

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

### General Description

The MAX9265 evaluation kit (EV kit) provides a proven design to evaluate the MAX9265 high-bandwidth digital-content protection (HDCP) gigabit multimedia serial link (GMSL) serializer with LVDS system interface and spread spectrum and full-duplex control channel. The EV kit also includes Windows XP®, Windows Vista®, and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the MAX9265.

The MAX9265 EV kit comes with a MAX9265GCM/V+ installed.

For complete GMSL evaluation, order both the MAX9265 EV kit and its companion board, the MAX9264 EV kit.

### Features

- ◆ Accepts 29-Bit Parallel Video and I<sup>2</sup>S Audio
- ◆ On-Board S/PDIF-to-I<sup>2</sup>S Audio Converter
- ◆ Windows XP-, Windows Vista-, and Windows 7-Compatible Software
- ◆ USB-PC Connection (Cable Included)
- ◆ USB Powered
- ◆ Proven PCB Layout
- ◆ Fully Assembled and Tested

Ordering Information appears at end of data sheet.

### Component List

DESIGNATION	QTY	DESCRIPTION
BC5-BC28	24	0.1µF ±10%, 16V X5R ceramic capacitors (0402) Murata GRM155R61C104K
C1-C9	9	0.01µF ±10%, 25V X7R ceramic capacitors (0402) Murata GRM155R71E103K
C10-C18, C101-C105, C111, C121, C131, C141, C151, C211-C214, C221, C231, C241, C251	27	0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C19, C20	2	0.22µF ±10%, 50V X7R ceramic capacitors (0805) Murata GRM21BR71H224K
C21, C31, C261	3	4.7µF ±20%, 25V X7R ceramic capacitors (1206) Murata GCM31CR71E475M
C22, C24, C25, C26, C32, C34, C109, C262, C264, C267	10	10µF ±20%, 16V X5R ceramic capacitors (1206) Murata GRM31CR61C106M
C23, C33, C263	0	Not installed, ceramic capacitors (1206)

DESIGNATION	QTY	DESCRIPTION
C106, C107, C122, C123	4	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
C108, C265, C268	3	1µF ±10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C110	1	0.033µF ±10%, 25V X7R ceramic capacitor (0603) Murata GRM188R71E333K
C201, C202, C203	3	1µF ±20%, 6.3V X5R ceramic capacitors (0402) TDK C1005X5R0J105M
C205, C206, C232, C266, C269	5	0.01µF ±5%, 25V C0G ceramic capacitors (0603) TDK C1608C0G1E103J
C207	1	1000pF ±10%, 50V X7R ceramic capacitor (0805) Murata GCM216R71H102K
C208	1	0.022µF ±10%, 25V X7R ceramic capacitor (0402) TDK C1005X7R1E223K
C233	0	Not installed, ceramic capacitor (0603)

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### Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C500, C527, C537, C547, C557, C567	6	100 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (1210) Murata GRM32ER60J107M
C501, C502	2	1000pF $\pm$ 10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H102K
C503, C504, C505, C511–C515, C521, C523, C531, C533, C541, C543, C551, C553, C560	17	0.1 $\mu$ F $\pm$ 10%, 16V X7R ceramic capacitors (0603) Murata GRM188R71C104K
C510	1	10 $\mu$ F $\pm$ 10%, 6.3V X5R ceramic capacitor (0603) Murata GRM188R60J106K
C520, C526, C530, C536, C540, C546, C550, C556	8	10 $\mu$ F $\pm$ 20%, 6.3V X5R ceramic capacitors (0603) Murata GRM188R60J106M
C522, C532, C542, C552	4	220pF $\pm$ 10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H221K
FB501–FB505	5	120 $\Omega$ $\pm$ 25%, 2A chip ferrite beads (0603) Murata BLM18PG121SN1
H1	1	72-pin (2 x 36) header
H2	1	10-pin (2 x 5) header
H3	0	Not installed, 10-pin (2 x 5) header
H500	0	Not installed, 32-pin (2 x 16) header
J1	1	High-speed automotive connector Rosenberger D4S20F-40MA5-Z
J2 (JTAGU500)	1	9-pin (2 x 5, key pin 7) header
J10	1	USB type-B right-angle female receptacle
J21	1	Phono jack
J23	0	Not installed, SMA connector
JU1, JU2, JU4–JU9, JU121, JU122, JU151, JU152, JU501, JU502, JU503	15	3-pin headers

DESIGNATION	QTY	DESCRIPTION
JU3, JU11	2	4-pin headers
JU10, JU21, JU22, JU23, JU31, JU125, JU153, JU154, JU191–JU194, JU210, JU261, JU500, JU520, JU530, JU540, JU550, JU560, JUCNTL0, JUCNTL1, JUCNTL2	23	2-pin headers
JU101–JU108, JU141–JU144, JU211–JU214	0	Not installed, 2-pin headers—short (PC trace)
L21, L22, L23, L31, L101, L261	6	300 $\Omega$ $\pm$ 25%, 500mA ferrite beads (0603) TDK MMZ1608R301A
L262	1	3.3 $\mu$ H $\pm$ 10% 30mA inductor (0805) Murata LQM21NN3R3K10
L520, L530, L540, L550	4	1.8 $\mu$ H $\pm$ 30%, 2.2A power inductors (5 mm) Sumida CDRH4D28NP-1R8NC
LED1, LED120, LED127, LED151–LED158	11	Red LEDs (0805)
LED2, LED126, LED500	3	Green LEDs (0805)
Q1, Q2, Q500	3	n-channel MOSFETs (SOT23) Central Semi 2N7002
R1, R2	2	45.3k $\Omega$ $\pm$ 1% resistors (0603)
R3, R4	2	4.99k $\Omega$ $\pm$ 1% resistors (0603)
R5, R11, R12, R111	4	2.2k $\Omega$ $\pm$ 5% resistors (0603)
R13	1	0 $\Omega$ $\pm$ 5% resistor (0603)
R14, R15, R123, R126, R127, R151–R158, R203, R500, R501, R502	17	1k $\Omega$ $\pm$ 5% resistors (0603)
R101, R102	2	27 $\Omega$ $\pm$ 5% resistors (0603)
R103	1	1.5k $\Omega$ $\pm$ 5% resistor (0603)
R104	1	470 $\Omega$ $\pm$ 5% resistor (0603)

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### Component List (continued)

DESIGNATION	QTY	DESCRIPTION
R112, R122, R211, R212, R503–R506	8	10k $\Omega$ $\pm$ 5% resistors (0603)
R121	1	1.1k $\Omega$ $\pm$ 5% resistor (0603)
R191, R192, R201, R202	4	4.7k $\Omega$ $\pm$ 5% resistors (0603)
R205	1	75k $\Omega$ $\pm$ 5% resistor (0603)
R208	1	3.01k $\Omega$ $\pm$ 1% resistor (0603)
R233	0	Not installed, resistor (0603)
R507	1	160 $\Omega$ $\pm$ 5% resistor (0603)
R510–R515	6	5.1k $\Omega$ $\pm$ 5% resistors (0603)
R521, R531, R541, R551	4	10 $\Omega$ $\pm$ 5% resistors (0603)
R522	1	110k $\Omega$ $\pm$ 5% resistor (0603)
R524	1	75k $\Omega$ $\pm$ 1% resistor (0603)
R525	1	24k $\Omega$ $\pm$ 1% resistor (0603)
R532	1	82k $\Omega$ $\pm$ 5% resistor (0603)
R534	1	30.1k $\Omega$ $\pm$ 1% resistor (0603)
R535	1	14k $\Omega$ $\pm$ 1% resistor (0603)
R542	1	39k $\Omega$ $\pm$ 5% resistor (0603)
R544	1	22.1k $\Omega$ $\pm$ 1% resistor (0603)
R545	1	44.2k $\Omega$ $\pm$ 1% resistor (0603)
R552	1	68k $\Omega$ $\pm$ 5% resistor (0603)
R561	1	1.5k $\Omega$ $\pm$ 1% resistor (0603)
R562	1	1k $\Omega$ $\pm$ 1% resistor (0603)
RT500–RT504	5	100 $\Omega$ $\pm$ 5% resistors (0402)
SW1	1	3-pin header
SW122, SW150–SW157, SW221	10	Momentary pushbutton switches (6mm)
TP500	1	Black multipurpose test point
TP501	1	White multipurpose test point
U1	1	HD-CPL GMSL serializer with LVDS (48 TQFP-EP) Maxim MAX9265GCM/V+
U2	1	1.8V, 500mA LDO regulator (8 $\mu$ MAX <sup>®</sup> -EP) Maxim MAX1792EUA18+ (Top Mark: AAAA)
U3, U26	2	3.3V, 500mA LDO regulators (8 $\mu$ MAX-EP) Maxim MAX1792EUA33+ (Top Mark: AAAC)

DESIGNATION	QTY	DESCRIPTION
U10	1	UART-to-USB converter (32 TQFP)
U11	1	93C46-type 3-wire EEPROM 16-bit architecture (8 SO)
U12	1	Ultra-high-speed microcontroller (44 TQFP) Maxim DS89C450-ENL+
U13	1	Quad three-state buffer (14 SO) Fairchild 74AC125SC
U14	1	Level translator (14 TSSOP) Maxim MAX3378EEUD+
U15	1	I <sup>2</sup> C I/O expander (24 QSOP) Maxim MAX7324AEG+
U19	1	Dual bidirectional level translator (8 SOT23) Maxim MAX3373EEKA+ (Top Mark: AAKS)
U20	1	Digital audio receiver (28 TSSOP)
U21	1	16-bit dual-supply bus transceiver (48 TSSOP)
U22	1	Low-power dual-voltage $\mu$ P supervisor (5 SC70) Maxim MAX6736XKTGD3+ (Top Mark: AFS)
U23, U24	2	2:1 noninverting multiplexers (SC70) Fairchild NC7SV157P6X_NL (Top Mark: VF7)
U25	1	Schmitt trigger buffer (5 SC70) Fairchild NC7SV17P5X_NL (Top Mark: V17)
U500	1	Cyclone III FPGA (324 FBGA) Altera EP3C25F324C8N
U510	1	16M x 16-bit flash memory (64 Easy BGA)
U520, U530, U540	3	Step-down DC-to-DC regulators (8 SO) Maxim MAX1951ESA+

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### Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U550	1	Step-down DC-to-DC regulator (8 SO) Maxim MAX1952ESA+
U560	1	0.2V LDO regulator (10 $\mu$ MAX) Maxim MAX8516EUB+
Y10	1	6MHz crystal (HCM49) Hong Kong X'tals SSL60000N1HK188F0-0
Y12	1	14.7456MHz crystal (HCM49) Hong Kong X'tals SSM1474518AFHHF0

DESIGNATION	QTY	DESCRIPTION
Y23	1	12MHz, 3.3V low-jitter clock oscillator (7mm x 5mm)
Y500	1	50MHz clock oscillator (7mm x 5mm) Hong Kong X'tals C4M5000031AEBH-0
—	1	USB high-speed A-to-B cables, 6ft
—	34	Shunts
—	1	PCB: MAX9265 EVALUATION KIT

### Component Suppliers

SUPPLIER	PHONE	WEBSITE
Altera Corp.	800-800-3753	www.altera.com
Central Semiconductor Corp.	631-435-1110	www.centalsemi.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Rosenberger Hochfrequenztechnik GmbH	011-49-86 84-18-0	www.rosenberger.de
Sumida Corp.	847-545-6700	www.sumida.com
TDK Corp.	847-803-6100	www.component.tdk.com

**Note:** Indicate that you are using the MAX9265 when contacting these component suppliers.

### MAX9265 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX9265.EXE	Application program for both MAX9264 and MAX9265 devices
CDM20600.EXE	Installs the USB device driver
UNINSTALL.EXE	Uninstalls the EV kit software
USB_Driver_Help_200.PDF	USB driver installation help file

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### Quick Start

#### Required Equipment

- MAX9265 EV kit (USB cable included)
- MAX9264 EV kit (USB cable included)
- 2m Rosenberger cable assembly (included with the MAX9264 EV kit)
- Parallel data source (such as digital video)
- Optional: Function generator (needed only if parallel data lacks a pixel clock)
- Optional: Function generator (needed only if parallel data lacks a VSYNC)
- Optional: I<sup>2</sup>S or S/PDIF audio source
- Optional: Pair of 8Ω speakers
- Optional: 3.5mm stereo headphones (16Ω or greater)
- User-supplied Windows XP, Windows Vista, or Windows 7 PC with a spare USB port (direct 500mA connection required; do not use a hub)
- 5V DC, 750mA power supply

**Note:** In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

#### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Visit [www.maxim-ic.com/evkitsoftware](http://www.maxim-ic.com/evkitsoftware) to download the latest version of the EV kit software, 9265Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.
- 2) Install the EV kit software and USB driver on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
- 3) Verify that all jumpers are in their default positions, as shown in Table 1.
- 4) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest GND PCB pad.
- 5) Connect the Rosenberger cable from the MAX9265 EV kit connector J1 to the MAX9264 EV kit connector J1.
- 6) Connect the parallel data source to MAX9265 header H1 (if using static data without a pixel clock, use external function generators to drive PCLK\_IN and VSYNC).
- 7) *Optional Audio Demo:* Connect an S/PDIF audio source (such as DVD player digital output) to the MAX9265 EV kit J21, or connect an I<sup>2</sup>S audio source to header H1 and remove jumper JU210. Connect speakers to the MAX9264 EV kit SPKR\_L and SPKR\_R oval pads, or plug headphones into the J206 headphone jack.
- 8) Turn on the DC power supply.
- 9) Connect the USB cable from the PC to the EV kit board. A Windows message appears when connecting the EV kit board to the PC for the first time. Each version of Windows has a slightly different message. If you see a Windows message stating **ready to use**, then proceed to the next step. Otherwise, open the USB\_Driver\_Help\_200.PDF document in the Windows **Start | Programs** menu to verify that the USB driver was installed successfully.
- 10) Verify that MAX9265 EV kit LED120 lights up, indicating that the microcontroller is powered and enabled.
- 11) Verify that MAX9264 EV kit LED120 lights up, indicating that the microcontroller is powered and enabled.
- 12) Verify that MAX9264 EV kit LED2 lights up, indicating that the link has been successfully established. If LED2 is off or LED1 is on, double-check that the PCLK\_IN signal is clocking data.
- 13) *Optional Audio Demo:* If I<sup>2</sup>S or S/PDIF audio was provided to the MAX9265 EV kit, audio should now be heard from the speakers or headphones previously connected to the MAX9264 EV kit.
- 14) Start the MAX9265 EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software configuration window appears, as shown in Figure 8.
- 15) Press the **Connect** button and the configuration window disappears.
- 16) The EV kit software main window appears, as shown in Figure 1.
- 17) Press the **Read All** button to read all registers on the MAX9265 and MAX9264.
- 18) *I<sup>2</sup>C Slave Device Demo:* Make sure that the MAX9264 EV kit jumpers JU151–JU154 are in the 1-2 position.
- 19) In the software's **MAX7324** tab sheet (Figure 4), press **Search for MAX7324**. Verify that the

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**MAX9264 Device Address** drop-down list shows **0xDA (JU151=1-2 JU152=1-2)**.

- 20) Press the **LED151-LED158 ON** button. Verify that MAX9264 EV kit LED151–LED158 turn on.
- 21) Press the **LEDs Alternating** button. Verify that MAX9264 EV kit LED151, LED153, LED156, and LED158 turn off.
- 22) *GPIO Demo*: In the software's **MAX9264** tab sheet (Figure 3), scroll down to **Register 0x06**. Uncheck **GPIO1OUT** and press **Write**. Verify that MAX9264 EV kit LED4 turns off.
- 23) Uncheck **GPIO0OUT** and press **Write**. Verify that MAX9264 EV kit LED3 turns off.
- 24) Check **GPIO1OUT** and press **Write**. Verify that MAX9264 EV kit LED4 turns on.
- 25) Check **GPIO0OUT** and press **Write**. Verify that MAX9264 EV kit LED3 turns on.
- 26) *INT Demo*: Toggle the MAX9264 EV kit switch SW2 up. Verify that MAX9265 EV kit LED1 turns on, indicating that the MAX9264 INT input is asserted.
- 27) In the software's **MAX9264** tab sheet, scroll to **Register 0x06** and press **Read**. Verify that **INT** is checked, indicating that the MAX9264 INT input is asserted.
- 28) Toggle the MAX9264 EV kit switch SW2 down. Verify that MAX9265 EV kit LED1 turns off, indicating that the MAX9264 INT input is not asserted.
- 29) In the software's **MAX9264** tab sheet, scroll to **Register 0x06** and press **Read**. Verify that **INT** is not checked, indicating that the MAX9264 INT input is not asserted.
- 30) *HDCP Authentication Demo*: Raise the **HDCP** tab sheet (Figure 7) and make sure that the **Link Check** drop-down list is set to **V00: No Link Check**.
- 31) Make sure the encryption button says **Enable Encryption** instead of **Disable Encryption**.
- 32) In **Register 0x95** Actrl, check or uncheck **EN\_INT\_COMP** to choose internal or external comparison mode. Refer to the MAX9265 IC data sheet for more information.
- 33) Press the **Authenticate** button. On success, the green LED (LED126) turns on; otherwise, the red LED (LED127) turns on.
- 34) Verify that the same R0 value is shown in **Register 0x85** on both the MAX9265 and MAX9264.
- 35) *HDCP Encryption Demo*: Press the **Enable Encryption** button. The Ri keys are updated approximately every 2s, assuming that the VSYNC

input rate is 60Hz. The GUI polls the Ri and Pj registers if their corresponding **Poll this register** checkbox is checked.

- 36) In the **Link Check** drop-down list, select **V80: Every 128 VSYNCs**.
- 37) The firmware performs the link integrity check after every 128 VSYNC pulses, turning off the green LED (LED126) if the link check fails.
- 38) In the **Link Check** drop-down list, select **V10: Every 16 VSYNCs**.
- 39) The firmware performs the advanced link integrity check after every 16 VSYNC pulses, turning off the green LED (LED126) if the link check fails.

### Quick Start for Repeater Demonstration

#### Required Equipment

- 5V DC, 100mA power supply
- Digital video source (or two function generators, to drive PCLK and VSYNC)
- Digital video display
- One MAX9265 EV kit board
- Two MAX9264 EV kit boards
- One MAX9263 EV kit board
- Two Rosenberger cables (included with the MAX9264 EV kit boards)
- Wires to interconnect the boards

#### Optional Equipment for Software Verification

- User-supplied Windows PC with available USB port
- USB A-to-B cable (included with the MAX9265 EV kit board)

#### Procedure

- 1) Label the boards for reference. Refer to the *Example Repeater Network—Two  $\mu$ Cs* section in the MAX9263/MAX9264 IC data sheet.
  - 1.1) Designate the MAX9265 EV kit board as Board #1 TX\_B1.
  - 1.2) Designate one of the MAX9264 EV kit boards as Board #2 RX\_R1.
  - 1.3) Designate the MAX9263 EV kit board as Board #3 TX\_R1.
  - 1.4) Designate the other MAX9264 EV kit board as Board #4 RX\_D1.
- 2) Prepare the bulkhead MAX9265 EV kit TX\_B1.



