Reference Manual

IEEE1588 GE Card

Revision

B

2017/10/23

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Contents

1. Read This First

1.1 Important Information

READ FIRST:
- Before using this card, be sure to read this Reference Manual.
- Keep this Reference Manual so you can refer to it when necessary.
- You should sufficiently understand the card's configuration before you use it.

Card Application:
- This card is a High Speed Mezzanine Card (hereafter HSMC) daughter card that can be connected to and used with any HSMC that complies with HSMC standard. Combining with an FPGA evaluation board (hereafter Evaluation board), this card supports the development and verification of hardware and software for 2 ports of Gigabit Ethernet i/o interface. Use this card correctly in line with the application.

People Who Are Expected to Use This Card:
- Only people who carefully read and understood this manual and the Getting Started manual should use this card. You need a fundamental understanding of FPGA, logic circuits, electronic circuits, and micro-computers to use this card.

Precautions When Using This Card:
- This card is a development support card used for the purpose of your hardware and software development and evaluation. This card cannot be used in your mass production products. Furthermore, when you want to use the card's sample designs for your products, please be sure to confirm if it withstands practical use at your own risk by doing necessary and sufficient tests and evaluations.
- Macnica Incorporated (hereafter Macnica Inc.) has no liability for any results arising from the use of the card.
- Macnica Inc. will attempt to provide either free or paid support to handle repair of faults or workarounds for faults with the card. 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 and precautions in this Reference Manual and on the card are therefore not all-inclusive. You are responsible for using the card correctly and safely.
- Even if there are faults with devices that are mounted on the card, Macnica Inc. will not replace it with a fault-fixed device.
- Each interface is not guaranteed to connect with all products.
- The card will not be replaced if you damaged or modified the card.
- The card uses lead-free parts.
- The rights to the trademarks and registered trademarks of the vendors noted in this manual belong to their respective vendors.

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, designs, this Reference Manual, and other documentation at any time, without prior notice to customers.

Warranty:

- Macnica Inc. offers to exchange this card free of charge only in case of initial malfunction noticed by you within 30 days from the delivery.
  Macnica Inc. cannot exchange cards in cases where the malfunction is caused by the following reasons:
  (1) Misuse, abuse of the card or use under abnormal conditions
  (2) Remodeling or repair
  (3) A fire, earthquake, fall or other accidents

Figures:

- Some figures in this manual may differ from your purchased card.

1.2   Developer Information

The Developer of this card is:
Macnica Inc.
1-6-3 Shin-Yokohama, Kouhoku-ku, Yokohama, 222-8561 JAPAN

1.3   Inquiries

In case you have any inquiries about the use of this card, please contact sales office you purchased or make inquiries through the contact form on the following web site.

Inquiries page:
>   http://www.m-pression.com/contact/inquiry

Inquiries to:
>   Macnica Inc.
>   Sales and Planning Advanced Technology
>   1-5-5 Shin-Yokohama, Kouhoku-ku, Yokohama, 222-8563 JAPAN
>   TEL: +81-45-470-9838

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

⚠️ **Warning** (Continued from previous page)	Plug the power plug securely into the outlet. If the power plug is not securely plugged into the outlet, it may cause accidents involving electrical shock or fire due to heat emitted.
	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.
	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 a dry cloth.
	Do not place any containers, such as cups or vases, filled with water or other liquids on the card. If the card is exposed to water or other liquids, it will cause a malfunction or electric shock. If you spilled water or other liquid on this card, immediately stop using the card, turn off the power, and unplug the power plug. If you have any requests for repairs or technical consultation, please contact the sales office you purchased or Mpression inquiry URL.
	Keep the card and accessories out of the reach of children. Failure to do so may lead to injuries.
⚠️ **Caution**	Do not place the card on unstable places such as shaky stands or tilted locations. Doing so may cause injuries or cause this card to malfunction if the card should fall.
	Do not attempt to use or leave the card 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 card to emit heat, break, ignite, run out of control, warp, or malfunction. Also, some parts of the equipment might emit heat, causing burn injuries.
	Do not use the card in places subject to extremely high or low temperatures or severe temperature changes. Doing so may cause the card to fail or to malfunction. Always be sure to use the card within a temperature range of 5°C to 35°C and a humidity range of 0% to 85%.
	Unplug the power supply when doing maintenance on equipment in which the card is embedded. Failure to do so may lead to accidents involving electrical shock.
	Do not place the card in locations where excessive force might be applied to it. Doing so may cause the printed circuit board to warp, leading to breakage of the printed circuit board, missing parts or malfunctioning parts.

