



**INICnet™ Technology 50utp
Slim Board Family
User's Guide**

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXA”, where “XXXX” is the document number and “A” is the revision level of the document.

INTRODUCTION

This chapter contains general information that will be useful to know before using a Slim Board. Topics discussed in this chapter include:

- [Intended Use](#)
- [Scope of Delivery](#)
- [Document Layout](#)
- [Term Definitions](#)
- [Recommended Reading](#)
- [Customer Support](#)
- [Document Revision History](#)

INTENDED USE

This Microchip product is intended to be used for developing or testing INICnet technology based multimedia products and systems by persons with experience in developing multimedia devices.

Note: The operation of this Microchip product is only admitted with original Microchip devices.
Do not interfere with the product's original state. Otherwise user safety, faultless operation and electromagnetic compatibility are not ensured.
To avoid electric shocks and short circuits use this device only in an appropriate environment.
This open device may exceed the limits of electromagnetic interference.
Electromagnetic compatibility can be only achieved if the equipment is built into an appropriate housing.

INICnet Technology 50utp Slim Board Family

SCOPE OF DELIVERY

The delivery includes the following parts:

- One Slim Board
- One bPHY cable

Each Slim Board can be identified by the label affixed on the bottom side of the board.

For the USB Application Board 50utp the label starts with either a prefixed capital M or S, identifying the board as a timing master (M) or timing slave (S) board, see example below.

The last five numbers represent the part number of each Slim Board.



Check your shipment for completeness.

If you have any complaints, direct them to your local Microchip sales and service office, listed on the last page of this document. Providing the delivery note number eases the handling.

DOCUMENT LAYOUT

This user's guide describes how to use a Slim Board and the PoDL Injector Box 50utp. The document is organized as follows:

- [Chapter 1, Introduction](#) – This chapter introduces the INICnet Technology 50utp Slim Board Family and shows a case of application.
- [Chapter 2, USB Application Board 50utp](#); [Chapter 3, Slim Microphone Board 50utp](#) and [Chapter 4, Slim Auxiliary I/O Board 50utp](#), [Chapter 5, Slim Amplifier Board 50utp](#) – For each Slim Board these chapters start with a description of a typical use case. They show an image of the board, list product features and provide a functional description. Furthermore, they explain board details, show the assembly plans and mechanical dimensions.
- [Chapter 6, PoDL Injector Box 50utp](#) – This chapter describes the PoDL Injector Box 50utp.

TERM DEFINITIONS

This user's guide uses the following term definitions:

Term	Description
ALSA	Advanced Linux [®] Sound Architecture
bPHY	Balanced media Physical Layer
GND	Ground
I ² C	Inter-Integrated Circuit
I ² S [™]	Inter-IC Sound
INIC	Intelligent Network Interface Controller
LED	Light Emitting Diode
MCU	Micro Controller Unit
MEMS	Micro-Electro-Mechanical Systems
NC	Not Connected
PoDL	Power over Data Line
RMS	Root Mean Square
SoC	System on Chip
UNICENS	Unified Centralized Network Stack
USB	Universal Serial Bus

RECOMMENDED READING

This user's guide describes how to use a Slim Board. Other useful documents are listed below.

- [1] INIC Hardware Data Sheet
- [2] INIC Interface Specification
- [3] Microchip Automotive Target Manager User's Guide
- [4] UNICENS[™] System Designer Online Help
- [5] INIC Device Update Process User's Guide
- [6] INICkit User's Guide

To obtain documents, go to: <http://www.microchip.com/support> and submit a technical support case (for details type "5951" into the search dialogue field).

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through <http://www.microchip.com/support>.

INICnet Technology 50utp Slim Board Family

DOCUMENT REVISION HISTORY

Revision A (March 2019)

- Initial release of this document.

Chapter 1. Introduction

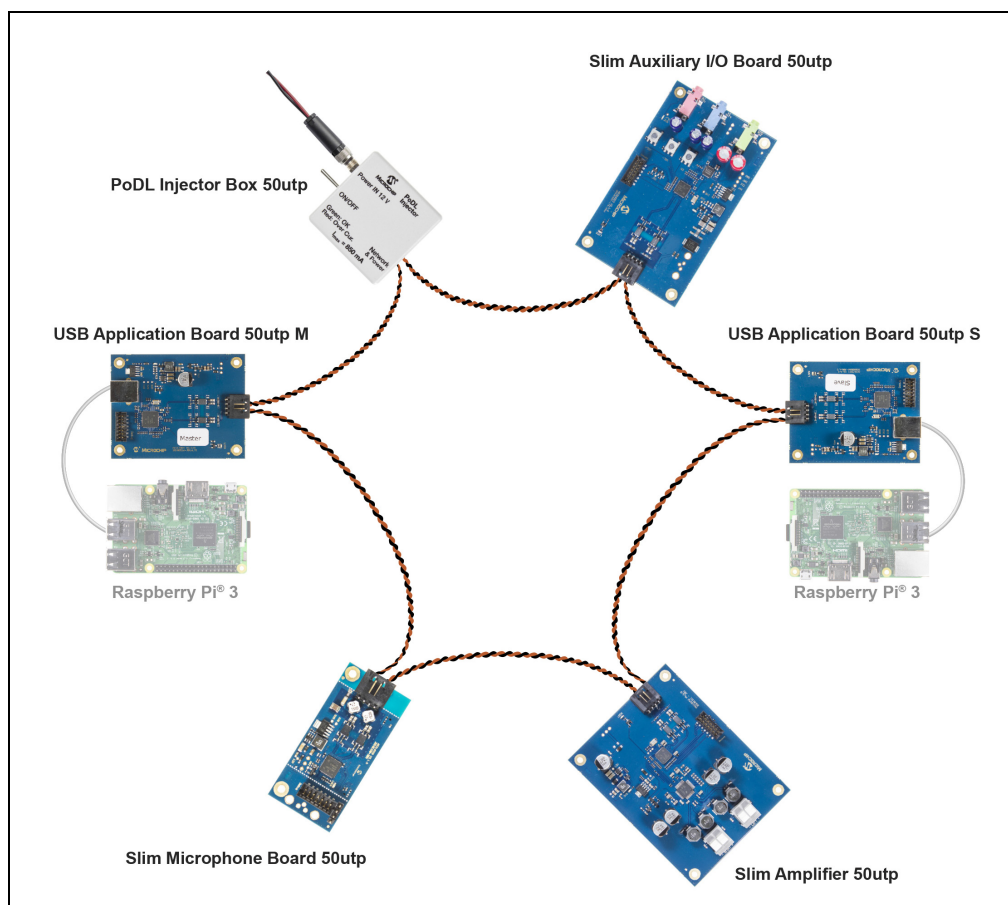
The INICnet Technology 50utp Slim Board Family is a powerful set of different demonstration boards that have been designed to showcase a variety of application-specific use cases, such as the operation of several audio instances.

Available demonstration boards are the:

- [USB Application Board 50utp](#) (available as timing master or timing slave board)
- [Slim Microphone Board 50utp](#)
- [Slim Auxiliary I/O Board 50utp](#)
- [Slim Amplifier Board 50utp](#)

[Figure 1-1](#) shows a powerful and low-cost example setup that uses Slim Boards; both Raspberry Pi® 3 are running Linux. The [PoDL Injector Box 50utp](#) is required for powering the Slim Boards.

FIGURE 1-1: EXAMPLE SETUP



INICnet Technology 50utp Slim Board Family

The idea behind the *Slim* design pattern is to avoid an MCU running on all of the devices in the network. However, at least a controlling instance is needed to allow a wide variety of use cases. This instance is a USB Application Board 50utp, which connects via USB to an MCU or SoC.

For Kernel driver and application examples for Linux go to:

<http://www.microchip.com/support> and submit a technical support case (for details type “5951” into the search dialogue field).

