AP08070

XC886CM DriveCard

Hardware Description

Board Version 2007/37

Microcontrollers

Never stop thinking

Edition 2007-12

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XC886CM DriveCard

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Previous Version(s):
none

Page	Subjects (major changes since last revision)

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1 Overview

The XC886CM DriveCard was designed to be used in motor control systems. It provides all signals necessary to drive a power inverter including feedback signals.

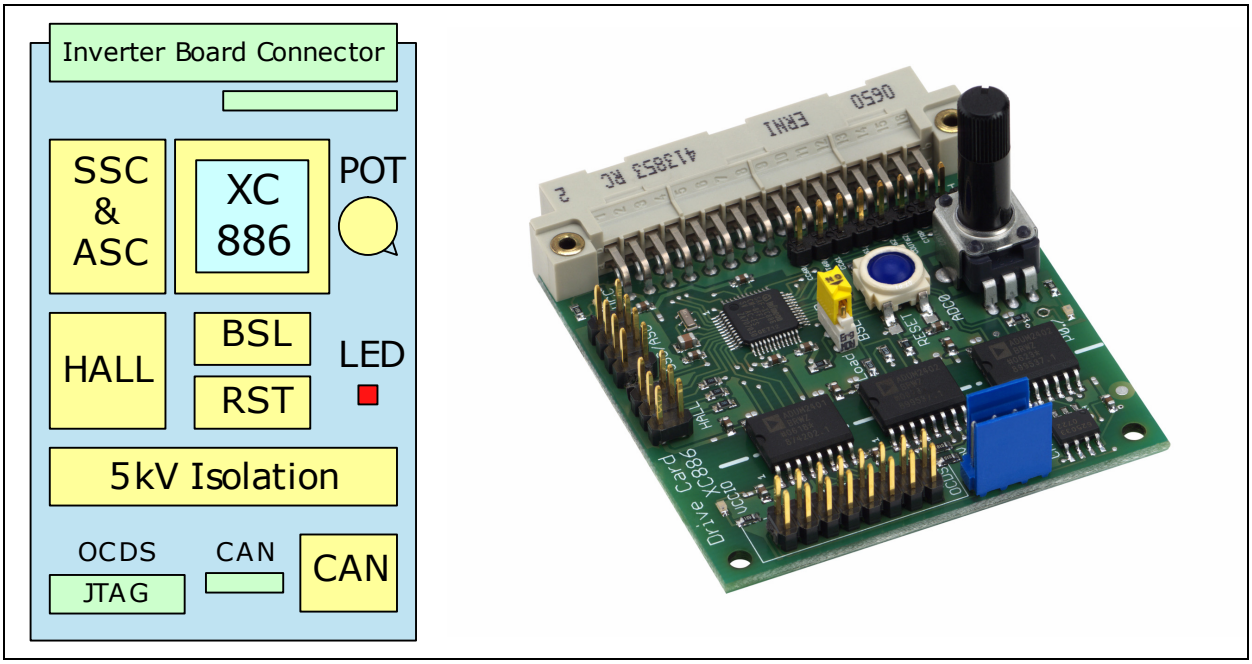

Figure 1 XC886CM DriveCard

This DriveCard, featuring the cost-effective 8-bit microcontroller XC886CM with 16-bit motor control performance, provides following interfaces:

- SSC: A synchronous serial interface like SPI
- ASC: An asynchronous serial interface based on UART protocol
- HALL: The hall interface can be used to directly connect hall sensors of a motor
- digital isolated JTAG: Programming and debugging interface
- digital isolated CAN: Controller Area Network e.g. for real-time monitoring and parameter setup
- User interface: A POT and a LED can be used as user interface in stand alone operation

The inverter board connector provides following signals:

- Six PWM channels for 3-phase motor control (CAPCOM6E)
- Shut down signal for PWM channels (CTRAP)
- Enable signal for power inverter
- Seven ADC channels for fast analog signals like DC-link current and phase voltages as well as slow signals like temperatures
- The power supply (5 V) for the drive card

