To our customers,

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April 1st, 2010
Renesas Electronics Corporation

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User's Manual

EB-USB-DA

Debug Adapter

On-Chip Debug Emulator with Programming Function

EB-USB-DA-K0R
EB-USB-DA-K0

Document no. U19833EU1V0UM00

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M8E 02.10

Revision History

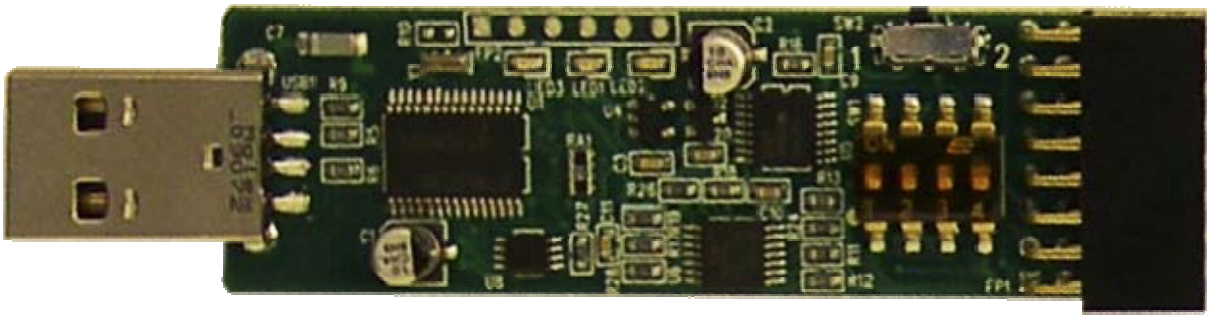
Date	Revision	Section	Description
5/14/09	—	—	First release

Contents

1. Introduction

The EB-USB-DA on chip debug tool (USB Debug Adapter or USB-DA) is designed to emulate and program 8-bit and 16-bit NEC microcontrollers (MCU). This tool can be used with selected MCUs for debugging and flash writing via various firmware packages and WriteEZ software. This tool is intended for demonstration purposes. For increased use and functionality, please use MINICUBE2 (QB-MINI2) and Flash Memory Programmer (PG-FP5). It will support selected single voltage flash microcontrollers as listed in Table 2.

Figure 1. EB-USB-DA Debugger (Top View)



2. Hardware Configuration

The USB Debug Adapter's small form factor allows easy integration with target systems. Its debug interface is compatible to MINICUBE2. This allows it to be used with NEC integrated development environment for software development. The USB interface allows microcontrollers to be flash programmed using WriteEZ software. Please refer to Table 2 for environment details.

Figure 2. EB-USB-DA debugger

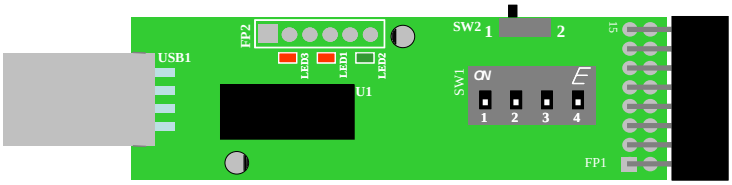


Table 1. Hardware Interface

Setting	Function	Description
USB1	PC interface	USB port interface
FP1	Debug interface	Target board interface
LED1	Break indicator	Indicate program operation mode - STOP or Break
LED2	Run Indicator	Indicate program operation mode - RUN
LED3	Power	Power ON indicator
SW1	Debug setting	Select target system power and utilized device
SW2	Mode selection	Select debug or standalone mode
FP2	Program Interface	Firmware update interface port

Table 2. Support platform

Supported Device List	Function	Application support requirements
78K0R/Kx3, 78K0R/Kx3-L	Debug	CubeSuite or ID78K0R-QB V3.50 or higher
	Programming	WriteEZ4
78K0/Kx2, 78K0/Ix2, 78K0/Kx2-L	Debug	CubeSuite or ID78K0-QB V3.10e or higher
	Programming	WriteEZ3

2.1 Power supply

The USB port from pc can be used to draw power for Debug Adapter and target system. This allows the USB Debug Adapter to supply target power at two different levels: 5 volts or 3.3 volts. This

feature can also be disabled when the target power is in use. Refer to Table 3 for power source selection.

