SIEMENS

ICs for Communications

IPAC, HSCX-TE, ISAC-S TE

PSB 2115, PSB 21525, PSB 2186

Application Hints for passive ISDN-PC-Cards

Application Note 08.97

DS 1

PSB 2115, PSB 21525, PSB 2186 **Revision History:** **Current Version: 08.97**		
Previous Version: none		
Page (in previous Version)	Page (in new Version)	Subjects (major changes since last revision)

Edition 08.97

This edition was realized using the software system FrameMaker®.

Published by Siemens AG,
HL TS

Balanstr. 73#

81541 München

Attention please!

As far as patents or other rights of third parties are concerned, liability is only assumed for components, not for applications, processes and circuits implemented within components or assemblies.

The information describes the type of component and shall not be considered as assured characteristics.

Terms of delivery and rights to change design reserved.

For questions on technology, delivery and prices please contact the Semiconductor Group Offices in Germany or the Siemens Companies and Representatives worldwide (see address list).

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Siemens Office, Semiconductor Group.

Siemens AG is an approved CECC manufacturer.

Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport.

For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

Components used in life-support devices or systems must be expressly authorized for such purpose!

Critical components[1] of the Semiconductor Group of Siemens AG, may only be used in life-support devices or systems[2] with the express written approval of the Semiconductor Group of Siemens AG.

1 A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or effectiveness of that device or system.

2Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health of the user may be endangered.

Table of Contents **Page**

1 Overview

Chapter 2 describes how the software for the current PSB 21525 and PSB 2186 solutions can be adapted to the integrated PSB 2115 solution.

Chapter 3 shows how the Texas Instruments Plug'n Play controller TL16PNP200 can be used for the Siemens ISDN PC cards.

Chapter 4 contains a schematic for the well known SIB 71525 Reference Board to reduce the glue logic on that board.

2 From PSB 21525/PSB 2186 to PSB 2115 Solutions

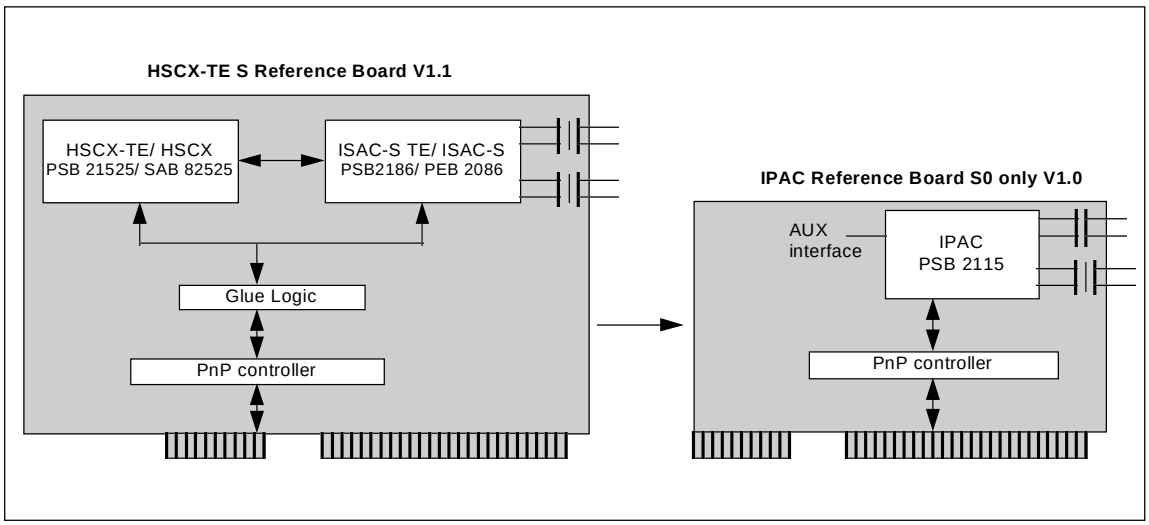


Figure 1

To adapt the software written for PSB 21525/PSB 2186 (HSCX-TE/ISAC-S TE) solutions to the PSB 2115 (IPAC, ISDN PC Adapter circuit) solution, some small changes have to be performed. Only the low-level routines are affected. The software should be changed with the help of the information listed below. The described changes are dedicated for the SIPB71525 and SIPB 72115 Reference Boards but they are also useful for other designs.

1. For each hardware access, change the address offset of the components:
   HSCX-TE software module: (old HSCX Address) -> (IPAC Base Address) + 00h
   ISAC-S TE software module: (old ISAC Address) -> (IPAC Base Address) + 80h

2. The HSCX-TE/ISAC-S FIFO size is 20h/20h. Change the software to support the IPAC B- and D-channel with a FIFO size of 40h and 20h, respectively.

3. The central interrupt handling can service the ISAC- and HSCX- part one after the other as it used to be.

4. The ISAC-S interrupt service routine needs not to be changed, i.e. the C/I-channel state machine is always the same and ISTAD/EXIRD are still at the ISAC-S address.

Note: The state machine for unconditional transitions (e.g. test loop) is different. Therefore the number of C/I-codes has been increased compared to the ISAC-S TE (see fig. 93/p.195 and p.314 of the IPAC Preliminary Data Sheet 03.97).

From PSB 21525/PSB 2186 to PSB 2115 Solutions

1. The HSCX-TE interrupt service routine requires some small changes:
   Old: After the HSCX-TE has indicated an interrupt via /INT-pin the CPU must first read the ISTA register of channel B and check the state of these bits in order to determine which interrupt source(s) of which channel(s) has caused the interrupt.

