

## Evaluates: MAX20084/ MAX20084B

## MAX20084 Evaluation Kit/ MAX20084 Evaluation System

### General Description

The MAX20084 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB used to evaluate the MAX20084/MAX20084B automotive dual-antenna power supply with I<sup>2</sup>C interface. Each channel can be independently configured to operate either as a switch or as an LDO with regulated adjustable output voltage using I<sup>2</sup>C. The EV kit demonstrates the device's features: adjustable current limit, adjustable overcurrent detection, adjustable open-load detection, and adjustable warning-current detection. The output current of each channel can be monitored using I<sup>2</sup>C or by measuring an analog output voltage. The EV kit exposes an I<sup>2</sup>C interface that can operate in conjunction with either the MINIQUSB+ adapter or a third-party I<sup>2</sup>C master, such as a general-purpose microcontroller. The EV kit also includes Windows-compatible software that provides a simple graphical user interface (GUI) for exercising the features of the IC. The EV system includes both the EV kit and the MINIQUSB+ adapter board.

### Benefits and Features

- 4.5V to 28V Wide Input Voltage Range (40V Load-Dump Tolerant)
- 2-Channel LDO/Switch
  - Adjustable Output Voltage using I<sup>2</sup>C
- Output Current Monitoring
  - Analog Output
  - I<sup>2</sup>C ADC
- Open-Drain Fault Indicator
- High-Voltage Enable Control Input (EN)
- Proven PCB Layout
- Fully Assembled and Tested

### MAX20084 EV Kit Files

| FILE                    | DESCRIPTION           |
|-------------------------|-----------------------|
| MAX20084GUISetupVxx.exe | Windows GUI Installer |

[Ordering Information](#) appears at end of data sheet.

### Quick Start

#### Required Equipment

- MAX20084 EV kit
- 12V, 1A power supply
- Voltmeter
- MINIQUSB+ interface board with USB cable
- User-supplied Windows-compatible PC with spare USB port

**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. Perform the following steps to verify board operation:

- 1) Install the EV kit software (GUI) on your PC by running the MAX20084GUISetupVxx.exe program. The EV kit software application is installed complete with the required MINIQUSB+ drivers.
- 2) Verify that shunts are installed across pins 1 and 2 on jumpers J2–J5.
- 3) Connect the MINIQUSB+ interface board's P3 header to the J1 header on the EV kit.
- 4) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the GND3 PCB pad.
- 5) Set the power supply  $V_{IN}$  at 12V.
- 6) Turn on the power supply.
- 7) Verify that the green LED (DS2) is on.
- 8) Launch the EV kit software application.
- 9) From the EV kit software toolbar, select **Device** → **Scan for Address**. The GUI scans the I<sup>2</sup>C bus for available slave addresses on the bus and selects the first one (in this case, the MAX20084 I<sup>2</sup>C address). Press **OK** once the MAX20084 I<sup>2</sup>C address has been found.

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- 10) Verify that the status bar in the bottom-right corner of the GUI displays **EV Kit: Connected**, as shown in [Figure 1](#).
- 11) In the **GENERAL SETTINGS** group box, check **MASKOL** and then press the **EN\_ALL** button.
- 12) Both channels should be turned on and outputting 5V; **FAULT PIN** status should be green.
- 13) For more details on how to use the GUI and all available features, click on the GUI Help menu item.

