

SOUNDS OF THE FUTURE

# FPT-3 Plus Operating Manual



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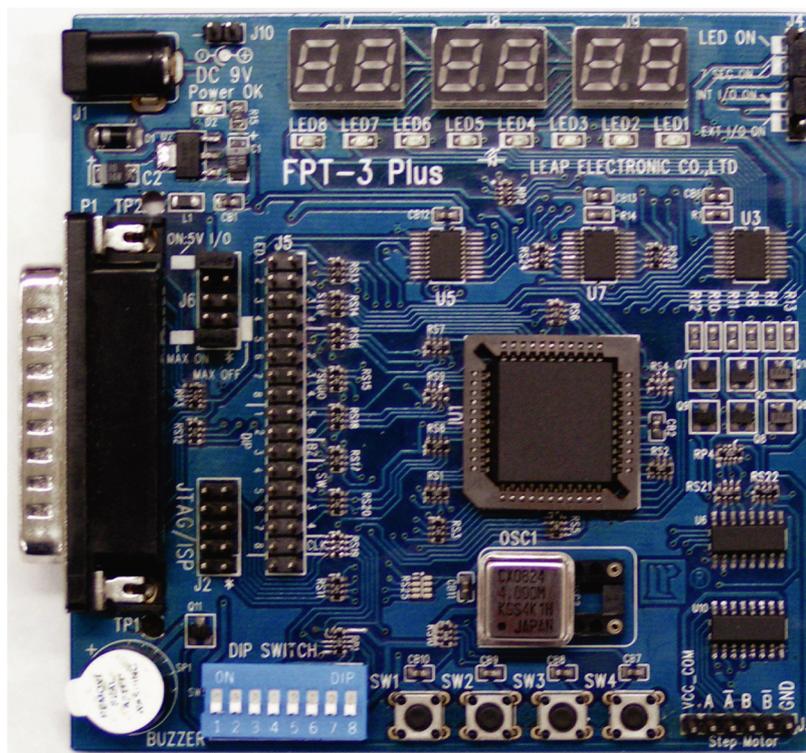
## CD-ROM contents instruction

|  |                              |
|--|------------------------------|
| <b>MAX+PLUS II 10.2</b>                |                              |
| student 102.exe                        | Maxplus II 10.2 software     |
| <b>update</b>                          |                              |
| maxplusii_1022_pc.exe                  | Maxplus II 10.22 update file |
| <b>pof</b>                             |                              |
| Demo.pof                               | FPT-3Plus Examples           |
| 7SEG.pof                               |                              |
| MOTOR.pof                              |                              |
| <b>autorun.exe</b>                     | CD-ROM auto-run program      |
| <b>FPT-3 Plus Operating Manual.pdf</b> | FPT-3 Plus Operating Manual  |

## Chapter 1 Introduction

### 1. Introduction of FPT3 Plus simple logic circuit design board

FPT-3 plus, simple logic circuit design board is produced by Leap Electronic Co., based on low cost and good function for the beginner for CPLD. FPT3 Plus carry on MAX7064LC44-10 chip, and seven-segment display (six -figure number) , LED, loudspeaker, motor driver, etc. put into the 10cm square.



Pic 1.FPT3 Plus

FPT-3 plus, simple logic circuit design board is produced by Leap Electronic Co., based on low cost and good function for the beginner for CPLD. FPT3 Plus carry on MAX7064LC44-10 chip, and seven-segment display (six -figure number) , LED, loudspeaker, motor driver, etc. put into the 10cm square.

#### 1-1 power

FPT3 Plus power is DC9V 500mA adaptor, inside anode and outside cathode.

## 1-2 I/O External Connector

FPT3 can connect the internal circuit and CPLD I/O pin to external circuit via I/O External Connector (J5) for expanding function. And the pin configuration of I/O external connector (34pin) is as follows:

| PIN | CPLD | Internal Circuit | PIN | CPLD | Internal Circuit |
|-----|------|------------------|-----|------|------------------|
| 1   | P4   | LED1             | 2   | P26  | STEP1            |
| 3   | P5   | LED2             | 4   | P27  | STEP2            |
| 5   | P6   | LED3             | 6   | P28  | STEP3            |
| 7   | P8   | LED4             | 8   | P29  | STEP4            |
| 9   | P9   | LED5             | 10  | P31  | 7SEGIO1          |
| 11  | P11  | LED6             | 12  | P33  | 7SEGIO2          |
| 13  | P12  | LED7             | 14  | P34  | 7SEGIO3          |
| 15  | P14  | LED8             | 16  | P36  | 7SEGIO4          |
| 17  | P16  | DIP1             | 18  | P37  | 7SEGIO5          |
| 19  | P17  | DIP2             | 20  | P39  | 7SEGIO6          |
| 21  | P18  | DIP3             | 22  | P40  | BZ               |
| 23  | P19  | DIP4             | 24  | P41  | SW1              |
| 25  | P20  | DIP5             | 26  | P43  | CLK              |
| 27  | P21  | DIP6             | 28  | P44  | SW2              |
| 29  | P24  | DIP7             | 30  | P1   | SW3              |
| 31  | P25  | DIP8             | 32  | P2   | SW4              |
| 33  | -    | GND              | 34  | -    | GND              |

Fig.7: I/O external connector

### 1-3 The power switch connector

FPT3 Plus internal power can switch over connector through power (J6 and J4) to distribute the power. It switches over way is:

| Connect | Introduction  |
|---------|---|
| 1-2     | Power connect to CPLD and start MAX7064S                  |
| 1-3     | Power do not connect to CPLD and do not start MAX7064S    |
| 9-10    | Power connect to JTAG · Dip Switch and Push Button Switch |

Fig.2 Function of J6 connector

| Connect | Introduction                        |
|---------|-------------------------------------|
| 1-2     | Start LED circuit                   |
| 2-3     | Start seven-segment display circuit |
| 4-5     | Start internal I/O circuit          |
| 5-6     | Start external I/O circuit          |

Fig.3 Function of J4 connector

### 1-4 Stepper motor driver signal connector

FPT3 Plus via 8550 crystal and J3 connector to output the driving signal for stepper motor. The pin assignments are:

| Connect | Introduction |
|---------|--------------|
| 1       | A            |
| 2       | A-           |
| 3       | B            |
| 4       | B-           |
| 5-6     | GND          |

