# CrossLink LIF-MD6000 Master Link Board

# Evaluation Board User Guide

EB105 Version 1.0

May 2016

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# Tables

# Acronyms in This Document

A list of acronyms used in this document.

| Acronym | Definition |
|---|---|
| CMOS | Complementary Metal-Oxide Semiconductor |
| CSI-2 | Camera Serial Interface |
| DSI | Display Serial Interface |
| FTDI | Future Technology Devices International |
| $I^2C$ | Inter-Integrated Circuit |
| LVDS | Low-Voltage Differential Signaling |
| SPI | Serial Peripheral Interface |

# 1. Introduction

This document describes the Lattice Semiconductor CrossLink™ LIF-MD6000 Master Link board that supports a variety of demos, encompassing different signaling logic standards bridging with MIPI® CSI-2/DSI interface. The board's key component is the CrossLink Family device that features built in MIPI D-PHY hard blocks to support different bridging solutions.

For the latest information about this board, including optional Tx/Rx Link boards, demo files, further documentation and more, see the Lattice website at: www.latticesemi.com/masterlink

For details about the CrossLink device refer to DS1055, CrossLink Family Data Sheet.

The content of this user guide includes descriptions of on-board jumper settings, programming circuit, a complete set of schematics, and bill of materials for LIF-MD6000 Master Link board.

Refer to Appendix A, B, C, D, E, F for the schematics and BOM of the CrossLink LIF-MD6000 Master Link board and the schematics and BOMs of the Breakout IOLink and SMA IOLink boards that are included in the demo kit.

Circuits on the development kit board:

- Programming Circuit
  - Mini USB Type-B connector to FTDI
  - FTDI to CrossLink using SPI
  - FTDI to XO3LF device using JTAG
- CrossLink
  - MIPI CSI-2/DSI hard block
  - Bridging of multiple signaling standards
  - SPI flash configuration
  - General Purpose Input/Output
  - LED display
- LCMXO3LF-1300E
  - $I^2C$ muxing

Figure 1.1 shows the top view of the LIF-MD6000 Master Link board and its key components. Figure 1.2 on the next page shows the bottom view of the board.

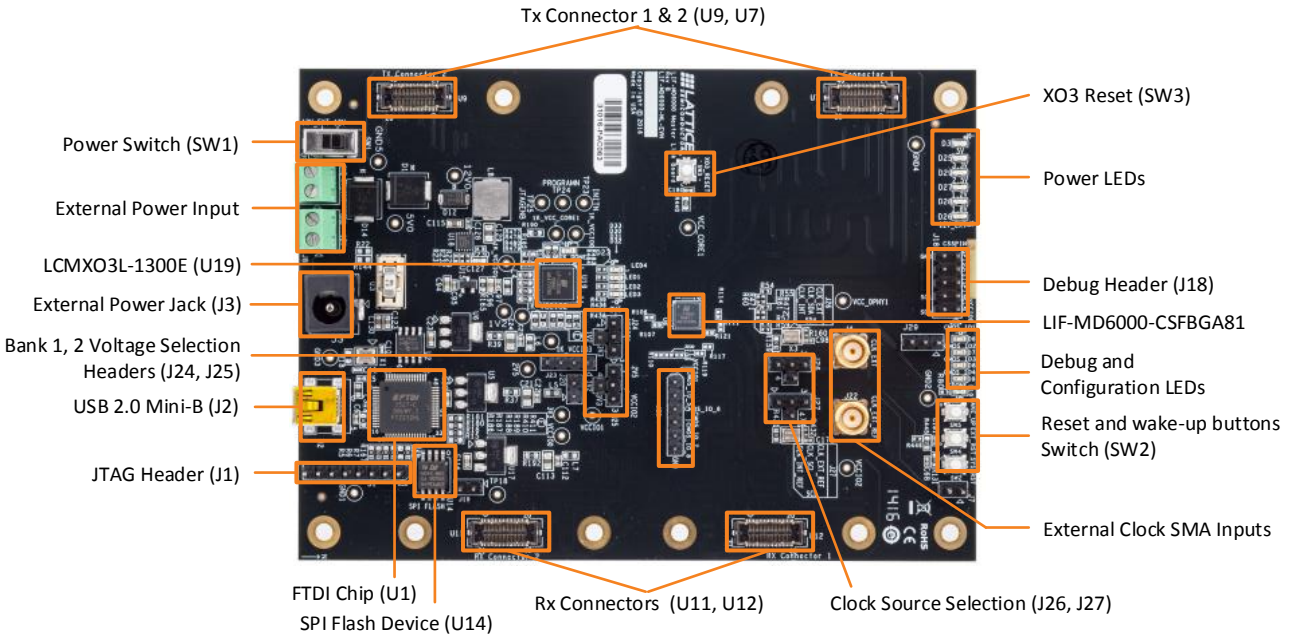



**Figure 1.1. Top View of Master Link Board and its Key Components**

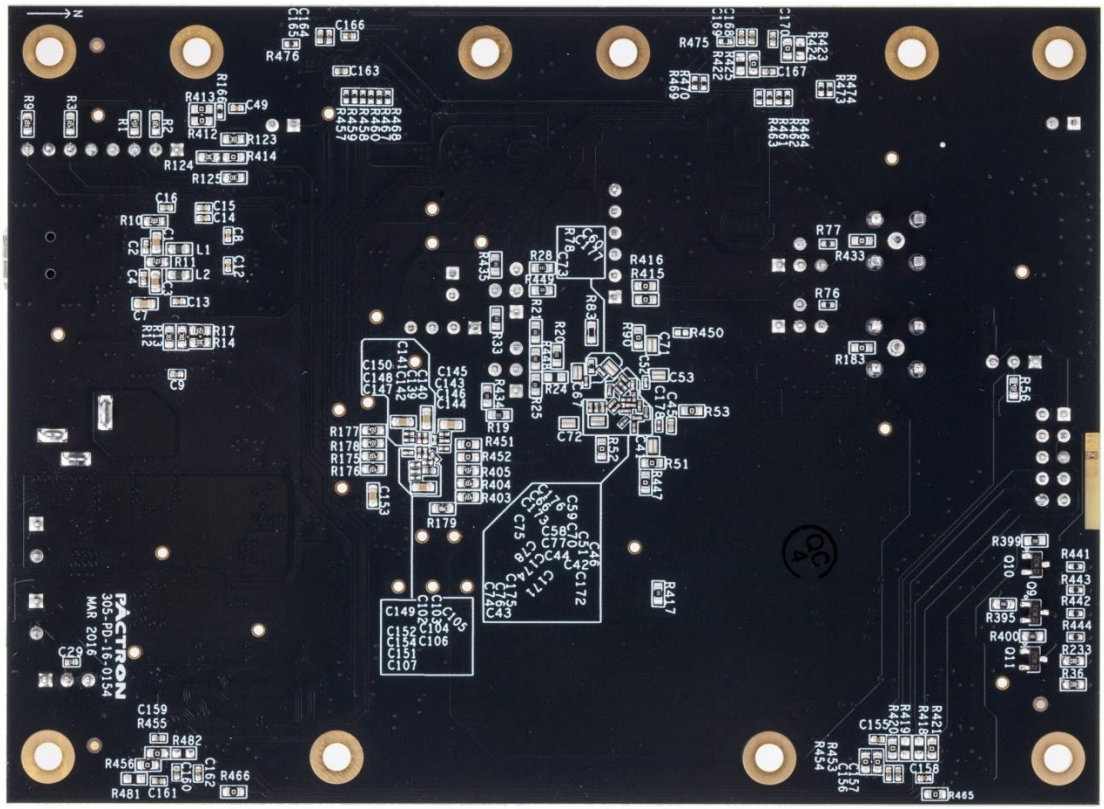


**Figure 1.2. Bottom View of Master Link Board**

# 2. Headers and Test Connections

Figure 1.1 shows the top view of the Master Link board. The headers and test connections on the board provide access to LIF-MD6000 Master Link demo board circuits. Table 2.1 lists the headers and test connectors.

**Table 2.1. Headers and Test Connectors**

| Part | Description | Setting |
|---|---|---|
| J1 | External JTAG interface - For LCMX03 only | — |
| J8 | External 12 V terminal block | Open |
| J9 | External 5 V terminal block | Open |
| SW1 | External adaptor power ON/OFF | — |
| J22 | External reference clock input for MIPI D-PHY reference clock | — |
| J21 | External or internal reference clock selection | 1–2 (External), 2–3 (Internal) |
| J5 | Debug I/O | — |
| J20 | LIF-MD6000 chip select | OPEN-OFF, SHORT-ON |
| J19 | SPI Flash chip select | OPEN-OFF, SHORT-ON |
| J4 | External clock input for MIPI D-PHY reference clock | — |
| J6 | External or internal clock selection | 1–2 (External), 2–3 (Internal) |
| J18 | External SP/$I^2C$ access | — |
| SW2 | Configuration reset for LIF-MD6000 | — |
| J29 | Reset signal voltage selector | 1-2 (VCCIO2), 2-3 (VCCIO0) |
| J28 | Reveal analyzer signal connector | — |
| J26 | Internal/External clock and I2C SDA Mux | 1-2 (CLK_INT), 2-3 (CLK_EXT), 2-4 (SDA) |
| J27 | Internal/External reference clock and I2C SCL Mux | 1-2 (CLK_INT_REF), 2-3 (CLK_EXT_REF), 2-4 (SCL) |
| J24 | VCCIO1 Bank voltage selector | 1-2 (2.5 V), 2-3 (3.3 V), 2-4 (1.2 V) |
| J25 | VCCIO1 Bank voltage selector | 1-2 (2.5 V), 2-3 (3.3 V), 2-4 (1.2 V) |
| J3 | External power jack | — |
| U7, U9 | Tx Connectors for external interface | — |
| U11, U12 | Rx Connectors for external interface | — |
| SW4 | External reset for LIF-MD6000 device | — |
| SW3 | External reset for LCMXO3L device | — |
| SW5 | PMU WAKEUP Switch | — |
| J23 | Debug Header for LCMXO3L device | — |

# 3. Programming Circuit

The Mini-B USB connector is used for programming the board by using Lattice Diamond® programmer software. Figure 3.1 shows the programming block of LIF-MD6000 Master Link board.

