

nanoEASE

User's manual

The 2nd edition

NOTICE

No copying or reproduction of this document, in part or in whole, is permitted without the consent of LAPIS Semiconductor Co., Ltd.

The content specified herein is subject to change for improvement without notice.

The content specified herein is for the purpose of introducing LAPIS Semiconductor's products (hereinafter "Products"). If you wish to use any such Product, please be sure to refer to the specifications, which can be obtained from LAPIS Semiconductor upon request.

Examples of application circuits, circuit constants and any other information contained herein illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

Great care was taken in ensuring the accuracy of the information specified in this document. However, should you incur any damage arising from any inaccuracy or misprint of such information, LAPIS Semiconductor shall bear no responsibility for such damage.

The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. LAPIS Semiconductor does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by LAPIS Semiconductor and other parties. LAPIS Semiconductor shall bear no responsibility whatsoever for any dispute arising from the use of such technical information.

The Products specified in this document are intended to be used with general-use electronic equipment or devices (such as audio visual equipment, office-automation equipment, communication devices, electronic appliances and amusement devices).

The Products specified in this document are not designed to be radiation tolerant.

While LAPIS Semiconductor always makes efforts to enhance the quality and reliability of its Products, a Product may fail or malfunction for a variety of reasons.

Please be sure to implement in your equipment using the Products safety measures to guard against the possibility of physical injury, fire or any other damage caused in the event of the failure of any Product, such as derating, redundancy, fire control and fail-safe designs. LAPIS Semiconductor shall bear no responsibility whatsoever for your use of any Product outside of the prescribed scope or not in accordance with the instruction manual.

The Products are not designed or manufactured to be used with any equipment, device or system which requires an extremely high level of reliability the failure or malfunction of which may result in a direct threat to human life or create a risk of human injury (such as a medical instrument, transportation equipment, aerospace machinery, nuclear-reactor controller, fuel-controller or other safety device). LAPIS Semiconductor shall bear no responsibility in any way for use of any of the Products for the above special purposes. If a Product is intended to be used for any such special purpose, please contact a ROHM sales representative before purchasing.

If you intend to export or ship overseas any Product or technology specified herein that may be controlled under the Foreign Exchange and the Foreign Trade Law, you will be required to obtain a license or permit under the Law.

Table of Contents

PREFACE	1
Product Inquiries	2
Using this Product Safely and Properly	3
Important Safety Notes	4
Notations	6
Terminology	7
1 OVERVIEW	8
1.1 About a product.....	9
1.2 Package components	10
1.3 External View	11
1.4 Operating condition	12
1.5 Requirements for user target board.....	13
1.5.1 Recommended circuitry of user target board for nanoEASE connection	14
2 GETTING STARTED	15
2.1 Setting up and Starting up	16
2.1.1 Procedure to Starting up	16
2.1.2 Procedure to disconnect	17
3 FUNCTION	18
3.1 Function	19
4 NOTES	21
4.1 About cables	22
5 APPENDIX.....	23

Table of Contents

5.1 Form information.....24

5.1.1 nanoEASE.....24

5.1.2 nanoEASE Interface Cable24

5.1.3 USB Cable24

5.2 External View of the nanoEASE interface cable.....25

Preface



Product Inquiries

Thank you for purchasing the nanoEASE on-chip debug emulator. Please direct any comments or questions that you may have about this product to your nearest LAPIS Semiconductor representative.

Using this Product Safely and Properly

This User's Guide uses various labels and icons that serve as your guides to operating this product safely and properly so as to prevent death, personal injury, and property damage. The following table lists these labels and their definitions.

Labels

 Warning	<p>1. This label indicates precautions that, if ignored or otherwise not completely followed, could lead to death or serious personal injury.</p>
 Caution	<p>1. This label indicates precautions that, if ignored or otherwise not completely followed, could lead to personal injury or property damage.</p>

Icons



A triangular icon draws your attention to the presence of a hazard. The illustration inside the triangular frame indicates the nature of the hazard—in this example, an electrical shock hazard.









