

## MAX16602CL8 Evaluation Kit

Evaluates: MAX16602 and MAX20790

### General Description

The MAX16602CL8 evaluation kit (EV kit) is a fully assembled and tested surface-mount circuit board that contains all of the components necessary to evaluate the MAX16602 and MAX20790. The MAX16602 is a PMBus™-compatible, multiphase voltage regulator controller for AI cores or Intel® VR13.HC server CPUs. The IC is packaged in a 56-pin, 7mm x 7mm QFN. The controller generates eight pulse-width modulated (PWM) control signals or phases. The EV kit is an 8-phase multiphase synchronous buck converter that uses 2-phase coupled inductors, which reduce the effective inductor value and size without excessive ripple current, thus reducing the required output capacitance and improving transient response.

The EV kit also demonstrates the full functionality of the MAX20790 smart power-stage IC. The IC has monolithic integration and advanced packaging technology that allow high-switching frequencies with significantly lower losses than conventional implementations. There are eight MAX20790 devices for the main output rail.

**Warning:** The EV kit is designed to operate with 12V input and high current. Follow safe procedures when working with high-current electrical equipment.

Under severe fault or failure conditions, this EV kit can dissipate large amounts of power, which could result in the mechanical ejection of a component or of component debris at high velocity. Operate this kit with care to avoid possible personal injury.

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

### Features

- High Power Density and Efficiency
  - Monolithic, Smart Power-Stage Support: MAX20790
  - Small Power-Stage Footprint: ~24mm<sup>2</sup>
  - Top-Tier Efficiency (95.6% Peak Efficiency at 1.8V<sub>OUT</sub>)
  - Integrated Input Power Monitor
- Telemetry Through PMBus
  - Digitally Programmable Configuration
  - Input Voltage, Current, and Power Monitoring
  - Power-Stage Temperature Monitoring and Reporting
- Advanced Power Management
  - Autonomous Phase-Shedding
  - Orthogonal Current Rebalance for Phase-Current Balance During Transients
  - Low Quiescent Current—Improves Light-Load and Standby Efficiency
  - Protection Features
  - Controller Input and Bias Supply Undervoltage Protection
  - Power-Stage Supply and Boost UVLO Protection
  - Power-Stage Boost Refresh
  - Power-Stage VX Short and Overtemperature Shutdown
  - Fast Overcurrent Protection
- Proven PCB Layout
- Fully Assembled and Tested

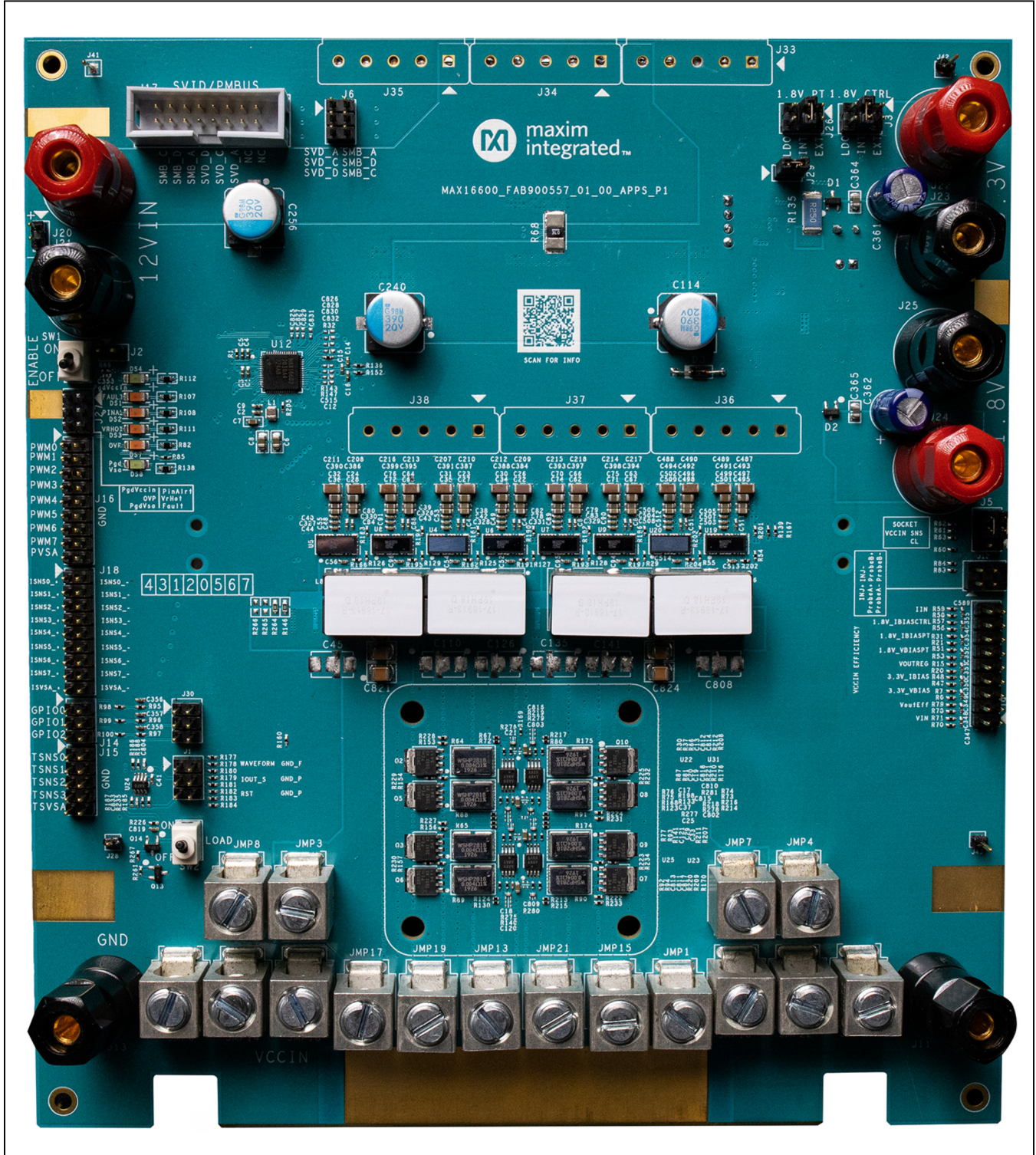
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MAX16602CL8  
Evaluation Kit

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MAX16602CL8 EV Kit Photo





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## Quick Start

### Required Equipment

- MAX16602CL8 EV kit
- 12V DC power supply with 350W or higher power delivering capability
- Electronic load capable of sinking 200A
- MAXPOWERUSB dongle to SMBus interface (order separately)
- Maxim MAXPOWERUSB graphical user interface (GUI software)
- Digital voltmeters
- 600MHz 4-channel oscilloscope

### Procedure

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) Connect the USB cable from the PC to the MAXPOWERUSB dongle. Connect the adapter ribbon cable to the matching header J17 on the EV kit.
- 2) Shunt pins 3-5 and shunt pins 4-6 of J5 to connect the core output feedback sensing.
- 3) Generate a 3.3V bias power supply for the controller, on-board load, and other logic circuits. Two options are provided:
  - a. **Using the on-board 3.3V LDO:** Shunt J19 and the on-board LDO (U10) to generate a 3.3V bias output from the 12V VDDH input.
  - b. **Using the external 3.3V bias power supply:** Connect an external 3.3V power supply to J22 and J23.
- 4) Generate a 1.8V bias power supply for the controller and power stages. Three options are provided:
  - a. **Using the MAX16602 integrated baby buck converter:** Place a shunt across pins 3-4 of J3 and J26. Do not install R22 to enable the integrated baby buck converter.
  - b. **Using the on-board 1.8V LDO:** Place a shunt across pins 5-6 of J3 and J26. Install R22 to disable the integrated baby buck converter.
  - c. **Using the external 1.8V bias power supply:** Connect an external 1.8V power supply to J24 and J25. Place a shunt across pins 1-2 of J3 and J26. Install R22 to disable the integrated baby buck converter.
- 5) Connect VCCIN\_VOUT to the load. Two options are provided:
  - a. **Using the external electronic load:** Connect JMP1, JMP3, JMP7, JMP12, JMP15, JMP17, JMP19, and JMP21 to the input terminal of the load. Connect JMP4, JMP6, JMP8, JMP14, JMP16, JMP18, JMP20, and JMP22 to the ground of the load, being careful to observe the VOUT and GND polarity indicated by the silkscreen labels.
  - b. **Using the on-board load:** Switch on SW2 to enable the on-board load. Connect the function generator to pin 1 of J1 to set the on-board load current.
- 6) Enable the external 12V power supply. Start the GUI software.

## Detailed Description of Software

The MAX16602 supports standard PMBus protocol. The MAXPOWERUSB software is designed to work with the MAX16602. The software GUI presents system-level information on the **Dashboard** tab. This view collects basic information for all Maxim PMBus devices detected on the bus. This tab configures enable control, an overview of the system status, fault flag, and sequencing. The tab also presents rolling plotting results of the READ\_VOUT and READ\_IOUT registers.

For detailed information about a particular device, click the sub-tab for that device's slave address. This opens a view with a set of further sub-tabs specific to that device. The available sub-tabs vary depending on the GUI version and the connected device's capability, but typically include **Command Monitor**, **Command Configure**, **Command Faults**, and **Settings**.

# MAX16602CL8 Evaluation Kit

Evaluates: MAX16602 and MAX20790

## Detailed Description of Hardware

The MAX16602CL8 EV kit is a fully assembled and tested board to evaluate the performance of the MAX16602 plus an 8-phase MAX20790 multiphase power solution to AI core or Intel VR13.HC server CPUs, which makes use of coupled inductors. This solution provides high output current with high efficiency, fast load-transient response, low ripple, and low noise. The EV kit provides completed peripheral circuits of the bias power supply, the on-board load, and PMBus for telemetry, which allow the EV kit to demonstrate the full functionality of the MAX16602 and MAX20790.

The MAX16602 controller automatically interleaves all PWM outputs assigned to a given output at even intervals. Each PWM signal is connected to one MAX20790 smart power-stage device, and each power stage is capable of supplying up to 45A with good air-cooling conditions. Every two power stages are connected to a 2-phase coupled inductor. Unused phases can be disabled by shorting the corresponding PWM pin to GND, allowing a single electrical design to be used for multiple applications with different output currents. A common PCB layout can be used with phases left unpopulated for lower output currents. The TSENSE and ISENSE pins for unused phases must be left unconnected.

The MAX16602 controller implements an orthogonal current rebalancing feature to provide active and dynamic current sharing between different phase currents. This

feature maintains current balance during load transients, even at load frequencies close to the VR switching frequency and its harmonics. The controller also allows autonomous phase-shedding control of the number of active phases to maximize the efficiency of the regulator and improve the transient response performance. The MAX16602 integrates all of the control-loop components that were previously externally mounted. The following V<sub>CORE</sub> regulator parameters are digitally selected:

- Switching frequency (300kHz to 857kHz)
- Load-line (0.105mΩ to 0.979mΩ). Refer to Table 6 in the MAX16602 data sheet for details on range and steps.
- System OCP (30A to 695A). Refer to Table 7 in the MAX16602 data sheet for details.
- APS fast and slow thresholds
- Modulator ramp rate (0.4V/μs to 1.9V/μs, 0.1V/μs LSB)
- AMS ramp rate (0.125V/μs to 1.0625V/μs, 0.0625V/μs LSB)
- Current-loop zero (8.4kHz to 45.5kHz)
- Voltage-loop zero (9.6kHz to 159.2kHz, no-droop configuration only)
- R<sub>P</sub> (195Ω to 3770Ω, 65Ω LSB lower range to 162.5Ω LSB upper range)
- R<sub>OCR</sub> (1.5kΩ to 17kΩ, 500Ω LSB)

**Table 1. Bias Power Supply Shunt/Connector**

SHUNT/CONNECTOR	SHUNT POSITION	DESCRIPTION
J19	Installed	Enable on-board 3.3V LDO
J29	Installed	Enable on-board 1V LDO
J22, J23	J22 connects to 3.3V, J23 connects to GND	Connect external 3.3V power supply
J24, J25	J24 connects to 1.8V, J25 connects to GND	Connect external 1.8V power supply
J3, J26	1-2 pins	Connect external 1.8V power supply
	3-4 pins	Connect the MAX16602 integrated 1.8V output
	5-6 pins	Connect 1.8V LDO output

## Ordering Information

PART	TYPE
MAX16602CL8EVKIT#	EV Kit

#Denotes RoHS compliance.



MAX16602CL8  
Evaluation Kit

Evaluates: MAX16602 and MAX20790

MAX16602CL8 EV Kit Bill of Materials

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C2, C14-C16, C20, C33, C41, C255, C332, C368, C372, C813, C814, C819, C820	-	16	GRM155R71E104KE14; C1005X7R1E104K050BB; TMK105B7104KVH; CGJ2B3X7R1E104K050BB	MURATA; TDK; TAIYO YUDEN; TDK	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 25V; X7R; CERAMIC
2	C3-C5, C9, C49, C53, C55, C89-C91, C347-C352, C354-C358, C411-C413, C453-C455, C483, C484, C511, C512, C589, C835	-	33	C0402C105K8PAC; CC0402KRX5R6BB105	KEMET; YAGEO	1UF	CAP; SMT (0402); 1UF; 10%; 10V; X5R; CERAMIC
3	C6, C8, C364, C365, C370, C373	-	6	C0805C226M9PAC; GRM21BR60J226ME39; JMK212BJ226MG; CL21A226MQCLQN; 885012107005	KEMET; MURATA; TAIYO YUDEN; SAMSUNG EL; WURTH ELECTRONIK	22UF	CAP; SMT (0805); 22UF; 20%; 6.3V; X5R; CERAMIC
4	C7, C22-C24, C26-C28, C62-C64, C66-C68, C374-C378, C380, C429-C434, C467-C470, C495-C498	-	33	C1608X5R1E106M080AC; CL10A106MA8NRNC; GRM188R61E106MA73; ZRB18AR61E106ME01; GRT188R61E106ME13	TDK; SAMSUNG ELECTRONICS; MURATA; MURATA	10UF	CAP; SMT (0603); 10UF; 20%; 25V; X5R; CERAMIC
5	C17, C18, C21, C25, C802, C803, C809, C810, C833, C834	-	10	C0402C0G500-100KNP	VENKEL LTD.	10PF	CAP; SMT (0402); 10PF; 10%; 50V; C0G; CERAMIC
6	C19, C29-C32, C34-C36, C70-C72, C74-C76, C259, C381-C383, C385, C389, C392, C435-C440, C471-C474, C499-C502, C811, C812	-	37	GMK107BJ105KA; C1608X5R1V105K080AB	TAIYO YUDEN; TDK	1.0UF	CAP; SMT (0603); 1.0UF; 10%; 35V; X5R; CERAMIC
7	C38-C40, C42-C44, C78-C80, C82-C84, C326-C331, C396, C400-C406, C408, C441-C448, C450, C475-C480, C503-C508	-	48	GRM155R71E472KA01	MURATA	4700PF	CAP; SMT (0402); 4700PF; 10%; 25V; X7R; CERAMIC
8	C46-C48, C86-C88, C407, C409, C410, C449, C451, C452, C481, C482, C509, C510	-	16	C1005X5R1E474K050; GRT155R61E474KE01	TDK; MURATA	0.47UF	CAP; SMT (0402); 0.47UF; 10%; 25V; X5R; CERAMIC
9	C51, C57-C61, C65, C69, C73, C77, C81, C85, C92, C93, C99-C109, C112, C115, C116, C118, C119, C122-C125, C128-C134, C137-C140, C143-C206, C219-C239, C241-C253, C262-C325, C333-C338, C340, C379, C516-C588, C590-C801	-	500	GRM158C80G226ME01	MURATA	22UF	CAP; SMT (0402); 22UF; 20%; 4V; X6S; CERAMIC ;
10	C52, C54, C56, C94-C96, C414-C416, C456-C458, C485, C486, C513, C514	-	16	C1005X5R1C684K050	TDK	0.68UF	CAP; SMT (0402); 0.68UF; 10%; 16V; X5R; CERAMIC
11	C97, C127, C136, C806, C821-C824	-	8	GRM32ER60J227ME05	MURATA	220UF	CAP; SMT (1210); 220UF; 20%; 6.3V; X5R; CERAMIC
12	C113, C114, C117, C240, C256	-	5	APXG200ARA391MJ80G	UNITED CHEMI-CON	390UF	CAP; SMT (CASE_J80); 390UF; 20%; 20V; CONDUCTIVE POLYMER
13	C207-C218, C339, C341-C345, C417-C422, C459-C462, C487-C490	-	32	C3216X5R1E226M160AB	TDK	22UF	CAP; SMT (1206); 22UF; 20%; 25V; X5R; CERAMIC
14	C254	-	1	C1005X7R1E473K050BC; GRM155R71E473K; GCM155R71E473KA55	TDK; MURATA; MURATA	0.047UF	CAP; SMT (0402); 0.047UF; 10%; 25V; X7R; CERAMIC
15	C257, C361, C362	-	3	ECA-1EM331	PANASONIC	330UF	CAP; THROUGH HOLE-RADIAL LEAD; 330UF; 20%; 25V; ALUMINUM-ELECTROLYTIC
16	C258, C260, C261	-	3	C3216X5R1E106M085	TDK	10UF	CAP; SMT (1206); 10UF; 20%; 25V; X5R; CERAMIC
17	C346, C359, C360, C363, C366, C367, C369, C371, C384, C386-C388, C390, C391, C393-C395, C397-C399, C423-C428, C463-C466, C491-C494	-	34	TMK212BBJ106KG; CL21A106KAFN3N	TAIYO YUDEN; SAMSUNG ELECTRO-MECHANI	10UF	CAPACITOR; SMT (0805); CERAMIC; 10UF; 25V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R ;
18	C353	-	1	C0402C102K5GAC	KEMET	1000PF	CAP; SMT (0402); 1000PF; 10%; 50V; C0G; CERAMIC