The Mini-B USB connector interfaces to the FTDI FT2232H IC. The FTDI IC works with Diamond programmer software to provide interfaces for:

- JTAG – to program MachXO2-1300E
- SPI – to program both CrossLink, and SPI Flash Memory

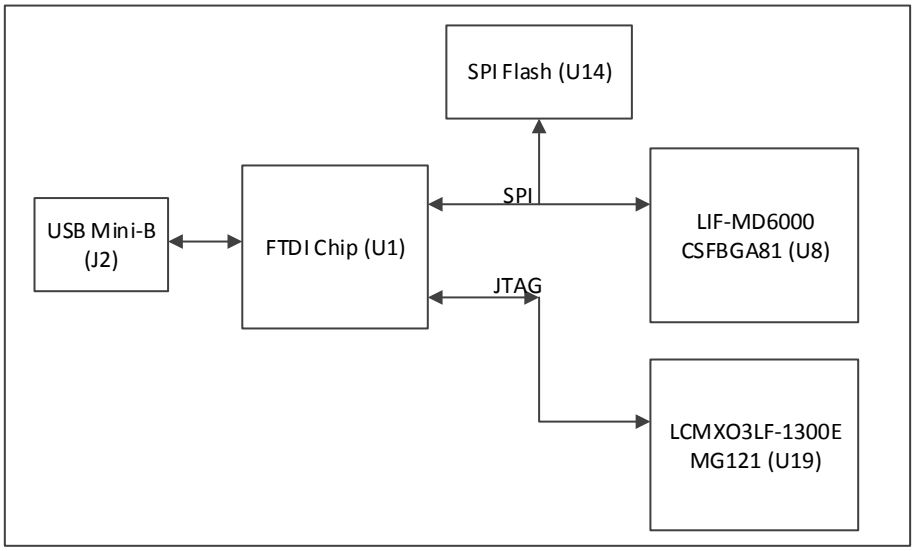



**Figure 3.1. Programming Block**

## 3.1. Bridging Circuit

Figure 3.2 shows the block diagram of bridging of different standard interfaces. The CrossLink device is used as a bridging device that supports a variety of I/O standards. This demo board supports development of the following interface bridges:

- 1:1 MIPI DSI Display Interface Bridge
- 1:2 MIPI DSI Display Interface Bridge
- 2:1 MIPI CSI-2 Image Sensor Aggregator Bridge
- CMOS to MIPI CSI-2 Image Sensor Interface Bridge
- MIPI CSI-2 to CMOS Image Sensor Interface Bridge
- MIPI DSI to CMOS Display Interface Bridge
- OpenLDI LVDS to MIPI DSI Display Interface Bridge
- CMOS to MIPI DSI Display Interface Bridge

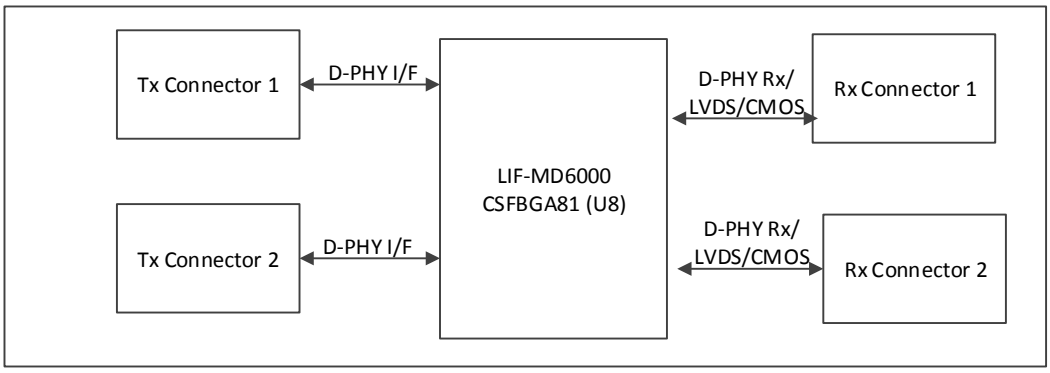



**Figure 3.2. Bridging Block**

## 3.2. I²C Expander

Figure 3.3 shows the block diagram of the I²C expander. The LCMXO3LF-1200E device is used as an I²C expander and it supports a single master and multiple slave devices connected to the board. The master I²C interface is connected to the Tx header and the slave device I²C interface is connected to the Rx connectors supporting any slave device access from the master based on the slave address.

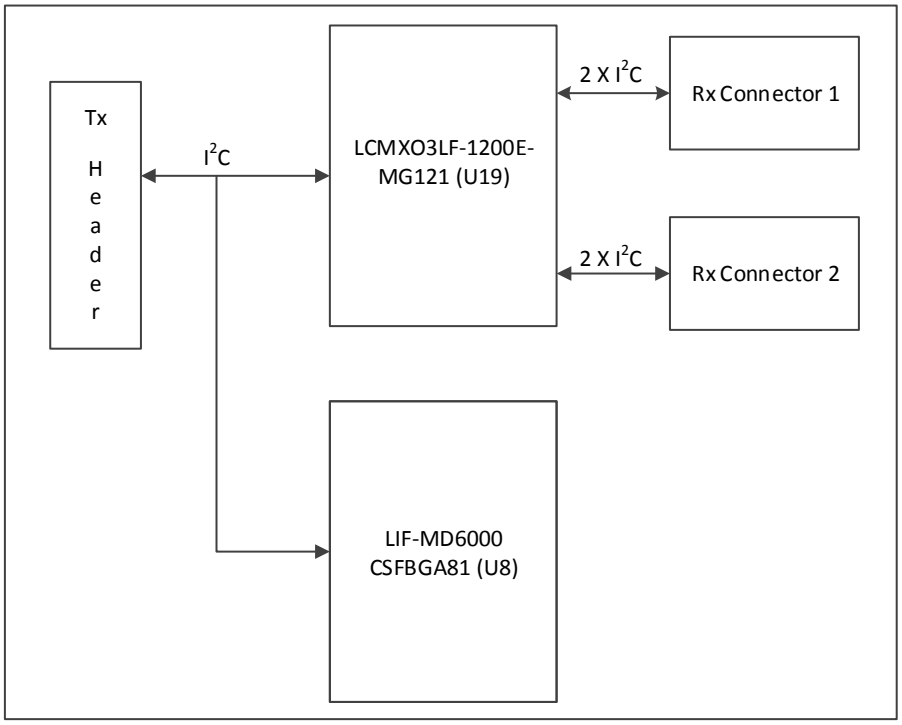



**Figure 3.3. I²C Expander Block**

# 4. Power Supply

The power supply to the development kit is provided by the Mini-B USB connector or from an external adaptor.

Figure 4.1 shows the power supply block of the CrossLink LIF-MD6000 Master Link board. The Mini-B USB connector is used only for programming and the onboard power regulator for the successful programming. The external adaptor provides 12 V power source through voltage regulators on the board to CrossLink and LCMXO3LF-1300E, as well as to the external boards connected to Tx and Rx Headers. Each I/O and core voltage rail on the board is accessible by a test point on the board. The current flowing to each rail can be measured using a 1 Ω resistor placed in the path of each voltage rail.

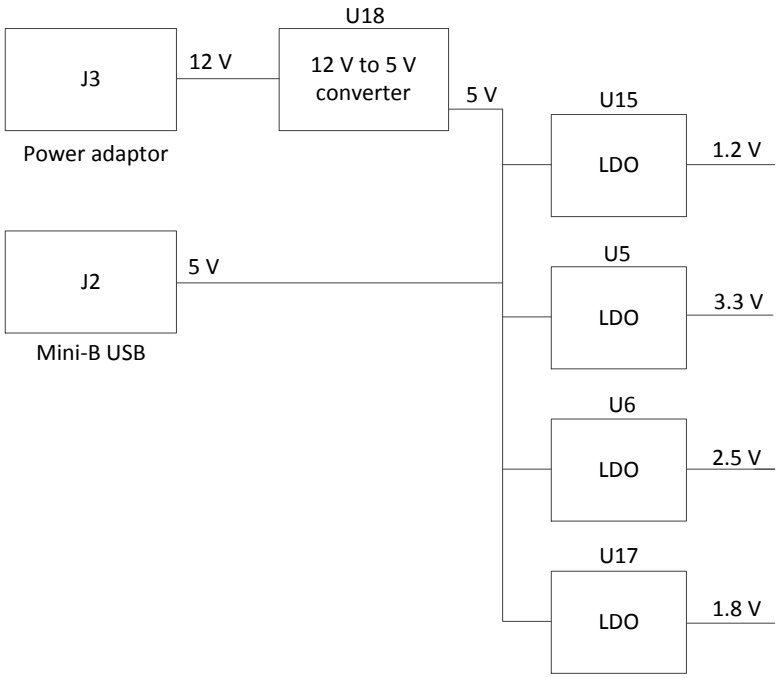



**Figure 4.1. Power Supply Block**

Table 4.1 lists the device power rails. There are five voltage regulators on the board used to supply the 5 V, 3.3 V, 2.5V 1.8 V, and 1.2 V rails. The input to these regulators is either from the Mini-B USB connector or the external 12 V adaptor that is connected to the board. Switch SW2 is used to connect or disconnect the external adaptor power to the board.

**Table 4.1. Power LEDs**

| Voltage Rail | LEDs | Colour |
|---|---|---|
| 12 | D26 | Green |
| 5 | D3 | Green |
| 3.3 | D25 | Green |
| 2.5 | D29 | Green |
| 1.8 | D28 | Green |
| 1.2 | D27 | Green |

Table 4.2 on the next page lists the board voltage rails, including the rail source voltage, test point number, and current sense resistor number.

**Table 4.2. Device Power Rail Summary and Test Points**

| Voltage Rail | Source Rail | Current Sense Resistor | Test Points |
|---|---|---|---|
| 12 V | 12_Ext | — | 12V |
| 5 V | 12 V | — | 5V |
| +3.3 V | 5 V | — | 3V3 |
| +2.5 V | 5 V | — | 2V5 |
| +1.8 V | 5 V | — | 1V8 |
| +1.2 V | 5 V | — | 1V2 |
| VCCCORE | +1.2 V | R19 | VCC_CORE |
| VCCIO0 | +3.3 V | R20 | VCCIO0 |
| VCCIO1 | +3.3 V | R21 | VCCIO1 |
| VCCIO2 | +3.3 V | R28 | VCCIO2 |
| VCC_DPHY | +1.2 V | R417 | VCC_DPHY |
| 1K_VCC_CORE | 1.2 V | R190 | 1K_VCC_CORE |
| 1K_VCCIO0 | +3.3 V | R410 | 1K_VCCIO0 |
| 1K_VCCIO1 | +3.3 V | R184 | 1K_VCCIO1 |
| 1K_VCCIO2 | +3.3 V | R186 | 1K_VCCIO2 |
| 1K_VCCIO3 | +3.3 V | R188 | 1K_VCCIO3 |

# 5. Status Indicators

The LED status indicators on the board show power, configuration, and application status. Table 5.1 lists the status LED I/O map.

