

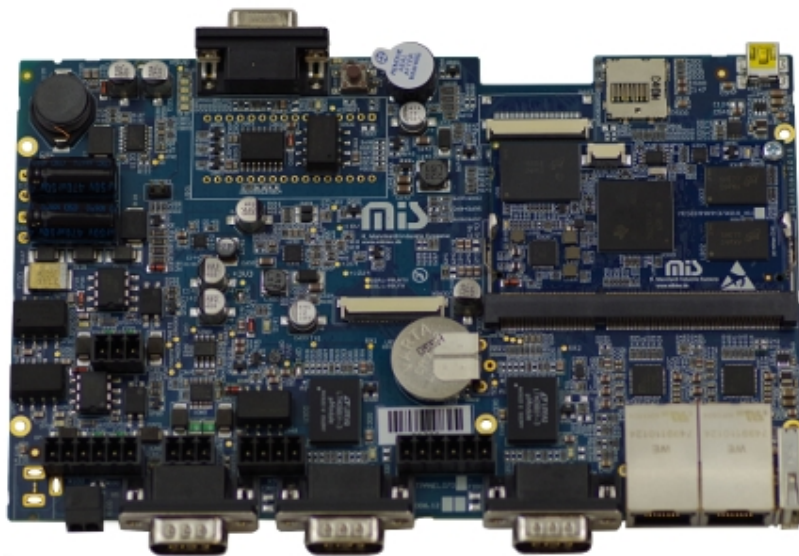


MIS R. Mannhardt Industrie Systeme

Datasheet

TPANEL070X006 Design Kit & Evaluation Module

Baseboard for the MIS-DIMM-AM437X (TI Sitara AM437x)



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Lohwiese 7
Scheuring
86937
Germany
Phone: +49 8195 998400 200
Fax: +49 8195 998400 222

I . Document Revision History:

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1.0	2015/12/09	Nep	released	released version
1.1	2016/02/19	Nep	released	corrections

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1 . About the TPANEL070X006

1.1 Overview

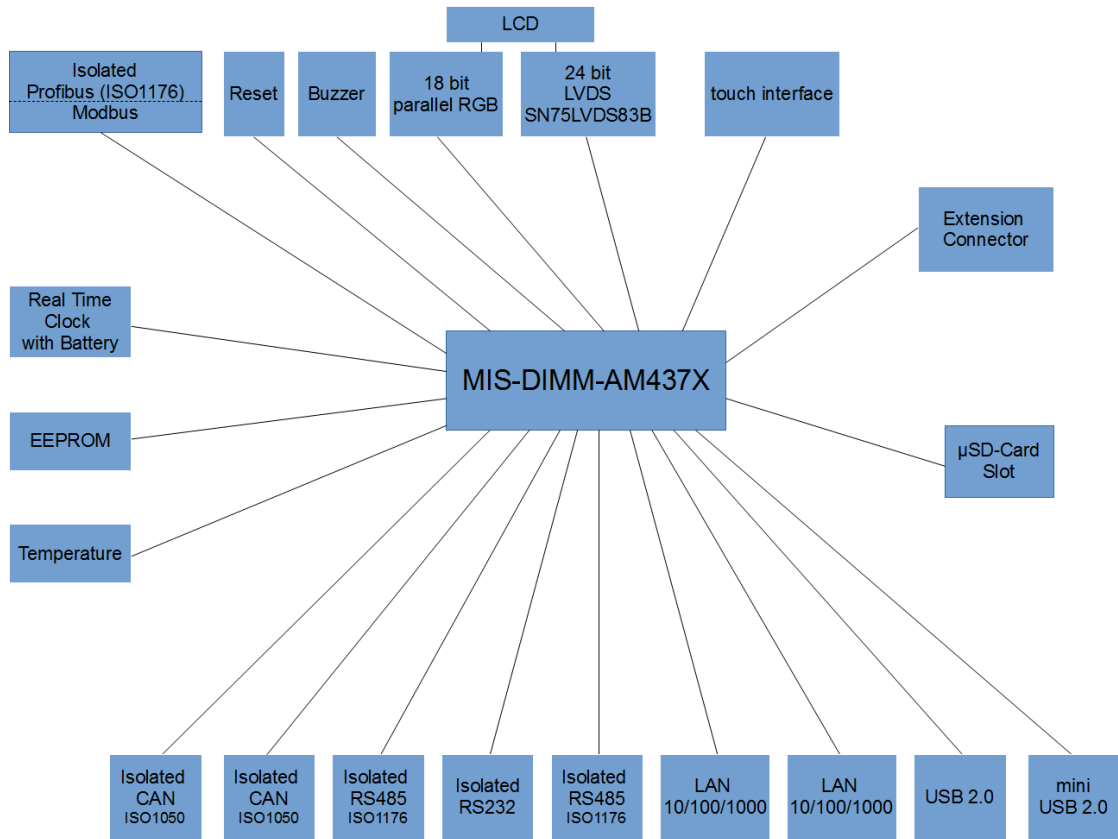
The TPANEL070X006 from MIS a high performance, easy-to-use baseboard built around the powerful Sitara AM437x (usable with the MIS-DIMM-AM437X). The TPANEL070X006 is ready for different displays and touch panels up to 17 inches. Its full compatibility with Linux and Android transforms the TPANEL070X006 in a powerful development tool for a variety of applications. Last but not least a huge amount of interfaces and expansion possibilities will inspire you.

1.2 TPANEL070X006 Features Summary

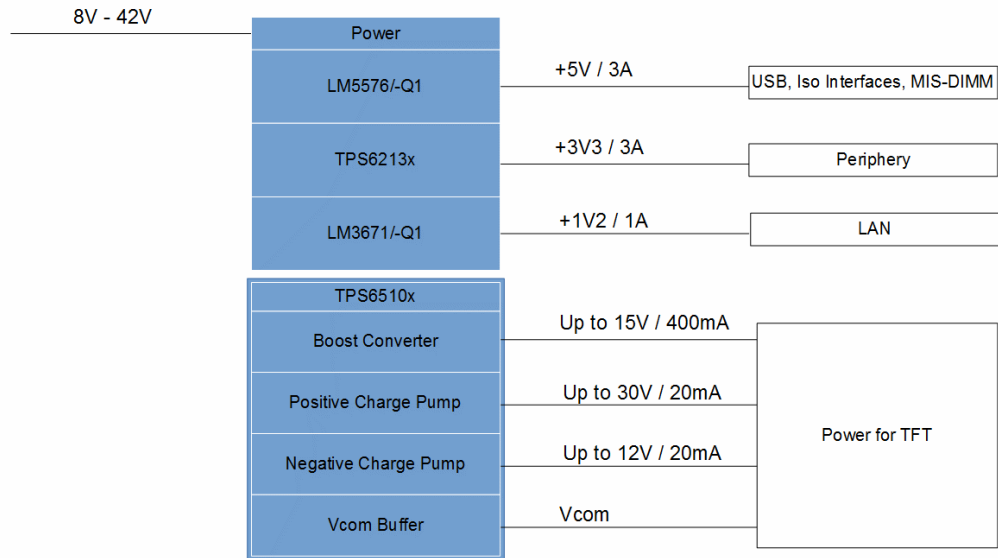
- 18 bit RGB, 24 bit LVDS
- resistive and capacitive touch panel
- 2x Gigabit-Ethernet
- 2x isolated CAN
- 2x isolated RS485
- 2x I2C
- SPI
- 16x ADC
- McASP
- isolated RS232
- 4x UART
- 2x USB 2.0
- Ethercat/Profinet/Profibus.
- micro SD card up to 64 GB
- wide voltage range of 8V to 42V
- low power consumption of maximum 9W

