

General Description

The MAX25203 evaluation kit (EV kit) is a fully assembled and tested board for evaluating the MAX25203 dual-phase automotive synchronous boost controller. The MAX25203 enables infotainment systems to stay in regulation during cold crank or start-stop operation all the way down to battery input of 1.8V. It can also be used to generate backlight voltage and class D audio amplifier voltages. This device can start with an input voltage supply from 4.5V to 42V and can operate down to 1.8V after start-up and has a low 5 μ A shutdown supply current.

The MAX25203 features a power-OK monitor, overvoltage and undervoltage lockout. Protection features include cycle-by-cycle current limit and thermal shutdown. It is specified for operation over the -40°C to +125°C automotive temperature range.

MAX25203 EV Kit Files

FILE	DESCRIPTION
SetupMAX25203EVkitV1.exe	Windows GUI Installer

Ordering Information

PART	TYPE
MAX25203EVKIT#	EV Kit

#Denotes RoHS compliance.

Features

- Meets Stringent OEM Module Power Consumption and Performance Specifications
 - $\pm 1.5\%$ Output-Voltage Accuracy at FB
 - Output Voltage Adjustable Between 12V and 65V
 - 5 μ A Shutdown Supply Current
- High Efficiency and Current Sharing
 - Preset Gate Drive Voltage for External MOSFETs from 5.5V to 10V Allows User to Optimize External MOSFETs
 - Current Sharing Accuracy is $\pm 5\%$ Between 2 Phases to Improve System Efficiency
- EMI Reduction Features Reduce Interference with Sensitive Radio Bands without Sacrificing Wide Input Voltage Range
 - Spread-Spectrum Option
 - Frequency-Synchronization Input
 - Resistor-Programmable Frequency Between 200kHz and 2.2MHz
- Integration and Thermally Enhanced Packages Save Board Space and Cost
 - Current-Mode Controllers with Forced-Continuous and Skip Modes
 - Side Wettable 32-Pin TQFN-EP Package
- Protection Features and I2C diagnostics for Improved System Reliability
 - Supply Undervoltage Lockout
 - Die Temperature Monitoring via I2C
 - Short Circuit Protection with True Shutdown
 - Individual Phase Current Monitoring via I2C

Quick Start

Required Equipment

- MAX25203 EV kit
- 12V DC power supply or battery
- Digital multimeter (DMM)
- Electronic load

Procedure (Stand-Alone)

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

Caution: Do not turn on the power supply until all connections are completed.

- 1) Verify the jumpers are set to the default positions as shown in [Table 1](#).
- 2) Preset the power supply voltage between 5V and 36V, and make sure the current limit is adequate for the desired load.
- 3) Disable or turn off the power supply. Do not turn on the supply until all connections are completed.
- 4) Connect the power supply to the BATT screw terminals on the EV kit.
- 5) Connect the load to the OUT screw terminals on the EV kit.
- 6) Turn on or enable the power supply.
- 7) With the DMM, verify the voltage from the OUT to GND terminal of the EV kit is 40V.

Software Setup and Procedure

- 1) Download the latest version of the EV kit software for Windows® 7/Windows® 10 from www.maximintegrated.com/evkitsoftware.
- 2) Install the software on your PC by running the installer.
- 3) Connect the USB cable from your PC to the EV kit (USB connector on module installed at U2).
- 4) Verify the jumpers are set to the default positions as shown in [Table 1](#). To allow the software to control the output voltage, set J1 to position 2-3 (for fixed output voltage set to 1-2).
- 5) Preset the power supply voltage between 5V and 36V, and make sure the current limit is adequate for the desired load.
- 6) Disable or turn off the power supply. Do not turn on the supply until all connections are completed.
- 7) Connect the power supply to the BATT screw terminals on the EV kit.
- 8) Connect the load to the OUT screw terminals on the EV kit.
- 9) Turn on or enable the power supply.
- 10) Launch the EV kit software application.
- 11) The EV kit software can be used to monitor the status and set various settings of the MAX25203. Refer to the MAX25203 data sheet for details.

Table 1. Jumper Settings

JUMPER	DESCRIPTION	DEFAULT
J1	Feedback Select. Connect 1-2 for external feedback divider (40V output). Connect 2-3 to use I2C or PWM input for setting the output voltage.	1-2
J2	SCL pullup resistor.	1-2
J3	SDA pullup resistor.	1-2
J10	Enable. Connect 1-2 to enable controller, or 2-3 to disable.	1-2
J13	PGOOD LED and pullup resistor. Connect 1-2 to use LED and pullup.	1-2
J22	Test header. Do not connect.	OPEN
J26	PWM input. Leave open when using the PWM input to control the output voltage. Connect 2-3 to set PWM low (recommended when not using the PWM input). Connect 1-2 to set PWM high.	2-3
J27	Leave open	OPEN
J28	FSYNC clock select. Leave open when synchronizing the clock to an external source connected to FSYNC. Connect 1-2 for internal clock with forced PWM switching. Connect 2-3 for skip mode operation.	1-2

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Detailed Description of Hardware

Enable/Shutdown

Enable/shutdown control is set by jumper J10 on the EV kit (see [Table 1](#)). Set J1 to the ON position for normal operation, or OFF for shutdown. In shutdown mode, the MAX25203 shuts off its internal circuitry to reduce the current draw to below 5 μ A.

An external logic signal can be used to control the enable/shutdown. For this, remove the shunt from J1 and connect the enable signal to pin 2 of J1.

Skip Mode/Forced-PWM Operation

Use J28 to select between skip mode and forced-PWM operation. Skip mode is used to optimize light-load efficiency by allowing the controller to switch only as necessary to maintain regulation. Forced-PWM keeps the switching frequency constant over the full-load range. Refer to the MAX25203 data sheet for more information.

PGOOD

PGOOD is an open-drain output of the MAX25203 that pulls low when the output is out of regulation. The EV kit includes an LED to indicate the PGOOD status (LED lights when output is out of regulation).

This LED and pullup resistor can be disconnected by removing the shunt from J13. This is recommended when measuring supply current.

Note the 3.3V pullup and LED supply is provided by the I2C interface board. If this is not connected when evaluating a stand-alone operation, an external logic supply can be connected to pin 1 of J4.

External Synchronization

To synchronize to an external, remove the shunt from J28 and connect the clock signal to the FSYNC terminal. When using an external clock, the MAX25203 operates in forced-PWM mode and spread-spectrum does not apply.

Note that the EV kit is optimized for 400kHz operation. A significant change from this frequency may require additional component changes. Refer to the MAX25203 data sheet for information on component selection.

PWM Voltage Control

To use the PWM voltage control feature of the MAX25203, connect J1 pins 2-3, remove the shunt from J26 and connect the PWM control signal to the PWM terminal of the EV kit. Refer to the MAX25203 data sheet for more information on the PWM voltage control feature.