**Table 5.1. Status LED I/O Map**

| Device | LED | Net Name | Colour |
|---|---|---|---|
| CrossLink | D6 | CMOS_IO_1 | Blue |
| CrossLink | D7 | CMOS_IO_2 | Blue |
| CrossLink | D8 | CMOS_IO_3 | Blue |
| CrossLink | D9 | CMOS_IO_4 | Blue |
| CrossLink | D10 | CDONE | Green |
| LCMX03LF-1300E | D23 | DONE | Red |

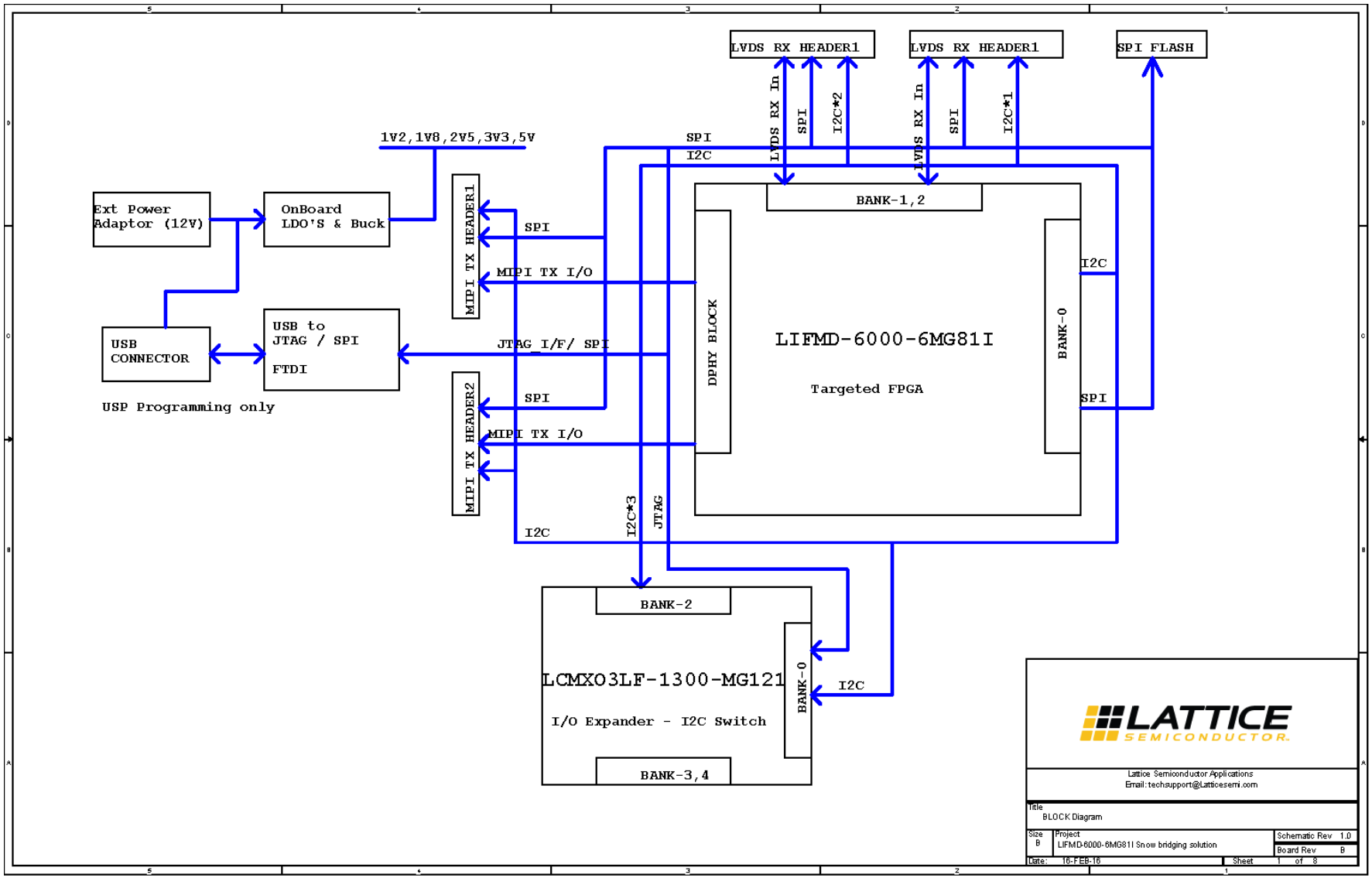
# References

For more information, refer to:
DS1055, CrossLink Family Data Sheet

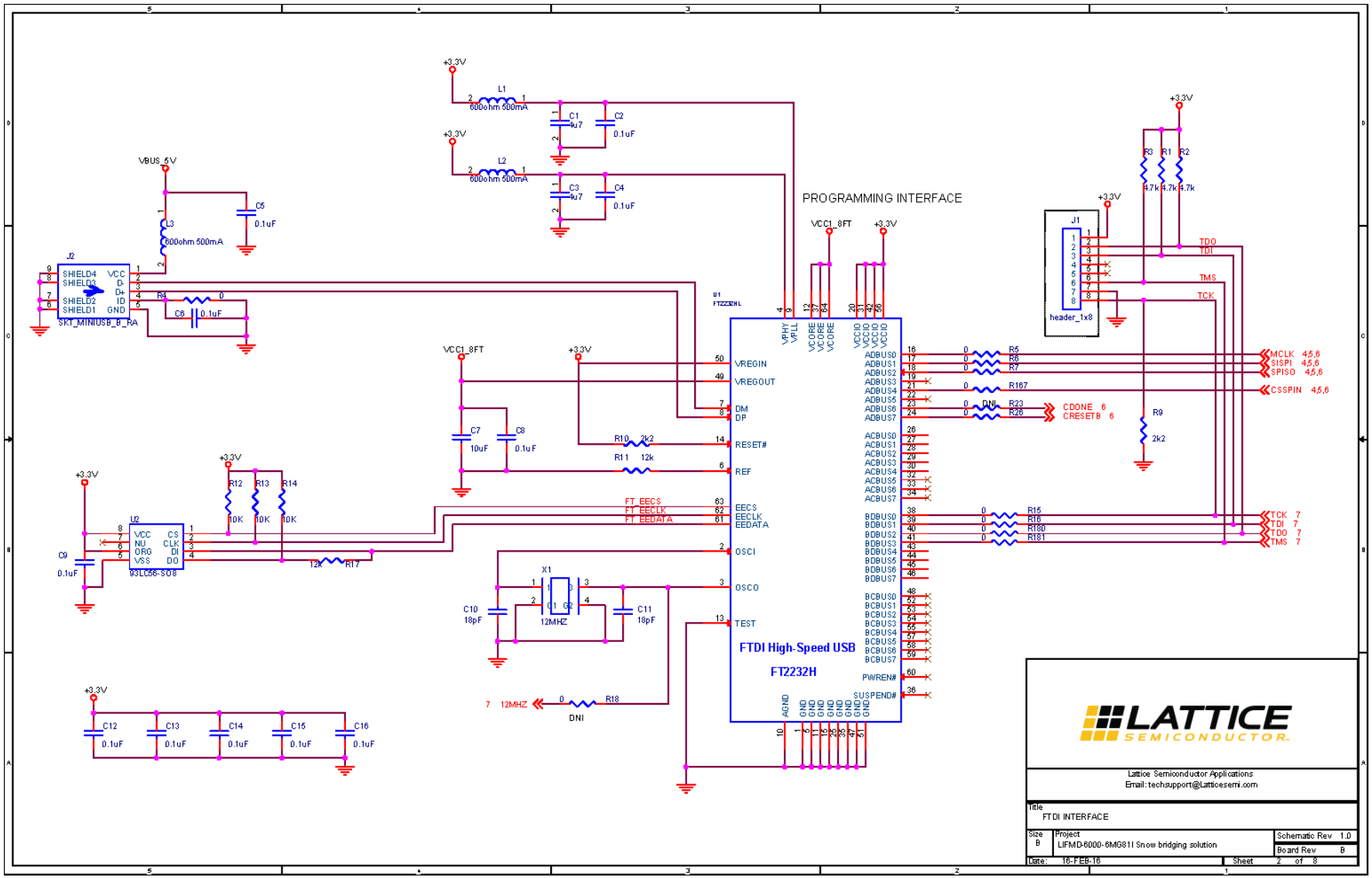
# Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

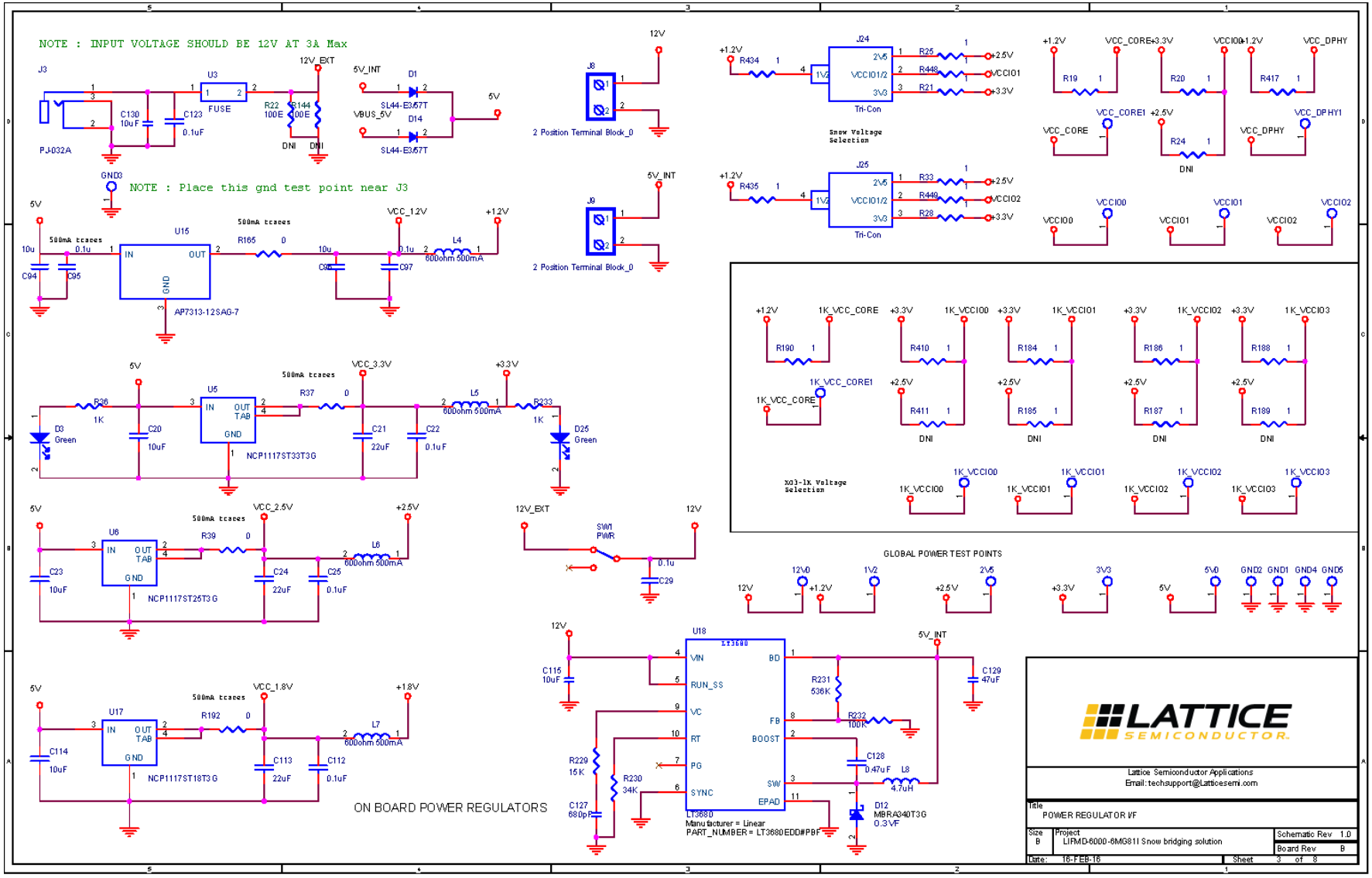
# Appendix A. LIF-MD6000-ML-EVN-BRD Schematics



