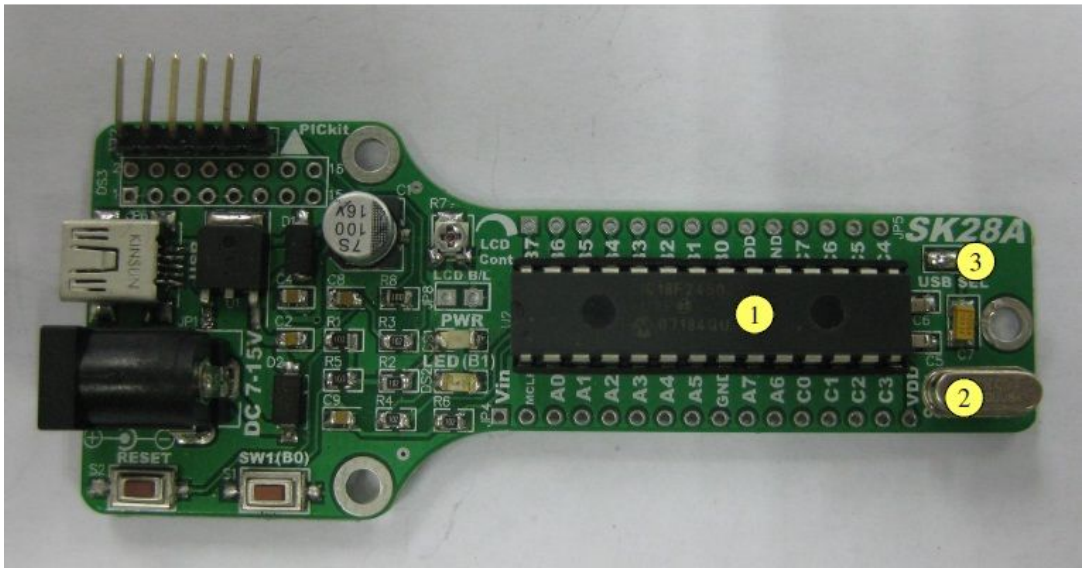
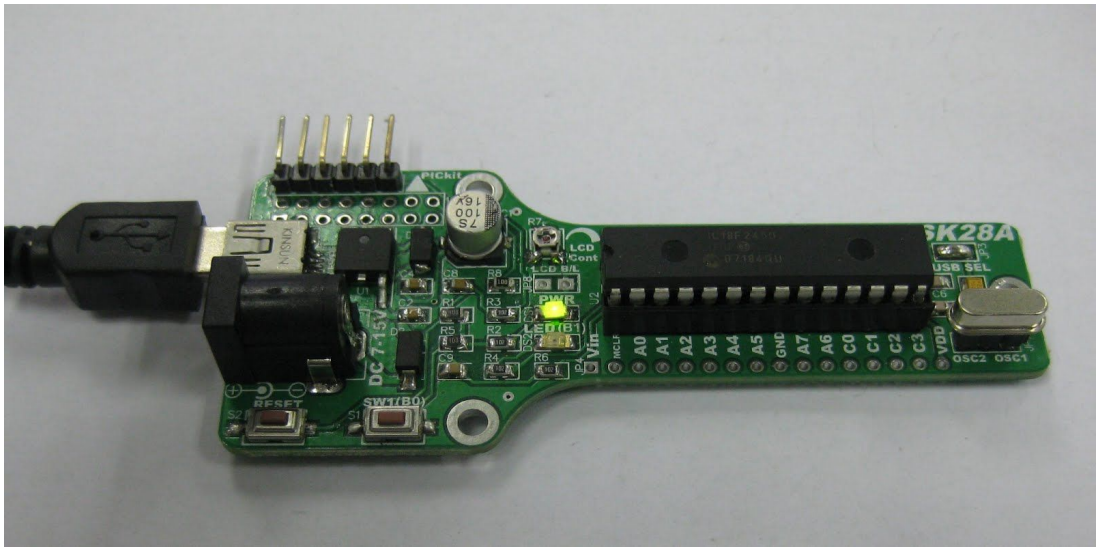
This section will show hardware installation for USB.

a. Plug in PIC which is support USB program. Make sure crystal 20MHz used (unless the configuration of MCHPFSUSB Framework change). JP3 (USB SEL) also need to connect as shown as figure below.



b. Connect USB mini cable to SK28A USB connector. Connect the other end of USB mini cable to PC USB port. No external power may needed for in USB application.