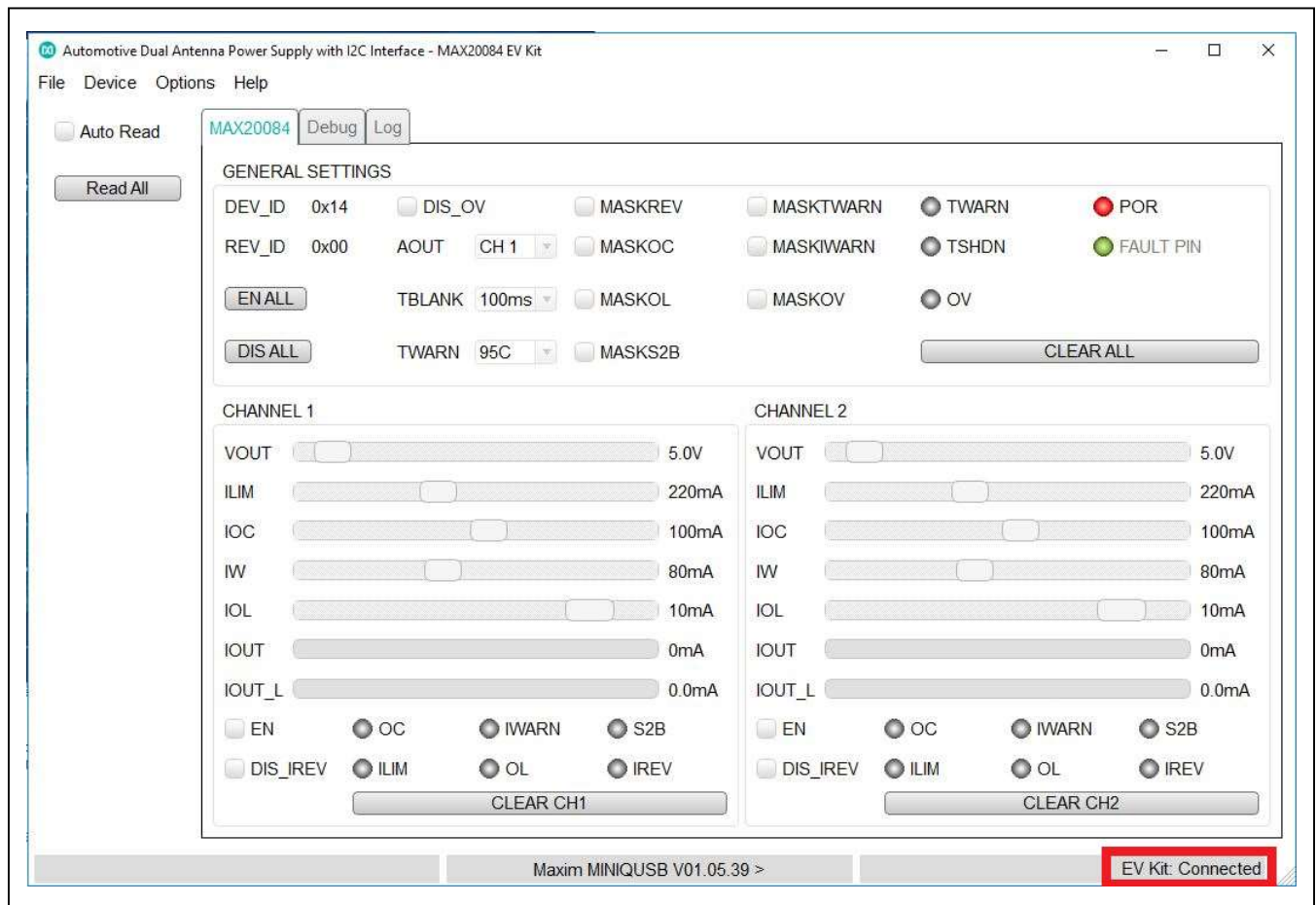


Figure 1. MAX20084 Evaluation Kit Software (GUI)

## Detailed Description of Hardware

Example jumper settings in the following tables illustrate features of the MAX20084 EV kit.

### Digital Domain Voltage (J2)

The EV kit exposes open-drain digital signals (FLT, SDA, and SCL) that are pulled up to what is referred to as the digital domain voltage.

Digital domain voltage can be selected between the MAX20084/MAX20084B internal-regulator voltage (PVL) and the fixed 3.3V provided by the MINQUSB+. Alternatively, you can force an external voltage as digital reference (see [Table 1](#)).

### Enable (J3)

The MAX20084/MAX20084B IC can be disabled by connecting the EN pin to ground, reducing the current consumption to its minimum value. Furthermore, an external digital signal can be used to enable/disable the IC (see [Table 2](#)).