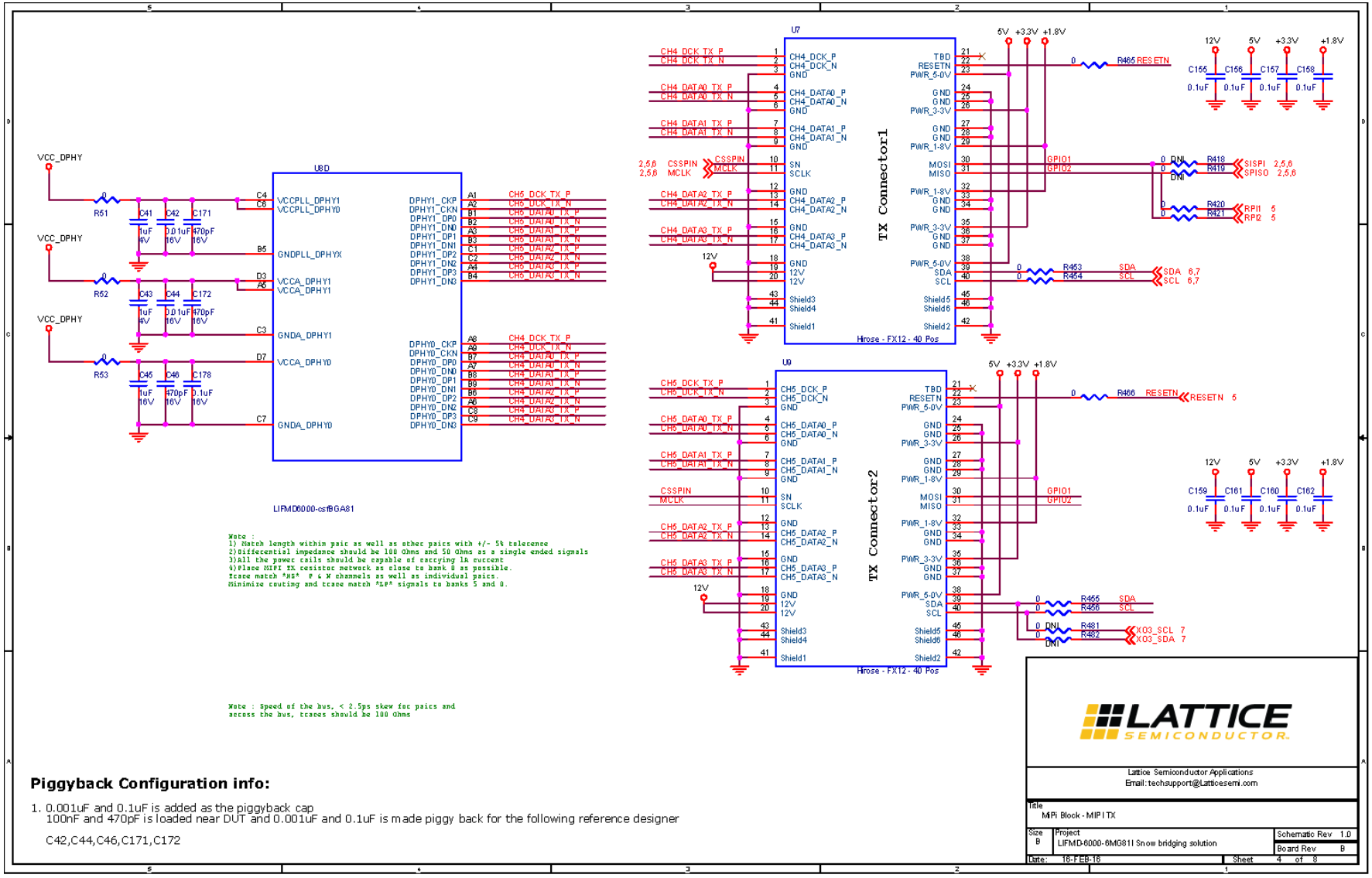

**LIF-MD6000 Master Link Board Block Diagram**



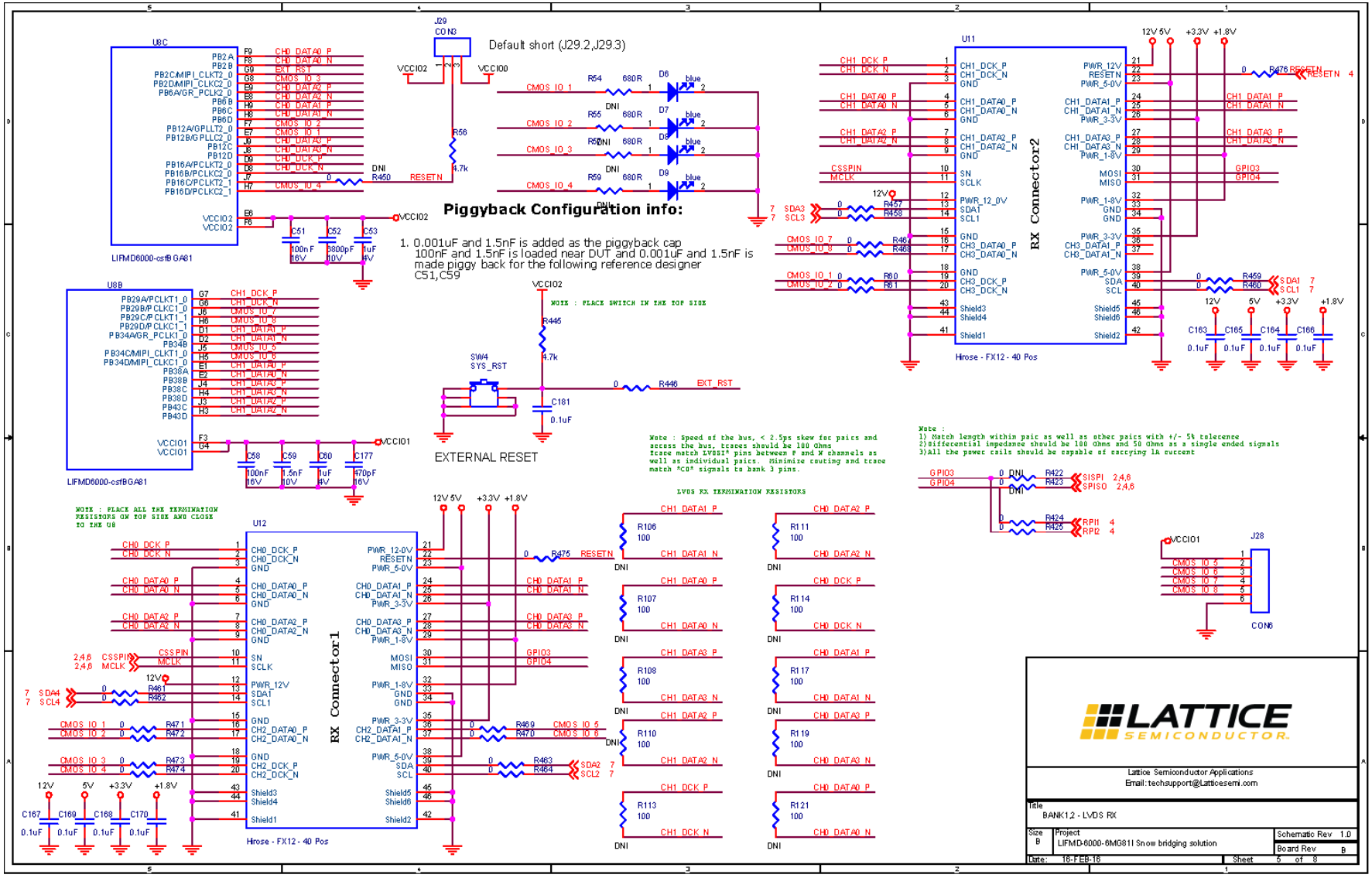

**FTDI Interface**



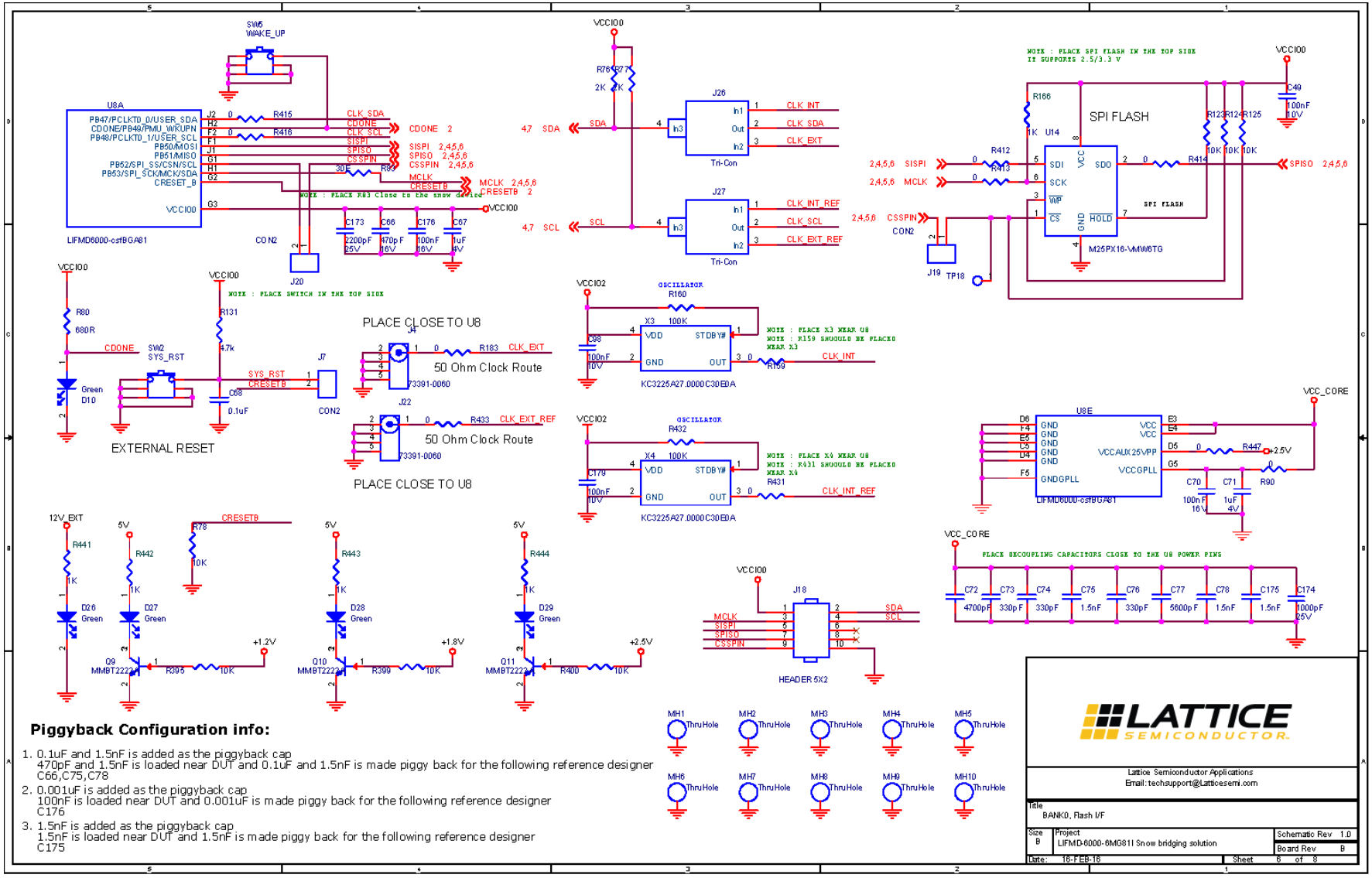

**Power Regulator Interface**



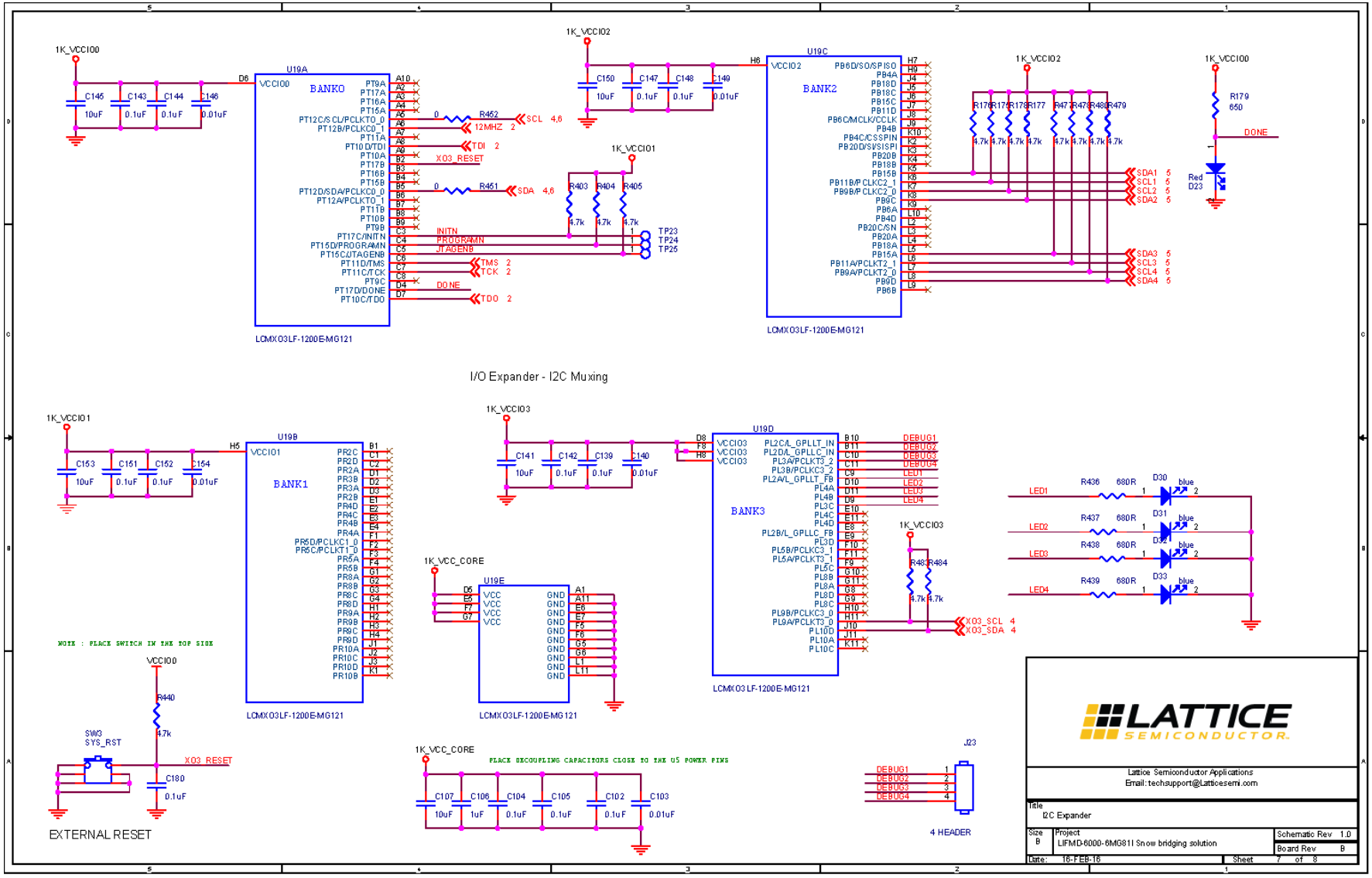

**MIPI Block – MIPI Tx**



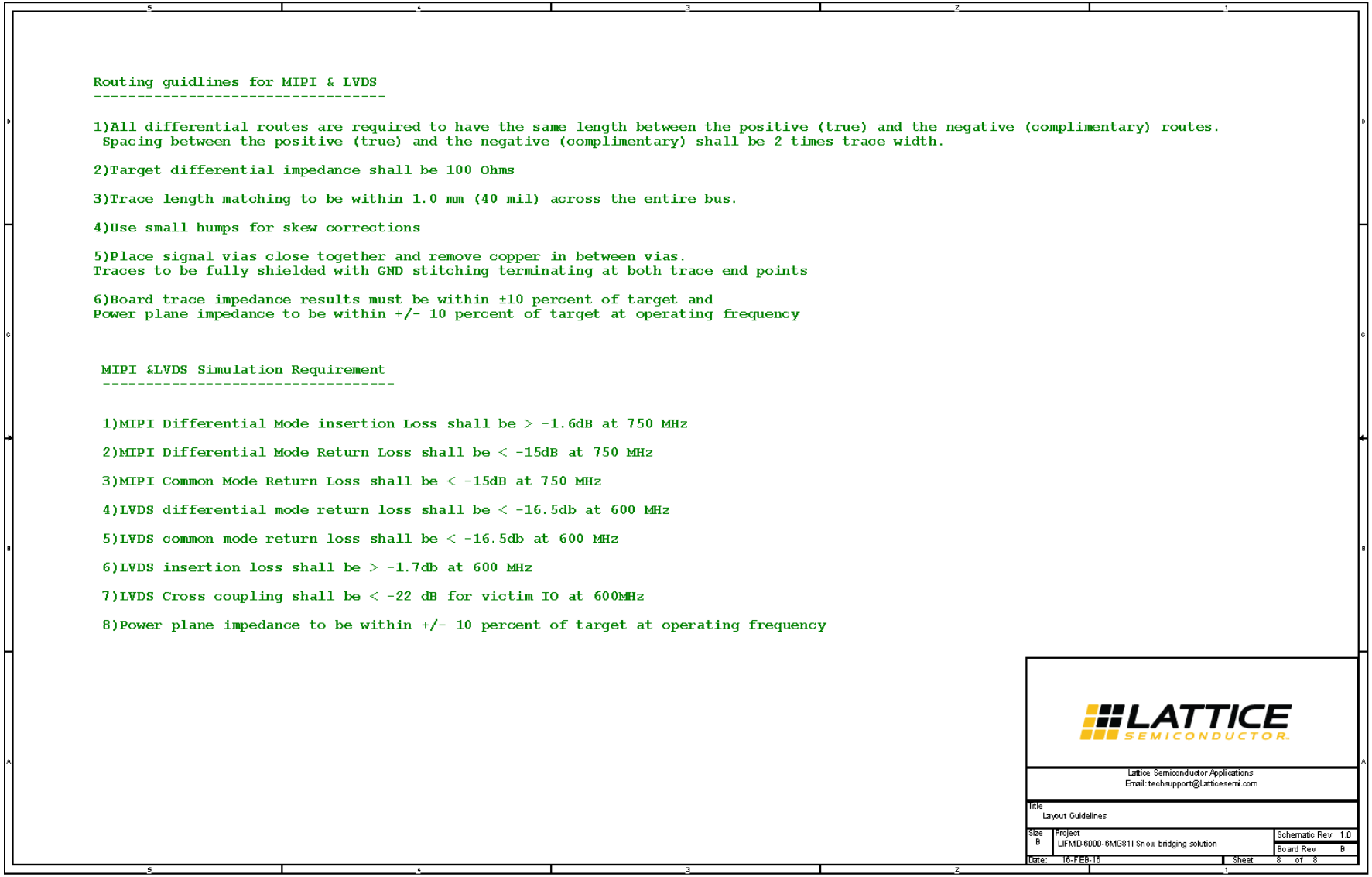

**Bank 1, 2 – LVDS Rx**




**BANK0, Flash Interface**




**I²C Expander**




**Layout Guidelines**

# Appendix B. LIF-MD6000-ML-EVN-BRD Bill of Materials

**LIF-MD6000 Master Link Board Bill of Materials**

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 1 | C1, C3 | 2 | 4u7 | C0603 | — | ECJ-1VB0J475K | Panasonic | Cap Cer 4.7 uF 6.3 V 10% X5R 0603 |
| 2 | C2, C4, C5, C6, C8, C9, C12, C13, C14, C15, C16, C22, C25, C68, C112, C180, C181 | 17 | 0.1 uF | C0402 | — | C0402C104K4RACTU | Kemet | CAP CERAMIC 0.1 uF 16 V X7R 0402 |
| 3 | C7, C20, C23, C107, C114, C141, C145, C150, C153 | 9 | 10 uF | C0603 | — | LMK107BJ106MALTD | Taiyo Yuden | CAP CECAP CER 10 uF 10 V X5R 20% 0603 |
| 4 | C10, C11 | 2 | 18 pF | C0402 | — | C0402C180K3GACTU | Kemet | CAP CER 18 pF 25 V C0G 0402 |
| 5 | C21, C24, C113 | 3 | 22 uF | C0805 | — | LMK212BJ226MG-T | Taiyo Yuden | CAP CERAMIC 22 uF 10 V X5R 0805 |
| 6 | C29, C95, C97 | 3 | 0.1 uF | C0402 | — | CL05A104MP5NNNC | Samsung | Cap Ceramic 0.1 uF 10 V X5R 20% SMD 0402 85C Paper T/R |
| 7 | C41, C43, C53, C60, C67, C71 | 6 | 1 uF | C0306 | — | LLR185C70G105ME05L | Murata | CAP CER 1uF 4 V X7S 0306 |
| 8 | C42, C44 | 2 | 0.01 uF | C0201 | — | GRM033R61C103KA12D | Murata | CAP CER 10000 pF 16 V X5R 0201 |
| 9 | C42, C44, C51, C176 | 4 | 0.001 uF | C0201 | Piggyback Configuration | GRM033R71C102KA01D | Murata | CAP CER 1000 pF 16 V X7R 0201 |
| 10 | C45 | 1 | 1 uF | C0402 | — | GRM155R61C105KA12D | Murata | CAP CER 1 uF 16 V X5R 0402 |
| 11 | C46, C66, C171, C172, C177 | 5 | 470 pF | C0201 | — | GRM033R71C471KA01D | Murata | CAP CER 470 pF 16 V X7R 0201 |
| 12 | C46, C66, C171, C172 | 4 | 0.1 uF | C0201 | Piggyback Configuration | GRM033R61C104KE84D | Murata | CAP CER 0.1 uF 16 V X5R 0201 |
| 13 | C49, C98, C179 | 3 | 100 nF | C0402 | — | GRM155R61A104KA01D | Murata | CAP CER 100 nF 10 V 10% X5R 0402 |
| 14 | C51, C58, C70, C176 | 4 | 100 nF | C0201 | — | C0603X5R1C104K030BC | TDK | CAP CER 0.1 uF 16 V X5R 0201 |
| 15 | C52 | 1 | 6800 pF | C0201 | — | GRM033R71A682KA01D | Murata | CAP CER 6800 pF 10 V X7R 0201 |