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7.0 GETTING STARTED

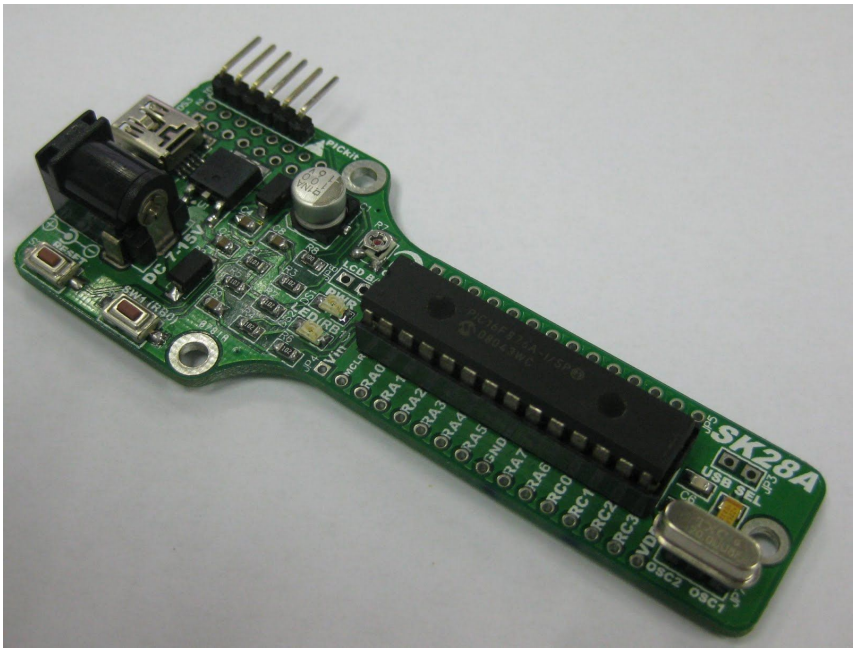
SK28A is ready to be plug and use, no extra driver in most of the cases.. It is a hardware platform.

7.1 LED and LCD Display

Example Source Code is provided to test the functionality of SK28A. Sample source code will show LED blinking and start up massage on LCD display. Sample source code can be downloaded from SK28A product page. This sample source code is provided for PIC 16F.

LCD display is not included in SK28B packing list. Get it separately if user need it. Please refer section 6.4 for interface SK28A with LCD display. Yet, the Sample source code works even without the LCD.

1. Plug in 28 pin PIC MCU. No restriction to what type of 28 pin PIC MCU can be used for SK28A, but the sample source code is written base on PIC18F2550.



