

# MAXIM

## MAX3780 Evaluation Kit

**Evaluates: MAX3780**

### General Description

The MAX3780 evaluation kit (EV kit) is an assembled demonstration board that provides easy evaluation of the MAX3780 quad 2.5Gbps cable transceiver. The MAX3780 EV kit requires only a single +3.3V supply and includes an LED to indicate the lock status of the MAX3780 PLLs.

### Features

- ◆ Fully Assembled and Tested
- ◆ +3.3V Operation
- ◆ Allows Easy Testing of Thermal Performance
- ◆ Easy Selection of Operating Modes

### Component Suppliers

SUPPLIER	PHONE	FAX
AVX	803-946-0690	803-626-3123
Coilcraft	847-639-6400	847-639-1469

### Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX3780EVKIT	0°C to +70°C	100 TQFP-EP*

\*EP = exposed pad.

### Component List

DESIGNATION	QTY	DESCRIPTION
C1–C21, C26–C28, C31, C32, C34–C49, C68, C69, C73, C79–C90	57	0.1μF ±10%, 10V (min) ceramic capacitors 0402
C22	1	22pF ±5%, 10V (min) ceramic capacitor (0402)
C23	1	0.1μF ±10%, 10V (min) ceramic capacitor (0603)
C24, C70, C74	3	1.0μF ±10%, 10V (min) ceramic capacitors (0805)
C29	1	33μF ±10%, 4V (min) tantalum capacitor
C30	1	2.2μF ±10%, 10V (min) ceramic capacitor (0805)
D1	1	Green LED T-1 package
J1–J38	38	SMB connectors, PC mount Digi-Key J467-ND
J44–J48, J51–J61	16	SMA connectors, side-mount tabs Digi-Key J502-ND
JU1, JU2, JU4, JU6, JU7	5	3-pin headers, 0.1in centers

DESIGNATION	QTY	DESCRIPTION
JU1–JU4, JU6, JU7	6	Shunts
JU3	1	2-pin header, 0.1 in center
L1, L3, L4	3	56nH inductors Coilcraft 0805CS-XKBC
R1	1	383Ω ±1% resistor (0402)
R2, R23, R25	3	0Ω ±5% resistors (0402)
R4, R6, R13	3	10.0kΩ ±1% resistors (0402)
R5, R7	2	4.99kΩ ±1% resistors (0402)
R8, R9	2	49.9Ω ±1% resistors (0402)
R14–R22	0	Open
TP2	0	Open
U1	1	MAX3780CCQ 100-pin TQFP-EP
U2	1	Inverter Digi-Key 296-1106-1 or Texas Instruments SN74AHCT04PWR
VCC, GND, TP1, TP3	4	Test points
None	1	MAX3780 EV kit circuit board, rev B
None	1	MAX3780 EV kit data sheet
None	1	MAX3780 data sheet

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## Quick Start

- 1) Apply +3.3V to the V<sub>CC</sub> pin (J49). Connect the power-supply ground to the GND pin (J50).
- 2) Disable system loopback by shorting the V<sub>CC</sub> side of the LOOPEN jumper.
- 3) Set LVDS outputs for normal operation by shorting the V<sub>CC</sub> side of TRIEN.
- 4) Apply 2.5Gbps data to the RX4<sub>±</sub> inputs. If possible, apply 2.5Gbps data to all RX1<sub>±</sub> to RX4<sub>±</sub> inputs.
- 5) Apply a 125MHz reference clock to the REFCLK<sub>±</sub> inputs.
- 6) Apply 1.25Gbps LVDS data to the TDAT1<sub>±</sub> and TDAT2<sub>±</sub> inputs.
- 7) Apply a 625MHz input clock to the TCLK<sub>±</sub> inputs. The phase drift between TCLK and REFCLK must be < 800ps after reset. For more information, refer to the MAX3780 data sheet.
- 8) Briefly short the GND side of the RESET jumper. Move the short to the V<sub>CC</sub> side.
- 9) The LOCK LED should light, indicating that the transmitter and receiver are in lock.
- 10) The demultiplexed data from RX4<sub>±</sub> should be present at the RDAT7<sub>±</sub> and RDAT8<sub>±</sub> outputs, with the recovered 625MHz clock at the RCLK<sub>±</sub> outputs.
- 11) The data applied at the TDAT1<sub>±</sub> and TDAT2<sub>±</sub> inputs should be multiplexed and present at the TX1<sub>±</sub> outputs.

## Detailed Description

### Interfacing to CML Inputs and Outputs

All CML inputs (RX1–RX4<sub>±</sub>) and outputs (TX1–TX4<sub>±</sub>) on the MAX3780 are AC-coupled and terminated to simplify connections. Differential input data with between 200mV<sub>P-P</sub> and 800mV<sub>P-P</sub> (100mV<sub>P-P</sub> and 400mV<sub>P-P</sub> as measured single ended) amplitude should be applied to the CML inputs. The CML outputs are AC-coupled, allowing direct connection to 50Ω oscilloscopes.