**Table 1. Jumper Functions (J2)**

| SHUNT POSITION | DIGITAL DOMAIN                  |
|----------------|---------------------------------|
| 1-2*           | PVL                             |
| 2-3            | 3.3V (with MINQUSB+ connected)  |
| Open           | Externally provided (J2, pin 2) |

\*Default Position

**Table 2. Jumper Functions (J3)**

| SHUNT POSITION | MAX20084/MAX20084B                                       |
|----------------|--|
| 1-2*           | Enabled  |
| 2-3            | Disabled   |
| Open           | Externally controlled through digital signal (J3, pin 2) |

\*Default Position

### I<sup>2</sup>C Slave Address (J4)

The IC's 7-bit I<sup>2</sup>C slave address can be selected between four options through the J4 jumper setting (see [Table 3](#)).

**Note:** Do not leave J4 open.

### Power LED Enable (J5)

A green LED (DS2) is used to indicate that the EV kit is powered on. The LED can be disconnected from the power supply, allowing precise current-consumption evaluation. See [Table 4](#) for shunt positions.

**Table 3. Jumper Functions (J4)**

| SHUNT POSITION | 7-BIT I <sup>2</sup> C SLAVE ADDRESS |
|----------------|--------------------------------------|
| 1-2*           | 0x3C                                 |
| 1-3            | 0x3D                                 |
| 1-4            | 0x3B                                 |
| 1-5            | 0x3A                                 |

\*Default Position

**Table 4. Jumper Functions (J5)**

| SHUNT POSITION | DS2 POWER LED |
|----------------|---------------|
| 1-2*           | Connected     |
| Open           | Disconnected  |

\*Default Position

## Ordering Information

| PART           | TYPE      |
|----------------|-----------|
| MAX20084EVKIT# | EV Kit    |
| MAX20084EVSYS# | EV System |

#Denotes RoHS compliant.

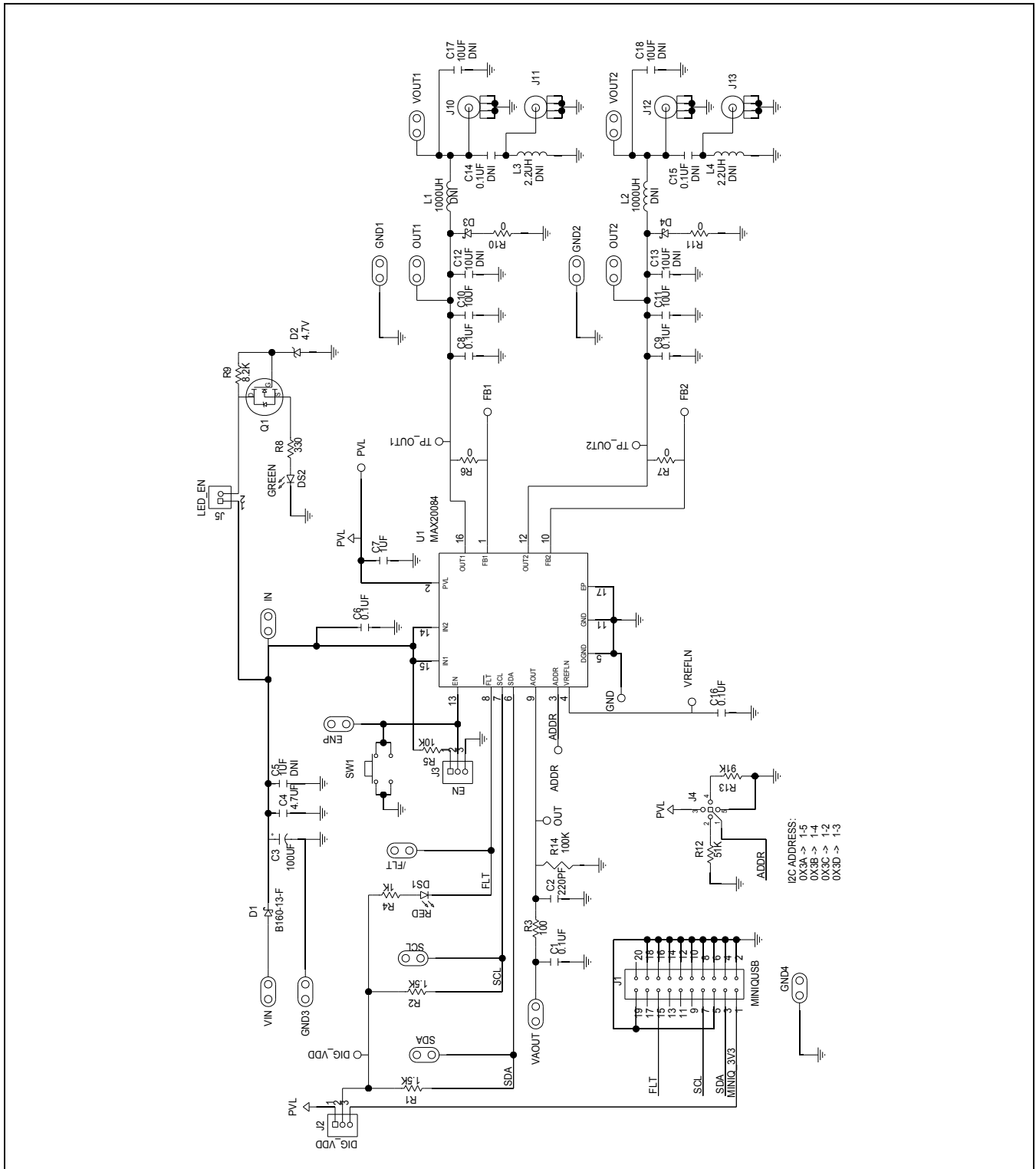
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## MAX20084 EV Kit Bill of Materials

