



Reference Manual

Mpression 100BASE-T1 HSMC Card

Revision 1.0

10/5/2016

© 2016 Macnica, Inc.

Disclaimer

The information in this document (hereinafter called “Information”) is subject to change without notice.

Macnica Inc. (Developer) makes no warranty of any kind regarding this document, or of any liability arising out of the application or use of information in this document, and assumes no responsibility for any errors that may appear in this document.

This document is distributed without any charge and reselling or copying without written authorization by Developer is restricted.

IN NO EVENT WILL DEVELOPER BE LIABLE FOR ANY CONSEQUENTIAL, INDIRECT, EXEMPLARY, SPECIAL, OR INCIDENTAL DAMAGES, INCLUDING ANY LOST DATA AND LOST PROFITS, ARISING FROM OR RELATING TO YOUR USE OF THE INFORMATION, EVEN IF YOU HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE TOTAL CUMULATIVE LIABILITY OF DEVELOPER IN CONNECTION WITH YOUR USE OF THE INFORMATION IN THIS DOCUMENT, WHETHER IN CONTRACT OR TORT OR OTHERWISE, WILL IN NO EVENT EXCEED THE AMOUNT OF FEES PAID BY YOU TO DEVELOPER HEREUNDER FOR USE OF THE INFORMATION. YOU ACKNOWLEDGE THAT THE FEES, IF ANY, REFLECT THE ALLOCATION OF RISK SET FORTH IN THIS AGREEMENT AND THAT DEVELOPER WOULD NOT MAKE AVAILABLE THE INFORMATION TO YOU WITHOUT THESE LIMITATIONS OF LIABILITY.

The Information is not intended for use in the development of on-line control equipment in hazardous environments requiring failsafe controls, such as in the operation of nuclear facilities, aircraft navigation or communications systems, air traffic control, life support, or weapons systems (“High-Risk Applications”). Developer specifically disclaims any express or implied warranties of fitness for such High-Risk Applications. You represent that use of the Information in such High-Risk Applications is fully at your risk.

Contents

1. Read This First	4
1.1 Important Information	4
1.2 Developer Information	5
1.3 Inquires	5
2. For Ensuring Safe Use	6
2.1 Legend	6
2.2 Cautions	6
3. Unpacking	9
4. Functions and Features of This Card	10
4.1 Main Features	10
4.2 Product Specifications	10
4.3 Block Diagram	11
4.4 Card Specification	12
5. Components of This Card	14
5.1 Connector Pin Assignments	14
6. Precautions during Use	19
6.1 Selecting the Unused Pin Mode	19
6.2 Inserting This Card into an HSMC Connector	20
7. Document Revision History	21

1. Read This First

1.1 Important Information

READ FIRST:

- **READ** this Reference Manual before using this product.
- **KEEP** the Reference Manual handy for future reference.
- **Do not attempt** to use the product until you fully understand its mechanism.

Purpose of the Product:

- This product is a verification board with an Altera FPGA. It supports development and verification of a system that uses BroadR-Reach, image sensor input, display port output, audio input/output, and other interfaces. It provides support for system development in both software and hardware. Be sure to use this product correctly for this purpose.

For Users of This Product:

- This product can only be used by operators who have carefully read and understand this manual and "Getting Started". Use of this product requires a basic knowledge of FPGAs, logic circuits, electric circuits, and microcomputers.

Precautions to be taken when using This Product:

- This product is to be used for development of a program, and the evaluation stage. You cannot install this Board in your product and cannot use this Board for mass-production. When mass-producing a program you have finished developing, be sure to decide at your own responsibility whether it can be put to practical use by performing integration test, evaluation, or some other experiment.
- In no event shall Macnica Inc. be liable for any consequence arising from the use of this product.
- Macnica Inc. shall make effort to provide a workaround or fix for failures of this product, with or without charge. This does not mean, however, that Macnica Inc. guarantees to provide a workaround or fix under all circumstances.
- Macnica Inc. cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this reference manual and on the product are therefore not all-inclusive. Use this product correctly and safely at your own responsibility.
- Even if a device installed on this product has a failure, it cannot be replaced.
- Not all types of apparatus are guaranteed to connect with the BroadR-Reach interface and the Display Port interface of this product.
- Remodeling or damages caused by the customer is not guaranteed.
- This product is a lead-free mounting product.
- Generally, the brand names carried in this reference manual each constitute a maker's trademark or registered trademark.

Improvement Policy:

- Macnica Inc. pursues a policy of continuous improvement in design, performance, and safety of the product.
Macnica Inc. reserves the right to change, wholly or partially, specifications, design, reference manual, and other documentation at any time without notice.

Warranty:

- Macnica Inc. offers exchange of this product free of charge only in a set range of cases of initial trouble for this product, and within 30 days from when the customer received delivery of the Board.

Macnica Inc. cannot exchange products in cases where breakdown is caused for the following reasons:

- (1) Misuse, abuse of the product or use under abnormal conditions
- (2) Remodeling or repair
- (3) A fire, earthquake, fall or other accidents

Figures:

- Some figures in this reference manual may differ from your system as purchased.

