



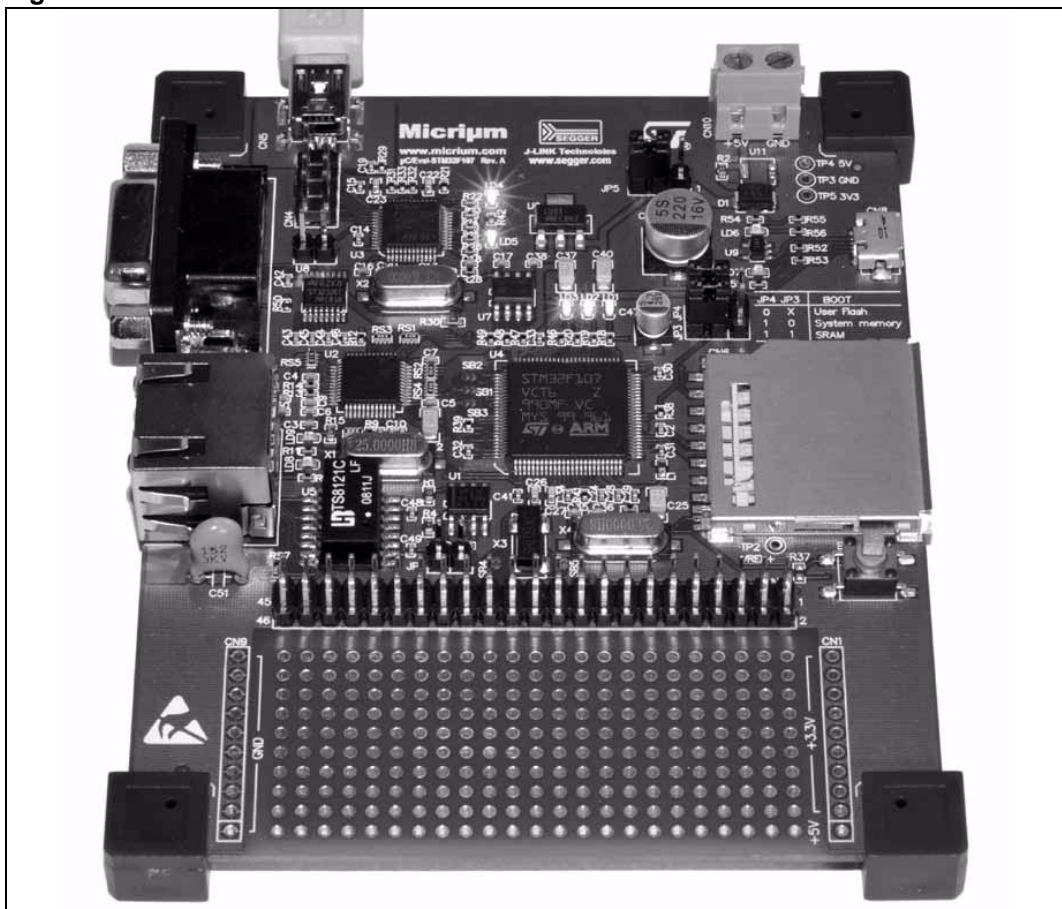
Introduction

The STM32-MICRIUM evaluation board is a complete development platform for STMicroelectronics' ARM Cortex™-M3 core-based microcontroller with full-speed USB-OTG, Ethernet MAC, two channels of CAN2.0A/B compliant interface, two I2S channels, two I2C channels, five USARTs with smartcard support, three SPIs, 64 KB internal SRAM and 256 KB Flash, JTAG and SWD debugging support.

The full range of hardware features on the board help you to evaluate all types of peripherals (USB-OTG FS, Ethernet, CAN, SD/MMC card, USART, temperature sensor, etc.) and develop your own applications. Extension pin headers and wire wrapping area make it possible to easily add your own components/interface on the board for a specific application.

Figure 1 shows a picture of the STM32-MICRIUM evaluation board.

Figure 1. STM32-MICRIUM evaluation board



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1 Overview

1.1 Features

- 72 MHz STM32F107 Cortex™-M3 based microcontroller with:
 - 256 Kbytes of Flash
 - 64 Kbytes of SRAM
- 10/100 Ethernet connector
- USB-OTG full-speed connector
- RS-232C connector
- CAN interface connected to pin headers
- SD/MMC socket
- STLM75 temperature sensor
- 3 user LEDs (red, yellow and green)
- Reset button
- Free I/O ports connector (pin headers)
- Prototyping area
- On-board J-Link SWD for debugging
- Powered by J-Link USB connector or 5V external power supply on screw terminal
- RoHS compliant

1.2 Software example

- Example #1 described in the μ C/OS-III book is preloaded in the board's Flash memory showing the LD1, DL2 & DL3 blinking. For more information on this demonstration example, please refer to Chapter 3 of the μ C/OS-III book .

1.3 Order code

- To order the μ C/OS-III book and the STM32-MICRIUM evaluation board, use the order code STM32CMICOS-EVAL.

1.4 Hardware layout

The STM32-MICRIUM evaluation board is designed around the STM32F107VCT in a 100-pin TQFP package.

Figure 2 illustrates the connection between the STM32F107VCT and peripherals (USB-OTG, Ethernet, SD/MMC, RS-232, CAN temperature sensor).

Figure 3 helps you to locate these features on the actual evaluation board.