### Interfacing to LVDS Inputs and Outputs

The LVDS outputs (RDAT1–RDAT8<sub>±</sub> and RCLK<sub>±</sub>) are AC-coupled to allow direct interfacing to 50Ω oscilloscopes. The LVDS inputs (TDAT1–TDAT8<sub>±</sub> and TCLK<sub>±</sub>) are DC-coupled. For these inputs to function properly, provide the proper AC and DC voltages. The LVDS inputs require DC biasing and therefore cannot be AC-coupled. For this reason, if the LVDS outputs are to be externally looped back to the LVDS inputs, the AC-coupling capacitors on the EV board (C2–C9 and C11–C20) must be replaced with 0Ω shorts.

### Interfacing to PECL Inputs and Outputs

The REFCLK<sub>±</sub> inputs of the MAX3780 use PECL logic. To simplify interfacing with test equipment, the evaluation board includes terminations of 50Ω to ground on each input, as well as DC-biasing resistors. The REFCLK inputs should be driven with a differential signal with amplitude between 620mV<sub>P-P</sub> and 1860mV<sub>P-P</sub>.

### Terminating Unused Outputs

If one side of a differential signal is being observed on a 50Ω oscilloscope, balance the circuit by similarly terminating the other output.

### Temperature Sensor

The MAX3780 has an integrated temperature sensor to indicate the die temperature. To independently power the temperature circuit, remove the jumper from JU3 and apply 3.3V to TP3. This allows calibration of the temperature sensor.

### Exposed-Pad Package

The exposed-pad (EP), 100-pin TQFP incorporates features that provide a low thermal resistance path for heat removal from the IC. The pad is electrical ground on the MAX3780 and must be soldered to the circuit board for proper thermal and electrical performance.

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**Table 1. Controls, Test Points, and LEDs**

NAME	TYPE	HEADER PIN	DESCRIPTION
$\overline{\text{TRIEN}}$ (JU1)	3-pin header	VCC	Short for normal operation.
		GND	Short to put LVDS outputs in high-impedance state.
$\overline{\text{LOOPEN}}$ (JU2)	3-pin header	VCC	Short for normal operation.
		GND	Short to enable loopback testing.
$\overline{\text{RESET}}$ (JU4)	3-pin header	VCC	Short for normal operation.
		GND	Momentarily short to reset FIFO and receiver components.
EQ2 (JU6)	3-pin header	MIN	Sets EQ2 = 1 for minimum compensation (refer to Table 1 in MAX3780 data sheet).
		MAX	Sets EQ2 = 0 for maximum compensation (refer to Table 1 in MAX3780 data sheet).
EQ1 (JU7)	3-pin header	MIN	Sets EQ1 = 1 for minimum compensation (refer to Table 1 in MAX3780 data sheet).
		MAX	Sets EQ1 = 0 for maximum compensation (refer to Table 1 in MAX3780 data sheet).
VCCTEMP ENABLE (JU3)	2-pin header	—	Short to connect VCCTEMP to rest of board supply network.
LOCK (D1)	LED	—	D1 lights to indicate that the transmitter and receiver PLLs of the MAX3780 are in lock.
TMPSENS (TP1)	Test point	—	When the TMPSENS circuit is powered, the voltage at TP1 is proportional to the die junction temperature.
PTPIN (TP2)	Test point	—	Reserved for Maxim use.
VCCTEMP (TP3)	Test point	—	With JU3 removed, the temperature-sensing circuit can be independently powered by applying +3.3V to TP3.