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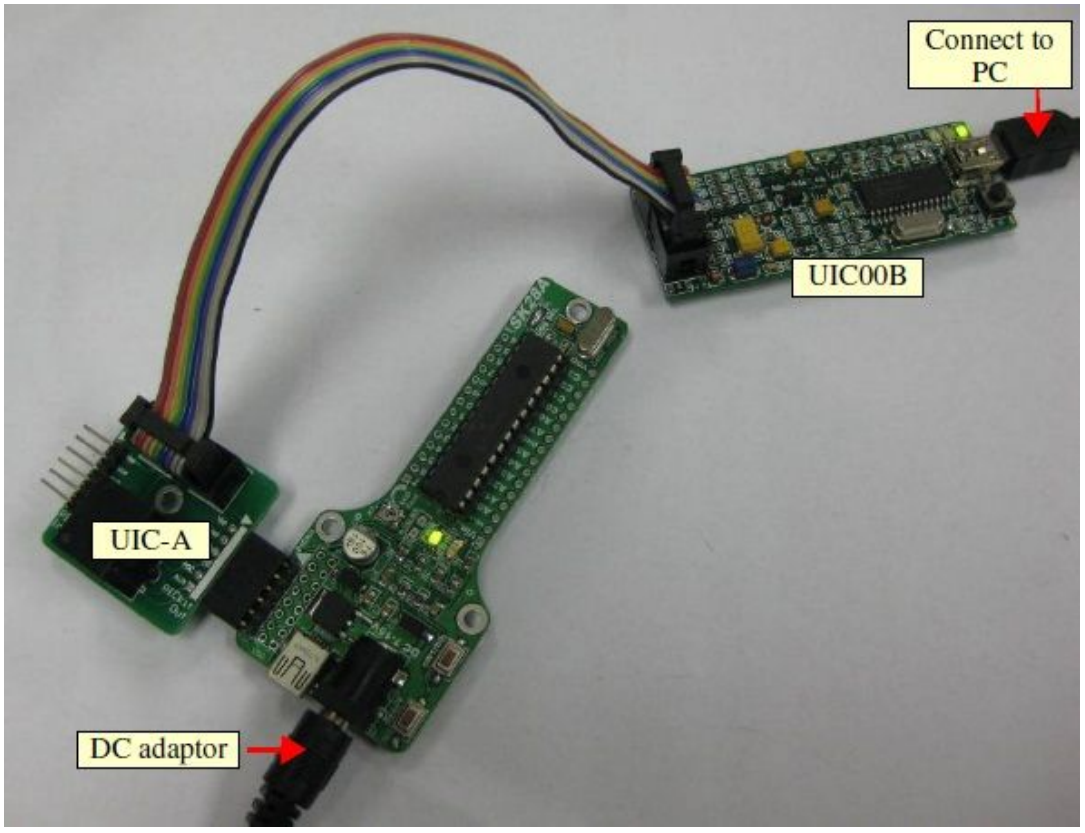
2. Connect adaptor to DC Power adaptor socket. PWR LED will turn ON. Connect UIC00B & UIC-A or others PICkit programmer.



3. Load hex code (18F2550 SK28A LCD.hex) into 28 pin PIC MCU.

4. LED is blinking. LED will stop blink when SW1 is pressed.

5. If SK28A is connected with LCD, user may see the LCD displayed "Cytron." at 1st line and "SK28A" at 2nd line.

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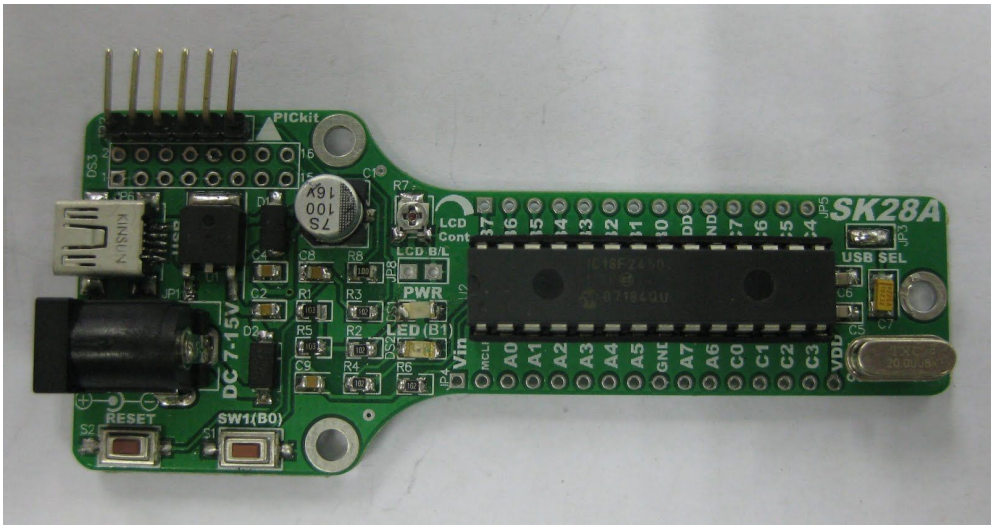
7.2 USB bootloader

This section shows example of loading code of LED Blinking using USB HID bootloader. Before loading the code, user need to upload USB bootloader firmware. We have provided the USB bootloader firmware and it valid only for PIC18F2550. User may download the sample source code and USB bootloader firmware at Cytron's website. The sample hex file is valid for PIC2550 only.

