DS21Q348DK
3.3V E1/T1/J1 Line Interface Design Kit Daughter Card

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GENERAL DESCRIPTION

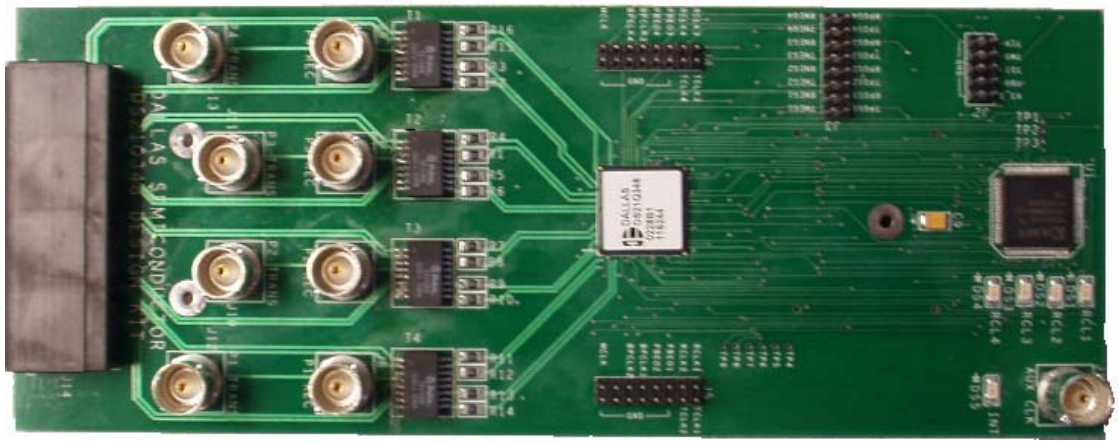
The DS21Q348 design kit is an evaluation board for the DS21Q348 3.3V E1/T1/J1 line interface. The DS21Q348DK is intended to be used as a daughter card with either the DK2000 or the DK101 motherboards. The board comes complete with a line interface unit (LIU), transformers, termination resistors, configuration switches, network connectors, and an interface to the motherboard.

ORDERING INFORMATION

PART	DESCRIPTION
DS21Q348DK	DS21Q348 (Quad BGA) Design Kit

FEATURES

- Expedites New Designs by Eliminating First-Pass Prototyping
- Interfaces Directly to the DK101 or DK2000 Motherboards
- Demonstrates Key Functions of the DS21Q348
- High-Level Software Provides Visual Access to Registers
- Software-Controlled (Register Mapped) Configuration Switches to Facilitate Clock and Signal Routing
- BNC Connections for 75Ω E1
- Bantam and RJ48 Connectors for 120Ω E1 and 100Ω T1
- Multitap Transformer Facilitates True Impedance Matching for 75Ω and 120Ω/100Ω Paths



REV: 060303

COMPONENT LIST

DESIGNATION	QTY	DESCRIPTION	SUPPLIER	PART
1	1	3.3V E1/T1/J1 line interface, 0°C to +70°C, 144-pin BGA	Dallas Semiconductor	DS21Q348
C1, C2, C6, C10, C12, C22, C24	7	0.47µF 10%, 25V ceramic capacitors (1206)	Digi-Key	PCC1891CT-ND
C13–C16	4	0.1µF 10%, 25V ceramic capacitors (1206)	Digi-Key	PCC1883CT-ND
C17–C20	4	1µF 10%, 16V ceramic capacitors (1206)	Digi-Key	PCC1882CT-ND
C3–C5, C7, C8, C11, C21, C23, C25, C26	10	0.1µF 10%, 16V ceramic capacitors (0603)	Digi-Key	311-1088-1-ND
C9	1	10µF 20%, 16V tantalum capacitors (B case)	Digi-Key	PCS3106CT-ND
DS1–DS5	5	LED, red, SMD	Digi-Key	P500CT-ND
J1, J6–J13	9	Right-angle, 5-pin BNC connectors	Kruvand	UCBJR220
J14	1	Right-angle RJ45, 8-pin, 4-port jack	Molex	43223-8140
J15, J16	2	50-pin, dual row, vertical SMD sockets	Samtec	TFM-125-02-S-D-LC
J2	1	10-pin, dual row, vertical connector	Digi-Key	S2012-05-ND
J3–J5	—	8-row by 2-column pin strip, 0.1" centers, 0.025" post	NA	Lab Stock
R17, R20, R21, R25, R28–R36, R53	14	10kΩ 1%, 1/10W resistors (0805)	Digi-Key	P10.0KCCT-ND
R18, R19, R22–R24, R26, R27	7	51.1Ω 1%, 1/10W resistors (0805)	Digi-Key	P51.1CCT-ND
R1–R16, R37–R41, R54–R57	25	0Ω 5%, 1/8W resistors (1206)	Digi-Key	P0.0ETR-ND
R42, R43	2	1.0kΩ 1%, 1/10W resistors (0805)	Digi-Key	P1.00KCCT-ND
R44–R51	8	61.9Ω 1%, 1/8W resistors (1206)	Digi-Key	P61.9FCT-ND
T1–T4	4	XFMR, dual, 16-pin SMT	Pulse Engineering	TX1099
U1	1	Xilinx CPLD 72 macrocell, 100-pin TQFP, 3.3V	Avnet	XC95142XL-10TQ100C

BASIC OPERATION

Hardware Configuration

Using the DK101 Processor Board:

- Connect the daughter card to the DK101 processor board.
- Supply 3.3V to the banana-plug receptacles marked GND and VCC_3.3V. (The external 5V connector is unused. Additionally, the TIM 5V supply headers are unused.)
- All processor-board DIP switch settings should be in the ON position with the exception of the flash-programming switch, which should be OFF.
- From the Programs menu launch the host application named ChipView.exe. Run the ChipView application. If the default installation in options were used, click the Start button on the Windows toolbar and select Programs→ChipView→ChipView.

Using the DK2000 Processor Board:

- Connect the daughter card to the DK2000 processor board.
- Connect J1 to the power supply that is delivered with the kit. Alternately, a PC power supply can be connected to connector J2.
- From the Programs menu launch the host application named ChipView.exe. Run the ChipView application. If the default installation in options were used, click the Start button on the Windows toolbar and select Programs→ChipView→ChipView.

General:

- Upon power-up, the RCL LEDs are lit, and the INT LED is off.
- After power-up, the RCL LEDs extinguish upon external loopback.
- Due to the dual winding transformer, only the 120Ω line build-out configuration setting is needed to cover 75Ω E1 and 120Ω E1.