   New: The IPAC interrupt structure is described in chapter 2.6.4 of the IPAC Preliminary Data Sheet (03.97). The general ISTA register collects all interrupt sources. The D- and B-channel status bits are directly derived from the corresponding ISTAD/B and EXIRD/B registers. If one of them is read out (i.e. serviced) the corresponding bit in the general ISTA is automatically cleared. Therefore:
   1. check ISTAB channel A for interrupt and service if present
   2. check EXIRB channel A ...
   3. check ISTAB channel B ...
   4. check EXIRB channel B ...

3 Using the TI PnP Controller with IPAC (SIPB72115)

Most of SIEMENS' ISDN Reference Boards (e.g. SIPB71525, SIPB72115,...) are equipped with a Plug and Play Controller. These reference designs use the NATIONAL SEMICONDUCTOR NM95MS16 PnP controller. A schematic with this PnP controller is available in chapter 3 of this document.

Section 2.1 describes the use of the TEXAS INSTRUMENTS TL 16PNP200 PnP controller with the SIEMENS IPAC Reference Board (SIPB72115).
Note: The standard IPAC Reference Board is equipped with the NATIONAL SEMICONDUCTOR PnP controller.

3.1 Plug and Play Configuration Information for TL16PNP200

The following Plug and Play resource data file is programmed into the Plug and Play controller's EEPROM (e.g. ST93C56 from SGS Thomson). It should be used as an example for PNP configuration. With this information the IPAC Reference Board (SIPB72115) will get the required resources during the arbitration process.

Steps to use:

1. Assemble the file below
2. Link it to an EXE file
3. Use EXE2BIN.EXE to create a BIN file
4. Program this binary data file to the external EEPROM of the PNP controller. The checksums should be calculated within the programming utility.

```
irq_desc_without_flags equ 022h
irq_desc_withflags     equ 023h
df_start               equ 030h
df_start_with_priority equ 031h
df_end                 equ 038h
ioport_desc            equ 047h
ioport_fixed_desc      equ 04Bh
end_tag                equ 079h

data segment

dw 0000h  ;LD0 Memory base adress bits 23-8 (Note1)
dw 0000h  ;LD1 Memory base adress bits 23-8 (Note1)
dw 0000h  ;LD0 Memory upper adress bits 23-8 (Note1)
dw 0000h  ;LD1 Memory upper adress bits 23-8 (Note1)

dw 0100h  ;LD0 I/O Base address bits 15-0
dw 0110h  ;LD1 I/O Base address bits 15-0
dw 0120h  ;LD2 I/O Base address bits 15-0 (Note 2)
dw 0130h  ;LD3 I/O Base address bits 15-0 (Note 2)
dw 0140h  ;LD4 I/O Base address bits 15-0 (Note 2)

dw 2492h  ;Bits 15-13     :LD0 I/O block size
          ;Bits 12-10     :LD1 I/O block size
          ;Bits 9-7       :LD2 I/O block size
```

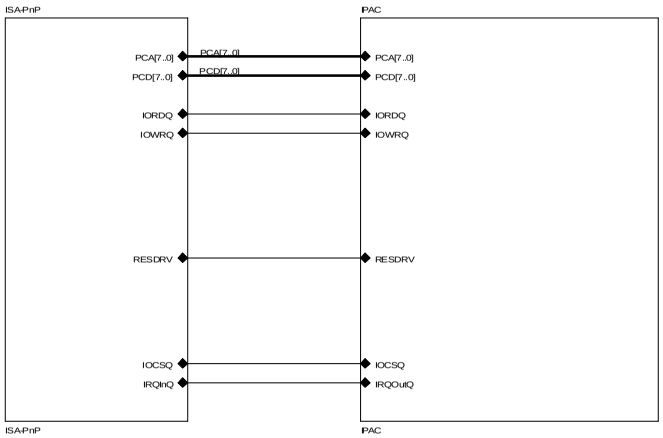
```
          ;Bits 6-4       :LD3 I/O block size
          ;Bits 3-1       :LD4 I/O block size

dw 5346h  ;Bits 15-12     :LD0 IRQ level
          ;Bits 11-8      :LD1 IRQ level
          ;Bits 7-4       :LD2 IRQ level
          ;Bits 3-0       :LD3 IRQ level (Note 4)

dw 72c0h  ;Bits 15-12     :LD4 IRQ level
          ;Bits 11-9      :LD0 DMA channel
          ;Bits 8-6       :LD1 DMA channel (Note 5)

dw 0010h  ;Bit 15         :LD0 active
          ;Bit 14         :LD1 active
          ;Bit 13         :LD2 active
          ;Bit 12         :LD3 active
          ;Bit 11         :LD4 active
          ;Bits 10-8      :/OEN0 configuration
          ;Bits 7-5       :/OEN1 configuration
          ;Bit 4          :mode (Note 6) mode 1 is used -> no memory support!

dw 0000h  ;Bits 14-12     :DMA 4 mapping
          ;Bits 11-9      :DMA 3 mapping
          ;Bits 8-6       :DMA 2 mapping
          ;Bits 5-3       :DMA 1 mapping
          ;Bits 2-0       :DMA 0 mapping (Note 7)


;----   Begin of pnp header mfg and device id
;SIE0012
db 4dh                  ; Vendor byte 0
db 25h                  ; Vendor byte 1
db 00h                  ; Vendor byte 2
db 12h                  ; Vendor byte 3
dw 0001h                ; Serial Number byte 0 ( 01234567 -- serial ID )
dw 0000h                ; Serial Number byte 1
db 00h                  ; ----- placeholder for checksum------


; Point 1. Plug and Play version number type
;---- begin of pnp Version

db 0ah                  ; Small item, item name = 0x1, len = 2
db 10h                  ; Plug and Play version 1.0
db 01h                  ; Vendor specific version number


; Point 2. indentifier string resource type
;------------------ Ansi Id string  -----------------
db 82h                  ; Large item, Type Identifier string(ANSI)
db 21h                  ; length of the string (lower byte)
db 00h                  ; length of the string (upper byte)
db „Siemens IPAC Reference Board V1.0“  ; String itself


;Point 3. logical device ID resource type
;----------------------  logical device ID  ----
;SIE0012
db 15h                  ; len = 5
```

```
db 4dh                  ;
db 25h                  ;
db 00h                  ;
db 12h                  ;
db 02h                  ; Indicates I/O range check option is implemented.


db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 00100h  ;
dw 00210h  ;
db 002h    ;
db 002h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15


db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 00220h  ;
dw 00270h  ;
db 002h    ;
db 002h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15


db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 00300h  ;
dw 00330h  ;
db 002h    ;
db 002h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15


db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
```

