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

Evaluates: MAX20039/MAX20040

MAX20040 Evaluation Kit

General Description

The MAX20040 evaluation kit (EV kit) is a fully assembled and tested application circuit for the MAX20040, which is a small, synchronous buck-boost converter family with integrated high-side and low-side switches. Each EV kit is designed to deliver up to 1.2A with input voltages from +4.5V to +36V, while using only 52µA quiescent current at no load. Input voltage can be lowered to +2V after regulation. Output-voltage quality can be monitored by observing the PGOOD signal.

Benefits and Features

- +2V to +36V Input Supply Range
- Delivers up to 1.2A Output Current (MAX20040)
- Frequency-Synchronization Input
- Enable Input
- Voltage-Monitoring PGOOD Output
- Enable or Disable Spread Spectrum
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Required Equipment

- MAX20040 EV kit
- 2V to 36V, 3A power supply capable of providing 3A at 2V input
- Digital multimeter (DMM)
- Oscilloscope
- Electronic load capable of sinking 1.2A

Procedure

Each 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 according to Table 1.
2) Connect the positive and negative terminals of the power supply to the SUP and GND1 test pads, respectively.
3) Set the power-supply voltage to 14V and current limit to 3A.
4) Turn on the power supply.
5) Verify using the DMM that OUT is approximately 5V.
6) Verify that switching frequency is approximately 400kHz by monitoring inductor switching voltage with the oscilloscope.

Additional Evaluation

7) Connect the positive and negative terminals of the electronic load to OUT and GND, respectively.
8) Set the electronic load to the desired current at or below 1.2A, or use an equivalent resistive load with an appropriate power rating.
9) Turn on the power supply and electronic load.
10) Verify that the voltage across the VOUT and GND PCB pads is 5V ±2%.

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Detailed Description of Hardware

The MAX20040 EV kit provides a proven layout for the MAX20040 synchronous buck regulator. The device accepts input voltages as high as +36V and delivers up to 1.2A. The EV kit can handle an input supply transient up to +40V. Various test points are included for evaluation.

External Synchronization

The device can operate in two modes, forced-PWM (FPWM) or skip mode. Skip mode has better efficiency for light-load conditions. When SYNC is pulled low, the device operates in skip mode for light loads and FPWM mode for larger loads. When SYNC is pulled high, the device is forced to operate in FPWM mode across all load conditions. SYNC can be used to synchronize with other supplies if a clock source is present. The device is forced to operate in FPWM mode when SYNC is connected to a clock source.

Buck 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 low impedance when the output voltage is in regulation. PGOOD is high impedance when the output voltage drops below 93% (typ) of its nominal regulated voltage. To obtain a logic signal, pull up PGOOD to BIAS by installing shunts on jumpers PU and LED.

Evaluating Other Output Voltages

The EV kit comes installed with a +5V MAX20040B (1.2A) device, with a switching frequency of 400kHz. For +5V, 2.2MHz operation, see the appropriate component changes in the *MAX20040 EV Kit Bill of Materials*. Other output voltages can require the IC (U1) to be uninstalled and reinstalled with the correct part number as well as other component changes. Refer to the MAX20039/MAX20040 IC data sheet for details.

Table 1. Default Jumper Settings

JUMPER	DEFAULT SHUNT POSITION	FUNCTIONS
EN	1-2 (ON-middle)	Buck-boost enabled
SPS	2-3 (middle-OFF)	Spread spectrum disabled
PGOOD PU	1-2	PGOOD pulls up to V_{BIAS} when OUT is in regulation
SYNC	1-2 (FPWM-middle)	Forced-PWM mode