Quick Setup (Register View)

- The PC loads the program, offering a choice between DEMO MODE, REGISTER VIEW, and TERMINAL MODE. Select Register View.
- The program requests a definition file. Select DS21Q348DK02A0_CPLD.DEF.
- The Register View Screen appears, showing the register names, acronyms, and values. Note the CPLD def file contains a link such that the def file for the DS21Q348 is also loaded. Selection among the def files is accomplished using the drop-down box on the right-hand side of the program window.
- From the drop-down box select the DS21Q348 def file and configure register CCR3 of ports 1 through 4 with a 90h.
  - The device begins transmitting a pseudorandom bit sequence. Upon external loopback, the RCL LED extinguishes, denoting that the device has found a carrier and has successfully decoded the pseudorandom bit sequence. For more advanced configurations, please refer to the DS21Q348 data sheet.

Miscellaneous:

- Clock frequencies are provided by a register-mapped CPLD, which is on the DS21Q348 daughter card.
- The definition file for this CPLD is named *DS21Q348DK02A0_CPLD.def*. See *CPLD Register Map* definitions.

ADDRESS MAP

The DK101 daughter card address space begins at 0x81000000.
The DK2000 daughter card address space begins at:

0x30000000 for slot 0
0x40000000 for slot 1
0x50000000 for slot 2
0x60000000 for slot 3

All offsets in the *Daughter Card Address Map* table are relative to the beginning of the daughter card address space.

Daughter Card Address Map

OFFSET	DEVICE	FUNCTION
0X0000 to 0X0015	CPLD	Board ID, clock and signal routing
0X2000 to 0X2015	LIU Port 1	Board is populated with either the DS21Q348 or the DS21448. Please see the factory data sheet for details.
0X3000 to 0X3015	LIU Port 2	
0X4000 to 0X4015	LIU Port 3	
0X5000 to 0X5015	LIU Port 4	

Registers in the CPLD can be easily modified using ChipView, a host-based user-interface software, with the definition file named *ds21q348dk02A0_cpld.def*. This file is included as part of the design kit documentation download (accessed through the DS21Q348's quick view data sheet). The definition file for the LIU is named *DS21Q348.def*.

CPLD Register Map

OFFSET	REGISTER	TYPE	FUNCTION
0X0000	BID	Read-Only	Board ID
0X0001	—	—	Unused
0X0002	XBIDH	Read-Only	High Nibble Extended Board ID
0X0003	XBIDM	Read-Only	Middle Nibble Extended Board ID
0X0004	XBIDL	Read-Only	Low Nibble Extended Board ID
0X0005	BREV	Read-Only	Board FAB Revision
0X0006	AREV	Read-Only	Board Assembly Revision
0X0007	PREV	Read-Only	PLD Revision
0X0011	MCLK_SRC	Read-Write	MCLK Source Register
0X0012	TCLK1_SRC	Read-Write	TCLK1 Source Register
0X0013	TCLK2_SRC	Read-Write	TCLK2 Source Register
0X0014	TCLK3_SRC	Read-Write	TCLK3 Source Register
0X0015	TCLK4_SRC	Read-Write	TCLK4 Source Register

ID Registers

OFFSET	NAME	FUNCTION
0X0000	BID	Board ID. BID is read-only with a value of 0xD.
0X0002	XBIDH	High Nibble Extended Board ID. XBIDH is read-only with a value of 0x00.
0X0003	XBIDM	Middle Nibble Extended Board ID. XBIDM is read-only with a value of 0x02.
0X0004	XBIDL	Low Nibble Extended Board ID. XBIDL is read-only with a value of 0x00.
0X0005	BREV	Board FAB Revision. BREV is read-only and displays the current fab revision.
0X0006	AREV	Board Assembly Revision. AREV is read-only and displays the assembly revision.
0X0007	PREV	PLD Revision. PREV is read-only and displays the current PLD firmware revision.

Control Registers

The control registers are used set the clock frequency on the MCLK and TCLK pins. Options are 1.544MHz, 2.048MHz, external source (through AUX CLK BNC), and tri-state.

MCLK_SRC: MCLK SOURCE (OFFSET = 0x0011) INITIAL VALUE = 0x1

(MSB)							(LSB)
—	—	—	—	HI_Z	EXTOSC	2048MHZ	1544MHZ

NAME	POSITION	FUNCTION
HI_Z	MCLK_SRC.3	1 = Tri-state MCLK.
EXTOSC	MCLK_SRC.2	1 = Connect MCLK to the external oscillator.
2048MHZ	MCLK_SRC.1	1 = Connect MCLK to the 2.048MHz clock.
1544MHZ	MCLK_SRC.0	1 = Connect MCLK to the 1.544MHz clock.

TCLK1_SRC: TCLK SOURCE (OFFSET = 0x0012) INITIAL VALUE = 0x1

(MSB)							(LSB)
—	—	—	—	HI_Z	EXTOSC	2048MHZ	1544MHZ

NAME	POSITION	FUNCTION
HI_Z	TCLK1_SRC.3	1 = Tri-state TCLK1.
EXTOSC	TCLK1_SRC.2	1 = Connect TCLK1 to the external oscillator.
2048MHZ	TCLK1_SRC.1	1 = Connect TCLK1 to the 2.048MHz clock.
1544MHZ	TCLK1_SRC.0	1 = Connect TCLK1 to the 1.544MHz clock.

TCLK2_SRC: TCLK SOURCE (OFFSET = 0x0013) INITIAL VALUE = 0x1

(MSB)							(LSB)
—	—	—	—	HI_Z	EXTOSC	2048MHZ	1544MHZ

NAME	POSITION	FUNCTION
HI_Z	TCLK2_SRC.3	1 = Tri-state TCLK2.
EXTOSC	TCLK2_SRC.2	1 = Connect TCLK2 to the external oscillator.
2048MHZ	TCLK2_SRC.1	1 = Connect TCLK2 to the 2.048MHz clock.
1544MHZ	TCLK2_SRC.0	1 = Connect TCLK2 to the 1.544MHz clock.

TCLK3_SRC: TCLK SOURCE (OFFSET = 0x0014) INITIAL VALUE = 0x1

(MSB)							(LSB)
—	—	—	—	HI_Z	EXTOSC	2048MHZ	1544MHZ

NAME	POSITION	FUNCTION
HI_Z	TCLK3_SRC.3	1 = Tri-state TCLK3.
EXTOSC	TCLK3_SRC.2	1 = Connect TCLK3 to the external oscillator.
2048MHZ	TCLK3_SRC.1	1 = Connect TCLK3 to the 2.048MHz clock.
1544MHZ	TCLK3_SRC.0	1 = Connect TCLK3 to the 1.544MHz clock.

TCLK4_SRC: TCLK SOURCE (OFFSET = 0x0015) INITIAL VALUE = 0x1

(MSB)							(LSB)
—	—	—	—	HI_Z	EXTOSC	2048MHZ	1544MHZ

NAME	POSITION	FUNCTION
HI_Z	TCLK4_SRC.3	1 = Tri-state TCLK4.
EXTOSC	TCLK4_SRC.2	1 = Connect TCLK4 to the external oscillator.
2048MHZ	TCLK4_SRC.1	1 = Connect TCLK4 to the 2.048MHz clock.
1544MHZ	TCLK4_SRC.0	1 = Connect TCLK4 to the 1.544MHz clock.

