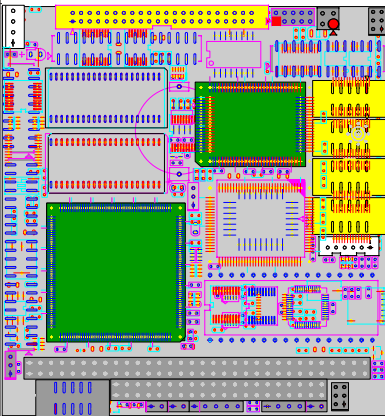


# Em104-i313

*PC-104 386SX-40 Module with  
Flat Panel / CRT SVGA,  
Digital I/O and LAN*



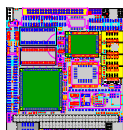
**ALi M6117 compatible 386SX-40 CPU,  
4MB EDO RAM Onboard,  
Supports DOC 2000, EIDE Interfaces,  
Realtek 8019AS 10BASE-T**

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## Specifications

- **CPU + Chipset** : ALi M6117 is an implementation of an INTEL compatible 386SX-40 CPU, Real-time clock, a watchdog timer and ALi's M6117 chipset
- **BIOS** : Y2K compliant AMI system BIOS
- **DRAM Memory**: 4MB EDO DRAM onboard
- **Bus Interface** : PC/104
- **Enhanced IDE** : Supports one port and up to two drives Enhanced IDE devices of PIO mode 4 44-pin connector
- **Flash Disk** : Supports Flash, EPROM and DOC 2000
- **Expansion Slot** : PC/104 Slot
- **Keyboard and Mouse Connectors**:  
External PS/2 KB/Mouse port (6-pin) box wafer
- **Watchdog Timer** : generates either a RESET, NMI or an IRQ when your application loses control over the system. Normally the watchdog can trigger a user specified interrupt. The watchdog is configurable from 30.5  $\mu$ s to 512 seconds (in 30.5  $\mu$ s segments)

### ***High Speed Multi I/O***

- **Chipset** : ALi M6117
- **Serial ports**: 2 high speed RS-232 ports, 2 high speed RS-232/485 ports (jumper selectable). Both with 16C550 UART and 16 byte FIFO. BIOS enabled/disabled. (COM3 and COM4 are optional.)
- **Bidirectional Parallel Port** : supports SPP, EPP and ECP mode. BIOS enabled/disabled

### ***Flat Panel Display Controller***

- **Chipset** : TP6508IQ (C&T 65545 optional)
- **Memory** : 1 MB onboard
- **System Bus** : 16-bit ISA bus
- **Panel Data Bus** : 24-bit
- **Display** : CRT and Flat Panel TTL-24 bit

### ***LAN Controller***

- **Chipset** : Realtek 8019AS single chip system
- **Transfer mode**: Full-duplex transfer mode

### ***Environmental and Power***

- **Power Requirements**:  
single voltage +5 V @ 800 mA with 4 MB EDO installed
- **Board Dimensions** : 90 (L) x 96 (W) mm.
- **Board Weight** : 100 g
- **Operating Temperature**: 0 ~ 60°C (32 to 140°F)

# Warning

PC/104 Modules and their components contain very delicate Integrated Circuits (IC). To protect the PC/104 Module and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your PC/104 Module from the power source whenever you want to handle the module
2. Use a grounded wrist strap when handling the module.
3. Hold the module by the edges and try not to touch the IC chips, leads or circuitry
4. Place the module on a grounded antistatic pad or on the bag that came with the PC/104 Module when handling it.

## Ordering Codes

### **Em104-i313DVL/4S**

PC/104 386SX-40 Module with 4MB EDO, Flat Panel/CRT SVGA, Fast Ethernet, DiskOnChip socket and 4 serial ports

### **Em104-i313DVL**

PC/104 386SX-40 Module with 4MB EDO, Flat Panel/CRT SVGA, Fast Ethernet, DiskOnChip socket and 2 serial ports