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- 2.1) Update Board #1 TX\_B1 firmware:
  - 2.1.1) **Start | Programs | Maxim EVKIT Software | MAX9265 | Repeater Firmware | MAX9265EVKIT Bulkhead\_UC\_B Firmware Update.**
  - 2.1.2) The firmware update batch file instructs you to **Plug USB cable into Maxim Evaluation Kit to begin firmware update...** and **Press any key to continue...** After plugging in the USB cable, wait at least 5s to allow Windows to catch up. Press the Enter key to begin the firmware update. After approximately 1min, verify that the batch file reports **Exit code = 0 EXIT\_CODE\_SUCCESS.**
  - 2.1.3) *Diagnostic:* Windows reports **USB over current surge.** Check if the USB connector is the type that has a separate back shield that can short across the USB signal pins. Pry off this back shield cover to clear the short.
  - 2.1.4) *Diagnostic:* **EXIT\_CODE\_JTAG\_ABSENT.** The USB cable seems not to be connected, or possibly the USB device driver software not installed. Check setup using a known good unit. Verify that the 6MHz crystal is working. Visually inspect failed board FT232 chip connections.
  - 2.1.5) Exit the firmware loader program.
  - 2.1.6) Disconnect the USB cable from the MAX9265 EV kit Board #1 TX\_B1.
  - 2.1.7) Replug the USB cable into the MAX9265 EV kit Board #1 TX\_B1.
- 2.2) Configure Board #1 TX\_B1 and UC\_B (MAX9265 EV kit) as follows:
  - 2.2.1) JU1 (CDS) = 2-3 to allow UC\_B firmware to access the MAX9265 registers.
  - 2.2.2) JU10 = 1-2 to power UC\_B microcontroller from repeater-provided 5V power.
  - 2.2.3) JU125 = 1-2 so UC\_B can sense the VSYNC input.
- 3) Prepare the repeater board set MAX9264 EV kit RX\_R1 plus MAX9263 EV kit TX\_R1.
  - 3.1) Update Board #2 RX\_R1 firmware:
    - 3.1.1) **Start | Programs | Maxim EVKIT Software | MAX9265 | Repeater Firmware | MAX9264EVKIT Repeater\_UC\_R Firmware Update.**
    - 3.1.2) The firmware update batch file instructs you to **Plug USB cable into Maxim Evaluation Kit to begin firmware update...** and **Press any key to continue...** After plugging in the USB cable, wait at least 5s to allow windows to catch up. Press the Enter key to begin the firmware update. After approximately 1min, verify that the batch file reports **Exit code = 0 EXIT\_CODE\_SUCCESS.**
    - 3.1.3) *Diagnostic:* Windows reports **USB over current surge.** Check if the USB connector is the type that has a separate back shield that can short across the USB signal pins. Pry off this back shield cover to clear the short.
    - 3.1.4) *Diagnostic:* **EXIT\_CODE\_JTAG\_ABSENT.** The USB cable seems not to be connected, or possibly USB device driver software not installed. Check setup using a known good unit. Verify that the 6MHz crystal is working. Visually inspect failed board FT232 chip connections.
    - 3.1.5) Exit the firmware loader program.
    - 3.1.6) Disconnect the USB cable from the MAX9264 EV kit Board #2 RX\_R1.
    - 3.1.7) Replug the USB cable into the MAX9264 EV kit Board #2 RX\_R1.
  - 3.2) Modify Board #2 RX\_R1 and UC\_R (MAX9264 EV kit) as follows:
    - 3.2.1) Install pins at JU141, JU142, GND, VIN, and IOVDD.
    - 3.2.2) Make sure that RX\_R1 JU143 and JU144 are open.
    - 3.2.3) Connect a wire between RX\_R1 JU143 bottom pin (U14 level-translated U12 RXD0) and TX\_R1 JU141 top pin (MAX9263 TX).
    - 3.2.4) Connect a wire between RX\_R1 JU144 bottom pin (U14 level-translated U12 TXD0) and TX\_R1 JU142 top pin (MAX9263 RX).
  - 3.3) Modify Board #3 TX\_R1 (MAX9263 EV kit) as follows:
    - 3.3.1) Install pins at JU141, JU142, GND, VIN, and IOVDD.

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- 3.4) Configure Board #2 RX\_R1 and UC\_R (MAX9264 EV kit) as follows:
  - 3.4.1) JU8 ( $\overline{\text{ENABLE}}$ ) = 2-3 so that  $\overline{\text{ENABLE}}$  is low, driving the video outputs on header H1.
  - 3.4.2) JU23 = open to disconnect IOVDD from the on-board 3.3V regulator U2.
  - 3.4.3) JU1 (CDS) = 1-2 to allow UC\_R firmware to access the MAX9264 registers.
- 3.5) Connect Board #2 to Board #3 as follows:
  - 3.5.1) Connect Board #2 GND to Board #3 GND.
  - 3.5.2) Connect Board #2 VIN to Board #3 VIN.
  - 3.5.3) Connect Board #2 IOVDD to Board #3 IOVDD (powered by the TX\_R1 board's 1.8V regulator U2).
  - 3.5.4) Connect RX\_R1 header H1, pin 62 (PCLK) to TX\_R1 header H1, pin 62 (PCLK).
  - 3.5.5) Connect RX\_R1 header H1, pin 40 (VSYNC) to TX\_R1 header H1 pin 40 (VSYNC).
  - 3.5.6) Connect RX\_R1 header H1, pins 2-58 (D[0:28]) to TX\_R1 header H1, pins 2-58 (D[0:28]).
- 3.6) Configure Board #3 TX\_R1 (MAX9263 EV kit) as follows:
  - 3.6.1) JU10 = open (Board #3 TX\_R1 micro-controller is not powered).
  - 3.6.2) JU1 (CDS) = 2-3.
- 4) Connect the 5V power supply to Board #2 RX\_R1 as follows (the USB does not provide sufficient current to power the EV kit demonstration):
  - 4.1) Set the 5V power-supply output voltage to 5V.
  - 4.2) Disable the power-supply output.
  - 4.3) Connect the power supply (+) to VIN.
  - 4.4) Connect power supply (-) to GND.
- 5) *Optional:* Verify that the repeater passes power-on self-test without TX\_B1 and RX\_D1.
  - 5.1) Enable the 5V power supply.
  - 5.2) The Board #2 UC\_R firmware verifies that required devices are attached and that required input signals are present. With no TX\_B1 connection, the UC\_R firmware should light LED127 and blink six red flashes on LED120 (to repeat the power-on test, press and release the reset button, SW122). If only four or five flashes on LED120, then RX\_R1 is not connected correctly to TX\_R1.
- 5.3) Disable the 5V power supply after verifying UC\_R reports the expected diagnostic code (six flashes).
- 6) Connect the authorized display MAX9264 EV kit RX\_D1.
  - 6.1) Configure Board #4 RX\_D1 (MAX9264 EV kit) as follows:
    - 6.1.1) JU1 (CDS) = 2-3.
    - 6.1.2) JU10 = open (Board #4 RX\_D1 micro-controller is not powered).
  - 6.2) Connect the digital video display to Board #4 header H1.
- 7) Connect the digital video source (or function generators) to Board #1 TX\_B1 as follows:
  - 7.1) Connect video data D[0:28] to header H1, even-numbered pins 2-58.
  - 7.2) Connect ground return to header H1, odd-numbered pins 1-71.
  - 7.3) Connect vertical sync VSYNC to header H1, pin 40.
  - 7.4) Connect PCLK\_IN to header H1, pin 62.
- 8) Connect a Rosenberger cable between Board #1 TX\_B1 and Board #2 RX\_R1 connector J1.
- 9) Connect a Rosenberger cable between Board #3 TX\_R1 and Board #4 RX\_D1 connector J1.
- 10) Set JU2 (BWS) and JU4 (DRS) for all four boards to the correct setting for the video signal PCLK frequency range. For example, if PCLK is between 8.33MHz and 16.7MHz, set JU2 (BWS) = 2-3 and JU4 (DRS) = 1-2. Refer to the MAX9263/MAX9264 IC data sheet for more details.
- 11) Enable the 5V power supply. Verify that Board #2 LED3 and LED4 are on. Verify that Board #3 LED120 is on. Verify that Board #4 LED3 and LED4 are on. No LEDs on Board #1.
- 12) Enable PCLK. Verify that Board #2 LED3 and LED4 are on. Board #2 LED2 may or may not be visible due to the reduced IOVDD voltage (the LED2 circuit is designed for 3.3V, not 1.8V operation). Verify that Board #4 LED2, LED3, and LED4 are on.



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

- 13) Enable the video source (or function generator driving VSYNC).
- 14) The UC\_R firmware performs a power-on self-test to verify that RX\_R1 and TX\_R1 are both accessible. The TX\_B1-RX\_R1 link is authenticated and then the TX\_R1-RX\_D1 link is authenticated. Encryption is enabled on both links. Finally, the KSV values are compiled and the SHA hash vector V is compared. The firmware reports success by lighting green LED126. If any part of the process fails, the firmware reports failure by lighting red LED127 while flashing diagnostic LED LED120. Table 3 lists the diagnostic LED codes for the repeater firmware (to repeat the power-on test, press and release the reset button, SW122).
- 15) *Optional:* Use the EV kit software to verify link authentication and encryption.
  - 15.1) Install the EV kit software and USB driver on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied to your PC and icons are created in the Windows **Start | Programs** menu. During software installation, some versions of Windows may show a warning message indicating that this software is from an unknown publisher. This is not an error condition and it is safe to proceed with installation. Administrator privileges are required to install the USB device driver on Windows.
  - 15.2) Start the MAX9265 EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software configuration window appears, as shown in Figure 8.
  - 15.3) Press the **Connect** button and the configuration window disappears. The software resets the bulkhead firmware, which in turn resets the repeater firmware. Authentication success is indicated by green-light LED126, or failure is indicated by red-light LED127.
  - 15.4) The EV kit software main window appears, as shown in Figure 1. When using the repeater firmware, the EV kit software tries to read the registers while the repeater firmware is busy authenticating the display, so initially the Figure 1 window may show failed reads. *This is not an error.*
  - 15.5) Press the **Read All** button to read all registers on the MAX9265 (Board #1 TX\_B1) and MAX9264 (Board #2 RX\_R1).
  - 15.6) On the HDCP tab sheet (Figure 7), verify that HDCP authentication between Board #1 and Board #2 is successful. The corresponding

Bksv and Aksv values should match, and the Ri keys should be updated with the same value.

- 15.7) Verify that HDCP authentication between Board #3 and Board #4 is successful, by examining the KSV list (the software cannot directly access Board #3 or Board #4). The EV kit software does not have a KSV revocation list to search.

### **Detailed Description of Software**

The main window of the evaluation software (Figure 1) shows a block diagram representing the MAX9264/MAX9265 system. The left column shows MAX9265 input data sources and the right column shows MAX9264 output data sinks.

The **Change Configuration** button brings up the software **Configuration** window (Figure 8), allowing the software GUI to select which side of the link the USB cable should be plugged into. Controlling from the MAX9264 side requires changing some jumper settings, as described in this window. If the MAX9265 and MAX9264 device addresses have been previously changed from their factory power-on-reset (POR) values, the new addresses must be specified in the software **Configuration** window to allow register access.

The **Baud Rate** drop-down list sets the communications baud rate. The USB link uses the same baud rate as the MAX9264/MAX9265. Note that the baud rate should only be changed one step at a time.

The **Read All** button reads all MAX9264 and MAX9265 device registers. The **Reset to Default Values** button restores the recommended factory settings and the **Write All** button writes all MAX9264 and MAX9265 device registers with the values shown in the GUI.

The **MAX9265** tab sheet (Figure 2) provides direct access to all registers of the MAX9265 and the **MAX9264** tab sheet (Figure 3) provides direct access to all registers of the MAX9264. Each register has its own **Read** and **Write** button. The small circle next to the **Read** button turns yellow to indicate an attempting read or write, red to indicate a failed read or write, or green to indicate a successful read or write operation.

The **MAX7324** tab sheet (Figure 4) controls the I<sup>2</sup>C I/O expander on the remote side of the link. When the USB is plugged into the MAX9265 EV kit, the MAX7324 tab sheet controls the MAX7324 (U15) on the MAX9264 EV kit. Note that the MAX7324 actually has two device addresses, but for simplicity, the software GUI only displays the device address associated with the MAX7324 outputs. For details, refer to the MAX7324 IC data sheet.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

The **PRBS Test** tab sheet (Figure 5) uses the MAX9264 registers to perform a pseudorandom bit sequence (PRBS) error-rate test. Select the test duration (maximum 32767s = 9.1hrs) and press **Start**. The software GUI configures the MAX9264 to begin the PRBS test, counts down the specified delay time, and then reports the final value of the MAX9264 PRBSERR register.

The **Interface History and Low Level Access** tab sheet (Figure 6) shows the recent low-level communications activity between the software GUI and the MAX9264/MAX9265 devices. The **Register Access** group box provides arbitrary device read/write control, supporting additional user-supplied devices besides the on-board MAX9264, MAX9265, and MAX7324. The **Device Address**, **Register**, and **Data** drop-down lists specify the device address and the register within the device, as well as one optional byte of data to be written. Pressing **Write Register** writes 1 byte of data to the specified device register. Pressing **Read Register** reads the specified device register and reports the result into the **Interface History** window. Devices that are not register-based (such as the MAX7324) are supported by **Send Data (no register)** and **Receive Data (no register)**. User-supplied devices requiring other interface protocols must use **Raw TX byte codes** to communicate. Note that in bypass mode, raw data is passed to the user-supplied slave device directly without modification.

The **HDCP** tab sheet (Figure 7) shows the HDCP registers of both the MAX9265 serializer and the MAX9264 deserializer side-by-side. This tab sheet is removed if the device capabilities register does not indicate that the device supports HDCP, so if the software is used with the MAX9259, MAX9260, MAX9249, or MAX9268, this tab sheet is not visible. Many of the HDCP registers are displayed as multiple hexadecimal bytes, with a 0x prefix before each byte and spaces between bytes. The **Authenticate** button commands the firmware to perform HDCP authentication, using either internal or external comparison depending on the **EN\_INT\_COMP** bit in the Actrl register. The **Enable Encryption** button waits for a falling edge on VSYNC and then writes to the MAX9265 Actrl and MAX9264 Bctrl registers, with the encryption enable bit set to 1. When the button caption changes to **Disable Encryption**, operation is the same except that the encryption enable bit is cleared to 0. After encryption is enabled, registers 0x85 and 0x87 are repeatedly polled as long as each register's **Poll this register** checkbox remains checked. The **Link Check** drop-down list configures the optional HDCP link integrity check, and can be used to check the R values every 128 VSYNC falling edges or check the P values every 16 VSYNC falling edges.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

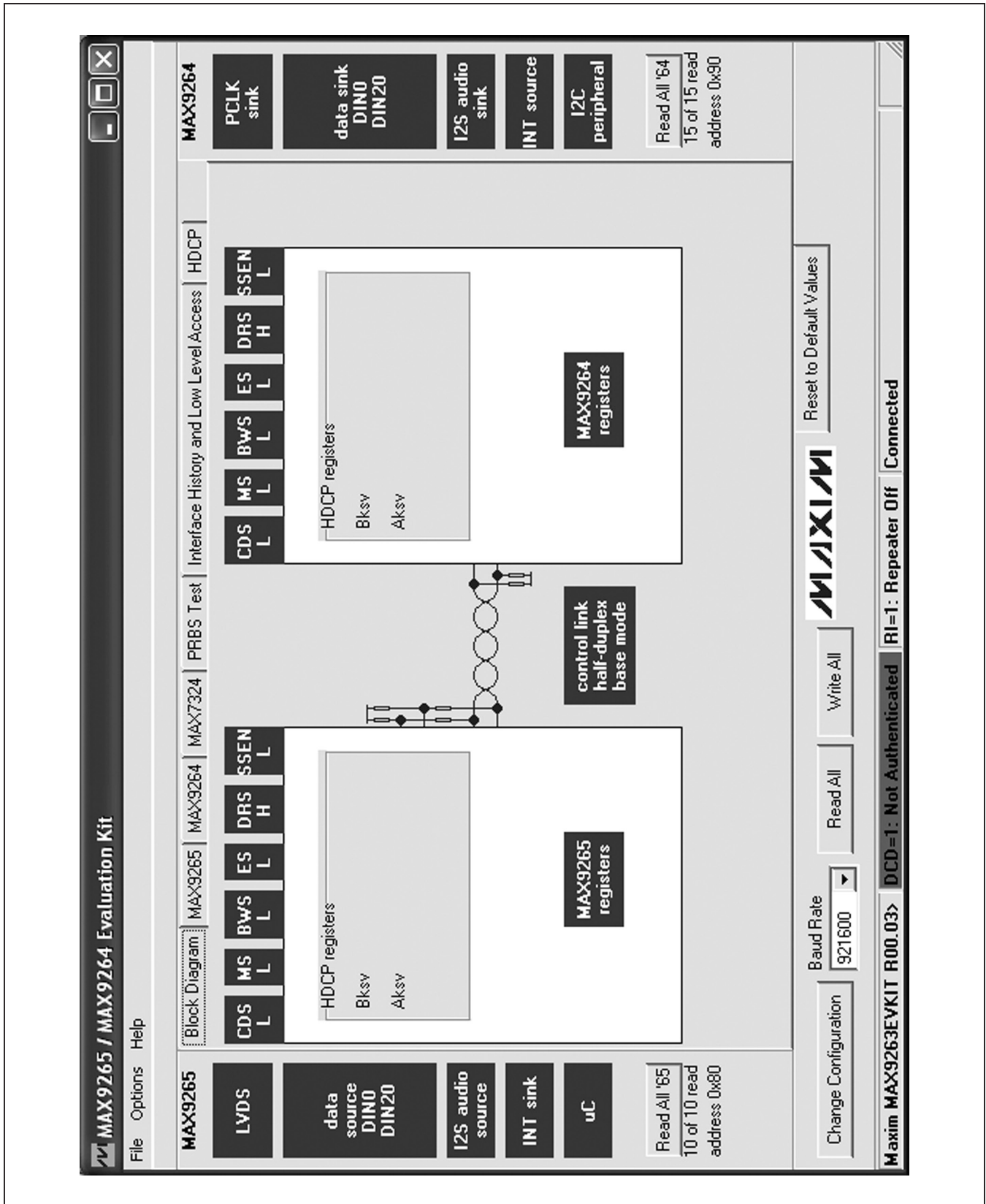


Figure 1. MAX9265/MAX9264 EV Kit Software Main Window (Block Diagram Tab)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