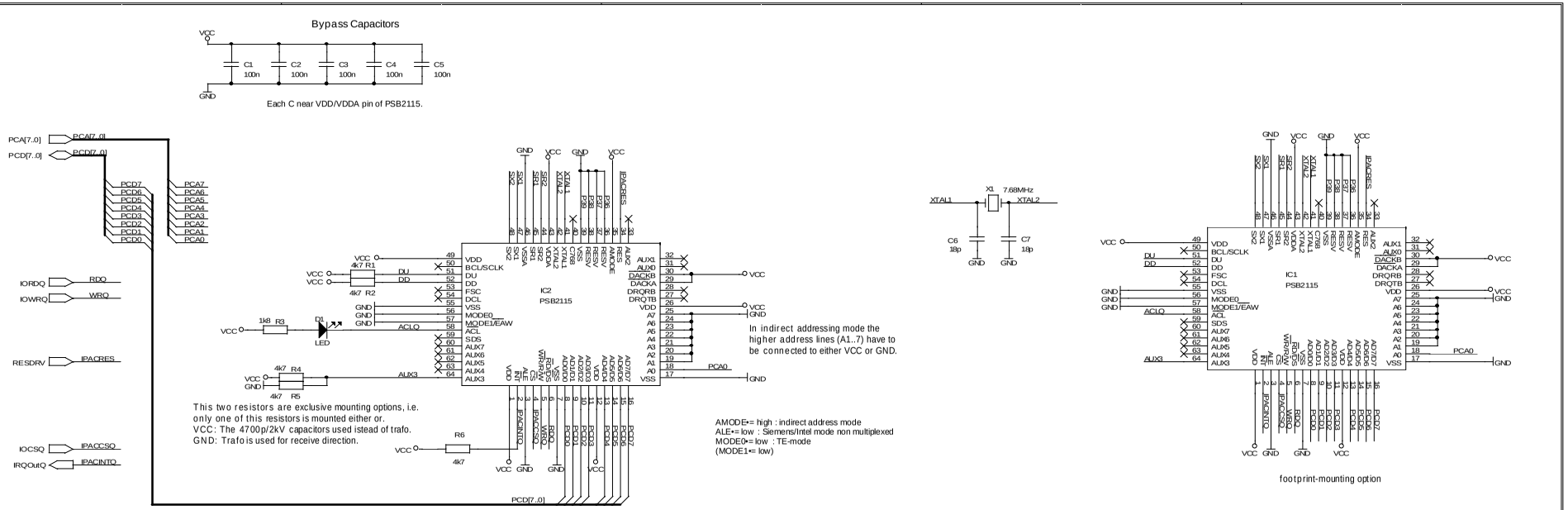
```
db ioport_desc
db 001h;
dw 003a0h  ;
dw 003b0h  ;
db 002h    ;
db 002h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15


db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 003e0h  ;
dw 003f0h  ;
db 002h    ;
db 002h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_end;


; Point 4. End tag resource type to indicate the end of resources
;-------------------  END of TAG -------

db end_tag
db 00h                  ;       -- placeholder for data checksum

data ends
end
```

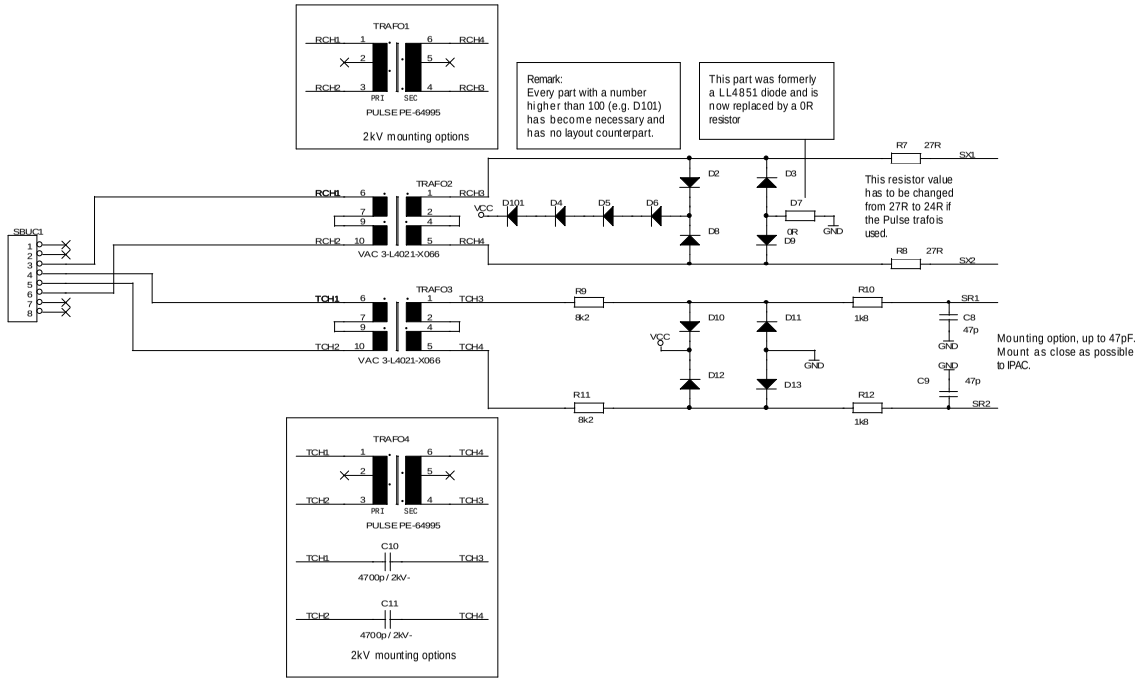
0.1 IPAC Reference Board with TL16PNP200 (schematic)