1.2 Developer Information

The Developer of this product is:

Macnica Inc.

1-6-3 Shin-Yokohama, Kouhoku-ku, Yokohama, 222-8561 JAPAN

1.3 Inquires

In case you have any inquiries about the use this product, please contact your local Macnica company or make inquiries through the contact form in the following web site:

<http://www.m-pression.com/contact>




Macnica companies:

- | | | |
|------------------|-----------------------|---|
| • China & HK: | Cytech Technology | http://www.cytech.com/ |
| • ASEAN & India: | Cytech Global | http://www.cytechglobal.com/ |
| • Taiwan: | Galaxy Far East Corp. | http://www.gfec.com.tw/ |
| • North America: | Macnica Americas | http://www.macnica-na.com/ |
| • Brazil: | Macnica DHW | http://www.macnicadhw.com.br/en/ |
| • Japan: | Altima | http://www.altima.co.jp |
| | Elsena | http://www.elsena.co.jp |



2. For Ensuring Safe Use



Be sure to follow the instructions given in this Manual which are intended to prevent harm to the user and others as well as material damage.

2.1 Legend

 Danger	Indicates an imminent hazardous situation which if not avoided will result in death or serious injury.
 Warning	Indicates a potentially hazardous situation which if not avoided could result in death or serious injury.
 Caution	Indicates a potentially hazardous situation which if not avoided may result in minor or moderate injury or in property damage.

2.2 Cautions

 Danger	<p>If an AC adapter is required, use one based on the specifications stipulated in this manual or use the AC adapter included in the package.</p> <p>Using an AC adapter not meeting the specifications described in this Manual may cause the kit to emit heat, explode, or ignite.</p>
 Warning	<p>Do not apply strong impacts or blows to the kit.</p> <p>Doing so may cause the kit to emit heat, explode, or ignite, or the equipment in the kit to fail or malfunction. This may also cause fire.</p>
	<p>Do not put the main unit or the AC adapter in cooking appliances such as microwave ovens, or high-pressure containers. Doing so might cause the main unit or AC adapter to emit heat, explode, ignite, or emit smoke, or its parts to break or warp.</p>
	<p>Do not wrap the main unit that is in use with cloth or other materials that are likely to allow heat to build up inside the wrapping.</p> <p>This will cause heat to build up inside the wrapping which may cause the main unit to ignite or malfunction.</p>
	<p>When disposing of the main unit, do not dispose of it along with general household waste.</p> <p>Throwing the main unit into fire may cause it to explode. Dispose of the main unit following the laws, regulations, and ordinances governing waste disposal.</p>
	<p>Do not pull the power supply cable with excessive force or place heavy items on it.</p> <p>Do not damage, break, bundle, or tamper with the power supply cable.</p> <p>Damaged parts of the power supply cable might cause a short circuit resulting in fire or accidents involving electrical shock.</p>
	<p>Do not plug or unplug the power plug with wet or moist hands.</p> <p>This might cause injuries or equipment malfunctions or failures due to electrical shock.</p>
	<p>Plug the power plug securely into the outlet.</p> <p>If the power plug is not securely plugged into the outlet, it may cause accidents involving electrical shock or fire due to heat emitted.</p>

 Warning (Continued from previous page)	<p>Do not connect many electrical cords to a single socket or connect an AC adapter to an outlet that is not rated for the specified voltage. Doing so may cause the equipment to malfunction or fail, or lead to accidents involving electrical shock or fire due to heat emitted.</p> <p>Periodically remove any dust accumulated on the power plug and around the outlet (socket). Do not use a power plug with dust accumulated on it because doing so will lead to insulation failure due to moisture which may lead to fire. Remove any dust on the power plug and around the outlet with dried cloth.</p> <p>Do not place any containers such as cups or vases filled with water or other liquid on this Board. If this Board is exposed to water or other liquid it may cause the Board to malfunction or lead to accidents involving electrical shock. If you spilled water or other liquid on this Board, immediately stop using the Board, turn off the power, and unplug the power plug. If you have any requests for repairs or technical consultation, please contact the local Macnica company or Mpression inquiry URL.</p> <p>Keep this board and accessories out of reach of children. Failure to do so may lead to injuries.</p>
 Caution	<p>Do not place the kit on unstable places such as shaky stands or tilted locations. Doing so may cause injuries or cause this Board to malfunction if the Board should fall.</p> <p>Do not attempt to use or leave the kit in places subject to strong direct sunlight or other places subject to high temperatures such as in cars in hot weather. Doing so might cause the kit to emit heat, break, ignite, run out of control, warp, or malfunction. Also, some parts of the equipment might emit heat causing burn injuries.</p> <p>Do not use the kit in places subject to extremely high or low temperatures or severe temperature changes. Doing so may cause the kit to fail or to malfunction. Always be sure to use the kit within a temperature range of 5° C to 35° C and a humidity range of 0% to 85%.</p> <p>Unplug the power supply cable when carrying out maintenance of devices in which the main unit is embedded. Failure to do so may lead to accidents involving electrical shock.</p> <p>Do not place this Board in locations where excessive force is applied to the Board. Doing so may cause the PC board to warp, leading to breakage of the PC board, missing parts or malfunctioning parts.</p> <p>When using the kit together with expansion boards or other peripheral devices, be sure to carefully read each of their manuals and to use them correctly. Developer does not guarantee the operation of specific expansion boards or peripheral devices when used in conjunction with this Board unless they are specifically mentioned in this Manual or their successful operation with this Board has been confirmed in separate documents.</p> <p>Be sure to turn off the power switch when moving this Board to connect to other devices. Failure to do so may cause this Board to fail or lead to accidents involving electrical shock.</p>