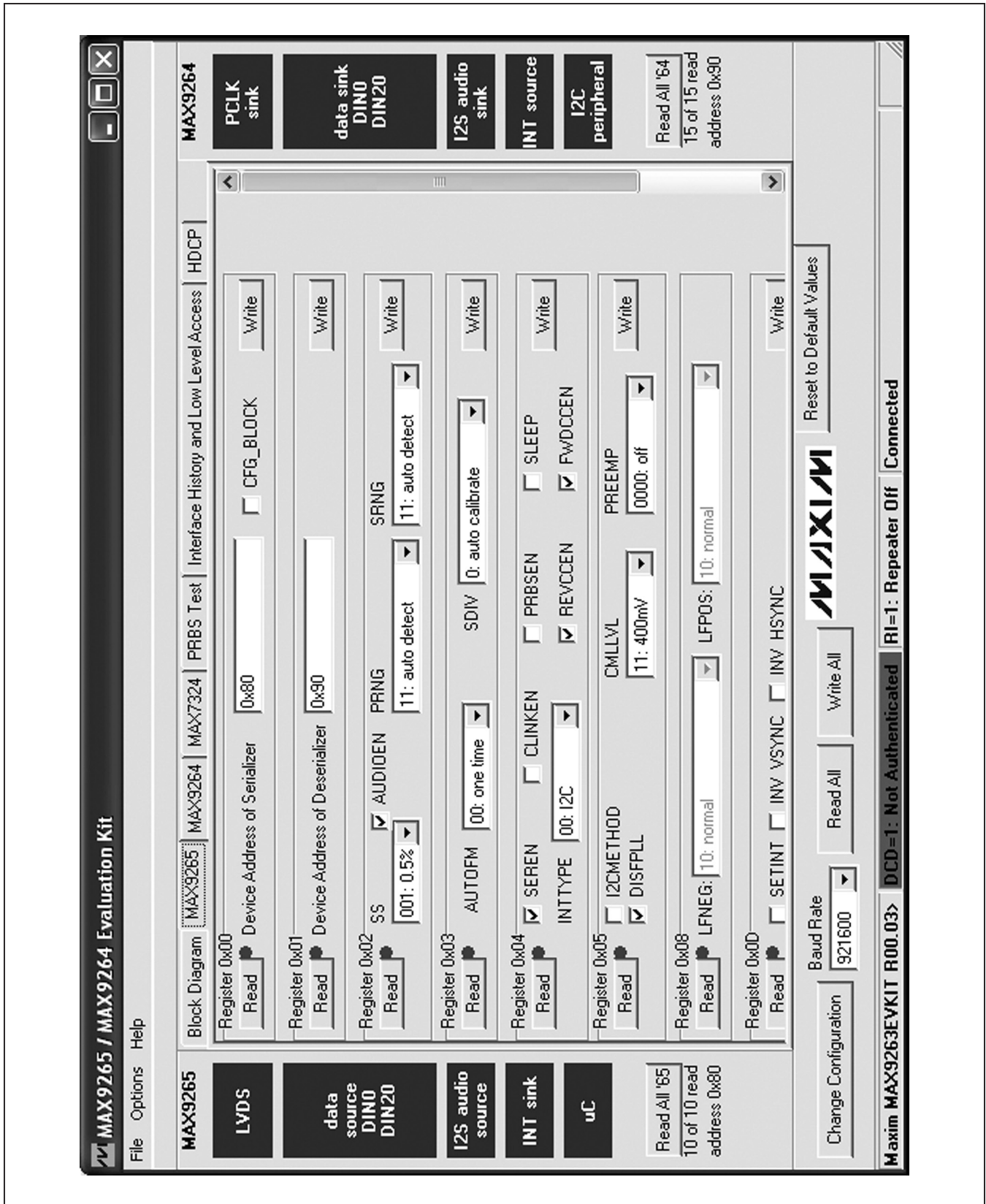


Figure 2. MAX9265/MAX9264 EV Kit Software Main Window (MAX9265 Tab)



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

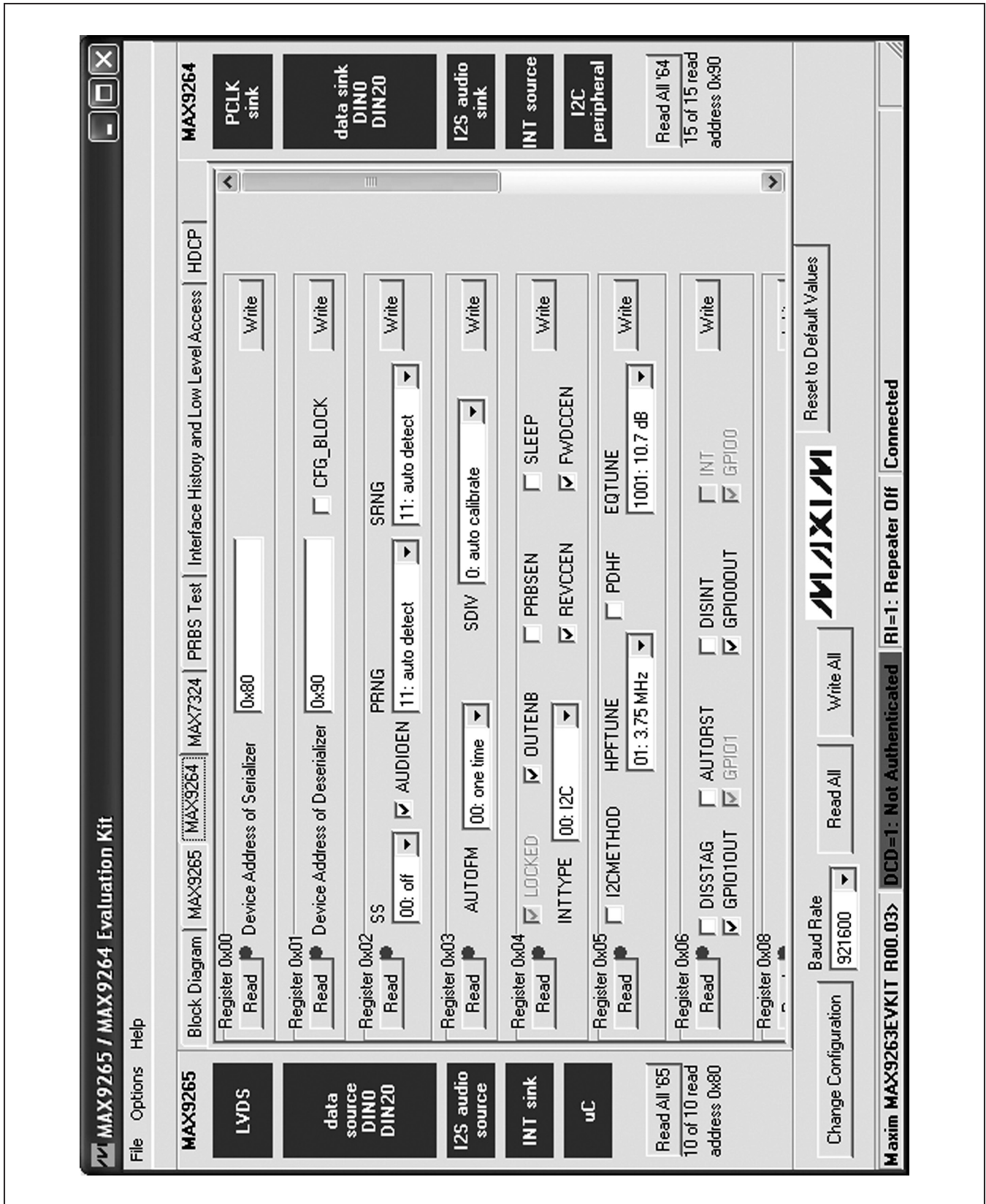


Figure 3. MAX9265/MAX9264 EV Kit Software Main Window (MAX9264 Tab)



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

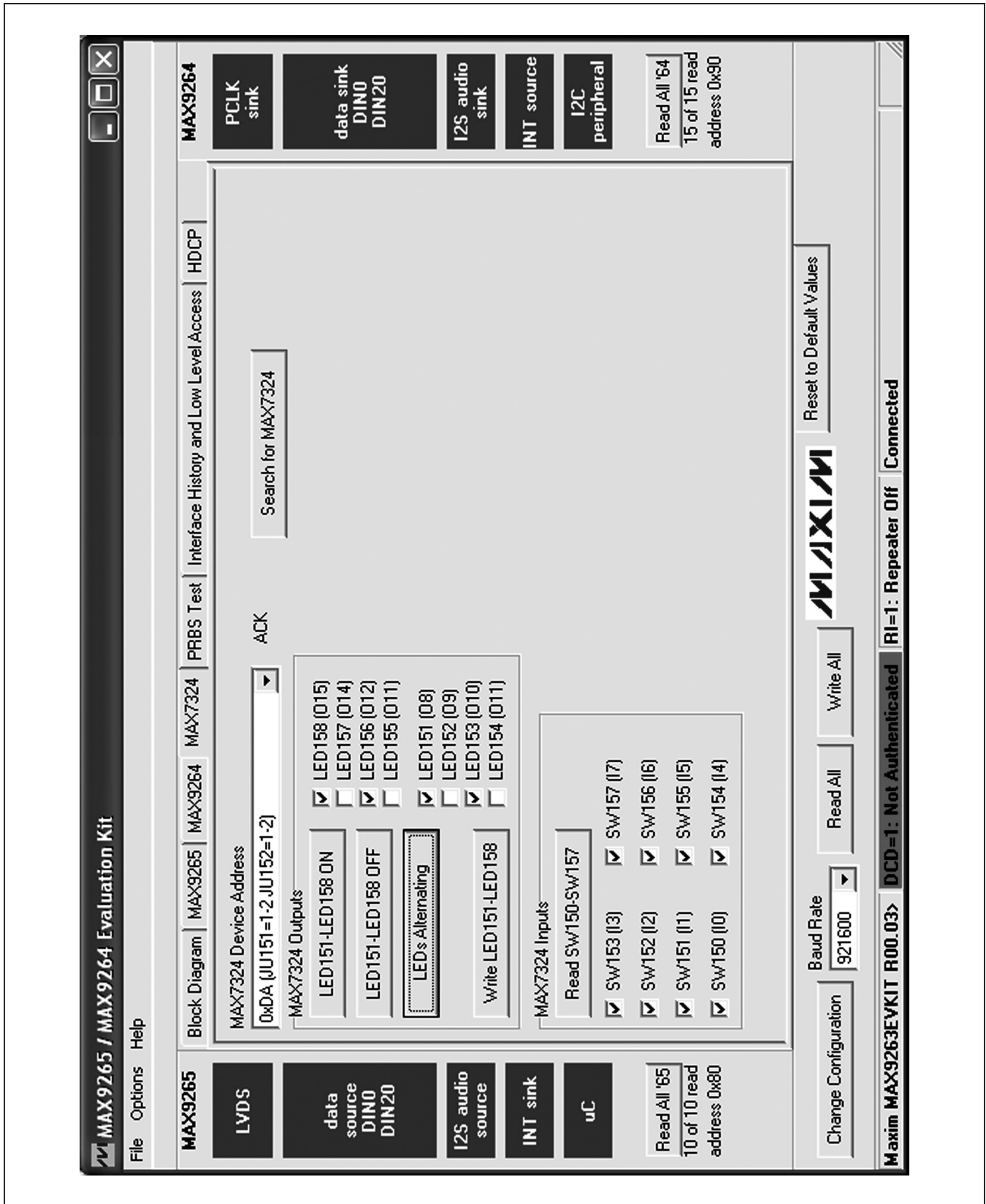


Figure 4. MAX9265/MAX9264 EV Kit Software Main Window (MAX7324 Tab)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

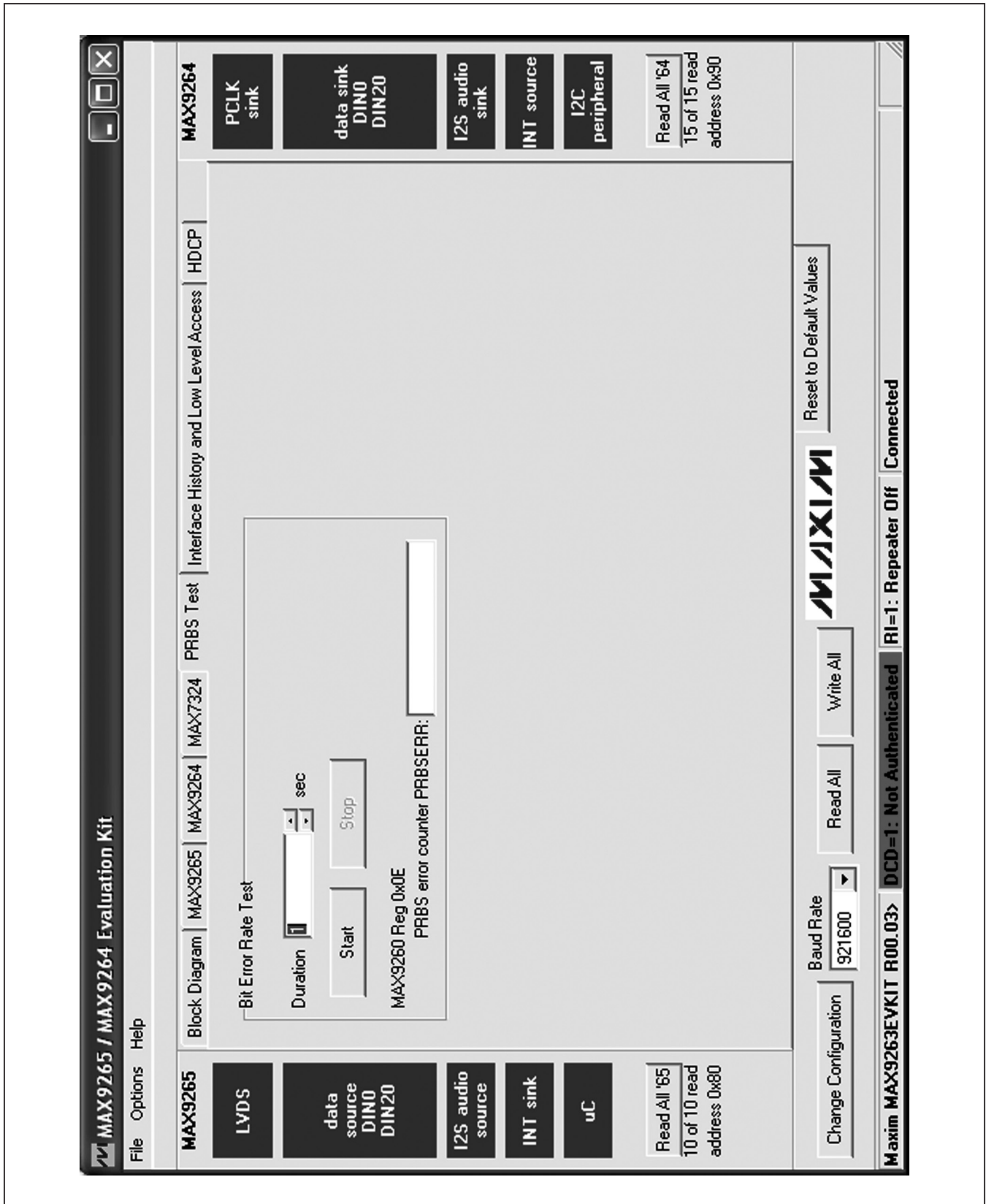


Figure 5. MAX9265/MAX9264 EV Kit Software Main Window (PRBS Test Tab)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

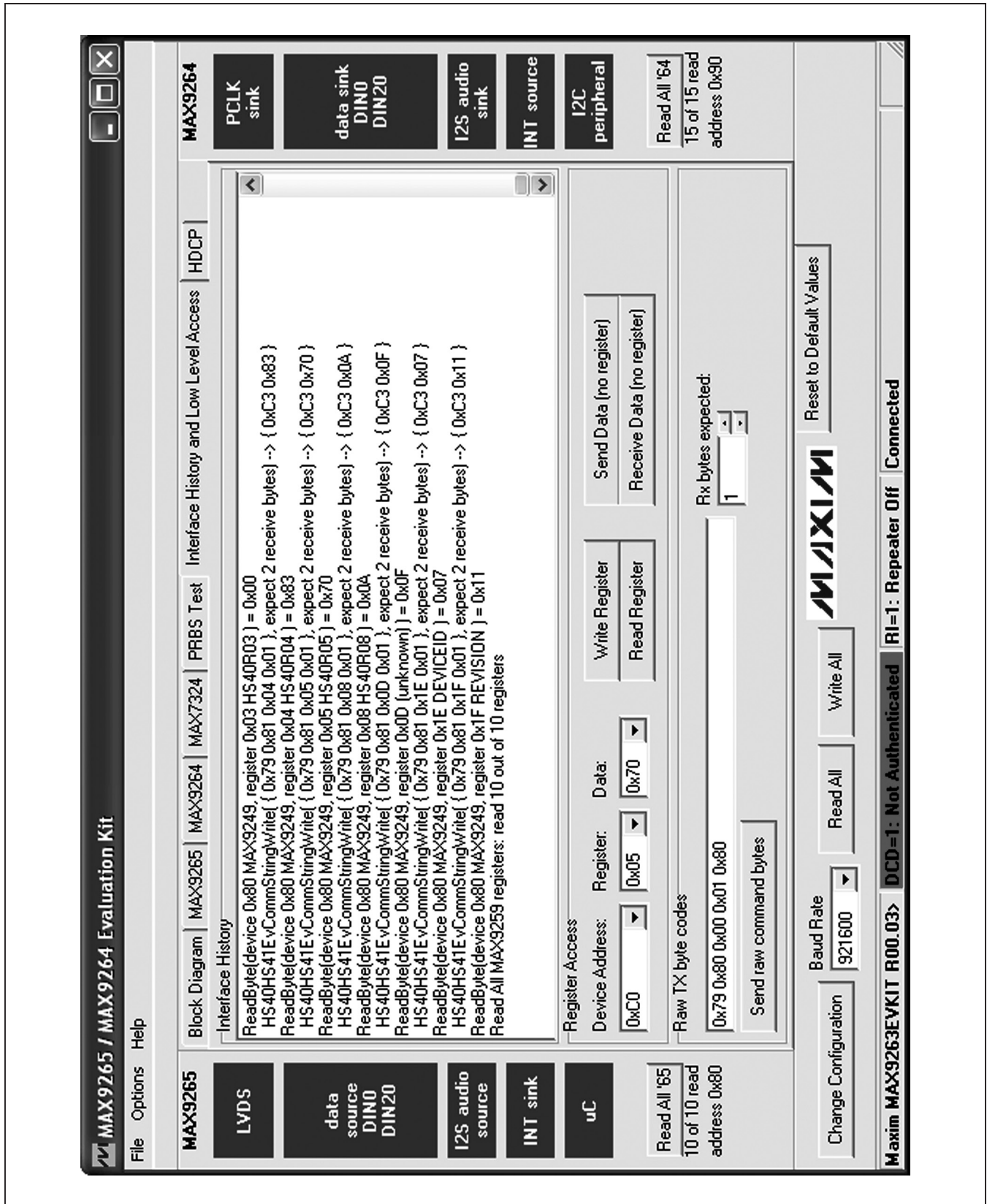


Figure 6. MAX9265/MAX9264 EV Kit Software Main Window (Interface History and Low Level Access Tab)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

