User's Guide

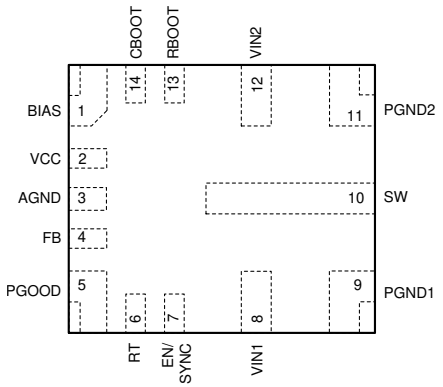
LM61430EVM-AS-2MHZ User's Guide

ABSTRACT

The LM61430-Q1 evaluation module (EVM) is designed to help customers evaluate the performance of the LM61430-Q1 synchronous, step-down voltage converter. This EVM implements the LM61430-Q1 in a 14-pin wettable flanks Hotrod™ package, as shown in Table 1-1. The EVM is configured for 5-V output voltage with DC load current up to 3 A. The EVM is optimized for small solution size and low noise.

Table 1-1. Device and Package Configurations

CONVERTER	IC	PACKAGE
U1	LM61430-Q1	14-pin wettable flanks Hotrod 4.0-mm × 3.5-mm × 1.0-mm package



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Trademarks

Hotrod™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

1 Quick Start

1. Connect the voltage supply between the VIN_EMI and GND_EMI pins.
2. Connect the load of the converter between the VOUT and GND connectors.
3. Set the supply voltage at an appropriate level between 6 V to 36 V. Set the current limit of the supply above 3 A. The 6-V minimum makes sure there is sufficient headroom on maximum dropout voltage.
4. Turn on the power supply. Monitor the output voltage with sense points. The maximum load current must be below 3 A with the LM61430-Q1.

See Figure 4-1 for connector locations.

CAUTION

Caution Hot surface.
Contact may cause burns.
Do not touch.

2 Detailed Descriptions

This section describes the connectors on the EVM and how to properly set up the EVM.

VOUT 5-V output voltage of the converter
Connect the loading device to the board with short and thick wires.

GND Ground of the converter
Connect to supply and load grounds with short and thick wires. "Clip-on" GND connectors are for signal measurement and probing.

VIN_EMI Input voltage to input filter of the converter
Connect with short and thick wires.

GND_EMI Ground return for the input filter
Connect with short and thick wires.

CLK For synchronization clock input
The buck PWM output is synchronized to the external clock when applied.

EN To monitor the EN pin or input EN control signal

PG To monitor the PGOOD/RESET pin
The PGOOD pin of the device is an open-drain output and it is pulled up to V_{OUT} when in regulation and pulled to GND when not.

VINJ To aid when making bode plots
There is injection resistor, Rinj, between VOUT and this node. Transformer-based stimulus can be applied across Rinj when taking measurements for bode plots.

VOUTS Kelvin sensing for VOUT
For accurate load and line regulation measurements, VOUTS must be utilized. There is non-neglible I-R drop at maximum load between the output capacitor and VOUT connector.

3 Schematic

The bill of materials for the EVM is tabulated in Table 6-1. In addition, Figure 3-1 shows the corresponding schematic.

