XE166 family Easy Kit

Board REV. V1.0

Microcontrollers

Never stop thinking.

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XE166 family Easy Kit

Revision History: **2007-10** V 1.0

Previous Version:

Page	Subjects (major changes since last revision)

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1 Introduction - XE166 family

XE166 family - More performance, more Flash, better peripherals

With more than 15 successful years in the microcontroller market place, C166 has set the standard for 16-bit architectures with the highest aggregate volume share of all available 16-bit devices.

With its fast interrupt response and context switching, the C166 family is ideally suited for automotive, industrial, mass storage and wired as well as wireless communications applications.

Compared with the XC166, XE166 delivers more performance, more Flash memory, more RAM, strongly enhanced peripherals and a complete DSP library.

MCU and DSP in a core

Infineon Technologies´ Real Time Signal Controller combines the traditional strengths of a Microcontroller Unit (MCU) to control peripherals with the computing power of Digital Signal Processors (DSP). All in one enhanced XE166 core. Together, the Microcontroller's real-time capability and ease of use and the DSP's mathematical performance and data throughput form a powerful singe-chip solution ideal for many embedded applications.

For detailed technical information about the different derivatives please refer to the XE166 family web pages on the Infineon Internet.

http://www.infineon.com/XE166

2 Features of the XE166 family Easy Kit Board

2.1 Summary of Features

- Infineon's XE166 Controller in TQFP144/100 Package
- High Speed CAN Transceivers, LIN Transceiver, USB to UART/JTAG bridge
- 8 Low Power Status LEDs
- Easy access to all pins
- 4-DIP switches for configuration
- On board USB to JTAG / UART interface
- Powered via USB

Connectors

The XE166 Easy Kit offers a wide variety of connectors:

- One USB connector for ASC0 Interface via virtual COM port, JTAG (OCDS Level 1) and Power Supply
- 4 pin header for LIN Transceiver
- 16-pin header for JTAG interface (OCDS)
- 10pin (2x5) Header for CAN High Speed Transceiver (CAN1/CAN2)

Components

- Low-Drop Voltage Regulator TLE 4274
- Step Down Voltage Regulator TLE 6365G (optional)
- Four status LED´s for Power / RESET / JTAG / DEBUG RUN
- 2 x CAN-Transceiver TLE 6251
- LIN Transceiver TLE 7259
- FT2232 Dual USB to UART/JTAG interface
- SPI EEPROM 128 Kbit AT25128N
- 8 general purpose LEDs
- Potentiometer for ADC0/1
- Reset switch

Zero Ohm Bridges

- Zero Ohm resistors give the flexibility to configure the systems functionality

2.2 Block Diagram

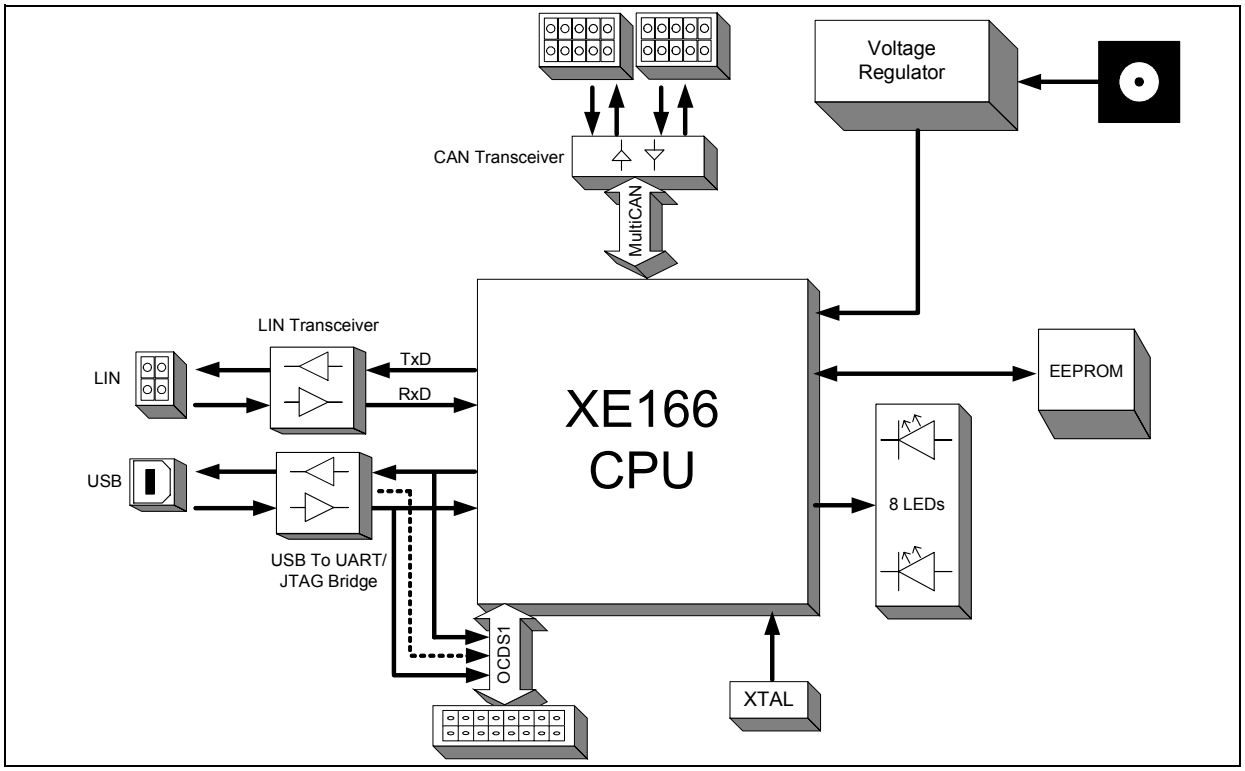


Figure 1 Block diagram of XE166 Easy Kit layout overview

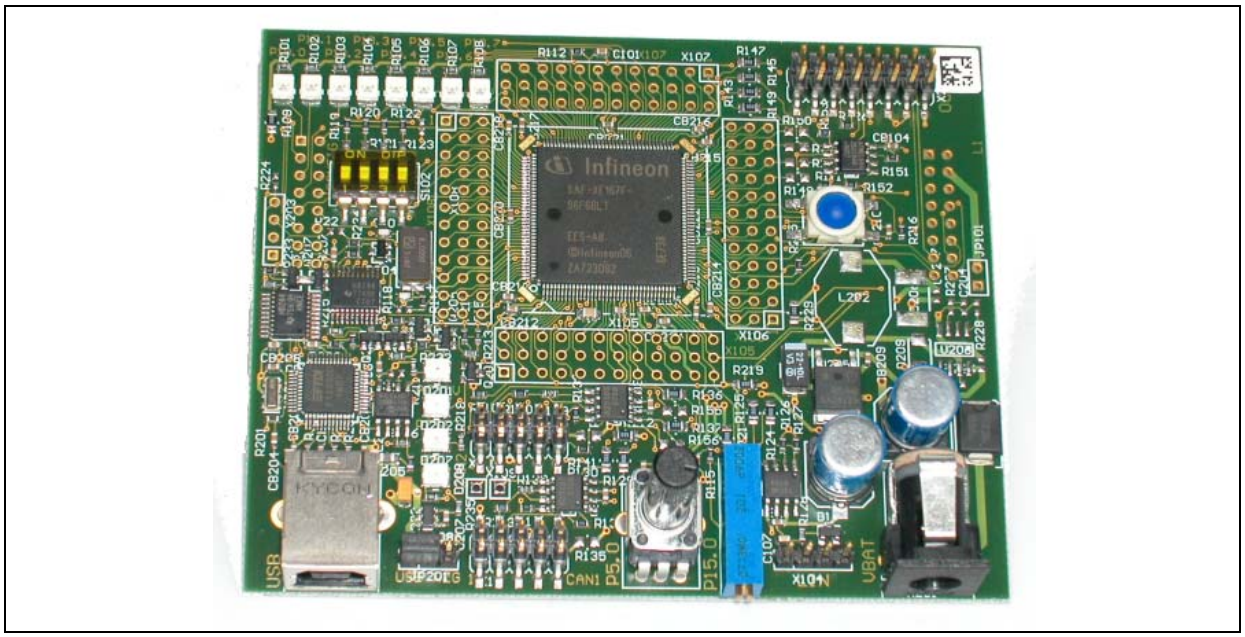


Figure 2 XE166 Easy Kit (144-Pin)

