

# AX88178 RTL8251CN RGMII GigaPHY Reference Schematic Index

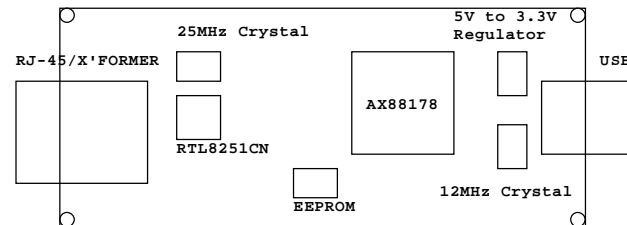
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## Note:

1.Please refer to AX88178 USB-to-Gigabit Ethernet Application Design Note for more AX88178 PCB layout design notes.

2.Please contact ASIX Support (support@asix.com.tw) to get AX88178 EEPROM User Guide for more details about AX88178 EEPROM setting.

3.Please deliver us your AX88178 schematic and your AX88178 EEPROM data file for further review.

4.Please contact Realtek's support guys to get the latest RTL8251CN reference schematic and Layout Guide and further suggestions before making your PCB board.

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**C4, C6 : Must be 12pF** \*Note-2-1

The diagram shows a 12MHz crystal oscillator circuit. It features a 12MHz crystal (Y1) with pins 1, 2, 3, and 4. Pin 1 is connected to the input XIN12M through a 1M resistor (R11). Pin 2 is connected to ground. Pin 4 is connected to ground through a 12pF capacitor (C6). Pin 3 is connected to the output XOUT12M through a 6R resistor (R10) and a 12pF capacitor (C4). The crystal is labeled '12M CRYSTAL MSK NON-53 (SMD)'.

**\*Note2-2**

MAC\_VDD33 L6 TI160808U110 MAC\_AVDD33

C64 0.1uF

C57 4.7uF/10V

**\*Note2:3**

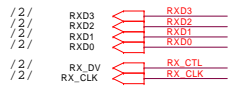
MAC\_VDD33

MAC\_AVDD33

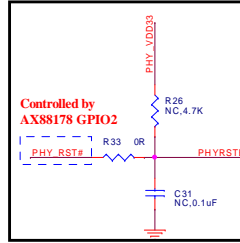
MAC\_VDD25

USB High Speed & TX Transfer LED

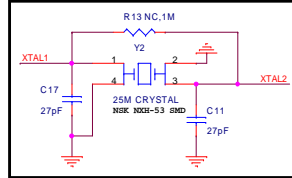
USB Full Speed LED



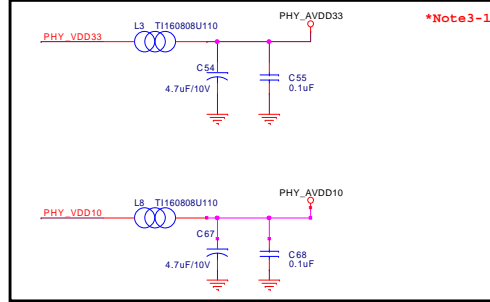
#### PHY Reset Circuit



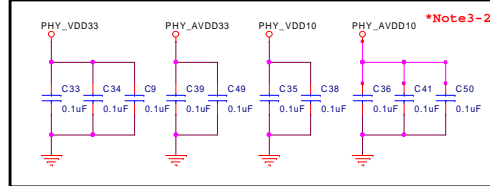
#### 25MHz +- 50ppm Crystal for Ethernet interface



#### PHY Analog power 3.3V/1.0V



#### PHY Power 3.3V and 1.0V By Pass



**\*Note3-1**  
The C54, C55, C67 and C68 should be close to L3 and L8 as possible for reduce power noise.

**\*Note3-2**  
Those by-pass capacitors 0.1uF as close to every power input pin as possible.

**\*Note3-3**  
The R5 and C3 are reserved for EMI, please close to PHY as possible.

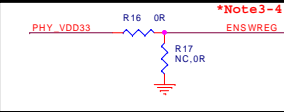
**\*Note3-4**  
1.Enable On-chip Switch Regulator: (Default)  
Connect ENSWREG to PHY\_VDD33 (i.e. Mount R16 and unmount R17)  
2.Disable On-chip Switch Regulator:  
Connect ENSWREG to GND (i.e. Mount R17 and unmount R16)

**\*Note3-5**  
The 3.3V power input VDDREG trace should be wider than 100mils (Keep floating while disabling on-chip switching regulator)  
The capacitors C61 and C58 as close to the VDDREG pin for good power efficiency.  
C61 must be a ceramic (X5R) capacitor  
C58 is recommended to be ceramic capacitor (Unmount L4, C61, C58 while disabling on-chip regulator)

