R5C476II

PCI-CARDBUS BRIDGE

Application Note

REV.   1.00

RICOH

REVISION HISTORY

REVISION	DATE	COMMENTS
0.10	01/09/99	Prerelease 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

1   OVERVIEW

Overview

The R5C476II is a PC card controller offering a single chip solution as a bridge between PCI bus and CardBus. The R5C476II includes two PC Card 95/97 compliant sockets interface and a bridge function to the PCI bus of 33Mhz. The R5C476II 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 R5C476II'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.

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 R5C476II also allows direct connection to PCI bus.

R5C476II 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 R5C476II allows using 3.3V or 5.0V 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.
        - ✧ Write Enable bit, Writable User Define Registers, Serial EEPROM I/F 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 ^{TM}
   ✓ 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
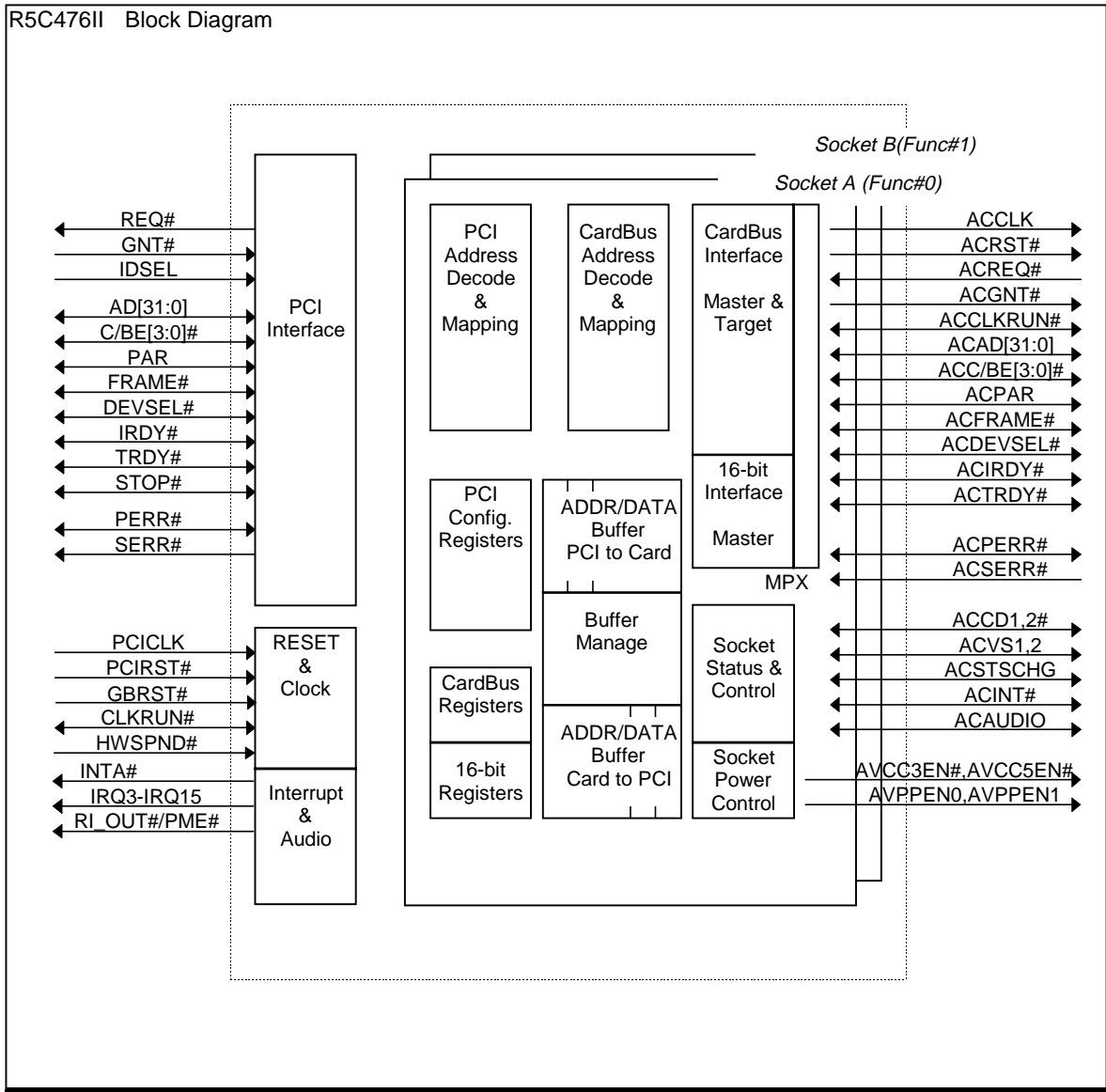 ✓ Bypass type ZV Port Buffer

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

■ GPIO support

■ 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
  ✓ 208pin   LQFP   t=1.7mm   Pitch = 0.5mm
  ✓ 216pin   LQFP   t=1.7mm   Pitch = 0.4mm
  ✓ 220pin   CSP

2   BLOCK DIAGRAM

R5C476II   Block Diagram

		Socket B(Func#1)
		Socket A (Func#0)

REQ#
GNT#
IDSEL

AD[31:0]
C/BE[3:0]#
PAR
FRAME#
DEVSEL#
IRDY#
TRDY#
STOP#
PERR#
SERR#

PCI Interface

PCI Address Decode & Mapping

CardBus Address Decode & Mapping

CardBus Interface

Master & Target

16-bit Interface

Master

MPX

ACCLK
ACRST#
ACREQ#
ACGNT#
ACCLKRUN#
ACAD[31:0]
ACC/BE[3:0]#
ACPAR
ACFRAME#
ACDEVSEL#
ACIRDY#
ACTRDY#

ACPERR#
ACSERR#

PCI Config. Registers

ADDR/DATA Buffer PCI to Card

Buffer Manage

CardBus Registers

ADDR/DATA Buffer Card to PCI

16-bit Registers

Socket Status & Control

Socket Power Control

ACCD1,2#
ACVS1,2
ACSTSCHG
ACINT#
ACAUDIO

AVCC3EN#,AVCC5EN#
AVPPEN0,AVPPEN1

PCICLK
PCIRST#
GBRST#
CLKRUN#
HWSPND#
INTA#
IRQ3-IRQ15
RI_OUT#/PME#
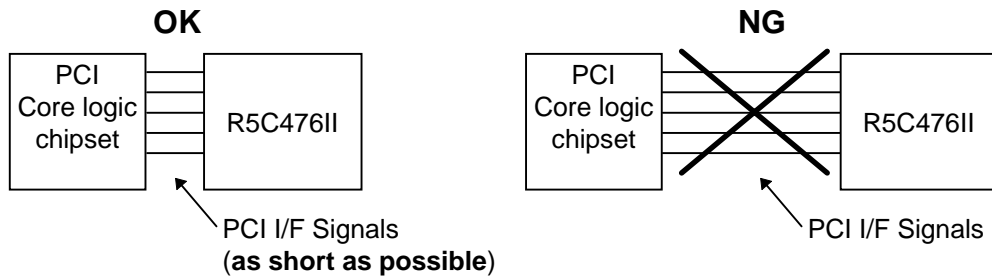
RESET & Clock

Interrupt & Audio

3   SYSTEM DESIGNING

3.1 Design Considerations

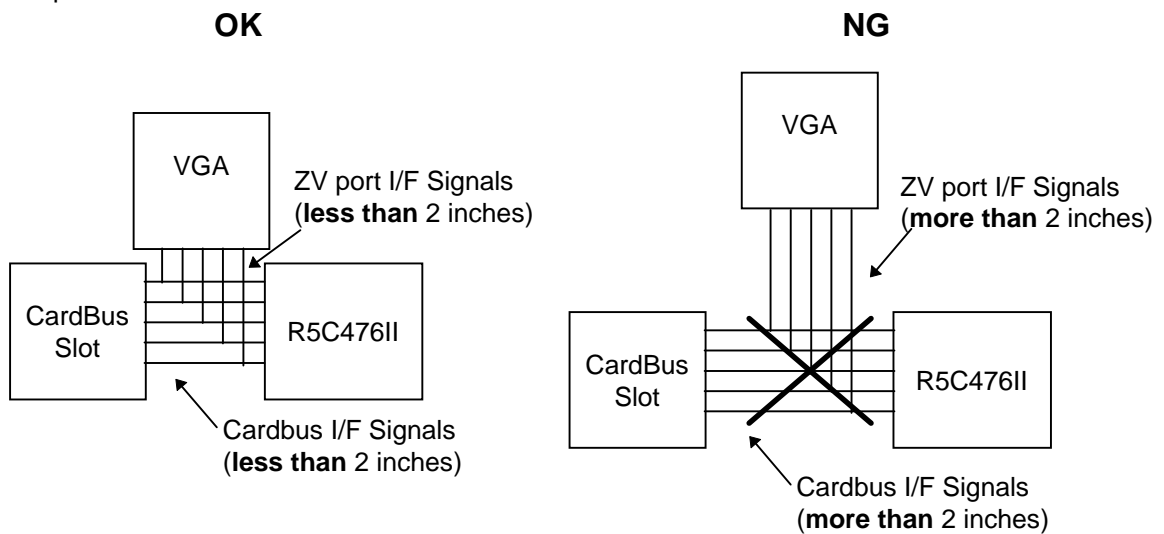Designing the circuit system with R5C476II, make sure to keep especially these instructions below.

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.

OK   **NG**

PCI Core logic chipset — R5C476II   PCI Core logic chipset — R5C476II

PCI I/F Signals
(**as short as possible**)   PCI I/F Signals

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.

