MAX20048 Evaluation Kit

Evaluates: MAX20048

General Description

The MAX20048 evaluation kit (EV kit) is a fully assembled and tested application circuit for the MAX20048 current-mode buck-boost controller IC. The EV kit is designed to deliver up to 16A (max) input current with input voltages from 2V to 36V. The output-voltage accuracy is ±2% within the normal 9V to 18V operation input range and a ±3% accuracy in the 2V to 18V range. Voltage quality can be monitored by observing the PGOOD signal.

The IC offers 5V fixed output voltage and a 4V to 25V OUT programmable range. Switching frequency is adjustable from 220kHz to 2.2MHz, which allows for small external components, reduced output ripple, and guarantees no AM interference. The IC automatically enters skip mode at light loads with low 55µA quiescent current at no load. The IC comes with a spread-spectrum frequency-modulation option designed to minimize EMI-radiated emissions and a SYNCOUT option that outputs 180° out-of-phase clock.

Benefits and Features

- 2V to 36V Input Supply Range
- Delivers Up to 16A Input Current
- Enable Input
- Frequency Synchronization Input
- Voltage-Monitoring PGOOD Output
- BIAS Voltage-Monitoring Test Point
- Fully Assembled and Tested
- Proven PCB Layout

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

Quick Start

Required Equipment

- MAX20048 EV kit
- 2V to 36V, 20A power supply capable of providing 20A at 2V input
- Voltmeter
- Electronic load

Procedure

The MAX20048 EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Verify that all jumpers are in their default positions, as shown in Table 1.
2) Connect the positive and negative terminals of the power supply to IN and GND test pads, respectively.
3) Set the power-supply voltage to 14V and 10A current limit.
4) Connect the positive terminal of the voltmeter to OUT and the negative terminal to GND2.
5) Turn on the power supply.
6) Verify that OUT is approximately 12V.

Additional Evaluation

7) Connect the positive terminal of the electronic load to OUT and the negative terminal to GND2.
8) Set the electronic load to 2A and turn on the load.
9) Verify output voltage on the voltmeter is 12V ±2%.
10) With the load still on, slowly reduce the input voltage from 14V to 8V. Verify output voltage on the voltmeter is 12V ±2%

Table 1. Default Jumper Settings

JUMPER	DEFAULT SHUNT POSITION	FUNCTIONS
EN	ON-Middle	Buck-boost enabled
PGOOD PU	Installed	PGOOD pulls up to VBIAS when OUT is in regulation
SYNC	FPWM-Middle	Forced-PWM mode

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Detailed Description of Hardware

The MAX20048 EV kit provides a proven layout for the MAX20048 buck-boost controller IC. The IC accepts input voltage as high as 36V and can deliver high-load currents, with a 20A (max) input current in boost mode. The EV kit can handle an input-supply transient up to 40V. Various test points are included for evaluation. The EV kit comes installed with a 3mΩ current-sense resistor on the input (R1) and a 4mΩ sense resistor on the output (R2). This sets the input current limit to 16.67A and the runaway current limit to 18.75A. A higher current limit can be set by changing the sense resistors. An optional filter input (IN_FILTER) is provided to test designs with an additional input filter. The default EV kit comes with no filter installed, so input terminal IN must be used.

External Synchronization

The IC can operate in fixed-PWM (FPWM) mode or skip mode. The EV kit comes with a default jumper setting of FPWM. To enable skip mode operation, change the jumper to Skip-Middle. The IC can be synchronized to an external clock by connecting the external clock between the middle and ground pins on the SYNC jumper. The IC is forced to operate in FPWM mode when SYNC is connected to a clock source.

Output Monitoring (PGOOD)

The EV kit provides a power-good output test point (PGOOD) to monitor the status of the buck output (OUT). PGOOD is an open-drain output and is high impedance when the output voltage is in regulation. PGOOD is low impedance when the output voltage drops below 92% (typ) of its nominal regulated voltage. To obtain a logic signal, pull up PGOOD to BIAS by installing a shunt on the PGOOD jumper.