1.1 Key Features of XC886CM for Motor Control Applications

- High performance 16-bit vector computer (CORDIC + MDU)
  - Vector rotation and transformations like Park and Clarke transformation
  - Normalizing and scaling
  - Interrupt based operation with minimum CPU load
- PWM unit for advanced motor control (CapCom6E)
  - 16-bit resolution for high precision space vector PWM generation
  - Dead time control for minimum hardware effort (direct control of MOSFET/IGBT)
  - CTRAP provides hardware overload protection
- A fast 10-bit A/D Converter
  - Hardware synchronization to PWM unit reduces CPU load
  - Eight ADC channels with a sample time of less than 200 ns
  - Four result registers to maximize sampling performance
  - Enables phase current reconstruction at single shunt current measurement
  - Fast ADC e.g. reduces torque ripple due to minimized blind angle in sensorless FOC

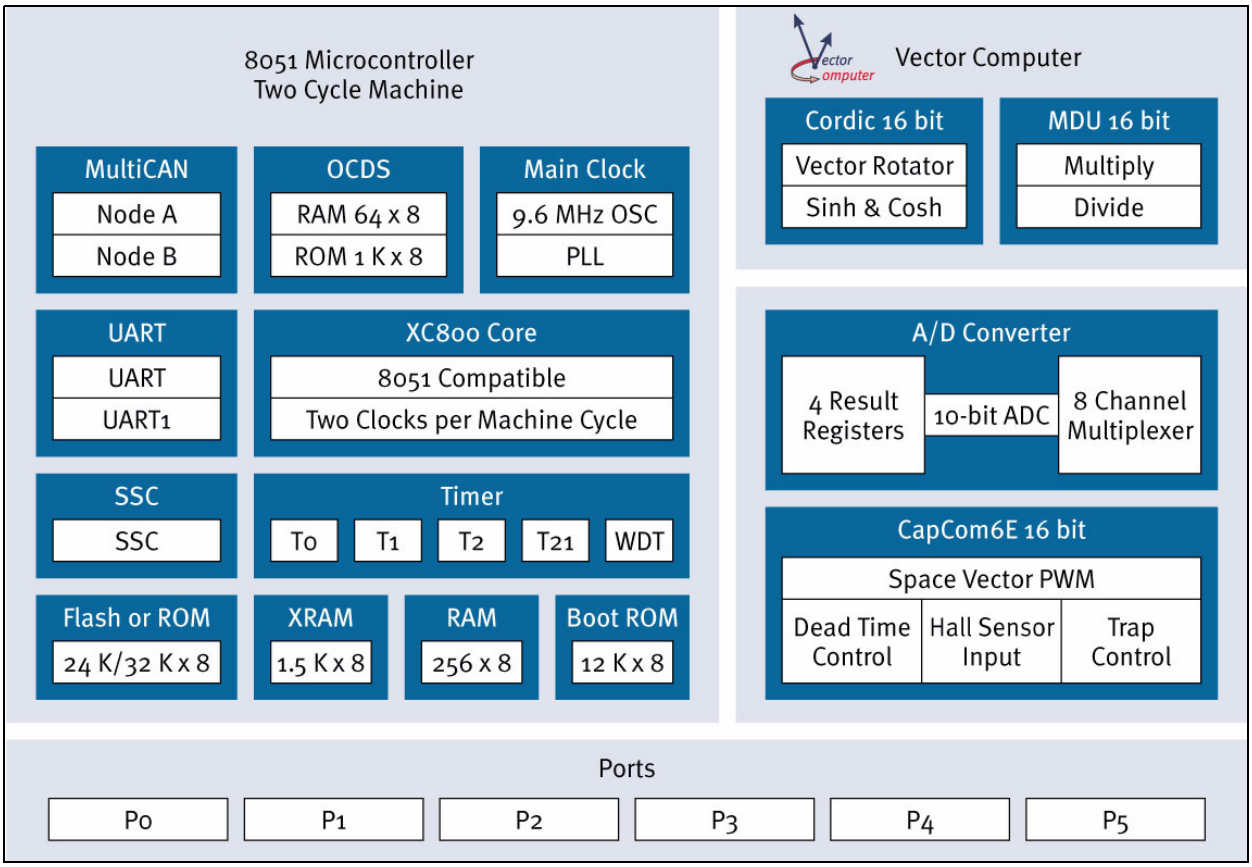

Figure 2 Block Diagram of XC886/8CM

2 Hardware Description

2.1 Power Supply

The XC886CM DriveCard is supplied by two power supply domains. The main supply (VCC) is fed from the inverter board connector (**Section 2.5**) and is connected to the MCU and all associated blocks. A second supply domain (VCCIO) exists for the digital isolation and the CAN transceiver. This can be provided via the CAN or the JTAG connector. Please refer to **Section 2.4** for details. Two LEDs indicate the presence of these supply voltages.