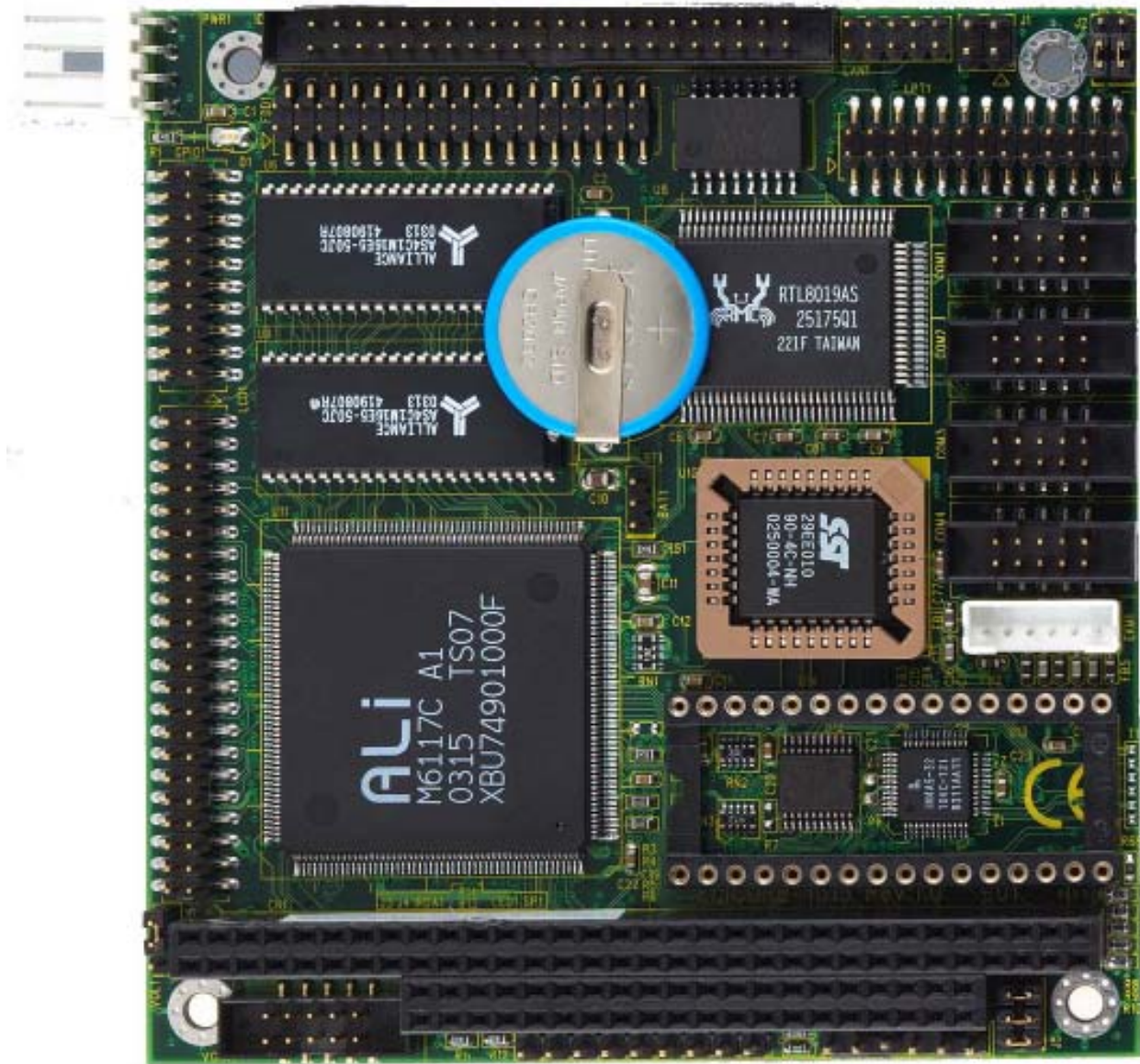
### **Em104-i313DV**

PC/104 386SX-40 Module with 4MB EDO, Flat Panel/CRT SVGA, 2 serial ports and DiskOnChip socket

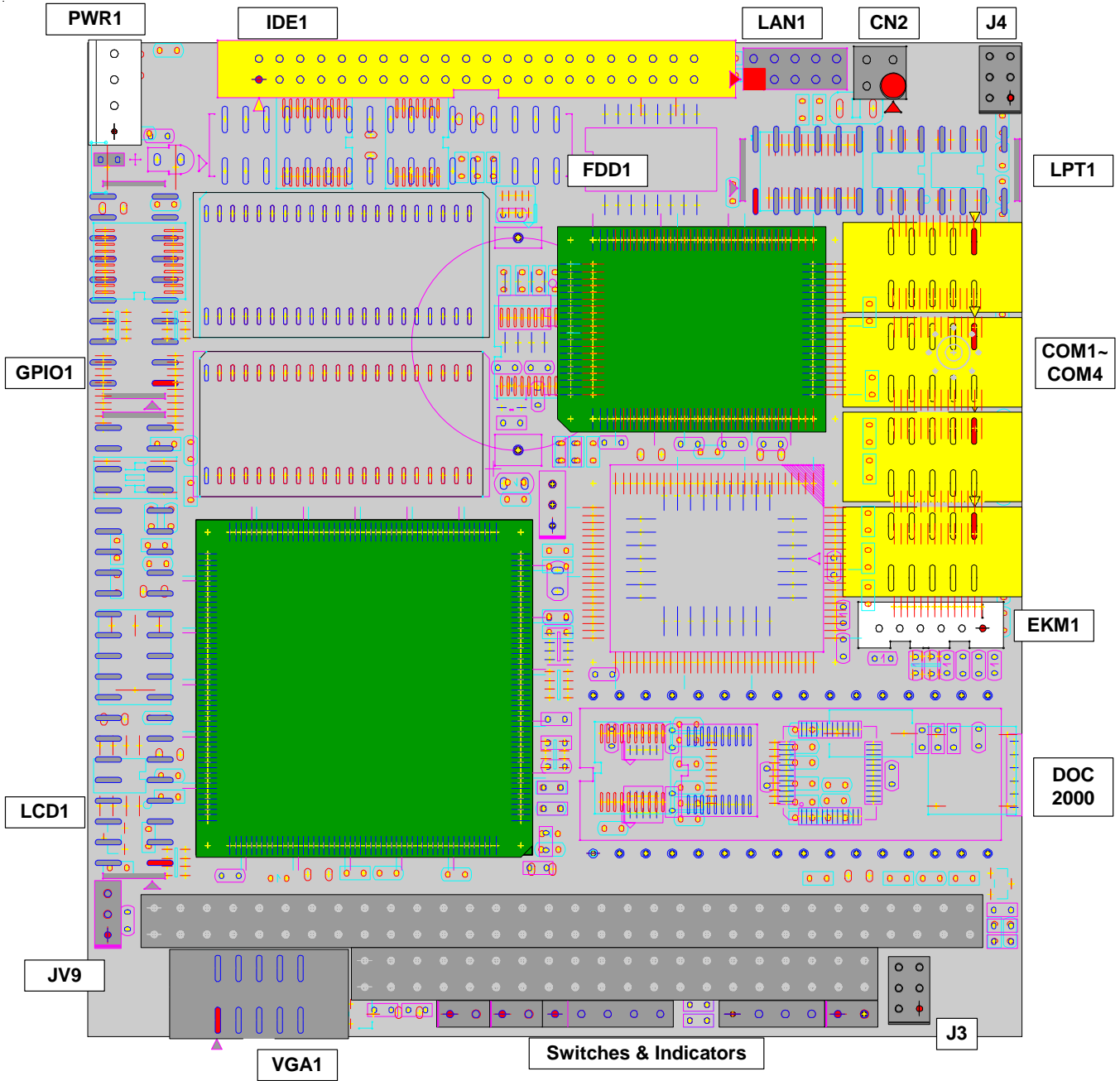
### **Em104-i313D/4S**

PC/104 386SX-40 Module with 4MB EDO, DiskOnChip socket and 4 serial ports

## Board Image



# Board Layout



## Jumper/Connector Quick Reference

Jumpers

<b>Label</b>	<b>Function</b>
J3	DOC, Flash and EPROM address selection
J4	RS-232 & RS-485 Selection on COM1 and COM2
JV9	LCD Power Selection

## Jumper/Connector Quick Reference

### Connectors

<b>Label</b>	<b>Function</b>
PWR1	Power 4P Power Connector
LAN1	LAN Connector
EKM1	PS/2 Keyboard and PS/2 Mouse
IDE1	Primary IDE Connector
LPT1	Parallel Port
LED1	LAN LED
HLED1	HDD LED
RES1	Reset
SP1	External Speaker
CN2	RS-485 Selection
GPIO1	16-bit General Purpose I/O
LCD1	LCD Connector