Ordering Information

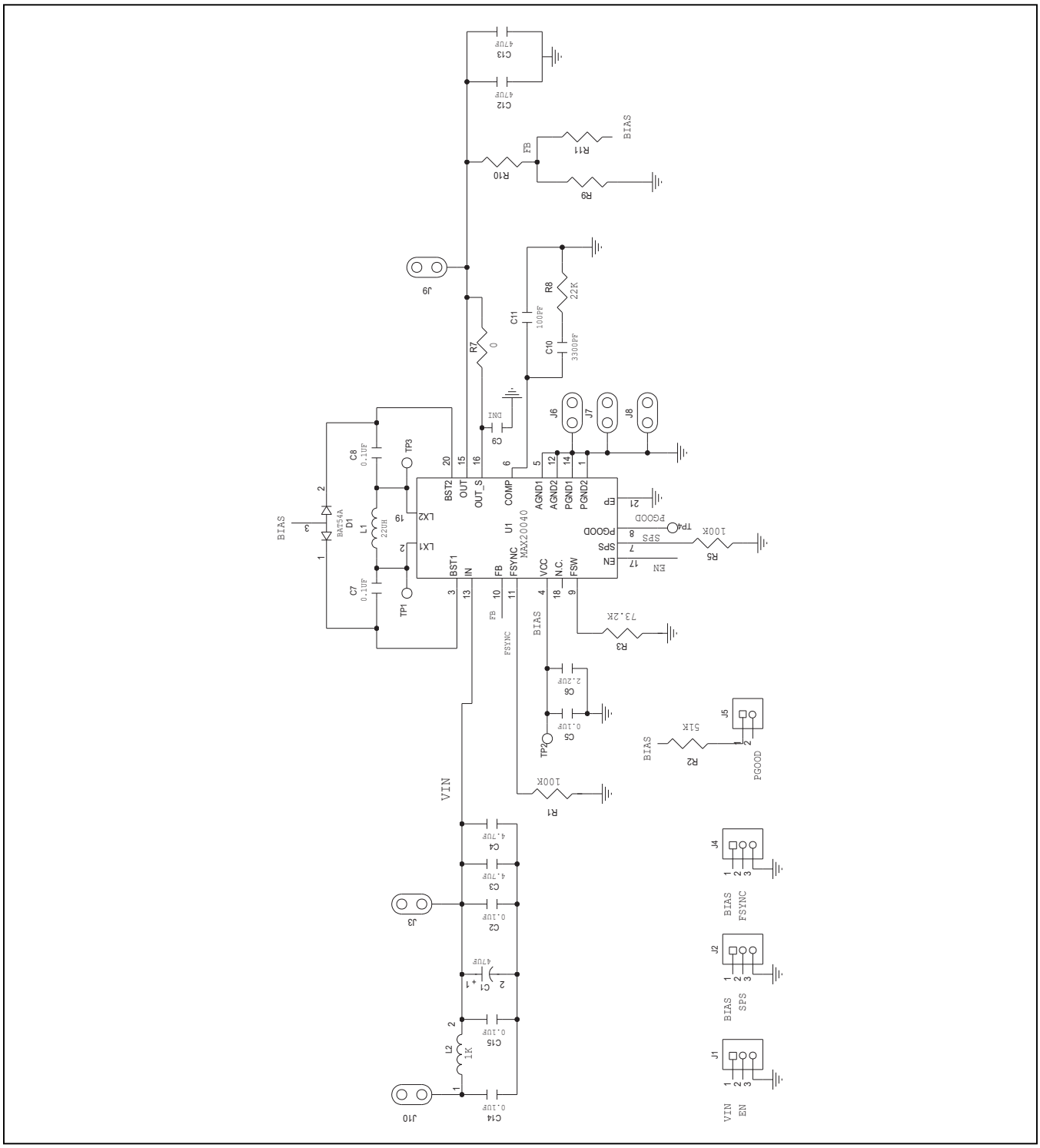
PART	TYPE
MAX20040EVKIT#	EV Kit

#Denotes RoHS compliant.

