

## General Description

The MAX20745 Evaluation Kit (EV kit) serves as a reference platform for evaluating the MAX20745 voltage regulator IC. This single-chip, integrated switching regulator provides an extremely compact, low-cost, highly efficient, fast, accurate and reliable power delivery solution for emerging low-output voltage applications up to 25A. Refer to the MAX20745 IC data sheet for more information.

The EV kit consists of a fully assembled and tested PCB implementation of the MAX20745. Jumper pins, test points, and input/output connectors are included for flexibility and ease-of-use in a wide range of applications.

The evaluation board is configured with an “edge strip” to allow high di/dt loading when evaluating the system. The +V<sub>OUT</sub> connection is on the top side, while the return (or -V<sub>OUT</sub>) is on the bottom side, directly mirroring the top-side strip.

Either solder directly to the output “strip” or use the J8 terminal block to interface to a load.

## Features

- High Efficiency and Power Density
- Low Component Count
- Small Solution Size
  - 509mm<sup>2</sup> Including Inductor and Output Capacitors
- Optimized Performance
- Reduced Design-In Time
- Proven PCB Layout
- Fully Assembled and Tested

## Getting Started

### Required Equipment

- MAX20745 EV kit
- 4.5V to 16V power supply
- 0A to 25A Load
- Oscilloscope, probes, voltmeter

### Procedure

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

- 1) Connect a 4.5V to 16V input supply to J1.
  - Optionally, connect supply sense leads to V<sub>DD1</sub> and GND1 for best accuracy.
- 2) Connect the load to J3 or J8.
- 3) Connect the V<sub>OUT</sub> scope probe/voltmeter to J4 or J11, as desired.
  - J4 and J11 are connected to the sense point for best accuracy.
- 4) Position the SW1 toggle switch, pointing away from J1 to enable the MAX20745 (if desired).
- 5) Turn on the power supply set to 12V and observe that V<sub>OUT</sub> = 1V.
- 6) For efficiency measurements, J6 has appropriate Kelvin sense points.

**Ordering Information** appears at end of data sheet.

## Operation

The MAX20745 IC is a monolithic, high-frequency step-down switching regulator optimized for applications requiring small-size, high-efficiency, and low-output voltages. Detailed product and application information is provided in the MAX20745 IC data sheet.

### Output Enable (OE)

OE is used to enable/disable the output voltage. The output voltage is enabled/disabled by SW1. Pointing SW1 in the direction of the silkscreened arrow enables the regulator.

### Output-Voltage Selection

The EV kit is setup to initially boot up to an output voltage of 1V. This has been accomplished by setting the reference to come up to a  $V_{BOOT}$  of 0.65V and placing a voltage-divider in the feedback path with a divide ratio of 0.65. For different  $V_{OUT}$  values, the  $V_{BOOT}$  and feedback-divider ratio can be changed, as described in the MAX20745 IC data sheet.

$R_{GAIN}$  and  $C_{OUT}$  can also be changed to affect performance. Refer to the MAX20745 IC data sheet for more details.

### Soft-Start and Switching Frequency

These are programmable parameters. For the EV kit, soft start is set to 3ms and switching frequency is set to 400kHz.

### Status Monitoring

Whenever the part is actively regulating, and the output voltage is within the power-good window, the STAT pin is high. In all other conditions, including enabled but in a fault state, the STAT pin is pulled low. Refer to the MAX20745 IC data sheet for more details.

### Input-Voltage Monitoring

The  $V_{DD1}$  and GND1 sense points monitor the input supply.

### Switching-Voltage Monitoring

The switching waveform can be monitored on VX1.

### Output-Voltage Monitoring

J4-1 and J4-2 monitor the output voltage of  $V_{OUT}$  and GND, respectively. These test points should not be used for loading. Alternatively, scopejack J11 can be used to monitor the output voltage.

### Efficiency Testing

J6 provides convenient access to the appropriate  $V_{IN}$  and  $V_{OUT}$  sense points.

- $V_{IN\_EFF\pm}$  are on J6 pins 1-2.
- $V_{OUT\_EFF\pm}$  are on J6 pins 3-4.
- Input and output currents should be measured with 0.1% lab shunts.
- For increased accuracy, shunt mismatch can be measured and calibrated out by doing a test running the same current through both shunts.

