MAX77839 Evaluation Kit

Evaluates: MAX77839 (FC2QFN)

General Description

The MAX77839 evaluation kit (EV kit) provides a proven design to evaluate MAX77839, a 2.5A buck-boost converter. The IC is capable of 1.8V to 5.5V input and is output voltage adjustable between 2.3V to 5.3V (with SEL pin). The factory default output voltage of this EV kit is set at 3.3V. Output voltage can be adjusted by changing the SEL resistor value (R3). GPIO pin is available to support Force PWM or POK functionality. The EV kit is compatible with any version of the MAX77839 FC2QFN IC (MAX77827AEFQ+ is the default).

Features

- Sense points for high-accuracy measurements
- Accessible test points for EN, POK, and OUTS
- Output Voltage adjustable with SEL
- FPWM and Skip mode configurable (A and C options) (Skip mode default)
- POK status configurable (B and D options)
- Active Discharge functionality

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

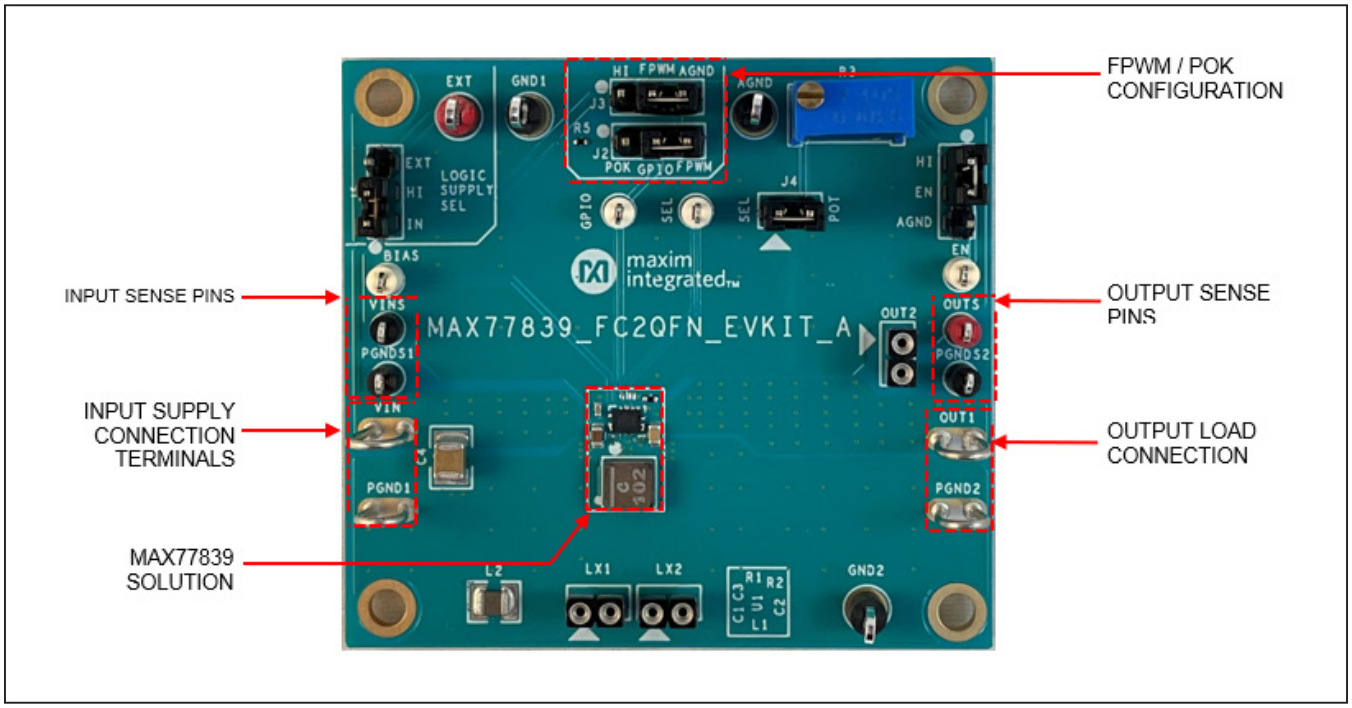

Figure 1. MAX77839 Evaluation Board

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EV Kit Specifications and Default Configurations

