



IDT™ 89EBPES16T7 Evaluation Board Manual

(Eval Board: 18-610-000)

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Notes



Description of the EB16T7 Eval Board

Notes

Introduction

The 89HPES16T7 switch (also referred to as PES16T7 in this manual) is a member of the IDT PCI Express® standard (PCIe®) based line of products. It is a 16-lane, 7-port switch, with 4 serial lanes on three ports and 1 serial lane on four ports. One upstream port is provided for connecting to the root complex (RC), and up to six downstream ports are available for connecting to PCIe endpoints or to another switch. More information on this device can be found in the 89HPES16T7 User Manual.

The 89EBPES16T7 Evaluation Board (also referred to as EB16T7 in this manual) provides an evaluation platform for the PES16T7 switch. It is also a cost effective way to add a PCIe downstream port (x4 and x1) to an existing system with a limited number of PCIe downstream ports. The EB16T7 eval board is designed to function as an add-on card to be plugged into a x8 PCIe slot available on a motherboard hosting an appropriate root complex, microprocessor(s), and five downstream ports. The EB16T7 is a vehicle to test and evaluate the functionality of the PES16T7 chip. Customers can use this board to get a headstart on software development prior to the arrival of their own hardware. The EB16T7 is also used by IDT to reproduce system-level hardware or software issues reported by customers. Figure 1.1 illustrates the functional block diagram representing the main parts of the EB16T7 board.

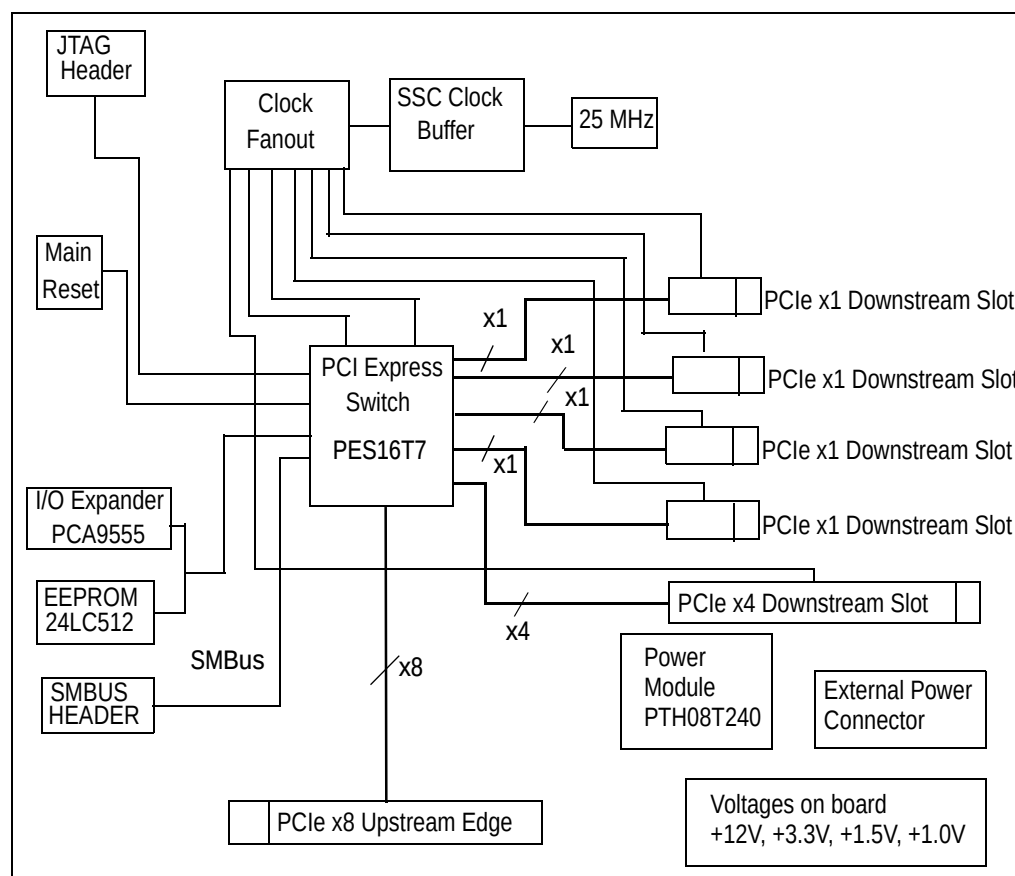


Figure 1.1 Function Block Diagram of the EB16T7 Eval Board

Notes

Board Features

Hardware

- ◆ PES16T7 PCIe 7 port switch
 - One x8 port, one x4 port, four x1 ports, 16 PCIe lanes
 - PCIe Base Specification Revision 1.1 compliant
 - 8 GBps (64Gbps) aggregate switching capacity
 - Up to 2048 byte maximum Payload Size
 - Automatic lane reversal and polarity inversion supported on all lanes
 - Automatic per port link width negotiation to x8, x4, x2, x1
 - Load configuration from an optional serial EEPROM via SMBUS
- ◆ Upstream, Downstream Port
 - One edge connector on the upstream port, to be plugged into a slot with at least x8 capable on a host motherboard
 - Five slot connectors on the downstream ports, for PCIe endpoint add-on cards to be plugged in. One of these slot connectors are x16 mechanically but electronically connected as x4 only.
- ◆ Numerous user selectable configurations set using onboard jumpers and DIP-switches
 - Source of clock - host clock or onboard clock generator
 - Two clock rates and spread spectrum settings
 - Boot mode selection
- ◆ SMBUS Slave Interface (4 pin header)
- ◆ SMBUS Master Interface connected to the Serial EEPROMs through I/O expander
- ◆ “Attention” button for each downstream port to initiate a hot swap event on each port
- ◆ Four pin connector for optional external power supply
- ◆ Push button for Warm Reset
- ◆ Several LEDs to display status, reset, power, “Attention”, etc.
- ◆ One 10-pin JTAG connector (pitch 2.54 mm x 2.54 mm)

Software

There is no software or firmware executed on the board. However, useful software is provided along with the Evaluation Board to facilitate configuration and evaluation of the PES16T7 within host systems running popular operating systems.

- ◆ Installation programs
 - Operating Systems Supported: Windows2000, WindowsXP, Linux
- ◆ GUI based application for Windows and Linux
 - Allows users to view and modify registers in the PES16T7
 - Binary file generator for programming the serial EEPROMs attached to the SMBUS.

Other

- ◆ A metal bracket is required to firmly hold in place two of the three endpoints plugged into the EB16T7 board.
- ◆ An external power supply may be required under some conditions.
- ◆ SMBUS cable may be required for certain evaluation exercises.
- ◆ SMA connectors are provided on the EB16T7 board for specific test points.

Notes

Revision History

October 19, 2006: Initial publication of board manual.

November 13, 2006: In Tables 2.7 and 2.8, changed MSMSDDR to MSMBADDR and removed references to P23MERGEN, P45MERGEN, and SWMODE[3].

March 30, 2007: In Figure 1.1, revised diagram to show a x4 connection from the PES16T7 device to the x4 downstream slot. In Board Features section, revised first line to clarify the board has one x8 port, one x4 port, and four x1 ports.

Notes



Installation of the EB16T7 Eval Board

Notes

EB16T7 Installation

This chapter discusses the steps required to configure and install the EB16T7 evaluation board. All available DIP switches and jumper configurations are explained in detail.

The primary installation steps are:

1. Configure jumper/switch options suitable for the evaluation or application requirements.
2. Connect PCI Express endpoint cards to the downstream port PCIe slots on the evaluation board.
3. Insert the evaluation board into the host system (motherboard with root complex chipset).
4. Apply power to the host system.

The EB16T7 board is shipped with all jumpers and switches configured to their default settings. In most cases, the board does not require further modification or setup.

Hardware Description

The PES16T7 is a 16-lane, 7-port PCI Express® switch. It is a peripheral chip that performs PCI Express based switching with a feature set optimized for high performance applications such as servers and storage. It provides fan-out and switching functions between a PCI Express upstream port and up to 6 downstream ports or peer-to-peer switching between downstream ports.

The EB16T7 has five PCI Express downstream ports, accessible through one x16 connector and four x1 connectors. One specific port is capable of negotiating a x1, x2, or x4 link width and the remaining four ports are capable of negotiating a x1 link width. All endpoint cards connected to the PES16T7 must support at least one of these link widths.

Basic requirements for the board to run are:

- Host system with a PCI Express root complex supporting x8 configuration through a PCI Express x8 slot. (If your host system does not offer a x8 slot, please contact ssdhelp@idt.com for alternative solutions.)
- x1, x2, x4, or x8 PCI Express Endpoint Cards.

Host System

The evaluation board cannot be operated as a standalone unit. A host system implementing a PCI Express root complex supporting x8 configuration through a PCI Express x8 slot is required to take full advantage of the PES16T7's capabilities. One such system is the SuperMicro X6DH8-G2 motherboard equipped with an Intel E7520 chipset which was introduced in 2004 to deploy dual-processor server chipset technology. The board has three PCI Express slots. All slots have x8 connectors, but only two are electronically connected for a x8 link width (J15 and J16). The remaining slots are electronically connected for a x4 link width configuration. Care must be taken to avoid using the EB16T7 in the x4 slot (J17). Figure 2.1 shows the proper connectors.

Notes

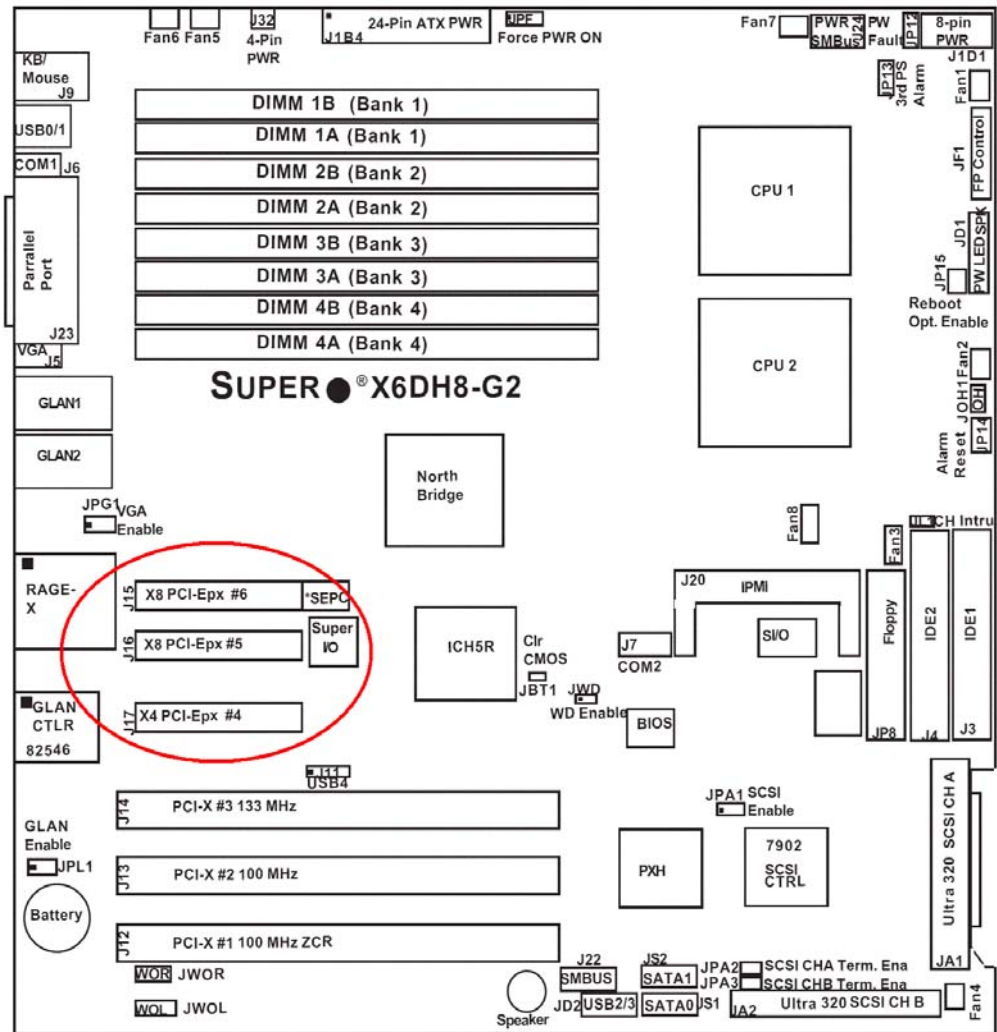


Figure 2.1 SuperMicro X6DH8-G2 Motherboard

Reference Clocks

The PES16T7 requires two differential reference clocks. The EB16T7 derives both of these clocks from a common source which is user-selectable. The common source can be either the host system's reference clock or the onboard clock generator. Selection is made by stuffing resistors described in Table 2.1.

