

R5C478II

PCI-CARDBUS BRIDGE

Application Note

REV. 1.00

RICOH



REVISION HISTORY

REVISION	DATE	COMMENTS
0.90	11/11/98	Prerelease Version
0.10	01/10/99	Prerelease Version (Evaluation board Manual unified) Synchronized with Japanese version
0.20	02/22/99	Fixed on the correction of the Support Group
0.30	02/24/99	Add the figures to the "4.4 Power Management".
1.00	02/25/99	First Public Release. PC98 Logo Applied.

Microsoft, Windows, the Windows logo, and Windows NT are registered trademarks of Microsoft Corporation.
All other brand and product names are trademarks or registered trademarks of their respective owners.

1 OVERVIEW

Overview

The R5C478II is a PC card controller offering a single chip solution as a bridge between PCI bus and CardBus. The R5C478II includes two PC Card 95/97 compliant sockets interface and a bridge function to the PCI bus of 33Mhz. The R5C478II can support the 32-bit CardBus (Card-32) and the 16-bit PC card(Card-16) without external buffers. Also, supports ZV (Zoomed Video) Card control Interface without external buffers.

Concerning the card control interface, the R5C478II's register set is compatible with the Intel 82365SL and Ricoh's RF5C396/366 in order to maintain backward compatibility with the existing 16-bit PC Card compliant with PCMCIA2.1/JEIDA4.2 so that the existing PC cards are available.

In the CardBus standard adopted by PC Card 95, the data transfer bus was extended to 32bit and bus clock became 33MHz. Since the busmaster mode is also implemented, CardBus is suitable for high performance required multimedia cards such as fast LAN Cards, Video Cards or graphic processing cards. With the ZV Card such as MPEG cards, multimedia environment will be easily realized.

16-bit PC Card control interface signals, controlled by the timing synthesizer circuit, are programmable so that not only timing requirement of 16-bit PC Card compliant with PCMCIA2.1/ JEIDA4.2 but also faster timing requirement than it is available.

Since the ZV buffers included in R5C478II, ZV Port signals can be directly connected with the display controllers such as VGA without external buffers.

The recognition of CardBus Card or 16-bit PC Card is examined automatically when cards are inserted, and the card control interface will be composed properly on the result of recognition. So, CardBus card and 16-bit PC Card are available simultaneously.

All PC card interface signals are individually buffered inside the PC card controller to allow direct connection to CardBus and Hot insertion/removal without external buffers. The R5C478II also allows direct connection to PCI bus.

R5C478II implements three kinds of power management,(Hardware suspend mode and two kind of Software suspend mode), in order to reduce the power dissipation in suspend, in addition to reduction of the power consumption when power on. The hardware suspend mode provides to shut the PCI power down without the loss of contents of PCI registers. One of the Software suspend mode conforms to the ACPI (Advanced Configuration and Power Interface) specification, the other allows the power reduction with CLKRUN# protocol.

Moreover, the Mixed-Voltage technology of R5C478II allows using 3.3V or 5.5V powers for the Card socket interface, ZV port interface independently. The PCI interface is powered at 3.3V and the internal core logic is powered at 2.5V or 3.3V.

Features

- PC97/98/99 Design requirements support
 - ✓ Subsystem ID, Subsystem Vender ID support.
 - ✓ ACPI Power Management compliant
 - ✓ Global Reset support.
- Low Power consumption
 - ✓ The improvement of Power Management reduced operating power consumption.
 - ✓ Software suspend mode compliant with ACPI
 - ✓ CLKRUN# (PCI I/F) and CCLKRUN# (CCLKRUN#) support
 - ✓ Independent Hardware Suspend input
 - ✓ 2.5V power supply for the internal core logic (Mobile Power Guideline 99 compliant)

- High-performance
 - ✓ Achieved the improvement of performance.
- Single Chip PCI-CardBus Bridge
 - ✓ 2 PCMCIA PC-Card 95/97 sockets support
 - ✓ CardBus(Card-32) Card and 16-bit (PCMCIA2.1/JEIDA4.2) Card are available simultaneously
 - ✓ Bridge function between 2 PC card interfaces
- PCI Bus Interface
 - ✓ Compliant with PCI Local Bus Specification 2.2
 - ✓ The maximum frequency 33MHz
 - ✓ PCI Master/Target protocol support
 - ✓ Separated PCI configuration for each socket, achieved as multi-functional device.
 - ✓ Direct connection to PCI bus
 - ✓ 3.3V/5.0V interface (3.3V power supply, 5V tolerant)
- CardBus PC Card Bridge
 - ✓ Compliant with PCMCIA PC Card 95/97, CardBus Standard Specification
 - ✓ Compliant with Yenta register set Rev2.2
 - ✓ The maximum frequency 33MHz
 - ✓ CardBus Master/Target protocol support
 - ✓ Transfer transactions
 - ◇ All memory read/write transactions (bi-direction)
 - ◇ I/O read/write transaction (bi-direction)
 - ◇ Configuration read/write transaction (PCI Card)
 - ✓ 2 programmable memory windows
 - ◇ Switching prefetchable/non-prefetchable field available
 - ◇ Memory transaction filtering
 - ✓ 2 programmable I/O windows
 - ◇ I/O transaction filtering function
 - ◇ ISA mode filtering function
 - ✓ VGA memory & I/O address transfer support
 - ✓ VGA palette I/O write snooping support
 - ✓ 8DWORD (32 bytes) maximum posted write support for memory write transaction
 - ✓ Read prefetch (8DWORD) for memory read transaction
- PC Card-16 Bridge
 - ✓ Compliant with PCMCIA PC Card 95/97 PC Card-16 Standard Specification
 - ✓ 5 programmable memory windows
 - ✓ Page addresses are independently configurable for each memory window.
 - ✓ 2 programmable I/O windows
 - ✓ Compliant with i82365SL compatible register set / ExCA™
 - ✓ Programmable interface timing
 - ✓ 32-bit 8/16-bit data assembly/disassembly
 - ✓ 8DWORD (32 bytes) maximum posted write support for memory write transaction
 - ✓ PCMCIA-ATA disk interface support
 - ✓ PCMCIA Zoomed Video Port support
 - ✓ Legacy 16-bit mode support
 - ◇ Registers available through 3E0h, 3E2h INDEX/DATA port.
 - ◇ 16bit Legacy Base Address Register configurable
 - ✓ Distributed DMA support

- System Interrupt
 - ✓ INTA#, INTB# support for PCI system interrupt
 - ✓ IRQn support for ISA system interrupt (Programmable Edge/Level mode)
 - ✓ Socket event, Card status event, functional interrupts programmable for PCI/ISA interrupts
 - ✓ Remote wake up available from PC Card through CSTSCHG.
 - ✓ Serialized IRQ support (IRQn, INTA# - INTD#)

- Zoomed Video Port support
 - ✓ Implemented ZV Port Buffer (Pass-through type)

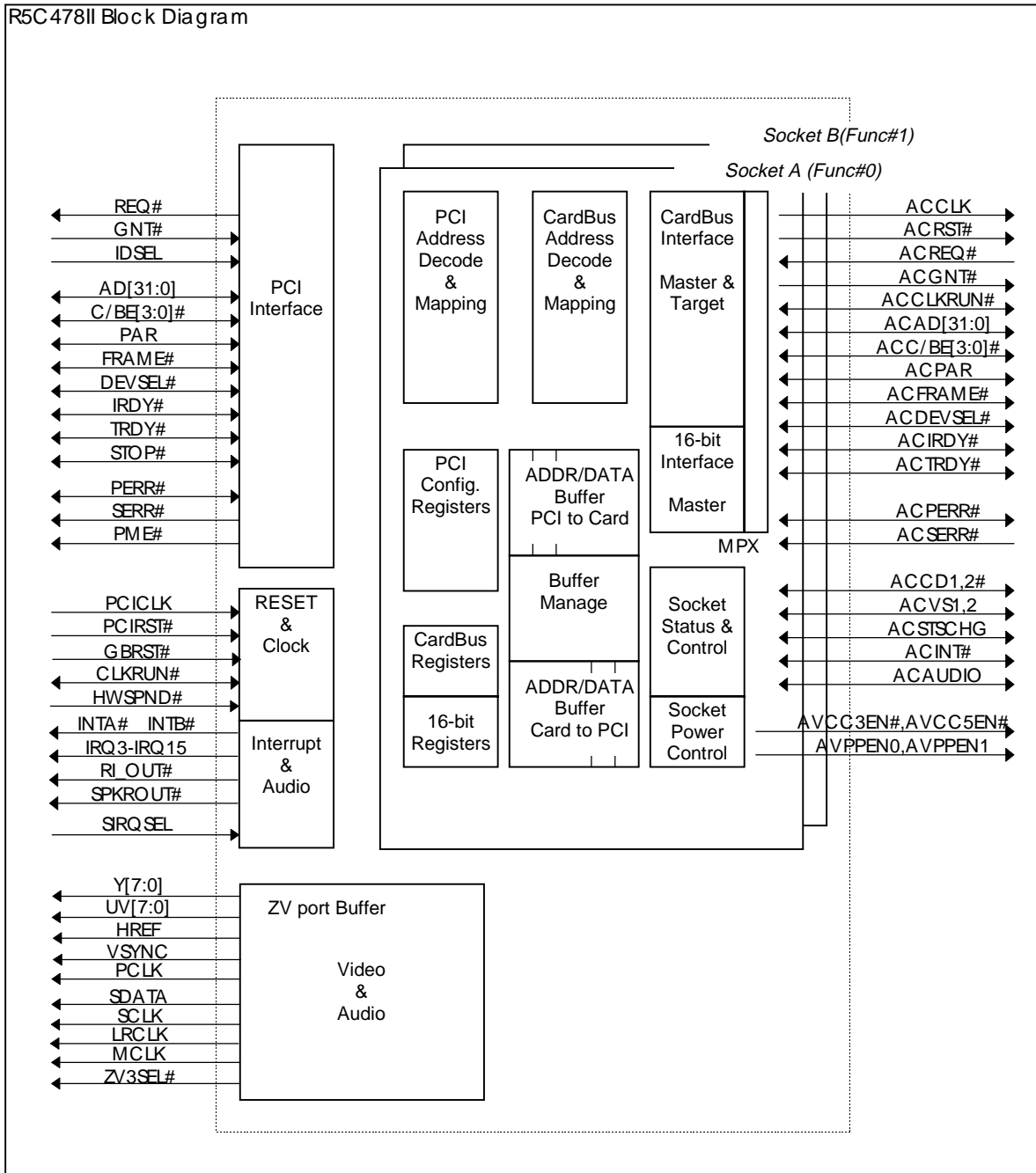
- 3.3V/5V Mixed Voltage Operation at 33Mhz

- GPIO support
 - ✓ GPIO available in the Serialized IRQ mode

- Socket voltage control
 - ✓ Supply voltage auto-detect operation for PC Card (Low voltage PC Card (X.XV) is detectable)
 - ✓ Socket voltage control pins for 5.0V,3.3V

- Package
 - ✓ 261pin PBGA t=1.76mm Pitch = 1.27mm
 - ✓ 256pin CSP t=1.5mm Pitch = 0.8mm

2 BLOCK DIAGRAM

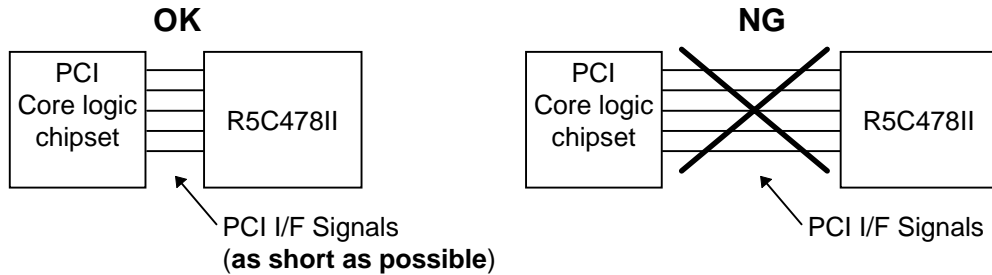


3 SYSTEM DESIGNING

3.1 Design Considerations

Designing the circuit system with R5C478II, make sure to keep especially these instructions below.

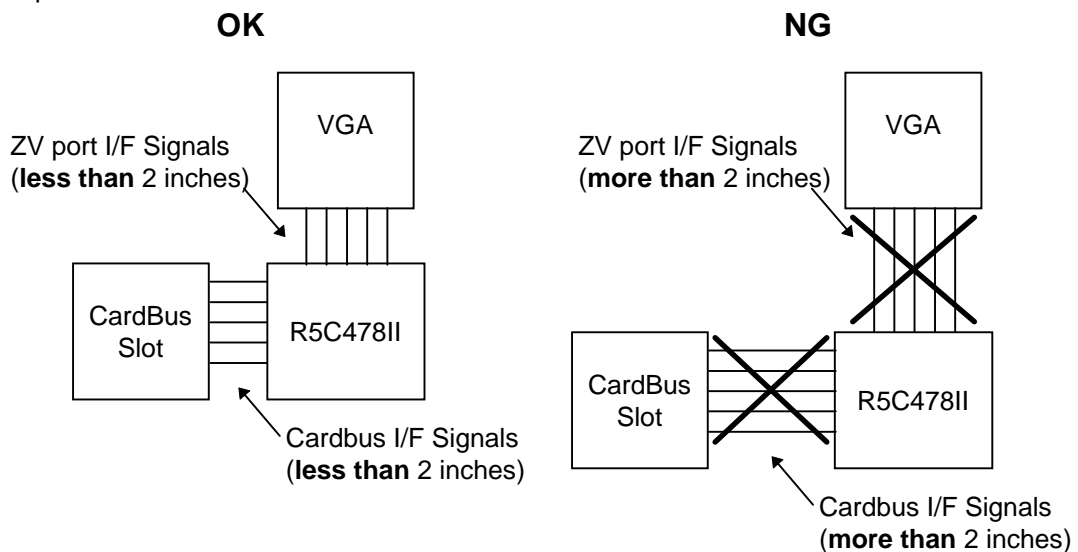
1. PCI Interface signals should be PCI Local Bus Specification 2.1/2.2 compliant, and those lines are to be designed as short as possible.



2. CardBus Interface signals should be PC Card Standard Vol. 2 (March 1997) Electrical Specification compliant.

PC Card Standard requires that all traces between the CardBus sockets connector pad and the CardBus PC Card adapter are to be stubbed within a length of 2 inches (50.8mm).