OK   **NG**

VGA
ZV port I/F Signals
(**less than** 2 inches)

CardBus Slot — R5C476II

Cardbus I/F Signals
(**less than** 2 inches)

VGA
ZV port I/F Signals
(**more than** 2 inches)

CardBus Slot — R5C476II

Cardbus I/F Signals
(**more than** 2 inches)

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

3.   Apply the same PCI CLK input signal for R5C476II 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 R5C476II, apply the PCI CLK with minimal delay (**under 2ns**) compared with PCI CLK input to the PCI Core logic Chipset (Diagram below right)
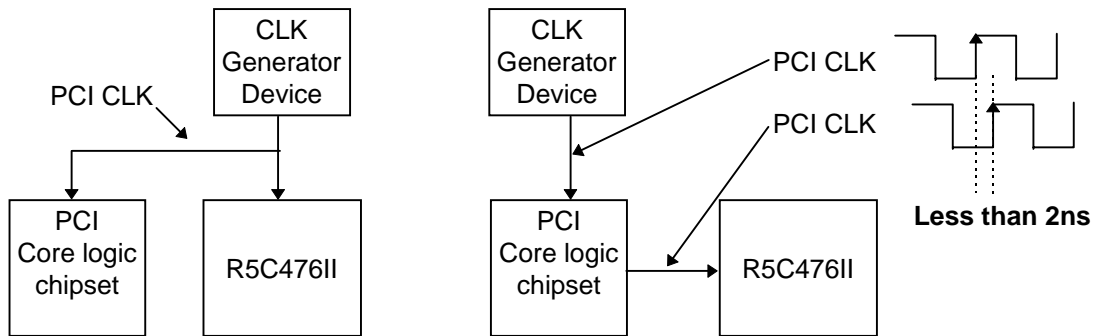

4.   Design the PCI CLK input for R5C476II to obey the AC characteristics in the specifications strictly.

5.   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.

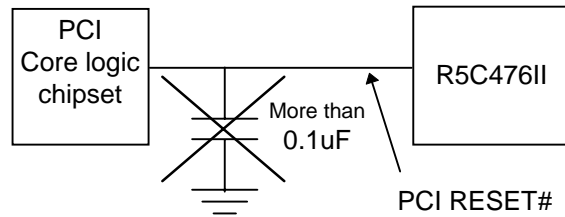|	208pin LQFP	216pin LQFP	220pin CSP		
ACADR16/ACCLK	152	158	TBO	<--->	CARD SLOT1, 19 pin (A16/CCLK)
BCADR16/BCCLK	14	14	TBO	<--->	CARD SLOT2, 19 pin (A16/CCLK)
PCICLK	55	57	TBO	<--->	PCIBUS SLOT, B16 pin (CLK)
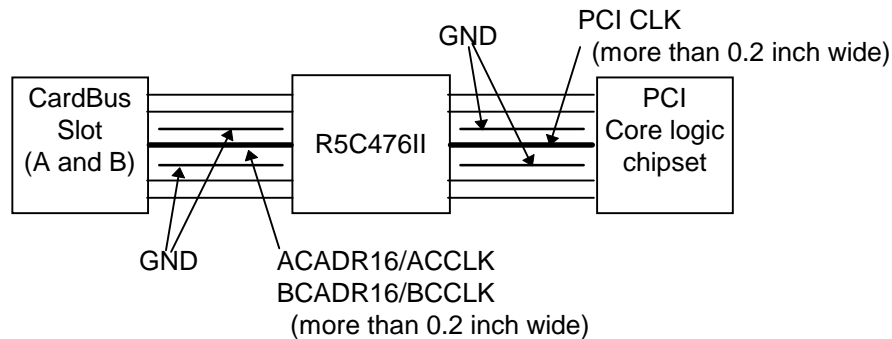
6.   Apply wide-width (more than 0.2 inch (0.5mm)) traces and wire as short as possible for these signals below.
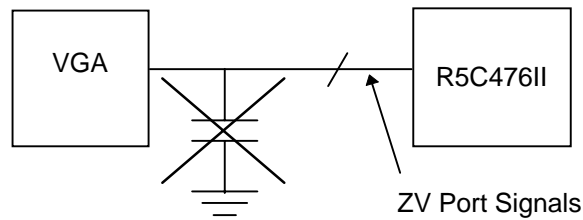
	208pin LQFP	216pin LQFP	220pin CSP		
ARESET/ACRST#	162	168	TBO	--->	CARD SLOT1, 58 pin (RESET/CRST#)
BRESET/BCRST#	191	198	TBO	<--->	CARD SLOT2, 58 pin (RESET/CRST#)
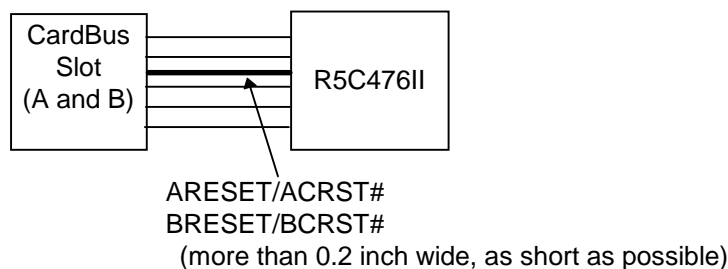
7. Avoid the to apply more than 0.1uF capacitance to **PCI Reset** signals for noise reduction.

```
┌──────────┐                      ┌──────────┐
│   PCI    │                      │          │
│Core logic│──────┬───────────────│ R5C476II │
│ chipset  │      │   More than    │          │
└──────────┘     ╳╳   0.1uF        └──────────┘
                  │        ╲
                 ═╧═        PCI RESET#
```

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

```
┌──────────┐                      ┌──────────┐
│          │                      │          │
│   VGA    │──────┬──────/────────│ R5C476II │
│          │     ╳╳       ╲       │          │
└──────────┘      │        ╲      └──────────┘
                 ═╧═        ZV Port Signals
```

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

**OK**                                          **NG**
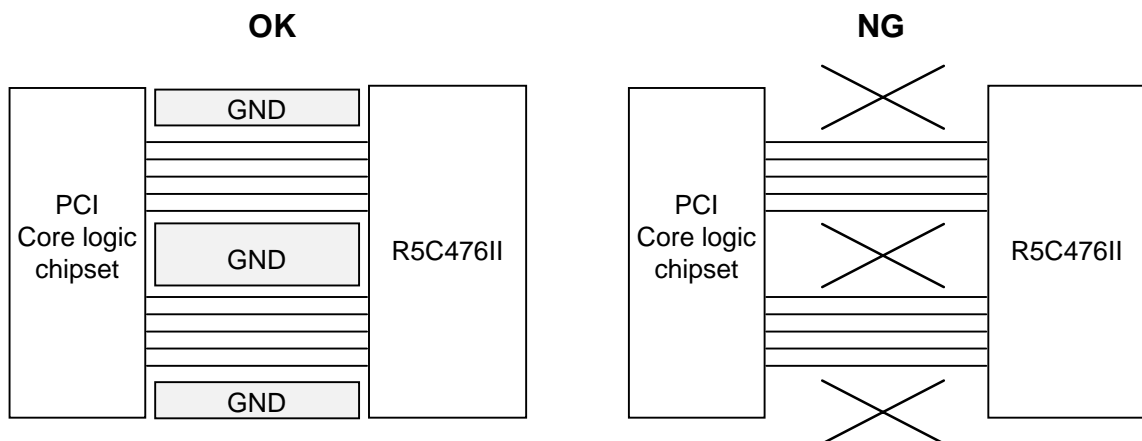


10. Available Power Supplies for VCCs of R5C476II.

| VCC of R5C476II | Available Power Supply |
|---|---|
| VCC_PCI | 3.3V |
| VCC_CORE | 2.5V . 3.3V |
| VCC_AUX | 3.3V |
| 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_PCI, VCC_SLOTx, VCC_AUX) 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_PCI, VCC_AUX) and GND as close as possible to wire shortly enough. (See the Diagram below)

13. Place the electolytic 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 R5C476II, 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 electolytic capacitors (47uF, approximately) between VCC_SLOTx pins of the Cardbus socket connector and GND pins.    (See the Diagram below)
    Also place the electolytic capacitors (100uF, approximately) between VCC_SLOTx pins of socket power controller (the power swithch) and GND pins as close as possible to wire shortly enough.   (See the Diagram below)
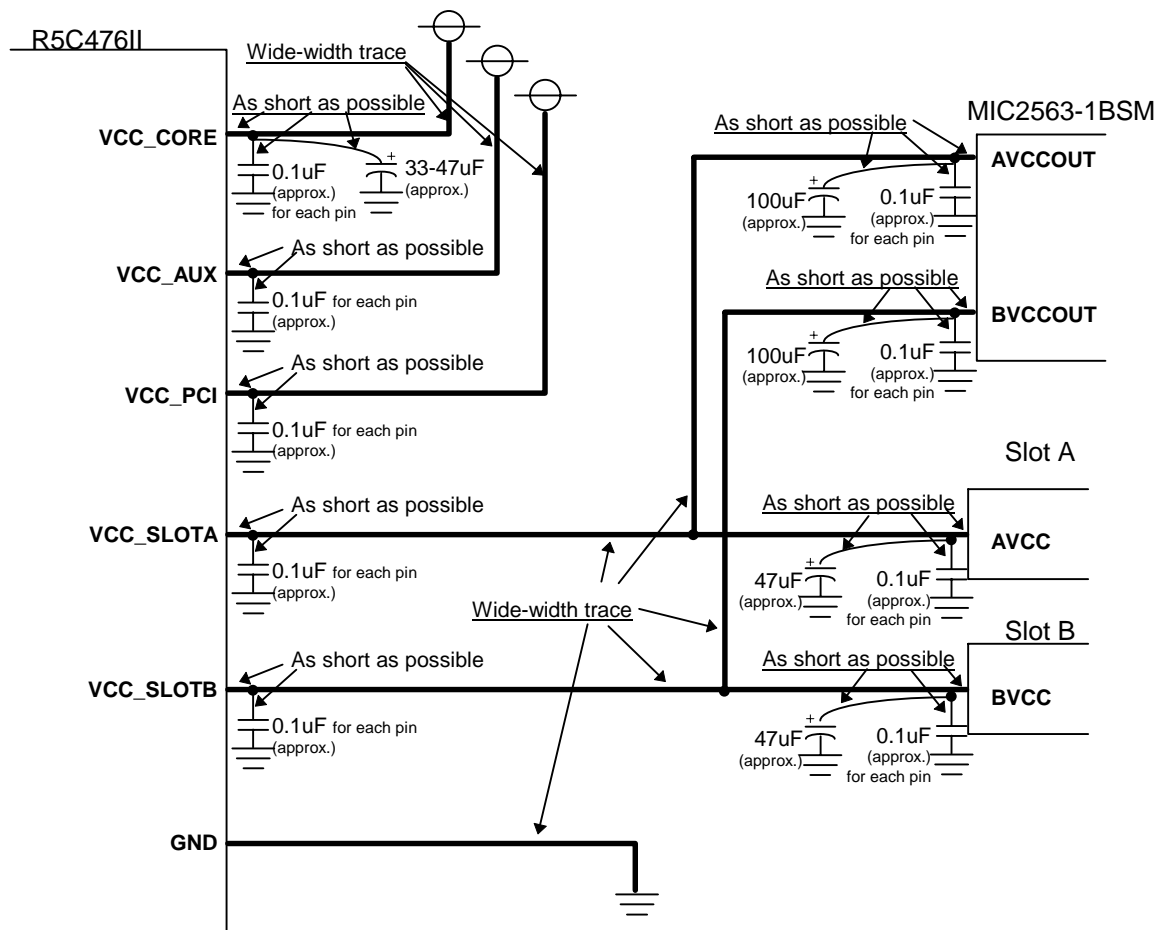
16. Prepare the pads of dumping resistors and/or Pull-Up/Pull-Down resistors for the control signals such as PCI CLK or CCLKs, when designing the evaluation board. (Recommended, they may be required to debug)
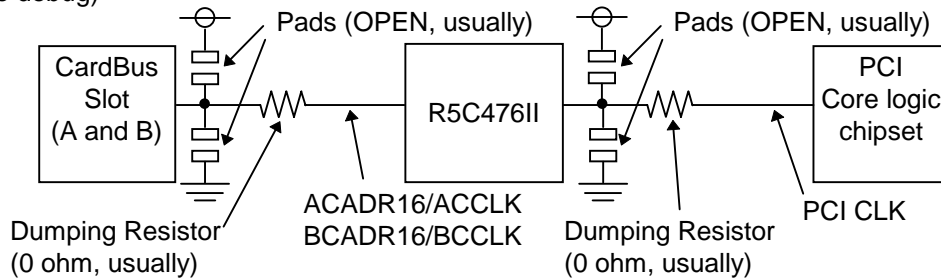