Caution (Continued from previous page)	When using the card together with expansion boards or other peripheral equipment, 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 card unless they are specifically mentioned in this Manual or their successful operation with this card has been confirmed in separate documents.
	Turn off the power switch when moving or connecting the card. Failure to do so may cause this card to fail or lead to accidents involving electrical shock.
	Do not clean this card by using a rag containing chemicals such as benzine or thinner. Doing so could degrade the card. When using a chemically treated cloth, comply with its directions and warnings.
	Do not immediately turn on the power if you find that moisture has condensed onto this card after removing it from the box. Condensation may form if the card is cold when moved from the box into a warm room. Turning on the power while there is moisture on the card may cause it to malfunction or shorten the service life of the parts. Allow the card to reach room temperature when you first take it out of the box. If condensation or moisture has occurred on this card, first wait for the moisture to fully evaporate before installing or connecting the card to other equipment.
	Operation of the card cannot be guaranteed if it has been disassembled, dismantled, altered, modified, or rebuilt.

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 sales agent within 30 days after receiving your purchase.

IEEE1588 GE Card: 1	
5-mm spacer: 2	
Washer: 2	
Nut: 2	
4-mm pan-head screw: 2	
Packing list/precautions: 1	
Packing list/precautions (English): 1	
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 the Card

4.1 Main Features

This card is a daughter card for expanding functions, that complies with High-Speed Mezzanine Card (hereafter HSMC) specifications. By inserting this card into an evaluation board, you can use a variety of FPGA functions to evaluate Gigabit Ethernet.

The evaluation board which has been verified to connect with this card so far is Macnica's Nitro – Cyclone® V GX I/O expansion base board.
Refer to the following links for more detailed information and related details.

● Information for the Cyclone® V device family
  Documentation: Cyclone®V Devices
● Documentation for Nitro – Cyclone® V GX I/O expansion base board
  Nitro – Cyclone® V GX I/O Expansion Base Board

4.2 Product Specifications

The product specifications for this card are shown below.

Product Specifications	IEEE1588 GE Card
External Dimensions	78.105 mm × 100.00 mm
Printed circuit board	6-layer FR4
HSMC	1
Power Supply	3.3 V, 2.5 V, 1.8 V, 1.0 V
Gigabit Ethernet PHY	MARVELL 88E1512 x 2
IDT clock	IDT 8T49N285
Interface	RJ45 x 2

4.3   Block Diagram

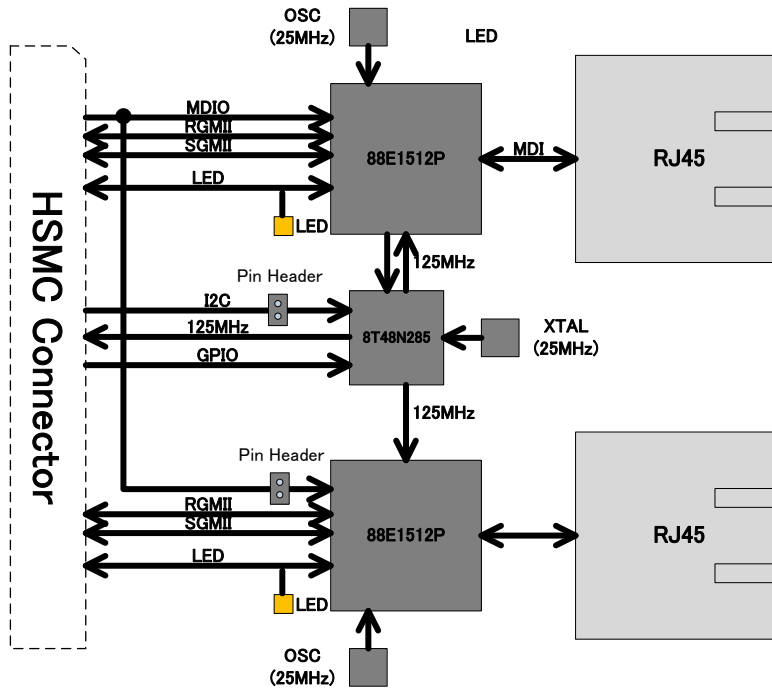Figure 4-1 shows the block diagram of this card.