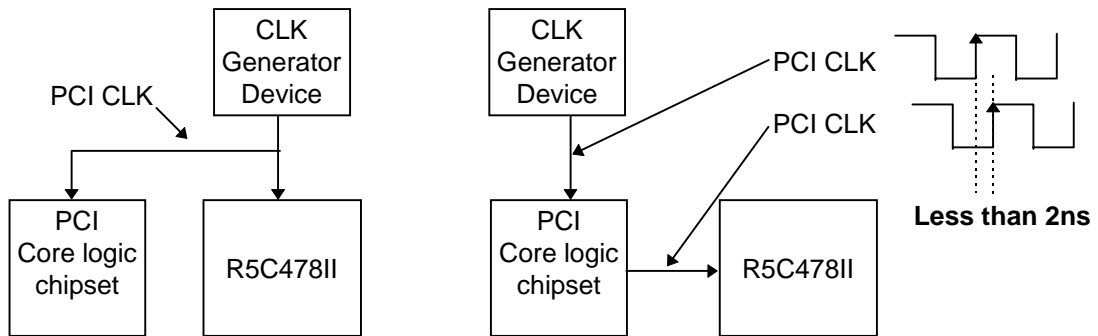
Also, PC Card Standard requires in the PC Card Connector Test Methodology that the all traces of the ZV Port interface are to be stubbed with in a length of 2 inches (50.8mm), so that we recommend such shape.



Violations of the specifications above are probably inevitable, however, consider the trace length to be as short as possible.

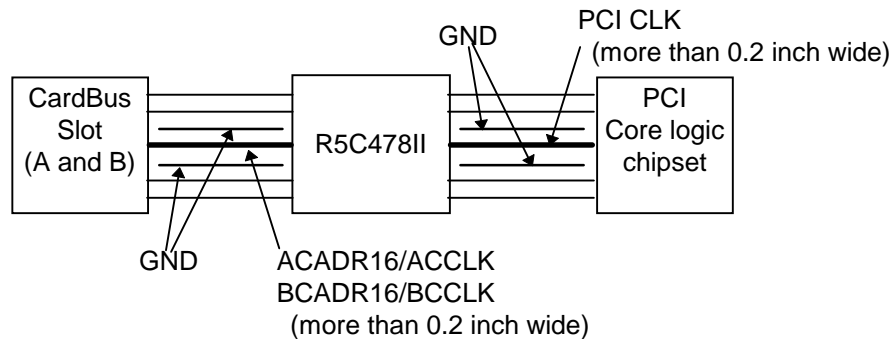
- Apply the same PCI CLK input signal for R5C478II as the PCI CLK input signal for PCI Core logic Chipset. (Diagram below left)

If the PCI CLK output signal from PCI Core logic Chipset is applied for the PCI CLK input of R5C478II, apply the PCI CLK with minimal delay (**under 2ns**) compared with PCI CLK input to the PCI Core logic Chipset (Diagram below right)



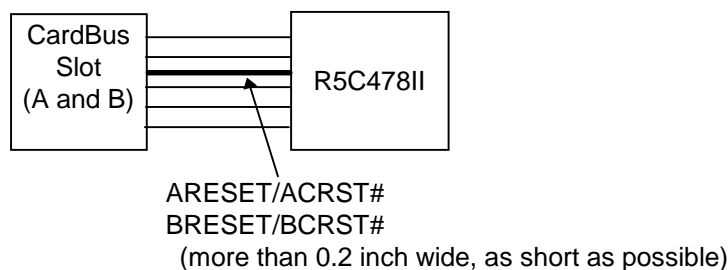
- Design the PCI CLK input for R5C478II to obey the AC characteristics in the specifications strictly.
- Apply wide-width (more than 0.2 inch (0.5mm)) traces for these signals below and wire GND lines along them, since they are to be used as clock signals.

	BGA	CSP		
ACADR16/ACCLK	H17	T12	<--->	CARD SLOT1, 19 pin (A16/CCLK)
BCADR16/BCCLK	G3	B14	<--->	CARD SLOT2, 19 pin (A16/CCLK)
PCICLK	V2	F4	<--->	PCIBUS SLOT, B16 pin (CLK)

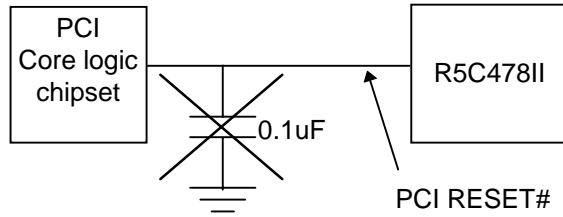


- Apply wide-width (more than 0.2 inch (0.5mm)) traces and wire as short as possible for these signals below.

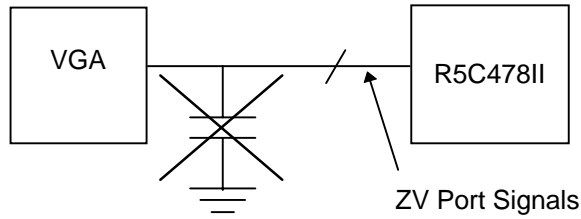
	BGA	CSP		
ARESET/ACRST#	G16	V15	<--->	CARD SLOT1, 58 pin (RESET/CRST#)
BRESET/BCRST#	B6	A11	<--->	CARD SLOT2, 58 pin (RESET/CRST#)



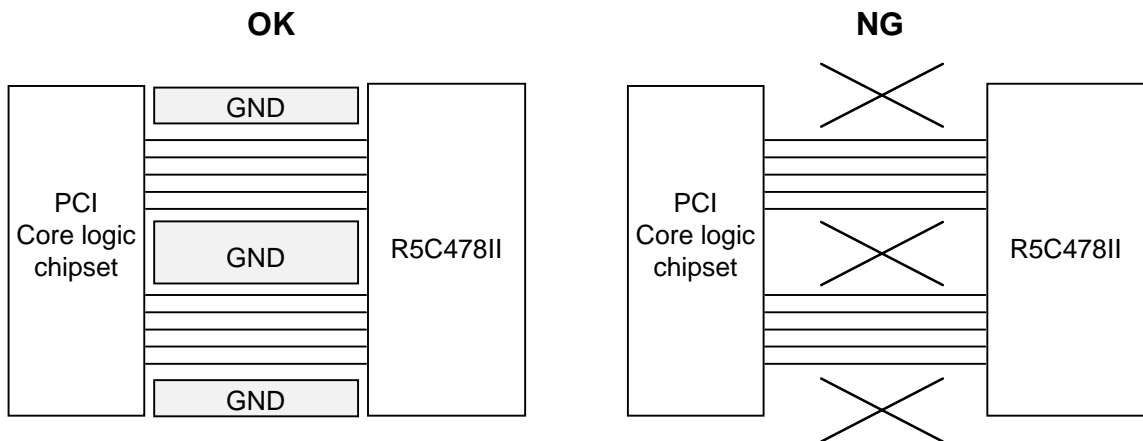
7. Avoid the to apply more than 0.1uF capacitance to **PCI Reset** signals for noise reduction.



8. Avoid to load the capacity for the signals related to **ZV Port**.



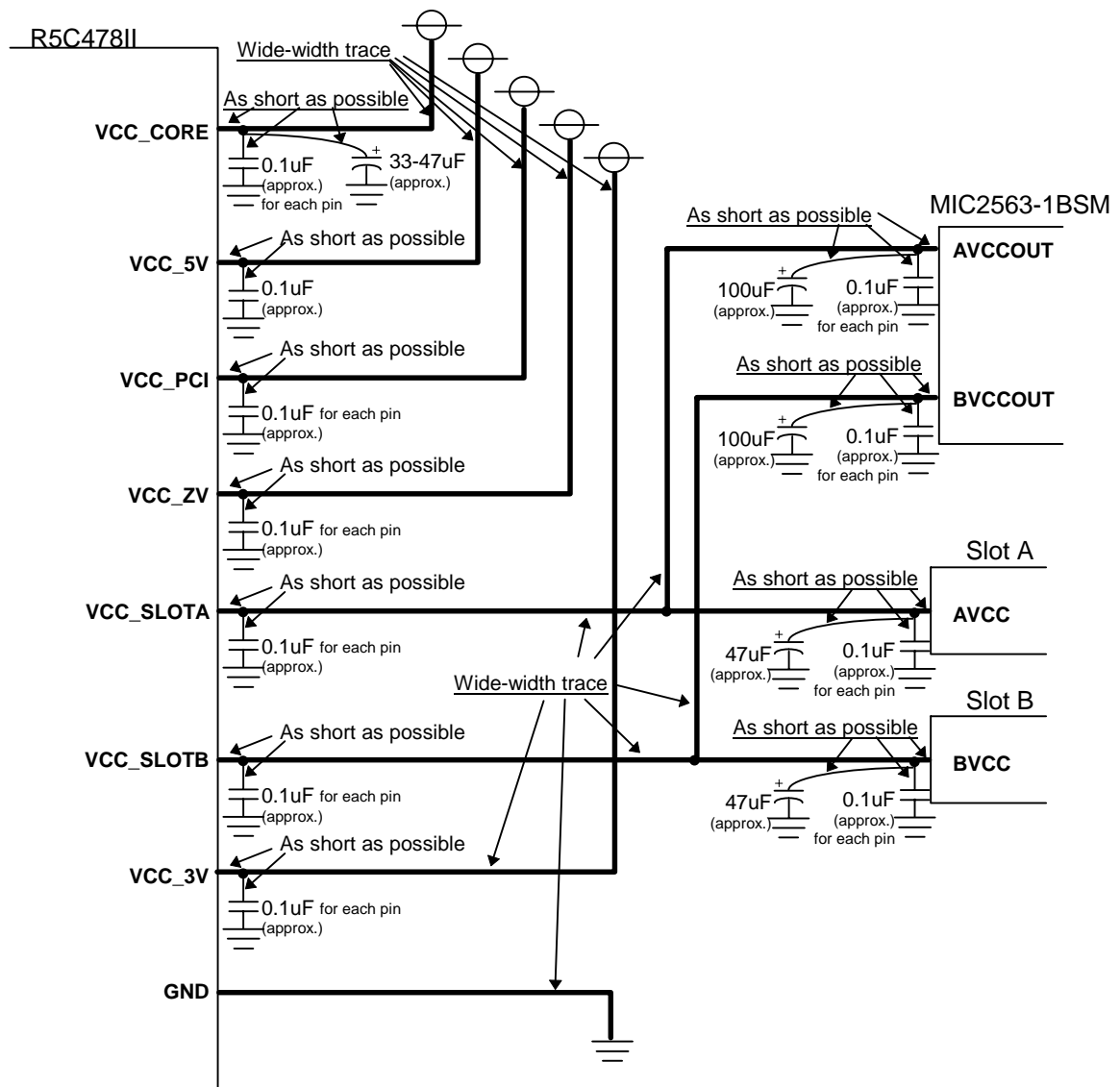
9. Apply GND planes for the blank spaces on wiring layers.



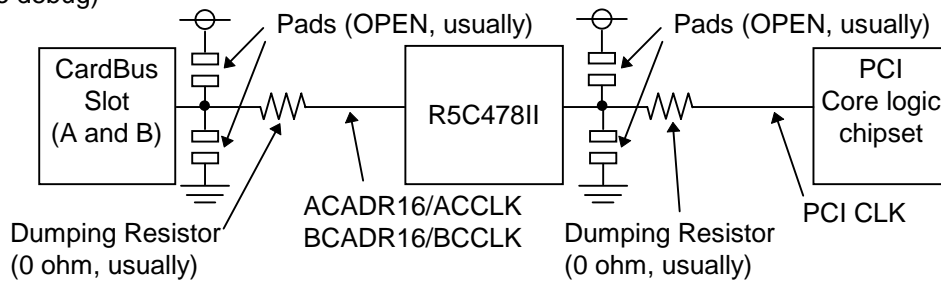
10. Available Power Supplies for VCCs of R5C478II.

VCC of R5C478II	Available Power Supply
VCC_PCI	3.3V
VCC_CORE	2.5V . 3.3V
VCC_5V	3.3V , 5.0V
VCC_3V	3.3V
VCC_ZV	3.3V , 5.0V
VCC_SLOTA	AVCCOUT from Power Control IC (3.3V , 5.0V)
VCC_SLOTB	BVCCOUT from Power Control IC (3.3V , 5.0V)

11. Apply wide-width traces for power supply pins (VCC_CORE, VCC_5V, VCC_PCI, VCC_SLOTx, VCC_ZV, VCC_3V) and GND pins as close as possible. (See the Diagram below)
12. Place the bypass capacitors (0.1uF, approximately) between each power supply (VCC_CORE, VCC_5V, VCC_PCI, VCC_ZV, VCC_3V) and GND as close as possible to wire shortly enough. (See the Diagram below)
13. Place the electrolytic capacitors (about 33uF to 47uF, totally) between CORE VCC pins (VCC_CORE) and GND pins as close as possible to wire shortly enough. (See the Diagram below)
14. Place the bypass capacitors (0.1uF, approximately) between VCC_SLOTx pins of R5C478II, the Cardbus socket connector and the socket power controller (the power switch) and GND pins as close as possible to wire shortly enough. (See the Diagram below)
15. Place the electrolytic capacitors (47uF, approximately) between VCC_SLOTx pins of the Cardbus socket connector and GND pins. (See the Diagram below)
Also place the electrolytic capacitors (100uF, approximately) between VCC_SLOTx pins of socket power controller (the power switch) and GND pins as close as possible to wire shortly enough. (See the Diagram below)



16. Prepare the pads of dumping resistors and/or Pull-Up/Pull-Down resistors for the control signals such as PCI CLK or CCLKs, when designing the evaluation board. (Recommended, they may be required to debug)



17. If the Serialized IRQ Mode is set, take care of the directions for use of and dealing with these pins below, since the functions of them will be changed.

[GPIO (IRQ3,4,5,7)]

GPIOs are I/O pins but these are to be made **pull-up even if used or not** (under 8mA, declared in drive ability specification).

[SRIRQ# (IRQ9)]

SRIRQ# is a output pin set wired-or in system. It **required the pull-up** resistor that value is assigned from the drive ability (under 8mA) of R5C478II and from system design.

[LEDA#,LEDB# (IRQ10,11)]

Although LEDA# and LEDB# output "Low" during card access, actually these are direct outputs of FRAME# and OE#/WE# signals. Even if LEDs are connected with these pins directly, the brightness of LED almost never rises because of that shortly driving time. Place the external monostable multivibrator between LEDA#(B#) and LED, in order to rise the brightness of LED.