Figure 2. STM32-MICRIUM evaluation board hardware block diagram

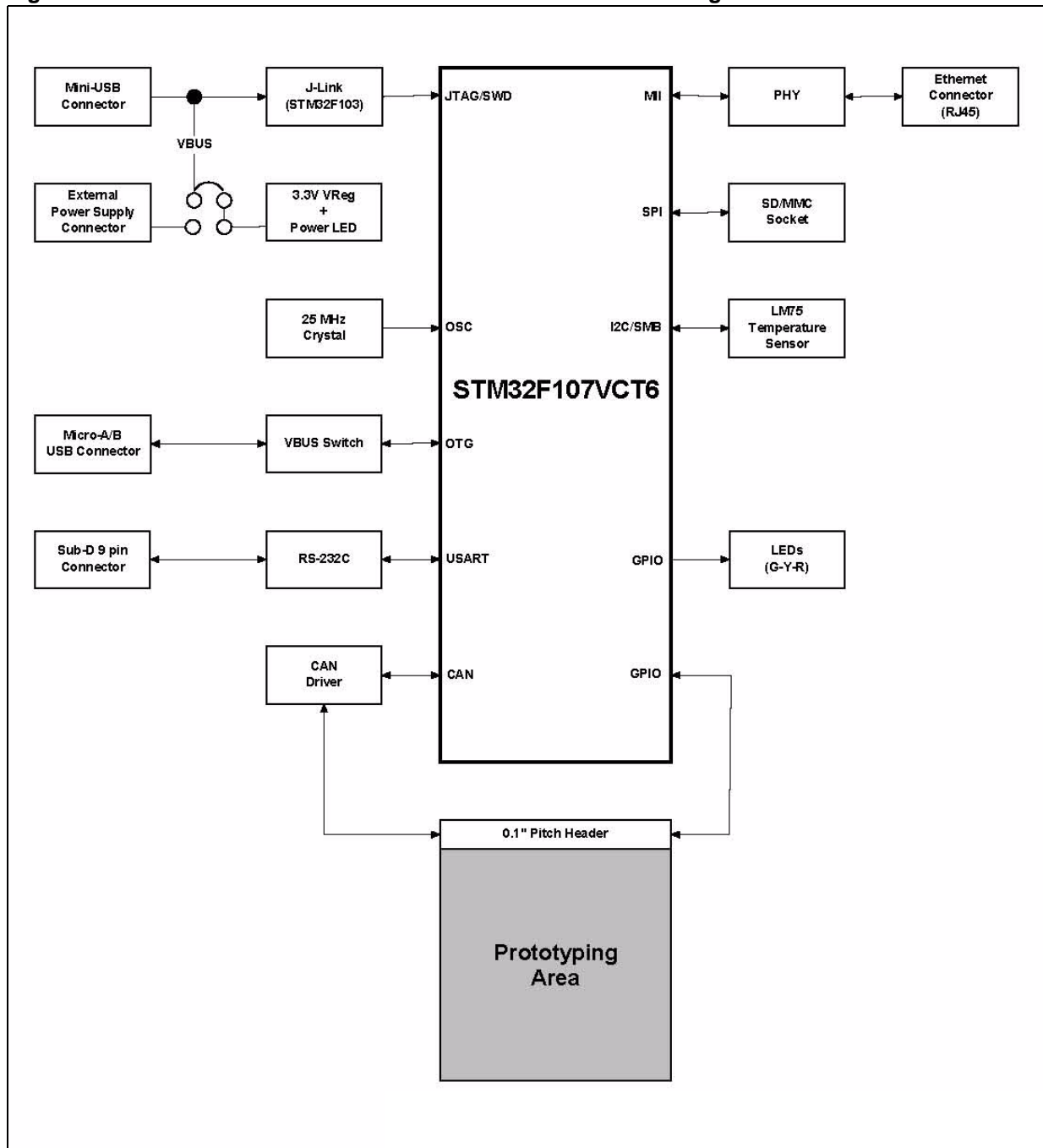
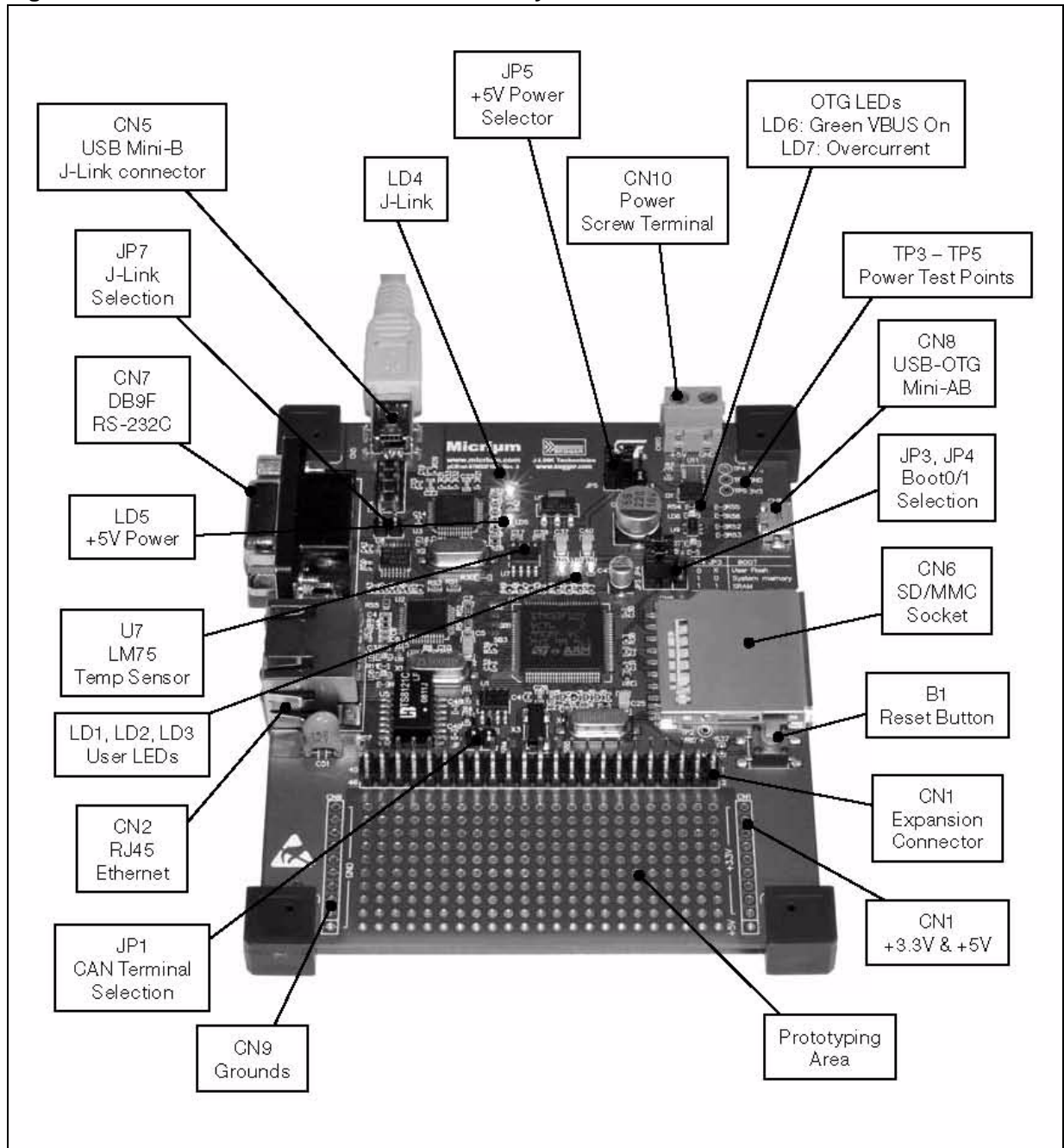


Figure 3. STM32-MICRIUM evaluation board layout



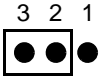
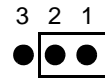
2 Configuration

2.1 Power supply

The STM32-MICRIUM evaluation board is powered by a 5V DC power supply. It is configured via JP5 to use the following power supply sources:

- 5V DC power adapter connected to CN10, the power screw terminal on the board.
- 5V VBUS power (500 mA limitation from CN5), the mini-B USB of embedded J-Link.

Table 1. STM32-MICRIUM evaluation board power supply jumper

| Jumper | Description | Switch configuration |
|--------|---|---|
| JP5 | The board is powered by VBUS of the embedded J-Link input CN5 when JP5 is set as shown on the right: (Default setting). |  |
| | The board is powered by 5V DC input CN10 when JP5 is set as shown on the right: |  |

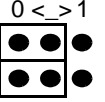
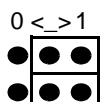
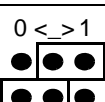
- Note:*
- 1 The board cannot be powered by VBUS on CN8 when USB-OTG is used as a USB device.
 - 2 The LED LD5 is lit when the STM32CMICOS-EVAL board is powered by the 5V correctly.
 - 3 Three test points TP4 (5V), TP3 (GND), and TP2 (3.3V) are available on the top right of the board to check power supply.

2.2 Boot options

The boot option is configured by setting switch JP3 (BOOT1) and JP4 (BOOT0). The STM32-MICRIUM evaluation board can boot from:

- Embedded user Flash.
- System memory.
- Embedded SRAM for debugging.