- IC Part Number: MAX77839AEFQ+T
- Switching Current Limit = 4.4A
- Active discharge engaged when EN = 0

UVLO Rising = 1.8V, UVLO Falling = 1.73V (MAX77839AEWC+)

Quick Start

Required Equipment

- MAX77839 EV kit
- Adjustable DC power supply
- A 1.8V DC power supply (optional)
- Digital multimeters

Setup Overview

A typical bench setup for MAX77839 FC2QFN EV kit is shown in Figure 2, and a simplified EV kit block diagram is shown in Figure 3.

Procedure

The EV kit is fully assembled and tested. Follow the steps to verify board operation. Use twisted wires of appropriate gauge (20AWG) that are as short as possible to connect the load and power sources.

1) Ensure that the EV kit has the correct jumper settings, as shown in Table 1.
2) Connect a DVM to the VINS and PGNDS1 sense pins to measure input voltage.
3) Connect a DVM to the OUTS and PGNDS2 sense pins to measure output voltage.
4) Apply a power supply set to 0V (100mA current limit) across the VIN and PGND1 terminals of the EV kit. Turn the supply on and increase the voltage to 3.8V.
5) Confirm the DVM connected to OUTS and PGNDS_ OUT reads the default output voltage of the EV kit (3.3V).

Table 1. EV Kit Default Specifications

SPECIFICATION	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage		1.8		5.5	V
Output Voltage	Configurable by SEL resistor R3 (see Table 2).	2.3		5.3	V
Default Output Voltage			3.3		V
Output Current		0		2.5	A
Switching Frequency			2.2		MHz
Current Limit	A and B options		4.4		A
Peak Efficiency	$3.3V_{IN}$, $3.3V_{OUT}$, 500mA load			96.0	%

