

General Description

The MAX16710 evaluation kit (EV kit) is a reference platform designed for the evaluation of the MAX16710, a 10A step-down DC-DC switching regulator IC with compact WLP package. The IC operates from 2.7V to 16V input supply. It features peak current mode control, high efficiency, high-power density, and easy selection of various application scenario configurations. For more information, refer to the MAX16710 IC data sheet.

The EV kit provides a proven design to evaluate the chip and has been developed with a 6-layer PCB layout and optimized overall performance. The jumper pins, test points, and the input/output connectors are included to provide flexible and convenient use in a wide range of applications.

Features and Benefits

- Wide 2.7V to 16V Input-Voltage Range
- 0.5V to 5.8V Output-Voltage Range
- Integrated Internal LDO for Bias Supply
- Selectable Switching Frequency, OCP Threshold, DCM Operation, Voltage Loop Gain
- Power Good (PGOOD) Indicator LED
- Fully Assembled and Tested

Quick Start

Required Equipment

- MAX16710 EV Kit
- 2.7V to 16V Power Supply
- 0A to 10A Load
- Digital Multimeters
- Oscilloscope and Probes

Procedure

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

Note: Do not supply V_{IN} until the board has been correctly configured with the input and output cables connected.

1. Set up the V_{IN} power supply at a voltage level between 2.7V and 16V. Disable the power-supply output. Verify jumper J6 is closed, all other jumpers are open, and SW1 is positioned to disable the IC.
2. Connect the positive and negative terminal of the V_{IN} power supply to the board using suitable section cables equipped with male banana plugs.
3. Respecting the polarity, connect the positive terminal to VIN+ and the negative terminal to VIN_GND with J5 and J8 connectors, respectively.
4. Verify that each jumper is correctly positioned for the required configuration.
5. Connect the electronic load to the output, respecting the polarity.
6. Connect all the required probing equipment to the EV kit.
7. Turn on the V_{IN} power supply. Ensure LED DS1 is off.
8. Position the SW1 toggle switch to enable the IC. Enable the load.
9. Ensure LED DS1 is on and measure $V_{OUT} = 1V$.