Table 2. STM32-MICRIUM evaluation board boot options jumpers

| Jumper | Description | Configuration |
|-----------|---|---|
| JP3 & JP4 | STM32-MICRIUM evaluation board boots from user Flash when JP4 is set as shown to the right. JP3 is not relevant in this configuration. (Default setting). |  |
| | STM32-MICRIUM evaluation board boots from embedded SRAM when JP3 and JP4 are set as shown to the right. |  |
| | STM32-MICRIUM evaluation board boots from system memory when JP3 and JP4 are set as shown to the right. |  |

2.3 Reset sources

The reset signal of the STM32-MICRIUM evaluation board is active low. The reset source may come from:

- Reset button B1 in bottom right of the board.
- Embedded J-Link.
- Extension connector CN3 pin 45 (pin header).

2.4 CAN (controller area network)

The STM32-MICRIUM evaluation board supports one channel of CAN2.0A/B-compliant CAN bus communication based on a 3.3V CAN transceiver. The CAN transceiver (U1) is configured for high-speed mode. The CAN bus is available on extension connector CN3 pin 28 (CAN_L) and pin 30 (CAN_H). The CAN interface is connected to CAN1 remapped (PD0, PD1) of the STM32F107VCT. The CAN terminal (120 ohm), available on the board, can be connected on the bus by the jumper JP1.

Table 3. STM32-MICRIUM evaluation board CAN related jumper

| Jumper | Description |
|--------|---|
| JP1 | CAN terminal resistor is enabled when JP1 is fitted. Default setting: Not fitted. |

2.5 RS-232C

The RS-232 communication with hardware flow control is supported by CN7 (a 9-pin D-type RS-232 connector) and the transceiver U8, which is connected to USART2 remapped on PD3 to PD6 of STM32F107VCT on STM32-MICRIUM evaluation board.

2.6 SD/MMC card

An SD/MMC card (Secure Digital/Multi-Media Card) connector (CN6) is available on the board, but the card is not provided by default with the product. The SD/MMC card is connected to SPI1 of STM32F107VCT (PA5 to PA7 without remap) with chip select on PA8 and card detection on PE6.

2.7 USB-OTG (USB ON-THE-GO)

The STM32-MICRIUM evaluation board supports USB-OTG full-speed communication via a USB Micro-AB connector (CN8) and USB power switch (U9) connected to VBUS. The evaluation board cannot be powered by this USB connector.

The green LED LD6 turns on when the power switch (U9) is ON, which corresponds to USB-host mode. In this case, the 5V VBUS is provided by the board to a USB device connected on CN8. The red LED LD7 turns on when an over-current condition is detected.

2.8 LM75 temperature sensor

A 10-bit temperature sensor, STLM75M2E (U7), is connected to the I2C1 bus of the STM32F107VCT without remap (PB5 to PB7).

2.9 Debug interface

An embedded J-Link (JTAG/SWD development tool from IAR) is available on the STM32-MICRIUM evaluation board as the default debugger/programmer interface. The mini-B USB connector CN5 is used to interface the embedded J-Link (U3) using the IAR Embedded Workbench for ARM toolchain. The SWD port of the embedded J-Link is directly connected to the STM32F107VCT debug port and optionally, through solder bridges, to all other JTAG signals, as detailed in [Table 5](#).

Other debugger/programmer hardware can be supported by the JTAG/SWD signals available on extension connector CN3. The debug tool used can be selected by the jumper JP2, as mentioned in [Table 4](#).

Table 4. STM32-MICRIUM evaluation board J-Link related jumper

| Jumper | Description |
|--------|--|
| JP2 | Open: embedded J-Link is selected as debugger/programmer tool (Default setting). |
| | Closed: external debugger/programmer tool connected on CN3 is used. |

Table 5. STM32-MICRIUM evaluation board J-TAG solder bridges

| Jumper | Description |
|--------|---|
| SB1 | Open: J-Link TDO/SWO is not connected to the TDO of the STM32F107VCT. J-Link supports SWD communication only. |
| | Closed: J-Link TDO/SWO is connected to the TDO of the STM32F107VCT. J-Link supports JTAG and SWD communication (Default setting). |
| SB2 | Open: J-Link TDI is not connected to the TDI of the STM32F107VCT. J-Link supports SWD communication only. |
| | Closed: J-Link TDI is connected to the TDI of the STM32F107VCT. J-Link supports JTAG and SWD communication (Default setting). |
| SB3 | Open: J-Link TRST is not connected to the TRST of the STM32F107VCT. J-Link supports SWD communication only. |
| | Closed: J-Link TRST is connected to the TRST of the STM32F107VCT. J-Link supports JTAG and SWD communication (Default setting). |

2.10 Ethernet

The STM32-MICRIUM evaluation board supports a 10/100 Ethernet communication interface with a 'PHY' (DP83848CVV, U2) and integrated RJ45 connector (CN2). MII interface mode is also supported.

The 25 MHz Ethernet clock is provided by crystal X1 connected to the PHY.

Note: Test point TP1 can be used to check the PHY clock frequency.

2.11 Clock sources

Two clock sources are available on the STM32-MICRIUM evaluation board for the STM32F107VCT, and also include an embedded RTC:

- X3, 32.768 KHz crystal for embedded RTC connected to PC14, PC15.
- X2, 25 MHz crystal for the STM32F107VCT microcontroller.

The PC14 and PC15 are available on extension connector CN3 depending on SB4 and SB5 configuration as mentioned in [Table 6](#).

Table 6. STM32-MICRIUM evaluation board 32 KHz crystal X3 solder bridges

| Jumper | Description |
|--------|--|
| SB4 | Open: PC14 is connected to 32 KHz crystal (Default setting). Closed: P14 is connected to extension connector CN3. |
| SB5 | Open: PC15 is connected to 32 KHz crystal (Default setting). Closed: P15 is connected to extension connector CN3. |

2.12 Connectors

2.12.1 RS-232C connector (CN7)

Figure 4. STM32CMICOS-EVAL DB-9F RS-232C CN6 with ISP support (front view)

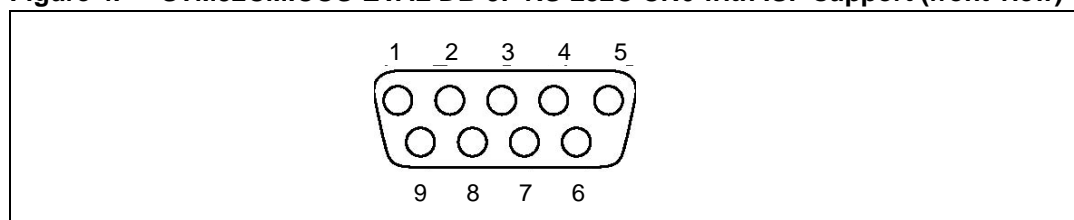


Table 7. RS-232C connector CN6 with ISP support

| Pin number | Description | Pin number | Description |
|------------|-----------------|------------|-----------------|
| 1 | NC | 6 | NC |
| 2 | RS232_TXD (PD5) | 7 | RS232_CTS (PD3) |
| 3 | RS232_RXD (PD6) | 8 | RS232_RTS (PD4) |
| 4 | NC | 9 | NC |
| 5 | GND | | |

2.12.2 Power connectors (CN1 and CN9)

The nine pins of connector CN9 on the left side of the wrapping area are connected to the board's ground.

The eight higher pins of connector CN8 are connected to the 3.3V power, and the lower pin is connected to the 5V power of the board.