Chapter 2. USB Application Board 50utp

2.1 OVERVIEW

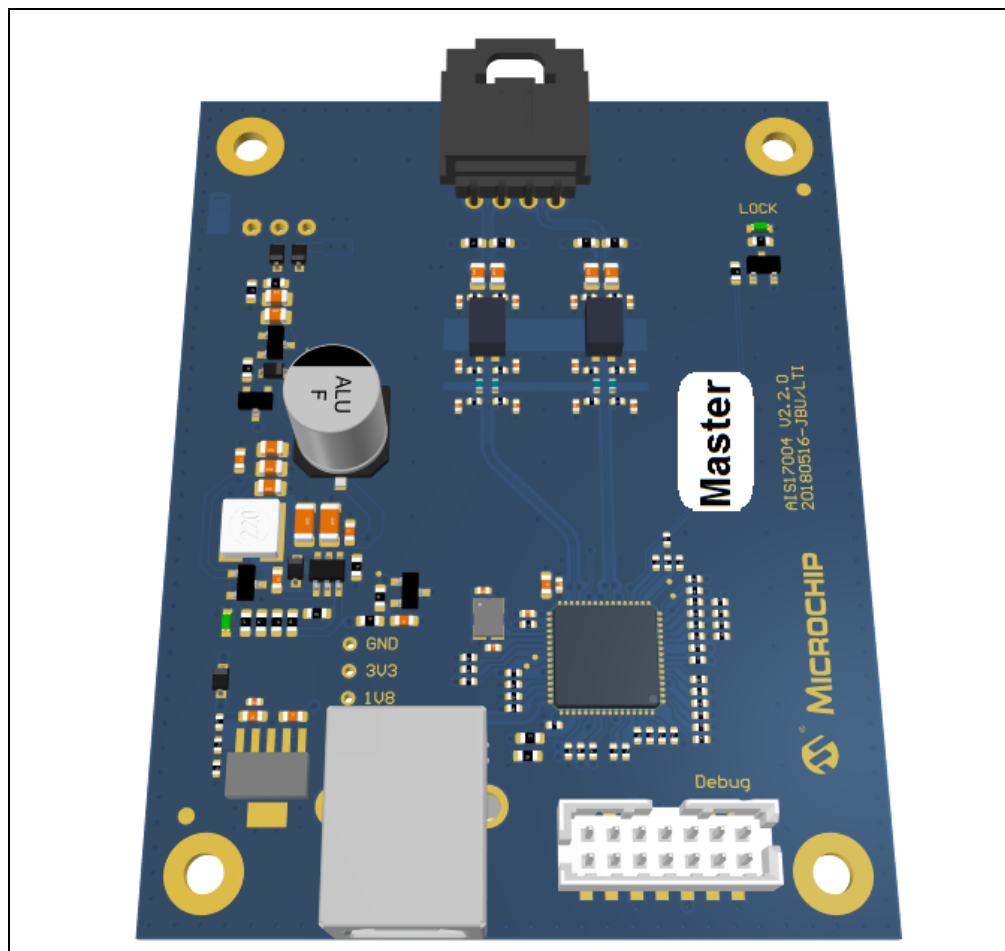
A USB Application Board 50utp is available in two flavors: as timing master board (USB Application Board 50utp M) and timing slave board (USB Application Board 50utp S). A timing slave board has per default the configuration interface disabled, which allows the configuration of INIC resources, such as ports and sockets from network side. The timing master board has per default the configuration interface enabled, which allows a locally attached EHC the configuration of INIC resources (configuration requests from network side are rejected). Both boards are identifiable by a Master or Slave sticker affixed on the top side of the board.

A USB Application Board 50utp is used to interface a controlling instance to the network. In many cases this will be a single board computer or a laptop running Linux. A USB Application Board 50utp is used to configure any Slim Board on the network and to feed and receive audio streams to/from the network. If the MOST[®] Linux Driver is used, a record or playback [ALSA](#) interface can be utilized for this purpose.

An image of the USB Application Board 50utp M master board is shown in [Figure 2-1](#).

INICnet Technology 50utp Slim Board Family

FIGURE 2-1: EXAMPLE – USB APPLICATION BOARD 50utp M



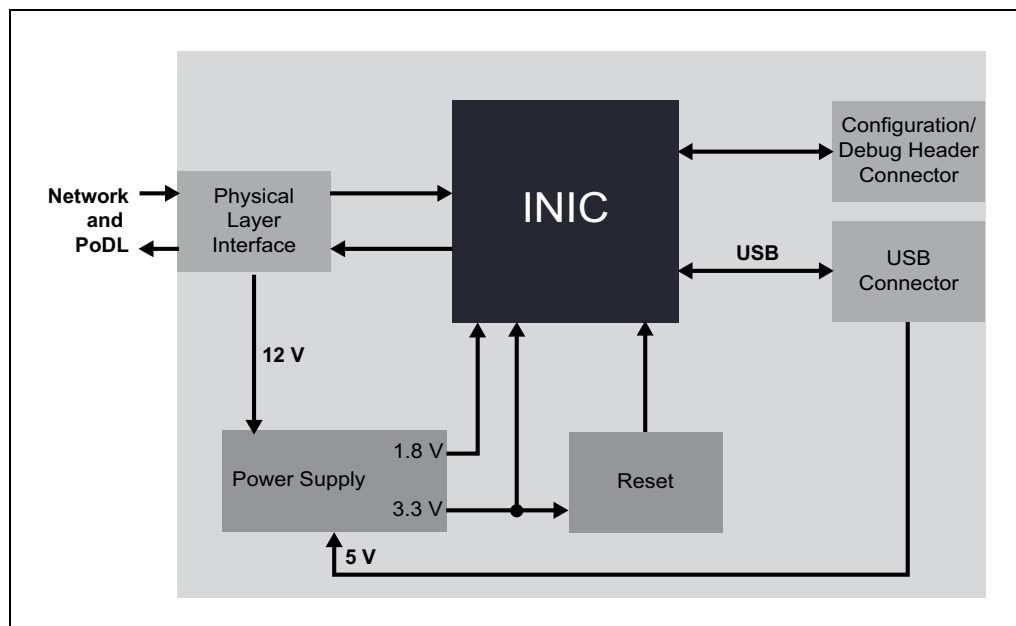
2.2 PRODUCT FEATURES

- Detached interface between application hardware and network
- Supports a network speed grade of 50 Mb/s
- Assembled with an OS81210 INIC
- Available for balanced media physical layer (bPHY) applications
- Configuration/Debug Header Connector
- Offers connection capabilities to the USB port
- Lock detection monitor (Lock LED)
- The timing master board is identified in the network by its node address 0x0200
- The timing slave board is identified in the network by its node address 0x02B0

2.3 FUNCTIONAL DESCRIPTION

Figure 2-2 gives an overview of the board's main components.

FIGURE 2-2: USB APPLICATION BOARD 50utp BLOCK DIAGRAM



A USB Application Board 50utp provides a **bPHY** interface to the network. The bPHY interface is implemented with passive front-end components [1].

If the board is connected with the PoDL Injector Box 50utp, the 12 V of the box are used to feed the on-board power supply, which provides 1.8 V INIC core supply and 3.3 V for INIC I/Os and other components. As long as the output voltage of the power supply is not stable, the INIC will be hold in reset.

The **Configuration/Debug Header Connector** is used to read, load or customize the INIC's initial start-up configuration data.

The USB connector is used to connect the board to USB applications. For more information refer to the INIC Hardware Data Sheet [1]. If the PoDL Injector Box 50utp is not connected, the board can also be powered via the USB connector.

INICnet Technology 50utp Slim Board Family

2.4 BOARD DETAILS

2.4.1 Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Board Current Consumption at Board Operating Voltage	— 9	90 12	— 15	mA V
USB Connector Current at USB Connector Voltage	— 4.75	190 5	— 5.25	mA V

2.4.2 Connectors

All connectors are mounted on the top side of the board.