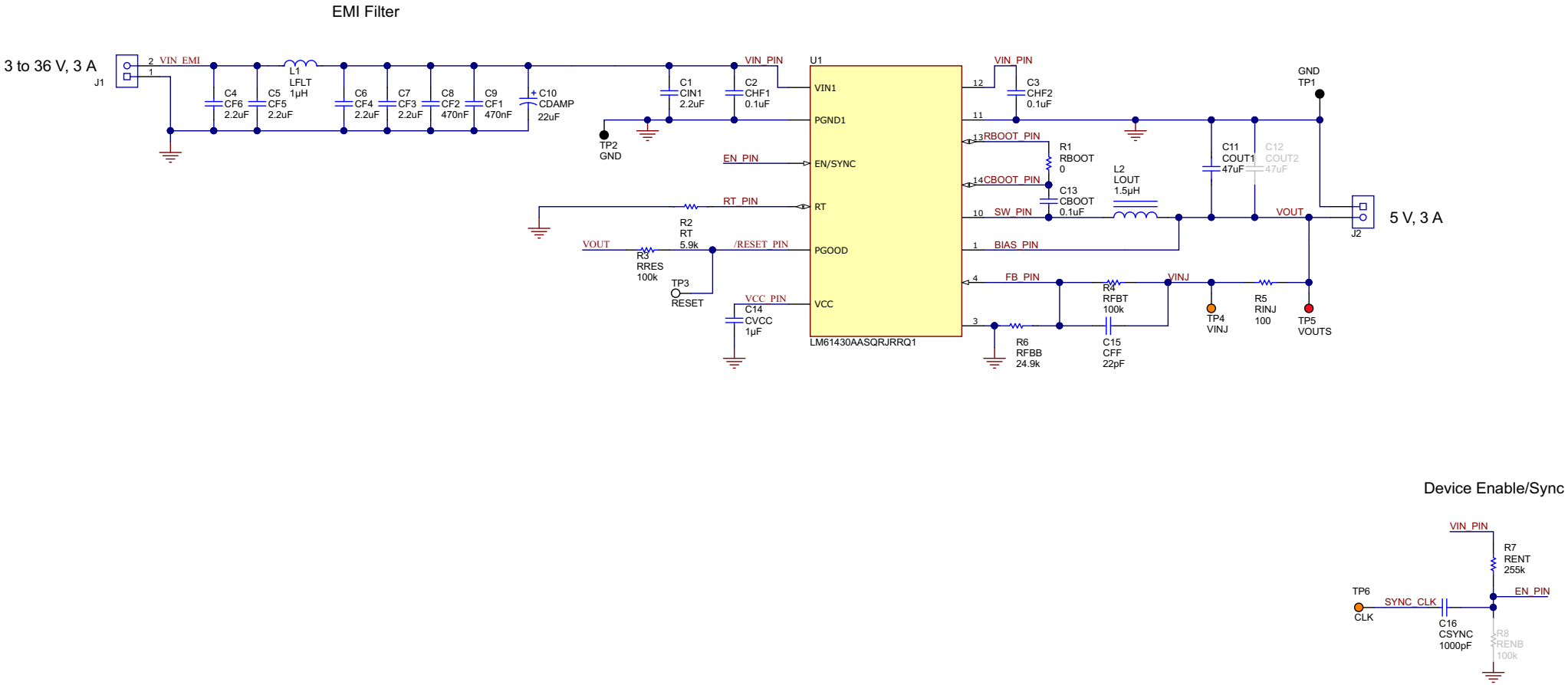

Figure 3-1. LM61430EVM-AS-2MHZ Schematic

4 Board Layout

The PCB consists of a 4-layer design. There are 2-oz copper planes on the top and bottom and 1-oz copper mid-layer planes to dissipate heat with an array of thermal vias to connect to all four layers.