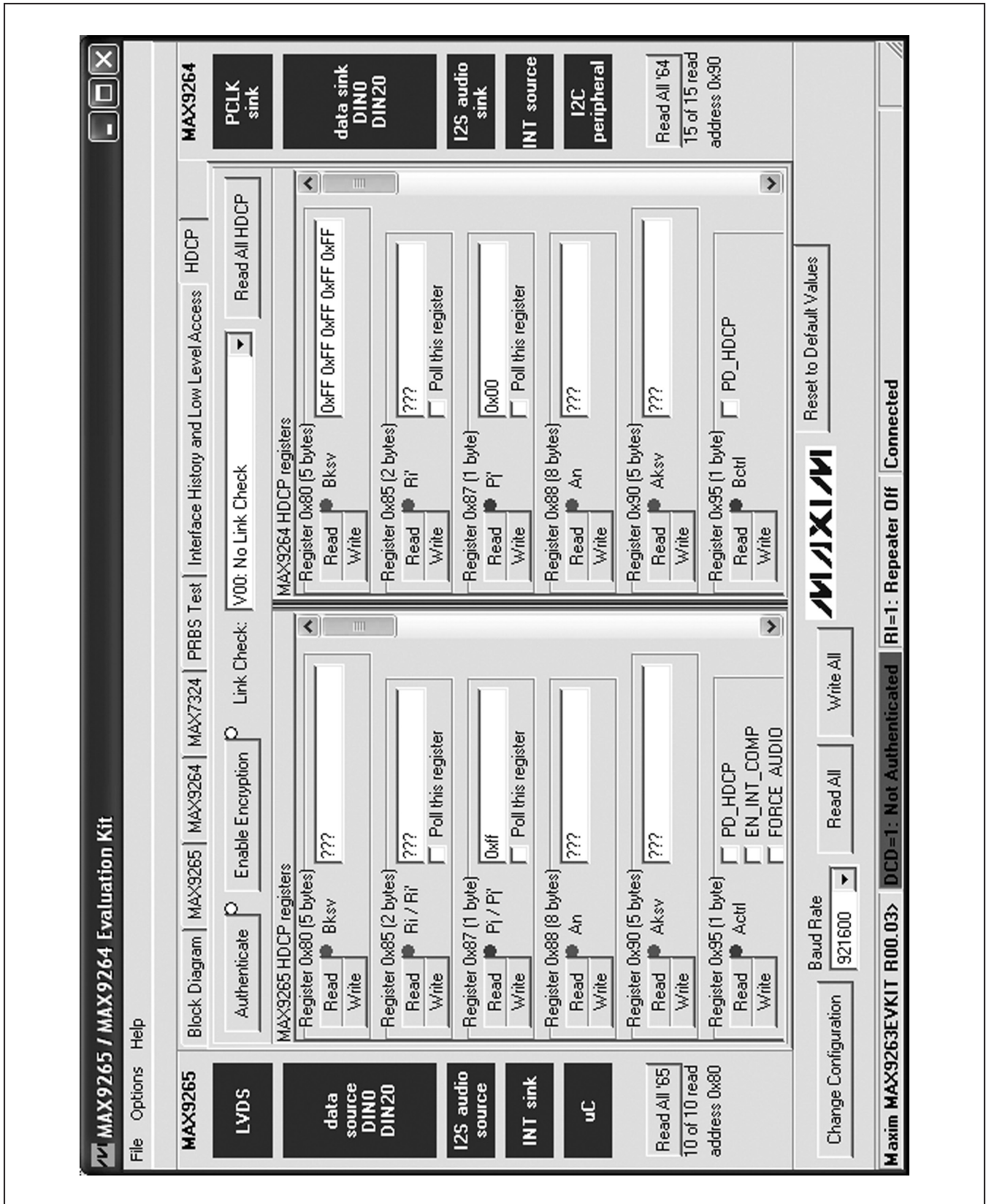


Figure 7. MAX9265/MAX9264 EV Kit Software Main Window (HDCP Tab)



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

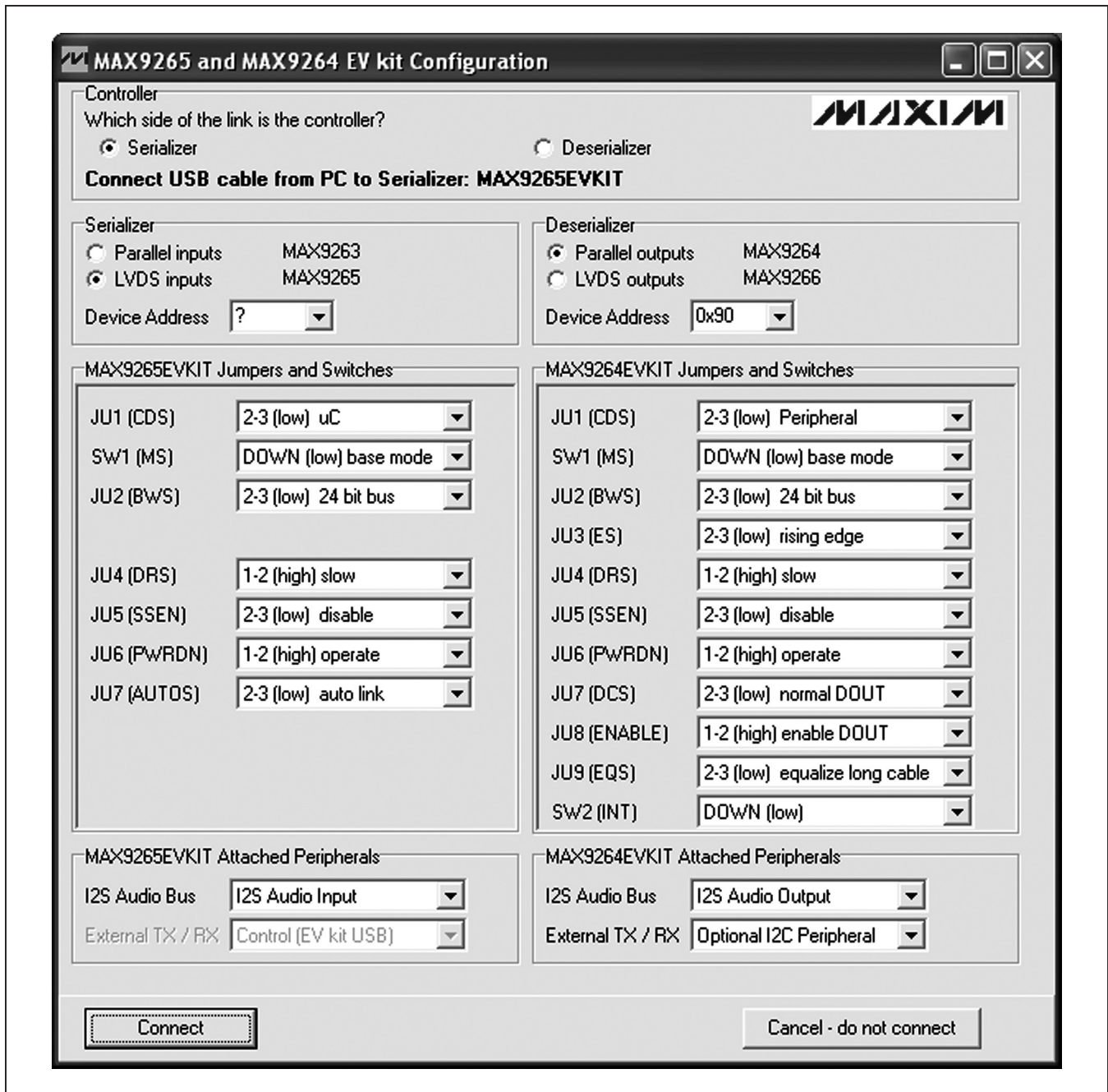


Figure 8. MAX9265/MAX9264 EV Kit Software Configuration Window



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

### **Detailed Description of Hardware**

The MAX9265 EV kit provides a proven layout for the MAX9265 HDCP GMSL serializer with LVDS system interface. On-board level translators, S/PDIF-to-I<sup>2</sup>S audio, and easy-to-use USB-PC connection are included on the EV kit.

The MAX9265 EV kit board layout is divided into four principal sections.

From header H3 to connector J1 are the support components specific to the MAX9265. On-board LDO regulator U2 powers the AVDD, DVDD, and IOVDD supplies from VIN. Jumper JU9 optionally connects VIN to the link cable, powering the remote EV kit board.

Between header H3 and H1, an Altera Cyclone III FPGA (U500) converts parallel video signals from header H1 into LVDS video at header H3. Jumper JU500 powers the FPGA's regulators U520–U560 from the USB.

Below header H1, the board layout has three sections: microcontroller (U10–U14), I<sup>2</sup>C slave device (U15), and audio (U20–U25). The microcontroller and I<sup>2</sup>C slave device sections are identical on the MAX9265 and MAX9264 EV kits.

The audio section of the MAX9265 EV kit contains S/PDIF-to-I<sup>2</sup>S audio converter circuits (U20–U25), which can be disabled by JU210 for applications already having I<sup>2</sup>S audio.

The audio section of the MAX9264 EV kit contains I<sup>2</sup>S-to-audio DAC circuits (U20, U21) and a Class D stereo power amplifier (U25). The audio DAC circuit is similar to the MAX9850 EV kit and the power amplifier (PA) circuit is similar to the MAX9701 EV kit.

### **Evaluating the LVDS Input Signals**

If the available video source uses 7-bit LVDS output format instead of parallel CMOS video, connect to the EV kit board as follows:

- With power off and the USB unconnected, connect the five pairs of LVDS signals to header H2. Move the shunt from jumper JU501 to pins 2-3 to select header H2 as the input source instead of header H1. Follow the *Quick Start* instructions, except in step 5 apply LVDS signals at header H2 instead of applying parallel CMOS signals at header H1. Refer to MAX9265 IC data sheet for LVDS specifications.

If the available video source uses 7-bit LVDS output format instead of parallel CMOS video, then adapt the EV kit board as follows:

- With power off and the USB unconnected, cut the five pairs of LVDS traces between header H3 and U500, and install a header at H3. Disconnect FPGA power from the USB by removing the shunt from jumper JU500. Follow the *Quick Start* instructions, except

in step 5 apply LVDS signals at header H3. Refer to MAX9265 IC data sheet for LVDS specifications.

### **User-Supplied Interface**

To use the MAX9265 EV kit with a user-supplied interface, first cut the PCB traces at jumpers JU141 and JU142. Next, apply your own TX/SCL signal at the U1 side of JU141 and RX/SDA at the U1 side of JU142. Refer to the MAX9263/MAX9264 and MAX9265 IC data sheets for details about UART protocol for base mode, write data format, read data format, selecting base mode or bypass mode, and selecting a UART or I<sup>2</sup>C slave device.

### **User-Supplied Power Supply**

The MAX9265 and MAX9264 EV kits are powered completely from the USB port by default. The 5V USB bus power is supplied to the remote EV kit over the link cable by default. Jumper JU10 powers the link cable VBUS from the 5V USB supply, and jumper JU9 connects the link cable VBUS to the VIN power supply.

To provide external power to each EV kit's VIN, and still power both microcontrollers from the USB, remove the shunt from JU9 but leave the shunt at JU10 installed. The link cable carries the USB 5V bus power to the remote EV kit board, but external user-supplied VIN supplies are required to power the MAX9265 and the MAX9264.

To provide different power supplies to DVDD, AVDD, and IOVDD, remove the shunts from jumpers JU21, JU22, and JU23 and apply external user-supplied power at the DVDD, AVDD, and IOVDD oval pads.

The I<sup>2</sup>S audio link demonstration requires both the MAX9265 EV kit and MAX9264 EV kit microcontrollers (U12) to be powered; otherwise, the on-board S/PDIF-to-I<sup>2</sup>S converter or the I<sup>2</sup>S audio DAC is not initialized.

### **Detailed Description of Firmware**

The DS89C450 microcontroller (U12) runs custom firmware that ensures that no breaks occur within register read/write commands. The firmware records 9-bit even-parity data received from the USB interface while RTS is set, and plays back the 9-bit data with 1.5 stop bits timing when RTS is cleared. Data received from the MAX9265 is immediately relayed to the USB.

The audio chips are initialized by an I<sup>2</sup>C command sequence sent by the firmware when the microcontroller is reset. This initialization sequence covers both the S/PDIF-to-I<sup>2</sup>S converter and the MAX9850 I<sup>2</sup>S stereo audio DAC. Pressing SW122 resets the microcontroller, resending the audio I<sup>2</sup>C initialization commands.

The firmware also supports a small set of commands, available when RTS is clear. Since all register read/write requests are sent with RTS set, there is no conflict between register data and firmware commands. These firmware commands are issued automatically by the

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

MAX9265 EV kit software GUI. The following information is provided for reference only:

- Firmware command “?” prints the firmware version banner message and brief command list.
- Firmware command “B” changes the baud rate by changing the internal TH1 baud-rate divisor. Refer to firmware help command “?” for details. Pressing SW122 resets the USB baud rate to 921600 baud. The software GUI automatically sends the baud-rate change command.
- Firmware command “T” supports waking up the MAX9265 from the MAX9264 side of the link. Command “T” performs a dummy read, followed by a delay on the order of 1ms to 8ms, and finally writes a register value. For example, send “T810504800483” to read from device address 0x81 register 0x05, delay 4ms, then write to device address 0x80 register 0x04 data 0x83. This is the MAX9265 wake-up sequence for the default device addresses. The software GUI automatically sends this command when the **Wake Up MAX9265** button is pressed.
- Firmware commands “R” and “W” read and write device registers. The 8-bit device address, register address, length, and data are sent in hexadecimal. On success, the return code is “+” followed by the read data. On failure, the return code is “-”.
- Firmware command “A” performs HDCP authentication. On success, the return code is “+”, LED126 (green) is on, and LED127 (red) is off. On failure, the return code is “-”, LED126 (green) is off, and LED127 (red) is on. Authorization status shown on the green LED is also available to the USB UART on the DCD modem status signal.
- Firmware command “E” sets or clears the encryption enable bits, by waiting for VSYNC and then writing values to the MAX9265 Actrl and MAX9264 Bctrl registers.
- Firmware command “V” configures the VSYNC interrupt handler to enable the optional link integrity checks. “V80” enables the standard HDCP link authentication check after every 128 VSYNC falling edges. “V10” enables the advanced HDCP link authentication check after every 16 VSYNC falling edges. “V00” disables the interrupt service routine.
- Some commands are used only during firmware development. Firmware command “S” simulates a dummy device using on-chip memory, instead of device registers, used during firmware development. Firmware command “~” prints a diagnostic trace dump used during firmware development. Firmware commands “1” and “2” perform HDCP link authentication-check operations, used during firmware development. In normal operation, these operations are triggered by the VSYNC interrupt handler.

**Table 1. MAX9265 EV Kit Jumper Descriptions**

JUMPER	SIGNAL	SHUNT POSITION	DESCRIPTION
JUCNTL0	CNTL0	1-2	CNTL0 = GND.
		Open*	CNTL0 = Unconnected.
JUCNTL1	CNTL1	1-2	CNTL1 = GND.
		Open*	CNTL1 = Unconnected.
JUCNTL2	CNTL2	1-2	CNTL2 = GND.
		Open*	CNTL2 = Unconnected.
JU1	CDS	1-2	CDS = High. Optional peripheral attached to the MAX9265.
		2-3*	CDS = Low. ECU attached to the MAX9265. <b>Connect the USB to the MAX9265 EV kit.</b>
		Open	Reserved.
JU2	BWS	1-2	BWS = High.
		2-3*	BWS = Low.
JU3	ADD0	1-2	ADD0 = IOVDD.
		1-3	ADD0 = Unconnected.
		1-4*	ADD0 = GND.
JU4	DRS	1-2*	DRS = High.
		2-3	DRS = Low.
JU5	SSEN	1-2	SSEN = High.
		2-3*	SSEN = Low.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

**Table 1. MAX9265 EV Kit Jumper Descriptions (continued)**

JUMPER	SIGNAL	SHUNT POSITION	DESCRIPTION
JU6	$\overline{\text{PWDN}}$	1-2*	$\overline{\text{PWDN}}$ = High.
		2-3	$\overline{\text{PWDN}}$ = Low.
JU7	$\overline{\text{AUTOS}}$	1-2	$\overline{\text{AUTOS}}$ = High.
		2-3*	$\overline{\text{AUTOS}}$ = Low.
JU8	H1 odd pins	Open*	H1 odd-numbered pins connect to GND through R13.
		1-2	H1 odd-numbered pins connect to IOVDD. <b>R13 must be open.</b>
		2-3	H1 odd-numbered pins connect to GND.
JU9	Bus power	1-2*	J1 pin 1 connects to VIN.
		2-3	J1 pin 1 connects to GND.
		Open	J1 pin 1 unconnected.
JU10	Bus power	1-2	J1 pin 1 connects to USB+5V.
		Open*	USB power is not connected to link cable power.
JU11	ADD1	1-2	ADD1 = IOVDD.
		1-3	ADD1 = Unconnected.
		1-4*	ADD1 = GND.
JU21	AVDD	1-2*	AVDD power from 1.8V LDO U2, powered by VIN.
		Open	AVDD must be provided from an external source.
JU22	DVDD	1-2*	DVDD power from 1.8V LDO U2, powered by VIN.
		Open	DVDD must be provided from an external source.
JU23	IOVDD	1-2*	IOVDD power from 1.8V LDO U2, powered by VIN.
		Open	IOVDD must be provided from an external source.
JU31	LVDSVDD	1-2*	LVDSVDD is powered from 3.3V LDO U3, powered by VIN.
		Open	LVDSVDD must be powered from an external user-supplied source.
JU101	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU102	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU103	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU104	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU105	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU106	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU107	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU108	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU121	Reserved	Not installed*	Reserved for factory diagnostic tests.
JU122	Reserved	Pin 1 only*	Reserved for factory diagnostic tests.
JU125	VSYNC	1-2*	Connects DIN19/VS to U12 interrupt input to allow firmware to count VSYNC edges when performing HDCP link check.
		Open	Disconnects DIN19/VS from U12 interrupt input.
JU141	TX/SCL	Not installed*	Connects U1 to U12 through level translator U14.
JU142	RX/SDA	Not installed*	Connects U1 to U12 through level translator U14.
JU143	LFLT	Not installed*	Connects U1 to USB through level translator U14.
JU144	INT	Not installed*	Connects U1 to USB through level translator U14.
JU151	U15 AD2	1-2*	Selects U15 I <sup>2</sup> C device address.
		2-3	Selects U15 I <sup>2</sup> C device address.
		Open	Reserved for factory diagnostic tests.
JU152	U15 AD0	1-2*	Selects U15 I <sup>2</sup> C device address.
		2-3	Selects U15 I <sup>2</sup> C device address.
		Open	Reserved for factory diagnostic tests.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