2.12.3 Extension connector (CN3)

Table 8. CN3 pinout

| Description | Pin name | Pin number of CN3 | | Pin name | Description |
|---------------|----------|-------------------|----|----------|-----------------------|
| IO port | PA4 | 1 | 2 | PE3 | IO port |
| IO port | PB0 | 3 | 4 | PE4 | IO port |
| IO port | PB1 | 5 | 6 | PB3 | IO port or TDO (SB1) |
| IO port | PB9 | 7 | 8 | PB4 | IO port or TRST (SB3) |
| IO port | PB14 | 9 | 10 | PE7 | IO port |
| IO port | PB15 | 11 | 12 | PE8 | IO port |
| IO port | PC0 | 13 | 14 | PE9 | IO port |
| IO port | PC4 | 15 | 16 | PE10 | IO port |
| IO port | PC5 | 17 | 18 | PE11 | IO port |
| IO port | PC6 | 19 | 20 | P12 | IO port |
| IO port | PC7 | 21 | 22 | PE13 | IO port |
| IO port | PC8 | 23 | 24 | PE14 | IO port |
| IO port | PC9 | 25 | 26 | PE15 | IO port |
| IO port | PC10 | 27 | 28 | CAN_L | CAN bus L |
| IO port | PC11 | 29 | 30 | CAN_H | CAN bus H |
| IO port | PC12 | 31 | 32 | PD6 | IO port |
| IO port | PC13 | 33 | 34 | PD5 | IO port |
| IO port (SB4) | PC14 | 35 | 36 | PD4 | IO port |
| IO port (SB5) | PC15 | 37 | 38 | PD3 | IO port |
| IO port | PD2 | 39 | 40 | PA15 | IO port or TDI (SB2) |
| IO port | PD7 | 41 | 42 | PE2 | IO port |
| IO port | PE0 | 43 | 44 | PA13 | IO port or TMS |
| Board reset | RESET | 45 | 46 | PA14 | IO port or TCK |

Note: (SBx) means that a corresponding solder bridge must be set to enable the signal on the connector.

3 I/O assignments

Table 9. I/O assignments

| Pin No. | Pin name | STM32-MICRIUM evaluation board processor I/O assignments |
|---------|----------------|--|
| 1 | PE2 | IO PORT PE2 |
| 2 | PE3 | IO PORT PE3 |
| 3 | PE4 | IO PORT PE4 |
| 4 | PE5 | MII_INT |
| 5 | PE6 | SDCard_Detection |
| 6 | VBAT | |
| 7 | PC13-ANTI_TAMP | IO PORT PC13 |
| 8 | PC14-OSC32_IN | OSC32K or IO PORT PC14 |
| 9 | PC15-OSC32_OUT | OSC32K or IO PORT PC15 |
| 10 | VSS_5 | |
| 11 | VDD_5 | |
| 12 | OSC_IN | |
| 13 | OSC_OUT | |
| 14 | NRST | RESET |
| 15 | PC0 | IO PORT PC0 |
| 16 | PC1 | ETHER_MDC |
| 17 | PC2 | ETHER_TXD2 |
| 18 | PC3 | ETHER_TX_CLK |
| 19 | VSSA | |
| 20 | VREF | |
| 21 | VREF+ | |
| 22 | VDDA | |
| 23 | PA0-WKUP | ETHER_CRS |
| 24 | PA1 | ETHER_RX_CLK |
| 25 | PA2 | ETHER_MDIO |
| 26 | PA3 | ETHER_COL |
| 27 | VSS_4 | |
| 28 | VDD_4 | |
| 29 | PA4 | IO PORT PA4 |
| 30 | PA5 | SPI_SCK_MMC |
| 31 | PA6 | SPI_MISO_MMC |
| 32 | PA7 | SPI_MOSI_MMC |

Table 9. I/O assignments (continued)

| Pin No. | Pin name | STM32-MICRIUM evaluation board processor I/O assignments |
|---------|----------|--|
| 33 | PC4 | IO PORT PC4 |
| 34 | PC5 | IO PORT PC5 |
| 35 | PB0 | IO PORT PB0 |
| 36 | PB1 | IO PORT PB1 |
| 37 | PB2 | BOOT1 |
| 38 | PE7 | IO PORT PE7 |
| 39 | PE8 | IO PORT PE8 |
| 40 | PE9 | IO PORT PE9 |
| 41 | PE10 | IO PORT PE10 |
| 42 | PE11 | IO PORT PE11 |
| 43 | PE12 | IO PORT PE12 |
| 44 | PE13 | IO PORT PE13 |
| 45 | PE14 | IO PORT PE14 |
| 46 | PE15 | IO PORT PE15 |
| 47 | PB10 | ETHER_RX_ER |
| 48 | PB11 | ETHER_TX_EN |
| 49 | VSS_1 | |
| 50 | VDD_1 | |
| 51 | PB12 | ETHER_TXD0 |
| 52 | PB13 | ETHER_TXD1 |
| 53 | PB14 | IO PORT PB14 |
| 54 | PB15 | IO PORT PB15 |
| 55 | PD8 | ETHER_RX_DV |
| 56 | PD9 | ETHER_RXD0 |
| 57 | PD10 | ETHER_RXD1 |
| 58 | PD11 | ETHER_RXD2 |
| 59 | PD12 | ETHER_RXD3 |
| 60 | PD13 | LED0 |
| 61 | PD14 | LED1 |
| 62 | PD15 | LED2 |
| 63 | PC6 | IO PORT PC6 |
| 64 | PC7 | IO PORT PC7 |
| 65 | PC8 | IO PORT PC8 |
| 66 | PC9 | IO PORT PC9 |
| 67 | PA8 | SPI_CS_MMC |

Table 9. I/O assignments (continued)

| Pin No. | Pin name | STM32-MICRIUM evaluation board processor I/O assignments |
|---------|----------|--|
| 68 | PA9 | VBUS |
| 69 | PA10 | ID |
| 70 | PA11 | DM |
| 71 | PA12 | DP |
| 72 | PA13 | Debug TMS |
| 73 | NC | |
| 74 | VSS_2 | |
| 75 | VDD_2 | |
| 76 | PA14 | Debug TCK |
| 77 | PA15 | Debug TDI |
| 78 | PC10 | IO PORT PC10 |
| 79 | PC11 | IO PORT PC11 |
| 80 | PC12 | IO PORT PC12 |
| 81 | PD0 | CAN_RX |
| 82 | PD1 | CAN_TX |
| 83 | PD2 | IO PORT PD2 |
| 84 | PD3 | USART_CTS |
| 85 | PD4 | USART_RTS |
| 86 | PD5 | USART_TX |
| 87 | PD6 | USART_RX |
| 88 | PD7 | IO PORT PD7 |
| 89 | PB3 | Debug TDO |
| 90 | PB4 | Debug TRST |
| 91 | PB5 | INT_Temperature |
| 92 | PB6 | I2C_SCL_Temperature |
| 93 | PB7 | I2C_SDA_Temperature |
| 94 | BOOT0 | BOOT0 |
| 95 | PB8 | ETHER_TXD3 |
| 96 | PB9 | IO PORT PB9 |
| 97 | PE0 | IO PORT PE0 |
| 98 | PE1 | USB_PowerSwitchOn |
| 99 | VSS_3 | |
| 100 | VDD_3 | |