Fig.4 Function of J3 connector

### 1-5 MAX7064SLCC44 connects the pin

The pin arrangement of MAX7064SLCC44:

| PIN        | Connect | PIN         | Connect |
|------------|---------|-------------|---------|
| 3、15、23、35 | VCC     | 10、22、30、42 | GND     |
| 4          | LED1    | 16          | DIP1    |
| 5          | LED2    | 17          | DIP2    |
| 6          | LED3    | 18          | DIP3    |
| 8          | LED4    | 19          | DIP4    |
| 9          | LED5    | 20          | DIP5    |
| 11         | LED6    | 21          | DIP6    |
| 12         | LED7    | 24          | DIP7    |
| 14         | LED8    | 25          | DIP8    |
| 31         | 7SEGIO1 | 41          | SW1     |
| 33         | 7SEGIO2 | 44          | SW2     |
| 34         | 7SEGIO3 | 1           | SW3     |
| 36         | 7SEGIO4 | 2           | SW4     |
| 37         | 7SEGIO5 | 26          | STEP1   |
| 39         | 7SEGIO6 | 27          | STEP2   |
| 7          | TDI     | 28          | STEP3   |
| 38         | TDO     | 29          | STEP4   |
| 13         | TMS     | 40          | BZ      |
| 32         | TCK     | 43          | CLK     |

Fig.5 Pin arrangement of 5 MAX7064SLCC44

### 1-6 JTAG connector

J2 connector is offered by FPT3 Plus JTAG connector, the pins' arrangement is as follows:

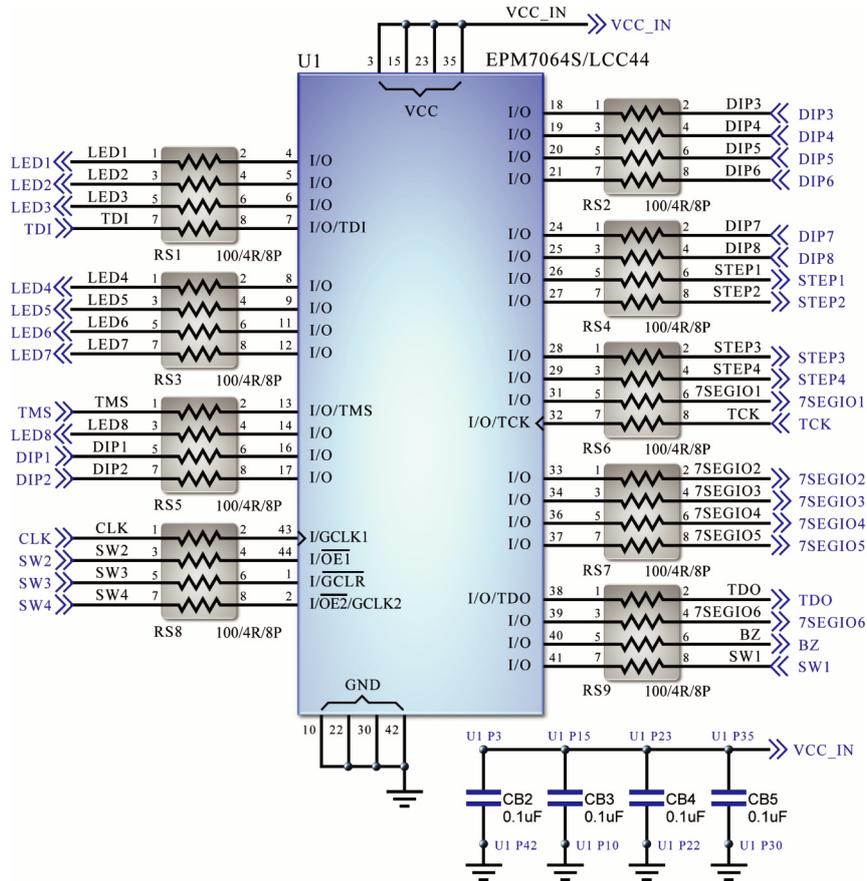
| Connect | Introduction |
|---------|--------------|
| 6、7、8   | Empty pin    |
| 4       | VCC          |
| 2、10    | GND          |
| 1       | TCK          |
| 3       | TDO          |
| 5       | TMS          |
| 9       | TDI          |