DS21Q348 INFORMATION

For more information about the DS21Q348, please consult the DS21Q348 data sheet available on our website, www.maxim-ic.com/DS21Q348.

DS21Q348DK INFORMATION

For more information about the DS21Q348DK, including software downloads, please consult the DS21Q348DK data sheet available on our website at www.maxim-ic.com/DS21Q348DK.

TECHNICAL SUPPORT

For additional technical support, please email your questions to telecom.support@dalsemi.com.

SCHEMATICS

The DS21Q348 schematics are featured in the following 11 pages.

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DS21Q348 DESIGN KIT

DS21Q348DK02A0

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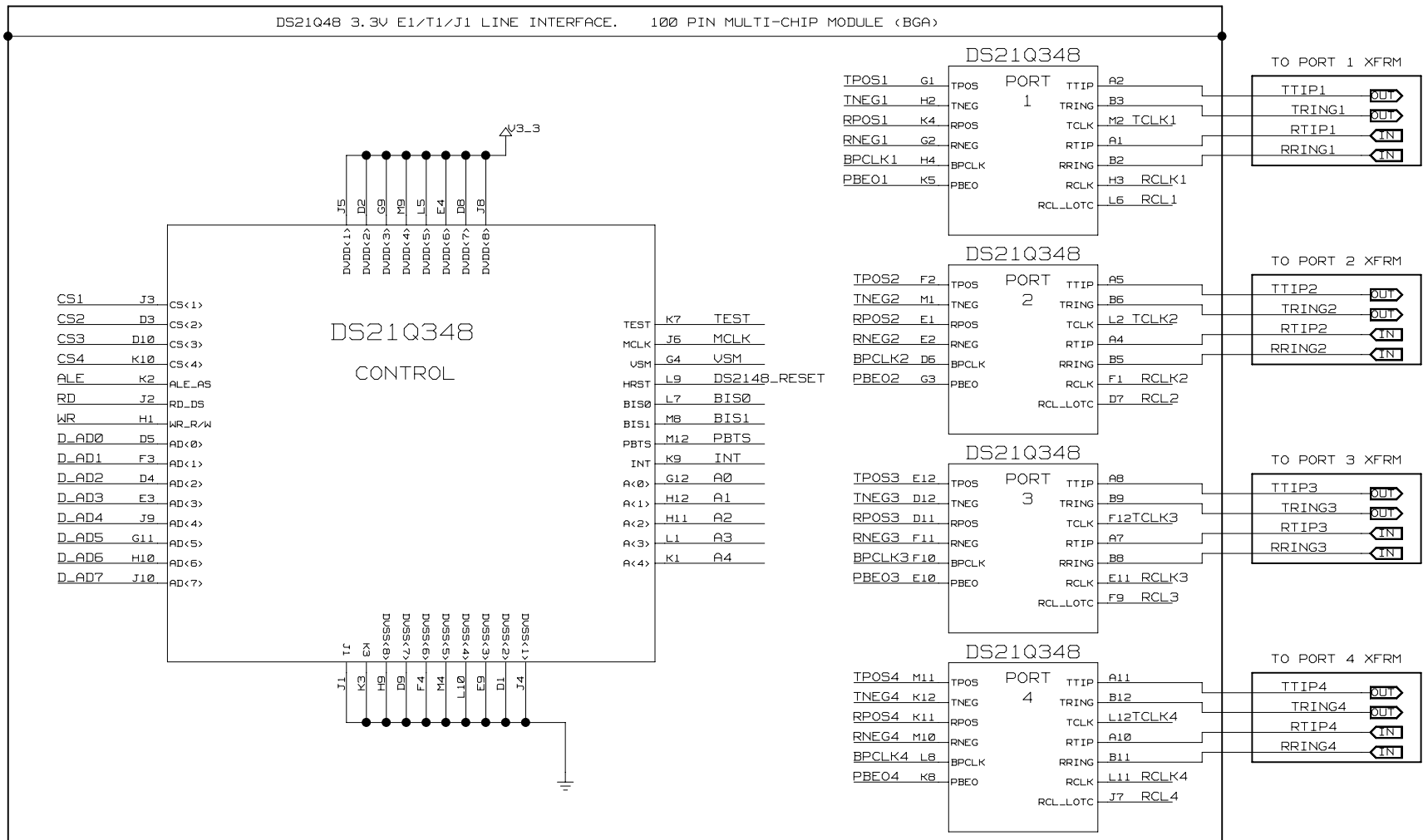
DS21Q48 3.3V E1/T1/J1 LINE INTERFACE. 100 PIN MULTI-CHIP MODULE (BGA)



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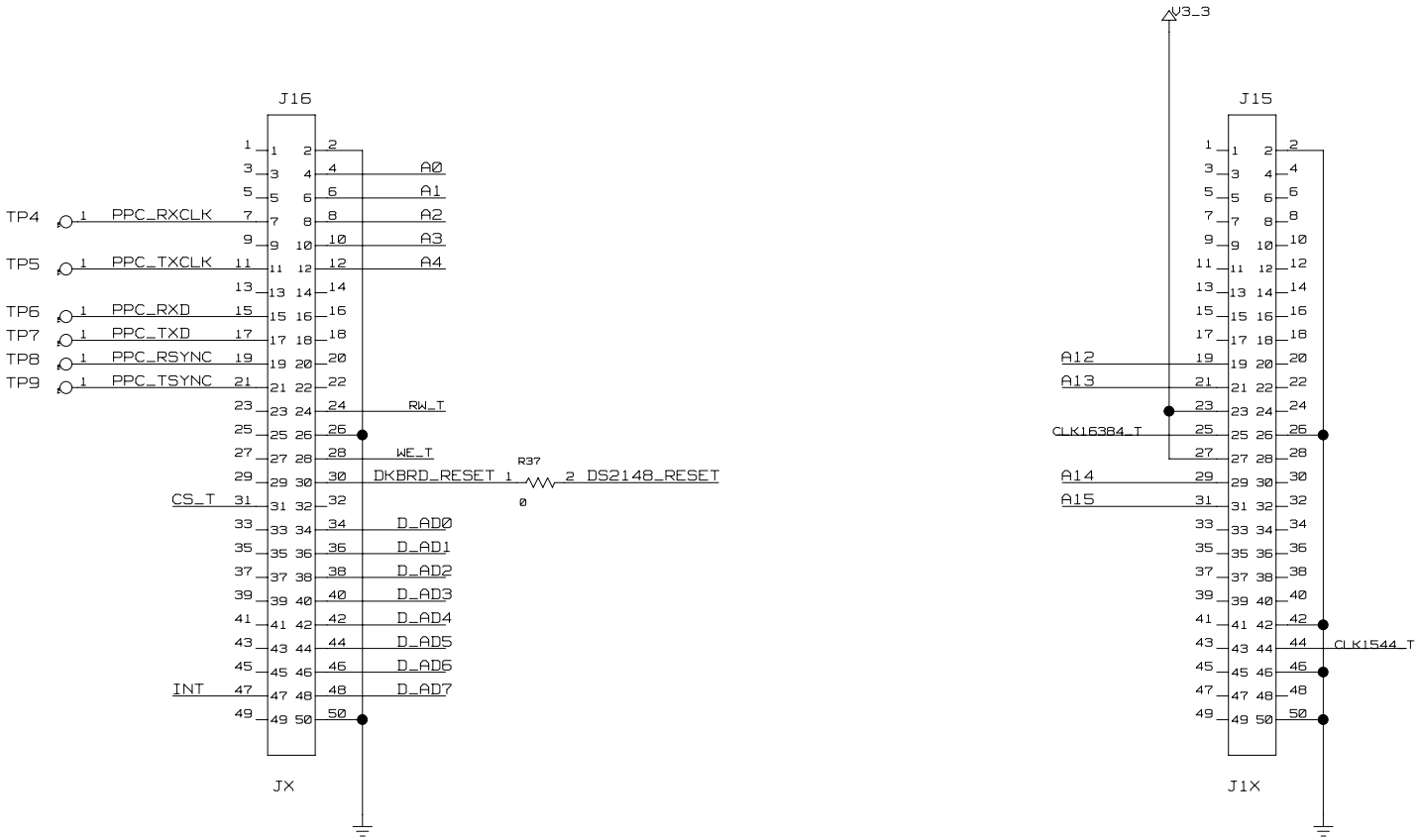