17. If the Serialized IRQ Mode is set, take care of the directions for use of and dealing with these pins below, since the functions of them will be changed.

**[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** resister that value is assigned from the drive ability (under 8mA) of R5C476II 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.

**[ZVENA#,B# (IRQ15,14)]**
   ZVENA# and ZVENB# are the output pins to control external buffers.

| 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 | -> | ZVENB# (OUT) |
| IRQ15 | -> | ZVENA# (OUT) |

(**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.
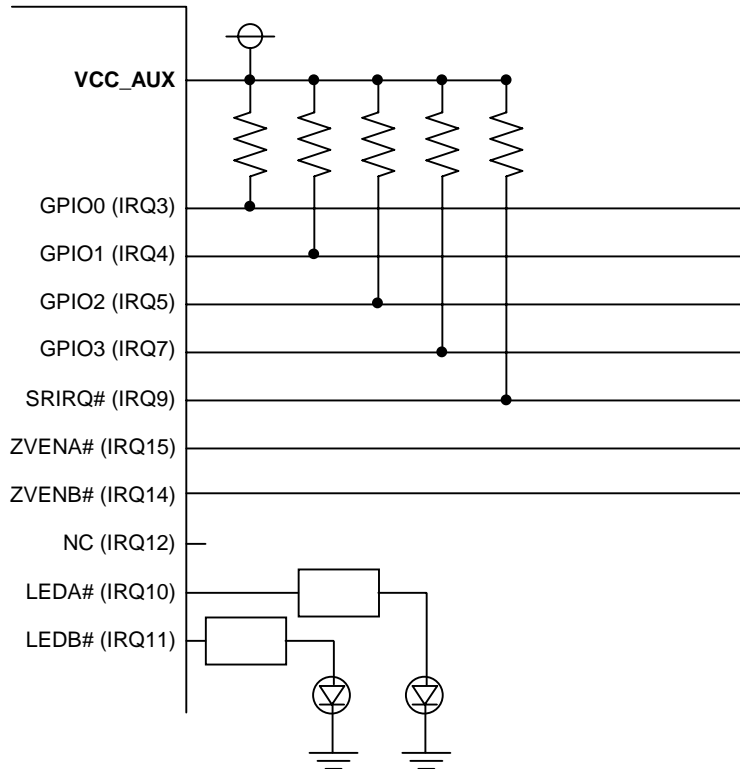


19.  In the Serialized IRQ mode, please design that the fall of the SRIRQ# will have **more than 5ns Hold time** for the raise of PCI_CLK which is input to the R5C476II.



**more than 5ns**
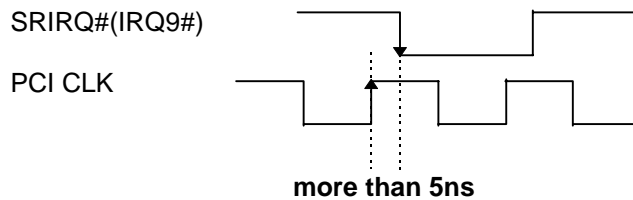
20.  Serialized IRQ selection Table
     The settings of the Serialize IRQ will effect the ISA IRQ#/PCI INT# as shown below.

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

21.  About SPKROUT Signal
     The example circuit of SPKROUT# to share the speaker with another speaker signal.
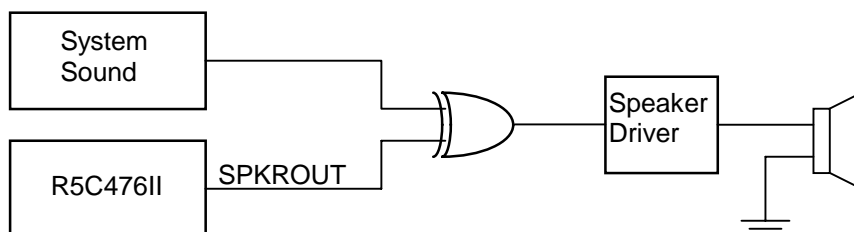
22.  About the socket power controller (the power switch).
     The connections of VCC 3.3V/5V Enable signals between R5C476II and the socket power controller (such as MICREL MIC2563-1BSM or MAXIM MAX1600) is shown as follows,
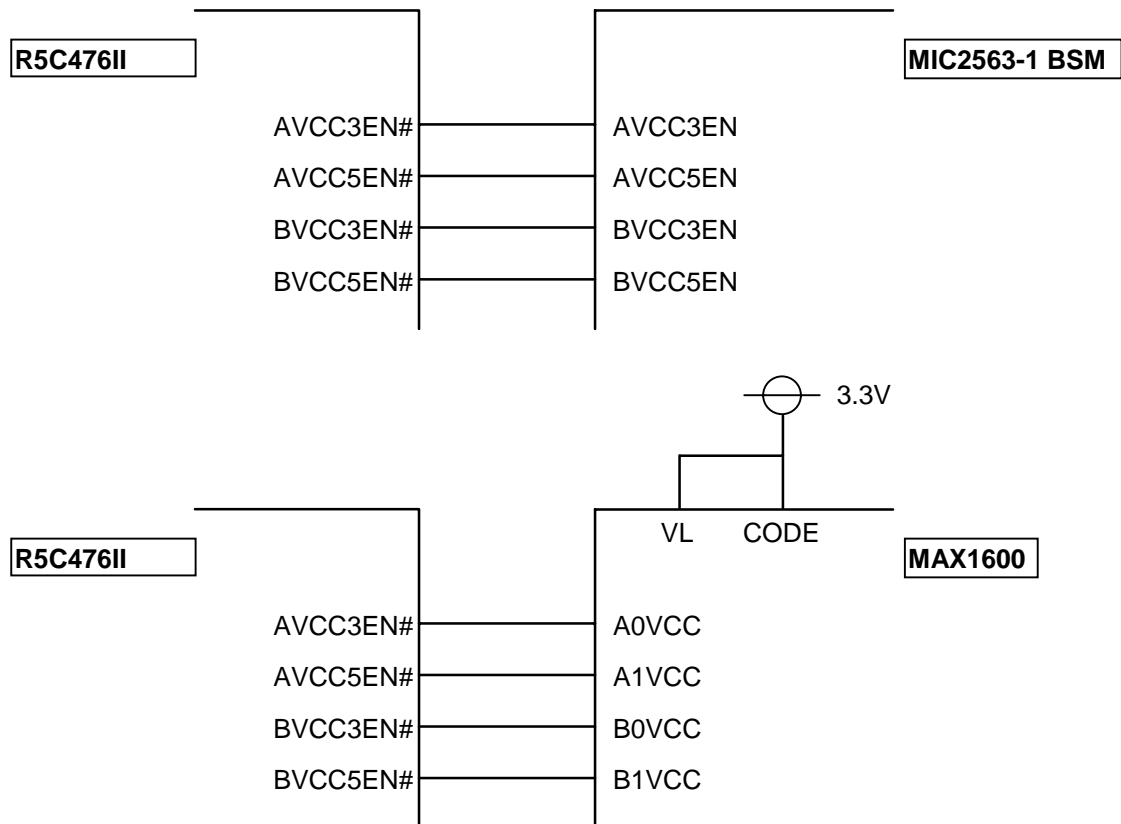


23.  About Power On / Power Off Sequences:
     Please keep these sequences below to power on and to power off

**Power ON:**
  1. Power on VCC_CORE
  2. Power on VCC_AUX
  3. Power on VCC_PCI

**Power OFF:**
  1. Power off VCC_PCI
  2. Power off VCC_AUX
  3. Power off VCC_CORE

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

25.  GBRST# (Global Reset)
     Apply the Power-on Reset for the GBRST#.

### 3.2 Reference circuit diagram (R5C476II evaluation board circuit diagram)

The circuit diagram of R5C476II 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.

(We have never seen the PC Card which requires the pull-up resistor for this pin)

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.