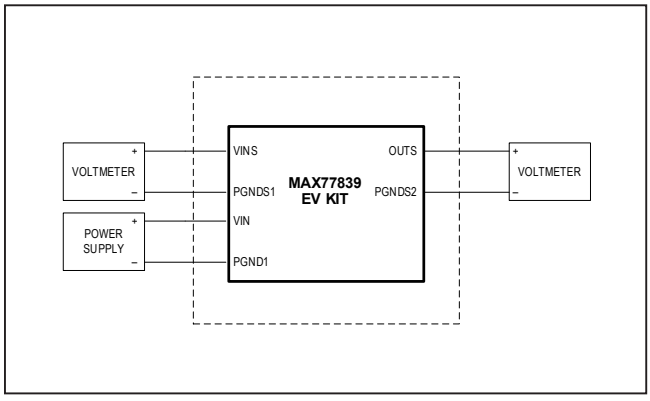


Figure 2. EV Kit Connection Block Diagram

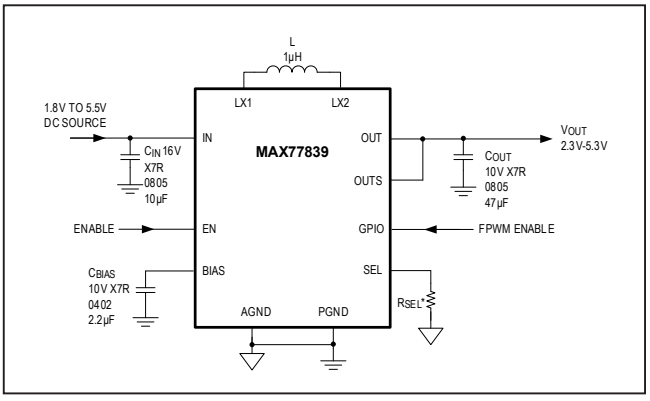


Figure 3. EV Kit Simplified Block Diagram

Table 2. Default Shunt Positions and Jumper Descriptions

JUMPER	NODE OR FUNCTION	SHUNT POSITION	FUNCTION
J1	EN	1-2*	Connects EN to HI (MAX77839 is enabled by default)
J2	GPIO	1-2	POK Selection (Options B and D)
		2-3*	FPWM Selection (Options A and C)
J3	FPWM	1-2	Enables FPWM function
		2-3*	Enables SKIP mode function
J4	SEL	1-2*	Configures output voltage with potentiometer R3. (0Ω = 3.3V_{OUT} Default)
J5	LOGIC SUPPLY	1-2*	Connects HI to VIN
		2-3	Connects HI to External Supply (EXT)

**Default position*

Detailed Description of Hardware

The MAX77839 EV kit demonstrates the MAX77839 buck-boost. It regulates output from input voltage ranges from 1.8V to 5.5V. Programmable output range is from 2.3V to 5.3V with 100mV steps. EV kit is suited with a general DC input. Table 2 lists jumpers and associated functions that are available on the EV kit.

The MAX77839 includes a SEL pin to configure the output voltage on startup. Resistors with a tolerance of 1% (or better) should be chosen for R3, with nominal values specified in Table 3.

High Temperature Testing

The MAX77839 is rated for operation under ambient temperatures up to 125°C. Note that not all components on the EV kit are rated for temperatures that high. Some ceramic capacitors experience extra leakage when put under temperatures higher than they are rated for, and supply current readings for the IC might be larger than expected. Double check the components on the EV kit if testing at 125°C ambient temperatures.

List of caps not rated for 125°C:

- C2 (output capacitor)
- C4 (VIN bulk capacitor)

Consider replacing these components if IC operation at 125°C ambient temperature is an important use case.

Table 3. MAX77839 RSEL Selection Table

VOUT (V)	RSEL (kΩ)
3.3	Short (0Ω)
2.3	4.99
2.4	5.90
2.5	7.15
2.6	8.45
2.7	10.0
2.8	11.8
2.9	14.0
3.0	16.9
3.1	20.0
3.2	23.7
3.4	28.0
3.5	34.0
3.6	40.2
3.7	47.5
3.8	56.2
3.9	66.5
4.0	80.6
4.1	95.3
4.2	113
4.3	133
4.4	162
4.5	191
4.6	226
4.7	267
4.8	324
4.9	383
5.0	452
5.1	536
5.2	634
5.3	768
2.85	909 or Open

Test Points and Critical Node Measurement (VOUT and LX)

The EV kit comes with sockets presoldered onto the board for measuring the critical nodes VOUT, LX1, and LX2. Use these probe sockets to eliminate as much noise as possible when measuring the critical nodes. To ensure best results, use a very short ground wire from the ground sleeve of the scope probe to the GND side of the probe socket, and use the bare tip of the probe directly to the signal side of the probe socket. Following these guidelines gives the most accurate results when measuring parameters like output voltage ripple, switching waveforms, and load transient response.

PCB Layout Guideline

Careful circuit board layout is critical to achieve low switching power losses and clean, stable operation. Refer to **https://www.maximintegrated.com/products/MAX77839** for the PCB Layout Guideline section of the MAX77839 data sheet.