Clock Configuration Stuffing Option	
Install	Clock Source
R36, R37	Onboard Reference Clock – Use onboard clock generator
R34, R35	Upstream Reference Clock – Host system provides clock (Default)

Table 2.1 Clock Source Selection

Notes

The source for the onboard clock is the ICS557-03 clock generator device (U8) connected to a 25MHz oscillator (Y1). When using the onboard clock generator, the EB16T7 allows selection between multiple clock rates and spread spectrum settings via DIP switches as described in Tables 2.2 and 2.3 respectively. Spread Spectrum technology reduces peak EMI emissions by modulating the frequency to spread the peak energy over a wider bandwidth.

Clock Frequency Switch - S2[2:1]		
S2[2]	S2[1]	Clock Frequency
OFF	OFF	Reserved
OFF	ON	125 MHz
ON	OFF	100 MHz (Default)
ON	ON	<Reserved>

Table 2.2 Clock Frequency Selection

Clock Spread Spectrum Switch - S2[4:3]		
S2[4]	S2[3]	Spread%
OFF	OFF	No Spread (Default)
OFF	ON	Down -0.75
ON	OFF	Down -0.50
ON	ON	Center ± 0.25

Table 2.3 Clock Spread Spectrum Selection

If the Clock Spread Spectrum is used to modulate data rate, then both ports must use same modulated clock source. Therefore, if your system uses SSC, the on-board clock generator must be disabled and the upstream reference clock should be used instead.

The output of the onboard clock generator is accessible through two SMA connectors located on the Evaluation Board. See Table 2.4. This can be used to connect a scope for probing or capturing purposes and cannot be used to drive the clock from an external source.

Onboard Reference Clock Output (Differential) - J3, J2	
J3	Positive Reference Clock
J2	Negative Reference Clock

Table 2.4 SMA Connectors - Onboard Reference Clock

Power Sources

The upstream port consists of port 0 and port 1. The EB16T7 and all downstream ports are powered from the upstream port slot power. If add-in cards require more power than the upstream slot can support, an external source is required to supply this extra power via an auxiliary 4-pin power connector on the board. Only downstream ports 2, 3, 4, and 5 can be powered by this external power source through jumpers W45, W46, and W47 (see Table 2.19). Note that on the schematic pages in Chapter 4, port 2 is also referred to as port F, port 3 as port E, port 4 as port D, and port 5 as port C.

External Power Source

If necessary, external power is supplied to the EB16T7 board through a 4-pin auxiliary power connector attached to J1. The external power supply provides +12V to the EB16T7 as described in Table 2.5. The +5V is unused.

Notes

Pin	Signal
1	+12V
2	GND
3	GND
4	+5V

Table 2.5 External Power Connector - J1

PCI Express Serial Data Transmit Termination Voltage Converter

A DC-DC converter (U6) provides a 1.5V PCI Express serial data transmit termination voltage (shown as VTTPE or VPETVTT) to the PES16T7.

PCI Express Digital Power Voltage Converter

A separate DC-DC converter (U3) provides a 1.0V PCI Express digital power voltage (VDDPE) to the PES16T7.

PCI Express Analog Power Voltage Converter

A separate DC-DC converter (U7) provides a 1.0V PCI Express analog power voltage (shown as VDDAPE or VDDPEA) to the PES16T7.

Core Logic Voltage Converter

A separate DC-DC converter (U1) provides the 1.0V core voltage (VDDCORE) to the PES16T7.

3.3V I/O Power Module

A 12V to 3.3V power module (U5 or U26) provides the 3.3V I/O voltage (VDDIO) to the PES16T7.

Power-up Sequence

The power-up sequence must be as following:

1. VDDIO - 3.3V
2. VDDCORE, VDDAPE, VDDPE - 1.0V
3. VTTPE - 1.5V

When powering up, each voltage level must ramp and stabilize prior to applying the next voltage in the sequence to ensure internal latch-up issues are avoided. There are no maximum limitations to the time to valid power level requirements. To insure that the sequencing requirements are met, a 0.047μF is used at the SOFTSTART cap on the VTTPE's voltage converter (U6 pin 36) in the EB16T7.

Required Jumpers

To deliver power to the PES16T7 switch, the following jumpers must be shunted: W10 and W22—W25. These jumpers were implemented so that the power consumption of the PES16T7 can be measured.

Reset

The PES16T7 supports two types of reset mechanisms as described in the PCI Express specification:

- Fundamental Reset: This is a system-generated reset that propagates along the PCI Express tree through a single side-band signal PERST# which is connected to the Root Complex, the PES16T7, and the endpoints.
- Hot Reset: This is an In-band Reset, communicated downstream via a link from one device to another. Hot Reset may be initiated by software. This is further discussed in the 89HPES16T7 User Manual. The EB16T7 evaluation board provides seamless support for Hot Reset.

Notes

Fundamental Reset

There are two types of Fundamental Resets which may occur on the EB16T7 evaluation board:

- Cold Reset: During initial power-on, the onboard voltage monitor (TLC7733D) will assert the PCI Express Reset (PERSTN) input pin of the PES16T7.
- Warm Reset: This is triggered by hardware while the device is powered on. Warm Reset can be initiated by two methods:
 - Pressing a push-button switch (S1) located on EB16T7 board
 - The host system board IO Controller Hub asserting PERST# signal, which propagates through the PCIe upstream edge connector of the EB16T7. Note that one can bypass the onboard voltage monitor (TLC7733D) by moving the shunt from pin 1-2 to pin 2-3 (default) on W1.

Both events cause the onboard voltage monitor (TLC7733D) to assert the PCI Express Reset (PERSTN) input of the PES16T7 while power is on.

Downstream Reset

The PES16T7 provides a choice of either a software-controlled reset for each downstream port through GPIO pins or a fundamental reset through PERST#. Selection is made by jumpers described in Table 2.6.

Port #	Jumper	Selection
6	W27	[1-2] Software controlled reset through GPIO11 [2-3] Fundamental reset PERST# (default)
5	W30	[1-2] Software controlled reset through GPIO10 [2-3] Fundamental reset PERST# (default)
4	W35	[1-2] Software controlled reset through GPIO01 [2-3] Fundamental reset PERST# (default)
3	W38	[1-2] Software controlled reset through GPIO9 [2-3] Fundamental reset PERST# (default)
2	W56	[1-2] Software controlled reset through GPIO0 [2-3] Fundamental reset PERST# (default)

Table 2.6 Downstream Reset Selection

Boot Configuration Vector

A boot configuration vector consisting of the signals listed in Table 2.7 is sampled by the PES16T7 during a fundamental reset (while PERSTN is active). The boot configuration vector defines the essential parameters for switch operation and is set using DIP switches S5 and S6 as defined in Table 2.8.

Notes

Signal	Description
CCLKDS	Common Clock Downstream. The assertion of this pin indicates that all downstream ports are using the same clock source as that provided to downstream devices. This pin is used as the initial value of the Slot Clock Configuration bit in all of the Link Status Registers for downstream ports. The value may be overridden by modifying the SCLK bit in the downstream port's PCIELSTS register. Default: 0x1
CCLKUS	Common Clock Upstream. The assertion of this pin indicates that the upstream port is using the same clock source as the upstream device. This pin is used as the initial value of the Slot Clock Configuration bit in the Link Status Register for the upstream port. The value may be overridden by modifying the SCLK bit in the P0_PCIELSTS register. Default: 0x1
MSMBSMODE	Master SMBus Slow Mode. The assertion of this pin indicates that the master SMBus should operate at 100 KHz instead of 400 KHz. Default: 0x0
P01MERGEN	Port 0 and 1 Merge: When this pin is asserted (i.e. low), port 1 is merged with port 0 to form a single x8 port. Default: 0x0
RSTHALT	Reset Halt. When this signal is asserted during a PCI Express fundamental reset, the PES16T7 executes the reset procedure and remains in a reset state with the Master and Slave SMBuses active. This allows software to read and write registers internal to the device before normal device operation begins. The device exits the reset state when the RSTHALT bit is cleared in the P0_SWCTL register through the SMBus. The value may be overridden by modifying the RSTHALT bit in the P0_SWCTL register. Default: 0x0
SWMODE[2:0]	Switch Mode. These configuration pins determine the PES16T7 switch operating mode. Default: 0x1 0x0 - Normal switch mode 0x1 - Normal switch mode with Serial EEPROM-based initialization 0x2 through 0x4 - Reserved 0x5 - Global SerDes test mode 0x6 - Reserved 0x7 - PLL bypass test mode
REFCLKM	PCI Express Reference Clock Mode Select. This signal selects the frequency of the reference clock input. Default: 0x0 0x0 - 100 MHz 0x1 - 125 MHz
MSMBADDR[2:0]	Master SMBus Address. These pins determine the SMBus address of the serial EEPROM from which configuration information is loaded. Default: 0x0

Table 2.7 Boot Configuration Vector Signals

Signal	Description	Default
S6[1]	CCLKDS	OFF
S6[2]	CCLKUS	OFF
S6[3]	MSMBSMODE	ON
S6[4]	P01MERGEN	ON
S6[5]	Not Used	OFF
S6[6]	Not Used	OFF
S6[7]	Not Used	OFF

Table 2.8 Boot Configuration Vector Switches S5 & S6 (ON=0, OFF=1) (Part 1 of 2)

Notes

Signal	Description	Default
S6[8]	RSTHALT	OFF
S5[1]	SWMODE[0]	OFF
S5[2]	SWMODE[1]	ON
S5[3]	SWMODE[2]	ON
S5[4]	Not Used	ON
S5[5]	REFCLKM	ON
S5[6]	MSMBADDR[0]	ON
S5[7]	MSMBADDR[1]	ON
S5[8]	MSMBADDR[2]	ON

Table 2.8 Boot Configuration Vector Switches S5 & S6 (ON=0, OFF=1) (Part 2 of 2)

SMBus Interfaces

The System Management Bus (SMBus) is a two-wire interface through which various system component chips can communicate. It is based on the principles of operation of I²C. Implementation of the SMBus signals in the PCI Express connector is optional and may not be present on the host system. The SMBus interface consists of an SMBus clock pin, an SMBus data pin, and 4 SMBus address pins.

The PES16T7 contains two SMBus interfaces: a slave SMBus interface and a master SMBus interface. The slave SMBus interface allows a SMBus Master device (such as the Intel E7520) full access to all software-visible registers. The Master SMBus interface provides connection to the external serial EEPROMs used for initialization and the I/O expander used for hot-plug signals.

SMBus Slave Interface

On the PES16T7 board, the slave SMBus interface is accessible through the PCI Express edge connector as well as a 4-pin header as described in Table 2.9.

Note: The SMBus signals to the PCI Express edge connector is disabled by default. To enable them, place 0-ohm resistors at locations R202 and R203.

Slave SMBus Interface Connector J10	
Pin	Signal
1	N/C
2	SCL
3	GND
4	SDA

Table 2.9 Slave SMBus Interface Connector

A fixed slave SMBus address specified by the SSMBADDR[5,3:1] pins is used.