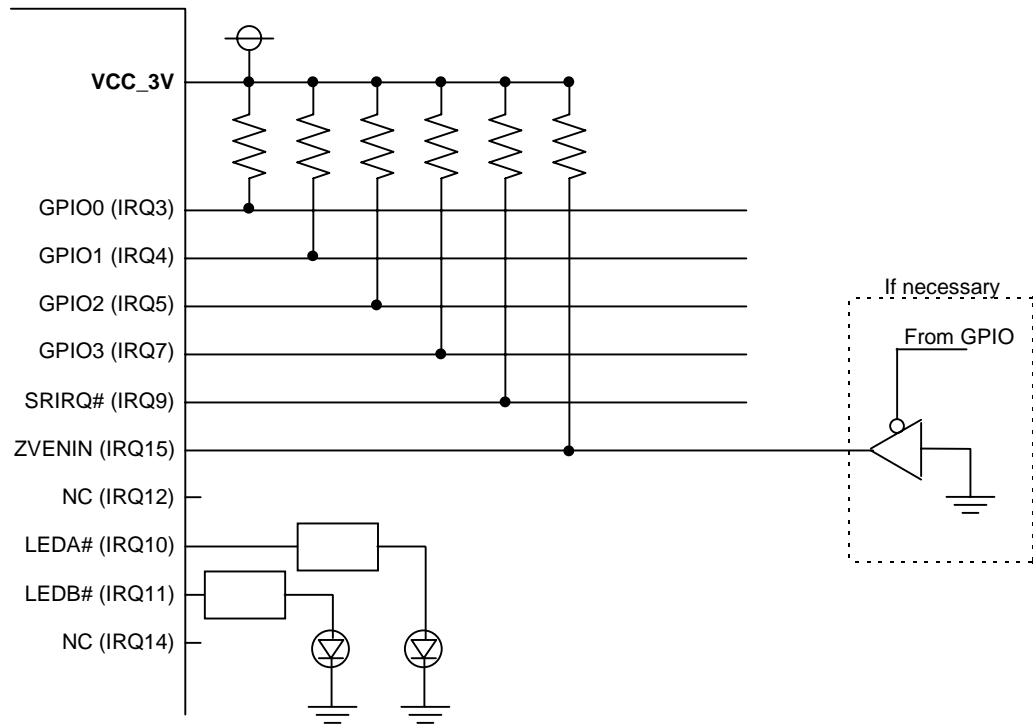
[ZVENIN (IRQ15)]

The **external pull-up resistor is required** since ZVENIN of R5C478II is the input pin which all outputs of the ZV port will be forced to be tri-stated while ZVENIN is low.

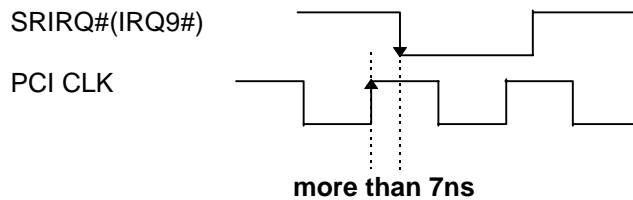
Default		Serialized IRQ Mode (Input / Output)
IRQ3	->	GPIO0 (I/O)
IRQ4	->	GPIO1 (I/O)
IRQ5	->	GPIO2 (I/O)
IRQ7	->	GPIO3 (I/O)
IRQ9	->	SRIRQ# (I/O)
IRQ10	->	LEDA# (OUT)
IRQ11	->	LEDB# (OUT)
IRQ12	->	(OPEN (NC))
IRQ14	->	(OPEN (NC))
IRQ15	->	ZVENIN (IN)

(See "18." on the next page for the example of the external circuit of IRQx pins in the SIRQ mode)

18. The example of the connections of IRQx pins in the Serialized IRQ mode.



19. In the Serialized IRQ mode, please design that the fall of the SRIRQ# will have **more than 7ns Hold time** for the raise of PCI_CLK which is input to the R5C478II.

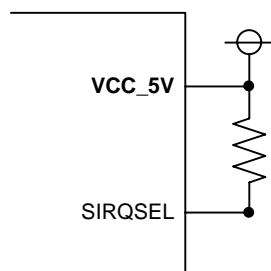


20. SIRQSEL

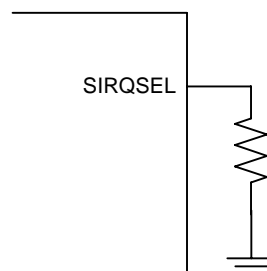
If the input of SIRQSEL pin is "H" level, the Serialized IRQ mode will be automatically selected, in spite of the setting of the SRIRQ Enable bit (Misc Control Registers, (bit 7 of 82-83h in the PCI Configuration Registers)). (See the diagram below left)

If the input of SIRQSEL pin is "L" level, the Software SIRQ select mode will be selected (See the diagram below right). By the setting the SRIRQ Enable bit (Misc Control Registers, (bit 7 of 82-83h in the PCI Configuration Registers)), you can decide whether SIRQ mode is selected or not.

Automatic SIRQ Mode
(No software setting is required)



Software SIRQ Select Mode
(Software setting required to select SIRQ)



* Do **NOT** apply the OPEN (NC) for the SIRQSEL pin.

21. Serialized IRQ selection Table

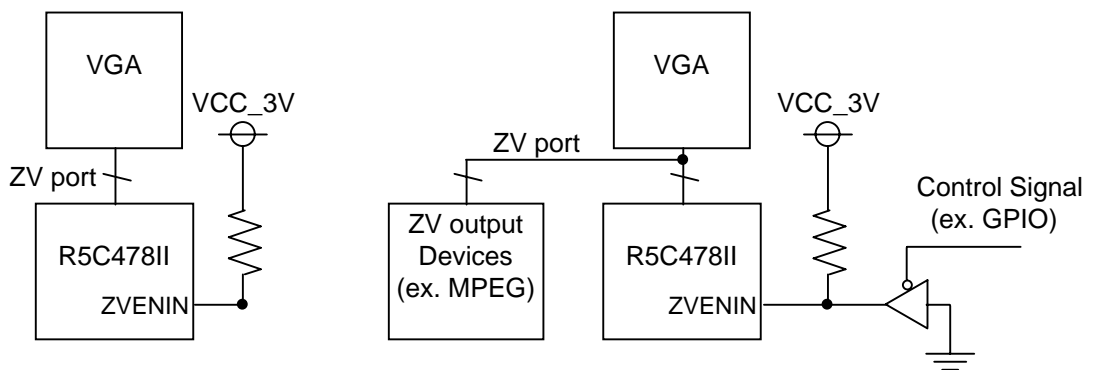
The settings of the Serialize IRQ will effect the ISA IRQ#/PCI INT# as shown below.

SIRQSEL	Misc. Control register (82-83h of PCI Config. Register)		ISA IRQ#	PCI INT#
	bit7	bit5		
L	L	X	Parallel	Parallel
L	H	L	Serial	Serial
L	H	H	Serial	Parallel
H	X	L	Serial	Serial
H	X	H	Serial	Parallel

21. ZVENIN (IRQ15)

If your system does not have another device which uses the ZV port (i.e. only R5C478II uses the ZV port), please apply pull-up resistor for ZVENIN (See the diagram as shown below left).

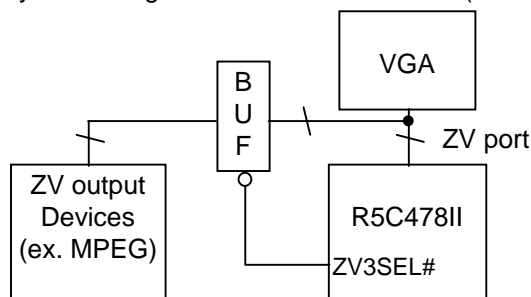
If your system has the another ZV output devices (ex. MPEG decoder), R5C478II can share the ZV port with it by controlling the ZVENIN (See the example diagram as shown below right). R5C478II will output Hi-Z, when ZVENIN is asserted.



* Do **NOT** apply the OPEN (NC) for the ZVENIN pin.

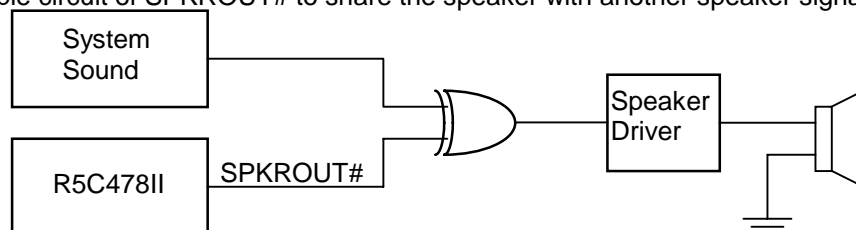
22. ZV3SEL#

If your system has the another ZV output devices (ex. MPEG decoder), R5C478II can share the ZV port with it by controlling the Buffer with ZV3SEL# (Example diagram is shown below).



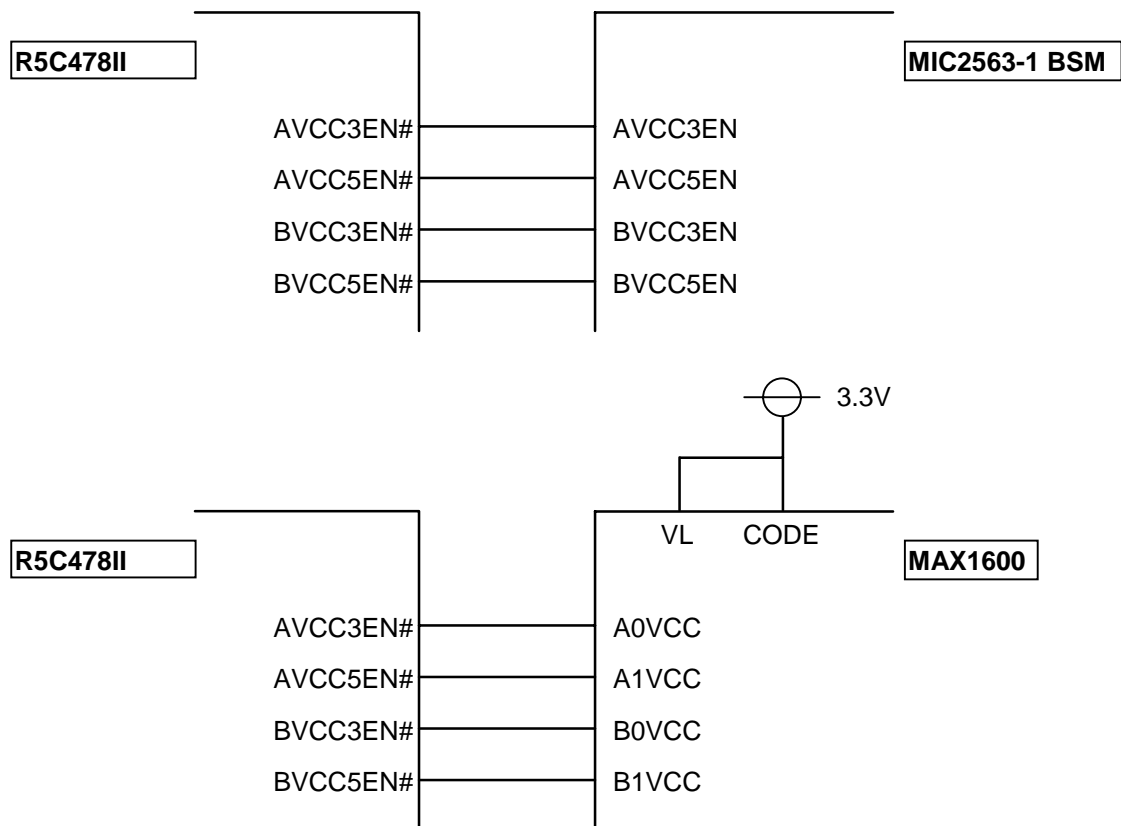
23. About SPKROUT# Signal

The example circuit of SPKROUT# to share the speaker with another speaker signal.



24. About the socket power controller (the power switch).

The connections of VCC 3.3V/5V Enable signals between R5C478II and the socket power controller (such as MICREL MIC2563-1BSM or MAXIM MAX1600) is shown as follows,



25. About Power On / Power Off Sequences:

Please keep these sequences below to power on and to power off

Power ON:

1. Power on VCC_CORE
2. Power on VCC_3V
3. Power on VCC_5V
4. Power on VCC_PCI

Power OFF:

1. Power off VCC_PCI
2. Power off VCC_5V
3. Power on VCC_3V
4. Power off VCC_CORE

26. About the PCIRST# signal and VCC_PCI:

When VCC_PCI is turned off, please assert (keep input "Low") the PCIRST# signal.

27. GBRST# (Global Reset)

Apply the Power-on Reset for the GBRST#.

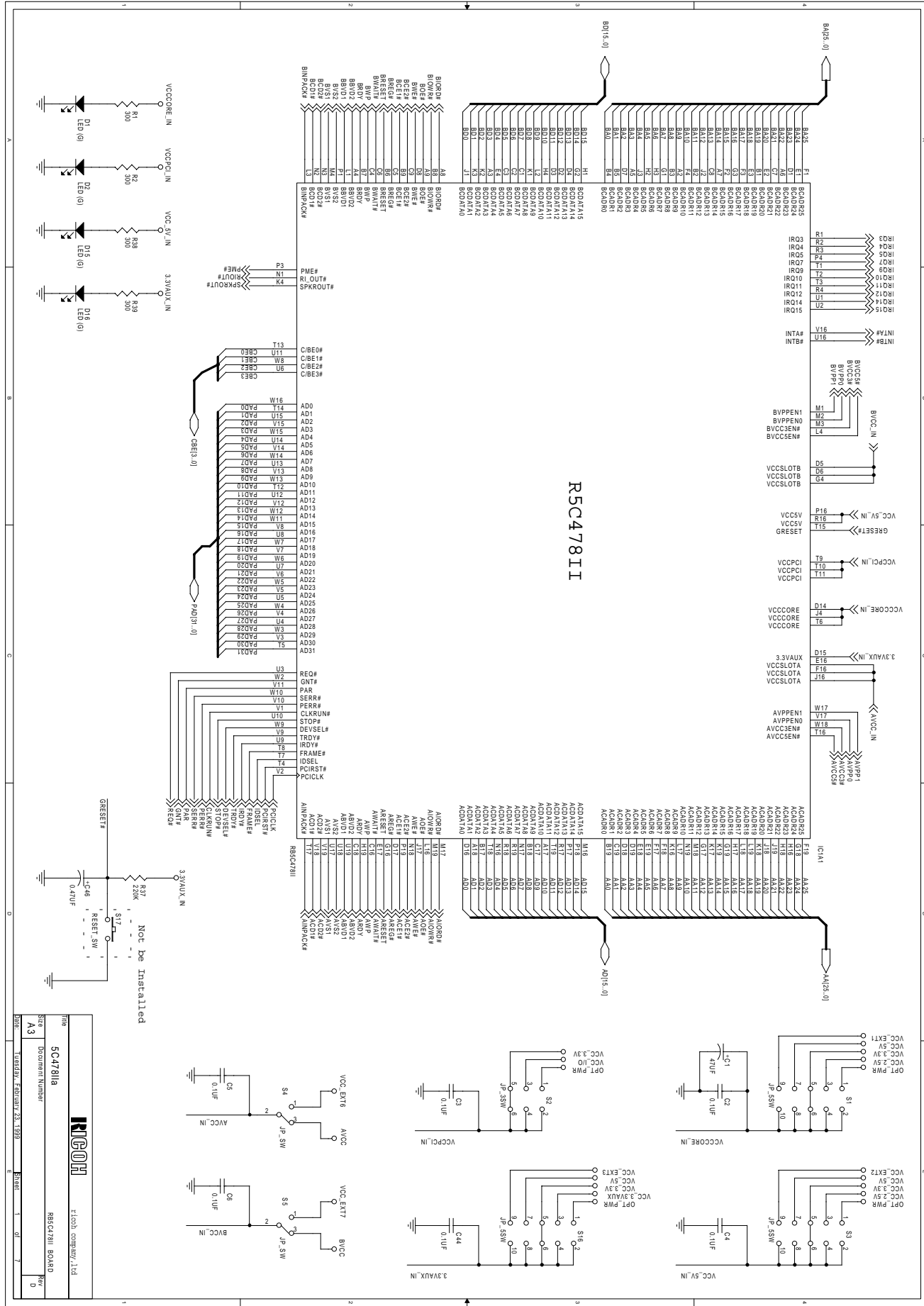
3.2 Reference circuit diagram (RB5C478II evaluation board circuit diagram)

The circuit diagram of RB5C478II evaluation board (applied for parallel IRQ) is attached to this document.