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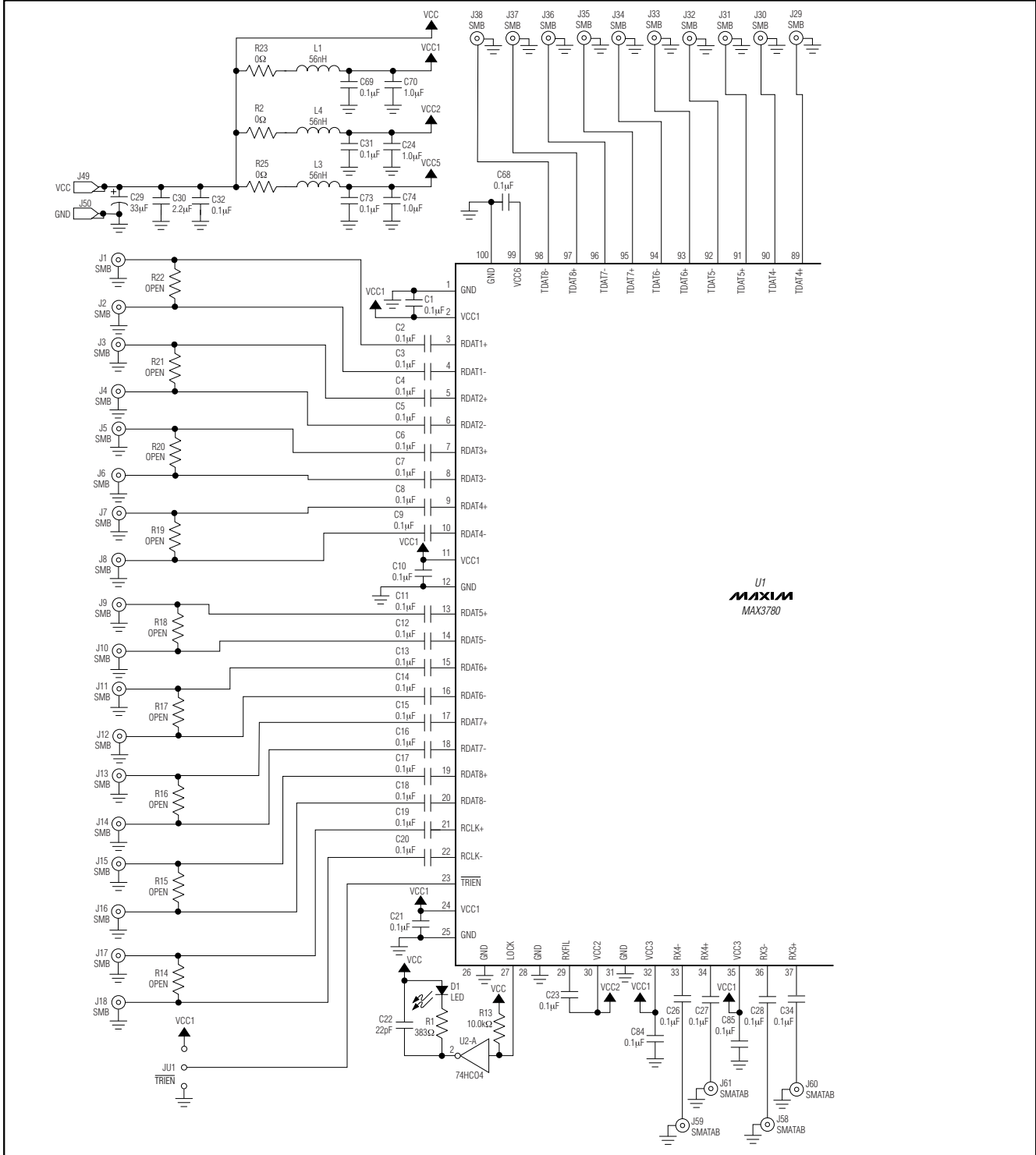


Figure 1. MAX3780 EV Kit Schematic (Sheet 1 of 2)

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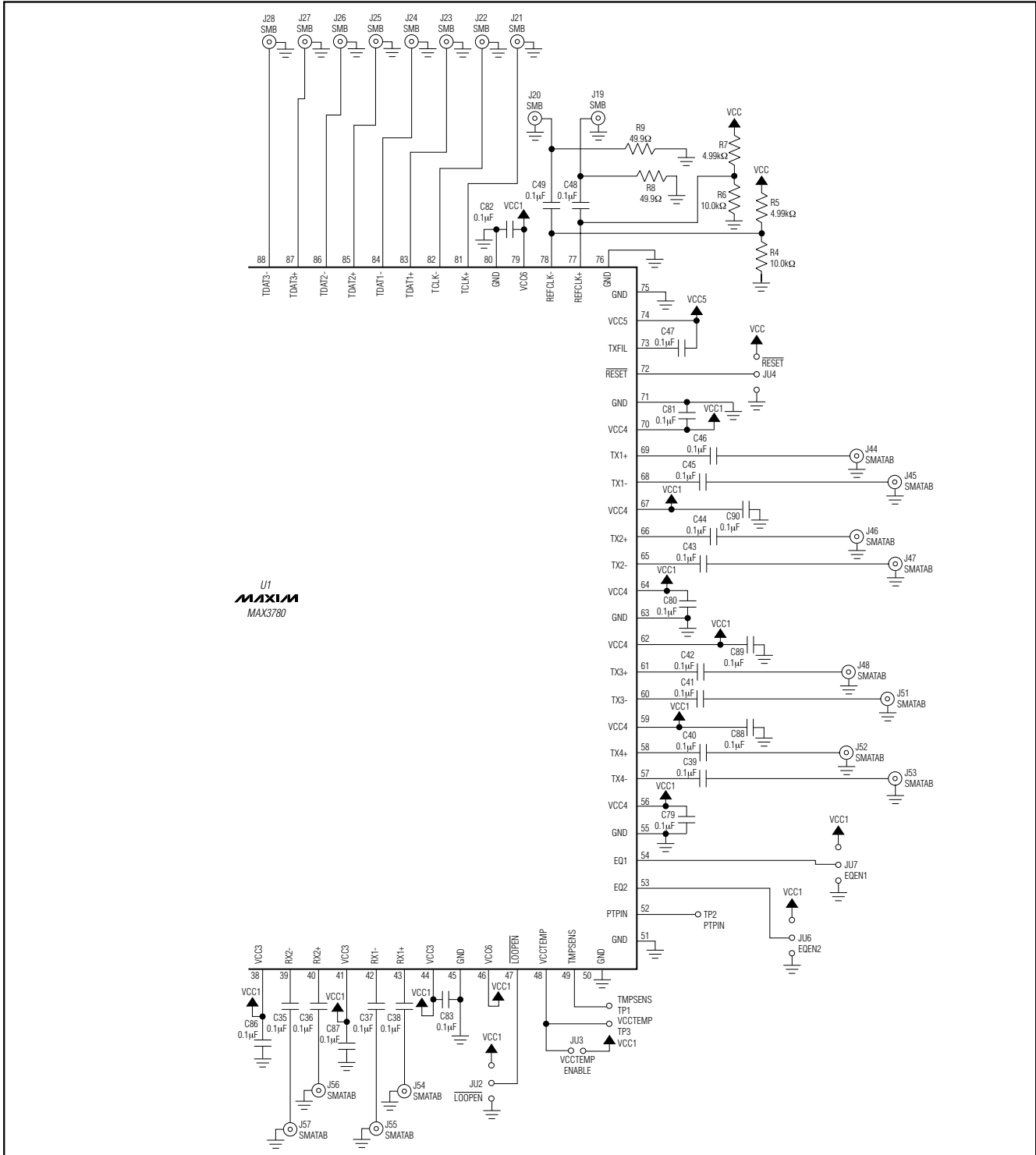