For a fixed address, the SMBus address of the PES16T7 slave interface is 0b1110111 by default and is configurable using jumpers W40, W41, W42, and W43 as described in Tables 2.10 and 2.11.

Notes

Slave Interface Address Configuration	
Address Bit	Signal
1	SSMBUSADDR[1]
2	SSMBUSADDR[2]
3	SSMBUSADDR[3]
4	0
5	SSMBUSADDR[5]
6	1
7	1

Table 2.10 SMBus Slave Interface Address Configuration

SMBUS Slave Interface Address Setting				
W40 SSMBADDR[5]	W41 SSMBADDR[3]	W42 SSMBADDR[2]	W43 SSMBADDR[1]	Slave Interface Bus Address
OFF	OFF	OFF	OFF	0b1110111 (Default)
OFF	OFF	OFF	ON	0b1110110
OFF	OFF	ON	OFF	0b1110101
OFF	OFF	ON	ON	0b1110100
OFF	ON	OFF	OFF	0b1110011
OFF	ON	OFF	ON	0b1110010
OFF	ON	ON	OFF	0b1110001
OFF	ON	ON	ON	0b1110000
ON	OFF	OFF	OFF	0b1100111
ON	OFF	OFF	ON	0b1100110
ON	OFF	ON	OFF	0b1100101
ON	OFF	ON	ON	0b1100100
ON	ON	OFF	OFF	0b1100011
ON	ON	OFF	ON	0b1100010
ON	ON	ON	OFF	0b1100001
ON	ON	ON	ON	0b1100000

Table 2.11 PES16T7 SMBus Slave Interface Address Setting

The slave SMBus interface responds to the following SMBus transactions initiated by an SMBus master. Initiation of any SMBus transaction other than those listed above produces undefined results. See the SMBus 2.0 specification for a detailed description of the following transactions:

- Byte and Word Write/Read
- Block Write/Read

Notes

SMBus Master Interface

Connected to the master SMBus interface are four 16-bit I/O Expanders (PCA9555) and a serial EEPROM (24LC512). Four I/O Expanders are used as the interface for the onboard hot-plug controllers (MIC2591B). The lower three bits of the bus address for the I/O Expander are configurable as described in Tables 2.12 through 2.15.

I/O Expander 0			
W4	W7	W11	Bus Address
ON	ON	ON	0b0100000 (Default)
ON	ON	OFF	0b0100001
ON	OFF	ON	0b0100010
ON	OFF	OFF	0b0100011
OFF	ON	ON	0b0100100
OFF	ON	OFF	0b0100101
OFF	OFF	ON	0b0100110
OFF	OFF	OFF	0b0100111

Table 2.12 I/O Expander 0 Bus Address

I/O Expander 1			
W2	W5	W8	Bus Address
ON	ON	OFF	0b0100001 (Default)
ON	ON	ON	0b0100000
ON	OFF	ON	0b0100010
ON	OFF	OFF	0b0100011
OFF	ON	ON	0b0100100
OFF	ON	OFF	0b0100101
OFF	OFF	ON	0b0100110
OFF	OFF	OFF	0b0100111

Table 2.13 I/O Expander 1 Bus Address

I/O Expander 2			
W3	W6	W9	Bus Address
ON	OFF	ON	0b0100010 (Default)
ON	ON	ON	0b0100000
ON	ON	OFF	0b0100001
ON	OFF	OFF	0b0100011
OFF	ON	ON	0b0100100

Table 2.14 I/O Expander 2 Bus Address (Part 1 of 2)

Notes

I/O Expander 2			
W3	W6	W9	Bus Address
OFF	ON	OFF	0b0100101
OFF	OFF	ON	0b0100110
OFF	OFF	OFF	0b0100111

Table 2.14 I/O Expander 2 Bus Address (Part 2 of 2)

I/O Expander 4			
W31	w44	w29	Bus Address
OFF	ON	ON	0b0100100 (Default)
ON	ON	ON	0b0100000
ON	ON	OFF	0b0100001
ON	OFF	ON	0b0100010
ON	OFF	OFF	0b0100011
OFF	ON	OFF	0b0100101
OFF	OFF	ON	0b0100110
OFF	OFF	OFF	0b0100111

Table 2.15 I/O Expander 4 Bus Address

The bus address for the selected EEPROM device is **0b1000** by default and is configurable using W39 and the switch S5 as described in Table 2.16.

W39	S5[8]	S5[7]	S5[6]	Bus Address
OFF	OFF	OFF	OFF	0b0101 1111
OFF	OFF	OFF	ON	0b0101 1110
OFF	OFF	ON	OFF	0b0101 1101
OFF	OFF	ON	ON	0b0101 1100
OFF	ON	OFF	OFF	0b0101 1011
OFF	ON	OFF	ON	0b0101 1010
OFF	ON	ON	OFF	0b0101 1001
OFF	ON	ON	ON	0b0101 1000
ON	ON	ON	ON	0b0101 0000 (Default)

Table 2.16 EEPROM SMBus Address Setting

JTAG Header

The PES16T7 provides a JTAG connector J4 for access to the PES16T7 JTAG interface. The connector is a 2.54 x 2.54 mm pitch male 10-pin connector. Refer to Table 2.17 for the JTAG Connector J4 pin out.

Notes

JTAG Connector J4					
Pin	Signal	Direction	Pin	Signal	Direction
1	/TRST - Test reset	Input	2	GND	—
3	TDI - Test data	Input	4	GND	—
5	TDO - Test data	Output	6	GND	—
7	TMS - Test mode select	Input	8	GND	—
9	TCK - Test clock	Input	10	GND	—

Table 2.17 JTAG Connector Pin Out

Attention Buttons

The PES16T7 features four attention buttons, shown in Table 2.18. Each button corresponds to a particular port and is used to initiate hot-swapping events.

Button	Description
S3	Port 6 Attention Button
S4	Port 5 Attention Button
S7	Port 4 Attention Button
S8	Port 3 Attention Button
S9	Port 2 Attention Button

Table 2.18 Attention Buttons

Miscellaneous Jumpers, Headers

Miscellaneous Jumpers, Headers			
Ref. Designator	Type	Default	Description
W45-W47	Header	1-2 Shunted	1-2: 12.0V source from Upstream Port (Default) 2-3: 12.0V source from external power connector
W48-W51	Header	Shunted	Bypass hot-plug controller - Enable REFCLK to downstream ports (Default)
W12	Header	Shunted	Disable EEPROM Write protect feature (Default)
W4, W7, W11 W2, W5, W8 W3, W6, W9 W31, W44, W29	Header	ON, ON, ON ON, ON, OFF ON, OFF, ON OFF, ON, ON	I/O Expander 0 Address[2:0]. Default to 0x0 I/O Expander 1 Address[2:0]. Default to 0x1 I/O Expander 2 Address[2:0]. Default to 0x2 I/O Expander 4 Address[2:0]. Default to 0x4
W13	Header	Shunted	Bypass hot-plug controller - Enables direct power (+12V and +3.3V) to Port 6 (Default)
W14	Header	Shunted	Bypass hot-plug controller - Enables direct power (+12V and +3.3V) to Ports 5 (Default)

Table 2.19 Miscellaneous Jumpers, Headers (Part 1 of 2)

Notes

Miscellaneous Jumpers, Headers			
Ref. Designator	Type	Default	Description
W17	Header	Shunted	Bypass hot-plug controller - Enables direct power (+12V and +3.3V) to Ports 4 (Default)
W18	Header	Shunted	Bypass hot-plug controller - Enables direct power (+12V and +3.3V) to Ports 3 (Default)
W52	Header	Shunted	Bypass hot-plug controller - Enables direct power (+12V and +3.3V) to Ports 2 (Default)
W16	Header	2-3 Shunted	2-3: Port 6, 3.3Vaux source from Upstream port (Default) 1-2: Port 6, 3.3Vaux source from hot-plug controller
W15	Header	2-3 Shunted	2-3: Port 5, 3.3Vaux source from Upstream port (Default) 1-2: Port 5, 3.3Vaux source from hot-plug controller
W20	Header	2-3 Shunted	2-3: Port 4, 3.3Vaux source from Upstream port (Default) 1-2: Port 4, 3.3Vaux source from hot-plug controller
W19	Header	2-3 Shunted	2-3: Port 3, 3.3Vaux source from Upstream port (Default) 1-2: Port 3, 3.3Vaux source from hot-plug controller
W53	Header	2-3 Shunted	2-3: Port 2, 3.3Vaux source from Upstream port (Default) 1-2: Port 2, 3.3Vaux source from hot-plug controller
W21	Header	2-3 Shunted	2-3: Port 6, +12V source base on W45-W47 (Default) 1-2: Port 6, +12V source from hot-plug controller
W28	Header	2-3 Shunted	2-3: Port 5, +12V source base on W45-W47 (Default) 1-2: Port 5, +12V source from hot-plug controller
W33	Header	2-3 Shunted	2-3: Port 4, +12V source base on W45-W47 (Default) 1-2: Port 4, +12V source from hot-plug controller
W36	Header	2-3 Shunted	2-3: Port 3, +12V source base on W45-W47 (Default) 1-2: Port 3, +12V source from hot-plug controller
W54	Header	2-3 Shunted	2-3: Port 2, +12V source base on W45-W47 (Default) 1-2: Port 2, +12V source from hot-plug controller
W26	Header	2-3 Shunted	2-3: Port 6, +3.3V source from upstream port (Default) 1-2: Port 6, +3.3V source from hot-plug controller
W32	Header	2-3 Shunted	2-3: Port 5, +3.3V source base on W45-W47 (Default) 1-2: Port 5, +3.3V source from hot-plug controller
W34	Header	2-3 Shunted	2-3: Port 4, +3.3V source base on W45-W47 (Default) 1-2: Port 4, +3.3V source from hot-plug controller
W37	Header	2-3 Shunted	2-3: Port 3, +3.3V source base on W45-W47 (Default) 1-2: Port 3, +3.3V source from hot-plug controller
W55	Header	2-3 Shunted	2-3: Port 2, +3.3V source base on W45-W47 (Default) 1-2: Port 2, +3.3V source from hot-plug controller

Table 2.19 Miscellaneous Jumpers, Headers (Part 2 of 2)

LEDs

There are several LED indicators on the EB16T7 which convey status feedback. A description of each is provided in Table 2.20.