2.4.2.1 CONFIGURATION/DEBUG HEADER CONNECTOR

The Configuration/Debug Header [1] connector is used as an interface between the INIC and an INIC debug/configuration tool, e.g. the INICkit [6]. In combination with the Microchip Automotive Target Manager [3] or UNICENS System Designer, initial configuration data [2] can be loaded into the INIC.

For more information go to: <http://www.microchip.com/support>.

For the update process refer to the INIC Device Update Process User's Guide [5].

Type:	87832-1420, from Molex®
Suitable counter-piece:	87568-1493, from Molex

The connector pins are described in [Table 2-1](#).

TABLE 2-1: CONFIGURATION/DEBUG HEADER – PIN DESCRIPTION

Pin	Description
1, 3, 13	NC
2, 5, 10	GND
4	Error/Boot
6, 9	3.3 V
7	TDI/DSDA
8	TCK/DSCL
11	TDO/DINT
12	Reset
14	TMS

2.4.2.2 bPHY CONNECTOR

The bPHY connector is used as the interface to the network.

Type:	70551-0038, from Molex
Suitable counter-piece:	50-57-9404 plus contact pin 16-02-0087, from Molex

2.4.2.3 USB CONNECTOR

A USB Application Board 50utp provides a USB connector to connect to a USB device.

Type:	614 004 161 21, standard type B, female, from Würth®
Suitable counter-piece:	CAUBLKAB-2M, USB Cable Type A male/Type B male, from L-COM®

2.4.3 LEDs

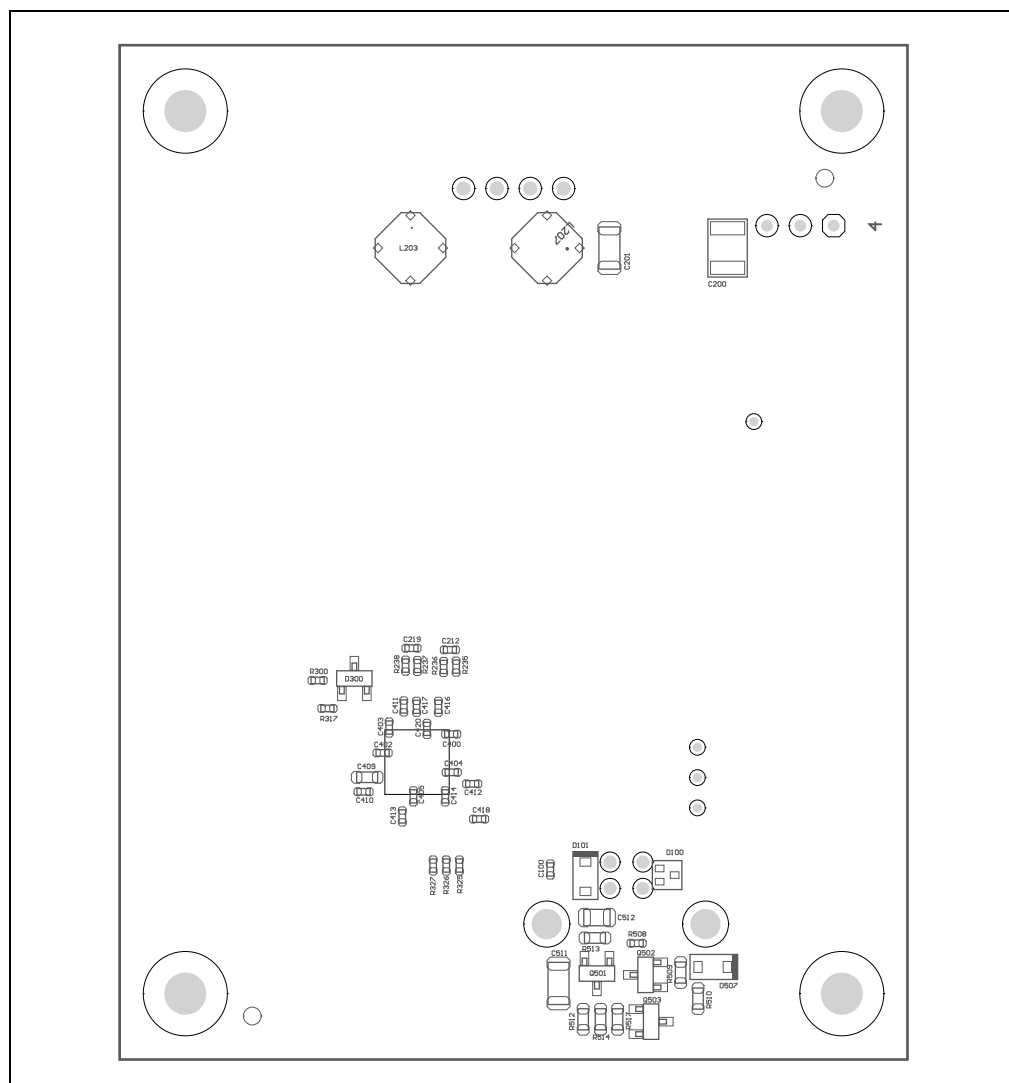
All LEDs are mounted on the top side of the Slim Board.

The table below gives an overview of the LEDs and the states they signal.

Name	State	Description
3V3 (Power)	Off	The Slim Board is not powered.
	On (green)	The Slim Board is powered.
Lock	Off	The INIC is not locked to the network.
	On (green)	The INIC is locked to the network.

2.5.2 Bottom View

FIGURE 2-4: ASSEMBLY PLAN – BOTTOM VIEW



INICnet Technology 50utp Slim Board Family

NOTES:

Chapter 3. Slim Microphone Board 50utp

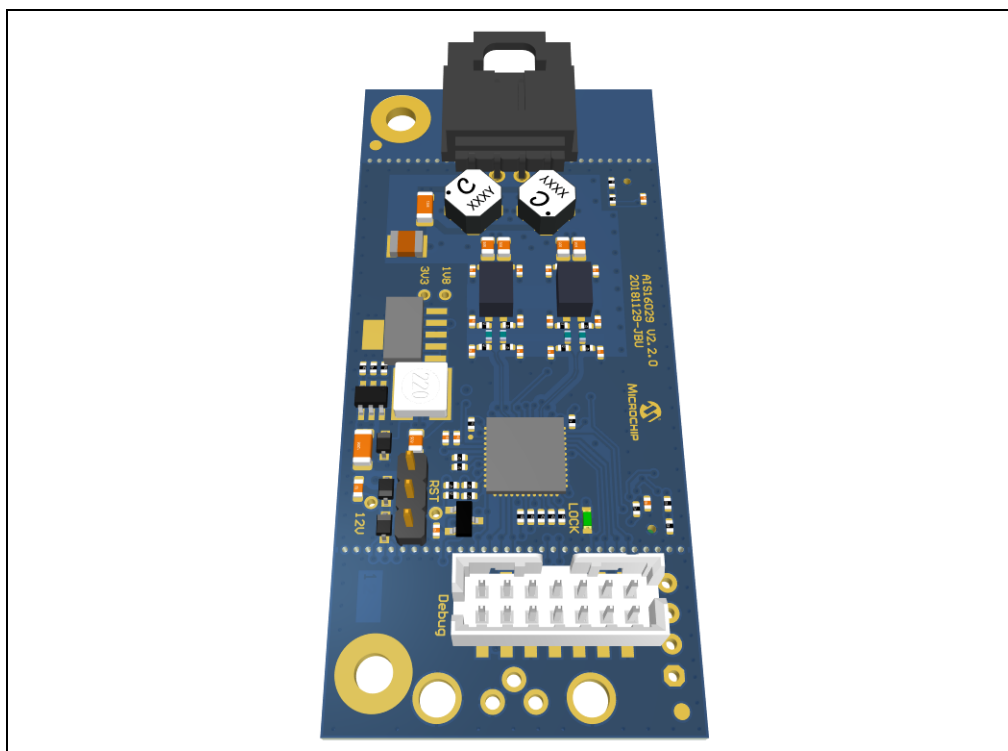
3.1 OVERVIEW

The Slim Microphone Board 50utp can serve as a stereo audio source feeding the network. The data can be routed to a Slim Auxiliary I/O Board 50utp and a Slim Amplifier Board 50utp to make it audible again.