<div data-bbox="226 589 295 649"></div> <div data-bbox="336 566 461 600">Caution</div> <div data-bbox="327 616 470 676">(Continued from previous page)</div>	<p>Do not clean this Board by using a rag containing chemicals such as benzine or thinner. Failure to do so will likely to cause this Board to deteriorate. When using a chemical cloth be sure to comply with any directions or warnings.</p>
	<p>Do not immediately turn on the power if you find that water or moisture had condensed onto the main unit after removing the board from the package. Condensation might occur on this Board when taking it out of the box, if the board is cool yet the room temperature is warm.</p>
	<p>Do not apply power to the Board while water or moisture has condensed on it because the moisture may cause the Board to break or may shorten the service life of the parts.</p>
	<p>When you first take this Board out of the box be sure to leave it at room temperature for a while before using it. If condensation or moisture has occurred on this Board, first wait for the moisture to fully evaporate before installing or connecting the Board to other devices.</p>
	<p>Do not disassemble, dismantle, modify, alter, or recycle parts unless they are clearly described as customizable in this Manual.</p> <p>Although this kit is customizable, if parts not specified in this Manual as customizable are modified in any way, then the overall product operation cannot be guaranteed. Please contact the local Macnica company or Mpression inquiry URL beforehand if you wish to customize or modify any parts that are not described in this Manual as customizable.</p>

3. Unpacking

During unpacking, check to make sure that all required items are included, and that nothing is damaged.

If something is missing or visibly damaged, contact your original retailer within 30 days after receiving your purchase.

100BASE-T1 HSMC Card: 1	
Product Fastening Stays: 1 set	
Twisted Pair Cable for BroadR-Reach: 1	
23-mm Spacers: 2	
15-mm Spacers: 4	
Countersunk Screws: 6	
Pan Head Screws: 6	
Packing List and Precautions	
Circuit diagram	To download these files, go to the URL noted on the Packing List and Precautions.
Reference Manual	
Getting Started	
Reference Design	

4. Functions and Features of This Card

4.1 Main Features

This card is a daughter card to the Altera High-Speed Mezzanine Card (HSMC). Inserting this card into an FPGA evaluation board equipped with HSMC provides the function of various types of FPGA. It is an expansion daughter board that enables verification of BROADCOM BroadR-Reach®, the Shikino High-Tech Image Sensor module, DisplayPort®, and the AnalogDevices Audio CODEC interface.

A verified FPGA evaluation board, which is a Macnica Mpression Nitro board, is equipped with an Altera Cyclone® V Series FPGA.

For more detailed information and other details, visit the links below.

- Cyclone® V Device Family Information
[Documentation: Cyclone V Devices](#)
- High-Speed Mezzanine Card (HSMC) Specification
[High-Speed Mezzanine Card \(HSMC\)](#)
- Mpression Nitro Board Documentation
[Nitro board](#)

4.2 Product Specifications

Table 1 shows the product specifications of this Card.

Table 1 100BASE-T1 HSMC Card Product Specifications

Product Specifications	ALTHSMCBRR1M
External Dimensions	110 mm x 146 mm
PCB specification	FR4 6-layer
HSMC	Samtec ASP-122952-01
Power Supply	DC12V/3.3V from HSMC
100BASE-T1 PHY	Broadcom BCM89810
Camera module	Shikino High-Tech KBCR-S02TXG-HPB1022 (720p@60)
Audio CODEC	Analog Devices ADAU1961
Interfaces	BroadR-Reach x 1 Audio Input x 1 Audio Output x 1 Display Port x 1
Operating Conditions	Ambient temperature: 5°C to 35°C, humidity: 0% to 85%

4.3 Block Diagram

Figure 4-1 shows the block diagram of this Card.