Evaluating Other Voltages

The EV kit comes installed with the MAX20048ATGCA/VY+ and is configured for $12V_{OUT}$ at a 420kHz switching frequency set for 16A (max) input current in boost mode. For evaluating other configurations, refer to the *Design Example* table in the MAX20048 IC data sheet. Other IC options for spread spectrum/SYNCOUT can be installed as well.

EMC Performance

EV kit provides a proven layout that is compliant with CISPR-25 requirements for EMC testing. The default EV kit ($12V_{OUT}$, 420kHz configuration, without spread spectrum) requires no additional filtering to meet the CISPR-25 EMC standards. The IC also comes with the spread-spectrum option, which can be ordered to improve EMC performance.

Specifications Summary

- V_{IN} (min): 2V
- V_{IN} (max): 36V
- V_{OUT}: 12V
- f_{SW}: 420kHz
- I_{OUT} (max): 5A
- Input Current: 16.67A peak current
- Runaway Current: 18.75A peak current
- SPS: Off
- FSYNC: Jumper set to PWM (default)

Ordering Information

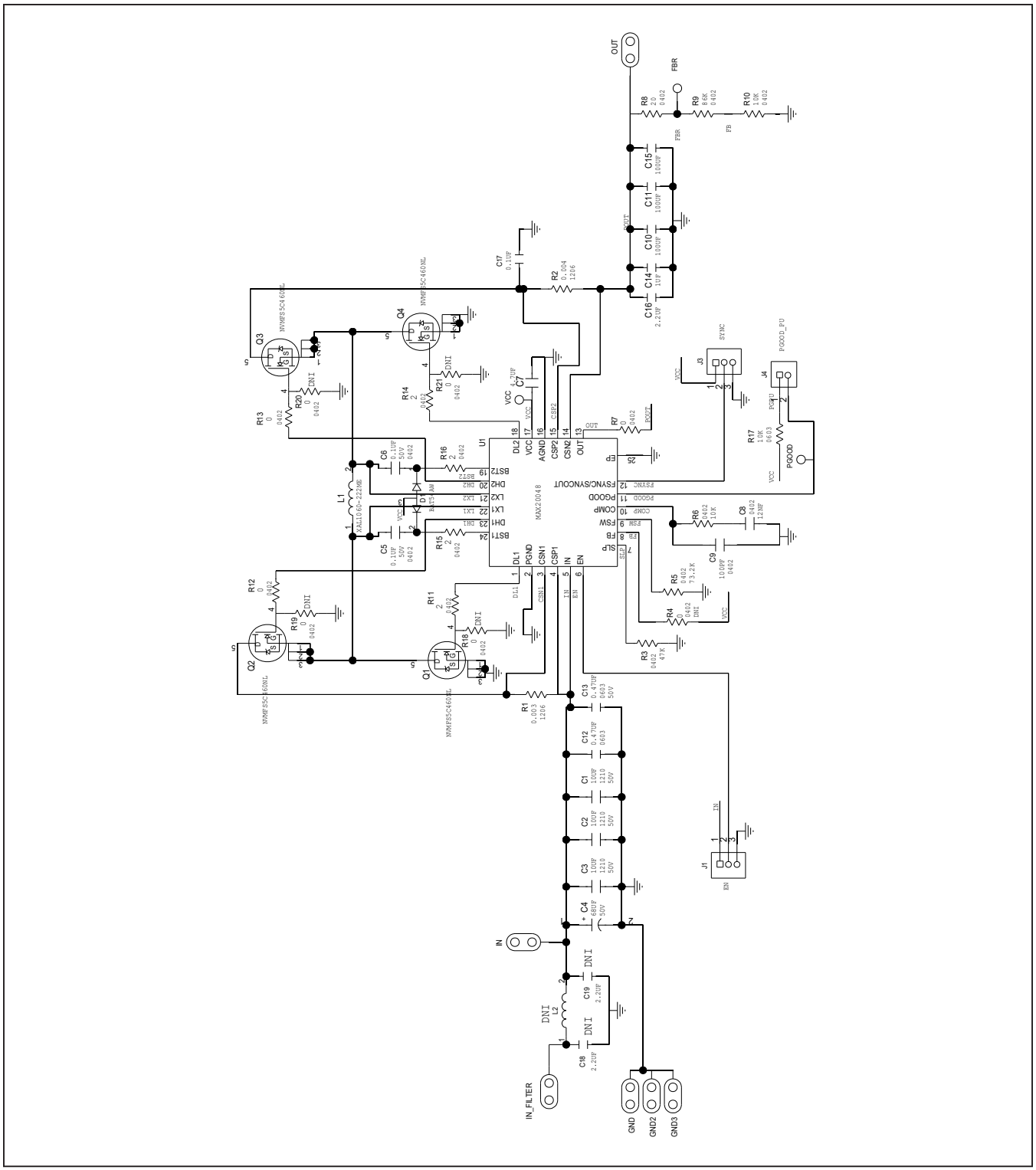
PART	TYPE
MAX20048EVKIT#	12V Output/420kHz EV kit