Fig.6 Function of J2 connector

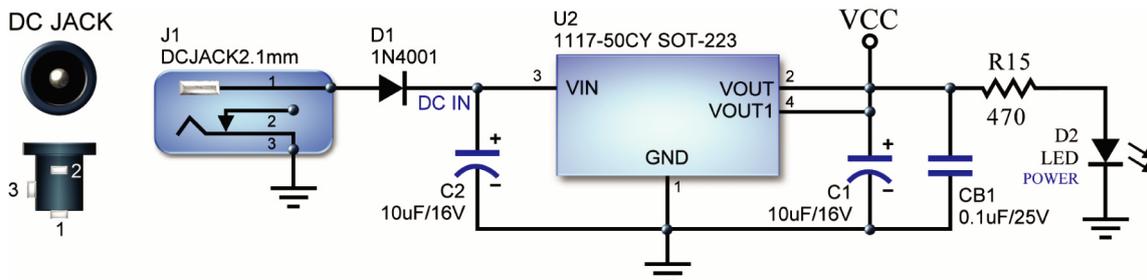


## Chapter 2 The Circuit of FPT-3 Plus

### 2-1 Chip Circuit

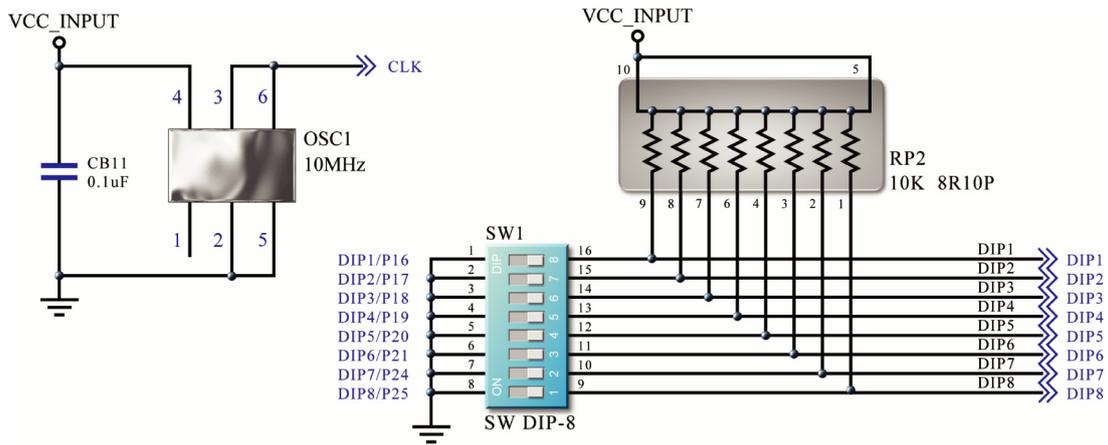


### 2-2 Power Circuit

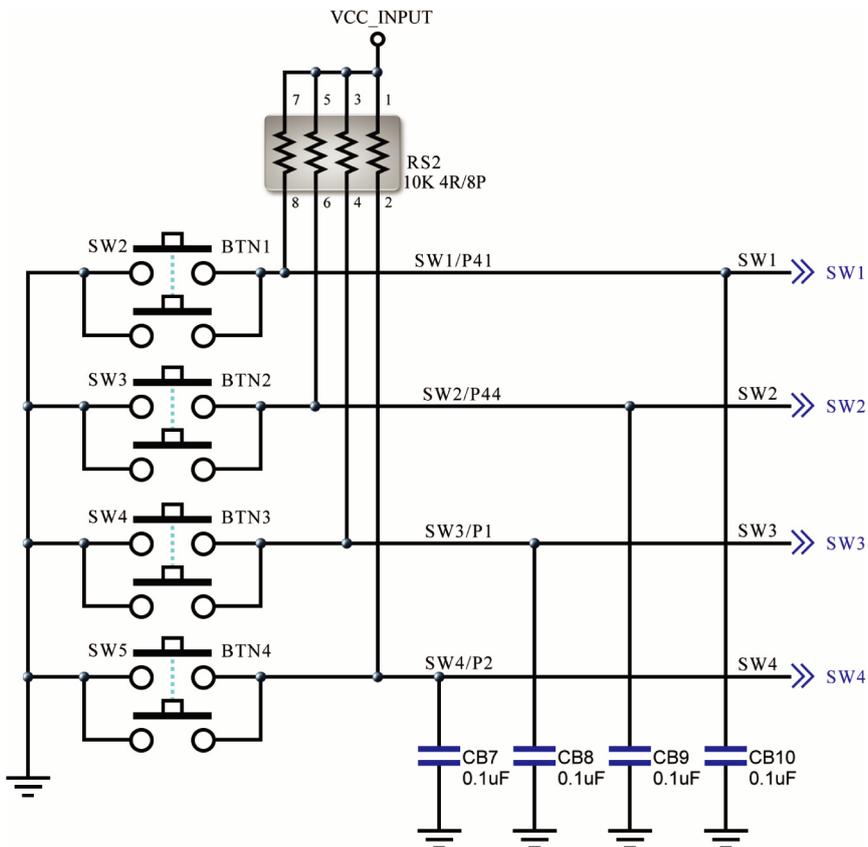