## Ordering Information

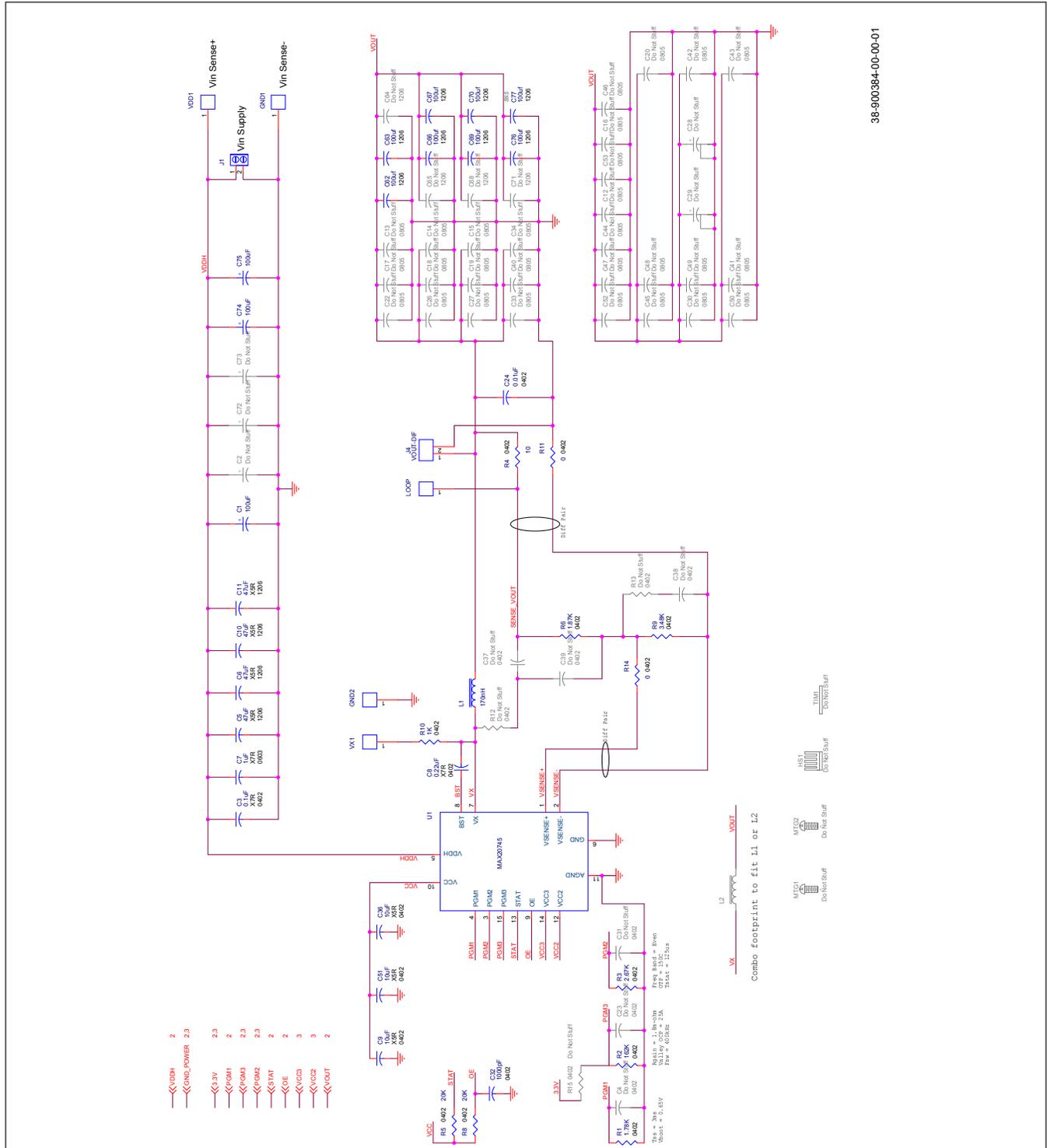
PART	TYPE
MAX20745EVKIT#	EV Kit

#Denotes RoHS compliant.