Notes

Location	Color	Definition
DS11	Green	Port 6: Power-is-good indicator
DS 12	Green	Port 5: Power-is-good indicator
DS15	Green	Port 4: Power-is-good indicator
DS14	Green	Port 3: Power-is-good indicator
DS28	Green	Port 2: Power-is-good indicator
DS7	Green	Port 6: Power Indicator
DS5	Yellow	Port 6: Attention Indicator
DS35	Green	Port 5: Power Indicator
DS34	Yellow	Port 5: Attention Indicator
DS10	Green	Port 4: Power Indicator
DS9	Yellow	Port 4: Attention Indicator
DS4	Green	Port 3: Power Indicator
DS3	Yellow	Port 3: Attention Indicator
DS8	Green	Port 2: Power Indicator
DS6	Yellow	Port 2: Attention Indicator
DS13	Red	Hot Plug Controller1: Power Fault Indicator
DS16	Red	Hot Plug Controller2: Power Fault Indicator
DS2	Green	Board Power Indicator (3.3V)
DS1	Red	Board Reset Indicator
DS17	Green	Port 6: link up status output
DS18	Green	Port 6: active status output
DS19	Green	Port 5: link up status output
DS20	Green	Port 5: active status output
DS21	Green	Port 4: link up status output
DS22	Green	Port 4: active status output
DS23	Green	Port 3: link up status output
DS24	Green	Port 3: active status output
DS30	Green	Port2: link up status output
DS33	Green	Port 2: active status output
DS25	Green	Port 0: link up status output
DS26	Green	Port1: active status output
DS31	Green	GPIO8
DS36	Green	GPIO7
DS27	Green	GPIO6
DS32	Green	GPIO5

Table 2.20 LED Indicators

Notes

PCI Express Connectors

Pin	Side A		Side B	
1	+12V	12V power	PRSNT1#	Hot-Plug presence detect
2	+12V	12V power	+12V	12V power
3	RSVD	Reserved	+12V	12V power
4	GND	Ground	GND	Ground
5	SMCLK	SMBus clock	JTAG2	TCK (Test Clock) JTAG i/f clk i/p
6	SMDAT	SMBus Data	JTAG	TDI (Test Data Input)
7	GND	Ground	JTAG	TDO (Test Data Output)
8	+3.3V	3.3V power	JTAG	TMS (Test Mode Select)
9	JTAG1	TRST# (Test/Reset) resets JTAG i/f	+3.3V	3.3V power
10	3.3Vaux	3.3V auxiliary power	+3.3V	3.3V power
11	WAKE#	Signal for Link reactivation	PERST#	Fundamental Reset
Mechanical Key				
12	RSVD	Reserved	GND	Ground
13	GND	Ground	REFCLK+	REFCLK Reference clock
14	PETp0	Transmitter differential	REFCLK-	(differential pair)
15	PETn0	pair, Lane 0	GND	Ground
16	GND	Ground	PERp0	Receiver differential
17	PRSNT2#	Hot-Plug presence detect	PERn0	pair, Lane 0
18	GND	Ground	GND	Ground
19	PETp1	Transmitter differential	RSVD	Reserved
20	PETn1	pair, Lane 1	GND	Ground
21	GND	Ground	PERp1	Receiver differential
22	GND	Ground	PERn1	pair, Lane 1
23	PETp2	Transmitter differential	GND	Ground
24	PETn2	pair, Lane 2	GND	Ground
25	GND	Ground	PERp2	Receiver differential
26	GND	Ground	PERn2	pair, Lane 2
27	PETp3	Transmitter differential	GND	Ground
28	PETn3	pair, Lane 3	GND	Ground
29	GND	Ground	PERp3	Receiver differential
30	RSVD	Reserved	PERn3	pair, Lane 3
31	PRSNT2#	Hot-Plug presence detect	GND	Ground
32	GND	Ground	RSVD	Reserved
33	PETp4	Transmitter differential	RSVD	Reserved

Table 2.21 PCI Express x16 Connector Pinout (Part 1 of 2)

Notes

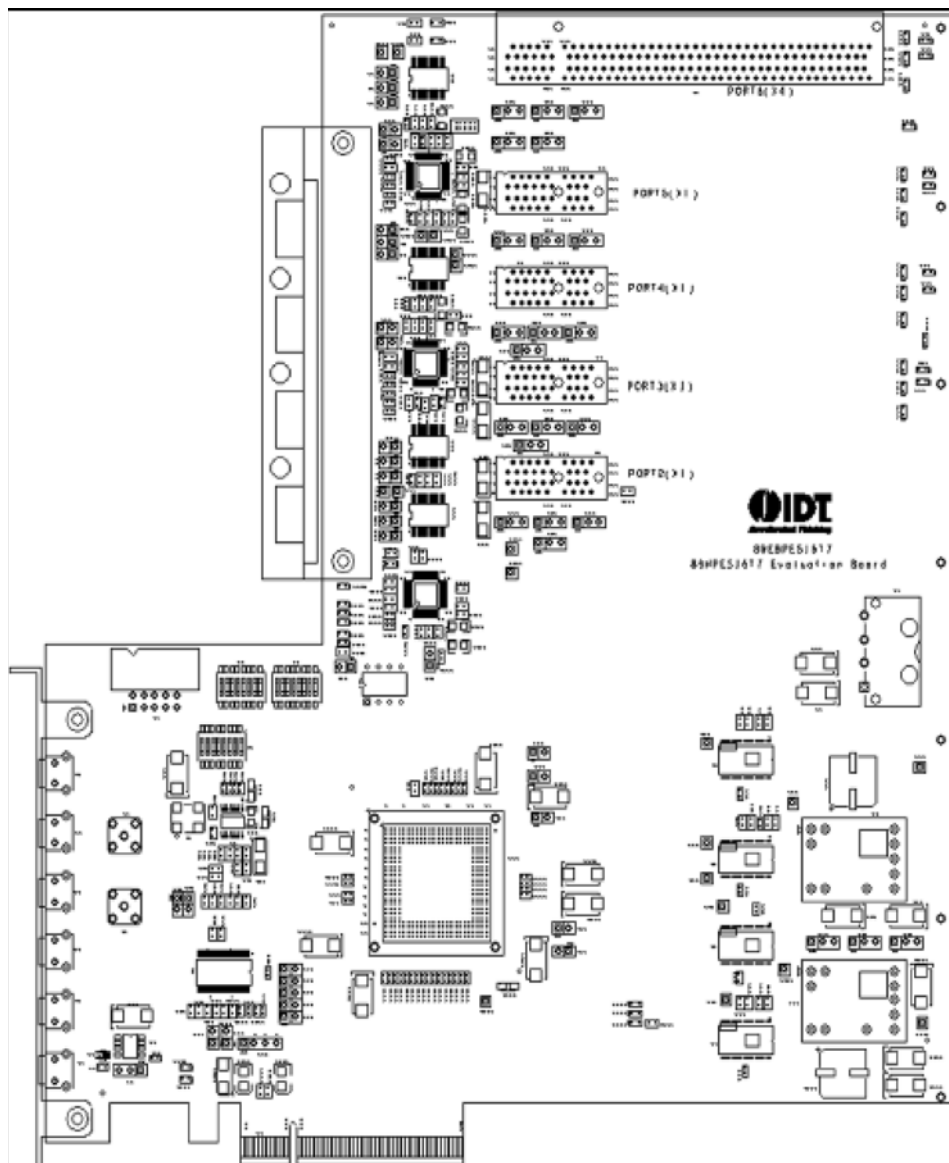
Pin	Side A		Side B	
34	PETn4	pair, Lane 4	GND	Ground
35	GND	Ground	PERp4	Receiver differential
36	GND	Ground	PERn4	pair, Lane 4
37	PETp5	Transmitter differential	GND	Ground
38	PETn5	pair, Lane 5	GND	Ground
39	GND	Ground	PERp5	Receiver differential
40	GND	Ground	PERn5	pair, Lane 5
41	PETp6	Transmitter differential	GND	Ground
42	PETn6	pair, Lane 6	GND	Ground
43	GND	Ground	PERp6	Receiver differential
44	GND	Ground	PERn6	pair, Lane 6
45	PETp7	Transmitter differential	GND	Ground
46	PETn7	pair, Lane 7	GND	Ground
47	GND	Ground	PERp7	Receiver differential
48	PRSNT2#	Hot-Plug presence detect	PERn7	pair, Lane 7
49	GND	Ground	GND	Ground
50	PETp8	Transmitter differential	RSVD	Reserved
51	PETn8	pair, Lane 8	GND	Ground
52	GND	Ground	PERp8	Receiver differential
53	GND	Ground	PERn8	pair, Lane 8
54	PETp9	Transmitter differential	GND	Ground
55	PETn9	pair, Lane 9	GND	Ground
56	GND	Ground	PERp9	Receiver differential
57	GND	Ground	PERn9	pair, Lane 9
58	PETp10	Transmitter differential	GND	Ground
59	PETn10	pair, Lane 10	GND	Ground
60	GND	Ground	PERp10	Receiver differential
61	GND	Ground	PERn10	pair, Lane 10
62	PETp11	Transmitter differential	GND	Ground
63	PETn11	pair, Lane 11	GND	Ground
64	GND	Ground	PERp11	Receiver differential
65	GND	Ground	PERn11	pair, Lane 11
66	PETp12	Transmitter differential	GND	Ground
67	PETn12	pair, Lane 12	GND	Ground
68	GND	Ground	PERp12	Receiver differential
69	GND	Ground	PERn12	pair, Lane 12
70	PETp13	Transmitter differential	GND	Ground

Table 2.21 PCI Express x16 Connector Pinout (Part 2 of 2)

Notes

Note: These x16 PCI Express connectors comply with the PCIe specification. However, the downstream ports on the EB16T7 are electronically connected in either a x4 configuration (port 6) or a x1 configuration (ports 2, 3, 4 and 5). According to the PCI Express specification, the PRSNT1# pin should be wired to the farthest available PRSNT2# pin on the connector. In the EB16T7, all PRSNT2# pins are tied together. This allows the board to be installed in a x1 or a x4 slot via a slot reducer.

Locations of Connectors, Jumpers, and Switches





Software for the EB16T7 Eval Board

Notes

Introduction

This chapter discusses some of the main features of the available software to give users a better understanding of what can be achieved with the EB16T7 evaluation board using the device management software.

Device management software and related user documentation are available on a CD which is included in the Evaluation Board Kit. This information is also available on IDT's FTP site. For more information, contact IDT at ssdhelp@idt.com.

Device Management Software

The primary use of the Device Management Software package is to enable users of the evaluation board to access all the registers in the PES16T7 device. This access can be achieved using the PCI Express in-band configuration cycles through the upstream port on the PES16T7.

This software also enables users to save a snapshot of the current register set into a dump file which can be used for debugging purposes. An export/import facility is also available to create and use "Configuration" files which can be used to initialize the switch device with specific values in specific registers.

A conversion utility is also provided to translate a configuration file into an EEPROM programmable data structure. This enables the user to program an appropriate serial EEPROM with desirable register settings for the PES16T7, and then to populate that EEPROM onto the Evaluation Board. It is also possible to program the EEPROM directly on the Evaluation Board using a feature provided by the software package.

The front end of the Device Management Software is a user-friendly Graphical User Interface which allows the user to quickly read or write the registers of interest. The GUI also permits the user to run the software in "simulation" mode with no real hardware attached, allowing the creation of configuration files for the PES16T7 in the absence of the actual device.

Much of the Device Management Software is written with device-independent and OS-independent code. The software will be guaranteed to work on Linux (/sys interface) and MS Windows XP. It may function flawlessly on various flavors of MS Windows, but may not be validated on all. The fact that the software is device-independent assures its scalability to future PCIe parts from IDT. Once users are familiar with the GUI, they will be able to use the same GUI on all PCIe parts from IDT. This software is customized for each device through an XML device description file which includes information on the number of ports, registers, types of registers, information on bit-fields within each register, etc.