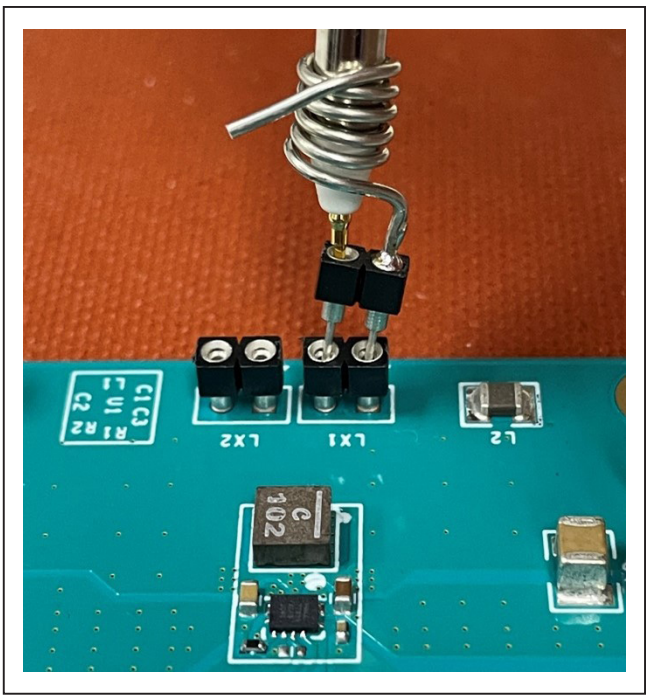


Figure 4. EV Kit Probing Critical Nodes

Ordering Information

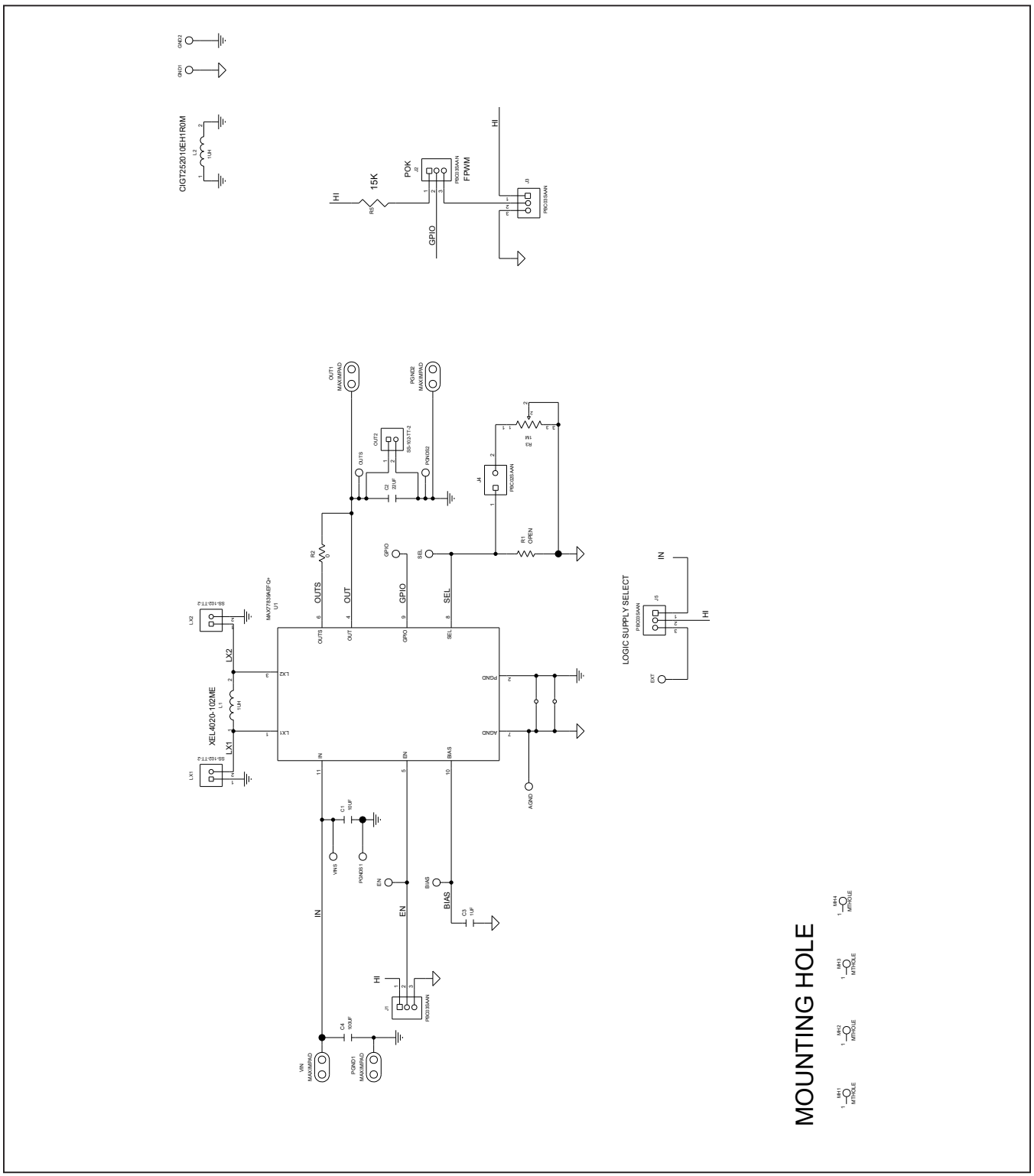
PART	U1 IC	DEFAULT OUTPUT VOLTAGE	UVLO FALLING	UVLO RISING
MAX77839QEVKIT#	MAX77839AEFQ+	3.3V	1.73V	1.8V