2.3 Layout Overview

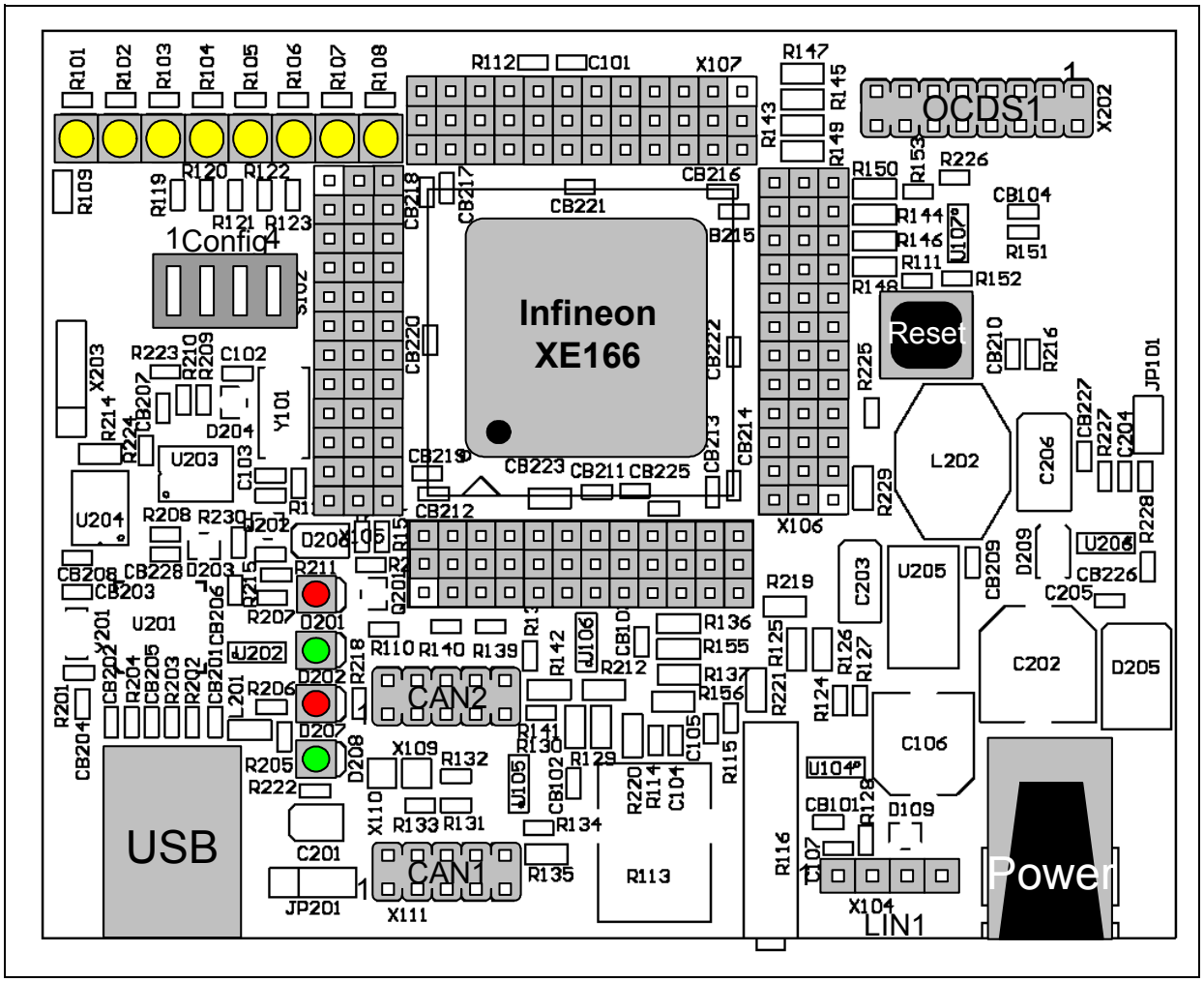


Figure 3 Top View

2.4 USB Driver installation

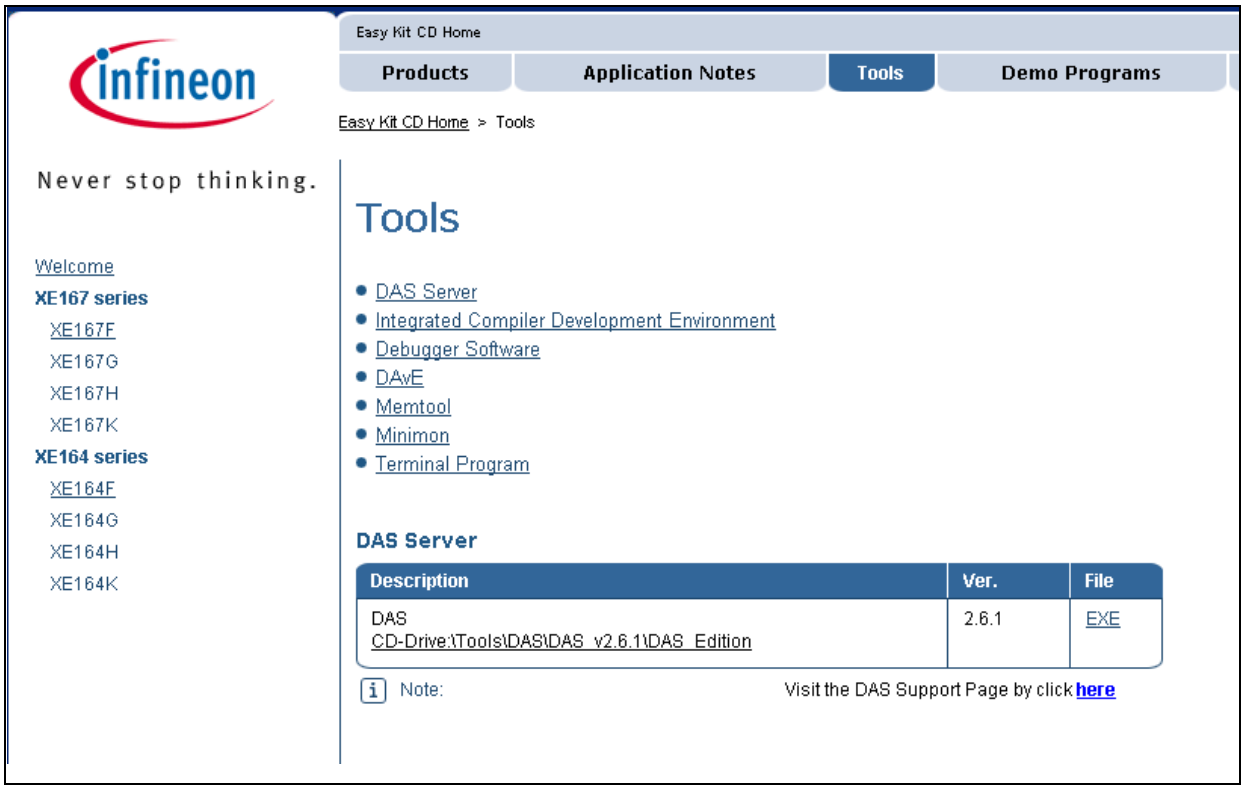
All USB-Transaction are realized by the USB-Software running on a Host-Computer. The USB-Device driver is communicating with the Equipment connected to the Computer.

The driver for Easy Kit USB interface will be delivered with a Software called DAS (Device Access Server). The goal of the DAS architecture is to provide one single interface for all types of tools, which fulfills all performance and reliability needs. Additionally a driver for a virtual COM port will be installed.

Find out more about DAS on the Infineon Web page:

http://www.infineon.com/DAS

This DAS Software can be found on the Easy Kit CD under Tools. A DAS Software Version 2.6.1 or higher need to be used for the Easy Kit.



2.5 Easy Kit Power Supply concept

The Easy Kit USB Power Supply concept enables the user to work with the Kit without an external Power Supply. If the USB power supply is not sufficient an additional regulated DC power supply can be used.

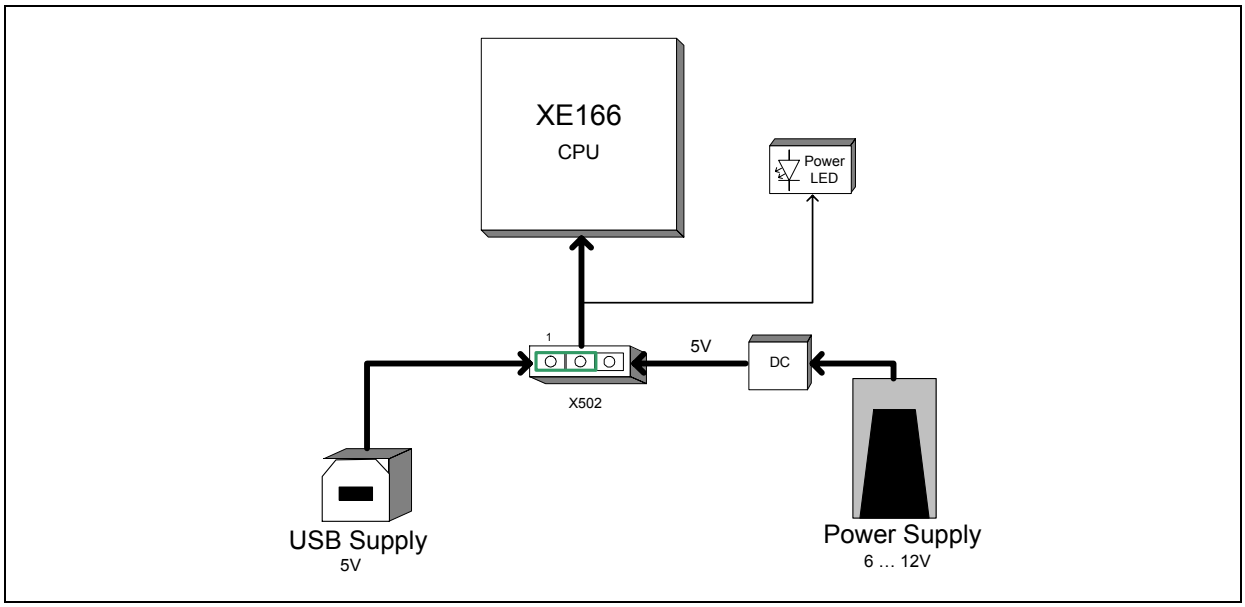


Figure 4 Easy Kit Power Supply concept

By means of the Power Supply Jumper X502, USB, or the external power Supply can be selected to run the Easy Kit. The Setup for the Jumper X502 is shown in **Table 1** below.

Table 1 Power Supply Jumper configuration

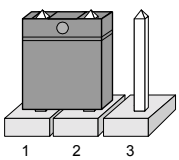
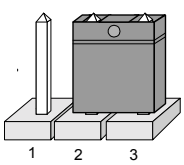
Name in schematic	Configuration	Description
X502		Power Supply via USB Interface **(Default)**
X502		Power Supply via Power Plug

Figure 5 Power Supply via USB Interface

The USB specification provides a 5 V supply on a single wire from which connected USB devices may draw power. The specification provides for no more than 5.25 V and no less than 4.35 V between the +ve and -ve bus power lines.