1. Make sure 20MHz crystal used (unless the configuration of MCHPFUSB Framework is change) and JP3 is connected shown as figure below. Plug in 28 pin PIC MCU. The sample source code is written base on PIC18F2550.



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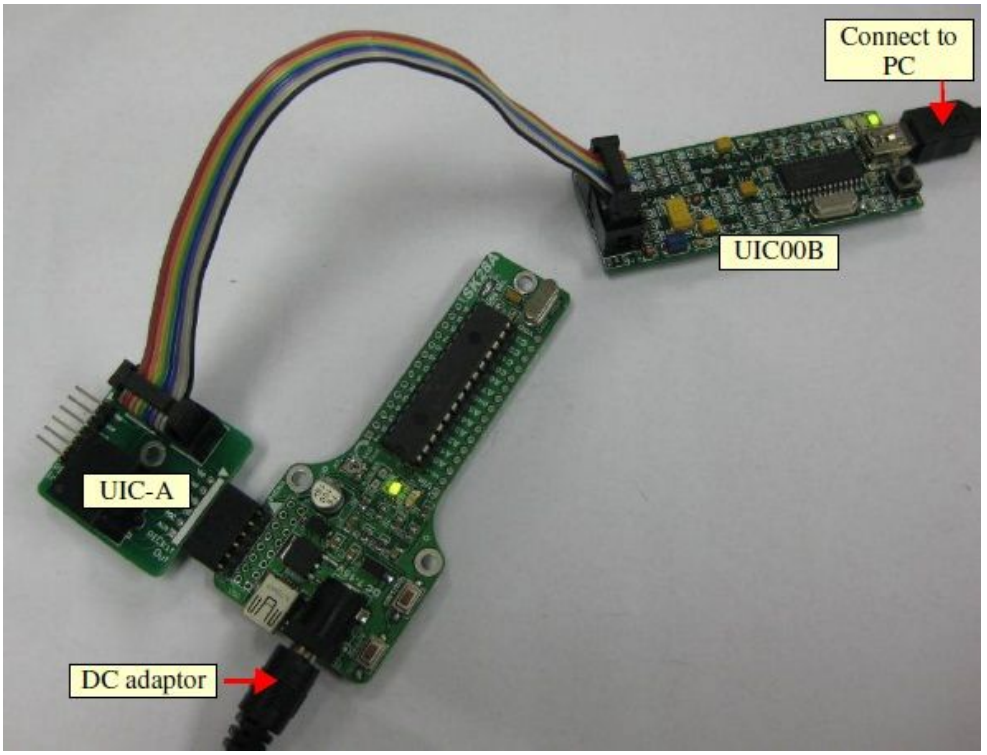

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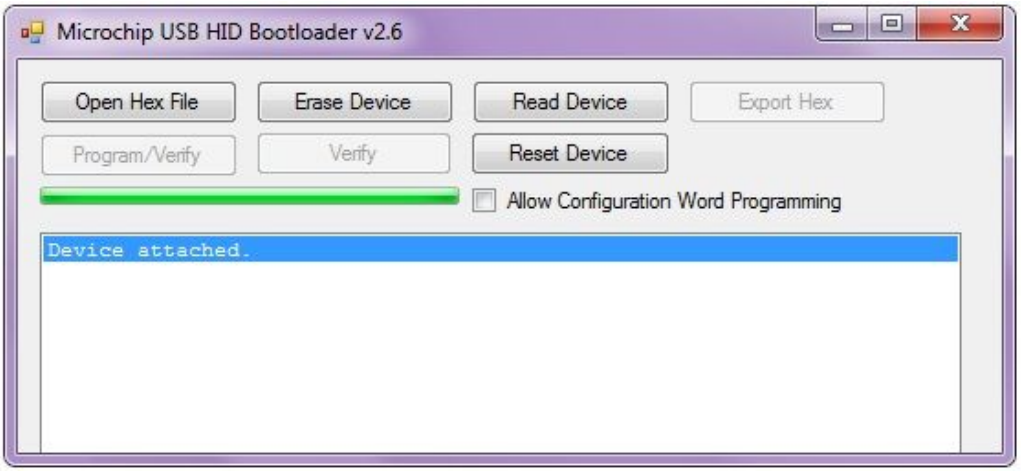
3. Load hex file of SK28A bootloader firmware for PIC18F2550. The bootloader firmware is inside SK28A Bootloader Firmware folder.

