TLE984x Evalboard Rev 1.3 User Manual

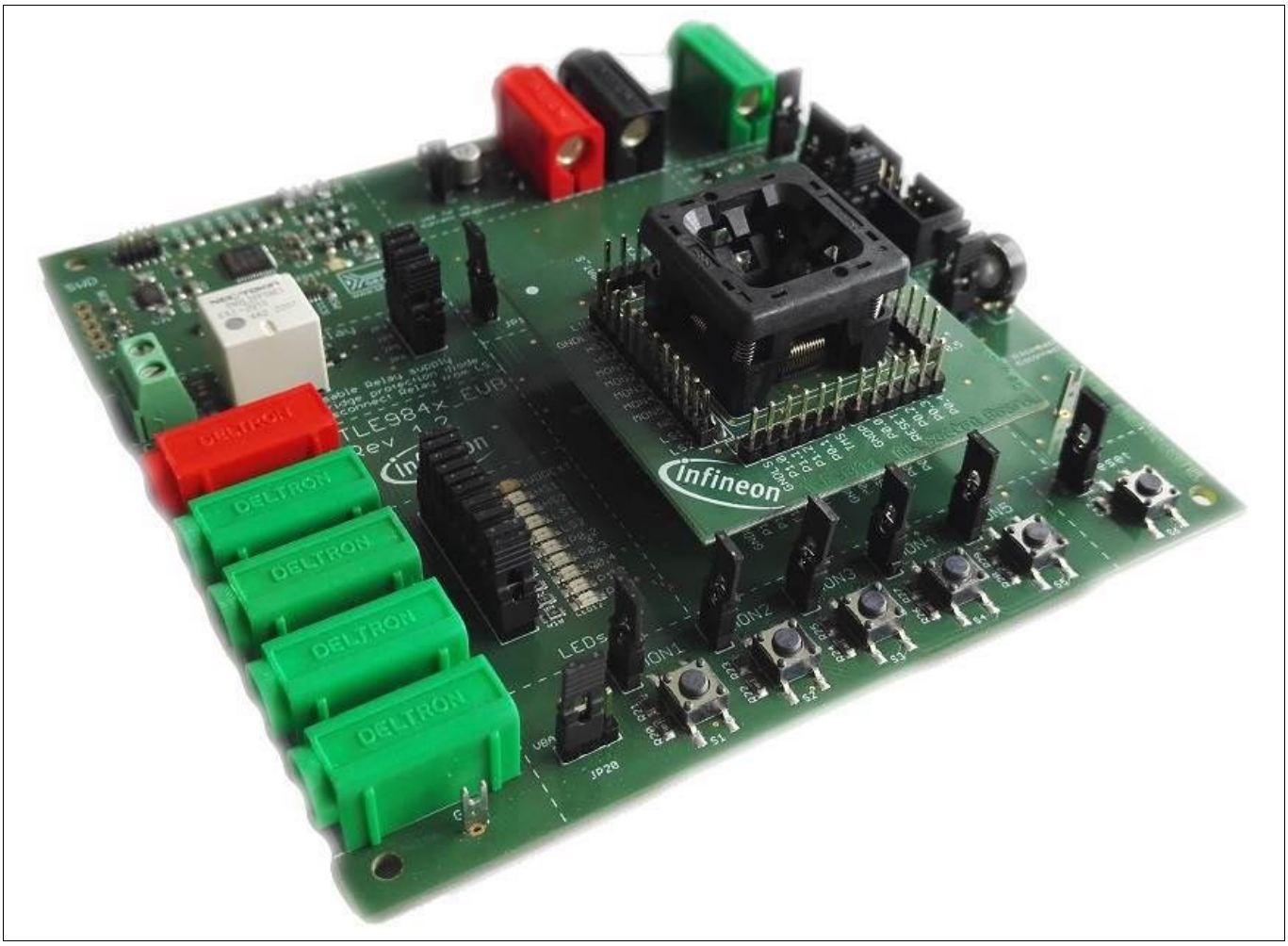

Figure 1

About this document

Scope and purpose

The TLE984x Evalboard is designed to evaluate hardware and software functionalities of the TLE984x device family. All Pins of the chip are able to be contacted via Pinheader. Further the bidirectional Relay can be used to evaluate DC motor applications.

This Manual provides additional information about the Boards Layout, Jumper settings, interfaces and Debug options. It introduces the Evaluation Plattform as well as how to create a software example and download it to the TLE984x.

Note: This Evaluationboard is not optimized for EMC behavior.

Intended audience

This Document is for everyone who works with the TLE984x_EVB.