Refer to this diagram for designing the board.

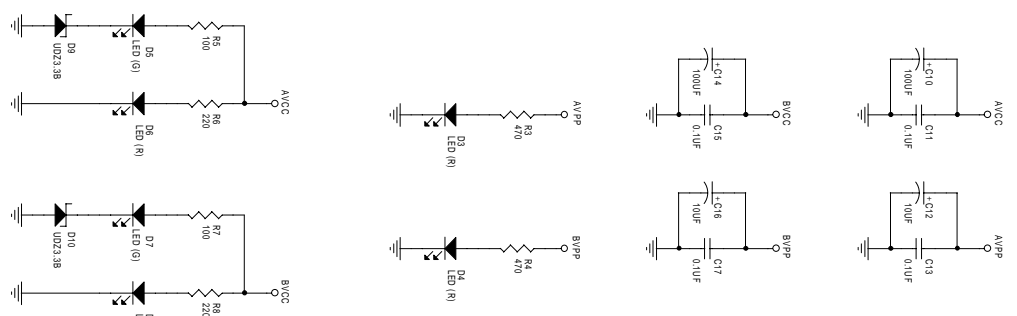
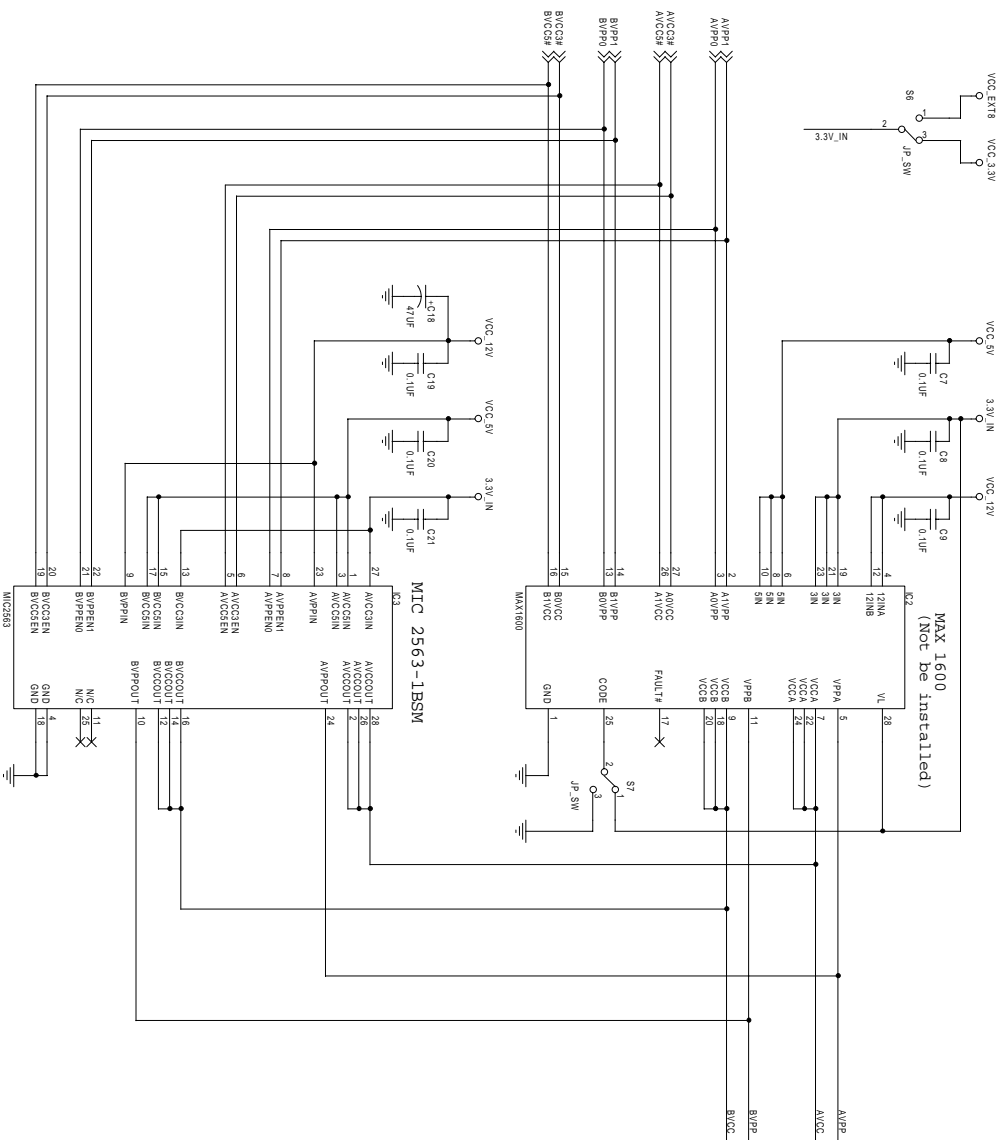
- 1 Some PC Cards require the pull-up resistor for the WP/CCLKRUN# signals (Both A and B slots) of PC Card Interface for some operating systems.
- 2 Some PC Cards may require the pull-up resistor for the RESET/CRST# signals (Both A and B slots) of PC Card Interface for some operating systems such as Windows NT 4.0.

Note: The circuit diagram attached to this document is just a reference Ricoh does not guarantee the parts and the constants of any parts applied on this circuit diagram.

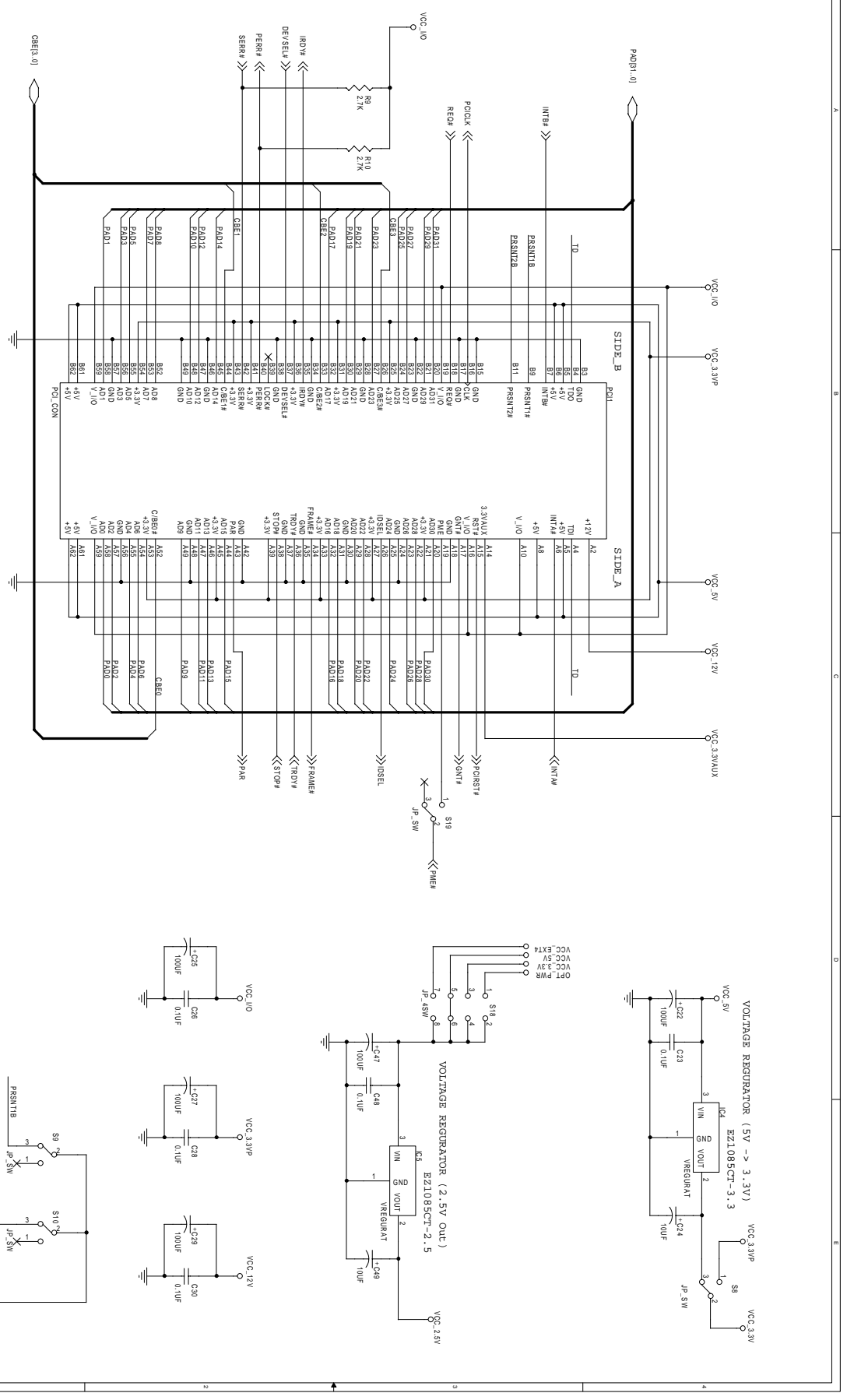


Part Number	5C4781Ia
Docuement Number	5C4781Ia
Revision	A3
Author	URSATA, February 23, 1999
Drawn	1
Checked	0
Approved	7

Part Number	5C4781Ia
Docuement Number	5C4781Ia
Revision	A3
Author	URSATA, February 23, 1999
Drawn	1
Checked	0
Approved	7

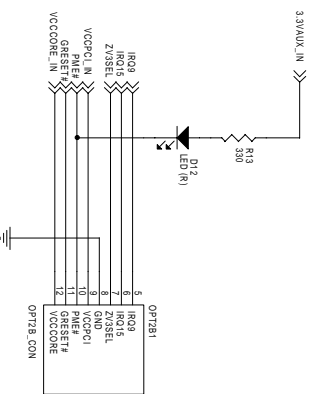
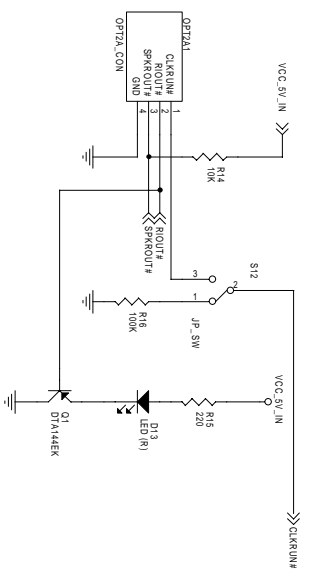
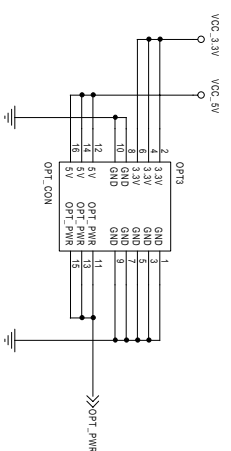
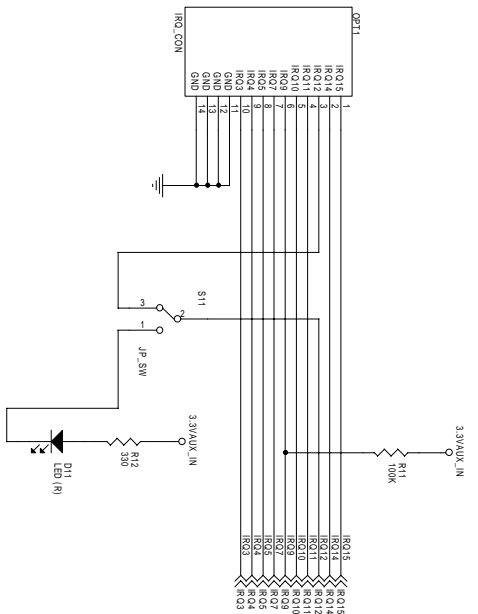


ROOH	
Title 47811a.PW	File Path 47811a.PW
Size A3	Document Number 888C47811_BOARD
Date 1998.04.23	Rev. D
Location FABRICATION	Sheet 2 of 7