Table 3. Target power setting

SW1		Target Power
2	3	
OFF	OFF	Use target power supply
OFF	ON	Provide 3.3 volt supply
ON	OFF	Provide 5 volt supply (USB level)
ON	ON	Invalid setting

Note: Debug Adapter can supply a maximum of 50 mA current to target system. USB power is protected by resettable fuse F1. If current levels are exceeded, please unplug the Debug Adapter board from USB port to reset fuse F1.

2.2 Target device selection

To debug 78K0R device series, turn ON switch 1 of SW1. When not in standalone mode (debug & programming), always turn OFF switch 4 of SW1.

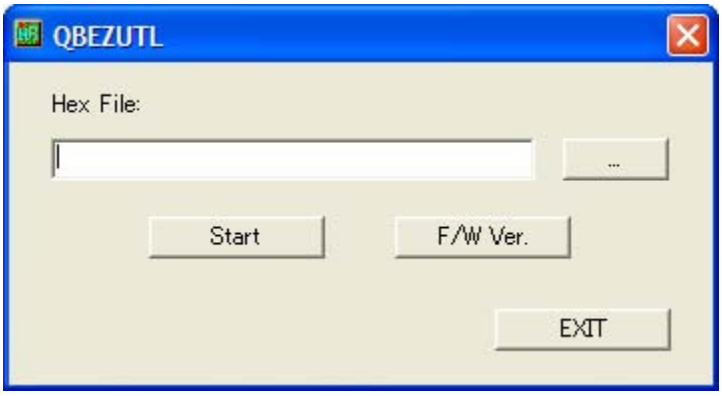
Table 4. Device Mode setting

SW1		Description
1	4	
OFF	OFF	78K0 as target device
ON	OFF	78K0R as target device

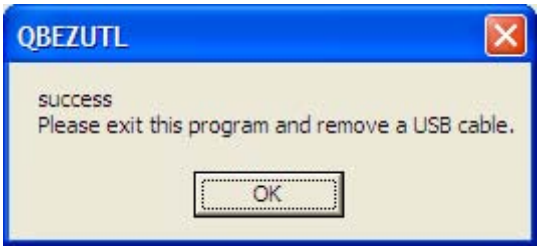
2.3 Firmware update interface

As new supported devices are added, firmware for USB Debug Adapter may change. Firmware updates can be downloaded by using QBEZUTL software. Please refer to Figure 3 for GUI usage. Load new firmware to utility Main window and then click “Start” button to program the firmware. After USB Debug Adapter is successfully programmed, “Success message” will prompt to exit the QBEZUTL. Disconnect USB connection and then reconnect to reboot USB Debug Adapter with new firmware. In addition, this utility can check current revision of firmware. Clicking “F/W Ver.” Button in Main window will pop up version message box.

Figure 3. QBEZUTL utility program



(a) QBEZUTL Main window



(b) Success message box

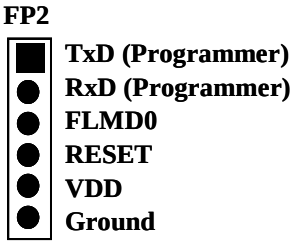
(b) Version message box

Table 5. Debug Adapter firmware list

Supported Device Series	Firmware support requirements
78K0	78K0_OCD_FW V406 or higher
78K0R	78K0R_OCD_FW V406 or higher

To download new firmware via FP2 connector, use either PG-FP5 or MINICUBE2 in conjunction with their associated programmer applications if this utility program does not available. Turn OFF all SW1 switches before updating the USB Debug Adapter. The FP2 connector diagram is shown in Figure 4.

Figure 4. FP2 connector



2.4 LED Indicators

The power and debug status are shown via three LEDs on USB Debug Adapter. LED3 is always ON after connecting to USB port (power indication). If target system is not powered (self or supplied), then LED1 and LED2 is OFF. LED1 and LED2 show mode. Red LED1 is ON when program is stopped and green LED2 is ON when program is running. Use SW2 to toggle between debug and standalone mode modification and monitoring.