4 Schematics

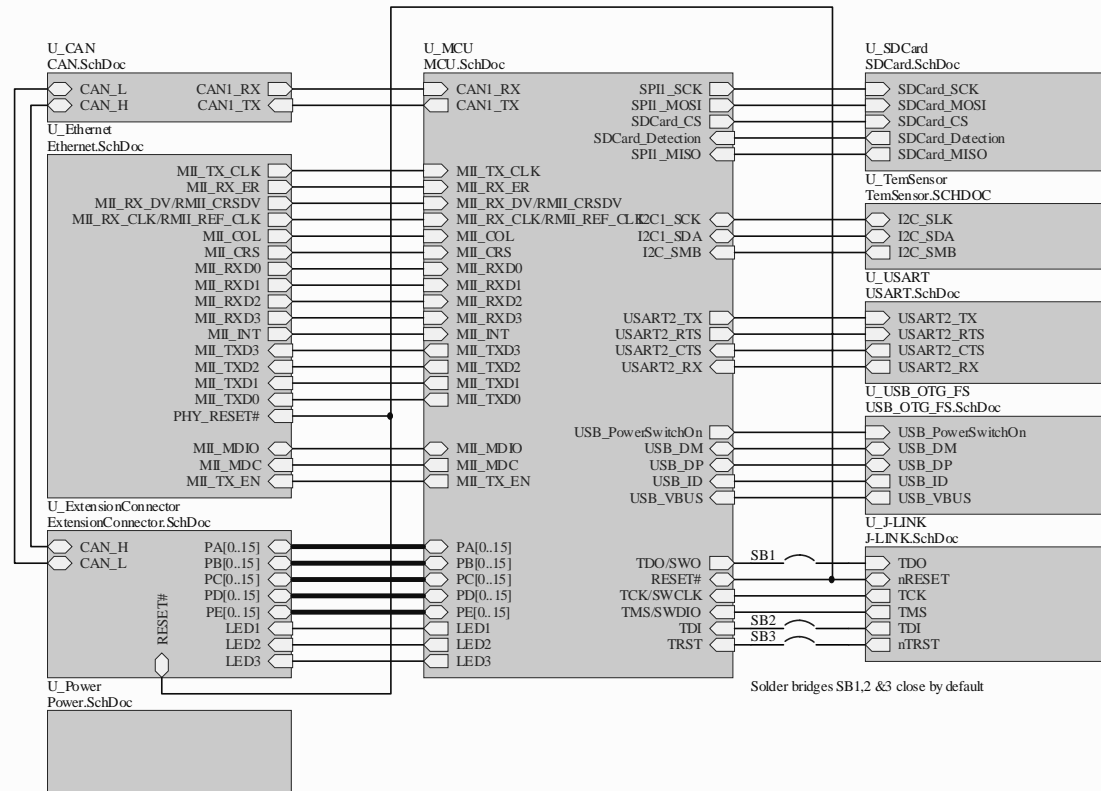
This section provides the design schematics for the STM32-MICRIUM evaluation board key features, to help you implement these features in your applications.

The following schematics are provided:

- [Figure 5: Block diagram on page 15](#)
- [Figure 6: STM32F107VCT6 on page 16](#)
- [Figure 7: CAN on page 17](#)
- [Figure 8: Ethernet on page 18](#)
- [Figure 9: Extension connector on page 19](#)
- [Figure 10: SD card on page 20](#)
- [Figure 11: Temperature sensor on page 21](#)
- [Figure 12: RS-232 on page 22](#)
- [Figure 13: USB-OTG-FS on page 23](#)
- [Figure 14: J-Link on page 24](#)
- [Figure 15: Power on page 25](#)



Figure 5. Block diagram



Solder bridges SB1,2 & SB3 close by default

Note 1: only default setting of SB1,2 & SB3 was updated to be close from Version B.1 to B.2.

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Title: uC/eval-STM32F107

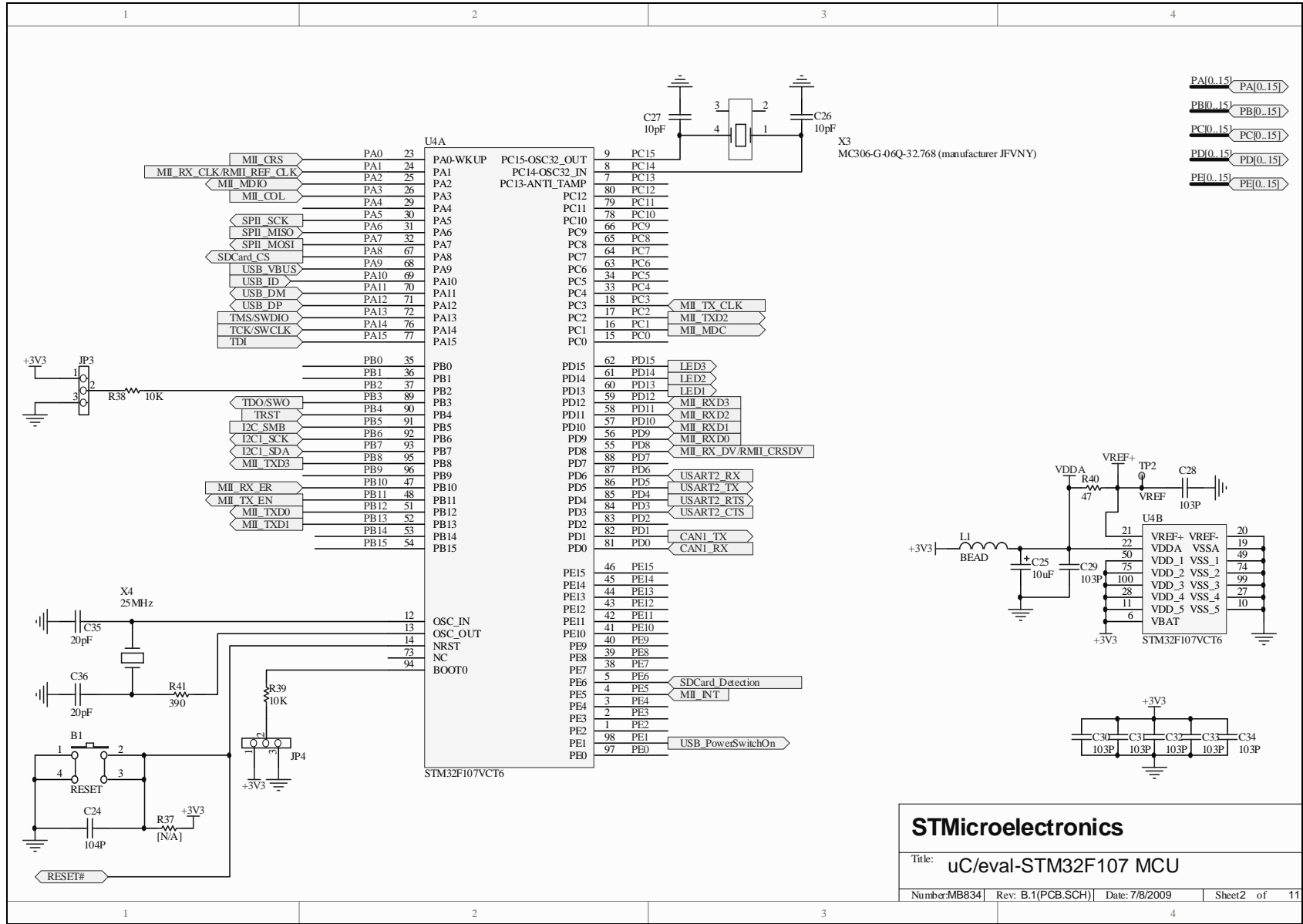
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Figure 6. STM32F107VCT6