A circular icon with a solid background illustrates an action to be performed. The illustration inside this circle indicates this action—in this example, unplugging the power cord.









A circular icon with a crossbar indicates a prohibition. The illustration inside this circle indicates the prohibited action—in this example, disassembly.






Important Safety Notes

Please read this page before using the product.

 Warning	
<p>Use only the specified voltage. Using the wrong voltage risks fire and electrical shock.</p>	
<p>At the first signs of smoke, an unusual smell, or other problems, unplug the emulator and disconnect all external power cords. Continued use risks fire and electrical shock.</p>	
<p>Do not use the product in an environment exposing it to moisture or high humidity. Such exposure risks fire and electrical shock.</p>	
<p>Do not pile objects on top of the product. Such pressure risks fire and electrical shock.</p>	
<p>At the first signs of breakdown, immediately stop using the product, unplug the emulator, and disconnect all external power cords. Continued use risks fire and electrical shock.</p>	

 Caution	
<p>Do not use this product on an unstable or inclined base as it can fall or overturn, producing injury.</p>	
<p>Do not use this product in an environment exposing it to excessive vibration, strong magnetic fields, or corrosive gases. Such factors can loosen or even disconnect cable connectors, producing a breakdown.</p>	
<p>Do not use this product in an environment exposing it to temperatures outside the specified range, direct sunlight, or excessive dust. Such factors risk fire and breakdown.</p>	
<p>Use only the cables and other accessories provided. Using non-compatible parts risks fire and breakdown.</p>	
<p>Do not use the cables and other accessories provided with other systems. Such improper usage risks fire.</p>	

Please read this page before using the product.

 Caution	
<p>Do not exceed the rated input voltage for the user cable VDD pin. Doing so risks fire and breakdown.</p>	
<p>Always observe the specified order for turning equipment on and off. Using the incorrect order risks fire and breakdown.</p>	
<p>Always cut the power to the emulator before altering connections. Connection or disconnection with the power on risks fire and breakdown.</p>	
<p>Always cut the power to the emulator and the user application system before altering connections between the two. Connection or disconnection with the power on risks fire and breakdown.</p>	

Notations

This User's Guide uses the following labels for material that complements the main text.

- | | |
|----------------------|---|
| ■ Caution ■ | This notation introduces material requiring special attention. |
| ■ Reference ■ | This notation introduces related material found elsewhere in this User's Guide. |
| ■ Example ■ | This notation introduces an example illustrating the discussion. |
| (See Note n.) | This notation introduces a reference to a numbered note providing supplementary information lower on the same page. |
| ■ Note n ■ | This notation introduces a numbered note providing supplementary information. |

Terminology

The following table lists the terms used in this manual.

Term	Description
nanoEASE	Hardware of the on-chip debug emulator for LAPIS Semiconductor 8-bit micro-controller.
DTU8 Debugger	Software, for Microsoft Windows, controls the nanoEASE as on-chip debug emulator.
User Target board	Board on which microcontroller has embedded On-chip-debug function is mounted.
Host PC	PC in which the DTU8 Debugger and the USB driver are installed.
USB cable	Cable used to connect the nanoEASE and Host PC
nanoEASE interface cable	Interface cable for connecting the nanoEASE and a user target board.

1 Overview

This chapter explains the outline of nanoEASE, the function, etc.

1.1 About a product

nanoEASE is a hardware that can be a protocol converter between PC based software and a LAPIS Semiconductor original low power microcontroller (here-in-after, called a target microcontroller) which has embedded low-voltage Flash ROM on a user target board.