Table of contents

1 Concept

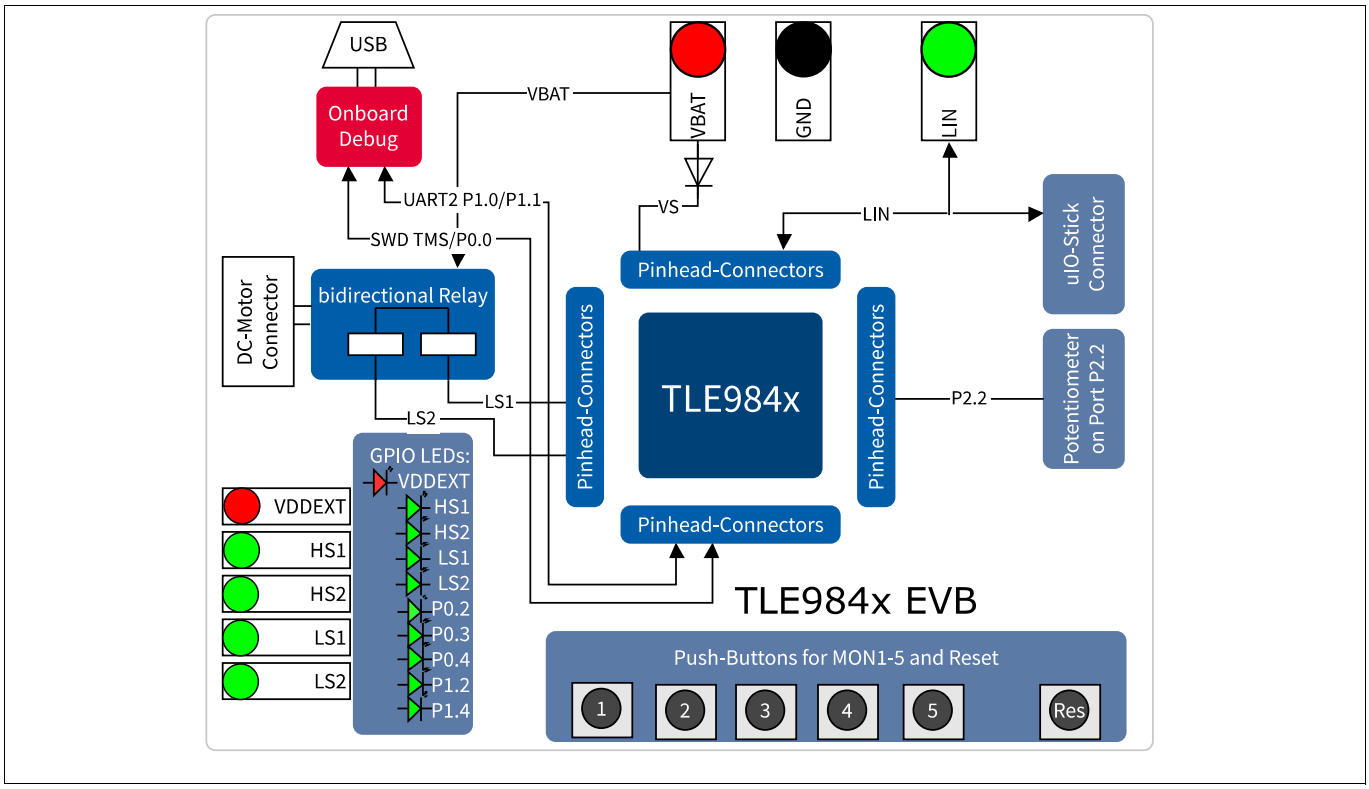

Figure 1 Evalboard Concept

This board is designed to provide a fast and easy start of evaluation, for Infineons embedded Power TLE984x device family. Initialy, the evaluation board brings several interfaces and interconnections shown in Figure 1.

The TLE984x device is placed in the center of the PCB. A socket provides the possibility to test and evaluate all ICs out of the TLE984x device family. Every pin of the IC is connectable via rows of pinheader. The board is protected against reverse polarity of input voltage supply. A bidirectional relay can be connected to the integrated lowside switches, optionaly. In addition to that, a scew-connector is placed near the relay to contact and drive a DC motor(example: window lift motor).

The evaluationboard provides an on board debugger. It is placed in the upper left of Figure 1. It provides a SWD-Debug connection and a virtual COM port for serial UART communication.

Highside and Lowside switches and VDDEXT are connectable via 4mm standard laboratory wires.

The High-Voltage-Monitor pins can be triggered with dedicated pushbuttons.

For analog input values a potentiometer is connected to PIN P2.2.

The LIN connection is able to be configured to master and slave mode.

2 Interconnections

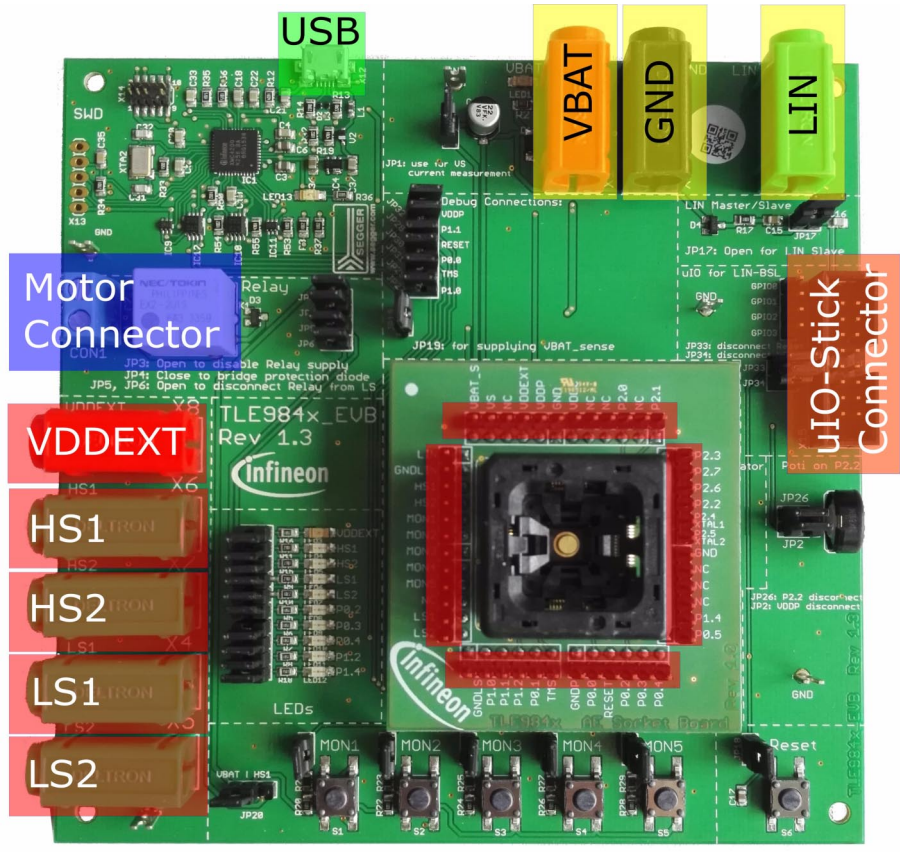

Figure 2 Interconnections

4mm Laboratory Connectors

Ground, voltagesupply (operating Voltage is documented in the datasheet) and LIN communication can be connected via banana jacks: GND (black), VBAT (red), LIN (green)

VDDEXT, HS- and LS-switch signals can also be accessed with laboratory equipment: VDDEXT(red), HS1(green), HS2(green), LS1(green), LS2(green).