2.2 MCU

The microcontroller unit XC886CM is directly connected to the dedicated interfaces. Next to the integrated clock oscillator, an external resonator is available. A software download can be performed via JTAG or CAN. In case of CAN download, the switch BSL (Boot Strap Loader) has to be set to “load”. For normal operation the position “run” has to be selected. A reset button is available to trigger a hardware reset.

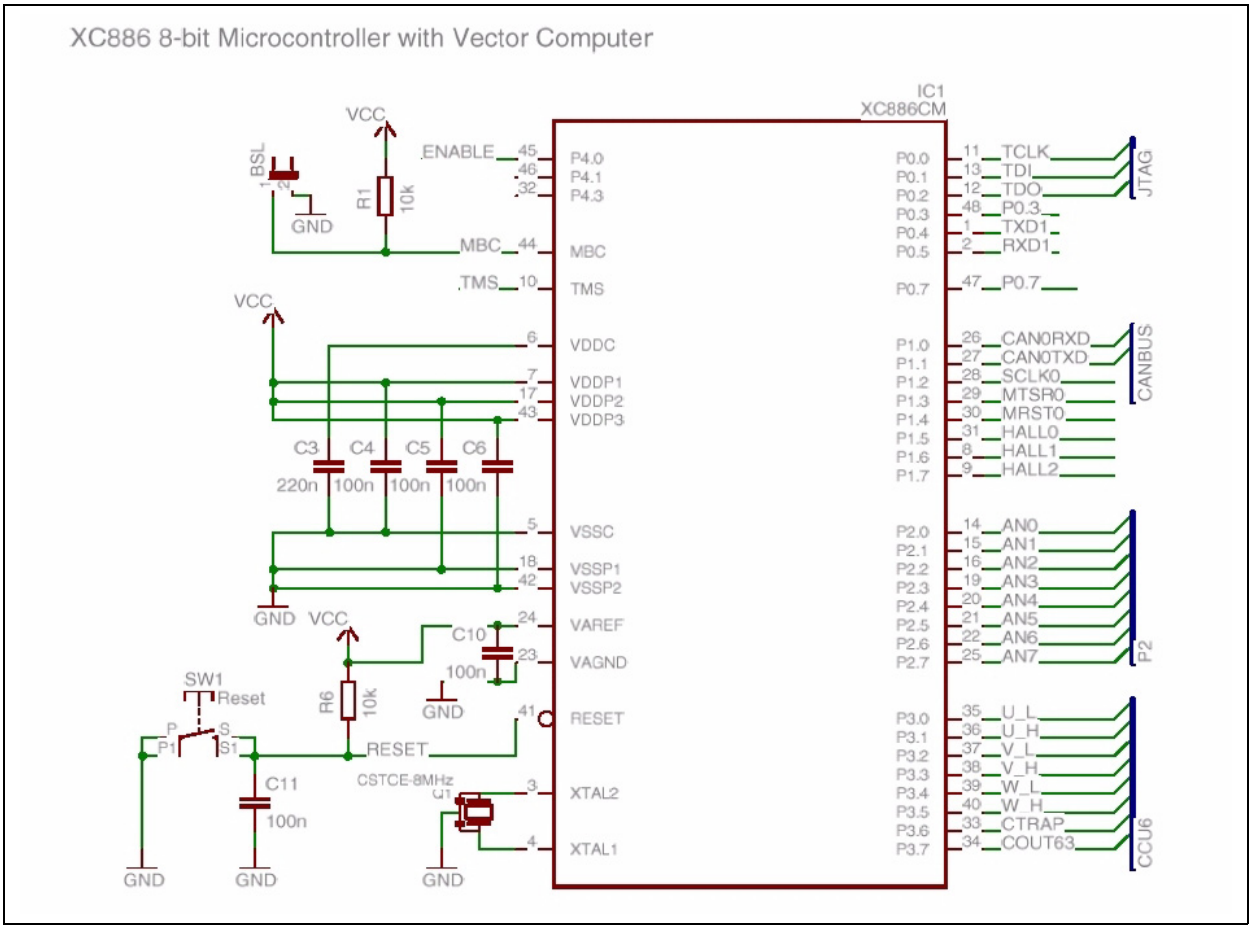

Figure 3 XC886CM

2.3 User Interface

There is a user interface available reflected by a pot and a LED. The pot is connected to ADC channel 0, the LED is connected to port 0.7. A test pad is connected to this port as well in order to measure fast signals at an oscilloscope.