MAX16602CL8  
Evaluation Kit

Evaluates: MAX16602 and MAX20790

MAX16602CL8 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
19	C804	-	1	C0402C121J5GAC; GCM1555C1H121JA16; UMK105CG121JVH	KEMET; MURATA; TAIYO YUDEN	120PF	CAP; SMT (0402); 120PF; 5%; 50V; COG; CERAMIC
20	D1	-	1	BZX84C3V9-7	DIODES INCORPORATED	3.9V	DIODE; ZNR; SMT (SOT-23); Vz=3.9V; Iz=0.005A
21	D2	-	1	BZX84C2V7LT1G	ON SEMICONDUCTOR	2.7V	DIODE; ZNR; SMT (SOT-23); Vz=2.7V; Iz=0.01A; Pd=0.225W
22	D3	-	1	1N5250B	FAIRCHILD SEMICONDUCTOR	20V	DIODE, ZENER, DO-35, Pd=0.5W, Vz=20V@Iz=6.2mA
23	DS1-DS3, DS7	-	4	HSMH-C650	AVAGO TECHNOLOGIES	HSMH-C650	DIODE; LED; STANDARD; TINTED DIFFUSED; RED; SMT (1206); PIV=1.8V; IF=0.025A
24	DS4, DS8	-	2	HSMG-C650	AVAGO TECHNOLOGIES	HSMG-C650	DIODE; LED; STANDARD; TINTED DIFFUSED; GREEN; SMT (1206); PIV=2.2V; IF=0.025A
25	J1, J3, J5, J6, J12, J14, J26, J30	-	8	TSW-103-07-L-D	SAMTEC	TSW-103-07-L-D	CONNECTOR; MALE; THROUGH HOLE; THROUGH HOLE 0.025 POST HEADER; STRAIGHT; 6PINS
26	J2, J19, J29	-	3	TSW-101-07-L-D	SAMTEC	TSW-101-07-L-D	CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; DOUBLE ROW; STRAIGHT; 2PINS
27	J4	-	1	TSW-101-22-L-D	SAMTEC	TSW-101-22-L-D	CONNECTOR; MALE; THROUGH HOLE; .025IN SQ POST HEADER; STRAIGHT; 2PINS
28	J7	-	1	22-28-4043	MOLEX	22-28-4043	CONNECTOR; MALE; THROUGH HOLE; FLAT VERTICAL BREAKAWAY; STRAIGHT; 4PINS
29	J9, J16, J18	-	3	PBC09DAAN	SULLINS ELECTRONICS CORP.	PBC09DAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 18PINS
30	J11, J13, J21, J23, J25	-	5	BP30B	SUPERIOR ELECTRIC	BP30B	CONNECTOR; FEMALE; PANELMOUNT; BLACK STANDARD SINGLE 5-WAY BINDING POST; STRAIGHT; 1PIN
31	J15	-	1	TSW-105-07-L-D	SAMTEC	TSW-105-07-L-D	CONNECTOR; THROUGH HOLE; DOUBLE ROW; STRAIGHT; 10PINS
32	J17	-	1	AWHW16G-0202-T	ASSMANN	AWHW16G-0202-T	CONNECTOR; MALE; THROUGH HOLE; BOXHEADER- LOW PROFILE; STRAIGHT; 16PINS
33	J20, J22, J24	-	3	BP30R	SUPERIOR ELECTRIC	BP30R	CONNECTOR; FEMALE; PANELMOUNT; RED STANDARD SINGLE 5-WAY BINDING POST; STRAIGHT; 1PIN
34	J27	-	1	PEC06SAAN	SULLINS ELECTRONICS CORP.	PEC06SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 6PINS
35	J28, J41-J43	-	4	TSW-101-07-L-S	SAMTEC	TSW-101-07-L-S	CONNECTOR; MALE; THROUGH HOLE; TSW SERIES; STRAIGHT; 1PIN
36	JMP1, JMP3, JMP4, JMP6-JMP8, JMP13-JMP22	-	16	B2A PCB	INTERNATIONAL HYDRAULICS INC	B2A PCB	TEST POINT; CONNECTOR BUSS STAPLE; STR; TOTAL LENGTH=0.565; TIN; BODY = BRASS COPPER; TIN PLATED
37	L1	-	1	DFE201610E-1R5M=P2	MURATA	1.5UH	INDUCTOR; SMT (0806); MAGNETICALLY SHIELDED; 1.5UH; TOL=+/-20%; 2.1A
38	L6, L8	-	4	CTX17-18913-R	EATON	CTX17-18913-R	INDUCTOR; SMT; FERRITE CORE; 100NH; TOL=+/-20%; 90A
39	MISC1	-	1	AFB0512VHD	DELTA ELECTRONICS, INC	AFB0512VHD	FAN; PANELMOUNT 50MM X 50MM X 20MM; 12V
40	Q1, Q4, Q11, Q14	-	4	BSS138	ON SEMICONDUCTOR	BSS138	TRAN; LOGIC LEVEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR; NCH; SOT-23; PD-(0.36W); I- (0.22A); V-(50V); -55 DEGC TO +150 DEGC
41	Q2, Q3, Q5-Q10	-	8	PSMN2R0-30YLE	NEXPERIA	PSMN2R0-30YLE	TRAN; NCH; 2 MILLI-OHM LOGIC LEVEL MOSFET; LFFPAK; PD-(272W); I-(100A); V-(30V)
42	Q13	-	1	FDV304P	FAIRCHILD SEMICONDUCTOR	FDV304P	TRAN; P-CHANNEL; DIGITAL FET; PCH; SOT-23 ; PD-(-); I- (-0.46A); V-(-25V)
43	R1	-	1	CRCW04024R70FK	VISHAY DALE	4.7	RES; SMT (0402); 4.7; 1%; +/-100PPM/DEGC; 0.0630W
44	R2	-	1	ERJ-2RKF2371	PANASONIC	2.37K	RES; SMT (0402); 2.37K; 1%; +/-100PPM/DEGC; 0.1000W

MAX16602CL8  
Evaluation Kit

Evaluates: MAX16602 and MAX20790

MAX16602CL8 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
45	R3	-	1	ERJ-2RKF1781	PANASONIC	1.78K	RES; SMT (0402); 1.78K; 1%; +/-100PPM/DEGC; 0.1000W
46	R4, R5, R16-R19, R23-R29, R32, R34-R36, R38, R39, R43, R54, R55, R61-R63, R83, R84, R95-R100, R125-R129, R131, R132, R144, R145, R148, R153, R154, R156, R157, R160-R163, R166, R167, R169, R190-R197, R201-R204, R206, R222-R225, R237-R260	-	95	ERJ-2GE0R00	PANASONIC	0	RES; SMT (0402); 0; JUMPER; JUMPER; 0.1000W
47	R8-R13, R46, R49	-	8	9C04021A1000FL; RC0402FR-07100RL	PANASONIC; YAGEO PHYCOMP	100	RES; SMT (0402); 100; 1%; +/-100PPM/DEGC; 0.0630W
48	R30, R37, R67, R72-R77, R80, R81, R87, R92-R94, R123, R124, R130, R168, R170, R176-R184, R207-R217	-	40	ERJ-2RKF2001; ERJ-S02F2001	PANASONIC; PANASONIC	2K	RES; SMT (0402); 2K; 1%; +/-100PPM/DEGC; 0.1000W
49	R33, R139	-	2	CRCW04022R0FK; CRCW04022R00FK	VISHAY DALE; VISHAY DALE	2	RES; SMT (0402); 2; 1%; +/-100PPM/DEGC; 0.0630W
50	R60, R136, R152	-	3	ERJ-2RKF10R0	PANASONIC	10	RES; SMT (0402); 10; 1%; +/-100PPM/DEGC; 0.1000W
51	R64, R65, R88-R91, R174, R175	-	8	WSHP28184L000F	VISHAY	0.004	RES; SMT (2818); 0.004; 1%; +/-200PPM/DEGC; 10W
52	R68	-	1	WSL25123L000F	VISHAY DALE	0.003	RES; SMT (2512); 0.003; 1%; +/-150PPM/DEGC; 1W
53	R69	-	1	ERA-2ARB4751	PANASONIC	4.75K	RES; SMT (0402); 4.75K; 0.10%; +/-10PPM/DEGC; 0.0630W
54	R6, R7, R15, R20, R21, R31, R47, R48, R51, R53, R56-R59, R78, R79, R199, R200, R70, R71	-	20	ERJ-2RKF1001	PANASONIC	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.1000W
55	R82, R107, R108, R111, R112, R138	-	6	CRCW0603280R0FK; ERJ-3EKF2800	VISHAY DALE; PANASONIC	280	RES; SMT (0603); 280; 1%; +/-100PPM/DEGC; 0.1000W
56	R85, R109	-	2	CRCW040220K0FK	VISHAY DALE	20K	RES; SMT (0402); 20K; 1%; +/-100PPM/DEGC; 0.0630W
57	R86, R114, R119, R158, R185, R187, R188, R226, R261, R268, R269	-	11	ERJ-2RKF1002	PANASONIC	10K	RES; SMT (0402); 10K; 1%; +/-100PPM/DEGC; 0.1000W
58	R101, R103, R105	-	3	CRCW04022K10FK	VISHAY DALE	2.1K	RES; SMT (0402); 2.1K; 1%; +/-100PPM/DEGC; 0.0630W
59	R102, R104, R106	-	3	ERJ-2RKF49R9	PANASONIC	49.9	RES; SMT (0402); 49.9; 1%; +/-100PPM/DEGC; 0.1000W
60	R110, R122	-	2	CRCW0603100R0FK; ERJ-3EKF1000; RC0603FR-07100RL	VISHAY DALE; PANASONIC	100	RES; SMT (0603); 100; 1%; +/-100PPM/DEGC; 0.1000W
61	R113, R118	-	2	ERJ-2RKF1003	PANASONIC	100K	RES; SMT (0402); 100K; 1%; +/-100PPM/DEGC; 0.1000W
62	R115, R135, R171-R173	-	5	LRC-LR2512LF-01-R250F	TT ELECTRONICS	0.25	RES; SMT (2512); 0.25; 1%; +/-100PPM/DEGC; 2W
63	R116	-	1	CRCW0402453R0FK	VISHAY DALE	453	RES; SMT (0402); 453; 1%; +/-100PPM/DEGC; 0.0630W
64	R117, R121	-	2	CR0402-16W-6040FT; CRCW0402604R0FK	VENKEL LTD.; VISHAY DALE	604	RES; SMT (0402); 604; 1%; +/-100PPM/DEGC; 0.0630W
65	R120	-	1	CRCW04021K50FK	VISHAY DALE	1.5K	RES; SMT (0402); 1.5K; 1%; +/-100PPM/DEGC; 0.0630W
66	R134	-	1	ERA-2AEB1962	PANASONIC	19.6K	RES; SMT (0402); 19.6K; 0.10%; +/-25PPM/DEGC; 0.0630W
67	R137	-	1	ERA-2AEB3740	PANASONIC	374	RES; SMT (0402); 374; 0.10%; +/-25PPM/DEGC; 0.0630W
68	R142	-	1	CR0402-16W-12R7FT	VENKEL LTD.	12.7	RES; SMT (0402); 12.7; 1%; +/-100PPM/DEGC; 0.0630W
69	R146, R264	-	2	RG1608P-101-B; ERA-3YEB101; ERA-3AEB101	SUSUMU CO LTD.; PANASONIC; PANASONIC	100	RES; SMT (0603); 100; 0.10%; +/-25PPM/DEGC; 0.1000W
70	R151	-	1	ERA-2ARB6650	PANASONIC	665	RES; SMT (0402); 665; 0.10%; +/-10PPM/DEGC; 0.0630W