On the following pages the the schematic for the IPAC Reference Board with TL16PNP200 is appended.

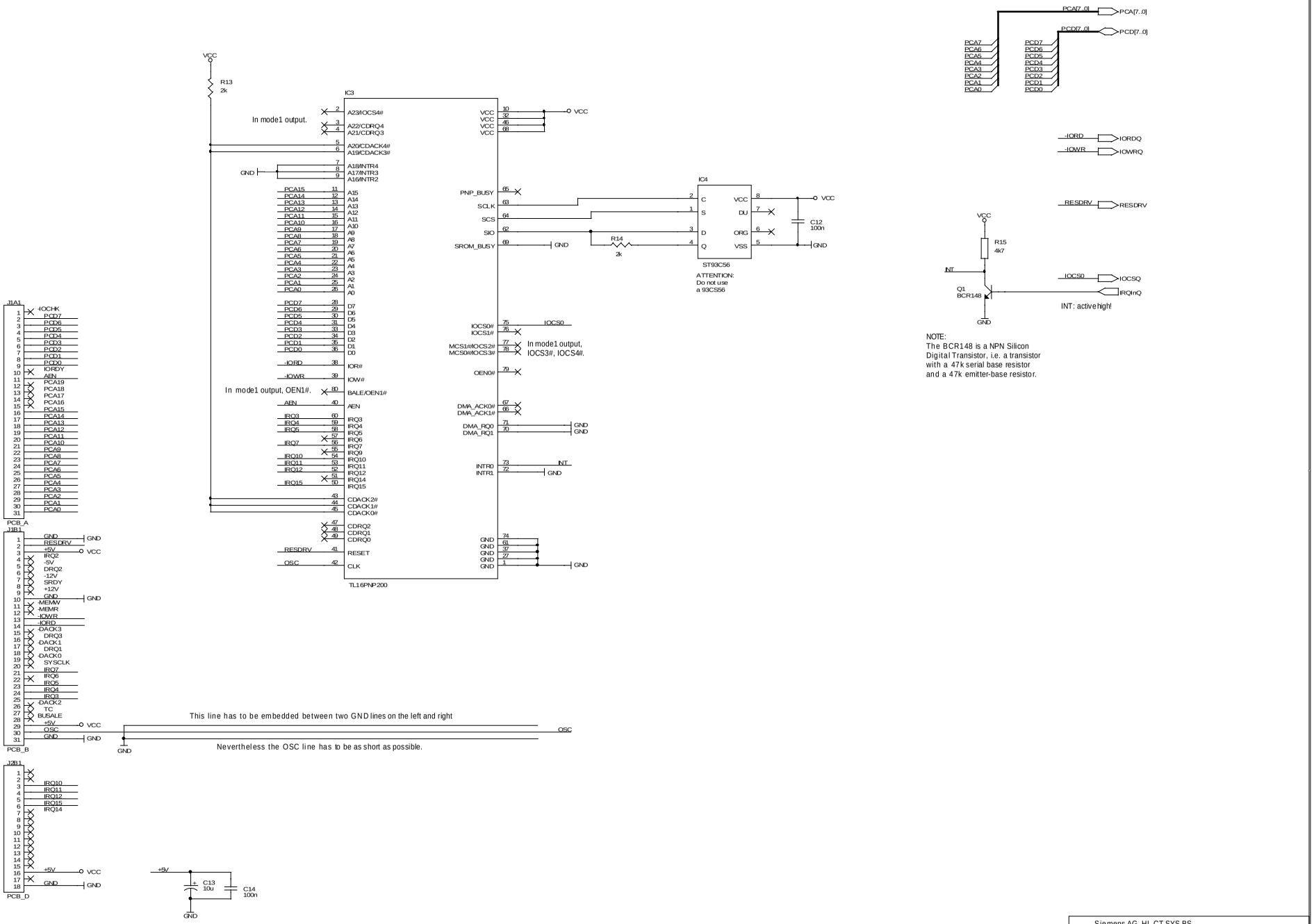


Siemens AG, HL CT SYS BS		
Title: IPAC-Reference Board V1.0, for TL16PNP200 Plug and Play Controller		
Size: C	Document Number	Rev: {RevCode}
Date: Tuesday, August 05, 1997	Sheet 1 of 3	





Siemens AG, HL CT SYS BS		
Title: IPAC-Reference Board V1.0, for TL16PNP200 Plug and Play Controller		
Size: C	Document Number	Rev: {RevCode}
Date: Tuesday, August 05, 1997	Sheet 2 of 3	



Siemens AG, HL CT SYS BS		
Title: IPAC-Reference Board V1.0, for TL16PNP200 Plug and Play Controller		
Size: C	Document Number: ISA-Bus & PnP	Rev: {RevCode}
Date: Tuesday, August05, 1997	Sheet 3 of 3	

4 PC-card with PSB21525/PSB2186 and Simple Glue Logic

On the HSCX-TE S only Reference Board Design (SIPB71525) a standard Lattice FPGA and a Plug and Play controller (NM95MS16 PnP) are placed on the board in addition to the ISDN components. The FPGA and the PnP controller represent the interface to the PC's ISA-bus.