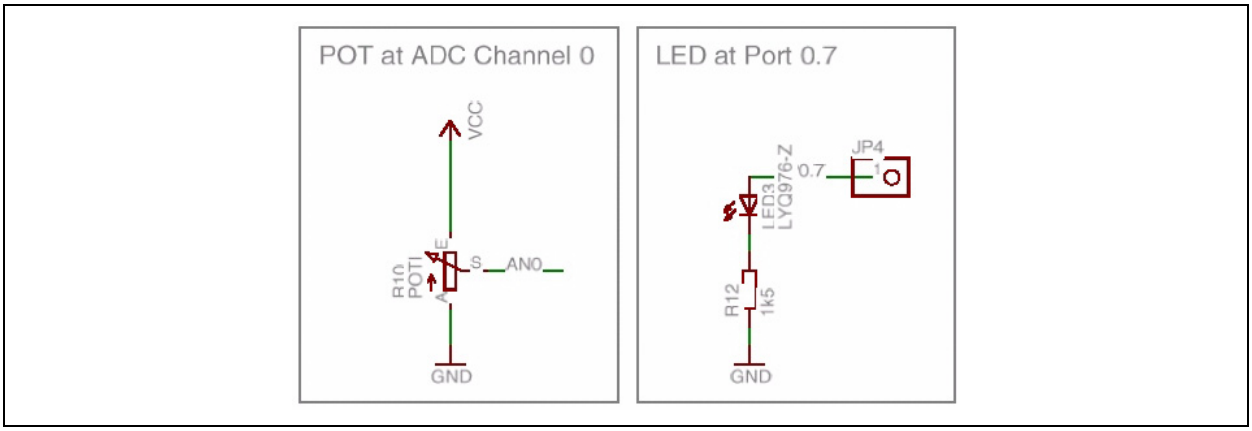

Figure 4 User interface: POT and LED

2.4 Digitally Isolated Debug Interface (JTAG and CAN)

The XC886CM DriveCard is equipped with a digital isolation for JTAG and CAN interface. The 5 kV digital isolation securely disconnects any debug and CAN devices from the high voltage levels. As there is a separate power domain for the PC part of the XC886CM DriveCard, a 5 V power supply must be provided separately at VCCIO and GNDIO. LED1 indicates the availability of this supply domain.

There is a DriveMonitor USB Stick available at Infineon Technologies that provides JTAG and CAN as well as the 5 V power supply in one device. Please refer to application note AP08071 for details.

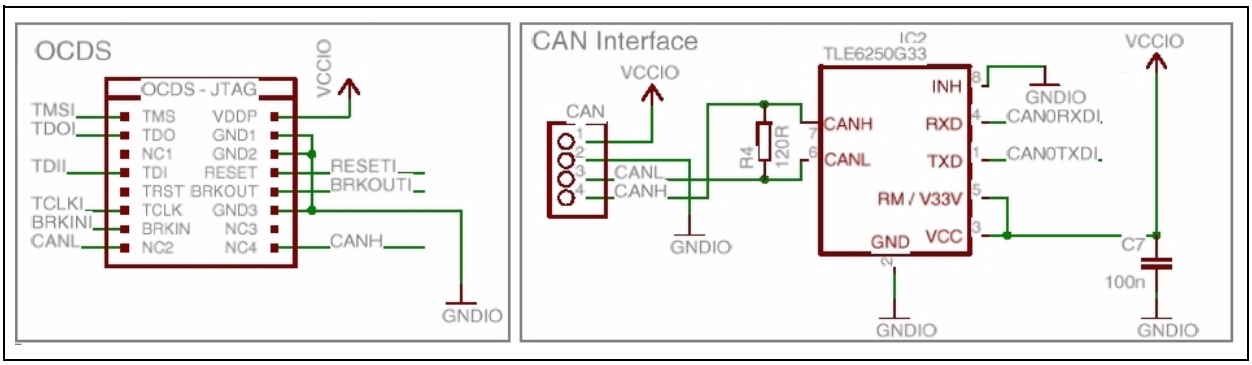

Figure 5 JTAG and CAN: Debugger and Real Time Monitoring Interface

Note: When a standard JTAG box is used, the VCCIO power supply must be provided at the CAN connector.

