DS3254DK
Quad DS3/E3/STS-1 LIU Demo Kit

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GENERAL DESCRIPTION

The DS3254DK is an easy-to-use evaluation kit for the DS3254 quad DS3/E3/STS-1 LIU. A surface-mounted DS3254 and careful layout of the analog signal traces provide maximum signal integrity to demonstrate the transmit and receive capabilities of the DS3254. On-board Dallas 8051-compatible microcontroller and included software give point-and-click access to configuration and status registers from a personal computer. LEDs on the board indicate interrupt, loss-of-signal, transmit driver monitor, and PRBS sync status for all four ports. The board provides BNC connectors for the line-side transmit and receive differential pairs and a 50-pin connector for framer interface signals. All LEDs and connectors are clearly labeled with silk screening to identify associated signals.

DEMO KIT CONTENTS

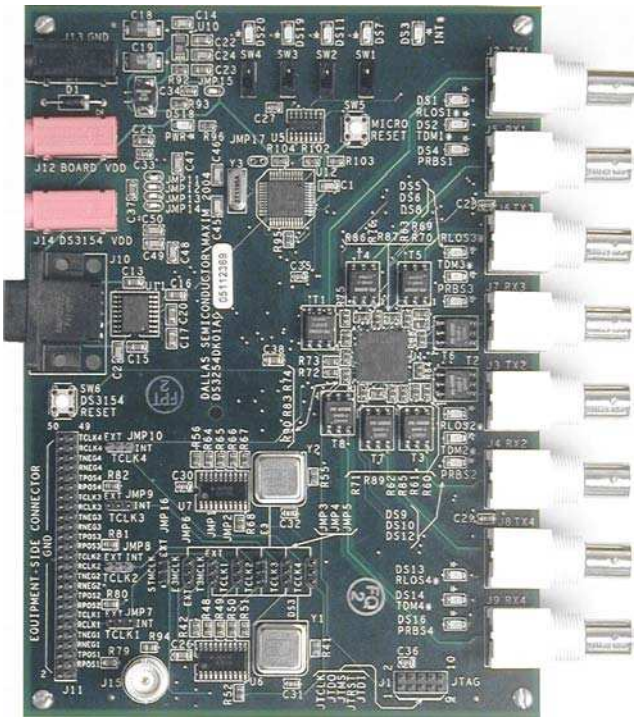
DS3254DK Board
CD-ROM
- ChipView Software
- DS3254.def Definition File
- DS3254DK Data Sheet
- DS3254 Data Sheet

ORDERING INFORMATION

PART	DESCRIPTION
DS3254DK	DS3254 Demo Kit

FEATURES

- Soldered DS3254 for Best Signal Integrity
- BNC Connectors, Transformers, and Termination Passives for All Four LIUs
- Careful Layout for Analog Signal Paths
- Equipment-Side Connector for External Data Source/Sink or External Remote Loopback
- On-Board DS3 and E3 Crystal Oscillators
- DS3254 Configured for CPU Bus Operation for Complete Control Over the Device
- On-Board Dallas Microcontroller and Included Software Provide Point-and-Click Access to the DS3254 Register Set
- LEDs for Interrupt, Loss-of-Signal, Transmit Driver Monitor, and PRBS Sync
- Banana Jack Connectors for V_{DD} and GND Support Use of Lab Power Supplies
- Separate DS3254 V_{DD} to Enable I_{DD} Measurements
- Easy-to-Read Silk Screen Labels Identify the Signals Associated with All Connectors, Jumpers and LEDs