## 2-3 Clock Pulse and Dip Switch Circuit

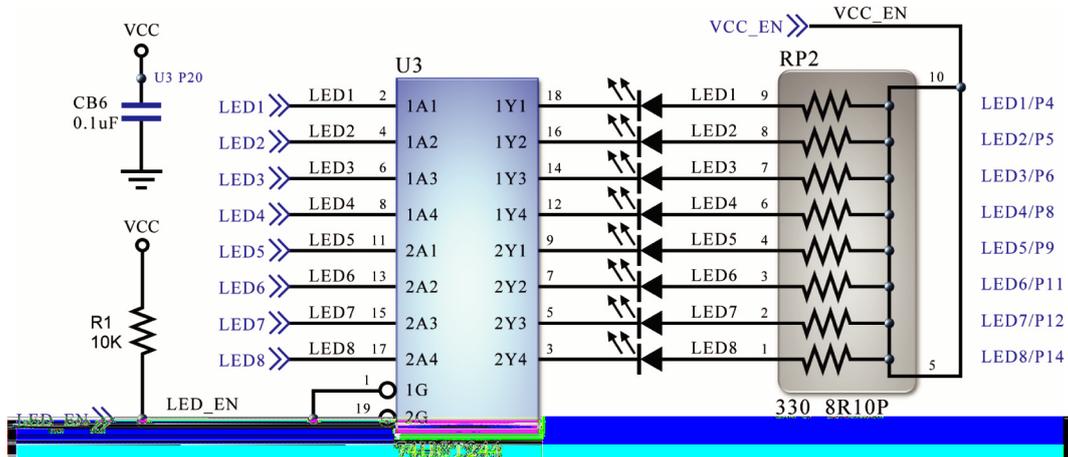


## 2-4 Push Button Switch Circuit

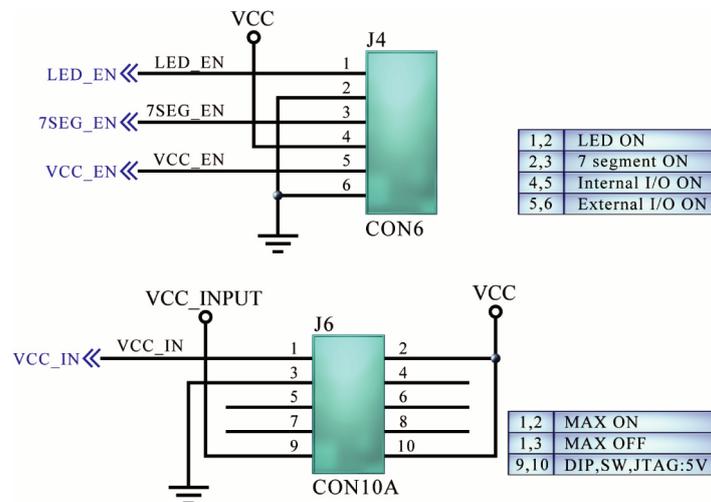




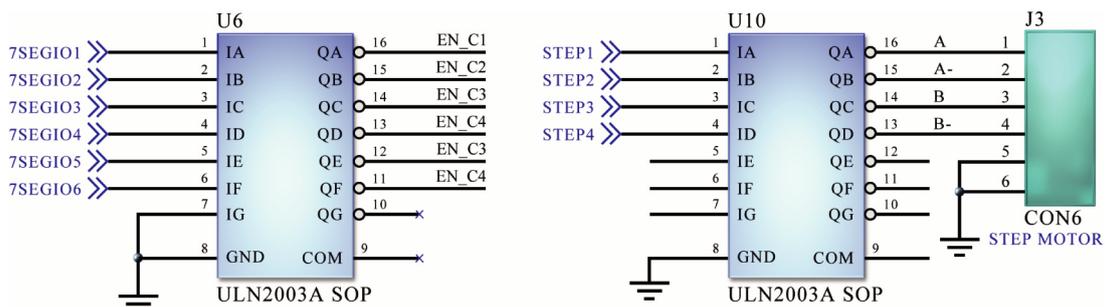
## 2-5 LED Circuit

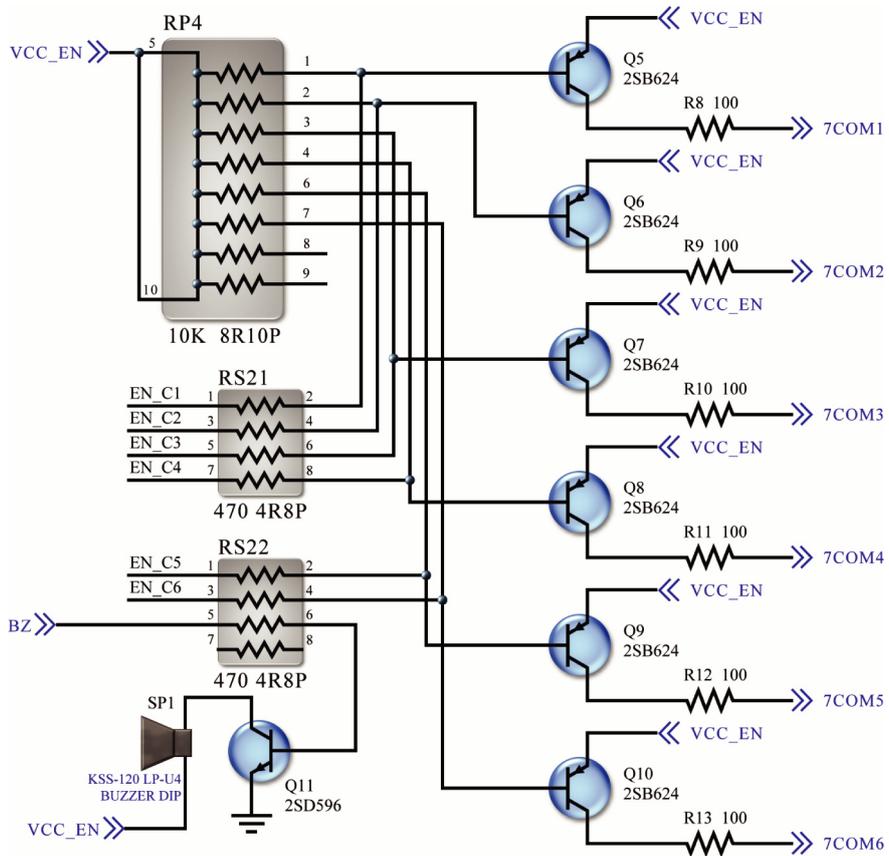
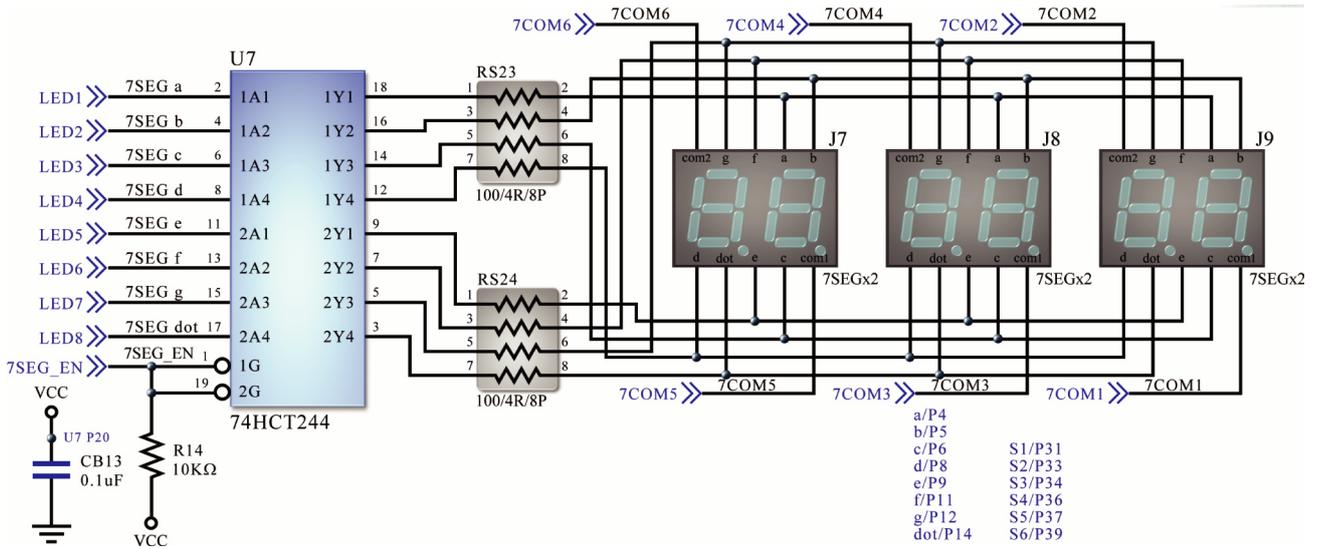


