Never stop thinking

XC2000 Family

AP16179

XC2236N Drive Card Description

Application Note

V1.0, 2010-07

Microcontrollers

Edition 2010-07

Published by
Infineon Technologies AG
81726 Munich, Germany

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Device1
Revision History: V1.0 2010-08

Previous Version(s): V0.0

Page	Subjects (major changes since last revision)
–	This is the first release …

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Table of Contents

1 Introduction

The Drive Card has been designed mainly for industrial applications. It is available for the XE166 family and the XC2000 family. This DriveCard supports XC2000 derivatives and as well all XE162 derivatives in a 64 Pin package. For simplicity reasons only XC2236N will be described in this document.

XC2000 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, XC2000 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 XC2000 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 XC2000 family web pages on the Infineon Internet.

http://www.infineon.com/XC2000

2 Overview

The XC2236N DriveCard has been designed for motor control systems. It provides all signals necessary to drive a power inverter including feedback signals.

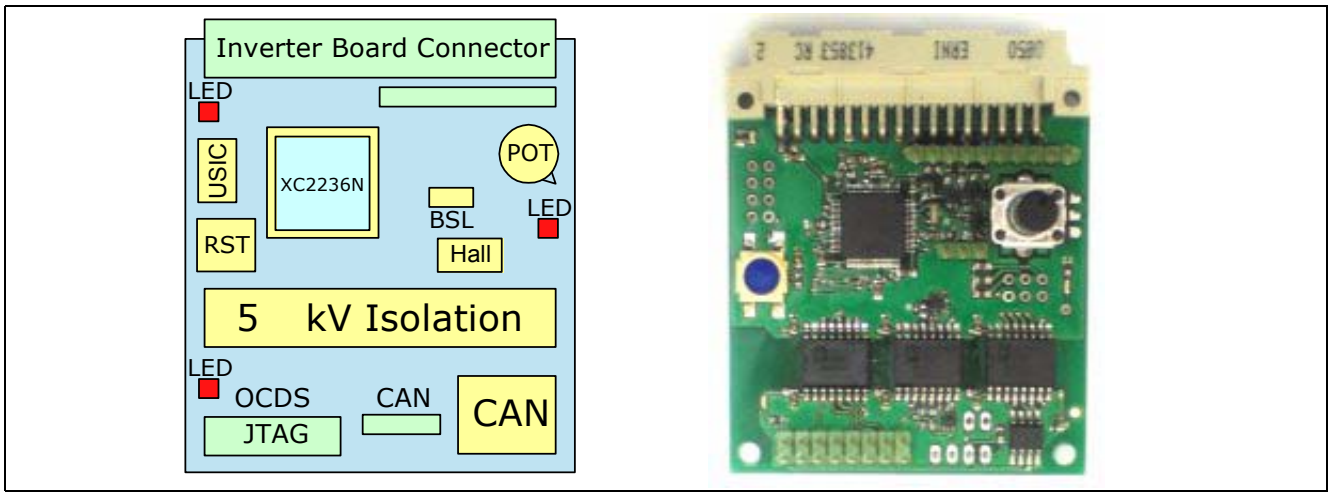


Figure 1 XC2236N DriveCard

This DriveCard, featuring the cost-effective 16-bit microcontroller XC2236N with 32-bit motor control performance, provides following interfaces:

- USIC ASC/SSC/IIC: A synchronous serial interface like SPI, UART interface or IIC
- One Hall Interface can be used to directly connect hall sensors of a motor
- One Encoder Interface to directly connect encoder signals 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
- Digital isolated UART: 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 the 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 such as DC-link current and phase voltages, as well as slow signals such as temperatures.
- Timer 3 output latch signal
- The power supply (5 V) for the drive card

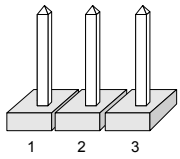
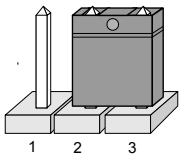
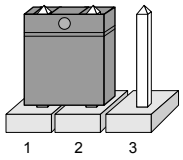
2.1 Drive Card Setup

Although most of the programmable features of the XC2000 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.

Jumper 8 is used to configure the startup setting of the XC2000 during RESET. The default System Startup Configuration is shown in Table 1 below. All Jumper positions are OFF. The XC2000 executes a standard start from internal Flash.