# R5C476II
## LQFP-208pin

IC1

RL5C476II

BA(25..0)
BD(15..0)
AA(25..0)
AD(15..0)
C/BE(3..0)
PAD(31..0)

VCCCORE_IN
VCCPCI_IN
VCCAUX_IN

R1 300 LED (G) D1
R2 300 LED (G) D2
R3 300 LED (G) D3

| Pin | Signal |
|---|---|
| 186 | GND |
| 151 | GND |
| 125 | GND |
| 87 | GND |
| 54 | GND |
| 13 | GND |
| 108 | HWSPND# |
| 52 | CLKRUN# |
| 107 | INTB# |
| 106 | INTA# |
| 97 | C/BE0# |
| 86 | C/BE1# |
| 77 | C/BE2# |
| 67 | C/BE3# |

#HWSPND#
CLKRUN#
INTB#
INTA#

CBE0
CBE1
CBE2
CBE3

CBE[3..0]

| Pin | Signal |
|---|---|
| 105 | AD0 |
| 104 | AD1 |
| 103 | AD2 |
| 102 | AD3 |
| 101 | AD4 |
| 100 | AD5 |
| 99 | AD6 |
| 98 | AD7 |
| 96 | AD8 |
| 95 | AD9 |
| 93 | AD10 |
| 92 | AD11 |
| 91 | AD12 |
| 90 | AD13 |
| 89 | AD14 |
| 88 | AD15 |
| 75 | AD16 |
| 74 | AD17 |
| 73 | AD18 |
| 72 | AD19 |
| 71 | AD20 |
| 70 | AD21 |
| 66 | AD22 |
| 65 | AD23 |
| 63 | AD24 |
| 62 | AD25 |
| 61 | AD26 |
| 60 | AD27 |
| 59 | AD28 |
| 58 | AD29 |
| 57 | AD30 |
| | AD31 |

PAD0 ... PAD31
PAD[31..0]

| Pin | Signal |
|---|---|
| 57 | REQ# |
| 56 | GNT# |
| 85 | PAR |
| 84 | SERR# |
| 83 | PERR# |
| 82 | STOP# |
| 81 | DEVSEL# |
| 80 | TRDY# |
| 79 | IRDY# |
| 78 | FRAME# |
| 68 | IDSEL |
| 53 | PCIRST# |
| 55 | PCICLK |

GBRESET#
RI_OUT#

| Pin | Signal |
|---|---|
| 32 | GBRESET# |
| 37 | RI_OUT# |
| 42 | IRQ3 |
| 43 | IRQ4 |
| 44 | IRQ5 |
| 45 | IRQ7 |
| 46 | IRQ9 |
| 47 | IRQ10 |
| 48 | IRQ11 |
| 49 | IRQ12 |
| 50 | IRQ14 |
| 51 | IRQ15 |

BVPPEN1
BVPPEN0
BVCC3EN#
BVCC5EN#

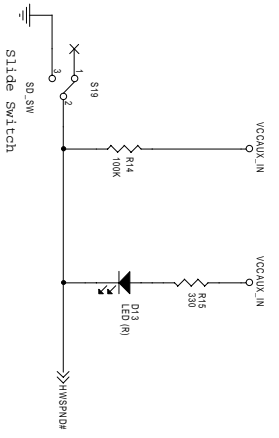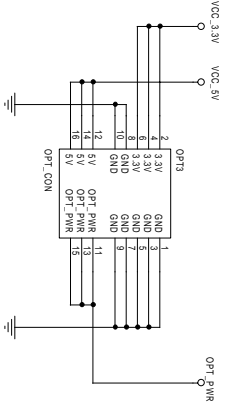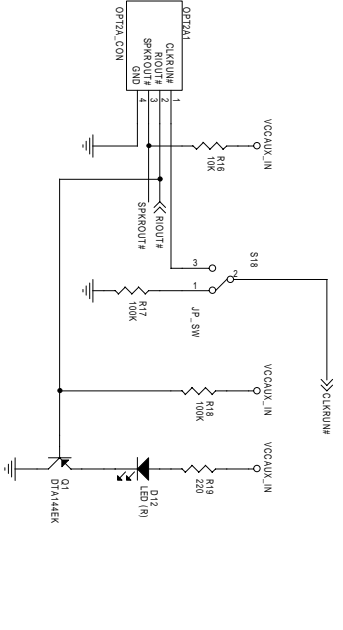| Pin | Signal |
|---|---|
| 33 | BVPPEN1 |
| 34 | BVPPEN0 |
| 35 | BVCC3EN# |
| 36 | BVCC5EN# |
| 8 | VCC_SLOTB |
| 194 | VCC_SLOTB |
| 113 | AUX |
| 64 | VCC_PCI |
| 94 | VCC_PCI |
| 31 | VCC_CORE |
| 178 | VCC_CORE |
| 138 | VCC_SLOTA |
| 160 | VCC_SLOTA |
| 109 | AVPPEN1 |
| 110 | AVPPEN0 |
| 111 | AVCC3EN# |
| 112 | AVCC5EN# |

BVCC_IN
VCCAUX_IN
VCCPCI_IN
VCCCORE_IN
AVCC_IN

GRESET#

VCCAUX_IN
R4 220K
C7 0.47UF
S6
RESET_SW

Not be Installed

# RICOH
## ricoh company,ltd

Title: R5C476II BOARD
Document Number: 5C476IIa
Size A3
Date: Tuesday, February 23, 1999
Rev B
Sheet of

C5 0.1UF  AVCC_IN
S4 JP_SW  AVCC / VCC_EXT4
C6 0.1UF  BVCC_IN
S5 JP_SW  BVCC / VCC_EXT5

+C47 47UF  C3 0.1UF  VCCPCI_IN
+C48 47UF  C4 0.1UF  VCCAUX_IN
+C1 47UF  C2 0.1UF  VCCCORE_IN

JP_5SW  S2_2  OPT_PWR VCC_3.3VAUX VCC_3.3V VCC_I/O VCC_3.3V VCC_EXT2
JP_4SW  S3_2  OPT_PWR VCC_3.3VAUX VCC_3.3V VCC_EXT3
JP_5SW  S1_2  OPT_PWR VCC_3.3VAUX VCC_2.5V VCC_3.3V VCC_EXT1

MIC 2563-1BSM  
IC3

MAX 1600  
(Not be installed)  
IC2

VCCAUX_IN  
R27 33K  
S7  
JP_SW  
R28 33K

C11 47UF  
C12 0.1UF  VCC_12V  
C13 0.1UF  5V_IN  
C14 0.1UF  3.3V_IN  
C8 0.1UF  5V_IN  
C9 0.1UF  3.3V_IN  
C10 0.1UF  VCC_12V

S8  
JP_SW  
BVCC  
AVCC  
AVPP

S9  
JP_SW  VCC_3.3V  VCC_EXT6  
3.3V_IN

S10  
JP_SW  VCC_5V  VCC_EXT7  
5V_IN

D10 UDZ3.3B  D6 LED (G)  R7 100  
D7 LED (R)  R8 300  AVCC  
D11 UDZ3.3B  D8 LED (G)  R9 100  
D9 LED (R)  R10 300  BVCC  
D4 LED (R)  R5 1K  AVPP  
D5 LED (R)  R6 1K  BVPP  

C19 100UF  C20 0.1UF  BVCC  
C21 10UF  C22 0.1UF  BVPP  
C15 100UF  C16 0.1UF  AVCC  
C17 10UF  C18 0.1UF  AVPP

AD[15..0]

AA[25..0]

AIORD#
AIOWR#
AOE#
AWE#
ACE2#
ACE1#
ARESET
AREG#
AWAIT#
ARDY
AWP
AVS2
AVS1
ABVD2#
ABVD1#
ACD2#
ACD1#
AINPACK#

AD0
AD1
AD2
AD3
AD4
AD5
AD6
AD7
AD8
AD9
AD10
AD11
AD12
AD13
AD14
AD15
AA0
AA1
AA2
AA3
AA4
AA5
AA6
AA7
AA8
AA9
AA10
AA11
AA12
AA13
AA14
AA15
AA16
AA17
AA18
AA19
AA20
AA21
AA22
AA23
AA24
AA25

C38 68PF
C39 68PF
C40 0.01UF

R 0

R21 47K
R22 100K

CARD_SLOT
SLOT1

VPP1
VPP2
VCC
VCC

GND
GND
GND
GND

C35 0.01UF
C36 47UF
C37 0.01UF

AVCC
AVPP

BD[15..0]

BA[25..0]

BIORD#
BIOWR#
BOCE#
BWE#
BCE1#
BCE2#
BREG#
BRESET
BWAIT#
BWP
BRDY
BBVD2
BBVD1
BVS2
BVS1
BCD2#
BCD1#
BINPACK#

BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7
BD8
BD9
BD10
BD11
BD12
BD13
BD14
BD15

BA0
BA1
BA2
BA3
BA4
BA5
BA6
BA7
BA8
BA9
BA10
BA11
BA12
BA13
BA14
BA15
BA16
BA17
BA18
BA19
BA20
BA21
BA22
BA23
BA24
BA25

R
0

R23
47K

R24
100K

C44
68PF
C45
68PF
C46
0.01UF

SLOT2

CARD_SLOT

56  A25
55  A24
54  A23
53  A22
50  A21
49  A20
48  A19
47  A18
46  A17
19  A16
20  A15
14  A14
13  A13
21  A12
8   A11
10  A10
9   A9
23  A8
22  A7
24  A6
25  A5
26  A4
27  A3
28  A2
29  A1
30  A0
45  IOWR#
44  IORD#
31  D0
32  D1
2   D2
3   D3
4   D4
5   D5
6   D6
7   D7
37  D8
38  D9
39  D10
66  D11
40  D12
41  D13
42  D14
43  D15
15  OE#
42  WE#
7   CE1#
61  CE2#
58  REG#
59  RESET
33  WAIT#
16  WP
62  READY
63  BVD2
57  BVD1
43  VS2#
67  VS1#
36  CD2#
60  CD1#
INPACK#

1   GND
34  GND
35  GND
68  GND

17  VCC
51  VCC
18  VPP1
52  VPP2

C41
0.01UF

+C42
47UF

C43
0.01UF

BVCC

BVPP

RICOH
ricoh company,ltd

Title
476IIa_SLOTB

Document Number
R6C476II BOARD

Size  A3
Date  Tuesday, February 23, 1999
Sheet    of
Rev  B

ZOOM VIDEO INTERFACE

ZOOM AUDIO INTERFACE

IRQ12
IRQ14

JP_1SW
S20
S21
JP_1SW

VCCAUX_IN
R25
10K
VCCAUX_IN
R26
10K

BR24C02
IC6
A0
A1
A2
SDA
SCL
VCC
TEST
GND

VCCAUX_IN

C49
0.1UF

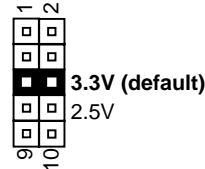AA[25..0]

AINPACK#
ABVD2
AWP

## 3.3  Users' Manual for R5C476II evaluation board

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

**S1**                    **R5C476II VCC_CORE Power Supply (default [5-6])**
Connect the power supply of R5C476II VCC_CORE (the power supply of core logic) with **2.5V** or **3.3V** power supply.
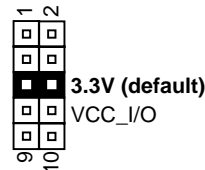
- 3.3V            **[5-6] (default)**
- 2.5V            [7-8]

**S2**                    **R5C476II VCC_PCI Power Supply (default [5-6])**
Connect the power supply of R5C476II VCC_PCI (the power supply of PCI I/F) with only **3.3V** power supply. (PCI I/F of R5C476II is the **5V tolerant**)
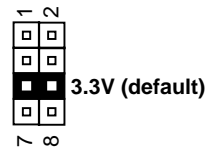
- VCC_3.3V       **[5-6] (default):** (You can choose VCC_3.3VP or 3.3V output of Voltage Regulator for the VCC_3.3V.   See **S11** for detail.)
- VCC_I/O        [7-8]: If the VCC_I/O of the PCI Slot is 3.3V, you can use [7-8]

**S3**                    **R5C476II VCC_AUX Power Supply (default [5-6])**
Connect the power supply of R5C476II VCC_AUX only with **3.3V** power supply.