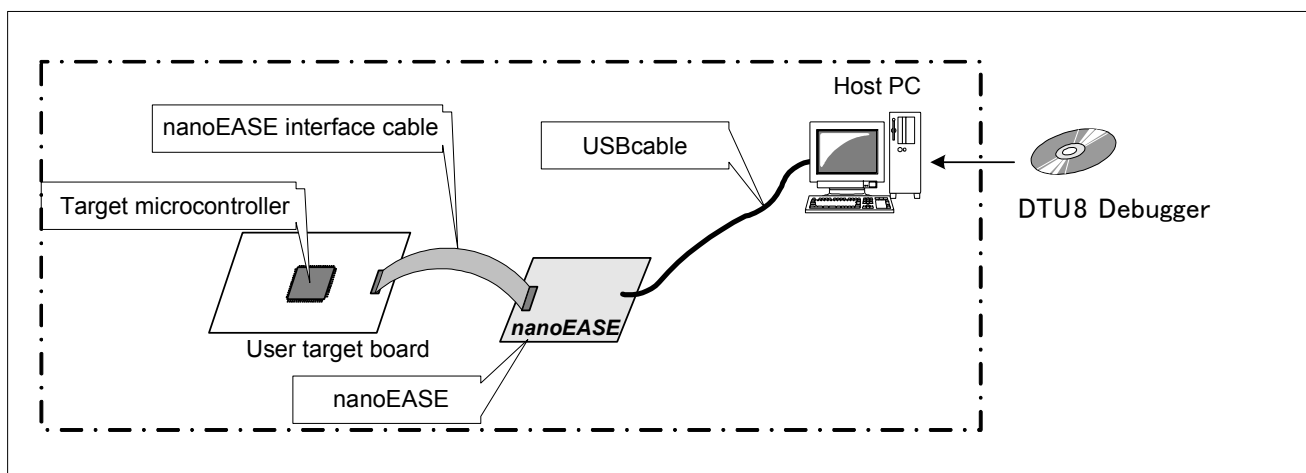


Fig 1-1 nanoEASE System configuration

1.2 Package components

The package contains the components listed below.