Initially, a device is only allowed to draw 100 mA. It may request more current from the upstream device in units of 100 mA up to a maximum of 500 mA. In practice, most ports will deliver the full 500 mA or more before shutting down power, even if the device hasn't requested it or even identified itself. If a (compliant) device requires more power than is available, then it cannot operate until the user changes the network (either by rearranging USB connections or by adding external power) to supply the required power.

Note: If the USB power supply is not sufficient, an external power supply is needed and the Jumper X502 setting need to be changed.

Note: In case the USB Host PC goes into Suspend Mode, an external Power Supply should be used.

2.5.1 Power Supply via Power Plug

The XE166 Board can be supplied either with USB cable or with an external power supply. For external power supply a regulated DC power supply with **max. 12Volt/ 400mA** can be connected to the power connector. The maximum power dissipation of the used voltage regulator has to be taken into account.

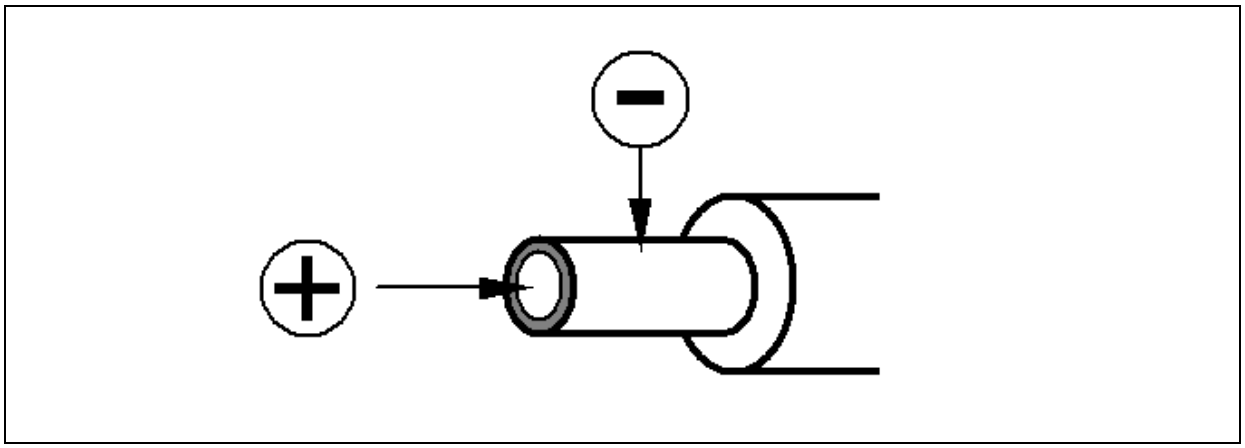


Figure 6 Power Supply

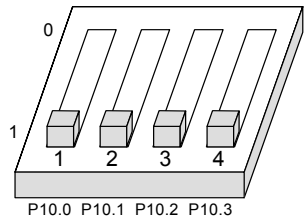
2.6 Easy Kit Default Setup

Although most of the programmable features of the XE166 are selected by software either during the initialization phase or repeatedly during program execution, some features must be selected earlier because they are used for the first access of the program execution.

These configurations are accomplished by latching the logic levels at a number of pins at the end of the internal reset sequence.

DIP Switch S102 allows to configure the startup setting of the XE166 during RESET. The default System Startup Configuration is shown in **Table 2** below. All DIP switches are OFF. The XE166 execute a standard start from internal Flash.

Table 2 Default configuration

Name in schematic	Default configuration	Description
S102		Startup configuration: Standard start from internal Flash (Default)

Note: For debugging purpose (OCDS) the standard start from internal Flash configuration must be used.

For more detailed information about the DIP Switch setting please refer to **Chapter 5.1**

3 Quick Start Up

For a successful start up of the XE166 Easy Kit the following Steps should be done:

Start the index.htm on the EasyKit CD and follow the Getting Started by click on the Logo in the center of the html Page.

Figure 7 Easy Kit CD

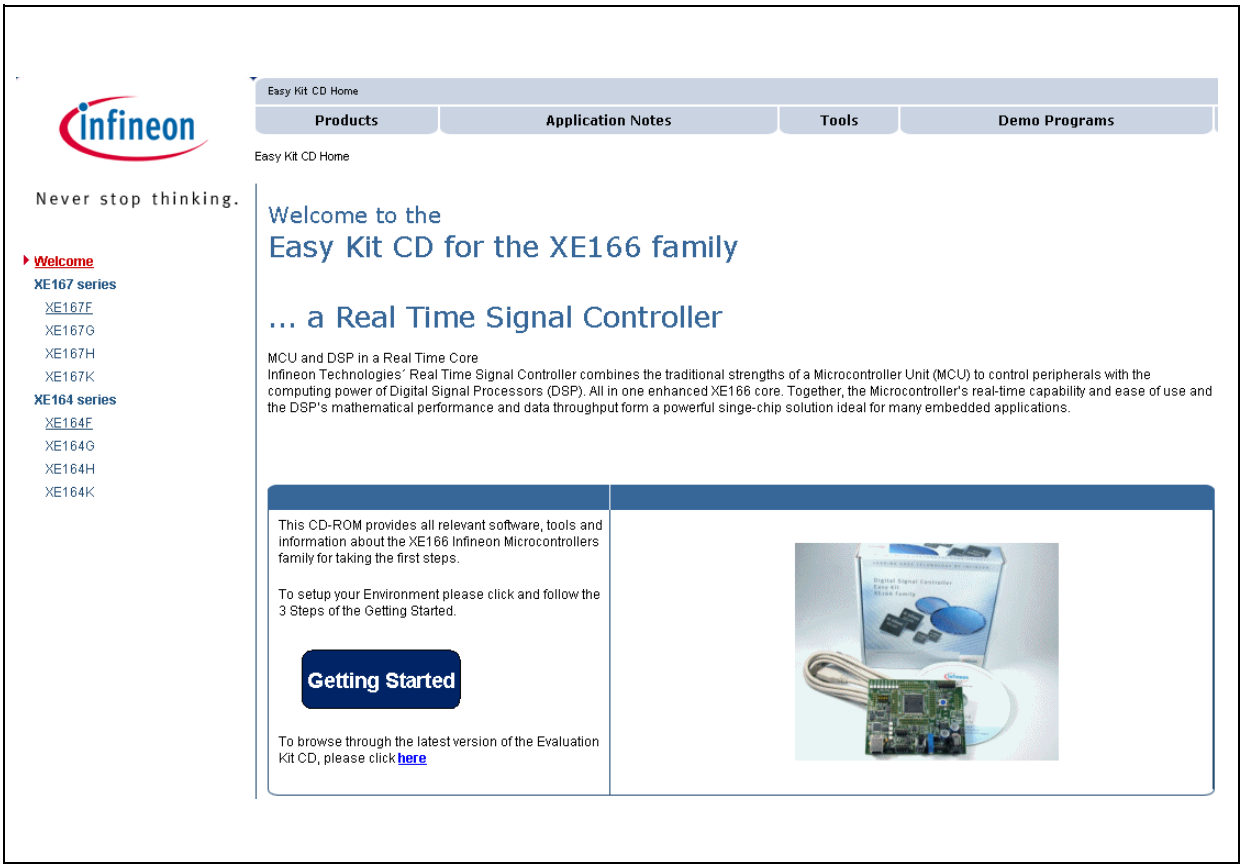


Figure 8 CD start page

3.1 OCDS debugging interfaces

The XE166 includes an On-Chip Debug Support (OCDS) system, which provides convenient debugging, XE166controlled directly by an external device via debug interface pins.

The XE166 Easy Kit uses an On-Board Wiggler. An additional a external Wiggler Box from a Tool Vendor can be connected via the JTAG Header.

To verify the connection between the Easy Kit and the DAS Software running on the PC, the following check should be done.

Open Start - Program - DAS the “DAS Server Control Panel” click in “Installed Servers” and start the “JTAG over USB Chip” Server by clicking on the Start Button on the right hand side.

