THSB-FMC-03ADC
User Manual

GENERAL DESCRIPTION

THSB-FMC-03ADC is an FMC/LPC daughter card supporting analog video output from a PC or video generator.

High-performance ADC THC7984 is applied as an analog-digital converter which decreases noise/color uniformity.

The Microcontroller on THSB-FMC-03ADC determines video format, set parameters to ADC, and indicates the result and status on LCD display.

FEATURE

* W 70mm x H 50mm small size
* FMC/LPC Standard [Vita 57.1] Connector
* 15pin D-SUB for analog video input
* THC7984 for analog-digital converter
* Automatic video resolution adjustment
* LCD display for status and resolution
* Support 2.5V or 3.3V for VADJ power supply

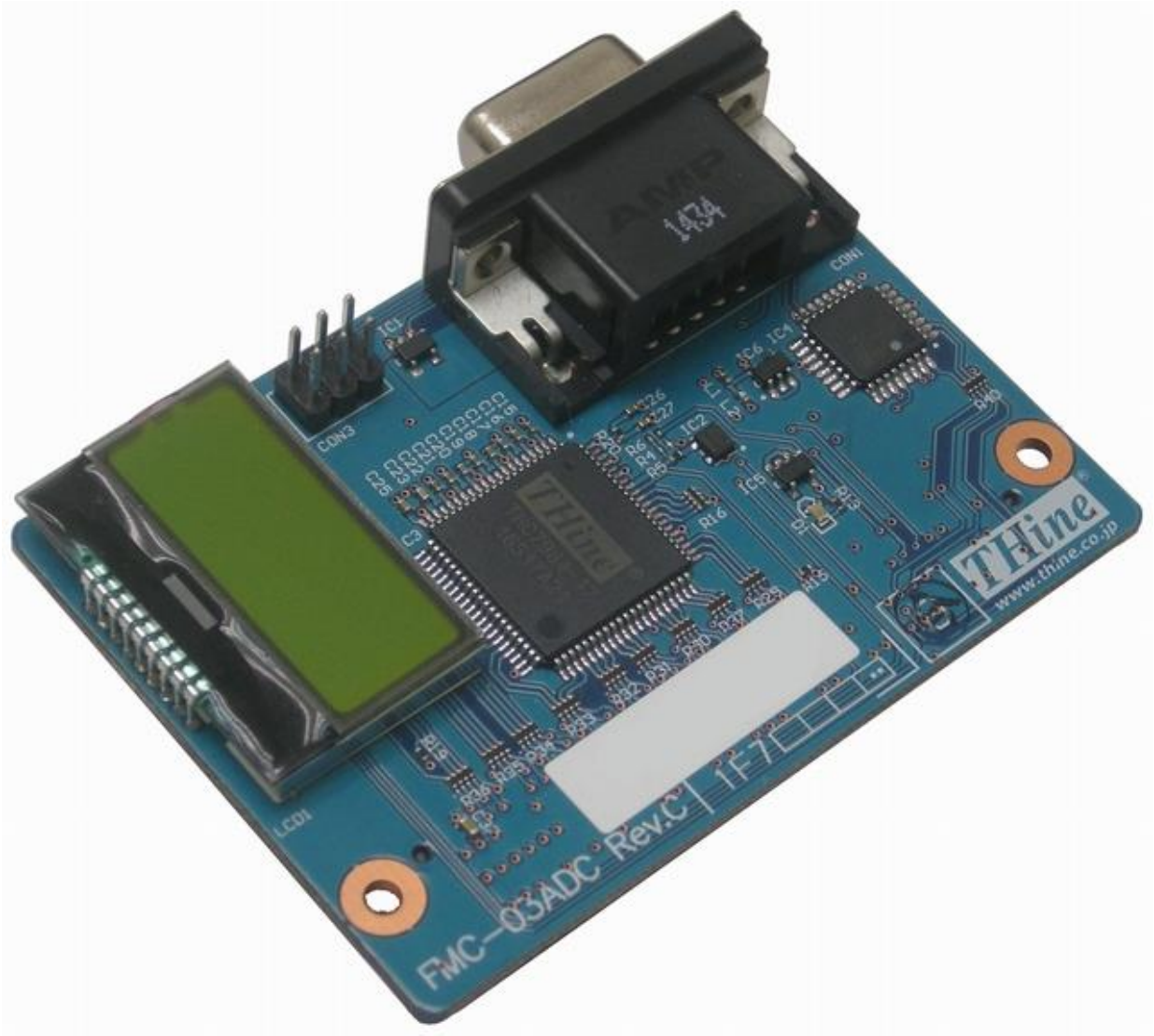

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FIGURE

TABLE

1. SAFETY PRECAUTIONS

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

- Before using the product, read these safety precautions carefully.
- These precautions contain serious safety instructions that must be observed.
- After reading through this manual, be sure to keep it always handy.