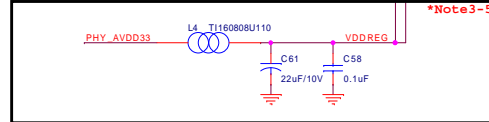
**\*Note3-6**  
L1 should be kept the trace wider 200 mils of REG\_OUT pin.  
The C18 and C19 capacitors as close to L1 if possible.  
The 1.05V power output REG\_OUT trace should be wider than 60 mils.  
(Keep floating while disabling on-chip switching regulator)

**\*Note3-7**  
The Ethernet LED circuit is a reference circuit while the PHY Address was set to 01h. (i.e. LED0\_AD0 was pulled high and LED1\_AD1 was pulled low)  
Please refer to Realtek's GigaPHY reference circuit for more details if necessary.  
The C26 and C27 are reserved for EMI please close to LED0\_AD0 and LED1\_AD1 pins.

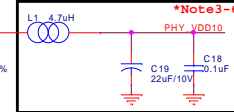
#### On-Chip Switching Regulator Circuit



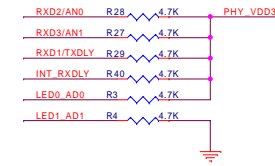
#### PHY Regulator Power Input



#### On-Chip Switching Regulator Circuit

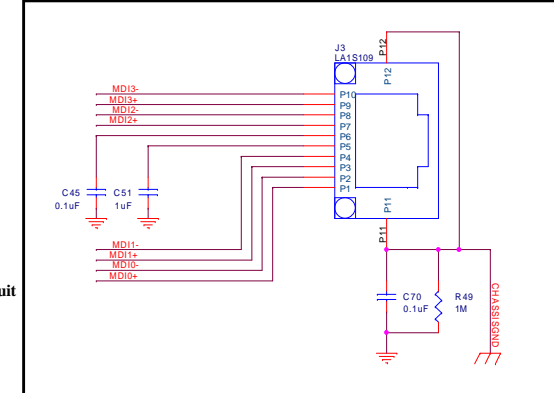


#### Hardware Configuration

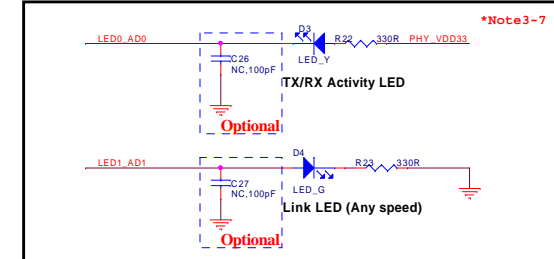


AN0 Pull High	AN1 Pull High	Enable all Nway capabilities
TXDLK Pull High	RXDLK Pull High	Delay TXCLK/RXCLK 2ns
AD1 Pull Low	AD0 Pull High	PHY Address=01