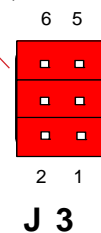
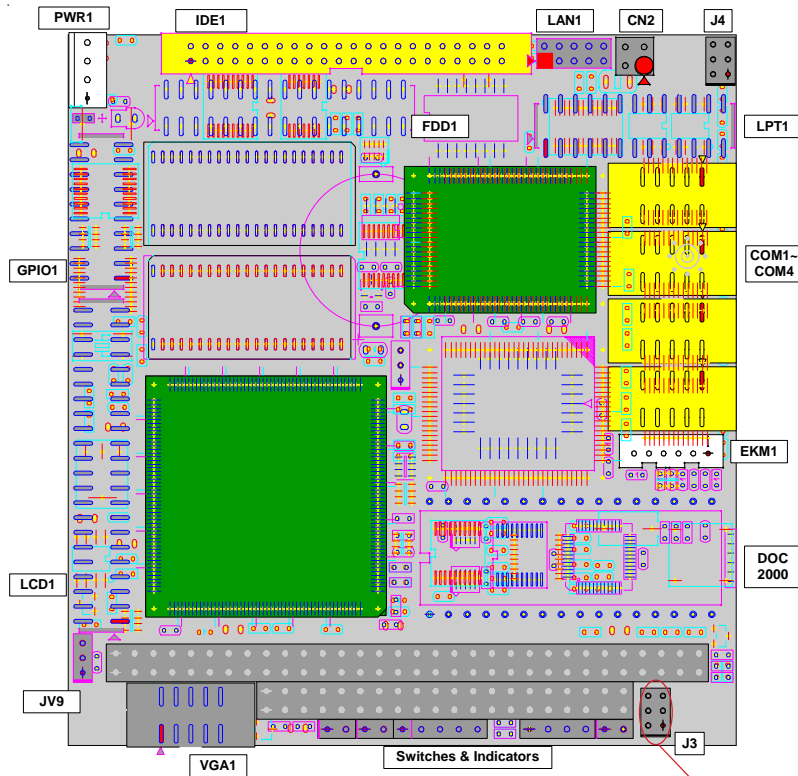


## DOC, Flash and EPROM

Jumper : J3

Type : Onboard 6-pin header

Pin			Status
1-2	3-4	5-6	
ON	ON	ON	DOC, D0000
OFF	ON	ON	DOC, D8000
ON	OFF	ON	FLASH, D0000
OFF	OFF	ON	FLASH, D8000
OFF	ON	ON	FLASH, D4000
OFF	ON	OFF	EPROM, D0000
ON	OFF	OF	EPROM, D8000
OFF	OFF	OFF	All Open
default setting			DOC, D000



# RS-232 & 485 selection On COM1 & COM2

## COM2 RS-232/485 selection (J4)

The EM104-i313 offers two serial ports: COM1 and COM2. These ports let you connect to serial devices (mouse, printers, etc.), or to a communication network. The EM104-i313 serial ports can be configured by jumpers J4.

Jumper : J4

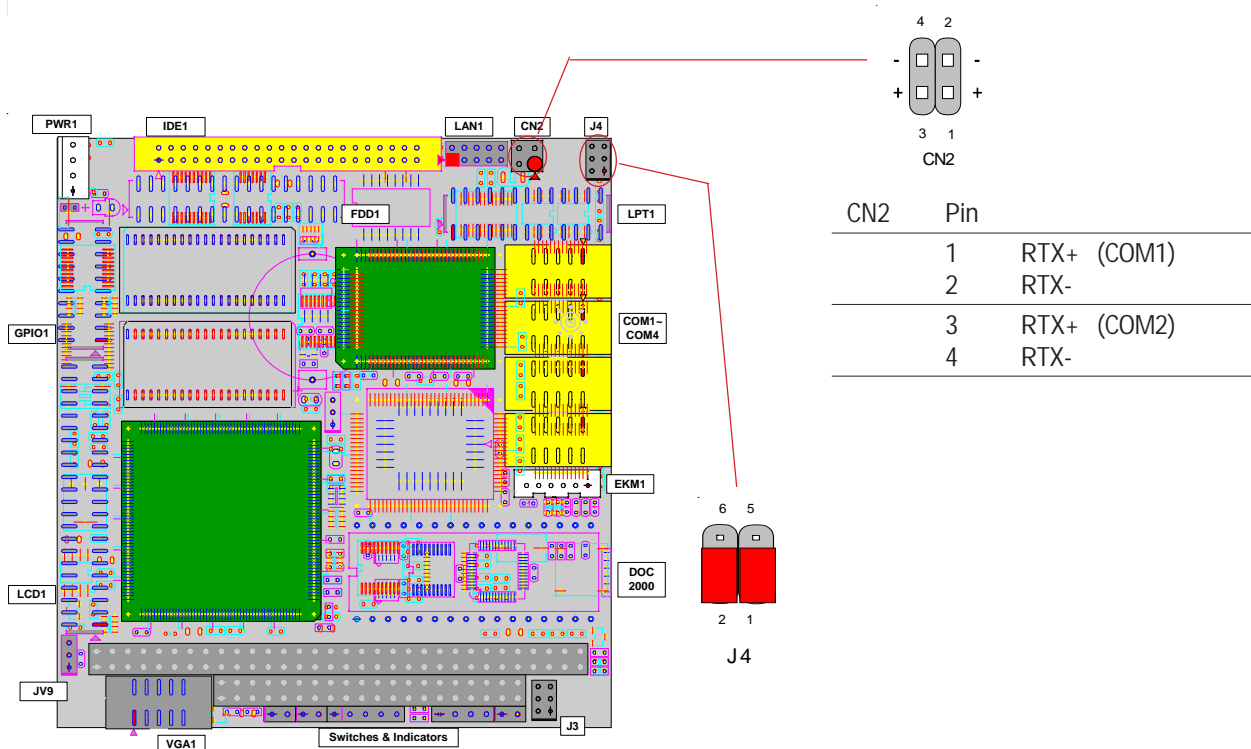
Type : onboard 6-pin(2\*3) header

Pin Selection	Status
1-3	RS232 on COM1
2-4	RS232 on COM2
3-5	RS485 on CN2
4-6	RS485 on CN2

## RS-232/485 Mode on COM1 and COM2

The onboard COM1 and COM2 port can be configured to operate in RS-232 or RS-485 modes. RS-232 modes differ in the way RX/TX is being handled. Jumper J4 switches between RS-232C or RS-485 mode. All of the RS-232C/485 modes are available on COM1 and COM2.