A cost reduction of the complete board can be performed if the FPGA is exchanged by simple glue logic. The equations and the corresponding schematics are located on the next pages.

4.1 Plug and Play Configuration Information for NM95MS16 PnP

The following Plug and Play resource data file is programmed into the on-chip EEPROM of the NATIONAL Plug and Play controller. It should be used as an example for PNP configuration. With this information the HSCX-TE Reference Board (SIPB71525) will get the required resources during the arbitration process.

Steps to use:

1. Assemble the file below
2. Link it to an EXE file
3. Use EXE2BIN.EXE to create a BIN file
4. Program this binary data file to EEPROM of the PNP controller. The checksums should be calculated within the programming utility.

```
irq_desc_without_flags equ 022h
irq_desc_withflags     equ 023h
df_start               equ 030h
df_start_with_priority equ 031h
df_end                 equ 038h
ioport_desc            equ 047h
ioport_fixed_desc      equ 04Bh
end_tag                equ 079h


data segment
db 00h                  ;I/O Decode Qualification Register
                        ; chip selects are qualified by read/write only
db 01h                  ; Extended Interrupt / Chip-select expansion mode
dw 0000h                ; DMA level select bits

dw 7543h                ; Interrupt level selection - A ( IRQs 3,4,5 & 7)

dw 0bacfh               ; Interrupt level selection - B ( IRQs 10,11,12 & 15 )

dw 0003h                  ; chipselect 0 decode size ( Range of 0x80 bytes ) ISAR
dw 0000h                  ; chipselect 1 decode size ( Range of 0x40 bytes ) ISAC
dw 0000h                  ; chipselect 2 decode size ( Range of 0x01 bytes )  REG
dw 0000h                  ; chipselect 3 decode size ( Don't care )          IECQ
```

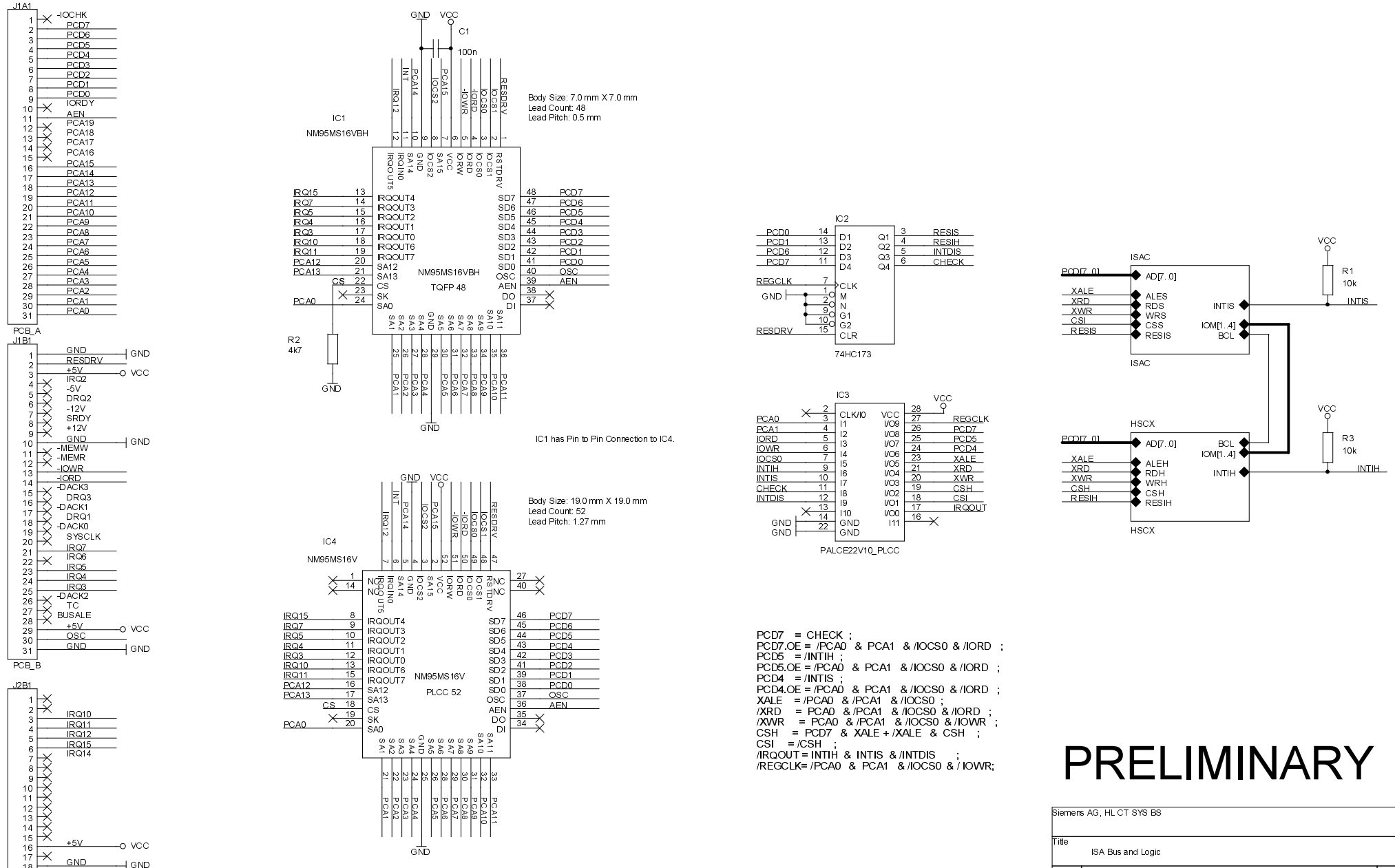
```
; Following 8 words are reserved for future use.

dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future
dw 0000h                ; Reserved for future

;----   Begin of pnp header mfg and device id

db 4dh                  ; Vendor byte 0
db 25h                  ; Vendor byte 1
db 00h                  ; Vendor byte 2
db 04h                  ; Vendor byte 3
dw 0001h                ; Serial Number byte 0 ( 01234567 -- serial ID )
dw 0000h                ; Serial Number byte 1
db 06Eh                 ; ----- placeholder for checksum------


; Point 1. Plug and Play version number type
;---- begin of pnp Version

db 0ah                  ; Small item, item name = 0x1, len = 2
db 10h                  ; Plug and Play version 1.0
db 00h                  ; Vendor specific version number


; Point 2. indentifier string resource type
;------------------ Ansi Id string  ----------------

db 82h                  ; Large item, Type Identifier string(ANSI)
db 29h                  ; length of the string (lower byte)
db 00h                  ; length of the string (upper byte)

db „Siemens HSCX TE - S0 Reference Board V1.1“  ; String itself


;Point 3. logical device ID resource type
;-----------------------  logical device ID  ----


db 15h                  ; len = 5
db 4dh                  ;
db 25h                  ;
db 00h                  ;
db 04h                  ;
db 02h                  ; Indicates I/O range check option is implemented.

db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
```

```
dw 00100h  ;
dw 00210h  ;
db 004h    ;
db 004h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 00220h  ;
dw 00270h  ;
db 004h    ;
db 004h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 00300h  ;
dw 00330h  ;
db 004h    ;
db 004h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
db 001h;
dw 003a0h  ;
dw 003b0h  ;
db 004h    ;
db 004h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_start ;
;*************************
; ADDRESS, DATA, Control
;*************************
db ioport_desc
```

```
db 001h;
dw 003e0h  ;
dw 003f0h  ;
db 004h    ;
db 004h    ;

db irq_desc_without_flags
db 0b8h  ;Request for one IRQ out of 3,4,5,7
db 09ch  ;Request for one IRQ out of 10,11,12,15

db df_end;

; Point 4. End tag resource type to indicate the end of resources
;-------------------  END of TAG -------

db end_tag
db 00h                  ;       -- placeholder for data checksum

data ends
end
```