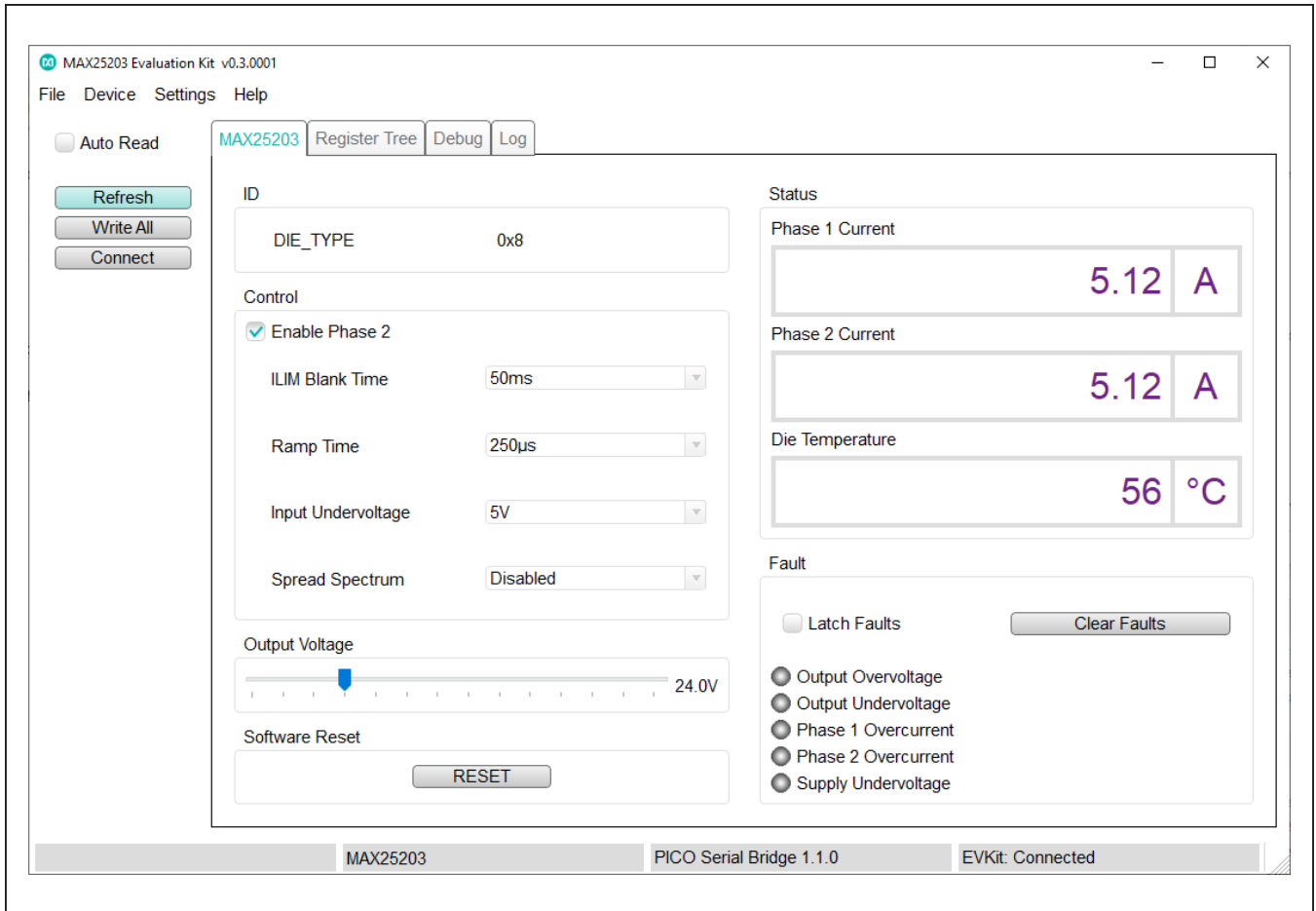


Figure 1. MAX25203 EV Kit GUI

MAX25203 EV Kit Bill of Materials

REF DES	QTY	MANUFACTURER PART NUMBER	VALUE	DESCRIPTION
C1	1	MURATA GCM188R71E-472KA37	4700PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 4700PF; 25V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; AUTO
C2, C6, C8-C11	6	PANASONIC EEH-ZC1H121P	120UF	CAP; SMT (CASE_G); 120UF; 20%; 50V; ALUMINUM-ELECTROLYTIC
C3	1	TDK CGA3E2X7R1H-473K080AA	0.047UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.047UF; 50V; TOL=10%; MODEL=X7R; TG=-55 DEGC TO +125 DEGC; TC=X7R
C4	1	TDK CGA3E1X7R-0J225K080AC	2.2UF	CAPACITOR; SMT (0603); CERAMIC; 2.2UF; 6.3V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; AUTO
C5	1	MURATA GC-M1885C2A220JA16	22PF	CAPACITOR; SMT (0603); CERAMIC CHIP; 22PF; 100V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G; AUTO
C7, C13, C20, C21, C43, C44	6	MURATA GCJ188R71H-104KA12	0.1UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; AUTO
C12	1	TDK CGA5L3X7R1H475K-160AB	4.7UF	CAPACITOR; SMT (1206); CERAMIC CHIP; 4.7UF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; AUTO
C22	1	MURATA GCM21BR71C-475KA73	4.7UF	CAP; SMT (0805); 4.7UF; 10%; 16V; X7R; CERAMIC CHIP; NOTE: AUTO
C24, C25, C32, C34, C36	5	UNITED CHEMI-CON EMH-S101ARA151MKG5S	150UF	CAP; SMT (CASE_KG5); 150UF; 20%; 100V; ALUMINUM-ELECTROLYTIC
C28, C35, C37, C38, C40, C41	6	TDK CGA6M3X-7S2A475K200AE	4.7UF	CAPACITOR; SMT (1210); CERAMIC CHIP; 4.7UF; 100V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7S; AUTO
D1, D2	2	DIODES INC BAV116WSQ		DIODE; SWT; SMT (SOD-323); PIV=85V; IF=0.215A
DRV	1	KEystone 5007		TEST POINT
DS1	1	LITE-ON LTST-C190KRKT		DIODE; LED; ULTRA BRIGHT AlInCaP CHIP LED; RED; SMT; VF=2V; IF=0.025A
J1, J10, J22, J26, J28	5	SULLINS PCC03SAAN		CONNECTOR; MALE; THROUGH HOLE; BREAK-AWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC
J2, J3, J13, J18, J19	5	SULLINS PCC02SAAN		CONNECTOR; MALE; THROUGH HOLE; BREAK-AWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC
J4	1	SULLINS PPTC102LJBN-RC		CONNECTOR; FEMALE; THROUGH HOLE; BREAK-AWAY HEADER; RIGHT ANGLE; 20PINS