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

EV Kit Board

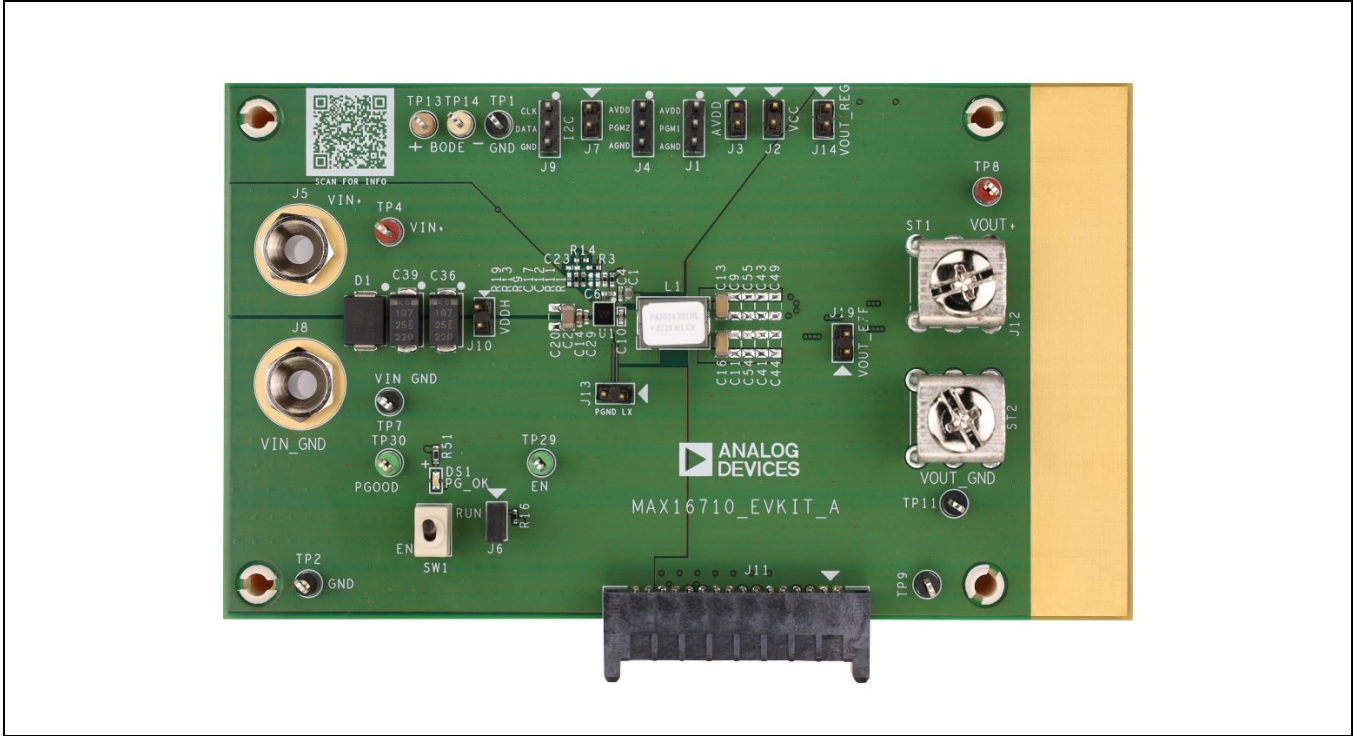


Figure 1. MAX16710 EV Kit Board—Top

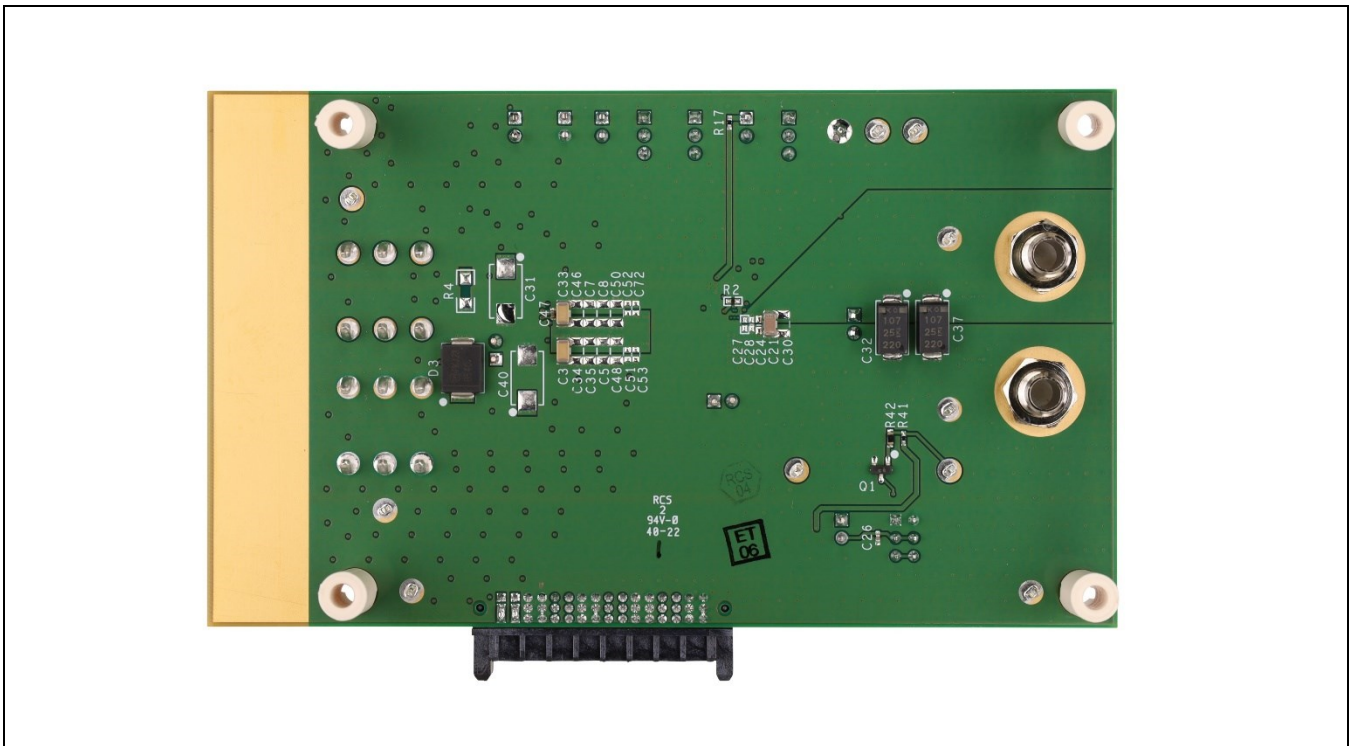


Figure 2. MAX16710 EV Kit Board—Bottom

Detailed Description of Hardware

The MAX16710 EV kit provides a proven design to evaluate the MAX16710 IC, which is a fully integrated, highly efficient, 10A buck regulator suitable for communications and data-center applications. The EV kit can be easily connected, configured, and tested with the input banana connectors, output screw connectors (suitable for high current), and full on-board test points (for the measurement and monitoring of significant waveforms).

Table 1. Jumper Connection Guide

JUMPER	DEFAULT CONNECTION	FEATURE
J1–J4, J7, J9, J10, J13, J19	Open	N/A
J6	Closed	Enable Switch

Output-Voltage Selection

The MAX16710 has an internal 0.5V reference voltage. When the targeted output voltage is higher than 0.5V, resistor dividers R_9 and R_{13} are required to sense the output voltage (see the [EV Kit Schematics](#) section). The resistor divider ratio is shown in Equation 1.

Equation 1:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_{13}}{R_9}\right)$$

where:

V_{OUT} = Output voltage.

V_{REF} = 0.5V fixed reference voltage.

R_{13} = Top divider resistor.

R_9 = Bottom divider resistor.

It is recommended that R_9 should not exceed 5k Ω . The EV kit is assembled for a standard configuration and demonstrates full operation at 1V output voltage and 10A load current.

Some do not install (DNI) component options (e.g. feedback net filtering or input/output capacitance place holders) can be useful for custom conditions. However, they are not required for full functionality within the input-voltage range, output-voltage range, and current.

The correct number of input and output capacitors (pre-installed) has been selected to guarantee input and output-voltage ripple as specified for safe operation. The MAX16710 does not require an external bias supply.

The J2 and J3 headers (VCC and AVDD, respectively) can be used as test points to measure the two bias voltages. VCC is provided by the on-chip LDO. AVDD (power IC internal analog block supply) is derived from VCC through a simple RC filter.

