» Kontron User's Guide «

ADA-LVDS-DVI

Document Revision 122

If it's embedded, it's Kontron.

» Table of Contents «

1 User Information

1.1 About This Document

This document provides information about products from Kontron Embedded Modules GmbH and/or its subsidiaries. No warranty of suitability, purpose, or fitness is implied. While every attempt has been made to ensure that the information in this document is accurate, the information contained within is supplied “as-is” and is subject to change without notice.

For the circuits, descriptions and tables indicated, Kontron assumes no responsibility as far as patents or other rights of third parties are concerned.

1.2 Copyright Notice

1.3 Trademarks

The following lists the trademarks of components used in this board.

- IBM, XT, AT, PS/2 and Personal System/2 are trademarks of International Business Machines Corp.
- Microsoft is a registered trademark of Microsoft Corp.
- Intel is a registered trademark of Intel Corp.
- All other products and trademarks mentioned in this manual are trademarks of their respective owners.

1.4 Standards

Kontron Embedded Modules GmbH is certified to ISO 9000 standards.

1.5 Warranty

This Kontron Embedded Modules GmbH product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron Embedded Modules GmbH will at its discretion decide to repair or replace defective products.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

Kontron Embedded Modules GmbH will not be responsible for any defects or damages to other products not supplied by Kontron Embedded Modules GmbH that are caused by a faulty Kontron Embedded Modules GmbH product.

1.6 Technical Support

Technicians and engineers from Kontron Embedded Modules GmbH and/or its subsidiaries are available for technical support. We are committed to making our product easy to use and will help you use our products in your systems.

Please consult our Web site at http://www.kontron.com/support for the latest product documentation, utilities, drivers and support contacts. Consult our customer section http://emdcustomersection.kontron.com for the latest BIOS downloads, Product Change Notifications and additional tools and software. In any case you can always contact your board supplier for technical support.

2 Introduction

The ADA-LVDS-DVI is a converter module from LVDS (Low Voltage Differential Signaling) to DVI (Digital Visual Interface). It offers a DVI-D interface with single-link TMDS® and DDC (Display Data Channel) compliance. This converter module can support DVI monitors with resolutions up to UXGA (1600x1200).

This converter module is designed for the use with Kontron Embedded Modules GmbH embedded computer boards that support the JILI (JUMPtec Intelligent LVDS Interface) standard. For the support of the complete functionality of DVI (including the DDC support) it is necessary that a VideoBIOS with DDC auto-detection capability is installed on the embedded computer board. Currently this is supported on modules with Intel® chipsets (852/855 and newer). Please contact your technical support for information about available BIOS versions to support this feature.

Most LVDS interfaces are 18 and 24bit compatible to work with default ADA-LVDS-DVI 24bit. For chipsets supporting 18bit LVDS only the second variant ADA-LVDS-DVI 18bit should be used.

Available variants

Part No.	Description
96007-0000-00-1	ADA-LVDS-DVI 24bit
96007-0000-00-2	ADA-LVDS-DVI 18bit

3 Specification

3.1 Functional Specification

Chipset

- National DS90CF388 LVDS receiver (LVDS-to-digital)
- Silicon Image Sil1160CTU PanelLink transmitter(digital-to-DVI)

LVDS interface

- Input to the adapter
- Compliant with the 40pin JILI standard of Kontron Embedded Modules GmbH
- Dual link LVDS channel with 1 DDC

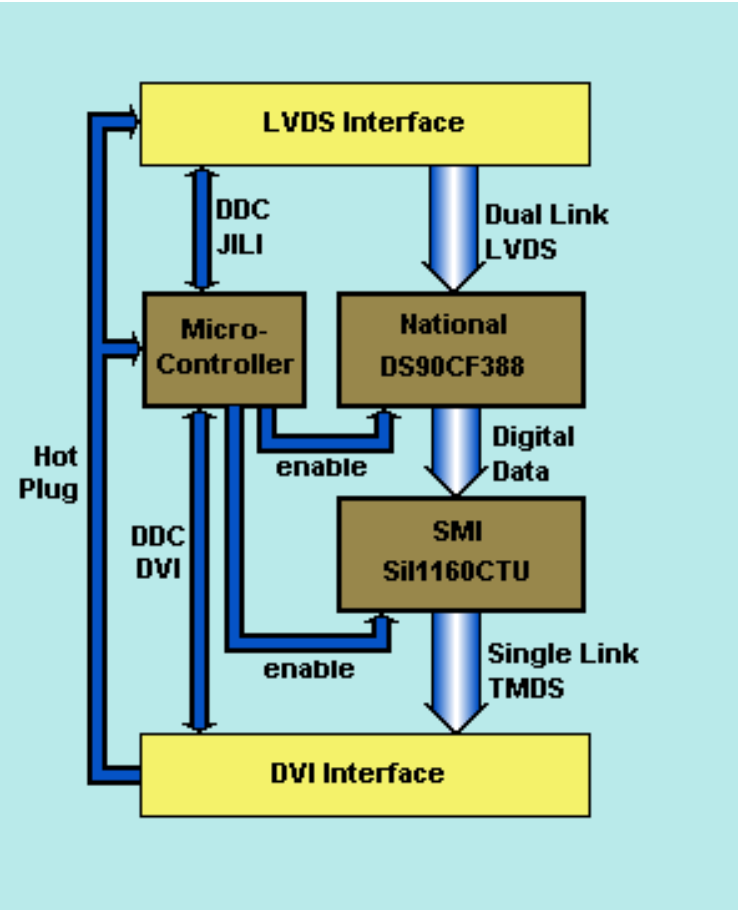
DVI interface

- Output from the adapter
- DVI-D interface
- single link TMDS® with DDC compliance