REV: 050205

COMPONENT LIST

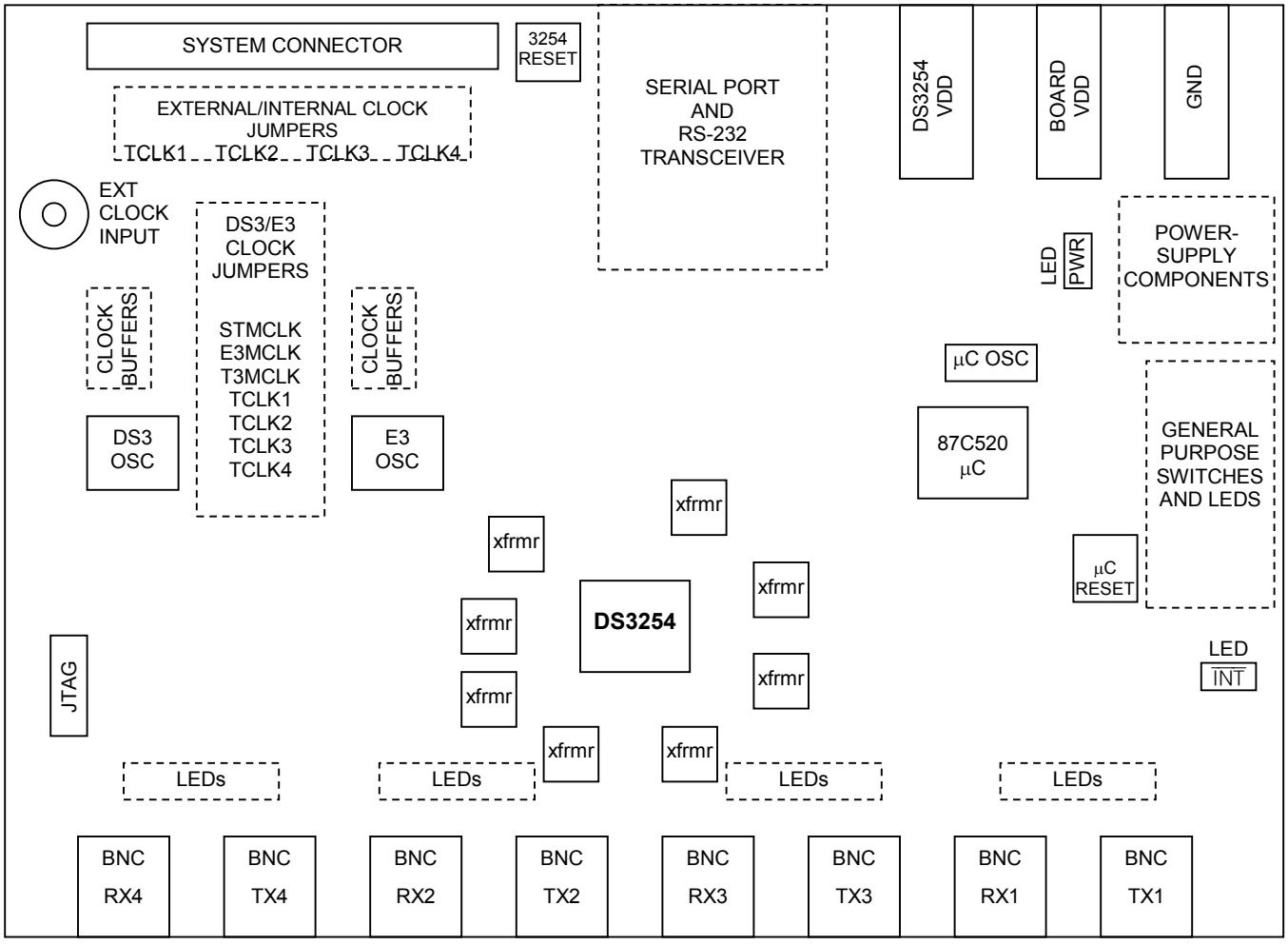
DESIGNATION	QTY	DESCRIPTION	MANUFACTURER	PART
U1	1	Quad DS3/E3/STS1 LIU, 144-pin BGA	Dallas Semiconductor	DS3254
U2, U4, U5	3	IC, hex inverter, SO	Toshiba	TC74HC04AFN
U3, U8, U9	3	Tiny logic, high-speed, 2-input OR gate, 5-pin SOT23	—	NC7SZ32M5
U6, U7	2	Oct buffer/driver, 3.3V SOP, 20-pin narrow	Texas Instruments	SN74ALVC244NSR
U10		SO, 8-pin, step-up DC-DC converter 0.5A limit	Maxim	MAX1675EUA
U11	1	Dual RS232 XMITR/RCVR, 16-pin SO (300-mil)	Dallas Semiconductor	DS232AS
U12	1	High-speed microcontroller, 44-pin TQFP	Dallas Semiconductor	DS87C520-ECL
C1, C2, C7, C8, C14, C24, C43, C44, C47–C60	22	0.1µF, 25V 10% ceramic capacitors (1206)	Panasonic	ECJ-3VB1E104K
C13, C15–C17, C20, C22, C23, C25, C26, C37, C38	11	10µF, 10V, 20% ceramic capacitors (1206)	Panasonic	ECJ-3YB1A106M
C27–C36, C39–C42	14	0.1µF, 16V 10% ceramic capacitors (0805)	Phycomp	08052R104K7B20D
C45, C46	2	22pF, 100V 10% ceramic capacitors (1206)	AVX	12061A220KAT2A
C18, C19	2	68µF, 16V 20% tantalum capacitors (D case)	Panasonic	ECS-T1CD686R
C3–C6, C9–C12	8	47,000pF, 50V 10% ceramic capacitors (1206)	Panasonic	ECU-V1H473KBW
D1	1	1A, 50V diode	Generic	1N4001
DS1-DS3, DS5, DS6, DS9, DS10, DS13, DS14, DS18	10	LED, red, SMD	Panasonic	LN1251C
DS4, DS7, DS8, DS11, DS12, DS16, DS19, DS20	8	LED, green, SMD	Panasonic	LN1351C
J1	1	Connector, 10-pin, dual row, vertical	Digi-Key (Distributor)	S2012-05-ND
J2–J9	8	Right angle BNC	Amphenol	31-5431
J10	1	Connector, DB9 RA, long case	Amp	747459-1
J11	1	Terminal strip, 50-pin, dual row vertical	Samtec	TSW-125-07-T-D
J12, J14	2	Socket, banana plug, horizontal, red	Mouser	164-6219
J13	1	Socket, banana plug, horizontal, black	Mouser	164-6218
J15	1	Connector, BNC, 50 ohm vertical 5 pin	CAM	CP-BNCPC-002
JMP1–JMP10, JMP16	11	Do not place, open 3-pin TH jumper	N/A	N/A
JMP11–JMR15	5	Do not place, shorted 2-pin TH jumper	N/A	N/A
L1	1	22.0µH, 2-pin SMT 20% inductor	Coiltronics	UP1B-220
R7–R12, R14, R31, R32, R34–R36, R38, R77, R78, R83-R90, R96–R98	26	332Ω 1% 1/10W resistors (0805)	Panasonic	ERJ-6ENF3320V
R48–R52, R60–R76, R99-101	25	33.2Ω 1% 1/10W resistors (0805)	Panasonic	ERJ-6ENF33R2V
R17, R41, R42, R46, R55, R56, R92, R102-R104	10	0Ω 5% 1/10W resistors (0805)	Panasonic	ERJ-6GEY0R00V
R1–R6, R13, R15, R16, R18, R19, R22, R24–R30, R40, R43, R53, R54, R79–R82, R91, R95	29	10kΩ 5%, 1/10W resistors (0805)	Panasonic	ERJ-6GEYJ103V
R93	1	3.9Ω 5%, 1/10W resistors (0805)	Panasonic	ERJ-6GEYJ3R9V
R94	1	51.1Ω 1%, 1/10W resistors	Panasonic	ERJ-6ENF51R1V
R20, R21, R23, R33, R37, R39, R44, R45, R47, R57–R59	12	Resistors (0805), do not populate	N/A	N/A
SW1–SW4	4	Switch, SPDT slide, 3-pin TH	Tyco	SSA12
SW5, SW6	2	Switch MOM 4-pin single pole	Panasonic	EVQPAE04M