J4, J1 can be used to change the IC default configuration.

J10 and J13 are V_{DDH} and LX test points.

J2, J3, J10, and J13 must be left open when unconnected to an external measurement instrument.

TP1, TP13, and TP14 are three test points dedicated to Bode-plot acquisition. A 10 Ω resistor is in series into the feedback line and provides the input port to inject the sweep frequency signal generated by the Bode-plot equipment.

Bode Plot

A 10 Ω resistor is installed between the V_{OUT} sense point and the SNSP pin to measure the Bode plot. TP13 and TP14 test points are provided on the board on either side of the 10 Ω resistor for small signal injection and to enable the Bode-plot measurement for V_{OUT} .

Output Enable (EN)

The EN pin is used to enable/disable an operation and the corresponding output voltage. On the EV kit board, the SW1 selection switch allows for the enabling and disabling of the regulator.

Status Monitoring

Whenever the part is actively regulating and the output voltage is within the power-good window, the PGOOD pin is high. Under all other conditions (including enabled but in a fault state), the PGOOD pin is pulled low.

Input-Voltage Monitoring

The input supply can be monitored on TP4 for V_{DDH} and on TP7 for GND.

Switching-Voltage Monitoring

The switching waveform can be monitored on J13.

Output-Voltage Monitoring

TP8 and TP11 monitor the output voltage. These test points should not be used for loading.

User Case and Scenario Selection

The MAX16710 gives flexibility to set application parameters based on the value of one resistor (R2 connected on the PGM0 pin) and the logic level of the PGM1 and PGM2 pins at power-up. Soldering a different value of the resistor R2 on PGM0 allows selection of one of 32 PGM0 codes that determine the switching frequency and one of six pre-defined scenarios (A, B, C, D, E, or F). Refer to the MAX16710 IC data sheet for more details. The default configuration is with PGM1 and PGM2 open, 500kHz switching frequency, scenario A, DCM disabled, and POCP of 15A.

PGM1 and PGM2 can recognize a three-level setting (AVDD, AGND, and high-impedance). Properly setting the position of J1 and J4 allows the selection of the targeted over-current protection (OCP) threshold level and provides the option to select discontinuous current mode (DCM) at light loads.

The R2 value (the resistor connected to PGM0) and the logic levels on PGM1 and PGM2 are only detected once at power-on reset. Moving the jumpers while the bias is present does not affect any of the parameters.

Switching Frequency

The switching frequency is programmable using PGM0. The default switching frequency of the MAX16710 EV kit is 500kHz.

Ordering Information

PART	TYPE
MAX16710EVKIT#	EV Kit

Denotes RoHS-compliant.

MAX16710 EV Kit Bill of Materials

ITEM	REF DES	DNI/DNP	QTY	MANUFACTURER PART NUMBER	MANUFACTURER	VALUE	DESCRIPTION
1	C1	—	1	GMC10X7R475K6R 3NT- CL10B475KQ8NQN- JMK107BB7475KA- CL10B475KQ8NQN C- 06036C475KAT2A	CAL-CHIP ELECTRONIC INC.-SAMSUNG- TAIYO YUDEN- SAMSUNG-AVX	4.7UF	CAP- SMT (0603)- 4.7UF- 10%- 6.3V- X7R- CERAMIC- NOTE: NOT RECOMMENDED FOR NEW DESIGN. USE 20- 004u7-16
2	C2, C21	—	2	CL31X226KAHN3N- GRM31CC81E226K E11	SAMSUNG- MURATA	22UF	CAP- SMT (1206)- 22UF- 10%- 25V- X6S- CERAMIC
3	C3, C13, C16, C33	—	4	GRM31CD80J107M E39	MURATA	100UF	CAP- SMT (1206)- 100UF- 20%- 6.3V- X6T- CERAMIC
4	C4	—	1	GRM155R70J104K A01	MURATA	0.1UF	CAP- SMT (0402)- 0.1UF- 10%- 6.3V- X7R- CERAMIC
5	C6	—	1	CL05B105KQ5NQN C- GRM155R70J105K A12	SAMSUNG ELECTRONICS- MURATA	1UF	CAP- SMT (0402)- 1UF- 10%- 6.3V- X7R- CERAMIC
6	C10	—	1	LMK105B7474KV- GRM155R71A474K E01	PANASONIC- MURATA	0.47UF	CAP- SMT (0402)- 0.47UF- 10%- 10V- X7R- CERAMIC
7	C14	—	1	TMK107B7105KA- 06033C105KAT2A- C1608X7R1E105K0 80AE	MURATA-TAIYO YUDEN-AVX- TAIYO YUDEN	1UF	CAP- SMT (0603)- 1UF- 10%- 25V- X7R- CERAMIC
8	C26	—	1	C0402C102K5GAC	KEMET	1000PF	CAP- SMT (0402)- 1000PF- 10%- 50V- C0G- CERAMIC
9	C29, C47	—	2	GRM155R71E104K E14- C1005X7R1E104K0 50BB- TMK105B7104KVH- CGJ2B3X7R1E104K 050BB	MURATA-TDK- TAIYO YUDEN- TDK	0.1UF	CAP- SMT (0402)- 0.1UF- 10%- 25V- X7R- CERAMIC
10	C32, C36, C37, C39	—	4	T521X107M025ATE 060	KEMET	100UF	CAP- SMT (7343)- 100UF- 20%- 25V- TANTALUM
11	D1, D3	—	2	MBRS540T3G	ON SEMICONDUCTO R	MBRS540 T3	DIODE- SCH- SURFACE MOUNT SCHOTTKY POWER RECTIFIER- SMC- PIV=40V- IF=5A
12	DS1	—	1	LGL29K-G2J1-24-Z	OSRAM	LGL29K- G2J1-24-Z	DIODE- LED- SMARTLED- GREEN- SMT- PIV=1.7V- IF=0.02A