4.2 Schematics for SIPB71525 Reference Board with Simple Glue Logic

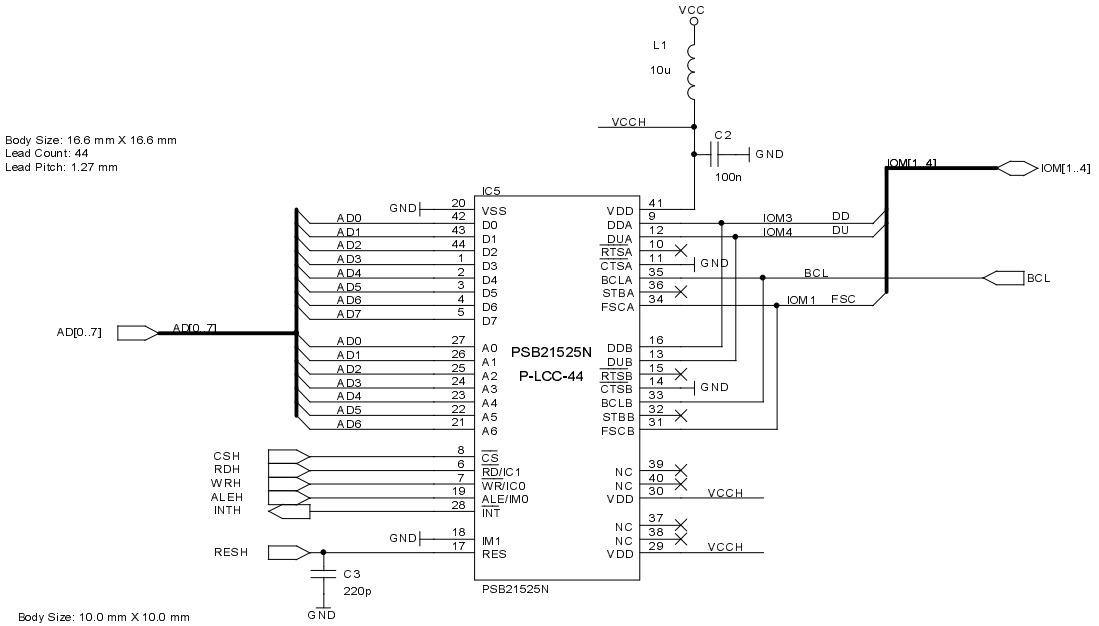
On the following pages the schematics for the SIPB71525 Reference Board with simple glue logic are appended.