Terminal Block (blue)

The two Pin Terminal provides a two wire DC-Motor connection. Both Pins are switched to VBAT or GND. Connected Motor can be operated in two directions.

uIO-Connector (orange)

The uIO-Stick can be connected at the upper right corner of the Evaluationboard. It provides BSL-Programming via LIN. The connector provides an reverse polarity protected connection between the Evaluationboard and uIO-Stick. (Signals: RESET, VS, LIN)

USB (green)

An Onboard-Debuger is implemented on the TLE984x_EVB. The USB-Connection provides a Debug- and Serial-interface to the PC.

Pinhead Rows (red)

Every Pin of the TLE984x is available for measurements and evaluation, via Pinhead rows.

3 Jumper Settings

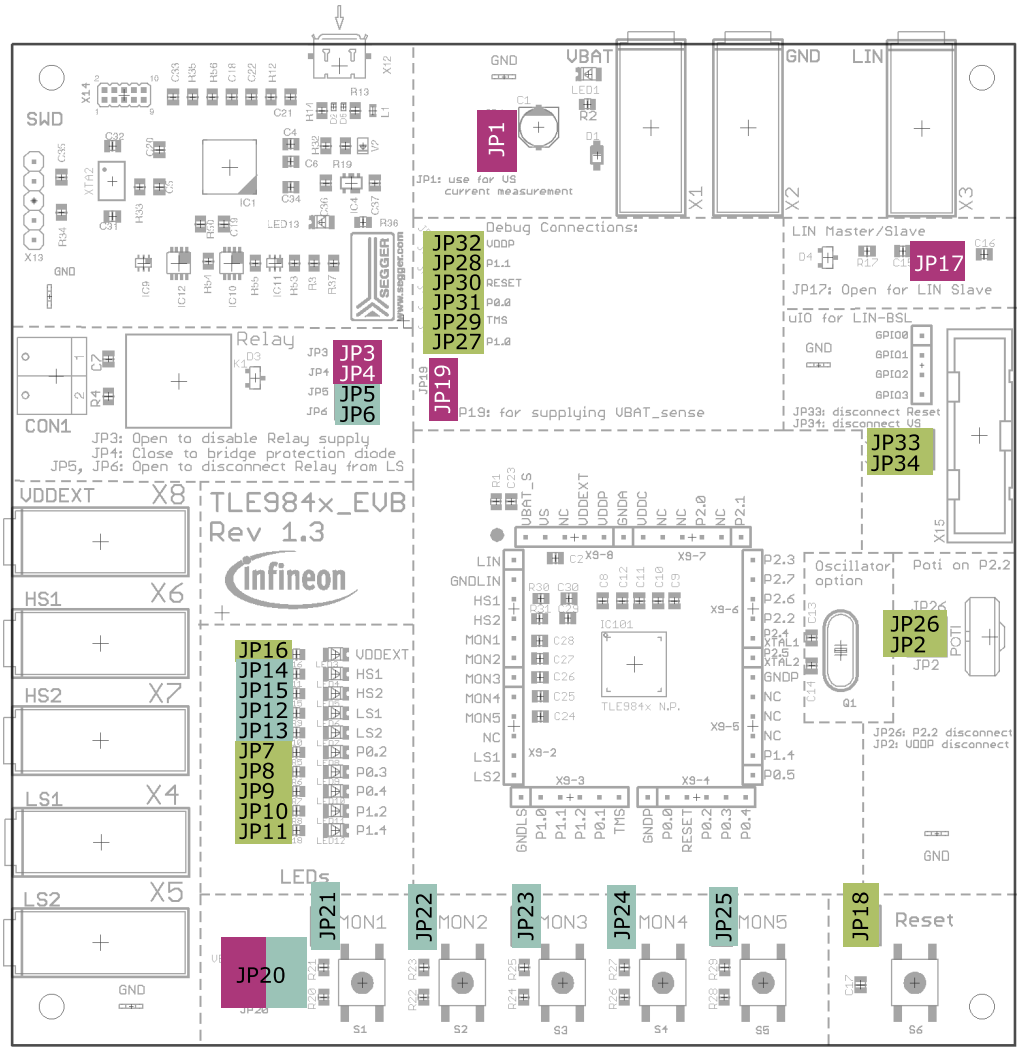

Figure 3 Jumper Settings

Figure 3 shows the jumper positions on the Evaluation Board. The color of gives an information about the voltage, which can appear at the Jumperpins.

Green marked jumper are related to the 5V domain (voltage range 0V...VDDP/VDDEXT).

Blue marked jumper are related to high voltage Inputs or Outputs of the TLE984x.

Purple jumper are connected to the supply voltage of the board.

Table 1 shows which Jumper is connected to the PINs of the TLE984x and the peripheral.