DESIGNATION	QTY	DESCRIPTION	MANUFACTURER	PART
T1–T8	8	XFMR, XMIT/RCV, 1 to 2CT, SMT 6-pin	Pulse Engineering	PE-65968
Y1	1	Oscillator, crystal clock, 3.3V, 44.736MHz	Saronix	NTH089AA3-44.736
Y2	1	Oscillator, crystal clock, 3.3V, 34.368MHz	Saronix	NTH089AA3-34.368
Y3	1	11.0592MHz low-profile crystal	Pletronics	LP49-33-11.0592M

BOARD FLOORPLAN

Figure 1 shows the floorplan of the DS3254DK. The DS3254 is near the center of the board, surrounded by 2:1 transformers. The line-side BNC connectors for the transmit (Tx) and receive (Rx) differential pairs are located at the bottom of the board. LEDs driven by DS3254 pins $\overline{\text{RLOSn}}$, $\overline{\text{TDMn}}$, and PRBSn are located next to the corresponding BNC connectors. An LED driven by the DS3254's $\overline{\text{INT}}$ pin is located to the far right. The system connector in the upper-left corner presents all of the DS3254's framer interface pins: RCLKn, RPOSn/RDATn, RNEG/RLCVn, TCLKn, TPOSn/TDATn, and TNEGn. In the upper-right corner are banana jacks for ground, board V_{DD}, and a separate DS3254 V_{DD} (useful for DS3254 I_{DD} measurements). The board also contains DS3 and E3 oscillators and the necessary jumpers to configure the DS3254 transmitters for clocking from the oscillators, from the system connector, from the external clock BNC jack, or from the DS3254 receivers (external remote loopback). In the right-center of the board are a DS87C520 microcontroller and associated components, including four switches and four LEDs connected to the controller's general-purpose I/O pins. The microcontroller translates memory access requests from the RS-232 serial port (top-center of the board) into register accesses on the DS3254.

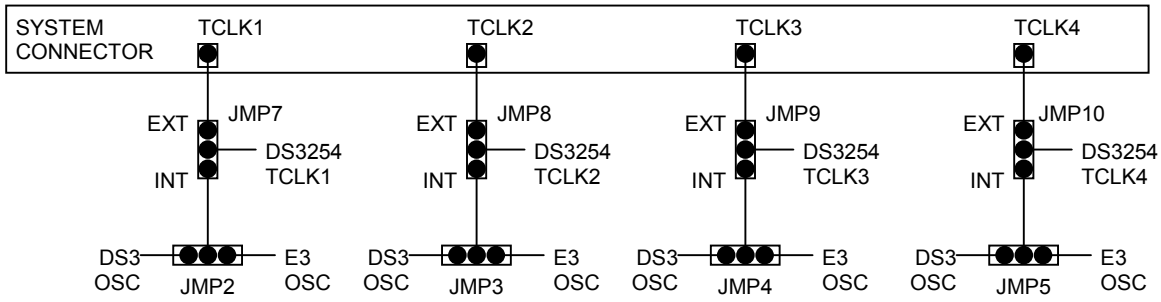
Figure 1. Board Floorplan



TCLK JUMPERS

Jumpers JMP7, JMP8, JMP9, and JMP10 (just below the system connector) select the clock source for the DS3254 transmitters. The center pin on each of these jumpers is connected directly to the associated TCLK pin on the DS3254. To drive a DS3254 TCLK pin from the system connector, connect the center pin and the EXT (external) pin of the associated jumper. To drive a DS3254 TCLK pin from one of the on-board oscillators, connect the center pin and the INT (internal) pin of the associated jumper. Jumpers JMP2, JMP3, JMP4, and JMP5 select between the DS3 oscillator and the E3 oscillator (Figure 2).