Table 1 Startup configuration

Name in schematic	Default configuration	Description
JP8		Startup configuration: Standard start from internal Flash (Default)
JP8		Startup configuration: Standard UART Bootloader mode *Note: For details about the UART Bootloader refer to the User Manual System Units.*
JP8		Startup configuration: CAN Bootloader mode *Note: For details about the CAN Bootloader refer to the User Manual System Units.*

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

3 Hardware Description

3.1 Power Supply

The XC2236N DriveCard is supplied by two power supply domains. The main supply (VCC) is fed from the inverter board connector (see **Chapter 3.5**) 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 **Chapter 3.4** for details. Two LEDs indicate the presence of these supply voltages.

3.2 XC2236N

The XC2236N microcontroller is directly connected to dedicated interfaces. Next to the integrated current trimmed oscillator, an external resonator with 8 Mhz is available. A software download can be performed via JTAG, UART or CAN. For a UART or CAN download, the dedicated BSL (Boot Strap Loader) has to be set (see **Chapter 2.1**). For normal operation, the Jumper must be 'off'. A reset button is available to trigger a hardware reset.

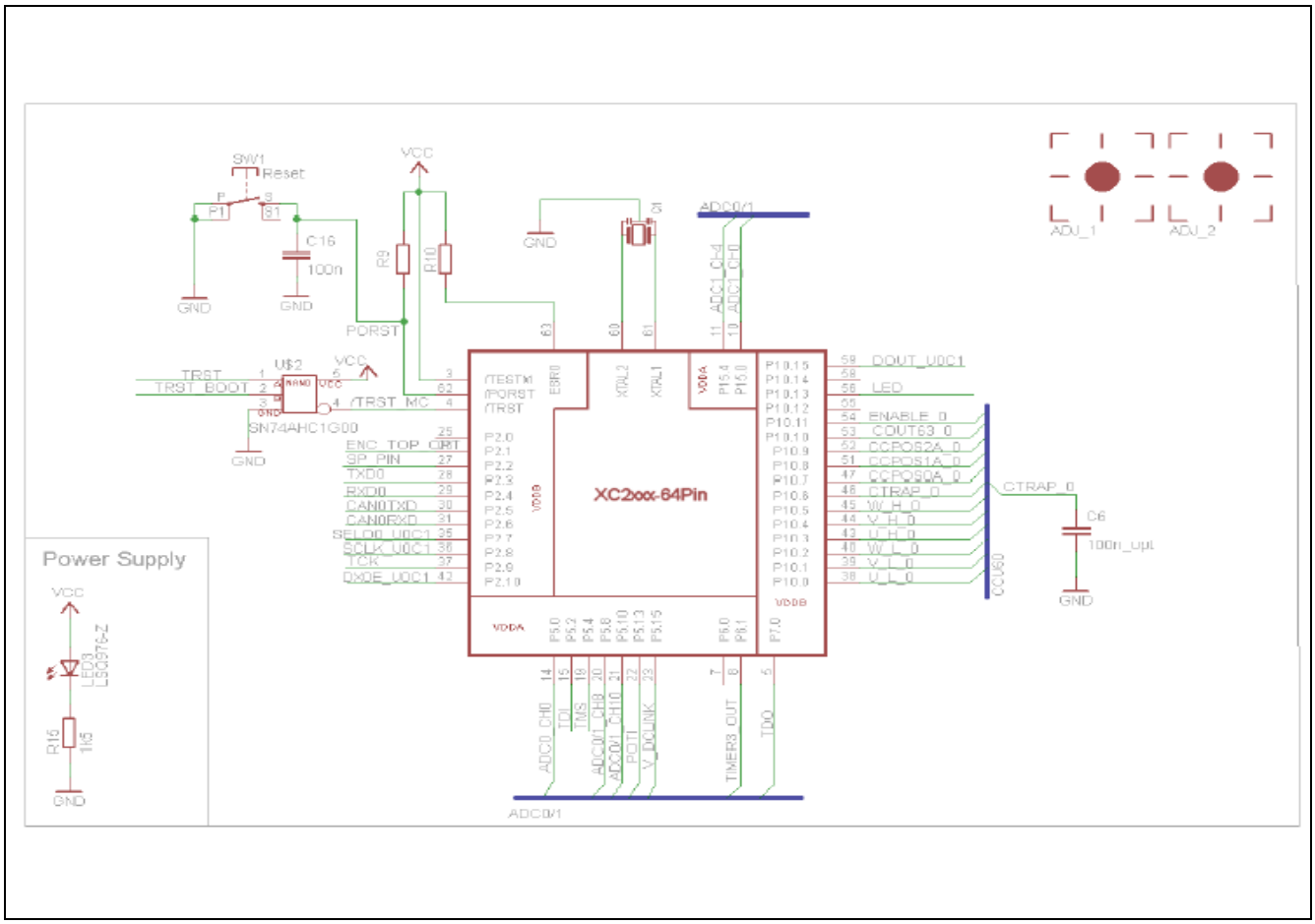


Figure 2 XC2236N

3.3 User Interface

There is a user interface available through a poti and a GPIO LED. The poti is connected to ADC0 channel 13, the LED is connected to port 10.13. A test pad is connected to this port as well in order to measure fast signals at an oscilloscope.

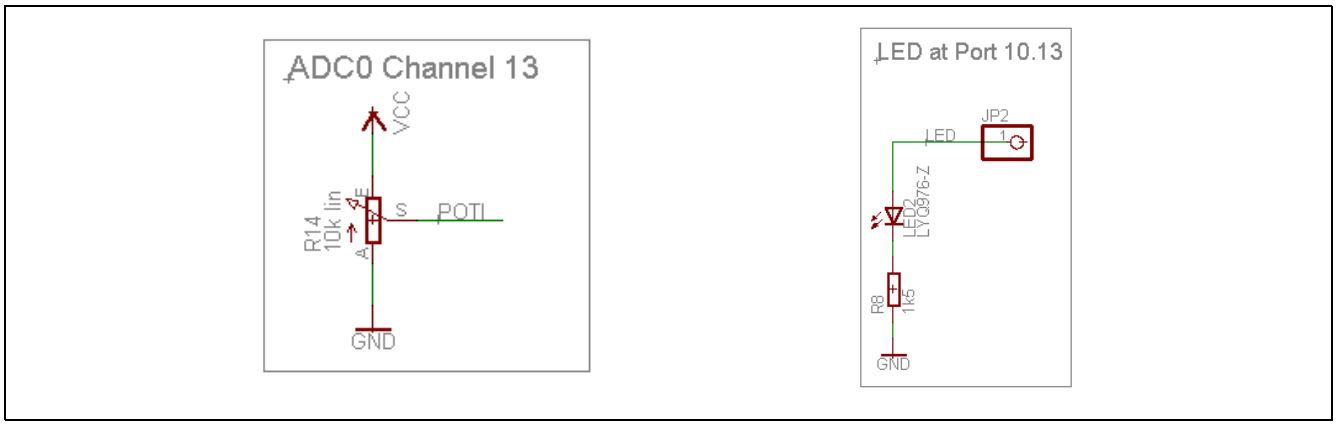


Figure 3 User Interface: POTi and LED

3.4 Digitally Isolated Debug Interface (JTAG, UART and CAN)

The XC2236N DriveCard is equipped with a digital isolation for JTAG, UART and the CAN interface. The 5 kV digital isolation, mainly designed for industrial applications, securely disconnects any debug, UART and CAN devices from the high voltage levels. As there is a separate power domain for the PC part of the XC2236N 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 from 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.