2 . Block Diagram

2.1 TPANEL070X006



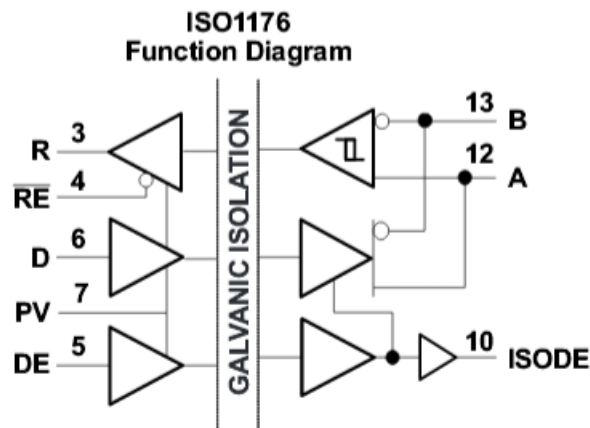
2.2 Power management



3 . Main Components

3.1 ISO1176 Isolated RS-485 Profibus Transceiver

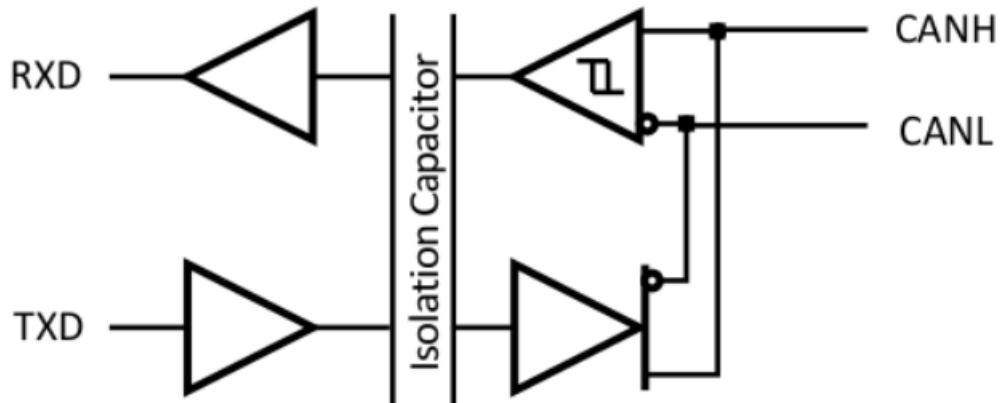
- Meets or Exceeds the Requirements of EN50170 and TIA/EIA-485-A
- Signal Rates up to 40 Mbps
- Differential Output Exceeds 2.1 V (54Ω Load)
- Low Bus Capacitance – 10pF (Maximum)
- Up to 160 Transceivers on a Bus
- 50kV/μs Typical Transient Immunity
- Fail-Safe Receiver for Bus Open, Short, Idle
- 3.3-V Inputs are 5-V Tolerant
- Bus-Pin ESD Protection
 - 16-kV HBM Between Bus Pins and GND2
 - 6-kV HBM Between Bus Pins and GND1
- Safety and Regulatory Approvals
 - 4000-VPK Isolation, 560-VPK VIORM per DIN V VDE V 0884-10 (VDE V 0884-10): 2006-12 and DIN EN 61010-1
 - 2500 VRMS Isolation Rating per UL 1577
 - 4000 VPK Isolation Rating per CSA CA5A and IEC 60950-1



3.2 ISO1050 Isolated CAN Transceiver

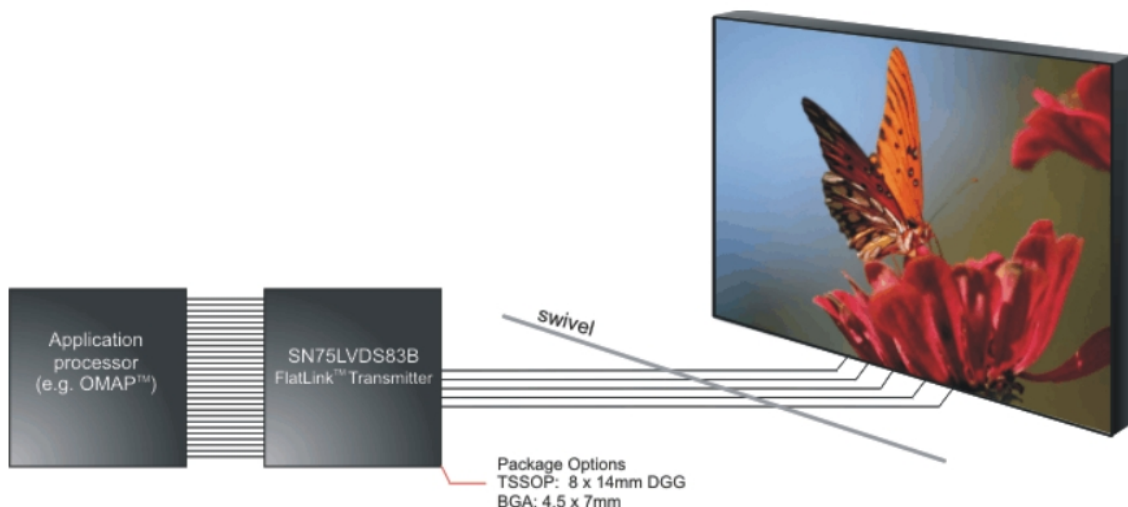
- Meets the Requirements of ISO11898-2
- 5000-VRMS Isolation (ISO1050DW)
- 2500-VRMS Isolation (ISO1050DUB)
- Fail-Safe Outputs
- Low Loop Delay: 150 ns (Typical), 210 ns (Maximum)
- 50-kV/μs Typical Transient Immunity
- Bus-Fault Protection of –27 V to 40 V
- Driver (TXD) Dominant Time-out Function
- I/O Voltage Range Supports 3.3-V and 5-V Microprocessors
- VDE Approval per DIN V VDE V 0884-10 (VDE V 0884-10):2006-12 and DIN EN 61010-1
- UL 1577 Approved
- CSA Approved for IEC 60950-1, IEC 61010-1, IEC 60601-1 3rd Ed (Medical) and Component Acceptance Notice 5A
- TUV 5-KVRMS Reinforced Insulation Approval for EN/UL/CSA 60950-1 (ISO1050DW-Only)
- CQC Reinforced Insulation per GB4843.1-2011 (ISO1050DW-Only)
- Typical 25-Year Life at Rated Working Voltage (see Application Report [SLLA197](#) and [Figure 30](#))