## MAX20745 Bill of Materials

Part Reference	Quantity	Description
C1, C74, C75	3	100 $\mu$ F, 25V, 20%, TANTALUM
C24	1	0.01 $\mu$ F, 25V, 10%, X7R
C3	1	0.1 $\mu$ F, 25V, 10%, X7R
C32	1	1000pF, 50V, 10%, X7R
C5, C6, C10, C11	4	47 $\mu$ F, 25V, 20%, X5R
C60, C61	2	1.0 $\mu$ F, 25V, 20%, X5R
C62, C63, C66, C67, C69, C70, C76, C77	8	100 $\mu$ f, 6.3V, 20%, X5R
C7	1	1 $\mu$ F, 25V, 10%, X7R
C8	1	0.22 $\mu$ F, 16V, 10%, X7R
C9, C36, C51	3	10 $\mu$ F, 6.3V, 20%, X5R
GND1, GND2, GND3, LOOP, VDD1, VX1	6	1_PIN-1X1 Straight
J1, J8	2	2_PIN-2 Pin, Terminal Block w/Screws, Blue
J11	1	Shielded Scope Probe Jack, Vertical
J3	1	2_Pin-Edge Fingers
J4	1	VOUT-DIF-1X2 Straight
J6	1	8_PIN-2X4 Straight
J7	1	6_PIN-2X3 Straight
L1	1	170nH, 10%, Isat= 66A
R1	1	1.78K $\Omega$ , 1%, 1/16W
R10, R20, R21, R22, R23	5	1K $\Omega$ , 5%, 1/16W
R11, R14	2	0 $\Omega$ , 5%, 1/16W
R2	1	162K $\Omega$ , 1%, 1/16W
R3	1	2.67K $\Omega$ , 1%, 1/16W
R4	1	10 $\Omega$ , 1%, 1/16W
R5, R8	2	20K $\Omega$ , 5%, 1/16W
R6	1	1.87K $\Omega$ , 1%, 1/16W
R9	1	3.48K $\Omega$ , 1%, 1/16W
SW1	1	DPDT-DPDT, 6pins, 1switch
U1	1	MAX20745, Maxim POL
	1	PCB# 35-900384-00-00