#Denotes RoHS-compliant.

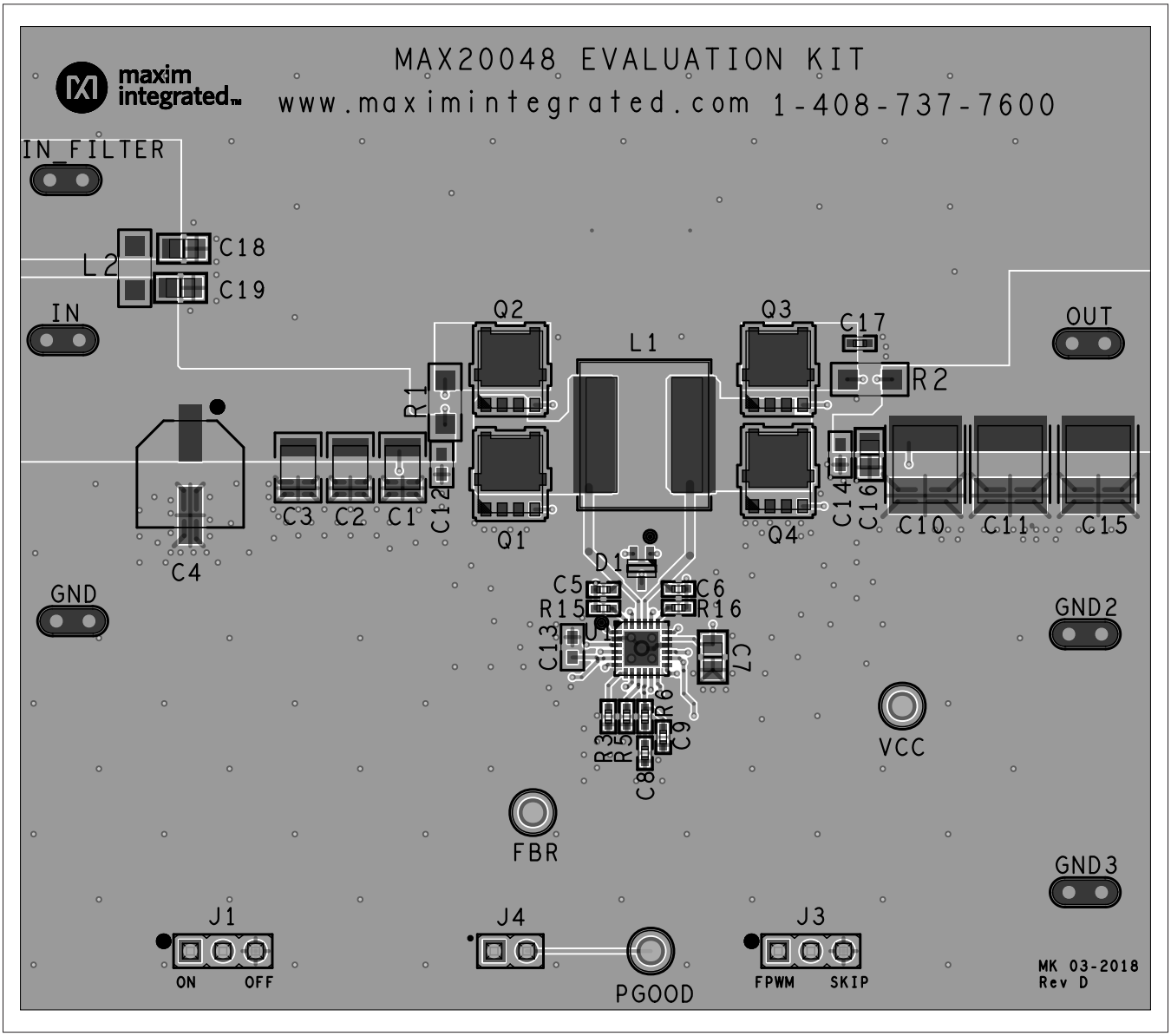
MAX20048 EV Kit Bill of Materials

MAX20048 EVKIT BOM				
REF DES	**QTY**	**MFG PART #**	**MANUFACTURER**	**DESCRIPTION**
C1, C2, C3	3	CGA6P3X7S1H106M	TDK	CAP CER 10UF 50V X7S 1210
C4	1	EEH-ZE1H680P	Panasonic	CAP ALUM POLY 68UF 20% 50V SMD
C5, C6, C17	3	CGA2B3X7R1H104M050BB	TDK	CAP CER 0.1UF 50V X7R 0402
C7	1	CGA4J1X7R1V475K125AE	TDK	CAP CER 4.7UF 35V X7R 0805
C8	1	CGA2B2X7R1E103K050BA	TDK	CAP CER 10000PF 25V X7R 0402
C9	1	C0402C101K4RACAUTO	KEMET	CAP CER SMD 0402 100PF 10% X7R 1
L2	0	--	--	Do Not Install
C10, C11, C15	3	CAA572X7R1V107M	TDK	CAP CER 100uF, 35V, 2220, X7R
C12, C13, C14	3	CGA3E3X7R1H474K080AE	TDK	CAP CER 0.47UF 50V X7R 0603
C16	1	CGA4J1X7R1V225M125AC	TDK	CAP CER 2.2UF 35V X7R 0805
C18, C19	2	--	--	Do Not Install
D1	1	BAT54AWFILMY	ST Microelectronics	DIODE ARRAY SCHOTTKY 40V SOT323
L1	1	XAL1060-222E	Coilcraft	Inductor, 2.2uH
R1	1	PMR18EZPFV3L00	ROHM	RES 0.003 OHM 1% 1W 1206
R2	1	PMR18EZPFV4L00	ROHM	RES 0.004 OHM 1% 1W 1206