Notes



Schematics

Notes

Schematics



D

C

B

A

D

C

B

A

8	7	6	5	4	3	2	1
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REVISIONS				
DCN	REV	DESCRIPTION	DATE	CHANGE BY
STGC-0002R01	1.0	INITIAL RELEASE	2006-08-01	J. CARRILLO

SHEET	DESCRIPTION
1	TABLE OF CONTENTS
2	BLOCK DIAGRAM
3	POWER SUPPLY AND RESET
4	CLOCKS
5	SMBUS, JTAG, I/O EXPANDER
6	HOT PLUG CONTROL PORT B/C
7	HOT PLUG CONTROL PORT D/E
8	HOT PLUG CONTROL PORT F
9	PORT B CONN AND 16T7 PORTS
10	PORT C CONNECTOR
11	PORT D CONNECTOR
12	PORT E CONNECTOR
13	PORT F CONNECTOR
14	PORT A UPSTREAM CONN 16T7
15	PES16T7 - POWER
16	PES16T7 - SMBUS REFCLKS
17	LINK STATUS WAKE



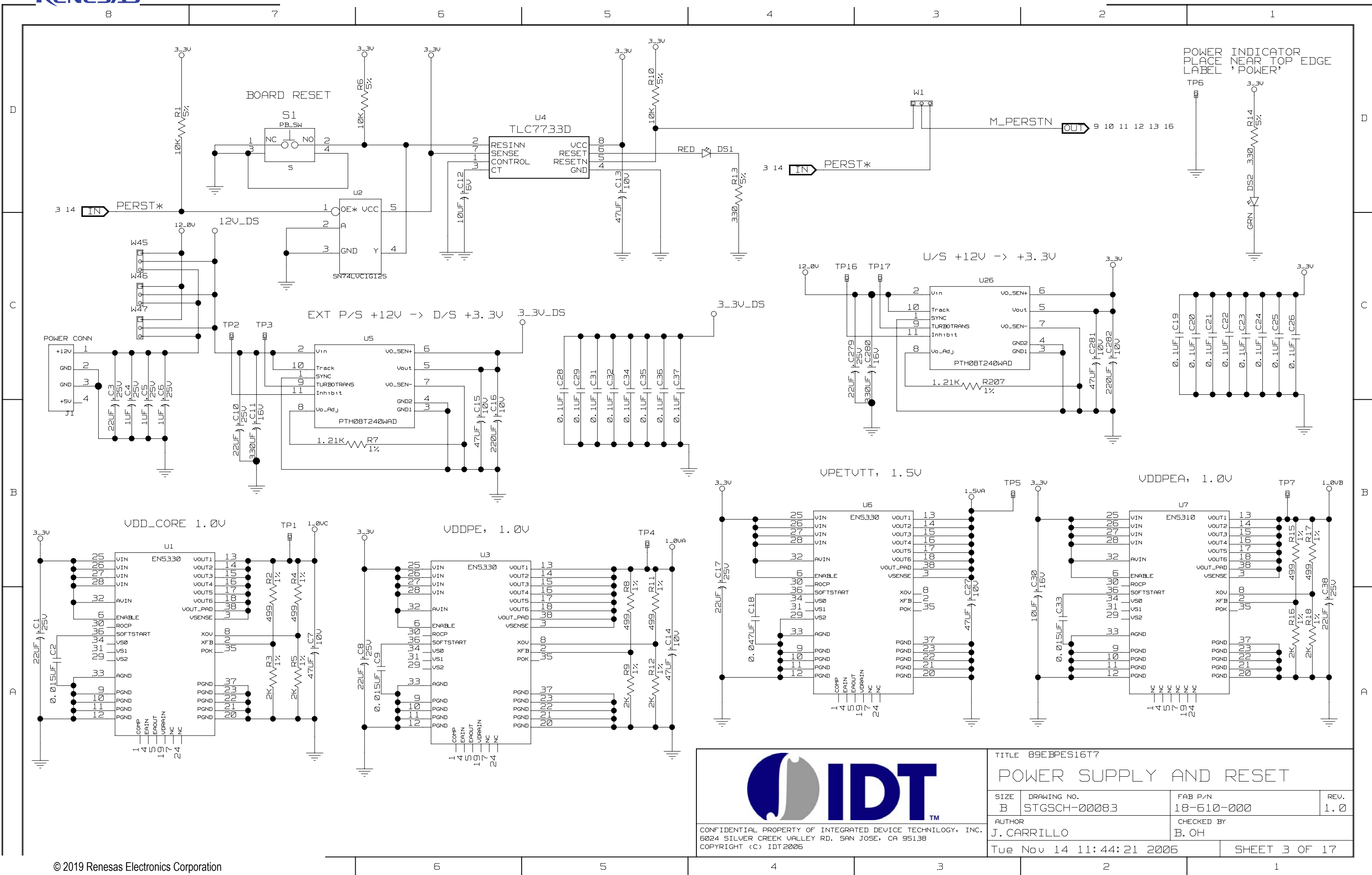
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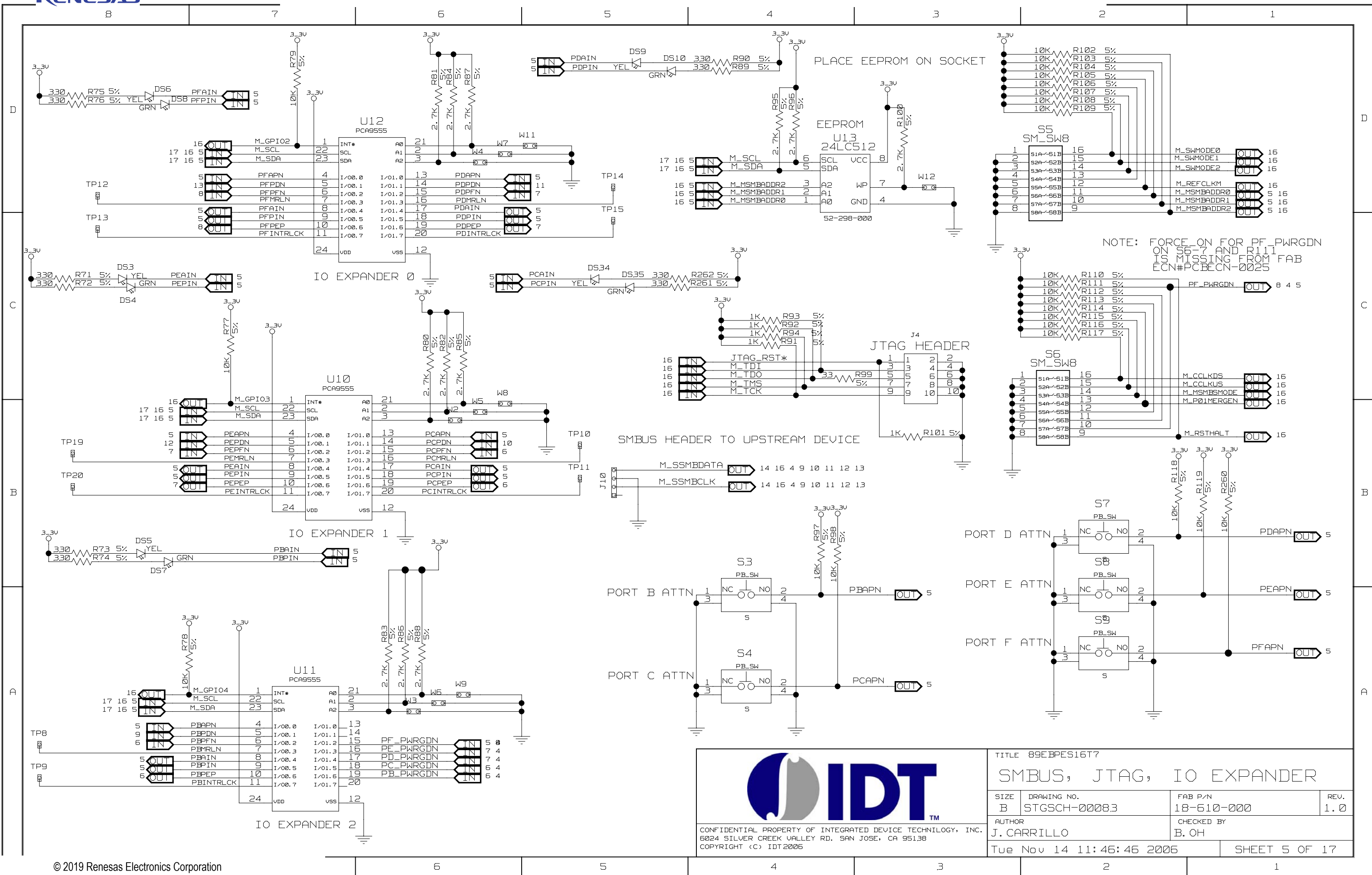
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AUTHOR J. CARRILLO		CHECKED BY B. OH	
Wed Nov 08 13:10:27 2006			SHEET 1 OF 17

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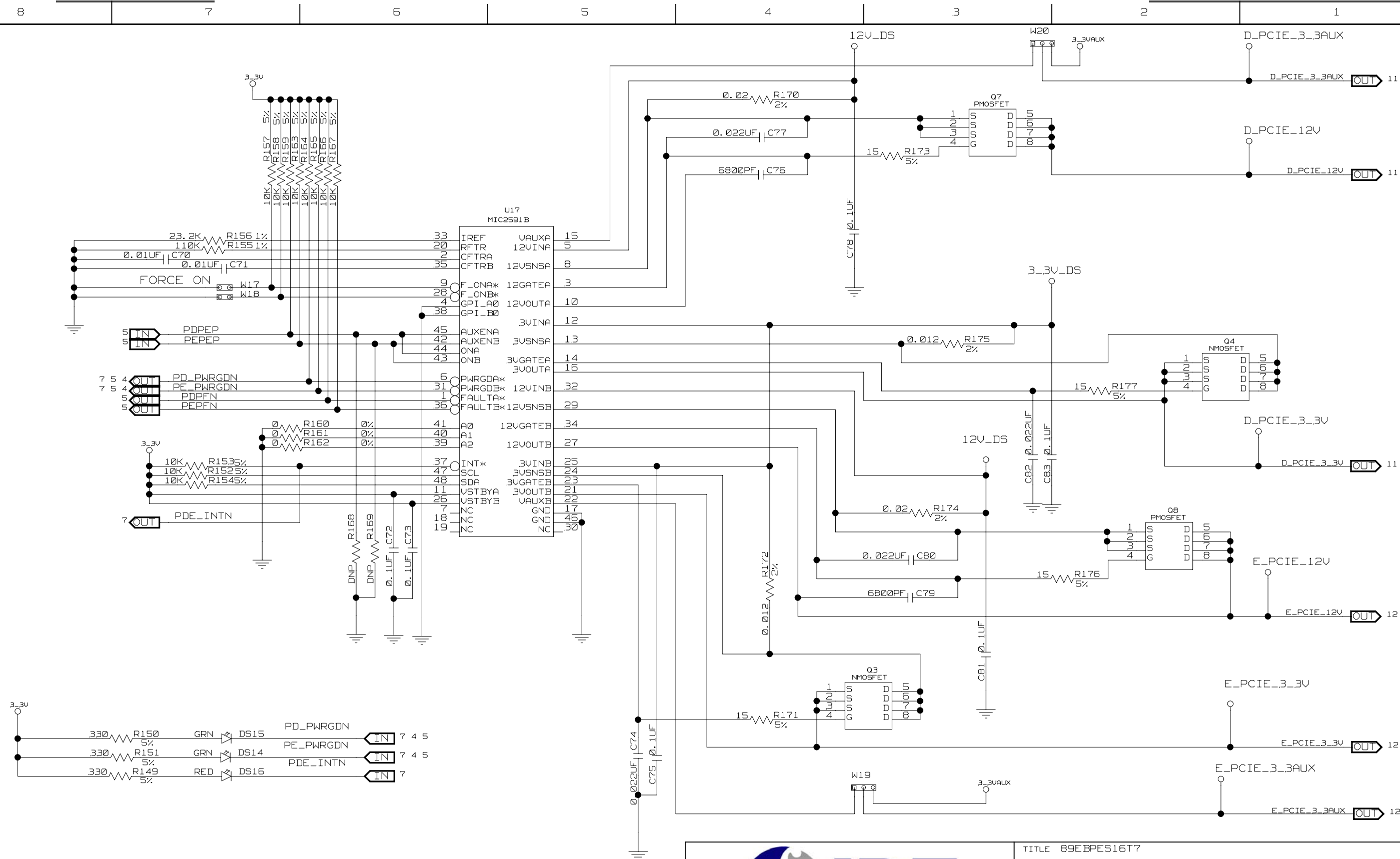








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HOT PLUG CONTROL PORT B/C			
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Tue Nov 14 11:44:23 2006		SHEET 6 OF 17	