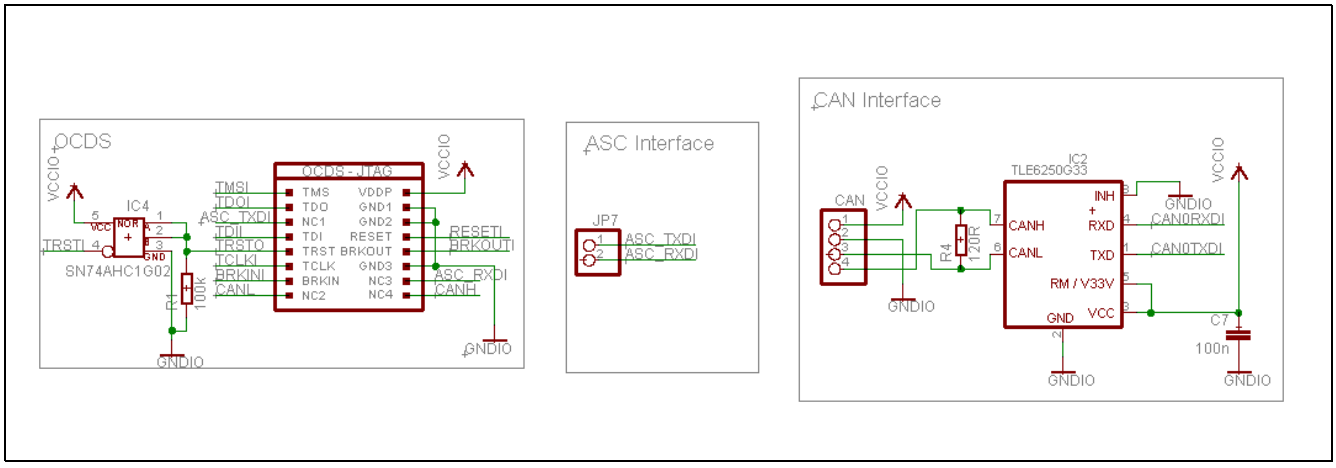


Figure 4 JTAG, UART and CAN: Debugger and Real Time Monitoring Interface

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

3.5 Inverter Board Connection

The standard 32-pin connector (DIN 41612, B/2) provides all signals needed for control of the 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 CCU60, flexible and powerful PWM unit very well suited for motor control. A low signal at the CTRAP pins 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 for CCU60

An enable signal for the power stages can be provided via signal ENABLE Signals which are connected to the MCU's GPIO port 10.11.

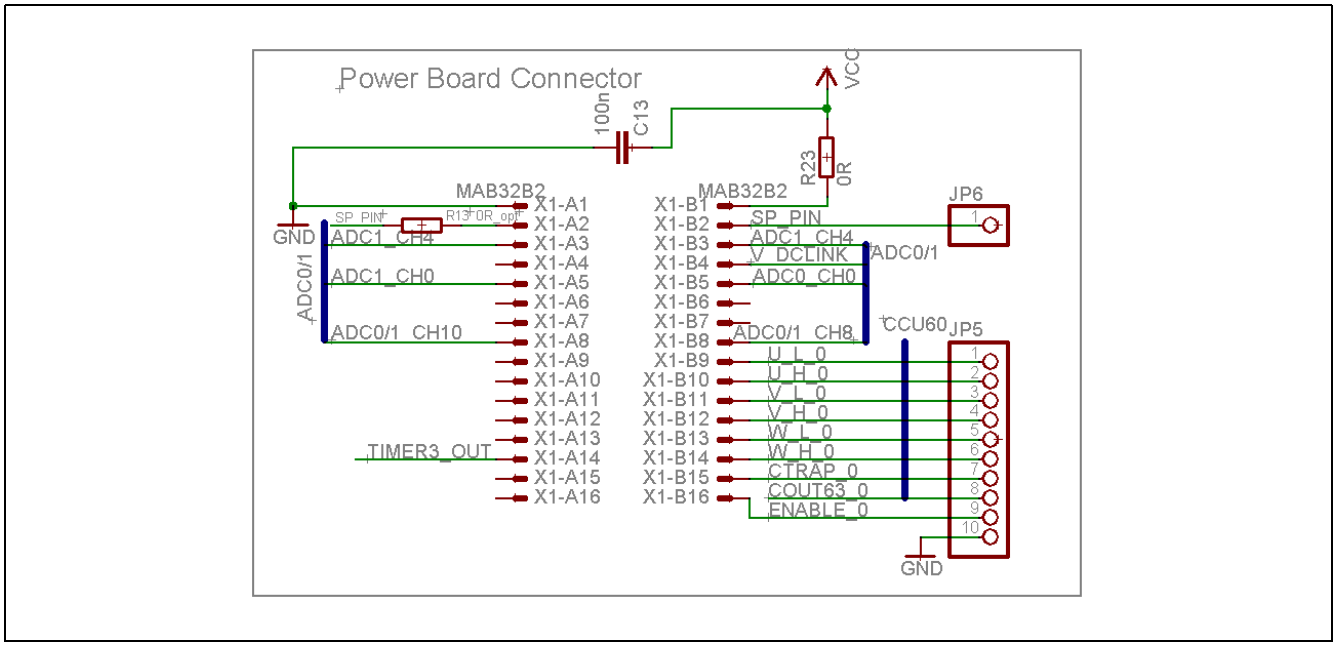


Figure 5 Power Board Connector

A 5 V power supply is expected at pins A1 and B1 of the inverter board connector in order to supply the MCU and peripheral components. A resistor and capacitor is placed near the connector to filter the power supply noise coming from the inverter board. The resistor R23 is soldered with a 0R and can be replaced if necessary with a other value or a ferrite bead.

