Click here to ask an associate for production status of specific part numbers.

Evaluates: MAX20812/MAX20812T

MAX20812 Evaluation Kit

General Description

The MAX20812 evaluation kit (EV kit) is a reference platform designed for the evaluation of the MAX20812/MAX20812T, a dual-output, compact, low-cost, fully integrated, highly efficient, step-down DC-DC switching regulator IC. The IC is available in a 21-pin, 3.5mm x 4.6mm, 0.5mm pitch, FC2QFN package. This EV kit can deliver up to 6A load per output. For the MAX20812, the two outputs can be connected as a single-output, dual-phase regulator that supports up to 12A load current. Refer to the MAX20812 IC data sheet for more information.

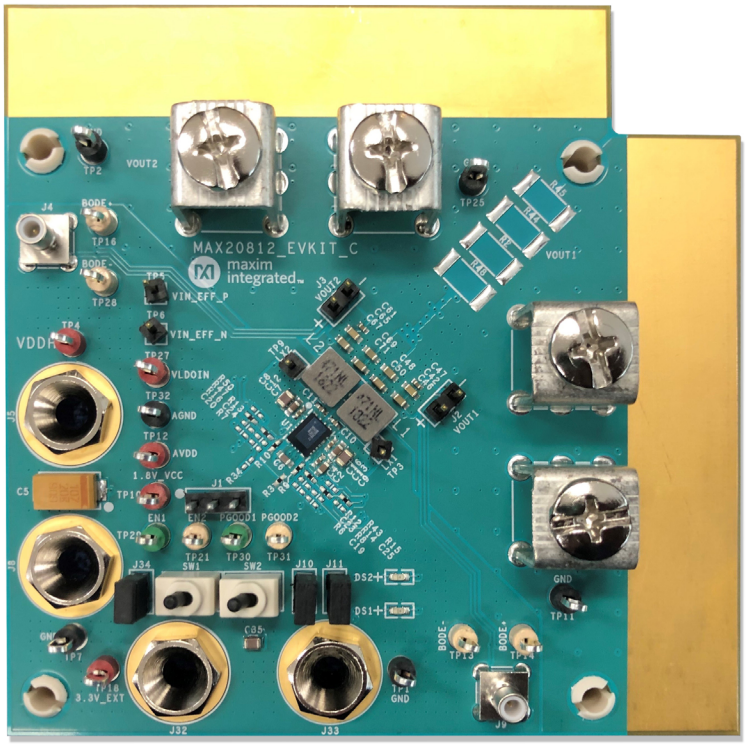
The EV kit comprises a fully assembled and tested PCB implementation of the MAX20812/MAX20812T. Jumper pins, test points, and input/output connectors are included for flexibility and convenience in a wide range of applications.

Benefits and Features

- 2.7V to 16V Input Voltage Range
- 0.5V to 5.8V Output Voltage Range
- High Efficiency and Power Density
- Low Component Count
- Dual-Output (MAX20812/MAX20812T) or Single-Output Dual-Phase Operation (MAX20812)
- Optimized Performance
- Proven PCB Layout
- Fully Assembled and Tested

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

MAX20812 EV Kit Board



319-100620; Rev 3; 10/22

One Analog Way, Wilmington, MA 01887 U.S.A. | Tel: 781.329.4700 |

Quick Start

Required Equipment

- MAX20812 EV Kit
- 2.7V to 16V Power Supply with Optional 3.3V External Power Supply
- 0 to 12A Load
- Digital Voltmeters
- Oscilloscope and Probes

Procedure

The EV kit is fully assembled and tested, and is preset with MAX20812/MAX20812T dual-output operation, having 1V on rail 1 and 1.8V on rail 2. Use the following steps to verify board operation.

For dual-output operation (MAX20812/MAX20812T):

1) Connect a powered-off 2.7V to 16V input supply to J5 (positive terminal) and J8 (negative terminal). Optionally, connect supply sense leads to TP5 (positive sense) and TP6 (negative sense) for best accuracy. If external bias is preferred, connect a powered-off 3.3V power supply to J32 (positive terminal) and J33 (negative terminal) with jumper J34 installed.
2) Connect the load to edge connector J12 for rail 1 or J13 for rail 2 (positive on the top and negative on the bottom).
3) Connect the V_{OUT} scope probe/voltmeter to J2 for rail 1 or J3 for rail 2.
4) Turn on the power supply.
5) Position the SW1 or SW2 toggle switch to enable the IC.
6) Observe that V_{OUT1} = 1V and V_{OUT2} = 1.8V.
7) For efficiency measurements, TP5 and TP6 will be used to measure V_{IN}; J2 and J3 will be used to measure V_{OUT1} and V_{OUT2}.

For dual-phase operation (MAX20812 only):

1) When configured to dual-phase operation, only the control loop for rail 1 will work and the control loop for rail 2 is bypassed. EN1 and PGOOD1 are used in dual-phase operation mode to enable the device and indicate power good status. EN2 and PGOOD2 can be disconnected.
2) Install a 0Ω resistor for R2, R44, R45, and R48 to short two rail outputs.
3) Remove R13 for rail 2 to disconnect the sense line, and install a 0Ω resistor in R34 to pull SNSP2 to AVDD.
4) Use the same inductors for L1 and L2, or replace them with one two-phase couple inductor.
5) Repeat steps 1–6 from the dual-output operation procedure.

Operation

EV Kit Interface

The MAX20812/MAX20812T ICs are monolithic, dual-output, high-frequency, step-down switching regulators optimized for applications requiring small size and high efficiency. Detailed product and application information is provided in the MAX20812 IC data sheet.

Output Enable (OE)

OE is used to enable/disable the output voltage. For dual-output operation, rail 1 output voltage is enabled/disabled by SW1 and rail 2 output voltage is enabled/disabled by SW2. For single-output dual-phase operation, EN1 is used and EN2 can be disconnected.

Output-Voltage Selection

The MAX20812 EV kit is set up to initially boot up to an output voltage of 1V of rail 1 and 1.8V of rail 2. The device has a fixed 0.5V reference voltage, and the output voltage is accomplished by placing a voltage-divider in the feedback path.

$$V_{OUT} = V_{REF} \times (1 + R_{FB1}/R_{FB2})$$

where:

V_{OUT} = Output voltage

V_{REF} = 0.5V fixed reference voltage

R_{FB1} = Top divider resistor

R_{FB2} = Bottom divider resistor

Soft-Start

When VDDH and EN are above their rising thresholds, soft-start begins, and switching is enabled. The soft-start ramp time is 3ms. The device supports smooth startup with the output prebiased.

Switching Frequency

Switching frequency is programmable—parameters and PGM0 are used to select the switching frequency. For the EV kit, the switching frequency is set to 1000kHz for rail 1 and 2000kHz for rail 2. Refer to the PGM0 Configurations table (Table 1) in the MAX20812 IC data sheet.

Pin-Strap Programmability

The EV kit provides an option to configure the part for desired application using PGMx resistor values. Refer to the PGMx Configurations tables (Table 1 through Table 3) in the MAX20812 IC data sheet. Appropriate values of resistors R11, R21, and R35 can be used for the desired application.

Status Monitoring

Whenever the part is actively regulating and the output voltage is within the power-good window, the PGOOD pin is high. In all other conditions, including enabled but in a fault state, the PGOOD pin is pulled low. Refer to the MAX20812 IC data sheet for more details.

Input-Voltage Monitoring

The input supply can be monitored on TP4 for VDDH and TP7 for GND.

Switching-Voltage Monitoring

The switching waveform can be monitored on TP3 for LX1 and TP9 for LX2.

Output-Voltage Monitoring

J2 and J3 monitor the output voltage of rail 1 and rail 2, respectively. These test points should not be used for loading.

Efficiency Testing

TP5 (VIN_EFF_P) and TP6 (VIN_EFF_N) are provided to measure V_{IN} during efficiency measurement. Additionally, J2 and J3 are provided to measure V_{OUT1} and V_{OUT2} during efficiency measurement.