For recording or further processing, the audio data can also be routed to a USB Application Board 50utp.

An image of the board is shown in [Figure 3-1](#).

FIGURE 3-1: SLIM MICROPHONE BOARD 50utp



INICnet Technology 50utp Slim Board Family

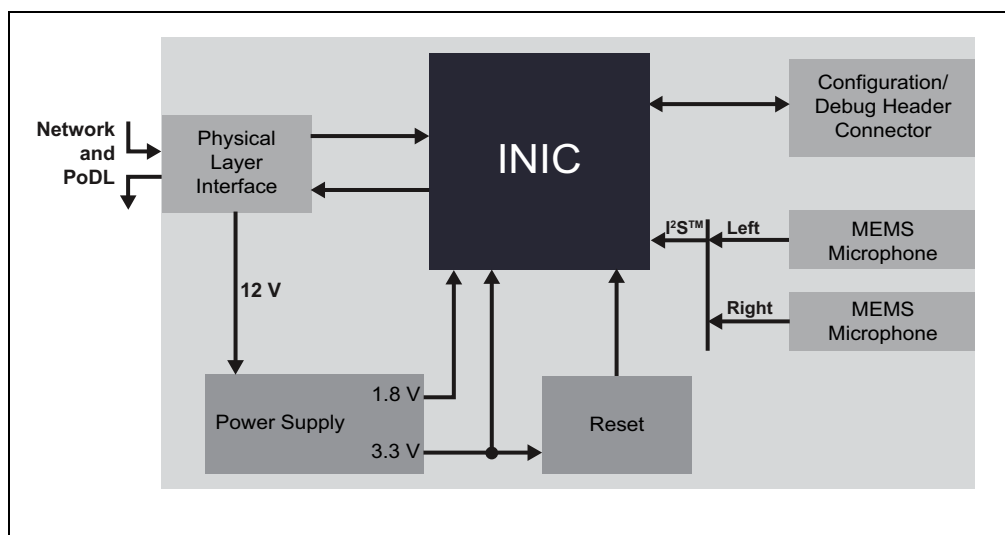
3.2 PRODUCT FEATURES

- Supports a network speed grade of 50 Mbps/s
- Assembled with an OS81216 INIC
- Available for [bPHY](#) applications
- Configuration/Debug Header Connector
- One streaming port
- Lock detection monitor (Lock LED)
- Is identified in the network by its node address 0x0210

3.3 FUNCTIONAL DESCRIPTION

[Figure 3-2](#) gives an overview of the board's main components.

FIGURE 3-2: SLIM MICROPHONE BOARD 50utp BLOCK DIAGRAM



The Slim Microphone Board 50utp provides a [bPHY](#) interface to the network. The bPHY interface is implemented with passive front-end components [1].

The PoDL Injector Box 50utp provides 12 V that are used to feed the on-board power supply, which provides 1.8 V INIC core supply and 3.3 V for INIC I/Os and other components. As long as the output voltage of the power supply is not stable, the INIC will be hold in reset.

The [Configuration/Debug Header Connector](#) is used to read, load or customize the INIC's initial start-up configuration data.

The two on-board omni-directional [MEMS](#) microphones (ICS-43434) are connected to the INIC via one I²S port. Together, they provide a stereo microphone input.

3.4 BOARD DETAILS

3.4.1 Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Board Current Consumption at	—	60	—	mA
Board Operating Voltage	9	12	15	V

3.4.2 Connectors

The Slim Microphone Board 50utp provides the following connectors:

- One bPHY connector
- One Configuration/Debug Header connector

For information on the connectors refer to [Section 2.4.2](#).

3.4.3 LED

The Slim Microphone Board 50utp provides a Lock LED, which is mounted on the top side of the Slim Board.

The table below shows the states the LED can signal.

Name	State	Description
Lock	Off	The INIC is not locked to the network.
	On (green)	The INIC is locked to the network.

INICnet Technology 50utp Slim Board Family

NOTES:

Chapter 4. Slim Auxiliary I/O Board 50utp

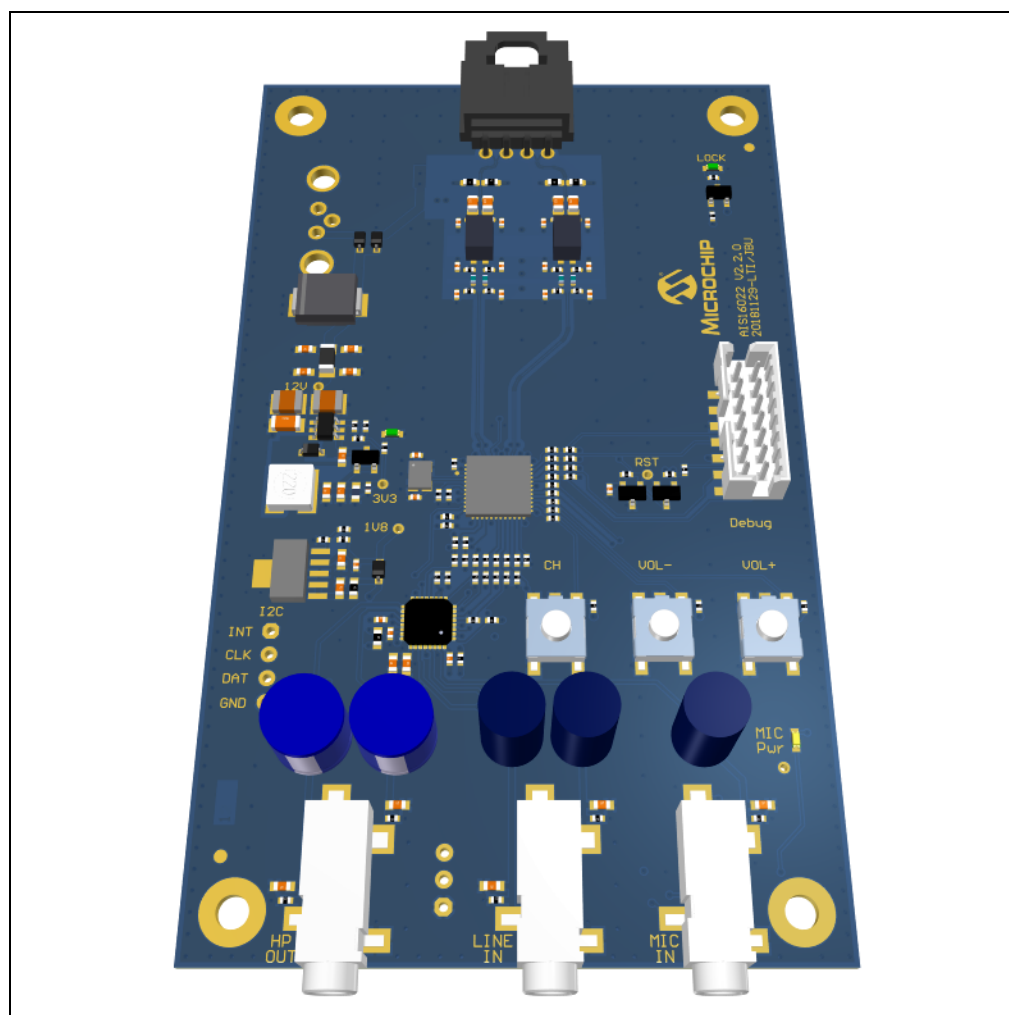
4.1 OVERVIEW

The Slim Auxiliary I/O Board 50utp is used to sink and source stereo audio streams from and to the network. It is able to deliver a stereo audio label sourced by a USB Application Board 50utp, Slim Microphone Board 50utp or another Slim Auxiliary I/O Board 50utp to its headphone jack to make it audible on a connected headphone or active speaker.