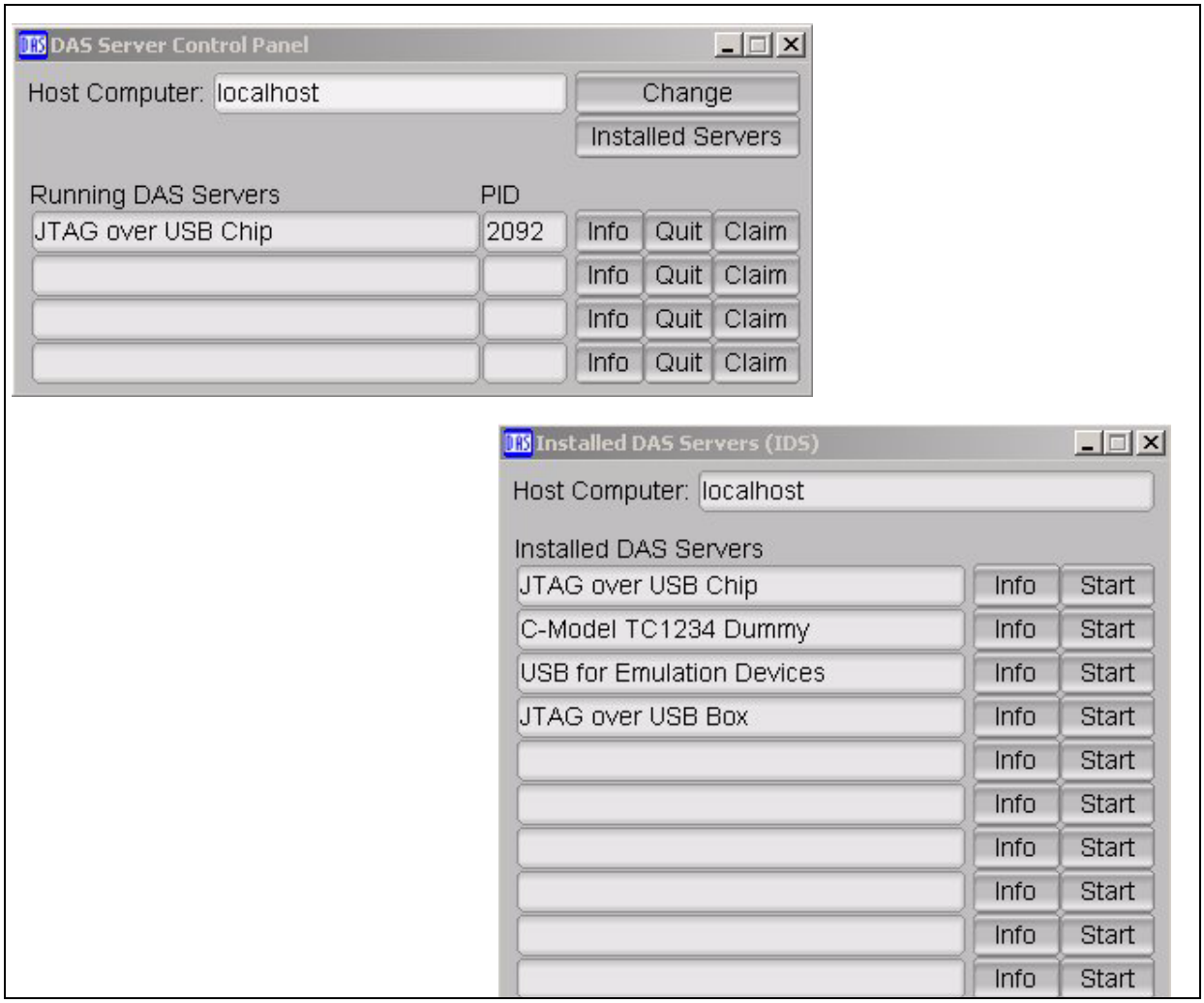


Figure 9 DAS Server Control Panel

After starting the DAS Server, open the “DAS Device Scanner” under Start - Program - DAS.

The “XC166-Family” in the Device list shows that the connection is established between Host Computer and the Easy Kit.

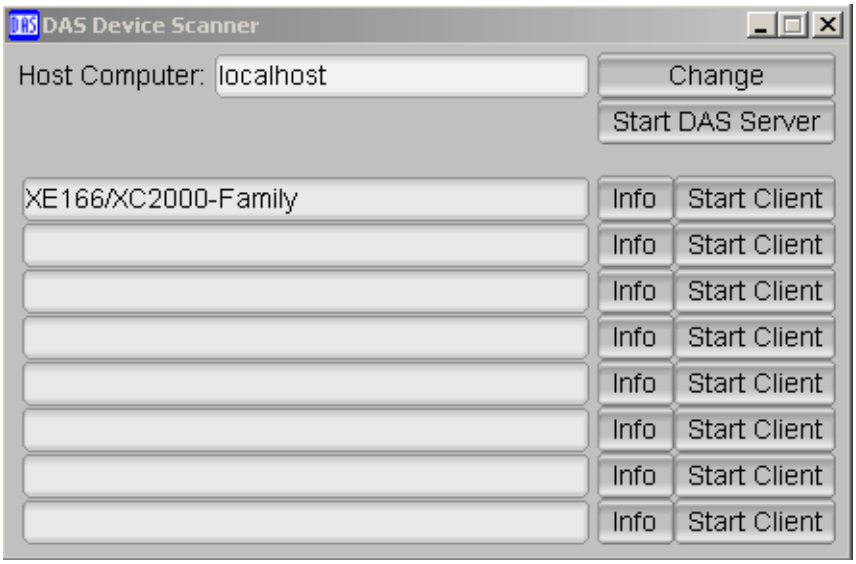


Figure 10 DAS Device Scanner

3.2 Using an external Debugger

A external Debugger Box can be connected on JTAG Connector (**Figure 3**). To work with the external Debugger the running DAS Server for the On Board Debug interface should be stopped. Use the “Quit” Button to stop the Server.

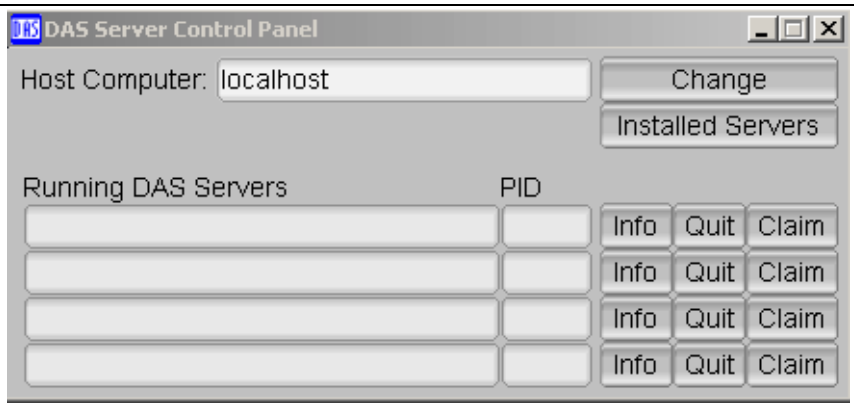


Figure 11 DAS default state

Note: Working with a running DAS Server and external Debugger can damage the Easy Kit Board or the external Debugger!

3.3 Virtual COM Port

The DAS Software package provides the driver for the virtual COM port of the second USB channel of the FTDI chip.

Virtual serial port is a trade term used by certain vendors of COM port redirector software that emulates a serial port (RS-232, RS-422, and RS-485). Virtual serial ports are created by special software which enables extra serial ports in the operating system without using additional hardware (such as expansion cards, etc.). The number of virtual serial ports that can be created in a system is limited only by its performance capacity. It may require a substantial amount of resources to emulate say 255 serial ports on a slow computer.

A virtual serial port emulates all serial port functionality, including Baud rate, Data bits, Parity bits, Stop bits, etc.

To work with the Serial Port of the XE166 Easy Kit the Hyper Terminal of your Windows Software or a free Program like MTTY can be used. A version of the MTTY can be found on the Easy Kit CD under Tools.

3.4 First Pluy in

By default a HELLO WORLD program is executed. The following steps are needed to be done.

1. Verify that the Jumper JP201 is in position 1-2 (powered via USB).
2. Install DAS driver from starterkit CD.
3. Connect USB cable with the Easy Kit and PC.
4. Verify if the standard start mode is selected as described in chapter 3.1.
5. LED D105 connected with P10.0 should flash, otherwise press the Reset button.
6. Verify which COM port is activated for the FTDI - chip.
7. Execute the monitor program MTTTY from the starterkit CD.
8. Select the corresponding COM port, 19200 Baud, none parity, 8 data Bit, one stop bit, parser off.
9. Start connection (File/connect).
10. Press Reset button on the starterkit, Hello World program is running .

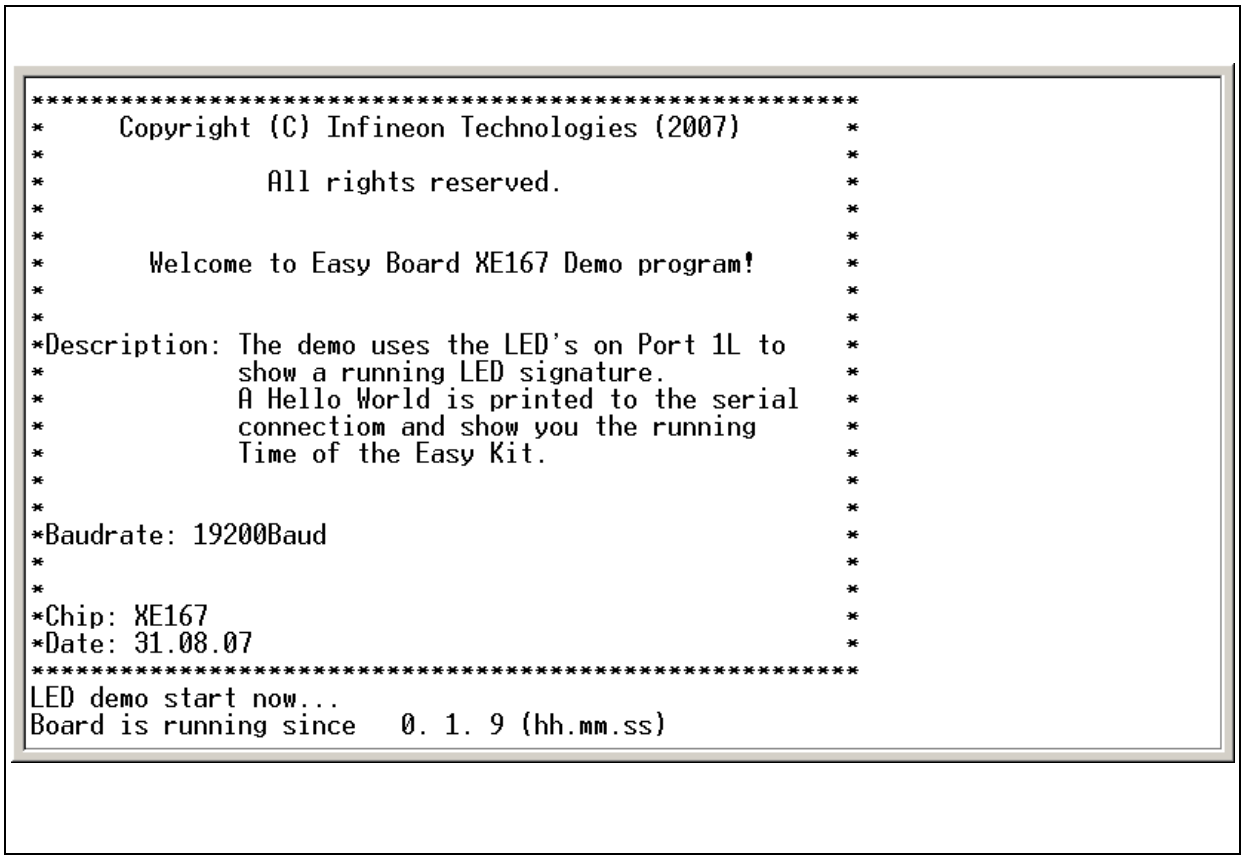


Figure 12 HyperTerminal with Hello World program

4 Memory Areas

The memory space of the XE166 is configured in a “Von Neumann” architecture. This means that code and data are accessed within the same linear address space.