Bode Plot

A 10Ω resistor is installed between the VOUTx sense point and SNSPx pin to measure the Bode plot. TP13 and TP14 test points are provided on the board on either side of 10Ω resistor for small signal injection ad ability to measure the Bode plot for V_{OUT1}. TP28 and TP16 test points are provided on the board on either side of 10Ω resistor for small signal injection and the ability to measure a Bode plot for V_{OUT2}.

Ordering Information

PART	TYPE
MAX20812EVKIT#	EV Kit
MAX20812TEVKIT#	EV Kit

#Denotes RoHS compliant.

MAX20812 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C2	—	1	C1608X5R1E475K080AC; GRM188R61E475KE11	TDK; MURATA	4.7UF	CAPACITOR; SMT (0603); CERAMIC CHIP; 4.7µF; 25V; TOL = 10%; TG = -55°C TO +85°C; TC = X5R
2	C3, C5, C34	—	3	TPSD107K020R0085	AVX	100µF	CAPACITOR; SMT; 7343; TANTALUM; 100µF; 20V; 10%; TPS; -55°C to +125°C
3	C4, C7, C16, C31	—	4	GRM155R71E104ME14	MURATA	0.1µF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1µF; 25V; TOL = 20%; TG = -55°C TO +125°C; TC = X7R
4	C6, C12, C13	—	3	GRM188R71E105KA12; CGA3E1X7R1E105K; TMK107B7105KA; 06033C105KAT2A;" GCM188R71E105KA64; C1608X7R1E105K080AE; CGA3E1X7R1E105K080AC	MURATA; TDK; TAIYO YUDEN; AVX; MURATA; TAIYO YUDEN; TDK	1µF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1µF; 25V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
5	C8, C9	—	2	GRM21BC71E106KE11	MURATA	10µF	CAPACITOR; SMT (0805); CERAMIC CHIP; 10µF; 25V; TOL = 10%; TG = -55°C TO +125°C; TC = X7S
6	C10, C11	—	2	LMK105B7474KV; GRM155R71A474KE01	PANASONIC; MURATA	0.47µF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.47µF; 10V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
7	C26, C30	—	2	C0402C102K5GAC	KEMET	1000PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL = 10%; MODEL =; TG = -55°C TO +125°C; TC = C0G
8	C27	—	1	GRM188Z71C225KE43	MURATA	2.2µF	CAPACITOR; SMT (0603); CERAMIC CHIP; 2.2µF; 16V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
9	C29, C45	—	2	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050BA; CGA2B2C0G1H101J050BA	KEMET; NIC COMPONENTS CORP.; YAGEO PHICOMP; MURATA; TDK; TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL = 5%; TG = -55°C TO +125°C; TC = C0G
10	C35	—	1	GRM21BZ70J226ME44	MURATA	22µF	CAP;SMT (0805); 22µF; 20%; 6.3V; X7R; CERAMIC CHIP; NOTE: PURCHASE DIRECT FROM THE MANUFACTURER
11	C32, C36, C37, C39, C42, C46, C48, C50, C60, C63, C65, C67, C69, C71	—	14	GRM188C80J226ME15	MURATA	22µF	CAP; SMT (0603); 22µF; 20%; 6.3V; X6S; CERAMIC CHIP

MAX20812 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
12	C47, C61	—	2	GRM155R71E104KE14; C1005X7R1E104K050BB; TMK105B7104KVH; CGJ2B3X7R1E104K050BB	MURATA; TDK; TAIYO YUDEN; TDK	0.1µF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1µF; 25V; TOL = 10%; MODEL = GRM SERIES; TG = -55°C TO +125°C; TC = X7R
13	D1, D3, D4	—	3	MBRS540T3G	ON SEMICONDUCTOR	MBRS540T3	DIODE; SCH; SURFACE MOUNT SCHOTTKY POWER RECTIFIER; SMC; PIV = 40V; IF = 5A
14	DS1, DS2	—	2	LGL29K-G2J1-24-Z	OSRAM	LGL29K-G2J1-24-Z	DIODE; LED; SMARTLED; GREEN; SMT; PIV = 1.7V; IF = 0.02A
15	J1	—	1	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
16	J2, J3, J10, J11, J34	—	5	TSW-101-22-L-D	SAMTEC	TSW-101-22-L-D	CONNECTOR; MALE; THROUGH HOLE; .025IN SQ POST HEADER; STRAIGHT; 2PINS
17	J4, J9	—	2	131-3701-266	JOHNSON COMPONENTS	131-3701-266	CONNECTOR; MALE; THROUGH HOLE; SMB JACK VERTICAL PCB MOUNT; STRAIGHT; 5PINS
18	J5, J8, J32, J33	—	4	6095	KEYSTONE	6095	CONNECTOR; FEMALE; PANELMOUNT; NON-INSULATED RECESSED HEAD BANANA JACK; STRAIGHT THROUGH; 1PIN
19	L1, L2	—	2	PA5003.471NLT	PULSE	0.47µH	INDUCTOR; SMT; COMPOSITE; 0.47µH; 20%; 18.4A
20	MH1-MH4	—	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
21	Q1, Q2	—	2	BSS138	ON SEMICONDUCTOR	BSS138	TRAN; LOGIC LEVEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR; NCH; SOT-23; PD-(0.36W); I-(0.22A); V-(50V); -55°C TO +150°C
22	R1	—	1	CRCW04024R70FK	VISHAY DALE	4.7	RESISTOR, 0402, 4.7Ω, 1%, 100PPM, 0.0625W, THICK FILM
23	R3, R15	—	2	RC0402JR-070RL; CR0402-16W-000RJT	YAGEO PHYCOMP; VENKEL LTD.	0	RESISTOR; 0402; 0Ω; 5%; JUMPER; 0.063W; THICK FILM
24	R9, R10, R12	—	3	CRCW04023K01FK	VISHAY DALE	3.01K	RESISTOR; 0402; 3.01KΩ; 1%; 100PPM; 0.063W; THICK FILM
25	R11	—	1	ERJ-2RKF7680	PANASONIC	768	RES; SMT (0402); 768; 1%; ±100PPM/°C; 0.1W
26	R13	—	1	ERJ-2RKF7871	PANASONIC	7.87K	RES;SMT (0402); 7.87K; 1%; ±100PPM/°K; 0.1W