4. After USB bootloader firmware was loaded into PIC, unplug the UIC00B programmer. To enter bootloader mode, **press and hold** the SW1, connect the mini USB port on SK28A board to computer and release the SW1. Another way to activate the bootloader mode is **press and hold SW1** while press RESET button without unplug the USB cable.

5. SK28A can take secondary power supplied by USB port, so external power may not needed for in USB application. LED will blink at the time when it is in bootloader mode. These messages will pop out one by one on PC for the first time plug in only.

6. Open this HIDBootLoader application file inside the folder. User may already have the .NET framework installed on PC especially if user have already installed other applications which were built with one of the Visual Studio 2005.NET languages. If user do not have it, the .NET framework may freely download from Microsoft's website. Users of Windows Vista do not need to install the .NET framework, as it comes pre-installed as part of the OS.

7. A window will pop out. Click "Open Hex File".



8. Search "SK28A Sample Program" folder which users have download from website. They are 2 sample programs for USB which are LCD and LED. Click on 18F2550 SK28A LED (bootloader).

9. Select the given file "18F2550 SK28A LED (bootloader).hex" file and click open. Note that the original sample hex file, "18F2550 SK28A LED (bootloader).hex" is for PIC18F2550

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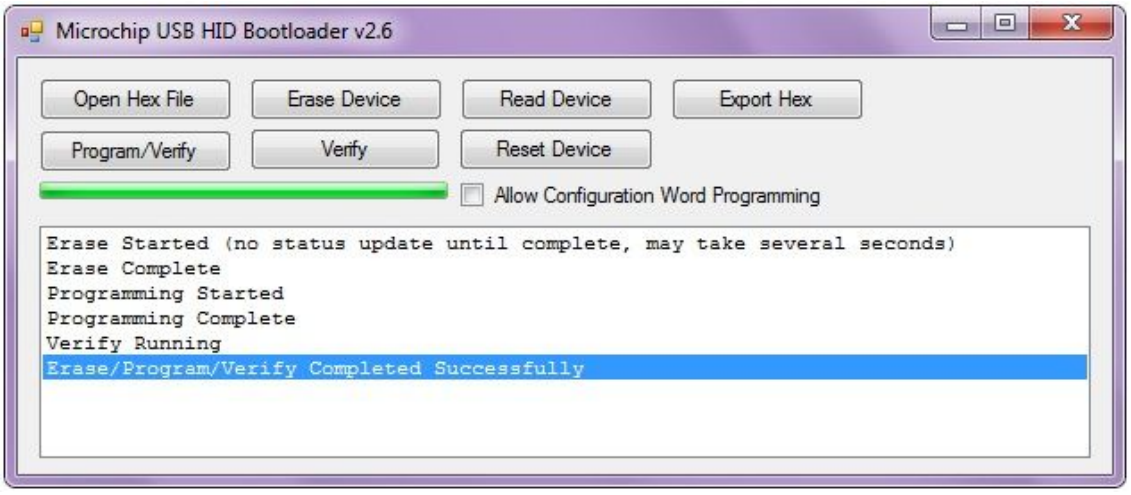
10. Click "Program/Verify" to load hex file to your PIC and programming status will be shown as below. Next, click "Reset Device" to run your program. LED is blinking and will stop blink if SW1 is being pressed.



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8.0 WARRANTY

- Product warranty is valid for 6 months.
- Warranty only applies to manufacturing defect.
- Damaged caused by misuse is not covered under warranty
- Warranty does not cover freight cost for both ways.

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