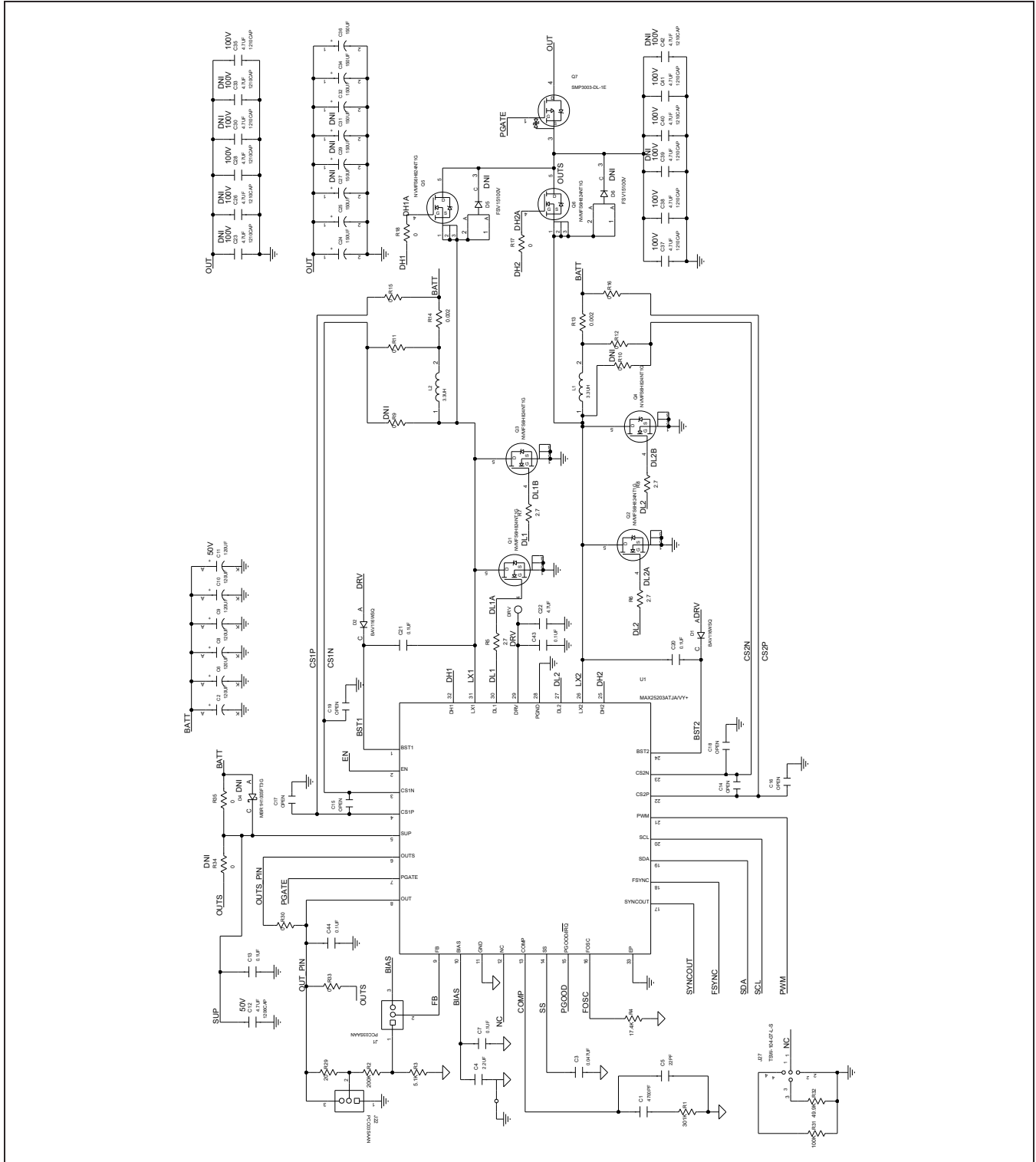
MAX25203 EV Kit Bill of Materials (continued)

REF DES	QTY	MANUFACTURER PART NUMBER	VALUE	DESCRIPTION
J11, J12, J14, J15	4	SAMTEC SSM-103-L-DV		CONNECTOR; FEMALE; SMT; DOUBLE ROW; STRAIGHT; 6PINS
J16, J17	2	KEYSTONE 8199-2		PC SCREW TERMINAL; THROUGH-HOLE; STRAIGHT; 6-32 X 1/4L SCREW; RED; 6PINS
J20, J21	2	SAMTEC SSW-112-22-F-D-VS		CONNECTOR; FEMALE; SMT; 0.025 POST SOCKET; STRAIGHT; 24PINS
J27	1	SAMTEC TSW-104-07-L-S		EVKIT PART-CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 4PINS
J29, J30, J33, J34	4	KEYSTONE 8199-3		PC SCREW TERMINAL; THROUGH-HOLE; STRAIGHT; 6-32 X 1/4L SCREW; BLACK; 6PINS
J31, J32	2	KEYSTONE 8199-7		PC SCREW TERMINAL; THROUGH-HOLE; STRAIGHT; 6-32 X 1/4L SCREW; YELLOW; 6PINS
L1, L2	2	COILCRAFT XAL1010-332ME	3.3UH	INDUCTOR; SMT; COMPOSITE CORE; 3.3UH; TOL=+/-20%; 18.2A
LX1, LX2	2	HARWIN S2751-46		TESTPOINT; SMT; TEST TERMINAL 2MMX1.2MM; TIN FINISH
MH1-MH4	4	KEYSTONE 9032		MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
Q1-Q6	6	ON SEMICONDUCTOR NVMF-S6H824NT1G		TRAN; NCH; SO-8FL; PD-(115W); I-(107A); V-(80V)
Q7	1	ON SEMICONDUCTOR SMP3003-DL-1E		TRAN; PCH; POWER MOSFET; SOT-263-2L; PD-(90W); I-(-100A); V-(-75V)
R1	1		301K	RESISTOR; 0603; 301K; 1%; 100PPM; 0.1W; THICK FILM
R2	1		200K	RESISTOR; 0603; 200K OHM; 0.1%; 100PPM; 0.1W; THICK FILM
R3	1		5.1K	RESISTOR; 0603; 5.1K OHM; 0.1%; 25PPM; 0.1W; THIN FILM
R4	1		17.4K	RESISTOR; 0603; 17.4K OHM; 1%; 100PPM; 0.10W; THICK FILM
R5-R8	4		2.7	RESISTOR, 0603, 2.7 OHM, 1%, 100PPM, 0.10W, THICK FILM
R11, R12, R15-R18, R30, R33, R35	9		0	RESISTOR; 0603; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM
R13, R14	2		0.002	RES; SMT (2512); 0.002; 2%; +/-100PPM/DEGC; 3W
R19, R20	2		4.7K	RESISTOR; 0603; 4.7K; 1%; 100PPM; 0.10W; THICK FILM