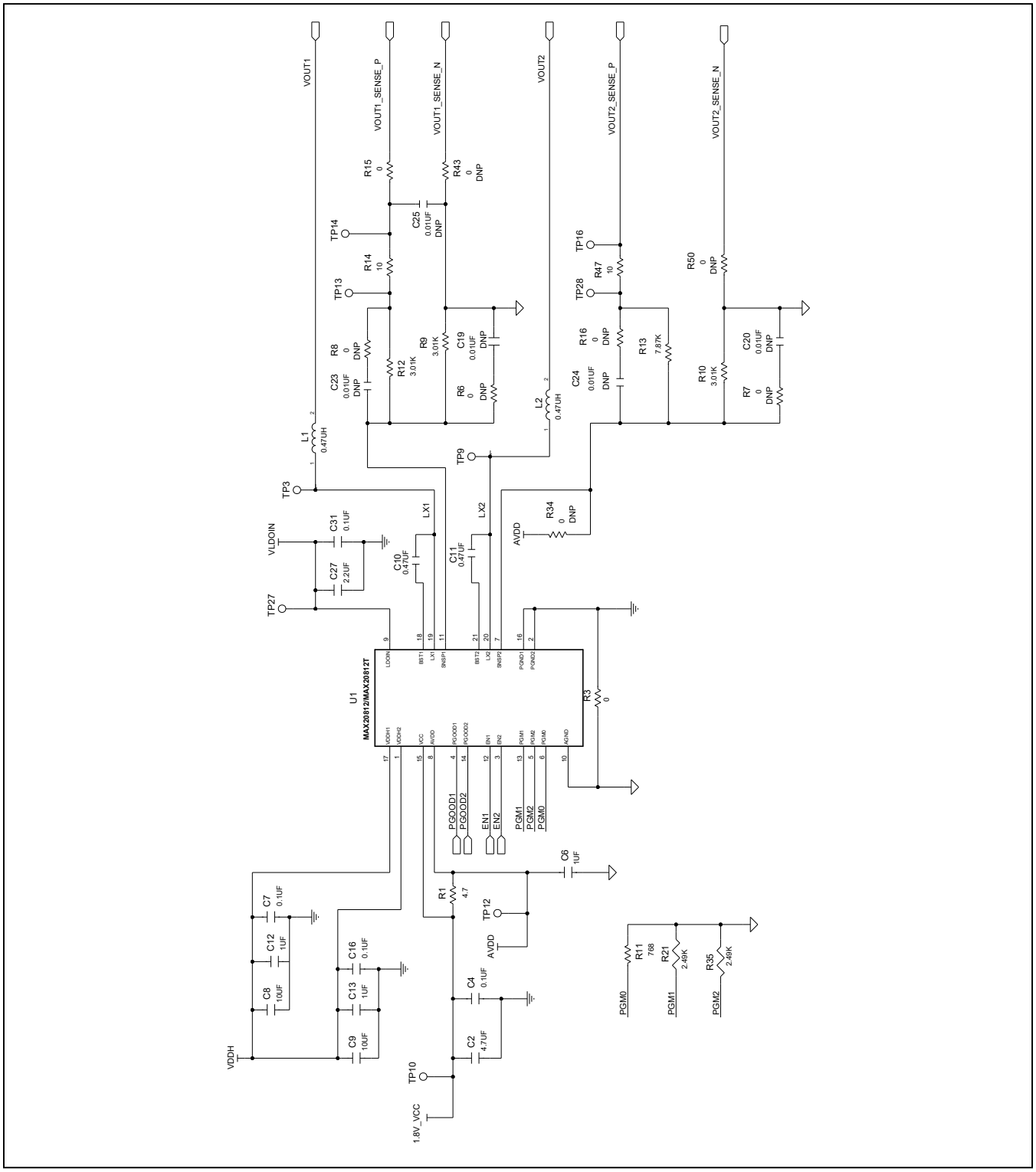
MAX20812 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
27	R14, R47	—	2	CRCW040210R0FK; 9C04021A10R0FL	VISHAY DALE; YAGEO	10	RESISTOR; 0402; 10Ω; 1%; 100PPM; 0.0625W; THICK FILM
28	R25, R26	—	2	CRCW040249R9FKEDHP	VISHAY DRALORIC	49.9	RESISTOR; 0402; 49.9Ω; 1%; 100PPM; 0.2W; THICK FILM
29	R21, R35	—	2	ERJ-2RKF2491	PANASONIC	2.49K	RESISTOR; 0402; 2.49KΩ; 1%; 100PPM; 0.10W; THICK FILM
30	R39, R40	—	2	ERJ-2RKF1002	PANASONIC	10K	RESISTOR; 0402; 10KΩ; 1%; 100PPM; 0.10W; THICK FILM
31	R41, R52	—	2	CRCW040220K0FK	VISHAY DALE	20K	RESISTOR; 0402; 20KΩ; 1%; 100PPM; 0.063W; THICK FILM
32	R42, R53	—	2	CRCW0603100RFK; ERJ-3EKF1000; RC0603FR-07100RL	VISHAY DALE; PANASONIC	100	RESISTOR; 0603; 100Ω; 1%; 100PPM; 0.10W; THICK FILM
33	R51, R54	—	2	ERJ-3EKF2100	PANASONIC	210	RESISTOR; 0603; 210Ω; 1%; 100PPM; 0.10W; THICK FILM
34	ST1-ST4	—	4	7808	KEYSTONE	7808	TERMINAL; BODY LENGTH = 0.67IN; BODY WIDTH = 0.47IN; HEIGHT = 0.45IN; SCRW; BRASS
35	SW1, SW2	—	2	GT21MCBE	C&K COMPONENTS	GT21MCBE	SWITCH; DPDT; THROUGH HOLE; 20V; 0.4VA; GT SERIES; SEALED ULTRAMINIATURE TOGGLE SWITCH; RCOIL = 0.05Ω; RINSULATION = 10GΩ; C&K COMPONENTS
36	TP1, TP2, TP7, TP11, TP25, TP32	—	6	5011	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST
37	TP3, TP5, TP6, TP9	—	4	PBC01SAAN	SULLINS ELECTRONICS CORP	PBC01SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 1PIN
38	TP4, TP10, TP12, TP18, TP27	—	5	5010	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; RED; PHOSPHOR BRONZE WIRE SIL; NOT FOR COLD TEST
39	TP13, TP14, TP16, TP21, TP28, TP31	—	6	5012	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST

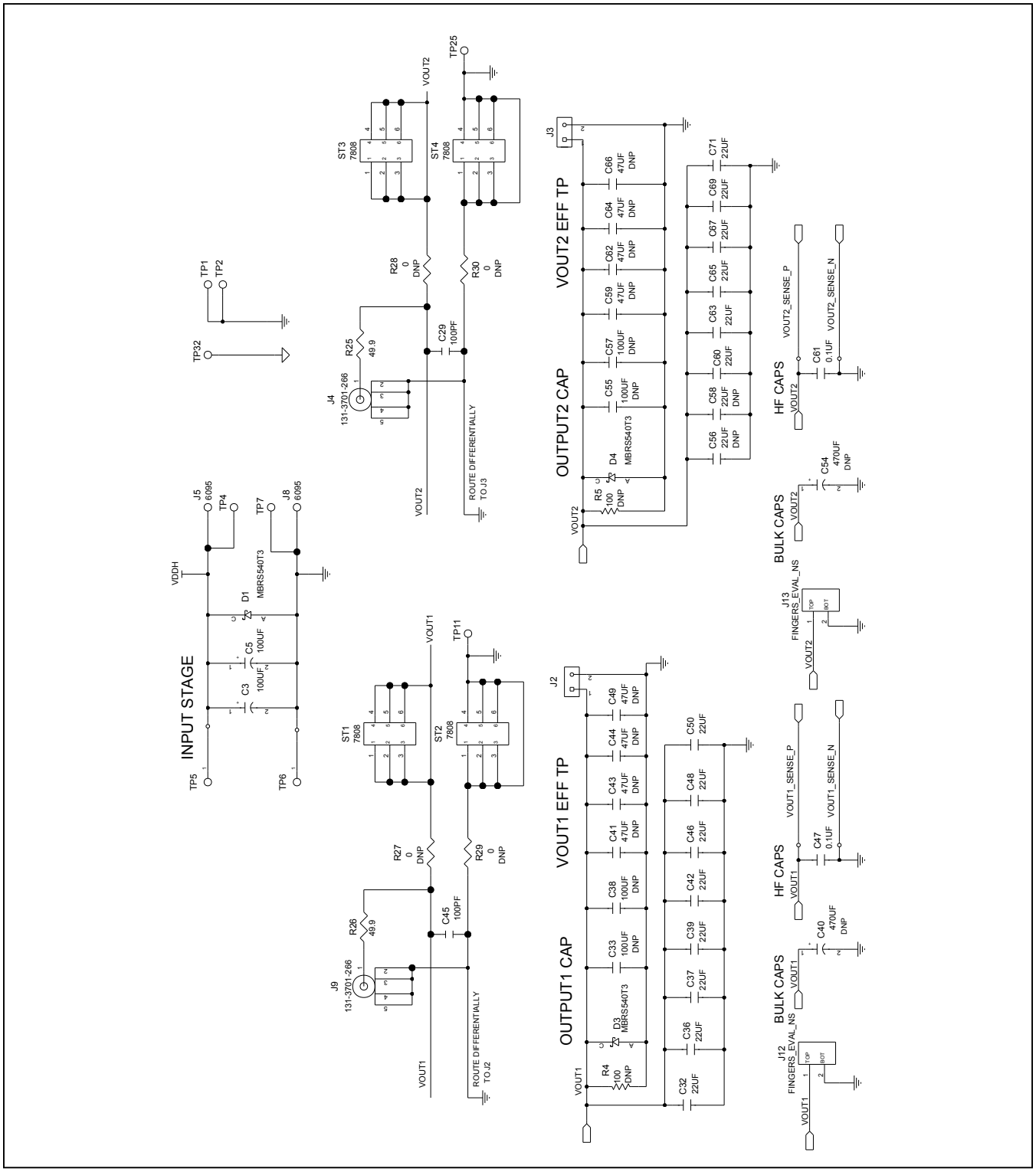
MAX20812 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
40	TP29, TP30	—	2	5126	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; GREEN; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS = 0.062IN; NOT FOR COLD TEST
41	U1	—	1	MAX20812AFH+/ MAX20812TAFH+	ANALOG DEVICES	MAX20812/ MAX20812T	EVKIT PART - IC; MAX20812AFH+/ MAX20812TAFH+; FC2QFN21; PACKAGE OUTLINE DRAWING NUMBER: 21-100394/21-100513; LAND PATTERN: 90-100134/90-100184; PACKAGE CODE: F213A4F+1/ F213A4F+2
42	PCB	—	1	MAX20812	ANALOG DEVICES	PCB	PCB:MAX20812
43	C19, C20, C23-C25	DNP	5	C0402C103J3RAC	KEMET	0.01µF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.01µF; 25V; TOL = 5%; TG = -55°C TO +125°C; TC = X7R
44	C56, C58	DNP	2	GRM188C80J226ME15	MURATA	22µF	CAP; SMT (0603); 22µF; 20%; 6.3V; X6S; CERAMIC CHIP
45	C33, C38, C55, C57	DNP	4	GRM31CD80J107ME39	MURATA	100µF	CAP; SMT (1206); 100µF; 20%; 6.3V; X6T; CERAMIC CHIP
46	C40, C54	DNP	2	T491X477K010AT	KEMET	470µF	CAPACITOR; SMT (7343); TANTALUM CHIP; 470µF; 10V; TOL = 10%; MODEL = T491 SERIES
47	C41, C43, C44, C49, C59, C62, C64, C66	DNP	8	C0805C476M9PAC; GRM21BR60J476ME15	KEMET; MURATA	47µF	CAPACITOR; SMT (0805); CERAMIC CHIP; 47µF; 6.3V; TOL = 20%; TG = -55°C TO +85°C; TC = X5R
48	L3	DNP	1	N/A	N/A	N/A	EVKIT PART-INDUCTOR; SMD; 10MMX5MM PACKAGE
49	R6-R8, R16, R34, R43, R50	DNP	7	RC0402JR-070RL; CR0402-16W-000RJT	YAGEO PHYCOMP; VENKEL LTD.	0	RESISTOR; 0402; 0Ω; 5%; JUMPER; 0.063W; THICK FILM
50	R27-R30	DNP	4	CRCW04020000Z0EDHP; RCS04020000Z0	VISHAY DRALORIC; VISHAY DALE	0	RESISTOR; 0402; 0Ω; 0%; JUMPER; 0.2W; THICK FILM
51	R2, R44, R45, R48	DNP	4	CRCW25120000ZS	VISHAY DALE	0	RESISTOR; 2512; 0Ω; 1%; JUMPER; 1.0W; METAL FILM
52	R4, R5	DNP	2	ERJ-P08J101	PANASONIC	100	RESISTOR; 1206; 100Ω; 5%; 200PPM; 0.66W; THICK FILM