Figure 4-1 IEEE1588 GE Card Block Diagram

4.4 Card Layout

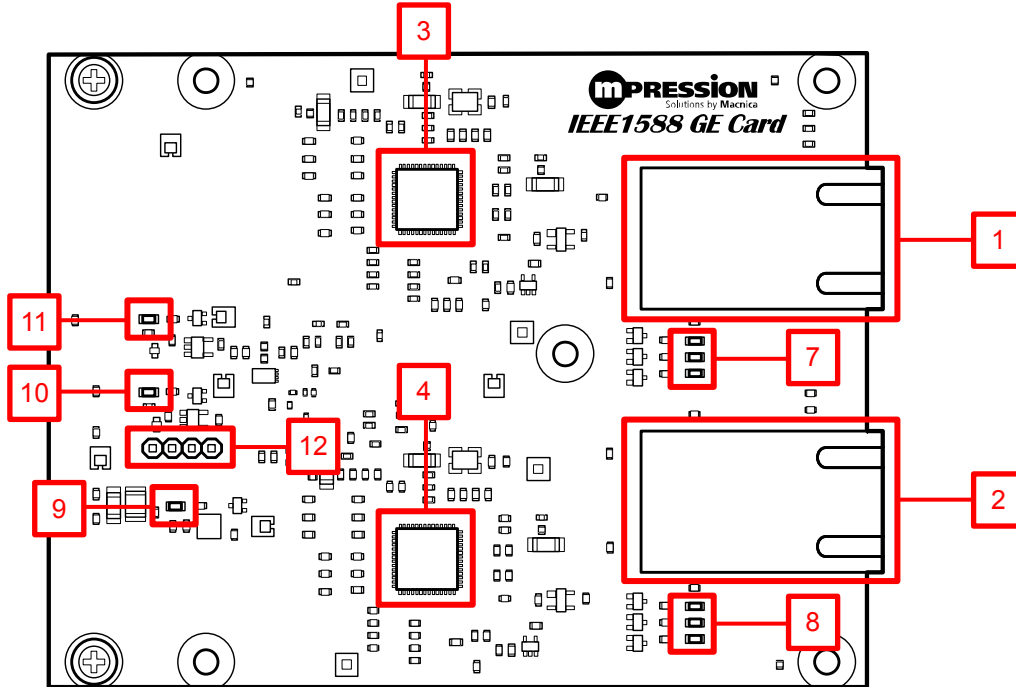Figure 4-2 and Figure 4-3 show the layout of the card.
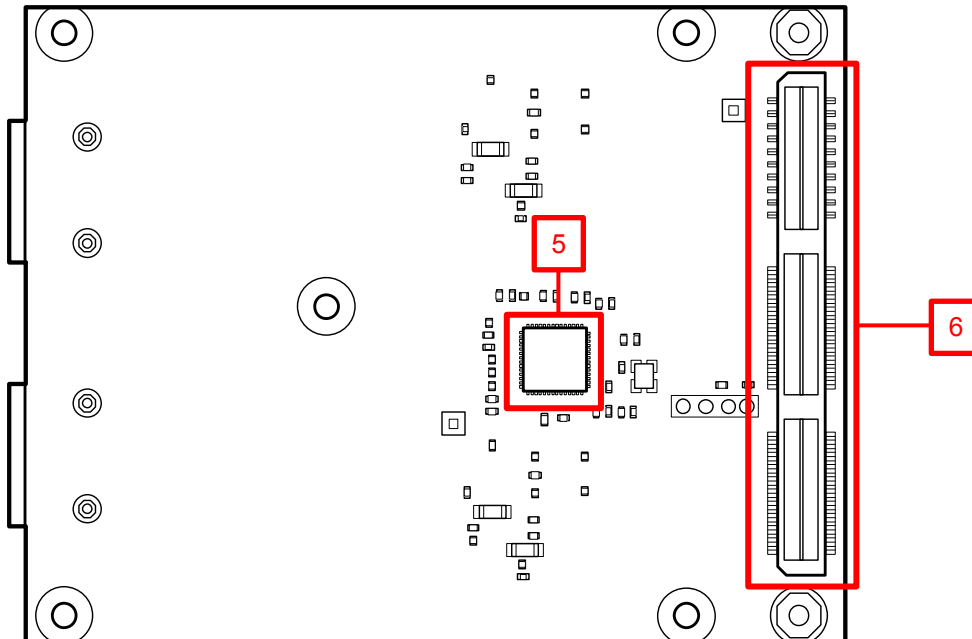