Supported Resolutions

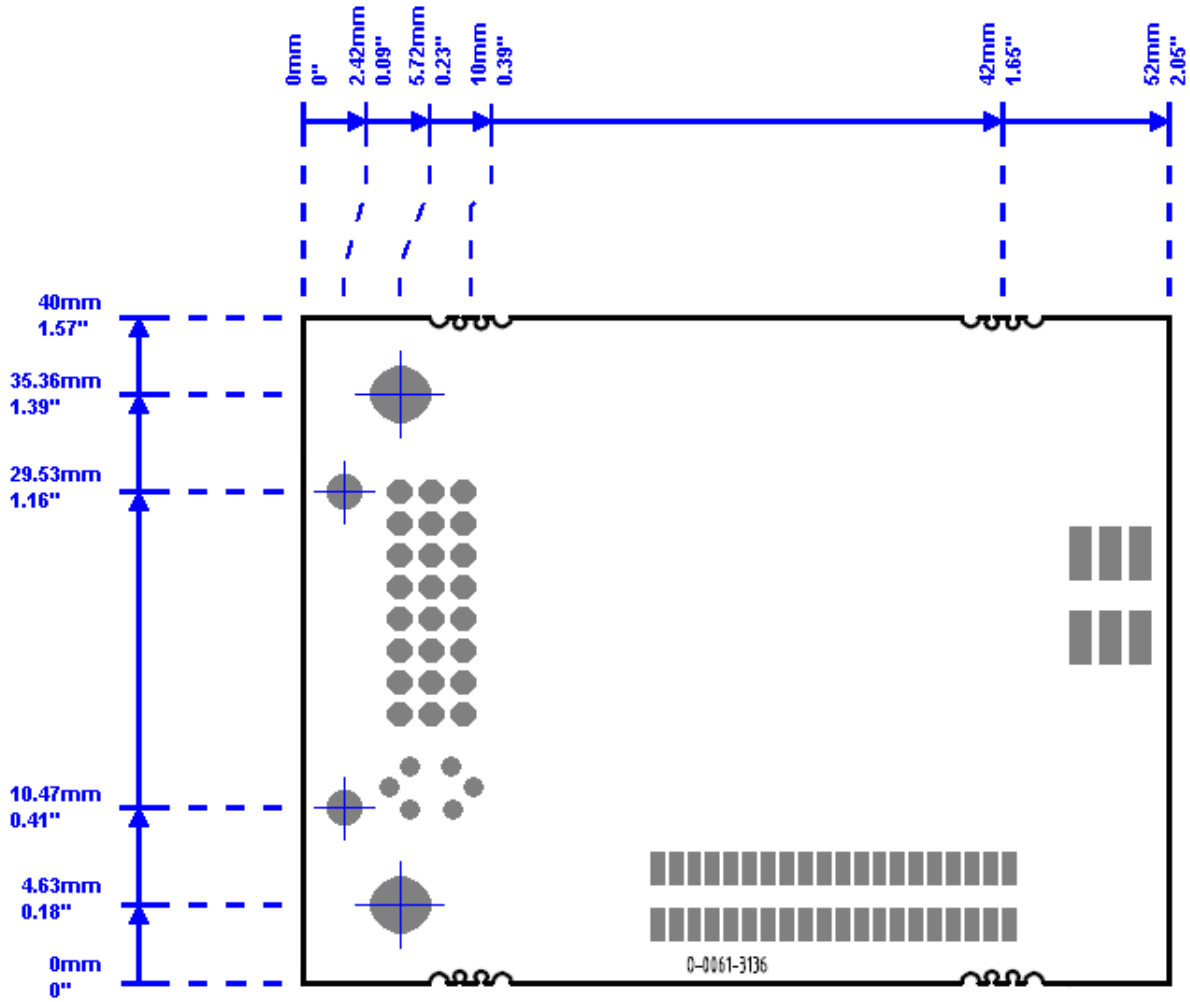
- From SVGA (800x600) up to UXGA (1600x1200)

3.2 Block Diagram



3.3 Meachnical Specification

- » PCB Length x Width: 52mm x 40mm (2.05" x 1.57")
- » Module Length with DVI connector: 59mm (2.32")
- » Minimum Cable Length: 200mm (7.87")
- » Height on Top: Maximum 10mm (0.39")
- » Height on Bottom: Maximum 3mm (0.12")
- » Weight: about 21g (with cable)



3.4 Electical Specification

3.4.1 Supply Voltage

» 5VDC ±5%

Supply Current

» Typical: 240mA

» Maximum: 500mA

Power Supply Risetime

» The input voltages shall rise from ≤10% of nominal to within the regulation ranges within 0.1ms to 20ms.

» There must be a smooth and continuous ramp of each DC input voltage from 10% to 90% of its final set-point following the ATX specification

Supply Voltage Ripple

» Maximum 100 mV peak to peak 0-20MHz

3.5 Environmental Specification

Temperature

- Maximum operating temperature: 0 to +60 °C (**)
- Non operating: -10 to +85 °C

Note: **The maximum operating temperature is the maximum measurable temperature on any spot on a module's surface. You must maintain the temperature according to the above specification.