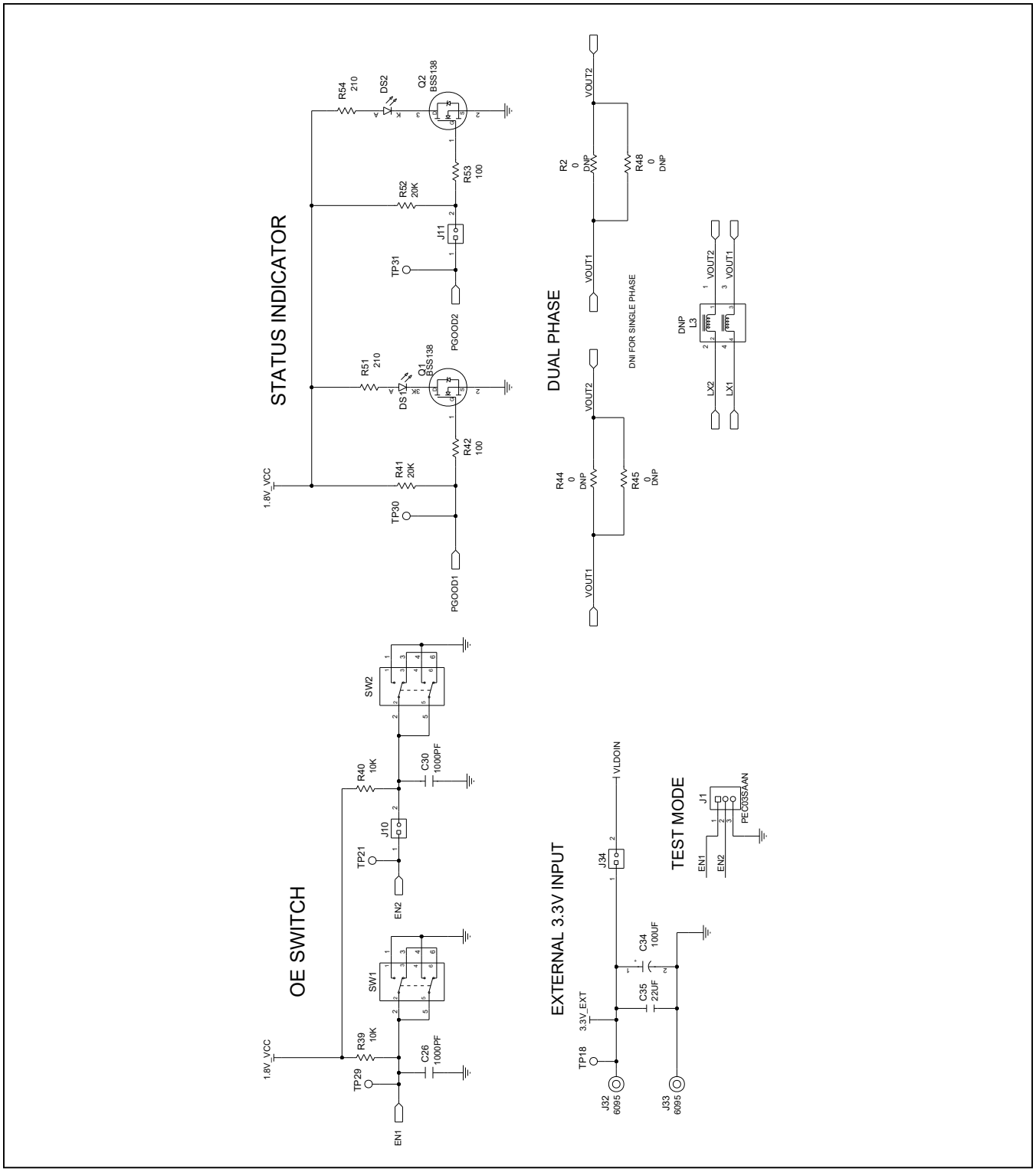
MAX20812 EV Kit Schematic Diagram



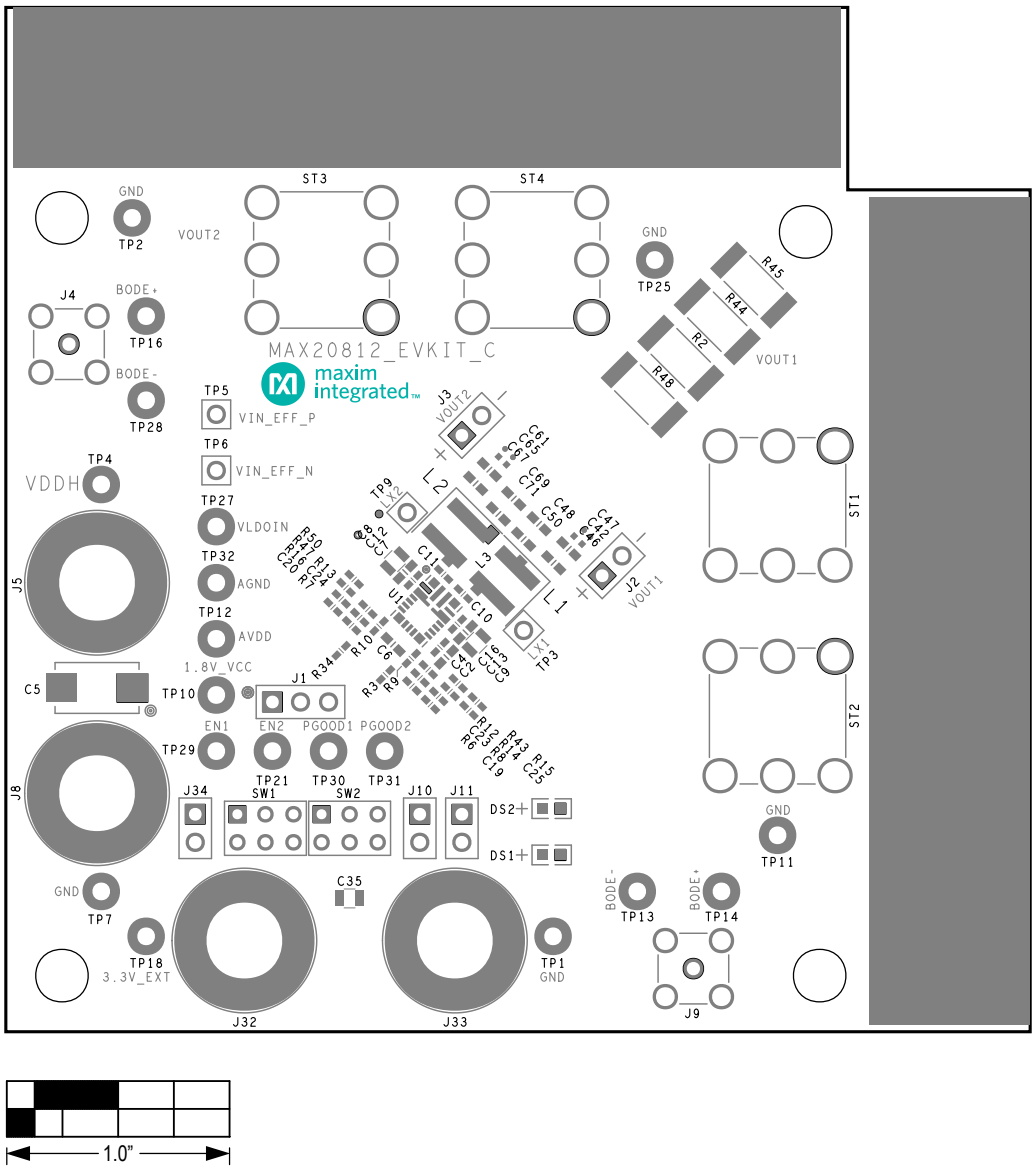
MAX20812 EV Kit Schematic Diagram (continued)



MAX20812 EV Kit Schematic Diagram (continued)