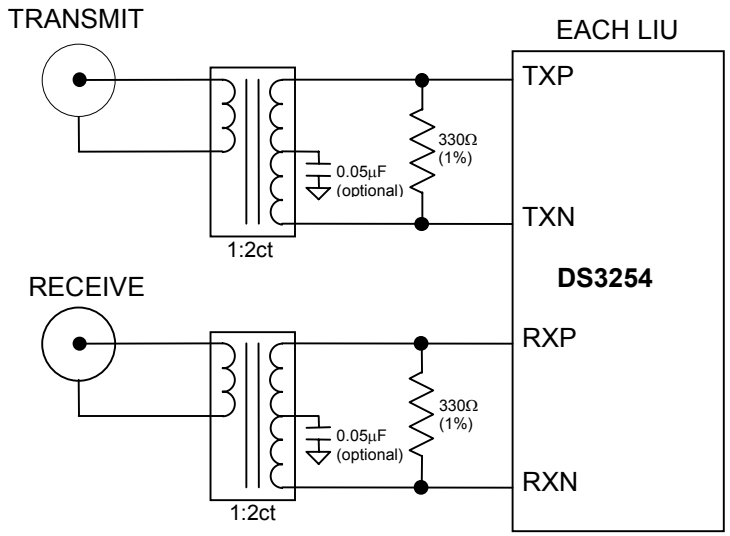
Figure 2. TCLK Jumpers



LINE-SIDE CONNECTIONS

The DS3254DK implements the transmit (Tx) and receive (Rx) line interface networks recommended in the DS3254 data sheet and shown in Figure 3. The BNC connectors for LIU1 are labeled TX1 and RX1. The BNC connectors for LIU2 are labeled TX2 and RX2. The BNC connectors for LIU3 are labeled TX3 and RX3. The BNC connectors for LIU4 are labeled TX4 and RX4.

Figure 3. Line-Side Circuitry



SYSTEM CONNECTOR

The 50-pin system connector at the top of the board gives access to the following DS3254 signals: RCLKn, RPOSn/RDATn, RNEG/RLCVn, TCLKn, TPOSn/TDATn, and TNEGn. The system connector can be used to connect the DS3254 to an external DS3/E3 framer or other data source/sink. By using jumpers to connect TCLKn to RCLKn, TPOSn to RPOSn, and TNEGn to RNEGn, the system connector can also be used to implement an external remote loopback. In addition, it can be used to wire DS3254 input pins like TPOSn and TNEGn low. To wire a pin low, use a jumper to connect it to the neighboring GND pin on the upper row of the system connector.

MICROCONTROLLER, SWITCHES, AND LEDS

The DS87C520 microcontroller has factory-installed firmware in on-chip nonvolatile memory. This firmware translates memory access requests from the RS-232 serial port into register accesses on the DS3254. Switches SW1 through SW4 and LEDs DS7, DS11, DS19, and DS20 are connected to four general-purpose I/O pins on the microcontroller. When the microcontroller starts up it turns on DS20 and leaves DS7, DS11, and DS19 off to indicate that the controller is working correctly. Otherwise, these switches and LEDs are not used by the DS3254DK firmware.

POWER-SUPPLY CONNECTORS

Connect a 3.3V power supply across the red J12 (DK V_{DD}) and black J13 (GND) banana jacks. Connect a separate supply to the red J14 (3154 V_{DD}) and black J13 (GND). Jumpers (JMP11–JMP14) are provided to measure the device's current and can be used instead of J14.

CONNECTING TO A COMPUTER

Connect a standard DB-9 serial cable between the serial port on the DS3254DK and an available serial port on the host computer. The host computer must be a Windows®-based PC. Be sure the cable is a standard straight-through cable rather than a null-modem cable. Null-modem cables prevent proper operation.

INSTALLING AND RUNNING THE SOFTWARE

ChipView is a general-purpose program that supports a number of Dallas Semiconductor demo kits. To install the ChipView software, run SETUP.EXE from the disk included in the DS3254DK box or from the zip file downloadable on our website at www.maxim-ic.com/DS3254DK.

After installation, run the ChipView program with the DS3254DK board powered up and connected to the PC. If the default installation options were used, one easy way to run ChipView is to click the Start button on the Windows toolbar and select Programs→ChipView→ChipView. In the opening screen, click the Register View button. (The Demo and Terminal buttons are not supported for the DS3254DK.) Select the correct serial port in the Port Selection dialog box, then click OK.

Next, the Definition File Assignment window appears. This window has subwindows to select definition files for up to four separate boards on other Dallas evaluation platforms. Because ChipView is communicating with the DS3254DK, only one subwindow is active. In the active subwindow, select the DS3254.DEF definition file from the list shown, or browse to find it in another directory. Press the Continue button.

After selecting the definition file, the main part of the ChipView window displays the DS3254's register map. The registers in LIU1 are displayed in the left column followed by registers for the other LIUs in subsequent columns. The clock adapter control register, CACR, appears below the LIU1 registers. To select a register, click on it in the register map. When a register is selected, the full name of the register and its bit map are displayed at the bottom of the ChipView window. Bits that are logic 0 are displayed in white, while bits that are logic 1 are displayed in green.

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The ChipView software supports the following actions:

- **Toggle a bit.** Select the register in the register map and then click the bit in the bit map.
- **Write a register.** Select the register, click the Write button, and enter the value to be written.
- **Write all registers.** Click the Write All button and enter the value to be written.
- **Read a register.** Select the register in the register map and click the Read button.
- **Read all registers.** Click the Read All button.