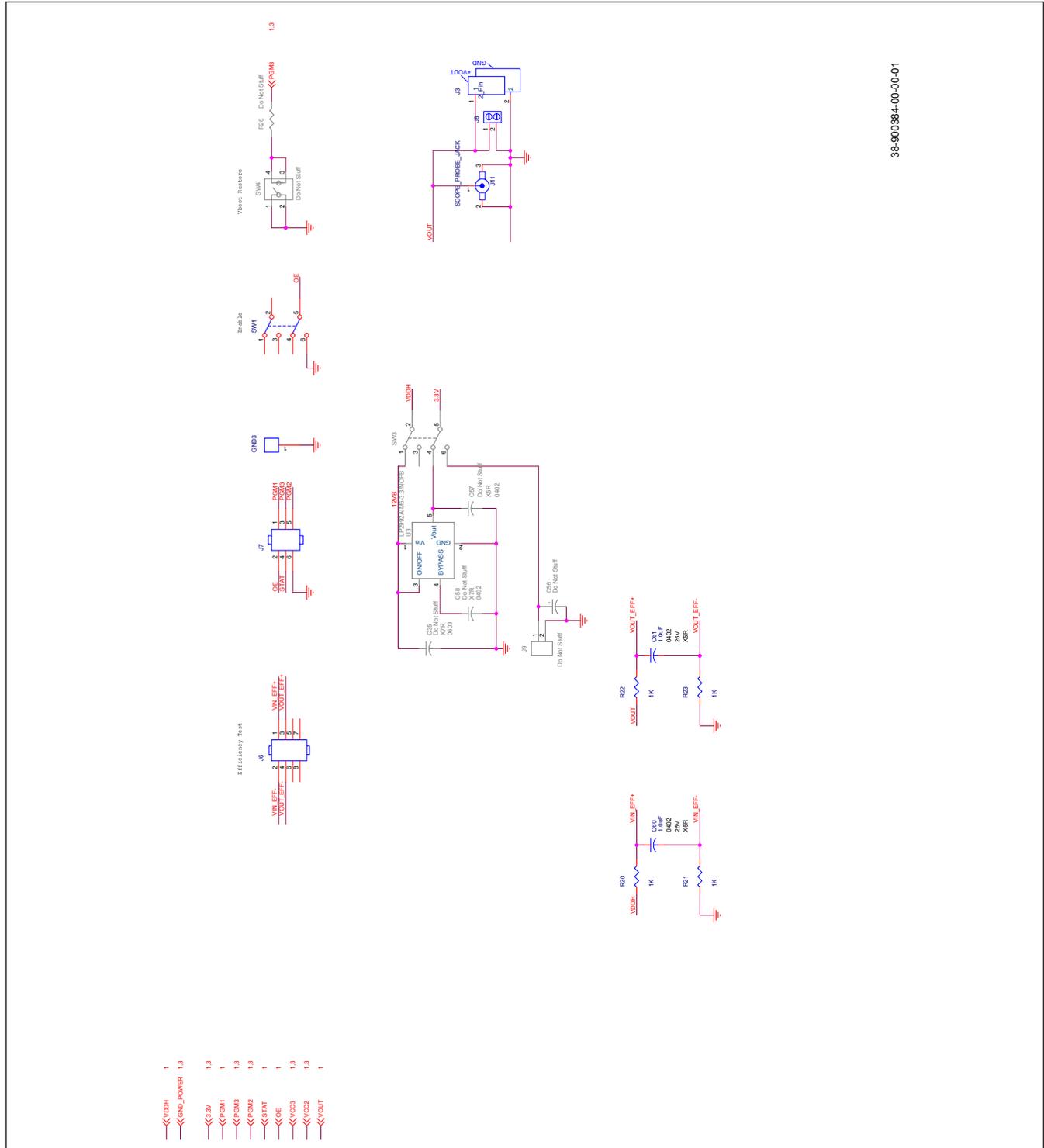
MAX20745 Schematics



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