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual. (Examples)

	**Turn off the power switch.**
	**Do not disassemble the product.**
	**Do not attempt this.**

Warning	
	**In the event of a failure, disconnect the power supply.** If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	**If an unpleasant smell or smoking occurs, disconnect the power supply.** If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	**Do not disassemble, repair or modify the product.** Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	**Do not place the product on unstable locations.** Otherwise, it may drop or fall, resulting in injury to persons or failure.
	**If the product is dropped or damaged, do not use it as is.** Otherwise, a fire or electric shock may occur.
	**Do not touch the product with a metallic object.** Otherwise, a fire or electric shock may occur.
	**Do not place the product in a place with dusty or humidity or getting water.** Otherwise, a fire or electric shock may occur.
	**Do not get the product wet or touch it with a wet hand.** Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	**Do not touch a connector on the product (gold-plated portion).** Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Caution	
	**Do not use or place the product in the following locations.** - Humid and dusty locations - Airless locations such as closet or bookshelf - Locations which receive oily smoke or steam - Locations exposed to direct sunlight - Locations close to heating equipment - Closed inside of a car where the temperature becomes high - Staticky locations - Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
	**Do not place heavy things on the product.** Otherwise, the product may be damaged.

2. Disclaimer

This product is an evaluation board intended for **FMC interface Card** function. Thine Electronics, Inc. assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, Thine Electronics, Inc. assumes no responsibility for any damages caused by:

(1) Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.

(2) Secondary impact arising from use of this product or its unusable state (business interruption or others)

(3) Use of this product against the instructions given in this manual.

(4) Malfunctions due to connection to other devices.

Thine Electronics, Inc. assumes no responsibility or liability for:

(1) Erasure or corruption of data arising from use of this product.

(2) Any consequences or other abnormalities arising from use of this product, or

(3) Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

The specification of this product is subject to change without prior notice. The product is subject to discontinuation without prior notice.