#Denotes RoHS compliant

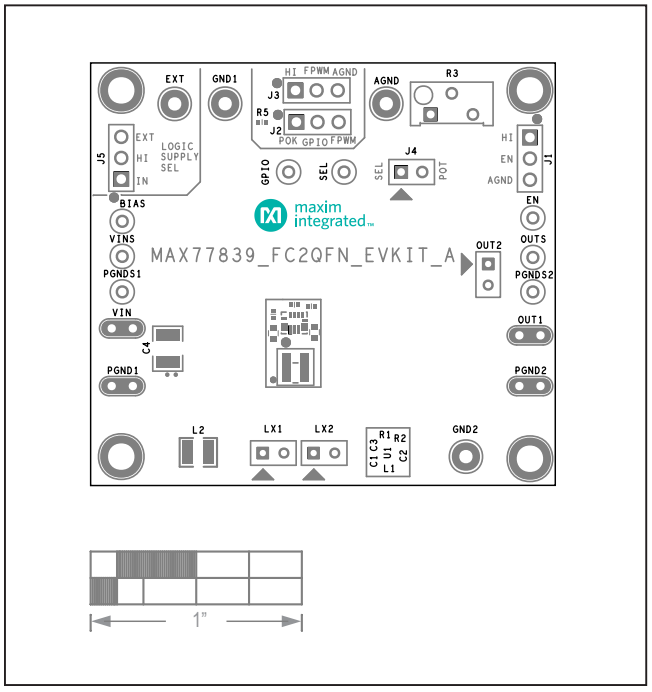
MAX77839 EV Kit Bill of Materials

PART	QTY	MFG PART #	MANUFACTURER	DESCRIPTION
C1	1	GRM188D71A106MA73	MURATA	10µF ±20%, 10V X7T CERAMIC CAPACITOR (0603)
C2	1	GRM188R60J476ME15	MURATA	47µF ±20%, 6.3V X5R CERAMIC CAPACITOR (0603)
C3	1	GRM155R70J105MA12	MURATA	1µF ±20%, 6.3V X7R CERAMIC CAPACITOR (0402)
J1-J3, J5	2	PBC03SAAN	SULLINS ELECTRONICS CORP.	STRAIGHT CONNECTOR, 3 PINS
J4	1	PBC02SAAN	SULLINS ELECTRONICS CORP.	STRAIGHT CONNECTOR, 2 PINS
L1	1	XAL4020-102ME	COILCRAFT	1µH ±20%, ISAT=9.6A, DCR=13.25mΩ
R2	1	ANY	ANY	0Ω, RESISTOR (0402)
U1	1	MAX77839AEFQ+	MAXIM	BUCK-BOOST (11 FC2QFN), MAX77839AEFQ+
Components below this line are outside of the immediate MAX77839 evaluation circuit and solution silkscreen.				
L2	1	CIGT252010EH1R0M	SAMSUNG ELECTRONICS	INDUCTOR; SMT (1008); MAGNETICALLY SHIELDED; 1UH; TOL=+/-20%; 4.3A
LX1, LX2, OUT2	3	SS-102-TT-2	SAMTEC	IC-SOCKET; SIP; STRAIGHT; PRECISION MACHINED SOCKET STRIP; OPEN FRAME; 2PINS; 100MIL
OUT1, PGND1, PGND2, VIN	4	9020 BUSS	WEICO WIRE	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
OUTS, VINS	2	5000	KEYSTONE	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
PGNDS1, PGNDS2	2	5001	KEYSTONE	TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
PCB	1	MAX77839FC2QFN	MAXIM	PCB:MAX77839FC2QFN
R3	1	3296Y-1-105LF	BOURNS	RES; THROUGH HOLE-RADIAL LEAD; 1M; 10%; +/-100PPM/DEGC; 0.5W
R5	0	CRCW040215K0FK	VISHAY DALE	RESISTOR; 0402; 15K; 1%; 100PPM; 0.0625W; THICK FILM