Figure 1. MAX3780 EV Kit Schematic (Sheet 2 of 2)

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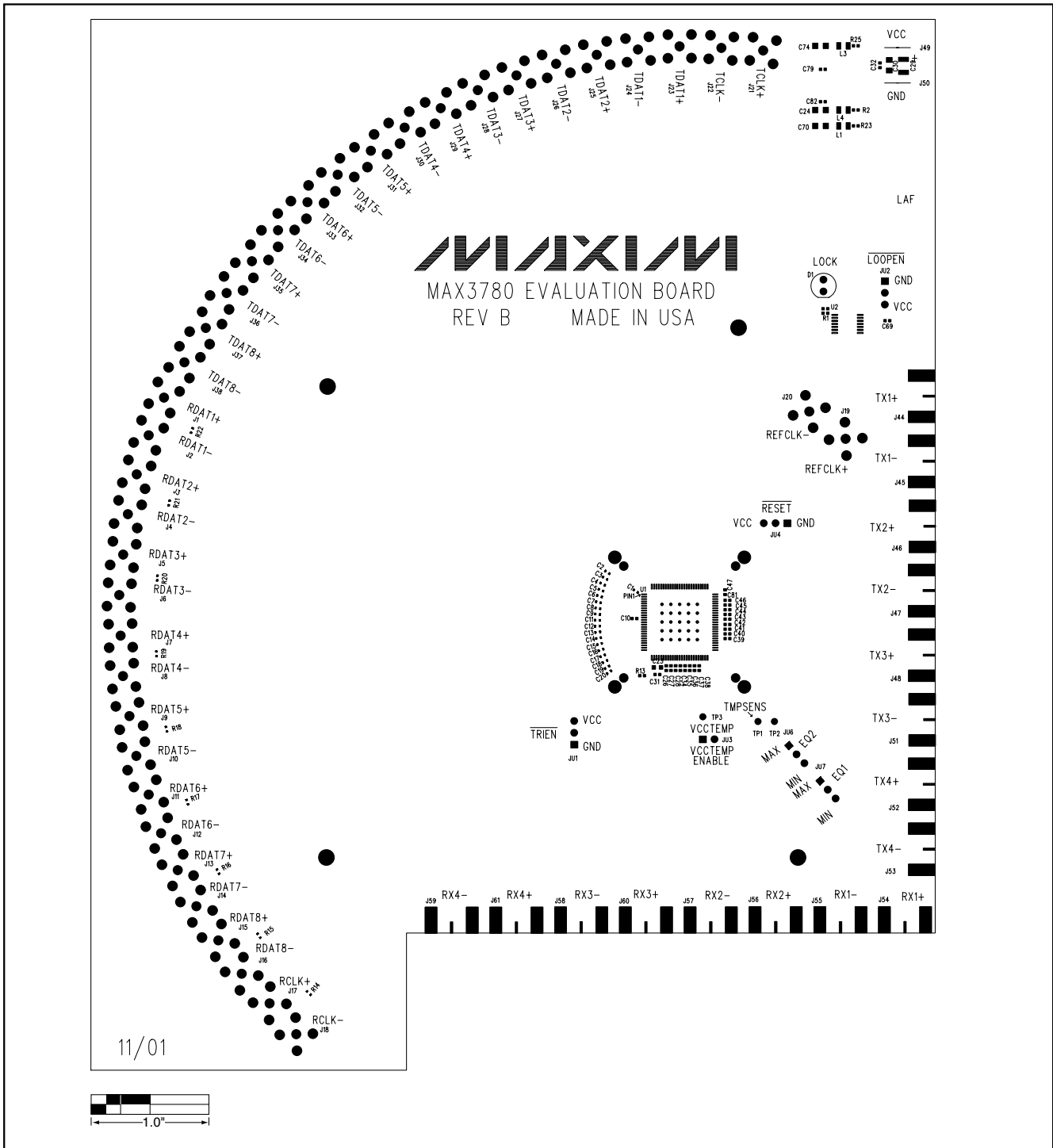