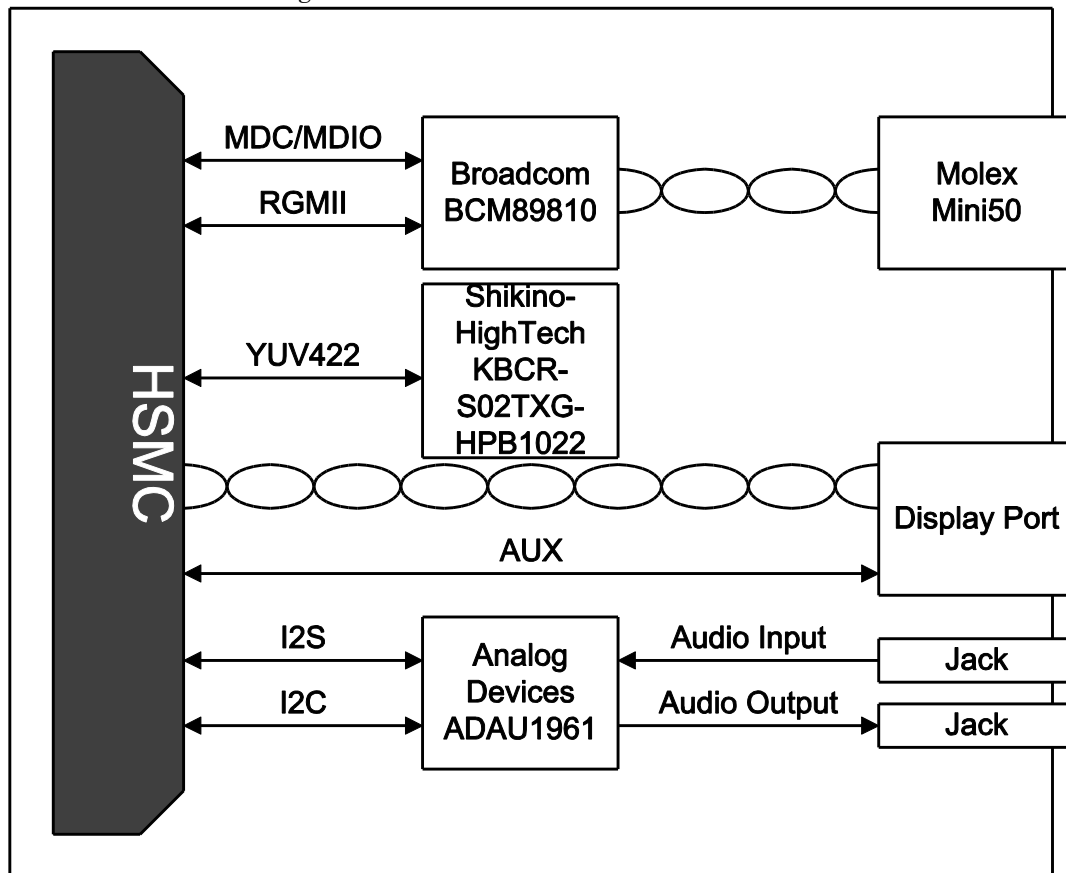


Figure 4-1 100BASE-T1 HSMC Card Block

4.4 Card Specification

Figure 4-2 and Figure 4-3 show the layout of this card.

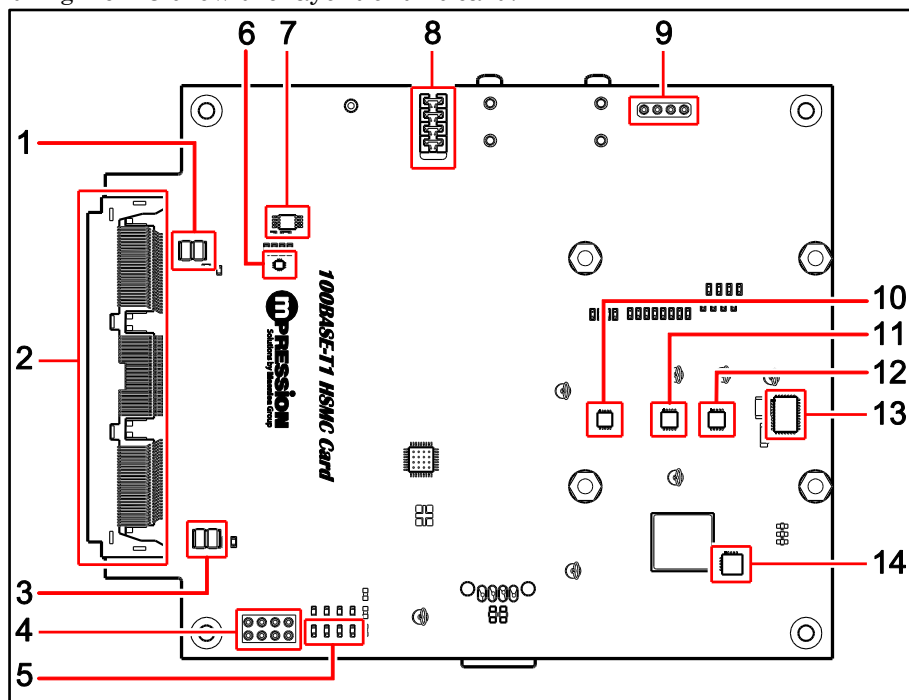


Figure 4-2 100BASE-T1 HSMC Card Layout (Top view)