## 2-6 Jumper and Wiring



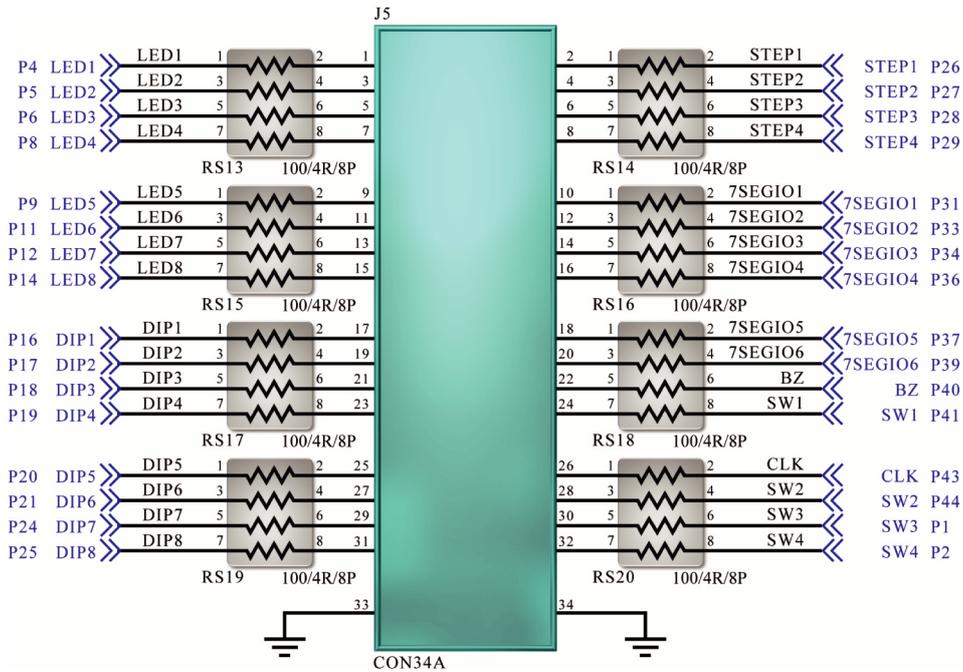
## 2-7 Stepper motor, seven-segment display and loudspeakers drive circuit



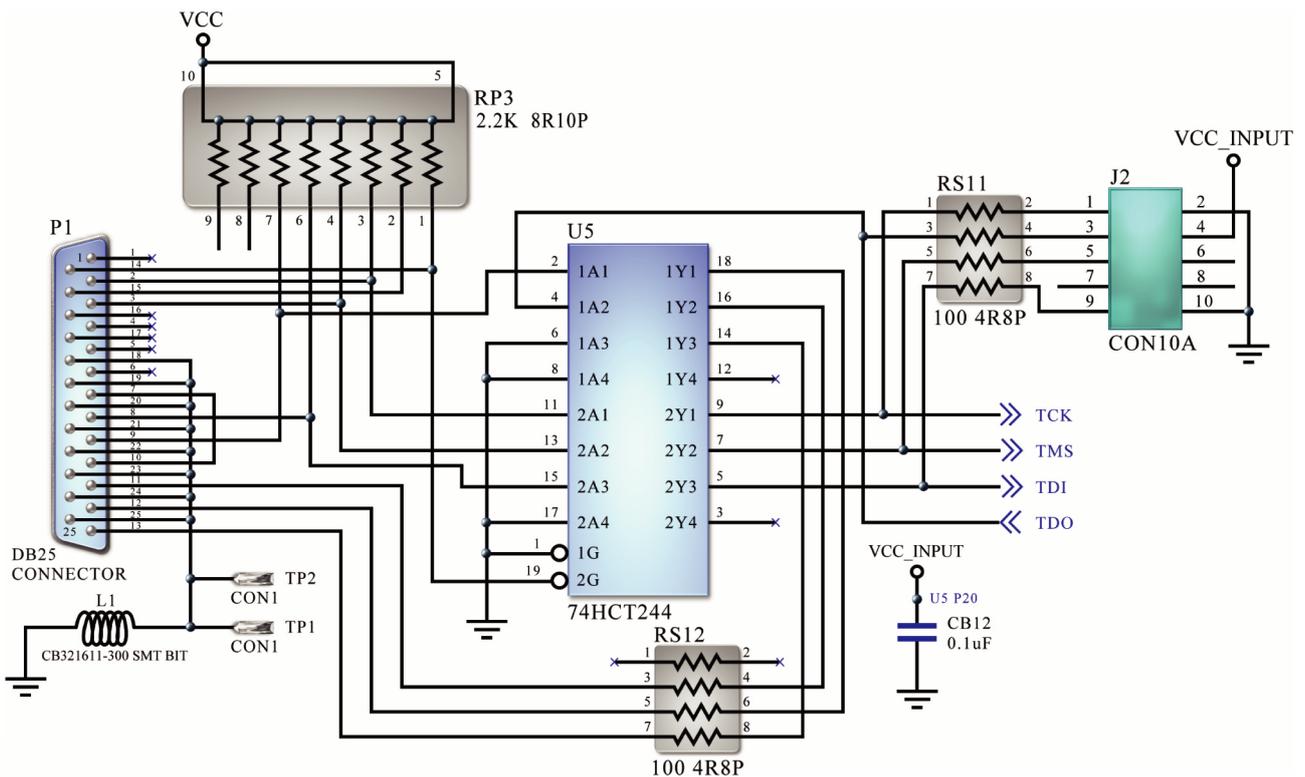




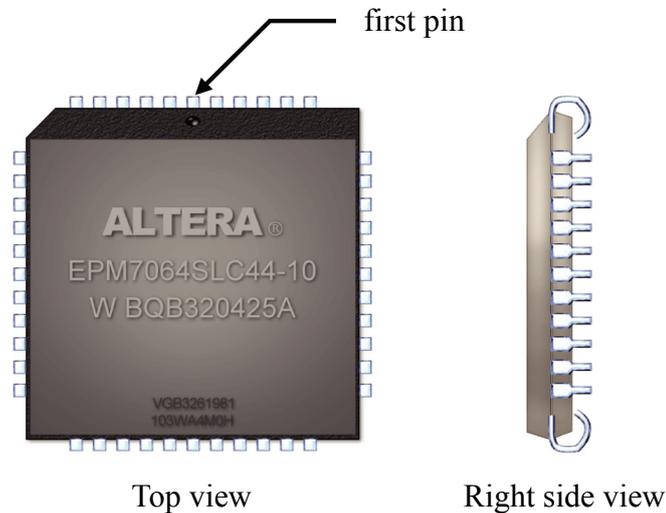
## 2-8 External connector



## 2-9 Printer port and JTAG



## Chapter 3 Introduce MAX7000S series



Pic.2 MAX7064SLC44-10 appearance (PLCC-44 pins)

FPT3 Plus uses MAX7000S series of Altera MAX7064SLC44-10 chip. The characteristic of MAX7000S series is as follows:

- MAX7000S is a programmable logical component (PLD) based on EEPROM with high capacity and efficiency
- Able to with 5V voltage in-system programmability (ISP) directly via IEEE Std. 1149.1 Joint Test Action Group (JTAG)
- Build in JTAG boundary-scan test (boundary-scan test, (BST)) Circuit, includes 128 or more of (depend on different serial number, please refer to the figure as follows) macrocells .
- Complete EPLD series, the logic density of the gate are from 600 to 5000 (depend on different serial number, please refer to the figure as follows) .
- 5 nanometer pin-to-pin transmitted rate and count frequency can reach 175.4MHZ.
- Capable to connect to the PCI standard devices.