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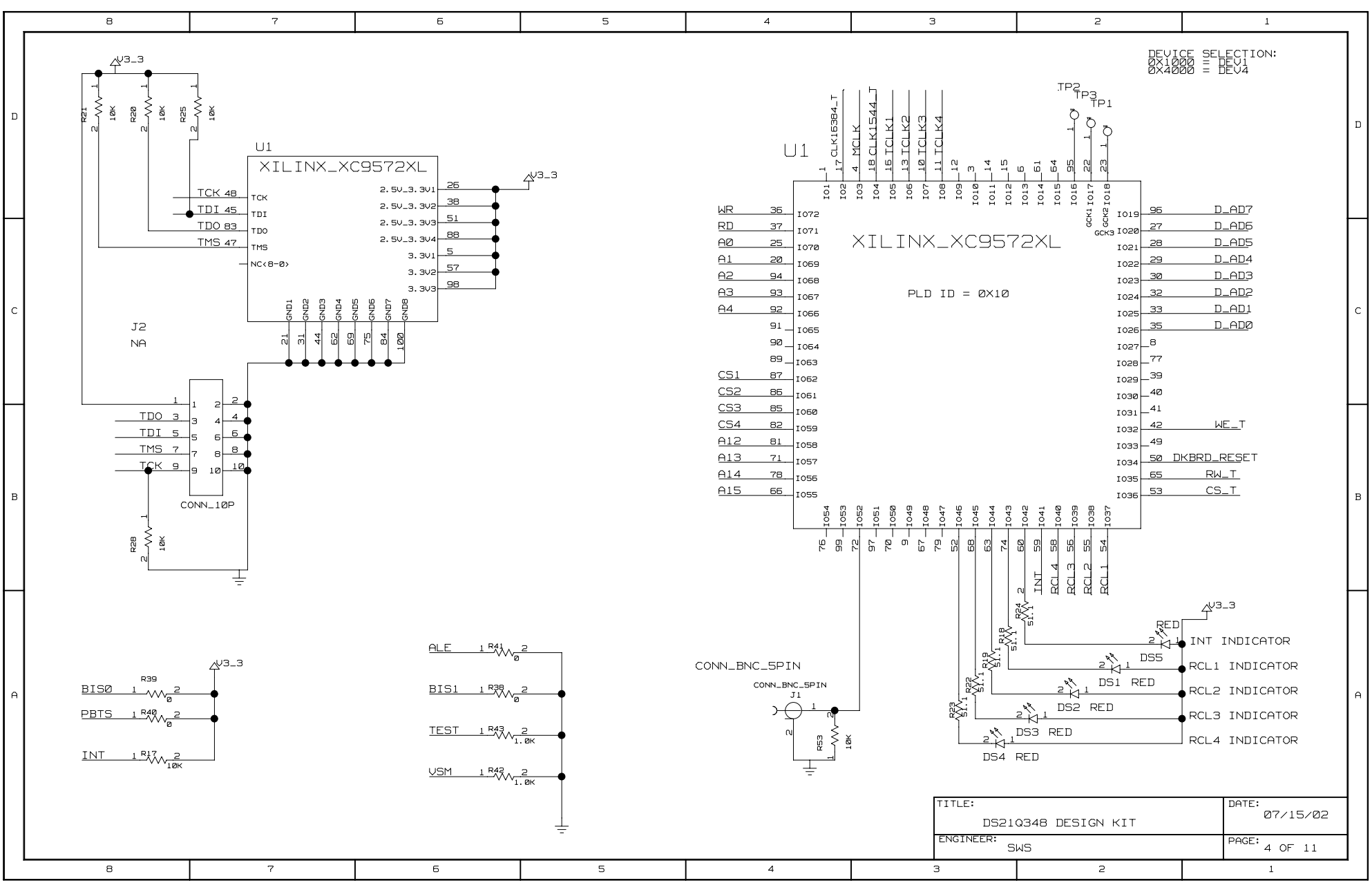
DEVICE SELECTION:
0X1000 = DEV1
0X4000 = DEV4
U1
XILINX_XC9572XL
PLD ID = 0X10
U1
XILINX_XC9572XL
J2
NA
CONN_10P
CONN_BNC_5PIN
J1
TP1
TP2
TP3
V3_3
TCK 48
TDI 45
TDO 83
TMS 47
WR
RD
A0
A1
A2
A3
A4
CS1
CS2
CS3
CS4
A12
A13
A14
A15
D_AD7
D_AD6
D_AD5
D_AD4
D_AD3
D_AD2
D_AD1
D_AD0
WE_T
DKBRD_RESET
RW_T
CS_T
INT
RCL4
RCL3
RCL2
RCL1
ALE
BIS0
BIS1
PBTS
TEST
VSM
INT
RED
INT INDICATOR
DS5
RCL1 INDICATOR
DS1 RED
RCL2 INDICATOR
DS2 RED
RCL3 INDICATOR
DS3 RED
RCL4 INDICATOR
DS4 RED
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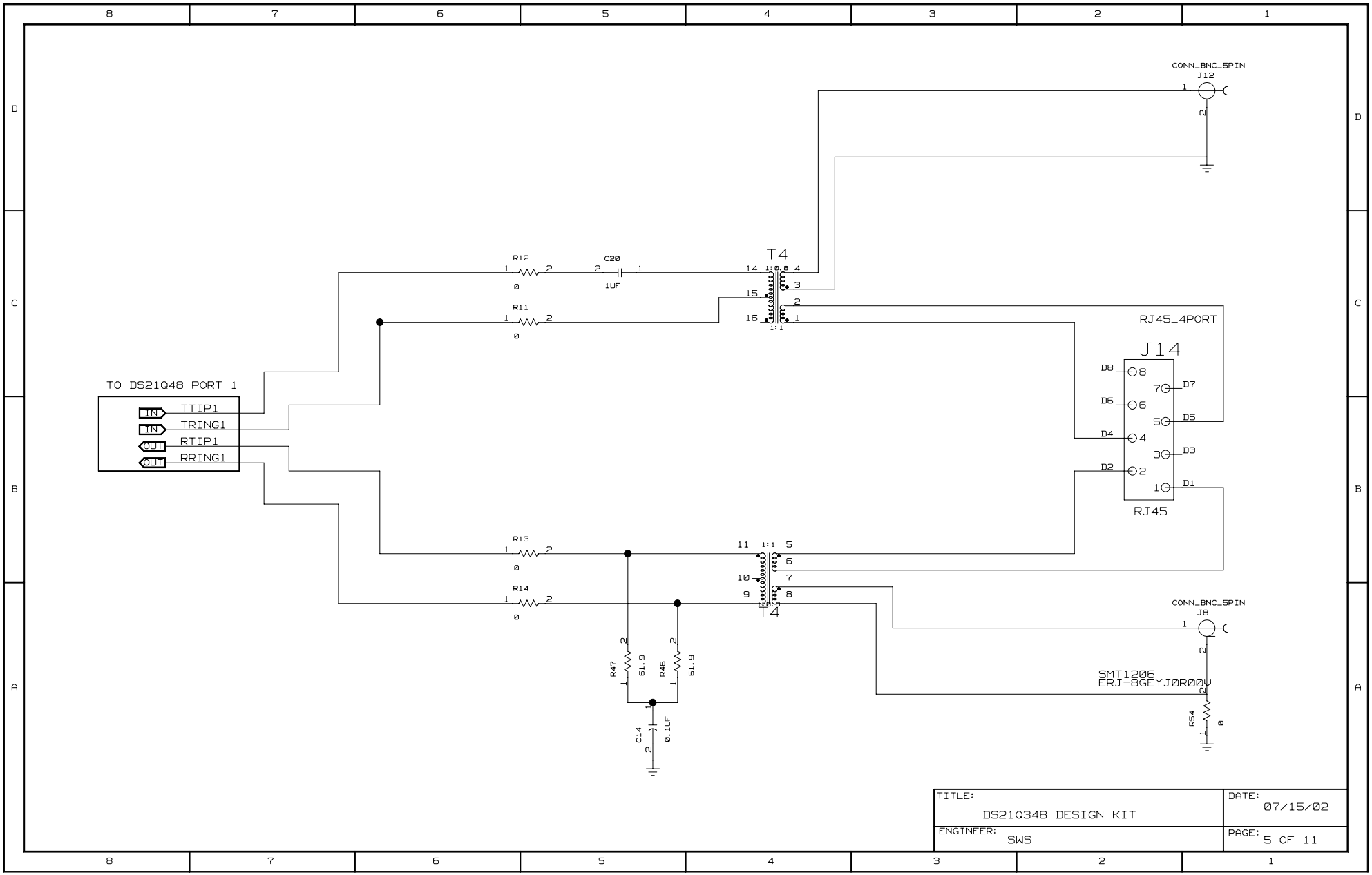