Simplified Schematic



3.3 SN75LVDS83B FlatLink 10-135MHz Transmitter

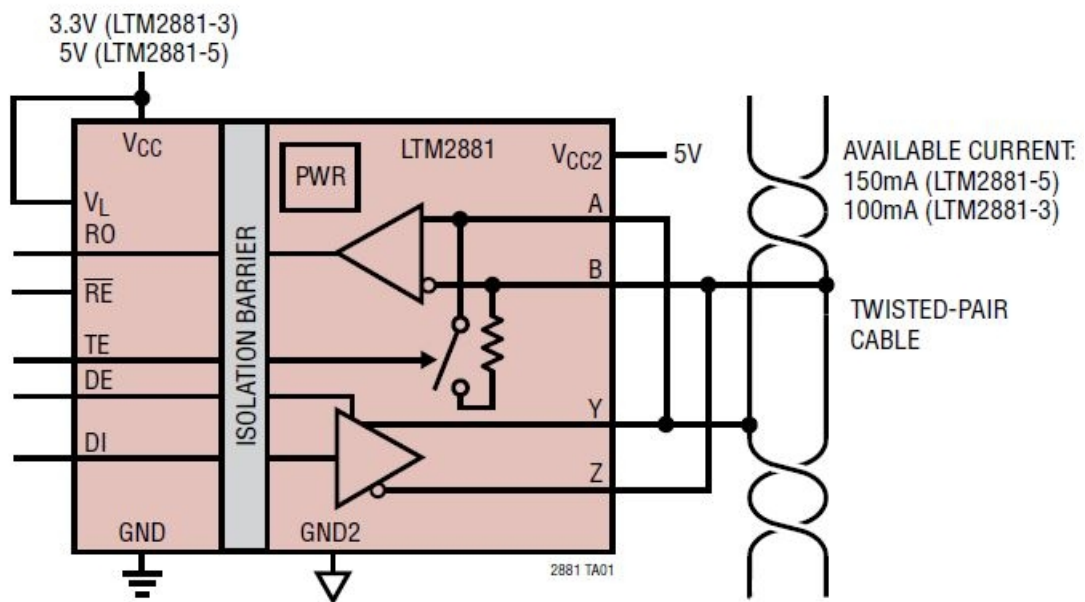
- LVDS Display Series Interfaces Directly to LCD Display Panels With Integrated LVDS
- Package Options: 4.5-mm x 7-mm BGA, and 8.1-mm x 14-mm TSSOP
- 1.8-V Up to 3.3-V Tolerant Data Inputs to Connect Directly to Low-Power, Low-Voltage Application and Graphic Processors
- Transfer Rate up to 135 Mpps (Mega Pixel Per Second); Pixel Clock Frequency Range 10 MHz to 135 MHz
- Suited for Display Resolutions Ranging From HVGA up to HD With Low EMI
- Operates From a Single 3.3-V Supply and 170 mW (Typ.) at 75 MHz
- 28 Data Channels Plus Clock in Low-Voltage TTL to 4 Data Channels Plus Clock Out Low-Voltage Differential
- Consumes Less Than 1 mW When Disabled
- Selectable Rising or Falling Clock Edge Triggered Inputs
- ESD: 5-kV HBM
- Support Spread Spectrum Clocking (SSC)
- Compatible with all OMAP™ 2x, OMAP™ 3x, and DaVinci™ Application Processors



3.4 Linear LTM2881 Isolated RS485/RS422

- RS485/RS422 Transceiver: 2500VRMS for 1 Minute
- UL Recognized File #E151738
- Isolated DC Power: 5V at Up to 200mA
- No External Components Required
- 20Mbps or Low EMI 250kbps Data Rate
- High ESD: $\pm 15\text{kV}$ HBM on Transceiver Interface
- High Common Mode Transient Immunity: $30\text{kV}/\mu\text{s}$
- Integrated Selectable 120Ω Termination
- 3.3V (LTM2881-3) or 5.0V (LTM2881-5) Operation
- 1.62V to 5.5V Logic Supply Pin for Flexible Digital Interface
- Maximum Continuous Working Voltage: 560VPEAK
- High Input Impedance Failsafe RS485 Receiver
- Current Limited Drivers and Thermal Shutdown
- Compatible with TIA/EIA-485-A and PROFIBUS
- High Impedance Output During Internal Fault Condition
- Low Current Shutdown Mode ($< 10\mu\text{A}$)
- General Purpose CMOS Isolated Channel

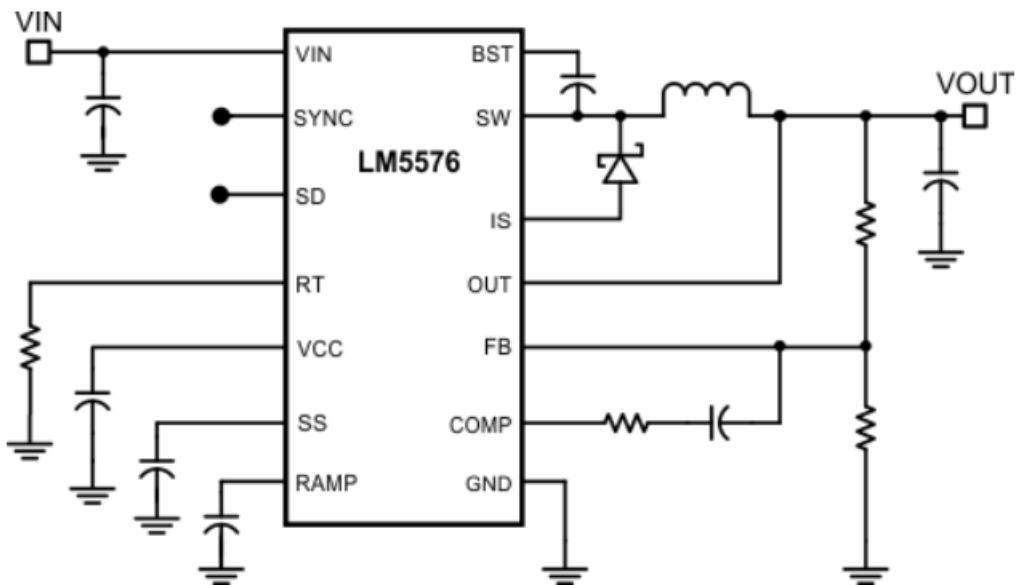
Isolated Half-Duplex RS485 μ Module Transceiver



3.5 LM5576 SIMPLE SWITCHER® 6V to 75V, 3A

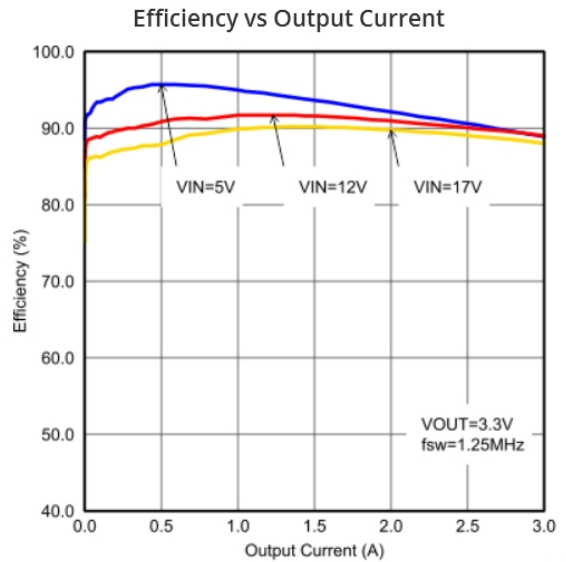
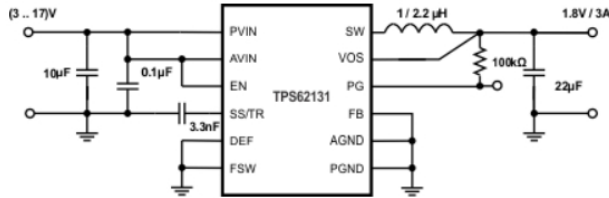
- LM5576-Q1 is an Automotive Grade Product that is AEC-Q100 grade 1 Qualified (-40°C to $+125^{\circ}\text{C}$ Operating Junction Temperature) and AEC-Q100 Grade 0 Qualified (-40°C to $+150^{\circ}\text{C}$ Operating Junction Temperature)
- Integrated 75 V, 170 m Ω N-channel MOSFET
- Ultra-Wide Input Voltage Range from 6 V to 75 V
- Adjustable Output Voltage as Low as 1.225 V
- 1.5% (Q1) and 1.65% (Q0) Feedback Reference Accuracy
- Operating Frequency Adjustable Between 50 kHz and 500 kHz with Single Resistor
- Master or Slave Frequency Synchronization
- Adjustable Soft-Start
- Emulated Current Mode Control Architecture
- Wide Bandwidth Error Amplifier
- Built-in Protection
- HTSSOP-20EP (Exposed Pad)