BASIC DS3254DK CONFIGURATION

These example configurations provide a quick start to using the DS3254DK. The DS3254 and the DS3254DK can be configured in many other ways. To set up other configurations, refer to the DS3254 data sheet and other sections of this data sheet.

DS3 Configuration

1) On the system connector, jumper all four TPOS pins and all four TNEG pins to ground.
2) On jumpers JMP7 through JMP10, connect the center post to the INT post. This connects the DS3254's TCLK1 through TCLK4 pins to an on-board oscillator.
3) Place jumpers JMP2 through JMP5 to connect the DS3254's TCLK1 through TCLK4 pins to the on-board DS3 oscillator. Make sure JMP1 has T3MCLK connected to the DS3 oscillator.
4) Press and release the DS3254 reset button on the DK board –OR– set and then clear the RST bit in each GCR register. The reset default mode is DS3.
5) Clear the TTS bit in each TCR register and clear the RTS bit in each RCR register.
6) Set the TDSA and TDSB bits in each GCR register to transmit a 2^{15} - 1 PRBS pattern.
7) For each LIU port, connect the transmitter to the receiver using 75Ω coax to configure an external local loopback –OR– set the LLB bit in each GCR register to configure an internal local loopback.
8) Press the Read All button twice to update the display.

At this point the transmitter is generating a 2^{15} - 1 PRBS pattern that is being looped back to the receiver. On the DS3254DK board, the PRBS LEDs should be lit, indicating PRBS sync. The $\overline{\text{TDM}}$ and $\overline{\text{RLOS}}$ LEDs should not be lit. In the register map, the SR and SRL registers should contain all zeros.

E3 Configuration

1) On the system connector, jumper all four TPOS pins and all four TNEG pins to ground.
2) On jumpers JMP7 through JMP10, connect the center post to the INT post. This connects the DS3254's TCLK1 through TCLK4 pins to an on-board oscillator.
3) Place jumpers JMP2 through JMP5 to connect the DS3254's TCLK1 through TCLK4 pins to the on-board E3 oscillator. Make sure JMP6 has E3MCLK connected to the E3 oscillator.
4) Press and release the DS3254 reset button on the DK board –OR– set and then clear the RST bit in each GCR register.
5) Set the E3 bit in each GCR register.
6) Clear the TTS bit in each TCR register and clear the RTS bit in each RCR register.
7) Set the TDSA and TDSB bits in each GCR register to transmit a 2^{23} - 1 PRBS pattern.
8) For each LIU port, connect the transmitter to the receiver using 75Ω coax to configure an external local loopback –OR– set the LLB bit in each GCR register to configure an internal local loopback.
9) Press the Read All button twice to update the display.

At this point the transmitter is generating a 2^{23} - 1 PRBS pattern that is being looped back to the receiver. On the DS3254DK board, the PRBS LEDs should be lit, indicating PRBS sync. The $\overline{\text{TDM}}$ and $\overline{\text{RLOS}}$ LEDs should not be lit. In the register map, the SR and SRL registers should contain all zeros.

STS-1 Configuration

1) On the system connector, jumper all four TPOS pins and all four TNEG pins to ground.
2) On jumpers JMP7 through JMP10, connect the center post to the EXT post. This connects the DS3254's TCLK1 through TCLK4 pins to the respective pins on the system connector. (The position of jumpers JMP1 through JMP6 does not matter.)
3) Apply an STS-1 clock source (51.84MHz) to the TCLK1, TCLK2, TCLK3, and TCLK4 pins on the system connector and to the external clock input on connector J15.
4) Press and release the DS3254 reset button on the DK board –OR– set and then clear the RST bit in each GCR register.
5) Set the E3 and STS bits in each GCR register to configure each LIU for STS-1 operation.
6) Clear the TTS bit in each TCR register and clear the RTS bit in each RCR register.
7) Set the TDSA and TDSB bits in each GCR register to transmit a 2^{15} - 1 PRBS pattern.
8) For each LIU port, connect the transmitter to the receiver using 75Ω coax to configure an external local loopback –OR– set the LLB bit in each GCR register to configure an internal local loopback.
9) Press the Read All button twice to update the display.

At this point the transmitter is generating a 2^{15} - 1 PRBS pattern that is being looped back to the receiver. On the DS3254DK board, the PRBS LEDs should be lit, indicating PRBS sync. The $\overline{\text{TDM}}$ and $\overline{\text{RLOS}}$ LEDs should not be lit. In the register map, the SR and SRL registers should contain all zeros.

DS3254 INFORMATION

The DS3254 Quick View page on our website has the latest DS3254 data sheet, application notes, and downloads. Go to **www.maxim-ic.com/DS3254.**

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TECHNICAL SUPPORT

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

SCHEMATICS

The DS3254DK schematics are featured in the following 5 pages.