2.5 Inverter Board Connection

The standard 32-pin connector (DIN 41612, B/2) provides all signals needed for control of a 3-phase power inverter. The lowside (_L) and highside (_H) switches of the three power stages U, V and W are to be connected to the signals U_L, U_H, V_L, V_H, W_L and W_H. They are connected to the MCU's CAPCOM6E peripheral, a flexible and powerful PWM unit very well suited for motor control. A low signal at the CTRAP pin of the CAPCOM6E immediately switches all power stages in passive state and acts as an emergency shut-down for the inverter. All CAPCOM6E signals, including COUT63, are available at pin header JP1.

An enable signal for the power stages can be provided via signal ENABLE and is connected to the MCU's GPIO port 4.0.

ADC channel 0 is directly connected to a pot (see **Section 2.3**). All remaining ADC signals are connected to the inverter board connector. Using the XC886CM DriveCard in motor control applications, it is recommended to use the channels as follows: Channel 3&4 are used for DC link current measurement, channels 5 to 7 can be used for output voltage (e.g. BEMF detection) or phase current measurement, channel 1 is used to monitor DC link voltage, whereas channel 2 is reserved for auxiliary signals like temperature or analog control information.

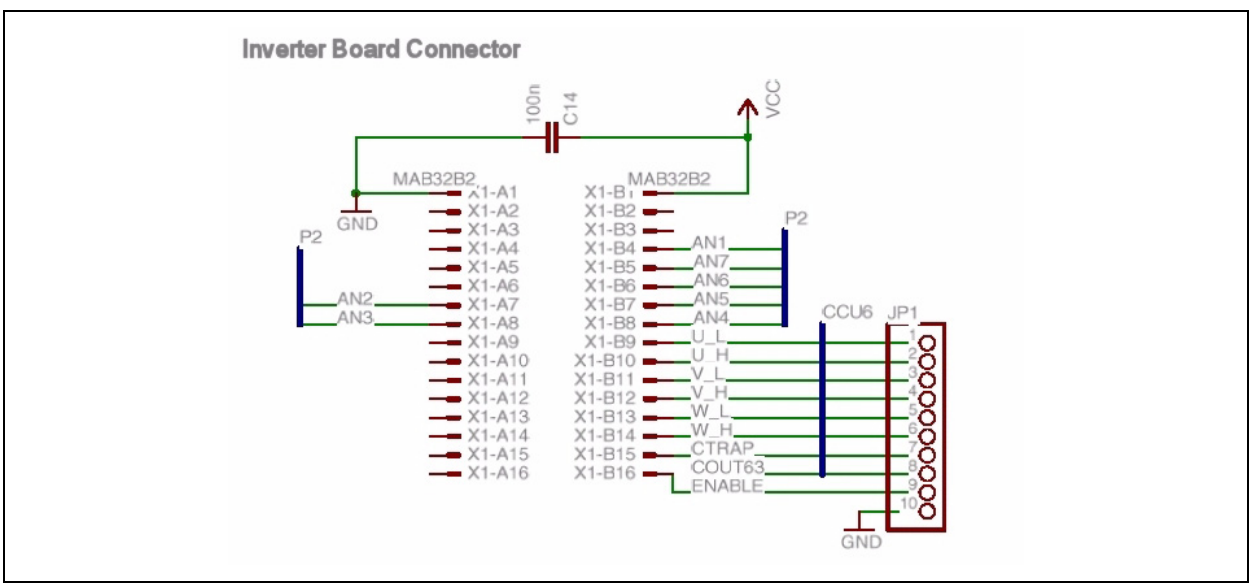

Figure 6 Inverter Board Connector

A 5 V power supply is expected at pins A1-B1 of the inverter board connector in order to supply the MCU and peripheral components.

2.6 Hall Sensor Interface

The MCU provides a HALL sensor interface which can be accessed via JP2. Next to the HALL signals that are pulled up to VCC = 5 V, the VCC and GND signals are available as well.