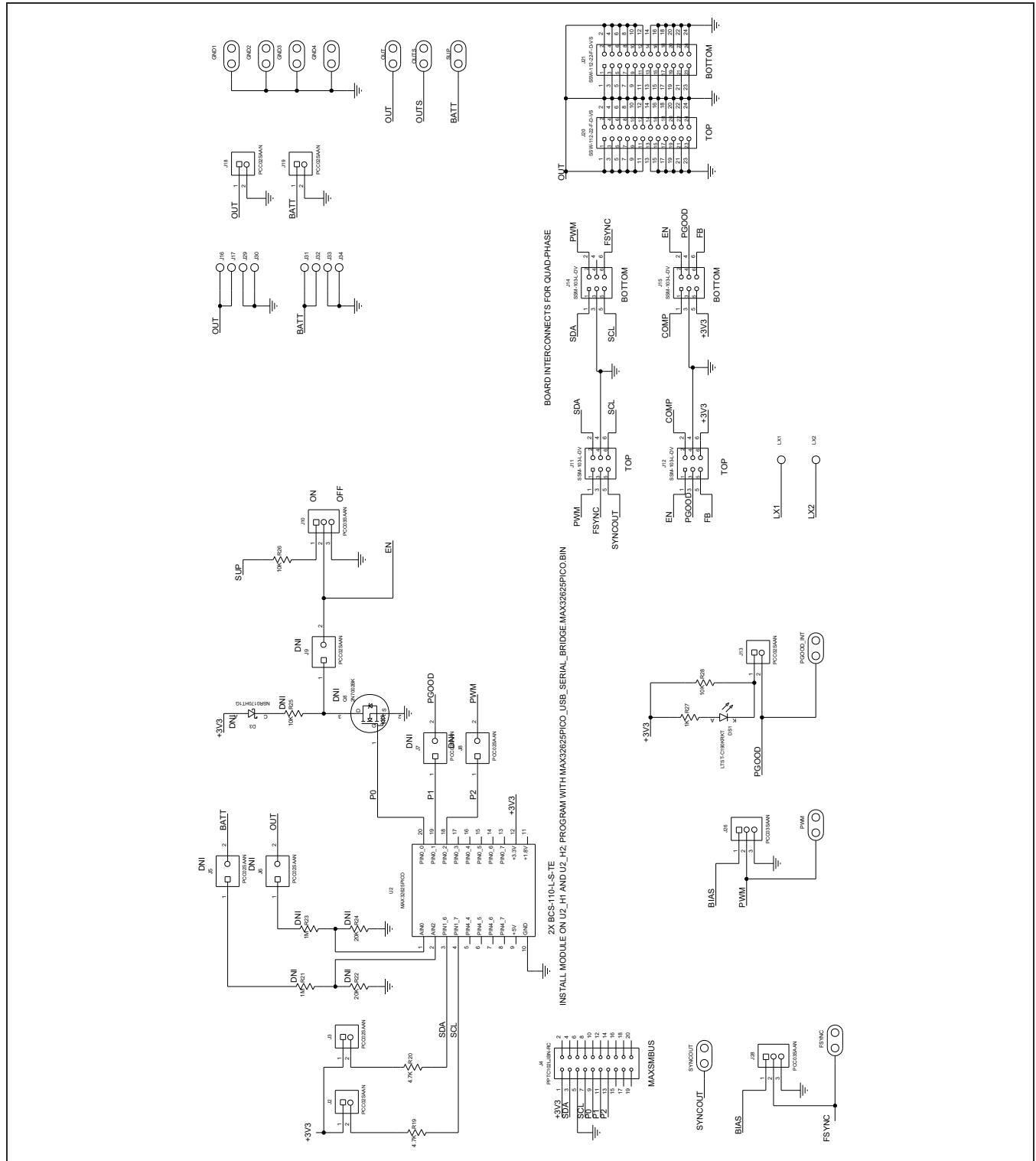
MAX25203 EV Kit Bill of Materials (continued)

REF DES	QTY	MANUFACTURER PART NUMBER	VALUE	DESCRIPTION
R26, R28	2		10K	RESISTOR; 0603; 10K OHM; 5%; 200PPM; 0.10W; THICK FILM
R27	1		1K	RESISTOR; 0603; 1K OHM; 5%; 200PPM; 0.10W; THICK FILM
R29	1		20	RESISTOR, 0603, 20 OHM, 1%, 100PPM, 0.10W, THICK FILM
R31	1		100K	RESISTOR; 0603; 100K; 1%; 100PPM; 0.10W; THICK FILM
R32	1		49.9K	RESISTOR; 0603; 49.9K OHM; 1%; 100PPM; 0.10W; THICK FILM
U1	1	MAXIM MAX25203ATJA/VY+		DUAL-PHASE SYNCHRONOUS BOOST CONTROLLER
U2	2	SAMTEC BCS-110-L-S-TE		CONNECTOR; FEMALE; THROUGH HOLE; TIGER CLAW PASS-THROUGH SOCKET; STRAIGHT; 10PINS
U2_MODULE	1	MAXIM MAX32625PICO		
C23, C26, C30, C33, C39, C42	0		DNI	
C27, C29, C31	0		DNI	
D3	0		DNI	
D4	0		DNI	
D5, D6	0		DNI	
J5-J9	0		DNI	
Q8	0		DNI	
R9, R10, R34	0		DNI	
R21, R23	0		DNI	
R22, R24	0		DNI	
R25	0		DNI	
C14-C19	0		DNI	