Pin	RS-232C	RS-485
1-3 :	COM1	x (Default)
3-5 :	x	CN2 1,2
2-4 :	COM2	x (Default)
4-6 :	x	CN2 3,4



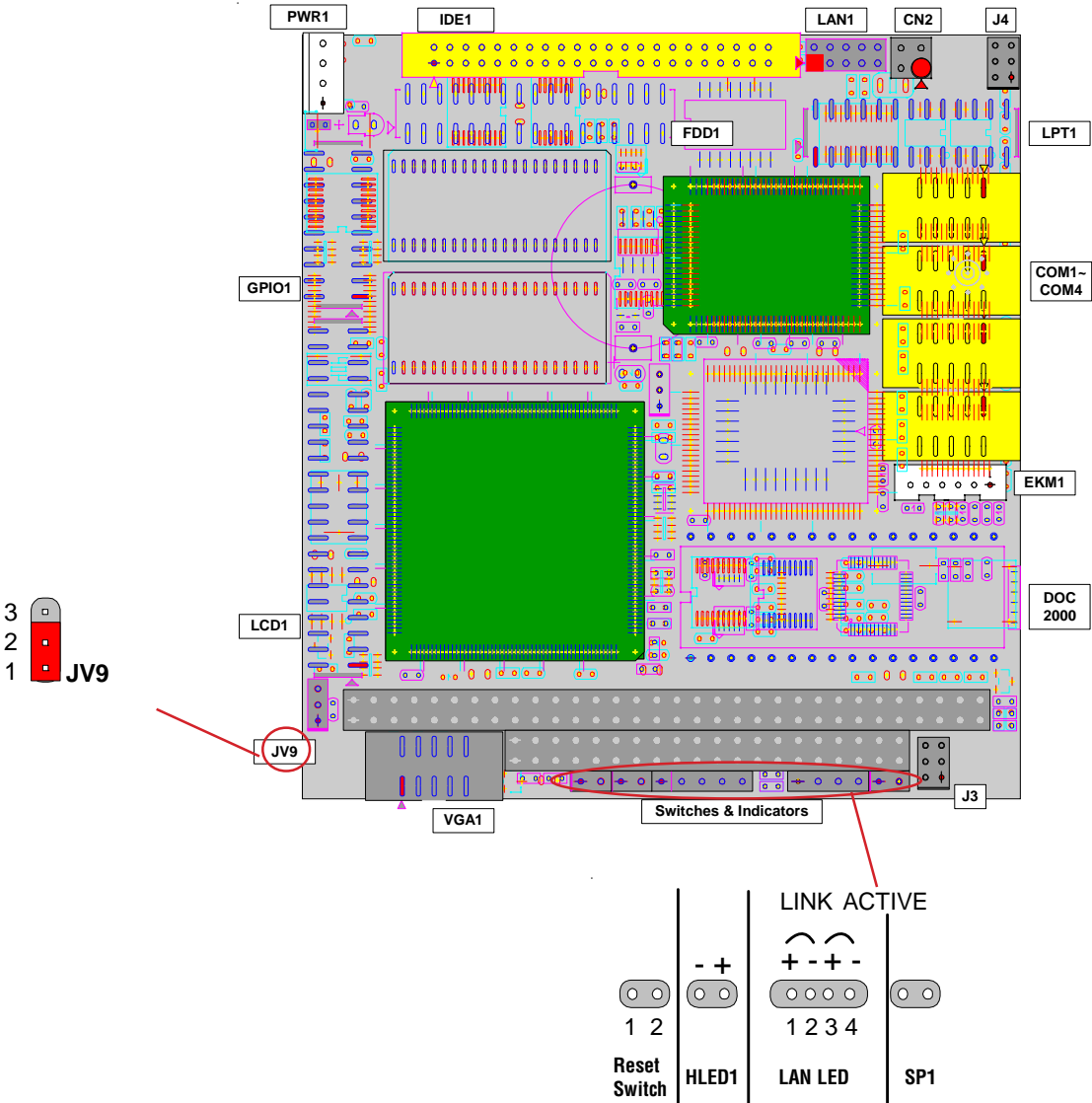
# LCD Power Selection

Jumper : JV9

Type : onboard 3-pin header

The voltage of LCD panel could be selected by JV9 in 5V or 3.3V .

Mode	JV9
5V	1-2
3.3V	2-3
default setting +5V	



# Switches and Indicators

Connector	Description
RES1	Reset function
HLED1	Hard Disk LED
LED1	LAN LED
SP1	Speaker