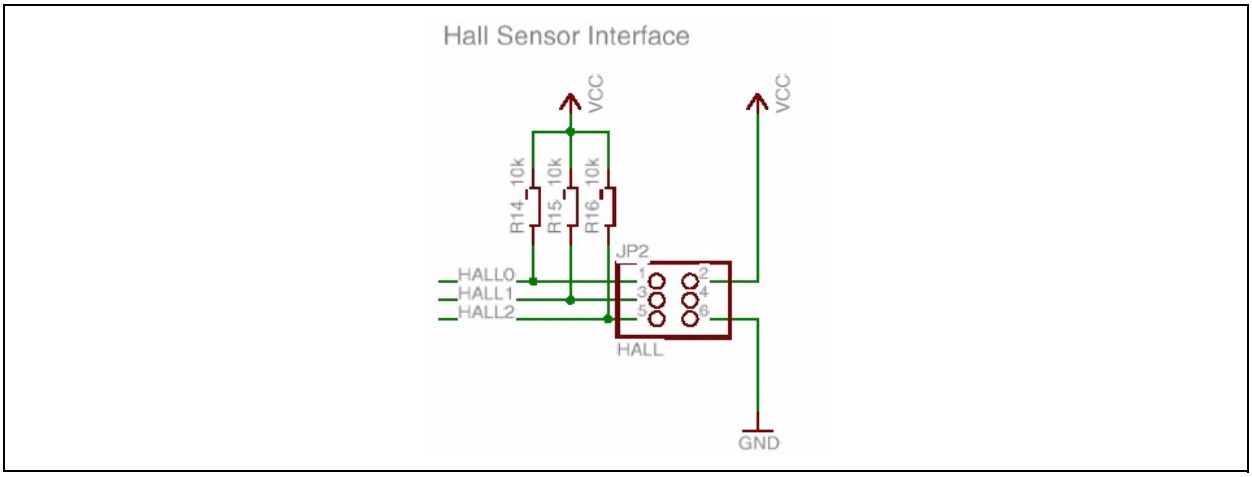

Figure 7 HALL Sensor Interface

2.7 SSC and ASC Interface

The SSC and ASC interface from the MCU are provided at JP3. These interfaces are connected directly to the MCU thus not isolated form the hot ground of the power inverter. The signals of JP3 can be mapped to GPIOs of the MCU as well.