3. Block Diagram

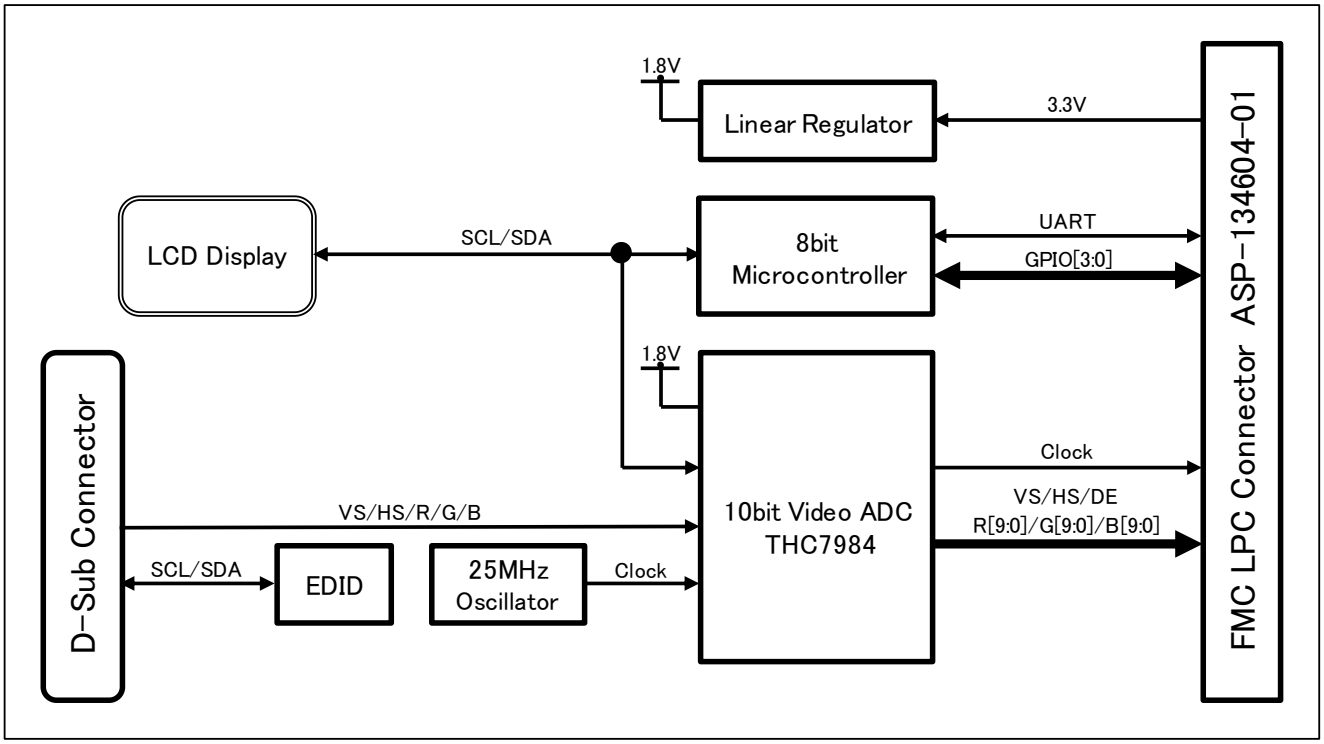


Fig 3-1 Block Diagram

4. Top & Bottom View

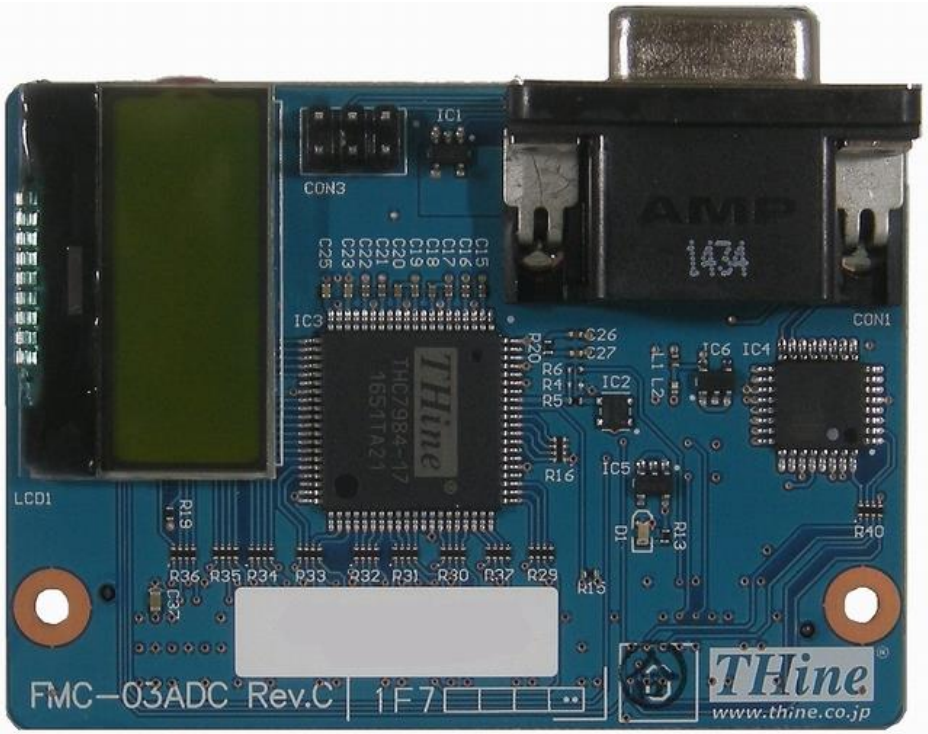


Fig 4-1 Top View

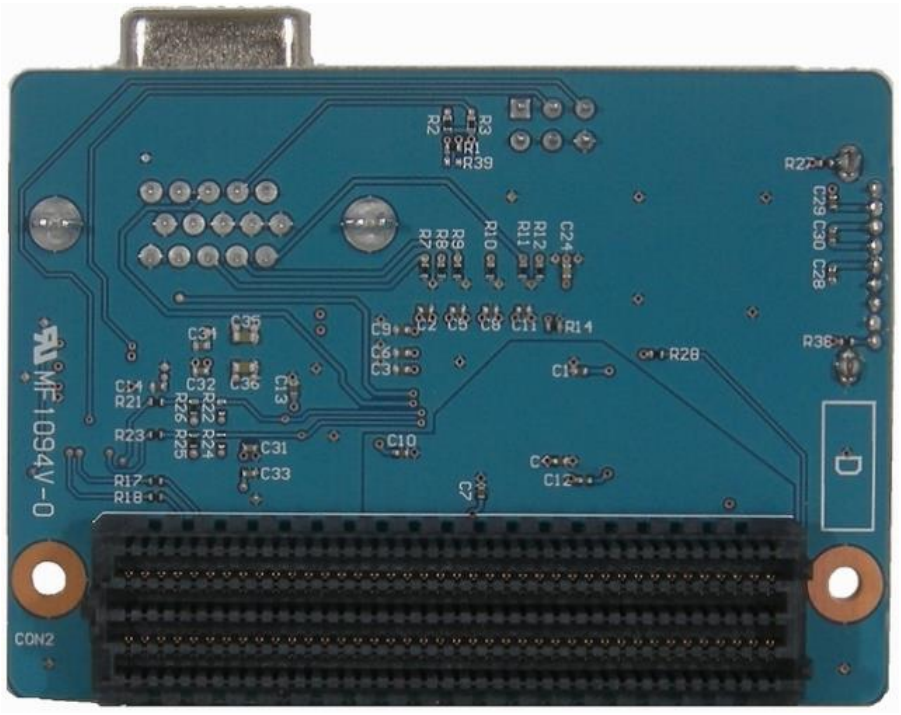


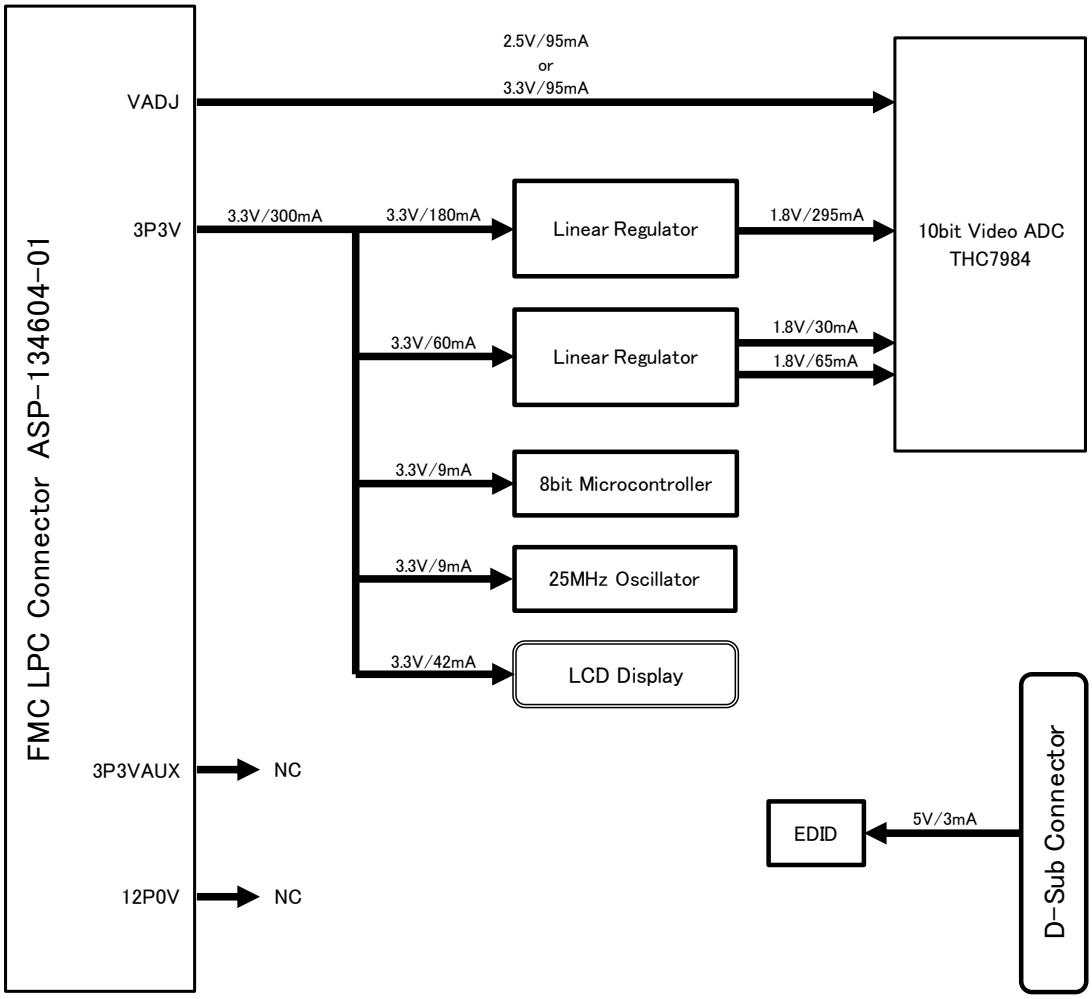
Fig 4-2 Bottom View

5. Board Specification

Outline size	: W: 70mm × H: 50mm
Layer structure	: 4 Layer
PCB Thickness	: 1.6 mm
Material	: FR-4
FMC Connector	: Samtec, ASP-134604-01
DSUB Connector	: TE Connectivity, 1-1734530-1
Video ADC	: THine Electronics, THC7984
EEPROM	: Microchip, 24AA01T-I/OT
microcontroller	: Microchip, ATMEGA328P-AUR
LCD Display	: Strawberry Linux, SB0802G

6. Power Supply System

Use 2.5 V or 3.3 V for VADJ voltage on your FPGA board. Other voltage is not supported.