Table 1 Jumper List

Jumper Number	Signal Name	Description and Board connection
JP1	VS	Current measure option
JP2	VDDP	Potentiometer supply
JP3	VBAT	Bypass connection for D3
JP4	VBAT	Relay Voltage supply

Jumper Settings

Table 1 Jumper List

Jumper Number	Signal Name	Description and Board connection
JP5	LS1	Relay coil K1
JP6	LS2	Relay coil K2
JP7	P0.2	LED8
JP8	P0.3	LED9
JP9	P0.4	LED10
JP10	P1.2	LED11
JP11	P1.4	LED12
JP12	LS1	LED6
JP13	LS2	LED7
JP14	HS1	LED4
JP15	HS2	LED5
JP16	VDDEXT	LED3
JP17	LIN	LIN Master pull up to VBAT
JP18	RESET	Pushbutton S6
JP19	VBAT_Sense	connection to VBAT
JP20	VBAT/HS1	pull up to S1...S5
JP21	MON1	Pushbutton S1
JP22	MON2	Pushbutton S2
JP23	MON3	Pushbutton S3
JP24	MON4	Pushbutton S4
JP25	MON5	Pushbutton S5
JP26	P2.2	Potentiometer connected to P2.2
JP27	P1.0	Disconnect UART/Debugger
JP28	P1.1	Disconnect UART/Debugger
JP29	TMS	Disconnect UART/Debugger
JP30	Reset	Disconnect UART/Debugger
JP31	P0.0	Disconnect UART/Debugger
JP32	VDDP	Disconnect UART/Debugger
JP33	Reset	Reset connection to uIO-Stick
JP34	VS	Supply connection to uIO-Stick

4 Communication Interfaces

4.1 LIN and uIO for LIN BSL

The device integrated LIN transceiver is connected to a banana jack and additionally to the uIO BSL interface. To integrate the device in a LIN network it is sufficient to use the single wire banana interface. The BSL interface is intended to program the device via LIN. For further information about the uIO interface see **www.hitex.com/uio**.

4.2 UART (Virtual COM PORT via USB)

A virtual COM port provided by Segger driver enables a PC – board – communication via UART. The UART2 module of TLE984x uses the pins P1.0 (transmit) and P1.1 (receive). Those are connected to the XMC4200, which emulates Rx and Tx on PC side with Segger firmware. Though they cannot be disconnected physically, bidirectional level shifters ensure that the XMC pins are hi-Z in case the virtual COM port is not used. By connecting the evaluation board to the PC a virtual COM port gets emulated by the Segger driver automatically. The port will show up in the Microsoft® Windows® device manager.

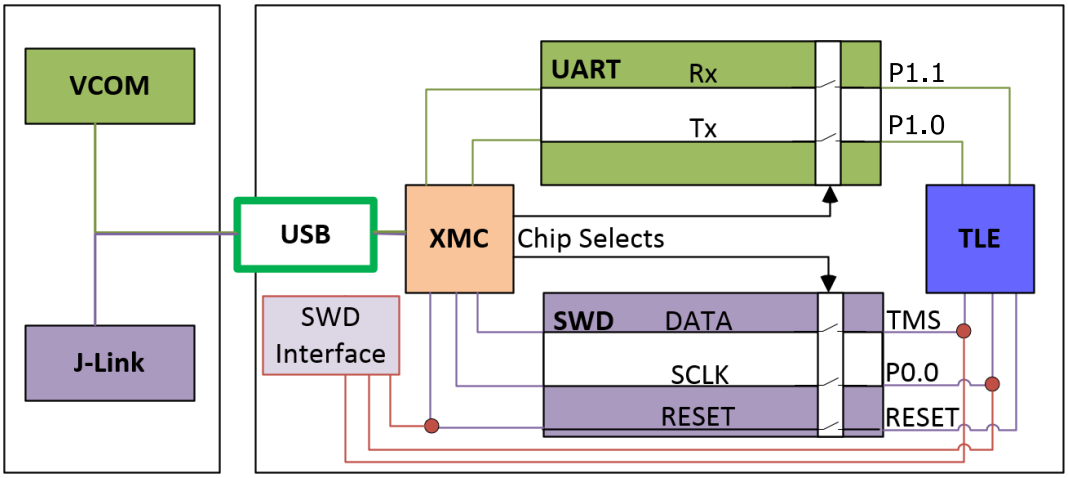

Figure 4 UART and Debugging

Note: Only one of the interfaces USB or SWD can be used at one time. While using the SWD interface the XMC is hold in reset. As long as a debugger is connected with the SWD interface it eliminates therefore debugging or UART via USB.

4.3 SWD-Debuginterface (J-Link via USB)

For serial wire debug (SWD) the TLE984x uses the pins TMS (data) and P0.0 (clock). Level shifters between XMC4200 and TLE984x allow using P0.0, while it is not used for debugging.

The Segger J-Link module on board allows serial wire debugging via USB.

It is also possible to use an alternative debugger than the onboard Segger debugger, e.g. Keil ULINK2. Therefore the signals are routed through the 10 pin header SWD interface between the XMC4200 and the TLE984x. The pin configuration makes sure that the XMC is hold in reset while another debugger is physically connected at X14. The virtual COM Port will be disabled, while the external ISP is connected.

5 Software Toolchain

5.1 Keil µVision 5

The recommended Integrated Software Developement Environment is Keil® µVision5®.
Infineons embedded Power family is suported. For more information about the Toolchain go to: **www.keil.com**

5.2 Infineon Config Wizard

In addition to the IDE, Infineon® provides the ConfigWizard. The tool is designed for code configuration, in combination with the IDE. Infineons Config Wizard can be downloaded via: **www.infineon.com/embeddedpower**

5.3 TLE984x Installation

All embedded Power products can be installed to Keil® µVision5® via “Pack Installer”. Browsing to the Infineon chapter in “All Devices” will lead to the “TLE98xx Series”. The “.pack” file comes with several code examples, to provide an easy start up and speed up software developement.