| ITEM  | REF_DES  | DNI/DNP | QTY | MFG PART #   | MANUFACTURER                 | VALUE                | DESCRIPTION  | COMMENTS |
|-------|--|---------|-----|--|------------------------------|----------------------|--|----------|
| 1     | IN, ENP, SCL, SDA, VIN, /FLT, GND1-GND4, OUT1, OUT2, VAOUT, VOUT1, VOUT2 | -       | 15  | 9020 BUSS  | WEICO WIRE                   | MAXIMPAD             | EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG   |          |
| 2     | FB1, FB2, OUT, PVL, ADDR, VREFLN, DIG_VDD, TP_OUT1, TP_OUT2              | -       | 9   | 5005   | KEYSTONE                     | N/A                  | TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;                               |          |
| 3     | C1, C6, C8, C9, C16  | -       | 5   | CGA3E3X752A104K080AB   | TDK                          | 0.1UF                | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X75  |          |
| 4     | C2   | -       | 1   | GRM188R71H221KA01  | MURATA                       | 220PF                | CAPACITOR; SMT (0603); CERAMIC CHIP; 220PF; 50V; TOL=10%; MODEL=GRM SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R                                       |          |
| 5     | C3   | -       | 1   | MAL214699103E3   | VISHAY BCCOMPONENTS          | 100UF                | CAPACITOR; SMT; ALUMINUM-ELECTROLYTIC; 100UF; 50V; TOL=20%   |          |
| 6     | C4   | -       | 1   | C2012X5R1H475K125AB  | TDK                          | 4.7UF                | CAPACITOR; SMT (0805); CERAMIC CHIP; 4.7UF; 50V; TOL=10%; MODEL=-; TG=-55 DEGC TO +85 DEGC; TC=X5R   |          |
| 7     | C7   | -       | 1   | GRM188R71E106KA12D; CGA3E1X7R1E105K; TMK107B7105KA; 06033C105KAT2A | MURATA;TDK; TAIYO YUDEN; AVX | 1UF                  | CAPACITOR; SMT (0603); CERAMIC CHIP; 1UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R   |          |
| 8     | C10, C11   | -       | 2   | GRM21B271E106KE15  | MURATA                       | 10UF                 | CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R  |          |
| 9     | D1   | -       | 1   | B160-13-F  | DIODES INCORPORATED          | B160-13-F            | DIODE; SCH; SMA; PIV=60V; IF=1A  |          |
| 10    | D2   | -       | 1   | BZX84C 4V7   | FAIRCHILD SEMICONDUCTOR      | 4.7V                 | DIODE; ZNR; SMT (SOT-23); PIV=4.7V; IF=0.25A   |          |
| 11    | D3, D4   | -       | 2   | MSS1P2L-M3/89A   | VISHAY GENERAL SEMICONDUCTOR | MSS1P2L-M3/89A       | DIODE; SCH; SMT (MICROSMP); PIV=20V; IF=1A   |          |
| 12    | DS1  | -       | 1   | LTST-C170EKT   | LITE-ON ELECTRONICS INC      | LTST-C170EKT         | DIODE; LED; STANDARD; RED; SMT (0805); PIV=2.0V; IF=0.02A  | RED      |
| 13    | DS2  | -       | 1   | LTST-C170GKT   | LITE-ON ELECTRONICS INC      | LTST-C170GKT         | DIODE; LED; STANDARD; GREEN; SMT (0805); PIV=2.1V; IF=0.01A  | GREEN    |
| 14    | GND  | -       | 1   | 5006   | KEYSTONE                     | N/A                  | TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;                             |          |
| 15    | J1   | -       | 1   | 803-87-020-20-001101   | PRECI-DIP SA                 | 803-87-020-20-001101 | EVKIT PART-CONNECTOR; FEMALE; TH; DOUBLE ROW; 2.54MM; RIGHT ANGLE SOLDER TAIL; MATING PIN DIA 0.76MM; RIGHT ANGLE; 20PINS;                         |          |
| 16    | J2, J3   | -       | 2   | PEC03SAAN  | SULLINS ELECTRONICS CORP.    | PEC03SAAN            | EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC;   |          |
| 17    | J4   | -       | 1   | PBC05SAAN  | SULLINS ELECTRONICS CORP.    | PBC05SAAN            | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 5PINS; -65 DEGC TO +125 DEGC   |          |
| 18    | J5   | -       | 1   | PBC02SAAN  | SULLINS ELECTRONICS CORP.    | PBC02SAAN            | EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS; -65 DEGC TO +125 DEGC;   |          |
| 19    | J10-J13  | -       | 4   | 73391-0060   | MOLEX                        | 73391-0060           | CONNECTOR; FEMALE; THROUGH HOLE; SMA JACK CONNECTOR; STRAIGHT; 5PINS   |          |