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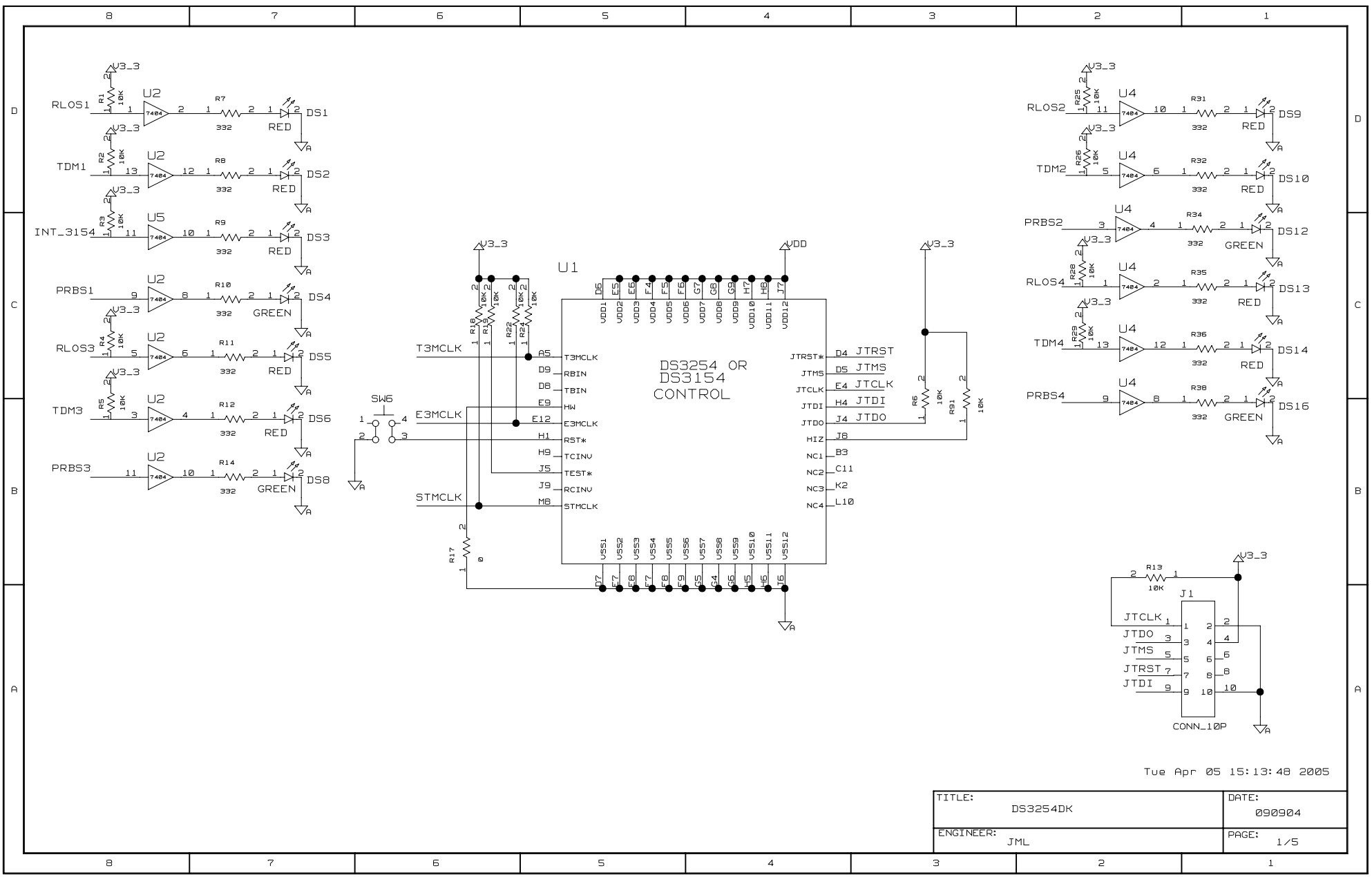