Table 6. LED indicators

LED		Description
LED1	RED	STOP or debug mode active
LED2	GREEN	RUN or standalone mode
LED3	RED	Power ON

2.5 Target Board Interface

Please attach target board to USB Debug Adapter via FP1 connector. This connection is compatible to MINICUBE2 on-chip debug emulator. Please check Table 2 for device target board compatibility.

Figure 5. Signal Assignments for 16-Pin Debugging and Flash Programming Interface Connector

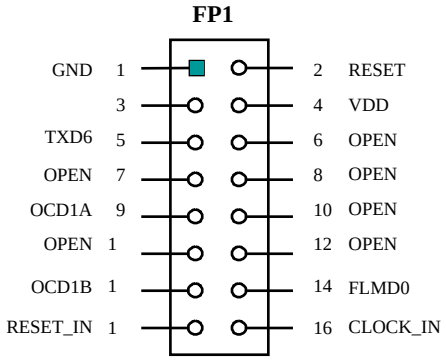


Table 7. Debugging and Flash Programming Signal Descriptions

Pin Number	Name	Function
1	GND	Ground
2	RESET	Reset sent to the MCU
3	RXD6	Receive signal from debugger (Tool 0)
4	VDD	Power source
5	TXD6	Transmit signal from debugger (Tool 0)
6	OPEN	Not in used
7	OPEN	Not in used
8	OPEN	Not in used
9	OCD1A	On-Chip-Debug pin
10	OPEN	Not in used
11	OPEN	Not in used
12	OPEN	Not in used
13	OCD1B	On-Chip-Debug pin
14	FLMD0	Programming mode pin
15	RESET_IN	External reset to MCU
16	CLOCK_IN	Clock input for 2-wire debug mode (Tool 1)

2.6 Mode selection

SW2 selects operation mode debug or standalone mode (Default mode). When in debug mode red LED1 is ON and target device is under control of integrated debug environment. However in standalone mode green LED2 is ON and target device runs program independently. When target device is in standalone mode, USB Debug Adapter can be used as an external UART interface to communicate with Hyper Terminal. To use as UART interface, turn OFF switch 1 of SW1 to avoid transmit and receive signals loopback.

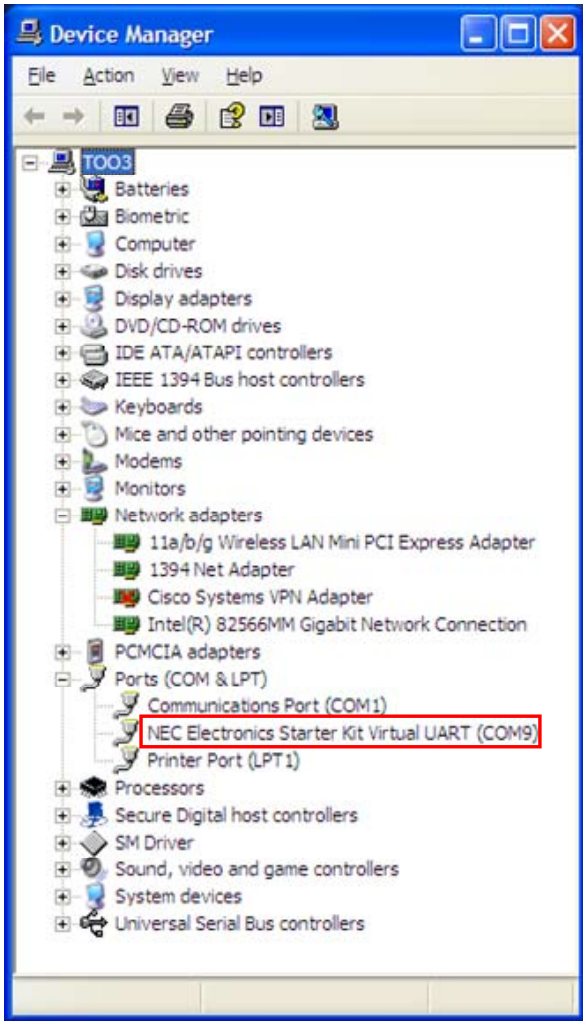
Table 8. Standalone Mode selection

SW2		Description
Position	Status	
2	OFF	Standalone operation
1	ON	Debug operation

3. Operation Mode

For initial use, install USB device driver to PC before connecting Debug Adapter to USB port. After installation, it is ready to emulate and program via virtual UART port (COM port). When USB Debug Adapter is connected to USB port, “NEC Electronics Starter Kit Virtual UART” will appear in Device Manager and available port number is shown in parentheses. Integrated Debug Environment and Programmer will use this port number for connection. Refer highlighted red box for virtual UART in Figure 6.