MAX16602CL8  
Evaluation Kit

Evaluates: MAX16602 and MAX20790

MAX16602CL8 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
71	R155	-	1	ERJ-2RKF7153	PANASONIC	715K	RES; SMT (0402); 715K; 1%; +/-100PPM/DEGC; 0.1000W
72	R159	-	1	CRCW040214K3FK	VISHAY DALE	14.3K	RES; SMT (0402); 14.3K; 1%; +/-100PPM/DEGC; 0.0630W
73	R164	-	1	CRCW040284K5FK	VISHAY DALE	84.5K	RES; SMT (0402); 84.5K; 1%; +/-100PPM/DEGC; 0.0630W
74	R165	-	1	CRCW040231K6FK	VISHAY DALE	31.6K	RES; SMT (0402); 31.6K; 1%; +/-100PPM/DEGC; 0.0630W
75	R186	-	1	CRCW04021K30FK	VISHAY DALE	1.3K	RES; SMT (0402); 1.3K; 1%; +/-100PPM/DEGC; 0.0630W
76	R189	-	1	CRCW040253R6FK; CR0402-16W-53R	VISHAY DALE; VENKEL LTD.	53.6	RES; SMT (0402); 53.6; 1%; +/-100PPM/DEGC; 0.0630W
77	R205	-	1	CRCW04021K00FK; RC0402FR-071KL; MCR01MZPF1001	VISHAY DALE; YAGEO PHICOMP; ROHM SEMI	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.0630W
78	R227-R234	-	8	ERJ-2GEJ104	PANASONIC	100K	RES; SMT (0402); 100K; 5%; +/-200PPM/DEGC; 0.1000W
79	R235, R236	-	2	RCC-0402PW5R00J	INTERNATIONAL MANUFACTURING SERVICE	5	RES; SMT (0402); 5; 5%; +/-100PPM/DEGC; 0.0630W
80	R267	-	1	CRCW040212K0FK; MCR01MZPF1202	VISHAY DALE; ROHM SEMICONDUCTOR	12K	RES; SMT (0402); 12K; 1%; +/-100PPM/DEGC; 0.0630W
81	SU1-SU5	-	5	S1100-B; SX1100-B; STC02SYAN	KYCON; KYCON; SULLINS ELECTRONICS CORP.	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; INSULATION=PBT;PHOSPHOR BRONZE CONTACT=GOLD PLATED
82	SW1, SW2	-	2	GT21MCBE	C&K COMPONENTS	GT21MCBE	SWITCH; DPDT; THROUGH HOLE; 20V; 0.4VA; GT SERIES; SEALED ULTRAMINIATURE TOGGLE SWITCH; RCOIL= 0.05 OHM; RINSULATION=10G OHM; C&K COMPONENTS
83	U1, U2	-	2	MAX15103EWL+	MAXIM	MAX15103EWL	IC; VREG; SMALL 3A, LOW-DROPOUT LINEAR REGULATOR; WLP15
84	U4-U9, U19, U20	-	8	MAX20790	MAXIM	MAX20790	EVKIT PART - IC; MAX20790; SMART POWER-STAGE IC WITH INTEGRATED CURRENT AND TEMPERATURE SENSORS; PACKAGE OUTLINE DRAWING: 21-100261; LAND PATTERN DRAWING: 90-100099; PACKAGE CODE: F123A7F+1; FC2QFN12
85	U12	-	1	MAX16602	MAXIM	MAX16602	EVKIT PART-IC; VREG; MAX16602; TQFN56-EP
86	U13	-	1	MAX40010LAUT+	MAXIM	MAX40010LAUT+	IC; AMP; 76V PRECISION; HIGH-VOLTAGE; CURRENT-SENSE AMPLIFIER; GAIN=12.5V/V; SOT23-6
87	U21	-	1	MAXM17575ALI#	MAXIM	MAXM17575ALI#	IC; PWRMOD; 4.5V TO 60V; 1.5A HIGH-EFFICIENCY; DC-DC STEP-DOWN POWER MODULE WITH INTEGRATED INDUCTOR; LGA28-3EP
88	U22, U23, U25, U31	-	4	MAX9651AUA+	MAXIM	MAX9651AUA+	IC; OPAMP; HIGH-CURRENT VCOM DRIVE OP AMP FOR TFT LCD; UMAX8-EP
89	U24	-	1	MAX9141EKA+	MAXIM	MAX9141EKA+	IC; COMP; 40NS, LOW-POWER, 3V/5V, RAIL-TO-RAIL SINGLE-SUPPLY COMPARATOR; SOT23-8
90	U26	-	1	LT1806CS6#PBF	ANALOG DEVICES	LT1806CS6#PBF	IC; OPAMP; 325MHZ; SINGLE; RAIL-TO-RAIL INPUT AND OUTPUT; LOW DISTORTION; LOW NOISE PRECISION OPERATIONAL AMPLIFIER; TSOT23-6
91	PCB	-	1	MAX16600_FAB900557_01_00_APPS_P1	MAXIM	PCB	PCB;MAX16600_FAB900557_01_00_APPS_P1
92	C10-C13, C37, C120, C121, C515, C815-C818	DNP	0	GRM155R71E104KE14; C1005X7R1E104K050BB; TMK105B7104KVH; CGJ2B3X7R1E104K050BB	MURATA; TDK; TAIYO YUDEN; TDK	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 25V; X7R; CERAMIC
93	C45, C50, C98, C110, C111, C126, C135, C141, C142, C805, C807, C808	DNP	0	EEF-GX0D561L	PANASONIC	560UF	CAP; SMT (7343-20); 560UF; 20%; 2V; ALUMINUM-ELECTROLYTIC

MAX16602CL8  
Evaluation Kit

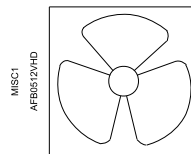
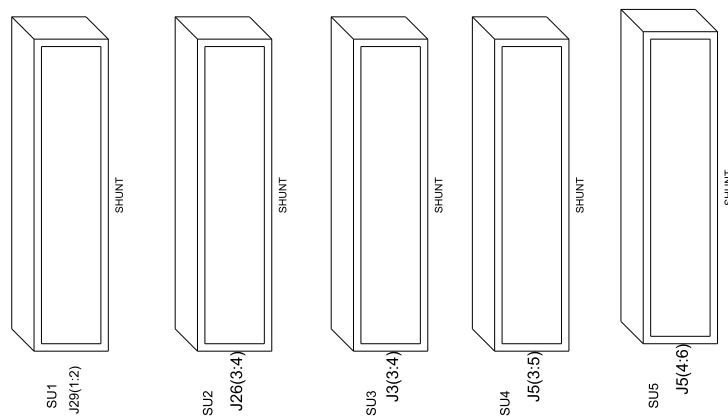
Evaluates: MAX16602 and MAX20790

MAX16602CL8 EV Kit Bill of Materials (continued)

ITEM	REF_DES	DNI/ DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
94	C825-C832	DNP	0	GRM1555C1E101GA01	MURATA	100PF	CAP; SMT (0402); 100PF; 2%; 25V; C0G; CERAMIC
95	J33-J38	DNP	0	5146800-1	TE CONNECTIVITY	5146800-1	CONNECTOR; FEMALE; THROUGH HOLE; KEYLESS INSERT ASSEMBLY; RIGHT ANGLE; 5PINS
96	L2, L4	DNP	0	CLB1108-4-50TR-R	COOPER BUSSMANN	CLB1108-4-50TR-R	INDUCTOR; SMT; FERRITE CORE; 50NH; TOL=+/-20%; 25A
97	Q12	DNP	0	BSS138	ON SEMICONDUCTOR	BSS138	TRAN; LOGIC LEVEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR; NCH; SOT-23; PD-(0.36W); I-(0.22A); V-(50V); -55 DEGC TO +150 DEGC
98	R14, R22, R40-R42, R44, R45, R50, R52, R143, R147, R149, R150	DNP	0	ERJ-2GE0R00	PANASONIC	0	RES; SMT (0402); 0; JUMPER; JUMPER; 0.1000W
99	R66, R133, R140, R141, R218-R221	DNP	0	CRCW04022R0FK; CRCW04022R00FK	VISHAY DALE; VISHAY DALE	2	RES; SMT (0402); 2; 1%; +/-100PPM/DEGC; 0.0630W
100	R198, R275-R281	DNP	0	CRCW0402200KFK; RF73H1ELTP2003	VISHAY DALE; KOA SPEER ELECTRONICS	200K	RES; SMT (0402); 200K; 1%; +/-100PPM/DEGC; 0.0630W
101	R262, R263	DNP	0	ERJ-2RKf1001	PANASONIC	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.1000W
102	R265, R266	DNP	0	RG1608P-101-B; ERA-3YEB101; ERA-3AEB101	SUSUMU CO LTD.; PANASONIC; PANASONIC	100	RES; SMT (0603); 100; 0.10%; +/-25PPM/DEGC; 0.1000W
103	U3, U10, U11, U14-U18	DNP	0	MAX20790	MAXIM	MAX20790	EVKIT PART - IC; MAX20790; SMART POWER-STAGE IC WITH INTEGRATED CURRENT AND TEMPERATURE SENSORS; PACKAGE OUTLINE DRAWING: 21-100261; LAND PATTERN DRAWING: 90-100099; PACKAGE CODE: F123A7F+1; FC2QFN12
TOTAL			1148				

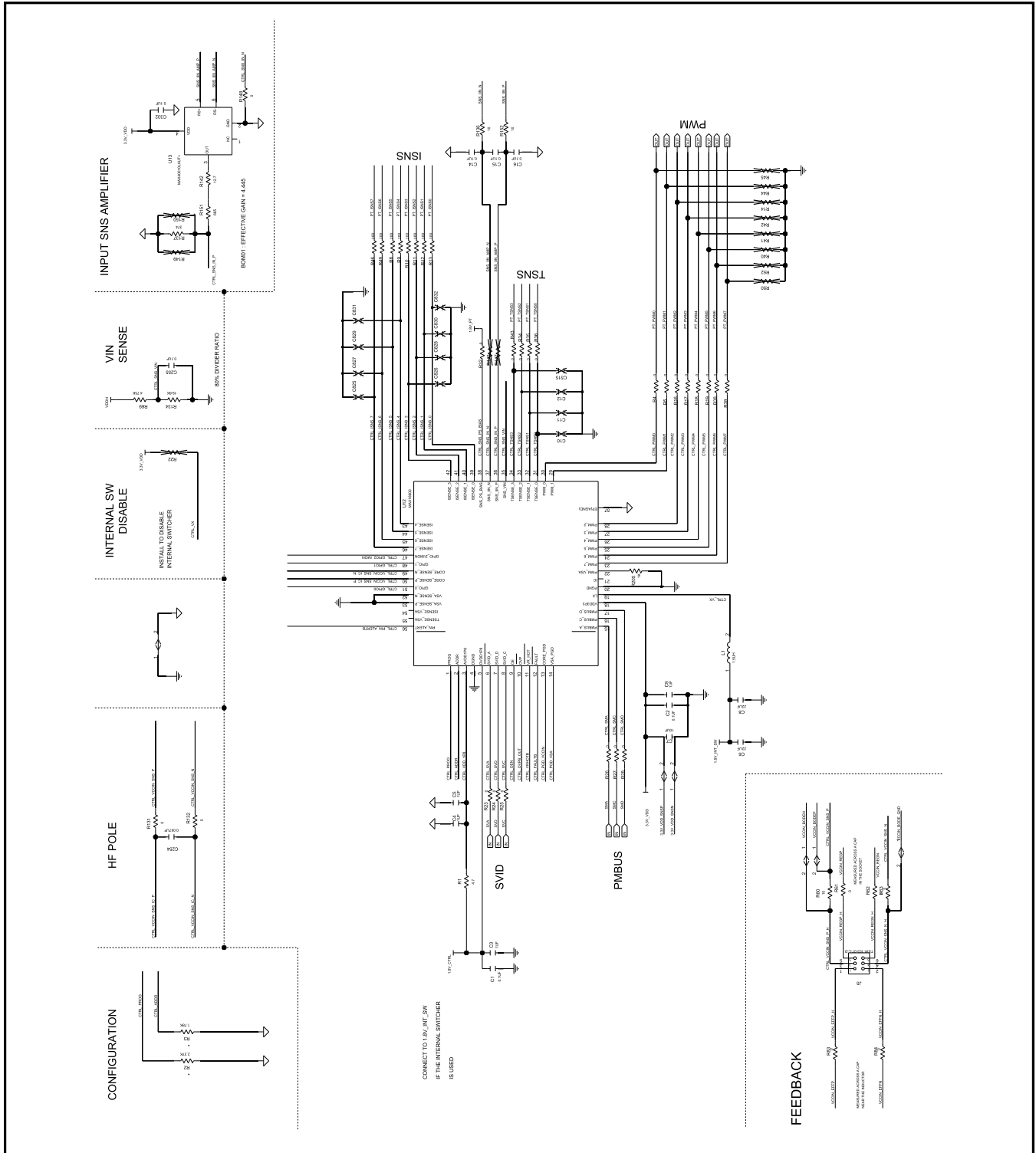
## MAX16602CL8 EV Kit Schematic Diagrams