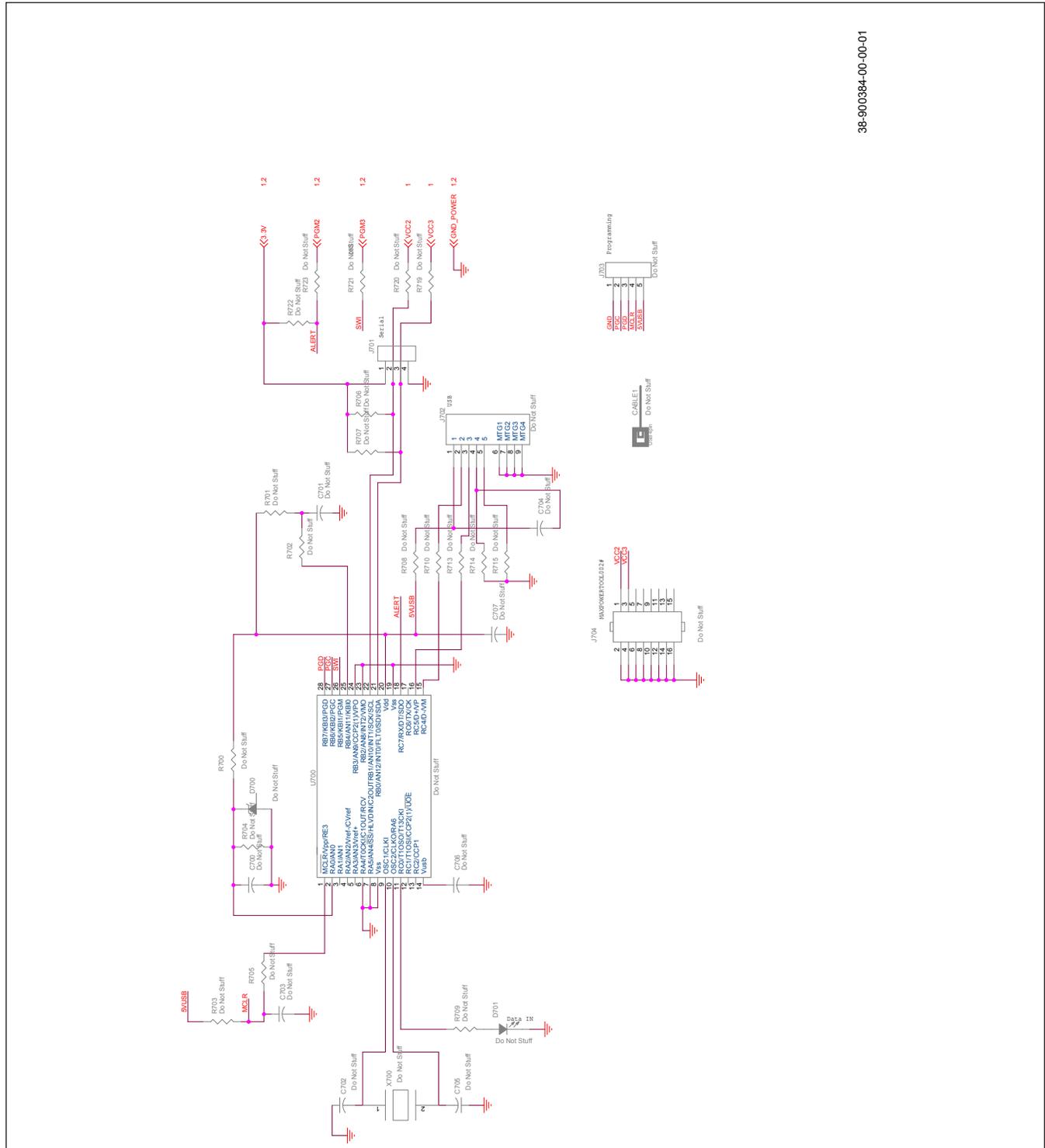
Reference Schematic 1 of 3

MAX20745 Schematics (continued)