Use 2.5V or 3.3V for VADJ Power Supply on your FPGA board

Fig 6-1 Power Supply System

7. Pin Assignment of FMC Connector

Table 7-1 Color Indicator for Pin Assignment

Color Indicator	Description
	Red channel output from THC7984
	Green channel output from THC7984
	Blue channel output from THC7984

Table 7-2 Pin Assignment of FMC C/D columns

THSB-FMC-03ADC Signal Name	Column C		Column D	THSB-FMC-03ADC Signal Name
GND	GND	1	PG_C2M	NC
NC	DP0_C2M_P	2	GND	GND
NC	DP0_C2M_N	3	GND	GND
GND	GND	4	GBTCLK0_M2C_P	NC
GND	GND	5	GBTCLK0_M2C_N	NC
NC	DP0_M2C_P	6	GND	GND
NC	DP0_M2C_N	7	GND	GND
GND	GND	8	LA01_P_CC	AVR-APD3
GND	GND	9	LA01_N_CC	AVR-APD2
AVR-APD5	LA06_P	10	GND	GND
AVR-APD4	LA06_N	11	LA05_P	NC
GND	GND	12	LA05_N	NC
GND	GND	13	GND	GND
NC	LA10_P	14	LA09_P	NC
NC	LA10_N	15	LA09_N	NC
GND	GND	16	GND	GND
GND	GND	17	LA13_P	NC
NC	LA14_P	18	LA13_N	NC
NC	LA14_N	19	GND	GND
GND	GND	20	LA17_P_CC	ABAD2
GND	GND	21	LA17_N_CC	ABAD1
ABAD0	LA18_P_CC	22	GND	GND
ABAD3	LA18_N_CC	23	LA23_P	ABAD4
GND	GND	24	LA23_N	ABAD5
GND	GND	25	GND	GND
ABAD6	LA27_P	26	LA26_P	ABAD7
ABAD9	LA27_N	27	LA26_N	ABAD8
GND	GND	28	GND	GND
GND	GND	29	TCK	NC
NC	SCL	30	TDI	TDI
NC	SDA	31	TDO	TDO
GND	GND	32	3P3VAUX	NC
GND	GND	33	TMS	NC
NC	GA0	34	TRST_L	NC
NC	12P0V	35	GA1	NC
GND	GND	36	3P3V	3P3V
NC	12P0V	37	GND	GND
GND	GND	38	3P3V	3P3V
3P3V	3P3V	39	GND	GND
GND	GND	40	3P3V	3P3V

Table 7-3 Pin Assignment of FMC G/H columns

THSB-FMC-03ADC Signal Name	Column G		Column H	THSB-FMC-03ADC Signal Name
GND	GND	1	VREF_A_M2C	NC
ADATACK	CLK1_M2C_P	2	PRSNT_M2C_L	GND
NC	CLK1_M2C_N	3	GND	GND
GND	GND	4	CLK0_M2C_P	UART-RX
GND	GND	5	CLK0_M2C_N	UART-TX
FMC-SCL	LA00_P_CC	6	GND	GND
FMC-SDA	LA00_N_CC	7	LA02_P	FMC-CLAMP
GND	GND	8	LA02_N	NC
NC	LA03_P	9	GND	GND
NC	LA03_N	10	LA04_P	NC
GND	GND	11	LA04_N	NC
NC	LA08_P	12	GND	GND
NC	LA08_N	13	LA07_P	FMC-COAST
GND	GND	14	LA07_N	NC
NC	LA12_P	15	GND	GND
NC	LA12_N	16	LA11_P	NC
GND	GND	17	LA11_N	NC
NC	LA16_P	18	GND	GND
NC	LA16_N	19	LA15_P	NC
GND	GND	20	LA15_N	NC
AGAD0	LA20_P	21	GND	GND
AGAD3	LA20_N	22	LA19_P	AGAD1
GND	GND	23	LA19_N	AGAD2
AGAD4	LA22_P	24	GND	GND
AGAD7	LA22_N	25	LA21_P	AGAD5
GND	GND	26	LA21_N	AGAD6
AGAD8	LA25_P	27	GND	GND
ARAD0	LA25_N	28	LA24_P	AGAD9
GND	GND	29	LA24_N	ARAD1
ARAD2	LA29_P	30	GND	GND
ARAD4	LA29_N	31	LA28_P	ARAD3
GND	GND	32	LA28_N	ARAD5
ARAD6	LA31_P	33	GND	GND
ARAD8	LA31_N	34	LA30_P	ARAD7
GND	GND	35	LA30_N	ARAD9
ASOGOUT	LA33_P	36	GND	GND
AVSOUT	LA33_N	37	LA32_P	AHSOUT
GND	GND	38	LA32_N	AOEFIELD
VADJ	VADJ	39	GND	GND
GND	GND	40	VADJ	VADJ