5.4 Debug Connection Setup

For a proper Flash and Debug Connection, Install V5.10 (or newer) from:
www.segger.com/jlink-software.html

Keil® µVision5® has to be configured in the IDE Menu “Options for Target”. After connecting the USB-cable and power up the Evalboard, go to the “Debug” register-card and choose “J-LINK / J-TRACE Cortex” and press ”Settings”.

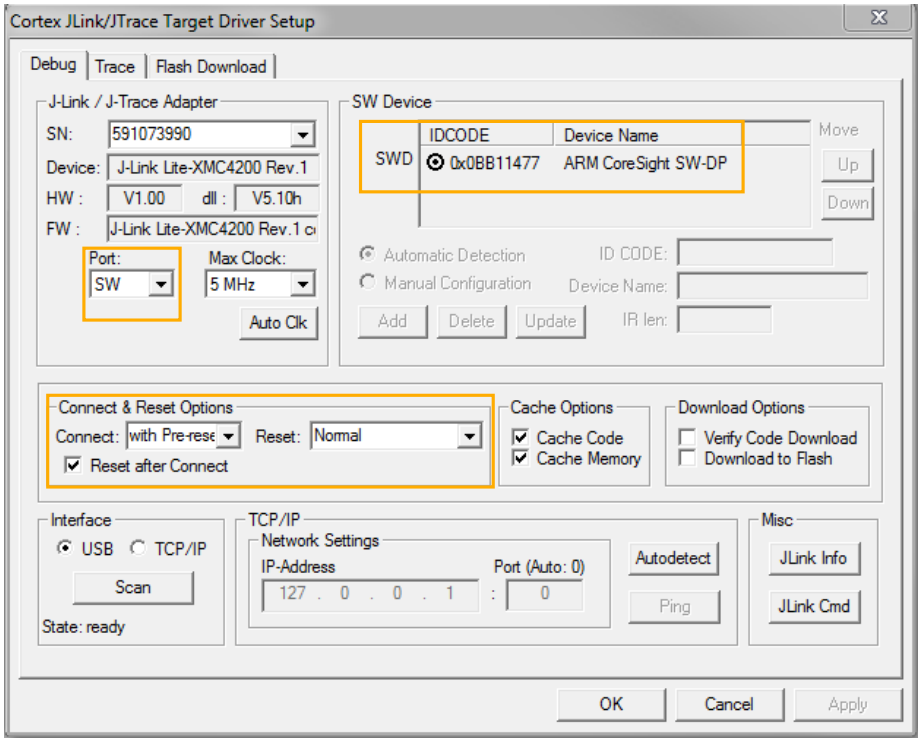

Figure 5 Debug and Flash Configuration

If the board has been connected successfully, the ARM IDCODE will be visible in the SW Device Window.
If connection fails, “Connect & Reset Options” and “Port” window has to be checked.

6 PCB Design Data

This Chapter contains Schematic- and Layout-Data.