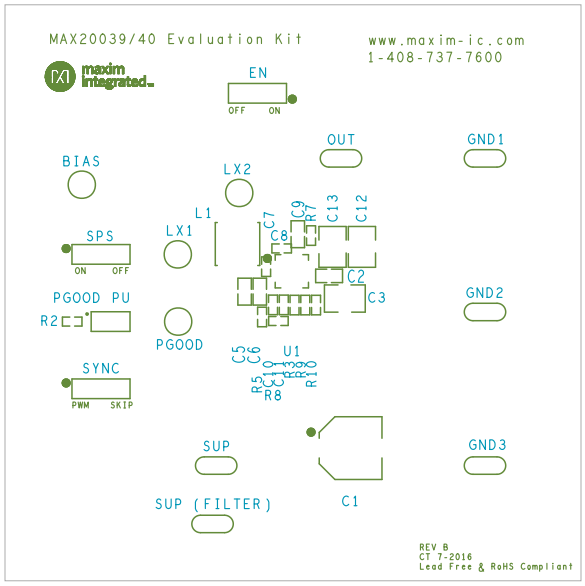
MAX20040 EV Kit Bill of Materials

Component List: 400kHz Switching Frequency		
REF DES	**QTY**	**DESCRIPTION**
C1	1	47µF +-20% 50V X7R ALUMINUM-ELECTROLYTIC capacitor Case E
C2	1	0.1µF ±10% 50V X7R Ceramic Capacitor (0603)
C3	1	4.7µF ±10% 50V X7R Ceramic Capacitor (1210)
C5; C6	1	2.2µF±10% 16V Ceramic Capacitor (0603)
C7-C8; C14-C15	4	0.1µF ±10% 50V Ceramic Capacitor (0402)
C10	1	3300pF ±5% 50V X7R Ceramic Capacitor (0402)
C11	1	100pF ±5% 25V NP0 Ceramic Capacitor (0402)
C12	1	47µF ±10% 16V X6S Ceramic Capacitor (1210)
C13	1	47µF ±10% 16V X6S Ceramic Capacitor (1210)
J1-J2; J4-J5	4	CONNECTOR; THROUGH HOLE
J3; J6-J10	6	TEST POINT PC LOW PRO W/OUT BASE
L1	1	22µH ±20% 3.4A INDUCTOR (0.208mmx0.216mm)
L2	1	1KΩ FERRITE BEAD (1206)
R1; R5	2	100KΩ resistor (0402)
R2	1	51KΩ resistor (0402)
R3	1	73.2KΩ RESISTOR (0402)
R7	1	0Ω resistor (0402)
R8	1	22KΩ resistor (0402)
R9	1	Add Resistor for variable output
R10	1	Add Resistor for variable output
R11	1	10KΩ resistor (0402)
R11	1	Remove for variable output
TP1-TP4	4	TEST POINT
U1	1	MAX20040BATPA/VY+ 5V / 1.2A
—	1	PCB: MAX20040 Evaluation Kit
Component Changes for 2.2MHz Switching Frequency		
REF DES	**QTY**	**DESCRIPTION**
C10	1	680pF ±5% 50V X7R Ceramic Capacitor (0402)
C11	1	22pF ±2% 25V C0G, NP0 Ceramic Capacitor (0402)
C12	1	22µF ±10% 25V X7R Ceramic Capacitor (1210)
C13	DNI	
L1	1	4.7µH INDUCTOR ±20% 5.9A (0.208mmx0.216mm)
R3	1	12KΩ resistor (0402)
Above components need to be changed from default.		