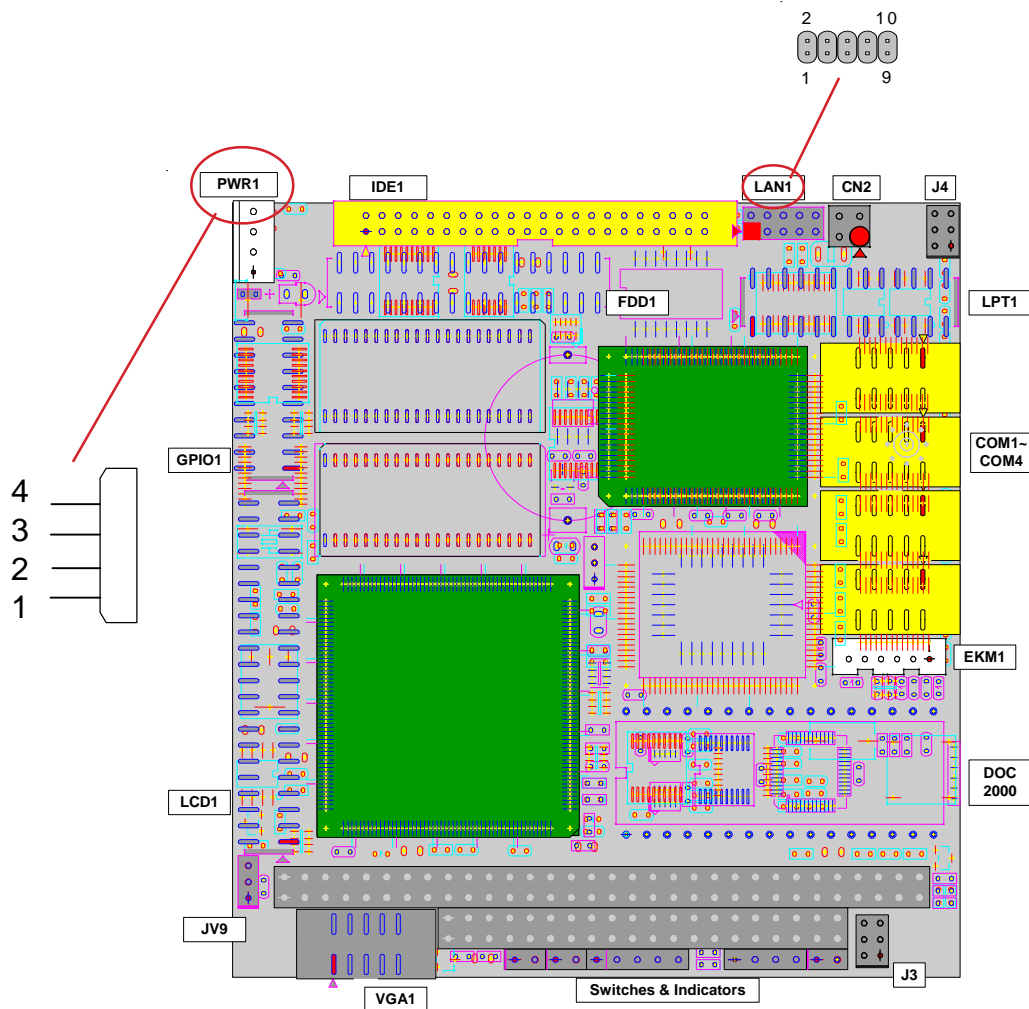
## Power Connector

### Power Connector : PWR1

Connector : PWR1

Type : PWR1: onboard small 4P connector

Pin	Description	Pin	Description
1	+5V	2	GND
3	GND	4	+12V



## Fast Ethernet Connectors

Connector : LAN1

Type : Onboard 10-pin header

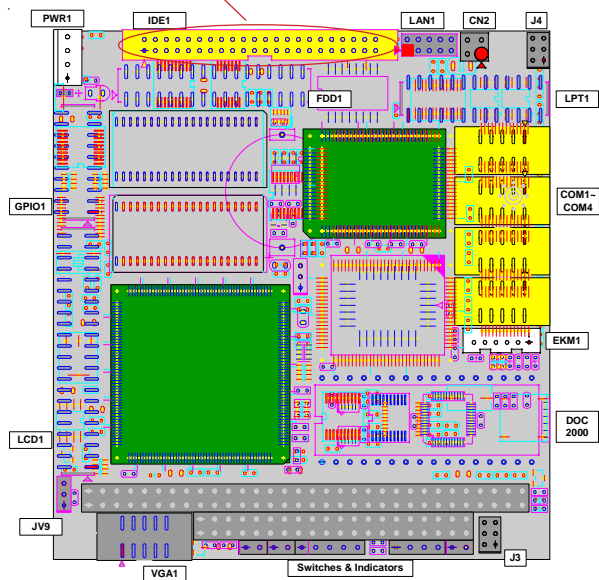
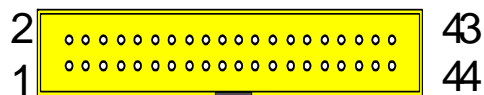
Pin	Description	Pin	Description
1	TX+	2	TX-
3	RX+	4	NC
5	NC	6	RX-
7	NC	8	NC
9	GND	10	NC

## Enhanced IDE Connector

Connector : **IDE1**

Type : onboard 44-pin box headers

Pin	Description	Pin	Description
1	#RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC/(Vcc)
21	REQ	22	GND
23	#IOW	24	GND
25	#IOR	26	GND
27	#IORDY	28	IDESEL
29	#DACK	30	GND
31	IRQ	32	NC
33	ADDR1	34	CBLID
35	ADDR0	36	ADDR2
37	#CS0	38	#CS1(#HD SELET1)
39	#ACT	40	GND
41	VCC	42	VCC
43	GND	44	NC

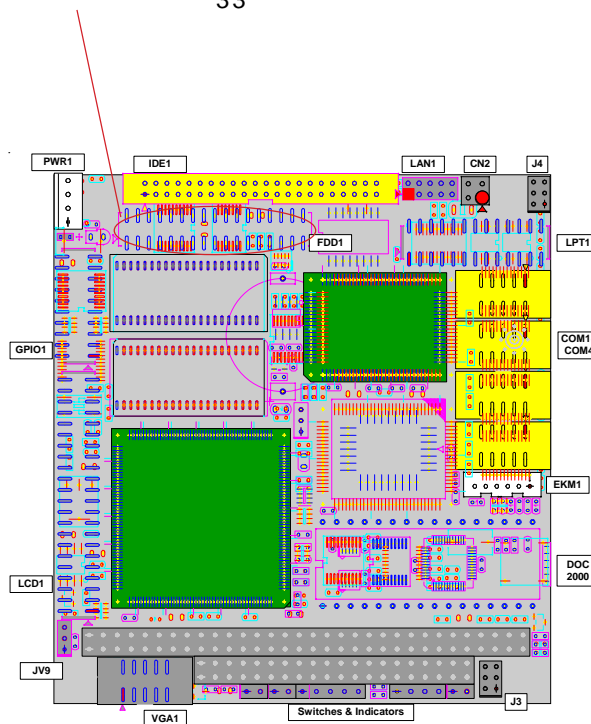
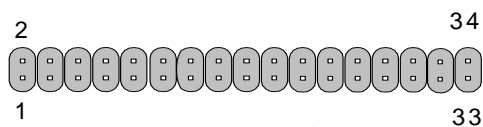


# Floppy Disk Drive Connector

Connector : **FDD1**

Type : onboard 34-pin header

Pin	Description	Pin	Description
1	GND	2	DRIVE DENSITY SELECT 0
3	GND	4	DRIVE DENSITY SELECT 1
5	GND	6	NC
7	GND	8	#INDEX
9	GND	10	#MOTOR ENABLE A
11	GND	12	#DRIVER SELECT B
13	GND	14	#DRIVER SELECT A
15	GND	16	#MOTOR ENABLE B
17	GND	18	#DIRECTION
19	GND	20	#STEP
21	GND	22	#WRITE DATA
23	GND	24	#WRITE GATE
25	GND	26	#TRACK 0
27	GND	28	#WRITE PROTECT
29	GND	30	#READ DATA
31	GND	32	#HEAD SELECT
33	GND	34	#DISK CHANGE