Simplified Application Schematic



3.6 TPS6213x 3V-17V 3A Step-Down Converter

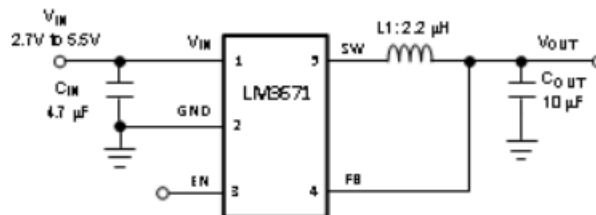
- DCS-Control™ Topology
- Input Voltage Range: 3 to 17V
- Up to 3A Output Current
- Adjustable Output Voltage from 0.9 to 6V
- Pin-Selectable Output Voltage (nominal, + 5%)
- Programmable Soft Start and Tracking
- Seamless Power Save Mode Transition
- Quiescent Current of 17 μA (typ.)
- Selectable Operating Frequency
- Power Good Output
- 100% Duty Cycle Mode
- Short Circuit Protection
- Over Temperature Protection
- Available in a 3 × 3 mm, QFN-16 Package



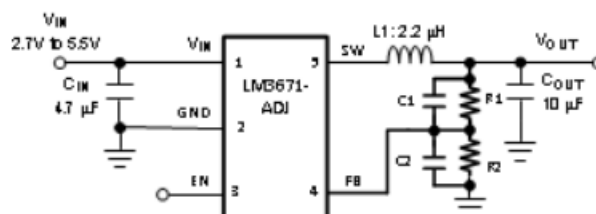
3.7 LM3671/-Q1 2-MHz, 600-mA Step-Down DC-DC Converter

- 16- μ A Typical Quiescent Current
- 600-mA Maximum Load Capability
- 2-MHz PWM Fixed Switching Frequency (Typ.)
- Automatic PFM/PWM Mode Switching
- Internal Synchronous Rectification for High Efficiency
- Internal Soft Start
- 0.01- μ A Typical Shutdown Current
- Operates from a Single Li-Ion Cell Battery
- Only Three Tiny Surface-Mount External Components Required (One Inductor, Two Ceramic Capacitors)
- Current Overload and Thermal Shutdown Protection
- Available in Fixed Output Voltages and Adjustable Version
- LM3671-Q1 is an AEC-Q100 Grade 1 Qualified Automotive Grade Product

Typical Application Circuit: Fixed-Voltage



Typical Application Circuit: ADJ



3.8 TPS65100 (ACTIVE)

- 2.7-V to 5.8-V Input Voltage Range
- 1.6-MHz Fixed Switching Frequency
- 3 Independent Adjustable Outputs
- Main Output of up to 15 V With < 1% Output Voltage Accuracy
- Virtual Synchronous Converter Technology
- Negative Regulated Charge Pump Driver Vo2
- Positive Charge Pump Converter Vo3
- Integrated VCOM Buffer
- Auxiliary 3.3-V Linear Regulator Controller
- Internal Soft Start
- Internal Power-On Sequencing
- Fault Detection of all Outputs (TPS65100/05)
- No Fault Detection (TPS65101)
- Thermal Shutdown

3.9 Memory

3.9.1 EEPROM

The TPANEL070 is supplemented with 256 kb EEPROM memory.

3.9.2 microSD

The TPANEL070 is usable with up to 64GB of microSD Card storage.

3.10 Ethernet

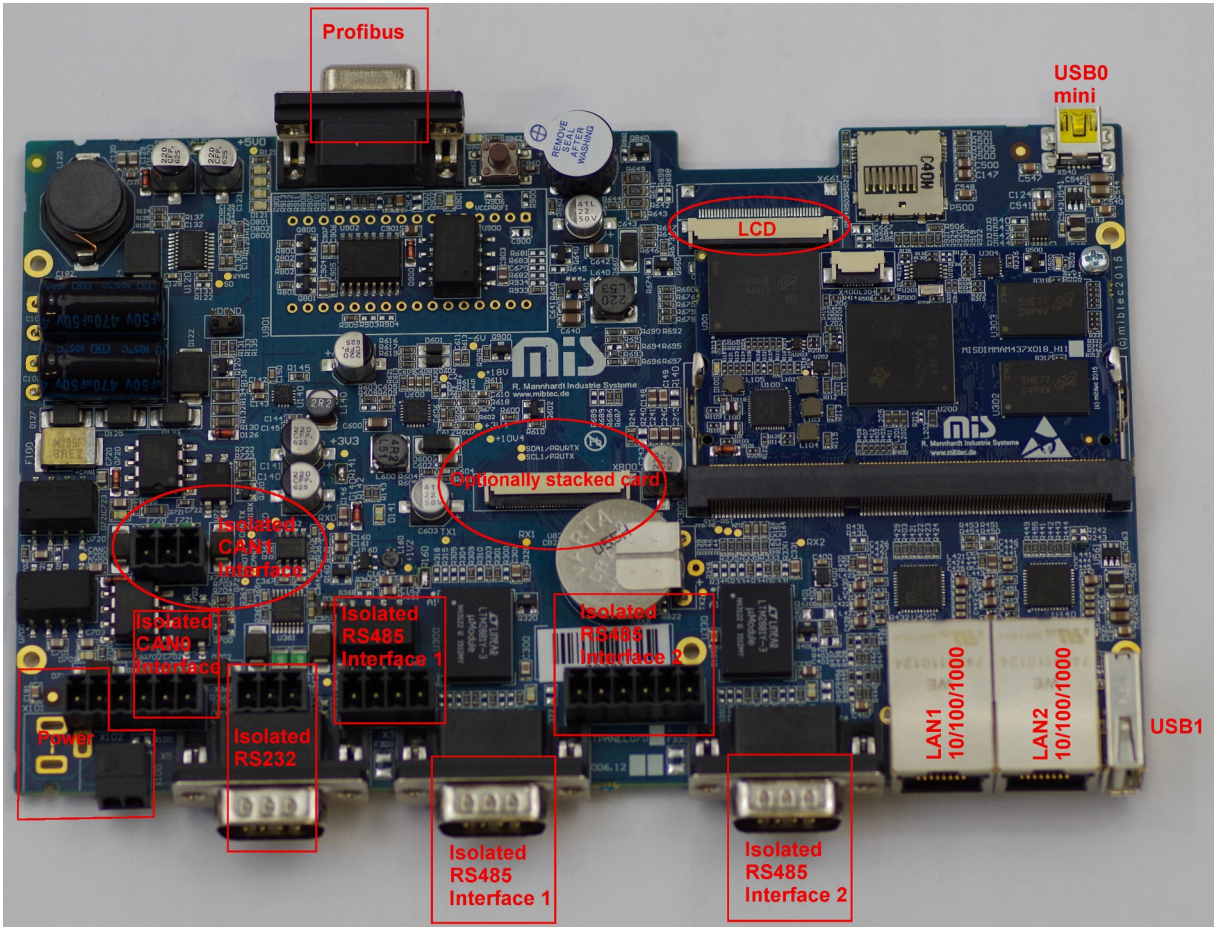
The TPANEL070 uses the two Industrial Gigabit Ethernet MACs (10, 100, and 1000 Mbps) interfaces of the Texas Instruments Sitara™ AM437x ARM® Cortex™ -A9 CPU.