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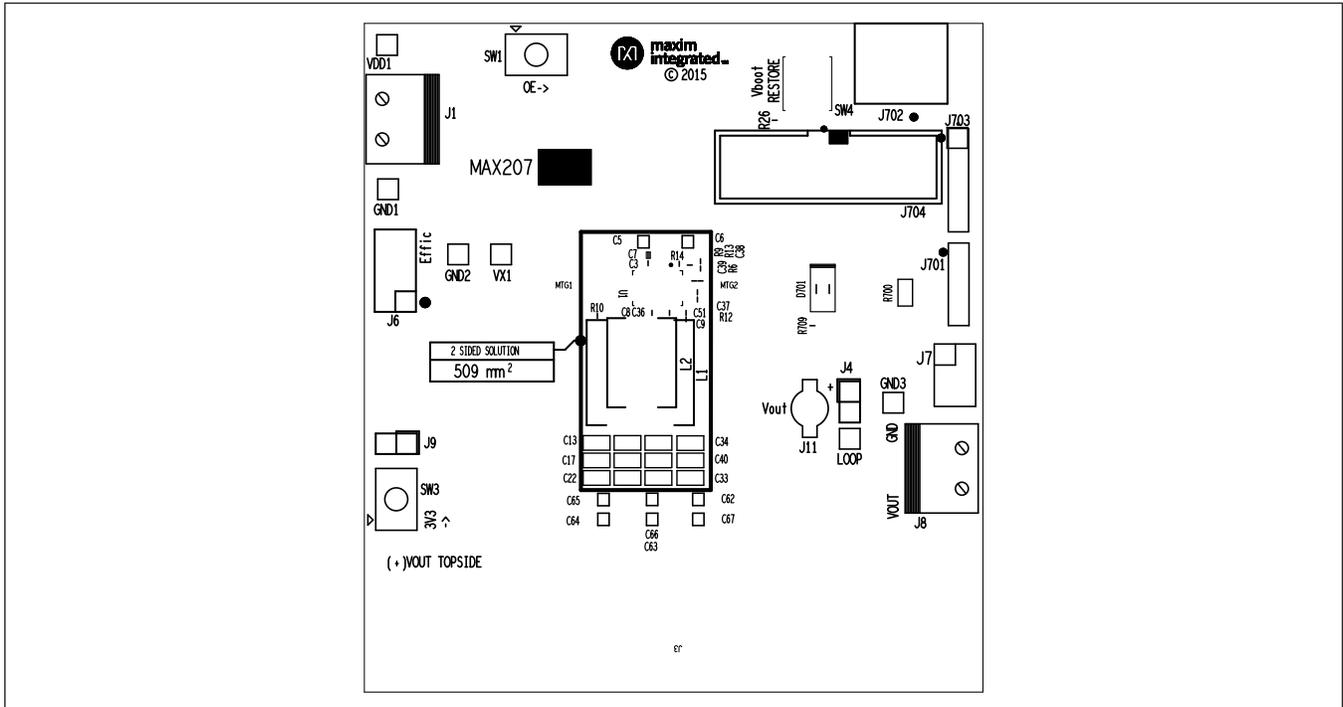
MAX20745 Schematics (continued)



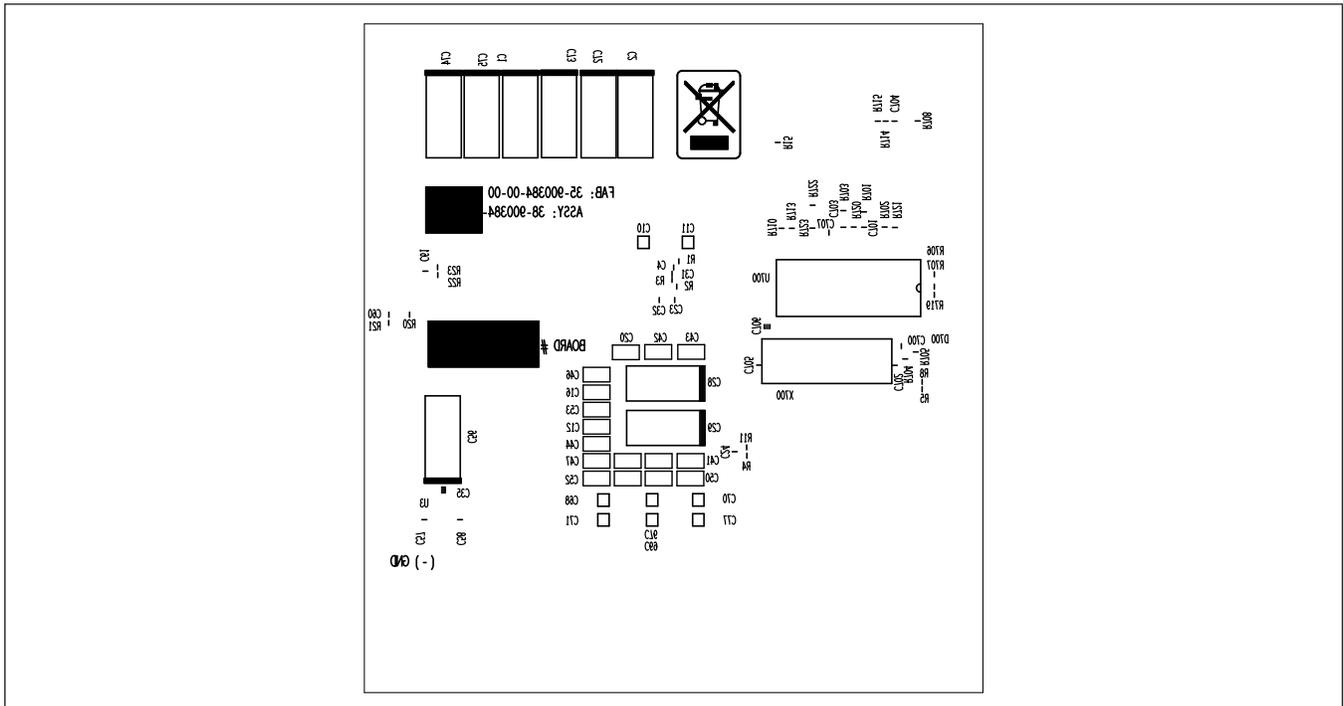
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Reference Schematic 3 of 3