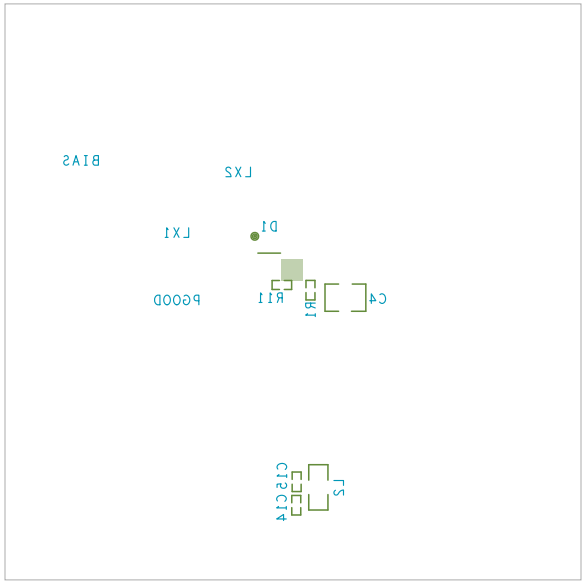
MAX20040 EV Kit Schematic



MAX20040 EV Kit PCB Layout Diagrams

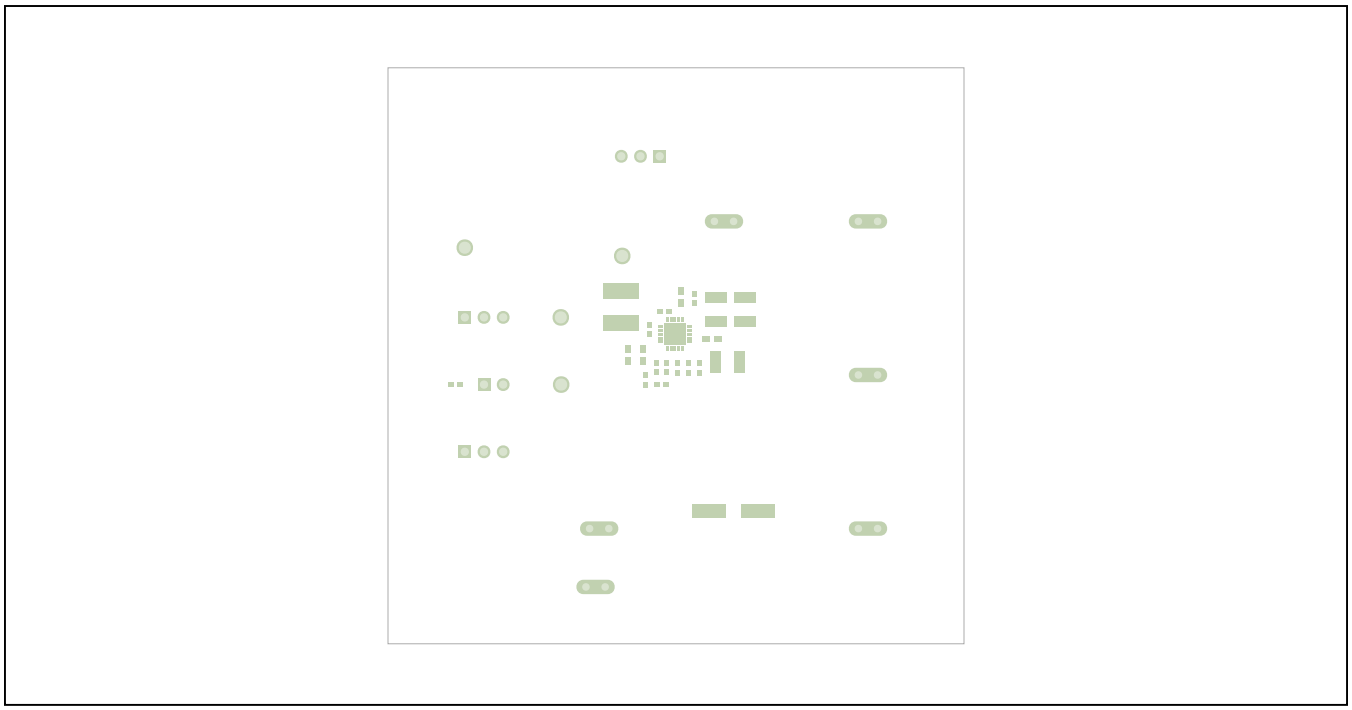


MAX20040 EV Kit Component Guide—Silkscreen (Top)