Humidity

- Operating: 10% to 90% (non condensing)
- Non operating: 5% to 95% (non condensing)

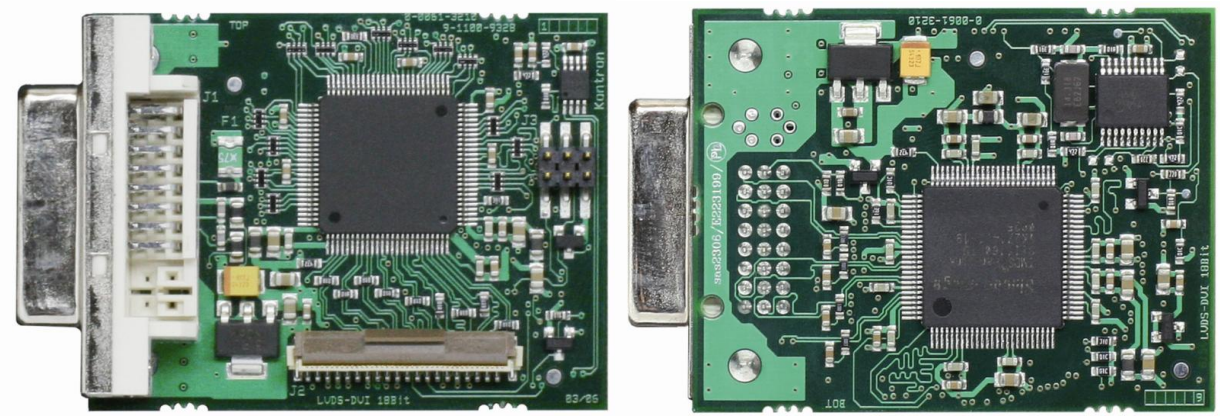
3.6 MTBF

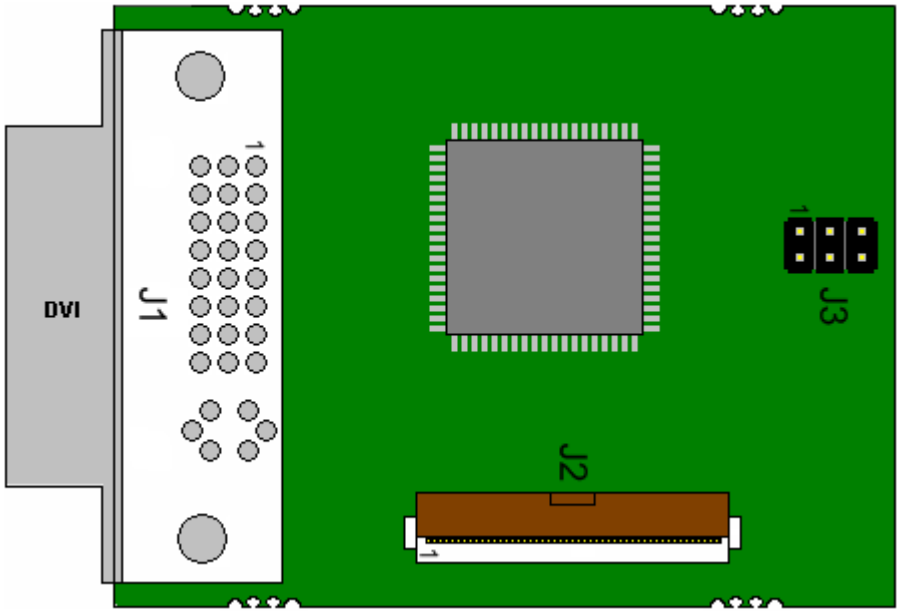
The following MTBF (Mean Time Between Failure) values were calculated using a combination of manufacturer's test data, if the data was available, and a Bellcore calculation for the remaining parts. The Bellcore calculation used is "Method 1 Case 1". In that particular method the components are assumed to be operating at a 50 % stress level in a 40° C ambient environment and the system is assumed to have not been burned in. Manufacturer's data has been used wherever possible. The manufacturer's data, when used, is specified at 50° C, so in that sense the following results are slightly conservative. The MTBF values shown below are for a 40° C in an office or telecommunications environment. Higher temperatures and other environmental stresses (extreme altitude, vibration, salt water exposure, etc.) lower MTBF values.

- Module MTBF (hours) : **> 125.000**

4 Connector Layout

4.1 Layout





4.2 Interfaces

Connector	Function	Used Connector	Description
J1	DVI Interface	MicroCross™ DVI Socket, right angle (Molex 74320-1004)	For DVI Monitor cable
J2	LVDS Interface	FFC 1x40 SG Head2 (Hirose FH12-40S-0.5SV)	For flat-foil cable
J3	PIC Programming Interface	2mm 2x3 pos.	For internal use only

5 Getting started

Getting started with the ADA-LVDS-DVI adapter is very easy. For location of the connectors, see Chapter 3: Connector Layout. Take the following steps:

» Turn off the power supply of your system.

» Connect the 40pin flat-foil cable coming with the adapter to the ADA-LVDS-DVI printed circuit board.