6.1 Schematic

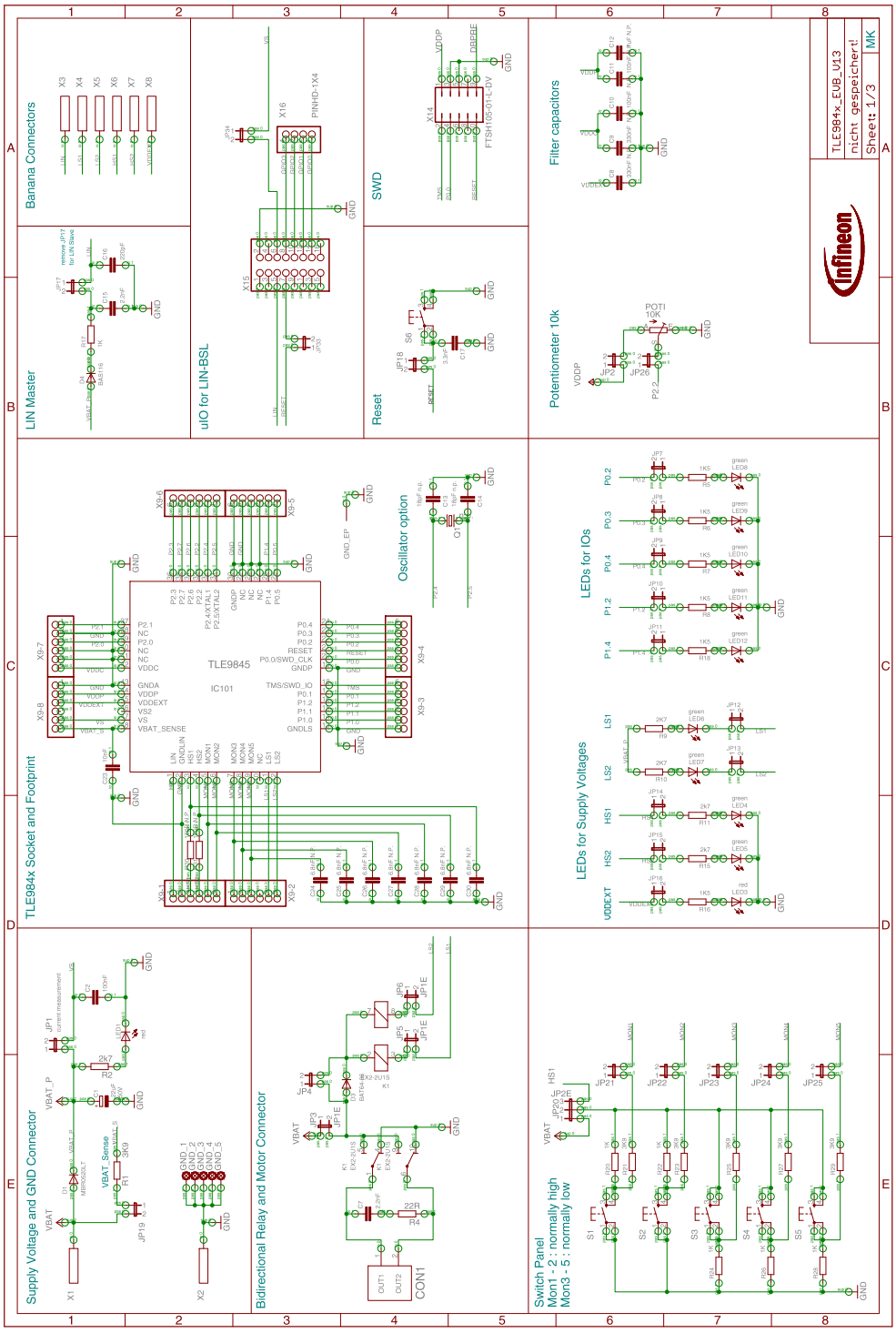

Figure 6 TLE984x Circuit and peripheral components

Note: This is a very simplified example of an application circuit and bill of material. The function must be verified in the application.

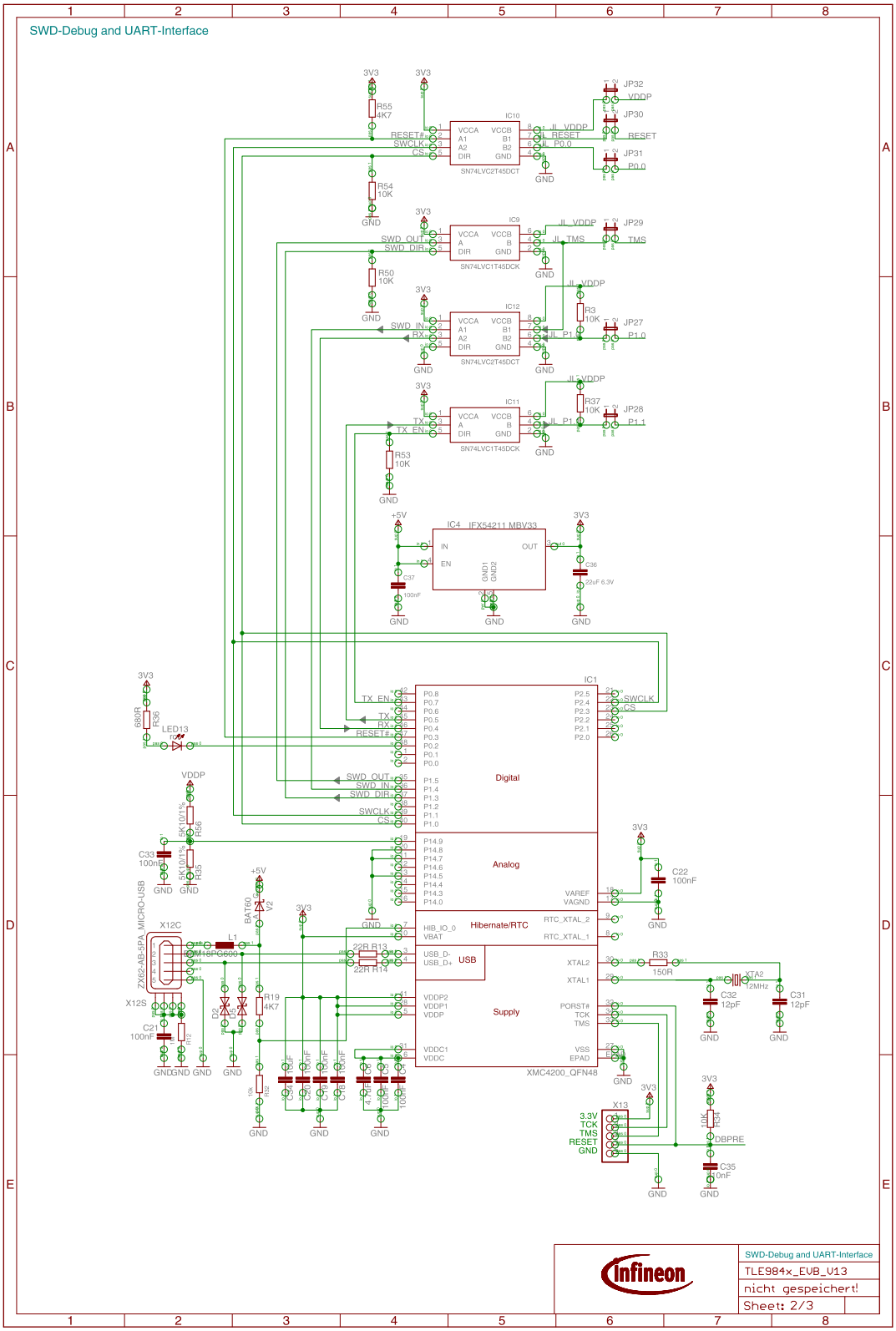

Figure 7 Onboard debug cicuit

Note: This is a very simplified example of an application circuit and bill of material. The function must be verified in the application.

