## 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 $+V_{OUT}$ connection is on the top side, while the return (or $-V_{OUT}$) 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$^2$ Including Inductor and Output Capacitors
- Optimized Performance
- Reduced Design-In Time
- Proven PCB Layout
- Fully Assembled and Tested

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

## Getting Started

### Required Equipment

- MAX20745 EV kit
- 4.5V to 16V power supply
- 0A to 25A Load
- Oscillocope, 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 $V_{DD1}$ and GND1 for best accuracy.
2) Connect the load to J3 or J8.
3) Connect the $V_{OUT}$ 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 $V_{OUT}$ = 1V.
6) For efficiency measurements, J6 has appropriate Kelvin sense points.



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## 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.

- VIN_EFF± are on J6 pins 1-2.
- VOUT_EFF± 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

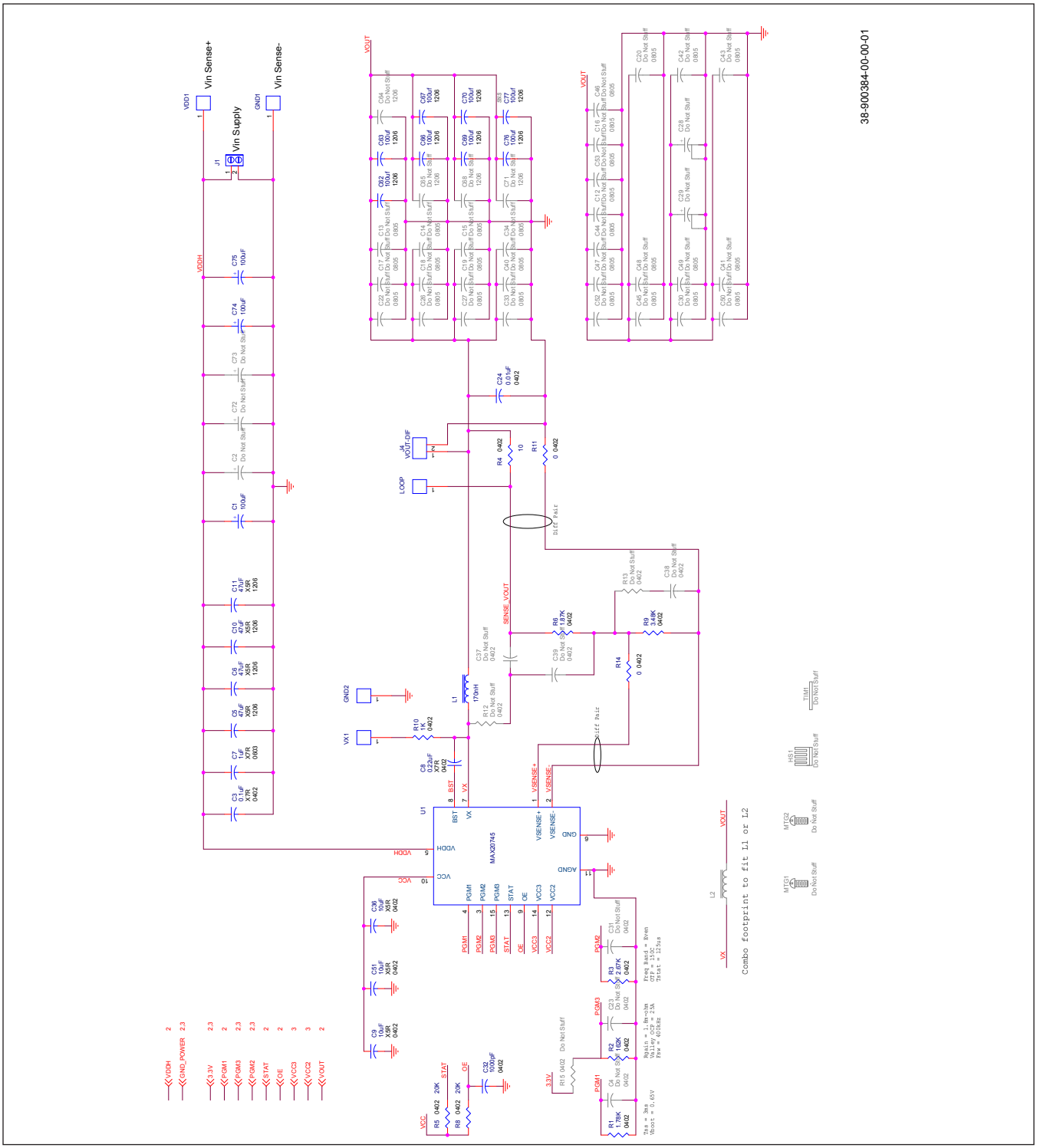
| PART | TYPE |
|---|---|
| MAX20745EVKIT# | EV Kit |