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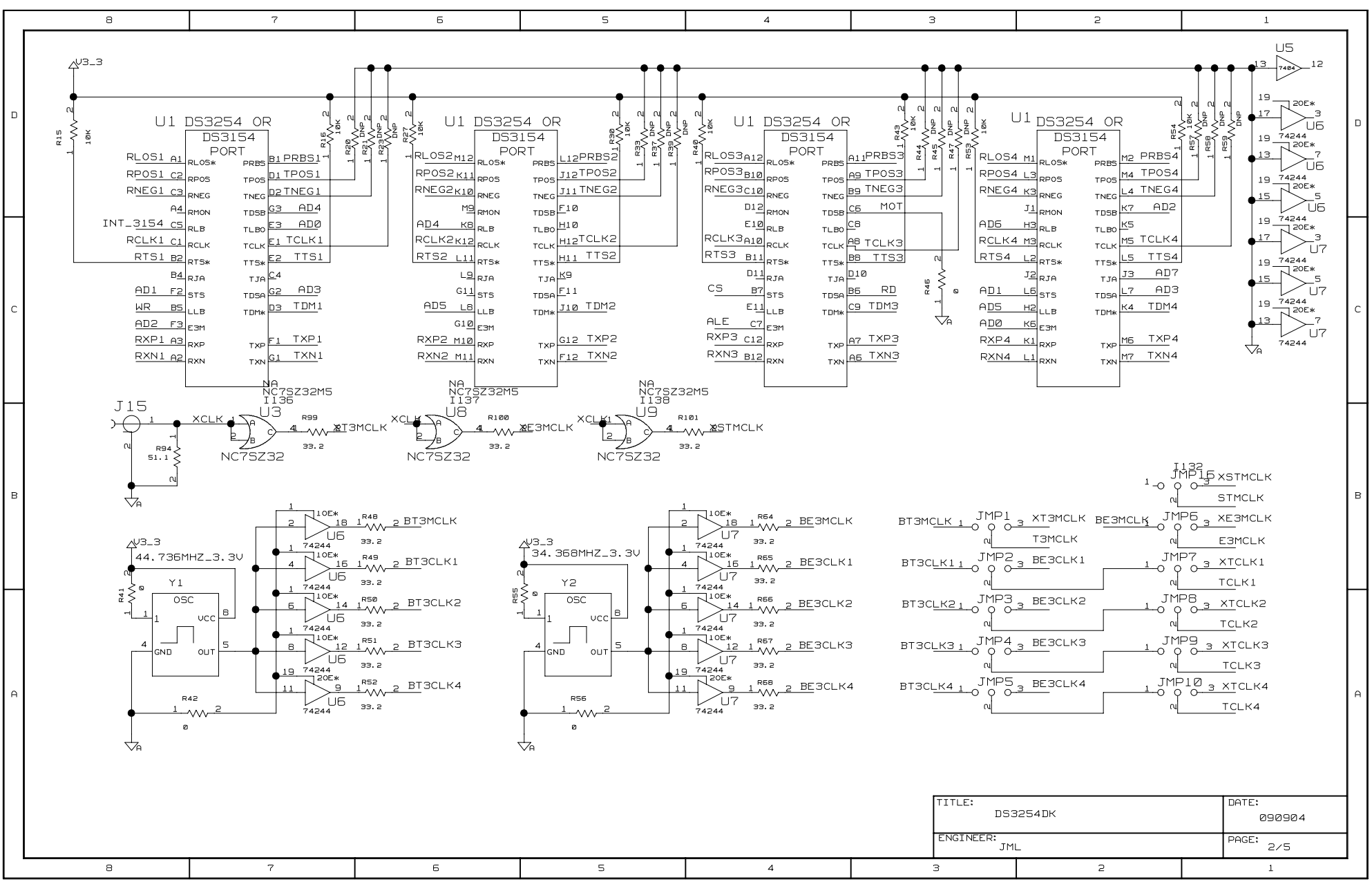

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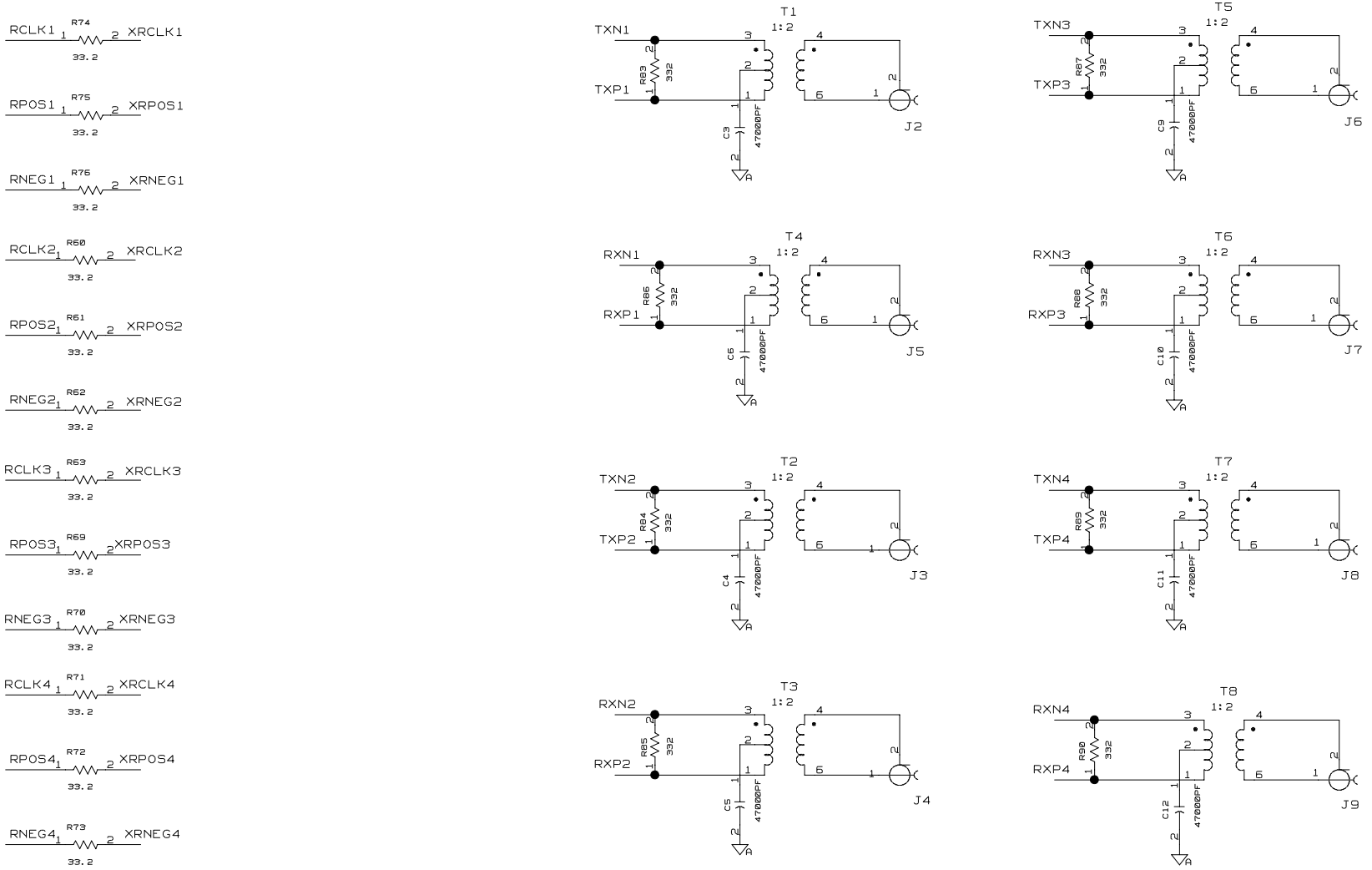