3.11 Audio

The TPANEL070 uses the Multichannel Audio Serial Port (McASP) of the Texas Instruments Sitara™ AM437x ARM® Cortex™ -A9 CPU.

4 . External Connectors

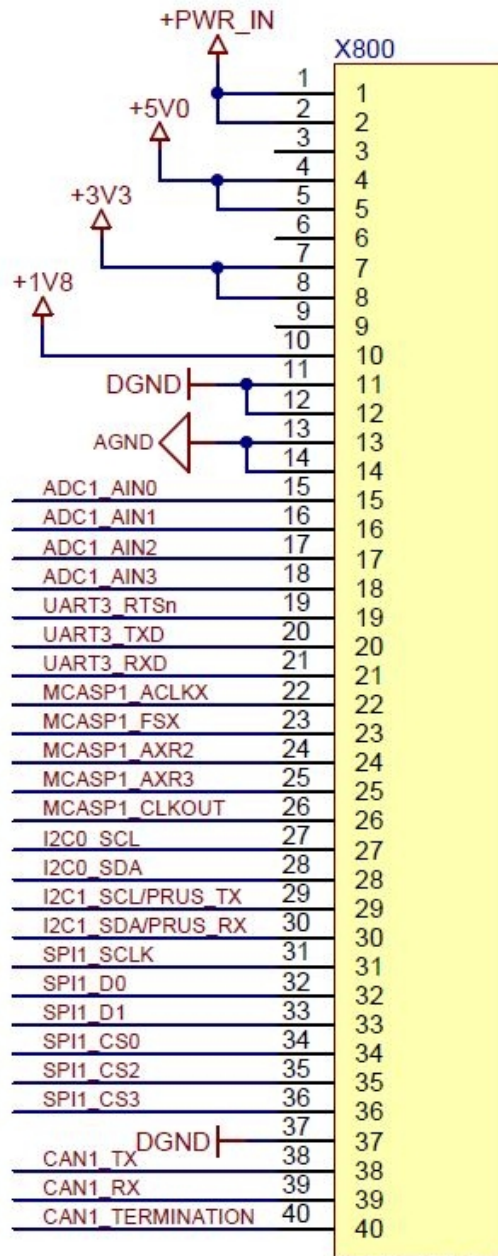
4.1 Overview



4.2 Optionally stacked card

The TPANEL070X006 can be upgraded with an optionally stacked card.

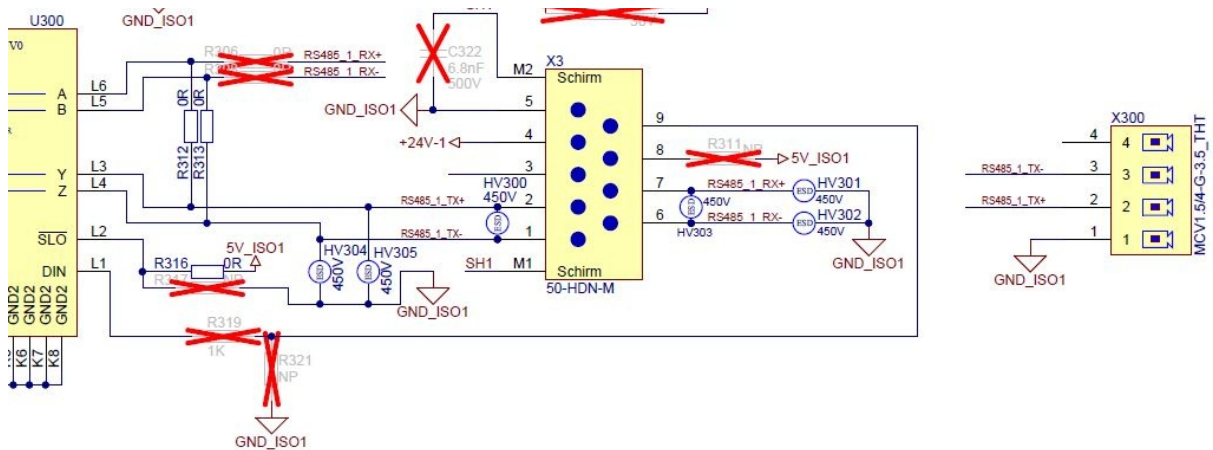
OPTIONALLY STACKED CARD



4.3 Isolated RS485 Interface 1

Depending on the expansion stage there are two different connection options for RS485. D-Sub 9P or Fixed Terminal Blocks 3.5mm 4P (Phoenix contact).

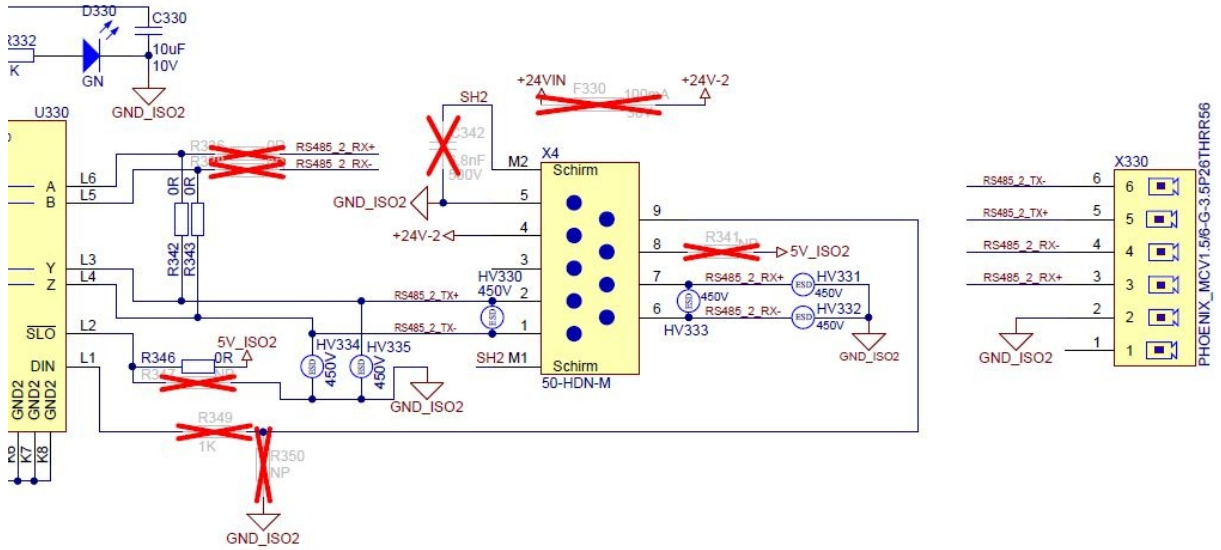
PIN No.	D-Sub	Fixed Terminal Blocks
1	RS485 1 TX -	GND
2	RS485 1 TX +	RS485 1 TX +
3	-	RS485 1 TX -
4	optionally +24V output	-
5	GND	-
6	optionally RX - for RS422 1	-
7	optionally RX + for RS422 1	-
8	optionally +5V isolated output	-
9	optionally isolated digital input	-