**Table 1. MAX9265 EV Kit Jumper Descriptions (continued)**

JUMPER	SIGNAL	SHUNT POSITION	DESCRIPTION
JU153	U15 SDA	1-2*	Connects U15 MAX7324 to I <sup>2</sup> C bus. MS must be low ( <b>SW1</b> ) and CDS must be high (JU1 = 1-2 on both boards).
		Open	Disconnects U15 MAX7324 from I <sup>2</sup> C bus. MS can be high ( <b>SW1</b> ).
JU154	U15 SCL	1-2*	Connects U15 MAX7324 to I <sup>2</sup> C bus. MS must be low ( <b>SW1</b> ) and CDS must be high (JU1 = 1-2 on both boards).
		Open	Disconnects U15 MAX7324 from I <sup>2</sup> C bus. MS can be high ( <b>SW1</b> ).
JU191	AUDIO_SCL	1-2*	U12 sends I <sup>2</sup> C initialization commands to audio chip U20.
		Open	Disconnects audio I <sup>2</sup> C bus pullup resistor.
JU192	AUDIO_SDA	1-2*	U12 sends I <sup>2</sup> C initialization commands to audio chip U20.
		Open	Disconnects audio I <sup>2</sup> C bus.
JU193	AUDIO_SCL	1-2*	U12 sends I <sup>2</sup> C initialization commands to audio chip U20.
		Open	Disconnects audio I <sup>2</sup> C bus pullup resistor.
JU194	AUDIO_SDA	1-2*	U12 sends I <sup>2</sup> C initialization commands to audio chip U20.
		Open	Disconnects audio I <sup>2</sup> C bus.
JU210	U21 OE	1-2*	J21 S/PDIF input drives I <sup>2</sup> S audio to H1 and U1.
		Open	External user-supplied I <sup>2</sup> S can be connected to H1.
JU211	I <sup>2</sup> S WS	Not installed*	J21 S/PDIF input drives I <sup>2</sup> S audio to H1 and U1.
		Open	Disconnects I <sup>2</sup> S signals.
JU212	I <sup>2</sup> S SCK	Not installed*	J21 S/PDIF input drives I <sup>2</sup> S audio to H1 and U1.
		Open	Disconnects I <sup>2</sup> S signals.
JU213	I <sup>2</sup> S SD	Not installed*	J21 S/PDIF input drives I <sup>2</sup> S audio to H1 and U1.
		Open	Disconnects I <sup>2</sup> S signals.
JU214	I <sup>2</sup> S MCLK	Not installed*	J21 S/PDIF input drives I <sup>2</sup> S audio to H1 and U1.
		Open	Disconnects I <sup>2</sup> S master clock.
JU261	VMOD	1-2*	VMOD audio power from 3.3V LDO U26, powered by VIN.
		Open	VMOD audio power must be provided from an external 3.3V source.
JU500	FPGA	1-2*	VCC5 power from USB+5V.
		Open	VCC5 power must be provided from an external source
JU501	FPGA	1-2*	FPGA drives H3 with data converted to LVDS from parallel input header H1.
		2-3	FPGA drives H3 with binary test counter data on all four LVDS channels.
JU502	FPGA	Open*	Reserved.
JU503	FPGA	Open*	Reserved.
JU520	FPGA	1-2*	VCC33 power from 3.3V regulator U520, powered by VCC5.
		Open	VCC33 must be provided from an external source.
JU530	FPGA	1-2*	VCC25 power from 2.5V regulator U530, powered by VCC5.
		Open	VCC25 must be provided from an external source.
JU540	FPGA	1-2*	VCC12 power from 1.2V regulator U540, powered by VCC5.
		Open	VCC12 must be provided from an external source.
JU550	FPGA	1-2*	VCC18 power from 1.8V regulator U550, powered by VCC5.
		Open	VCC18 must be provided from an external source.
JU560	FPGA	1-2*	VCC125 power from 1.25V regulator U560, powered by VCC18.
		Open	VCC125 must be provided from an external source.
SW1	MS	1-2	MS = High. Full-duplex bypass mode. <b>Device registers not accessible.</b>
		2-3*	MS = Low. Half-duplex base mode. <b>Required when writing to device registers or when using an external I<sup>2</sup>C peripheral.</b>

\*Default position.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

### MAX9264/MAX9265 Repeater Demo (LED Error Codes)

The bulkhead firmware (UC\_B) and repeater firmware (UC\_R) both perform a self-test at power-up and after reset. The firmware first verifies that required devices are attached and that required input signals are present. If any of these required resources are not found, the firmware turns on LED127 (red, error/unauthenticated) and blinks an error code on LED120 (red, diagnostic code). If all required resources are found, and the links are successfully authenticated, then the firmware turns on LED126 (green, authenticated) steady on and blinks LED120 three times.

The repeater demo firmware only supports the minimal repeater configuration (DEPTH = 1, DEVICE\_COUNT = 1). This is a limitation of the firmware and not a limitation of the MAX9263/MAX9264. DEPTH and DEVICE\_COUNT values can be different for different repeater configurations.

The RX\_R1 LED2 led appears very dim, because the MAX9264 EV kit is designed to operate at IOVDD = 3.3V. However, in the repeater demo configuration, the MAX9264 IOVDD is powered from the MAX9263 EV kit board IOVDD, which is only 1.8V. Due to the lower interface supply voltage, green LED2 is very dim.

**Table 2. Address-Select Jumpers (JU11, JU3)**

JU11		JU3		MAX9265 ADDRESS
SHUNT POSITION	ADD1	SHUNT POSITION	ADD0	
1-2	IOVDD	1-2	IOVDD	0xC4
		1-3	N.C.	0xC8
		1-4	GND	0xC0
1-3	N.C.	1-2	IOVDD	0x44
		1-3	N.C.	0x48
		1-4	GND	0x40
1-4*	GND	1-2	IOVDD	0x84
		1-3	N.C.	0x88
		1-4*	GND	0x80

**Note:** Device address is determined when power is applied.

**Table 3. Diagnostic Error Codes from UC\_B Bulkhead Firmware**

LED120 FLASHES AFTER SELF-TEST	MEANING
3 green flashes LED120, while steady on LED126 (green)	Success: Authenticated bulkhead link TX_B1 to RX_R1; authenticated display link TX_R1 to RX_D1; enabled encryption; exchanged Binfo and KSVlist.
4 red flashes LED120	No PCLK IN signal received at TX_B1, or no RX_R1.
5 red flashes LED120	No UC_R TXD0/RXD0 connection to TX_R1. Check the JU143, JU144 wires from the RX_R1 board to the TX_R1 board.
6 red flashes LED120	No UC_B TXD1/RXD1 connection to TX_B1.
7 red flashes LED120	No PCLK IN signal received at TX_B1, or no RX_D1 attached to TX_R1.
8 red flashes LED120	No VSYNC IN to TX_B1.
9 red flashes LED120	No UC_R connection to RX_R1.
10 red flashes LED120	Bulkhead authentication failure between TX_B1 and RX_R1.
11 red flashes LED120	Display authentication failure between TX_R1 and RX_D1.
12 red flashes LED120	Encryption-enable failure.
13 red flashes LED120	Error building KSV list.



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

**Table 4. Diagnostic Error Codes from UC\_R Repeater Firmware**

LED120 FLASHES AFTER SELF-TEST	MEANING
3 green flashes LED120, while steady on LED126 (green)	Success.
4 red flashes LED120	No UC_R TXD1/RXD1 connection to RX_R1 (check if the RX_R1 board JU1 CDS shunt is in the 1-2 position).
5 red flashes LED120	No UC_R TXD0/RXD0 connection to TX_R1. Check the JU143, JU144 wires from the RX_R1 board to the TX_R1 board.
6 red flashes LED120	No PCLK IN signal received at TX_B1, or no TX_B1 attached to RX_R1.
7 red flashes LED120	No PCLK IN signal received at TX_B1, or no RX_D1 attached to TX_R1.
8 red flashes LED120	No VSYNC IN signal received at TX_B1.
11 red flashes LED120	Display authentication failure between TX_R1 and RX_D1.
12 red flashes LED120	Encryption-enable failure.
13 red flashes LED120	Error building KSV list.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

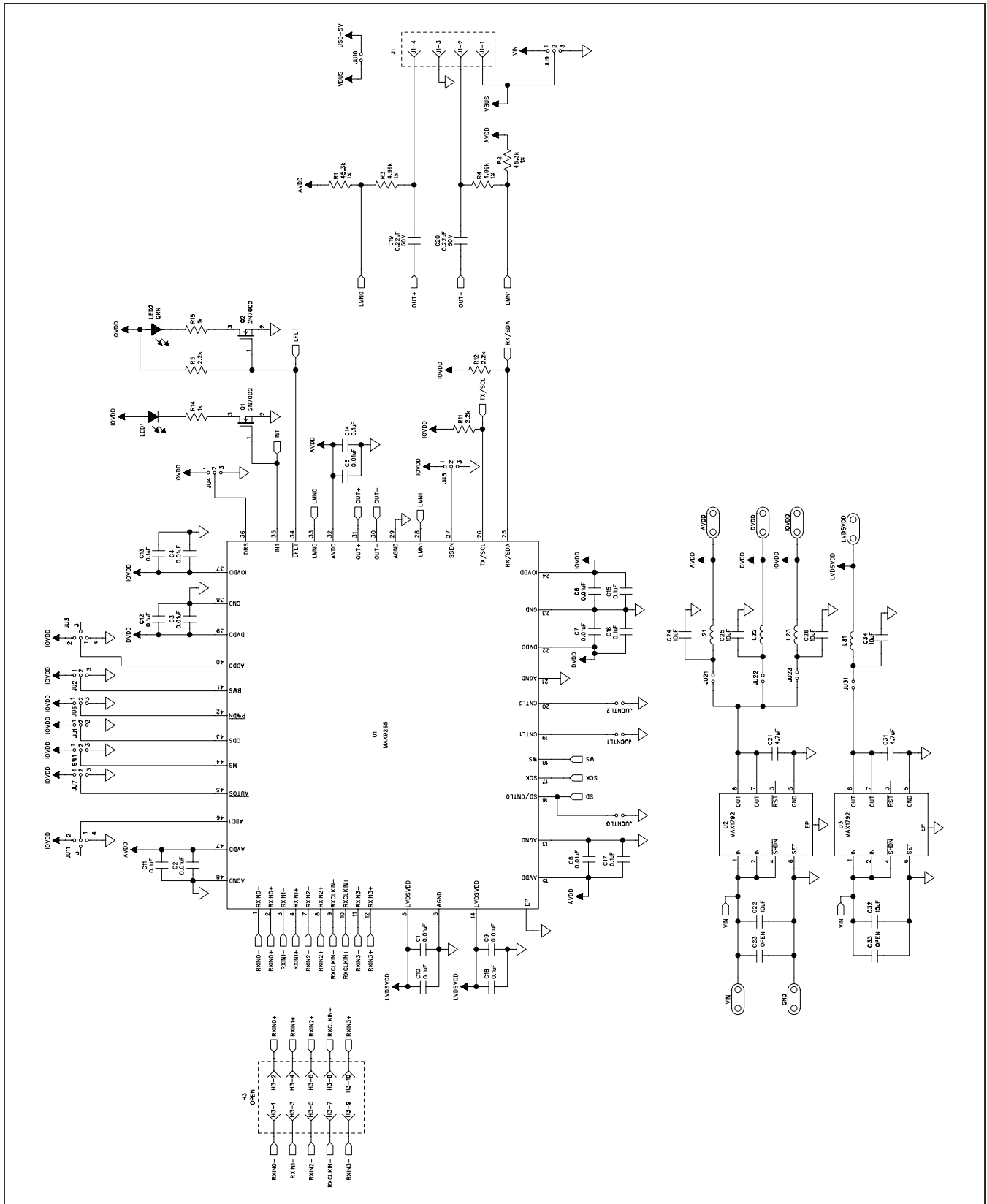


Figure 9a. MAX9265 EV Kit Schematic (Sheet 1 of 11)



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

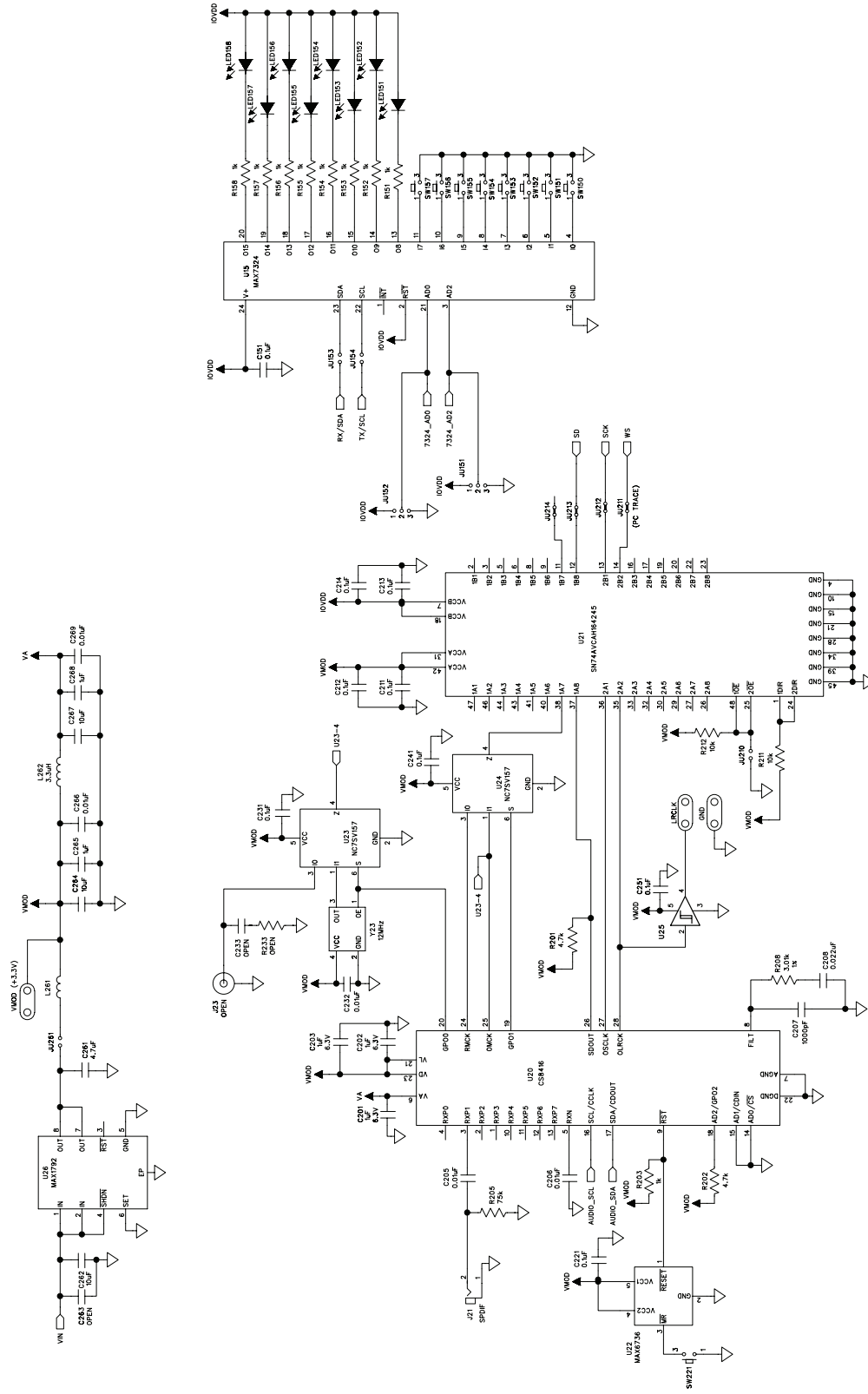


Figure 9c. MAX9265 EV Kit Schematic (Sheet 3 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

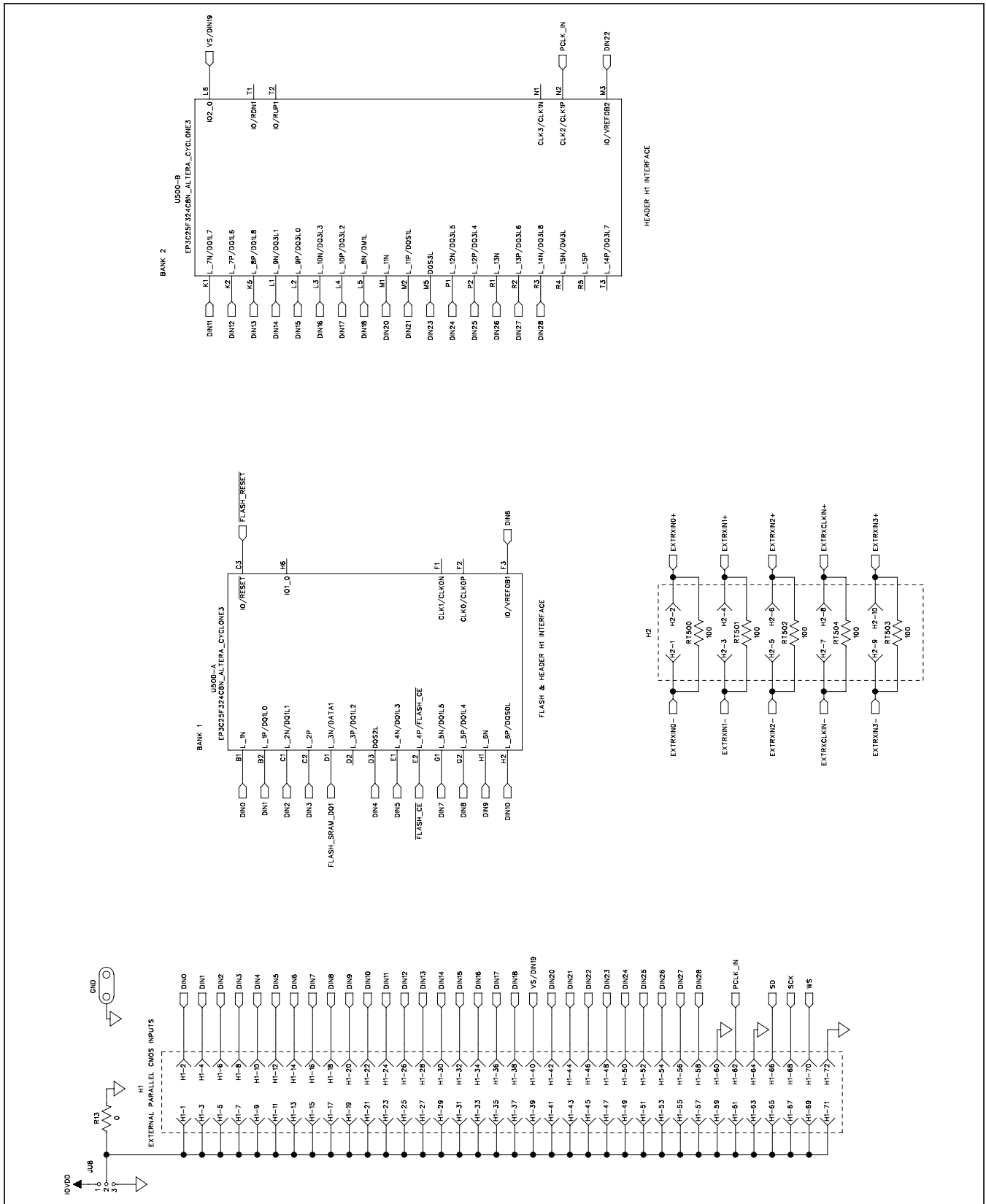


Figure 9d. MAX9265 EV Kit Schematic (Sheet 4 of 11)





# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

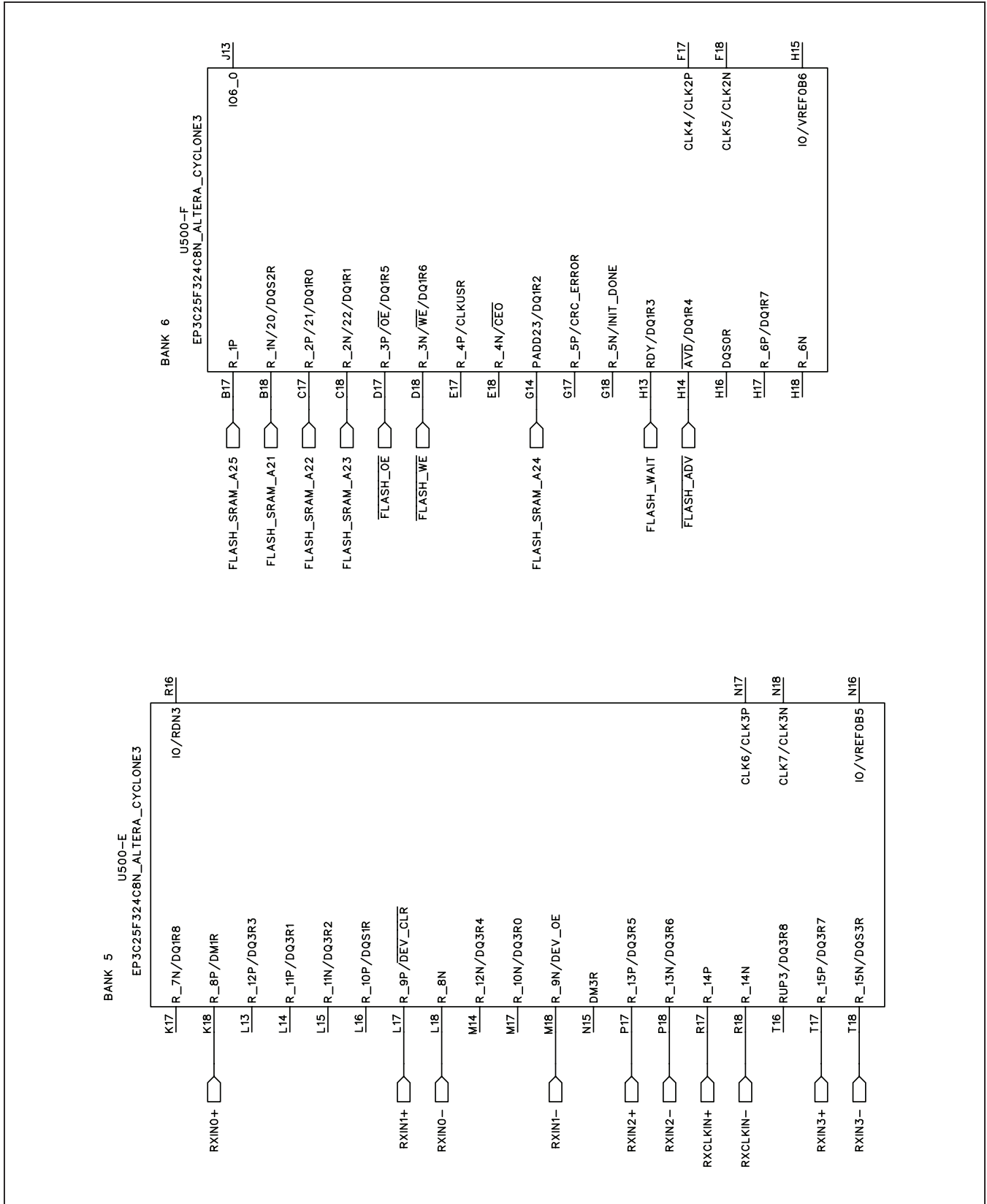


Figure 9f. MAX9265 EV Kit Schematic (Sheet 6 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

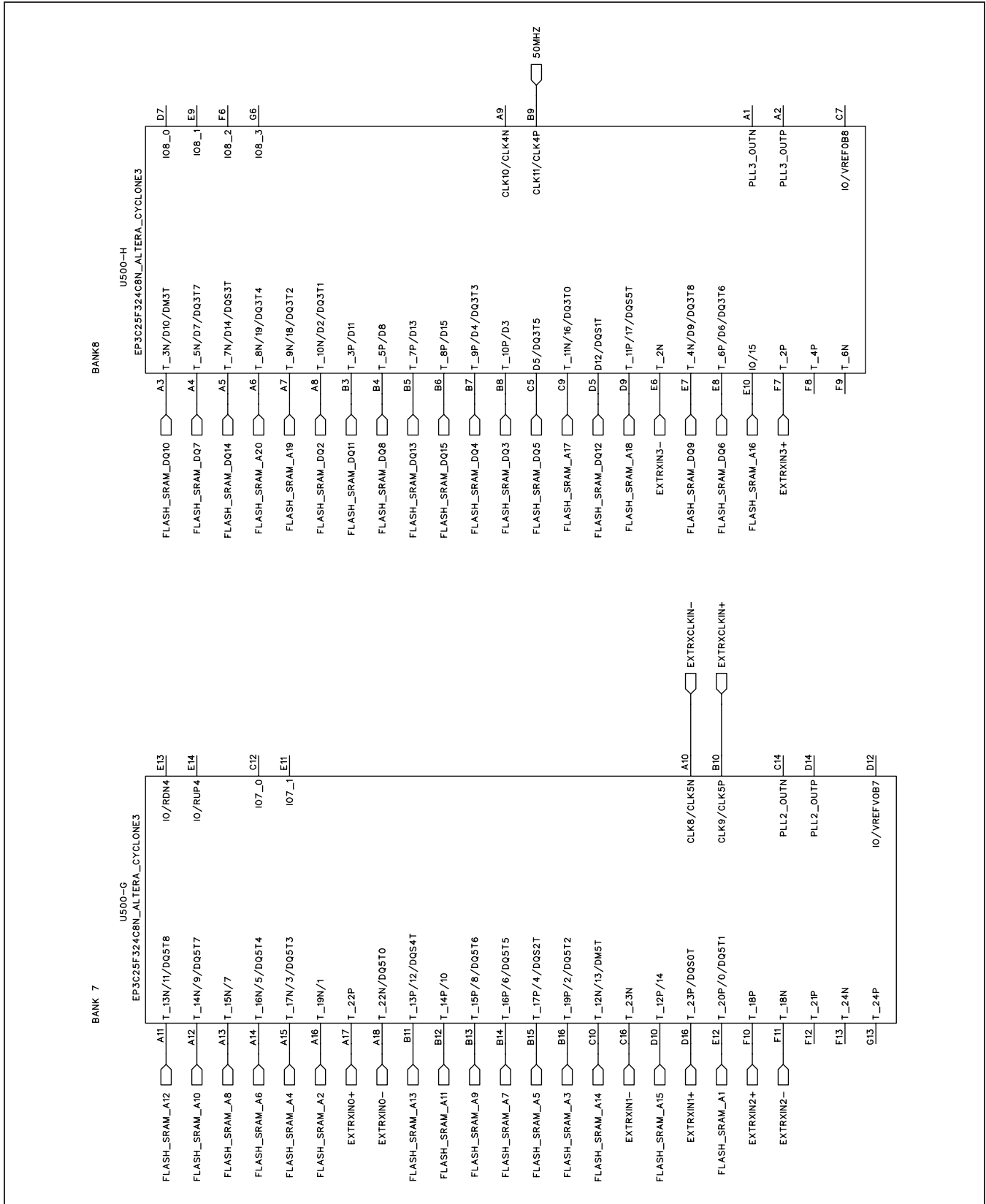


Figure 9g. MAX9265 EV Kit Schematic (Sheet 7 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

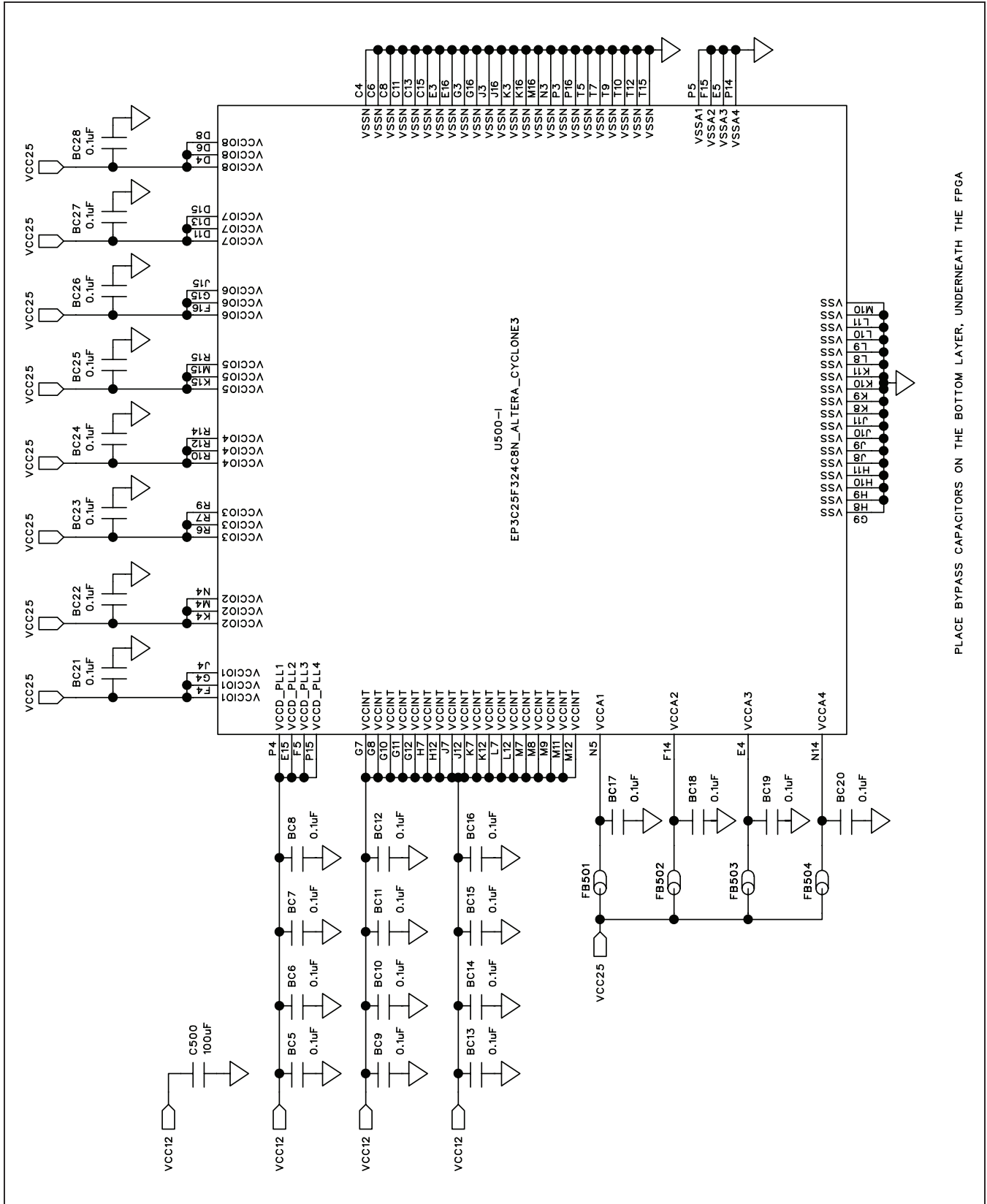


Figure 9h. MAX9265 EV Kit Schematic (Sheet 8 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

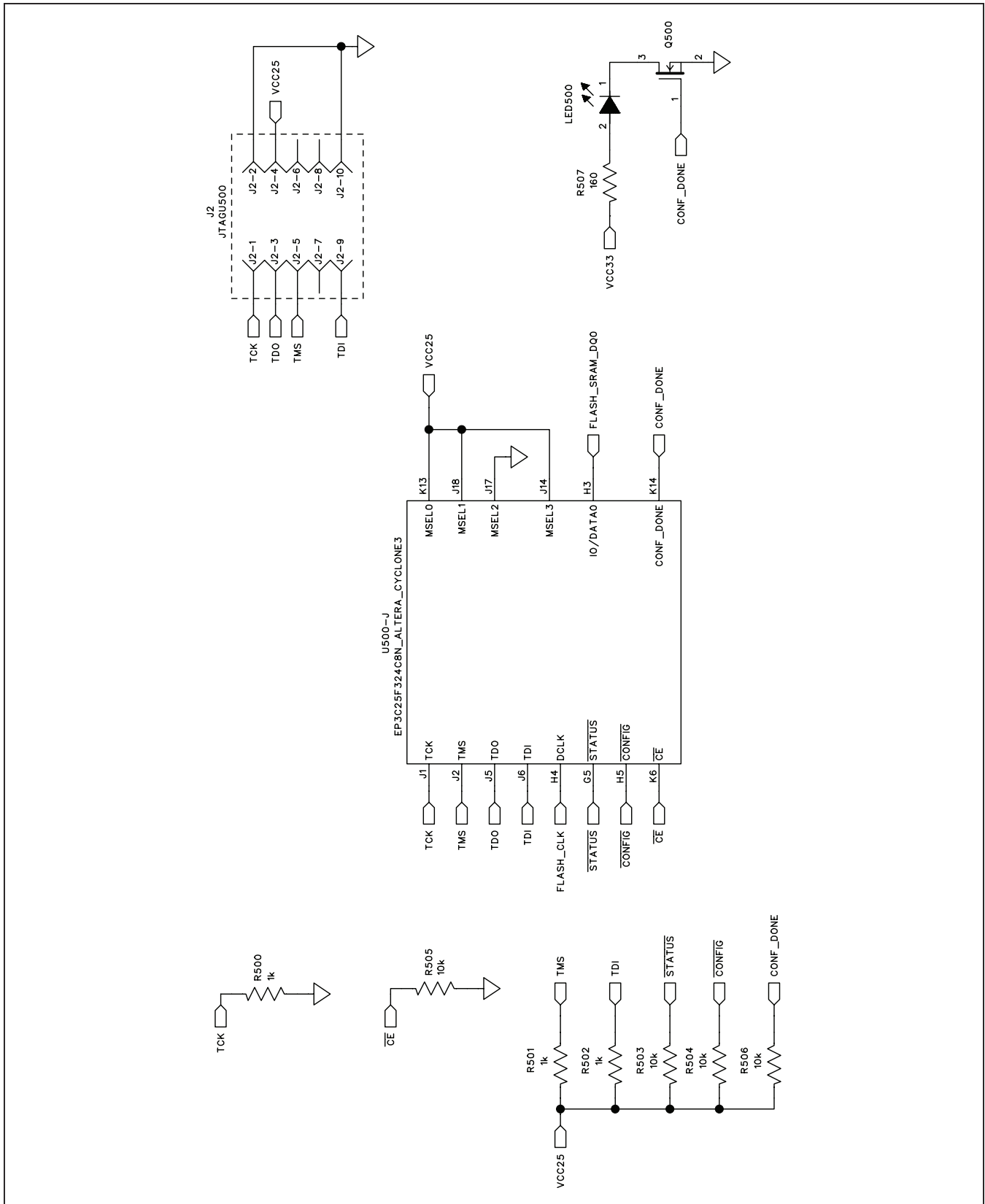


Figure 9i. MAX9265 EV Kit Schematic (Sheet 9 of 11)



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

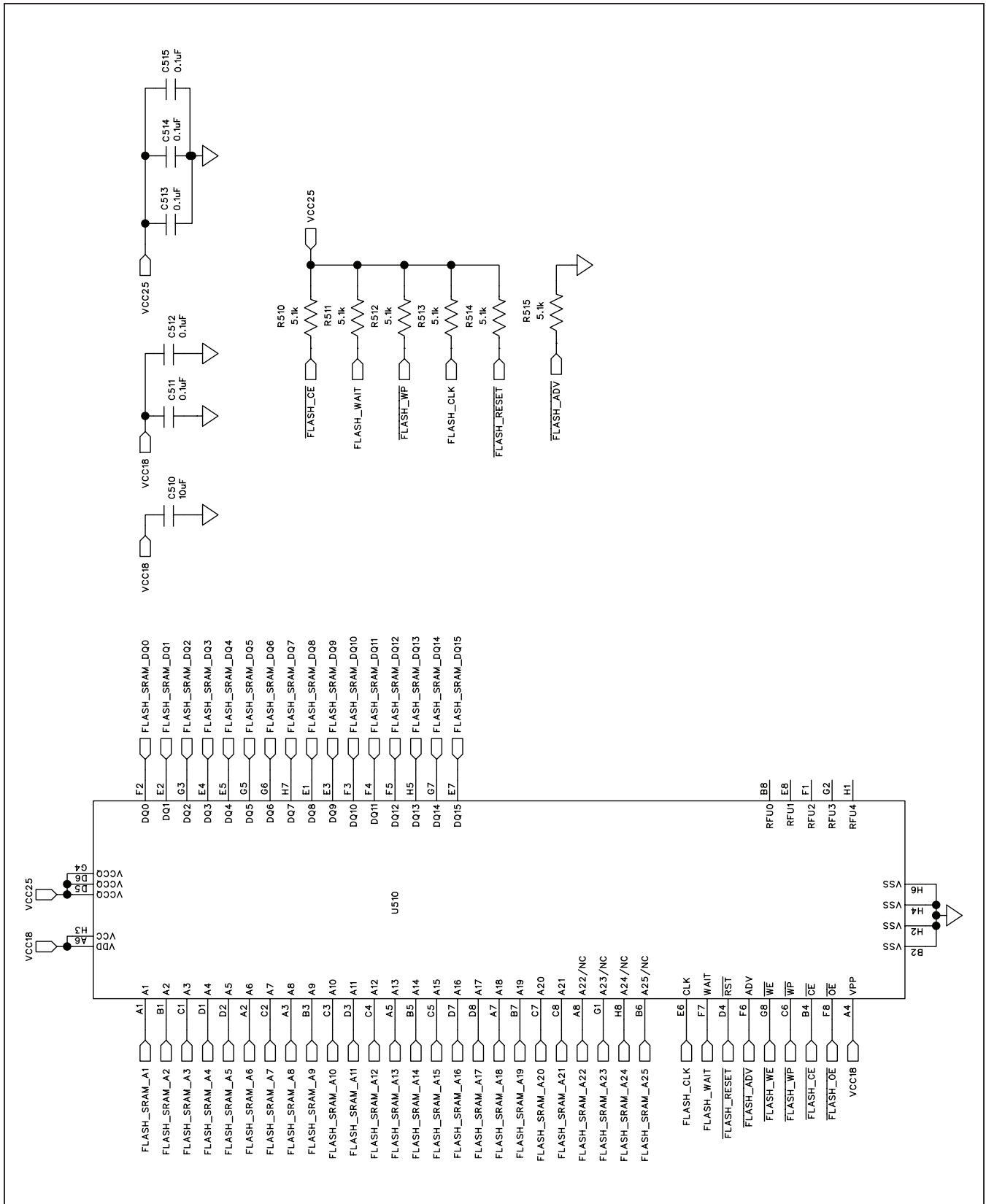


Figure 9j. MAX9265 EV Kit Schematic (Sheet 10 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