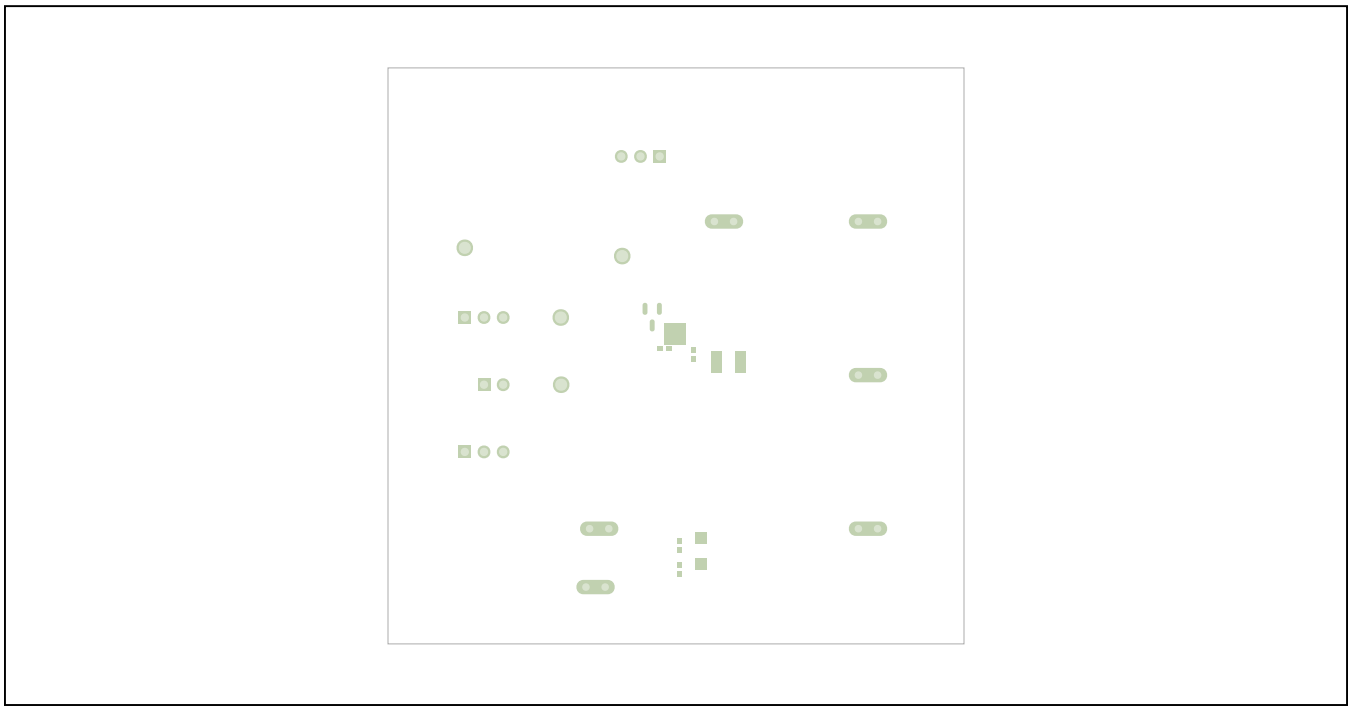


MAX20040 EV Kit PCB Layout—Silkscreen (Bottom)

MAX20040 EV Kit PCB Layout Diagrams (continued)

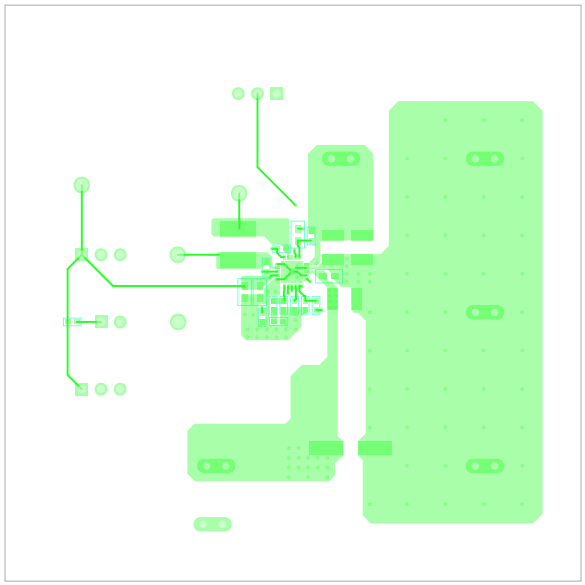


MAX20040 EV Kit PCB Layout—Soldermask (Top)

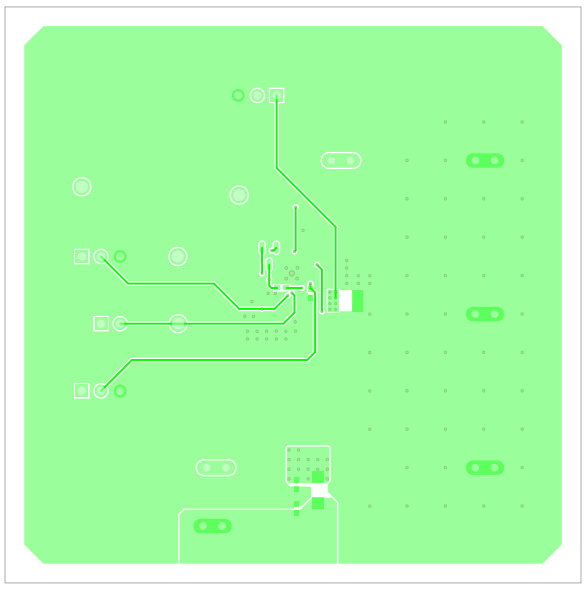


MAX20040 EV Kit PCB Layout—Soldermask (Bottom)

MAX20040 EV Kit PCB Layout Diagrams (continued)

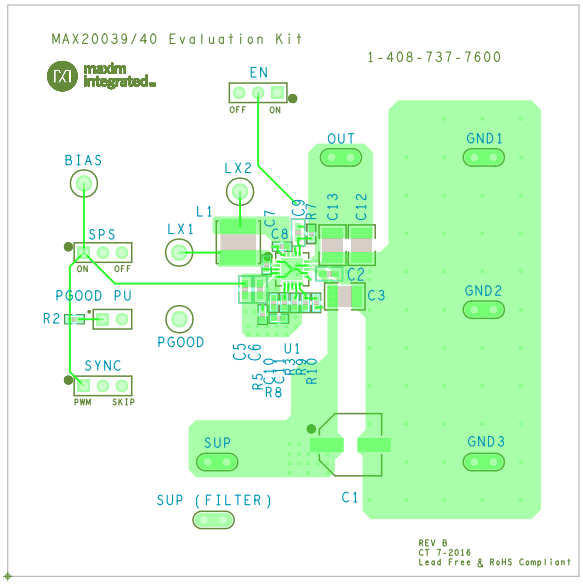


MAX20040 EV Kit PCB Layout—Art Film (Top)