In parallel, an audio stream from the microphone or Line In can be sourced to the network and routed to a Slim Auxiliary I/O Board 50utp and a Slim Amplifier Board 50utp to make it audible again. For recording or further processing, the audio data can also be routed to a USB Application Board 50utp.

An image of the board is shown in [Figure 4-1](#).

FIGURE 4-1: SLIM AUXILIARY I/O BOARD 50utp



INICnet Technology 50utp Slim Board Family

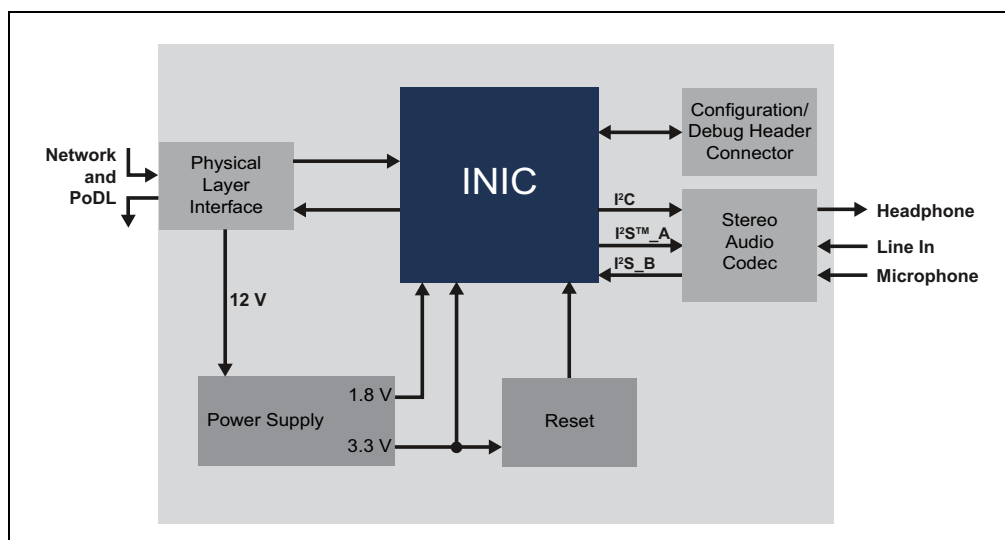
4.2 PRODUCT FEATURES

- Supports a network speed grade of 50 Mbps/s
- Assembled with an OS81214 INIC
- Available for bPHY applications
- Configuration/Debug Header Connector
- Lock detection monitor (Lock LED)
- Active jack (for noise cancellation; audio sockets are only active when jack is plugged-in)
- Microphone input (with phantom power)
- Line input
- Headphone output
- One button for channel select
- Two buttons for volume adjust
- Is identified in the network by its node address 0x0240

4.3 FUNCTIONAL DESCRIPTION

Figure 4-2 gives an overview of the board's main components.

FIGURE 4-2: SLIM AUXILIARY I/O BOARD 50utp BLOCK DIAGRAM



The Slim Auxiliary I/O Board 50utp provides a bPHY interface to the network. The bPHY interface is implemented with passive front-end components [1].

The PoDL Injector Box 50utp provides 12 V that are used to feed the on-board power supply, which provides 1.8 V INIC core supply and 3.3 V for INIC I/Os and other components. As long as the output voltage of the power supply is not stable, the INIC will be hold in reset.

The Configuration/Debug Header Connector is used to read, load or customize the INIC's initial start-up configuration data.

The stereo audio codec (UDA1380) is connected to the INIC through one I²C port and two Streaming (I²S) ports. It provides a headphone output, a stereo line input and a mono microphone input.

Note: Use of microphone and line input at the same time is not supported.

4.4 BOARD DETAILS

4.4.1 Electrical Characteristics

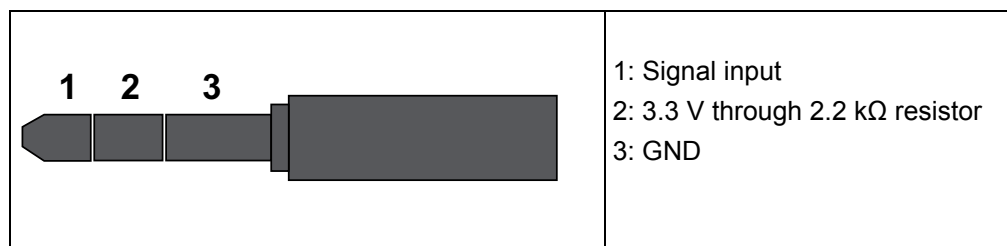
Parameter	Min.	Typ.	Max.	Unit
Board Current Consumption at	—	70	—	mA
Board Operating Voltage	9	12	15	V
Headphone Output Power ($R_L = 16 \Omega$)	30	35	40	mW (RMS)
Line In Voltage	—	—	1	V (RMS)
Microphone Input Voltage	—	—	35	mV (RMS)
Microphone DC Bias	—	3.3 ¹	—	V

Note 1: Through 2.2 k Ω resistor. For details refer to [Section 4.4.2](#).

4.4.2 Microphone Power

The Slim Auxiliary I/O Board 50utp supports standard electret microphones that need a bias voltage. [Figure 4-3](#) shows the pin assignment on the 3.5 mm stereo plug.

FIGURE 4-3: PIN ASSIGNMENT OF STEREO PLUG



4.4.3 Connectors

The Slim Auxiliary I/O Board 50utp provides the following connectors:

- One bPHY connector
- One Configuration/Debug Header connector
- Three audio sockets

For information on the bPHY and Configuration/Debug Header connectors refer to [Section 2.4.2](#). The audio socket connectors are described in [Section 4.4.3.1](#).

4.4.3.1 AUDIO SOCKET

The Slim Auxiliary I/O Board 50utp provides the following audio socket connectors:

Headphone socket type:	SJ-3524-SMT-TR-GR, standard jack, stereo, 3.5 mm, green, from CUI Inc.
Line In socket type:	SJ-3524-SMT-TR-BE, standard jack, stereo, 3.5 mm, blue, from CUI Inc.
Microphone socket type:	SJ-3524-SMT-TR-PI, standard jack, stereo, 3.5 mm, pink, from CUI Inc.
Suitable counter-piece:	SP-3501, stereo plug, 3.5 mm male, from CUI Inc.

4.4.4 LEDs

All LEDs are mounted on the top side of the Slim Board.

The table below gives an overview of the LEDs and the states they signal.