# MECHANICAL

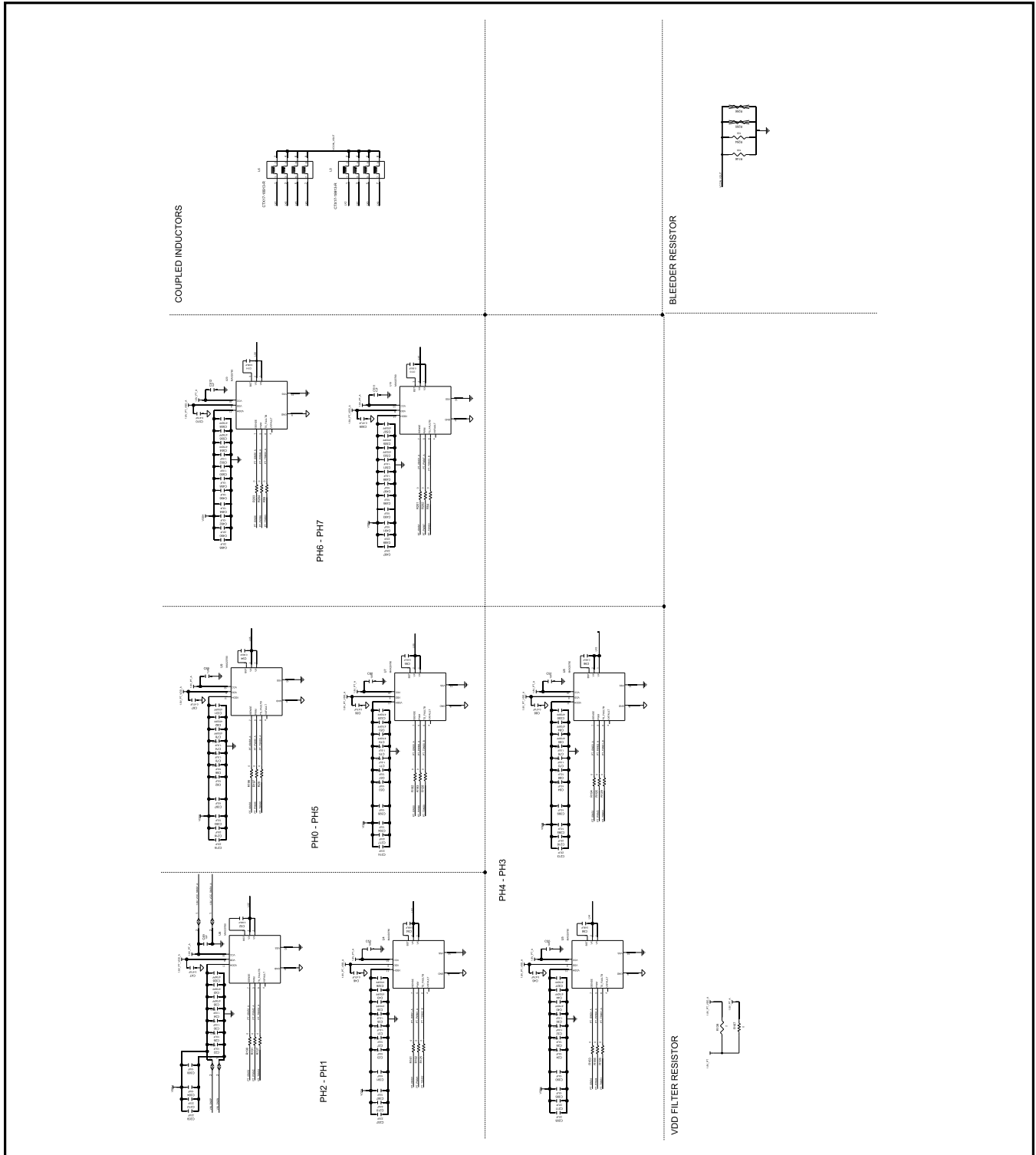




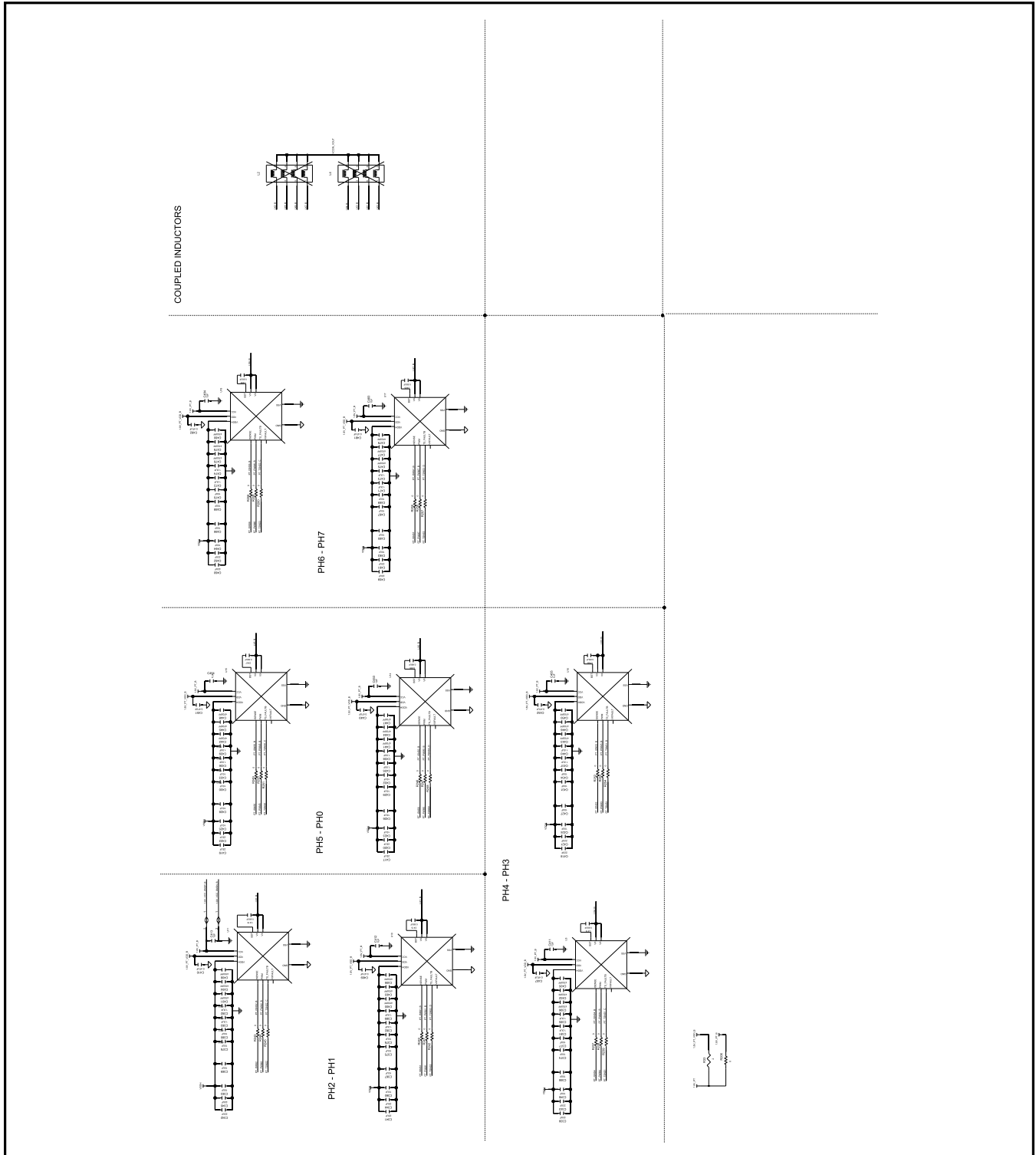
MAX16602CL8 EV Kit Schematic Diagrams (continued)



MAX16602CL8 EV Kit Schematic Diagrams (continued)

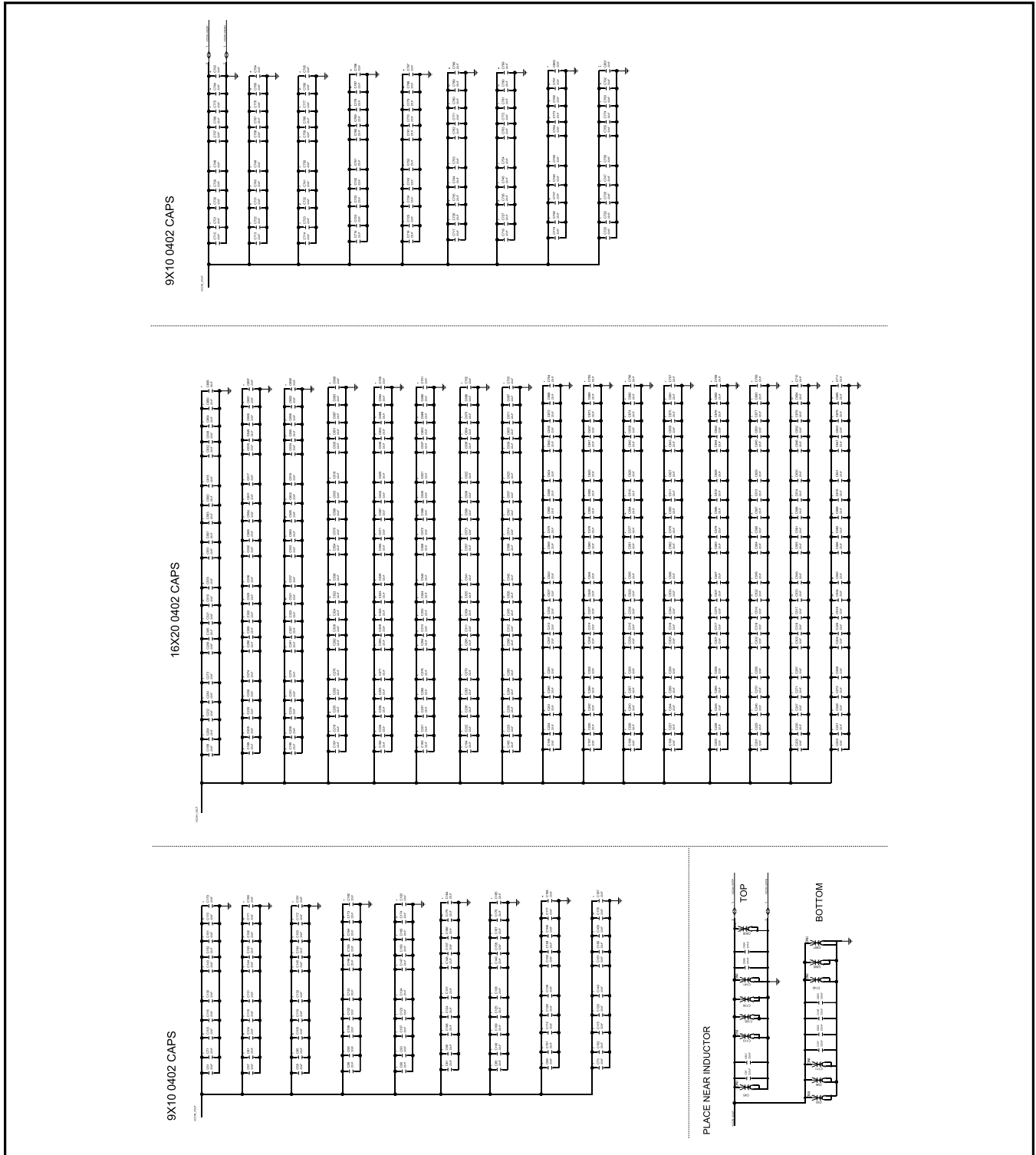


MAX16602CL8 EV Kit Schematic Diagrams (continued)

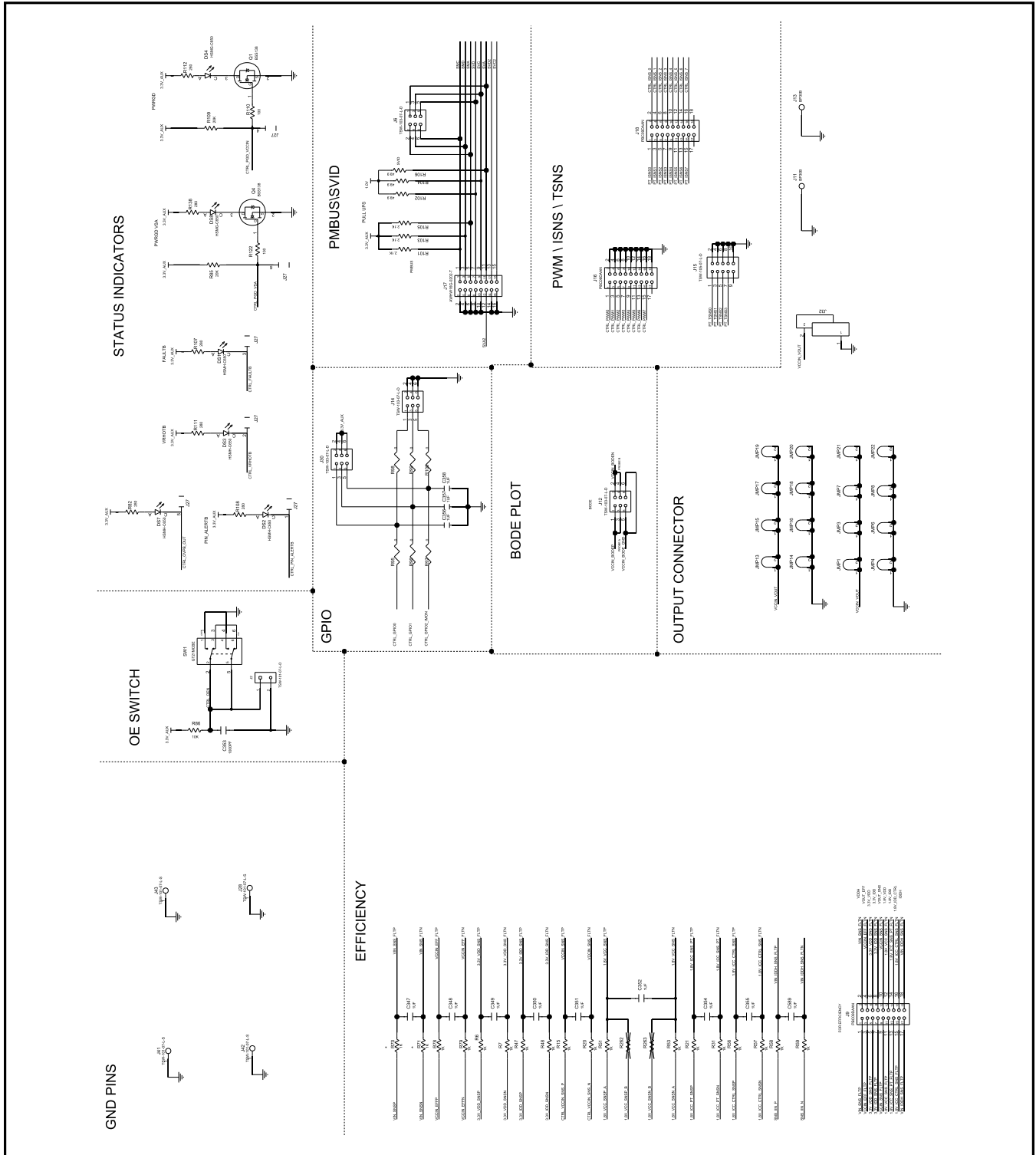




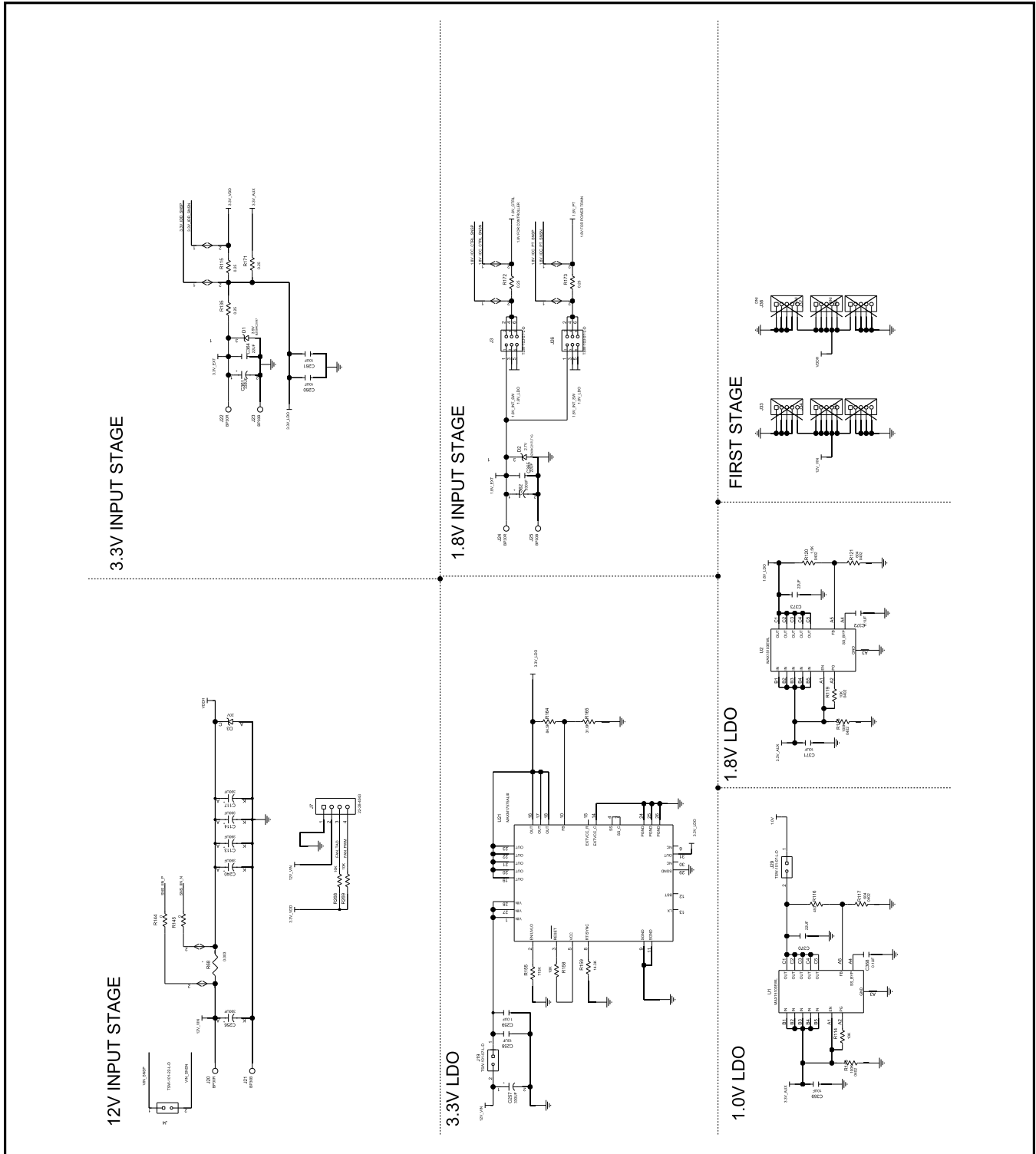
MAX16602CL8 EV Kit Schematic Diagrams (continued)