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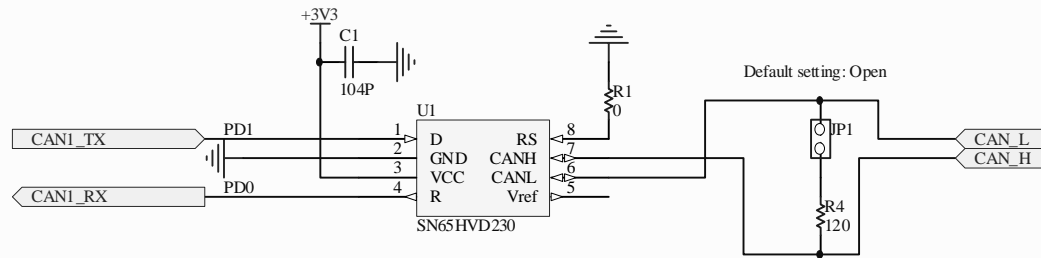
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STM32-MICRUM

Schematics



Figure 7. CAN



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Title: uC/eval-STM32F107 CAN

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Figure 8. Ethernet

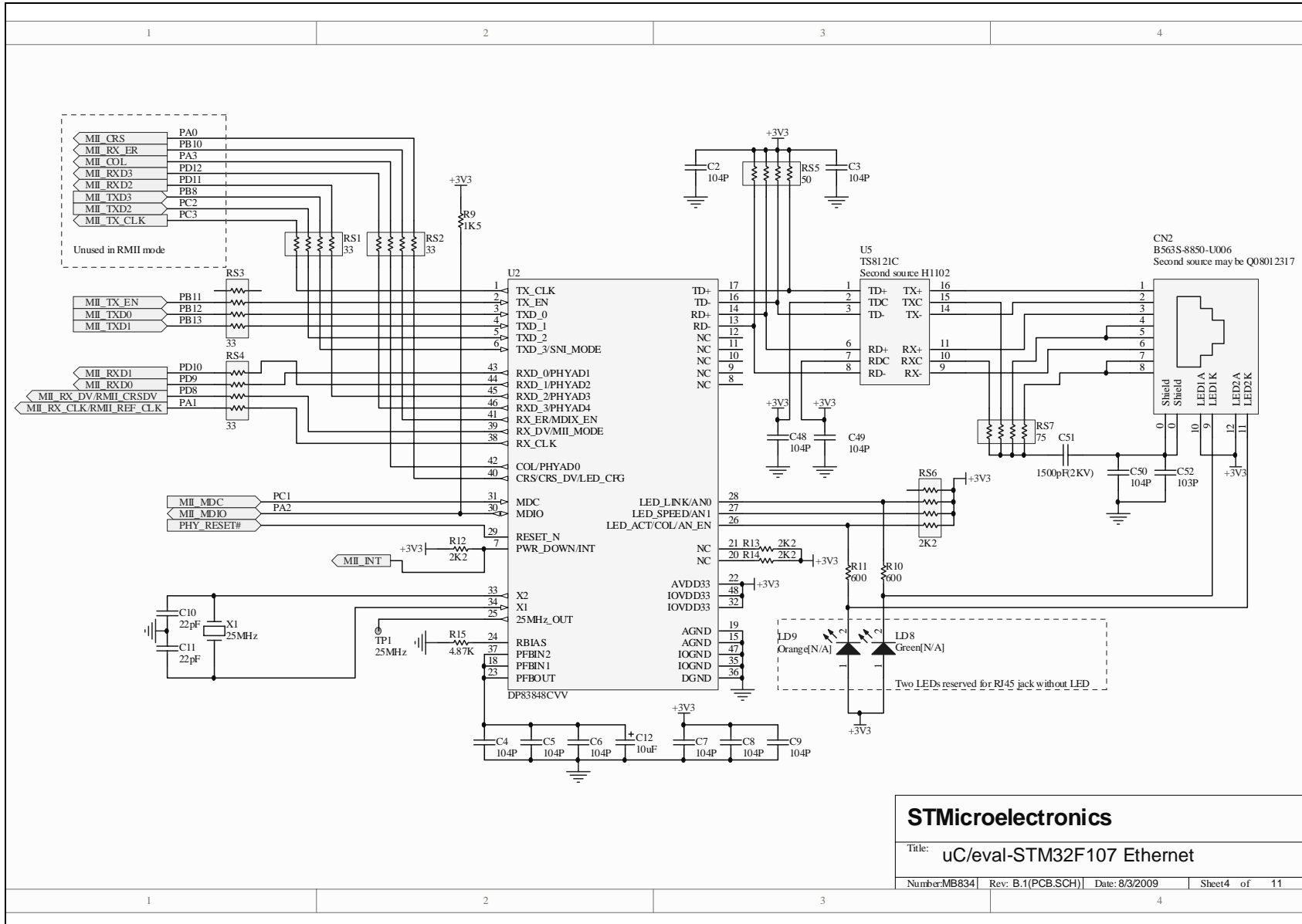
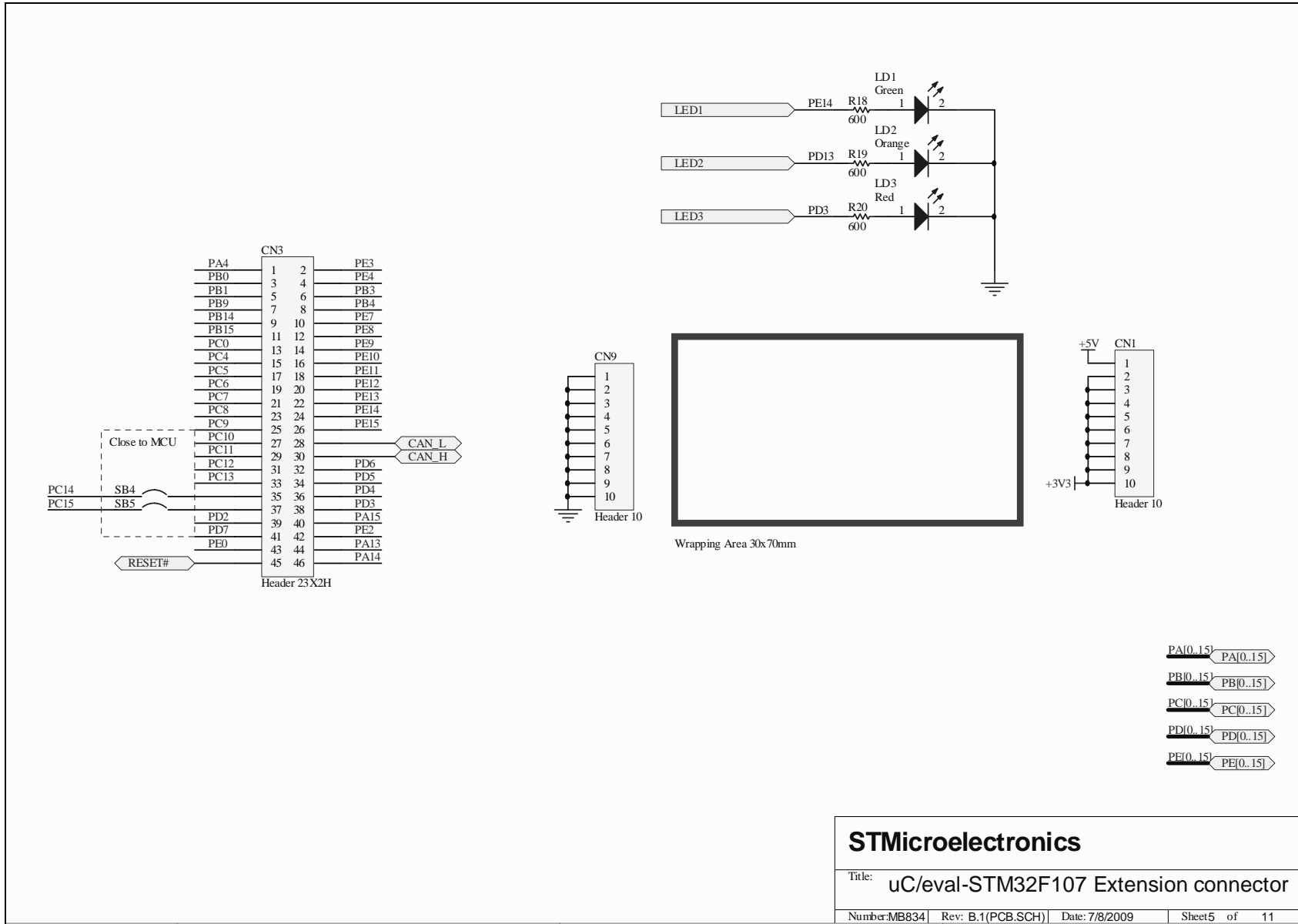