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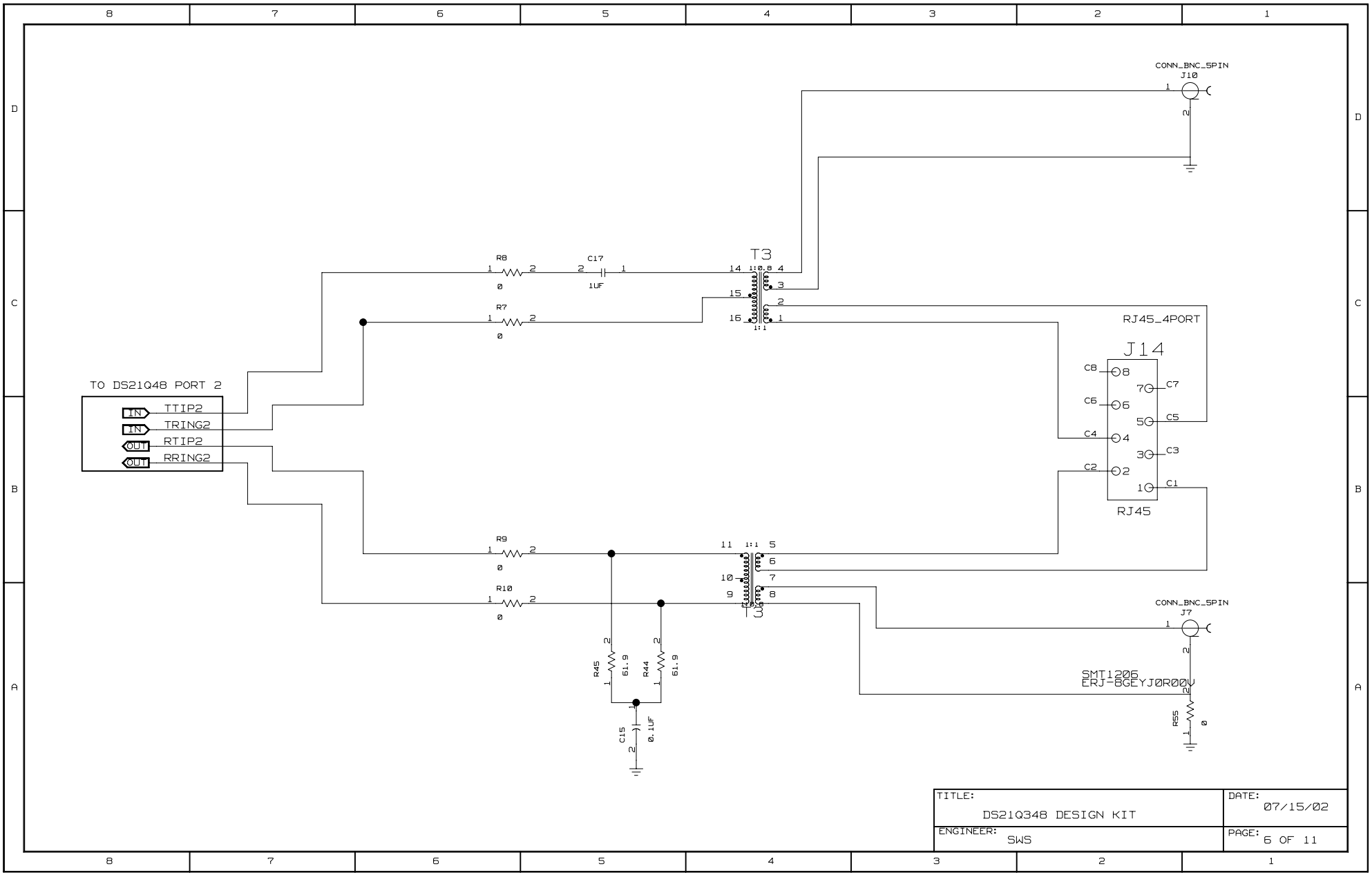
CONN_BNC_5PIN
J10
T3
R8
C17
1UF
R7
RJ45_4PORT
J14
RJ45
TO DS21Q48 PORT 2
IN TTIP2
IN TRING2
OUT RTIP2
OUT RRING2
R9
R10
R45
61.9
R44
61.9
C15
0.1UF
CONN_BNC_5PIN
J7
SMT1206
ERJ-8GEYJ0R00V
R55
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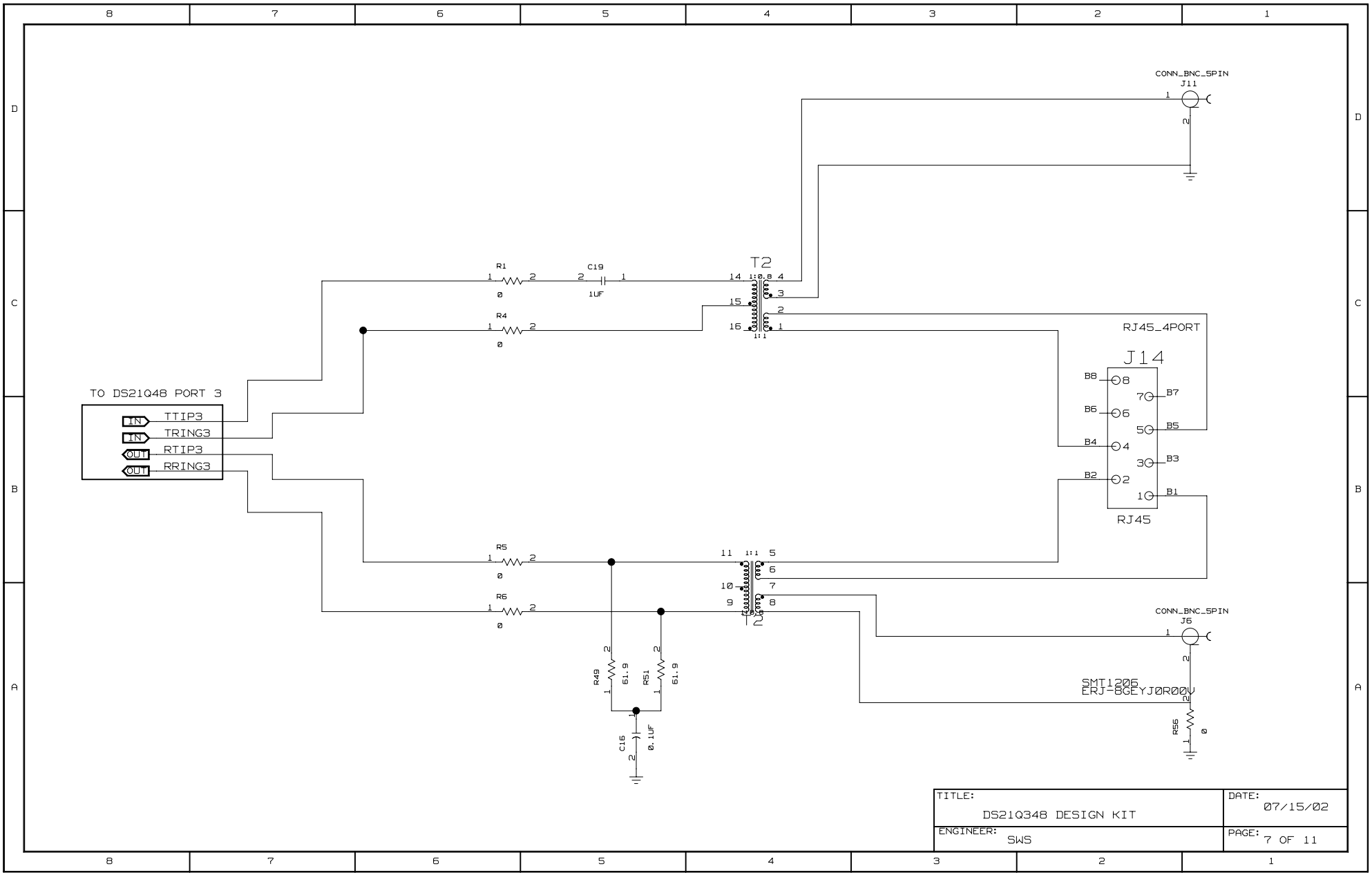