R3	1	ERJ-2GEJ473X	Panasonic	RES SMD 47K OHM 5% 1/10W 0402
R5	1	ERA-2AEB7322X	Panasonic	RES SMD 73.2K OHM 5% 1/10W 0402
R6, R10	2	ERA-2AED103X	Panasonic	RES SMD 10K OHM 0.5% 1/16W 0402
R11, R14, R15, R16	4	ERJ-2GEJ2R0X	Panasonic	RES SMD 2 OHM 5% 1/10W 0402
R7, R12, R13	3	RC0402JR-070RL	Yageo	RES SMD 0 OHM JUMPER 1/16W 0402
R8	1	ERJ-2GEJ200X	Panasonic	RES SMD 20 OHM 5% 1/10W 0402
R9	1	ERA-2AEB8662X	Panasonic	RES SMD 86.6KOHM 0.1% 1/16W 0402
R17	1	RC0603JR-0710KL	Yageo	RES SMD 10K OHM 5% 1/10W 0603
R4	1	--	--	Do Not Install
R18, R19, R20, R21	4	--	--	Do Not Install
U1	1	MAX20048ATGA/VY+	Maxim Integrated	Automotive 40V, 55uA Iq, 2.2MHz, H-Bridge Buck-Boost Controller
Q1, Q2, Q3, Q4	4	NVMFS5C460NL	ON Semiconductor	MOSFET N-CH 40V 21A 78A 5DFN
IN_FILTER, IN, OUT, GND, GND2, GND3	6	5020	Keystone Electronics	TEST POINT PC LOW PRO W/OUT BASE
FBR, PGOOD, VCC	3	5012	Keystone Electronics	TEST POINT PC MULTI PURPOSE WHT
ENABLE, SYNC	2	PEC03SAAN	Sullins	CONN HEADER .100 SINGL STR 3POS
J4	1	PEC02SAAN	Sullins	CONN HEADER .100 SINGL STR 2POS