Figure 4-2 IEEE1588 GE Card Layout (Front)

Figure 4-3 IEEE1588 GE Card Layout (Back)

No.	Reference	Functions	Details
1	CN3	Ethernet port 0 RJ45	Belfuse 0826-1G1T-43-F
2	CN5	Ethernet port 1 RJ45	Belfuse 0826-1G1T-43-F
3	U1	Gigabit Ethernet PHY port 0	MARVELL 88E1512
4	U5	Gigabit Ethernet PHY port 1	MARVELL 88E1512
5	U7	Clock Generator	IDT 8T49N285
6	CN1	Interface for ALTERA FPGA Development Board High Speed Mezzanine Card (HSMC) connector	Samtec ASP-122952-01
7	LED1-3	PH1 CH1 LED status indicators	88E1512#LED[0]-[2] status
8	LED4-6	PH1 CH2 LED status indicators	88E1512#LED[0]-[2] status
9	LED7	2.5 V power source status indicator	LED on: Normal, LED off: Abnormal
10	LED8	1.8 V power source status indicator	LED on: Normal, LED off: Abnormal
11	LED9	1.0 V power source status indicator	LED on: Normal, LED off: Abnormal
12	CN6	Configuration connector for U7 Clock Generator	I2C interface

5. Components on the Card

5.1 Connector Pin Assignments

Table 5-1 CN1 HSMC Pin Assignments

Board	HSMC (signal left)	Pin	Pin	HSMC (signal right)	Board
		(1)	(2)		
		(3)	(4)		
		(5)	(6)		
		(7)	(8)		
		(9)	(10)		
		(11)	(12)		
		(13)	(14)		
		(15)	(16)		
	HSMC_TX_P3	(17)	(18)	HSMC_RX_P3	
	HSMC_TX_N3	(19)	(20)	HSMC_RX_N3	
	HSMC_TX_P2	(21)	(22)	HSMC_RX_P2	
	HSMC_TX_N2	(23)	(24)	HSMC_RX_N2	
NET0_S_TX_P	HSMC_TX_P1	(25)	(26)	HSMC_RX_P1	NET0_S_RX_P
NET0_S_TX_N	HSMC_TX_N1	(27)	(28)	HSMC_RX_N1	NET0_S_RX_N
NET1_S_TX_P	HSMC_TX_P0	(29)	(30)	HSMC_RX_P0	NET1_S_RX_P
NET1_S_TX_N	HSMC_TX_N0	(31)	(32)	HSMC_RX_N0	NET1_S_RX_N
	HSMC_SDA	(33)	(34)	HSMC_SCL	
		(35)	(36)		
		(37)	(38)		
NET0_TX_CLK	HSMC_CLK_OUT0	(39)	(40)	HSMC_CLK_IN0	NET0_RX_CLK
	NC			NC	
NET0_TX_CTRL	HSMC_D0	(41)	(42)	HSMC_D1	NET0_RX_CTRL
	HSMC_D2	(43)	(44)	HSMC_D3	
3.3V	3.3V	(45)	(46)	12V	12V
NET0_TXD[0]	HSMC_D4	(47)	(48)	HSMC_D5	NET0_RXD[0]
NET0_TXD[1]	HSMC_D8	(49)	(50)	HSMC_D7	NET0_RXD[1]
3.3V	3.3V	(51)	(52)	12V	12V
NET0_TXD[2]	HSMC_TX_D_P0	(53)	(54)	HSMC_RX_D_P0	NET0_RXD[2]
NET0_TXD[3]	HSMC_TX_D_N0	(55)	(56)	HSMC_RX_D_N0	NET0_RXD[3]
3.3V	3.3V	(57)	(58)	12V	12V
NET0_RESET_N	HSMC_TX_D_P1	(59)	(60)	HSMC_RX_D_P1	NET0_INTn