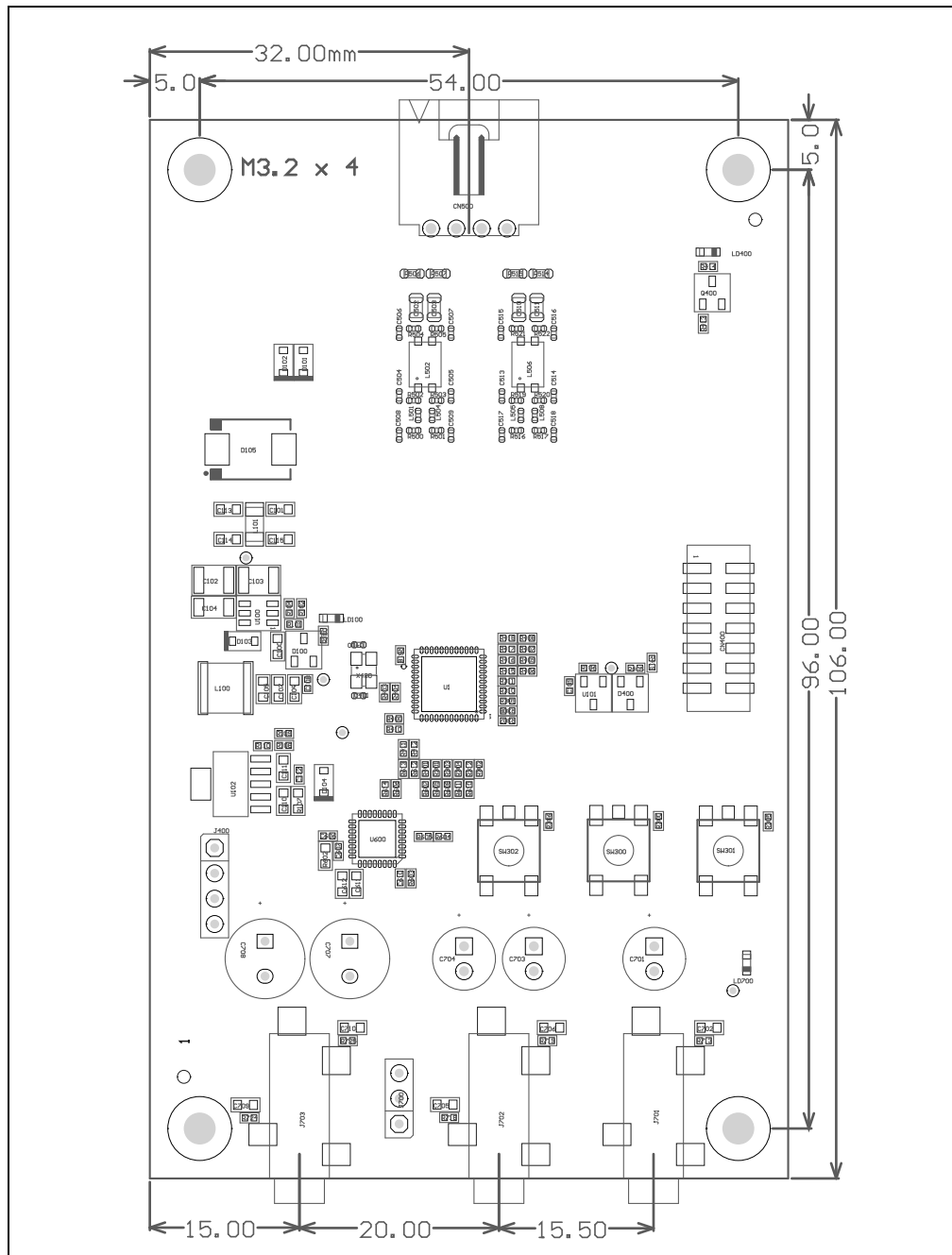
Name	State	Description
Power	See Section 2.4.3	
Lock		
Microphone Power	Off	Microphone is not powered.
	On (yellow)	Microphone is powered (with phantom power).

4.5 ASSEMBLY PLAN AND MECHANICAL DIMENSIONS

4.5.1 Top View and Mechanical Dimensions

The mechanical dimensions shown in [Figure 4-4](#) are in [mm].