*#Denotes RoHS compliant.*

## MAX20745 Bill of Materials

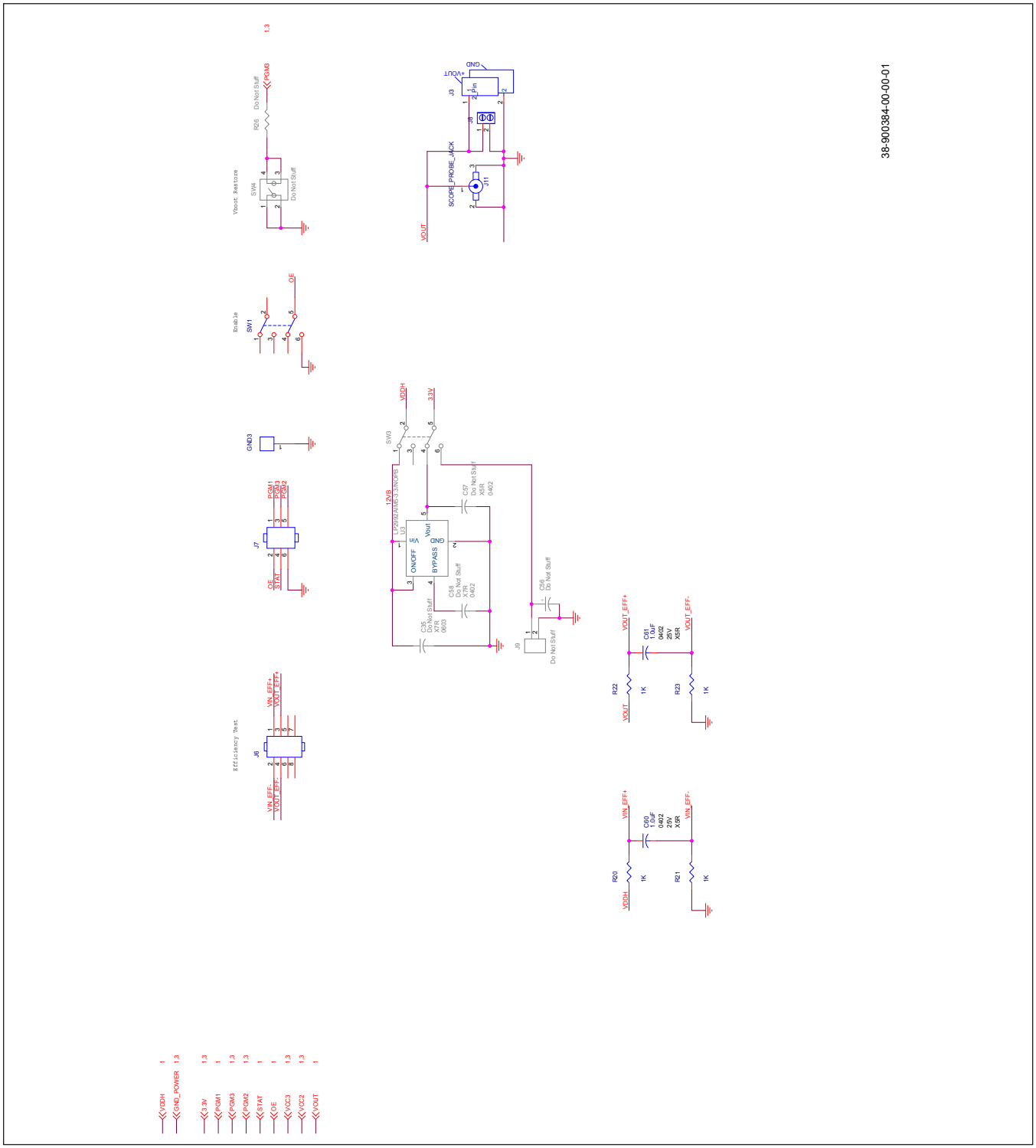
| Part Reference | Quantity | Description |
|---|---|---|
| C1, C74, C75 | 3 | 100µF, 25V, 20%, TANTALUM |
| C24 | 1 | 0.01µF, 25V, 10%, X7R |
| C3 | 1 | 0.1µF, 25V, 10%, X7R |
| C32 | 1 | 1000pF, 50V, 10%, X7R |
| C5, C6, C10, C11 | 4 | 47µF, 25V, 20%, X5R |
| C60, C61 | 2 | 1.0µF, 25V, 20%, X5R |
| C62, C63, C66, C67, C69, C70, C76, C77 | 8 | 100µf, 6.3V, 20%, X5R |
| C7 | 1 | 1µF, 25V, 10%, X7R |
| C8 | 1 | 0.22µF, 16V, 10%, X7R |
| C9, C36, C51 | 3 | 10µF, 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 | 1.78KΩ, 1%, 1/16W |
| R10, R20, R21, R22, R23 | 5 | 1KΩ, 5%, 1/16W |
| R11, R14 | 2 | 0Ω, 5%, 1/16W |
| R2 | 1 | 162KΩ, 1%, 1/16W |
| R3 | 1 | 2.67KΩ, 1%, 1/16W |
| R4 | 1 | 10Ω, 1%, 1/16W |
| R5, R8 | 2 | 20KΩ, 5%, 1/16W |
| R6 | 1 | 1.87KΩ, 1%, 1/16W |
| R9 | 1 | 3.48KΩ, 1%, 1/16W |
| SW1 | 1 | DPDT-DPDT, 6pins, 1switch |
| U1 | 1 | MAX20745, Maxim POL |
|  | 1 | PCB# 35-900384-00-00 |