ITEM	REF DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
13	J1, J4, J9	—	3	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR- MALE- THROUGH HOLE- BREAKAWAY- STRAIGHT- 3PINS
14	J2, J3, J6, J7, J10, J13, J14, J19	—	8	TSW-101-22-L-D	SAMTEC	TSW-101-22-L-D	CONNECTOR- MALE- THROUGH HOLE- .025IN SQ POST HEADER- STRAIGHT- 2PINS
15	J5, J8	—	2	6095	KEYSTONE	6095	CONNECTOR- FEMALE- PANELMOUNT- NON- INSULATED RECESSED HEAD BANANA JACK- STRAIGHT THROUGH- 1PIN
16	J11	—	1	UPS-08-01-01-L-RA	SAMTEC	UPS-08-01-01-L-RA	CONNECTOR- FEMALE- THROUGH HOLE- DUAL LEAF POWER HEADER- RIGHT ANGLE- 8PINS
17	L1	—	1	PA5034.331HLT	PULSE ELECTRONICS	330NH	INDUCTOR- SMT- SHIELDED- 330NH- 15%- 40A
18	MH1- MH4	—	4	9032	KEYSTONE	9032	MACHINE FABRICATED- ROUND-THRU HOLE SPACER- NO THREAD- M3.5- 5/8IN- NYLON
19	Q1	—	1	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
20	R1	—	1	CRCW04024R70FK	VISHAY DALE	4.7	RES- SMT (0402)- 4.7- 1%- +/-100PPM/DEGC- 0.0630W
21	R2	—	1	CRCW040295R3FK	VISHAY DALE	95.3	RES- SMT (0402)- 95.3- 1%- +/-100PPM/DEGC- 0.0630W
22	R3, R11	—	2	RC0402JR-070RL- CR0402-16W- 000RJT	YAGEO PHYCOMP- VENKEL LTD.	0	RES- SMT (0402)- 0- 5%- JUMPER- 0.0630W
23	R9, R13, R16, R17	—	4	CRCW04023K00FK	VISHAY DALE	3K	RES- SMT (0402)- 3K- 1%- +/-100PPM/DEGC- 0.0630W
24	R14	—	1	9C04021A10R0FL	YAGEO	10	RES- SMT (0402)- 10- 1%- +/-100PPM/DEGC- 0.0630W
25	R41	—	1	CRCW040220K0FK	VISHAY DALE	20K	RES- SMT (0402)- 20K- 1%- +/-100PPM/DEGC- 0.0630W

ITEM	REF DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
26	R42	—	1	RC0603FR-07100RL-CR0603-FX-1000ELF	YAGEO-BOURNS	100	RES- SMT (0603)- 100-1%- +/-100PPM/DEGC-0.1000W
27	R51	—	1	ERJ-3EKF2100	PANASONIC	210	RES- SMT (0603)- 210-1%- +/-100PPM/DEGK-0.1000W
28	ST1, ST2	—	2	7808	KEYSTONE	7808	TERMINAL- BODY LENGTH=0.67IN- BODY WIDTH=0.47IN- HEIGHT=0.45IN- SCRW-BRASS
29	SU3	—	1	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
30	SW1	—	1	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
31	TP1, TP2, TP7, TP9, TP11	—	5	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
32	TP4, TP8	—	2	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
33	TP13, TP14	—	2	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