| Specification          | EPM7032S | EPM7064S | EPM7128S | EPM7160S | EPM7192S | EPM7256S |
|------------------------|----------|----------|----------|----------|----------|----------|
| Gate Count             | 600      | 1,250    | 2,500    | 3,200    | 3,750    | 5,000    |
| Macrocell              | 32       | 64       | 128      | 160      | 192      | 256      |
| Logic array blocks     | 2        | 4        | 8        | 10       | 12       | 16       |
| I/O Pin Max            | 36       | 68       | 100      | 104      | 124      | 164      |
| t <sub>PD</sub> (ns)   | 5        | 5        | 6        | 6        | 7.5      | 7.5      |
| t <sub>SU</sub> (ns)   | 2.9      | 2.9      | 3.4      | 3.4      | 4.1      | 3.9      |
| t <sub>FSU</sub> (ns)  | 2.5      | 2.5      | 2.5      | 2.5      | 3        | 3        |
| t <sub>CO1</sub> (ns)  | 3.2      | 3.2      | 4        | 3.9      | 4.7      | 4.7      |
| f <sub>CNT</sub> (MHZ) | 175.4    | 175.4    | 147.1    | 149.3    | 125.0    | 128.2    |

Fig.7: Specification of MAX7000S

### 3-1 MAX7064SLCC44 connects the pin

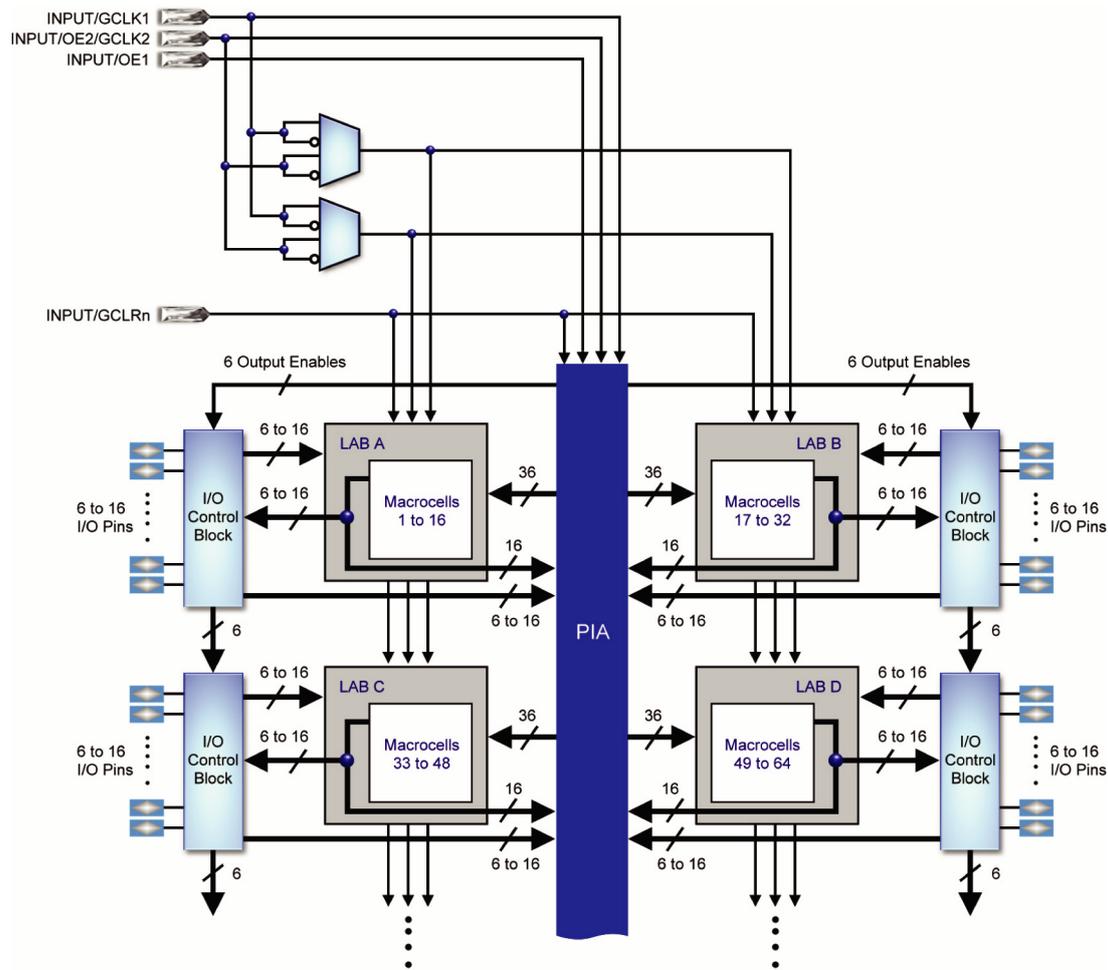
There are five kinds of ways of packing of EPM7064S, PLCC and TQFP with 44pin, PLCC with 84pin, PQFP with 100pin and TQFP, are as following:

| PIN QTY | Way of Packing | L X W (mm)  | Distance of Pin (mm) | Square |
|---------|----------------|-------------|----------------------|--------|
| 44      | PLCC           | 17.52X17.52 | 1.270                | 306.9  |
| 44      | TQFP           | 12.00X12.00 | 0.800                | 144.0  |
| 84      | PLCC           | 30.22X30.22 | 1.270                | 913.2  |
| 100     | PQFP           | 17.19X23.20 | 0.650                | 398.8  |
| 100     | TQFP           | 16.00X16.00 | 0.500                | 256.0  |

Fig.8: Packaging of MAX7064S

PLCC (plastic J-lead chip carrier) packing is a kind of the pin in J type (as Fig.2 shows). Because of this kind of packing can be used by socket and weld in circuit board directly. Therefore, it is utilized in the school, laboratory frequently. But the dimension of PLCC packing is relatively large, the cost is relatively high, Therefore, it often changes into PQFP (plastic quad flat pack) Or TQFP (thin quad flat pack) while mass production. Two packaging are lightly smaller than PLCC, and adopt L type evert pin instead. The traditional surface mount device (SMD) is very difficult to use in the school or the laboratory. Among them PQFP is the plastic encapsulation, the volume is larger than TQFP.