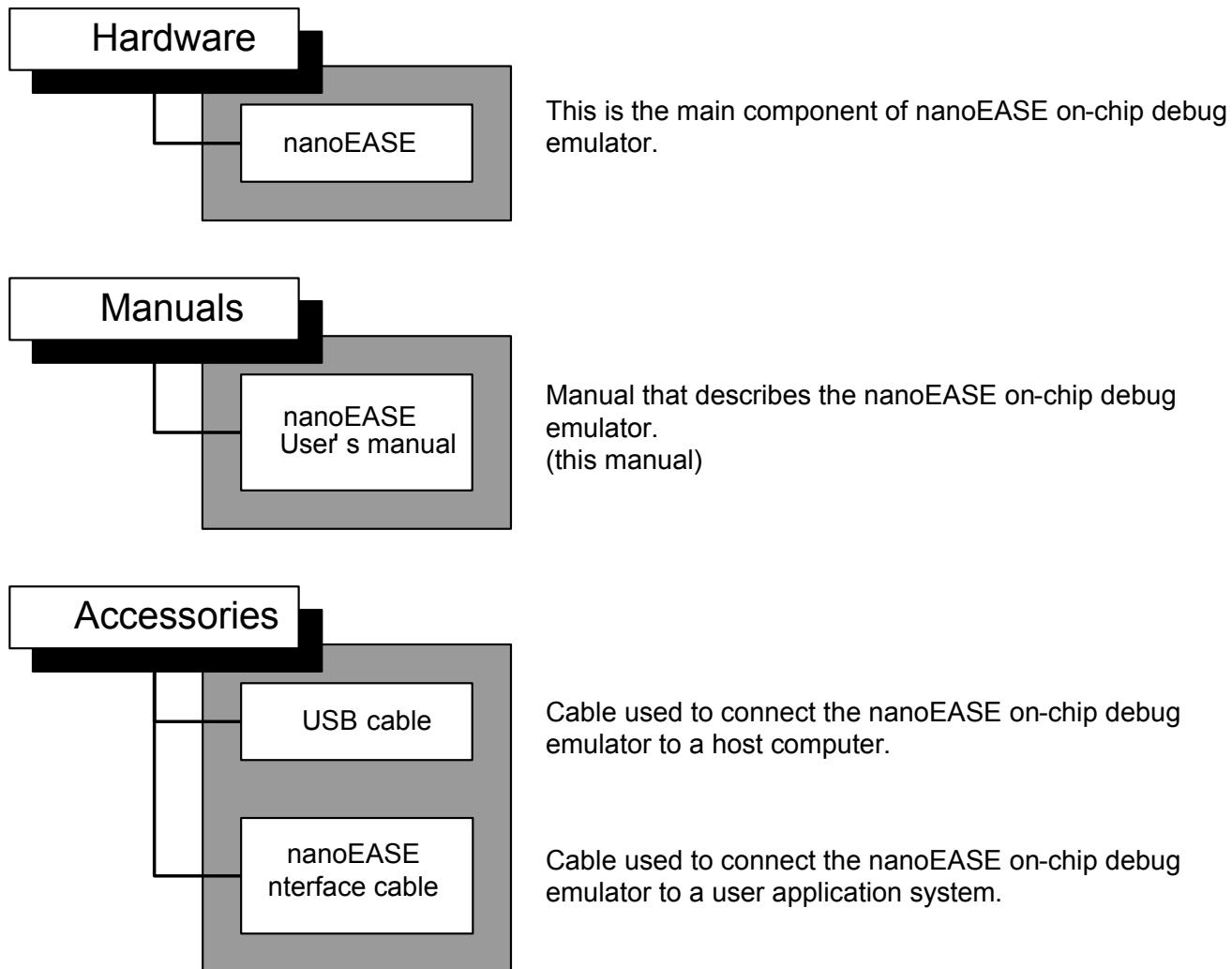


Fig 1-2 Package components of nanoEASE

1.3 External View

Below, the external view of nanoEASE and explanation of each part are indicated. The portion shown in the following sentences and within () shows the name printed by the board.