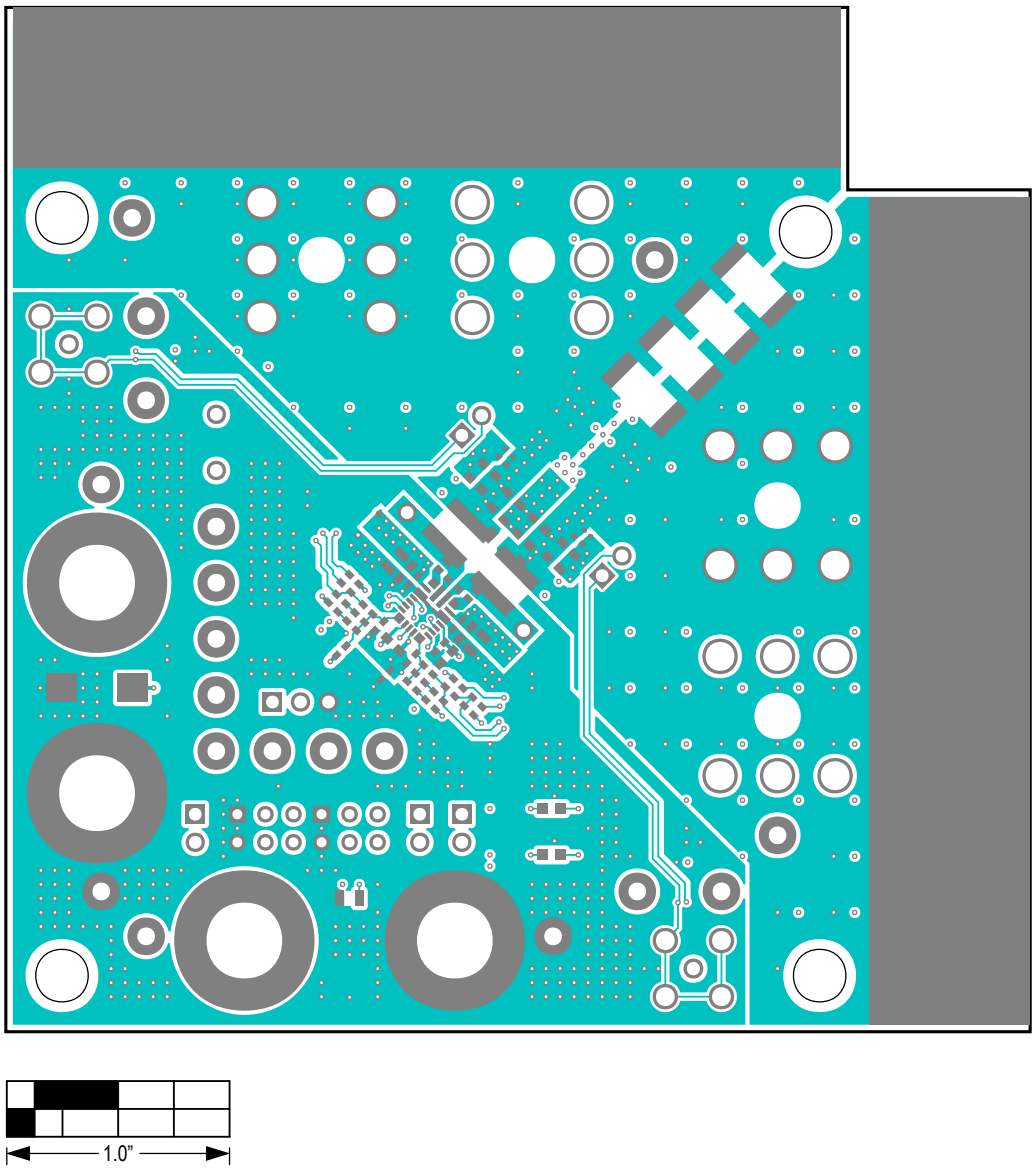


MAX20812 EV Kit PCB Layout Diagrams



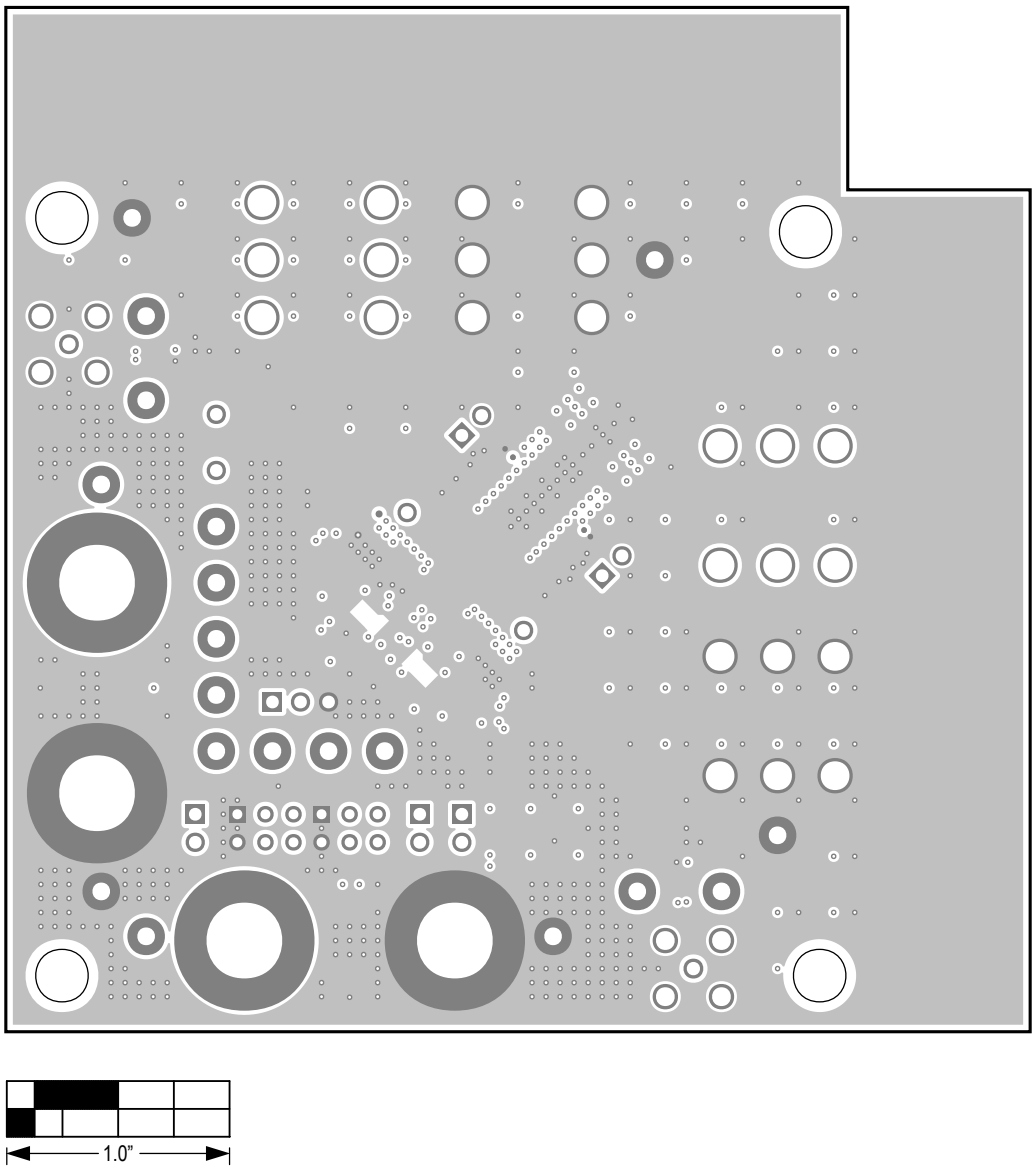
MAX20812 EV Kit PCB—Silkscreen Top Side

MAX20812 EV Kit PCB Layout Diagrams (continued)



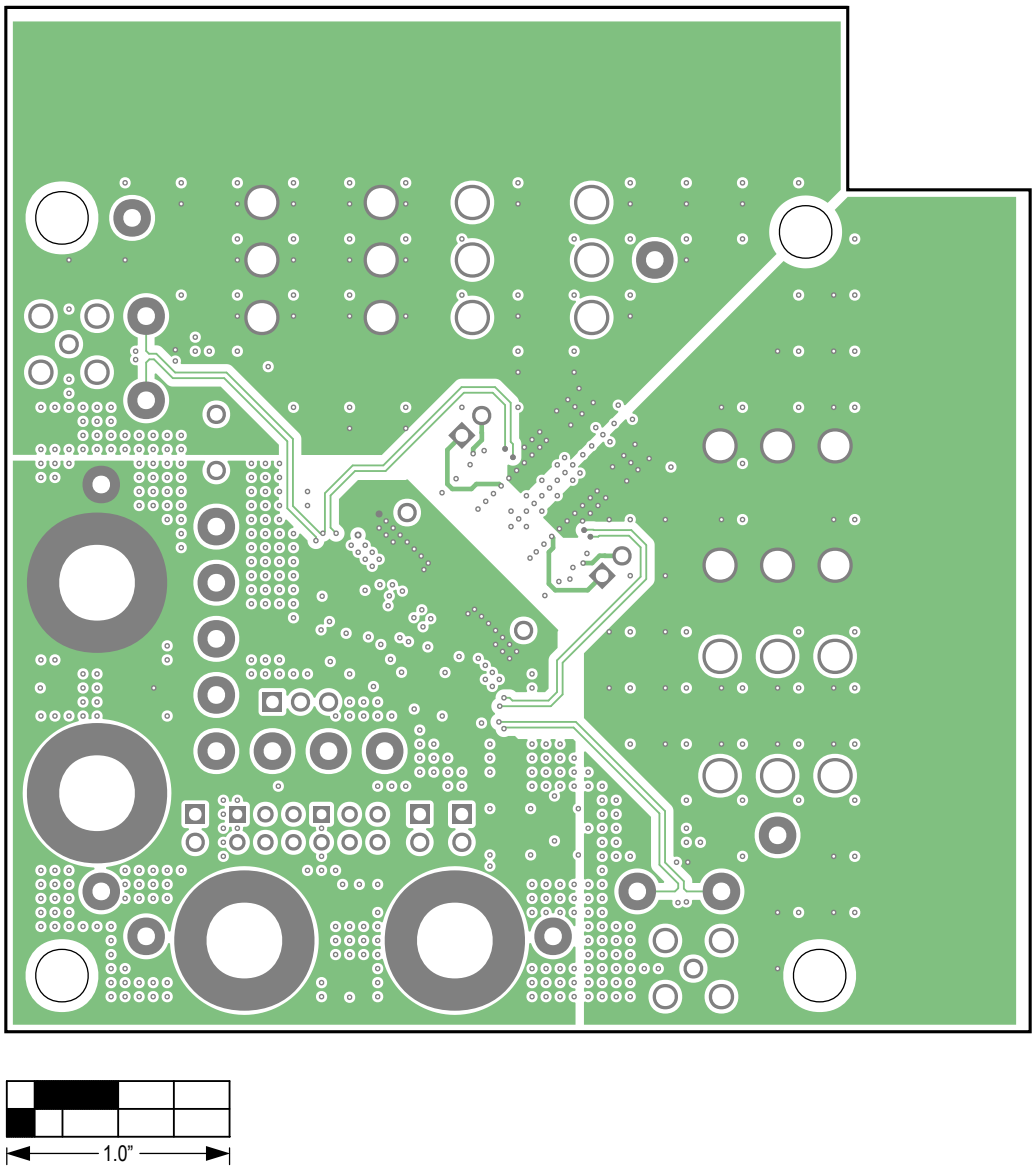
MAX20812 EV Kit PCB—Top Side

MAX20812 EV Kit PCB Layout Diagrams (continued)