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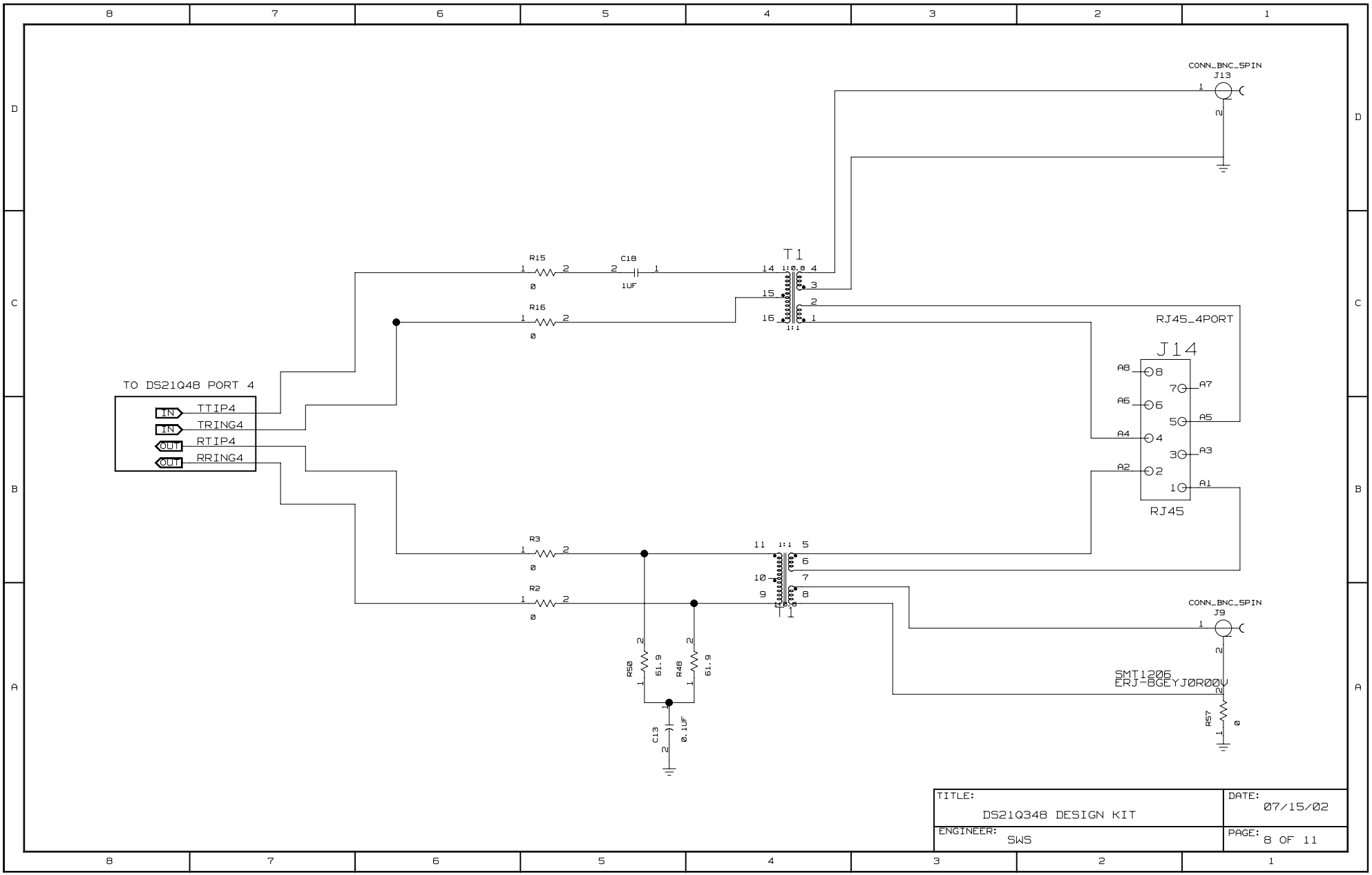
CONN_BNC_SPIN
J13
T1
R15
C18
1UF
R16
RJ45_4PORT
J14
RJ45
TO DS21Q48 PORT 4
IN TTIP4
IN TRING4
OUT RTIP4
OUT RRING4
R3
R2
R50
R48
61.9
C13
0.1UF
CONN_BNC_SPIN
J9
SMT1206
ERJ-8GEYJ0R00V
R57
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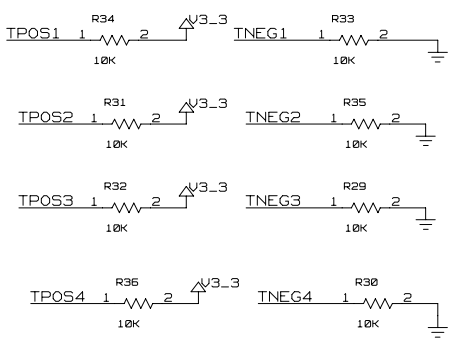