3.6 Hall Sensor and Encoder Interfaces

The MCU provides a HALL sensor interfaces which can be accessed via JP4. Next to the HALL signals that are pulled up to VCC = 5 V, the VCC and GND signals are available as well

The Encodeer Signals ENC_A and ENC_B are conected to the Timer 3 input. T3 operates in incremental interface mode automatically providing information on the sensor's current position. These pins are overlayed with the CCPOS1A and CCPOS2A pins.

In incremental interface mode, the two inputs associated with core timer T3 (T3IN, T3EUD) are used to interface to an incremental encoder. T3 is clocked by each transition on one or both of the external input pins to provide 2-fold or 4-fold resolution of the encoder input.

The Encoder_Top signal is connected to pin 2.1. With the ERU unit this pin can act like an external Interrupt request pin.

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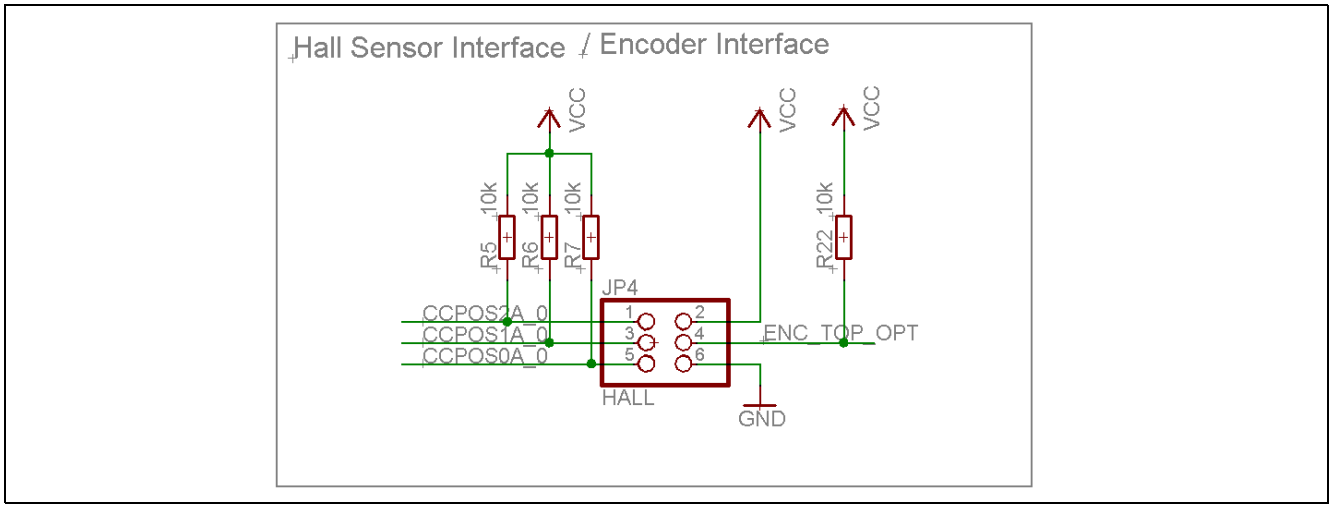

Figure 6 Hall Sensor Interfaces

3.7 USIC Interface

The USIC0 Channel1 signals from the MCU are provided at JP7. This interface is connected directly to the MCU , and is therefore not isolated form the hot ground of the power inverter. The Interface can be used as ASC or SSC. The signals of JP7 can be mapped to GPIOs of the XC2236N as well.