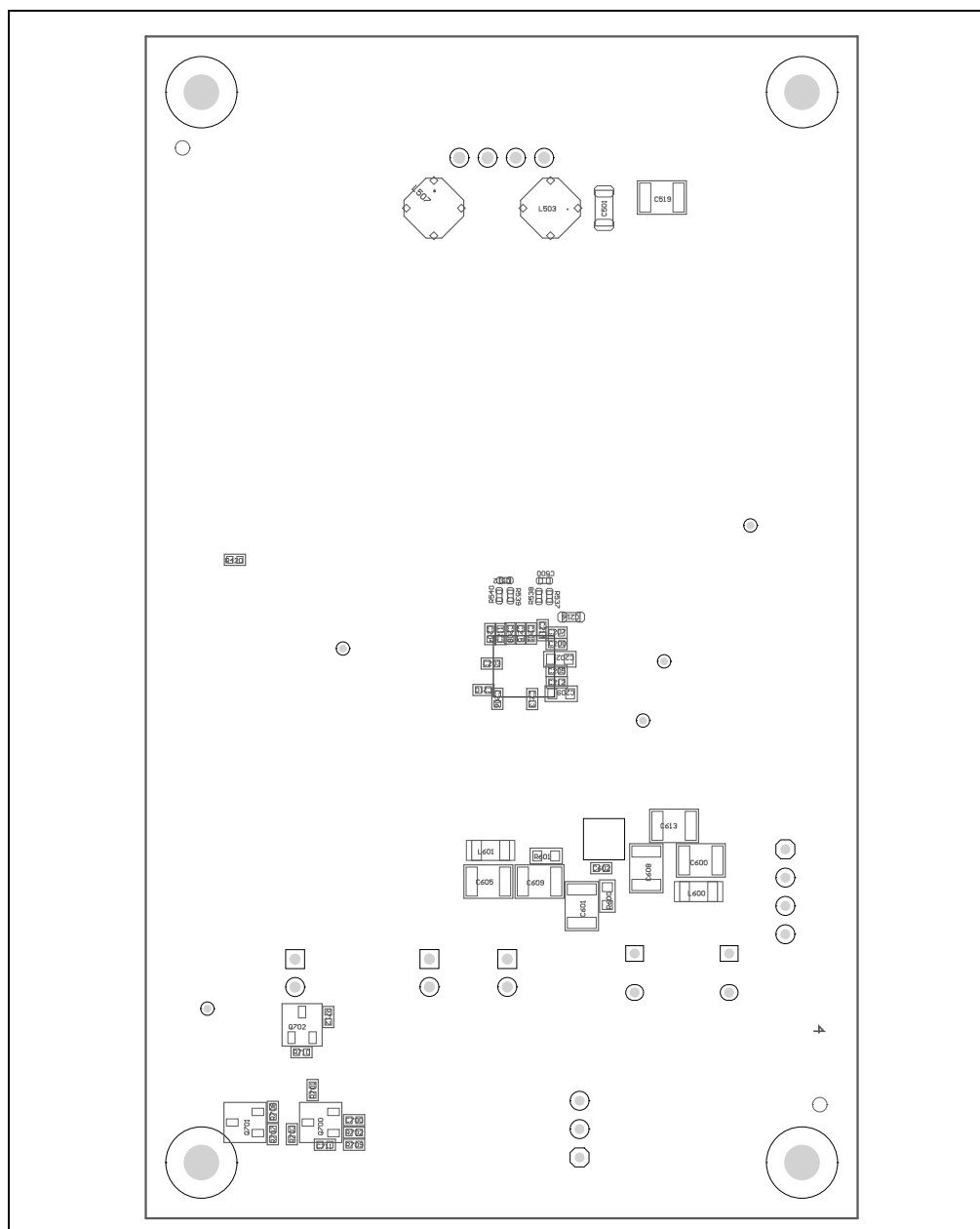
FIGURE 4-4: ASSEMBLY PLAN – TOP VIEW AND MECHANICAL DIMENSIONS



INICnet Technology 50utp Slim Board Family

4.5.2 Bottom View

FIGURE 4-5: ASSEMBLY PLAN – BOTTOM VIEW



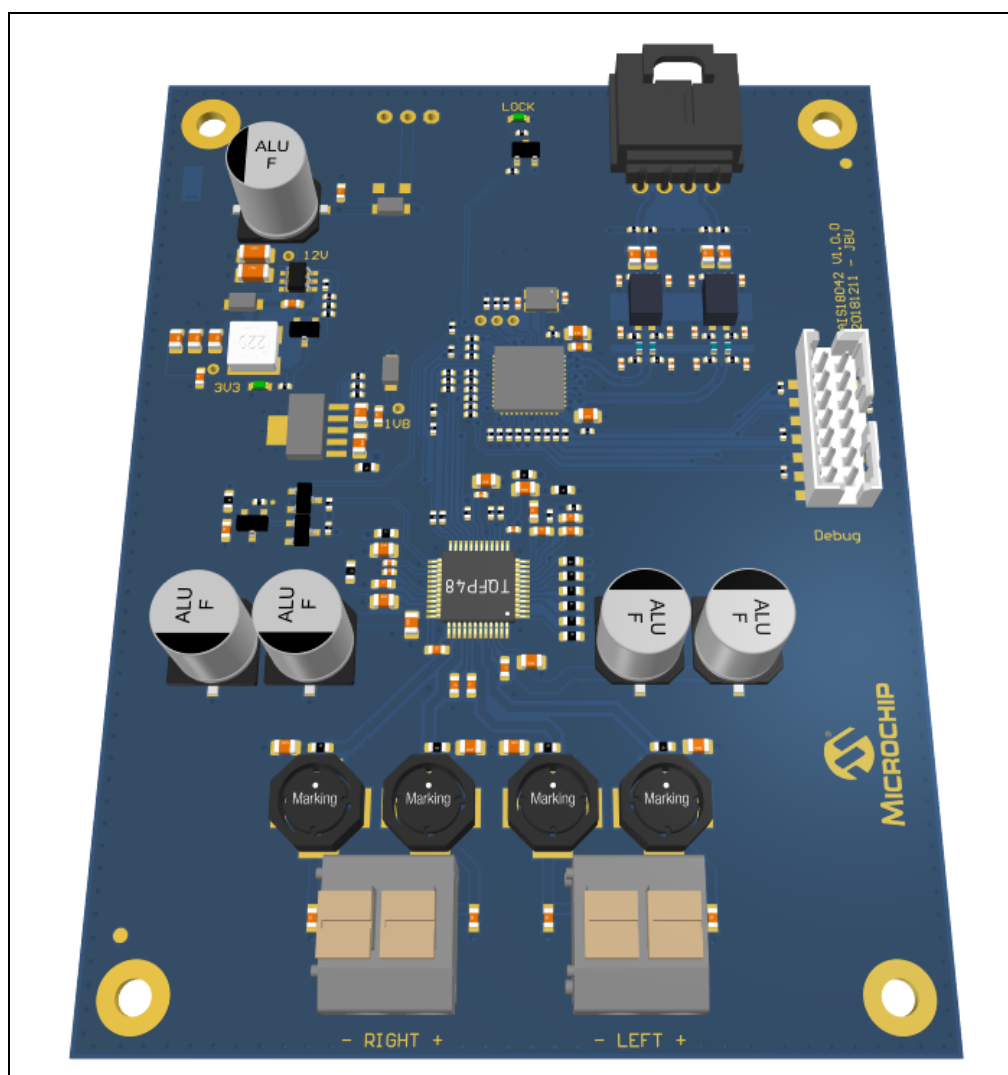
Chapter 5. Slim Amplifier Board 50utp

5.1 OVERVIEW

The Slim Amplifier Board 50utp is used to sink a stereo audio stream from the network. It is able to deliver a stereo audio signal sourced by the USB Application Board 50utp, Slim Microphone Board 50utp or another Slim Auxiliary I/O Board 50utp to its loudspeaker terminals to make it audible through a connected loudspeaker.

An image of the board is shown in [Figure 5-1](#).

FIGURE 5-1: SLIM AMPLIFIER BOARD 50utp



INICnet Technology 50utp Slim Board Family

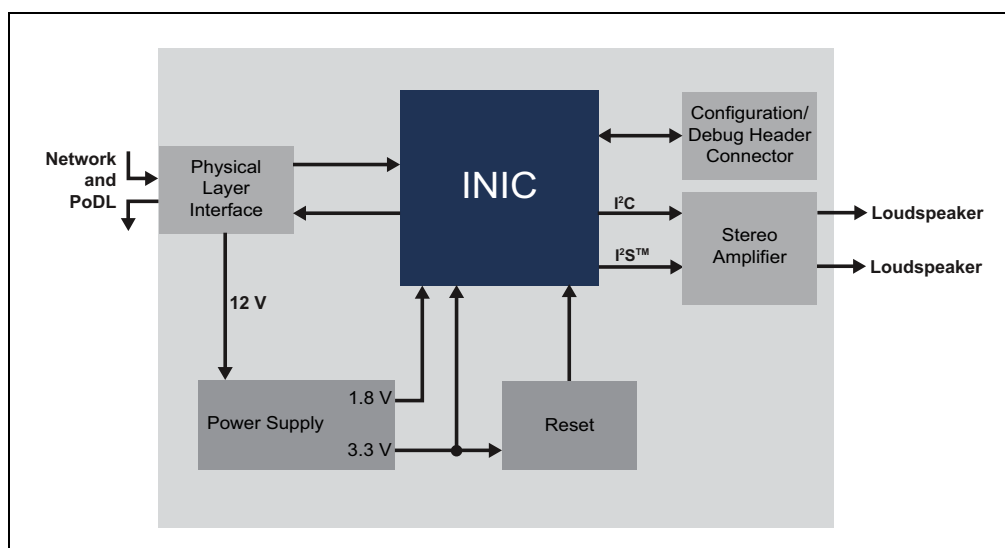
5.2 PRODUCT FEATURES

- Supports a network speed grade of 50 Mbps/s
- Assembled with an OS81214 INIC
- Available for bPHY applications
- Configuration/Debug Header Connector
- Lock detection
- Power indication
- Loudspeaker power output
- Is identified in the network by its group address 0x0270

5.3 FUNCTIONAL DESCRIPTION

Figure 5-2 gives an overview of the board's main components.

FIGURE 5-2: SLIM AMPLIFIER BOARD 50utp BLOCK DIAGRAM



The Slim Amplifier Board 50utp provides a **bPHY** interface to the network. The bPHY interface is implemented with passive front-end components [1].

The PoDL Injector Box 50utp provides 12 V that are used to feed the on-board power supply, which provides 1.8 V INIC core supply and 3.3 V for INIC I/Os and other components. As long as the output voltage of the power supply is not stable, the INIC will be hold in reset.

The **Configuration/Debug Header Connector** is used to read, load or customize the INIC's initial start-up configuration data.

The stereo amplifier (TAS5717) is connected to the INIC through a I^2C port and a I^2S port. It can provide 2 x 10 W Output on 8 Ω loudspeakers.

5.4 BOARD DETAILS

5.4.1 Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Board Current Consumption at	—	140 ¹	—	mA
Board Operating Voltage	9	12	15	V
Audio Output Power:	—	—	2 x 10	W
Load Impedance:	4	8	—	Ω

Note 1: Too high amplification levels can drain a maximum current, overloading the PoDL injector(s). As a result, network stability can go lost (lock state is left). It also may happen that the PoDL Injector Box 50utp will be turned off. To restart the box, the input power must be switched off/on.

5.4.2 Connectors

The Slim Amplifier Board 50utp provides the following connectors:

- bPHY connector
- One Configuration/Debug Header connector
- Two terminal blocks

For information on the bPHY and Configuration/Debug Header connectors refer to [Section 2.4.2](#). The terminal blocks are described in [Section 5.4.2.1](#).

5.4.2.1 TERMINAL BLOCKS

The terminal blocks are used to output stereo audio data.

Type: 691 411 710 002B, from Würth

5.4.3 LEDs

The Slim Amplifier Board 50utp provides a Power LED and a Lock LED.

For LED states and a description refer to [Section 2.4.3](#).

5.5 ASSEMBLY PLAN AND MECHANICAL DIMENSIONS

5.5.1 Top View and Mechanical Dimensions

The mechanical dimensions shown in [Figure 5-3](#) are in [mm].