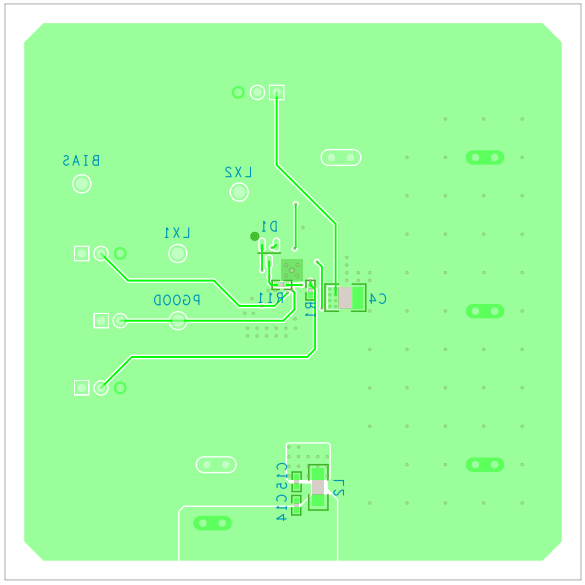


sMAX20040 EV Kit PCB Layout—Art Film (Bottom)

MAX20040 EV Kit PCB Layout Diagrams (continued)

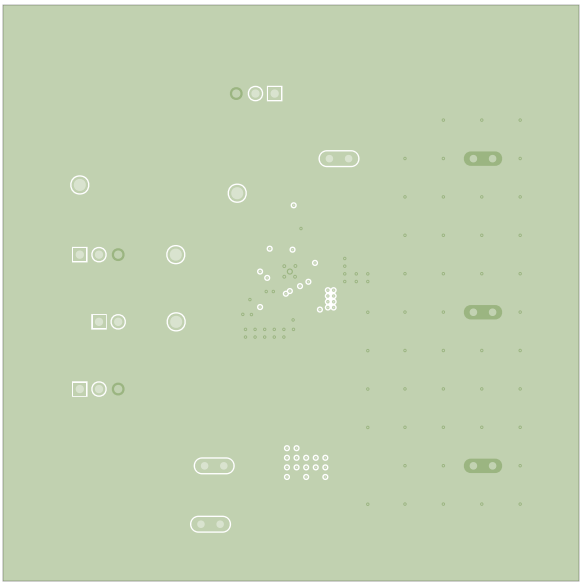


MAX20040 EV Kit PCB Layout—Art Film (Top, All)

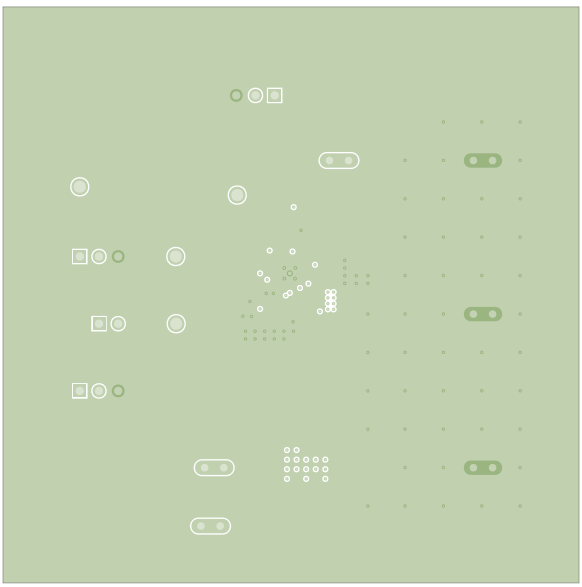


MAX20040 EV Kit PCB Layout—Art Film (Bottom, All)

MAX20040 EV Kit PCB Layout Diagrams (continued)



MAX20040 EV Kit PCB Layout—Layer 2



MAX20040 EV Kit PCB Layout—Layer 3

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/18	Initial release	—
1	12/18	Updated *Detailed Description of Hardware* and *MAX20040 EV Kit Bill of Materials*	2, 3
2	10/20	Updated *MAX20040 EV Kit Schematic*	4