| 20    | Q1   | -       | 1   | BSS138LT1G   | ON SEMICONDUCTOR             | BSS138LT1G           | TRAN; POWER MOSFET; N-CHANNEL; NCH; SOT-23; PD-(0.225W); I-(0.2A); V-(50V)   |          |
| 21    | R1, R2   | -       | 2   | CRCW06031K50JN   | VISHAY DALE                  | 1.5K                 | RESISTOR; 0603; 1.5K OHM; 5%; 200PPM; 0.10W; METAL FILM  |          |
| 22    | R3   | -       | 1   | CRCW0603100RFKEAHP   | VISHAY DRALORIC              | 100                  | RESISTOR; 0603; 100 OHM; 1%; 100PPM; 0.25W; THICK FILM   |          |
| 23    | R4   | -       | 1   | ERI-3GEYJ102V  | PANASONIC                    | 1K                   | RESISTOR; 0603; 1K OHM; 5%; 200PPM; 0.10W; THICK FILM  |          |
| 24    | R5   | -       | 1   | RC0603FR-0710KL  | YAGEO                        | 10K                  | RESISTOR; 0603; 10K OHM; 1%; 100PPM; 0.1W; THICK FILM  |          |
| 25    | R6, R7   | -       | 2   | CR0805-10W-000   | VENKEL LTD.                  | 0                    | RESISTOR; 0805; 0 OHM; 0.1W; THIN FILM   |          |
| 26    | R8   | -       | 1   | CRCW0603330RFK   | VISHAY DALE                  | 330                  | RESISTOR; 0603; 330 OHM; 1%; 100PPM; 0.10W; THICK FILM   |          |
| 27    | R9   | -       | 1   | CRCW08058K20FK   | VISHAY DALE                  | 8.2K                 | RESISTOR; 0805; 8.2K OHM; 1%; 100PPM; 0.125W; THICK FILM   |          |
| 28    | R10, R11   | -       | 2   | CRCW0603000020EAHP   | VISHAY DRALORIC              | 0                    | RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.25W; THICK FILM   |          |
| 29    | R12  | -       | 1   | ERI-3EKF5102   | PANASONIC                    | 51K                  | RESISTOR; 0603; 51K OHM; 1%; 100PPM; 0.1W; THICK FILM  |          |
| 30    | R13  | -       | 1   | ERI-3EKF9102   | PANASONIC                    | 91K                  | RESISTOR; 0603; 91K OHM; 1%; 100PPM; 0.1W; THICK FILM  |          |
| 31    | R14  | -       | 1   | ERI-3EKF1003   | PANASONIC                    | 100K                 | RESISTOR; 0603; 100K OHM; 1%; 100PPM; 0.1W; THICK FILM   |          |
| 32    | SW1  | -       | 1   | EVQ-Q2K03W   | PANASONIC                    | EVQ-Q2K03W           | SWITCH; SPST; SMT; 15V; 0.02A; LIGHT TOUCH SWITCH; RCOIL= OHM; RINSULATION= OHM; PANASONIC   |          |
| 33    | U1   | -       | 1   | MAX20084BATEA/VY+  | MAXIM                        | MAX20084BATEA/VY+    | EVKIT PART-IC; INFC, AUTOMOTIVE DUAL ANTENNA POWER SUPPLY WITH SERIAL INTERFACE; PACKAGE CODE: T1644Y-4C; PACKAGE LAND PATTERN: 90-0070; TQFN16-EP |          |
| 34    | PCB  | -       | 1   | MAX20084   | MAXIM                        | PCB                  | PCB:MAX20084   |          |
| 35    | C5   | DNP     | 0   | CGA4J3X752A105K125AB   | TDK                          | 1UF                  | CAPACITOR; SMT (0805); CERAMIC; 1UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X75; AUTO   |          |
| 36    | C12, C13, C17, C18   | DNP     | 0   | GRM21B271E106KE15  | MURATA                       | 10UF                 | CAPACITOR; SMT (0805); CERAMIC CHIP; 10UF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R  |          |
| 37    | C14, C15   | DNP     | 0   | CGI4J3X7T2D104K125   | TDK                          | 0.1UF                | CAPACITOR; SMT (0805); CERAMIC CHIP; 0.1UF; 200V; TOL=10%; MODEL=CGI SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7T                                      |          |
| 38    | L1, L2   | DNP     | 0   | 74477130   | WURTH ELECTRONICS INC.       | 1000UH               | INDUCTOR; SMT; SHIELDED; 1000UH; 20%; 0.43A  |          |
| 39    | L3, L4   | DNP     | 0   | AIML-1206HC-2R2M   | ABRACON                      | 2.2UH                | INDUCTOR; SMT (1206); FERRITE CHIP; 2.2UH; TOL=+/-20%; 1.3A  |          |
| TOTAL |  |         | 69  |  |                              |                      |  |          |