### 3-2 Internal structure



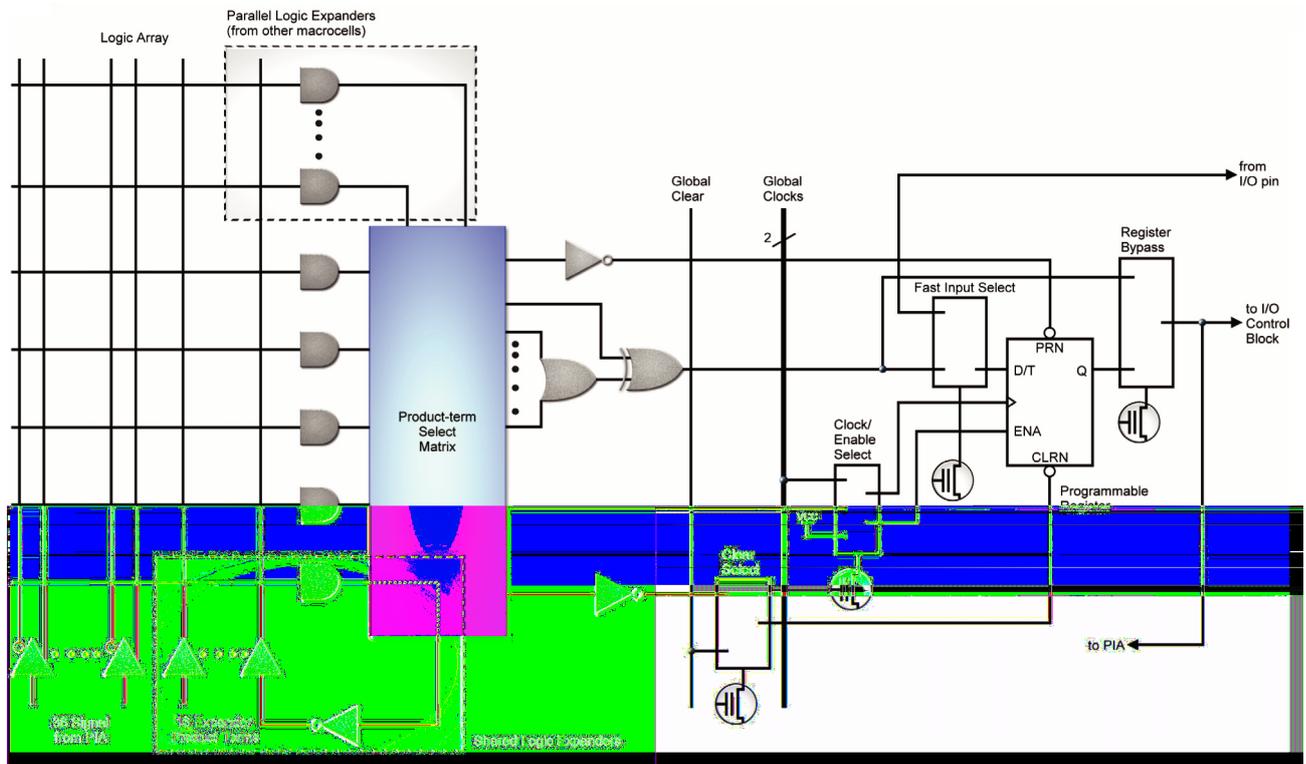
Pic.3:MAX7064S Internal structure:

Given as above, the internal of MAX7064S can be divided into five parts:

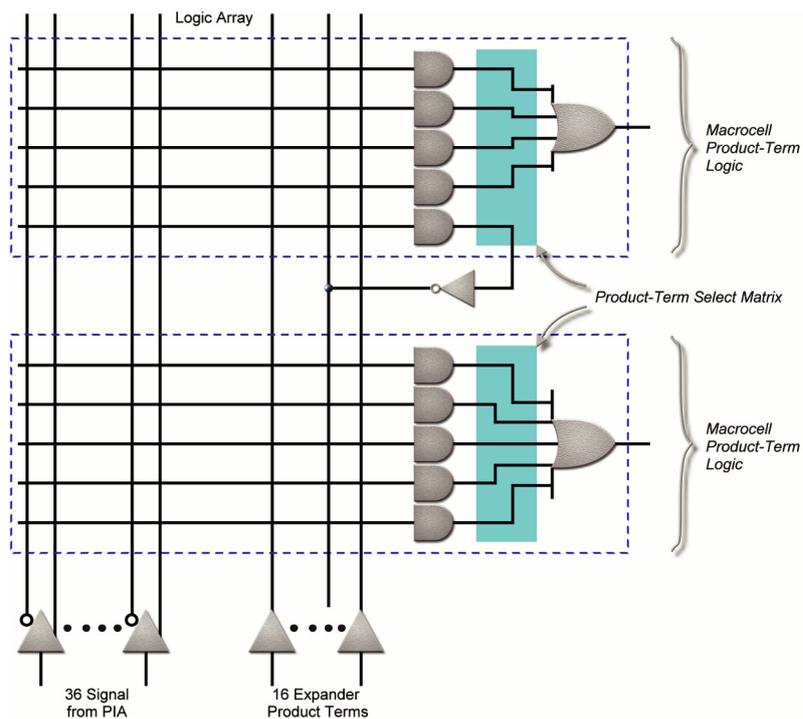
- Logic array blocks, (LAB), namely logic array block.
- Macrocells.
- Expander product terms (Shareable and parallel).
- Programmable interconnect array.
- I/O control blocks.



Macrocells and Expander product terms outline show:



Pic. 4 Macrocells of MAX7064S

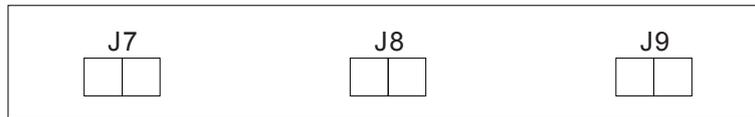


Pic. 5 Expander product terms of MAX7064S



## Chapter 4 FPT-3 Plus Pin Arrangement

### 4-1 Seven-segment display



Pic.6

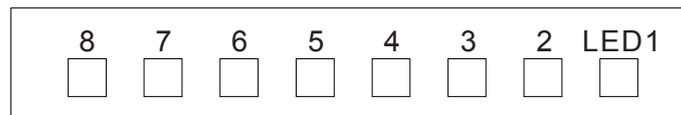
| Assignment | Seven-segment display |    |    |    |    |     |     |     |
|------------|-----------------------|----|----|----|----|-----|-----|-----|
| Name       | a                     | b  | c  | d  | e  | f   | g   | dot |
| Pin        | P4                    | P5 | P6 | P8 | P9 | P11 | P12 | P14 |