## MAX20745 Schematics



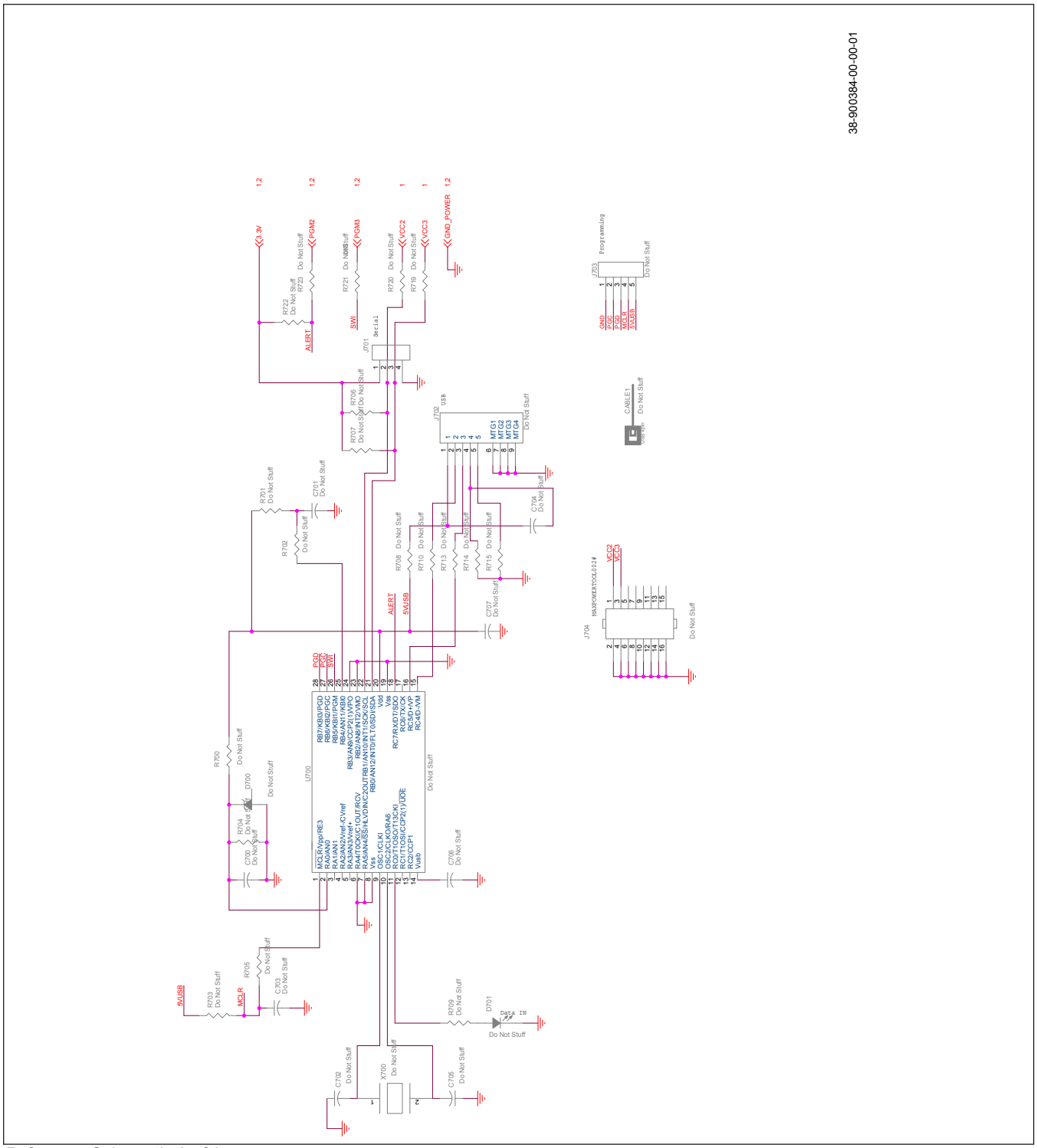

*Reference Schematic 1 of 3*

## MAX20745 Schematics (continued)



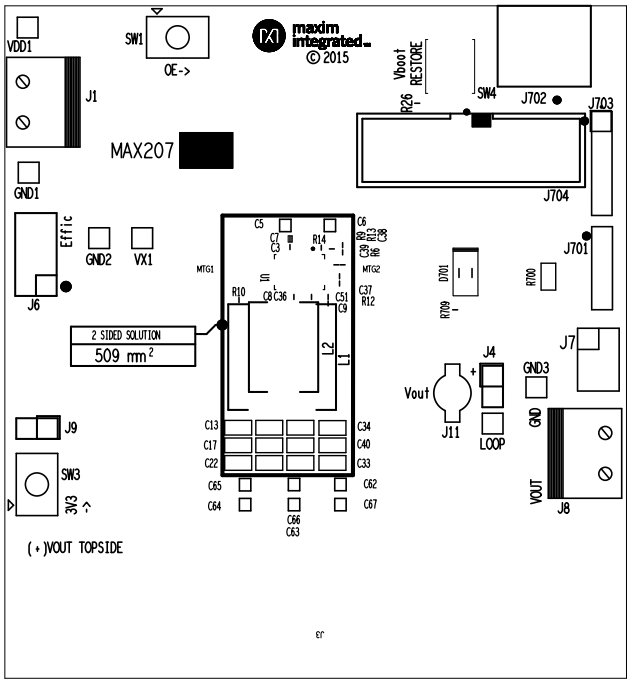

*Reference Schematic 2 of 3*

## MAX20745 Schematics (continued)

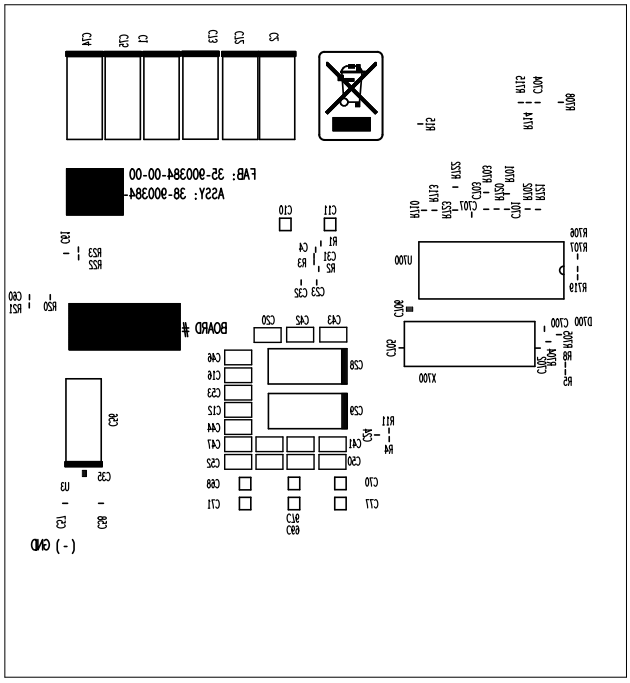