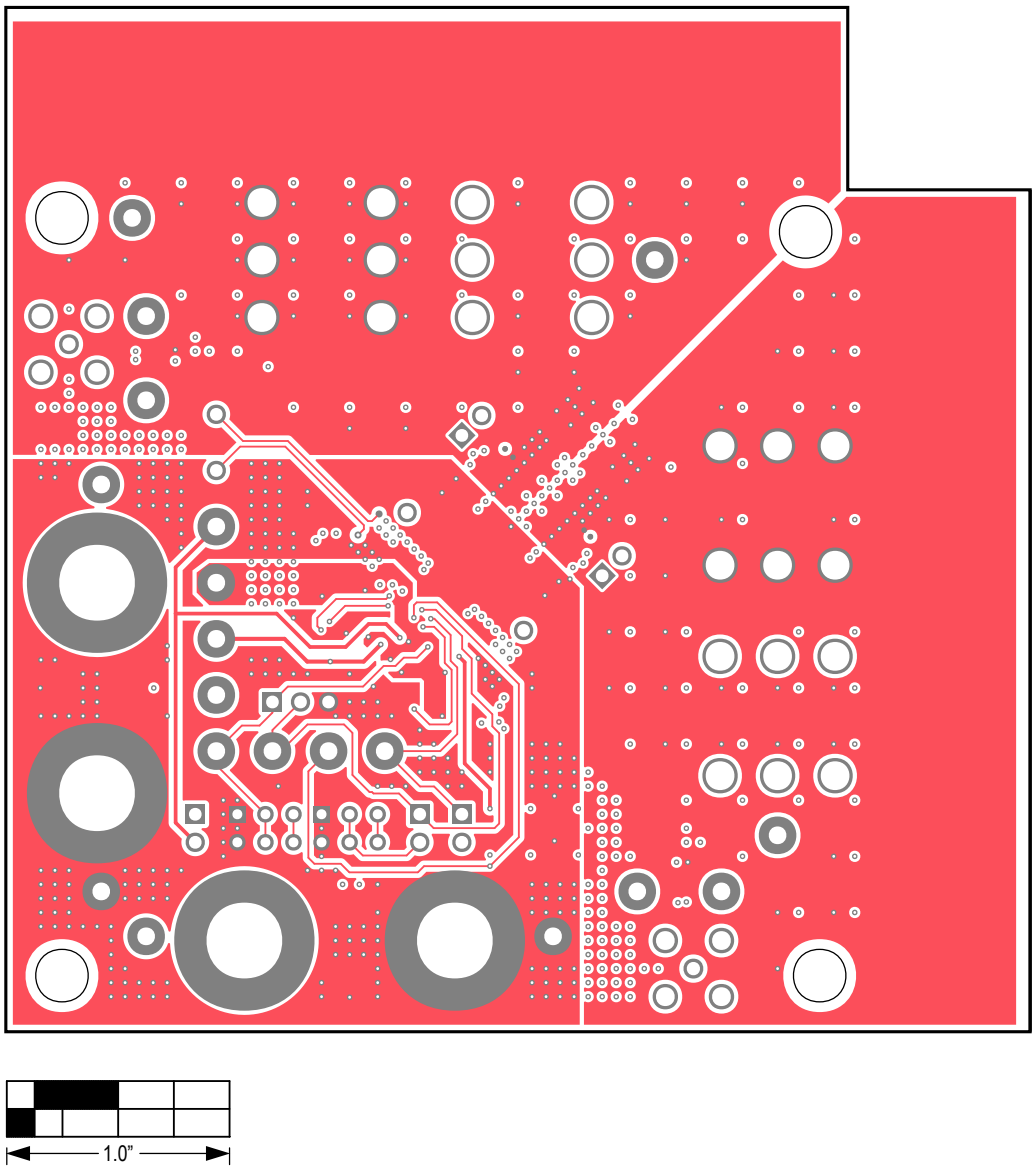
MAX20812 EV Kit PCB—Internal Layer 2

MAX20812 EV Kit PCB Layout Diagrams (continued)



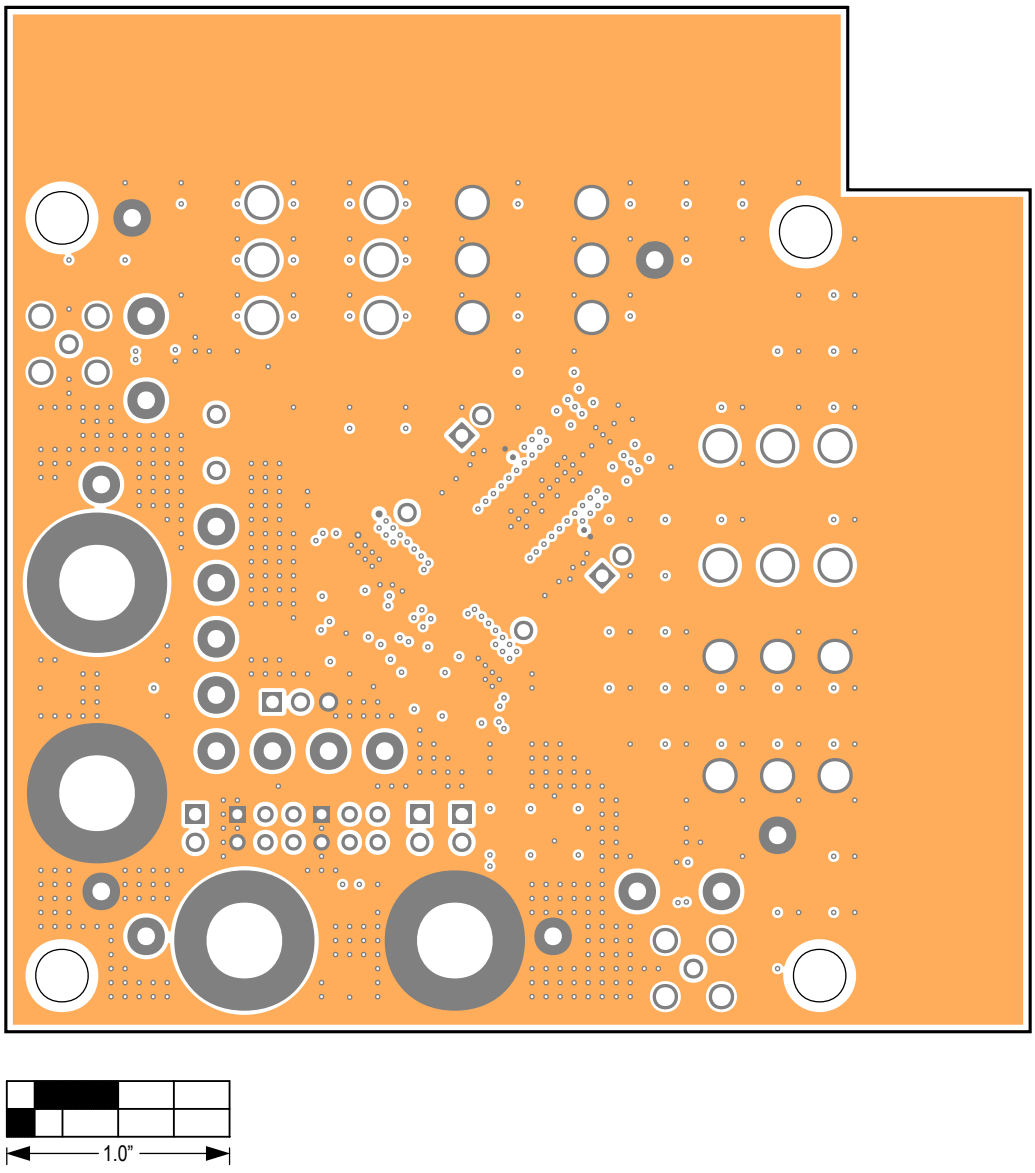
MAX20812 EV Kit PCB—Internal Layer 3

MAX20812 EV Kit PCB Layout Diagrams (continued)