| 16 | C59, C75, C78, C175 | 4 | 1.5 nF | C0201 | — | GRM033R71A152KA01D | Murata | CAP CER 1500 pF 10 V X7R 0201 |
| 17 | C75, C78, C59, C175 | 4 | 1.5 nF | C0201 | Piggyback Configuration | GRM033R71A152KA01D | Murata | CAP CER 1500 pF 10 V X7R 0201 |
| 18 | C72 | 1 | 4700 pF | C0306 | — | LLL185R71H472MA01L | Murata | CAP CER 4700 pF 50 V X7R 0306 |
| 19 | C73, C74, C76 | 3 | 330 pF | C0201 | — | GRM033R71H331KA12D | Murata | CAP CER 330 pF 50 V X7R 0201 |
| 20 | C77 | 1 | 5600 pF | C0201 | — | GRM033R71A562KA01D | Murata | CAP CER 5600 pF 10 V X7R 0201 |

**LIF-MD6000 Master Link Board Bill of Materials** *(Continued)*

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 21 | C94, C96 | 2 | 10 uF | C0603 | — | CL10X106MP 8NRNC | Samsung | CAP CER 10 uF 10 V 20% X6S 0603 |
| 22 | C102, C104, C105, C139, C142, C143, C144, C147, C148, C151, C152 | 11 | 0.1 uF | C0201 | -— | C0603X5R1C1 04K030BC | TDK | CAP CER 0.1 uF 16 V 10% X5R 0201 |
| 23 | C103, C140, C146, C149, C154 | 5 | 0.01 uF | C0201 | — | CC0201KRX7R 7BB103 | Yageo | CAP CER 10000 pF 16 V 10% X7R 0201 |
| 24 | C106 | 1 | 1 uF | C0402 | — | C0402C105K9 PACTU | Kemet | CAP CERAMIC 1 uF 6.3 V X5R 0402 |
| 25 | C115, C130 | 2 | 10 uF | C0603 | — | CL10A106MA 8NRNC | Samsung | CAP CER 10 uF 25 V 20% X5R 0603 |
| 26 | C123 | 1 | 0.1 uF | C0603 | — | GRM188R71E 104KA01D | Murata | CAP CER 0.1 uF 25 V 10% X7R 0603 |
| 27 | C127 | 1 | 680 pF | C0603 | — | C0603C681J3 GACTU | Kemet | CAP CER 680 pF 25 V 5% NP0 0603 |
| 28 | C128 | 1 | 0.47 uF | C0402 | — | CL05A474KA5 NNNC | Samsung | CAP CER 0.47 uF 25 V 10% X5R 0402 |
| 29 | C129 | 1 | 47 uF | C0805 | — | C2012X5R1A4 76M125AC | TDK | CAP CER 47 uF 10 V 20% X5R 0805 |
| 30 | C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170 | 16 | 0.1 uF | C0402 | — | 04023C104KA T2A | AVX | CAP CER 0.1 uF 25 V 10% X7R 0402 |
| 31 | C173 | 1 | 2200 pF | C0201 | — | GRM033R71E 222KA12D | Murata | CAP CER 2200 pF 25 V X7R 0201 |
| 32 | C174 | 1 | 1000 pF | C0201 | — | GRM033R61E 102KA01D | Murata | CAP CER 1000 pF 25 V X5R 0201 |
| 33 | C178 | 1 | 0.1 uF | C0201 | — | GRM033R61C 104KE84D | Murata | CAP CER 0.1 uF 16 V X5R 0201 |
| 34 | D1, D14 | 2 | SL44-E3/ 57T | SL44E357T | — | SL44-E3/57T | Vishay semiconducto r | Schottky Diodes & Rectifiers 4.0 A 40 V |
| 35 | D3, D25, D26, D27, D28, D29 | 6 | Green | led_0603 | — | LTST-C190KGKT | LITE-On INC | LED SUPER GREEN CLEAR 0603 SMD |