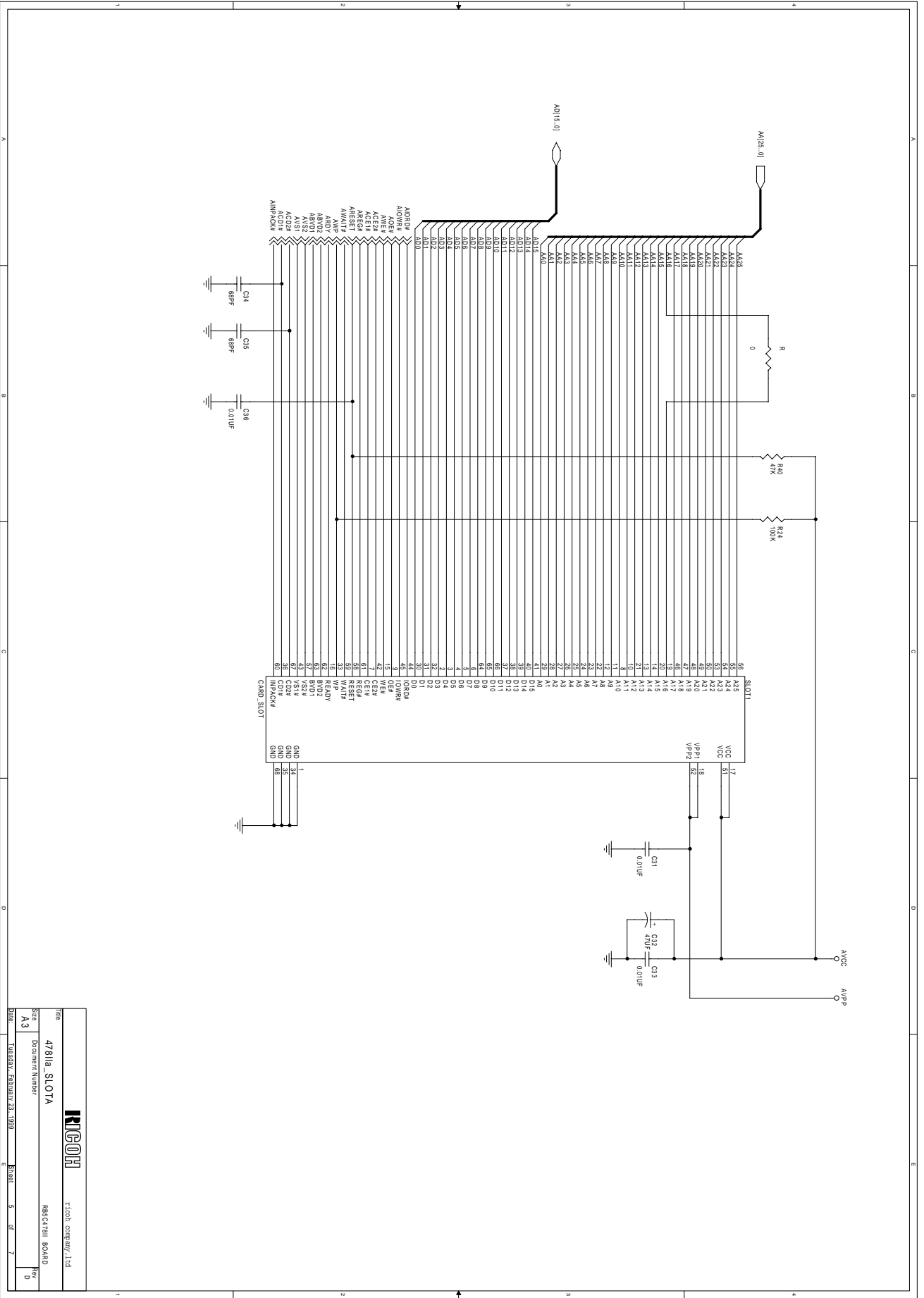


DATE	1/20/04	FORM	3	OF	7
TITLE	47811a PCI				
SHEET	A3				
DOCUMENT NUMBER	R88C12811 BOARD				
REV	D				
DATE	1/20/04	FORM	3	OF	7

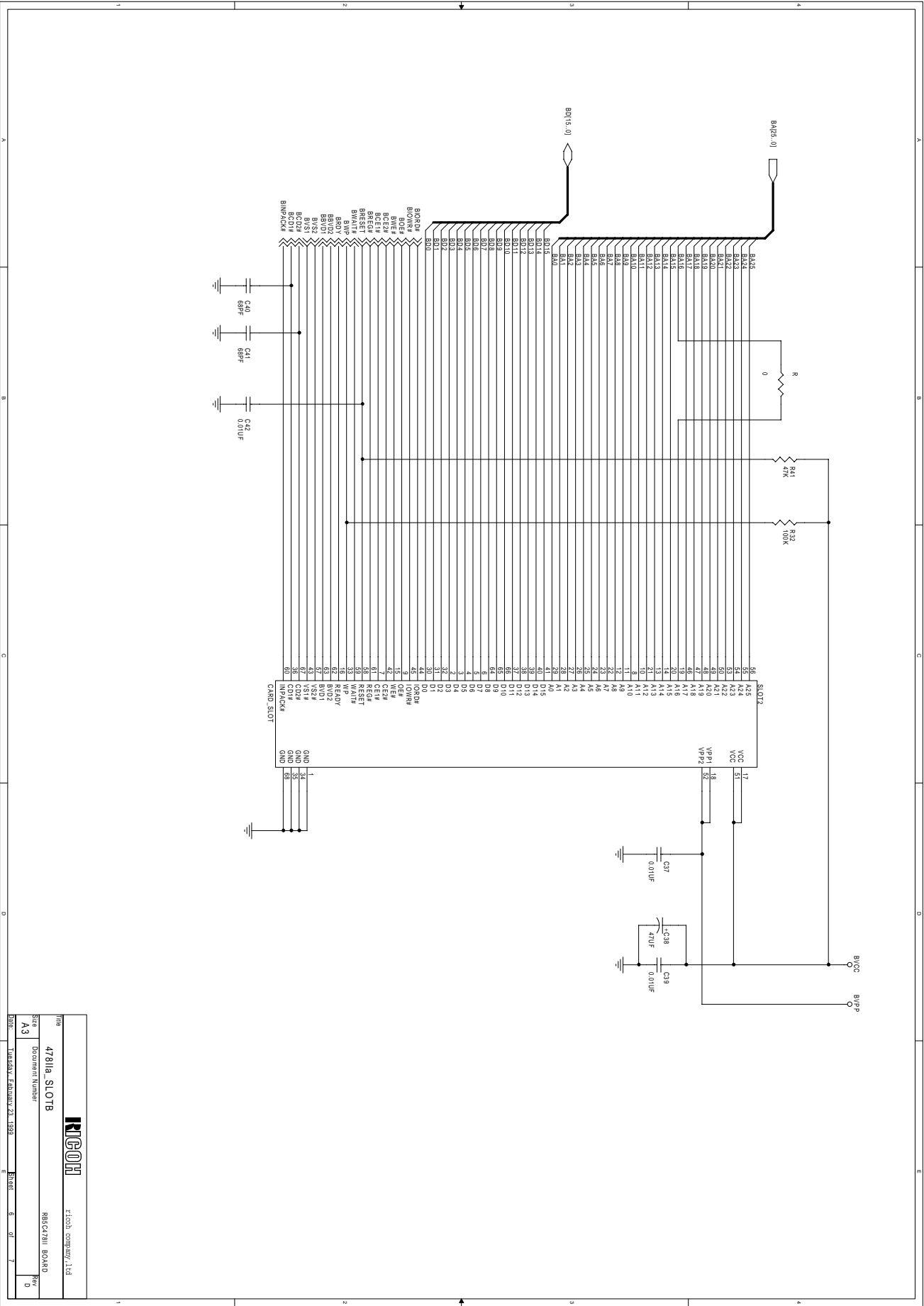
ROGHI TECHNOLOGY, LTD.




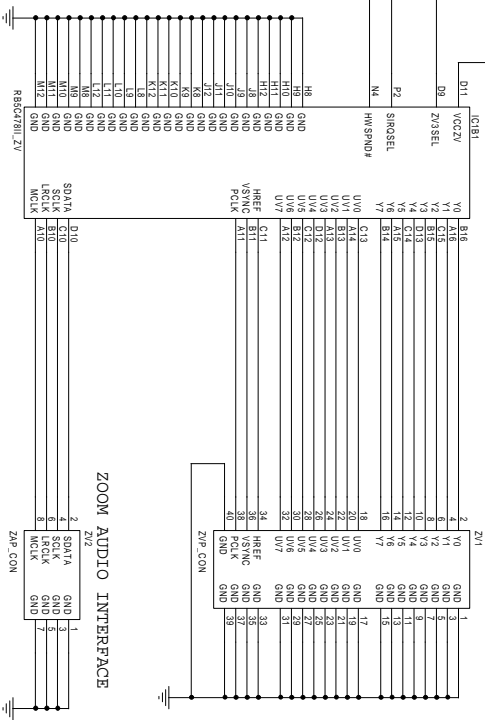
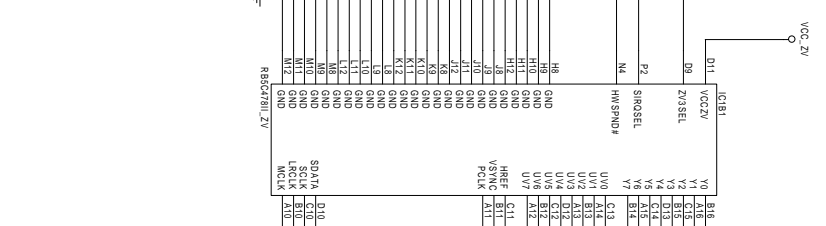
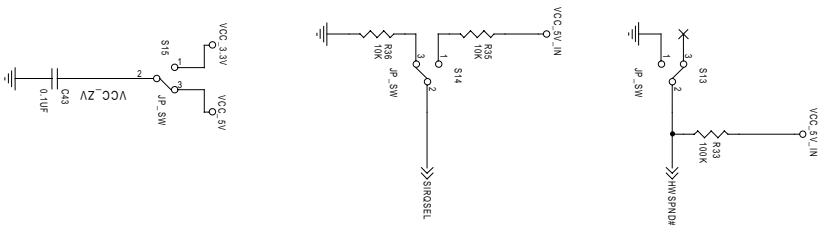
ROHM		ROHM COMPANY, LTD.	
Title		4781a OPT	
Sheet		A3	
Document Number		R88C4781I BOARD	
Date		2008.04.23	
Version		1.0	



ROHM	
ROHM COMPANY, LTD.	
47811a SLOT A	
REPLACEMENT BOARD	
REV. D	
DATE	TUESDAY, FEBRUARY 23, 1999
SHEET	5 OF 7



	
ROGH COMPANY, LTD	
47811a SLOT	
REVISION BOARD	
TITLE	A3
SHEET	1
DOCUMENT NUMBER	47811a_SLOT_A3
DATE	2008.06.07



ZOOM VIDEO INTERFACE

ZOOM AUDIO INTERFACE

	
Vision Systems, Ltd	
Title	47811a_ZV
Part	47811a_ZV
Document Number	47811a_ZV
Rev	0
Date	1999

3.3 Users' Manual for R5C478II evaluation board

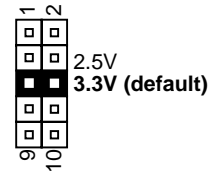
3.3.1 Jumper / Switch Settings (SW JP) (Please see 3.3.5 for the location on the Evaluation board)

1) Jumper Setting (SW JP) (Please see P. 6 for the location on the Evaluation board)

S1 R5C478II VCC_CORE Power Supply (default [5-6])

Connect the power supply of R5C478II VCC_CORE (the power supply of core logic) with **2.5V** or **3.3V** power supply.

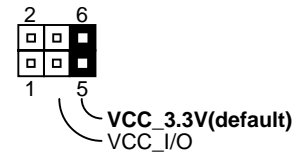
- 3.3V [5-6] (default)
- 2.5V [3-4]



S2 R5C478II VCC_PCI Power Supply (default [5-6])

Connect the power supply of R5C478II VCC_PCI (the power supply of PCI I/F) with only **3.3V** power supply. (PCI I/F of R5C478II is the **5V tolerant**)

- VCC_3.3V [5-6] (default): (You can choose VCC_3.3VP or 3.3V output of Voltage Regulator for the VCC_3.3V. See **S8** for detail.)
- VCC_I/O [3-4]: If the VCC_I/O of the PCI Slot is 3.3V, you can use [3-4]

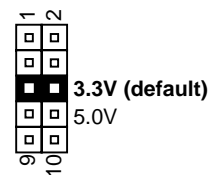


S3 R5C478II VCC_5V Power Supply (default [5-6])

Connect the power supply of R5C478II VCC_5V (the power supply of 5V) with **3.3V** power supply. (VCC_5V can be connect with **3.3V** in spite of VCC_5V.)

You can use 5.0V instead of 3.3V.

- 3.3V [5-6](default)
- 5.0V [7-8] (default)



S4 R5C478II VCC_SLOTA Power Supply (default [2-3])

Connect the power supply of R5C478II VCC_SLOTA (the power supply of A Slot) with the **VCCA** (the power supply of the A Slot of PC Card and comes from "MIC2563" Power Control IC)

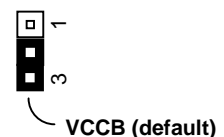
- VCCA [2-3] (default)



S5 R5C478II VCC_SLOTB Power Supply (default [2-3])

Connect the power supply of R5C478II VCC_SLOTB (the power supply of B Slot) with the **VCCB** (the power supply of the B Slot of PC Card and comes from "MIC2563" Power Control IC)

- VCCB [2-3] (default)



S6 3.3V Power Supply of Power Control IC (default [2-3])

Connect the 3.3V_IN (3.3V power supply) of Power Control IC ("MIC2563" or "MAX1600") with the VCC_3.3V

- VCC_3.3V **[2-3] (default):** (You can choose VCC_3.3VP or 3.3V output of Voltage Regulator for the VCC_3.3V. See **S8** for detail.)

1  3 VCC_3.3V (default)

S7 Selection of Power Control IC (default [1-2])

Set [1-2] short to select the "MIC2563-1 BSM" for the Power Control IC. For this evaluation board, either "Max1600" or "MIC2563" can be used. However, since "MAX1600" is not implemented on this evaluation board, this jumper has no effect.

- MIC2563 **[1-2] (default):** MIC2563 (default) 1  2

S8 VCC_3.3V Power Supply of the Evaluation board (default [2-3])

Connect the VCC_3.3V with the VREGURAT. VREGURAT is the 3.3V output from the voltage regulator (5.0V -> 3.3V).

If the PCI Slot supports the 3.3V power supply, you can connect the VCC_3.3V with the VCC_3.3VP.

- VREGURAT **[2-3] (default):** 3.3V output from the 3.3V voltage regulator
- VCC_3.3VP **[1-2]:** 3.3V power supply from PCI Slot.

VCC_3.3VP 1  3 VREGURAT (default)

S9, S10 Detection of Expansion Board (default [2-3])

These jumpers are used for the detection of the expansion board of PCI bus. If these jumpers are open, PC system bypass the RB5C478II Evaluation board.


- PRSNT1,2B **[2-3] (default):** Presence of the expansion board on the PCI Bus.

1  3 PRSNT1,2B (default)

S11 ATA LED(D11) (default [2-3])

The default setting is ATA LED disable. Set [1-2] short to enable the ATA LED (D11).

- ATA LED disable **[2-3] (default)**
- ATA LED enable [1-2]

ATA LED Enable —  2
ATA LED Disable (default)

S12 CLKRUN (default [1-2])

The default setting is CLKRUN disable. To support the CLKRUN#, set [2-3] short and connect CLKRUN signal to #1 pin of OPT2.