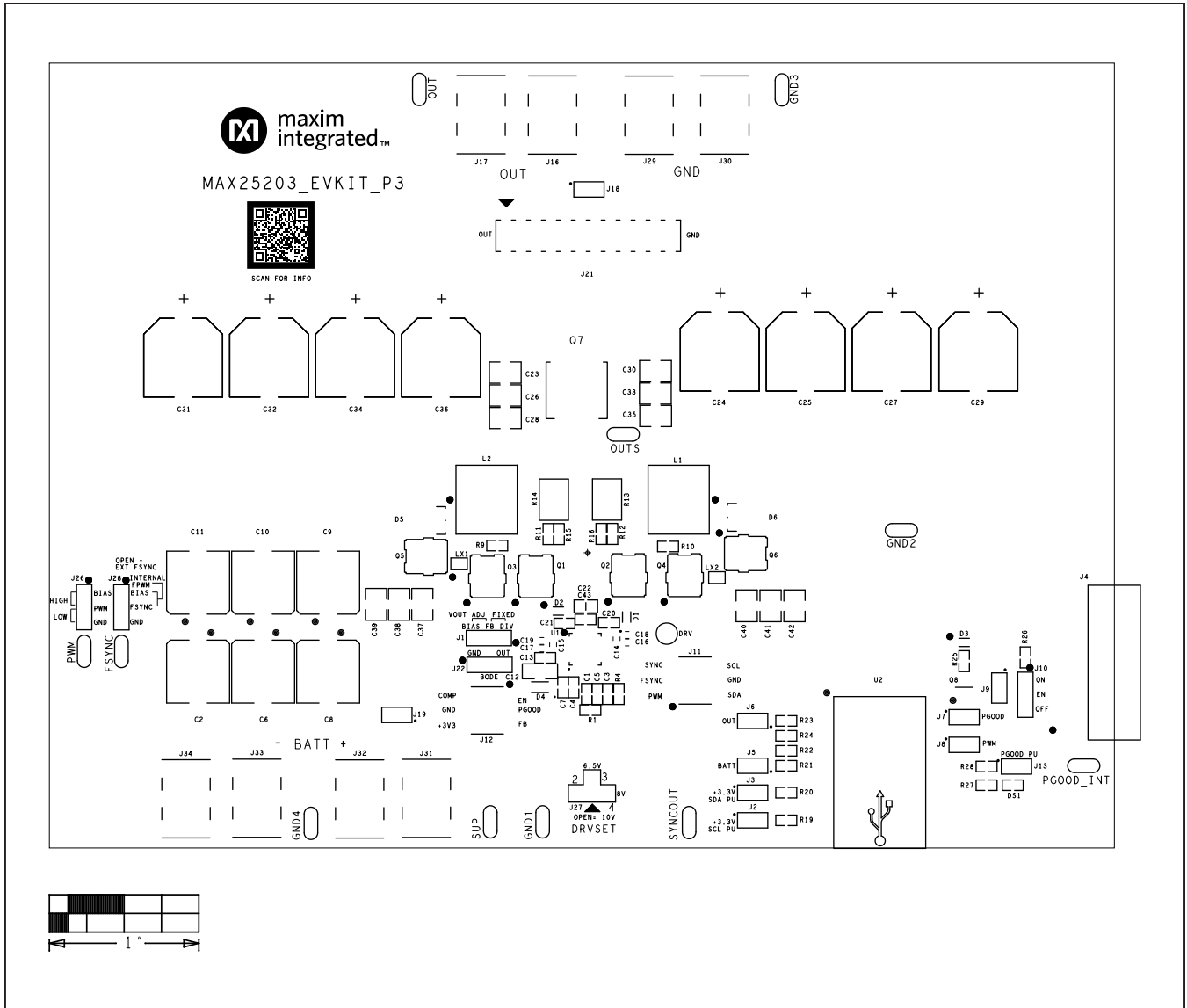
MAX25203 EV Kit Schematics



MAX25203 EV Kit Schematics (continued)