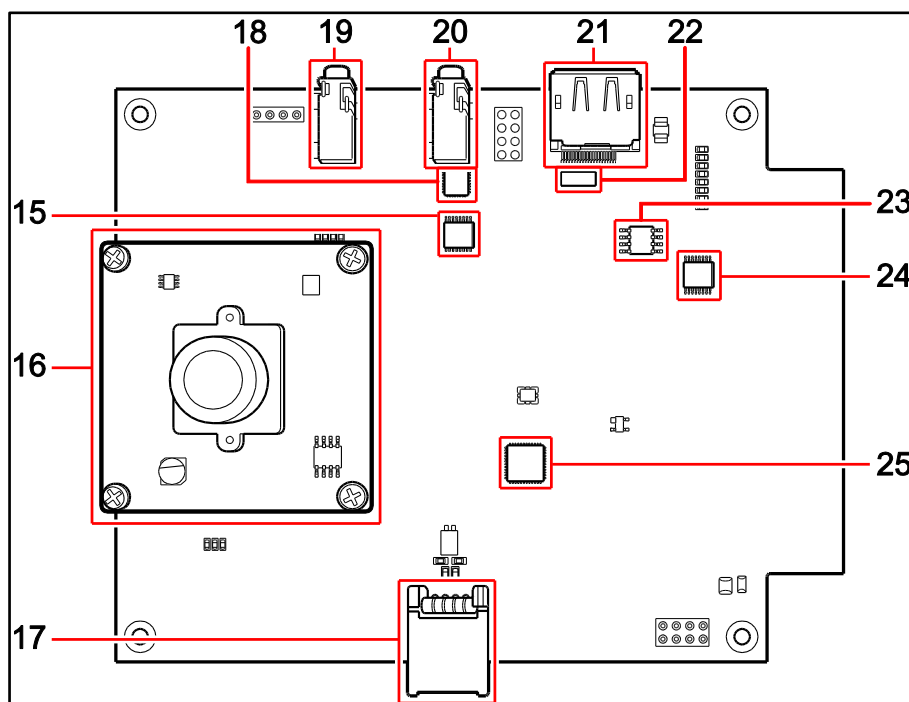


Figure 4-3 100BASE-T1 HSMC Card Layout (Bottom View)

	Reference	Function	Details
1	Y2	Crystal Oscillator	16 MHz
2	CN1	HSMC	ALTERA FPGA Base Board Interface
3	Y3	Crystal Oscillator	24.576 MHz
4	CN2	MDC/MDIO	For PHY Setting
5	LED1 to 4	LED	100BASE-T1 Status LED
6	U14	Level Shifter	Display Port Control Signal Level Shifter
7	U5	Op Amp	For Display Port AUX Line
8	CN7	I2S	Audio CODEC(U6) Interface
9	CN6	I2C for Camera	I2C for Setting Shikino High-Tech Sensor Module
10	U12	6V Module Setting	Enpirion EY1501DI-ADJ
11	U9	6V 1501DI	Enpirion EY1501DI-ADJ
12	U10	6V 1501	Enpirion EY1501DI-ADJ
13	U11	6V 501DI-	Enpirion EN6337QI
14	U8	12V 37QI	Enpirion ER3125QI
15	U7	Level Shifter	Level Shifter for I2S Signal
16	(CN5)	Camera Interface	Shikino High-Tech Sensor Module Connector
17	CN3	100BASE-T1	100BASE-T1 Interface Mini50 Connector
18	U6	Audio CODEC	Analog Devices ADAU1961
19	J1	3.5mm Phone Jack	Audio Output
20	J2	3.5mm Phone Jack	Audio Input
21	CN4	Display Port	Display Port Connector
22	D2	Diode	ESD Protection for Display Port
23	U4	Bus LVDS Transceiver	Display Port Control Signal Level Shifter
24	U3	Level Shifter	Display Port Control Signal Level Shifter
25	U1	100BASE-T1 PHY	Broadcom BCM89810

5. Components of This Card

5.1 Connector Pin Assignments

Figure 5-1 and Figure 5-2 show connector positions.