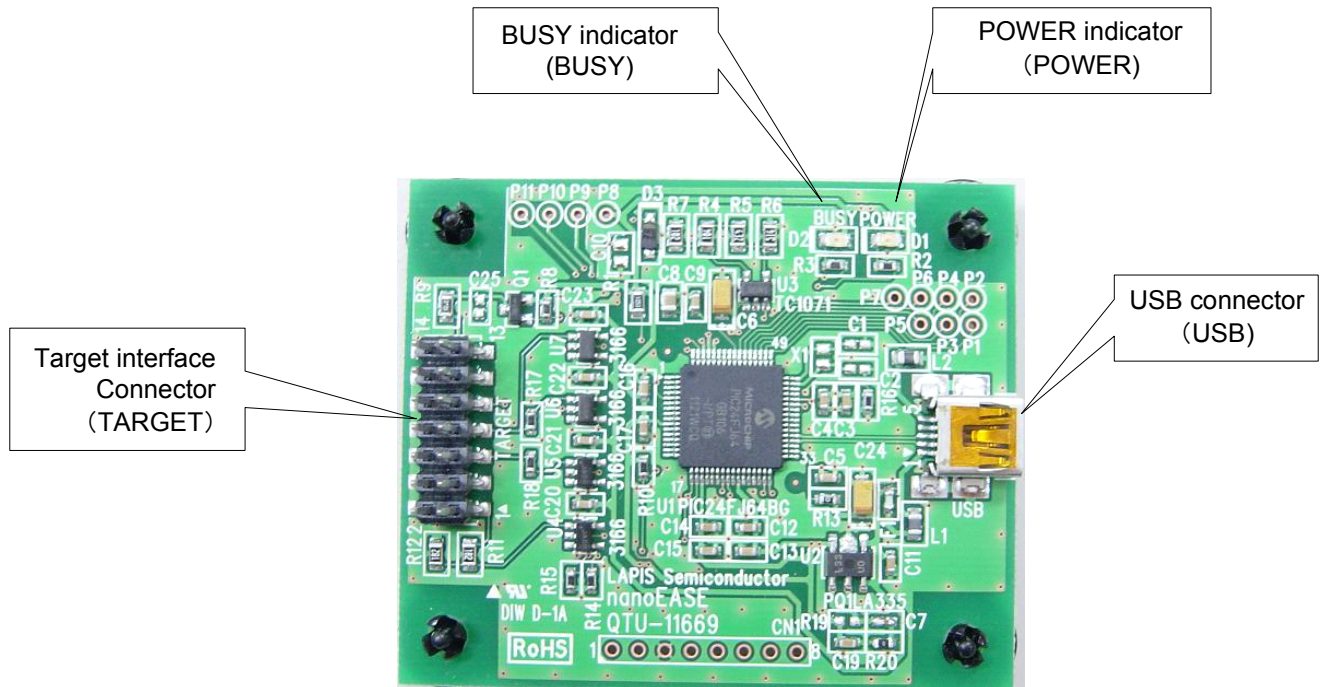


Fig 1-3 External view (Top View)

Target interface connector (TARGET)

: It is a connector for connecting a user target board with nanoEASE. An attached nanoEASE interface cable is connected.

USB connector (USB)

: It is a connector (Type-B mini) for connecting host PC with nanoEASE. It connects with an attached USB cable.

POWER indicator (POWER)

: It is LED which tells the state of nanoEASE. It switches on the light or blinks green. Please refer to the 3.2nd clause "Function" for correspondence with the lighting state of an indicator, and the state of nanoEASE.

BUSY indicator (BUSY)

: It is LED which tells the state of nanoEASE. It switches on the light or blinks in yellow. Please refer to the 3.2nd clause "Function" for correspondence with the lighting state of an indicator, and the state of nanoEASE.

1.4 Operating condition

Please use the nanoEASE in the following conditions.

Operating condition	
Item	Description
Power supply.	A USB port on PC has to be capable to supply 5V, 500mA to nanoEASE
Ambient environment.	Temperature:5 to 40 (centigrade) Humidity: 30 to 80% (Non Condensingx)
The input voltage of the positive power supply for target microcontroller. (VTref)	3.3V

Please refer to the following documents for the operating environment of the software which works on host PC.

- DTU8 debugger user's manual

Please refer to the following document for the connection with your target microcontroller.

- nanoEASE connection manual ML610QXXX

When nanoEASE is used as an on-chip debugging emulator , the power supply supplied to a target microcomputer from nanoEASE is as follows.

Operating condition	
Item	Description
The output voltage of power supply for target microcontroller. (3.3VOUT)	3.3V(typ)/100mA(max)
The output voltage of the positive power supply for internal logic(VDDL)	1.45V(typ)/20mA(max)

- The power supply for target microcontroller (3.3VOUT) is outputted while the nanoEASE is in a debugging state.
- The positive power supply for internal logic (VDDL) is outputted 1.45V while the nanoEASE is in debugging state,.

1.5 Requirements for user target board

The user target system linked to nanoEASE needs to satisfy the following requirements.

The requirements for a user target system	
Item	Description
Recommended interface socket for nanoEASE interface cable connector	Part Number : 7614-6002 Supplier : 3M
Positive power supply (VDD) voltage of target microcontroller	3.3V
Consumption current (VTref)	10mA

nanoEASE uses the VDD power supply for generating the interface signals which is used for communication to the target microcontroller.

The maximum current of VDD power supply which consumed by nanoEASE is shown below.

nanoEASE VTref terminal consumption current (except for transient current)	
The VDD power supply voltage	Consumption current (max)
+3.3V	2mA

Please use the VDD power supply of a target system by sufficient capacity in consideration of a part for the consumed current by nanoEASE.

1.5.1 Recommended circuitry of user target board for nanoEASE connection

Please refer to the attached "nanoEASE connection manual" for the recommended circuitry of user target microcontroller for nanoEASE.

2 Getting started

This chapter explains the starting method at the time of actually using nanoEASE, and the operation method.

2.1 Setting up and Starting up

This clause explains the starting method of nanoEASE.

In addition, please refer to each user's manual for the following software that operates on host PC.

- DTU8 Debugger User's Manual

2.1.1 Procedure to Starting up

It starts according to the following procedures.