| 36 | D6, D7, D8, D9, D30, D31, D32, D33 | 8 | blue | led_0603 | — | LTST-C193TBKT-5A | LITE-On INC | Standard LEDs - SMD Blue 470 nm 28mcd 5 mA |
| 37 | D10 | 1 | Green | led_0603 | — | LG L29K-G2J1-24-Z | OSRAM | LED SUPER GREEN CLEAR 0603 SMD |
| 38 | D12 | 1 | 0.3 VF | MBRA340T 3G | — | MBRA340T3G | ON Semi | DIODE SCHOTTKY 40 V 3 A SMA |
| 39 | D23 | 1 | Red | led_0603 | — | LTST-C193KRKT-5A | LITE-On INC | Standard LEDs - SMD Red 631 nm 14mcd 5 mA |

**LIF-MD6000 Master Link Board Bill of Materials** *(Continued)*

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 40 | VCC_DPHY1, VCC_CORE1, VCCIO1, GND1, VCCIO2, GND2, GND3, GND4, GND5, 1K_VCCIO0, 1K_VCC_CORE1, 1K_VCCIO1, 1V2, 1K_VCCIO2, 1K_VCCIO3, TP18, TP23, TP24, TP25, 2V5, 3V3, 5V0, 12V0, VCCIO0 | 24 | TP_S_40_ 63 | tp_s_ 40_63 | DNI | — | — | Square test point, 40 mil inner diameter, 63 mil outer diameter |
| 41 | J1 | 1 | header_1x 8 | hdr_amp_ 87220_8_ 1x8_100 | — | 22-28-4081 | Molex | CONN HEADER 8POS .100 VERT TIN |
| 42 | J2 | 1 | SKT_MINI USB_B_RA | skt_miniu sb_b_ra | — | 5075BMR-05-SM-CR | Neltron | CONN MINI USB RCPT RA TYPE B SMD |
| 43 | J3 | 1 | PJ-032A | PJ-032A | — | PJ-032A | CUI Inc. | CON PWR JCK 2.0 X 6.5 M VERT |
| 44 | J4, J22 | 2 | 73391-0060 | 73391-0060 | — | 73391-0060 | Molex | CONN SMA JACK STR 50 OHM PCB |
| 45 | J7, J19, J20 | 3 | CON2 | CON2 | REGULAR 100 MIL HEADER | — | — | General 100 mils 2 Position header |
| 46 | J8, J9 | 2 | 2 Position Terminal Block_0 | TERM_BL OCK_2POS _10A | — | 1727010 | Phoenix Contact | TERM BLOCK 2POS 3.81 mm PCB GRN |
| 47 | J18 | 1 | HEADER 5X2 | HEADER 2X5 | REGULAR 100 MIL HEADER | — | — | General 100 Mils 2*5 header |
| 48 | J23 | 1 | 4 HEADER | CON4 | REGULAR 100 MIL HEADER | — | — | General 100 Mils 4 Position Header |
| 49 | J24, J25, J26, J27 | 4 | Tri-Con | TriCon | REGULAR 100 MIL HEADER | — | — | General 100 Mils Header |
| 50 | J28 | 1 | CON6 | HDR1X6 | REGULAR 100 MIL HEADER | — | — | — |
| 51 | J29 | 1 | CON3 | HDR1X3 | REGULAR 100 MIL HEADER | — | — | — |
| 52 | L1, L2, L3, L4, L5, L6, L7 | 7 | 600 Ω 500 mA | FB0603 | — | BLM18AG601 SN1D | Murata | Ferrite Bead 600 Ω @100 MHz 500 mA 0603 |
| 53 | L8 | 1 | 4.7 uH | MPLC0730 L4R7 | — | MPLC0730L4R 7 | Kemet | INDUCTOR POWER 4.7 uH 20% SMD |
| 54 | MH1, MH2, MH3, MH4, MH5, MH6, MH7, MH8, MH9, MH10 | 10 | Thru Hole | MTG125 | DNL | — | — | — |