- 3.3V            **[5-6](default)**

**S4**                    **R5C476II VCC _SLOTA Power Supply (default [1-2])**
Connect the power supply of R5C476II 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           **[1-2] (default)**

**S5**                    **R5C476II VCC _SLOTB Power Supply (default [1-2])**
Connect the power supply of R5C476II VCC_SLOTB (the power supply of A Slot) with the **VCCB** (the power supply of the B Slot of PC Card and comes from MIC2563 Power Control IC)

- VCCB           **[1-2] (default)**

**S6**                    **RESET Switch of Global Reset   [NOT Implemented]**
RESET Switch can be implemented to apply the Global Reset for the R5C476II manually.

■   **Not Implemented**


**S7**                    **Presence of external Serial ROM in the [IC6] socket (default [1-2])**
Set [1-2], if SROM is **not** installed in the [IC6] socket on the R5C476II evaluation board.
Set [2-3], if SROM is installed in the [IC6] socket on the R5C476II evaluation board.

No SROM (default) 1 ■■■□ 3  SROM Installed

■   No SROM          **[1-2] (default):**
■   SROM Installed    [2-3] : Please apply [1-2] short for the S20 and S21


**S8**                    **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 ■■■□ 3


**S9**                    **3.3V Power supply for Power Control IC (default [1-2])**
Set [1-2] to apply the 3.3V power supply for the Power Control IC ("MIC2563-1 BSM").

■   VCC_3.3V         **[1-2] (default):**               VCC_3.3V (default) 1 ■■■□ 3

**S10**                   **5.0V Power supply for Power Control IC (default [1-2])**
Set [1-2] to apply the 5.0V power supply for the Power Control IC ("MIC2563-1 BSM").

■   VCC_5V           **[1-2] (default):**    VCC_5V (default) — (vertical 1-3)


**S11**                   **VCC_3.3V Power Supply of the Evaluation board (default [1-2])**
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    **[1-2] (default):** 3.3V output from the 3.3V voltage regulator
■   VCC_3.3VP    [3-4]: 3.3V power supply from PCI Slot.

VREGURAT (default) 1 ■■■□ 3  VCC_3.3VP


**S12**                   **5.0V Power Supply of the 2.5V Voltage Regulator (default [1-2])**
Set [1-2] short for the **5.0V** power supply for the 2.5V voltage regulator (5.0V -> 2.5V) .

■   VCC_5V           **[1-2] (default):** 5.0V output from the 2.5V voltage regulator

VCC_5V (default) — (vertical 1-3)

**S13                           PME (Power Management Event) Output (default [OPEN])**

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 R5C476II will be routed to the system.

- ■   NC                      **[OPEN] (default)**
- ■   A19                     [1-2]:

PME# output   1 ▢▢ 2   A19 of PCI I/F
from R5C476II

**OPEN (default)**

**S14, S15                      Detection of Expansion Board (default [1-2])**

These jumpers are used for the detection of the expansion board of PCI bus. If these jumpers are open, PC system bypass the R5C476II Evaluation board.

- ■   PRSNT1,2B   **[1-2] (default):** Presence of the expansion board on the PCI Bus.

PRSNT1,2B (default)  1 ■■▢ 3

**S16                           Pull-UP Resistor for the Serialized IRQ   (default [OPEN])**

The default setting is the Parallel (Non-Serialized) IRQ mode and pull-up resistor for the IRQ9 (SRIRQ#) pin is not necessary.

Set [1-2] short if Serialized IRQ is used.

- ■   NC                             **[OPEN] (default)**
- ■   IRQ9 (SRIRQ#) Pull-up   [1-2]:

IRQ9
(SRIRQ#) —
of R5C476II

Pull-up Resistor for VCC_AUX

**OPEN (default)**
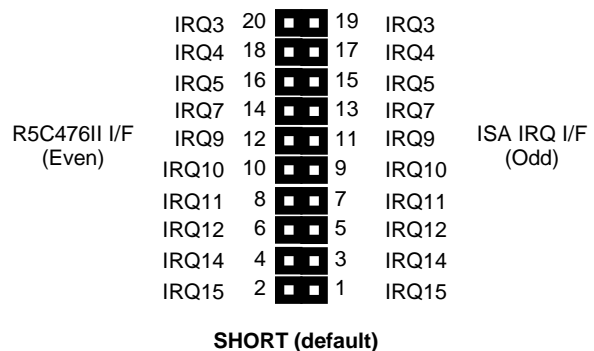
**S17                           Multi-Function IRQ (default [SHORT])**

The default setting is the Parallel (Non-Serial) IRQ mode, so set [SHORT] for all jumpers.

- ■   Parallel (Non-Serialized) IRQ mode:   **[1-2], [3-4], [5-6], [7-8], [9-10]**
                                          **[11-12], [13-14], [15-16], [17-18], [19-20] (default)**

If some function is applied for IRQx pin, apply [OPEN] for its jumper.
(You can apply the function for IRQx pin by the register setting of Misc. Control Register 4
 (A4h-A7h of PCI Configuration Registers).   See **4.3.3** for detail)

| R5C476II I/F (Even) | | | ISA IRQ I/F (Odd) |
|---|---|---|---|
| IRQ3 | 20 | 19 | IRQ3 |
| IRQ4 | 18 | 17 | IRQ4 |
| IRQ5 | 16 | 15 | IRQ5 |
| IRQ7 | 14 | 13 | IRQ7 |
| IRQ9 | 12 | 11 | IRQ9 |
| IRQ10 | 10 | 9 | IRQ10 |
| IRQ11 | 8 | 7 | IRQ11 |
| IRQ12 | 6 | 5 | IRQ12 |
| IRQ14 | 4 | 3 | IRQ14 |
| IRQ15 | 2 | 1 | IRQ15 |

**SHORT (default)**

**S18                           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

### S19                    Hardware Suspend Input (default [OPEN])

Slide Switch is implemented to apply the Hardware Suspend mode for the R5C476II manually.
To have the normal operation of the R5C476II, please apply the **switch to [OPEN]**.
(If the [OPEN] is selected, the pull-up will be applied for the HWSPND# of the R5C476II)

■ Hardware Suspend Disabled    **Switch to [OPEN] (default)**
■ Hardware Suspend Enabled     Switch to [GND]

OPEN    GND

**Switch to**
**OPEN**
**(default)**
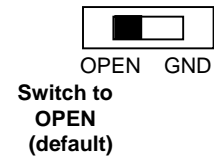
### S20,21                  SROM I/F (SDA=S20, SCL=S21)    (default [OPEN])

The default setting of SROM I/F is **open**.
If SROM is implemented for the [IC6] socket on the R5C476II evaluation board, please set [1-2]
short for both S20 and S21.

■ SROM not implemented    **[OPEN] (default)**
■ SROM implemented        [1-2]: Also, please apply [2-3] short of **S7**

SCL/SDA
of SROM

IRQ12/14
(SCL/SDA)
of R5C476II

**OPEN (default)**
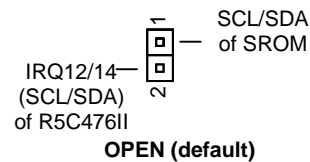
### 3.3.2 ISA-IRQ

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

**Please make sure to use the ISA_IRQ board** packed with R5C476II 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 |
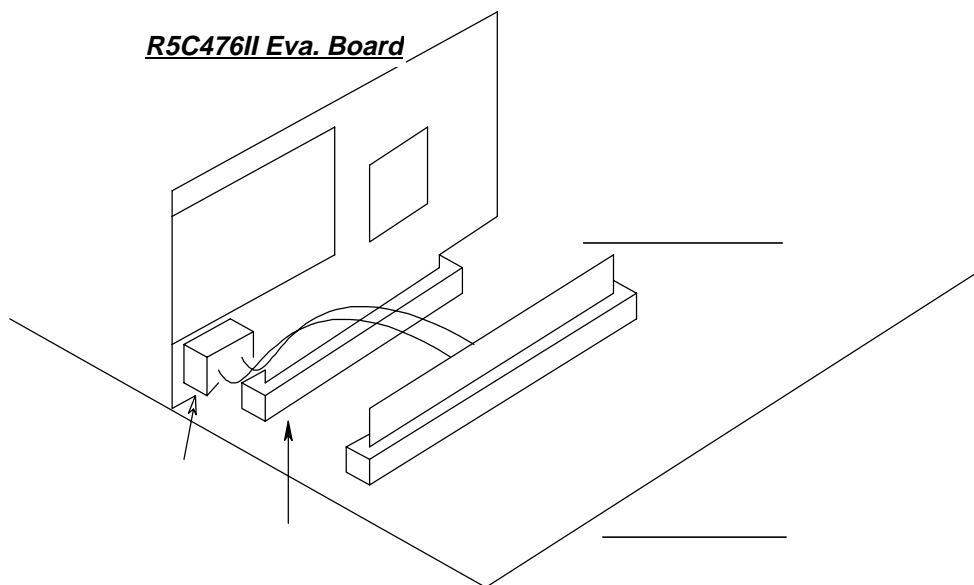


*R5C476II Eva. Board*

### 3.3.3   Zoomed Video Port

The R5C476II 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 R5C476II 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 | VCC_AUX | 10 | LEDOUT |
| 2 | RIOUT# | 5 | IRQ9 (SIRQ) | 8 | GND | 11 | GBRST# |
| 3 | SPKROUT | 6 | SPKROUT | 9 | VCC_PCI | 12 | VCC_CORE |

The R5C476II Evaluation board also has OPT3 connectors, but these connectors are not used.