- (1) Connect a nanoEASE and a user target board with an attached nanoEASE interface cable.
- (2) Connect nanoEASE and host PC with an attached USB cable.
nanoEASE works with the power supply through USB cable from host PC. Therefore, when a USB cable is connected to nanoEASE, the POWER indicator on nanoEASE will turn on a light.
- (3) A power supply is supplied to a user target board
- (4) The software on Host computer is started.

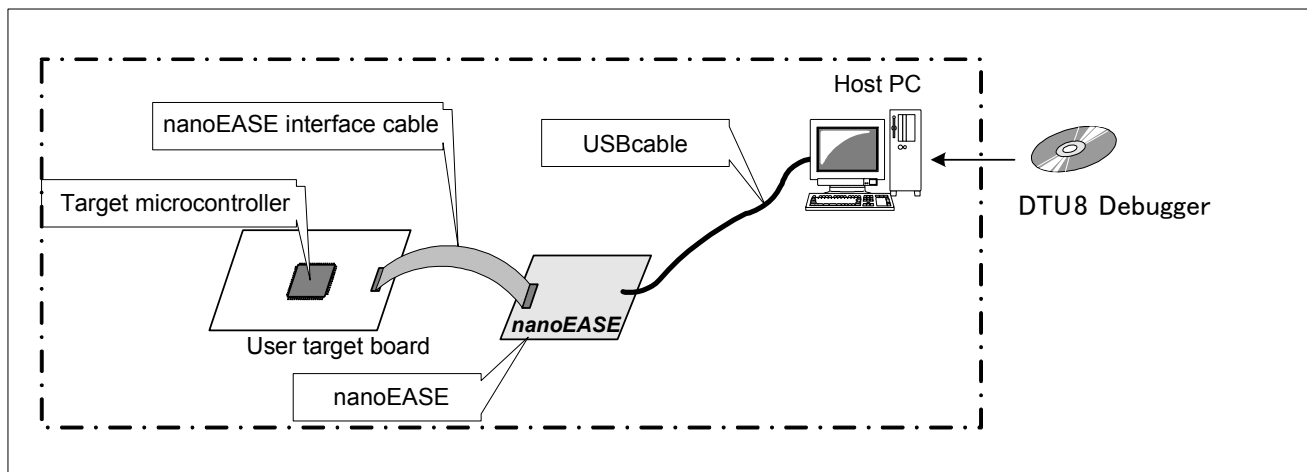


Fig 2-1 nanoEASE System configuration



Caution

Be sure to protect a starting procedure, if turn is mistaken, the may break down, or it may cause a fire.



Caution

Be sure to use the accessories provided. If you using a method other than the designated method, the may break down, or it may cause a fire.

2.1.2 Procedure to disconnect

- (1) Close the software on host PC
- (2) A user target system is turned off.
- (3) Remove a USB cable from nanoEASE.
- (4) Remove the nanoEASE interface cable between nanoEASE and a user target system.



Caution

Be sure to protect a disconnect procedure. If turn is mistaken, the may break down, or it may cause a fire.

3 Function

This chapter explains the function of nanoEASE.

3.1 Function

The functional description of nanoEASE is shown below.

■ On-chip debug function

The nanoEASE provides the on-chip debug function by connection to the DTU8 debugger. In this case, you can use the following functions.

- A download, display and change the contents of your application program in the Flash ROM which is embedded in a target microcontroller.
- A display and change of a target microcontroller's status (Registers, ROM/RAM, SFR)
- Emulation (a real-time emulation function, a single step emulation function)
- Break (hardware/software breakpoints, Force break, etc.)

For more details, please refer the attached sheet "nanoEASE connection manual ML610QXXX".

■ Indicator

Correspondence with the state of nanoEASE and the lighting state of an indicator is shown below.

Table 3-1 The state of the nanoEASE and indicator

The state of nanoEASE	Indicator classification	Indicator lighting state
Idle state	POWER	Turn on
	BUSY	Turn off
Emulation running	POWER	Turn on
	BUSY	Turn on
Flash ROM writing	POWER	Turn on
	BUSY	Turn on
Detected illegal input voltage at VTref port	POWER	Turn on
	BUSY	Blink (0.5 second interval)
Failed the recognition of device driver	POWER	Blink (0.5 second interval)
	BUSY	Blink (0.5 second interval)
Command execution error	POWER	Blink (0.5 second interval)
	BUSY	Turn off
nanoEASE failure	POWER	Turn off
	BUSY	Turn off

Each states of nanoEASE are explained in below.