	HSMC_TX_D_N1	(61)	(62)	HSMC_RX_D_N1	NET0_EVREQ_TRG
3.3V	3.3V	(63)	(64)	12V	12V
	HSMC_TX_D_P2	(65)	(66)	HSMC_RX_D_P2	
	HSMC_TX_D_N2	(67)	(68)	HSMC_RX_D_N2	
3.3V	3.3V	(69)	(70)	12V	12V
	HSMC_TX_D_P3	(71)	(72)	HSMC_RX_D_P3	
	HSMC_TX_D_N3	(73)	(74)	HSMC_RX_D_N3	
3.3V	3.3V	(75)	(76)	12V	12V
	HSMC_TX_D_P4	(77)	(78)	HSMC_RX_D_P4	
	HSMC_TX_D_N4	(79)	(80)	HSMC_RX_D_N4	
3.3V	3.3V	(81)	(82)	12V	12V
	HSMC_TX_D_P5	(83)	(84)	HSMC_RX_D_P5	
	HSMC_TX_D_N5	(85)	(86)	HSMC_RX_D_N5	
3.3V	3.3V	(87)	(88)	12V	12V
MDC	HSMC_TX_D_P6	(89)	(90)	HSMC_RX_D_P6	MDIO
	HSMC_TX_D_N6	(91)	(92)	HSMC_RX_D_N6	
3.3V	3.3V	(93)	(94)	12V	12V
	HSMC_CLK_OUT_P1	(95)	(96)	HSMC_CLK_IN_P1	PLLCLK_125M
	HSMC_CLK_OUT_N1	(97)	(98)	HSMC_CLK_IN_N1	
3.3V	3.3V	(99)	(100)	12V	12V
PLLI2C_SCL	HSMC_TX_D_P7	(101)	(102)	HSMC_RX_D_P7	PLLI2C_SDA
	HSMC_TX_D_N7	(103)	(104)	HSMC_RX_D_N7	
3.3V	3.3V	(105)	(106)	12V	12V
	HSMC_TX_D_P8	(107)	(108)	HSMC_RX_D_P8	PLL_OE
	HSMC_TX_D_N8	(109)	(110)	HSMC_RX_D_N8	PLL_CLKSEL
3.3V	3.3V	(111)	(112)	12V	12V
	HSMC_TX_D_P9	(113)	(114)	HSMC_RX_D_P9	
	HSMC_TX_D_N9	(115)	(116)	HSMC_RX_D_N9	
3.3V	3.3V	(117)	(118)	12V	12V
	HSMC_TX_D_P10	(119)	(120)	HSMC_RX_D_P10	
	HSMC_TX_D_N10	(121)	(122)	HSMC_RX_D_N10	
3.3V	3.3V	(123)	(124)	12V	12V
	HSMC_TX_D_P11	(125)	(126)	HSMC_RX_D_P11	
	HSMC_TX_D_N11	(127)	(128)	HSMC_RX_D_N11	
3.3V	3.3V	(129)	(130)	12V	12V
NET1_TX_CTRL	HSMC_TX_D_P12	(131)	(132)	HSMC_RX_D_P12	NET1_RX_CTRL
	HSMC_TX_D_N12	(133)	(134)	HSMC_RX_D_N12	
3.3V	3.3V	(135)	(136)	12V	12V
NET1_TXD[0]	HSMC_TX_D_P13	(137)	(138)	HSMC_RX_D_P13	NET1_RXD[0]
NET1_TXD[1]	HSMC_TX_D_N13	(139)	(140)	HSMC_RX_D_N13	NET1_RXD[1]
3.3V	3.3V	(141)	(142)	12V	12V
NET1_TXD[2]	HSMC_TX_D_P14	(143)	(144)	HSMC_RX_D_P14	NET1_RXD[2]
NET1_TXD[3]	HSMC_TX_D_N14	(145)	(146)	HSMC_RX_D_N14	NET1_RXD[3]
3.3V	3.3V	(147)	(148)	12V	12V
NET1_RESET_N	HSMC_TX_D_P15	(149)	(150)	HSMC_RX_D_P15	NET1_INTn
	HSMC_TX_D_N15	(151)	(152)	HSMC_RX_D_N15	NET1_EVREQ_TRG
3.3V	3.3V	(153)	(154)	12V	12V
NET1_TX_CLK	HSMC_CLK_OUT_P2	(155)	(156)	HSMC_CLK_IN_P2	NET1_RX_CLK
	HSMC_CLK_OUT_N2	(157)	(158)	HSMC_CLK_IN_N2	
3.3V	3.3V	(159)	(160)	HSMC_PSNT	GND