Figure 2. MAX3780 EV Kit Component Placement Guide—Component Side

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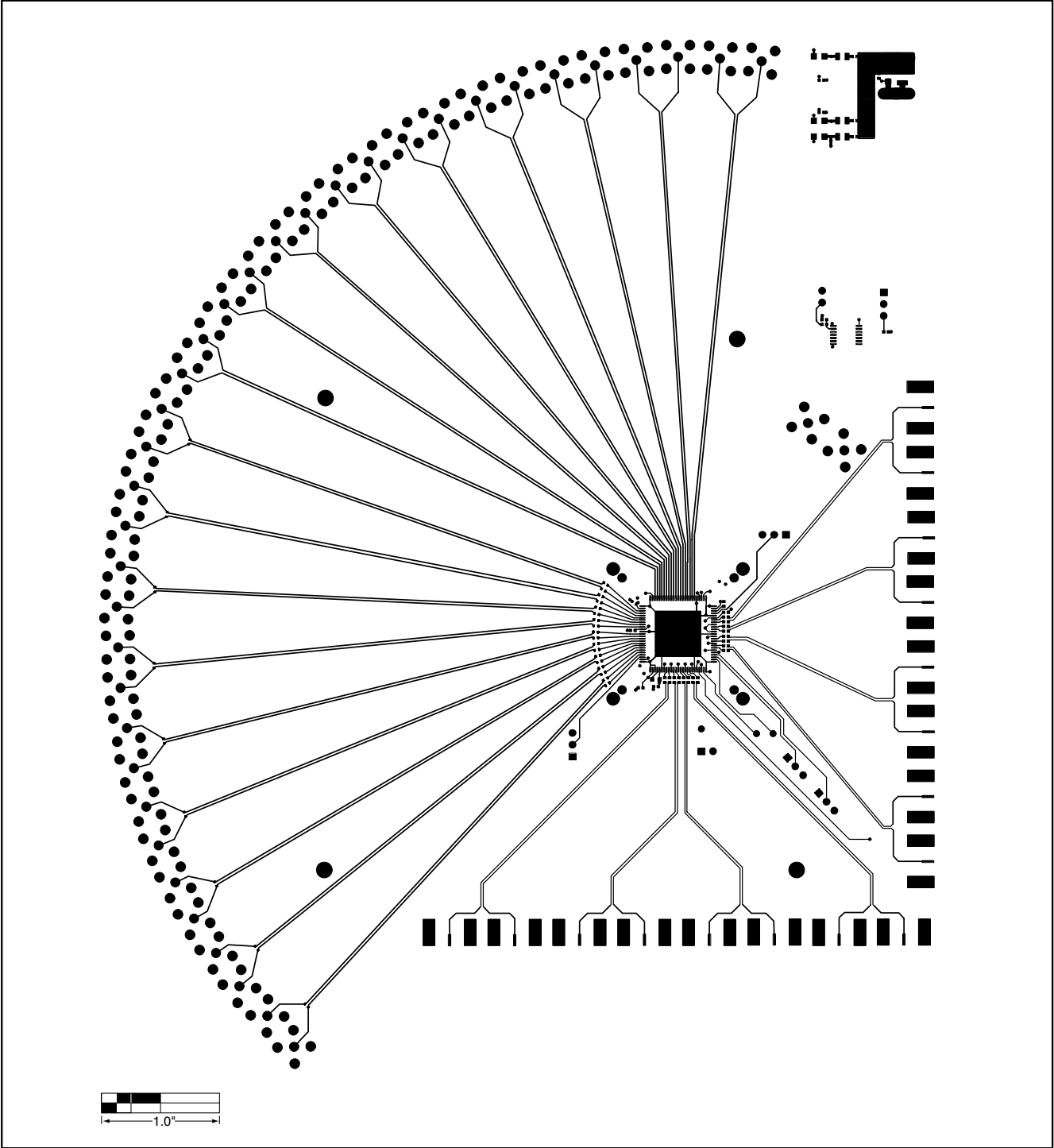