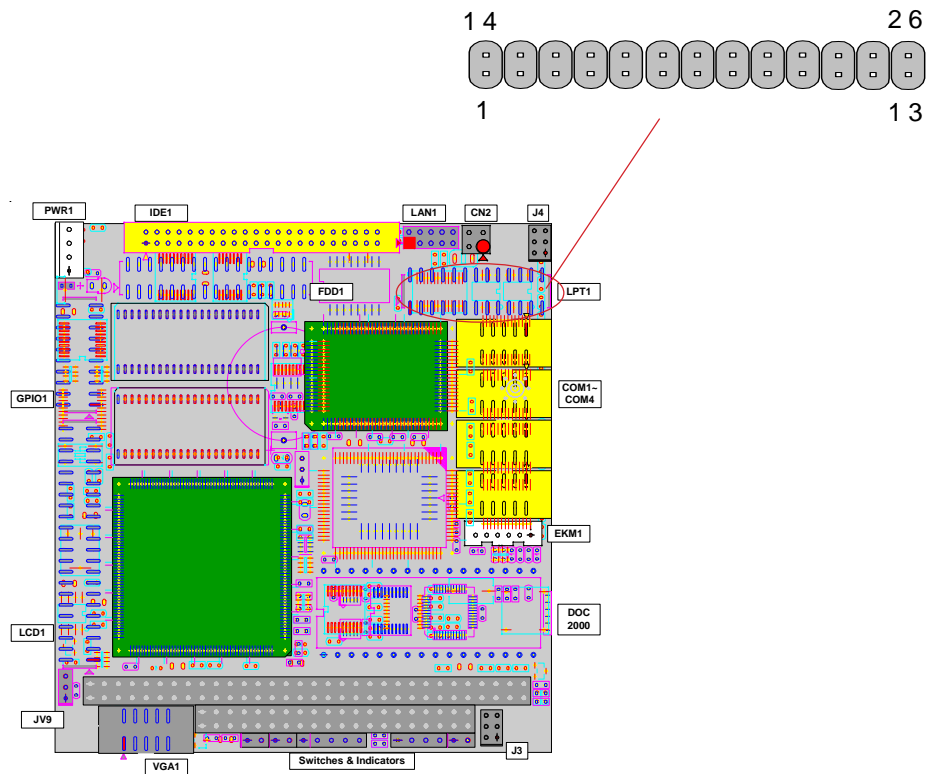


# Parallel Port

Connector : **LPT1**

Type : onboard 26-pin header

Pin	Description	Pin	Description
1	#STROBE	14	#AUTO FEED
2	DATA0	15	#ERROR
3	DATA1	16	#INITIALIZE
4	DATA2	17	#SELECT INPUT
5	DATA3	18	GND
6	DATA4	19	GND
7	DATA5	20	GND
8	DATA6	21	GND
9	DATA7	22	GND
10	#ACKNOWLEDGE	23	GND
11	BUSY	24	GND
12	PAPER EMPTY	25	GND
13	SELECT	26	GND



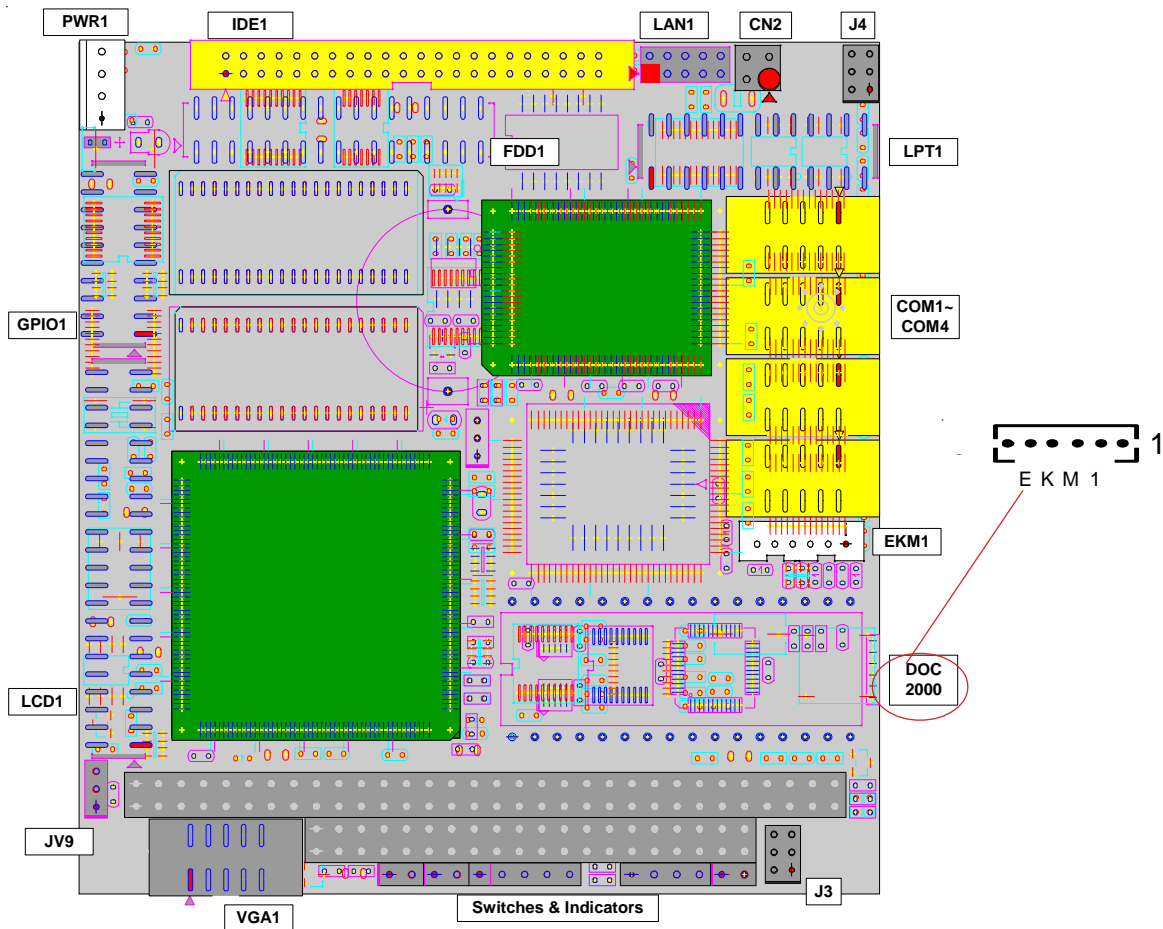
# PS/2 Keyboard & Mouse

Connector: **EKM1**

Type: Onboard 6-pin box header

Pin	Description	Pin	Description
1	KB-DATA	2	GND
3	MS-DATA	4	KB-CLK
5	+5V	6	MS-CLK

Note: EKM1 supports PS/2 keyboard directly, and PS/2 mouse supported with the additional PS2 1-to-2 cable in the standard packing.