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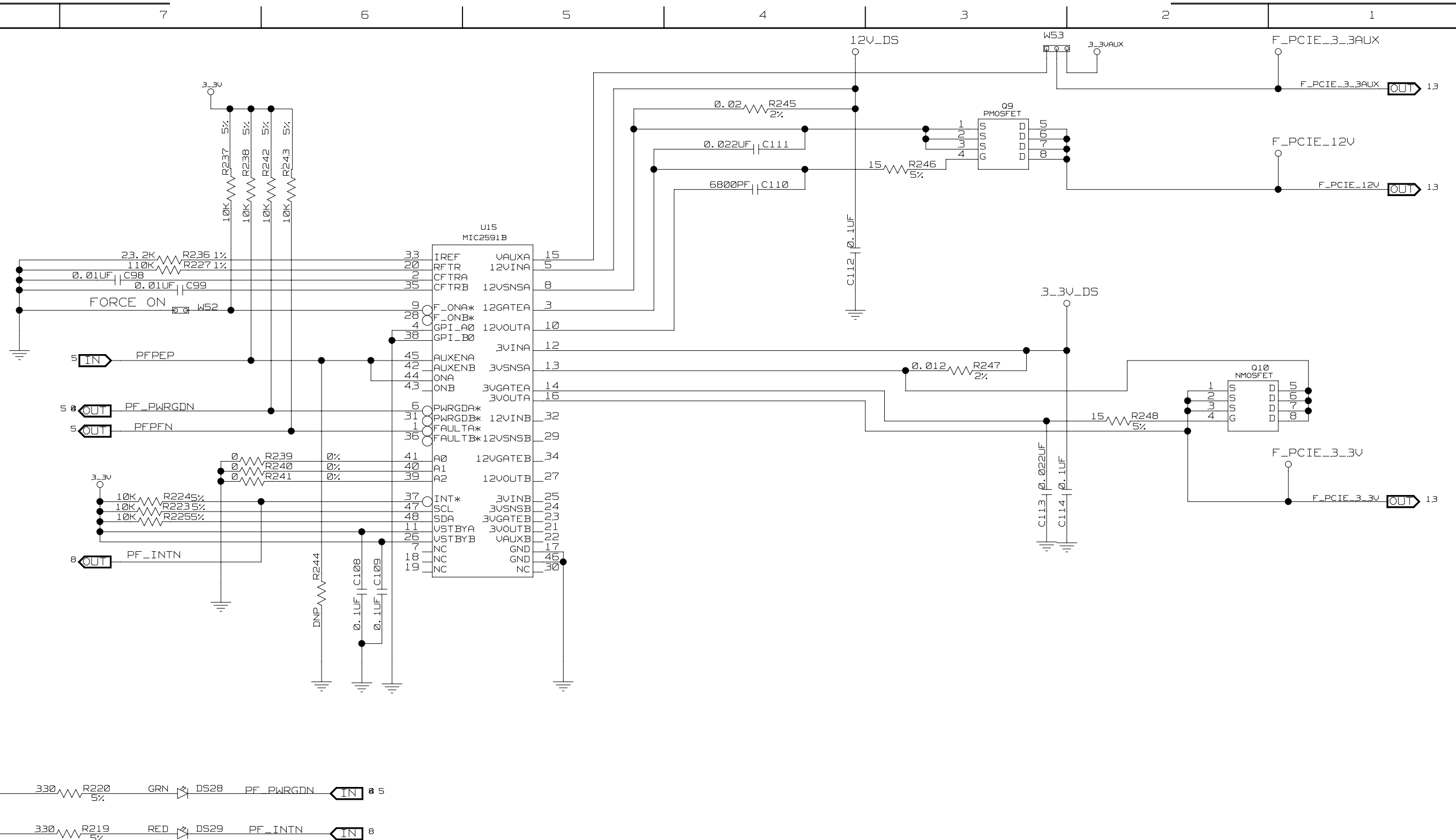
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HOT PLUG CONTROL PORT D/E

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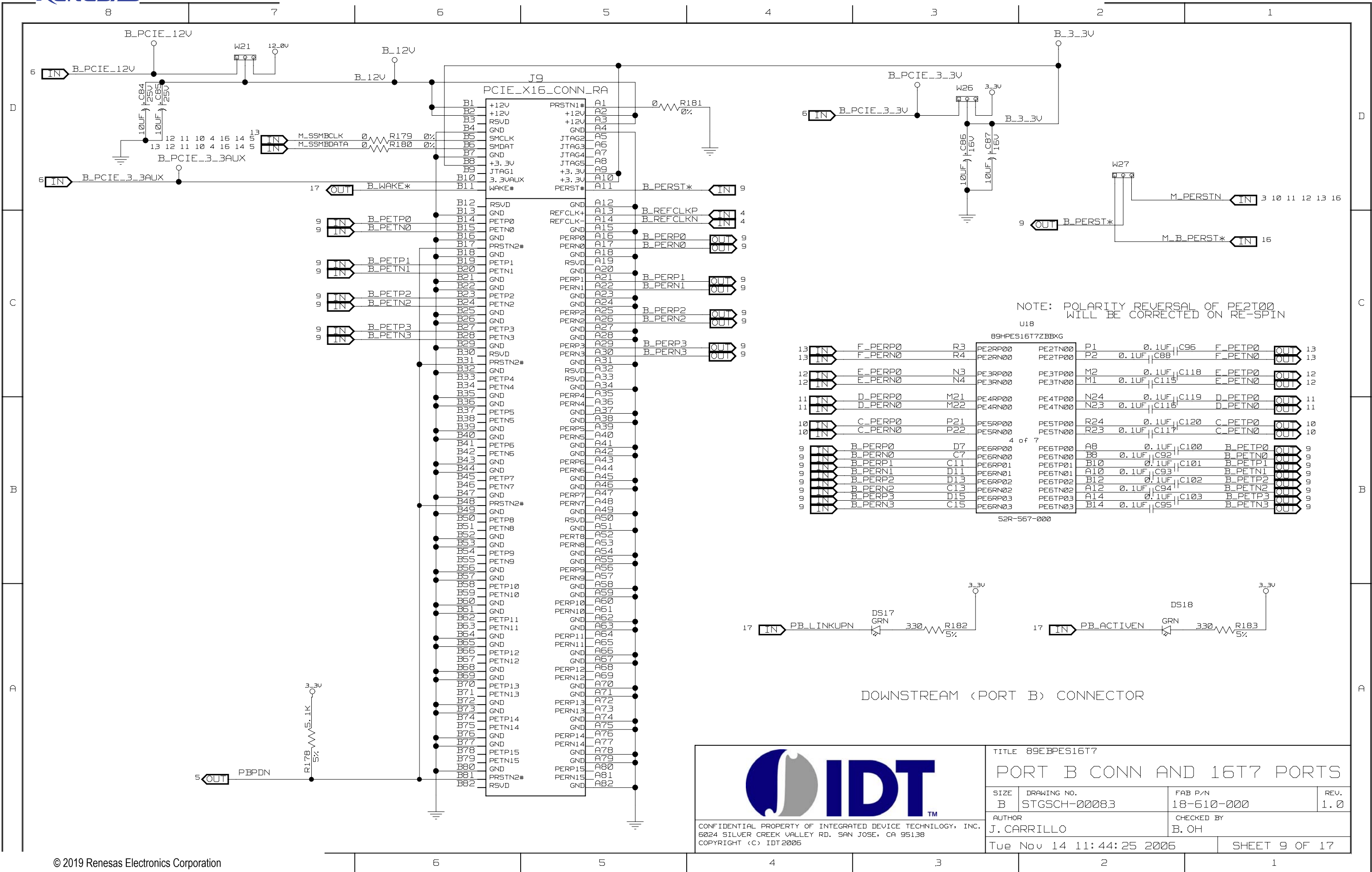
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J. CARRILLO	B. OH

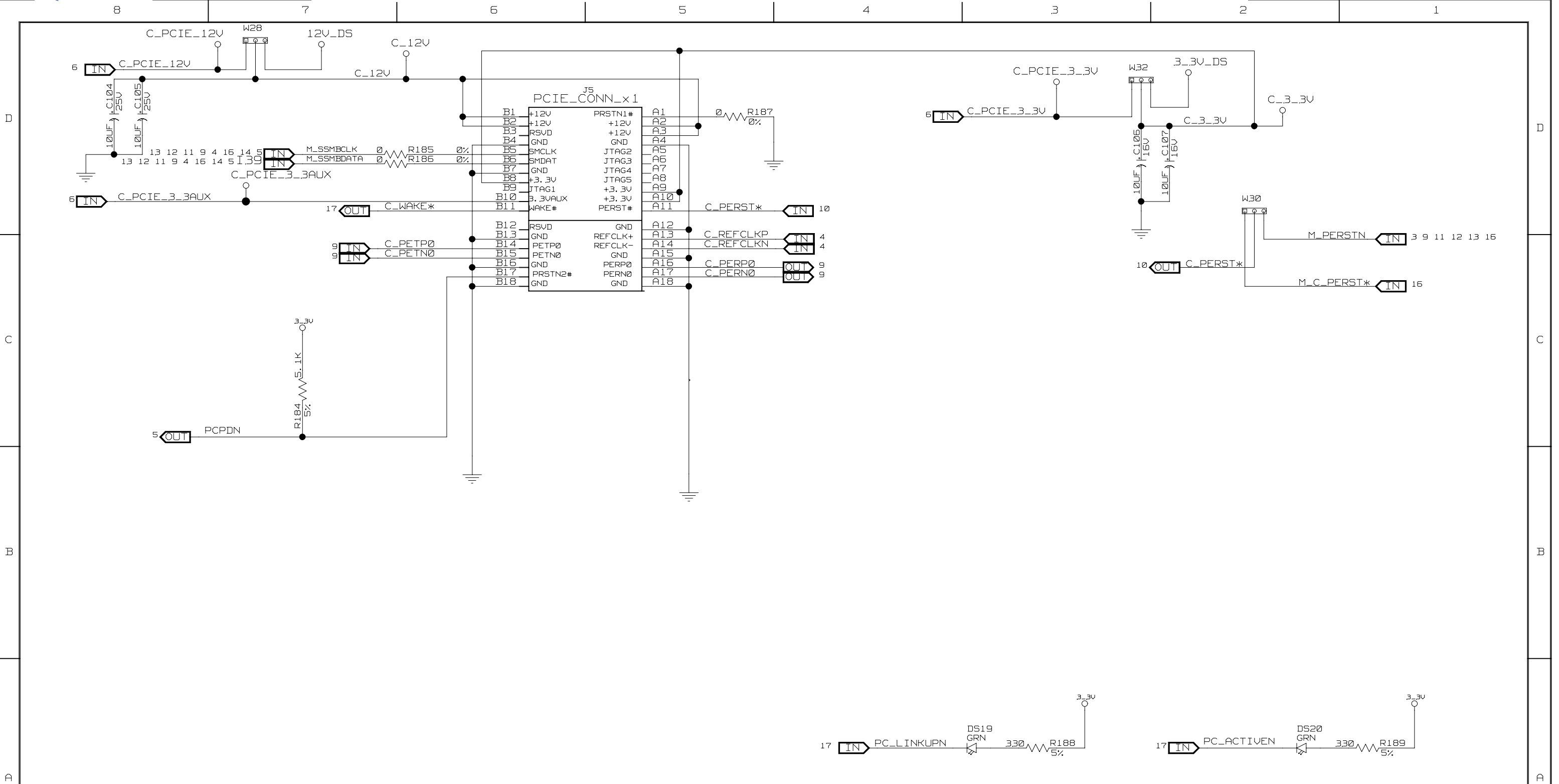
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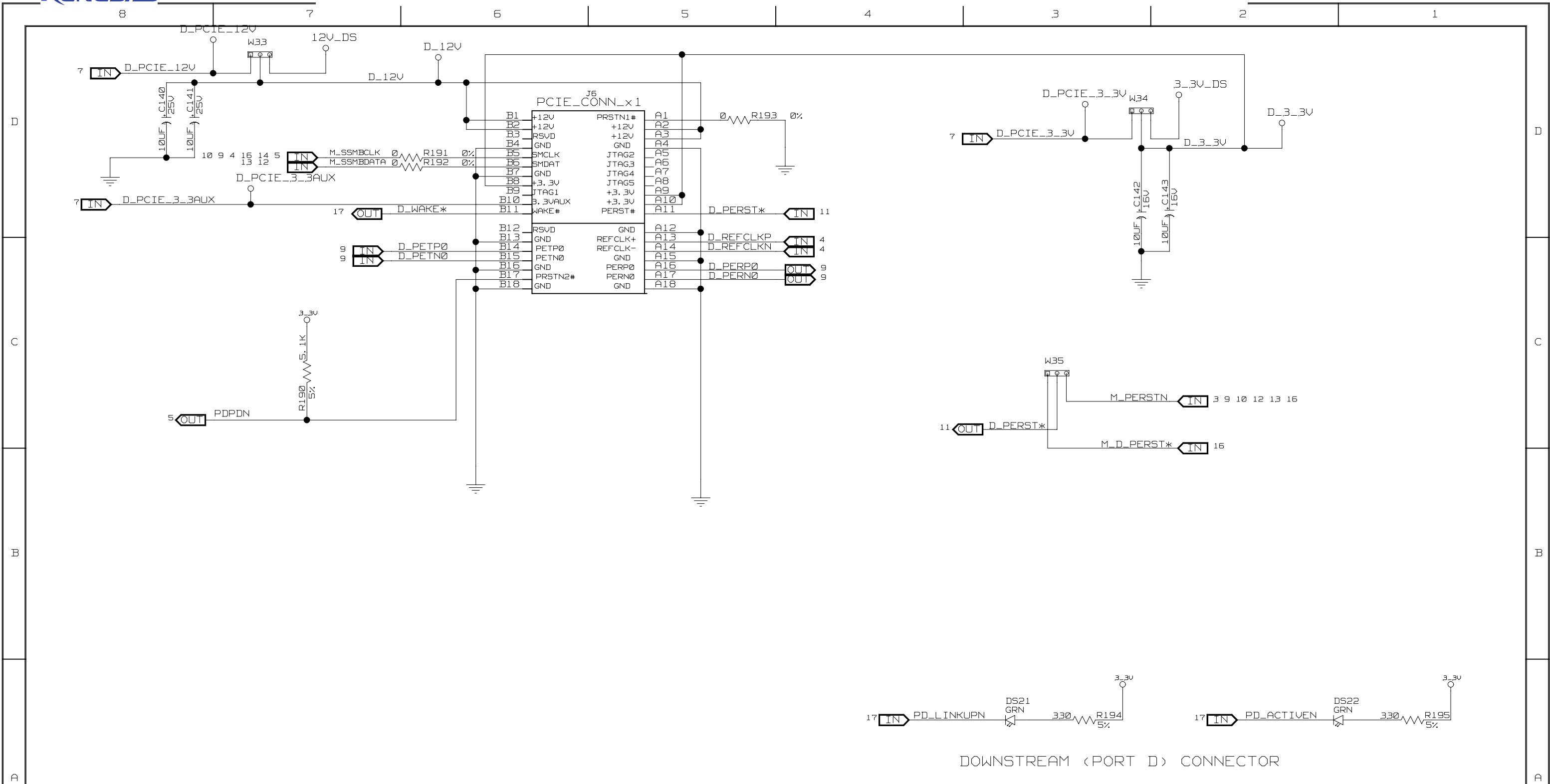
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TITLE 89EBPES16T7			
HOT PLUG CONTROL PORT F			
SIZE B	DRAWING NO. STGSCH-00083	FAB P/N 18-610-000	REV. 1.0
AUTHOR J. CARRILLO		CHECKED BY B. OH	
Tue Nov 14 11:44:24 2006			SHEET 8 OF 17