» Connect the other side of the flat-foil cable to the JILI connector of your Kontron module or to the corresponding base board equipped with a JILI connector.

» Connect the DVI monitor to the DVI interface connector of the ADA-LVDS-DVI printed circuit board.

» Make sure all your connections have been made correctly.

» Turn on the power of your DVI monitor and of your system.

» Enter the BIOS of your Kontron Embedded Modules GmbH board and make sure the JILI interface (LVDS) is activated. See the BIOS chapter of the manual for the corresponding board you are using for details.

Note:	Only use the 40pin flat-foil cable delivered with the ADA-LVDS-DVI adapter for connection to the JILI connector. This flat-foil cable has its contacts of both cable ends on the same side. A flat-foil cable delivered with another JILI-adapter usually has its contacts on both cable ends on different sides and may damage your system.

6 Chipset

The chipset of the ADA-LVDS-DVI consists of the National DS90CF388 LVDS receiver and the Silicon Image Sil1160CTU PanelLink Transmitter.

6.1 LVDS Receiver DS90CF388

- Supports dual-pixel data transmission
- Up to UXGA (1600x1200) resolution
- Complies with OpenLDI specification for digital display interfaces
- 40 to 112MHz clock support
- Converts 8 LVDS data streams into 48bit of digital data (dual pixel 24bit color)

6.2 PanelLink Transmitter Sil1160CTU

- High Bandwidth (up to 165 MHz)
- Resolutions up to UXGA
- Flexible Interface (24bit with 1 pixel/clock or 48bit with 2 pixels/clock)
- Low Power (3.3V) core operation
- High Jitter Tolerance
- Transmitter is compliant with DVI 1.0

7 LVDS Interface

The LVDS interface functions as an input to the ADA-LVDS-DVI module. It is available through the flat-foil connector J2 (40 pins). You can connect the LVDS interface to your Kontron Embedded Modules board's JILI connector via the 40pin flat-foil cable delivered with this adapter.

Note: Only use the 40pin flat-foil cable delivered with the ADA-LVDS-DVI adapter for connection to the JILI connector. This flat-foil cable has its contacts of both cable ends on the same side. A flat-foil cable delivered with another JILI-adapter usually has its contacts on both cable ends on different sides and may damage your system.

7.1 Connector

The following table shows the pin-out of the LVDS connector.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	NC	Not Connected	2	NC	Not Connected
3	NC	Not Connected	4	GND	Ground
5	GND	Ground	6	NC	Not Connected
7	VCC (*)	+5V	8	VCC (*)	+5V
9	VCC (*)	+5V	10	VCC (*)	+5V
11	STX3+	Second Channel 3	12	STX3-	Second Channel 3
13	GND	Ground	14	STXCLK+	Second Clock
15	STXCLK-	Second Clock	16	GND	Ground
17	STX2+	Second Channel 2	18	STX2-	Second Channel 2
19	HOTPLUG	Hot Plug	20	STX1+	Second Channel 1
21	STX1-	Channel 0 -	22	DDC_CLK	DDC Clock
23	STX0+	Second Channel 0	24	STX0-	Second Channel 0
25	DDC_DAT	DDC Data	26	FTX3+	First Channel 0
27	FTX3-	First Channel 3	28	GND	Ground
29	FTXCLK+	First Clock	30	FTXCLK-	First Clock
31	GND	Ground	32	FTX2+	First Channel 2
33	FTX2-	First Channel 2	34	NC	Not Connected
35	FTX1+	First Channel 1	36	FTX1-	First Channel 1
37	NC	Not Connected	38	FTX0+	First Channel 0
39	FTX0-	First Channel 0	40	NC	Not Connected

Notes: (*) To protect the external power lines of peripheral devices, make sure that:

-- the wires have the right diameter to withstand the maximum available current

-- the enclosure of the peripheral device fulfils the fire-protecting requirements of

-- IEC/EN 60950.

7.2 Connection table ADA-LVDS-DVI to JILI interface

The following table gives a better understanding about which signal of the LVDS interface corresponds to which signal of the JILI interface. The pin counting is inverted due to the use of the 40pin flat-foil cable with contacts on one side.

Pin	ADA-LVDS-DVI	JILI Interface	Pin
1	NC	+12V	40
2	NC	+12V	39
3	NC	+12V	38
4	GND	BKLGND	37
5	GND	BKLGND	36
6	NC	ENABKL	35
7	VCC	VCC	34
8	VCC	VCC	33
9	VCC	VCC	32
10	VCC	VCC	31
11	STX3+	LCDDO19	30
12	STX3-	LCDDO18	29
13	GND	GND	28
14	STXCLK+	LCDDO17	27
15	STXCLK-	LCDDO16	26
16	GND	GND	25
17	STX2+	LCDDO15	24
18	STX2-	LCDDO14	23
19	/HOTPLUG	/DETECT	22
20	STX1+	LCDDO13	21
21	STX1-	LCDDO12	20
22	DDC_CLK	JILI_CLK	19
23	STX0+	LCDDO11	18
24	STX0-	LCDDO10	17
25	DDC_DAT	JILI_DAT	16
26	FTX3+	LCDDO9	15
27	FTX3-	LCDDO8	14
28	GND	GND	13
29	FTXCLK+	LCDDO7	12
30	FTXCLK-	LCDDO6	11
31	GND	GND	10
32	FTX2+	LCDDO5	9
33	FTX2-	LCDDO4	8
34	NC	LCDLP	7
35	FTX1+	LCDDO3	6
36	FTX1-	LCDDO2	5
37	NC	ENAVDD	4
38	FTX0+	LCDDO1	3
39	FTX0-	LCDDO0	2
40	NC	LCDFLM	1

8 DVI Interface

The DVI interface functions as an output from the ADA-LVDS-DVI. This interface is available through the female DVI-D connector J1 (24 pins). You can directly connect a DVI monitor with its male connector to this interface. This interface is a single link TMDS® with DDC compliance.