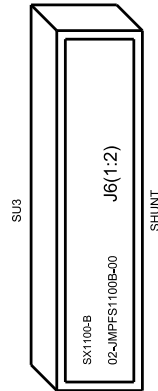
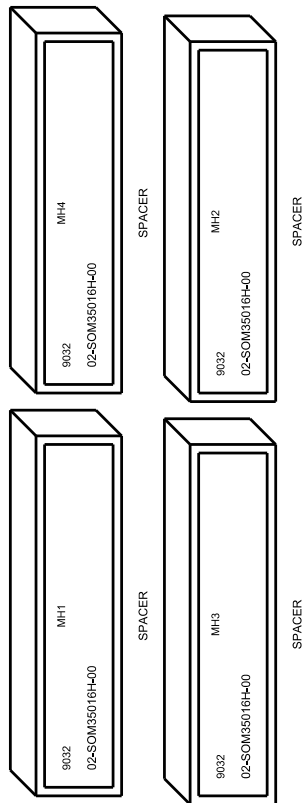
ITEM	REF DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
34	TP29, TP30	—	2	5126	KEYSTONE	N/A	TEST POINT- PIN DIA=0.125IN- TOTAL LENGTH=0.445IN- BOARD HOLE=0.063IN- GREEN- PHOSPHOR BRONZE WIRE SILVER PLATE FINISH- RECOMMENDED FOR BOARD THICKNESS=0.062IN- NOT FOR COLD TEST
35	U1	—	1	MAX16710AWA+	ANALOG DEVICES	MAX16710	EVKIT PART - IC- MAX16710AWA+ PACKAGE OUTLINE NUMBER: 21-100614 - PACKAGE CODE: W252W2Z+1- WLP25- SOLDERMASK DEFINED FOOTPRINT
36	PCB	—	1	MAX16710	ANALOG DEVICES	PCB	PCB:MAX16710
37	C5, C7- C9, C11, C34, C35, C46, C48, C50, C54, C55	DNP	12	GRM31CD80J107ME39	MURATA	100UF	CAP- SMT (1206)- 100UF- 20%- 6.3V- X6T- CERAMIC
38	C12	DNP	1	C0402C333J4RAC	KEMET	0.033UF	CAP- SMT (0402)- 0.033UF- 5%- 16V- X7R- CERAMIC
39	C17	DNP	1	VJ0402A101FXJCW1BC	VISHAY	100PF	CAP- SMT (0402)- 100PF- 1%- 16V- C0G- CERAMIC
40	C20, C30	DNP	2	CL31X226KAHN3N- GRM31CC81E226KE11	SAMSUNG- MURATA	22UF	CAP- SMT (1206)- 22UF- 10%- 25V- X6S- CERAMIC
41	C23	DNP	1	C0402C103J3RAC	KEMET	0.01UF	CAP- SMT (0402)- 0.01UF- 5%- 25V- X7R- CERAMIC
42	C24	DNP	1	TMK107B7105KA- 06033C105KAT2A- C1608X7R1E105K080AE	MURATA-TAIYO YUDEN-AVX- TAIYO YUDEN	1UF	CAP- SMT (0603)- 1UF- 10%- 25V- X7R- CERAMIC
43	C27, C28	DNP	2	GRM155R71E472KA01	MURATA	4700PF	CAP- SMT (0402)- 4700PF- 10%- 25V- X7R- CERAMIC
44	C31, C40	DNP	2	T491X477K010AT	KEMET	470UF	CAP- SMT (7343)- 470UF- 10%- 10V- TANTALUM
45	C41, C43, C44, C49	DNP	4	CL31X476KQHNNN- GRT31CC80J476KE13	SAMSUNG- MURATA	47UF	CAP- SMT (1206)- 47UF- 10%- 6.3V- X6S- CERAMIC

ITEM	REF DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
46	C51-C53, C72	DNP	4	GRM188C81A106 MA73	MURATA	10UF	CAP- SMT (0603)- 10UF- 20%- 10V- X6S- CERAMIC
47	R4	DNP	1	ERJ-P08J101	PANASONIC	100	RES- SMT (1206)- 100- 5%- +/-200PPM/DEGC- 0.6600W
48	R19	DNP	1	RC0402JR-070RL- CR0402-16W- 000RJT	YAGEO PHYCOMP- VENKEL LTD.	0	RES- SMT (0402)- 0- 5%- JUMPER- 0.0630W