**LIF-MD6000 Master Link Board Bill of Materials** *(Continued)*

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 55 | Q9, Q10, Q11 | 3 | MMBT2222A | SM_SOT23-3 | — | MMBT2222A,215 | NXP Semiconductor | TRANS NPN 40 V 0.6 A SOT23 |
| 56 | R1, R2, R3, R56, R131, R175, R176, R177, R178, R403, R404, R405, R440, R445, R477, R478, R479, R480, R483, R484 | 20 | 4.7K | R0603 | — | CRCW06034K70FKEA | Vishay | RES SMD 4.7 kΩ HM 1% 1/10 W 0603 |
| 57 | R4, R5, R6, R7, R15, R16, R26, R37, R39, R51, R52, R53, R90, R159, R165, R167, R180, R181, R183, R192, R431, R433, R447 | 23 | 0 | R0603 | — | RC0603JR-070RL | Yageo | Res 1/10 W 0.0 Ω 5% 0603 |
| 58 | R9, R10 | 2 | 2K2 | R0603 | — | CRCW06032K20FKEA | Vishay | RES SMD 2.2 kΩ 1% 1/10 W 0603 |
| 59 | R11, R17 | 2 | 12K | R0603 | — | RC0603FR-0712KL | Yageo | RES SMD 12 kΩ 1% 1/10 W 0603 |
| 60 | R12, R13, R14, R123, R124, R125 | 6 | 10K | R0603 | — | RMCF0603JT10K0 | Stackpole Electronics Inc | RES SMD 10 kΩ 5% 1/10 W 0603 |
| 61 | R18, R418, R419, R422, R423 | 5 | 0 | R0603 | DNI | RC0603JR-070RL | Yageo | Res 1/10 W 0.0 Ω 5% 0603 |
| 62 | R19, R20, R21, R25, R28, R33, R184, R186, R188, R190, R410, R417, R434, R435, R448, R449 | 16 | 1 | R0603 | — | CRCW06031R00JNEAHP | Vishay/Dale | RES SMD 1 Ω 5% 1/4W 0603 |
| 63 | R22, R144 | 2 | 100E | R0603 | DNI | CRCW0603100RFKEAHP | Vishay / Dale | RES SMD 100 Ω 1% 1/4W 0603 |
| 64 | R23 | 1 | 0 | R0603 | DNI | RC0603JR-070RL | Yageo | Res 1/10 W 0.0 Ω 5% 0603 |
| 65 | R24, R185, R187, R189, R411 | 5 | 1 | R0603 | DNI | CRCW06031R00JNEAHP | Vishay/Dale | RES SMD 1 Ω 5% 1/4W 0603 |
| 66 | R36, R233 | 2 | 1K | R0603 | — | RC0603FR-071KL | Yageo | RES SMD 1 kΩ 1% 1/10 W 0603 |
| 67 | R54, R55, R57, R59 | 4 | 680R | R0402 | DNI | RMCF0402JT680R | Stackpole Electronics Inc | RES 680 Ω 1/16 W 5% 0402 |
| 68 | R60, R61, R446, R457, R458, R459, R460, R461, R462, R463, R464, R467, R468, R469, R470, R471, R472, R473, R474, R475, R476 | 21 | 0 | R0402 | — | RC0402JR-070RL | Yageo | RES SMD 0.0O HM JUMPER 1/16 W 0402 |

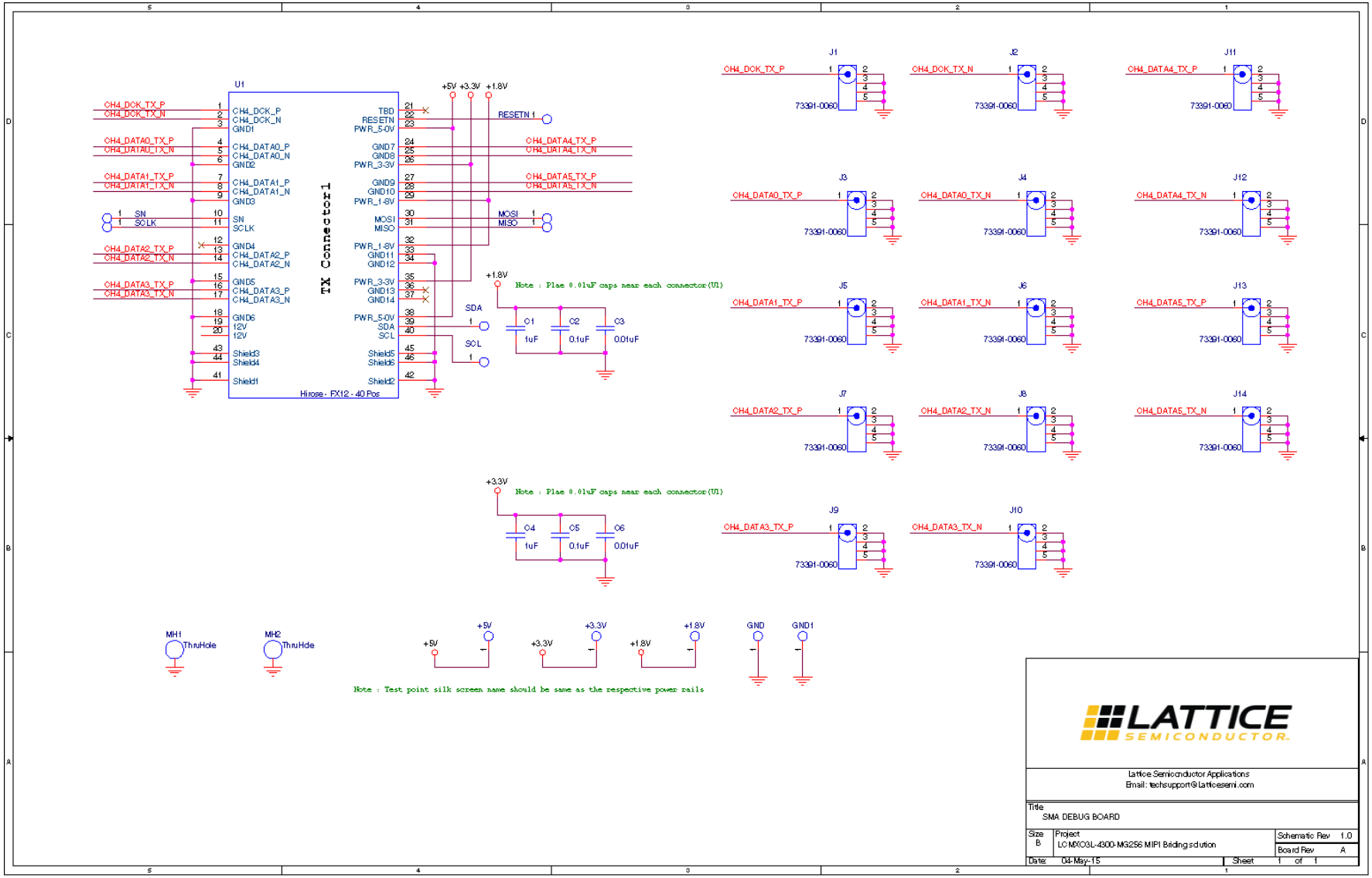
**LIF-MD6000 Master Link Board Bill of Materials** *(Continued)*

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 69 | R76, R77 | 2 | 2K | R0402 | — | ERJ-2RKF2001X | Panasonic | RES SMD 2 kΩ 1% 1/10 W 0402 |
| 70 | R78 | 1 | 10K | R0402 | — | RMCF0402JT10K0 | Stackpole Electronics Inc | RES 10 kΩ 1/16 W 5% 0402 |
| 71 | R80, R436, R437, R438, R439 | 5 | 680R | R0402 | — | RMCF0402JT680R | Stackpole Electronics Inc | RES 680 Ω 1/16 W 5% 0402 |
| 72 | R83 | 1 | 30E | R0603 | — | RC0603FR-0730RL | Yageo | RES SMD 30 Ω 1% 1/10 W 0603 |
| 73 | R106, R107, R108, R110, R111, R113, R114, R117, R119, R121 | 10 | 100 | R0402 | DNI | RC0402FR-07100RL | Yageo | RES SMD 100 Ω 1% 1/16 W 0402 |
| 74 | R160, R432 | 2 | 100K | R0402 | — | RMCF0402JT100K | Stackpole Electronics Inc | RES 100 kΩ 1/16 W 5% 0402 |
| 75 | R166, R441, R442, R443, R444 | 5 | 1K | R0402 | — | RMCF0402JT1K00 | Stackpole Electronics Inc | RES 1 kΩ 1/16 W 5% 0402 |
| 76 | R179 | 1 | 650 | R0603 | — | RC0603FR-07649RL | Yageo | RES SMD 649 Ω 1% 1/10 W 0603 |
| 77 | R229 | 1 | 15K | R0402 | — | ERJ-2RKF1502X | Panasonic | RES 15 kΩ 1/10 W 1% 0402 SMD |
| 78 | R230 | 1 | 34K | R0402 | — | ERJ-2RKF3402X | Panasonic | RES 34 kΩ 1/10 W 1% 0402 SMD |
| 79 | R231 | 1 | 536K | R0402 | — | ERJ-2RKF5363X | Panasonic Electronic Components | RES 536 kΩ 1/10 W 1% 0402 SMD |
| 80 | R232 | 1 | 100K | R0402 | — | ERJ-2RKF1003X | Panasonic Electronic Components | RES 100 kΩ 1/10 W 1% 0402 SMD |
| 81 | R395, R399, R400 | 3 | 10K | R0603 | — | ERJ-3EKF1002V | Panasonic | RES SMD 10 kΩ 1% 1/10 W 0603 |
| 82 | R412, R413, R414, R415, R416, R420, R421, R424, R425, R451, R452, R453, R454, R455, R456, R465, R466 | 17 | 0 | R0603 | — | RC0603JR-070RL | Yageo | Res 1/10 W 0.0 Ω 5% 0603 |
| 83 | R450 | 1 | 0 | R0402 | DNI | RC0402JR-070RL | Yageo | RES SMD 0.0O HM JUMPER 1/16 W 0402 |
| 84 | R481, R482 | 2 | 0 | R0603 | DNL | RC0603JR-070RL | Yageo | Res 1/10 W 0.0 Ω 5% 0603 |
| 85 | SW1 | 1 | PWR | TS01CQE_ switch | — | TS01CQE | C&K Components | SWITCH SLIDE SPDT 3 A 120 V |