BANK A, BANK B, BANK C

Table 5-2 CN6 PLL_I2C Pin Assignments

Pin#	Signal name
1	SCL
2	SDA
3	2.5V
4	GND

6. Handling Precautions

6.1 Connecting/disconnecting to the HSMC

Always turn off the power to the evaluation board when connecting or disconnecting the card to the HSMC connector on the evaluation board.
Note that connecting or disconnecting the card while the power is on may result in damage to or destruction of the device.
You need to arrange sufficient anti-static prevention measures because the act of contacting the card with a person or any object carrying a static charge may also result in damage to or destruction of the device.

6.2 Using the Mounted IC

Refer to the following site and data sheet to use the IC that is mounted on the card. It should not be used in nonstandard ways.

| IC	Model	Link
Gigabit Ethernet PHY	88E1512	http://www.marvell.com/88E1512
Clock Generator	8T49N285	https://www.idt.com/8T49N285

6.3 Mode Selection of Unused Pins

We recommend that pins of FPGA that are not used (unused pins) in the design or hardware to be set in tri-state mode to prevent malfunction. The following shows how to set the unused pins using Quartus Prime development software.
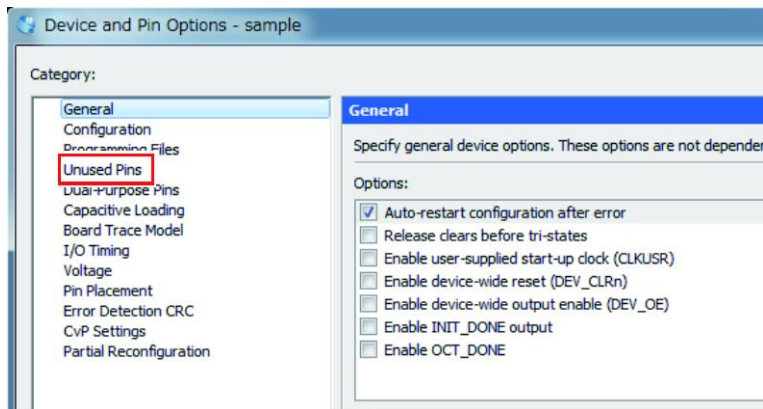
1) Select the [Assignments] menu > [Device].
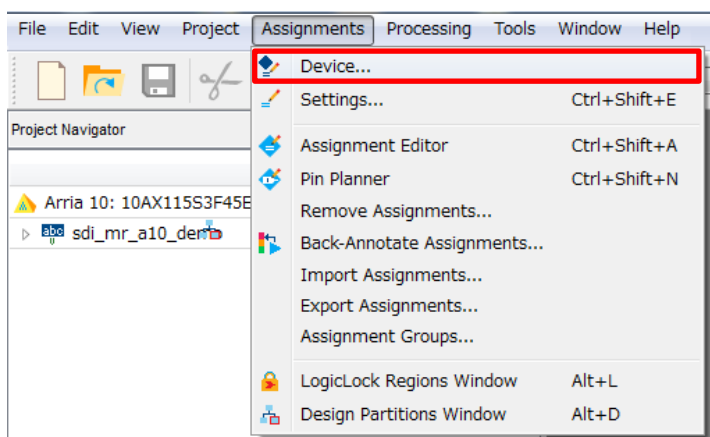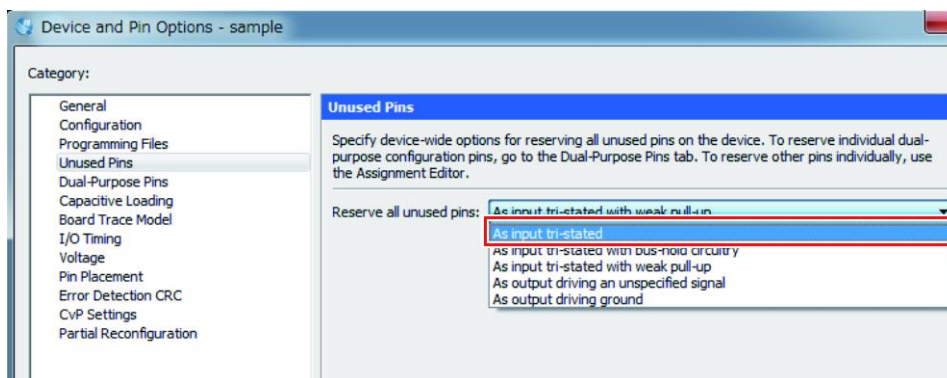
2) Click the [Device and Pin Options] button.
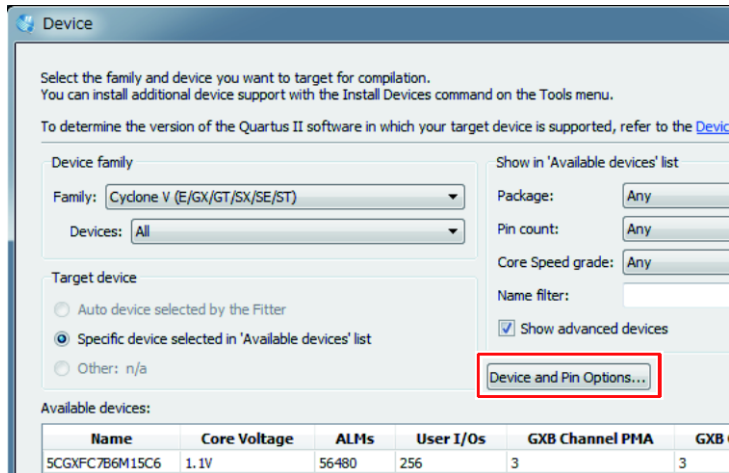
The [Device and Pin Options] window opens.

3) Select [Unused Pins].

4) Select [As input tri-stated] for the [Reserve all unused pins] item.

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

7. Document Revision History

Date	Revision	Changes
January 31, 2017	A	• First Edition
October 23, 2017	B	• Change URL

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