Attached there are two examples for memory mapping of the XE166 Board.

4.1 Internal Flash

As a example the XE167F-96F66L incorporates 768 Kbytes of embedded Flash memory (starting at location $C0'0000_H$) for code or constant data. It is operated from the 5Volt pad supply and requires no additional programming voltage. The Flash memory consists of three independent flash modules. Each module is 256 Kbyte wide. Each Flash array is organized in 64 physical sectors of 4 Kbytes. It combines the advantages of very fast read accesses with protected but simple writing algorithms for programming and erasing. The 128-bit code read accesses from the Flash memory realize maximum CPU performance by fetching two double word instructions (or four single word instructions) in a single access cycle.

Data integrity is enhanced by an error correction code enabling dynamic correction of single bit errors. Additionally, special margin checks are provided to detect and correct problematic bits before they lead to actual malfunctions.

The On-chip programming can be done either with a utility program, so called “Memtool” or with several other Toolchains from our Tool vendors. Memtool is using the ASC bootstrap Loader. The latest version can be found on the Infineon website. Other tools use the OCDS interface.

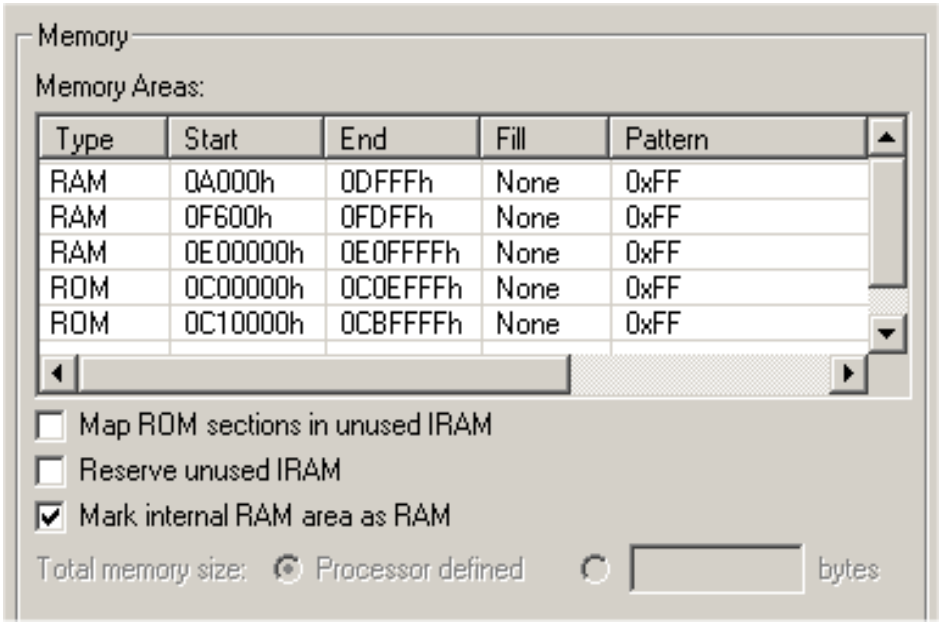


Figure 13 Example for memory mapping (internal flash)

4.2 Internal PRAM

As a example the XE167F-96F66L provides 64 Kbytes of PSRAM (E0'0000$_H$ … E0'FFFF$_H$). The PSRAM provides fast code execution without initial delays. Therefore, it supports non-sequential code execution, for example via the interrupt vector table.

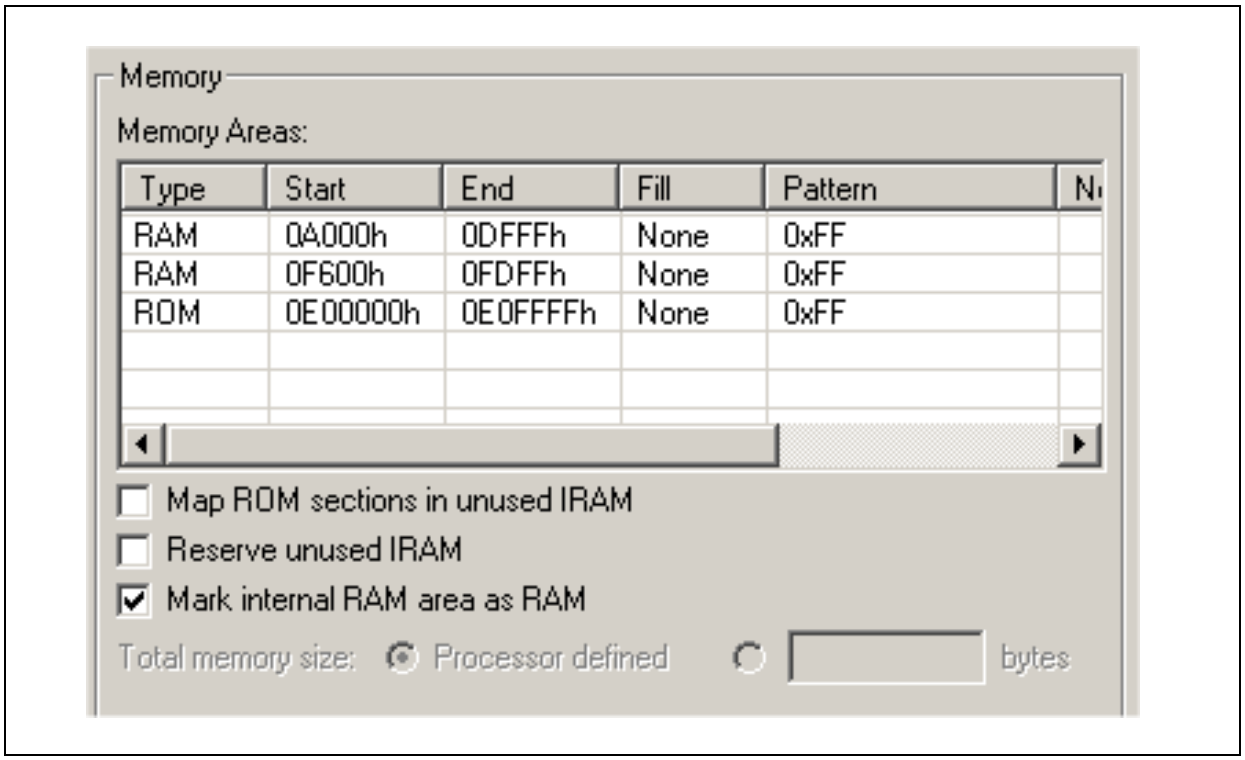


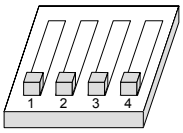
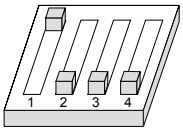
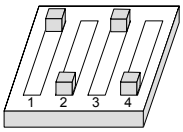
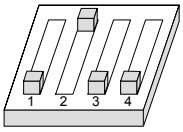
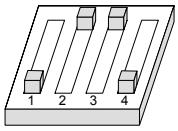
Figure 14 Memory mapping for internal PRAM

5 Description of Connectors and Switches

DIP switch S102 allows to configure the startup setting of the XC167CI during RESET. All possible System Startup Configuration are shown in **Table 3**.

5.1 Switch S102

Table 3 DIP Switch Settings for S102

Name in schematic	Default configuration	Description
S102		Startup configuration: Standard start from internal Flash **OFF-OFF-OFF-OFF**
S102		Startup configuration: Bootstrap loader ASC **ON-OFF-OFF-OFF**
S102		Startup configuration: Enhanced bootstrap loader ASC **ON-OFF-ON-OFF**
S102		Startup configuration Bootstrap loader CAN **OFF-ON-OFF-OFF**
S102		Startup configuration Bootstrap loader SSC **OFF-ON-ON-OFF**
S102		Startup configuration All other positions are reserved

By default all DIP Switches are OFF. The XE166 executes a standard start from internal Flash.

Table 4 Default configuration

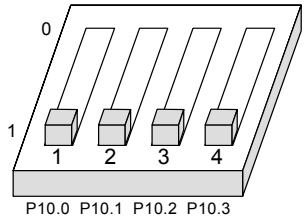
Name in schematic	Default configuration	Description
S102		Startup configuration: Standard start from internal Flash (Default)

Table 5 Basic Startup Configuration via External Circuit

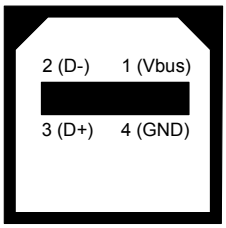
XC2xxx Pin level configured by S102	Function
P10.0 = 1, P10.1 = 1, P10.2 = P10.3 = X	Standard start internal Flash
P10.0 = 0, P10.1 = 1, P10.2 = 1, P10.3 = X	Bootstrap loader ASC0
P10.0 = 0, P10.1 = 1, P10.2 = 0, P10.3 = X	Enhanced bootstrap loader ASC0
P10.0 = 1, P10.1 = 0, P10.2 = 1, P10.3 = X	Bootstrap loader MultiCAN
P10.0 = 1, P10.1 = 0, P10.2 = 0, P10.3 = 1	Bootstrap loader SSC
All other positions	Reserved

Note: For debugging purpose (OCDS) the standard start from internal Flash configuration must be used.