MAX20745 PCB Layout

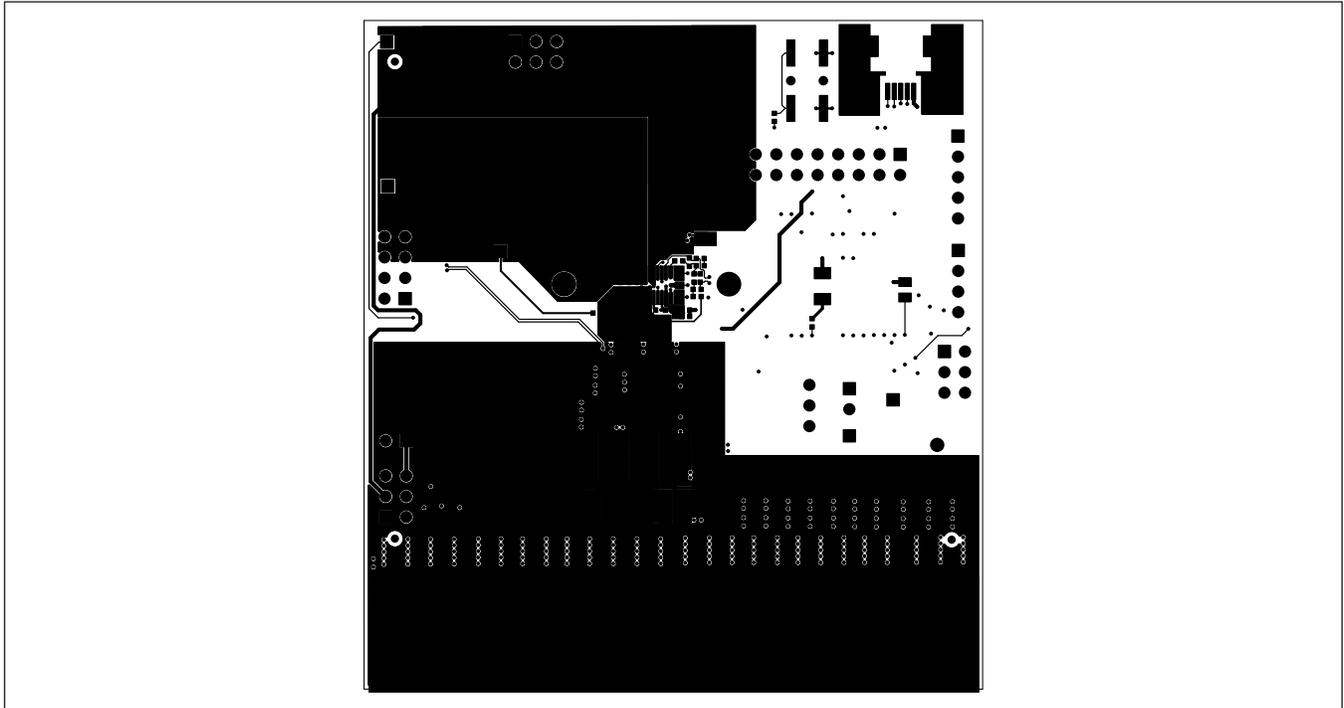


Top Silkscreen

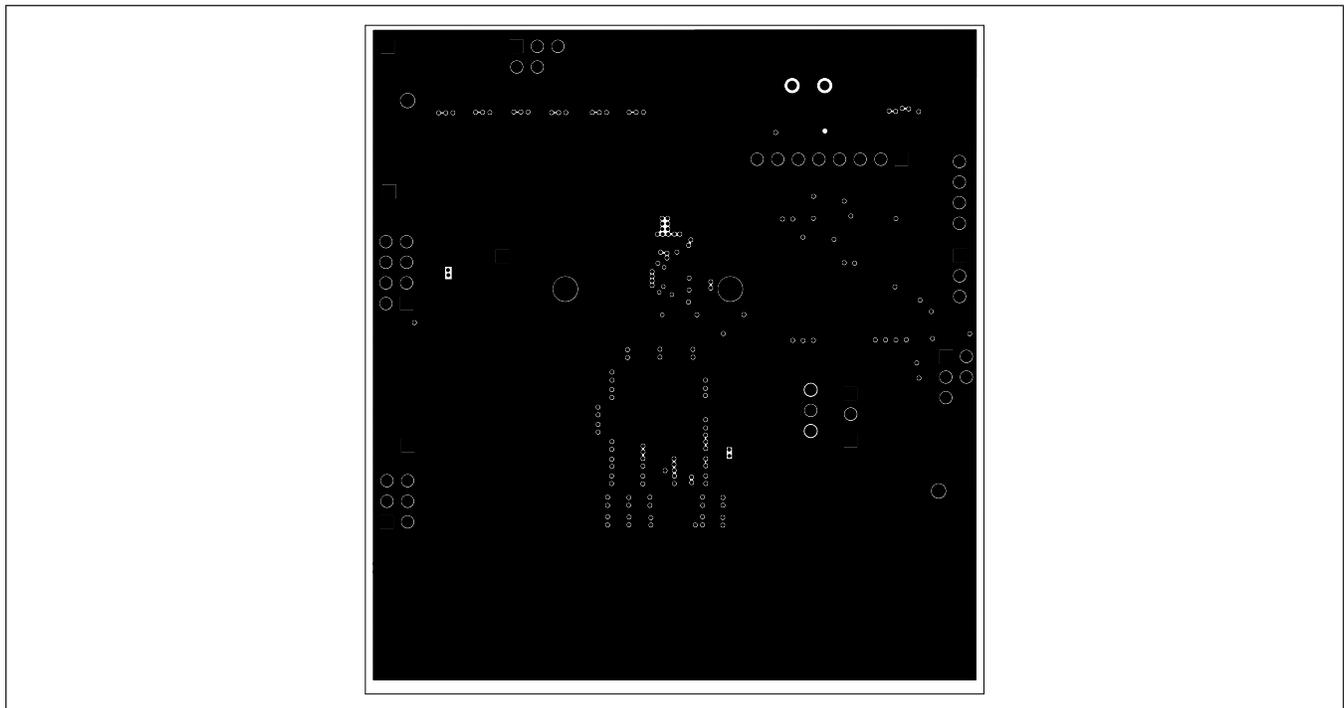


Bottom Silkscreen

MAX20745 PCB Layout (continued)