Figure 6. Starter Kit Virtual UART port



3.1 Standalone Mode

Target board can run in standalone mode (Normal mode) when SW2 is in position 2 and integrated debug environment is closed. When in standalone mode, target system is not under control of integrated debug environment. Refer detail switch setting in Table 6.

3.2 Emulation Mode

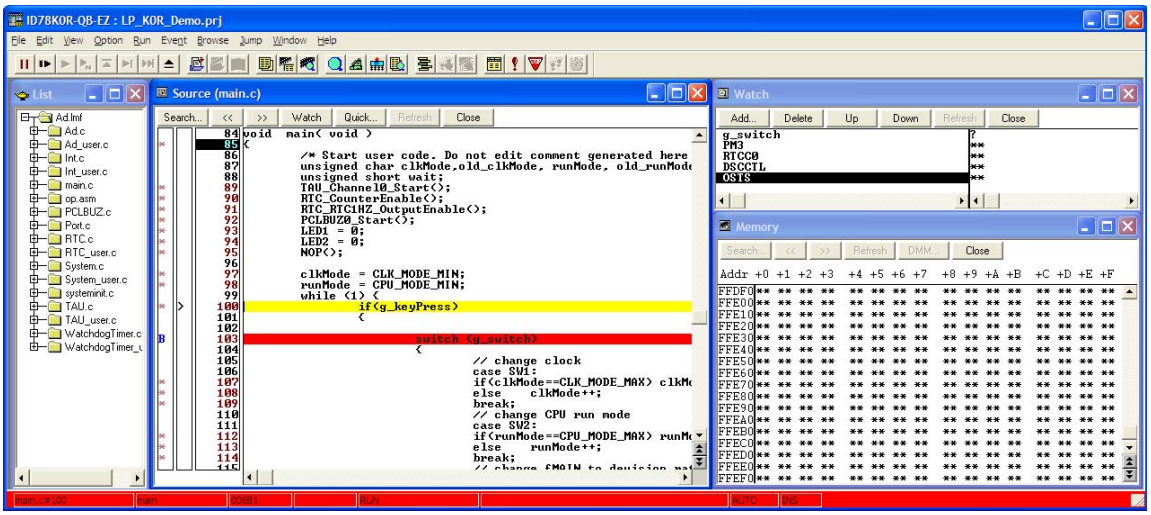
3.2.1 Debug Mode

For debugging target devices, open appropriate integrated debug environment. It will load the user program to debugger and then run the program. The requirements of debugging respective devices are shown in Table 2. For debug status, green LED2 indicates run and red LED1 indicates stop at breakpoint. Refer to the *User's Manual* for integrated debug environment for more information about configuration settings.

Table 9. RUN/STOP indicators

Status	LED1	LED2
RUN	OFF	ON
STOP	ON	OFF
No target power	OFF	OFF

Figure 7. NEC Integrated debugger (ID-QB)