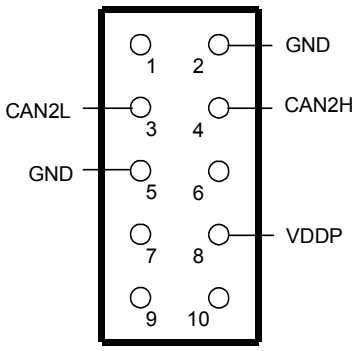
Note: The Easy Kit does not support external start.

5.2 Headers and Connectors

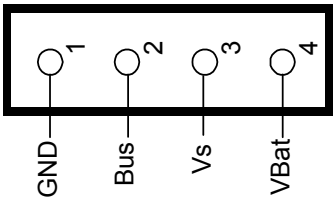
5.2.1 USB (P101)



5.2.2 CAN1/2 (X103)

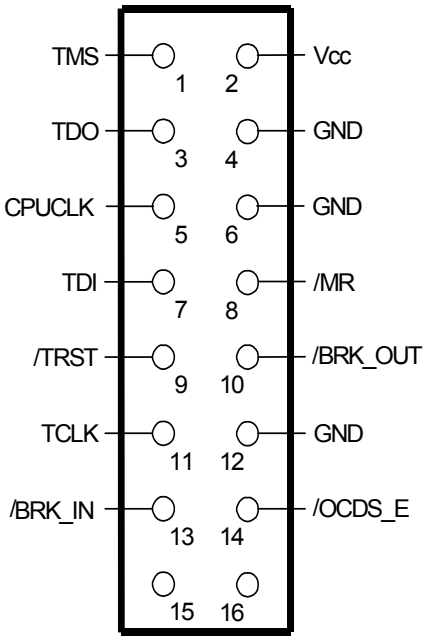


5.2.3 LIN Header (X104)



5.2.4 OCDS Interface

On-board header X102



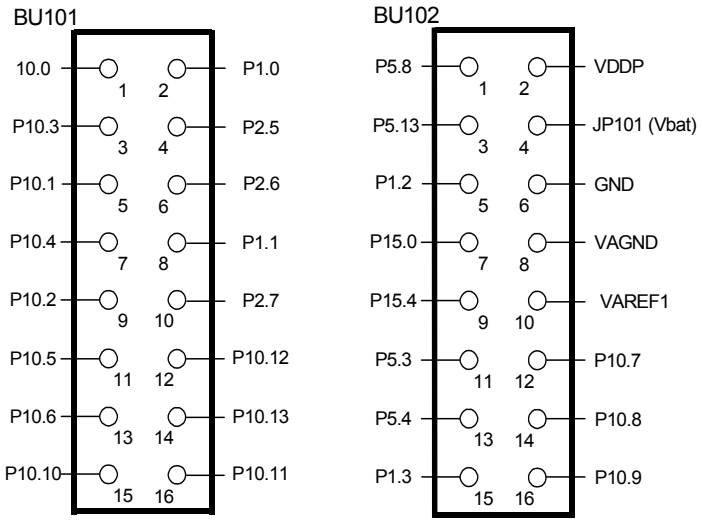
5.2.5 LEDs

Table 6 LEDs description

LED number	Description
D201	Debug Run Mode
D202	Debug Active
D207	Power On Reset Active
D208	Board Voltage 5 Volt
D105 - D112	Status of P10L

5.2.6 Power Headers (optional)

The power headers can be mounted if a power inverter board for an electrical motor drive application is used.