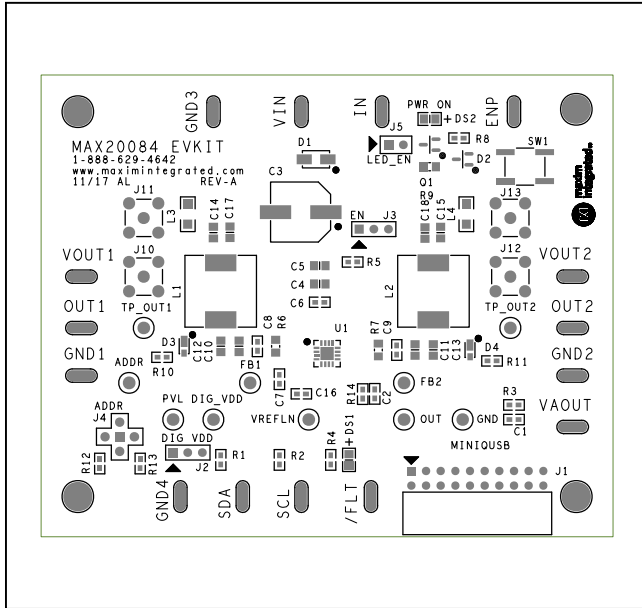
MAX20084 EV Kit Schematic



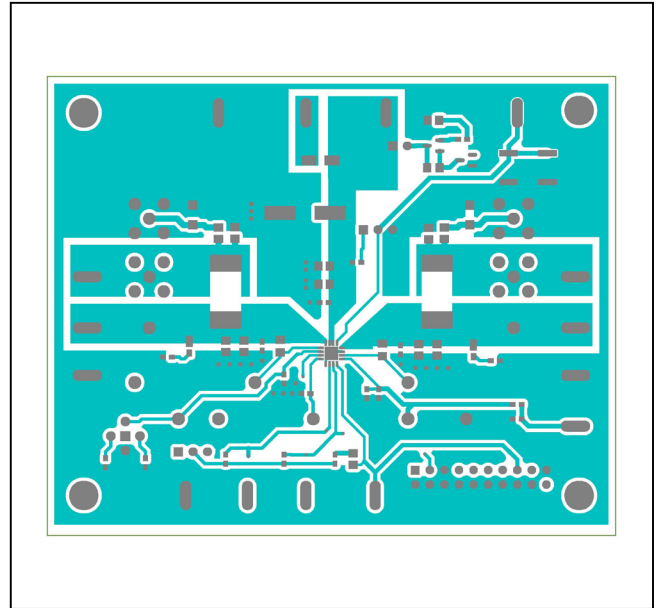
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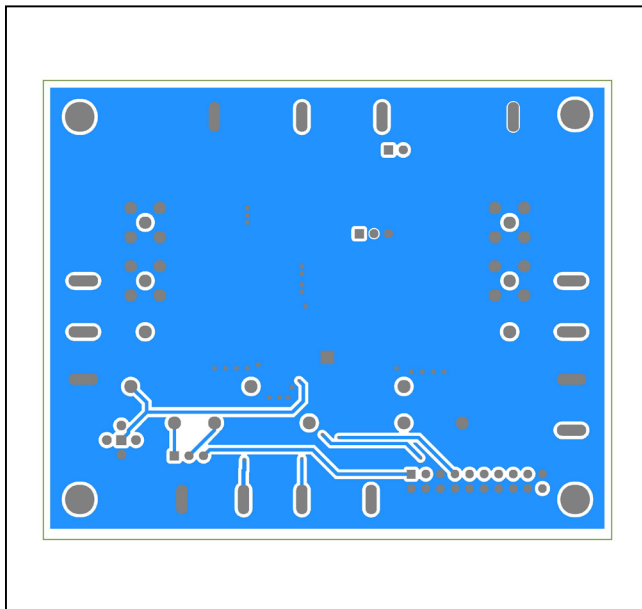
## MAX20084 EV PCB Layouts



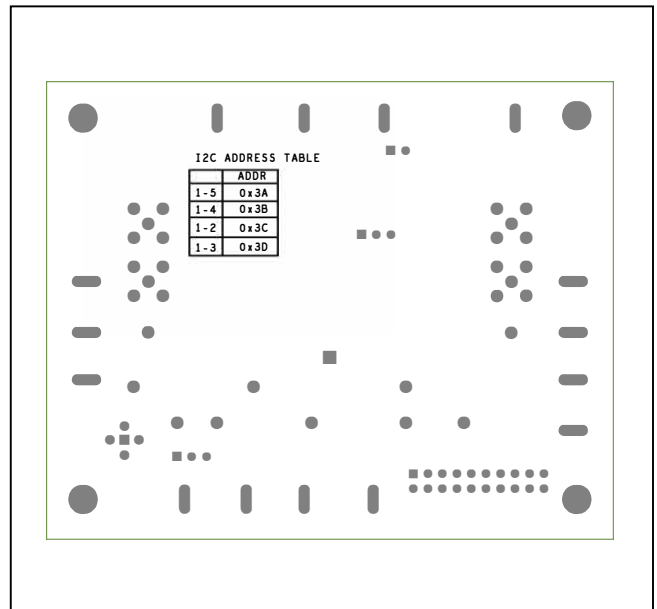
Silk\_Top



Top



Bottom



Silk\_Bottom