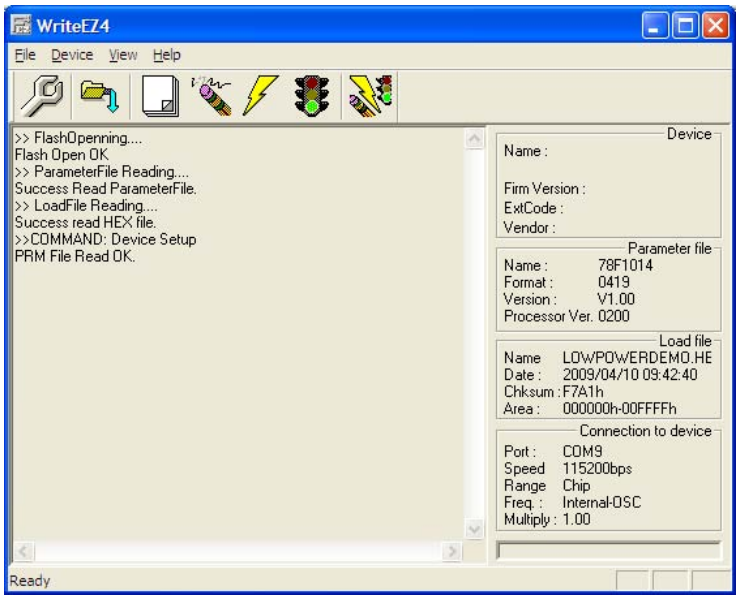


3.2.2 Programming Mode

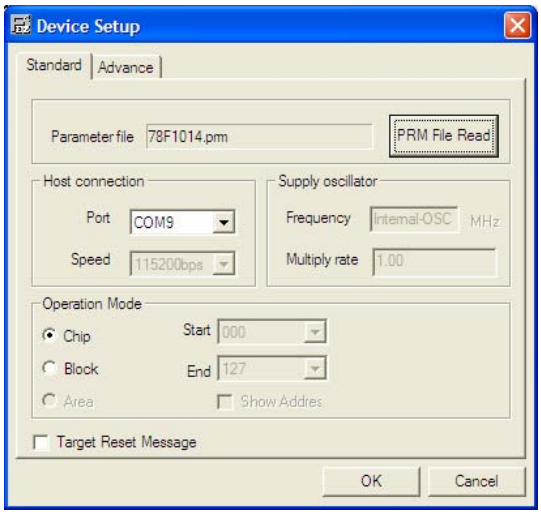
For programming devices, open appropriate WriteEZ program and click “Setup” from Device pull-down menu. Device Setup box will appear in window. Load parameter file and select COM port number which is the same as “NEC Electronics Starter Kit Virtual UART” in Device Manager. Close the Device Setup box after configuration. Use these settings for programming target board. Load

target hex file from File pull-down menu and click EPV icon to program with auto procedure (Erase, Program, and Verify commands).