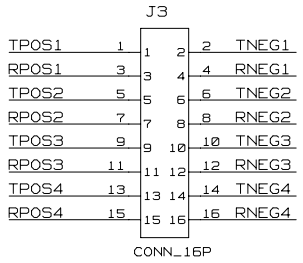

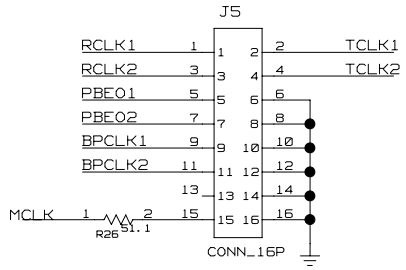

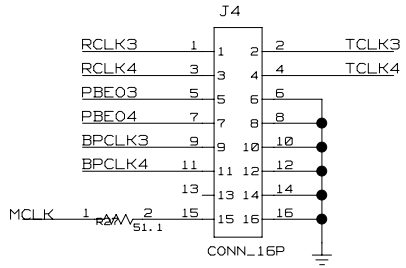

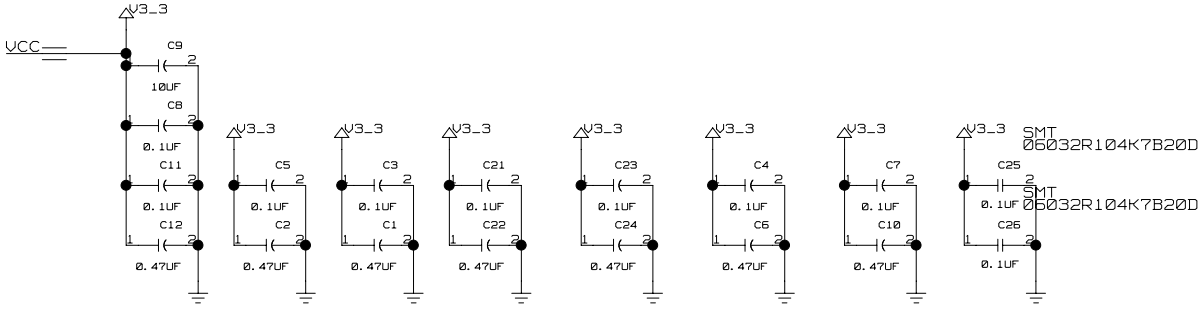

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*** Signal Cross-Reference for the entire design ***