- CLKRUN disable **[1-2] (default)**
- CLKRUN support [2-3]

CLKRUN disable (default) 1  3 CLKRUN support

S13 Hardware Suspend Input (default [2-3])

The default setting is Hardware suspend disabled. (Pull-up to the VCC_5V_IN)

Set [1-2] short to enable the Hardware suspend. PCI interface will be disabled and PCI_VCC can be turned off. (Note: In case of [1-2] short, R5C478II will not accept any PCI Bus transaction)

- Hardware Suspend Disable [2-3] (default)
- Hardware Suspend Enable [1-2]

Hardware Suspend Enable 1 3 Hardware Suspend Disable, (default)

S14 Hardware Serialized IRQ Select (default [2-3])

The default setting is Hardware Serialized IRQ disabled. (SERIRQ# de-asserted). However, you can set the Serialized IRQ in the Misc Register (82-83H, bit7 (Serialized IRQ Enable bit)) of the PCI Configuration Space.

Set [1-2] short to enable the Hardware Serialized IRQ. (SERIRQ# asserted). Only Serialized IRQ is selected and the setting of Misc Register (82-83H, bit7 (Serialized IRQ Enable bit)) has no effect.

- Hardware Serialized IRQ disable [2-3] (default)
- Hardware Serialized IRQ enable [1-2]

Hardware Serialized IRQ Enable 1 3 Hardware Serialized IRQ Disable, (default)

S15 R5C478II VCC_ZV Power Supply (default [2-3])

Connect the power supply of R5C478II VCC_ZV (the power supply of ZV port interface) with **5.0V**, if the ZV port Interface (of VGA) is 5.0V. Connect the power supply of R5C478II VCC_ZV (the power supply of ZV port interface) with **3.3V**, if the ZV port Interface (of VGA) is 3.3V.

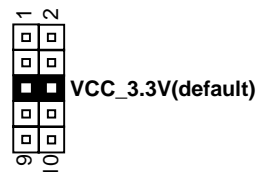
- 5.0V [2-3] (default)
- 3.3V [1-2]

3.3V 1 3 5.0V, (default)

S16 R5C478II VCC_3V Power Supply (default [5-6])

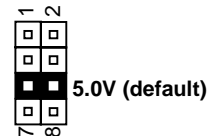
Connect the power supply of R5C478II VCC_3V (the power supply of 3.3V) with only **3.3V** power supply (VCC_3.3V).

- 3.3V [5-6] (default)

**S18 5.0V Power Supply of the 2.5V Voltage Regulator (default [5-6])**

Set [5-6] short for the **5.0V** power supply for the 2.5V voltage regulator (5.0V -> 2.5V).

- 5.0V [5-6] (default)

**S19 PME (Power Management Event) Output (default [2-3])**

The default setting of PME# output is **open**.

If the PCI Slot of your system supports the **A19** for the PME# signal, you can set [1-2] short so that PME# signal from R5C478II will be routed to the system.

- OPEN [2-3] (default)
- A19 [1-2]

A19 1 3 OPEN (default)

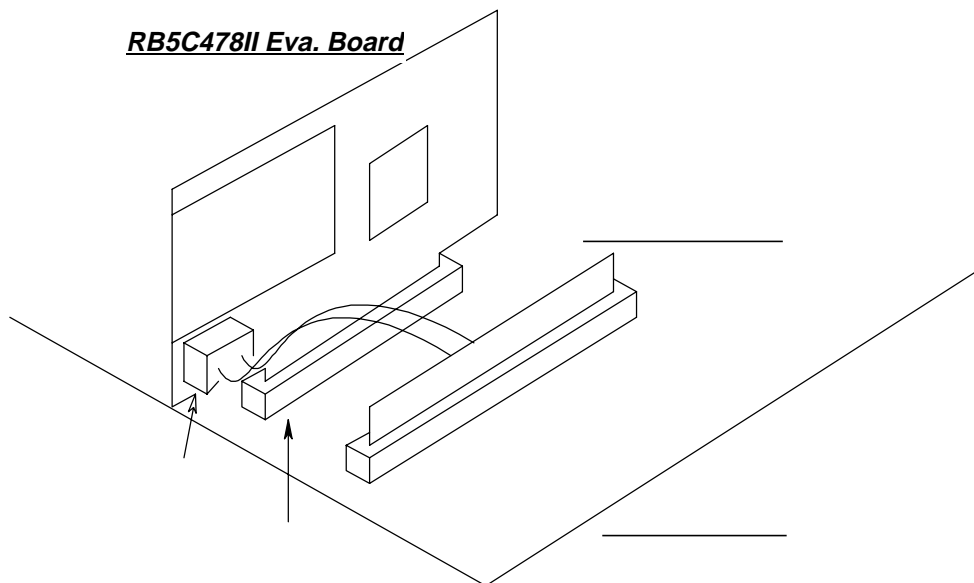
3.3.2 ISA-IRQ

PCI bus does not support ISA interrupt signals - IRQ(15-3).

Please make sure to use the ISA_IRQ board packed with RB5C478II evaluation board and connect it to **OPT1**.

Table 1: OPI1 port pin description

PIN No.	SIGNAL	PIN No.	SIGNAL
1	IRQ15	8	IRQ5
2	IRQ14	9	IRQ4
3	IRQ12	10	IRQ3
4	IRQ11	11	GND
5	IRQ10	12	GND
6	IRQ9	13	GND
7	IRQ7	14	GND



3.3.3 Zoomed Video Port

The RB5C478II Evaluation board supports Zoomed Video Port.

ZV1 (40 pins): Zoomed Video signal port

ZV2 (8 pins): Zoomed Audio signal port

Some VGA chip(board) require pull-down resistors in order to minimize supply current.

Please refer documents related to a VGA controller chip.

Table 2: ZV1 port pin descriptions

PIN No.	SIGNAL	PIN No.	SIGNAL	PIN No.	SIGNAL	PIN No.	SIGNAL
1	GND	11	GND	21	GND	31	GND
2	Y0	12	Y5	22	UV2	32	UV7
3	GND	13	GND	23	GND	33	GND
4	Y1	14	Y6	24	UV3	34	HREF
5	GND	15	GND	25	GND	35	GND
6	Y2	16	Y7	26	UV4	36	VSYNC
7	GND	17	GND	27	GND	37	GND
8	Y3	18	UV0	28	UV5	38	PCLK
9	GND	19	GND	29	GND	39	GND
10	Y4	20	UV1	30	UV6	40	GND

Table 3: ZV2 port pin descriptions

PIN No.	SIGNAL	PIN No.	SIGNAL
1	GND	5	GND
2	SDATA	6	LRCLK
3	GND	7	GND
4	SCLK	8	MCLK

3.3.4 Other Connectors

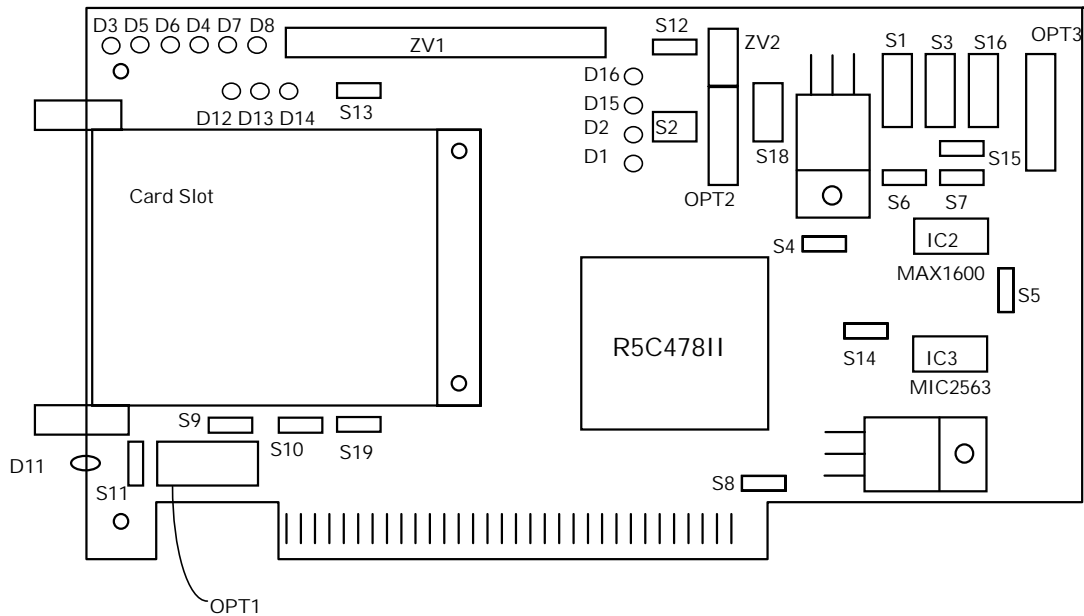
The RB5C478II Evaluation board has OPT2 connectors.

Table 4: OPT2 port pin descriptions

PIN No.	SIGNAL	PIN No.	SIGNAL	PIN No.	SIGNAL	PIN No.	SIGNAL
1	CLKRUN#	4	GND	7	ZV3SEL	10	PME#
2	RIOUT#	5	IRQ9 (SIRQ)	8	GND	11	GBRST#
3	SPKOUT#	6	IRQ15 (ZVENIN)	9	VCC_PCI	12	VCC_CORE

The RB5C478II Evaluation board also has OPT3 connectors, but these connectors are not used.

3.3.5 RB5C478II Evaluation board, Jumper & LED layout



Power On LED:

R5C478II

- D1** Internal Core Logic (VCC_CORE): Power on
- D2** PCI I/F (VCC_PCI): Power on
- D15** 5V Power Supply (VCC_5V): Power on
- D16** 3.3V Power Supply (VCC_3V): Power on

PC Card

- D3** SLOTA programmable (VPP of Slot A) power on
- D4** SLOTB programmable (VPP of Slot B) power on

- | | | |
|-----------|-----------|-----------------------|
| D5 | D6 | VCC of Slot A |
| off | off | SLOTA card power off |
| off | ON | SLOTA powered at 3.3V |
| ON | off | ----- |
| ON | ON | SLOTA powered at 5.0V |

- | | | |
|-----------|-----------|-----------------------|
| D7 | D8 | VCC of Slot B |
| off | off | SLOTB card power off |
| off | ON | SLOTB powered at 3.3V |
| ON | off | ----- |
| ON | ON | SLOTB powered at 5.0V |

Functional LED:

- D11** LED_OUT Assertion of R5C478II
- D12** PME# Assertion of R5C478II
- D13** RIOUT# Assertion of R5C478II
- D14** HWSUSP# Assertion of R5C478II

4 SOFTWARE SUPPORT

4.1 OS Support

[Windows 95 OSR1 (Retail)]

Since Windows 95 itself does not support CardBus controllers, apply **PCIC Compatible mode** for PC Card Controllers.

[Windows 95 OSR2.x]

Windows 95 OSR2 itself supports CardBus controllers. However, R5C478II is not included in PCMCIA.INF file so that it is **necessary to edit PCMCIA.INF**.

Note: Since Microsoft does not support new devices on Windows 95 OSR2, R5C478II is not supported on Windows 95 OSR2

[Windows NT 4.0]

Since Windows NT 4.0 itself does not support CardBus controllers, apply **PCIC Compatible mode** for PC Card Controllers.

Otherwise, apply the **3rd Party products** (such as Phoenix/SystemSoft, CardBus is available in this case) for PC Card Controllers.

[MS-DOS/Windows 3.1/WfW3.11]

The **3rd party Socket/Card services** are necessary.

R5C478II are supported by PCM Plus of Phoenix Technologies and CardWizard of SystemSoft

[Windows 98]

R5C478II is **fully supported** by Windows 98.

4.1.1 R5C478II Installation

[Windows 95 OSR1]

R5C478II will be enabled in **PCIC Compatible Mode** configured by **BIOS setting** or with **our driver**. Refer to the description on this document which explains the operation procedures.

[Windows 95 OSR2]

Refer to the description on this document which explains to **edit PCMCIA.INF** and R5C478II installation.

[Windows NT 4.0]

R5C478II will be enabled in **PCIC Compatible Mode** configured by **BIOS setting** or with **our driver**. Refer to the description on this document which explains the operation procedures.

[MS-DOS/Windows 3.1/WfW3.11]

The **Socket/Card services of SystemSoft or Phoenix** are necessary.

Ask our sales office so that we will send you the copy of evaluation drivers with application manual.

[Windows 98]

No configuration is necessary except the general settings of BIOS . (4.3)

4.2 3rd Party Driver Support

	Phoenix				SystemSoft			
	Windows	Windows	Windows	Windows	Windows	Windows	Windows	Windows
	3.1	95	98	NT	3.1	95	98	NT
R5C478II	○*1	◎*2	-	◎*3	◎	◎*2	-	◎*3

○ : Not support CardBus, ◎: Support CardBus

Notes:

1. Only 16bit and ZV PC Cards are supported by Phoenix products on Windows 3.1
2. CardBus Cards are supported Windows 95 OSR2 or later. Only 16bit and ZV PC Cards are supported on Windows 95 OSR1.
3. Windows NT 4.0 is supported. CardBus Cards are also available.

4.3 BIOS Configurations

BIOS will set the RICOH CardBus controller as the PCIC compatibles mode or the CardBus mode.

Also, you can design the BIOS which mode to select. The minimal BIOS settings are shown in the 4.3.1 (for CardBus mode) and 4.3.2 (for PCIC mode).