5.3 Pin Definition and Location

5.3.1 XE167 - Pinout

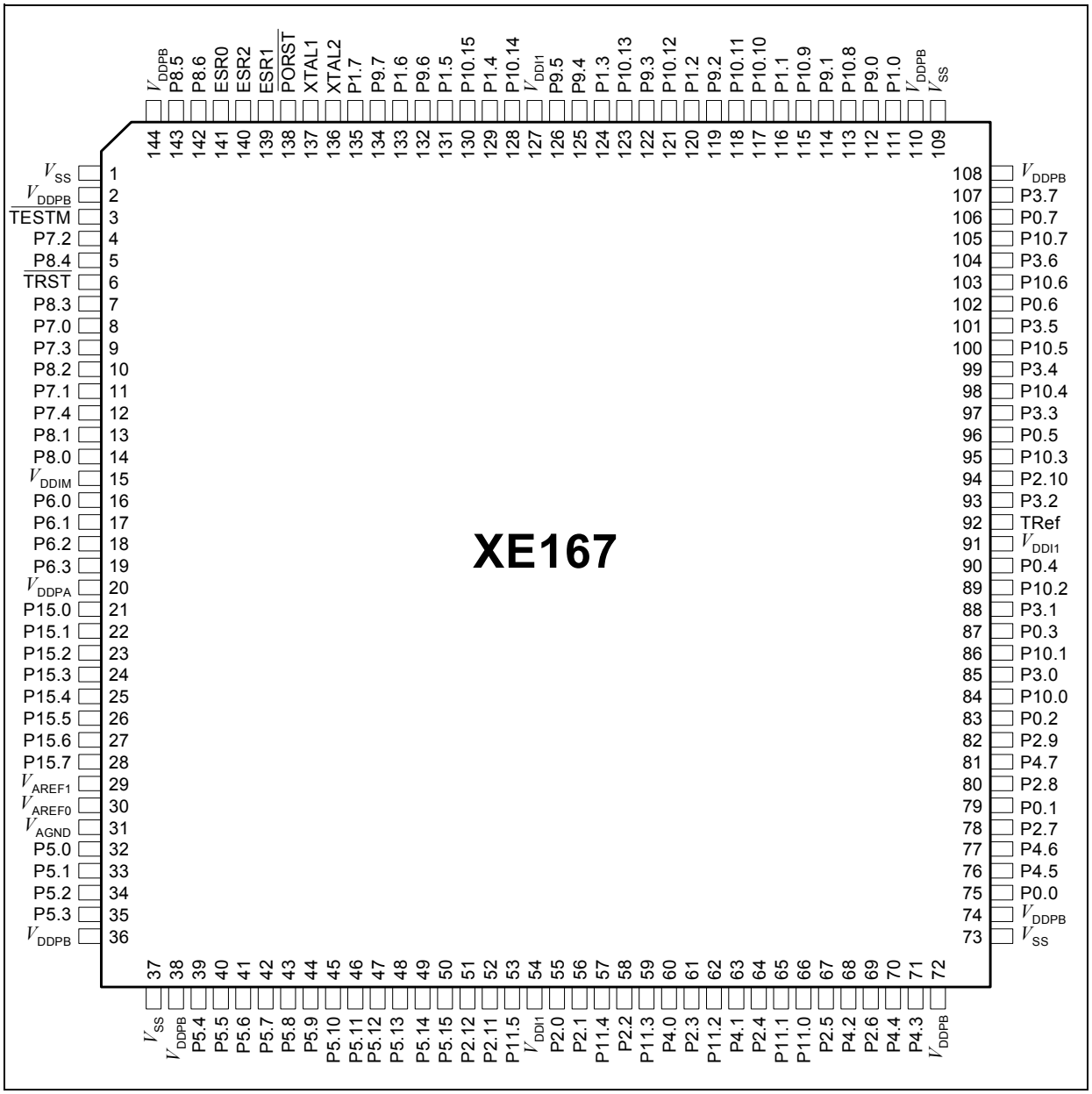


Figure 15 Pinout of the XE167 device's

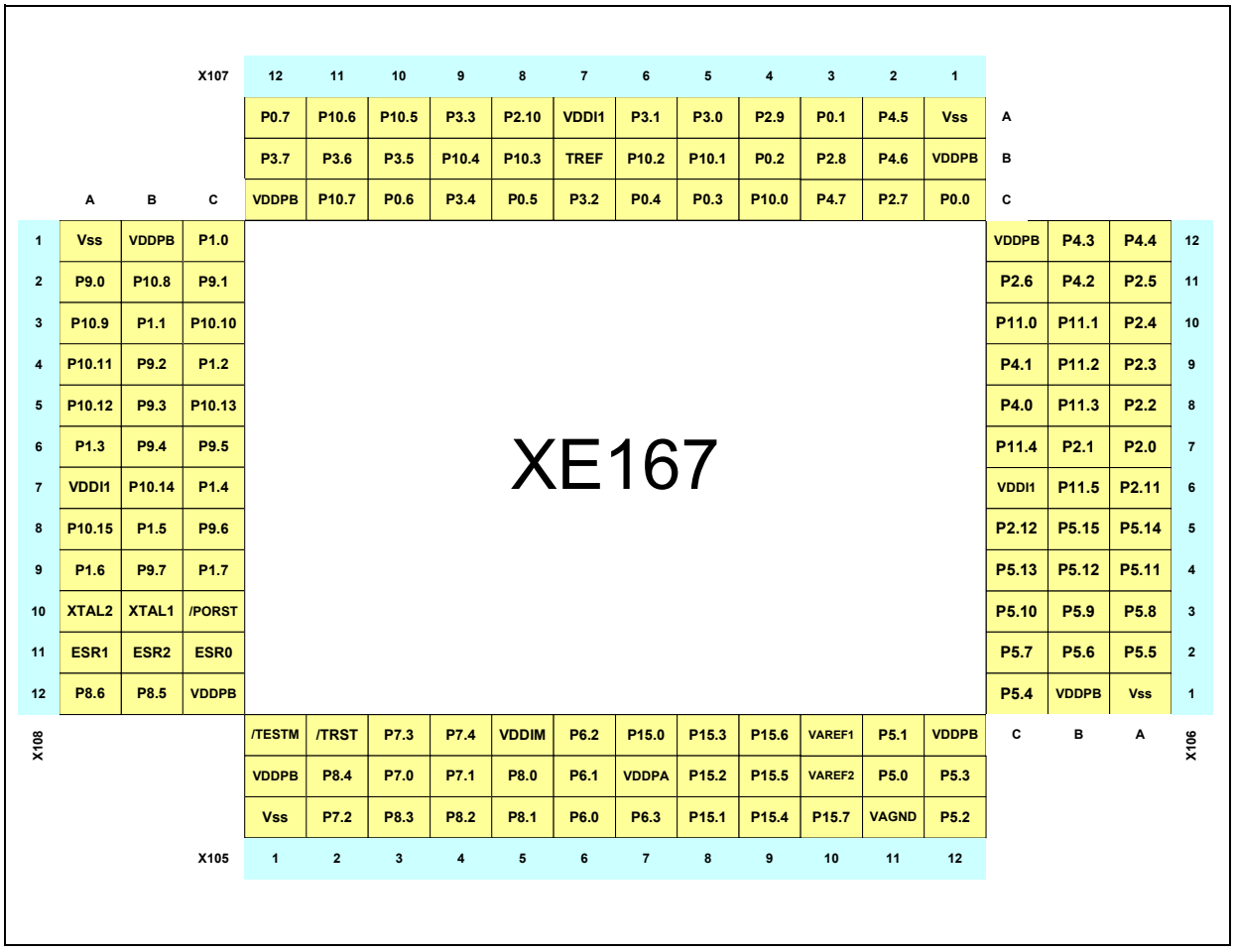


Figure 16 Pin connector of the XE167 pin device

5.3.2 100 - Pinout

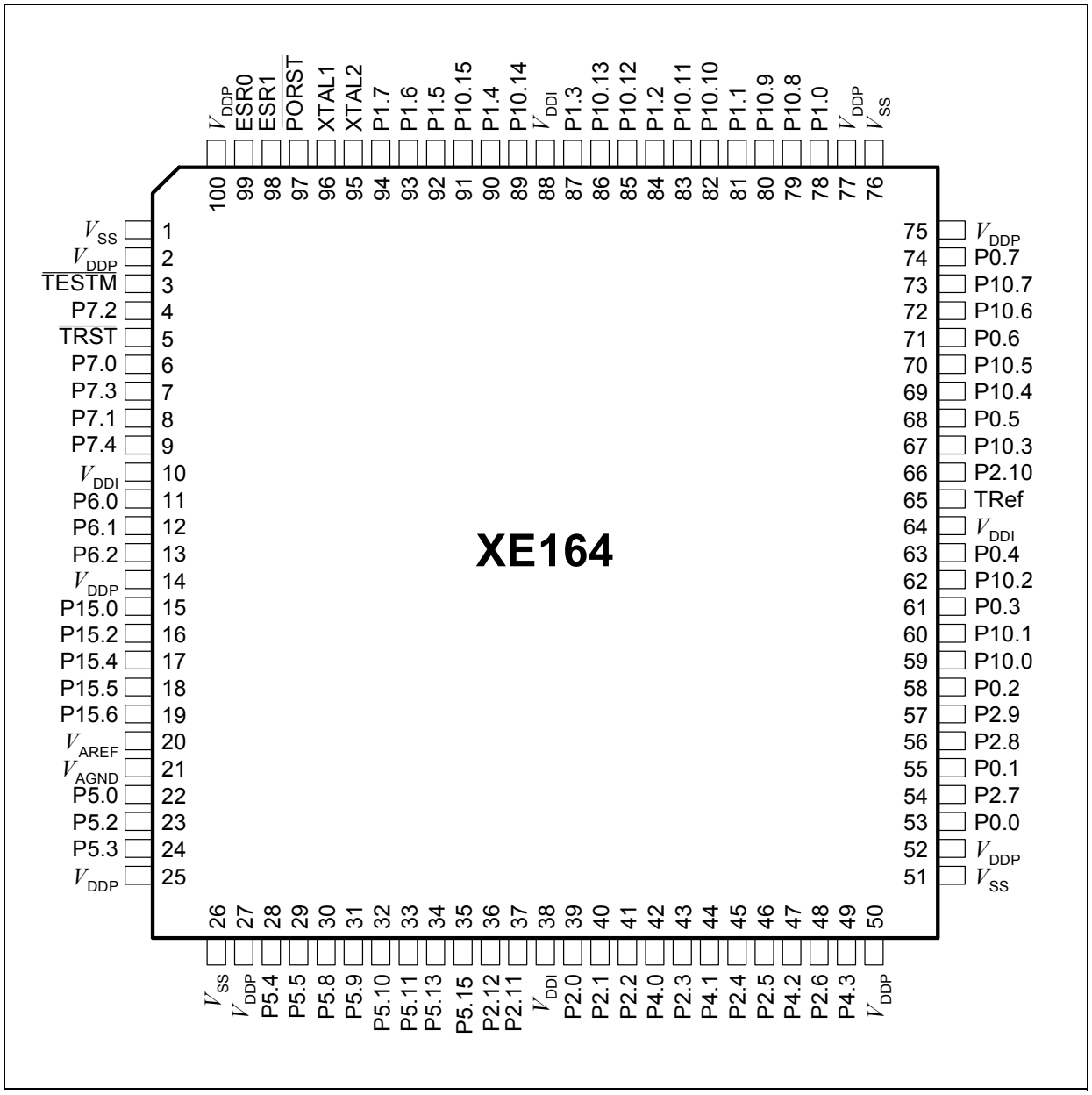


Figure 17 Pinout of the XE164 device's

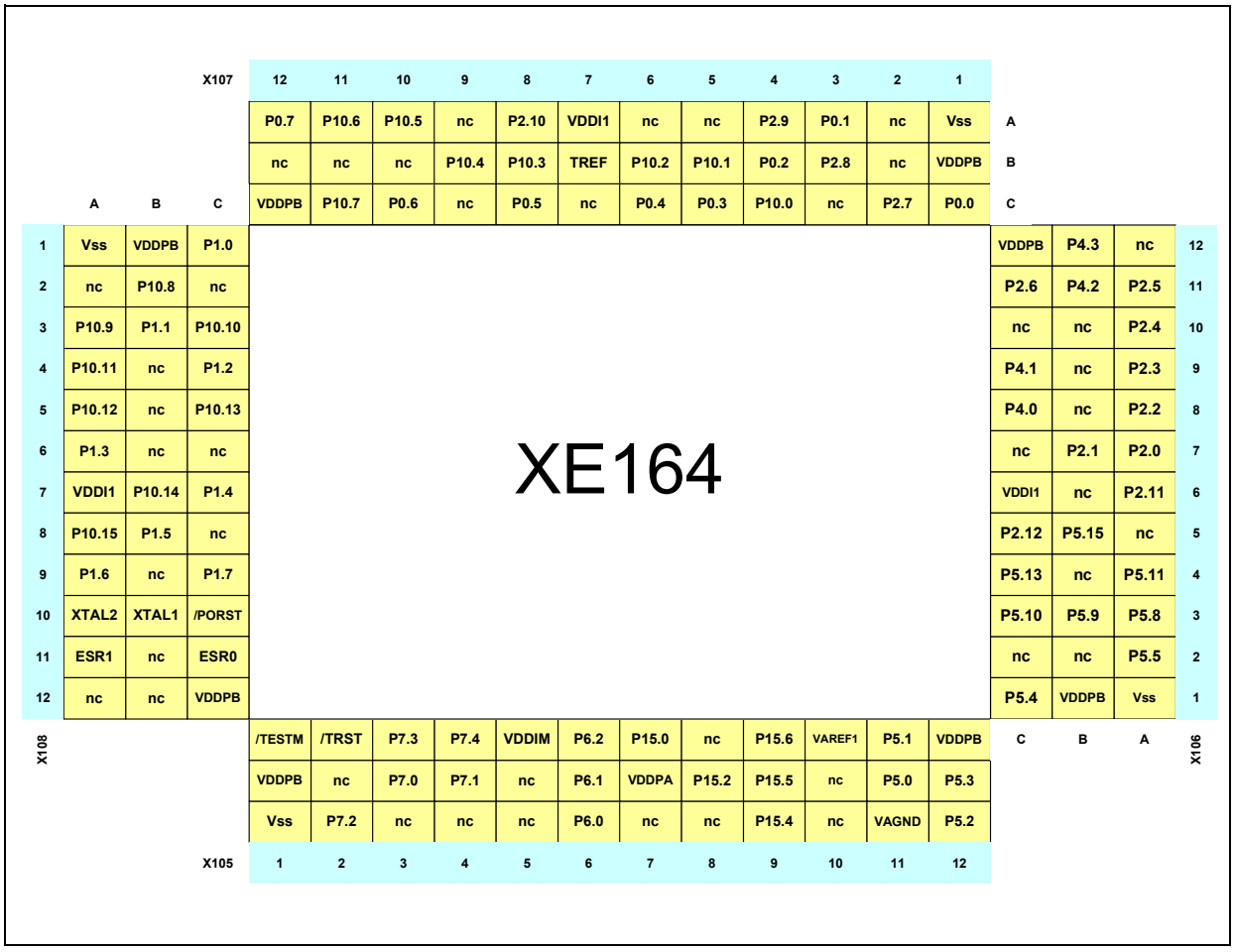


Figure 18 Pin connector of the XE164 device

5.4 Zero Ohm Resistors

For configuration purposes several zero ohm resistors have been implemented. The functionality of these resistors are shown in the table below.