4.4 Isolated RS485 Interface 2

Depending on the expansion stage there are two different connection options for RS485. D-Sub 9P or Fixed Terminal Blocks 3.5mm 6P (Phoenix contact).

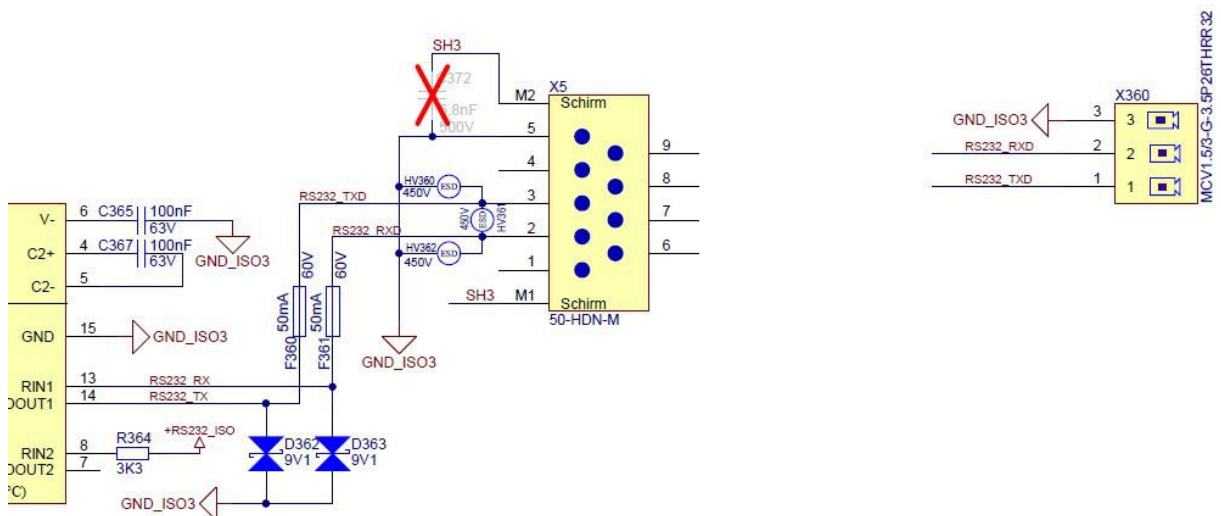
PIN No.	D-Sub	Fixed Terminal Blocks
1	RS485 2 TX -	-
2	RS485 2 TX +	GND
3	-	RS485 2 RX +
4	optionally +24V output	RS485 2 RX -
5	GND	RS485 2 TX +
6	optionally RX - for RS422 2	RS485 2 TX -
7	optionally RX + for RS422 2	-
8	optionally +5V isolated output	-
9	optionally isolated digital input	-



4.5 Isolated RS232

Depending on the expansion stage there are two different connection options for RS485. D-Sub 9P or Fixed Terminal Blocks 3.5mm 3P (Phoenix contact).

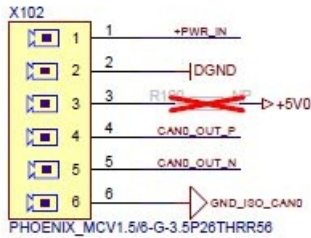
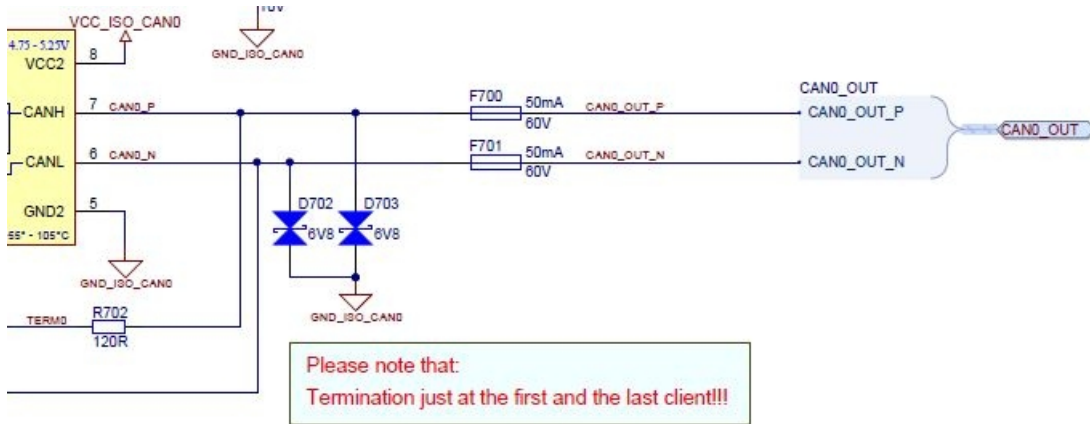
PIN No.	D-Sub	Fixed Terminal Blocks
1	-	RS232_TXD
2	RS232_RXD	RS232_RXD
3	RS232_TXD	GND
4	-	-
5	GND	-
6	-	-
7	-	-
8	-	-
9	-	-



4.6 Isolated CAN0 Interface

The CAN0 Interface is located at X102 (also depending on the expansion stage) Pin 4- 6.

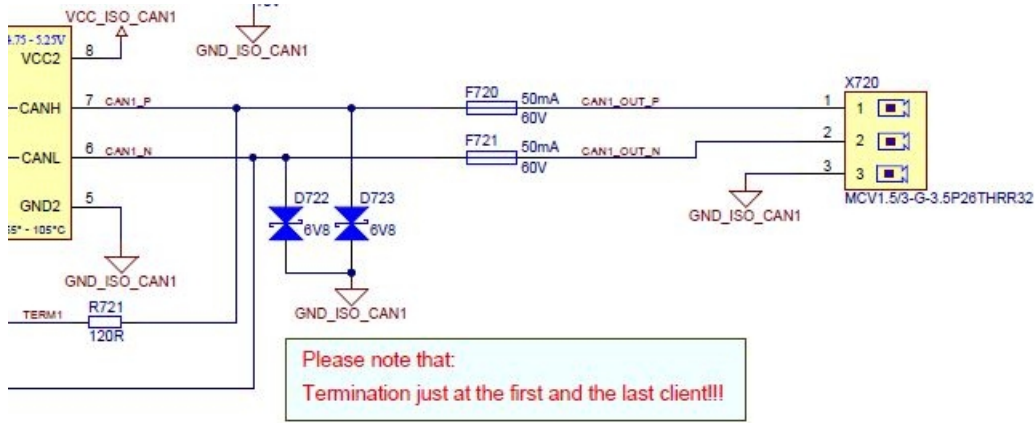
PIN No.	Fixed Terminal Blocks
4	CAN0 High
5	CAN0 Low
6	GND



4.7 Isolated CAN1 Interface

The CAN1 Interface is located at X720 (also depending on the expansion stage).