MAX20048 EV Kit Schematic

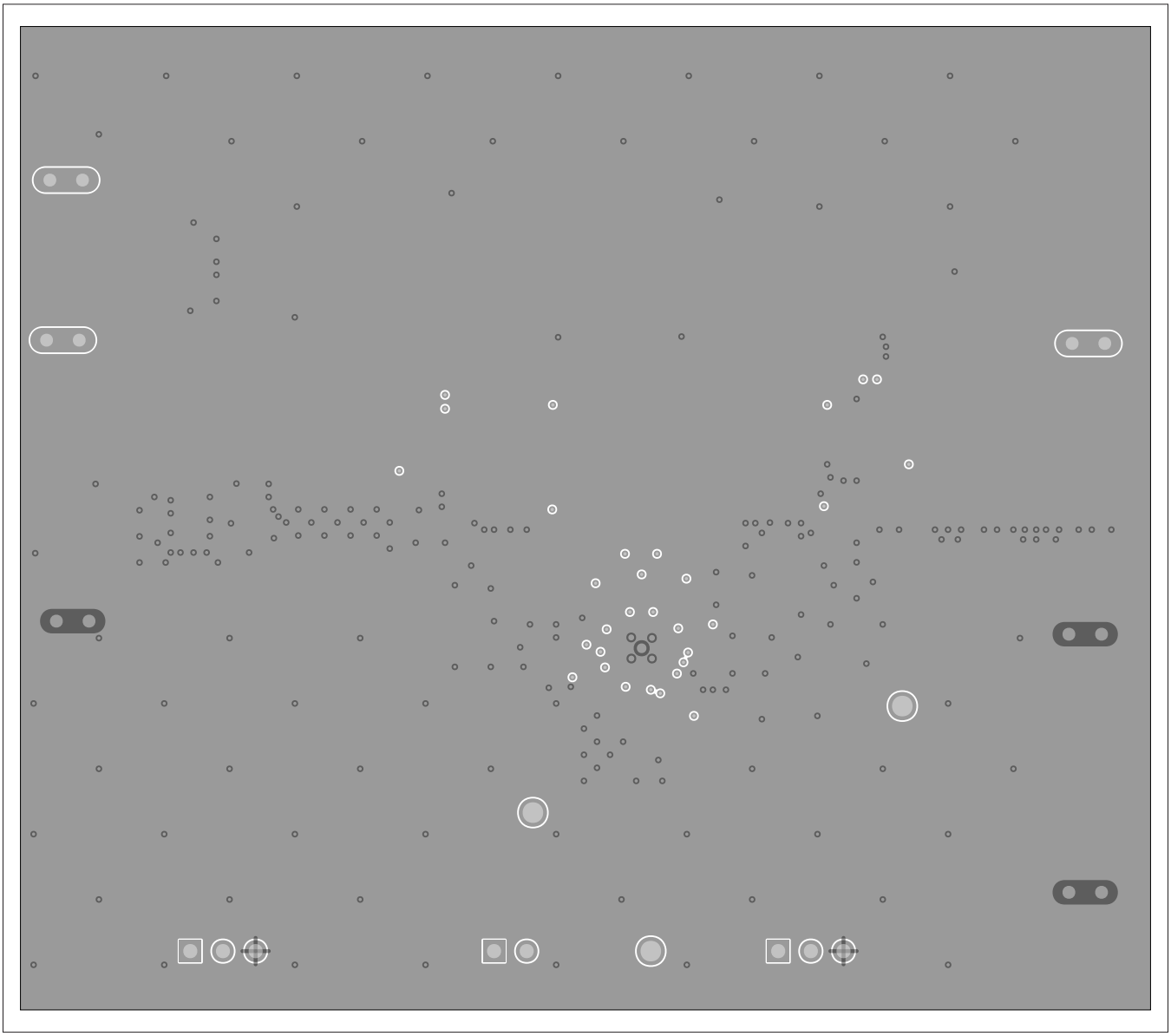


MAX20048 EV Kit PCB Layouts