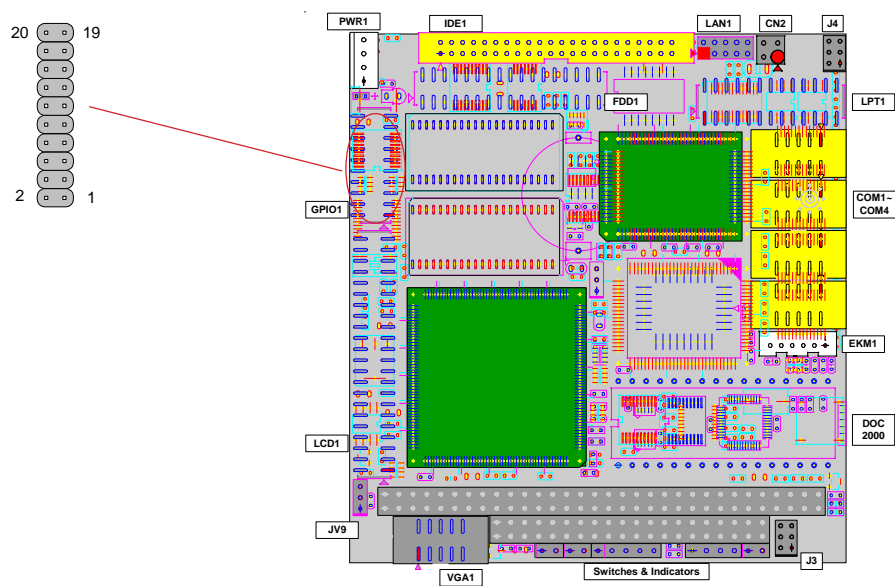


## 16-bit General Purpose I/O

Connector : **GPIO1**

Type : Onboard 20-pin header

Pin	Description	Pin	Description
1	GROUND	2	VCC
3	GP0	4	GP8
5	GP1	6	GP9
7	GP2	8	GP10
9	GP3	10	GP11
11	GP4	12	GP12
13	GP5	14	GP13
15	GP6	16	GP14
17	GP7	18	GP15
19	VCC	20	GROUND