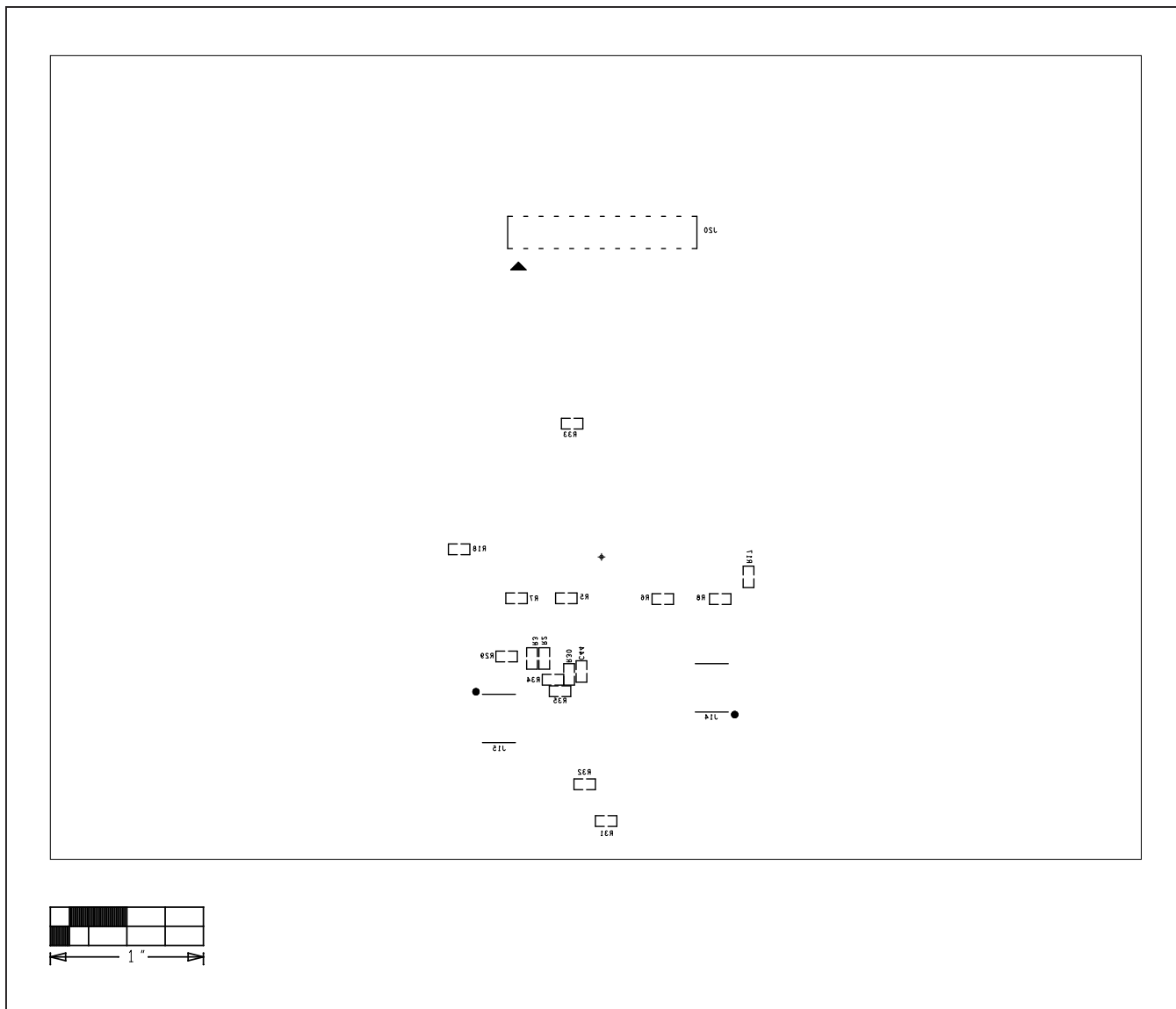


MAX25203 EV Kit Layouts

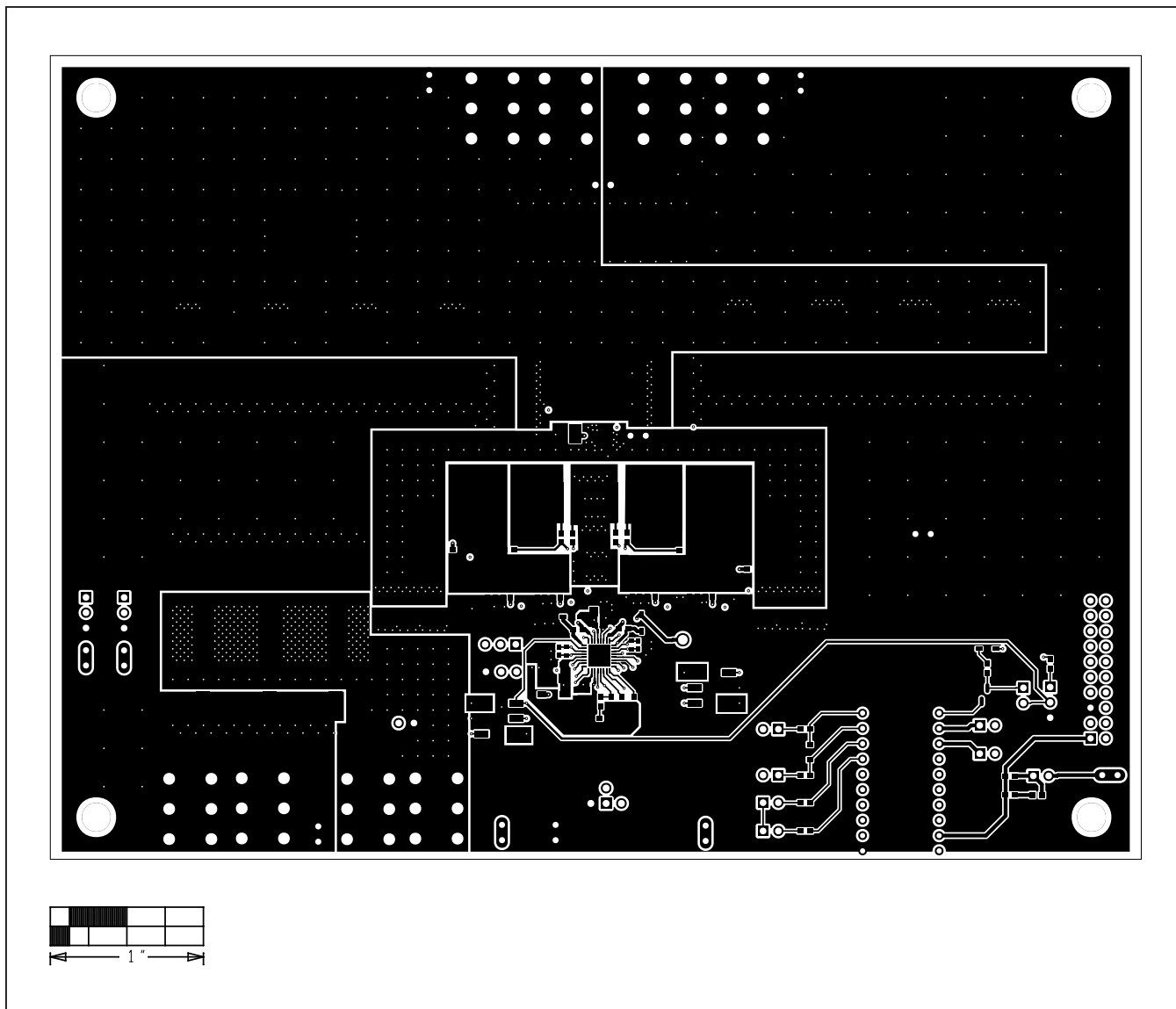


MAX25203 EV Kit Component Placement Guide—Top Silkscreen

MAX25203 EV Kit Layouts (continued)



MAX25203 EV Kit Layouts (continued)