MAX16602CL8 EV Kit Schematic Diagrams (continued)



MAX16602CL8 EV Kit Schematic Diagrams (continued)





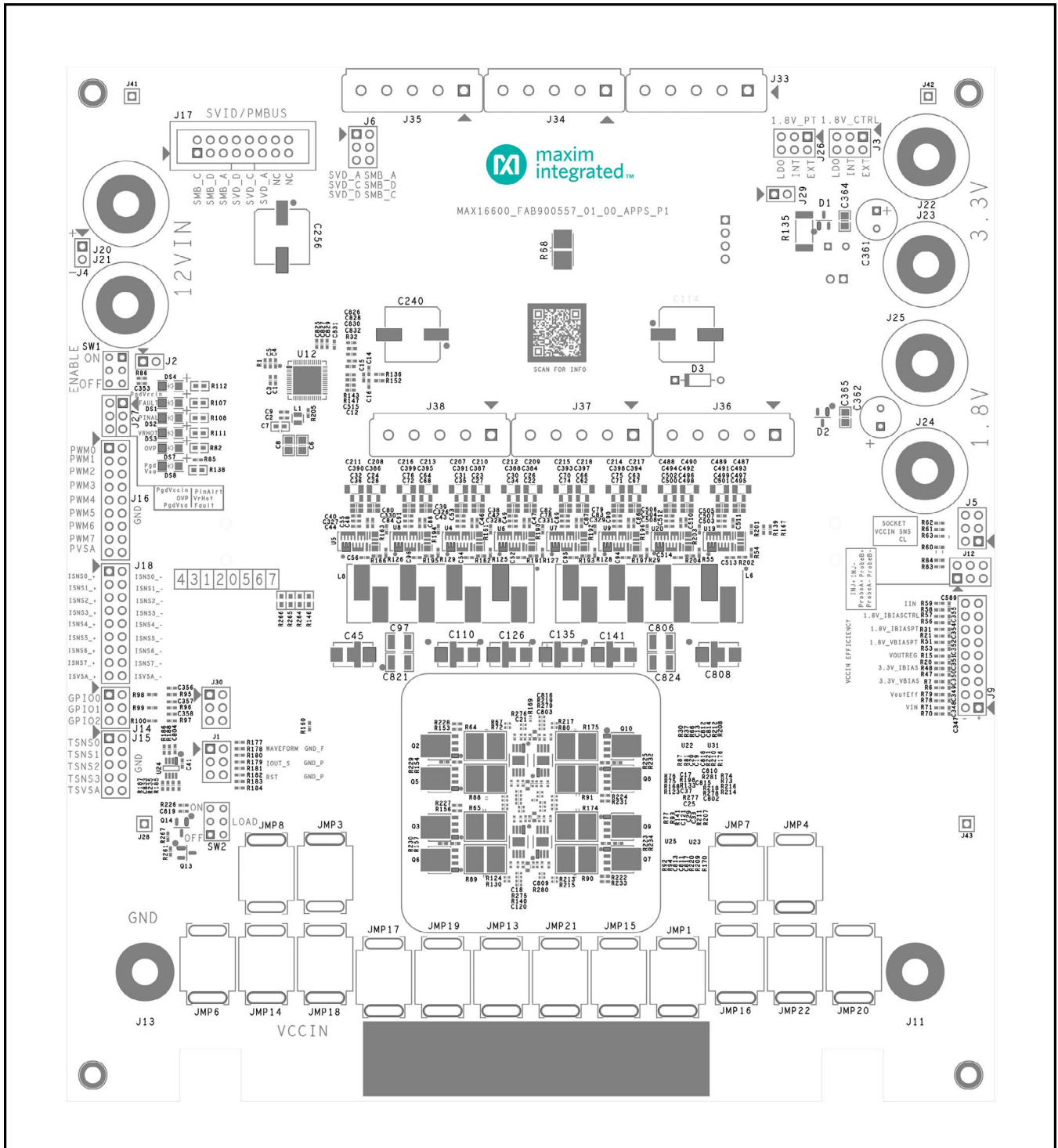




# MAX16602CL8 Evaluation Kit

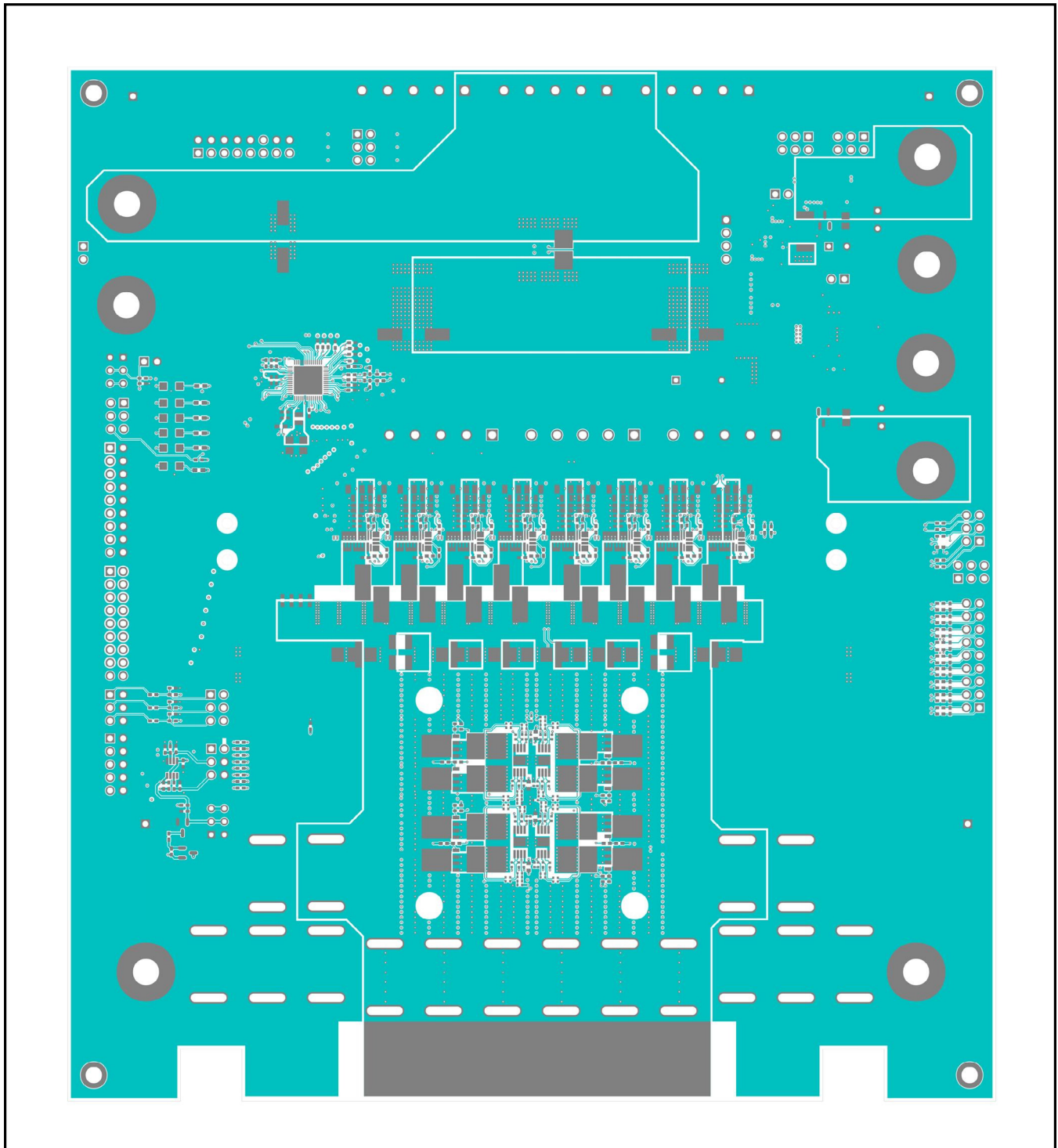
Evaluates: MAX16602 and MAX20790

## MAX16602CL8 EV Kit PCB Layout Diagrams



MAX16602CL8 EV Kit PCB—Silkscreen Top Side

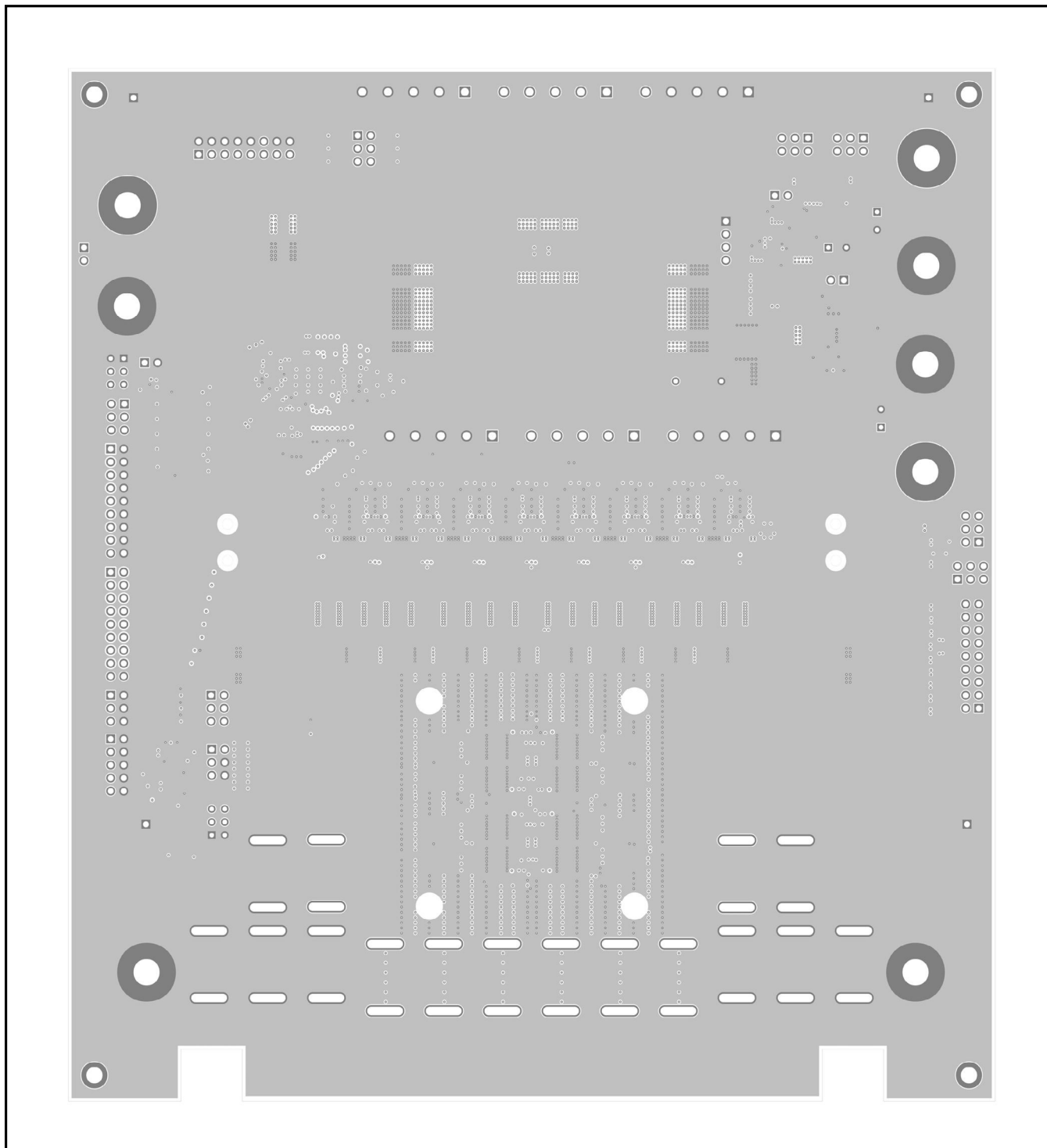
MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Top Side