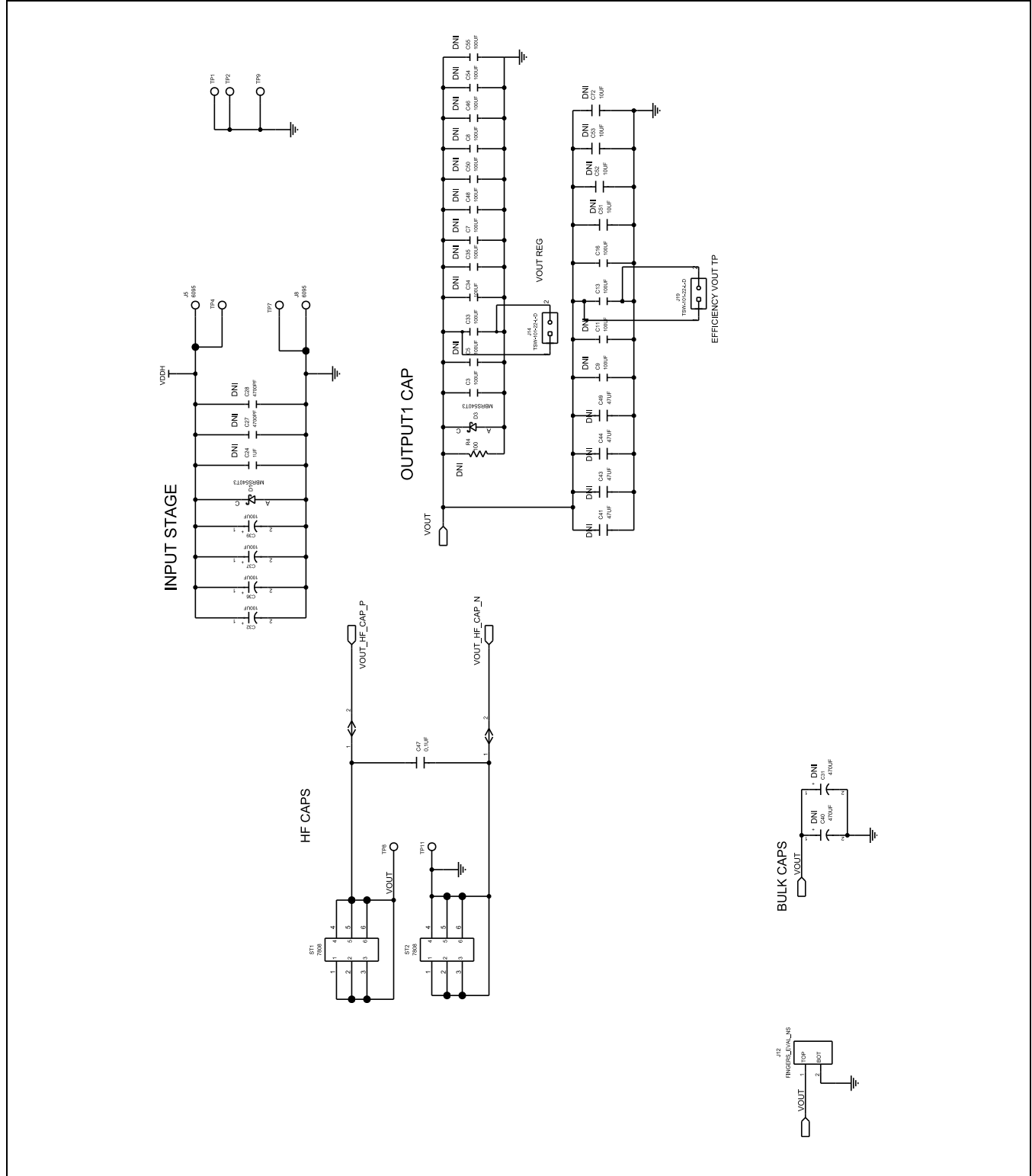
MAX16710 EV Kit Schematics

MECHANICAL

STAND OFF

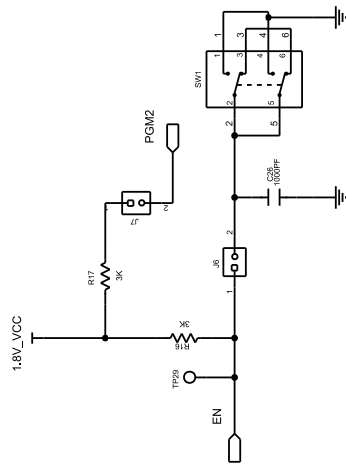


MAX16710 EV Kit Schematic (continued)

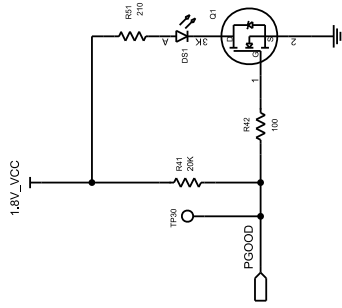


MAX16710 EV Kit Schematic (continued)

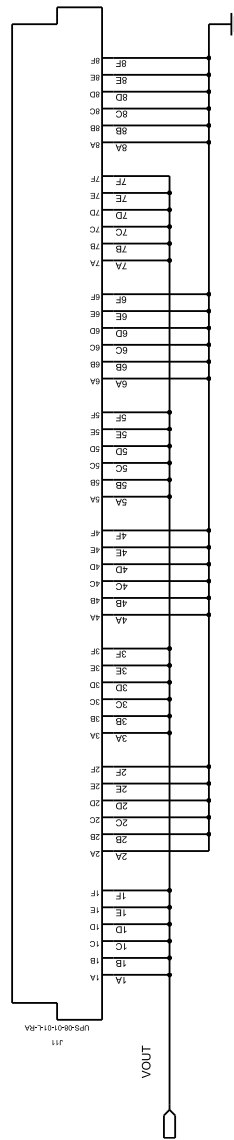
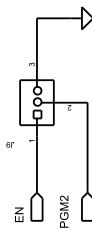
OE SWITCH