8.1 Connector

The following table shows the pin-out of the DVI connector.

Pin	Signal Name	Function	Pin	Signal Name	Function
1	Tx2N	TMDS Data 2-	13	NC	Not Connected
2	Tx2P	TMDS Data 2+	14	VCC (*)	+5V Power via FerritBead
3	GND	Ground	15	GND	Ground
4	NC	Not Connected	16	HTPGL	Hot Plug Detect
5	NC	Not Connected	17	TxON	TMDS Data 0-
6	DDCCLK	DDC Clock	18	TxoP	TMDS Data 0+
7	DDCDAT	DDC Data	19	GND	Ground
8	NC	Not Connected	20	NC	Not Connected
9	Tx1N	TMDS Data 1-	21	NC	Not Connected
10	Tx1P	TMDS Data 1+	22	GND	Ground
11	GND	Ground	23	TxCP	TMDS Clock+
12	NC	Not Connected	24	TxCN	TMDS Clock-

Notes: (*) To protect the external power lines of peripheral devices, make sure that:

-- the wires have the right diameter to withstand the maximum available current

-- the enclosure of the peripheral device fulfils the fire-protecting requirements of

-- IEC/EN 60950.

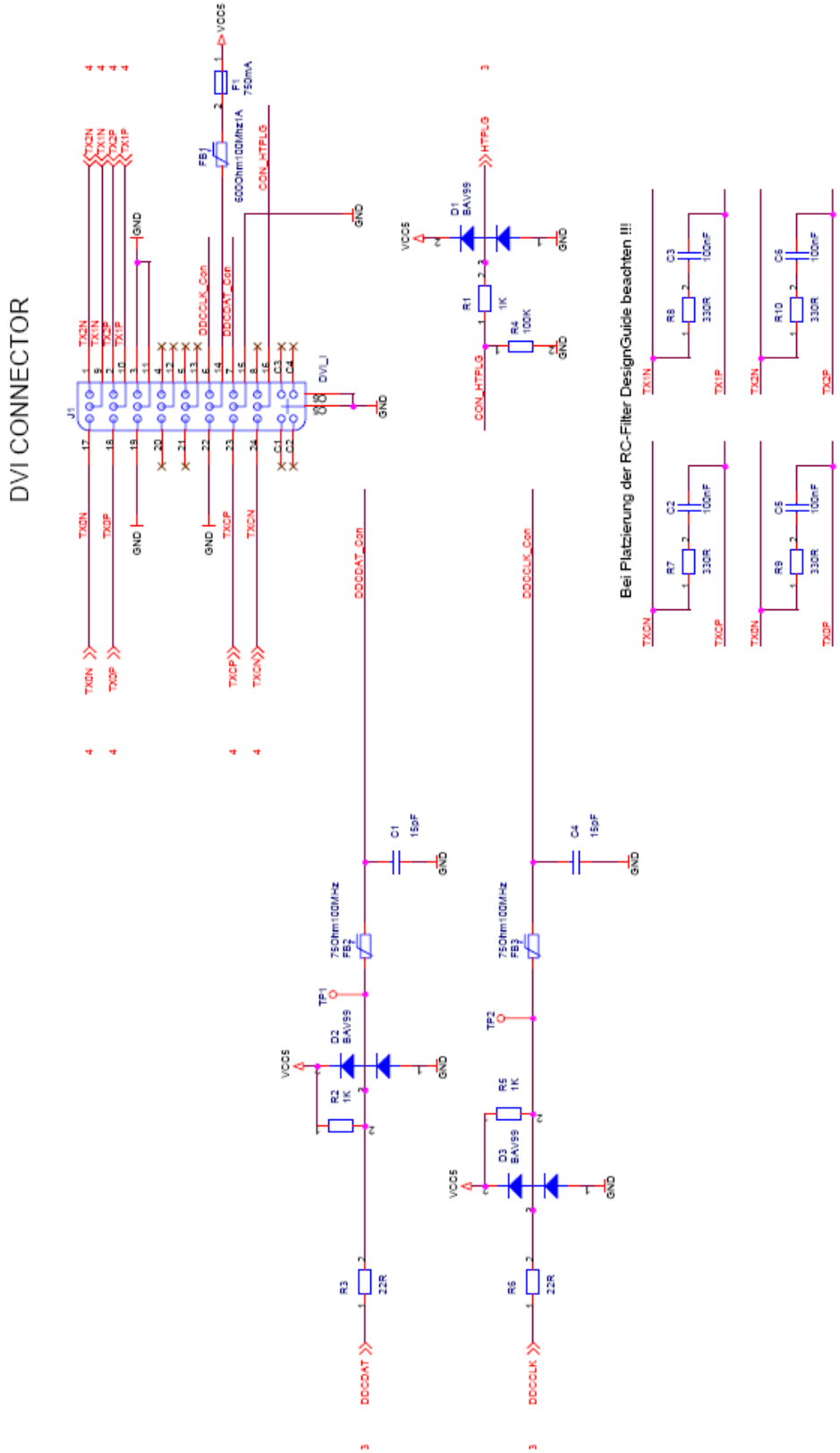
8.2 DDC and Hot-Plug information

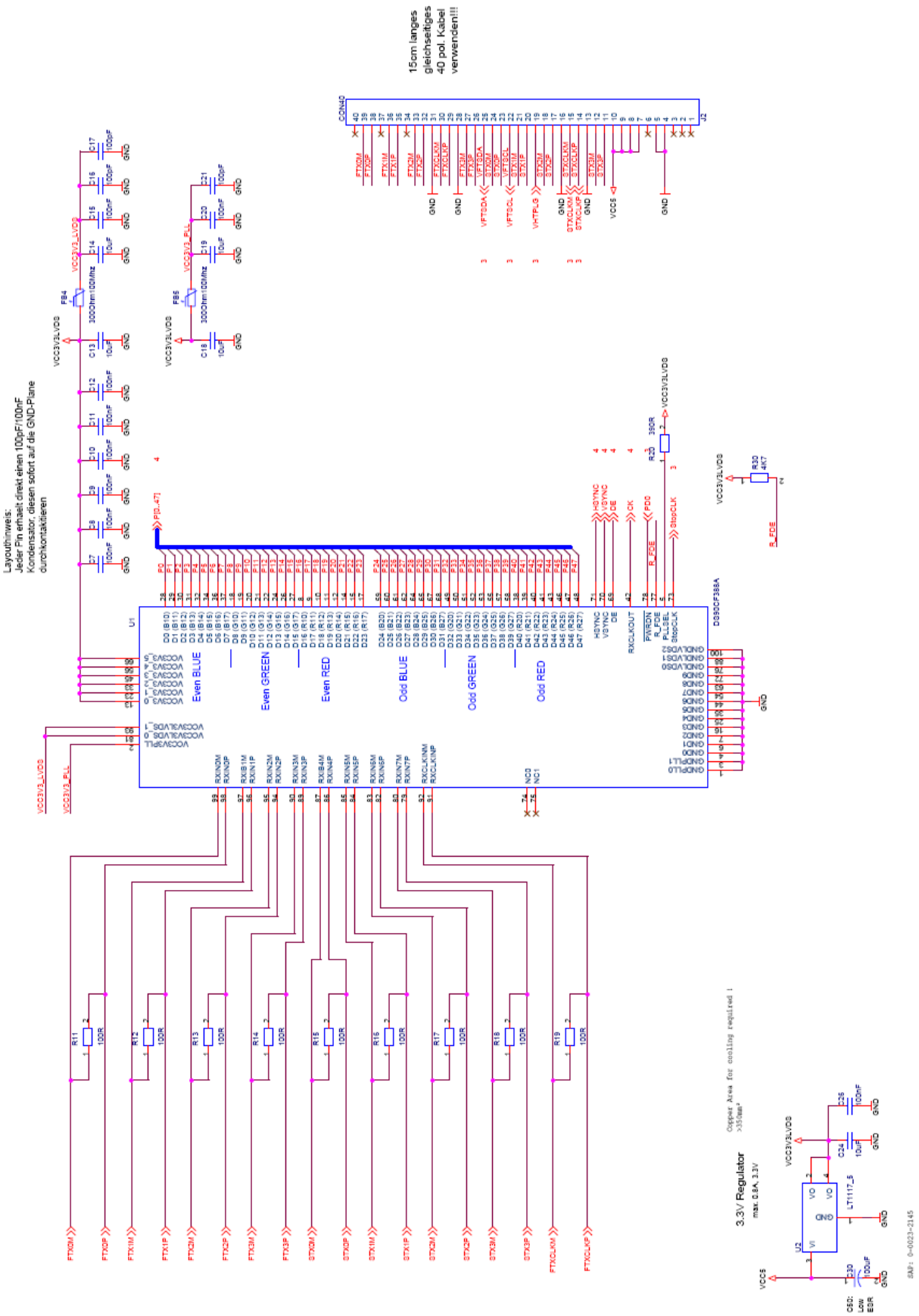
The ADA-LVDS-DVI is equipped with an onboard microcontroller. After power-on of the system the /HOTPLUG signal of the LVDS interface goes high for about 10ms and the microcontroller is initialized. After initialization the /HOTPLUG signal goes low and the microcontroller will read in the DDC (Display Data Channel) of the connected DVI monitor. This transaction runs with 10kHz by using the signals DDCDAT and DDCCLK and is completed within 500ms. Then /HOTPLUG goes high again. After this transaction is finished the Kontron Embedded Modules GmbH embedded computer board reads the DDC structure from the microcontroller through the DDC signals of the JILI interface (DDC_DAT and DDC_CLK) with up to 100kHz.