### 3.3.5   R5C476II Evaluation board, Jumper & LED layout
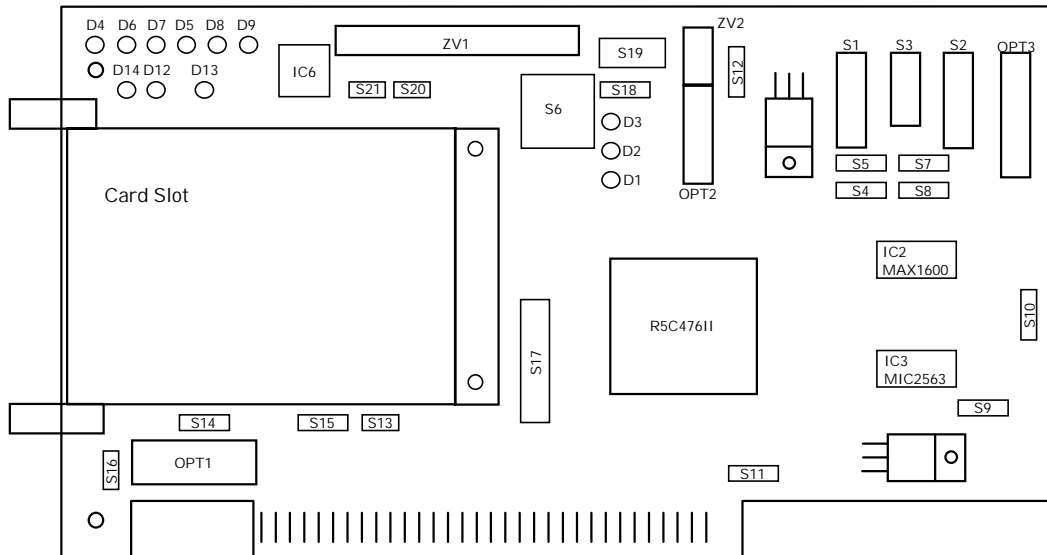


**Power On LED:**

R5C476II
- **D1**   Internal Core Logic (VCC_CORE): Power on
- **D2**   PCI I/F (VCC_PCI): Power on
- **D3**   Auxiliary Power (VCC_AUX): Power on

PC Card
- **D4**   SLOTA programmable (VPP of Slot A) power on
- **D5**   SLOTB programmable (VPP of Slot B) power on

| **D6** | **D7** | 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 |

| **D8** | **D9** | 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:**
- **D12**     RI_OUT#/ PME# Assertion of R5C476II
- **D13**     HWSPND# Assertion of R5C476II
- **D14**     LED_OUT Assertion of R5C476II

## 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, R5C476II 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, R5C476II 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.
R5C476II are supported by PCM Plus of Phoenix Technologies and CardWizard of SystemSoft

**[Windows 98]**
R5C476II is **fully supported** by Windows 98.

### 4.1.1   R5C476II   Installation

**[Windows 95 OSR1]**
R5C476II 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 R5C476II installation.

**[Windows NT 4.0]**
R5C476II 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)

**Note:** See. " **6. Appendix** " for detail of installation procedures of DOS/Win3.1x, Win95, WinNT.

## 4.2   3rd Party Driver Support

| | Phoenix | | | | SystemSoft | | | |
|---|---|---|---|---|---|---|---|---|
| | Windows 3.1 | Windows 95 | Windows 98 | Windows NT | Windows 3.1 | Windows 95 | Windows 98 | Windows NT |
| R5C476II | ○ *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 (IRQ-ISA Enable bit) | 0000h |
| 16-bit Legacy Mode Base Address | (44h-47h) | 000003E1h | 00000001h |

### 4.3.3 R5C476II 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)   **1**   **SPKROUT Enable**

If this bit is set to "1", HWSPND# pin can be used as SPKROUT#.

**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)　　　**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.   Namely if the CSC-IRQ* register is set as "0000"b, the interrupt will NOT be output.

The default after reset is "0"

\* bit 7-4 of Card Status Change Interrupt Configuration register (805h of 16bit Socket Status/Control Registers)

**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 2**　　　　(A0h-A1h)　　　**11,12**　　　**DREQ Enable**

If these bits are used to enable the DREQ input and to determine which pin is assigned as the DREQ pin.

Value:　　Status:
00　　　　DREQ disable
01　　　　INPACK# pin is assigned as DREQ
10　　　　WP/IOIS16# pin is assigned as DREQ
11　　　　BVD2/SPKR# pin is assigned as DREQ
The default after reset is "00"b.

**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".

**Misc Control 3**　　　　(A2h-A3h)　　　**15-5**　　　**Ricoh Purpose Register**

These are the test registers for internal use in RICOH.

Writing any values for these register is strictly prohibited.

(If these registers are not "0", R5C476II does not work properly)

| PCI Config. Registers | (offset) | Bit | Bit Name |
|---|---|---|---|

**Misc Control 4**          (A4h-A7h)          **ALL**          **Multi_IRQ[15,14,12,11,10,9,7,5,4,3]**

IRQx pins can be assigned as other funciton pins (such as GPIO, SPKROUT, LEDA/B#, ZVENA/B#. D3STATE)

The default after reset is "00000000"h.

| | Multi-IRQ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Value | 15 | 14 | 12 | 11 | 10 | 9 | 7 | 5 | 4 | 3 |
| bit | 29,28,27 | 26,25,24 | 23,22,21 | 20,19,18 | 17,16,15 | 14,13,12 | 11,10,9 | 8,7,6 | 5,4,3 | 2,1,0 |
| 000 | IRQ15 | IRQ14 | IRQ12 | IRQ11 | IRQ10 | IRQ9 | IRQ7 | IRQ5 | IRQ4 | IRQ3 |
| 000 (SIRQ) | ZVENA# | ZVENB# | - | LEDB# | LEDA# | SRIRQ# | GPIO3 | GPIO2 | GPIO1 | GPIO0 |
| 001 | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT | SPKR OUT |
| 010 | D3STATE | LEDA# | LEDA# | D3STATE | LEDA# | IRQ12 | IRQ14 | IRQ12 | D3STATE | IRQ12 |
| 011 | LEDA# | ZVENA# | ZVENA# | LEDA# | ZVENA# | ZVENA# | LEDA# | LEDA# | LEDA# | LEDA# |
| 100 | ZVENA# | IRQ4 | IRQ3 | ZVENA# | IRQ12 | LEDA# | ZVENA# | ZVENA# | ZVENA# | ZVENA# |
| 101 | LEDB# | LEDB# | LEDB# | LEDB# | IRQ15 | IRQ15 | LEDB# | LEDB# | LEDB# | LEDB# |
| 110 | ZVENB# | ZVENB# | ZVENB# | ZVENB# | LEDB# | LEDB# | ZVENB# | ZVENB# | ZVENB# | ZVENB# |
| 111 | IRQ5 | D3STATE | D3STATE | IRQ12 | ZVENB# | ZVENB# | GPIO3 | GPIO2 | GPIO1 | GPIO0 |

**General Purpose I/O 1**          (AAh)          **ALL**          **GPIO Direction [3:0], GPIO Data [3:0]**

IRQ3,4,5,7 can be used as the GPIO, if
   Serialized IRQ is enabled

or

   IRQ3,4,5,6 is assigned as the GPIO in the Misc Control 4 (as described above).
The definition of each bit is shown below.

| | bit7 | bit6 | bit5 | bit4 |
|---|---|---|---|---|
| GPIO direction<br>* bit=1: output,<br>* bit=0: input | GPIO3 | GPIO2 | GPIO1 | GPIO0 |

| | bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|
| GPIO Data | GPIO3 | GPIO2 | GPIO1 | GPIO0 |

The default after reset is "00"h.

**Writable Subsystem**          (C0-C1h)          **ALL**          -
   **Vendor ID**

The value written in this register will be shadowed to the "Subsystem Vendor ID" register (40-41h of PCI Config. Registers).
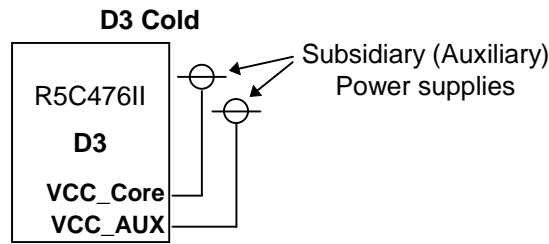The "Subsystem ID Write Enable" bit is NOT necessary to be set to "1".

**Writable System**          (C2-C3h)          **ALL**          -
   **Vendor ID**

The value written in this register will be shadowed to the "Subsystem ID" register (42-43h of PCI Config. Registers).
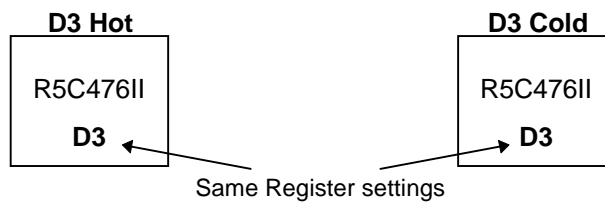The "Subsystem ID Write Enable" bit is NOT necessary to be set to "1".
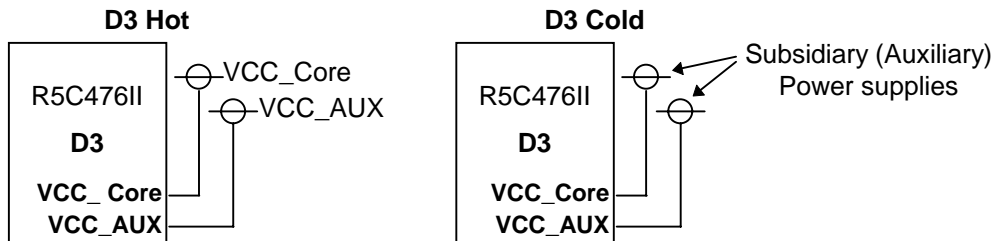
### *4.4 Power Management*

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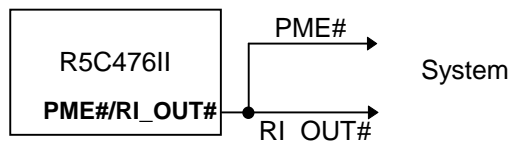
**D3 Cold**

```
┌──────────────┐      ⊖ ←── Subsidiary (Auxiliary)
│  R5C476II    │      ⊖ ←──     Power supplies
│              │
│     D3       │
│              │
│  VCC_Core ───┘
│  VCC_AUX ────┘
└──────────────┘
```