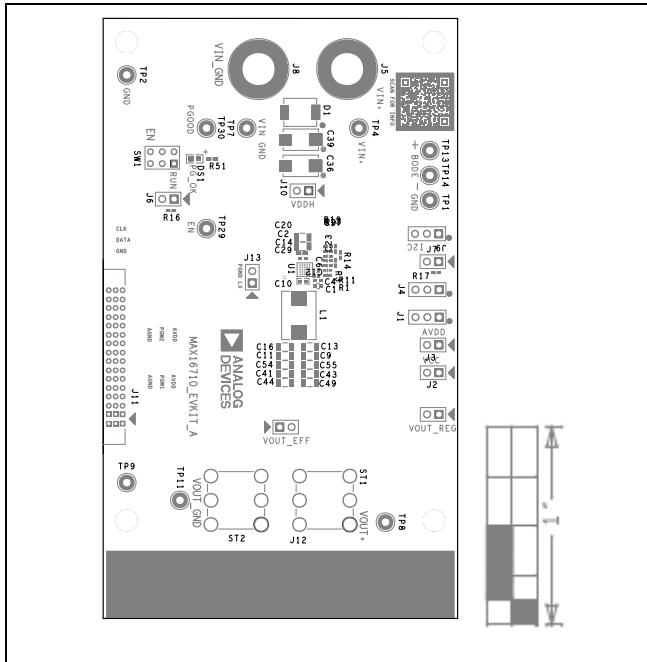
STATUS INDICATOR



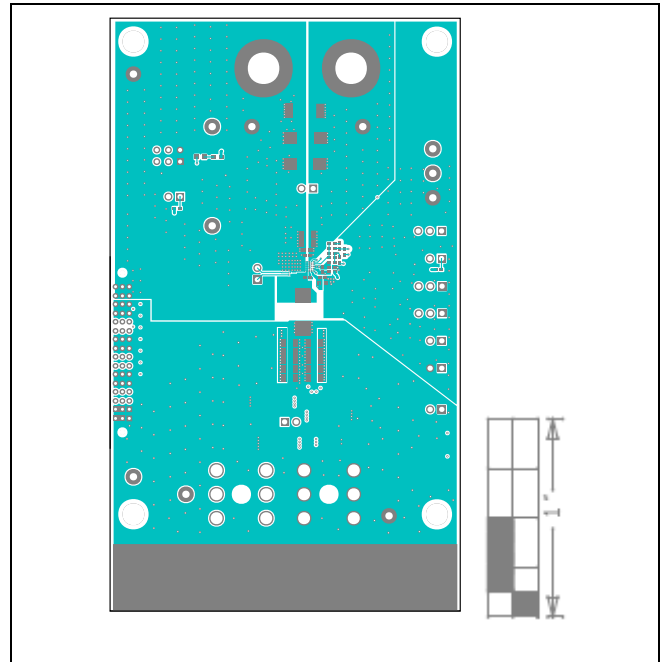
I2C CONNECTOR



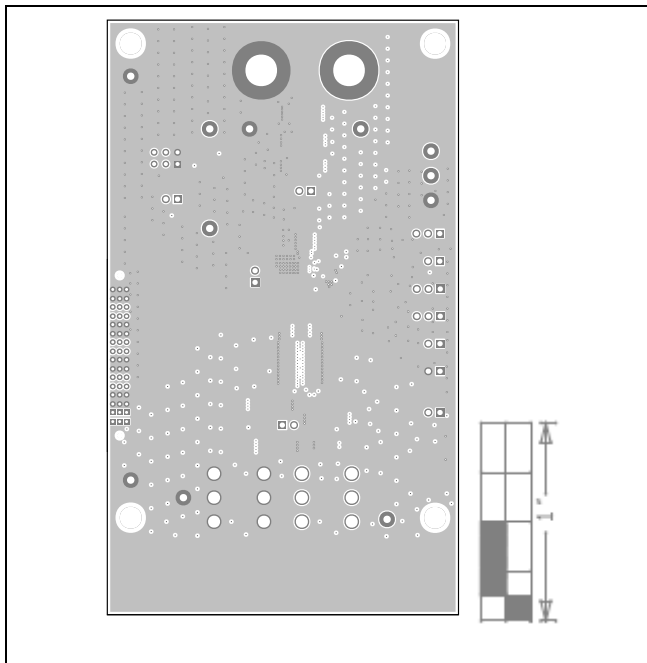
MAX16710 EV Kit PCB Layout



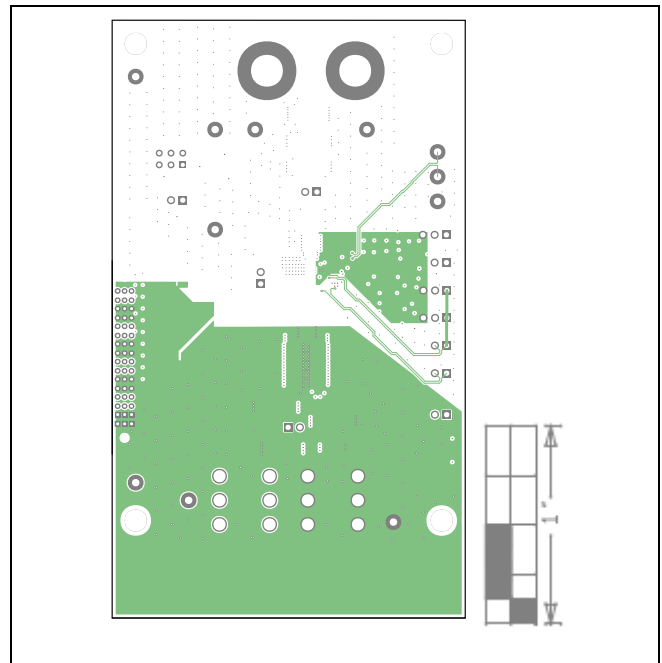
MAX16710 EV Kit PCB Layout—Top Silkscreen