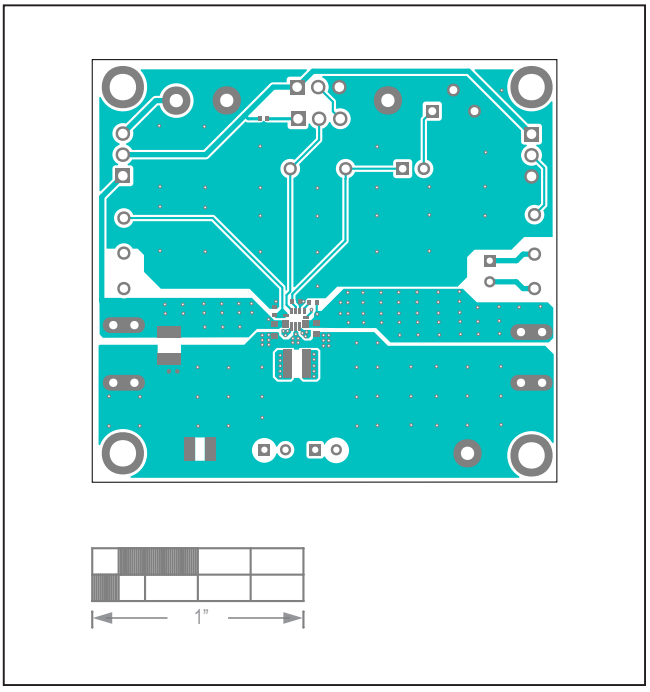
MAX77839 EV Kit Schematic



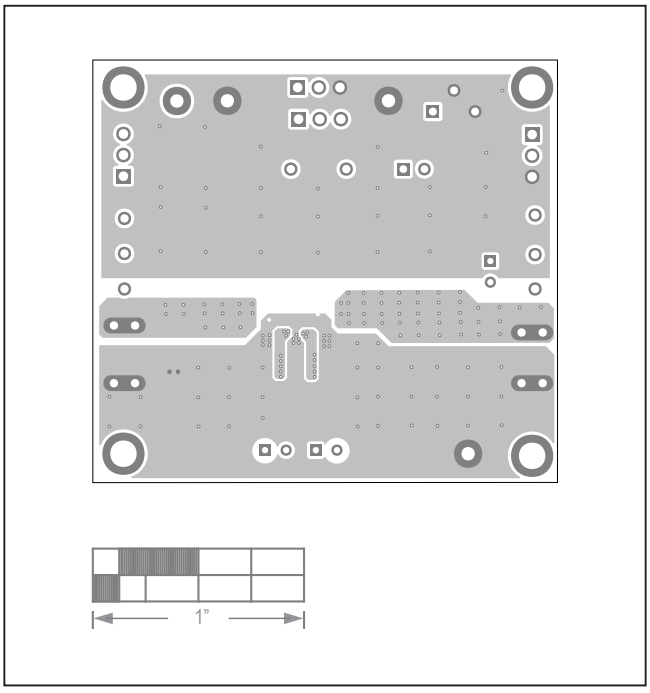
MAX77839 EV Kit PCB Layout Diagrams



MAX77839 EV Kit Component Placement Guide—Top Silkscreen

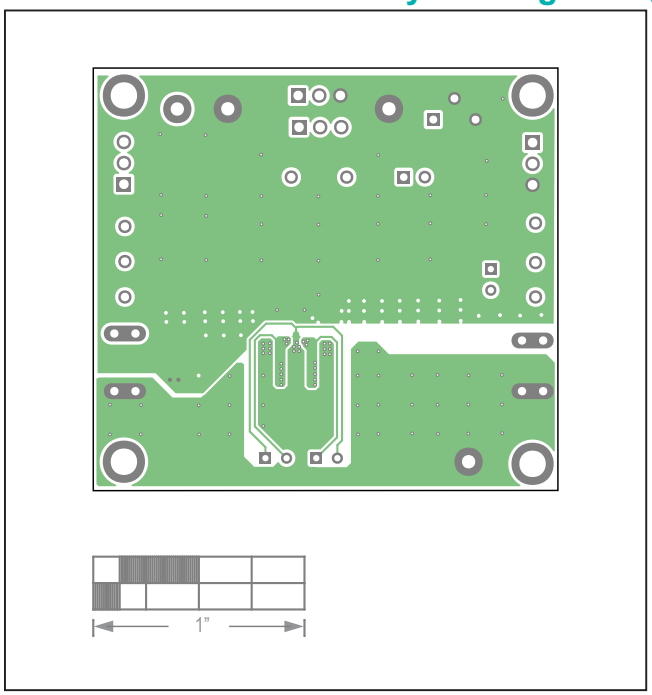


MAX77839 EV Kit PCB Layout—Top Layer

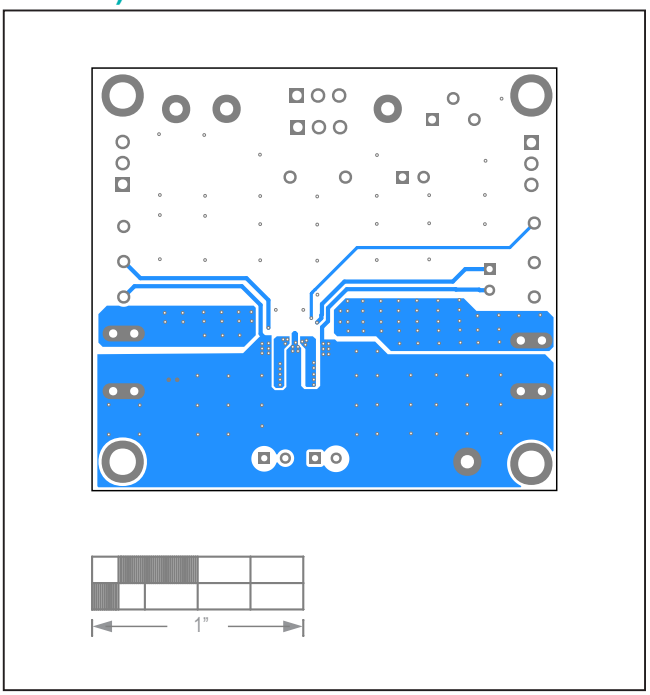


MAX77839 EV Kit PCB Layout—Layer 2

MAX77839 EV Kit PCB Layout Diagrams (continued)



MAX77839 EV Kit PCB Layout—Layer 3



MAX77839 EV Kit PCB Layout—Bottom Layer

Revision History

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

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