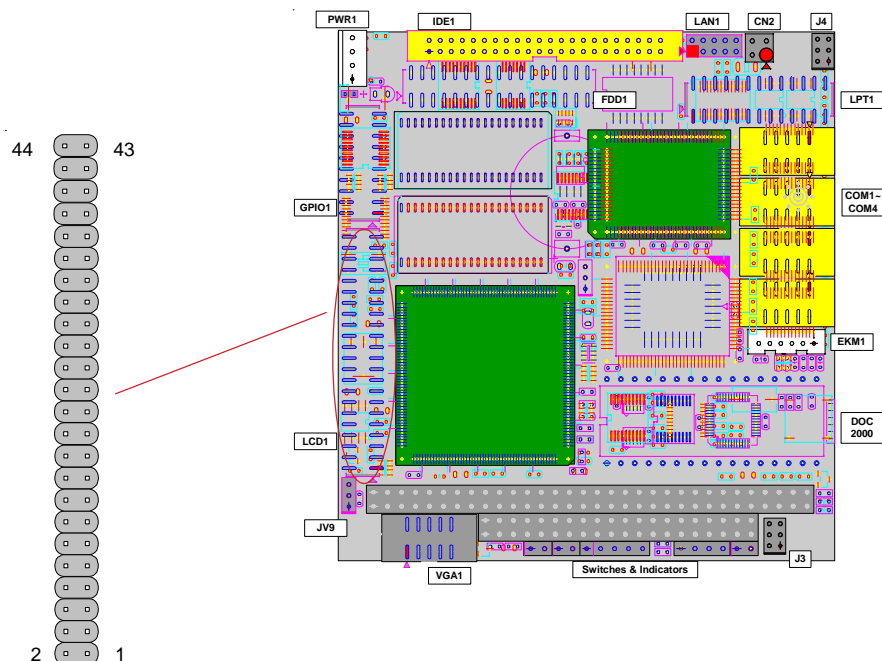


# LCD Connector

Connector : **LCD1**

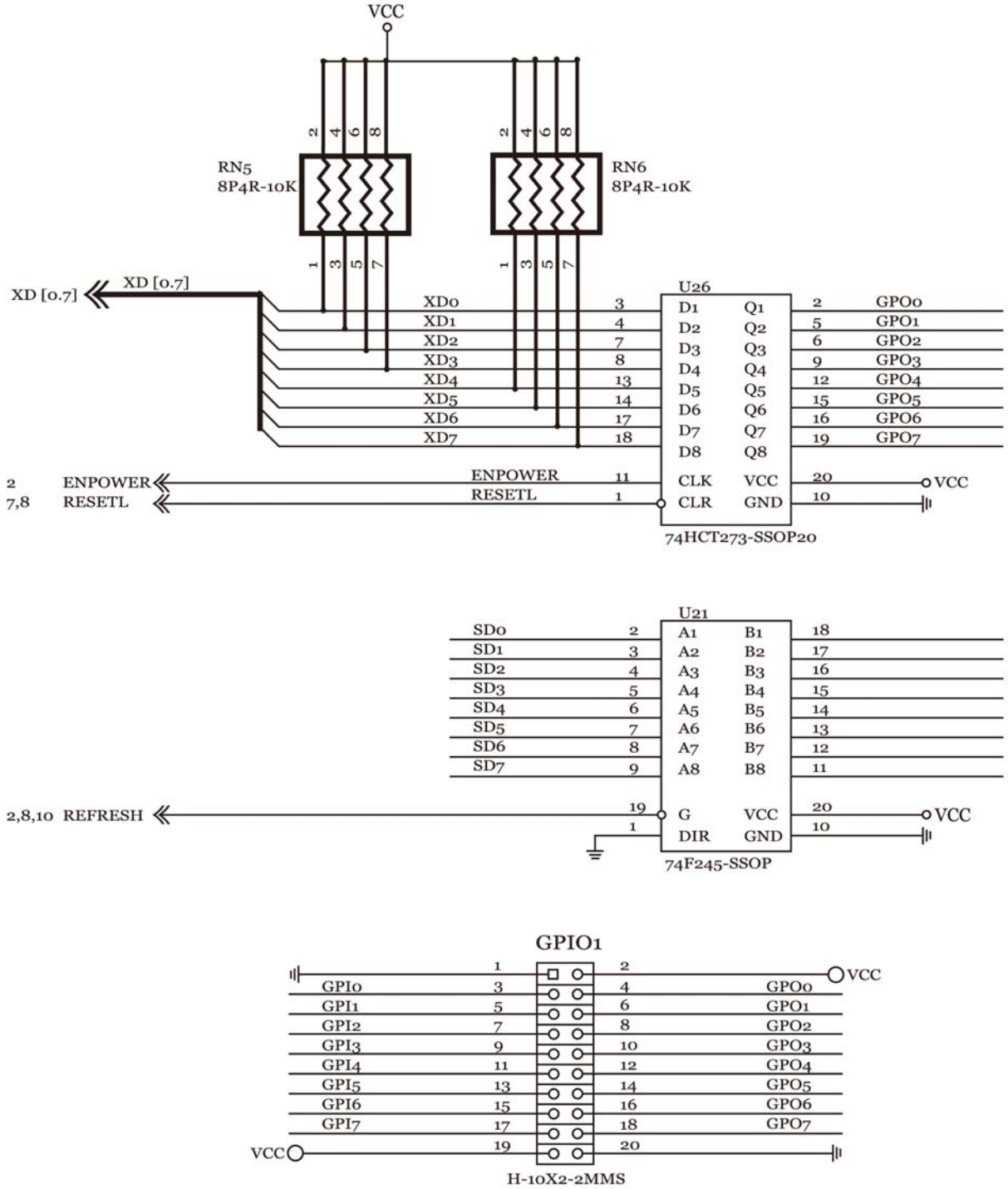
Type : onboard 44-pin header

Pin	Description	Pin	Description
1	Reserved for 12V	2	Reserved for 12V
3	GND	4	GND
5	LCDVDD	6	FPVDDEN
7	VBIAEN	8	GND
9	B0	10	B1
11	B2	12	B3
13	B4	14	B5
15	B6	16	B7
17	G0	18	G1
19	G2	20	G3
21	G4	22	G5
23	G6	24	G7
25	R0	26	R1
27	R2	28	R3
29	R4	30	R5
31	R6	32	R7
33	GND	34	GND
35	FPCLK	36	FP
37	DE	38	LP
39	GND	40	FPEN
41	GND	42	NC
43	VCC	44	VCC



# GPIO for ALi 6117

Em104-i313 use M6117 to supports GPIO (8 expandable GPOs & 8 expandable GPIs). During normal condition, pins XD[7:0] are data bus to peripheral devices. But during cold reset, XD[7:0] is an input pin and latched by internal register - index 68h; the pin ENPOWER is also active at this time to latch XD[7:0] at external 74LS373. Because there is no default value in index 68hand as to XD[7:0] without any pulling resistor. Designer has to connect externally pull-up or pull down resistors to XD[7:0] to initialize index 68h. The index 68h : D[7-0] are both readable and writable. If BIOS wants to change the external 74LS373 latch value. It should first set index 68h:D[7:0] a new value, then write any value to index 73h, that will generate an ENPOWER signal to update 74LS373 latch value. The index value in 68h will appear at XD[7:0] bus and ENPOWER will update the XD value to 74LS373. [Index 3Eh: The low byte GPI value. Default 00h Read only.]



## 1. Generate GPOs method

- (1) Use external 74373 input connect to SD bus. The latch enable pin connects to ENPOWER.
- (2) Set index 68h to desired GPO value.
- (3) Write index 73h.
- (4) Then data stored in index 68h will be sent to SD[7:0] and XD[7:0]. and ENPOWER will be active.
- (5) The value will be latched by 74373.

## 2. Generate GPIs method

- (1) Add external 74245, the input connects to GPIs, the output connects to ISA SD bus. The OE control connects to ISA REFRESHJ.
- (2) When REFRESHJ is active, the SD will become input and M6117 will use MEMRJ rising edge to latch the SD value.
- (3) Every 15us, the GPIs value will be updated.
- (4) It can read the GPIvalue through index 3Eh which store SD[7:0] value.

## \*Configuration Registers

### 1. Register Bit Definition:

The details of M6117 configuration registers are described as follows :

PORT 22H      default 00H

Bit            Description

7~0            Index of Configuration register

PORT 23H      default 00H

Bit            Description

7~0            Data of Configuration register if unlock register unlocked.

INDEX 3EH     default 00H

Bit            Description

7~0            GPI signals. When REFRESHJ is active, the SD will become input and M6117D will use MEMRJ rising edge to latch the SD[7:0] to Bit 7~0. Read only

INDEX 68H     default 00H

Bit            Description

7~0            Power ON latched Power Control Initial status from XXD[7-0] D[7-0] : PWR[7-0] control pin status

INDEX 73H     default 00H

Bit            Description

7~0            Power Control status output command Write to this port will generate enpower pulse to update power control status.

## 2. How to read/write to configuration registers

The read/write configuration register is the first index to be processed. On board I/O port 22h is the index register and I/O port 23h is the data register. To read a configuration register, write the index value to I/O port 22h in advance, then read data from I/O port 23h. To write a configuration register, write the index value to I/O port 22h, then write data to I/O port 23h. For instance, if we want to read the data of configuration register which index is 10h, the steps are :

- 1) Write 10h (index) to I/O port 22h
- 2) Read data from I/O port 23h

If we want to write data 55h to configuration register which index is 12h, then the steps are :

- 1) Write 12h (index) to I/O port 22h
- 2) Write data 55h to I/O port 23h

\*The steps of locking/unlocking the configuration registers :

```
OUT 22h, 13h (Enable 13h)
OUT 23h, C5h (Unlock)
OUT 22h, XXh (XX = Configuration Index)
OUT 23h, YYh (YY = Configuration data)
OUT 22h, XXh
OUT 23h, YYh (Configuration can be written repeatedly)
:
OUT 22h, 13h (Enable 13h)
OUT 23h, 00h (Lock)
```

### **\*Programming Guide - Basic Procedure and Macro Definition**

a) Delay

```
IO_Delay MACRO
    jcxz $+2
    jcxz $+2
ENDM
```

b) Unlock chipset configure registers;@

```
Open_Chip MACRO
    mov al, 013h
    out 022h, al
    IO_Delay
    mov al, 0c5h
    out 023h, al
    IO_Delay
ENDM
```

c) Lock chipset configure registers;@

```
Close_Chip MACRO
mov al, 013h
out 022h, al
IO_Delay
mov al, 000h
out 023h, al
IO_Delay
ENDM
```

d) Write data to configure register

```
; INPUT : AH - INDEX#
; INPUT : AL - Data
; ACTION : Write the value of AL into the value of AH INDEX
; Interrupt controller and Stack are available
Write_To_Chip PROCEDURE
cli
push ax
Open_Chip
pop ax
out 022h, al
IO_Delay
xchg ah, al
out 023h, al
IO_Delay
xchg ah, al
push ax
Close_Chip
pop ax
sti
ret
ENDP
```

e) Read data from configure register

```
; INPUT : AL - INDEX#
; OUTPUT : AL - Data
; ACTION : Read data from the value of AL INDEX
; Interrupt controller and Stack are available
Read_From_Chip PROC
cli
push ax
Open_Chip
pop ax
out 022h, al
IO_Delay
in al, 023h
IO_Delay
push ax
Close_Chip
pop ax
sti
ret
ENDP
```

## Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