PLACE SERIES TERMINATION FOR RCLK,RPOS AND RNEG SIGNALS AT DS3254

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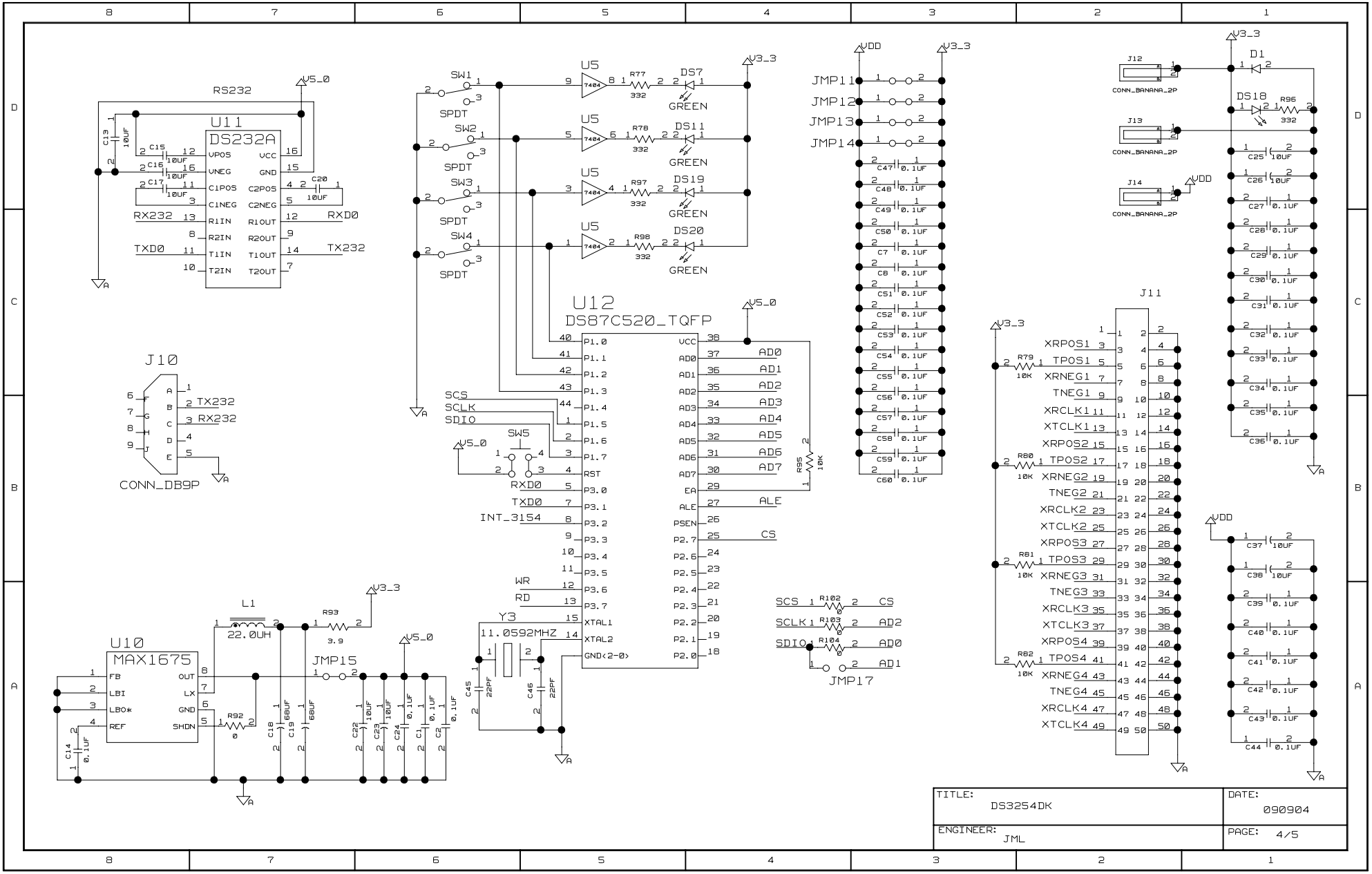

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REVISION HISTORY:

09/09/04 - A0 - STARTED WITH DS3154DK01B0, ADDED CIRCUITS FOR EXTERNAL CLOCK AND CIRCUITS FOR SPI INTERFACE SUPPORT
04/05/05 - A1 - ADDED INITIALS IN TITLE BLOCK; CLEANED UP TEXT AT R102, R103 & R104; REFERENCED DS3254 IN NOTE ON SHEET 3.

TITLE: DS3254DK	DATE: 090904
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