**LIF-MD6000 Master Link Board Bill of Materials** *(Continued)*

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_ NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 86 | SW2, SW3, SW4 | 3 | SYS_ RST | 2psmd_es witch | — | TL1015AF160QG | E-Switch | SWITCH TACTILE SPST-NO 0.05 A 12 V |
| 87 | SW5 | 1 | WAKE_ UP | 2psmd_es witch | — | TL1015AF160QG | E-Switch | SWITCH TACTILE SPST-NO 0.05 A 12 V |
| 88 | U1 | 1 | FT2232HL | tqfp64_0p 5_12p2x1 2p2_h1p6 | — | FT2232HL | FTDI | USB to UART / FIFO |
| 89 | U2 | 1 | 93LC56-SO8 | so8_50_24 4 | — | 93LC56C-I/SN | Microchip | IC 93LC56 EEPROM |
| 90 | U3 | 1 | FUSE | 0154004D RT | — | 0154004.DRT | Littlefuse | Surface Mount Fuses Fuseblock with fuse 4A OMNI BLOK 154T |
| 91 | U5 | 1 | NCP1117ST 33T3G | sot223_4p | — | NCP1117ST33T3G | On Semi | IC Reg LDO 3.3 V SOT-223 |
| 92 | U6 | 1 | NCP1117ST 25T3G | sot223_4p | — | NCP1117ST25T3G | On Semi | IC Reg LDO 2.5 V SOT-223 |
| 93 | U7, U9, U11, U12 | 4 | Hirose - FX12 - 40 Pos | Hirose-FX12 | — | FX12B-40P-0.4SV | Hirose Electric Co Ltd | Conn Board to Board PL 40 POS 0.4 mm Solder ST SMD T/R |
| 94 | U8 | 1 | LIF-MD6000-csfBGA81 | LIF-MD6000-csfBGA81 | Customer supplied | LIF-MD6000-csfBGA81 | Lattice Semiconductor | Lattice Semiconductor 6K CrossLink FPGA Family |
| 95 | U14 | 1 | M25PX16-VMW6TG | SOIC8 | — | M25PX16-VMW6TG | Micron Technology Inc | IC FLASH 16 Mbit 75 MHz 8SO |
| 96 | U15 | 1 | AP7313-12SAG-7 | SOT23 | — | AP7313-12SAG-7 | Diodes Inc | LDO Voltage Regulators LDO SOT-23R 1.2 V/ 150 mA |
| 97 | U17 | 1 | NCP1117ST 18T3G | sot223_4p | — | NCP1117ST18T3G | On Semi | IC Reg LDO 1.8 V SOT-223 |
| 98 | U18 | 1 | LT3680 | LT3680_10 QFN | — | LT3680EDD#PBF | Linear | 5 V Step down converter |
| 99 | U19 | 1 | LCMXO3LF-1200E-MG121 | LCMXO3LF -1200E-MG121 | Customer supplied | LCMXO3LF-1200E-MG121 | Lattice Semiconductor | CPLD MachXO3 Family 121-Pin CSFBGA-0.5 mm Pitch |
| 100 | X1 | 1 | 12MHZ | crystal_4p _3p2x2p5 | — | 7M-12.000MAAJ-T | TXC | 12 MHz Crystal |
| 101 | X3, X4 | 2 | KC3225A27. 0000C30E0 A | 27MHZ_O SC | — | KC3225A27.0000C 30E0A | AVX Corporation | Standard Clock Oscillators 27.000 MHz |
| 102 | LIF-MD6000 MASTER LINK BOARD PCB | 1 | — | — | — | 305-PD-16-0154 | PACTRON | — |

# Appendix C. SMA-IOL-EVN-BRD Schematics



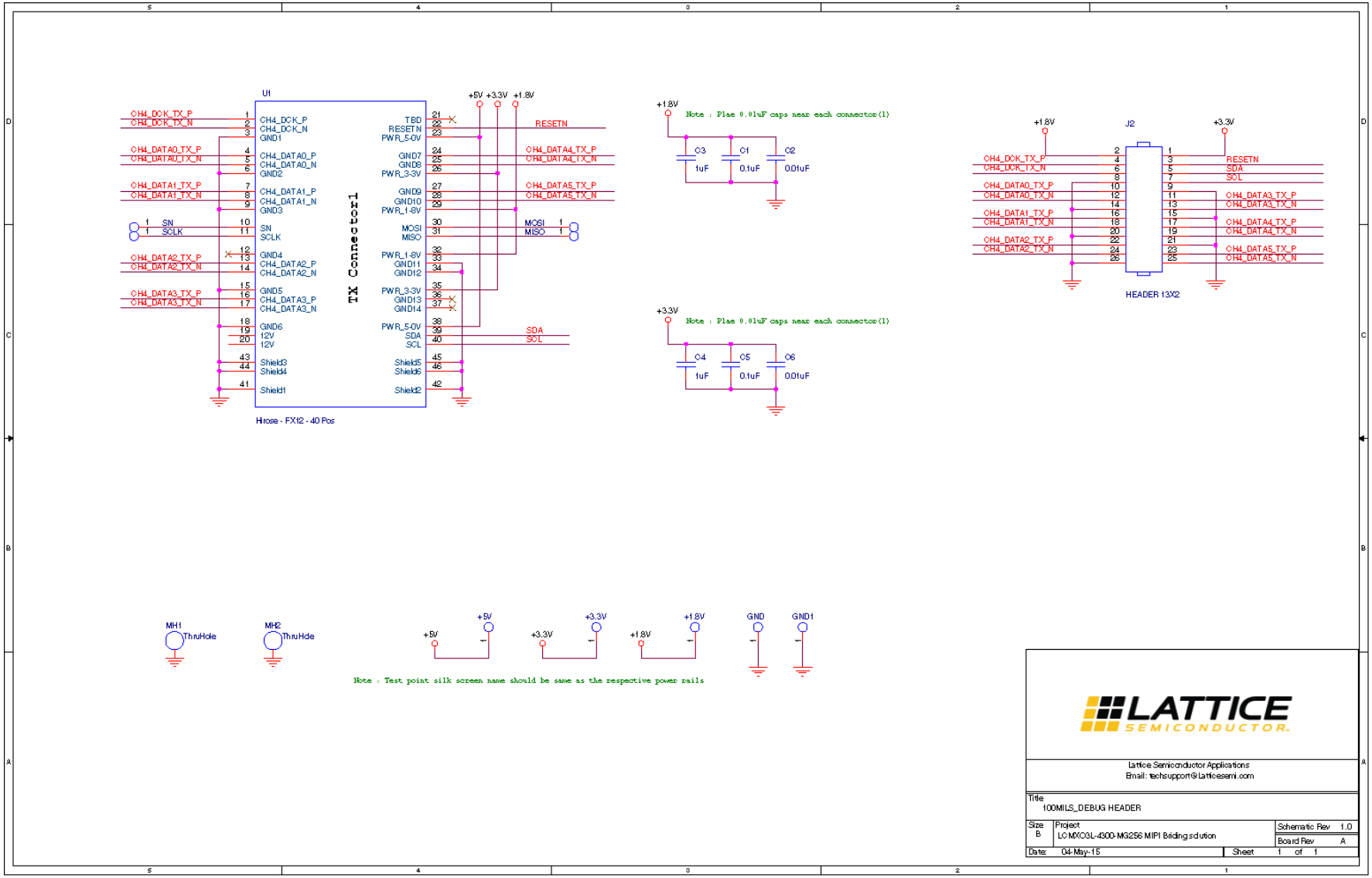

**SMA Debug Board**

# Appendix D. SMA-IOL-EVN-BRD Bill of Materials

**SMA IOLink Board Bill of Materials**

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 1 | GND1, +5 V, +1.8 V, +3.3 V, SN, SDA, SCLK, SCL, RESETN, MOSI, MISO, GND | 12 | TP_S_40_63 | tp_s_40_63 | **DNI** | — | — | Square test point, 40 mil inner diameter, 63 mil outer diameter |
| 2 | C1, C4 | 2 | 1 uF | C0402 | — | C0402C105K9PACTU | Kemet | CAP CERAMIC 1 uF 6.3 V X5R 0402 |
| 3 | C2, C5 | 2 | 0.1 uF | C0402 | — | C0402C104K4RACTU | Kemet | CAP CERAMIC 0. 1 uF 16 V X7R 0402 |
| 4 | C3, C6 | 2 | 0.01 uF | C0402 | — | C0402C103J4RACTU | Kemet | CAP CERAMIC 10 nF 16 V 5% X7R 0402 |
| 5 | J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14 | 14 | 73391-0060 | 73391-0060 | — | 73391-0060 | Molex | Molex Straight 50O Through Hole SMA Connector, jack, Solder Termination |
| 6 | MH1, MH2 | 2 | Thru Hole | MTG125 | — | — | — | — |
| 7 | U1 | 1 | Hirose - FX12 - 40 Pos | Hirose-FX12S | — | FX12B-40S-0.4SV | Hirose Electric Co Ltd | Conn Board to Board PL 40 POS 0.4 mm Solder ST SMD T/R |
| 8 | SMA IOLINK BOARD PCB | 1 | — | — | — | 305-PD-15-0589 | PACTRON | — |

# Appendix E. B-IOL-EVN-BRD Schematics




**100MILS_DEBUG Header**

# Appendix F. B-IOL-EVN-BRD Bill of Materials

**Breakout IOLink Board Bill of Materials**

| Item | Reference | Quantity | Part | PCB Footprint | Comments | PART_NUMBER | Manufacturer | Description |
|---|---|---|---|---|---|---|---|---|
| 1 | GND1, +5 V, +1.8 V, +3.3 V, SN, SCLK, MOSI, MISO, GND | 9 | TP_S_40_63 | tp_s_40_63 | DNL | — | — | Square test point, 40 mil inner diameter, 63 mil outer diameter |
| 2 | C1, C5 | 2 | 0.1uF | C0402 | — | C0402C104K4RACTU | Kemet | CAP CERAMIC 0.1 uF 16 V X7R 0402 |
| 3 | C2, C6 | 2 | 0.01uF | C0402 | — | C0402C103J4RACTU | Kemet | CAP CERAMIC 10 nF 16 V 5% X7R 0402 |
| 4 | C3, C4 | 2 | 1uF | C0402 | — | C0402C105K9PACTU | Kemet | CAP CERAMIC 1 uF 6.3 V X5R 0402 |
| 5 | J2 | 1 | HEADER 13X2 | 13X2_HDR | REGULAR 100 MIL HEADER | — | — | — |
| 6 | MH1, MH2 | 2 | ThruHole | MTG125 | DNL | — | — | — |
| 7 | U1 | 1 | Hirose - FX12 - 40 Pos | Hirose-FX12S | — | FX12B-40S-0.4SV | Hirose Electric Co Ltd | Conn Board to Board PL 40 POS 0.4 mm Solder ST SMD T/R |
| 8 | BREAKOUT IOLINK BOARD PCB | 1 | — | — | — | 305-PD-15-0595 | PACTRON | — |

# Revision History

| Date | Version | Change Summary |
|---|---|---|
| May 2016 | 1.0 | Initial release. |

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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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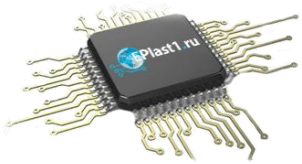
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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