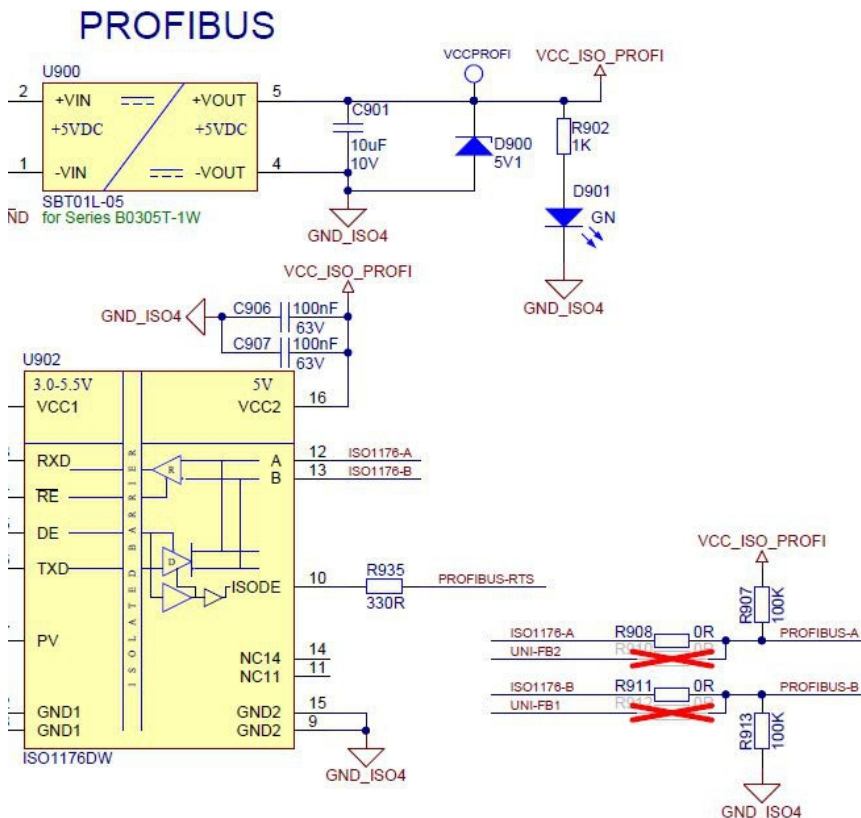
PIN No.	Fixed Terminal Blocks
1	CAN1 High
2	CAN1 Low
3	GND

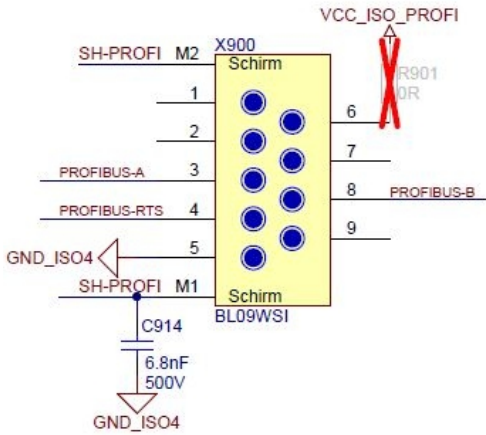


4.8 Profibus

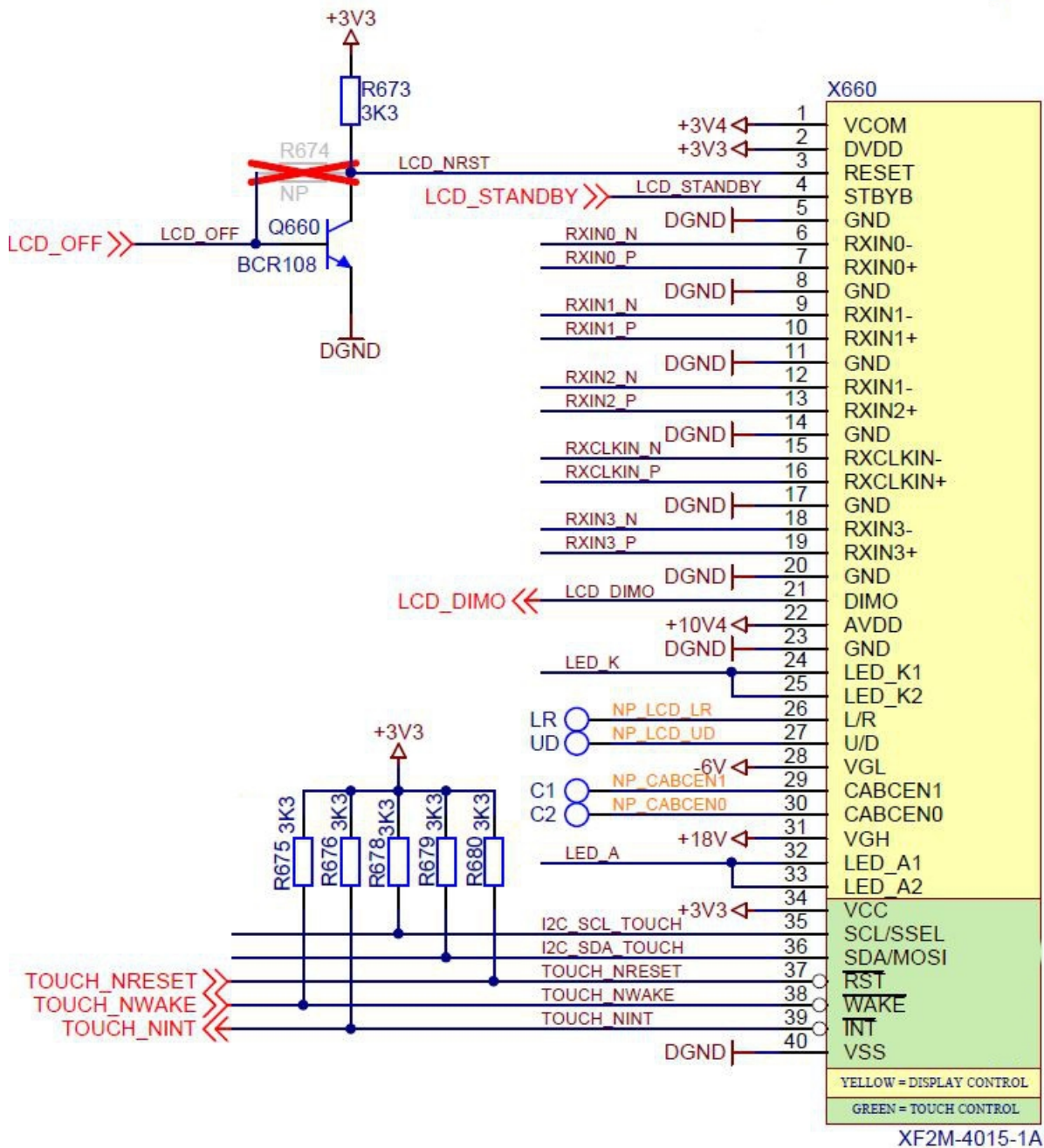
The Profibus Interface is located at X900 (also depending on the expansion stage).