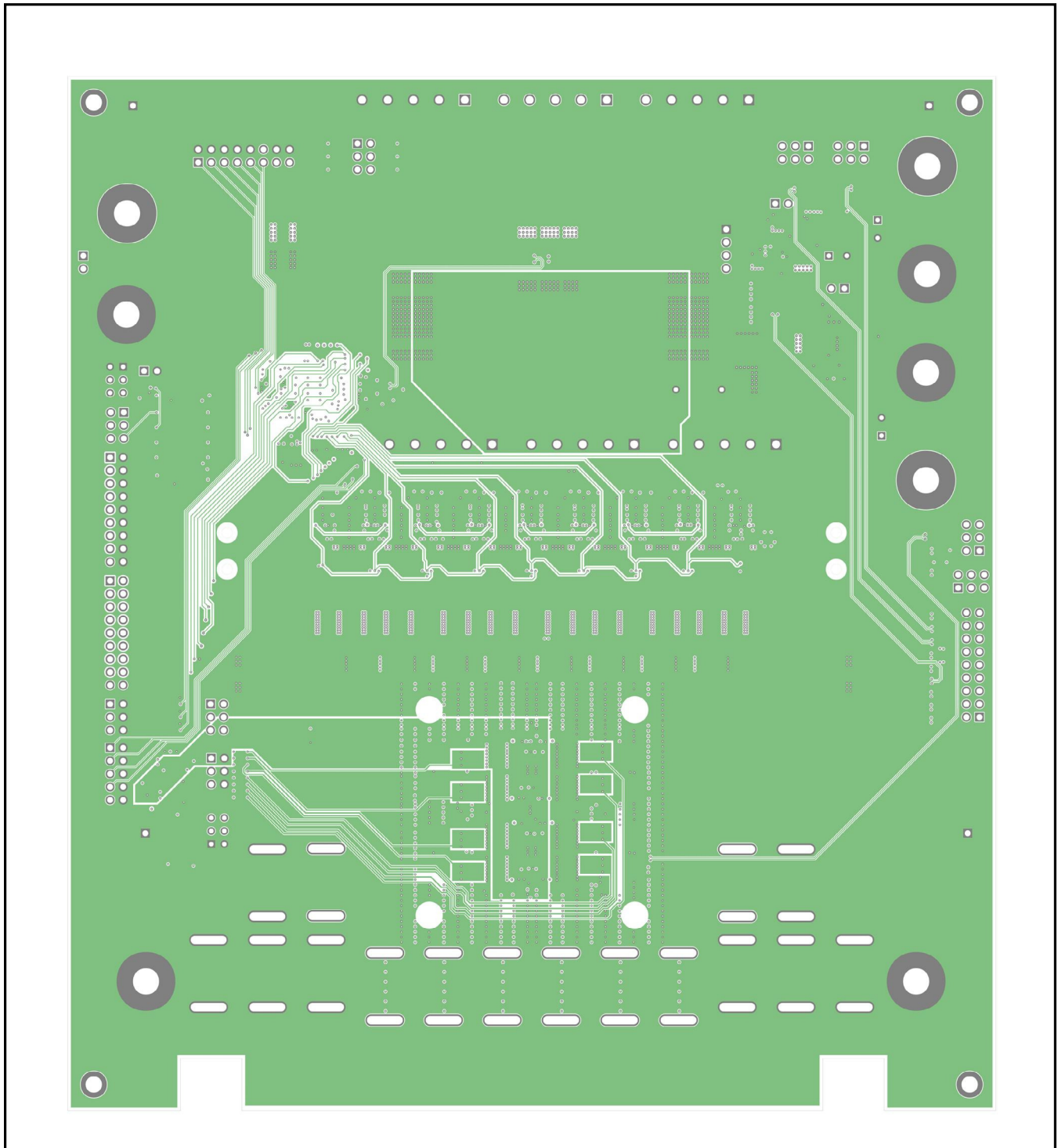


MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



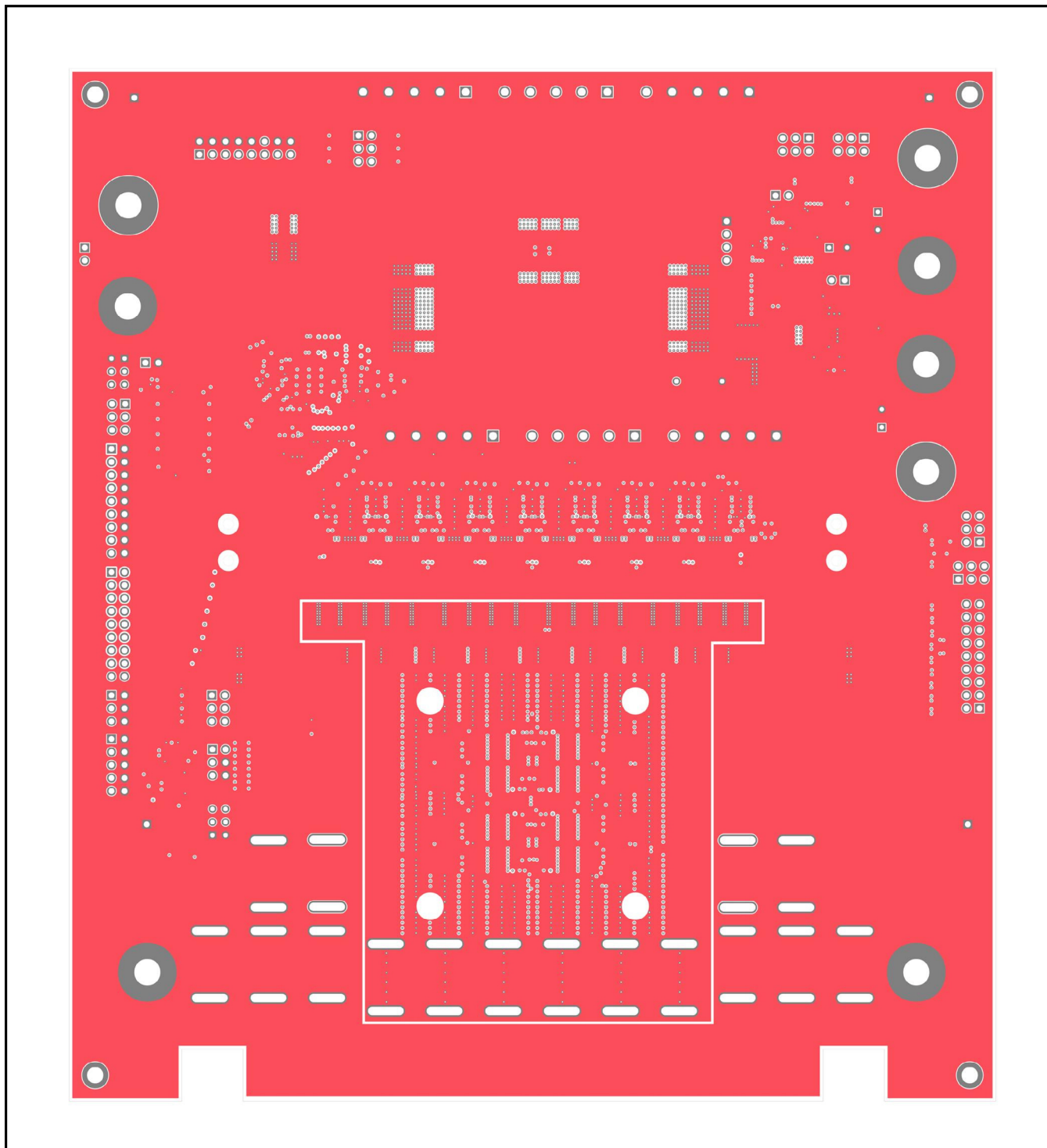
MAX16602CL8 EV Kit PCB—Internal Layer 2

MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



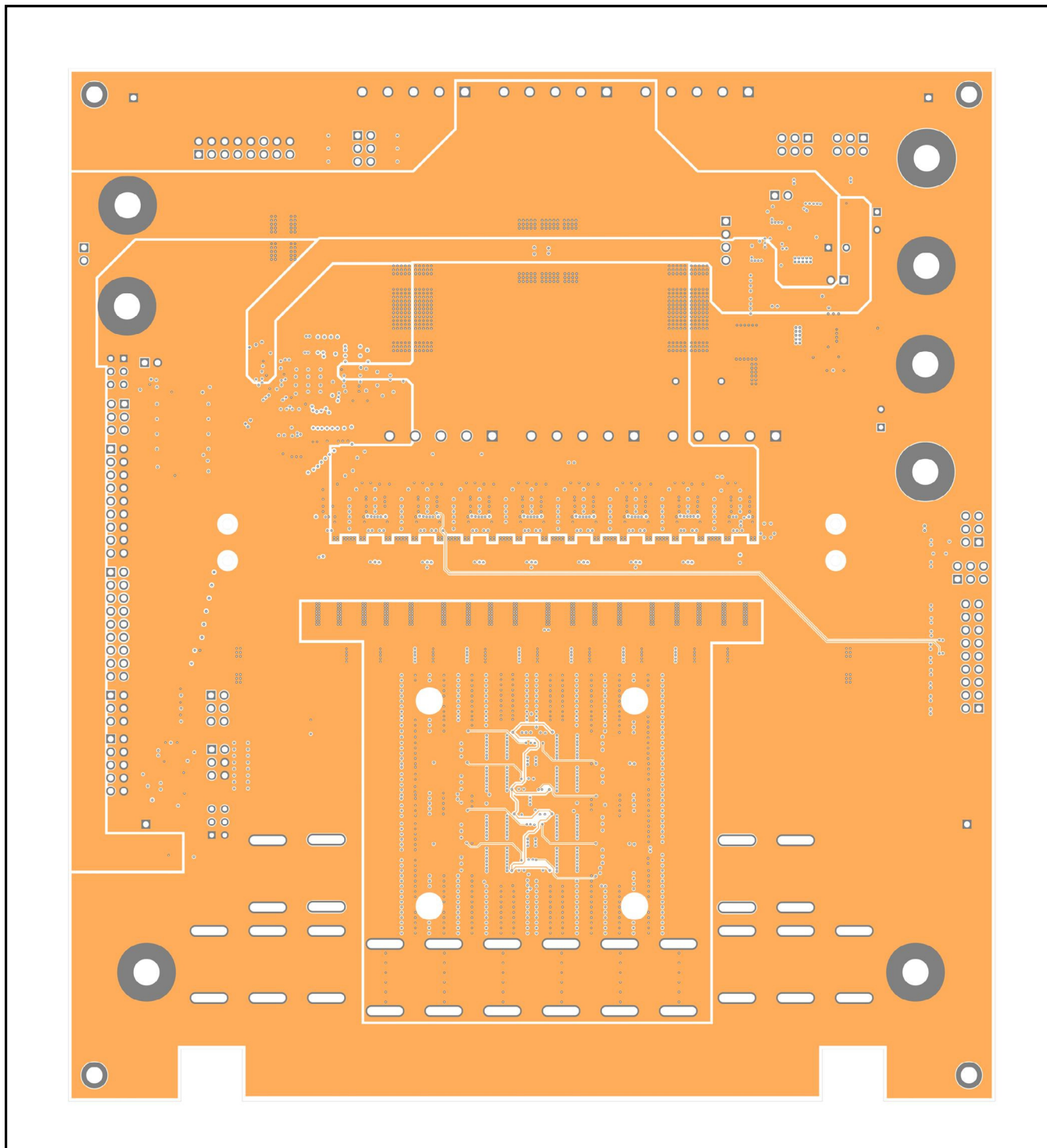
MAX16602CL8 EV Kit PCB—Internal Layer 3

MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 4

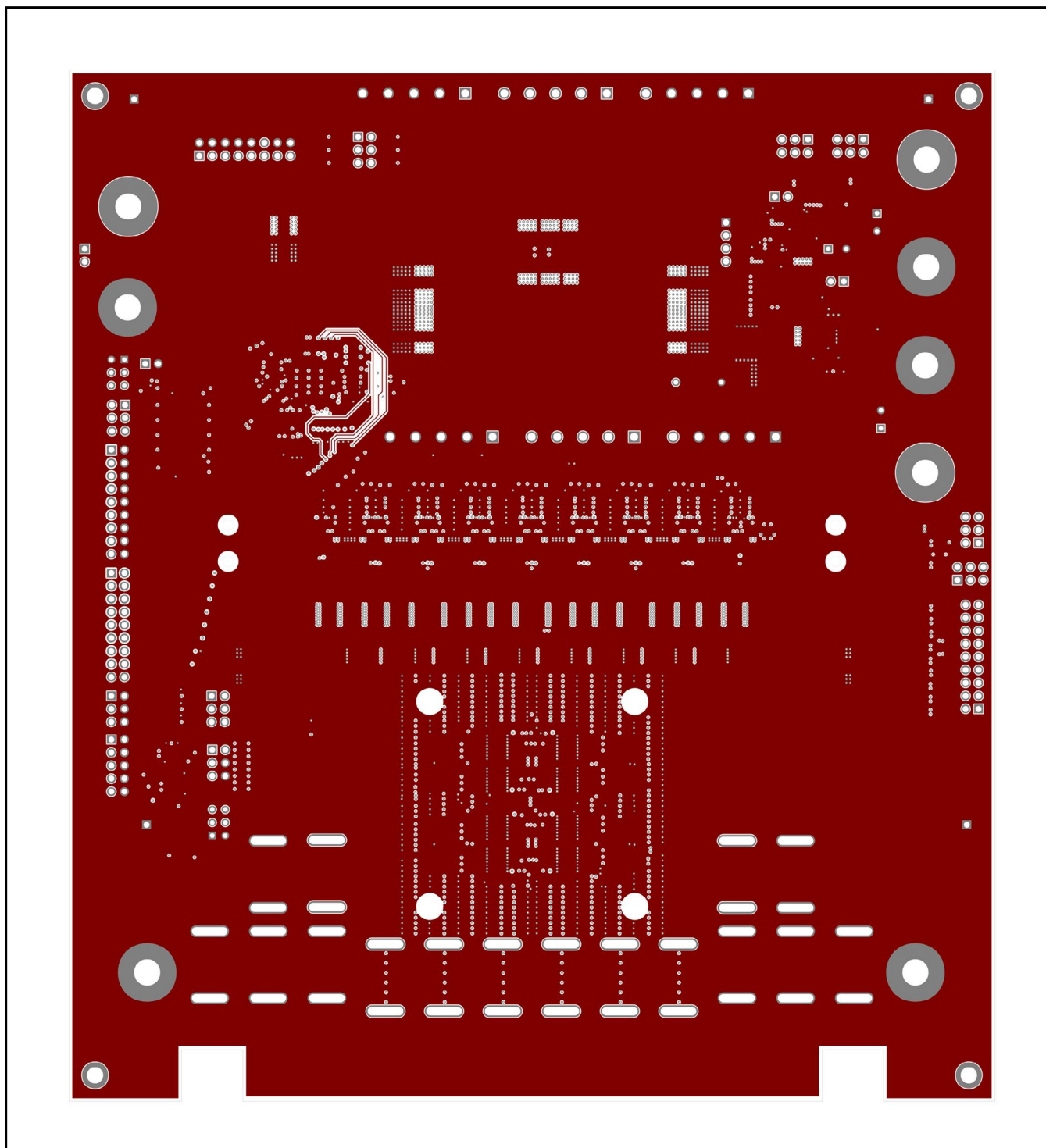
MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 5