8. Pin Description of FMC Connector

Table 8-1 Pin Description of FMC Connector

Signal Name	FMC Pin Name	Pin Direction	Detail information
ADATACK	CLK1_M2C_P	Output	THC7984 pixel clock
AVSOUT	LA33_N	Output	THC7984 Vsync
AHSOUT	LA32_P	Output	THC7984 Hsync
AOEFILED	LA32_N	Output	THC7984 Data Enable
ASOUGOUT	LA33_P	Output	THC7984 SOG Slicer
ARAD0	LA25_N	Output	THC7984 pixel data R bit 0
ARAD1	LA24_N	Output	THC7984 pixel data R bit 1
ARAD2	LA29_P	Output	THC7984 pixel data R bit 2
ARAD3	LA28_P	Output	THC7984 pixel data R bit 3
ARAD4	LA29_N	Output	THC7984 pixel data R bit 4
ARAD5	LA28_N	Output	THC7984 pixel data R bit 5
ARAD6	LA31_P	Output	THC7984 pixel data R bit 6
ARAD7	LA30_P	Output	THC7984 pixel data R bit 7
ARAD8	LA31_N	Output	THC7984 pixel data R bit 8
ARAD9	LA30_N	Output	THC7984 pixel data R bit 9
AGAD0	LA20_P	Output	THC7984 pixel data G bit 0
AGAD1	LA19_P	Output	THC7984 pixel data G bit 1
AGAD2	LA19_N	Output	THC7984 pixel data G bit 2
AGAD3	LA20_N	Output	THC7984 pixel data G bit 3
AGAD4	LA22_P	Output	THC7984 pixel data G bit 4
AGAD5	LA21_P	Output	THC7984 pixel data G bit 5
AGAD6	LA21_N	Output	THC7984 pixel data G bit 6
AGAD7	LA22_N	Output	THC7984 pixel data G bit 7
AGAD8	LA25_P	Output	THC7984 pixel data G bit 8
AGAD9	LA24_P	Output	THC7984 pixel data G bit 9
ABAD0	LA18_P_CC	Output	THC7984 pixel data B bit 0
ABAD1	LA17_N_CC	Output	THC7984 pixel data B bit 1
ABAD2	LA17_P_CC	Output	THC7984 pixel data B bit 2
ABAD3	LA18_N_CC	Output	THC7984 pixel data B bit 3
ABAD4	LA23_P	Output	THC7984 pixel data B bit 4
ABAD5	LA23_N	Output	THC7984 pixel data B bit 5
ABAD6	LA27_P	Output	THC7984 pixel data B bit 6
ABAD7	LA26_P	Output	THC7984 pixel data B bit 7
ABAD8	LA26_N	Output	THC7984 pixel data B bit 8
ABAD9	LA27_N	Output	THC7984 pixel data B bit 9
FMC-CLAMP	LA02_P	Input	THC7984 Clamp Pulse
FMC-COAST	LA07_P	Input	THC7984 Coast Signal
FMC-SCL	LA00_P_CC	Output	I2C serial clock for THC7984 and LCD
FMC-SDA	LA00_N_CC	Input/Output	I2C serial data for THC7984 and LCD
UART-RX	CLK0_M2C_P	Output	UART Tx from ATMega328P
UART-TX	CLK0_M2C_N	Input	UART Rx to ATMega328P
AVR-APD2	LA01_N_CC	Input/Output	GPIO from/to ATMega328P
AVR-ADP3	LA01_P_CC	Input/Output	GPIO from/to ATMega328P
AVR-ADP4	LA06_N	Input/Output	GPIO from/to ATMega328P
AVR-ADP5	LA06_P	Input/Output	GPIO from/to ATMega328P

9. Microcontroller

THSB-FMC-03ADC has microchip/ATMege328P 8-bit microcontroller which allows the following functions.

1. Acquisition information about input video sync from THC7984 registers
2. Supposition for input video format with above information
3. Setting parameters to THC7984 register
4. Display video format and status

A) Rewriting program code for microcontroller through pin header

Allows to rewrite your program code for microcontroller via CON3 pin header (*1). Please note that we cannot guarantee operation after rewriting your program code.

(*1) Recommended programmer: ‘Atmel-ICE’ from microchip

10. SYNC Voltage Level

It is necessary to meet the specification of high-level voltage for input video sync. Otherwise, THSB-FMC-03ADC board disables to recognize input video sync. Confirm the following specification.

Table 10-1 Sync Level Specification

VADJ voltage [V]	SYNC HIGH LEVEL SPEC.
2.5	Over 1.1V
3.3	Over 1.4V

11. LCD Display

LCD Display (eight char * two rows) indicates the result of video format supposition and status of the microcontroller.

A) When power supplies to THSB-FMC-03ADC

LCD display indicates “FMC03ADC Rev.C” during 5 seconds after power-on.

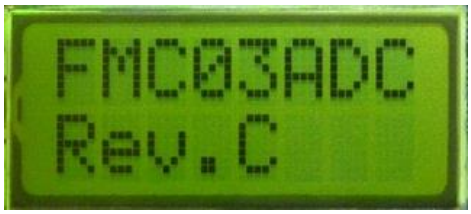


Fig 11-1 “FMC03ADC Rev.C” on LCD Display

B) While FPGA is on configuration

LCD display indicates “FPGA is NotReady”.

Fig 11-2 “FPGA is NotReady” on LCD Display

C) When supported analog video signal is input

LCD display indicates the resolution and vertical frequency.