2. There is no difference between D3-Hot and D3-Cold regarding R5C476II.

D3 Hot   **D3 Cold**

```
┌──────────┐            ┌──────────┐
│ R5C476II │            │ R5C476II │
│          │            │          │
│   D3  ←──┼──┐      ┌──┼→  D3     │
└──────────┘  │      │  └──────────┘
```
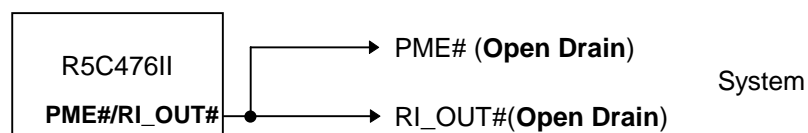Same Register settings

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

D3 Hot   **D3 Cold**

```
┌──────────┐   ⊖─VCC_Core        ┌──────────┐   ⊖ ←── Subsidiary (Auxiliary)
│ R5C476II │   ⊖─VCC_AUX         │ R5C476II │   ⊖ ←──    Power supplies
│   D3     │                     │   D3     │
│ VCC_Core─┘                     │ VCC_Core─┘
│ VCC_AUX──┘                     │ VCC_AUX──┘
└──────────┘                     └──────────┘
```

4. PME# and RI_OUT# signals are shared.

```
┌──────────────┐       PME#
│  R5C476II    │   ┌────────────→
│              │   │          System
│ PME#/RI_OUT#─┼───●
└──────────────┘   └────────────→
                      RI_OUT#
```
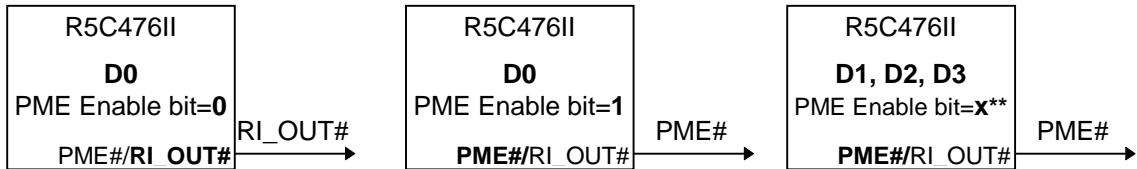
5. R5C476II output open-drain for both PME# and RI_OUT#, since PME# and RI_OUT# are shared, though PME# is open-drain output and RI_OUT# is H/L output basically.

```
┌──────────────┐   ┌────────→ PME# (**Open Drain**)
│  R5C476II    │   │                              System
│              │   │
│ PME#/RI_OUT#─┼───●────────→ RI_OUT#(**Open Drain**)
└──────────────┘
```

6. To Switch the function of PME# / RI_OUT#

> D0 (PME Enable bit* = 0):   RI_OUT#   (Left)
> D0 (PME Enable bit* = 1):   PME#   (Middle)
> D1 (PME Enable bit* = x**): PME#   (Right)
> D2 (PME Enable bit* = x**): PME#   (Right)
> D3 (PME Enable bit* = x**): PME#   (Right)

R5C476II	R5C476II	R5C476II
D0	**D0**	**D1, D2, D3**
PME Enable bit=**0**	PME Enable bit=**1**	PME Enable bit=**x****
PME#/**RI_OUT#** →RI_OUT#	**PME#**/RI_OUT# →PME#	**PME#**/RI_OUT# →PME#

> *   bit 8 of Power Management Control/Status register (E0-E2h) of PCI Config. Registers.
> ** PME Enable bit must be set ("1") to assert the PME#

7. PME# signal will keep asserting, when "PME Status"* bit is set ("1") and until "PME Status"* bit will be cleared ("0").

R5C476II	PME Status bit* Set (1) Clear (0)
PME#/RI_OUT# →PME#	
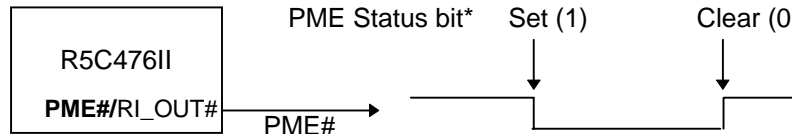
> * bit 15 of Power Management Control/Status register (E0-E2h) of PCI Config. Registers.

8. PME Status bit will be set, when
   **RI_OUT# is asserted internally**
    or
    Event (STSCHG) such as Insertion/Removal is detected.
    So, to assert the PME#, the register settings are required such as to output RI_OUT# or to detect the STSCHG event.

9. Regarding the RI(CSTSCHG) and Card Insertion/Removal, PME# can be asserted without PCI_CLK.

> PC Card   RI/ CSTSCHG →   R5C476II   → PME#   System
>   Insertion →
>   ← Removal   PCI_CLK
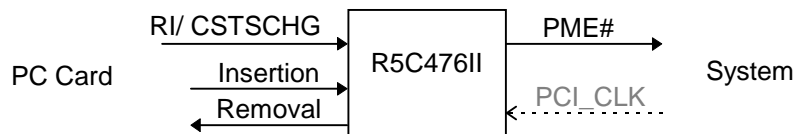
10. In the hardware suspend mode, if the Status Change Event from PC Cards or the event of the Insertion/Removal of the PC Card occurs, PME# can be asserted.

> PC Card   Status Change →   R5C476II   → PME#   System
>   Insertion →   PCI_CLK
>   ← Removal   **HWSPND#** ← "L"
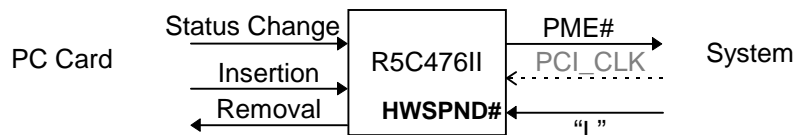
However, PME# asserting by other events in suspend mode requires   PCI_CLK.

11. HWSPND# asserting does not require synchronizing with PCI_CLK.
    However, in case that Serialized IRQ is used, after disabling the Serial IRQ of core logic chipset, assert the HWSPND#.
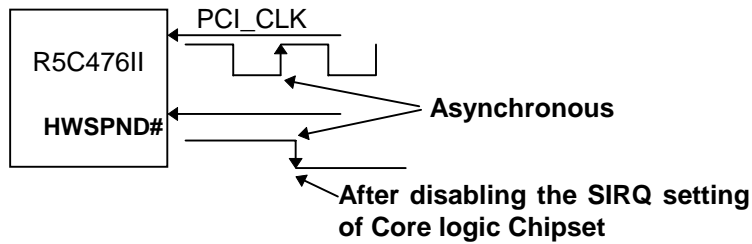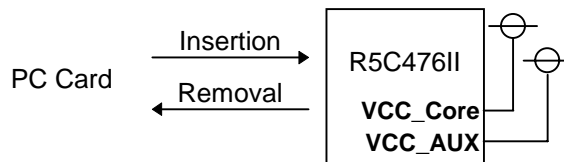

12. PCI signals of other PCI devices should not keep active when VCC_PCI of R5C476II is turned off in hardware suspend mode.
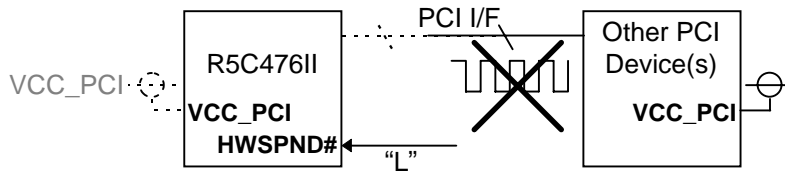
13. When Vcc_PCI is supplied in hardware suspend, R5C476II signals to PCI-Bus Interface maintain output Hi-Z.
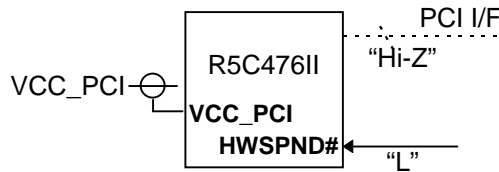
14. It requires the power supply to Vcc_Core and Vcc_AUX, to use the function that detects the PC Card insertion during the suspend mode.

15. There are no bit to set CLKRUN# enabled/disabled.   CLKRUN# is always enable.

16. If the system indicates to halt clock with CLKRUN# protocol, R5C476II 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, R5C476II 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 (Margi MPEG to Go)
     Sigma Design   Real Magic Pocket

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

[Subsystem ID and Subsystem Vendor ID]
2.   R5C476II 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)
     C.   To connect with the external Serial EEPROM.   (See 3. below)

3.   Example External Circuit for Serial EEPROM
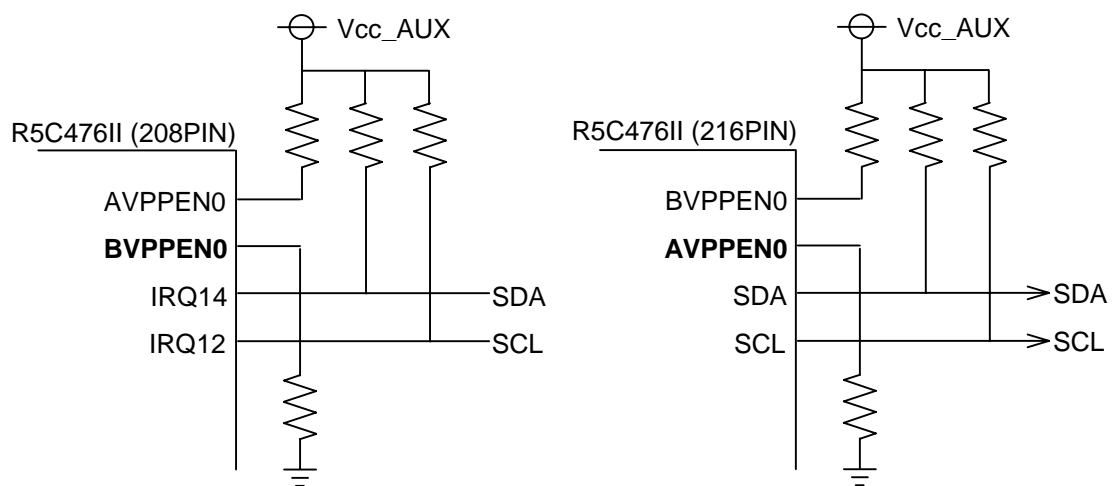
                         Pull-down Resistor
          216pin LQFP: **A**VPPEN0
          208pin LQFP: **B**VPPEN0

     Note: Please apply pull-down resistors for the AVPPEN0 and BVPPEN0, if SROM is not used.