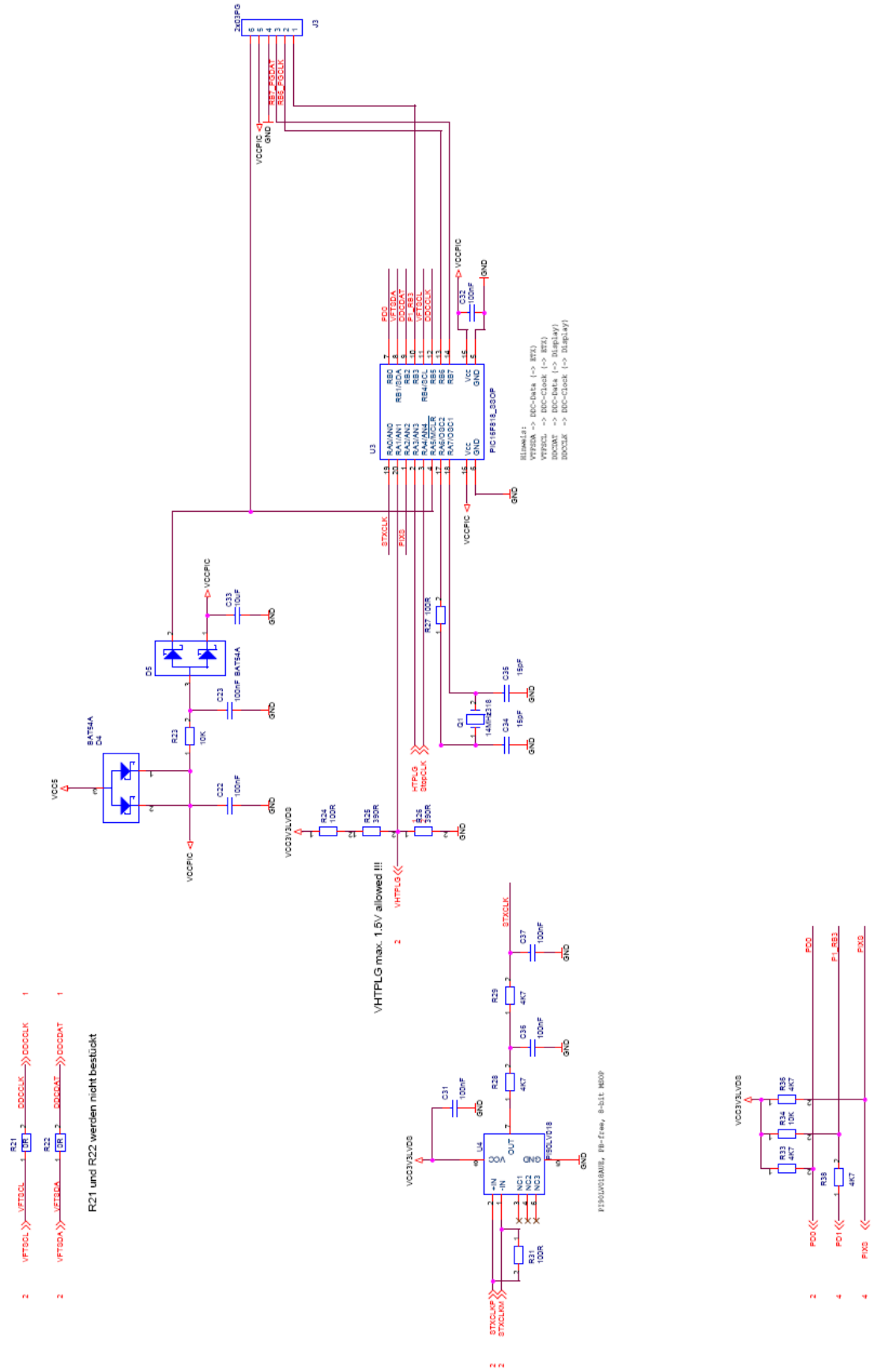
In case of the system is already powered up and the DVI Monitor is connected later (Hot Plug), the signal HTPGL on the DVI interface goes high and the microcontroller starts reading the DDC from the DVI Monitor. After all of the DDC data is read the /HOTPLUG signal on the LVDS interface goes high and the embedded computer board reads the DDC structure from the microcontroller.