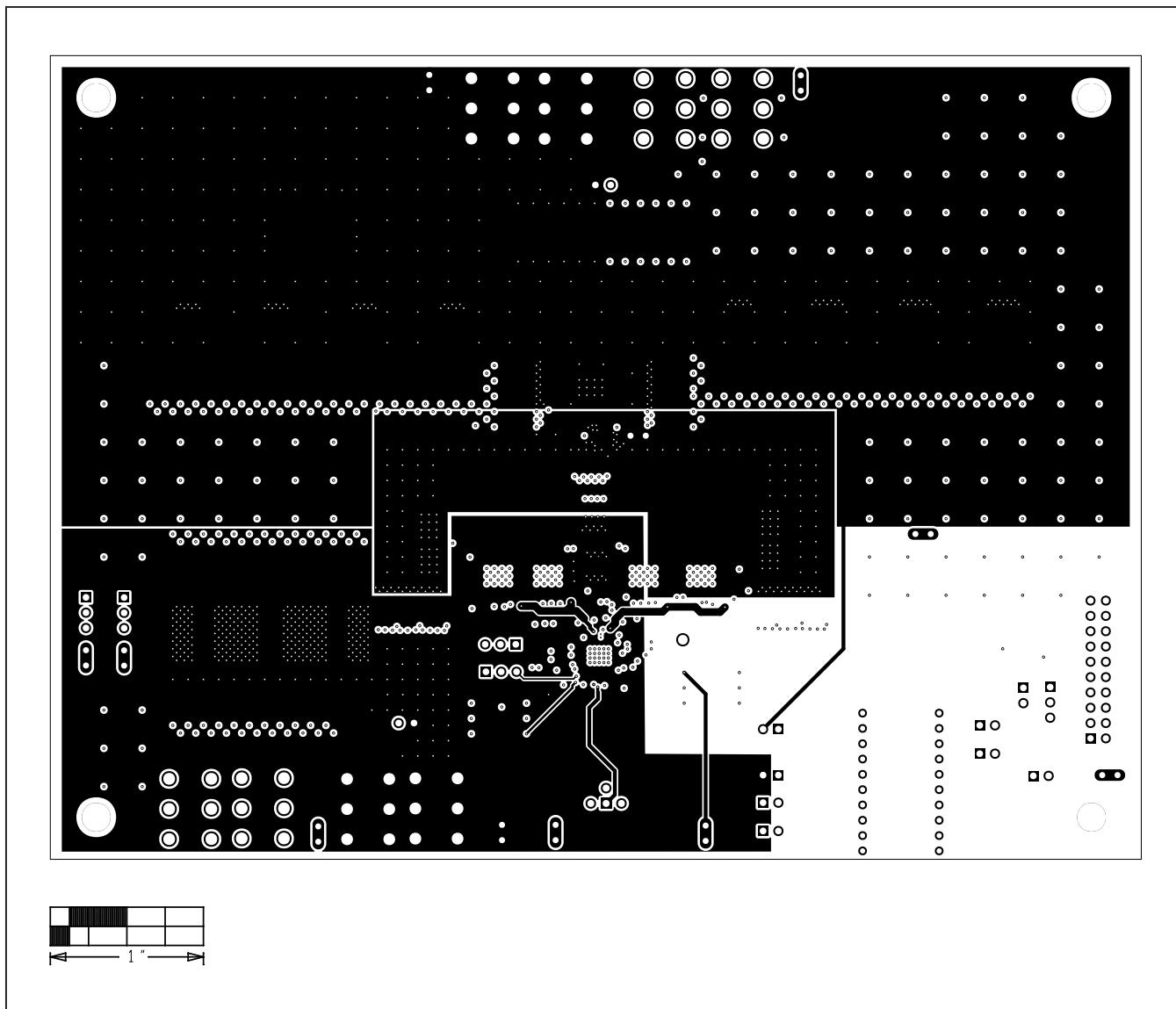
MAX25203 EV Kit PCB Layout—Top

MAX25203 EV Kit Layouts (continued)



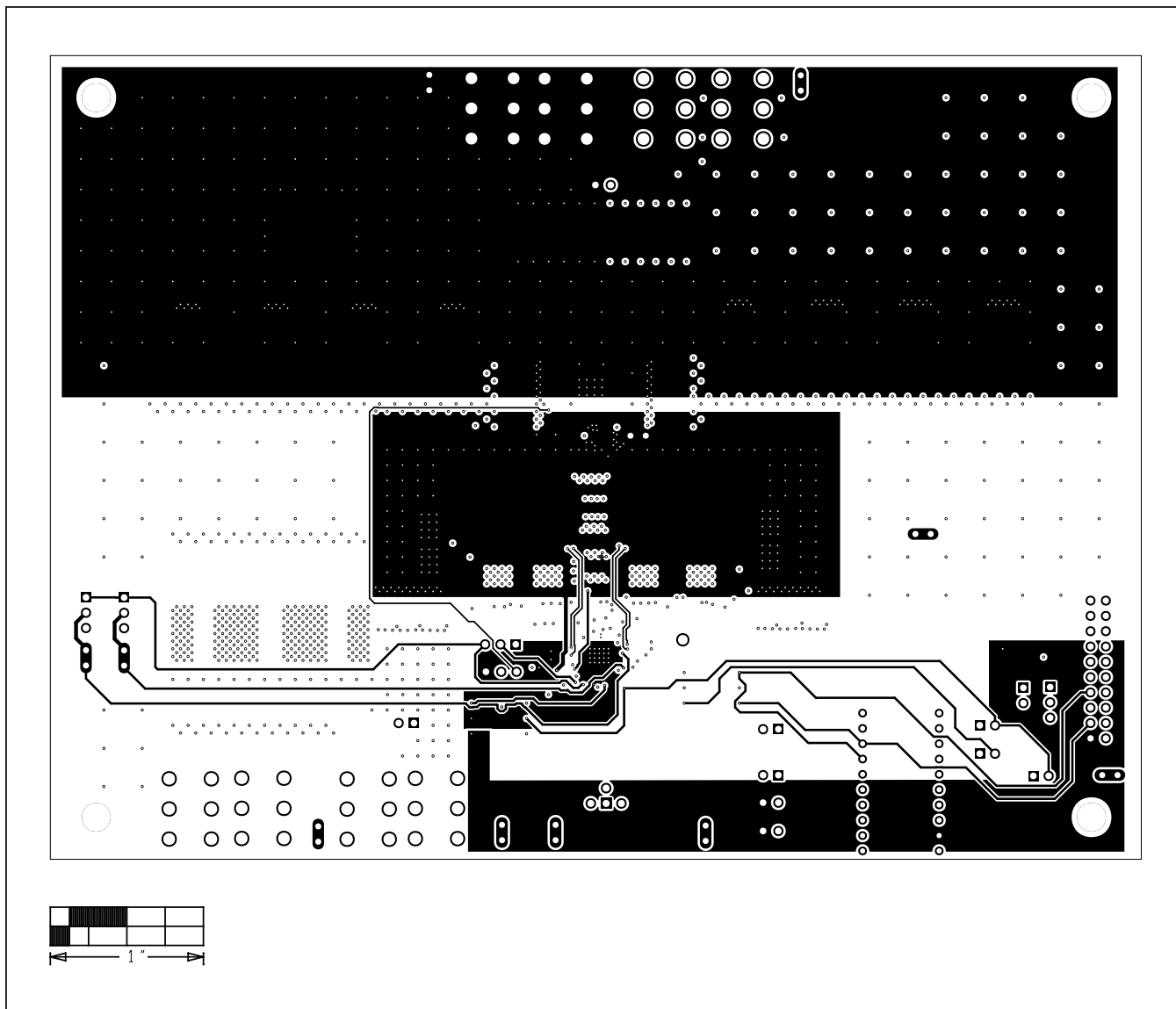
MAX25203 EV Kit PCB Layout—LAYER-2

MAX25203 EV Kit Layouts (continued)