Figure 3. MAX3780 EV Kit PC Board Layout—Component Side

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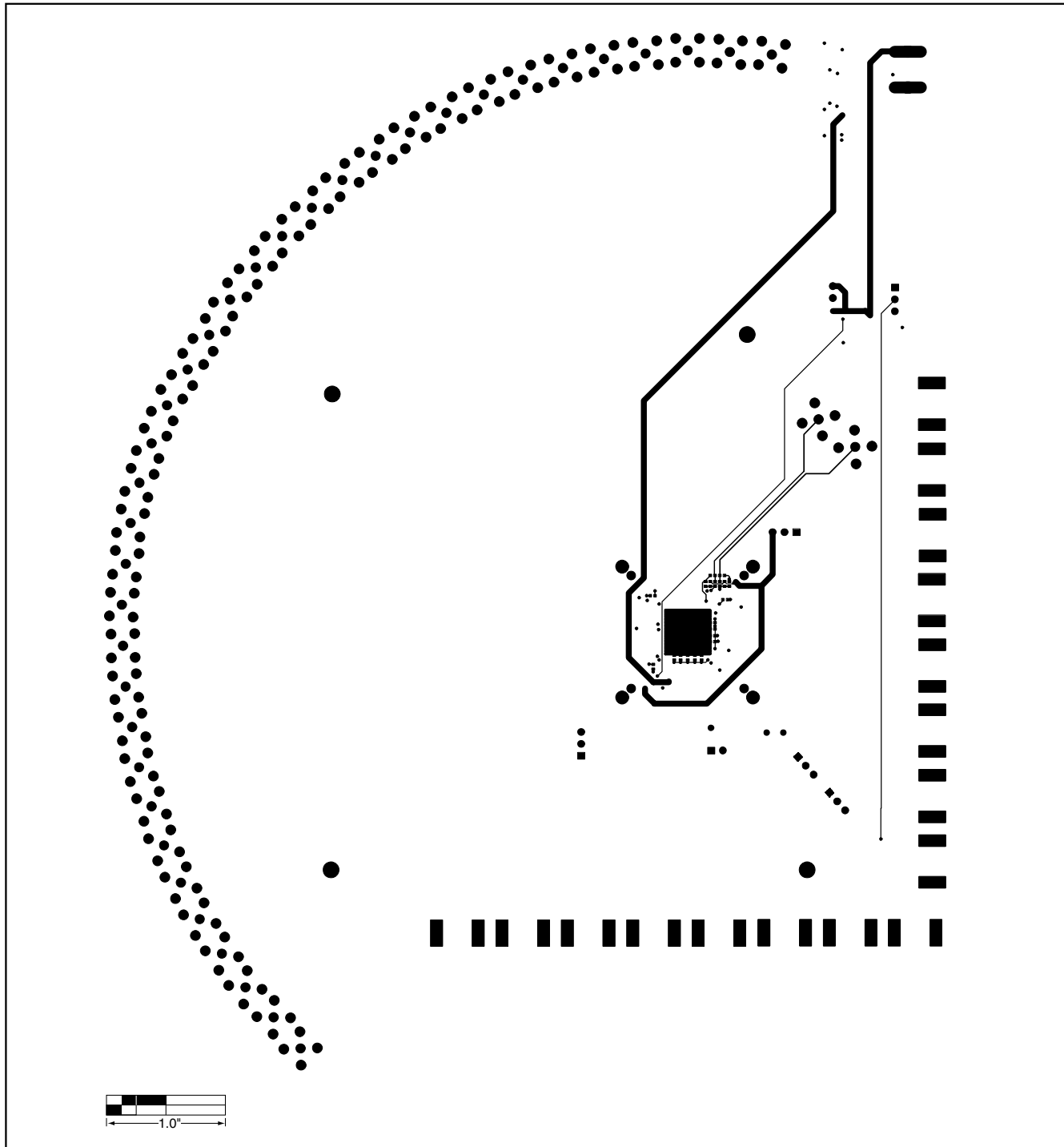