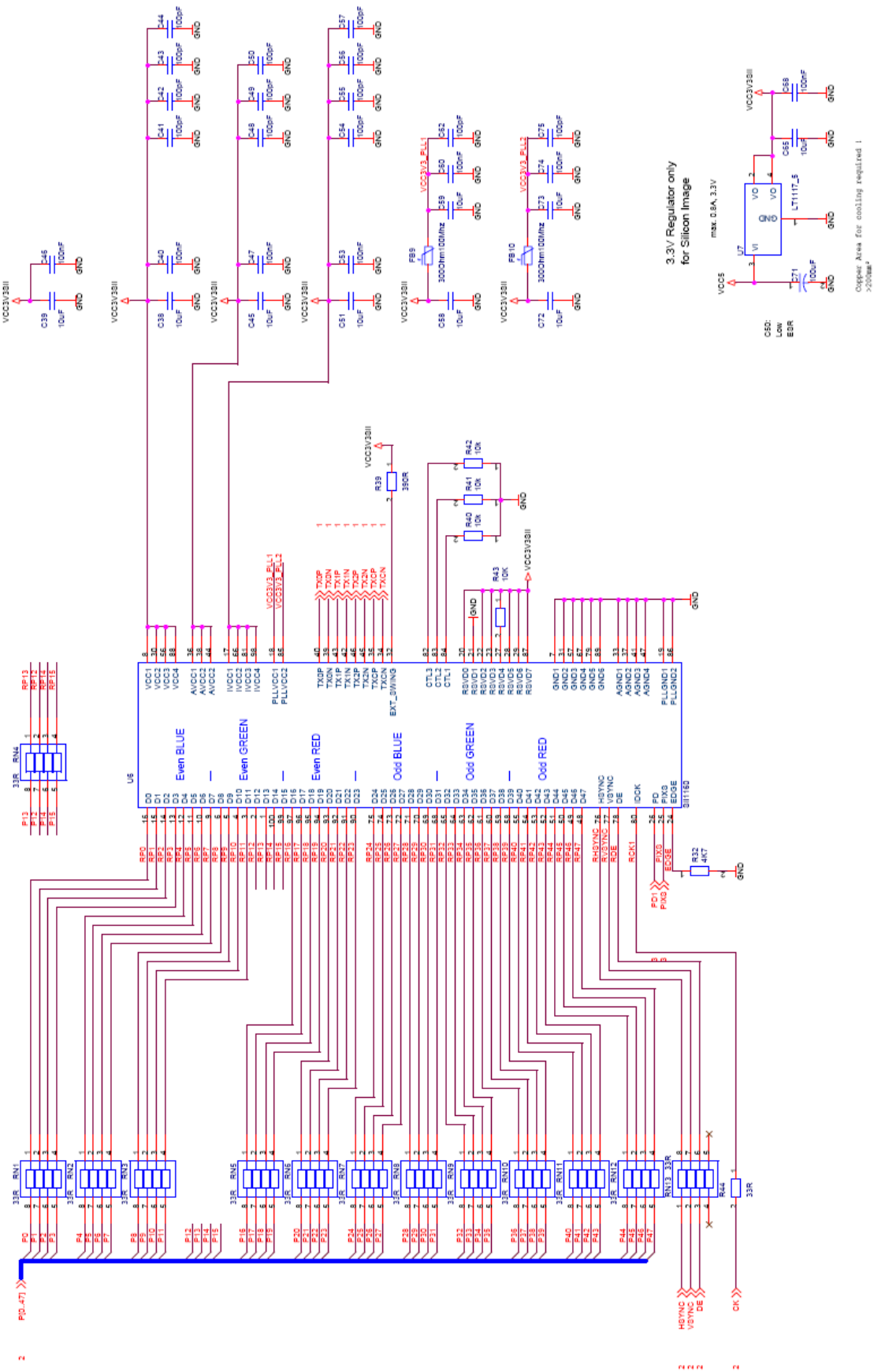
Note:	The DDC and Hot Plug feature requires BIOS support. Currently it is only possible to use it on boards equipped with the Intel® chipsets (852/855 or newer). Please contact your technical support for information about the required BIOS version for your special Kontron Embedded Modules GmbH board.

9 Schematics

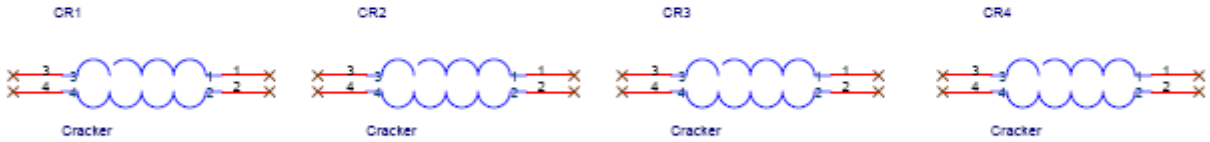



15cm langes gleichseitiges 40 pol. Kabel verwenden!!!
Layouthinweis:
Jeder Pin erhaelt direkt einen 100pF/100nF Kondensator, diesen sofort auf die GND-Plane durchkontaktieren
Even BLUE
Even GREEN
Even RED
Odd BLUE
Odd GREEN
Odd RED
3.3V Regulator
max. 0.8A, 3.3V
Copper Area for cooling required !


R21 und R22 werden nicht bestückt
VHTPLG max. 1.5V allowed !!!


3.3V Regulator only
for Silicon Image
Even BLUE
Even GREEN
Even RED
Odd BLUE
Odd GREEN
Odd RED
U5
U7
LT1117_5
VCC3V3III
GND

Passamarken



10 Document Revision History

Revision	Date	Edited by	Changes
110	03.01.2006	BHO	Initial Release
120	09.09.2008	PRO	Changed to new Kontron Style Updated descriptions due to compatibility to all new Intel Chipsets
121	14.01.2009	PRO	Replaced DVI-I with DVI-D in functional specification
122	13.09.2010	PRO	Updated to new Kontron CI Added schematics and new product images

Corporate Offices

Europe, Middle East & Africa

Oskar-von-Miller-Str. 1
85386 Eching/Munich
Germany
Tel.: +49 (0)8165/ 77 777
Fax: +49 (0)8165/ 77 219
info@kontron.com

North America

14118 Stowe Drive
Poway, CA 92064-7147
USA
Tel.: +1 888 294 4558
Fax: +1 858 677 0898
info@us.kontron.com

Asia Pacific

17 Building,Block #1,ABP.
188 Southern West 4th Ring
Beijing 100070, P.R.China
Tel.: + 86 10 63751188
Fax: + 86 10 83682438
info@kontron.cn