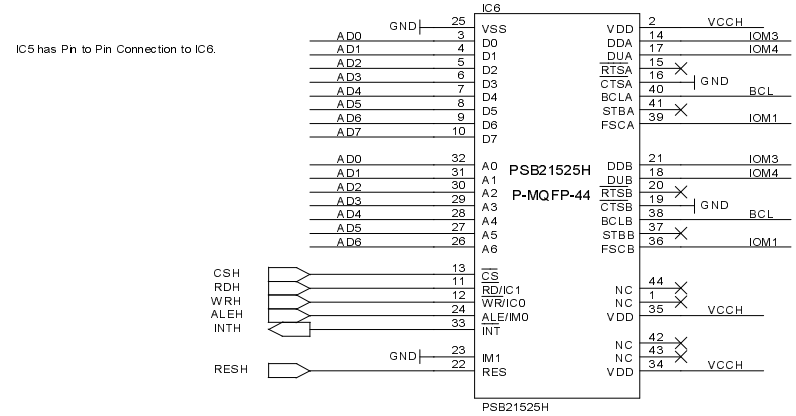



```
PCD7   = CHECK ;
PCD7.OE = /PCA0  & PCA1  & /IOCS0 & /IORD  ;
PCD5   = /INTIH ;
PCD5.OE = /PCA0  & PCA1  & /IOCS0 & /IORD  ;
PCD4   = /INTIS ;
PCD4.OE = /PCA0  & PCA1  & /IOCS0 & /IORD  ;
XALE   = /PCA0  & /PCA1  & /IOCS0 ;
/XRD   = PCA0  & /PCA1  & /IOCS0 & /IORD  ;
/XWR   = PCA0  & /PCA1  & /IOCS0 & /IOWR  ;
CSH    = PCD7  & XALE + /XALE  & CSH   ;
CSI    = /CSH   ;
/IRQOUT = INTIH  & INTIS  & /INTDIS     ;
/REGCLK= /PCA0  & PCA1  & /IOCS0 & / IOWR;
```

PRELIMINARY

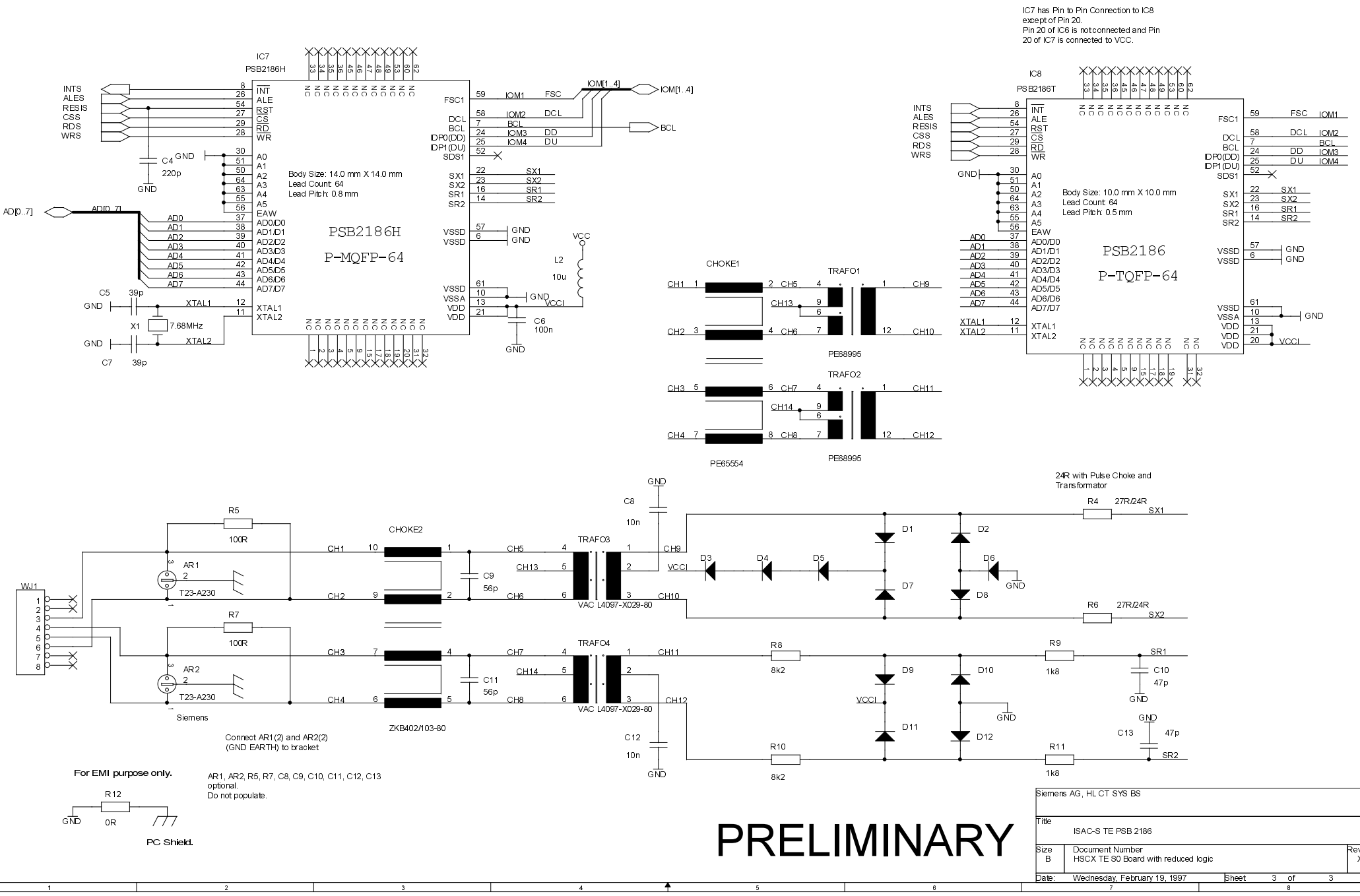
Siemens AG, HL CT SYS BS		
Title: ISA Bus and Logic		
Size: B	Document Number: HSCX TE S0 Board with reduced logic	Rev: X
Date: Wednesday, February 19, 1997	Sheet 1 of 3	