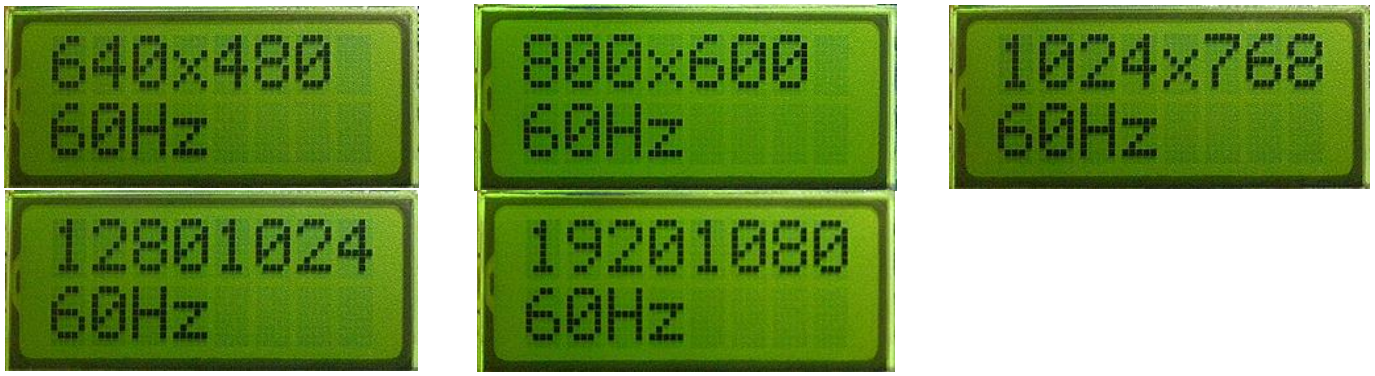


Fig 11-3 Resolution and Frequency of Input Video Format

D) When analog video format is not supported

LCD display indicates “Unknown Input”.

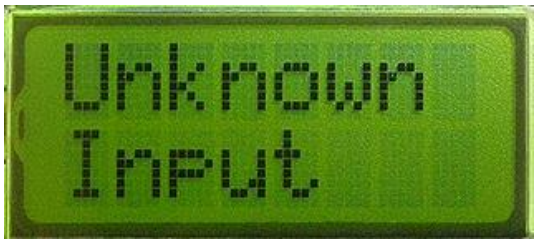


Fig 11-4 “Unknown Input” on LCD Display

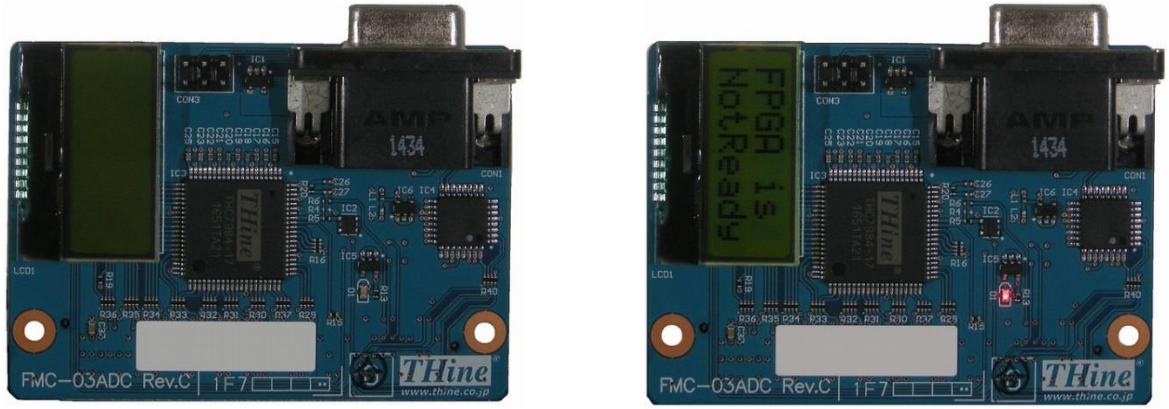
E) When analog video is not input

LCD display indicates “No Input Signal”.

Fig 11-5 “No Input Signal” on LCD Display

12. Power-on LED

THSB-FMC-03ADC has power-on LED. It turns on a red light upon supplying 3.3V power through FMC connector.



LED turns off LED turns on

Fig 12-1 Power-on LED

13. EDID

EDID (Extended Display Identification Data) is in EEPROM (24AA01T-I/OT) on THSB-FMC-03ADC.

A) Supported video format on EDID

Table13-1 indicates supported video format.

Table 13-1 Supported Format on EDID

Horizontal [pix]	Vertical [line]	Refresh-Rate [Hz]
640	480	60Hz
800	600	60Hz
1024	768	60Hz
1280	800	60Hz
1280	1024	60Hz
1400	1050	60Hz
1440	900	60Hz
1600	900	60Hz
1600	1200	60Hz
1680	1050	60Hz
1920	1080	60Hz

B) Screen Resolution on WINDOWS

When THSB-FMC-03ADC is connected to WINDOWS PC, PC displays the following screen resolution window.