PIN No.	D-Sub
1	-
2	-
3	Profibus-A
4	Profibus-RTS
5	GND
6	-
7	-
8	Profibus-B
9	-





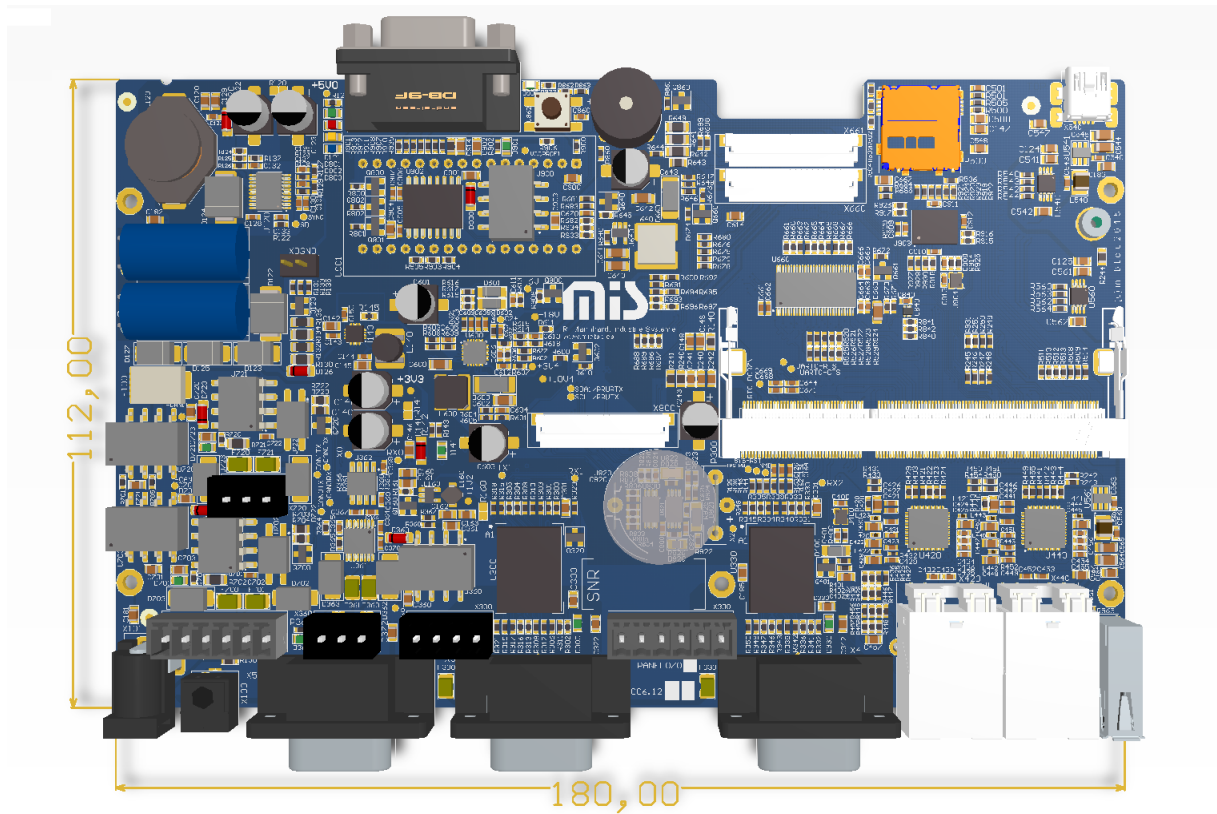
4.9 LCD



XF2M-4015-1A

orange = Pull ups Pull downs at extension pcb

5. Mechanical Specifications



For a better mechanical stability the MIS-DIMM-AM437X SOM can be fasten to the TPANEL070X006 using the mechanical hole in the upper right corner.

Diameter: 2.5mm for a M2.5 screw

The mounting hole is NOT connected to GND.

6 . RoHS compliance

TPANEL070 complies with the European Union Restriction on Use of Hazardous Substance Directive 2002/95/EC (“RoHS 1”), Directive 2011/65/EU (“RoHS 2”).

7 . Ordering Information

Please refer to www.mibtec.de

8 . Warranty Terms

MIS guarantees hardware products against defects in workmanship and material for a period of one year from the date of shipment. Your sole remedy and MIS sole liability shall be for MIS, at its sole discretion, to either repair or replace the defective hardware product at no charge or to refund the purchase price. Shipment costs in both directions are the responsibility of the customer. This warranty is void if the hardware product has been altered or damaged by accident, misuse or abuse.

8.1 Disclaimer of Warranty

This warranty is made in lieu of any other warranty, whether expressed, or implied, of merchantability, fitness for a specific purpose, non-infringement or their equivalents under the laws of any jurisdiction, except the warranty expressly stated herein. The remedies set forth herein shall be the sole and exclusive remedies of any purchaser with respect to any defective product.

8.2 Limitation on Liability

To the maximum extent permitted by law, MIS is not liable under any contract, negligence, strict liability or other legal or equitable theory for any loss of use of the product, inconvenience or damages of any character, whether direct, special, incidental or consequential (including, but not limited to, damages for loss of good will, loss of revenue or profit, work stoppage, computer failure or malfunction, failure of other equipment) resulting from the use of the product, relating to warranty service, or arising out of any breach of this limited warranty, even if MIS has been advised of the possibility of such damages.

MIS products are not authorized for use in safety-critical applications (such as life support) where a failure of the MIS product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of MIS products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by MIS. Further, buyers must fully indemnify MIS and its representatives against any damages arising out of the use of MIS products in such safety-critical applications.

The sole remedy for a breach of the foregoing limited warranty is repair, replacement or refund of the defective or non-conforming product. The maximum liability of MIS under this warranty is limited to the purchase price of the product covered by the warranty. The foregoing express written warranties and remedies are exclusive and are in lieu of any other warranties or remedies, express, implied or statutory.

9 . About MIS

MIS is located in the southern part of Bavaria/Germany. Our core competencies are developing and manufacturing electronics. Today MIS is a full service provider starting from a customers product idea or specification, HW- and SW development, product certifications. Also we have our own production facility, so everything is produced in house. We offer design services from full custom solutions to very specialist area.

Product-ready System on Modules (SOMs) and development kits based on TI processors allow product designers to begin developing quickly. MIS provides its customers with a complete development kit supporting Openembedded/Yocto/Poky Linux and Android.

MIS can also assist at any point in the product development process: from interaction and industrial design to electrical, mechanical, and software engineering to test development and manufacturing.

Our experience in both hardware design and embedded software development allows us to deliver complete solutions to our clients.

The services include but are not limited to, driver development, RTOS/OS porting, board support packages, video streaming applications based on TI AM437x, specific algorithm design in C/C++, board layout. MIS offers development kits and system-on-modules based on TI's AM437x processor to meet customers different requirements.

Headquarters:

Lohwiese 7

Scheuring

86937

Germany

Phone: +49 8195 998400 200

Fax: +49 8195 998400 222

email

info@mibtec.de

sales

sales@mibtec.de

technical support

support@mibtec.de