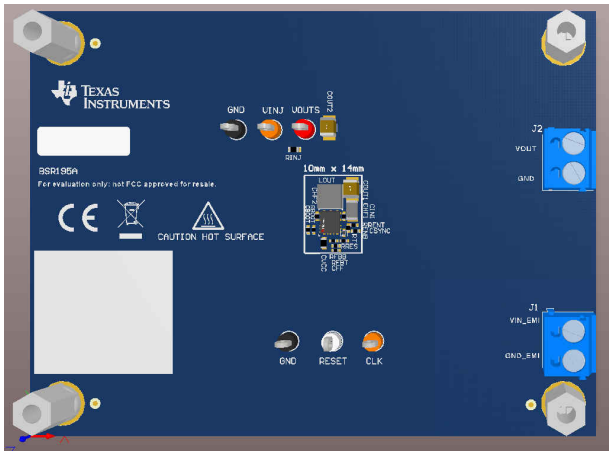

Figure 4-1. Top 3-D View

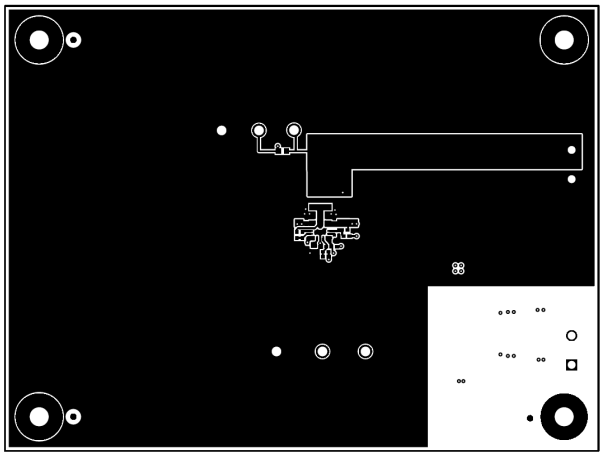

Figure 4-2. Top Layer

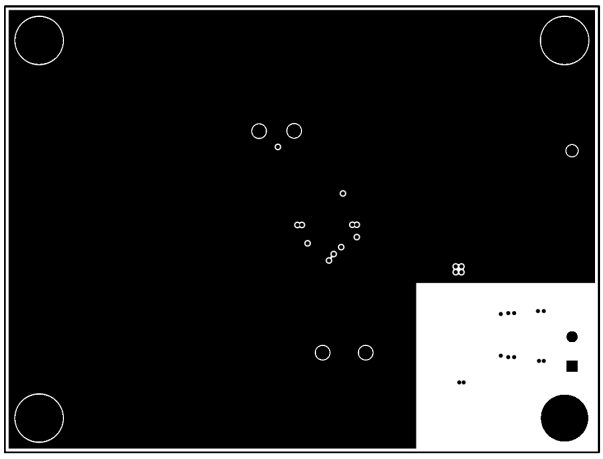

Figure 4-3. Signal Layer 1 – Ground Plane

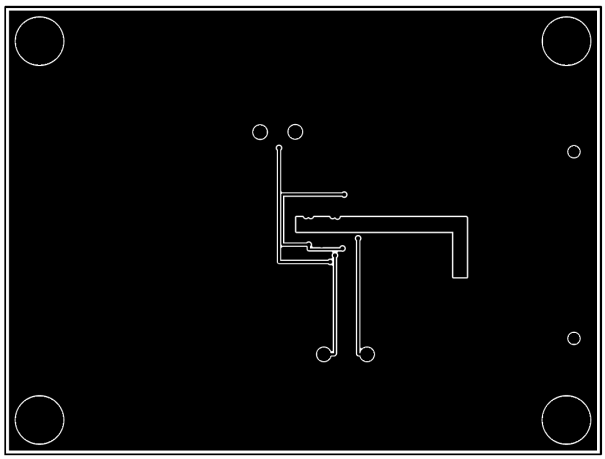

Figure 4-4. Signal Layer 2 – Routing

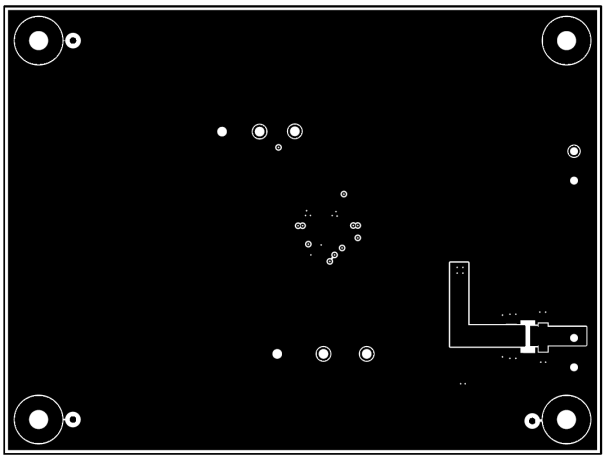

Figure 4-5. Bottom Layer

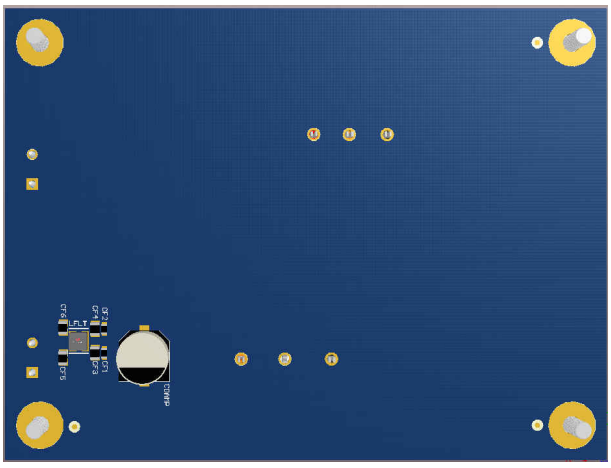

Figure 4-6. Bottom 3-D View

5 Thermal Performance

IC top case measured with 13.5-V input, 5-V output, and 3-A load.