Figure 4. MAX3780 EV Kit PC Board Layout—Solder Side



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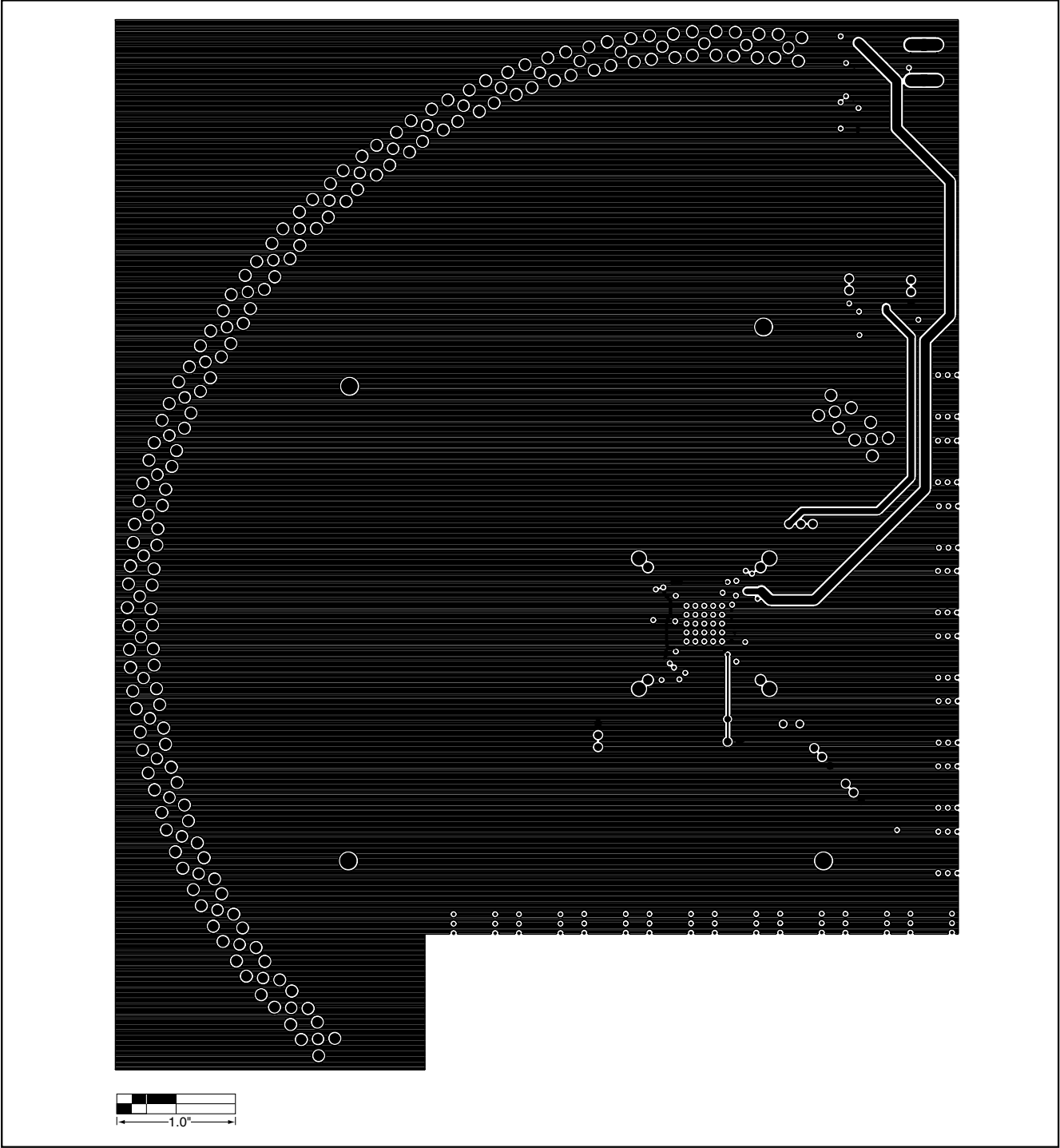


Figure 5. MAX3780 EV Kit PC Board Layout—Power Plane

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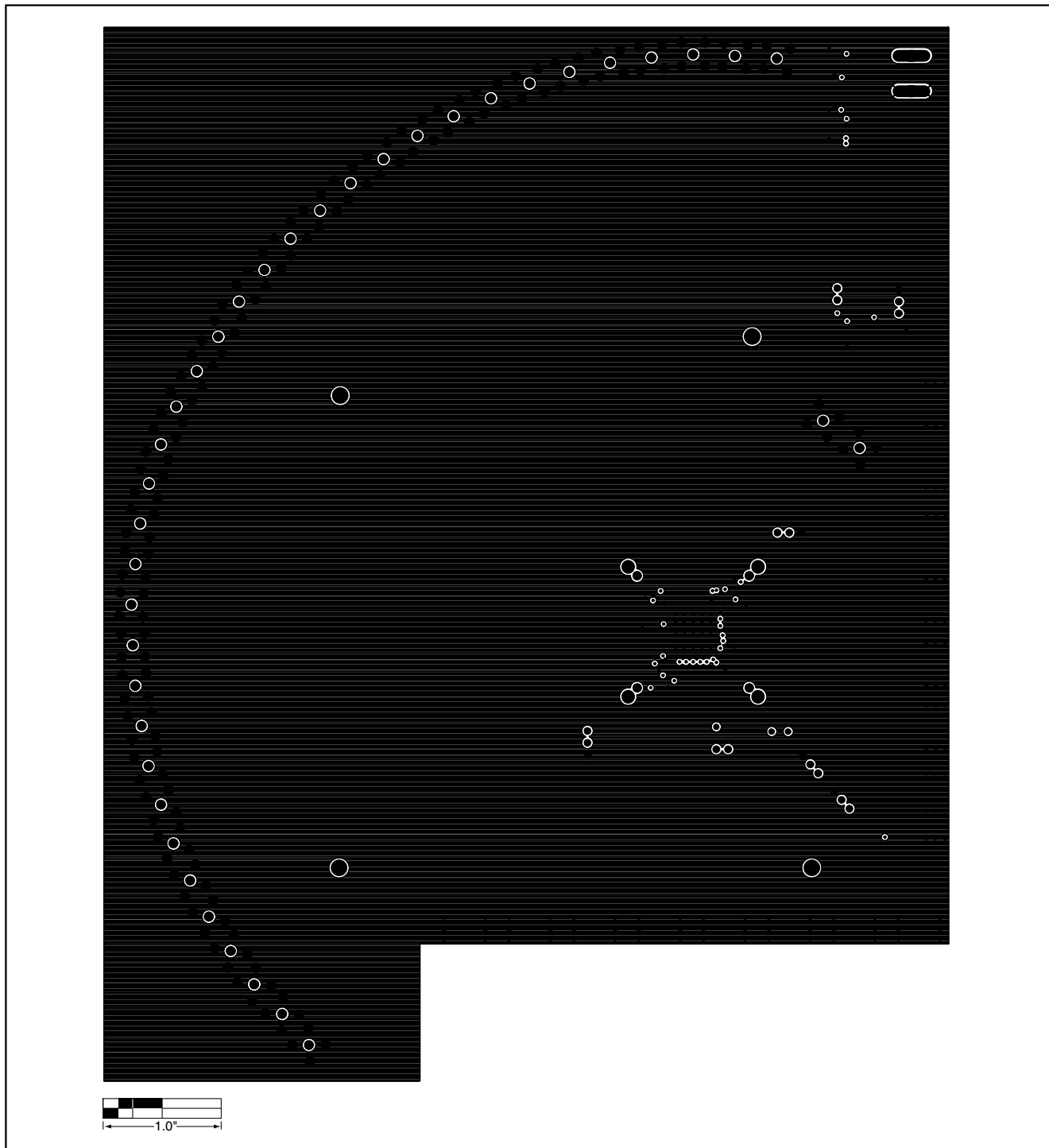