*Reference Schematic 3 of 3*

## MAX20745 PCB Layout

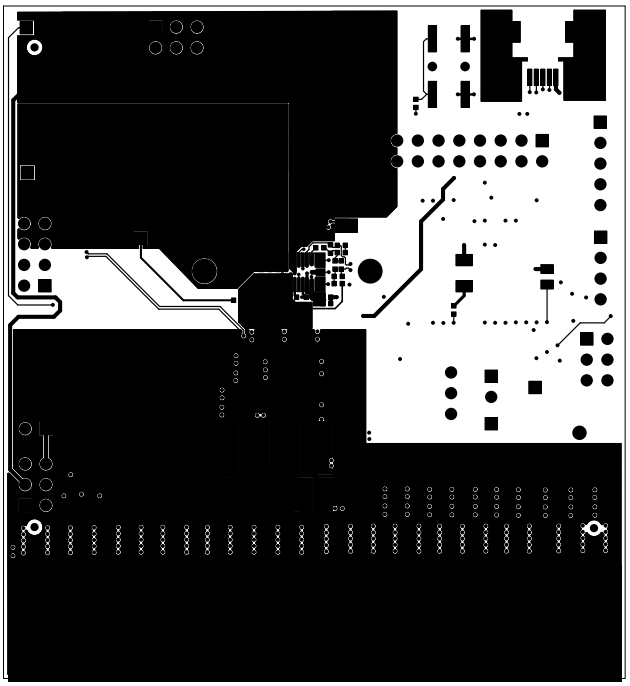



*Top Silkscreen*

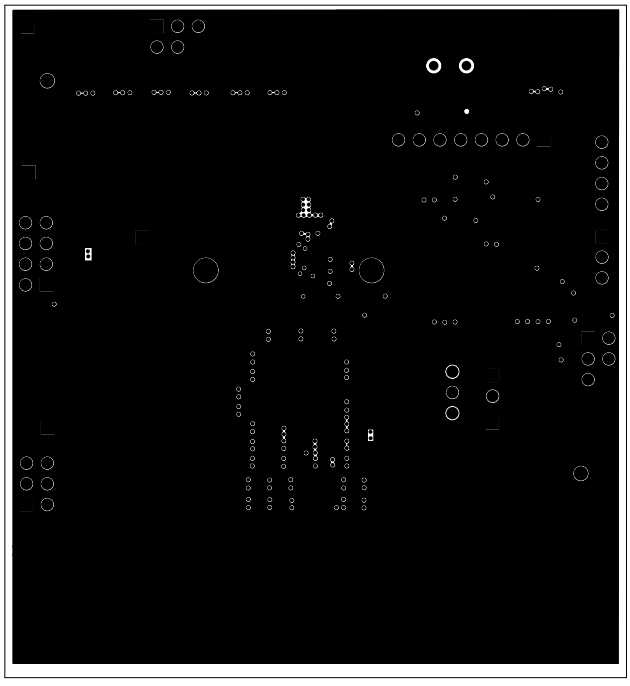


*Bottom Silkscreen*

## MAX20745 PCB Layout (continued)

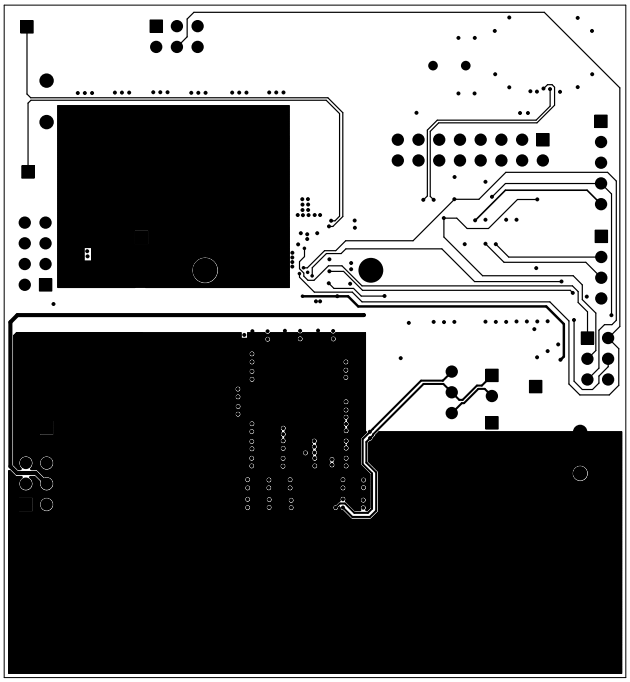