Figure 8. WriteEZ programmer

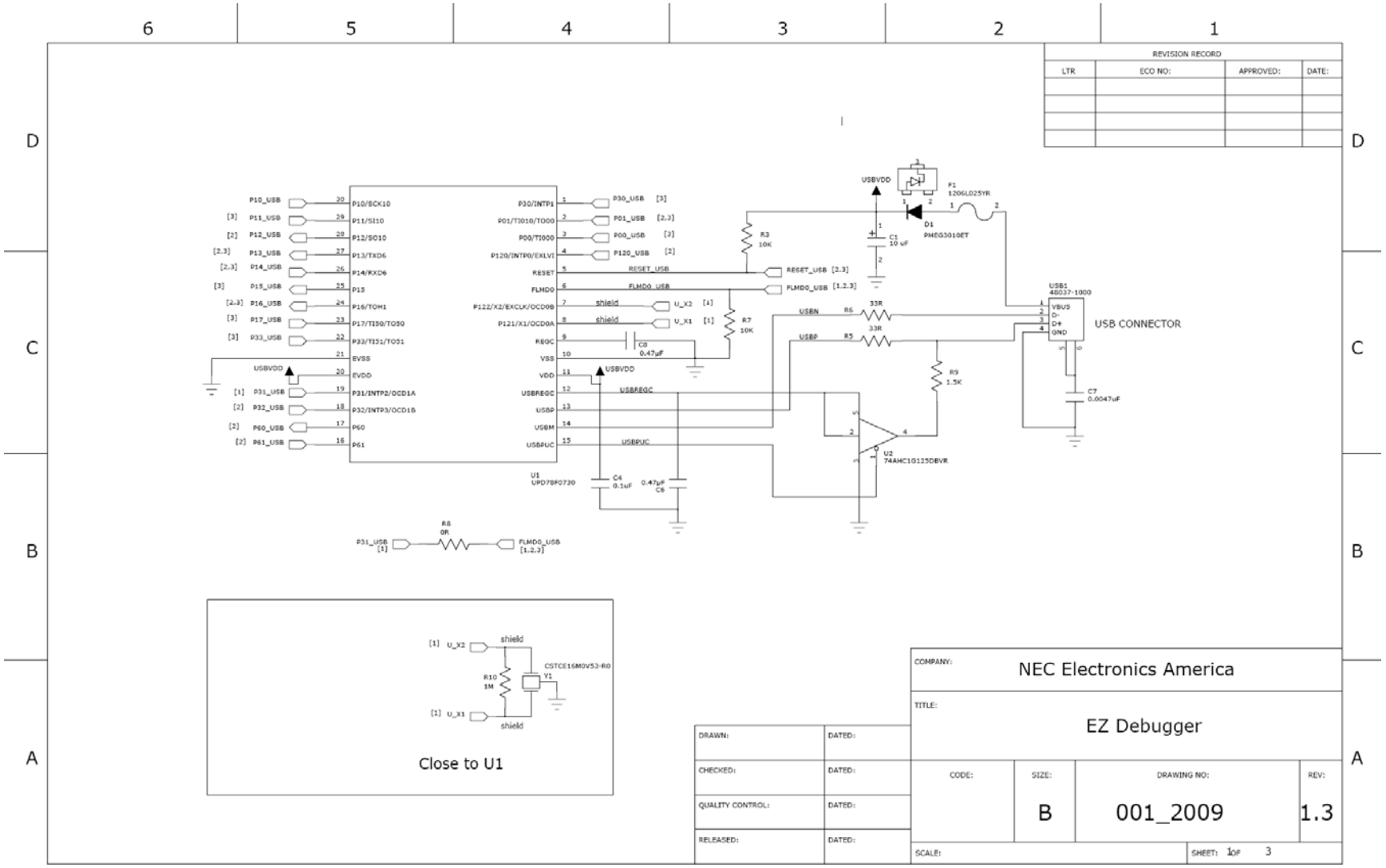


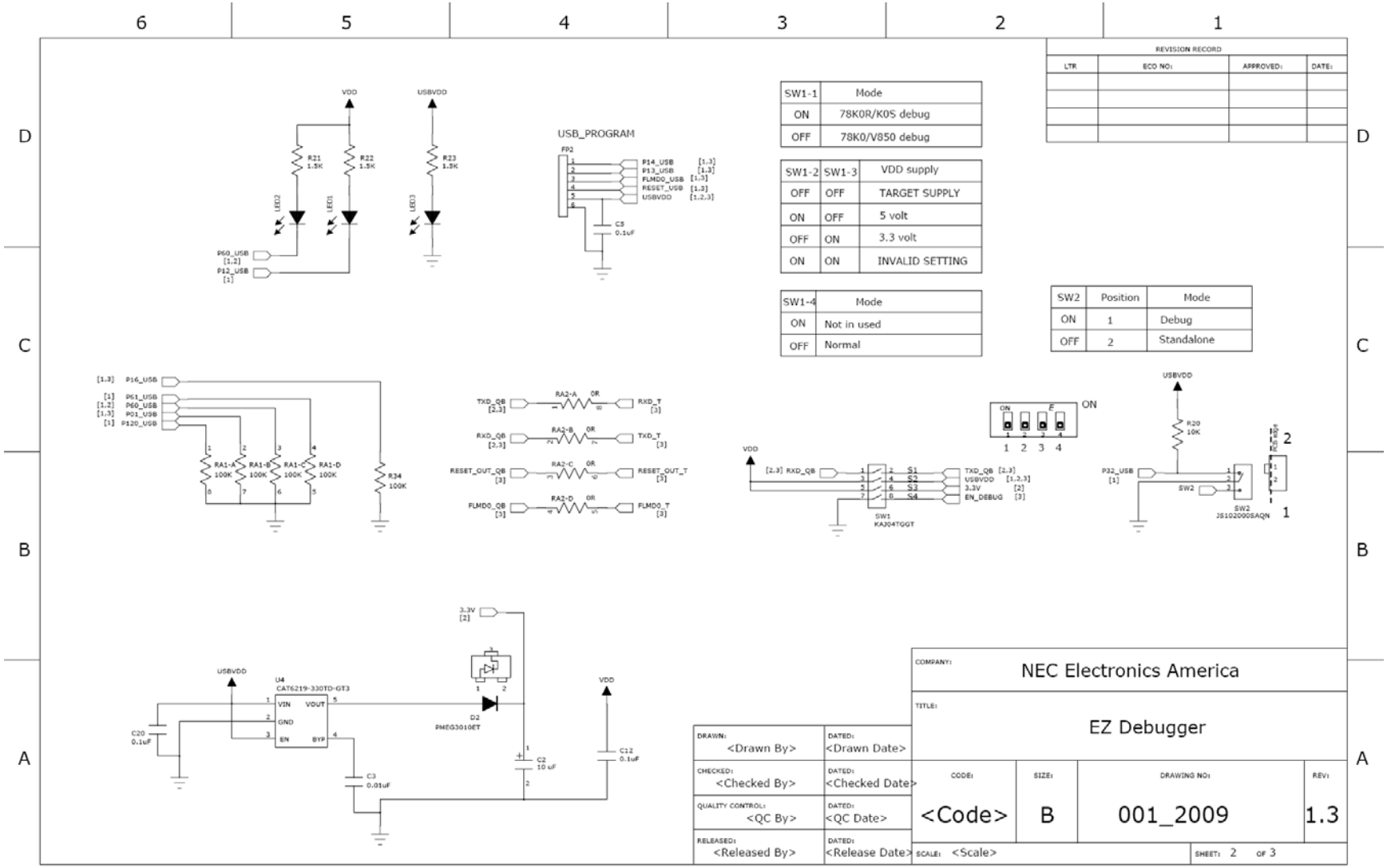
(a) WriteEZ main window



(b) Device Setup window

4. Schematics

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4
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2
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APPROVED:
DATE:
VDD
USBVDD
R21 1.5K
R22 1.5K
R23 1.5K
LED2
LED1
LED3
P60_USB [1,2]
P12_USB [1]
USB_PROGRAM
FP2
P14_USB [1,3]
P13_USB [1,3]
FLMD0_USB [1,3]
RESET_USB [1,3]
USBVDD [1,2,3]
C5 0.1uF
SW1-1 Mode
ON 78K0R/K0S debug
OFF 78K0/V850 debug
SW1-2 SW1-3 VDD supply
OFF OFF TARGET SUPPLY
ON OFF 5 volt
OFF ON 3.3 volt
ON ON INVALID SETTING
SW1-4 Mode
ON Not in used
OFF Normal
SW2 Position Mode
ON 1 Debug
OFF 2 Standalone