FIGURE 5-3: ASSEMBLY PLAN – TOP VIEW AND MECHANICAL DIMENSIONS

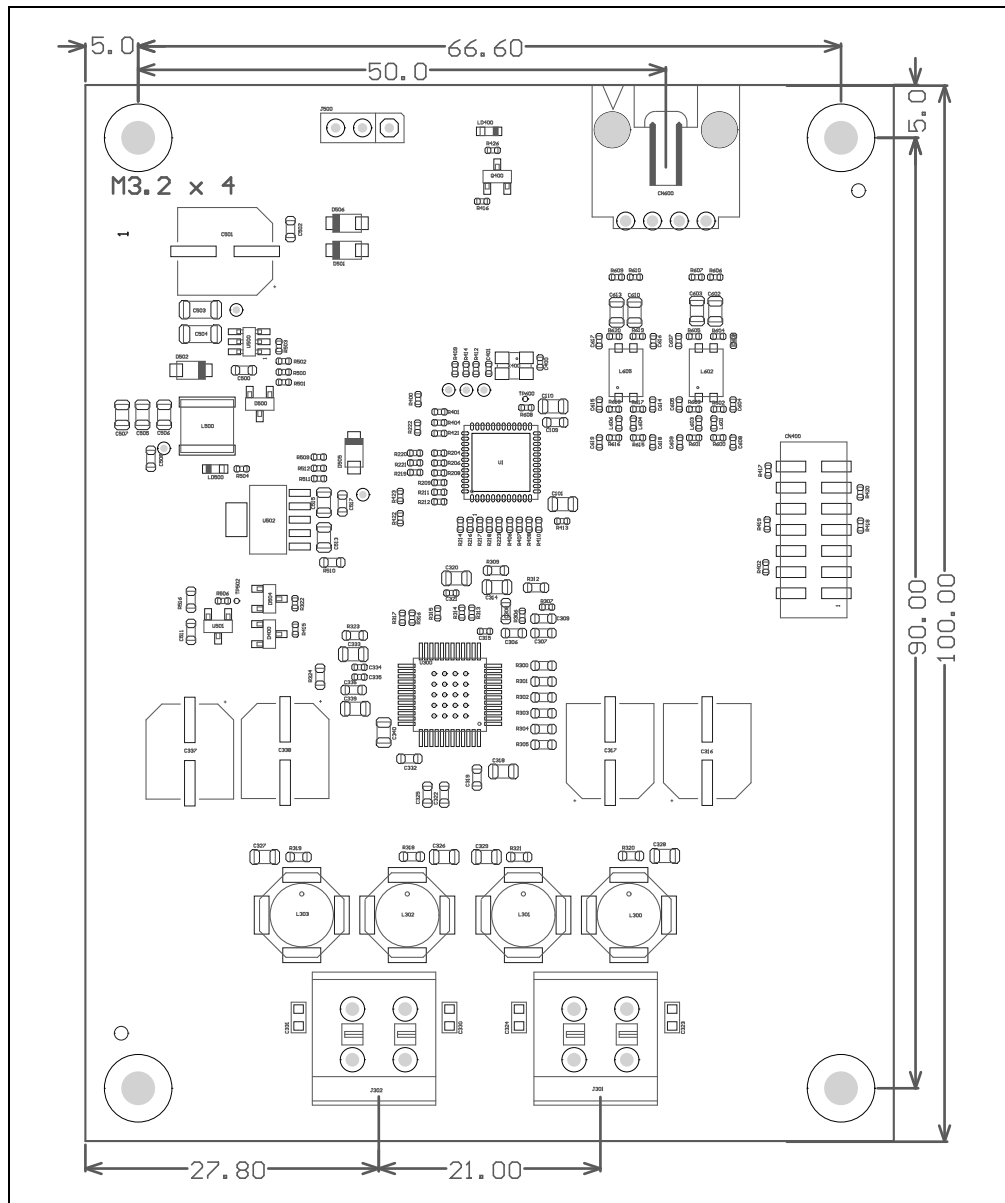


FIGURE 5-4: ASSEMBLY PLAN – BOTTOM VIEW



INICnet Technology 50utp Slim Board Family

NOTES:

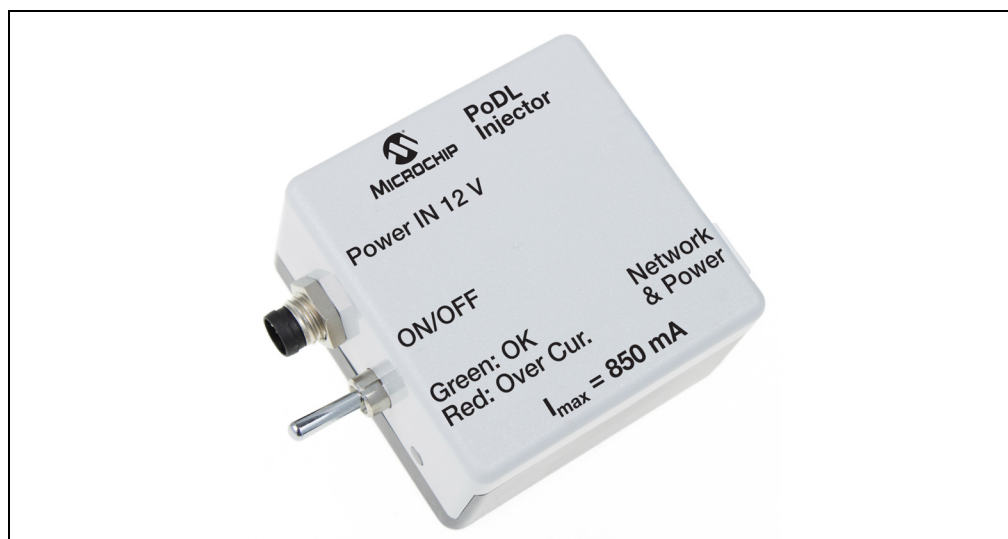
Chapter 6. PoDL Injector Box 50utp

6.1 OVERVIEW

The PoDL Injector Box 50utp is used to power the Slim Boards.

A photo of the box is shown in [Figure 6-1](#).

FIGURE 6-1: PoDL INJECTOR BOX 50utp



6.2 ELECTRICAL CHARACTERISTICS

Parameter	Min.	Typ.	Max.	Unit
Power In Voltage	9	12	15	V
Output Current	—	—	850	mA

6.3 ON/OFF SWITCH

The ON/OFF switch is used to switch on/off the PoDL Injector Box 50utp.

INICnet Technology 50utp Slim Board Family

6.4 CONNECTORS

6.4.1 bPHY Connector

The **bPHY** connector cable of the PoDL Injector Box 50utp provides the power for the boards and is connected to the Slim Boards as shown in [Figure 1-1](#).

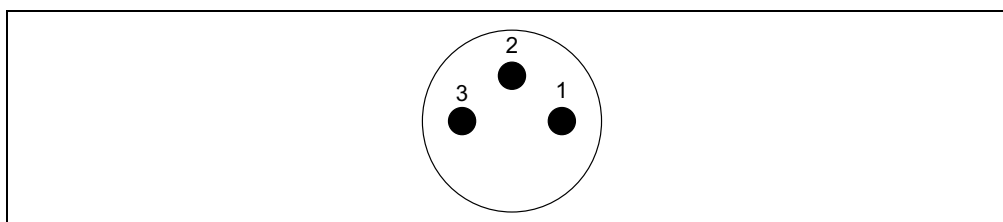
Type:	70551-0038, from Molex
Suitable counter-piece:	50-57-9404 plus contact pin 16-02-0087, from Molex

6.4.2 Power Connector

The power connector must be connected to a 12 V DC power supply.

The connector pins are illustrated in [Figure 6-2](#).

FIGURE 6-2: POWER CONNECTOR



The pin assignment is as described in [Table 6-1](#).

TABLE 6-1: POWER CONNECTOR - PIN DESCRIPTION

Pin Number	Signal	Description
1	12 V DC	Power supply
2	NC	—
3	GND	Ground

Type:	09-3419-82-03, sensor connector series 718, 3 pole, from Binder
Suitable counter-piece:	99 3400 100 03, M8, IP67, series 768, 3 pole, from Binder

6.5 POWER LED

The power LED indicates different power states:

Name	State	Description
Power	Off	Device is not powered.
	On (green)	Device is powered.
	On (red)	Over current condition has been detected, or the input power is out of the permitted range. ¹

Note 1: If an over current condition has been detected, the output power of the PoDL Injector Box 50utp will be turned off. To restart the PoDL Injector Box 50utp, the input power must be switched off/on.

6.6 TECHNICAL SPECIFICATIONS

Parameter	Value	Unit
Dimensions (W x D x H)	50 x 50 x 30	mm
Dimensions incl. connectors and switch (W x D x H)	75 x 50 x 30	
Ambient Temperature Range	0-70	°C

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