		TITLE 89EBPES16T7	
		PORT C CONNECTOR	
SIZE	DRAWING NO.	FAB P/N	REV.
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AUTHOR		CHECKED BY	
J. CARRILLO		B. OH	
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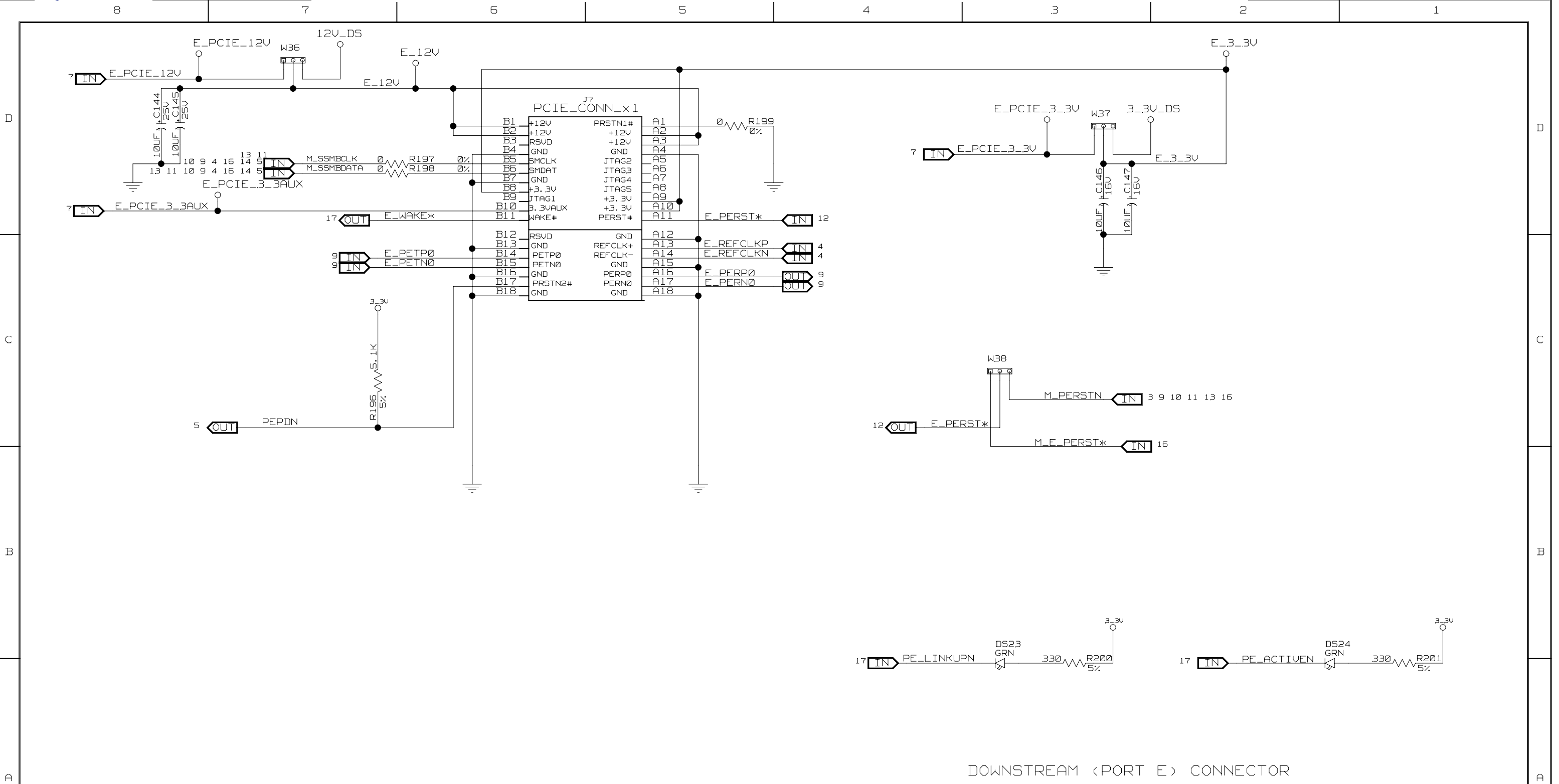


DOWNSTREAM (PORT D) CONNECTOR



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TITLE 89EBPES16T7			
PORT D CONNECTOR			
SIZE B	DRAWING NO. STGSCH-00083	FAB P/N 18-610-000	REV. 1.0
AUTHOR J. CARRILLO		CHECKED BY B. OH	
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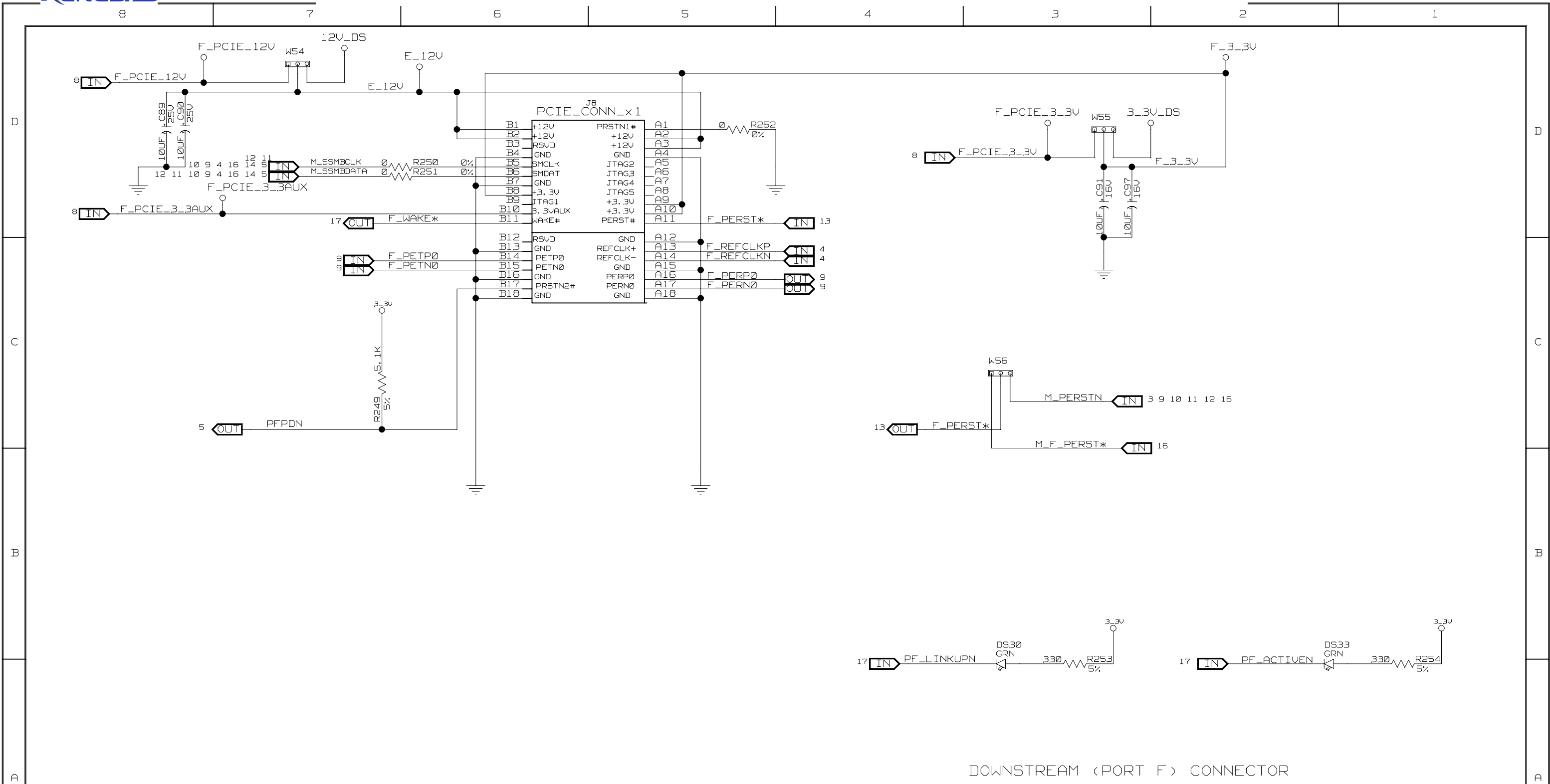