P16_USB [1,3]
P61_USB [1]
P60_USB [1,2]
P01_USB [1,3]
P120_USB [1]
RA1-A 100K
RA1-B 100K
RA1-C 100K
RA1-D 100K
R34 100K
TXD_QB [2,3]
RXD_QB [2,3]
RESET_OUT_QB [3]
FLMD0_QB [3]
RA2-A 0R
RA2-B 0R
RA2-C 0R
RA2-D 0R
RXD_T [3]
TXD_T [3]
RESET_OUT_T [3]
FLMD0_T [3]
ON
1 2 3 4
SW1 KAJ04TGGT
S1
S2
S3
S4
3.3V [2]
EN_DEBUG [3]
R20 10K
P32_USB [1]
SW2
SW2 JS102000SAQN
3.3V [2]
USBVDD
U4 CAT6219-330TD-GT3
VIN
VOUT
GND
EN
BYP
C20 0.1uF
C3 0.01uF
C2 10 uF
C12 0.1uF
D2 PMEG3010ET
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TITLE: EZ Debugger
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CHECKED: <Checked By>
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DATED: <QC Date>
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REV: 1.3
SCALE: <Scale>
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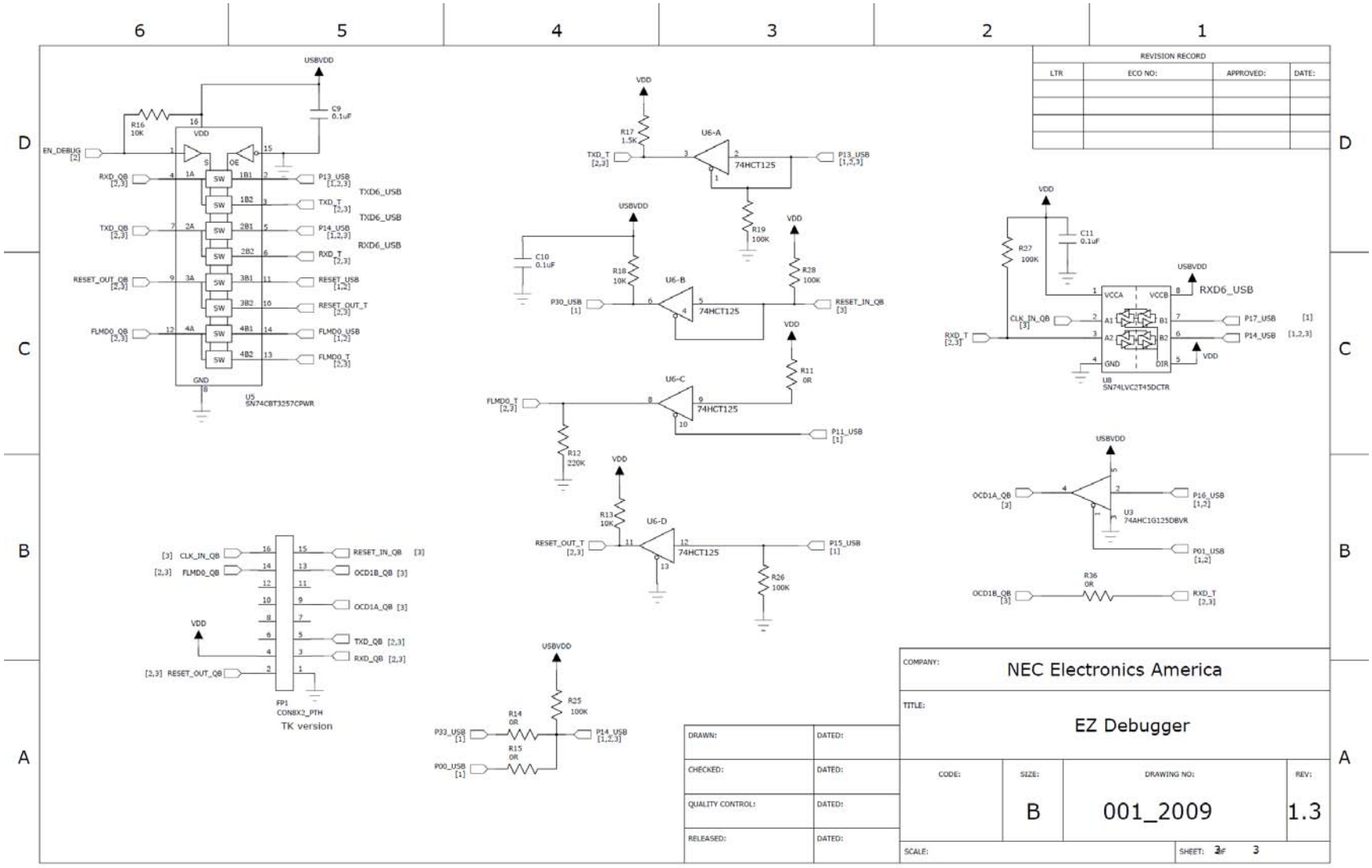
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TXD_QB [2,3]
RESET_OUT_QB [2,3]
FLMD0_QB [2,3]
TXD6_USB
RXD6_USB
U5 SN74CBT3257CPWR
U6-A 74HCT125
U6-B 74HCT125
U6-C 74HCT125
U6-D 74HCT125
P30_USB [1]
RESET_IN_QB [3]
FLMD0_T [2,3]
P11_USB [1]
RESET_OUT_T [2,3]
P15_USB [1]
P33_USB [1]
P00_USB [1]
P14_USB [1,2,3]
P13_USB [1,2,3]
U8 SN74LVC2T45DCTR
CLK_IN_QB [3]
P17_USB [1]
OCD1A_QB [3]
P16_USB [1,2]
P01_USB [1,2]
OCD1B_QB [3]
RXD_T [2,3]
FP1 CONBX2_PTH
TK version
COMPANY: NEC Electronics America
TITLE: EZ Debugger
DRAWN:
CHECKED:
QUALITY CONTROL:
RELEASED:
DATED:
CODE:
SIZE: B
DRAWING NO: 001_2009
REV: 1.3
SCALE:
SHEET: 3 OF 3

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