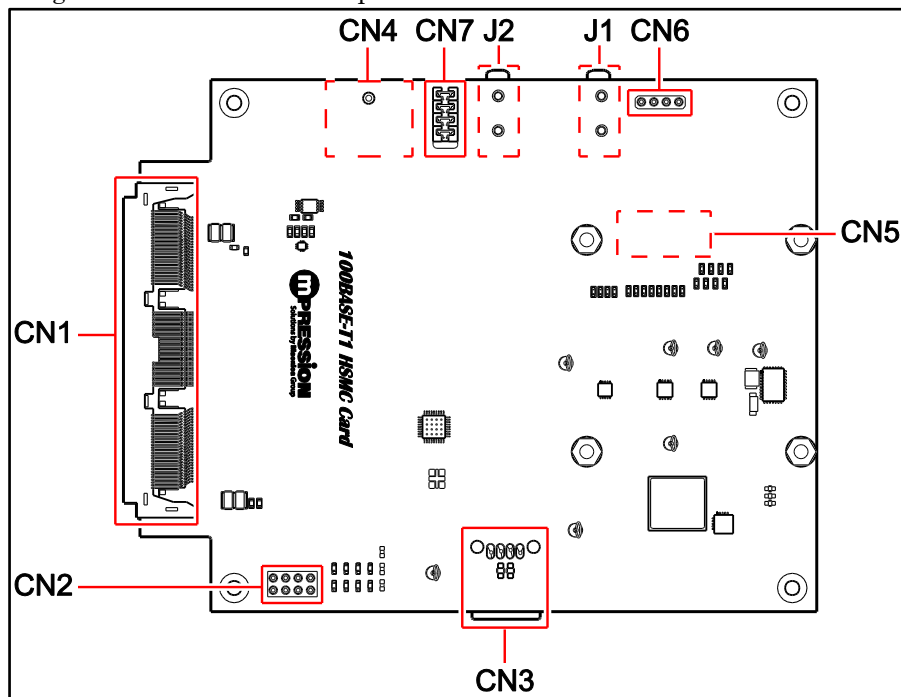


Figure 5-1 100BASE-T1 HSMC Card Connector Positions (Top View)

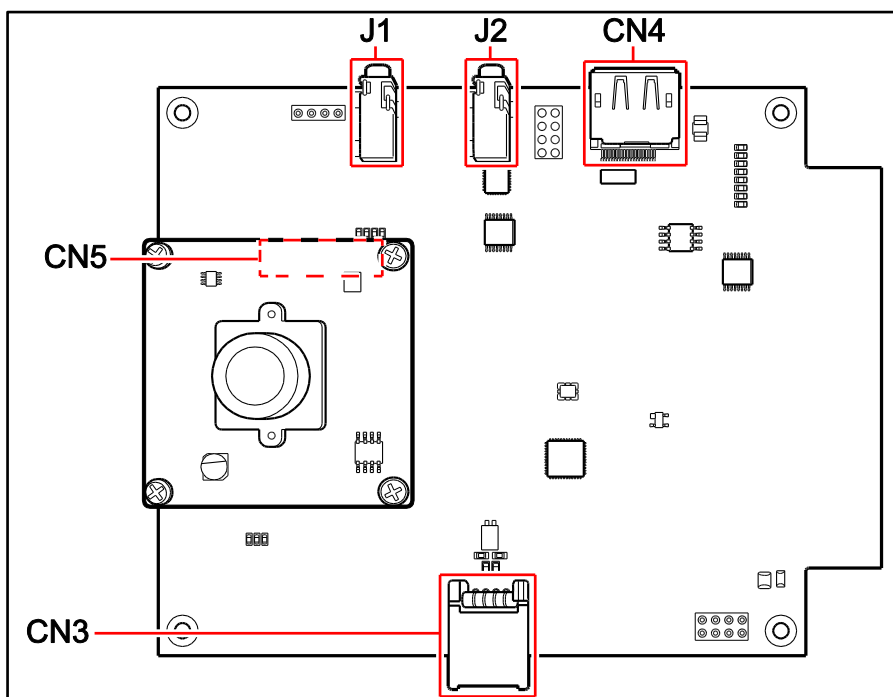
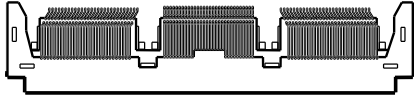


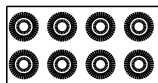
Figure 5-2 100BASE-T1 HSMC Card Connector Positions (Bottom View)

CN1 (HSMC)