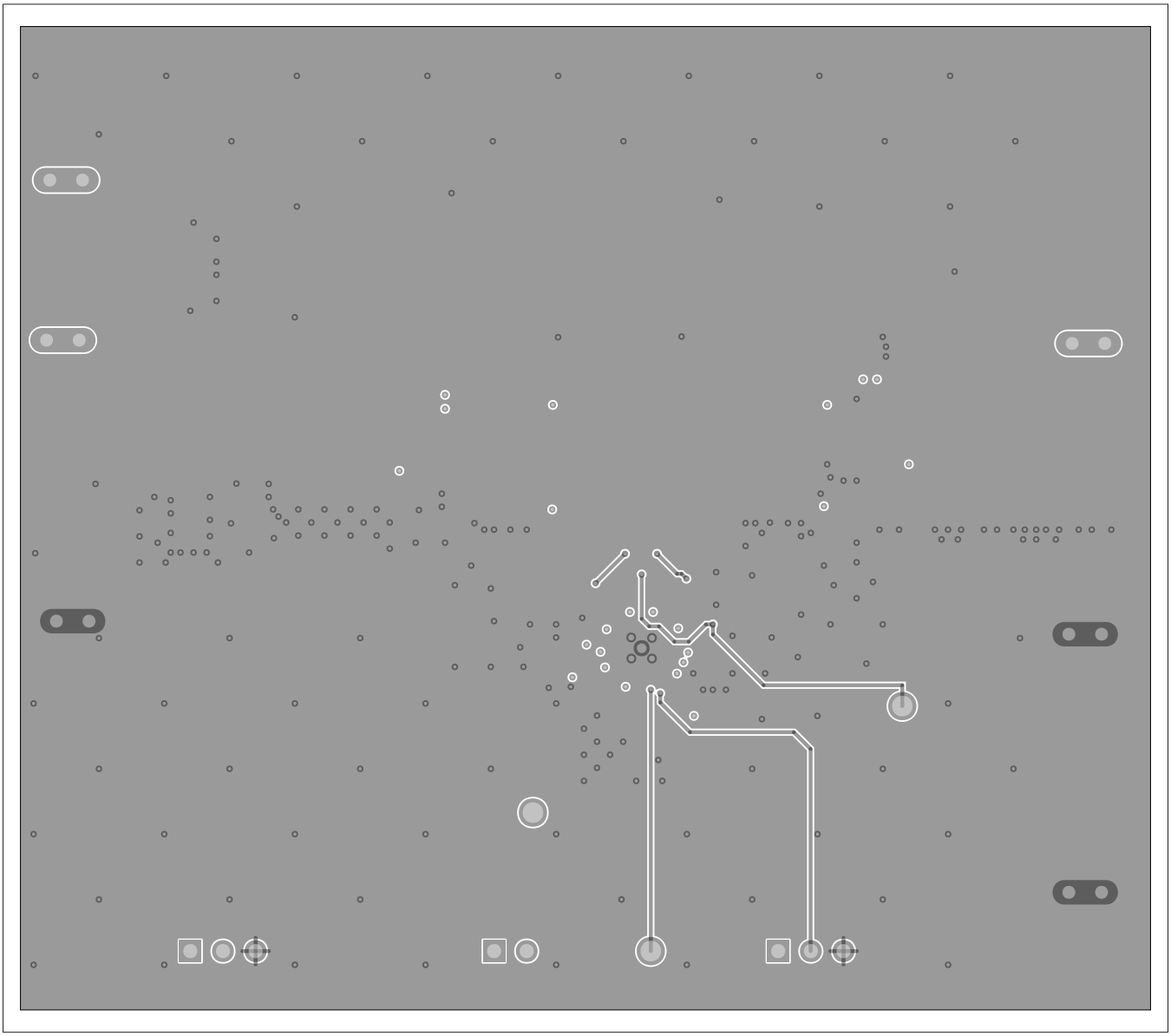
MAX20048 EV Kit Component Placement Guide—Top

MAX20048 EV Kit PCB Layouts (continued)