DOWNSTREAM (PORT E) CONNECTOR



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TITLE 89EBPES16T7			
PORT E CONNECTOR			
SIZE B	DRAWING NO. STGSCH-00083	FAB P/N 18-610-000	REV. 1.0
AUTHOR J. CARRILLO		CHECKED BY B. OH	
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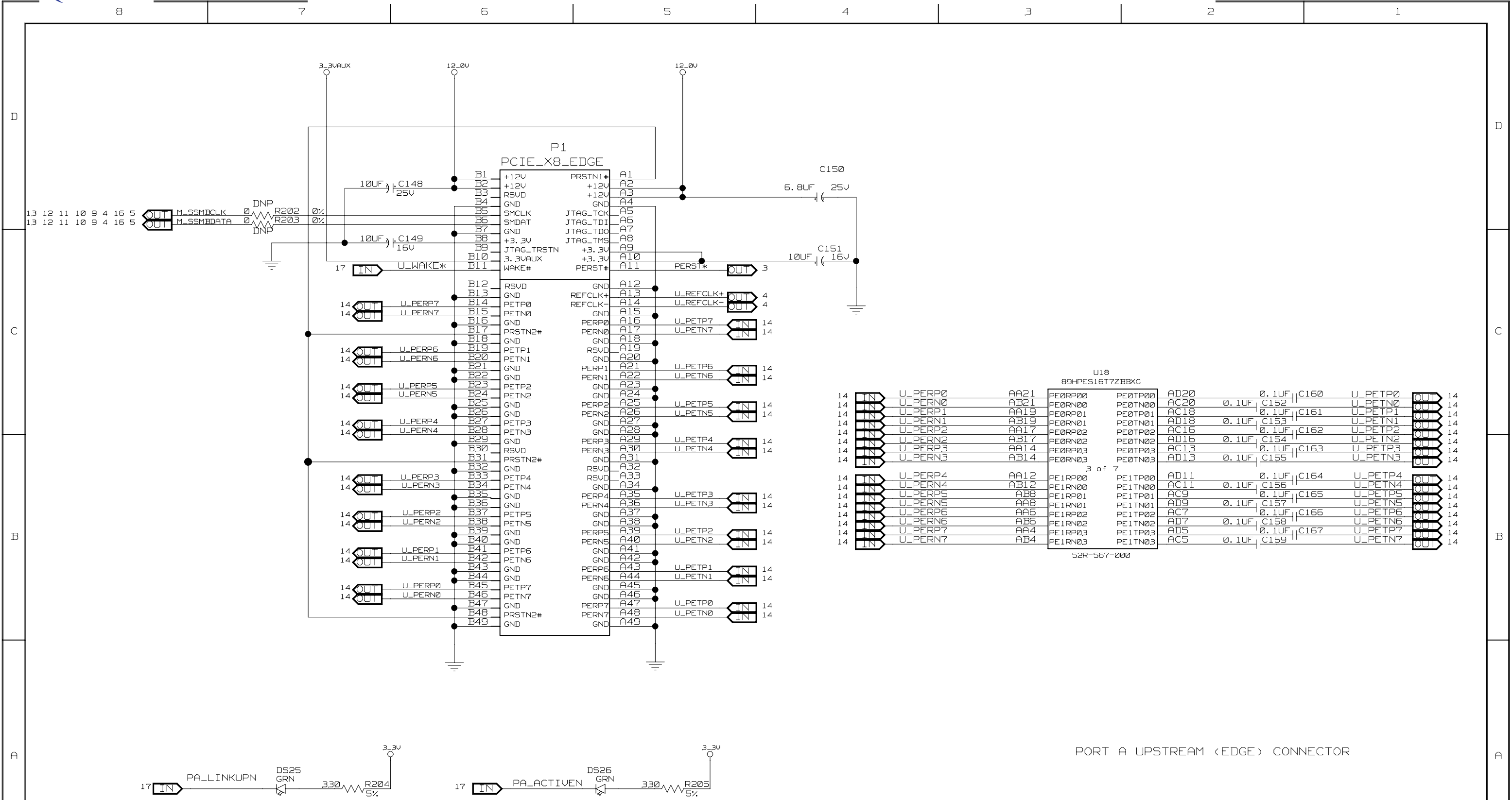


DOWNSTREAM (PORT F) CONNECTOR



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PORT F CONNECTOR			
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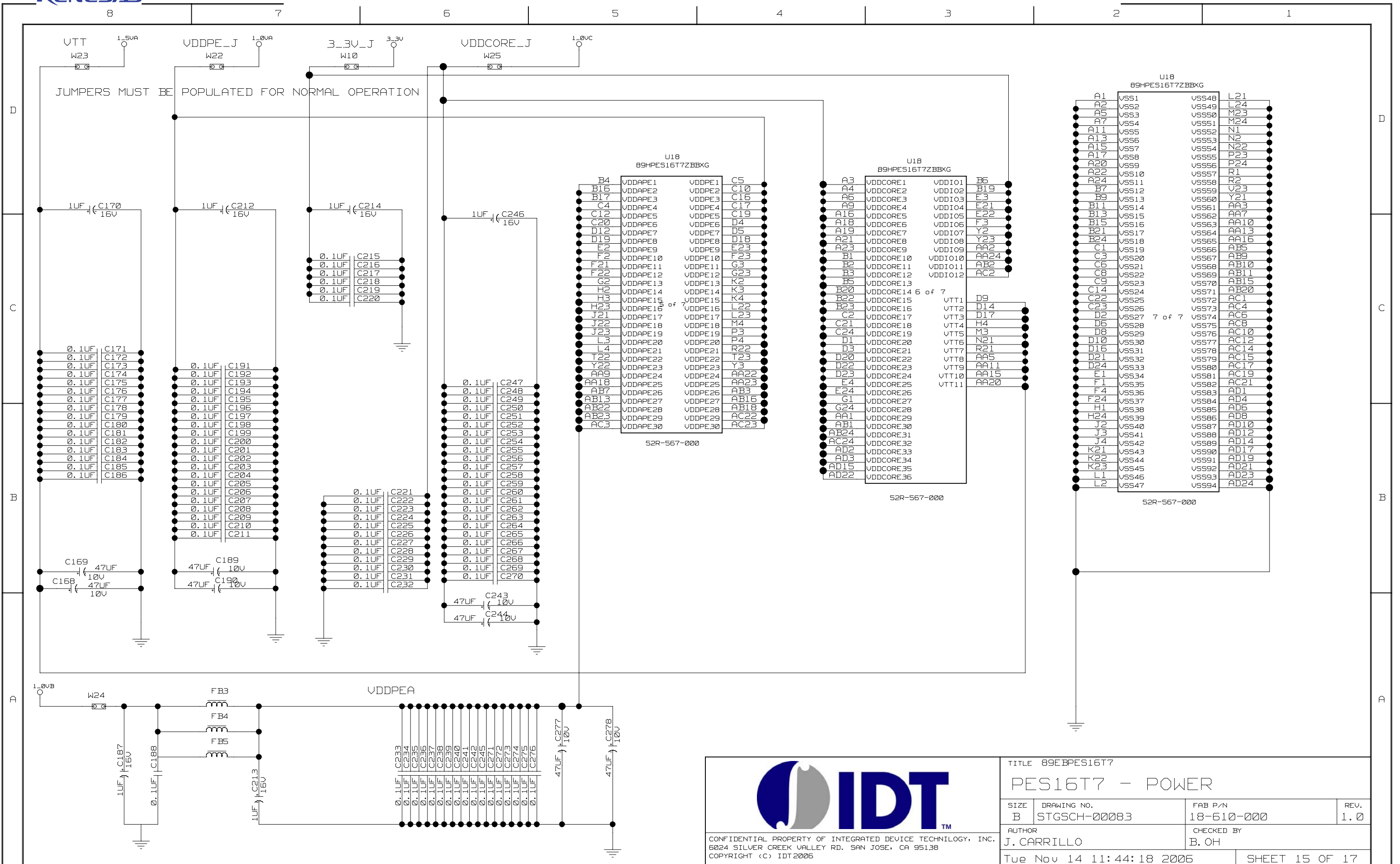


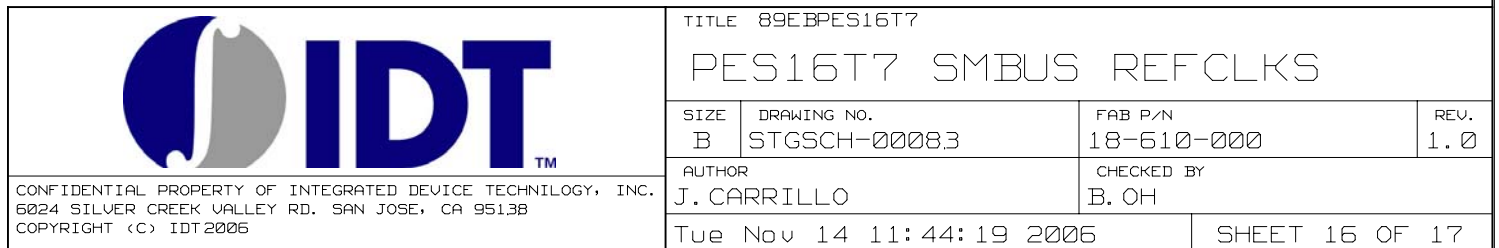
PORT A UPSTREAM (EDGE) CONNECTOR



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PORT A UPSTREAM CONN 16T7			
SIZE	DRAWING NO.	FAB P/N	REV.
B	STGSCH-00083	18-610-000	1.0
AUTHOR		CHECKED BY	
J. CARRILLO		B. OH	
Tue Nov 14 11:44:17 2006			SHEET 14 OF 17







LINK STATUS WAKE

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AUTHOR J. CARRILLO		CHECKED BY B. OH	
Tue Nov 14 11:44:19 2006		SHEET 17 OF 17	

Engineering Change Notice

STG DCN# : STGC-0082R01

Project Name <u>89EBPES16T7 - McKinley Eval Bd</u>		Current Fab Rev. <u>18-610-000</u> New Fab Rev. <u>N/A</u>	Release/Effective Date: <u>11/14/2006</u>
Documentation Affected: ☐ Assembly Drawing ☐ Fab Drawing ☐ PCB Database ☐ Other ☐ FSD ☐ Pick And Place File ☒ Bill Of Materials ☐ Gerber Data ☐ Product Spec ☐ Drill File ☒ IPC356 Netlist ☒ Schematic Drawing		Originator's Approval: APPROVED Name: <u>Brandon Wong</u> ☒ YES Date: <u>11/14/2006</u> ☐ NO	
Reason For Change: (Originator) The differential clock fan out device (U9) has OE6# pulled high, so the REFCLK to Port F (J8) is never supplied.		Rework Description or Action Required: (STG) On the bottom-side of the board: 1) Connect wire from R242 (left side - non 3.3V side) to R111 (bottom of resistor - non 3.3V side). [Allows SW6-7 to allow manual control of OE6# pin]	
Description of Requested Change: (Originator) Connect the PF_PWRGDN signal to U9 pin 35, and enable manual control of the OE6# signal by changing SW6-7. OFF => pull-up on OE6# to disable output- allows control of OE signals via SMBus ON => pull-down on OE6# - Manual enable of the OE6# signal		On the top-side of the board: 2) Remove R214 3) Connect wire from SW6 pin 10 to R214 top pad (non 3.3V side).	
Disposition of Existing Material: ☐ Scrap And Replace ☐ Use As Is ☒ Rework Per ECN ☐ Other			
STG Approval Signatures:			
Eng. Mgr. / Director: ☒ YES ☐ NO Name: <u>Dave Winn</u> Date: <u>11/14/2006</u>		Project Mgr.: ☐ YES ☐ NO Name: <u>Brian Oh</u> Date: _____	
Component Engineer: ☒ YES ☐ NO Name: <u>Ben Hinson</u> Date: <u>11/14/2006</u>		Mfg. Engineer: ☐ YES ☐ NO Name: <u>Robert Yang</u> Date: _____	
STG Approval Signatures:			Copy Distribution:
			☒ Apps. Engineering ☐ Design Engineering ☐ Product Marketing ☒ STG Doc. Control

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