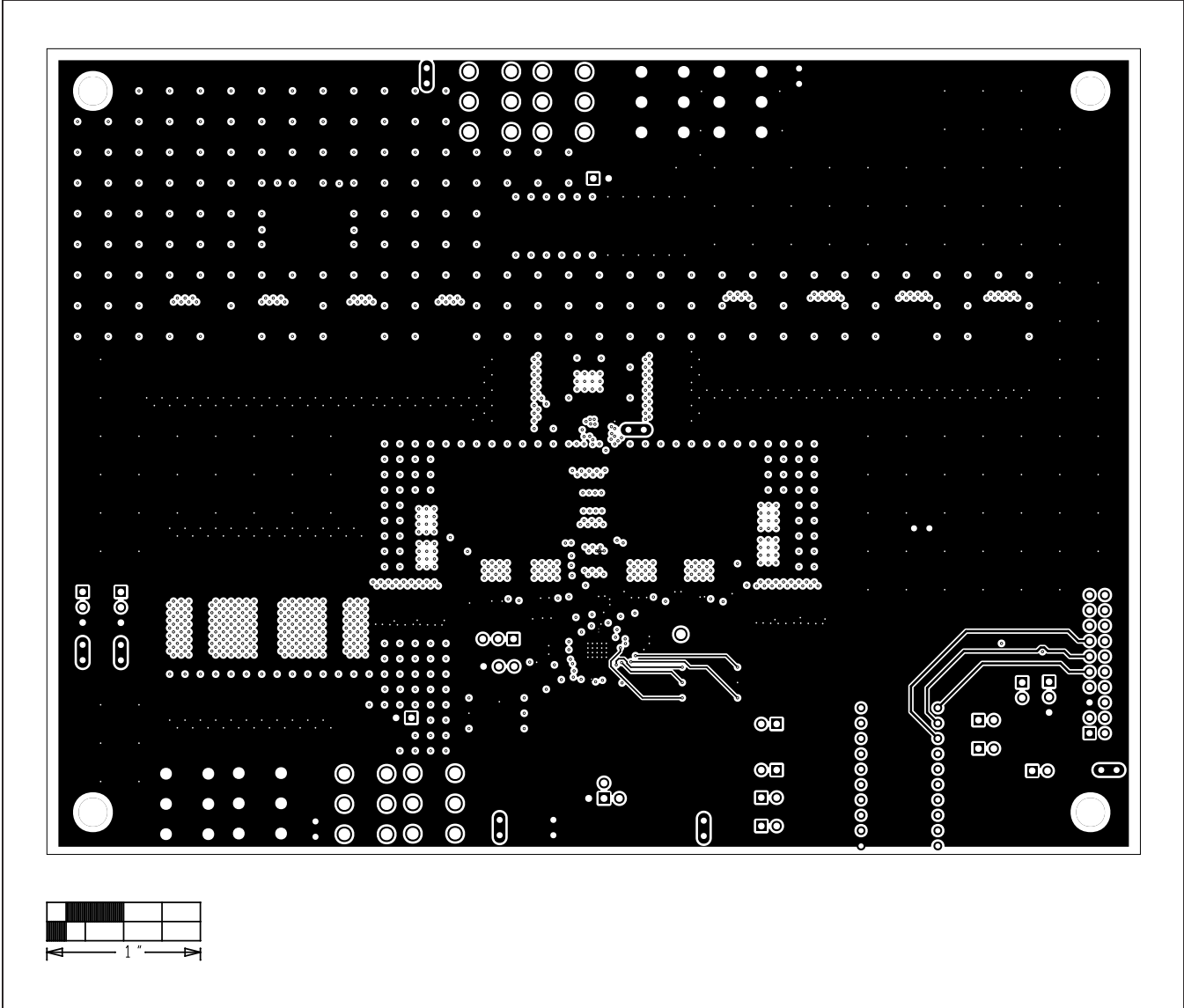
MAX25203 EV Kit PCB Layout—LAYER-3

MAX25203 EV Kit Layouts (continued)



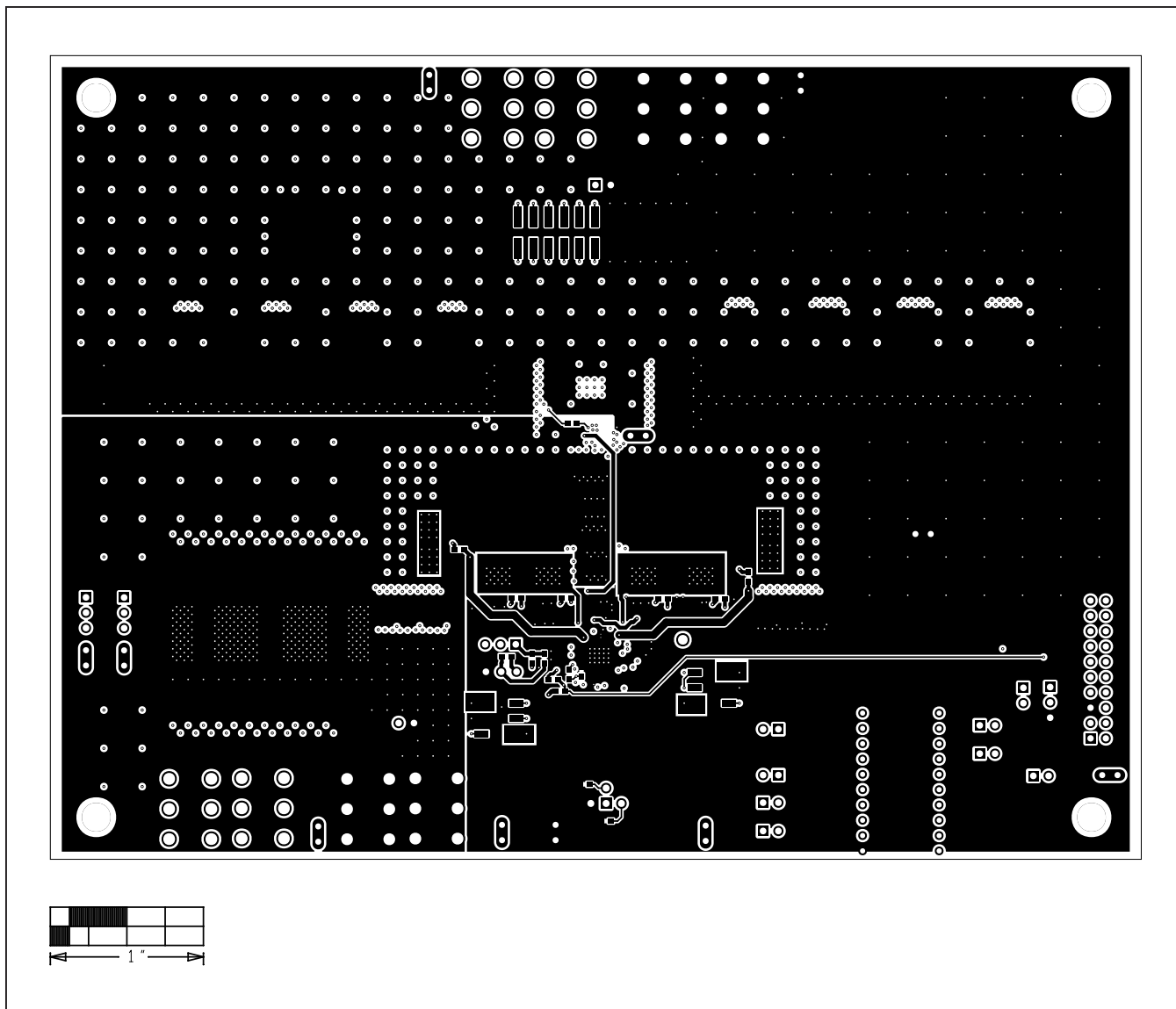
MAX25203 EV Kit PCB Layout—LAYER-4

MAX25203 EV Kit Layouts (continued)



MAX25203 EV Kit PCB Layout—LAYER-5

MAX25203 EV Kit Layouts (continued)



MAX25203 EV Kit PCB Layout—BOTTOM

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/21	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at <https://www.maximintegrated.com/en/storefront/storefront.html>.

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