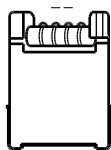
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1		46		91		136	
2		47		92	HD_U[2]	137	3.3 V
3		48		93		138	12 V
4		49		94	HD_U[3]	139	
5		50		95	3.3 V	140	
6		51		96	12 V	141	
7		52		97		142	
8		53		98	HD_U[4]	143	3.3 V
9		54		99		144	12 V
10		55		100	HD_U[5]	145	ENET_RXD[3]
11		56		101	3.3 V	146	ENET_RX_DV
12		57		102	12 V	147	ENET_RXD[1]
13		58	DP_16MCLK	103	DP_CONFIG1	148	ENET_RXD[2]
14		59		104	HD_U[6]	149	3.3 V
15		60		105		150	12 V
16		61	DP_HPD	106	HD_U[7]	151	ENET_TX_EN
17		62	HD_Y[0]	107	3.3 V	152	ENET_RXD[0]
18		63		108	12 V	153	ENET_TXD[3]
19		64	HD_Y[1]	109	DP_CONFIG2	154	
20		65	3.3 V	110	HD_BHD	155	3.3 V
21		66	12 V	111		156	12 V
22		67	DP_AUX_DIN	112	HD_BVD	157	ENET_TXD[1]
23		68	HD_Y[2]	113	3.3 V	158	ENET_TXD[2]
24		69		114	12 V	159	
25	DP_TX3_P	70	HD_Y[3]	115		160	ENET_TXD[0]
26		71	3.3 V	116	HD_BCK	161	3.3 V
27	DP_TX3_N	72	12 V	117	AD_MCLK	162	12 V
28		73	DP_AUX_DOUT	118		163	ENET_MDIO
29		74	HD_Y[4]	119	3.3 V	164	ENET_RESET_N
30		75		120	12 V	165	ENET_MDC
31	DP_TX2_P	76	HD_Y[5]	121	HD_EXTRST	166	ENET_SYNC
32		77	3.3 V	122	HD_BDEN	167	3.3 V
33	DP_TX2_N	78	12 V	123	HD_PWDN	168	12 V
34		79	DP_AUX_DIR	124	AD_BCLK	169	ENET_LED4
35		80	HD_Y[6]	125	3.3 V	170	ENET_LED3
36		81		126	12 V	171	ENET_LED2
37	DP_TX1_P	82	HD_Y[7]	127	HD_SCL	172	ENET_LED1
38		83	3.3 V	128	AD_SDA	173	3.3 V
39	DP_TX1_N	84	12 V	129	HD_SDA	174	12 V
40		85	DP_AUX_P	130	AD_SCL	175	ENET_GTX_CLK
41		86	HD_U[0]	131	3.3 V	176	AD_24MCLK
42		87	DP_AUX_N	132	12 V	177	
43	DP_TX0_P	88	HD_U[1]	133	AD_DAC_SDATA	178	ENET_RXC
44		89	3.3 V	134	AD_ADC_SDATA	179	3.3 V
45	DP_TX0_N	90	12 V	135	AD_LRCLK	180	GND

CN2 (MDC/MDIO)



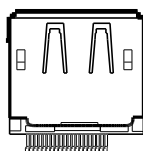
Pin	Signal Name	Pin	Signal Name
1	GND	5	PHY_MDIO
2	GND	6	MDIO
3	PHY_MDC	7	GND
4	MDC	8	GND

CN3 (100BASE-T1)



Pin	Signal Name	Pin	Signal Name
1	Open (12 V)	3	TRD-
2	TRD+	4	Open (GND)

CN4 (Display Port)

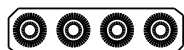


Pin	Signal Name	Pin	Signal Name
1	ML_Lane0P	11	GND
2	GND	12	ML_Lane3n
3	ML_Lane0n	13	CONFIG1
4	ML_Lane1p	14	CONFIG2
5	GND	15	AUX_CHp
6	ML_Lane1n	16	GND
7	ML_Lane2p	17	AUX_CHn
8	GND	18	Hot_Plug_Detect
9	ML_Lane2n	19	ReturnDP_PWR
10	ML_Lane3p	20	DP_PWR

CN5 (YUV422)

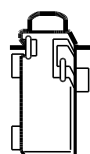
Pin	Signal Name	Pin	Signal Name	Pin	Signal Name
1	GND	21		41	PWDN
2	GND	22		42	
3	GND	23	GND	43	GND
4	YOUT0	24	GND	44	
5	YOUT1	25	GND	45	
6	YOUT2	26	GND	46	
7	YOUT3	27		47	
8	YOUT4	28		48	
9	YOUT5	29		49	
10	YOUT6	30		50	UVOUT0
11	YOUT7	31	EXTVIN	51	UVOUT1
12	GND	32	EXTVIN	52	UVOUT2
13	BCK	33	EXTVIN	53	UVOUT3
14	GND	34	EXTVIN	54	UVOUT4
15	BDEN	35		55	UVOUT5
16	BHD	36	GND	56	UVOUT6
17	BVD	37	SCL	57	UVOUT7
18	GND	38	SDA	58	
19		39	GND	59	
20	GND	40	EXTRST	60	

CN6 (I2C)



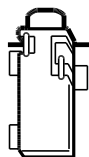
Pin	Signal Name	Pin	Signal Name
1	3.3 V	3	HD_SDA
2	HD_SCL	4	GND

J1 (Audio Output)



Pin	Signal Name	Pin	Signal Name
1	LOUTP	4	ROUTP
2		5	GND
3			

J2 (Audio Input)



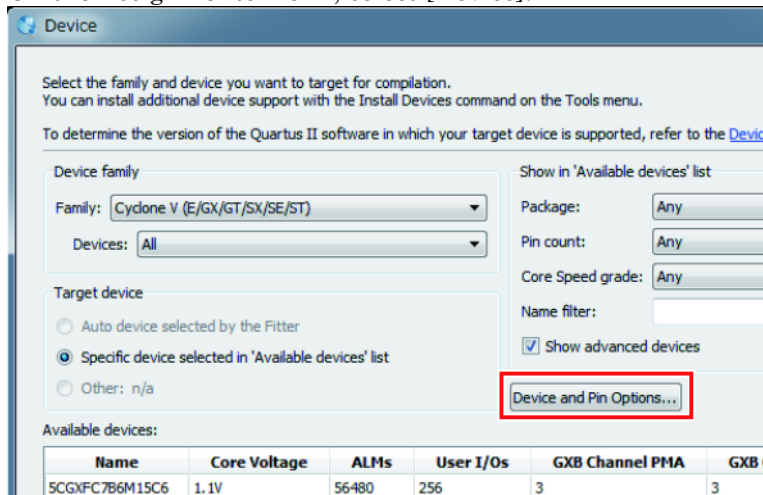
Pin	Signal Name	Pin	Signal Name
1	LINP	4	RINP
2		5	GND
3			