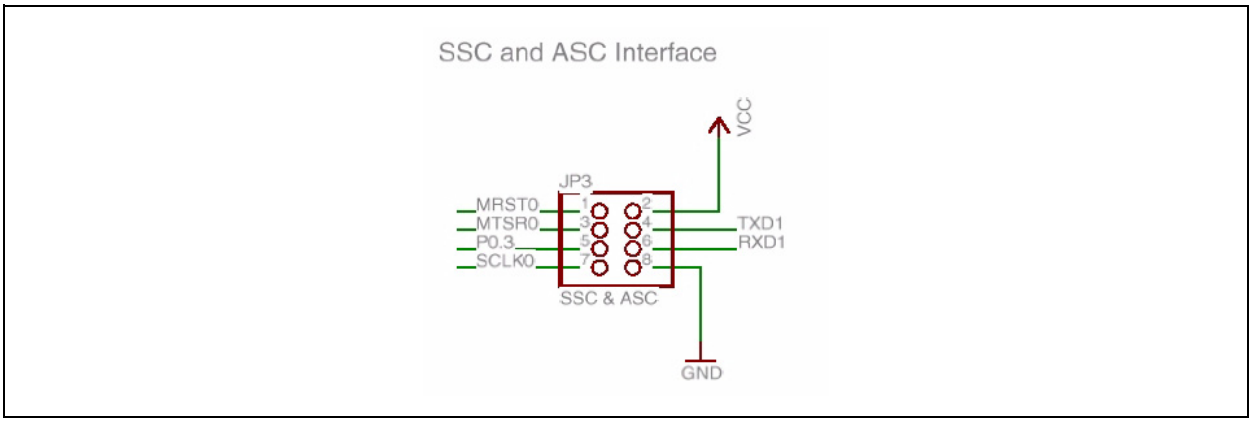

Figure 8 SSC and ASC Interface

2.8 PCB Layout

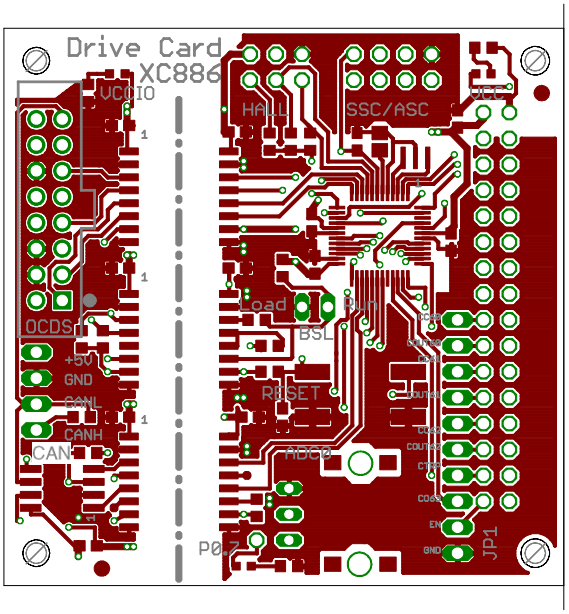

Figure 9 Top Layer + Text

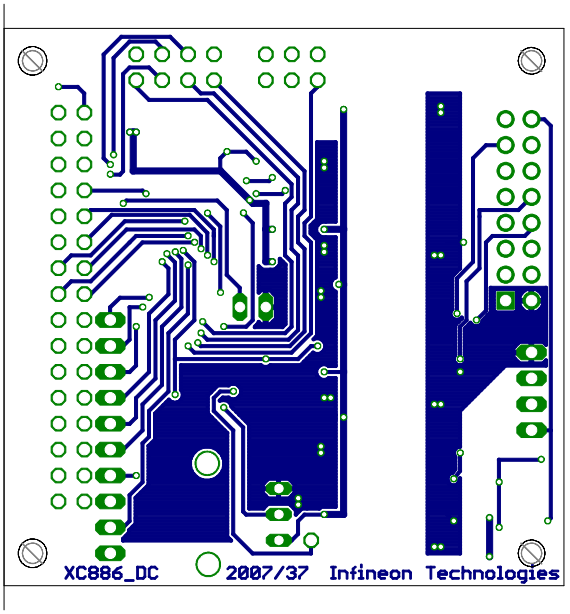

Figure 10 Bottom Layer

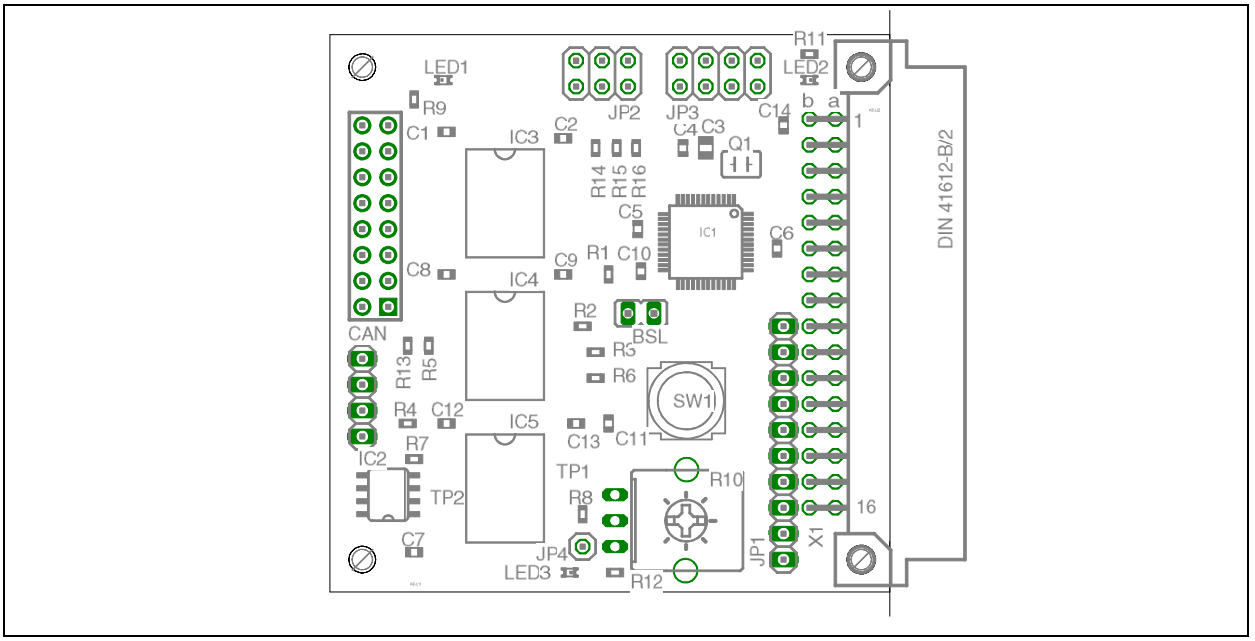

Figure 11 Placement of the Components

w w w . i n f i n e o n . c o m

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