6.2 Layout Data

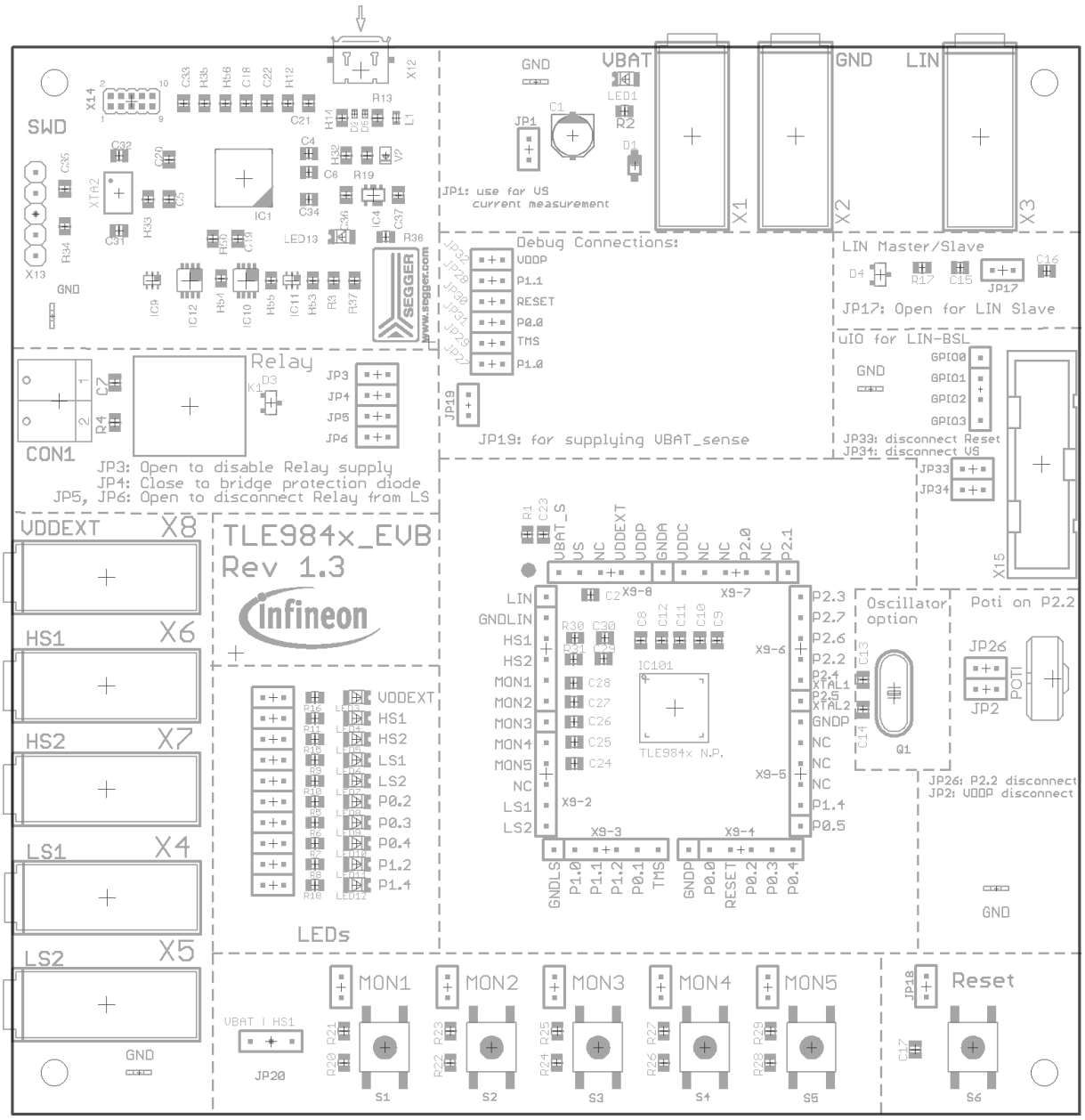

Figure 8 Parts placement

Note: This is a very simplified example of an application circuit and bill of material. The function must be verified in the application.