Fig. 9 J7

| Assignment | S1 | S2 | S3 | S4 | S5 | S6  |
|------------|----|----|----|----|----|-----|
| Pin        | P4 | P5 | P6 | P8 | P9 | P11 |

Fig.10

### 4-2 LED 1~8

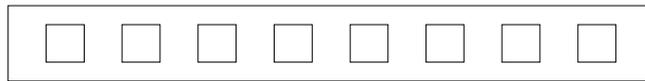


Pic. 7

| Assignment | LED1~8 |    |    |    |    |     |     |     |
|------------|--------|----|----|----|----|-----|-----|-----|
| Name       | LED1   | 2  | 3  | 4  | 5  | 6   | 7   | 8   |
| Pin        | P4     | P5 | P6 | P8 | P9 | P11 | P12 | P14 |

Fig. 11

### 4-3 DIP SWITCH



Pic. 8

| Assignment | DIP SWITCH |     |     |     |     |     |     |     |
|------------|------------|-----|-----|-----|-----|-----|-----|-----|
| Name       | 1          | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| Pin        | P16        | P17 | P18 | P19 | P20 | P21 | P24 | P25 |

Fig. 12 DIP SWITCH

### 4-4 SW1~SW4



Pic. 9

| Assignment | SW1~SW4 |     |     |     |
|------------|---------|-----|-----|-----|
| Name       | SW1     | SW2 | SW3 | SW4 |
| Pin        | P41     | P44 | P1  | P2  |

Fig. 13



## Chapter 5 FPT-3 Plus example

### 5-1 Start the software

1. Start MAX +plusII download software
2. Connect DC 9V power
3. Make sure FPT-3Plus upper left corner POWER red light is on

### 5-2 Test every site

1. The switch is checked initially
  - Make sure jumper of J4 is connected in LED ON and I/O ON position.
  - Make sure jumper of J6 is connected in ON: 5V I/O and MAX ON position.
  - Check DIP1~DIP8 are all OFF (downward).
2. LED and loudspeaker circuit
  - DOWNLOAD FPT3 \_ PLUS \_ DEMO.pof to FPT-3 Plus.
  - Push SW1~ SW4 separately, distinguish BUZZER to send out Do-Re-Mi-Fa four pieces of sound.
  - Open DIP1 ~ DIP8 ON separately (upwards), Observe LED whether LED8 sends out a warning in order.
  - Close DIP1 and differentiate DIP8 ON separately (upwards). Observe LED1~LED8 off in order.
3. 7-segment LED circuit
  - Adjust J4 JUMPER and change 7SEG ON from LED ON to first.
  - DOWNLOAD FPT3 \_ PLUS \_ 7SEG..to FPT-3 Plus.
  - Check J7 J8 J9 is in accordance with showing from 0~9 and F.
4. Stepper Motor circuit
  - Connect the motor driver, please caution for pin directionality (connect J10 \_ DC9V to anode and 4-line bus black symbol J3 \_ A end).
  - DOWNLOAD FPT3 \_ PLUS \_ MOTOR.pof to FPT-3 Plus.
  - Check the motor rotate clockwise.
  - Push SW1, check the motor rotate counterclockwise.

### 5-3 Check JUMPER set up

1. Check JUMPER of J4 is connected in 7SEG ON and INT I/O ON position.
2. Check JUMPER of J6 is connected in ON: 5V I/O and MAX ON position.
3. Check DIP1~ DIP8 is all ON (upwards).



## Chapter 6 Install the ByteBlaster driver in Windows 2000

On Windows 2000 computers, you must install the ByteBlaster driver before you want to program the CPLDs. You must have system administration privileges to install the ByteBlaster driver.

### 6-1 Driver Installation

1. Click on the Start menu, choose **Settings**, and click on **Control Panel**.
2. Double-click the **Add/Remove Hardware** icon to start the Add/Remove Hardware Wizard and click **Next** to continue.
3. Select the **Add/Troubleshoot a device** radio button in the Choose a Hardware Task panel, and click **Next** to continue. Windows 2000 will search for new Plug and Play hardware (New Hardware Detection window).
4. Select **Add a new device** in the Choose a Hardware Device window, and click **Next** to continue.
5. Select the **No, I want to select the hardware from a list** radio button in the Find New Hardware window, and click **Next** to continue.
6. Select **Sound, video and game controllers** in the Hardware Type window, and click **Next** to continue.
7. Select **Have Disk ...** in the Select a Device Driver window.
8. Browse to the **win2000.inf** file in the **\drivers\win2000** directory of your MAX+PLUS II software installation and click **OK**.
9. Click **Yes** at the Digital Signature Not Found warning dialog box.
10. Select **Altera ByteBlaster** or **Altera ByteBlaster II** in the Select a Device Driver window, and click **Next** to continue.
11. Click **Next** after the Start Hardware Installation window displays the hardware being installed.
12. Click **Yes** at the Digital Signature Not Found warning dialog box.
13. Click **Finish** in the Completing the Add/Remove Hardware Wizard window.
14. Reboot the computer.



## Chapter 7 Install the ByteBlaster driver in Windows XP

On Windows XP computers, you must install the ByteBlaster driver before you want to program the CPLDs. You must have system administration privileges to install the ByteBlaster driver.

### 7 -1 Driver Installation

1. Click on the Start menu, and click on **Control Panel**.
2. Click the **Switch to Classic View** link if necessary.
3. Double-click the **Add Hardware** icon to start the Add Hardware Wizard and click **Next** to continue.
4. Select **Yes, I have already connected the hardware** and click **Next**.
5. Select **Add a new hardware device** in the Installed hardware list, and click **Next** to continue.
6. Select **Install the hardware that I manually select from a list (Advanced)** and click **Next** to continue.
7. Select **Sound, video and game controllers**, and click **Next** to continue.
8. Select **Have Disk ....**
9. Browse to the **win2000.inf** file in the **\drivers\win2000** directory of your MAX+PLUS II software installation and click **OK**.
10. Click **Continue Anyway** when the Software Installation warning appears.
11. Select **Altera® ByteBlaster** and click **Next** to continue.
12. Click **Next** to install the driver.
13. Click **Continue Anyway** when the Hardware Installation warning appears.
14. Click **Finish** in the Completing the Add/Remove Hardware Wizard window.
15. Reboot the computer.