[SRAM Card]
4.   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)
5.   No Flash Memory PC Cards is supported by native socket/card services on Windows 95.

6.   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

7.   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.

8.   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]
9.   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]
10. 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]
11. AVCC5EN#, BVCC5EN#, AVCC3EN#, BVCC3EN#, AVPPEN0, BVPPEN0, AVPPEN1 and BVPPEN1 signals do not turn to Hi-Z.   Namely, these are always "High" or "Low".

12. Regarding hardware suspend which the system uses the serialized IRQ, HWSPND# is to be asserted after disabling serial IRQ setting of the Core logic Chipset.

13. There is no problem to read the reserved registers. However, to write the reserved registers is prohibited.

14. While system power is OFF, power of the equipment connected with inserted cards should be also turned off.

6   APPENDIX

6.1   *Driver Installation for R5C476II CardBus Controller on Windows 95 OSR1 (Retail)*

This section describes how to setup for R5C476II on Windows 95 OSR1 (Retail).

[Abstract of OS boot-up procedure]

To evaluate the R5C476II on Windows95 (Retail or OSR1), the R5C476II 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.

   CFG476N1.EXE

   * CFG476N1.EXE is the driver for the R5C476II.

2)   Create or Edit "CONFIG.SYS" file and add below line.

   DEVICE=C:¥CFG476N1.EXE

3)   Restart the system.

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

6.2 Driver Installation for R5C476II CardBus Controller on Windows95 OSR2

[Abstract]

This section describes how to setup for R5C476II on Windows 95 OSR2.
The drivers for R5C476II CardBus Controller are included Windows95/OSR2.

[Description of the procesure]

In order to install evaluation board and to enable R5C476II CardBus Controller correctly, use the following procedure.

Install the Windows 95 OSR2 onto a clean machine
(**Note: Do not** put the R5C476II 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
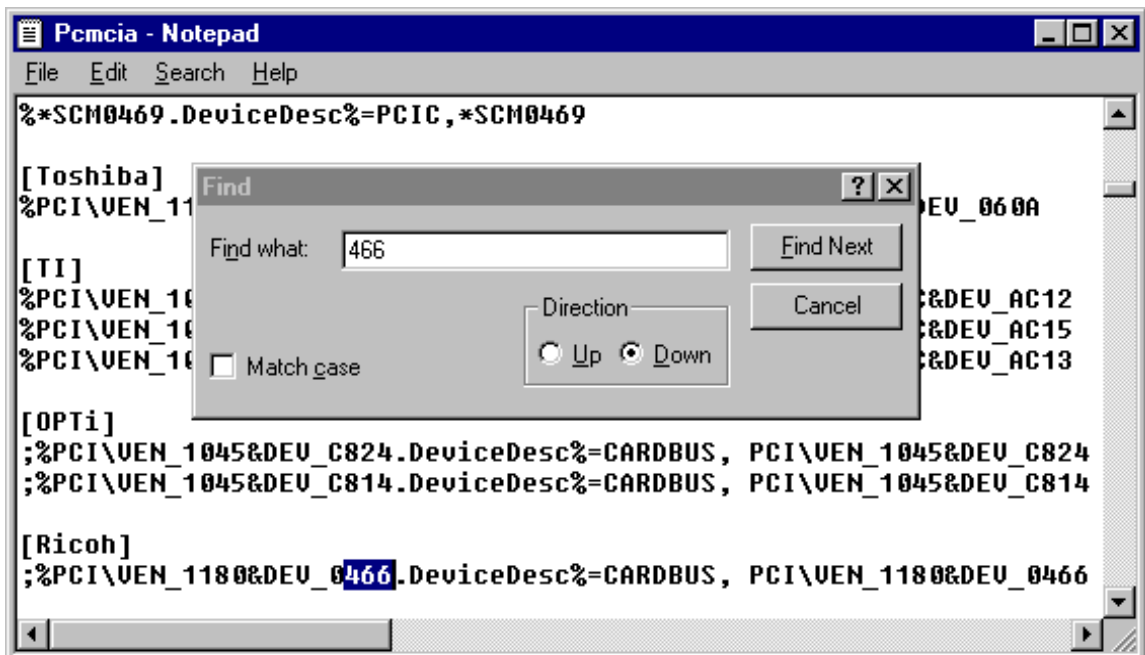
6) Remove the semi-colon in front.   Change the strings from "0466" to "0476" as shown below.
   [Ricoh]
   %PCI¥VEN_1180&DEV_0476.DeviceDesc%=CARDBUS, PCI¥VEN_1180&DEV_0476

7) Find another Ricoh product's lines in the "PCMCIA.INF" file:
    PCI¥VEN_1180&DEV_0466.DeviceDesc="Ricoh RL5C466 CardBus Controller"

```
Pcmcia - Notepad                                             _ □ ×
File  Edit  Search  Help
*DBK0204.DeviceDesc="Databook Plug and Play PCMCIA Controller based ▲
*DBK1402.DeviceDesc="Databook Plug and Play PCMCIA Controller based
*DBK0214.Dev ┌─ Find ──────────────────────── ? × ┐ller based
PCI\VEN_10B3 │                                    │s Controlle
MXTR.Deskrun │  Find what:  [466            ]  [Find Next] │er"
*CPQA0DE.Dev │                                    │MCIA Bridge
PCI\VEN_8086 │  ┌─ Direction ─┐  [Cancel]         │
IntelPCI="Ir │  □ Match case  │ ○ Up  ● Down │    │ Controller
PCI\VEN_1179 └───────────────────────────────────┘130 CardBus
PCI\VEN_104C                                        131 CardBus
PCI\VEN_104C&DEV_AC15.DeviceDesc="Texas Instruments PCI-1131 CardBus
PCI\VEN_104C&DEV_AC13.DeviceDesc="Texas Instruments PCI-1031 PCMCIA
PCI\VEN_1045&DEV_C824.DeviceDesc="OPTi 82C824 CardBus Controller"
PCI\VEN_1045&DEV_C814.DeviceDesc="OPTi 82C814 Docking Controller"
PCI\VEN_1013&DEV_1110.DeviceDesc="Cirrus Logic PD6832 CardBus Contro
PCI\VEN_1180&DEV_0466.DeviceDesc="Ricoh RL5C466 CardBus Controller" ▼
```
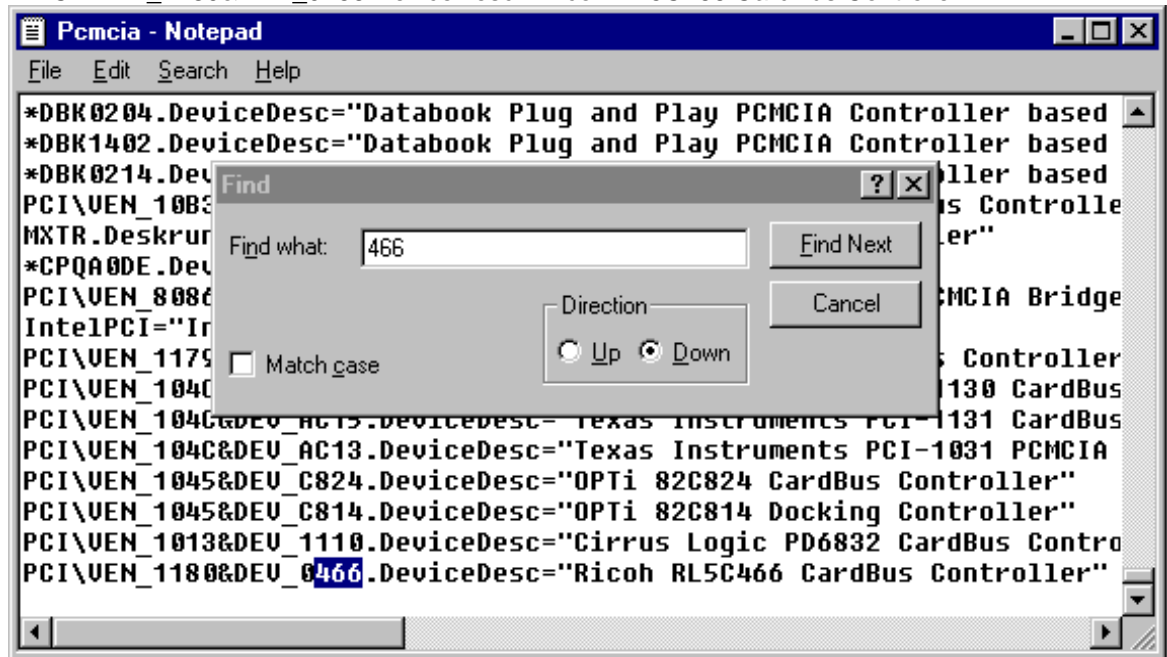
Change the strings "0466" to "0476" and "RL5C466" to "R5C476II" like below.
Then, Ricoh R5C476II CardBus controller will be supported.
    PCI¥VEN_1180&DEV_0466.DeviceDesc="Ricoh RL5C466 CardBus Controller"
                        ↓   ↓
    PCI¥VEN_1180&DEV_0476.DeviceDesc="Ricoh R5C476II CardBus Controller"

9) Turn off the machine and install the evaluation board of R5C476II 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 R5C476II CardBus controller.

11) Open "Controll 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 R5C476II 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 R5C476II.

    Double click the other instance of Ricoh R5C476II 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 R5C476II CardBus controller should be working.

[In case that R5C476II is not detected]

16) If you can not find the instances of the R5C476II 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 R5C476II 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 (%windows%¥inf, %windows% 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 Mananger]
        "PCI-CardBus Bridge"

    C. Shutdown the system and Restart the Windows95 OSR2.

    D. Start the procedure from "**11)**"

6.3 PCMCIA Driver Installation & Enabling for R5C476II on Windows NT 4.0

This document describes how to set R5C476II 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 R5C476II 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 R5C476II 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 procesure whenever booting up the system.   Ricoh supplies a real mode driver, named "CFG476N1.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 R5C476II 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
             CFG476N1.EXE

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

             DEVICE=A:¥CFG476N1.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 R5C476II controller should be working as PCIC compatibles.

Note **a.** "CFG476N1.EXE"

      A real mode driver for setting R5C476II 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,

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