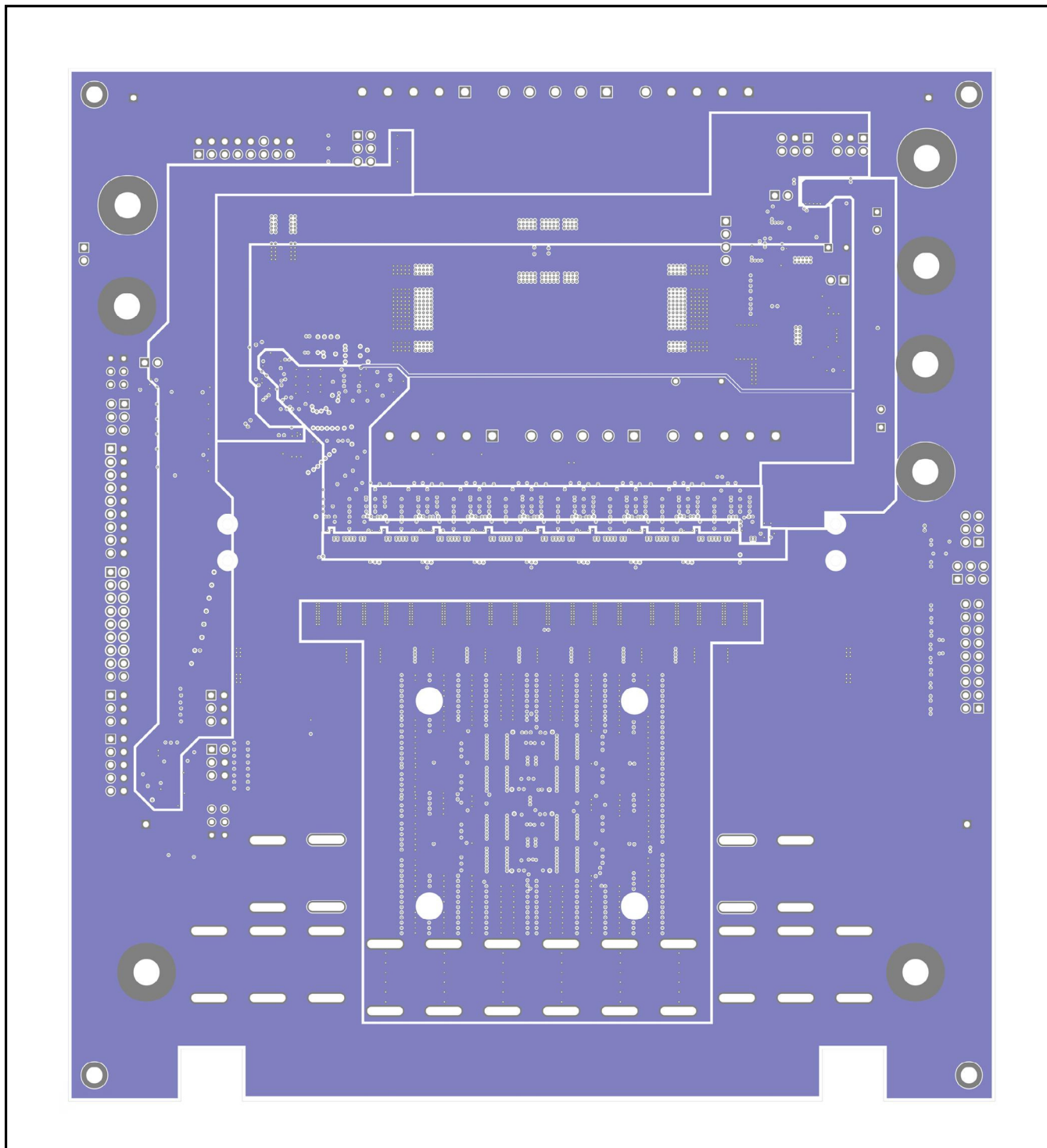


MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 6

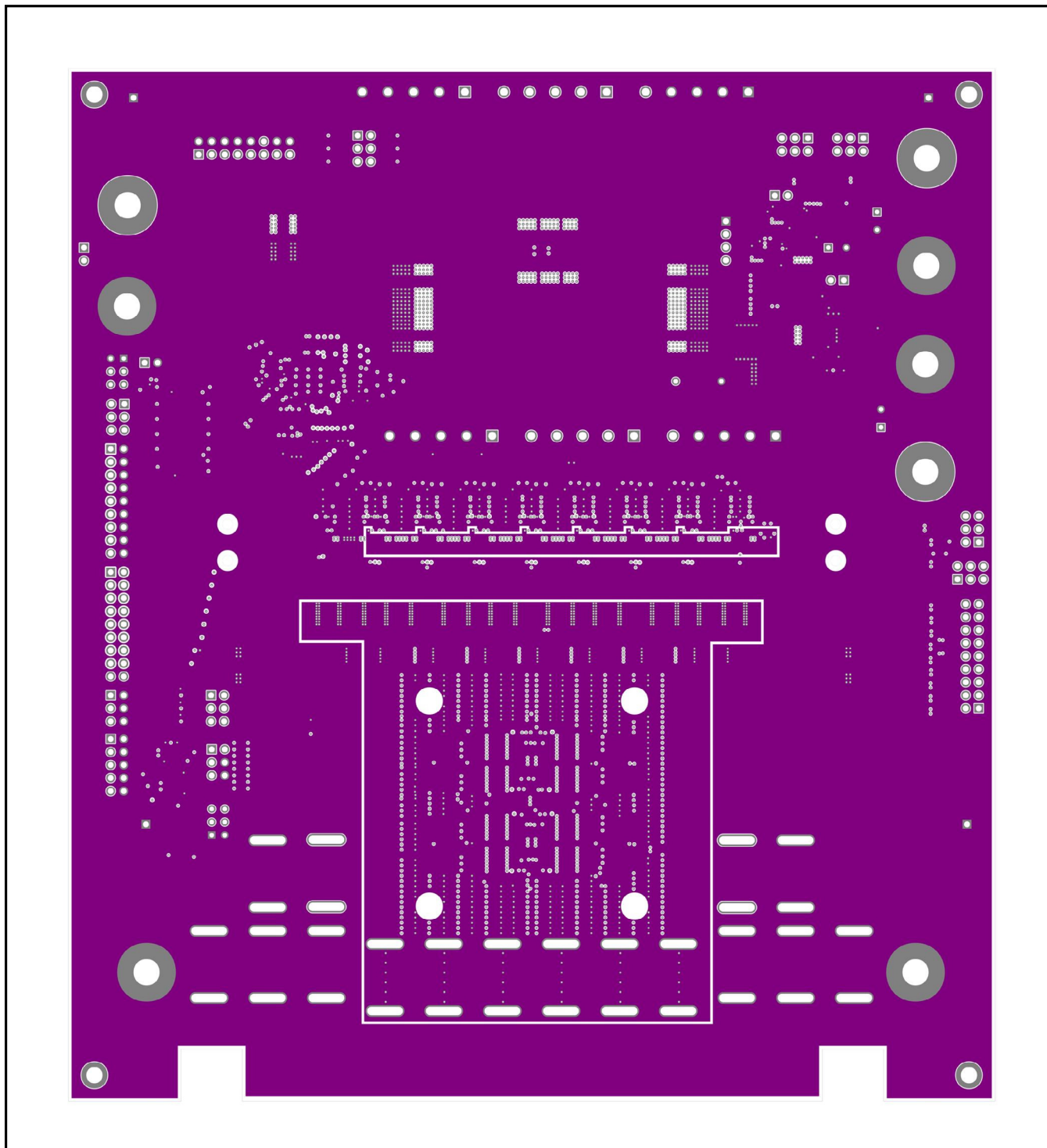
MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 7