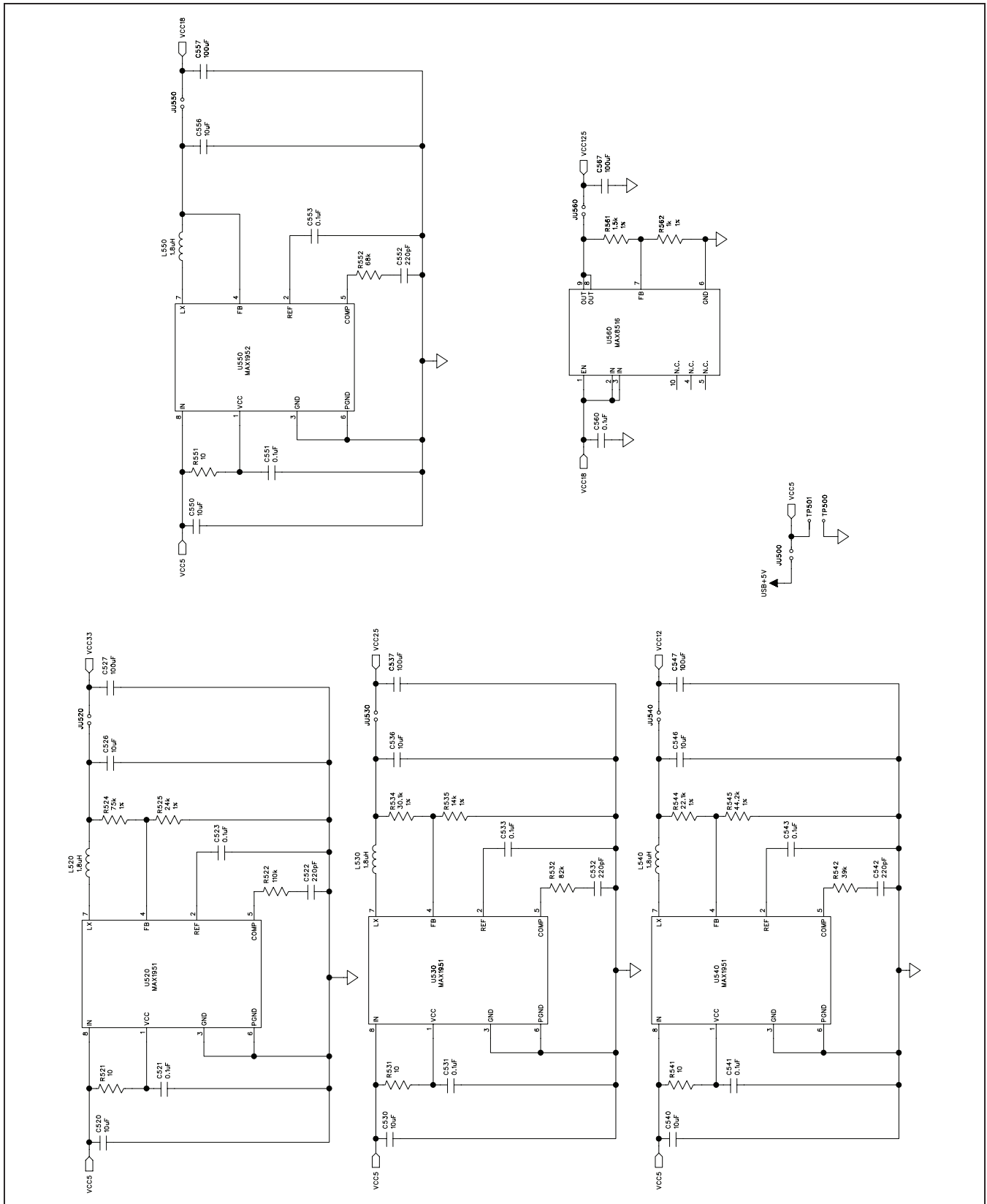


Figure 9k. MAX9265 EV Kit Schematic (Sheet 11 of 11)