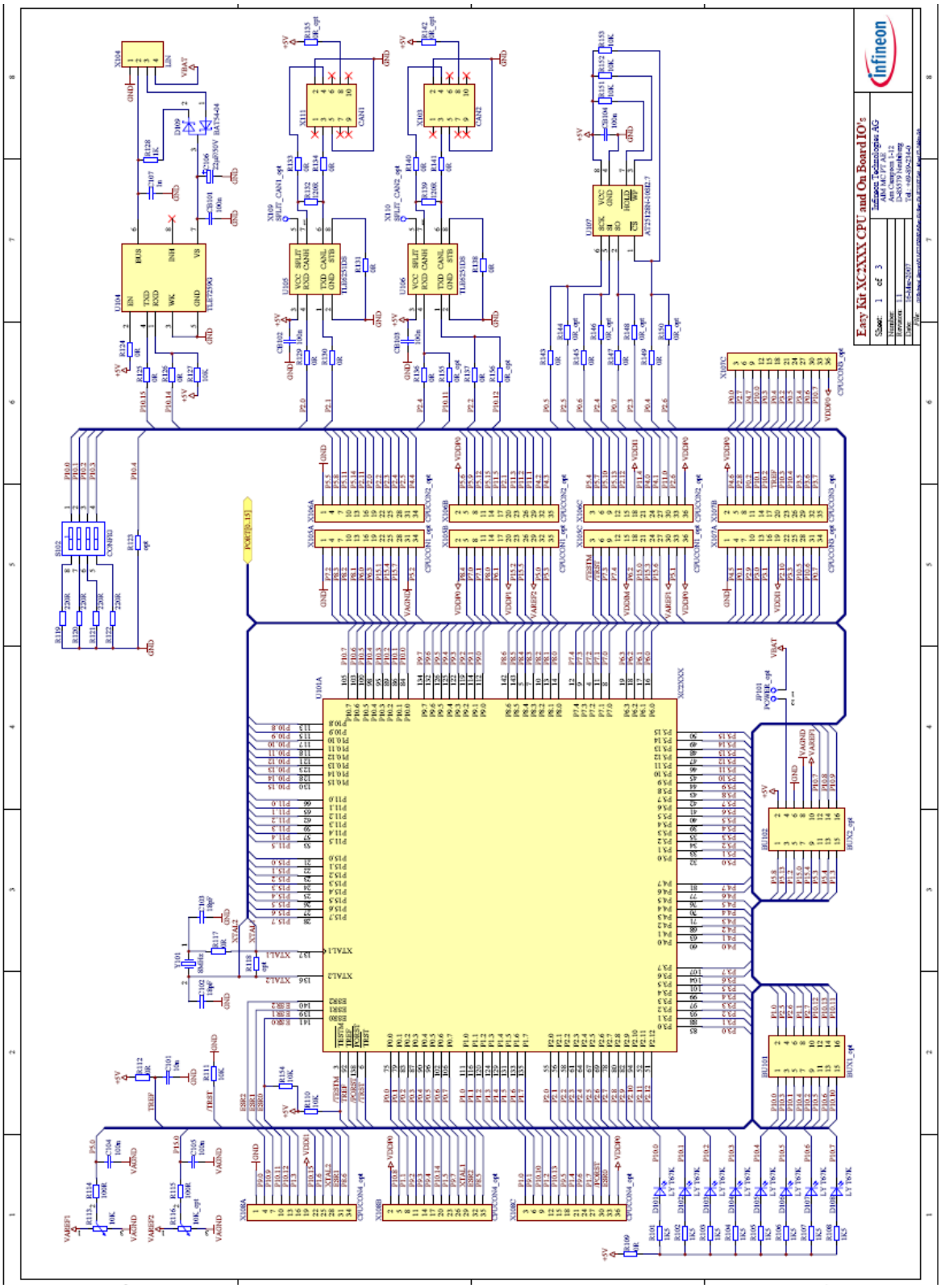
Table 7 Zero Ohm Resistors

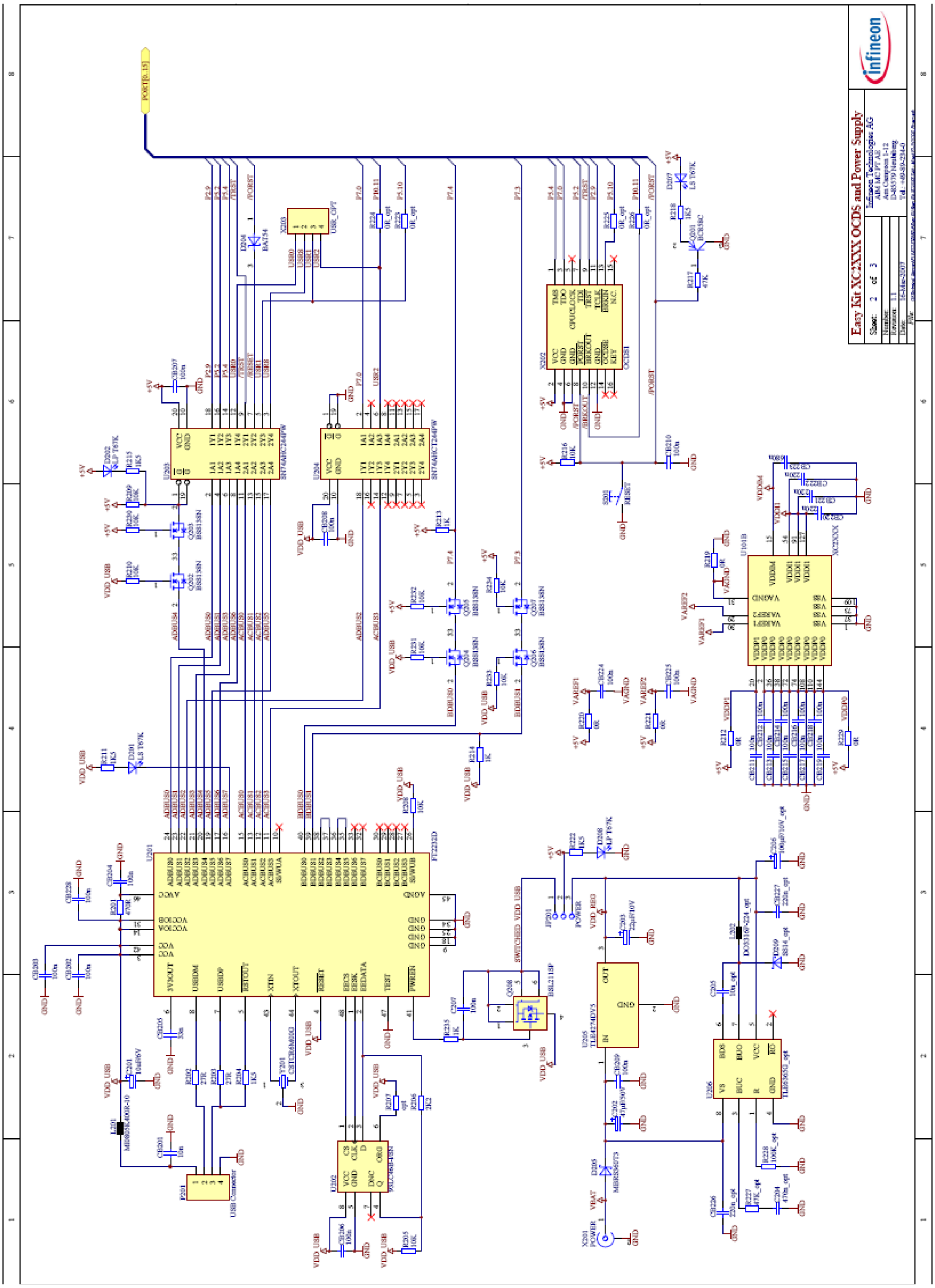
Component	Name in schematic	Description
TLE 7259G (LIN Transceiver Board)	 R124 R125 / R126	 enable / disable connect / disconnect
TLE 6251DS (CAN Transceiver)	 R129 / R130 R136 / R137 R155 / R156 R131 R138 R135 R142 R133 / 134 R140 / 141	 connect / disconnect (CAN1) connect / disconnect (CAN2) or connect / disconnect (CAN2) enable / disable (CAN1) enable / disable (CAN2) supply Bus voltage internal / external (CAN1) supply Bus voltage internal / external (CAN2) connect Bus / disconnect Bus (CAN1) connect Bus / disconnect Bus (CAN2)
AT25128N (Serial EEPROM)	 R143 / R145 R147 / R149 R144 / R146 R148 / R150	 connect to USIC1 Channel1 connect to USIC1 Channel1 connect to SSC bootstrap loader (U0C0) connect to SSC bootstrap loader (U0C0)
FT2232D (USB to UART / JTAG Bridge) U203 EEPROM 93LC46B	 R214 R224 R223 R214 R210 R207	 connect / disconnect Receive RxD0 /BRKOUT (optional) /BRKIN (optional) connect / disconnect UART RxD For internal use only If ORG functionality is needed
Microcontroller XC2xxx Analog reference Voltage supply	 R220 / R221 R219 R212 / R229	 change of analog reference source change of voltage supply

Table 7 Zero Ohm Resistors

Component	Name in schematic	Description
JTAG X202		
	R225	/BRKIN (optional)
	R226	/BRKOUT (optional)
Status LED´s	R109	connect / disconnect LED´s to 5 V
Oscillator circuit	R117/R118	oscillator gain

6 Schematic





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