6. Precautions during Use

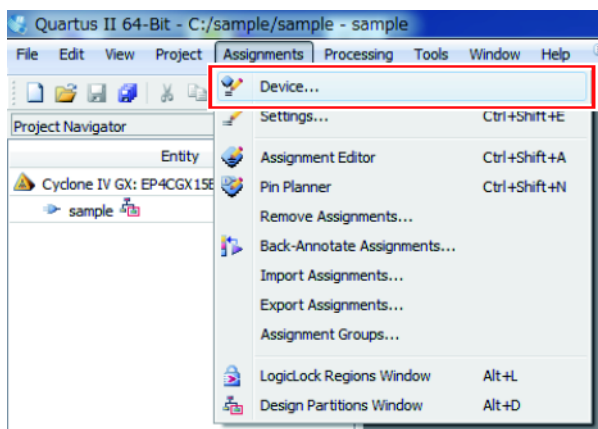
6.1 Selecting the Unused Pin Mode

To prevent incorrect operation, it is recommended that pins not used in the FPGA hardware design (unused pins) be set to tri-state mode. The procedure below shows how to configure unused pin settings using Quartus II development software.

- 1) On the Assignments menu, select [Device].

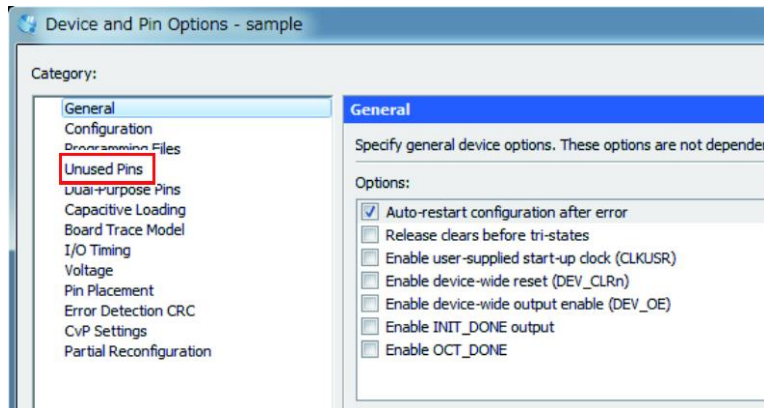


- 2) Click the [Device & Pin Options] button.

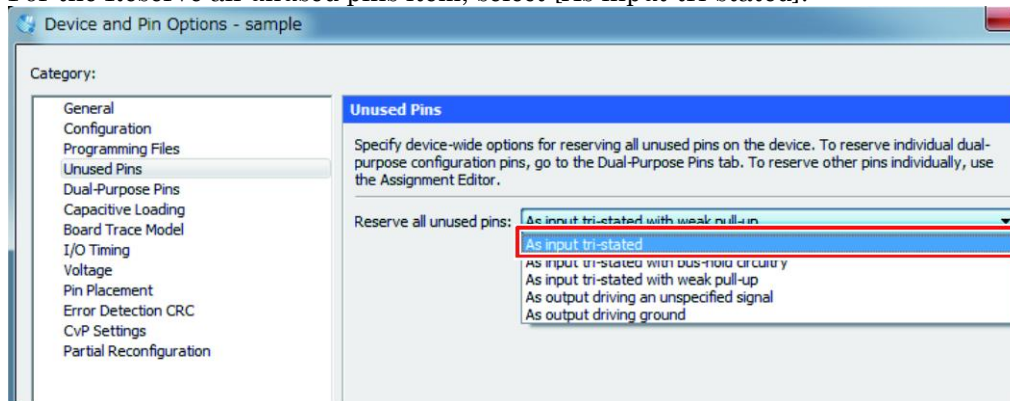


This displays the Device & Pin Options window.

- 3) Select [Unused Pins].



- 4) For the Reserve all unused pins item, select [As input tri-stated].



- 5) Click the [OK] button.
- 6) Click the [OK] button and close the Device window.

6.2 Inserting This Card into an HSMC Connector

Before inserting this card into or removing it from the HSMC connector of an FPGA evaluation board, always make sure that FPGA evaluation board is powered down.

Note that inserting this card while power is being supplied to the FPGA evaluation board creates the risk of device malfunction and/or damage.

Also note that touching this card in a charged state also creates the risk of device malfunction and/or damage. Be sure to take appropriate electrostatic discharge measures before handling this card.

7. Document Revision History

Date	Revision	Changes
Oct 5, 2016	1.0	<ul style="list-style-type: none">• First Edition