Figure 6. MAX3780 EV Kit PC Board Layout—Ground Plane

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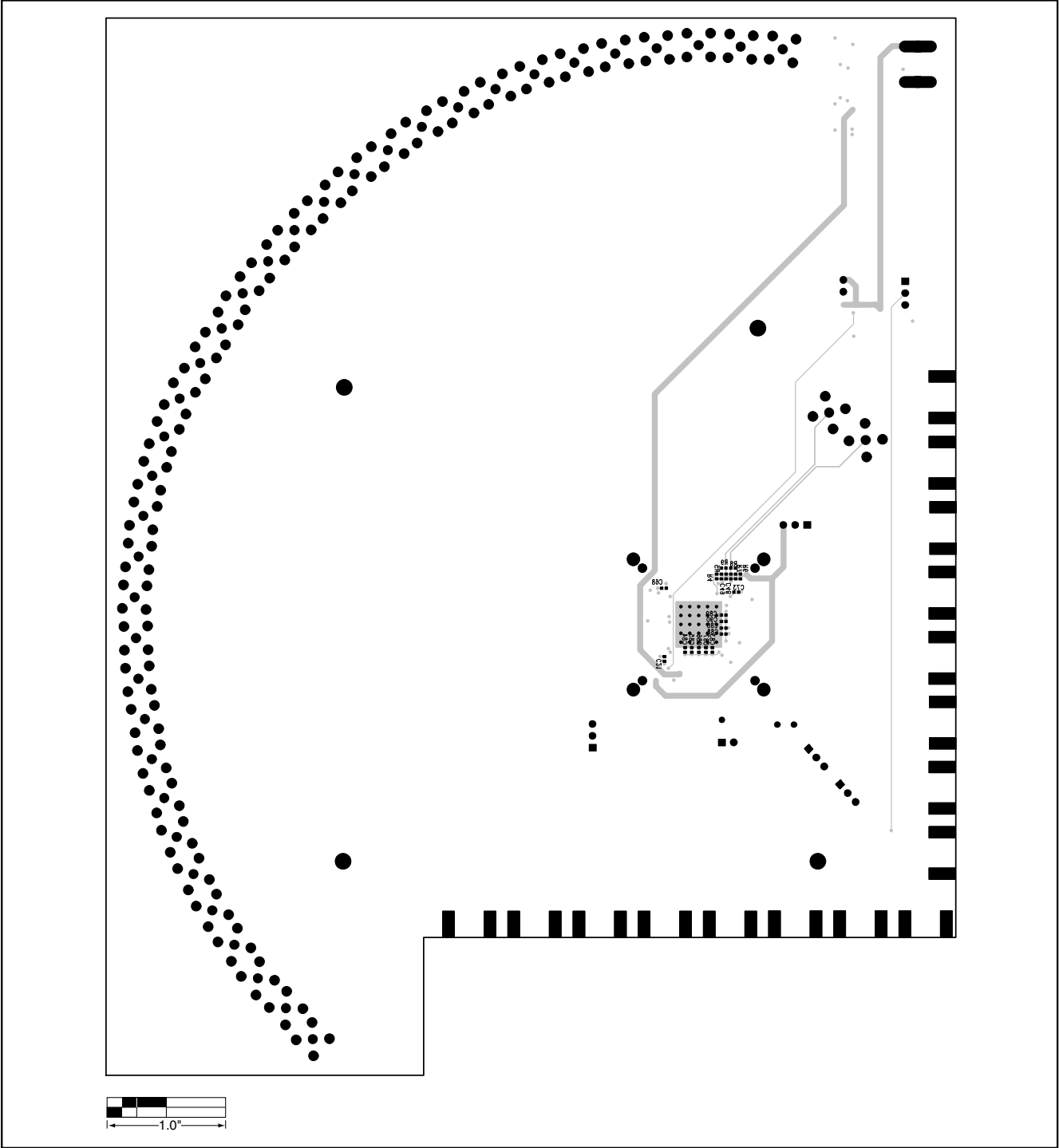


Figure 7. MAX3780 EV Kit Component Placement Guide—Solder Side

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