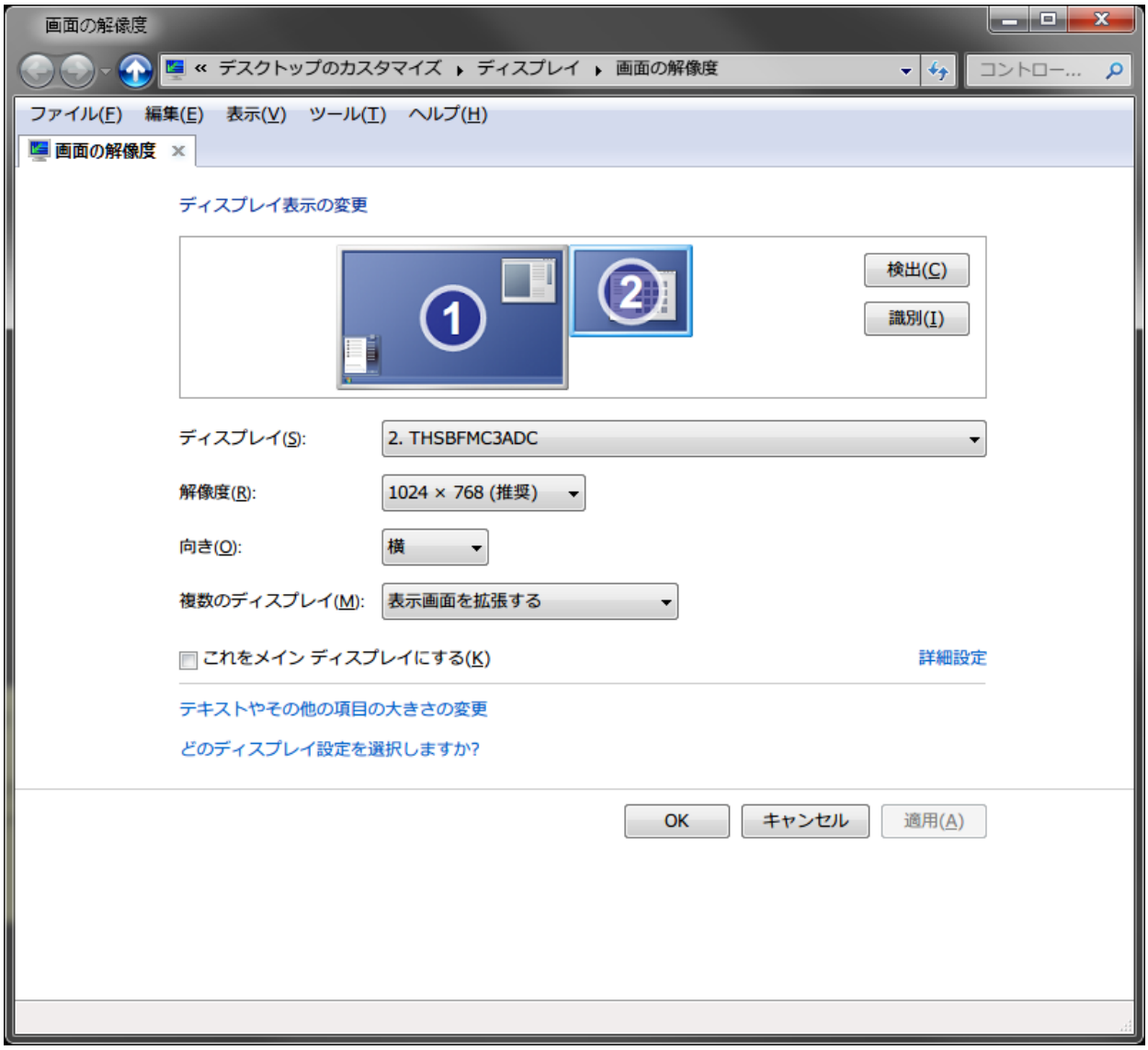


Fig 13-1 Screen Resolution window

Note) Display Name is “THSBFMC3ADC”

14. Unexpected Display

A few analog video signals unexpectedly cause the following problems.

A) The format different from the setting is input.

PC does not support the video format you set. In such case, it can output unexpected format. For example, PC outputs 1680x1050 format even though setting the video format on WINDOWS is 1280x720. Please input supported video format or use other video generators.

B) Although input video signal would be correct, LCD display indicates “Unknown Input”.

Unexpected video signal on EDID can be input. See section 13 and input supported video format.

C) Although input video signals would be correct, LCD display indicates “No Input signal”.

A voltage level of video sync signals can be low. Check section 10 and raise the voltage level.

Notices and Requests

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5. Customers are asked, if required, to judge by themselves if this product falls under the category of strategic goods under the Foreign Exchange and Foreign Trade Control Law.

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