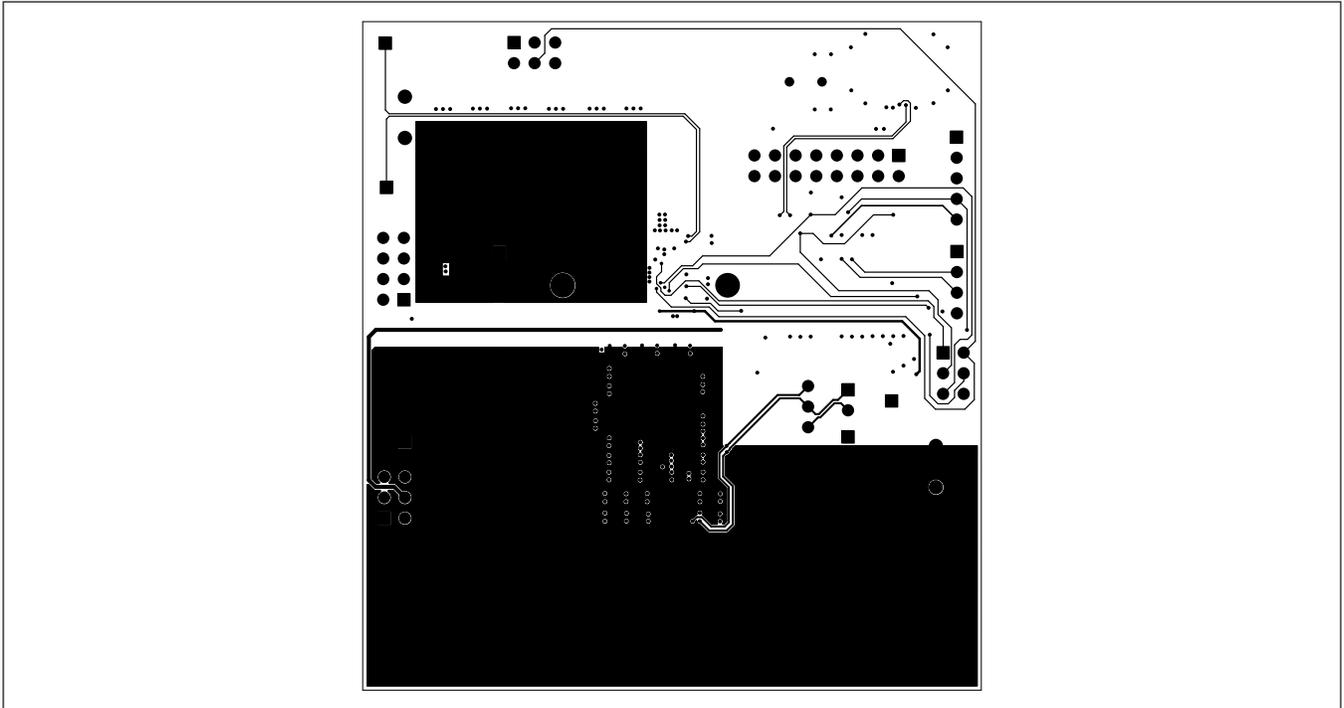


Layer 1

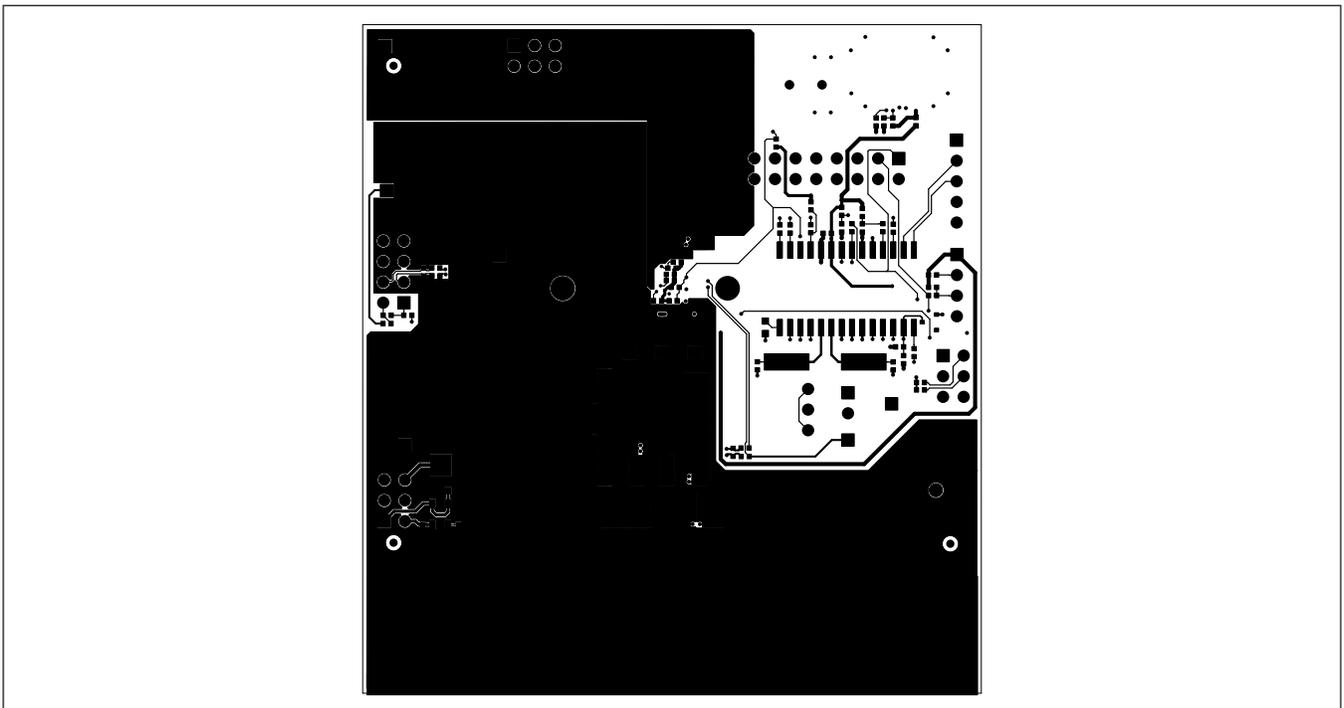


Layer 2

MAX20745 PCB Layout (continued)



Layer 3



Layer 4

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/15	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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