*Layer 1*

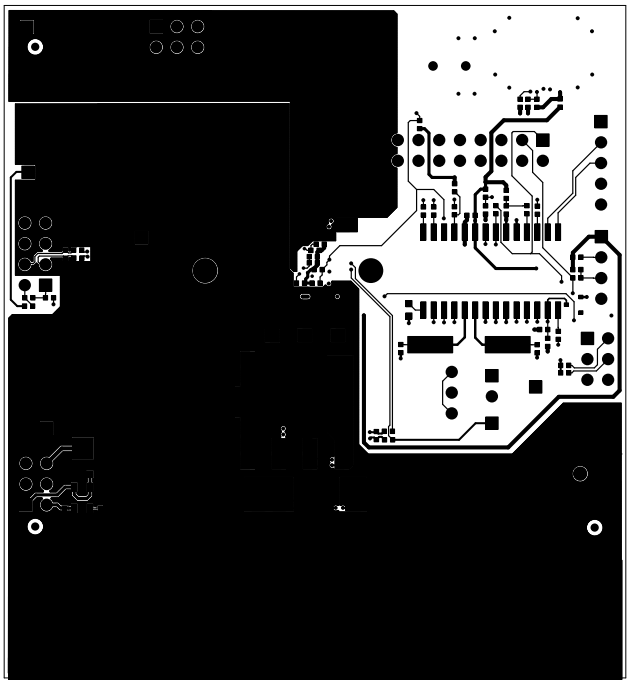


*Layer 2*

## MAX20745 PCB Layout (continued)



*Layer 3*



*Layer 4*

## Revision History

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

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