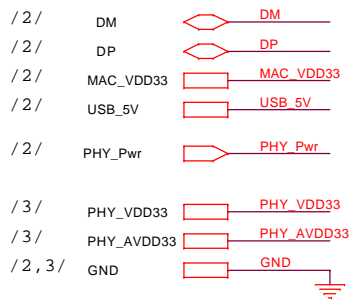
#### RJ-45 Connector



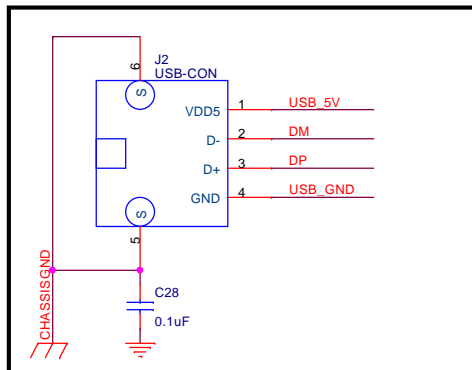
#### Ethernet LED Circuit



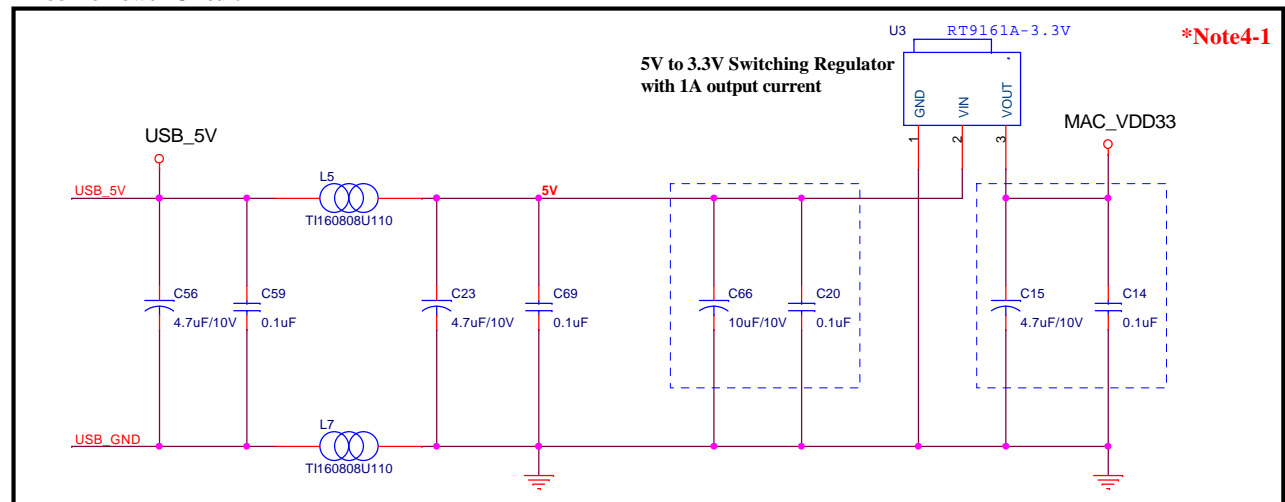
**\*Note:**  
1.The RTL8251CN GigaPHY reference circuits are for customers' reference purpose.  
Please contact Realtek's support guys to get the latest RTL8251CN reference schematic and Layout Guide before making your PCB board.  
2.Please exactly follow up Realtek's RTL8251CN Layout Guide to layout RTL8251CN 3.3V to 1.05V On-chip Switching Regulator and Ethernet magnetic circuits; otherwise, the RTL8251CN might not work normally. Please refer to Realtek's layout guide for more details.



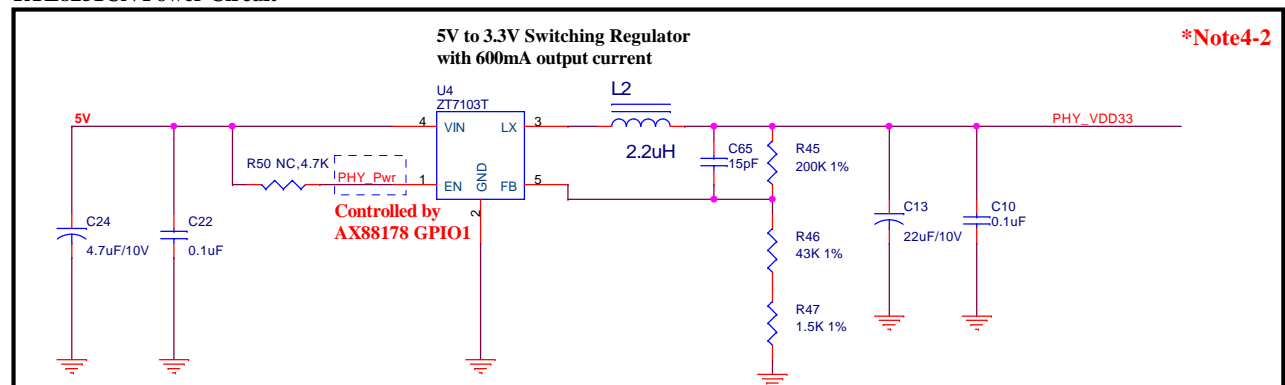
### USB Connector



### AX88178 Power Circuit



### RTL8251CN Power Circuit



#### \*Note4-1:

The USB\_5V should be kept the trace wider than 200mil.  
 The C56, C59, C23 and C69 as close to L5 for good power efficiency.  
 The 5V power trace as short as possible with Regulator input pin and kept the trace over than 100mils as possible.  
 The C66, C20, C14 and C15 as close to Regulator(U5) Vin/Out pin for good power efficiency and please kept the trace over than 50mils as possible.

#### \*Note4-2:

The C22, C24 as close to Regulator(U4) Vin for good power regulation and kept the 5V trace wider than 100 mils.  
 The L2, C13 and C65 as close to U4's LX pin for good power switching.  
 The R50 is used to enable Regulator(U4) if without controlled by AX88178 GPIO1.

#### \*Note:

The RTL8251CN GigaPHY power circuits and power consumption information are for customers' reference purpose.  
 Please contact Realtek's support guys to get more detailed information of RTL8251CN GigaPHY related power circuits and power consumption information.

### ASIX ELECTRONIC CORPORATION

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Power Circuit		
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Revision	Date	Comment
V1.00	2010/05/18	Initial release.

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A

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