PRELIMINARY

Siemens AG, HL CT SYS BS		
Title: HSCX TE PSB21525		
Size: B	Document Number: HSCX TE S0 Board with reduced logic	Rev: X
Date: Wednesday, February 19, 1997	Sheet 2 of 3	


IC7 has Pin to Pin Connection to IC8 except of Pin 20.
Pin 20 of IC6 is not connected and Pin 20 of IC7 is connected to VCC.
IC7
PSB2186H
P-MQFP-64
Body Size: 14.0 mm X 14.0 mm
Lead Count: 64
Lead Pitch: 0.8 mm
IC8
PSB2186T
PSB2186
P-TQFP-64
Body Size: 10.0 mm X 10.0 mm
Lead Count: 64
Lead Pitch: 0.5 mm
CHOKE1
CHOKE2
TRAFO1
TRAFO2
TRAFO3
TRAFO4
PE68995
PE65554
VAC L4097-X029-80
ZKB402/103-80
24R with Pulse Choke and Transformator
Connect AR1(2) and AR2(2) (GND EARTH) to bracket
For EMI purpose only.
AR1, AR2, R5, R7, C8, C9, C10, C11, C12, C13 optional.
Do not populate.
PC Shield.
PRELIMINARY
Siemens AG, HL CT SYS BS
Title
ISAC-S TE PSB 2186
Size B
Document Number
HSCX TE S0 Board with reduced logic
Rev X
Date: Wednesday, February 19, 1997
Sheet 3 of 3

ISABUS Signals:
DATA : PCD0, PCD1, PCD4, PCD5, PCD6, PCD7
ADDRESS : PCA0, PCA1
OTHER : RESDRV

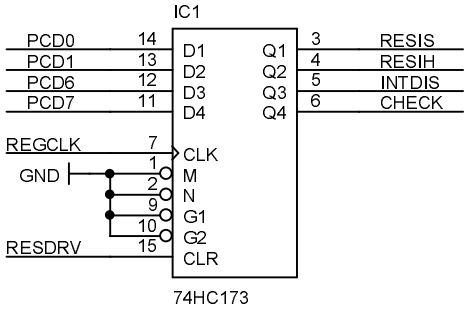
Control Bus ISAC, HSCX:
XALE, XWR, XRD

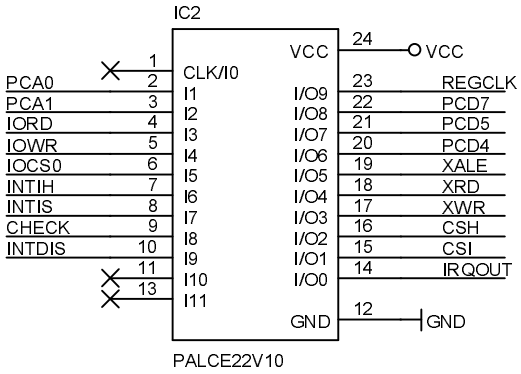
PnP:
IOSC0, IRQOUT

HSCX:
CSH, RESH, INTIH

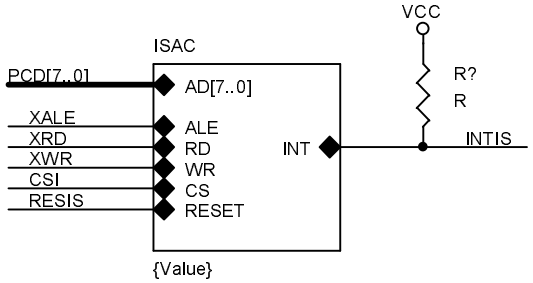
ISAC:
CSI, RESI, INTIS

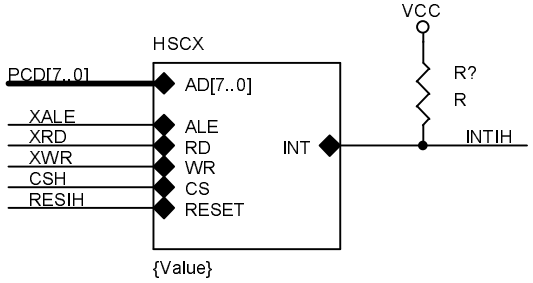
```
PCD7   = CHECK ;
PCD7.OE =  /PCA0  & PCA1  & /IOCS0 & /IORD  ;
PCD5   = /INTIH ;
PCD5.OE = /PCA0  & PCA1  & /IOCS0 & /IORD  ;
PCD4   = /INTIS ;
PCD4.OE = /PCA0  & PCA1  & /IOCS0 & /IORD  ;
XALE   = /PCA0  & /PCA1  & /IOCS0 ;
/XRD    = PCA0  & /PCA1  & /IOCS0 & /IORD  ;
/XWR    = PCA0  & /PCA1  & /IOCS0 & /IOWR  ;
CSH    = PCD7  & XALE + /XALE  & CSH   ;
CSI    = /CSH   ;
/IRQOUT = INTIH  &  INTIS  & /INTDIS      ;
/REGCLK= /PCA0  & PCA1  & /IOCS0 & / IOWR;
```





PALCE22V10 is printed as DIP-Package.
Choose PLCC for your layout.





SIEMENS AG	HL CT SYS BS, Bernd Brachmann	
Title: HSCX S0		
Size: A	Document Number: simple logic	Rev: A
Date: Wednesday, February 19, 1997	Sheet 1 of 1	