However, to assure the compatibility with Microsoft Windows, please refer the White Paper in the Microsoft Web site. (Sep. 1998)

<http://www.microsoft.com/hwdev/busbios/cardbus1.htm>

<http://www.microsoft.com/hwdev/desinit/cardbus.htm>

4.3.1 CardBus Mode General Configurations

PCI Config. Registers	(offset)	Value	Default
PCI Command	(04h-05h)	0007h	0000h
PCI Latency Timer	(0Dh)	System dependence	
Interrupt Line	(3Ch)	System dependence	

4.3.2 PCIC Compatible Mode General Configurations

PCI Config. Registers	(offset)	Value	Default
PCI Command	(04h-05h)	0007h	0000h
PCI Latency Timer	(0Dh)	System dependence	
Interrupt Line	(3Ch)	System dependence	
Bridge Control	(3Eh-3Fh)	0080h	0000h
16-bit Legacy Mode Base Address	(44h-47h)	(IRQ-ISA Enable bit) 000003E1h	00000001h

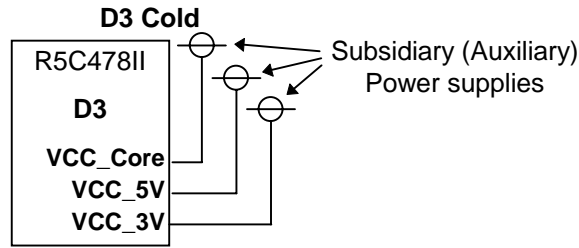
4.3.3 R5C478II Extended Function Configurations

PCI Config. Registers	(offset)	Bit	Bit Name
Bridge Configuration	(80h-81h)	0	Card to PCI Prefetch Enable
If this bit is set to "1", the Read Prefetch from CardBus to PCI will be enabled. The default after reset is "0".			
Misc Control	(82h-83h)	7	Serialized IRQ Enable
If this bit is set to "1", the serialized IRQ mode will be enabled and the functions of IRQn Pins will be changed. The default after reset is "0".			
Note: If the input of SIRQSEL pin is "H" level, the setting of this bit will be ignored.			
Misc Control	(82h-83h)	5	SR_PCI_INT_Disable
If this bit is set to "1", the PCI INT# will be output from INTA#, INTB# pins in instead of the SRIRQ# (IRQ9#) pin even in the serialized IRQ mode. The default after reset is "0".			
Misc Control	(82h-83h)	4	SR_PCI_INT_SELECT
If this bit is set to "1", PCI INT# will be output from INTC# and INTD# timing instead of INTA# and INTB# timing in the serialized IRQ mode. The default after reset is "0".			
Misc Control	(82h-83h)	10	5V Disable
If this bit is set to "1", 5V input to the PC Card will be disabled for the 3.3V/5V PC Cards. The default after reset is "0".			
Misc Control	(82h-83h)	11	LED Polarity
If this bit is set to "1", the polarity of LEDx# signals will be switched (High-Active). The default after reset is "0".			
16bit Interface Control	(84h-85h)	3	Legacy Index Range
By operating bit 3, the range of "PCIC compatible index" will be switched.			
	Value	Slot A	Slot B
	0	00h-3Fh	40h-7Fh
	1	80h-BFh	C0h-FFh
The default after reset is "0".			
16bit Interface Control	(84h-85h)	8	16-bit I/O Enhance Timing
If this bit is set to "1", together with setting bit 7 (I/O win1 Enhance Timing) and bit 3 (I/O win0 Enhanced Timing) of "I/O Control Register" (807h) in the "16-bit Socket/Control Register"s, configurations of "16-bit I/O Timing 0" (88h-89h) will be valid. (This bit is the Global bit.) The default after reset is "0".			
16bit Interface Control	(84h-85h)	9	16-bit Memory Enhance Timing
If this bit is set to "1", together with setting bit 7 and 6 (MemEnhanceTiming) of "System Memory Address 0-4 Mapping Stop High Byte" registers (813h, 81Bh, 823h, 82Bh, 833h) in the "16-bit Socket/Control Registers", the configurations of "16-bit Memory Timing 0" (8Ah-8Bh) will be valid. The default after reset is "0".			

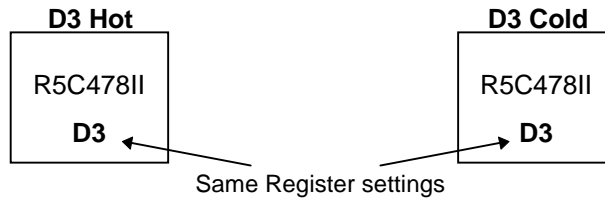
PCI Config. Registers	(offset)	Bit	Bit Name
Misc Control 2	(A0h-A1h)	1	CSTSCHG Input Enable
If this bit is set to "1", CSTSCHG input signal is enabled and WOL (Wake On LAN) is supported even if VCC_SLOT power is off. The default after reset is "0".			
Misc Control 2	(A0h-A1h)	2	RI_OUT# Select
If this bit is set to "1", the PME# pin is enabled to work as RI_OUT# ONLY on the D0 mode. However, if PME_En bit* is set to one, PME# pin works as PME# even in the D0 mode. The default after reset is "0"			
* bit 8 of "Power Management Control/Status register (E0h of PCI Config. Registers)			
Misc Control 2	(A0h-A1h)	6	CINT-ISA Disable
If this bit is set to "1", CINT# will not be output to ISA interrupt signal in spite of the setting of the IREQ-ISA Enable bit*. The default after reset is "0"			
* bit 7 of "Bridge Control register (3Eh of PCI Config. Registers)			
Misc Control 2	(A0h-A1h)	7	CSC to INT# Disable
On the default, the 16bit status Change interrupt signal is output to either INTA# or INTB#. If this bit is set to "1", it is output to ISA interrupt signal ONLY. The default after reset is "0"			
Misc Control 2	(A0h-A1h)	10	ZV Port Enable
If this bit is set to "1", the ZV Port will be enabled. This bit works same as the ZV Port Enable bit of the Misc Control 1 (82Fh) in the 16bit Socket Status/Control Registers (ExCA registers). If either one is set to "1", ZV Port will be enabled. The default after reset is "0"			
Misc Control 3	(A2h-A3h)	0	5V Read Enable
If this bit is set to "1", when 3V/5V PC Card is inserted, both of the "3V Card" bit* and "5V Card" bit** will be set to "1". The default after reset is "0".			
* bit11 of Socket Present State register (008-00Bh of 32bit Socket Status/Control Registers)			
** bit10 of Socket Present State register (008-00Bh of 32bit Socket Status/Control Registers)			
Note: If this bit is set to "1", "5V Card" bit will be set to "1", when 3V PC Card is inserted.			
Misc Control 3	(A2h-A3h)	3	SPKROUT# Hi-Z Enable
If this bit is set to "1", SPKROUT# output is forced to be Hi-Z on Hardware Suspend mode. The default after reset is "0".			
Writable Subsystem Vendor ID	(C0-C1h)	ALL	-
The value written in this register will be shadowed to the "Subsystem Vendor ID" register (40-41h of PCI Config. Registers). The "Subsystem ID Write Enable" bit is NOT necessary to be set to "1".			
Writable System Vendor ID	(C2-C3h)	ALL	-
The value written in this register will be shadowed to the "Subsystem ID" register (42-43h of PCI Config. Registers). The "Subsystem ID Write Enable" bit is NOT necessary to be set to "1".			

4.4 Power Management

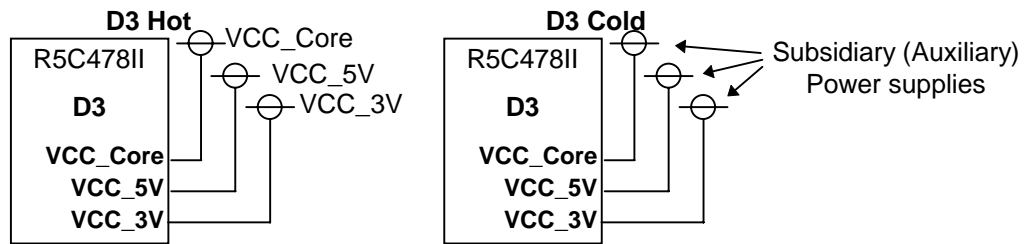
1. It is the Vcc_Core, Vcc_5V, Vcc_3V that the Power Supply Pins which need to be connect with subsidiary (auxiliary) power supply in D3 Cold Status.



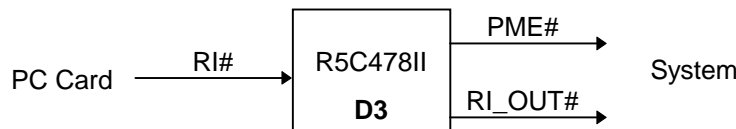
2. There is no difference between D3-Hot and D3-Cold regarding R5C478II.



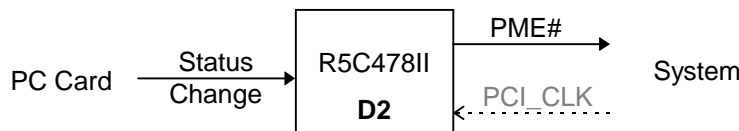
3. We express that "D3cold" is the status that power supplies are switched to the subsidiary (auxiliary) power supply in the D3hot.



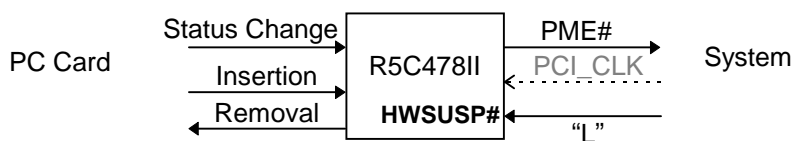
4. When RI# signal is input to the R5C478II in D3 status, both PME# and RI_OUT# will be asserted.



5. In the D2 status, only in case of receiving the Status Change Event from PC Cards and in case of the event of the Insertion/Removal of the PC Card, PME# can be asserted without PCI_CLK

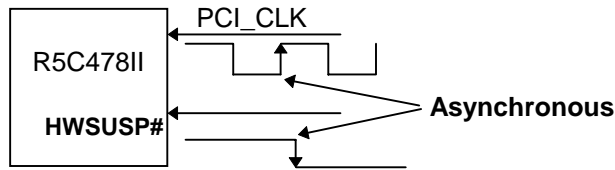


6. In the hardware suspend mode, if the Status Change Event from PC Cards or the event of the Insertion/Removal of the PC Card occurs, PME# can be asserted.

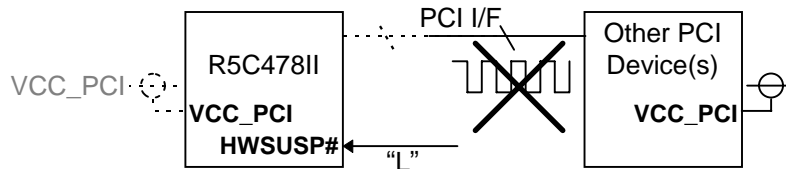


However, PME# asserting by other events in suspend mode requires PCI_CLK.

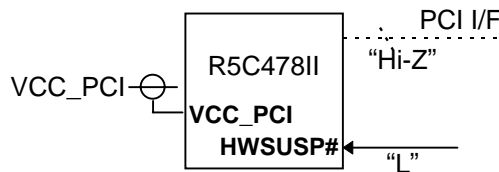
7. HWSUSP# asserting does not require synchronizing with PCI_CLK.



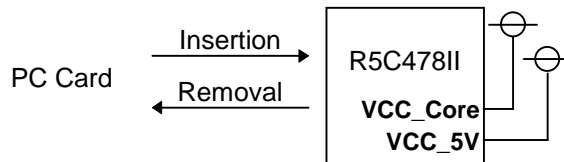
8. PCI signals of other PCI devices should not keep active when VCC_PCI of R5C478II is turned off in hardware suspend mode.



9. When Vcc_PCI is supplied in hardware suspend, R5C478II signals to PCI-Bus Interface maintain output Hi-Z.



10. It requires the power supply to Vcc_Core and Vcc_5V, to use the function that detects the PC Card insertion during the suspend mode.



11. There are no bit to set CLKRUN# enabled/disabled. CLKRUN# is always enable.
12. If the system indicates to halt clock with CLKRUN# protocol, R5C478II will halt the C_CLK output, even if the PC Card does not support CLKRUN#.
- If the pull-down resistor is applied for the CCLKRUN# signal, R5C478II will not halt the C_CLK output.

5 MISCELLANEOUS NOTES**[ZV Card]**

1. The socket/card services of Microsoft Windows95 do not support ZV Port Enable Bit (Bit #3 of 16-Bit Socket Status Control Register offset (82Fh)).
Each driver of ZV-Card have to support it.
Following ZV-Cards support our controller in Windows95

SONY: Video Capture Card / Digital Camera Card
FujiFilm(Margi): RI7001

NOTE: The socket/card services of 3rd party Phoenix or SystemSoft support ZV-Port Cards.

[Subsystem ID and Subsystem Vendor ID]

2. R5C478II supports Subsystem ID and Subsystem Vendor ID. And there are the following 2 ways to set the data for these registers.
 - A. If the "Subsystem ID Write Enable Bit"* is set, writing into "Subsystem Vendor ID" (40-41h of PCI Config. Registers) and "Subsystem ID" registers (42-43h of PCI Config. Registers) will be available through BIOS.
 - B. The value written in the "Writable Subsystem Vendor ID" register (C0-C1h of PCI Config. Registers) will be shadowed to the "Subsystem Vendor ID" register
Also, The value written in the "Writable System ID" register (C2-C3h of PCI Config. Registers) will be shadowed to the "Subsystem ID" register.

* bit 6 of Misc Control Register (82-83h of PCI Config. Registers)

[SRAM Card]

3. If SRAM PC Card do not work normally on Windows 95, add these lines below into Config.sys.
Also some versions of virtual drivers such as PCCARD.VXD, CBSS.VXD, PCI.VXD may take long time to recognize SRAM Card.

```
device=c:\windows\system\csmapper.sys
device=c:\windows\system\carddrv.exe /slot=2
```

[Flash Memory Card] (NOT ATA Flash Memory Card)

4. No Flash Memory PC Cards is supported by native socket/card services on Windows 95.
5. When Flash Memory PC Cards are used on Windows 95, the drivers and formatters which are released from PC Card makers are required. The 3rd party products such as Phoenix or SystemSoft socket/card services include these drivers and/or formatters
6. On the Windows 95 OSR2, if you install the "TrueFFS" which is included in the Windows 95 OSR2 CD-ROM, you can use the Flash Memory PC Card of "Intel Series 2" compatibles.
To install the TrueFFS, apply the right click and select "Install (I) ..." for the "TRUEFFS.INF".
The "TRUEFFS.INF" is placed in **x:\DRIVERS\STORDD\TRUEFFS** (x: is the drive letter of CD-ROM) directory of Windows95 OSR2 CD-ROM.
7. On the Windows 98, if you install the "TrueFFS" which is included in the Windows 98 CD-ROM, you can use the Flash Memory PC Card of "Intel Series 2" compatibles.
To install the TrueFFS, apply the right click and select "Install (I)" for the "TRUEFFS.INF".
The "TRUEFFS.INF" is placed in **x:\DRIVERS\STORAGE\FTL** (x: is the drive letter of CD-ROM) directory of Windows98 CD-ROM.

[Modem Card]

8. If Modem PC Cards do not work properly on Windows95, disable the [Turn off PC-Card modems when not in use] checkbox in the [PC-Card Modems] sheet of [Control Panel]-[Power] properties.
Because some modems do not work properly if this power management function is enabled.

[DEC 21143 compatible CardBus LAN Card]

9. In case of the CardBus Card with the DEC 21143 PCI/CardBus 10/100Mbps Ethernet Controller, the CardBus Card does not work properly depending on the driver configuration. Confirm these configurations below.
Enable the "Value" of "Store And Forward" in the [Advanced] sheet of [Control Panel]-[Network]-[Configuration]-[applied LAN adapter]

[System considerations]

10. RI_OUT#,AVCC5EN#,BVCC5EN#,AVCC3EN#,BVCC3EN#,AVPPEN0,BVPPEN0,AVPPEN1 and BVPPEN1 signals do not turn to Hi-Z. Namely, these are always "High" or "Low". When PCI Reset is applied or when the HWSUSP# is asserted and "SPKROUT# Hi-Z Enable" bit* is set, SPKROUT# turns to Hi-Z.