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

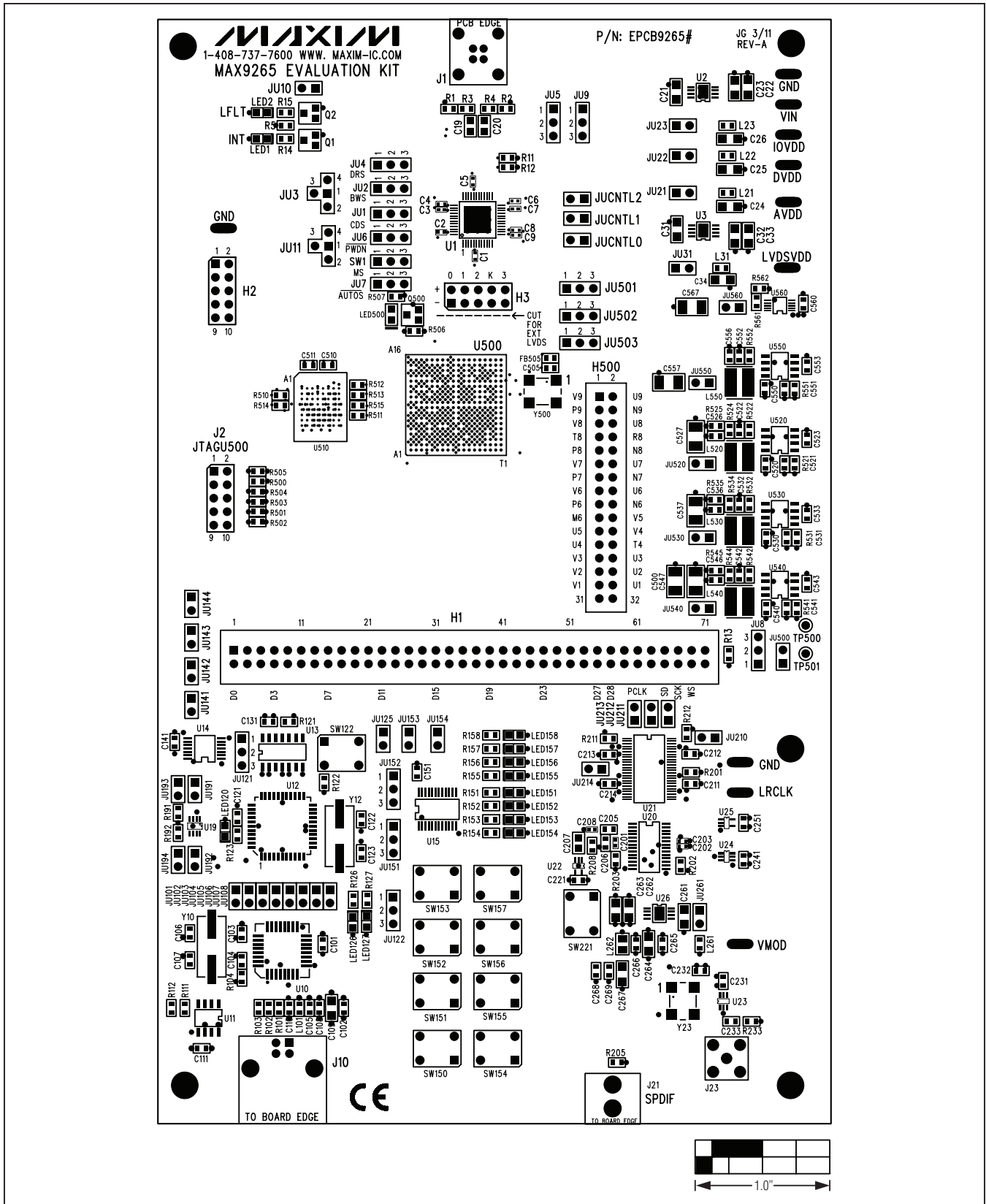


Figure 10. MAX9265 EV Kit Component Placement Guide—Component Side



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

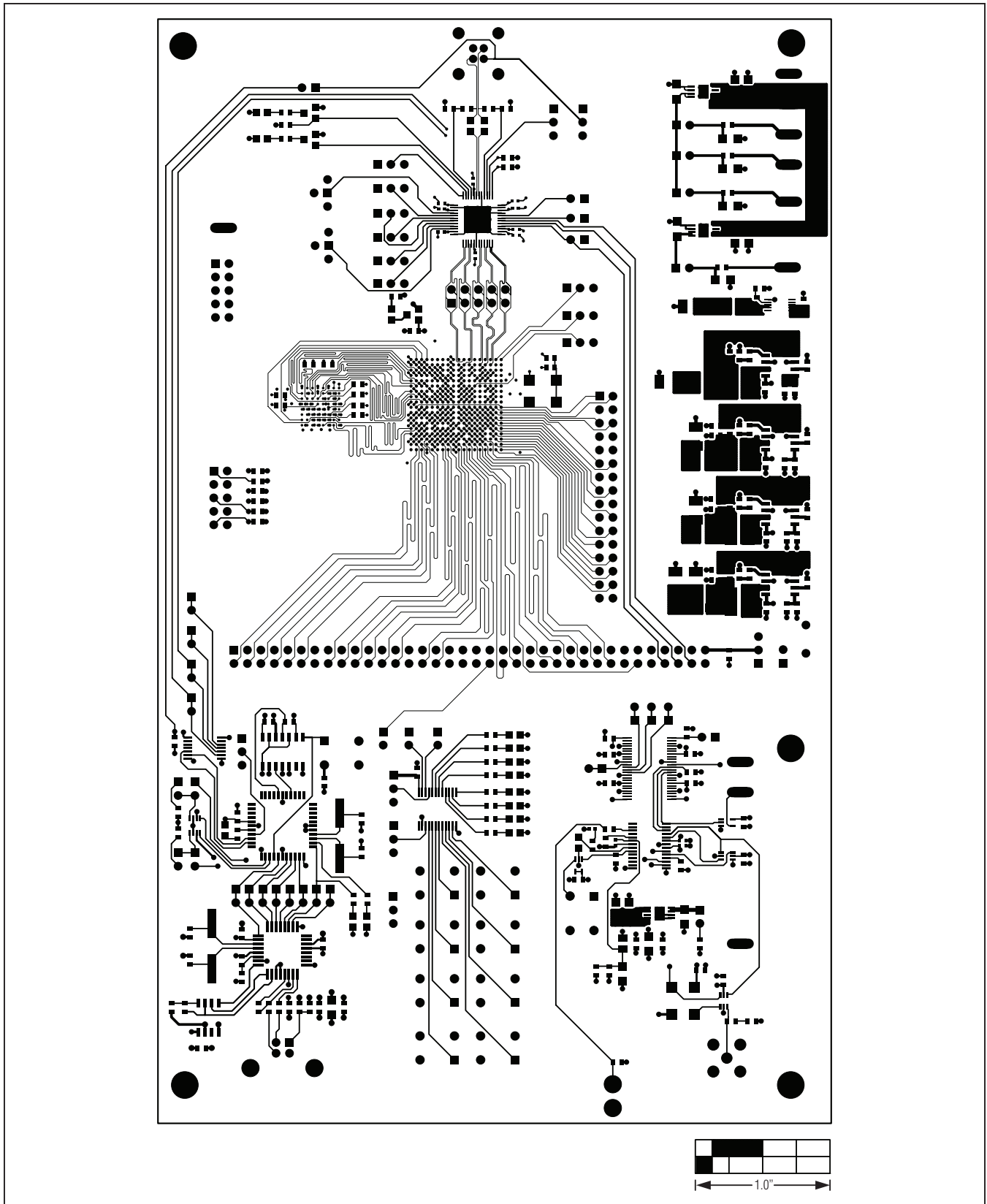


Figure 12. MAX9265 EV Kit PCB Layout—Component Side

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

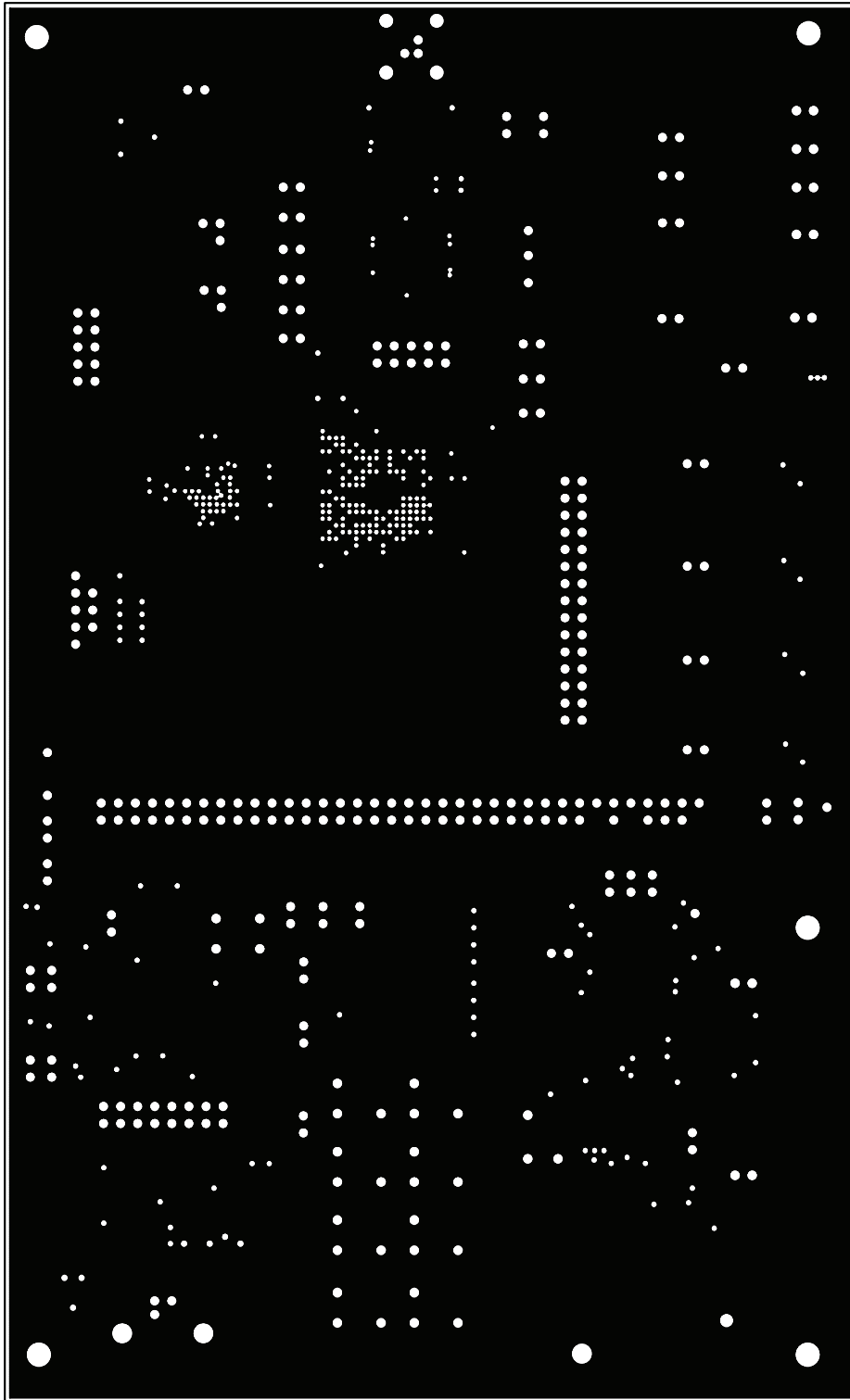


Figure 13. MAX9265 EV Kit PCB Layout—Ground Layer 2



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

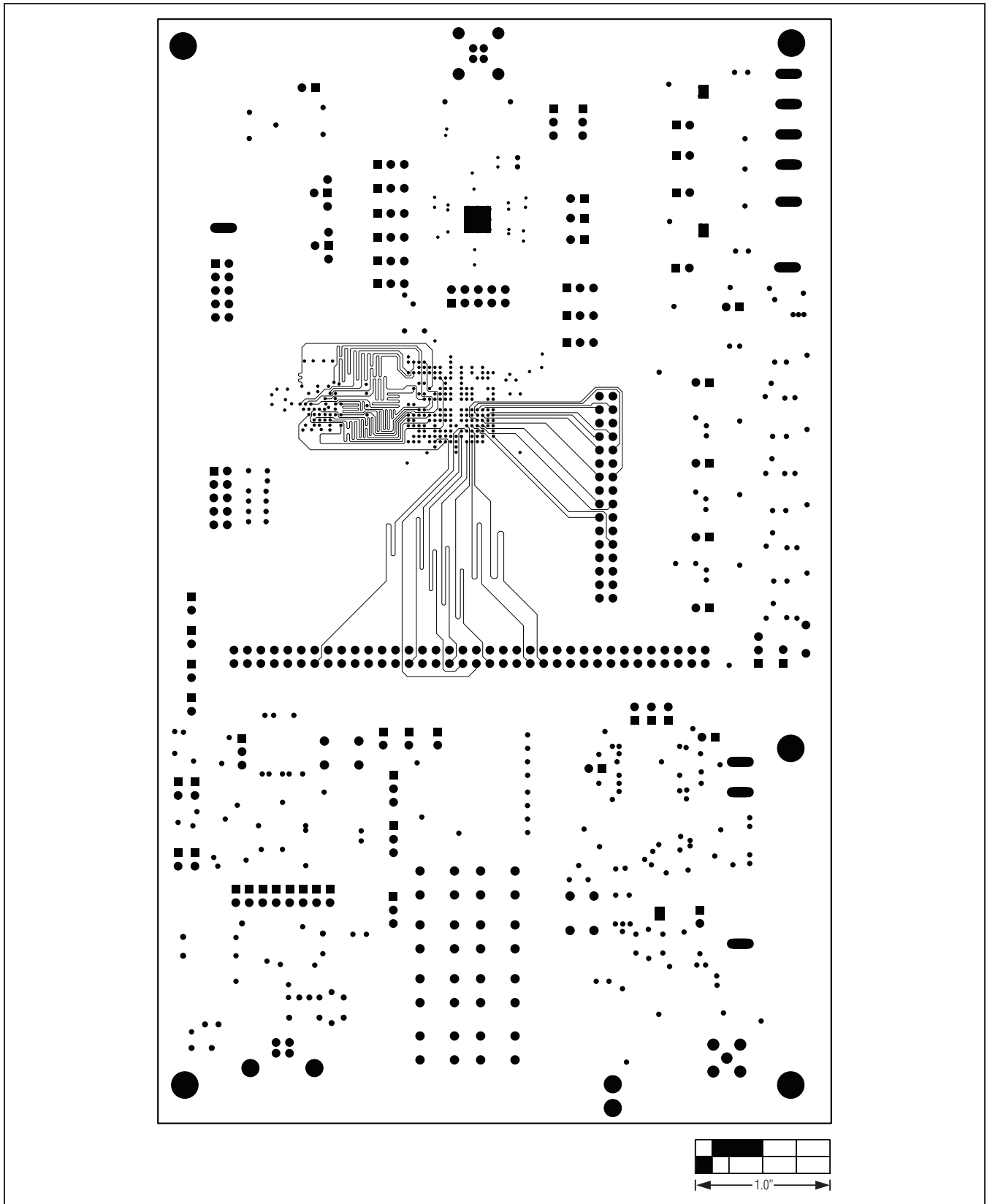


Figure 14. MAX9265 EV Kit PCB Layout—Power Layer 3

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

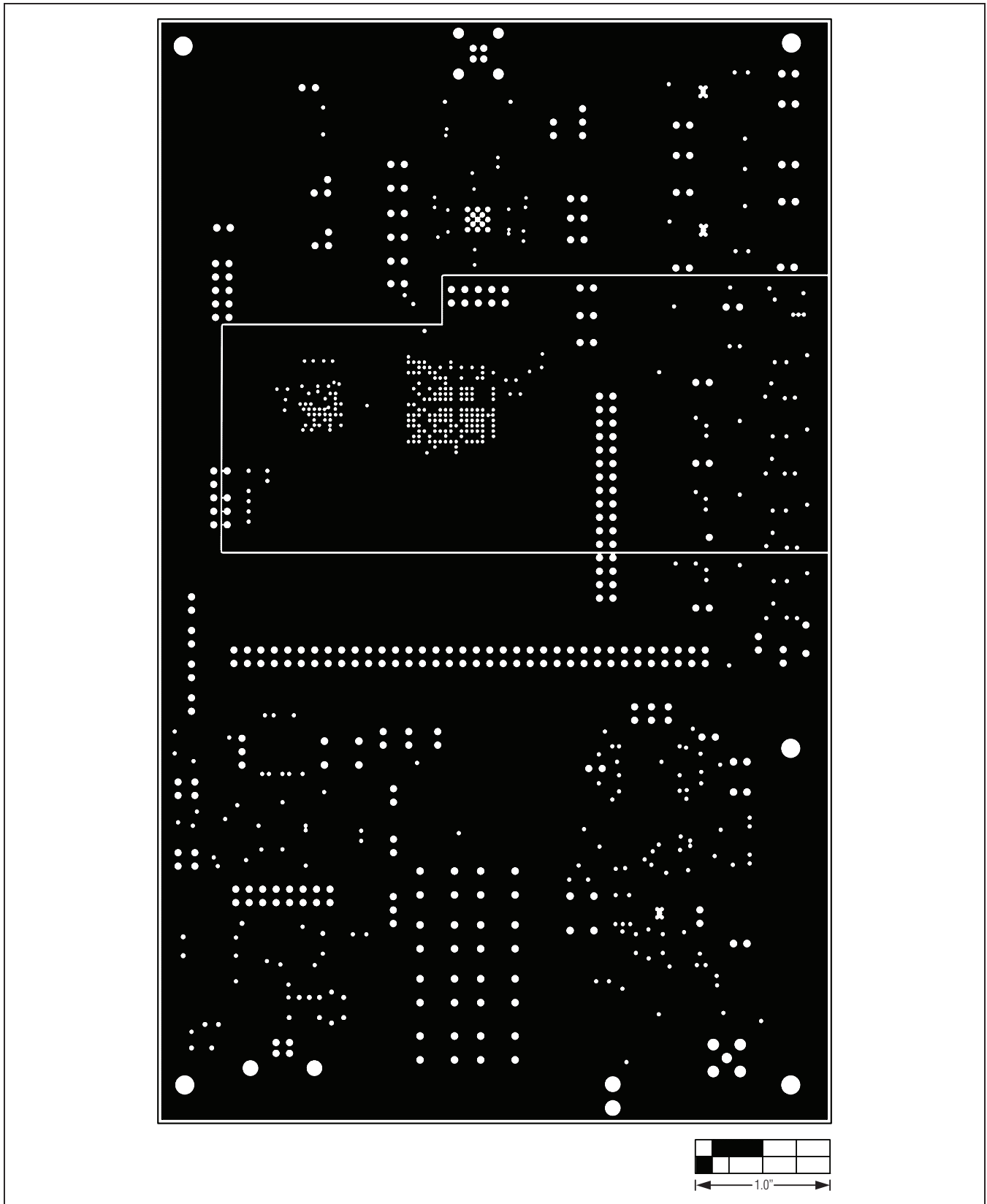


Figure 15. MAX9265 EV Kit PCB Layout—Ground Layer 4

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

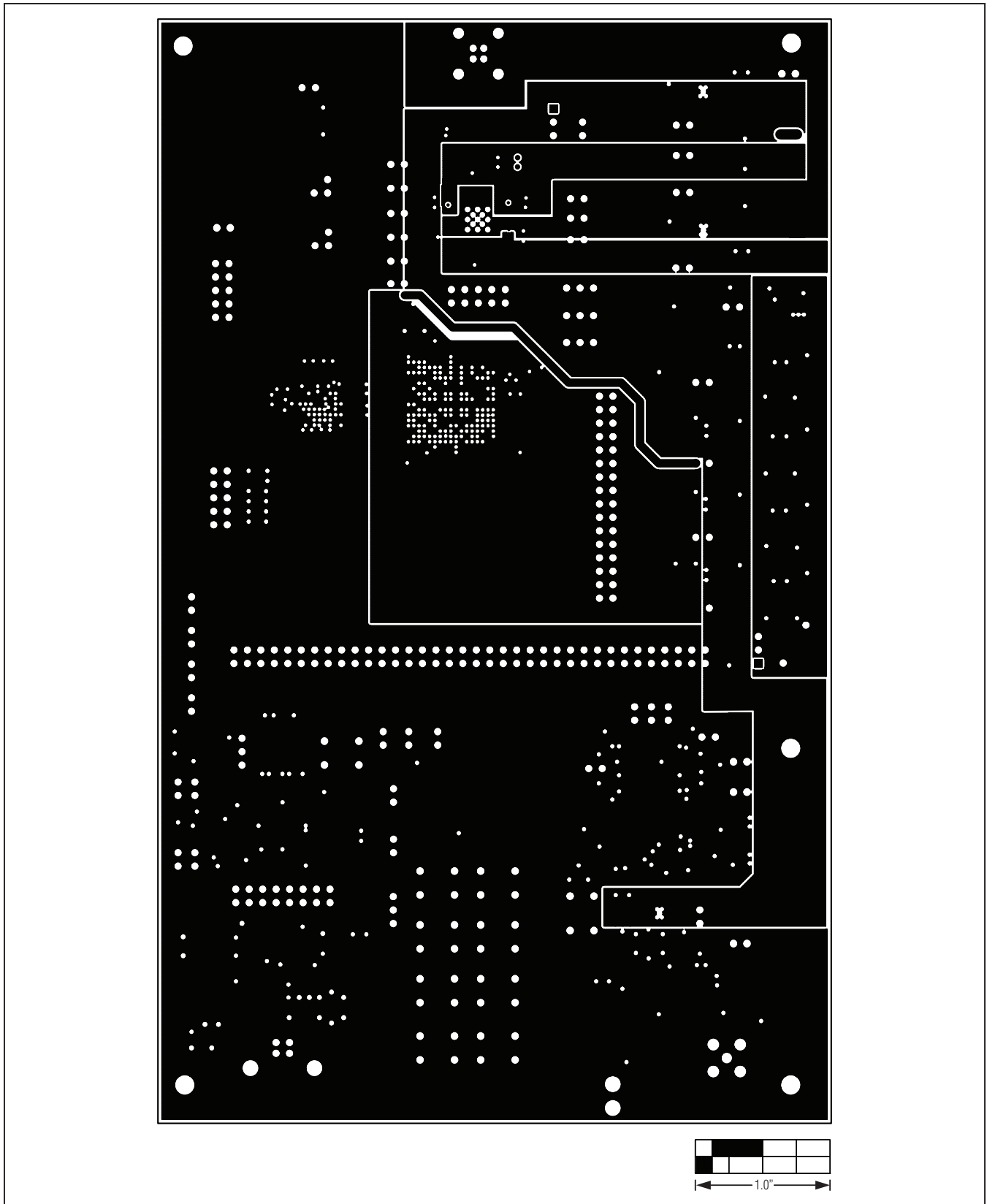


Figure 16. MAX9265 EV Kit PCB Layout—Power Layer 5

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

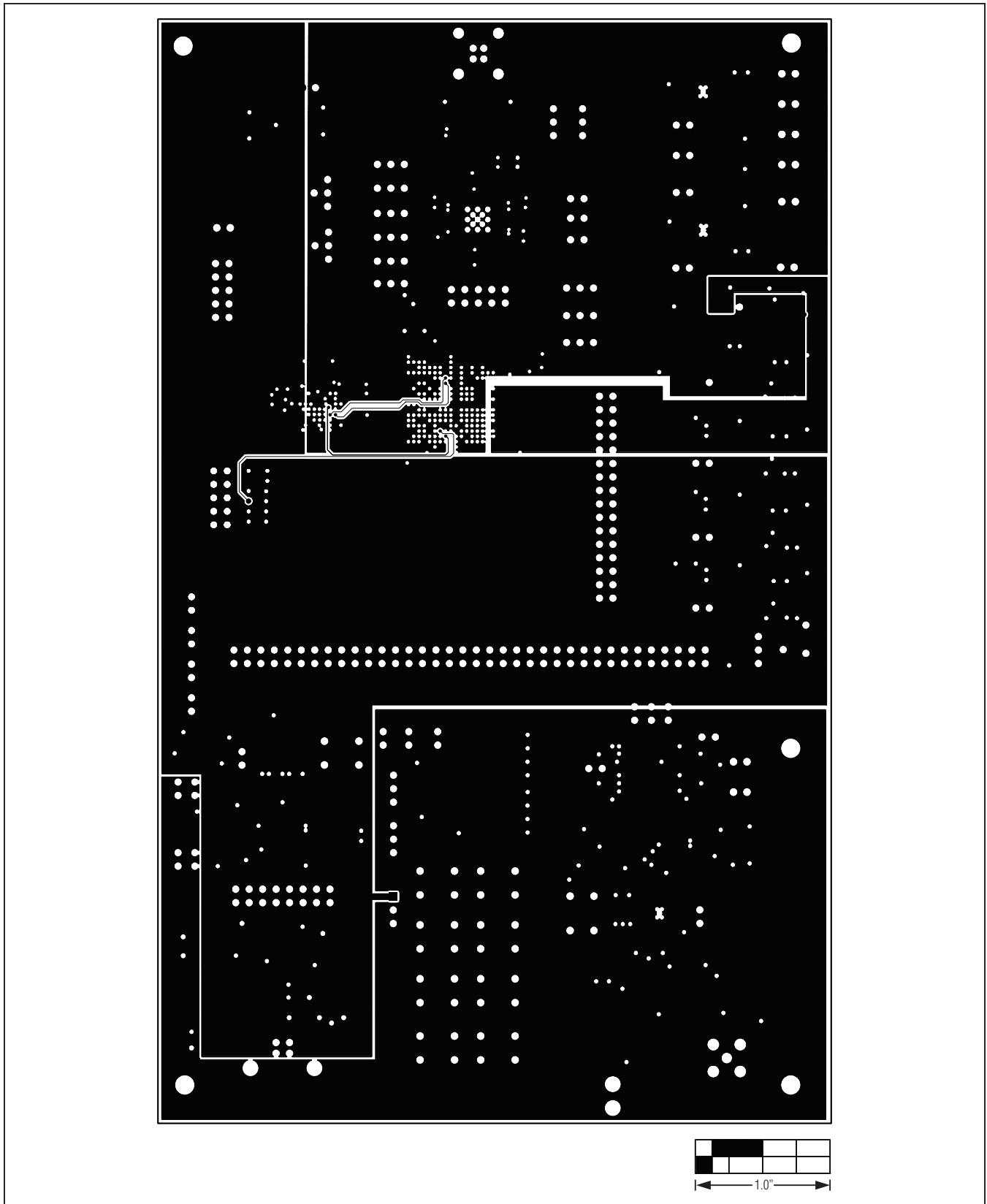


Figure 17. MAX9265 EV Kit PCB Layout—Power Layer 6

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

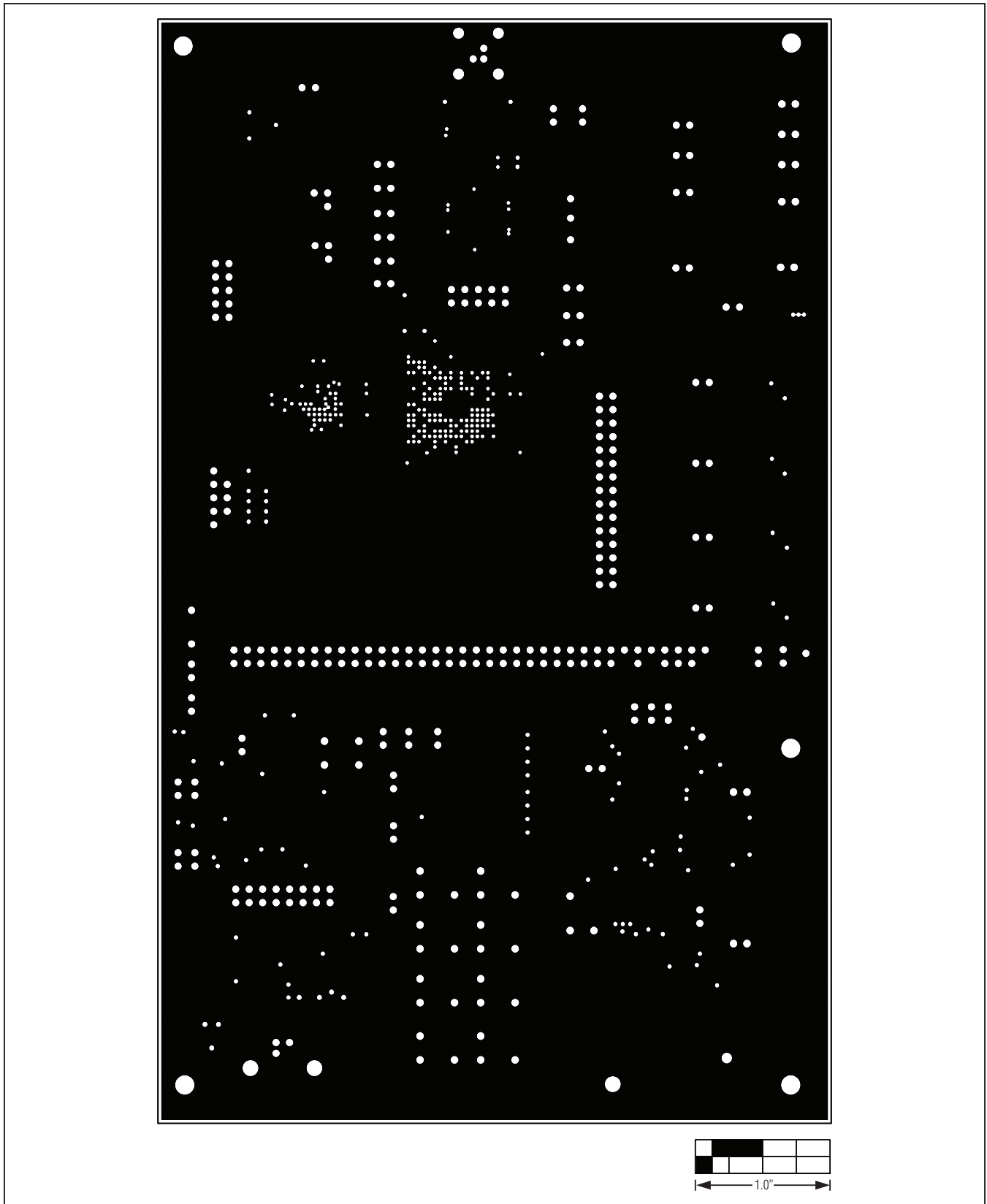


Figure 18. MAX9265 EV Kit PCB Layout—Ground Layer 7

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

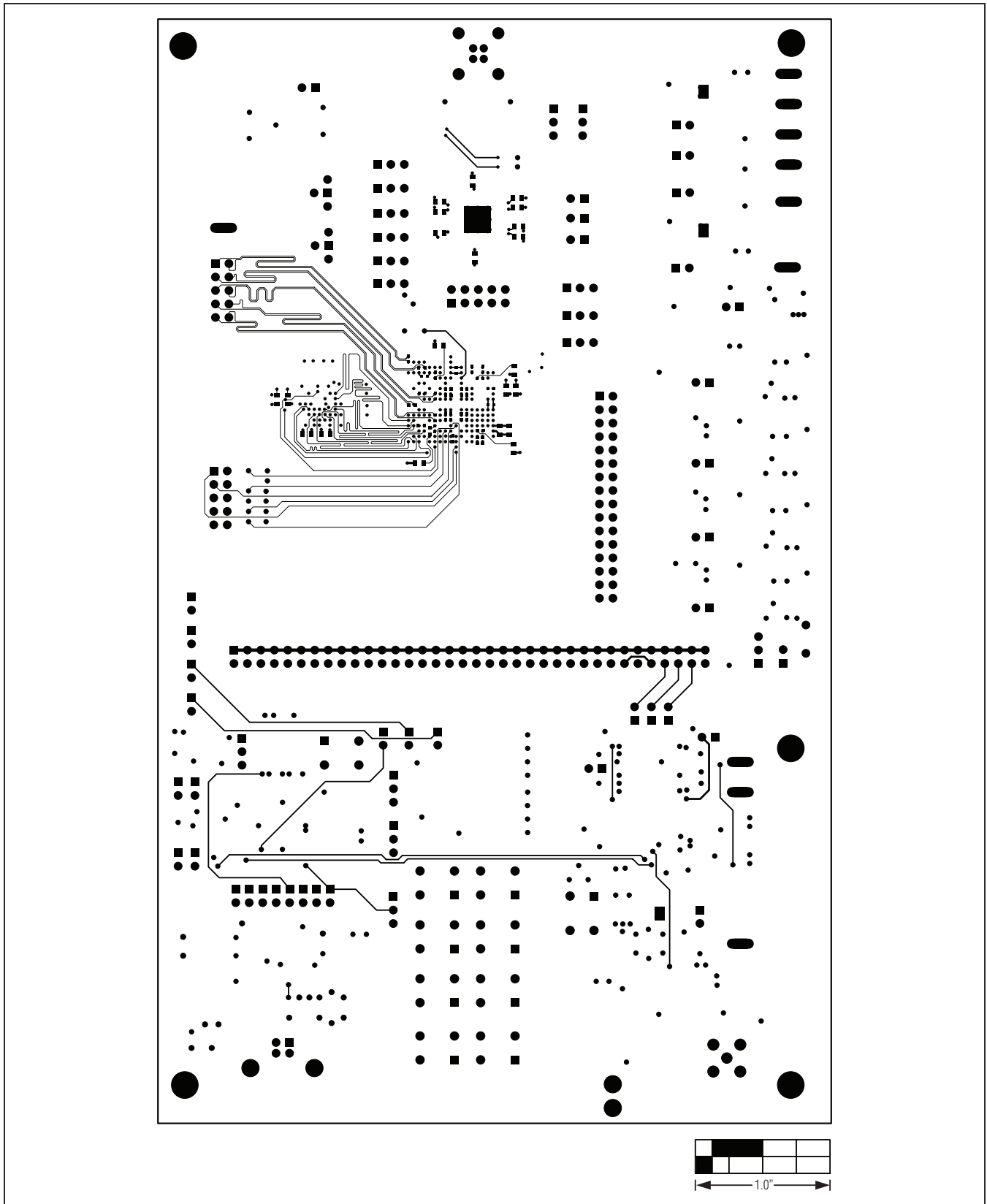


Figure 19. MAX9265 EV Kit PCB Layout—Solder Side



# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

### Ordering Information

PART	TYPE
MAX9265EVKIT#	EV Kit

#Denotes RoHS compliant.

**Note:** The MAX9265 EV kit should be ordered with its companion board, the MAX9264 EV kit.

# MAX9265 Evaluation Kit

## Evaluates: MAX9264/MAX9265

### Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/11	Initial release	—

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