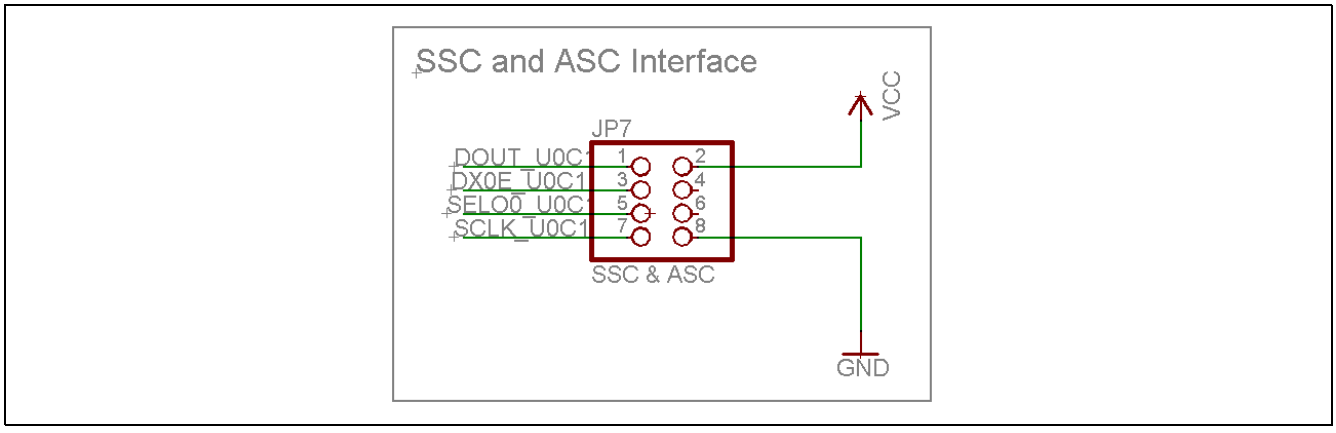

Figure 7 USIC Interface (SSC, ASC)

4 PCB Layout

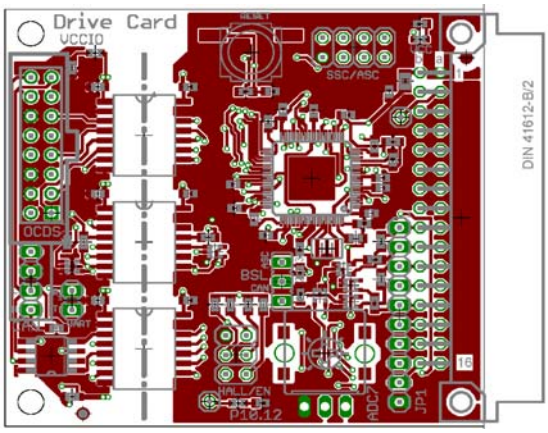

Figure 8 Top view and Text

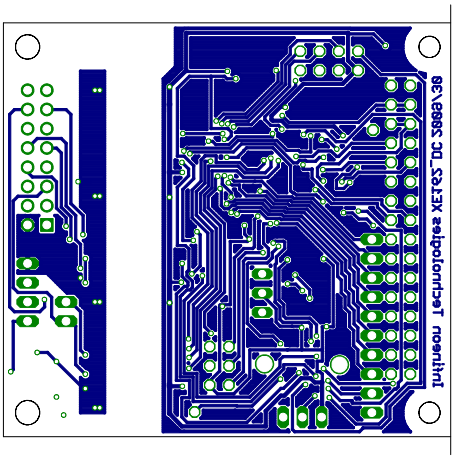

Figure 9 Bottom view

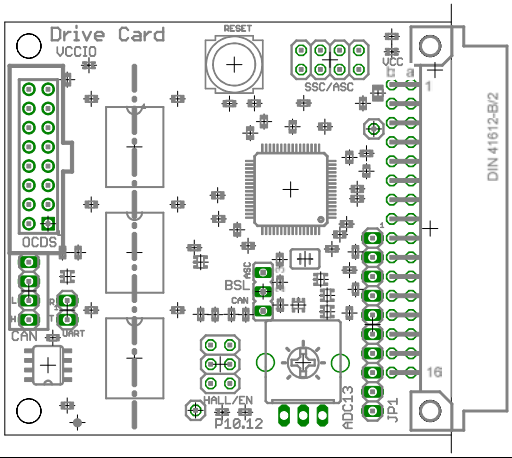

Figure 10 Solder view

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

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