A0	3C6<> 4C4<> 2B4<
A1	3C6<> 4C4<> 2B4<
A2	3C6<> 4C4<> 2B4<
A3	3C6<> 4C4<> 2B4<
A4	2B4<> 3C6<> 4C4<>
A12	3C3<> 4B4<>
A13	3B3<> 4B4<>
A14	3B3<> 4B4<>
A15	3B3<> 4B4<>
ALE	2C8< 4A6<
BIS0	2C4< 4A8<
BIS1	2B4< 4A6<
BPCLK1	2D4> 9C2<>
BPCLK2	2C4> 9C2<>
BPCLK3	2B4> 9B2<>
BPCLK4	2A4> 9B2<>
CLK1544_T	3B2<> 4D3<>
CLK16384_T	3B3<> 4D4<>
CS1	4C4<> 2C8<
CS2	4C4<> 2C8<
CS3	4B4<> 2C8<
CS4	4B4<> 2C8<
CS_T	3B7<> 4B1<>
DKBRD_RESET	3B6<> 4B1<>
DS2148_RESET	2C4< 3B5<
D_AD0	2B8<> 3B6<> 4C1<>
D_AD1	2B8<> 3B6<> 4C1<>
D_AD2	2B8<> 3B6<> 4C1<>
D_AD3	2B8<> 3B6<> 4C1<>
D_AD4	2B8<> 3B6<> 4C1<>
D_AD5	2B8<> 3B6<> 4C1<>
D_AD6	2B8<> 3A6<> 4C1<>
D_AD7	2B8<> 3A6<> 4C1<>
INT	2B4<> 3A7<> 4A2<> 4A8<
MCLK	4D3<> 2C4< 9B3< 9C3<
PBE01	2D4> 9D2<>
PBE02	2C4> 9C2<>
PBE03	2B4> 9B2<>
PBE04	2A4> 9B2<>
PBTS	2B4< 4A8<
PPC_RSYNC	3C7<>
PPC_RXCLK	3C7<>
PPC_RXD	3C7<>
PPC_TSYNC	3B7<>
PPC_TXCLK	3C7<>
PPC_TXD	3C7<>
RCL1	2C2> 4B2<>
RCL2	2C2> 4B2<>
RCL3	2B2> 4B2<>
RCL4	2A2> 4A2<>
RCLK1	2D2> 9D2<>
RCLK2	2C2> 9D2<>
RCLK3	2B2> 9C2<>
RCLK4	2A2> 9C2<>
RD	4C4<> 2C8<
RNEG1	2D4> 9D4<>
RNEG2	2C4> 9C4<>
RNEG3	2B4> 9C4<>
RNEG4	2A4> 9C4<>
RPOS1	2D4> 9D5<>
RPOS2	2C4> 9C5<>
RPOS3	2B4> 9C5<>
RPOS4	2A4> 9C5<>
RRING1	5B8> 2D1<
RRING2	6B8> 2C1<
RRING3	7B8> 2B1<
RRING4	8B8> 2A1<
RTIP1	5B8> 2D1<
RTIP2	6B8> 2C1<
RTIP3	7B8> 2B1<
RTIP4	8B8> 2A1<
RW_T	3B6<> 4B1<>
TCK	4B8<> 4D8<
TCLK1	4D3<> 9D1<> 2D2<
TCLK2	4D3<> 9D1<> 2C2<
TCLK3	4D3<> 9C1<> 2B2<
TCLK4	4D3<> 9C1<> 2A2<
TDI	4B8<> 4C8<
TDO	4B8<> 4C7<
TEST	2C4< 4A6<
TMS	4B8<> 4C7<
TNEG1	9D4<> 2D4< 9D7<
TNEG2	9D4<> 2C4< 9C7<
TNEG3	9C4<> 2B4< 9C7<
TNEG4	9C4<> 2A4< 9C7<
TPOS1	9D5<> 2D4< 9D8<
TPOS2	9D5<> 2C4< 9C8<
TPOS3	9C5<> 2B4< 9C8<
TPOS4	9C5<> 2A4< 9C8<
TRING1	2D1> 5B8<
TRING2	2C1> 6B8<
TRING3	2B1> 7B8<
TRING4	2A1> 8B8<
TTIP1	2D1> 5B8<
TTIP2	2C1> 6B8<
TTIP3	2B1> 7B8<
TTIP4	2A1> 8B8<
VSM	2C4< 4A6<
WE_T	3B6<> 4B1<>
WR	4C4<> 2B8<

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*** Part Cross-Reference for the entire design ***

1	DS21Q348	2A3 2B3 2B6 2C3 2D3
C1	CAP	9A4
C2	CAP	9A5
C3	CAP	9A4
C4	CAP	9A3
C5	CAP	9A5
C6	CAP	9A3
C7	CAP	9A2
C8	CAP	9A5
C9	CAP	9B5
C10	CAP	9A2
C11	CAP	9A5
C12	CAP	9A5
C13	CAP	8A5
C14	CAP	5A5
C15	CAP	6A5
C16	CAP	7A5
C17	CAP	6C5
C18	CAP	8C5
C19	CAP	7C5
C20	CAP	5C5
C21	CAP	9A4
C22	CAP	9A4
C23	CAP	9A3
C24	CAP	9A3
C25	CAP	9A2
C26	CAP	9A2
DS1	LED	4A2
DS2	LED	4A2
DS3	LED	4A3
DS4	LED	4A3
DS5	LED	4A2
J1	CONN_BNC_5PIN	4A4
J2	CONN_10P	4C8
J3	CONN_16P	9D4
J4	CONN_16P	9C2
J5	CONN_16P	9D2
J6	CONN_BNC_5PIN	7A2
J7	CONN_BNC_5PIN	6A2
J8	CONN_BNC_5PIN	5A1
J9	CONN_BNC_5PIN	8A1
J10	CONN_BNC_5PIN	6D2
J11	CONN_BNC_5PIN	7D2
J12	CONN_BNC_5PIN	5D1
J13	CONN_BNC_5PIN	8D1
J14	RJ45_8	5C2 6C2 7C2 8C2
J15	CONN_50P2	3D3
J16	CONN_50P2	3D7
R1	RES	7C6
R2	RES	8A5
R3	RES	8B5
R4	RES	7C6
R5	RES	7B6
R6	RES	7A6
R7	RES	6C6
R8	RES	6C6
R9	RES	6B6
R10	RES	6A6
R11	RES	5C6
R12	RES	5C6
R13	RES	5B6
R14	RES	5A6
R15	RES	8C5
R16	RES	8C5
R17	RES	4A8
R18	RES	4A3
R19	RES	4A3
R20	RES	4D8
R21	RES	4D8
R22	RES	4A3
R23	RES	4A3
R24	RES	4A2
R25	RES	4D8
R26	RES	9C2
R27	RES	9B2
R28	RES	4B8
R29	RES	9C7
R30	RES	9C6
R31	RES	9D8
R32	RES	9C8
R33	RES	9D7
R34	RES	9D8
R35	RES	9D7
R36	RES	9C7
R37	RES	3B6
R38	RES	4A6
R39	RES	4A8
R40	RES	4A8
R41	RES	4A6
R42	RES	4A6
R43	RES	4A6
R44	RES	6A5
R45	RES	6A5
R46	RES	5A5
R47	RES	5A5
R48	RES	8A5
R49	RES	7A5
R50	RES	8A5
R51	RES	7A5
R53	RES	4A4
R54	RES	5A1
R55	RES	6A2
R56	RES	7A2
R57	RES	8A1
T1	XFMR_2IN_4OUT	8A4 8C4
T2	XFMR_2IN_4OUT	7A4 7C4
T3	XFMR_2IN_4OUT	6A4 6C4
T4	XFMR_2IN_4OUT	5A4 5C4
TP1	TSTPNT_SNG	4D2
TP2	TSTPNT_SNG	4D2
TP3	TSTPNT_SNG	4D2
TP4	TSTPNT_SNG	3C8
TP5	TSTPNT_SNG	3C8
TP6	TSTPNT_SNG	3C8
TP7	TSTPNT_SNG	3C8
TP8	TSTPNT_SNG	3C8
TP9	TSTPNT_SNG	3B8
U1	XILINX_XC9572XL	4D4 4D7

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