* bit 3 of the Misc Control 3 Register (A2-A3h of PCI Config. Registers)
11. By applying the pull-up register for the SIRQSEL pin, Register Setting of R5C478II will be ignored and it remains Serial IRQ Mode. And by applying the pull-down to the SIRQSEL validates the "Serialized IRQ Enable" bit of Misc Control Registers (82h-83h) in the PCI Configuration Registers.
12. Regarding hardware suspend which the system uses the serialized IRQ, HWSUSP# is to be asserted after disabling serial IRQ setting of the Core logic Chipset.
13. There is no problem to access(Read/Write) into reserved registers.
14. While system power is OFF, power of the equipment connected with inserted cards should be also turned off.

6 APPENDIX**6.1 RB5C478II Evaluation Board Circuit Diagram & User's Manual**

- 1 Some PC Card may require the pull-up resistor for the WP/CCLKRUN# signals (Both A and B slots) of PC Card Interface for some operating systems.
(We have never seen the PC Card which requires the pull-up resistor for this pin)

- 2 Some PC Card may require the pull-up resistor for the RESET/CRST# signals (Both A and B slots) of PC Card Interface for some operating systems such as Windows NT 4.0.

6.2 Driver Installation for R5C478II CardBus Controller on Windows 95 OSR1 (Retail)

This section describes how to setup for R5C478II on Windows 95 OSR1 (Retail).

[Abstract of OS boot-up procedure]

To evaluate the R5C478II on Windows95 (Retail or OSR1), the R5C478II have to be set as the legacy “**PCIC Compatible mode**” before booting the Windows95 OSR1.

If the PC can not change into this mode through BIOS POST, that can be accomplished with the driver provided by RICOH.

[Description of the procesure]

- 1) Install following driver into root directory of boot disk.

CFG478N1.EXE

* CFG478N1.EXE is the driver for the R5C478II.

- 2) Create or Edit “CONFIG.SYS” file and add below line.

DEVICE=C:¥CFG478N1.EXE

- 3) Restart the system.

- 4) Start the “Hardware Wizard” of Windows95 and detect the “PCIC or PCIC Compatible Controller” to install the driver.

6.3 Driver Installation for R5C478II CardBus Controller on Windows95 OSR2

[Abstract]

This section describes how to setup for R5C478II on Windows 95 OSR2.

The drivers for R5C478II CardBus Controller are included Windows95/OSR2.

[Description of the procedure]

In order to install evaluation board and to enable R5C478II CardBus Controller correctly, use the following procedure.

Install the Windows 95 OSR2 onto a clean machine

(**Note: Do not** put the RB5C478II evaluation board and ISA-IRQ board in it yet).

Make sure the **machine supports PCI BIOS 2.1**.

After installation of Windows 95 OSR2, open "Controll Panel" and select "System"Icon.

Select "Device manager "sheet on "System Properties"Dialogbox.

Expand the "System devices" class and double click "PCI bus".

- 3) Choose the "IRQ Steering" tab and make sure the "Use IRQ Steering" checkbox is checked.

Make sure IRQ steering is "**Enabled**" on the "IRQ Routing Status" text box

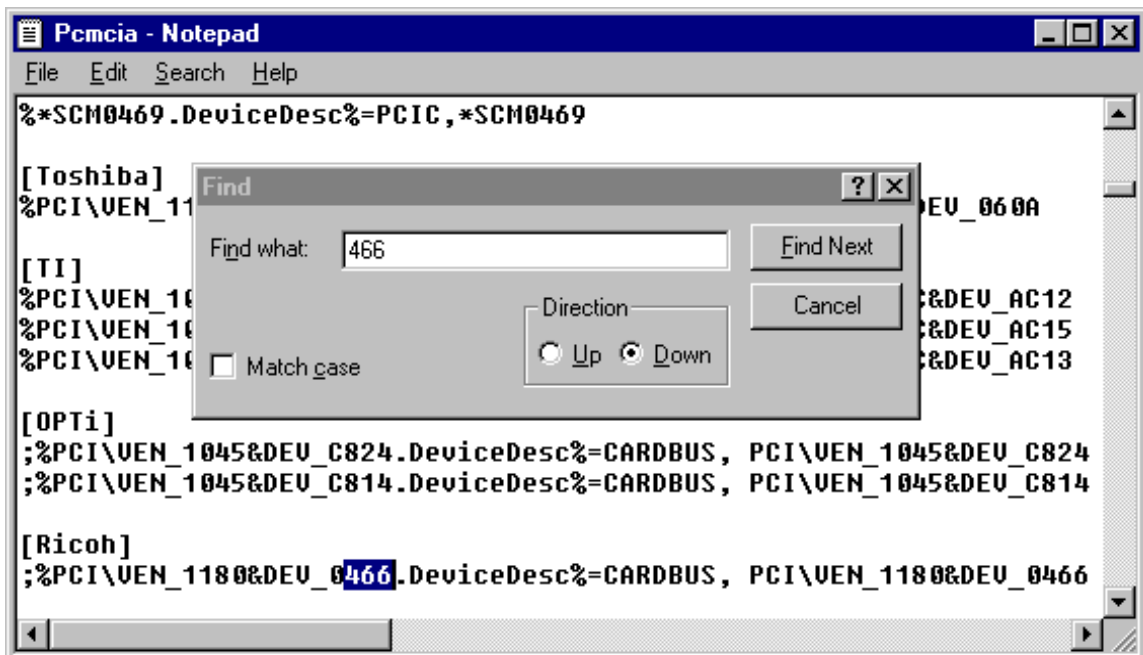
If it says disabled, also check the "Get IRQ table from PCI BIOS 2.1 call" checkbox.

Then click OK and exit device manager.

- 5) **Edit the "PCMCIA.INF" file** in the INF directory (%windows%\inf, %windows% is usually "C:\%windows"). Find the Ricoh product's lines in the "PCMCIA.INF" file:

[Ricoh]

;%PCI\VEN_1180&DEV_0466.DeviceDesc%=CARDBUS, PCI\VEN_1180&DEV_0466



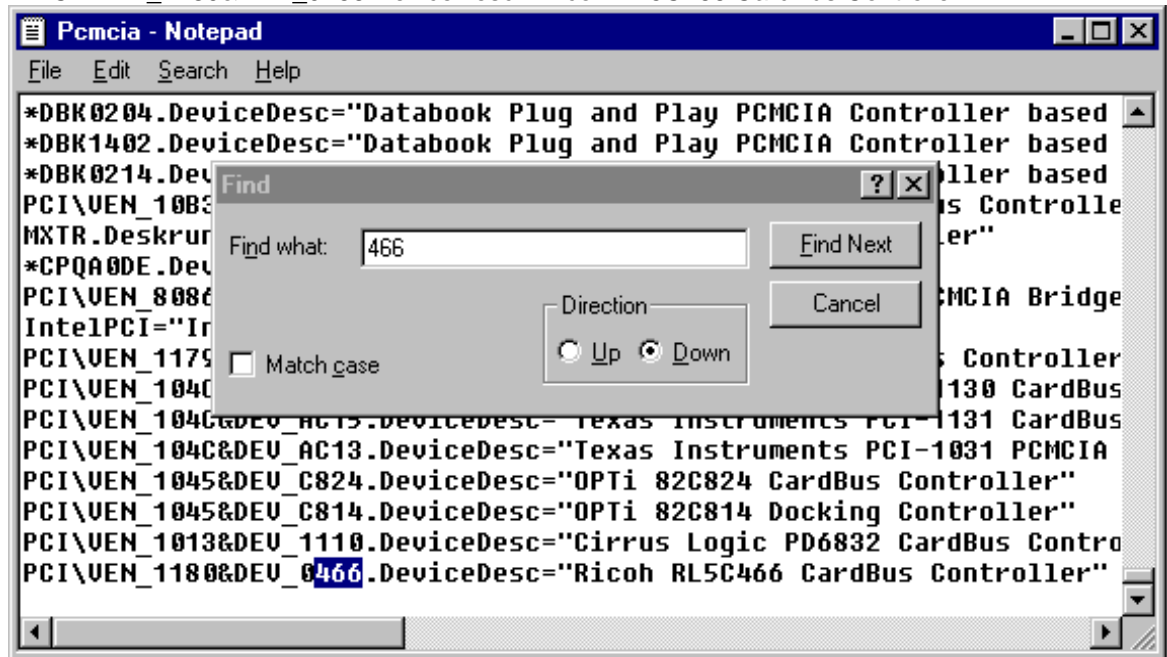
- 6) Remove the semi-colon in front. Change the strings from "0466" to "0478" as shown below.

[Ricoh]

_%PCI\VEN_1180&DEV_0478.DeviceDesc%=CARDBUS, PCI\VEN_1180&DEV_0478

- 7) Find another Ricoh product's lines in the "PCMCIA.INF" file:

```
PCI\VEN_1180&DEV_0466.DeviceDesc="Ricoh RL5C466 CardBus Controller"
```



Change the strings "0466" to "0478" and "RL5C466" to "R5C478II" like below.

Then, Ricoh R5C478II CardBus controller will be supported.

```
PCI\VEN_1180&DEV_0466.DeviceDesc="Ricoh RL5C466 CardBus Controller"
```

```
PCI\VEN_1180&DEV_0478.DeviceDesc="Ricoh R5C478II CardBus Controller"
```

- 9) Turn off the machine and install the evaluation board of R5C478II CardBus controller into the system.

Boot up the machine and Windows 95 OSR2 will announce "found new hardware" and will install the driver for the R5C478II CardBus controller.

- 11) Open "Control Panel" and select "System" icon.
Select "Device manager" sheet on "System Properties" Dialogbox.
- 12) Expand the PCMCIA class and make sure it has two instances of "Ricoh R5C478II CardBus controller".
- 13) Double click one of the instances and make sure the "**Disable in this hardware profile**" checkbox is unchecked. If not, uncheck the checkbox and click OK.
The PCMCIA wizard will come up, just click "Next", "Next".... "Finish". Then PCMCIA wizard will prompt you to reboot the system.
Choose "No" so that you can continue enabling the other instance of Ricoh R5C478II.

Double click the other instance of Ricoh R5C478II CardBus controller and do the same procedure as the above step except choosing "Yes" at the end to reboot the system.

- 15) After rebooting the machine, Ricoh R5C478II CardBus controller should be working.

[In case that R5C478II is not detected]

- 16) If you can not find the instances of the R5C478II CardBus controllers in the “12)”,
 - A. Open [Other Devices] in the [Device Manager]
 - B. If you **can** find the [PCI-CardBus Bridge] in the [Device Manager], please try “17)”.
The driver information of the Windows may have not been updated
 - C. If you **can not** find the [PCI-CardBus Bridge] in the [Device Manager], please confirm whether the evaluation board of R5C478II is correctly installed into the PCI expansion slot.

- 17) If you **can** find the [PCI-CardBus Bridge] in the [Device Manager],
 - A. Open the INF directory (%windir%\inf, %windir% is usually “C:\windows”) and delete the files as shown below,
Drvidx.bin
Drvdata.bin
 - B. Delete all of the following instances of the [Other devices] in the [Device Manager]
“PCI-CardBus Bridge”
 - C. Shutdown the system and Restart the Windows95 OSR2.
 - D. Start the procedure from “11)”

6.4 PCMCIA Driver Installation & Enabling for R5C478II on Windows NT 4.0

This document describes how to set R5C478II cardbus controller as the “**PCIC Compatible mode**” before Windows NT 4.0 OS boot. The Windows NT 4.0 has a socket driver only for the standard PCIC compatibles. Use these procedures below when installing the evaluation board into the Windows NT4.0 platform and enabling the R5C478II as PCIC compatible to test with the evaluation board.

[Abstract of OS boot-up procedure]

Typical Cardbus controllers have there legacy “PCIC Compatible mode”, where socket drivers can access ExCA registers through 0x3e0-0x3e1 I/O port. The Windows NT 4.0’s PCMCIA support uses only this mode. On the Laptop designs, this setting is typically done through BIOS POST.

However, on the Desktops, the BIOS can not set, because BIOS does not know whether the Cardbus controller exists or not. It is necessary to do special device setting before OS boot when testing the evaluation board on the Desktops.

For this purpose, at first you must boot the system through DOS with a real mode driver which set the R5C478II controller as the PCIC compatible mode, by using a boot floppy, and then reboot the system without BIOS POST, using INT19H system call. You must operate this proceure whenever booting up the system. Ricoh supplies a real mode driver, named “CFG478N1.EXE”, and a command “Reboot.com” for this purpose.

[Description of the procesure]

Here are the steps to enable PCMCIA support on Windows NT4.0:

Step A) Making DOS boot floppy for R5C478II setup:

- 1) Make a MS-DOS Boot floppy.
- 2) Make sure that these files below are included in the **root directory** of the floppy.

Debug.exe

Reboot.com

CFG478N1.EXE

- 3) Create or Edit “CONFIG.SYS” file and add the line as shown below.

DEVICE=A:¥CFG478N1.EXE

Step B) Booting Windows NT 4.0:

- 1) Booting the MS-DOS system with the floppy.
- 2) Type the command as shown below on the command line.
A:¥>DEBUG REBOOT.COM [Enter]
- 3) Remove the floppy from the drive.
- 4) Type the command as shown below on the debugger command line.
-g [Enter]
- 5) Then Windows NT boot process goes, and R5C478II controller should be working as PCIC compatibles.

Note a. “CFG478N1.EXE”

A real mode driver for setting R5C478II to “PCIC Compatible mode.”
This is used for Windows NT4.0 boot.

b. “Reboot.com”

A command for booting OS without BIOS POST process.
This is used for Windows NT4.0 boot.

c. “Debug.exe”

A application program what is included in Microsoft Windows 95 and 3.1X OS.

7 ERROR REPORT

Technical Support

If you have any technical questions or comments,

Please send E-Mail to: pccard@mserv2.redd.ricoh.co.jp

RICOH Company, Ltd.
Electronic Devices Division

■ Head Office

13-1, Himemurocho, Ikeda-shi, Osaka 563-8501 JAPAN

Phone: 0727(53)6003, Fax: 0727(53)2120

■ Yokohama Office

3-2-3, Shinyokohama, Kouhoku-ku, Yokohama-shi, Kanagawa 222-8530 JAPAN

Phone: 045(477)1703/1705, Fax: 045(477)1694

RICOH CORPORATION
Electronic Devices Division

■ San Jose Office

3001, Orchard Parkway San Jose, CA, 95134-2088 USA

Phone: 408(944)3303, Fax: 408(432)8375