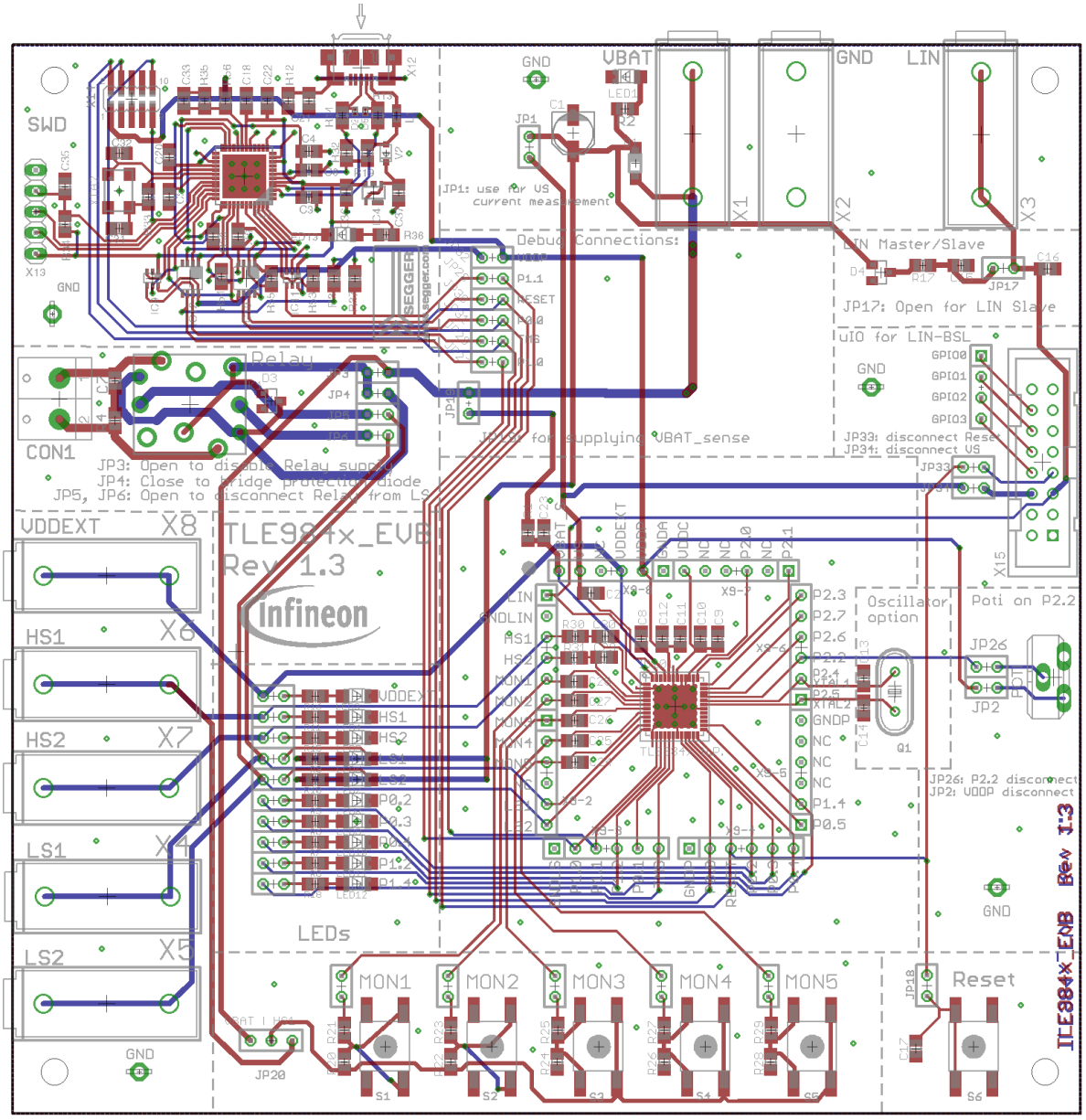

Figure 9 Full Layout

Note: This is a very simplified example of an application circuit and bill of material. The function must be verified in the application.

6.3 Partlist

Table 2 Evalboard Partlist

Part Number	Value	Package
C1	22µF	ELKO_SMD_ALU_BF-C
C2, C4, C5, C10, C11, C18, C19, C20, C21, C22, C33, C37	100nF	0805
C6	4.7µF	0805
C7, C15	2.2nF	0805
C8, C9	330nF	0805
C12	1µF	0805
C13, C14	18pF	0805
C16	220pF	0805
C17	3.3nF	0805
C23, C35	10nF	0805
C24, C25, C26, C27, C28, C29, C30	6.8nF	0805
C31, C32	12pF	0805
C34	10µF	0805
C36	22µF	0805
D1	MBR0520LT	SOD123
D2, D5	ESD205-B1-02EL	TSLP-2
D3, D4	BAT64-06	SOT23
IC1	XMC4200_QFN48	QFN48
IC4	IFX54211 MBV33	SCT595
IC9, IC11	SN74LVC1T45DCK	R-PDSO-G6
IC10, IC12	SN74LVC2T45DCT	R-PDSO-G8
IC101	TLE984x	VQFN48
K1	EX2-2U1S	EX2
LED1, LED3, LED13	red	1206
LED4, LED5, LED6, LED7, LED8, LED9, LED10, LED11, LED12	green	1206
POTI	10K	PT-10S
Q1		HC49/S
R1	3K3	0805
R2, R9, R10, R11, R15	2K7	0805
R4, R13, R14	22R	0805
R5, R6, R7, R8, R16, R18	1K5	0805
R12	1M	0805
R17, R20, R22, R24, R26, R28	1K	0805
R19, R55	4K7	0805

Table 2 Evalboard Partlist

Part Number	Value	Package
R21, R23, R25, R27, R29	3K9	0805
R30, R31	160R	0805
R33	150R	0805
R36	680R	0805
R3, R32, R34, R37, R50, R53, R54	10K	0805
R56, R35	5K1	0805
S1, S2, S3, S4, S5, S6	Button	6x6 SMD
V2	BAT60	SOD323-R
X1, X8	red	4mm Banana
X2	black	4mm Banana
X3, X4, X5, X6, X7,	green	4mm Banana
X9-1, X9-2, X9-3, X9-4, X9-5, X9-6, X9-7, X9-8	Pinhead 1x6	1x06
X12	ZX62-AB-5PA	USB - Mikro-AB
X13	Pinhead 1x5	1x05
X14	FTSH105-01-L-DV	FTSH105_SMD
X15	Pinhead 2x8	PAK100/2500-16
X16	Pinhead 1x4	1x04
XTAL2	12MHz	HC5032

References

[1] TLE9842QX Data Sheet Rev. 1.0

[2] TLE9842-2QX Data Sheet Rev. 1.0

[3] TLE9843QX Data Sheet Rev. 1.0

[4] TLE9843-2QX Data Sheet Rev. 1.0

[5] TLE9844QX Data Sheet Rev. 1.0

[6] TLE9844-2QX Data Sheet Rev. 1.0

[7] TLE9845QX Data Sheet Rev. 1.0

[8] **www.infineon.com/embeddedpower**

[9] **www.infineon.com/tle984x**

Revision History

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
Rev 1.0	Update from Eval Rev1.2 to Eval Rev1.3

Edition 2016-10-24
Published by
Infineon Technologies AG
81726 Munich, Germany

Do you have a question about any aspect of this document?
Email: erratum@infineon.com

Document reference
Doc_Number

IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (**www.infineon.com**).

WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.