Idle state	: it means the state of nanoEASE is waiting for a command from the software on host PC.
Emulation running	: it means a emulation is under execution. To avoid damaging a target microcontroller, please do not remove each cables at this state.
Flash ROM writing	: it means the state of nanoEASE is writing contents into the Flash ROM. To avoid damaging a target microcontroller, please do not remove each cables at this state.
Detected illegal input voltage on VTref port	: it means the supplied voltage on VTref port of nanoEASE is not within the guaranteed range of nanoEASE. Please confirm connections and their restrictions between nanoEASE and user target board, and check the voltage level of power supply on a user target board.
Failed the recognition of device driver	: It means the host PC cannot recognize nanoEASE connected to host PC with the USB cable. Please install a device driver according to the dialog displayed on host PC.
Command execution error	: it means the state of command response from a target microcomputer to nanoEASE is not normal. Please confirm whether there is any problem in the connection state of a user target system and nanoEASE, and a command operating procedure.
nanoEASE failure	: It means the nanoEASE may be out of order. Continued use risks fire and electrical shock. Please extract immediately the USB cable connected to nanoEASE, and separate all external power cords. Please contact a distributor, when you cannot discover a problem in the connection state of nanoEASE and a user target system, and the connection state of nanoEASE and a USB cable.

4 Notes

4.1 About cables

Be sure to use the accessories provided.

If you use other accessories, we can not guarantee the function of nanoEASE.



Caution

Be sure to use the accessories provided. If you using a method other than the designated method, the may break down, or it may cause a fire.

5 Appendix

5.1 Form information

5.1.1 nanoEASE

Item	Description
Outside dimension	60 (W)×7(H)×50(D)[mm]
weight	0.1kg

5.1.2 nanoEASE Interface Cable

Item	Description
Cable length	150[mm]
Connector form	2.54mm pitch 14 pins Two-row socket

5.1.3 USB Cable

Item	Description
Cable length	100[cm]
Connector form	host side : USB Type-A nanoEASE side : USB Type-B mini

5.2 External View of the nanoEASE interface cable

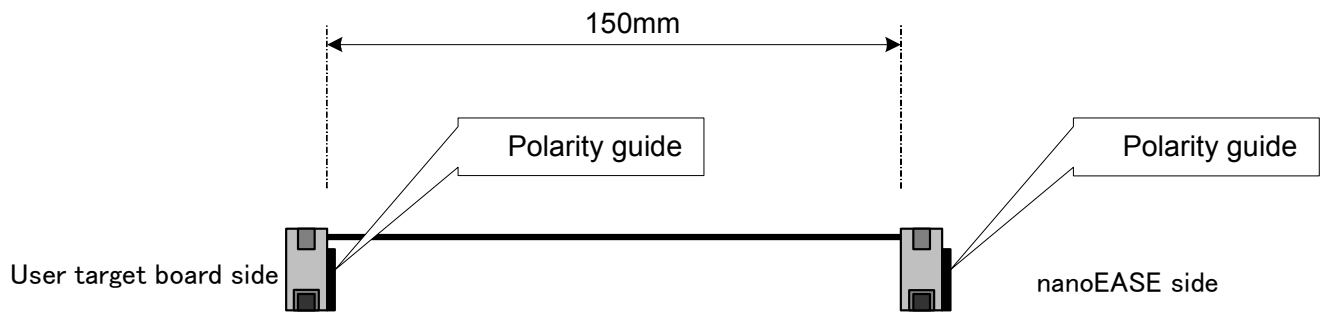


Fig 5-1 nanoEASE interface cable appearance

Revision History

Revision No.	Date	Description
1.0	Dec. 21, 2011	First edition.
2.0	Jan. 17, 2012	Clerical error correction