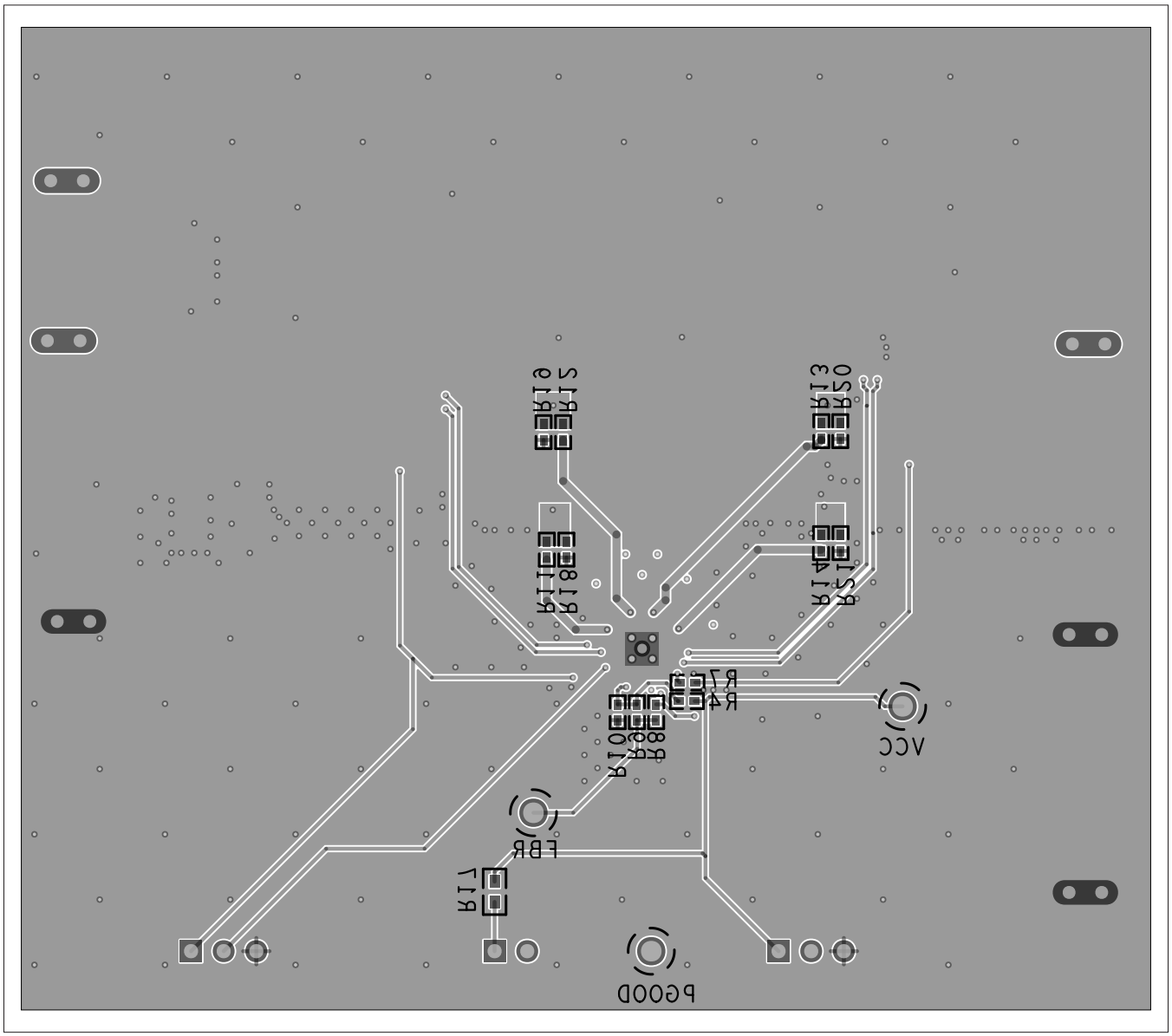
MAX20048 EV Kit PCB Layout—Layer 2

MAX20048 EV Kit PCB Layouts (continued)



MAX20048 EV Kit PCB Layout—Layer 3

MAX20048 EV Kit PCB Layouts (continued)



MAX20048 EV Kit Component Placement Guide—Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/18	Initial release	—

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