Figure 9. Extension connector

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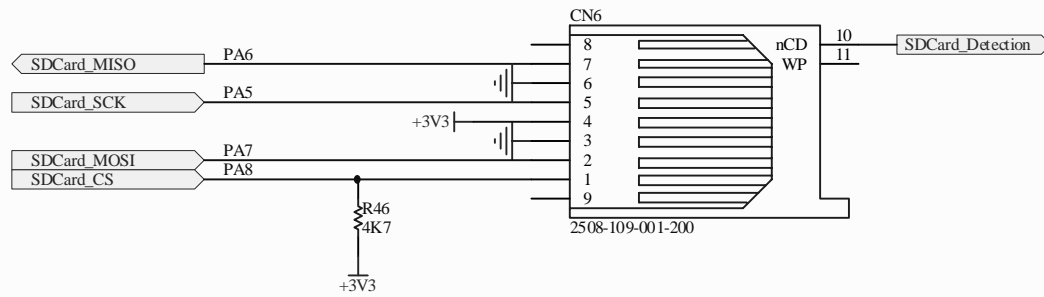
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Figure 10. SD card



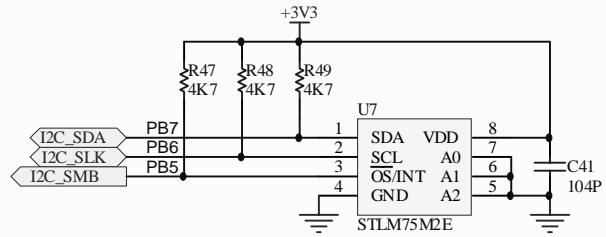
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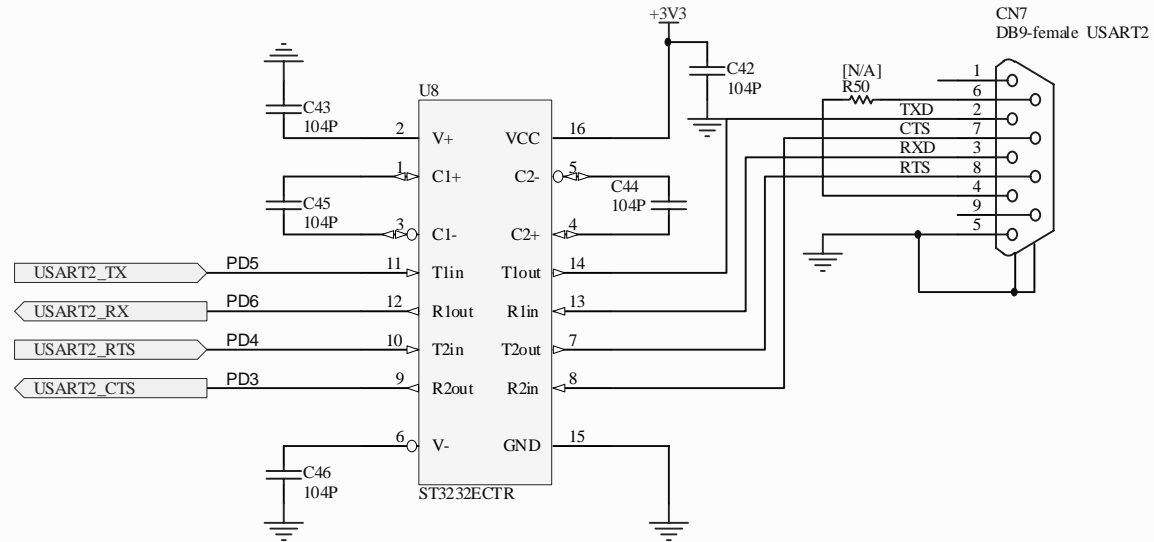
Figure 11. Temperature sensor



| | | | |
|--|-------------------|----------------|--------------|
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Figure 12. RS-232



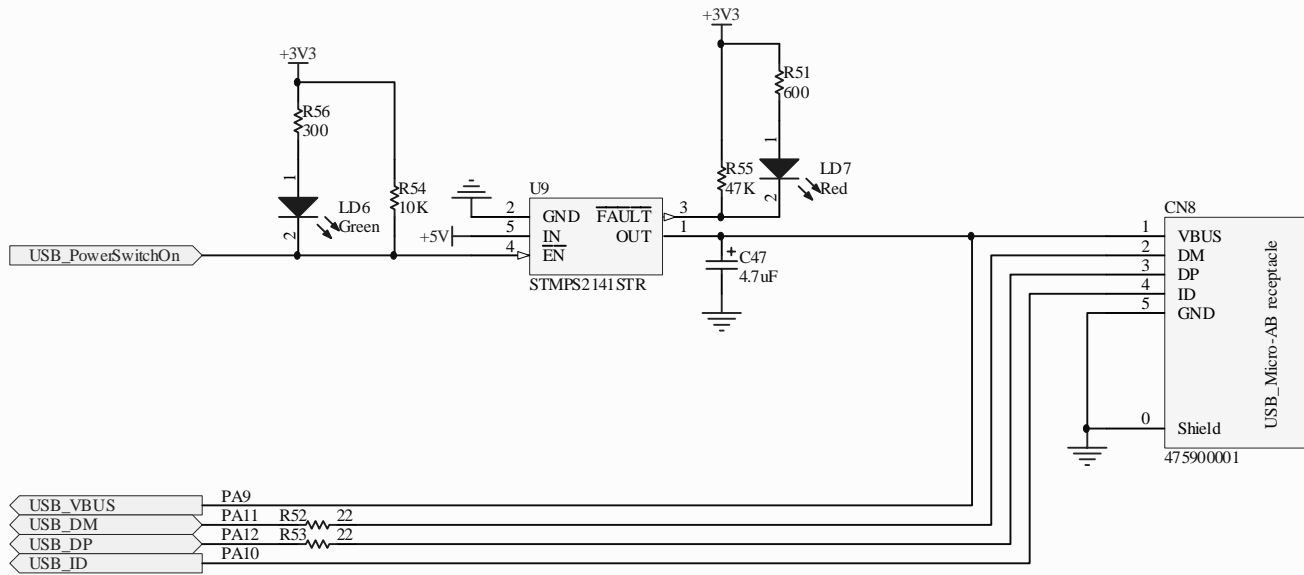
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Figure 13. USB-OTG-FS