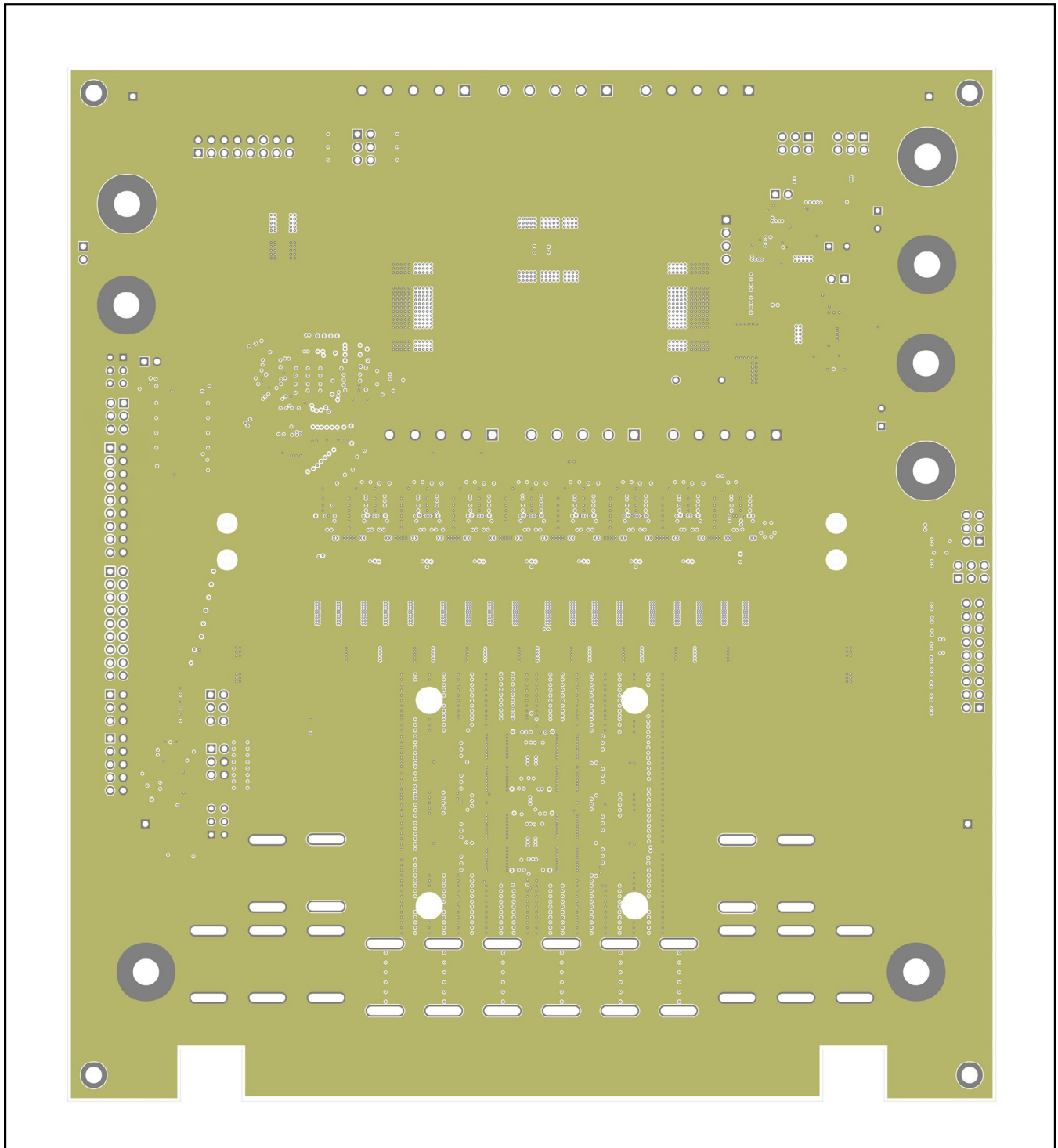


MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



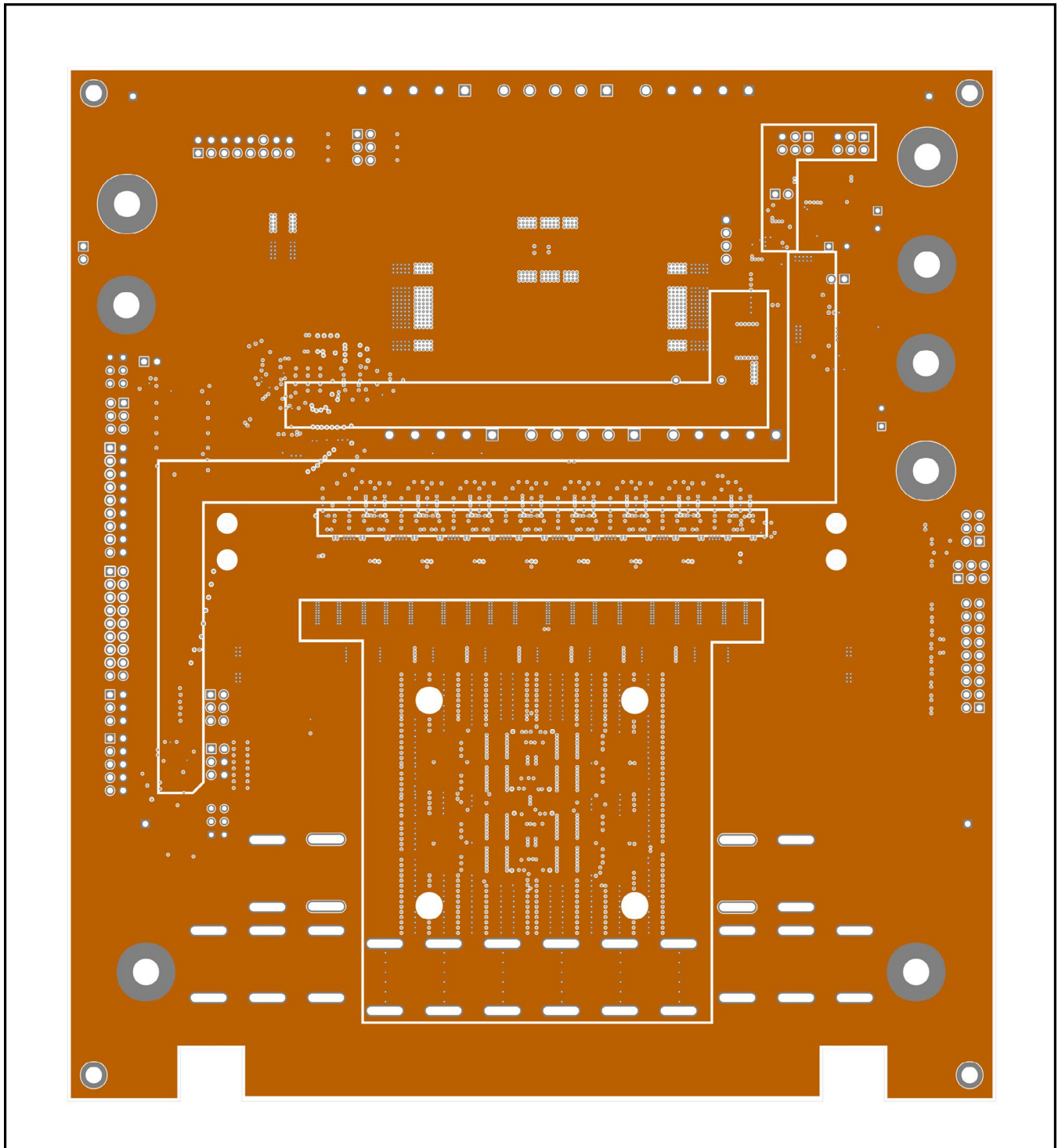
MAX16602CL8 EV Kit PCB—Internal Layer 8

MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



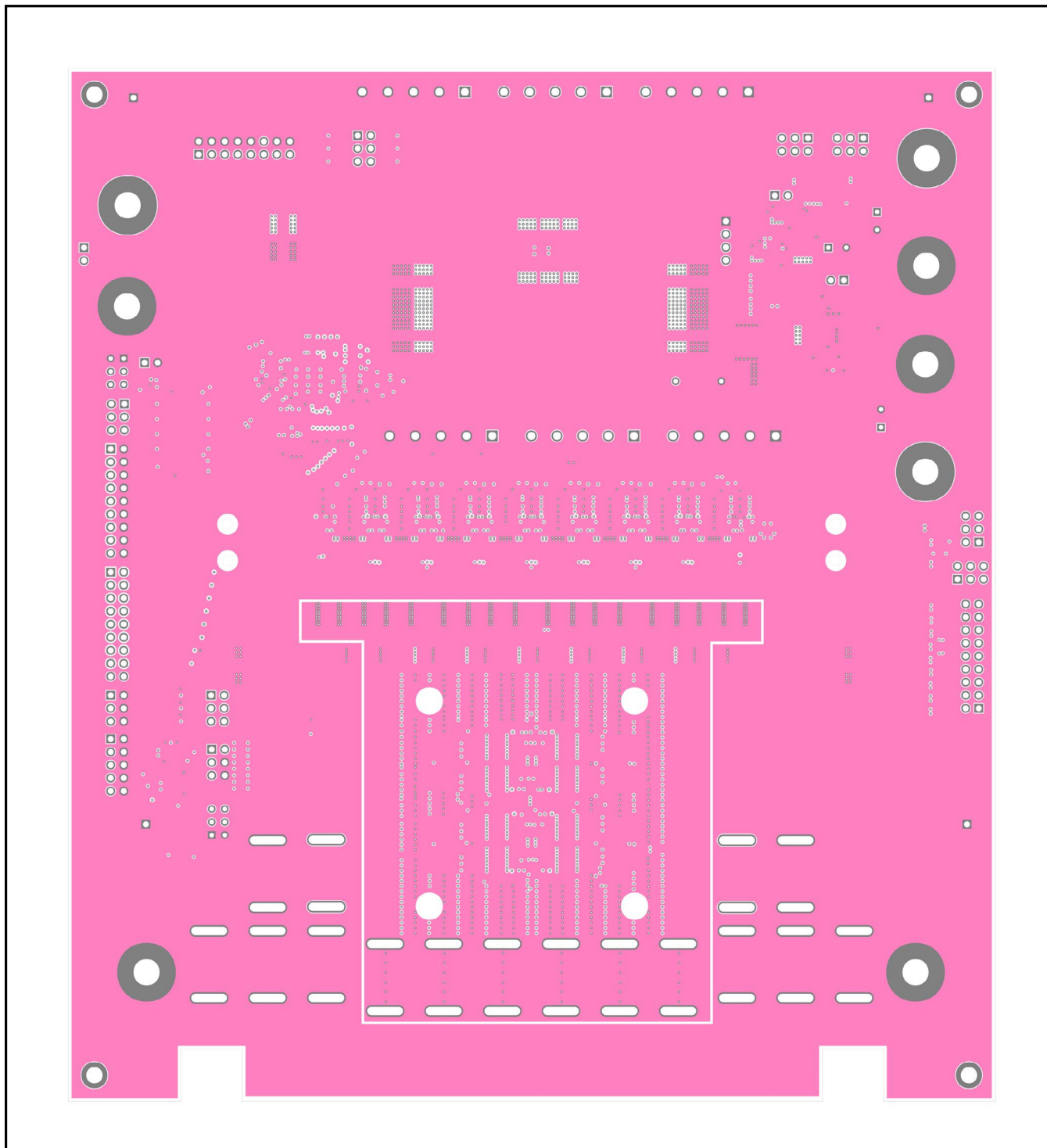
MAX16602CL8 EV Kit PCB—Internal Layer 9

MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 10

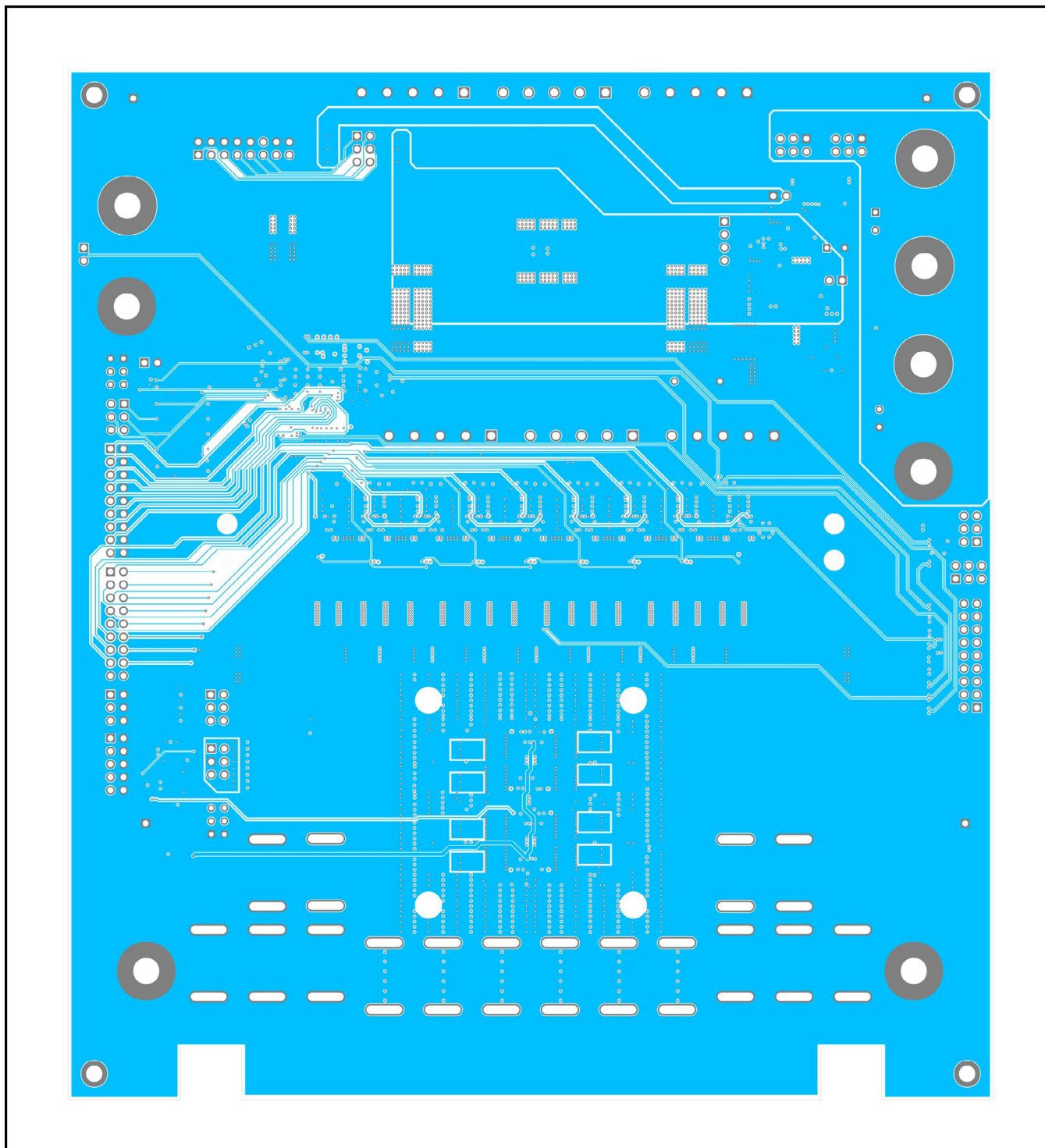
MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 11

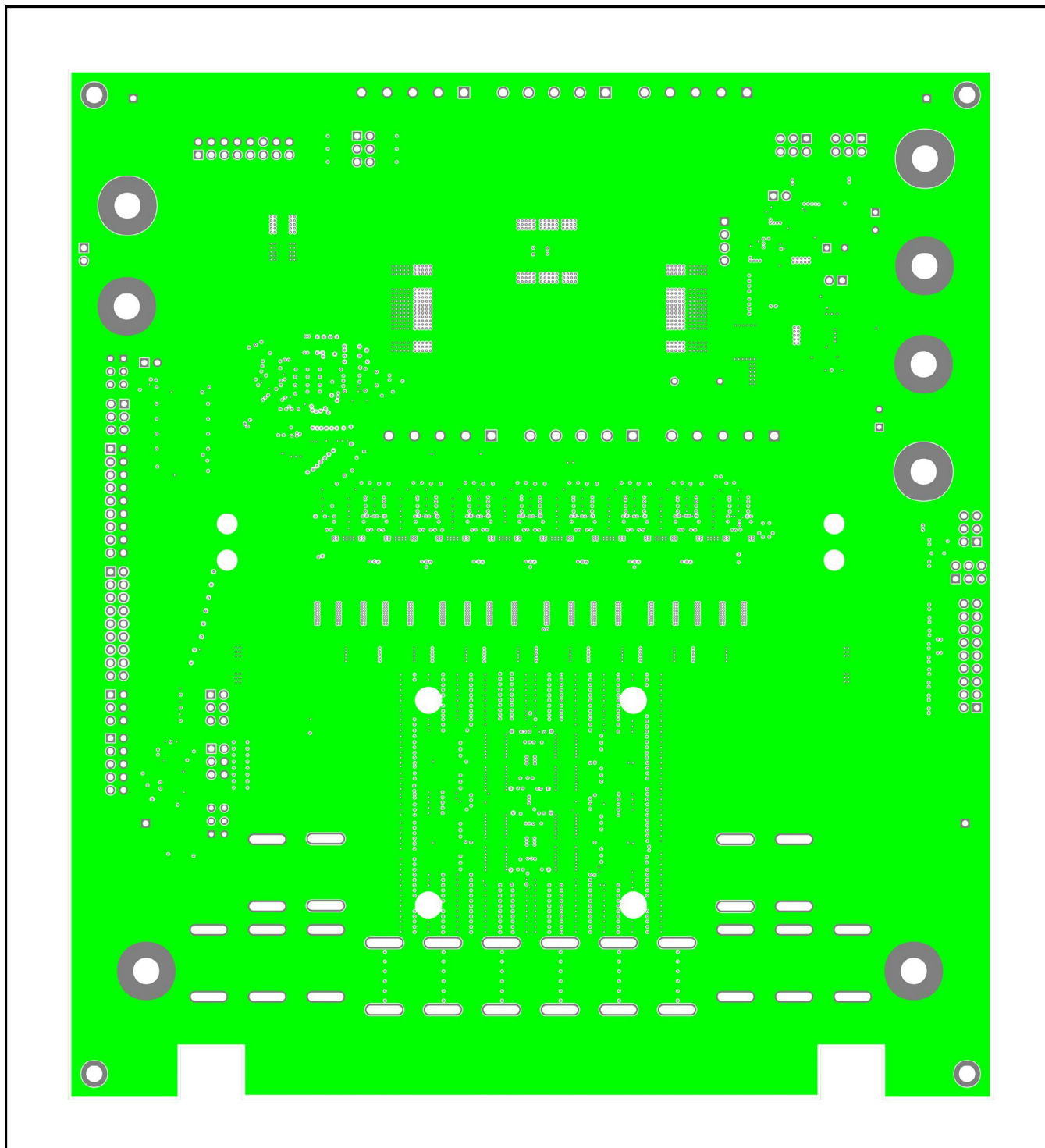


MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 12

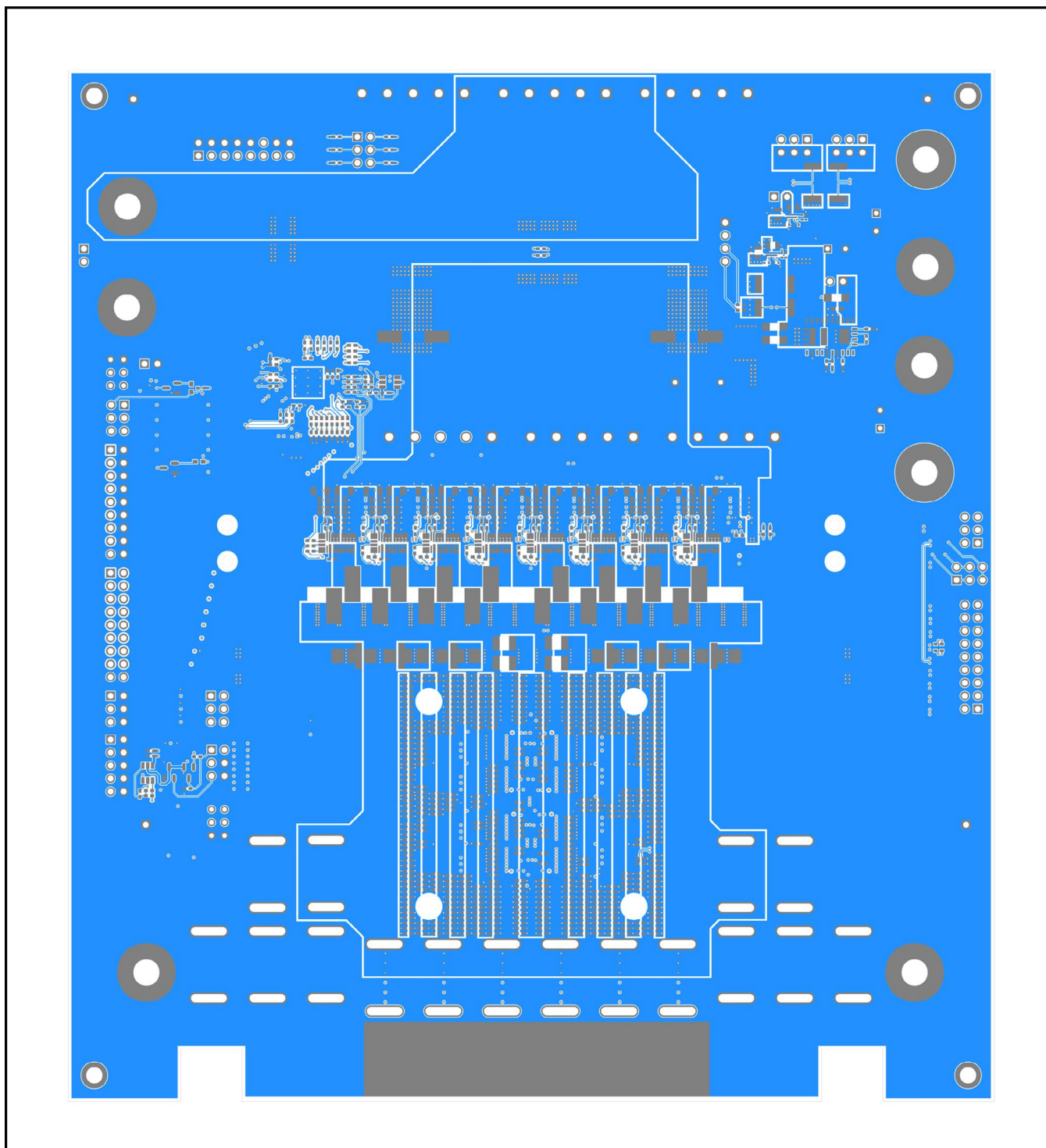
MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Internal Layer 13

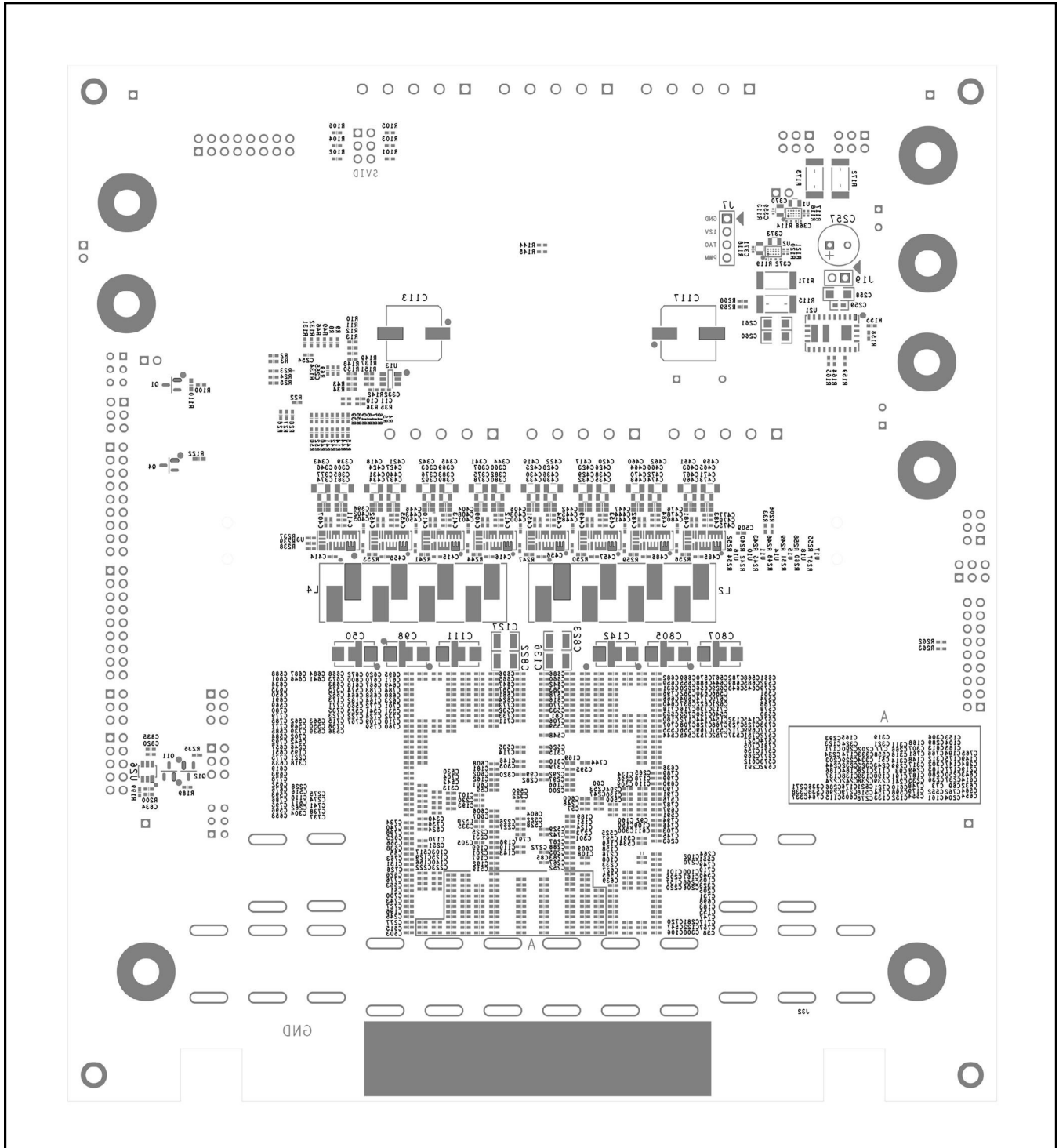


MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Bottom Side

MAX16602CL8 EV Kit PCB Layout Diagrams (continued)



MAX16602CL8 EV Kit PCB—Silkscreen Bottom Side

MAX16602CL8  
Evaluation Kit

Evaluates: MAX16602 and MAX20790

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	11/20	Initial release	—

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