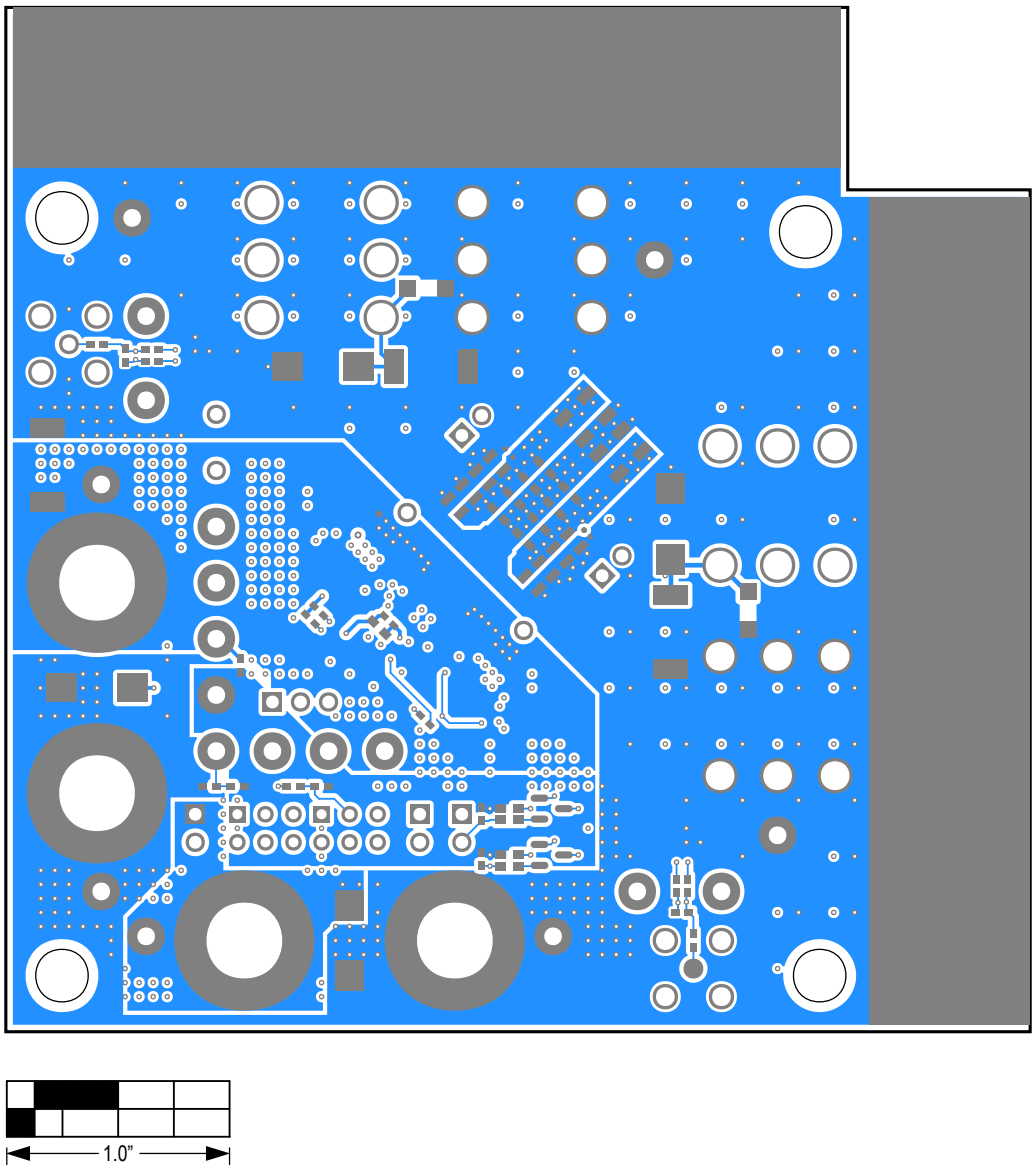
MAX20812 EV Kit PCB—Internal Layer 4

MAX20812 EV Kit PCB Layout Diagrams (continued)



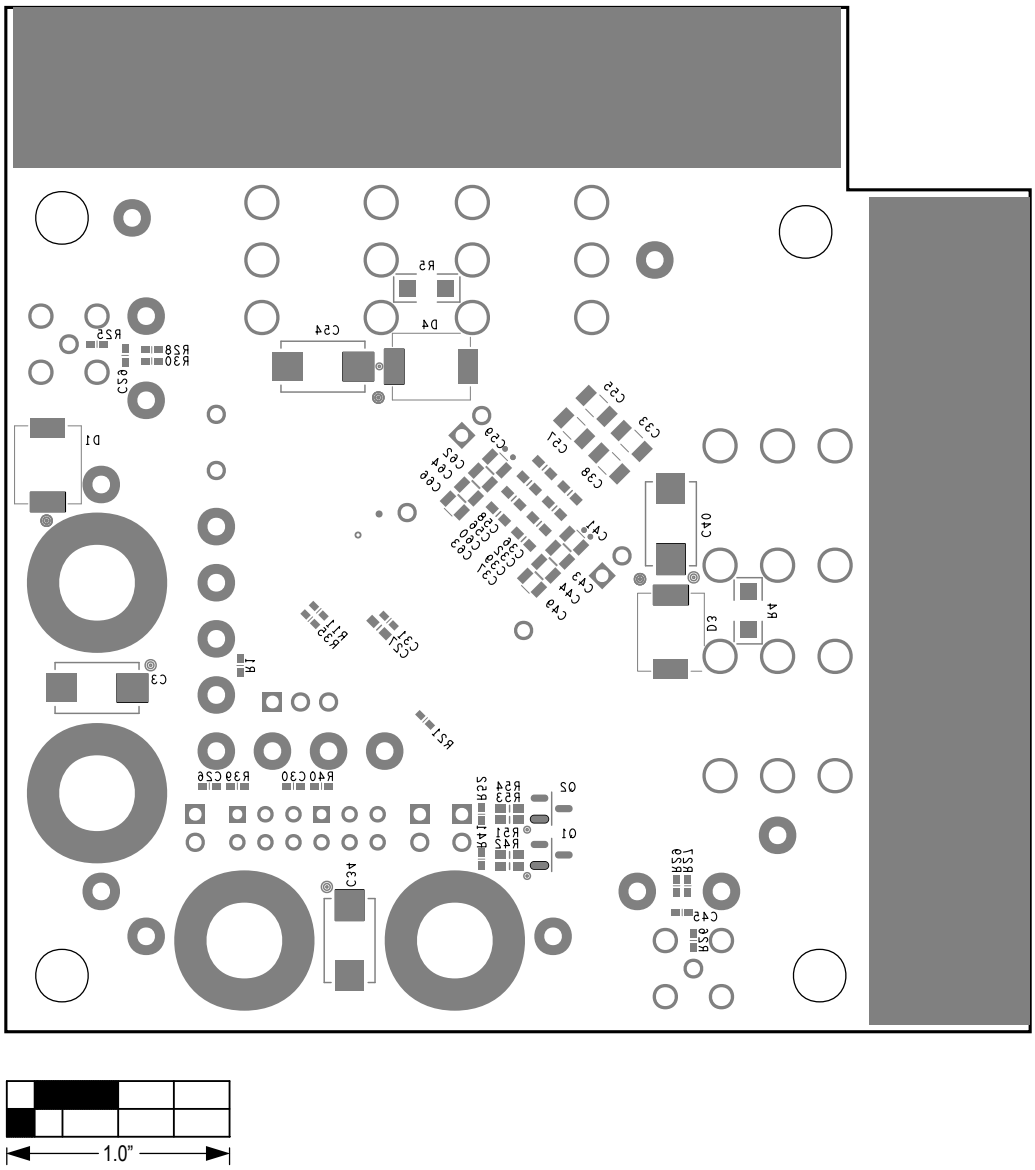
MAX20812 EV Kit PCB—Internal Layer 5

MAX20812 EV Kit PCB Layout Diagrams (continued)



MAX20812 EV Kit PCB—Bottom Side

MAX20812 EV Kit PCB Layout Diagrams (continued)



MAX20812 EV Kit PCB—Silkscreen Bottom Side

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/20	Initial release	—
1	3/21	Updated MAX20812AFH+ to MAX20812; updated *Bill of Materials*	All
2	6/22	Added MAX20812T	All
3	10/22	Updated *Bill of Materials* and *Schematic Diagram*	6, 9