MAX16710 EV Kit PCB Layout—Top

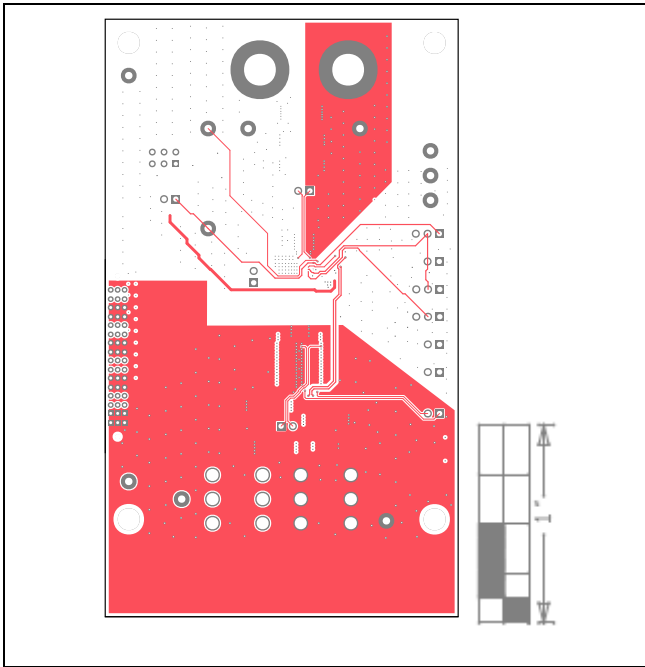


MAX16710 EV Kit PCB Layout—Layer 2 PGND

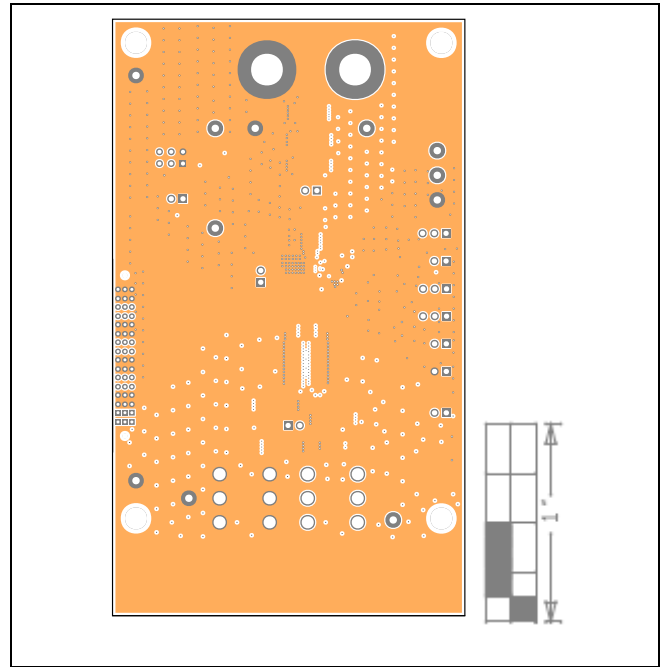


MAX16710 EV Kit PCB Layout—Layer 3 SIG AGND

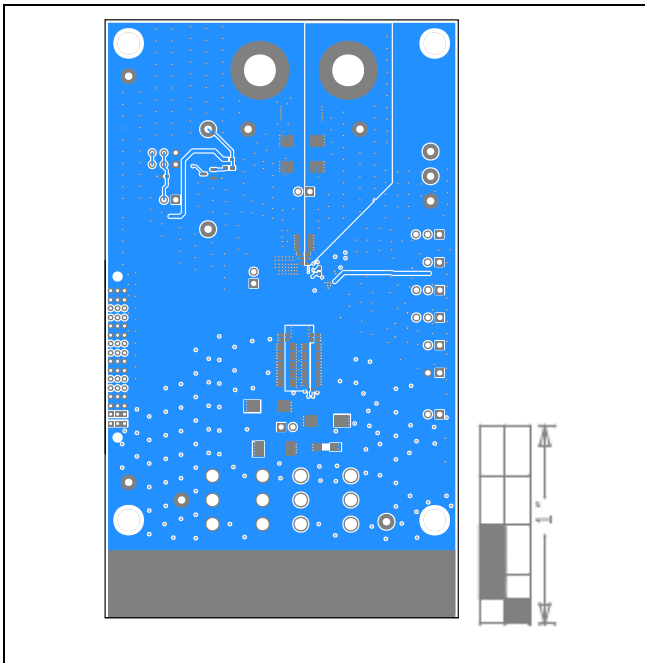
MAX16710 EV Kit PCB Layout
(continued)



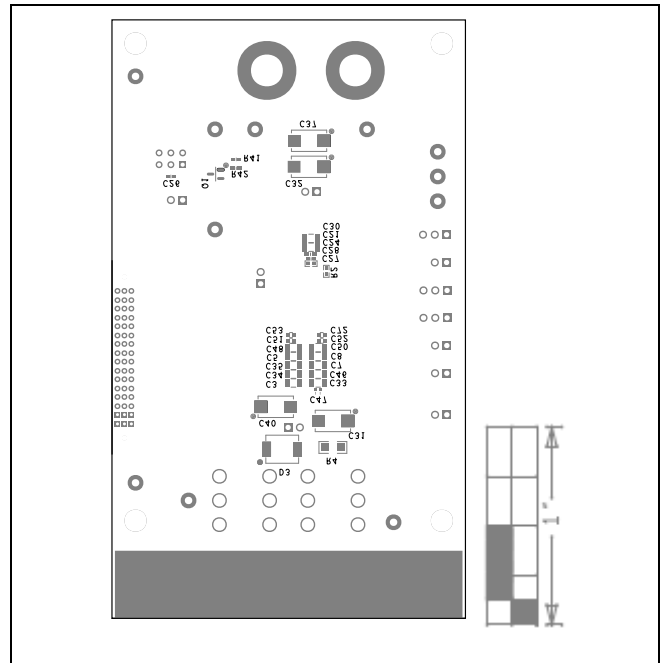
MAX16710 EV Kit PCB Layout—Layer 4



MAX16710 EV Kit PCB Layout—Layer 5 PGND



MAX16710 EV Kit PCB Layout—Bottom



MAX16710 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	02/23	Initial release	—



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