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Title: uC/eval-STM32F107 USB_OTG_FS

Number:MB834 Rev: B.1(PCB.SCH) Date: 7/8/2009 Sheet9 of



Figure 14. J-Link

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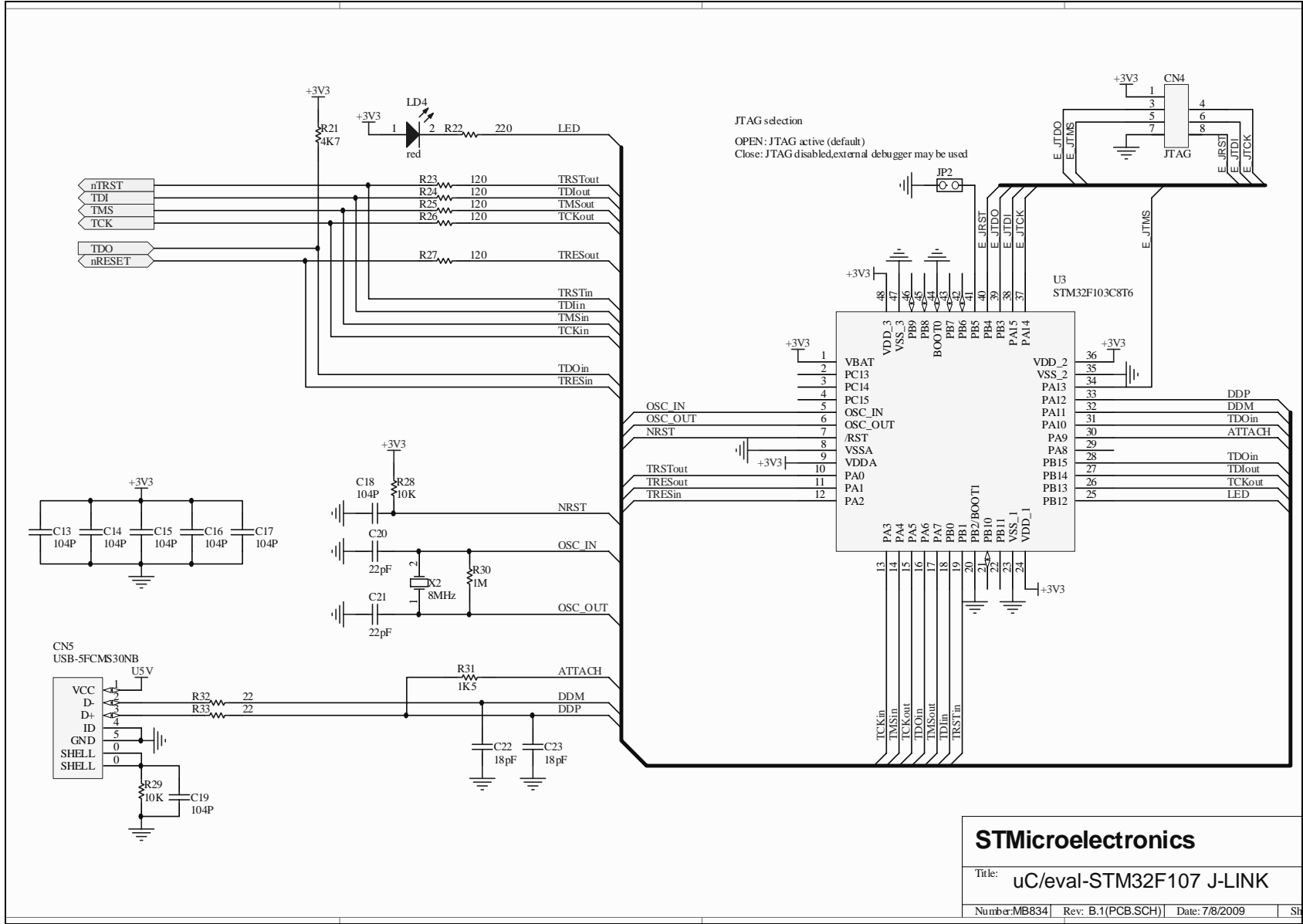
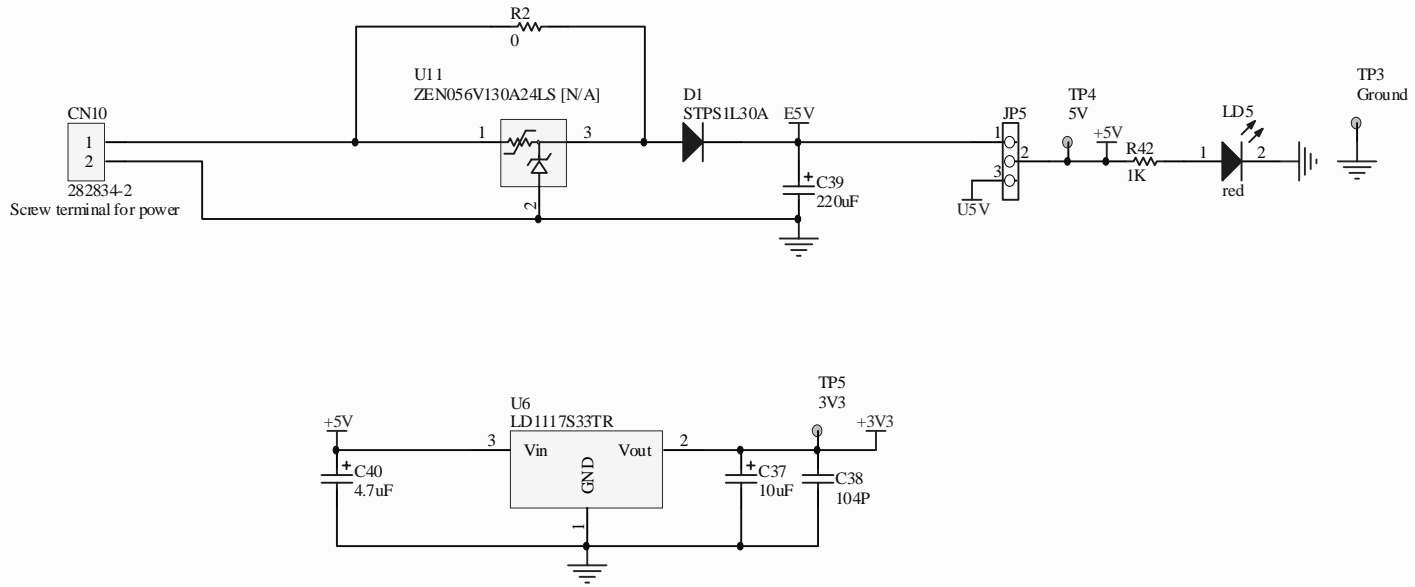




Figure 15. Power



STMicroelectronics

Title: uC/eval-STM32F107 Power

Number: MB834 | Rev: B.1(PCB.SCH) | Date: 7/8/2009 | She

5 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|--------------|----------|--|
| 14-Sept-2009 | 1 | Initial release. |
| 22-Oct-2009 | 2 | Table 5 default settings changed. Section 1.2 added, Section 1.3 changed. |

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