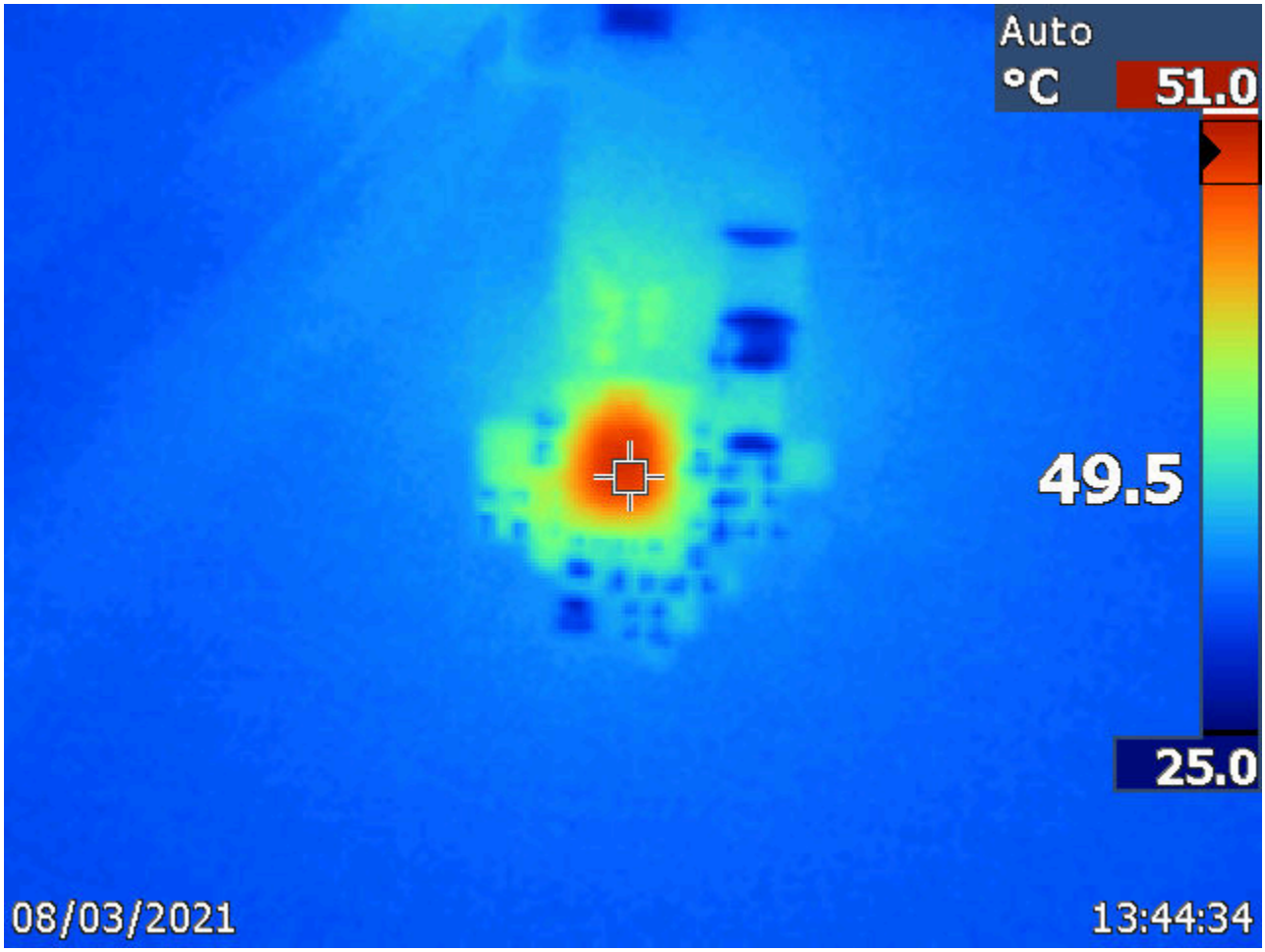

Figure 5-1. Thermal Performance

5.1 Additional Performance Curves

Please reference the *LM61430-Q1 3-V to 36-V, Low EMI Synchronous Step-Down Converter Data Sheet* for additional IC performance curves. The data would be located in the application's section of the datasheet being, performed on the LM61430EVM-AS-2MHZ.

6 Bill of Materials (BOM)

Table 6-1. LM61430EVM-AS-2MHZ Bill of Materials

DESIGNATOR	QUANTITY	VALUE	DESCRIPTION	PACKAGEREFERENCE	PART NUMBER	MANUFACTURER
C1	1	2.2 µF	CAP, CERM, 2.2 µF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 1206	1206	GCM31CR71H225KA55L	MuRata
C2, C3, C13	3	0.1 µF	CAP, CERM, 0.1 µF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0402	0402	GCM155R71H104KE02D	MuRata
C4, C5, C6, C7	4	2.2 µF	CAP, CERM, 2.2 µF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0805	0805	CGA4J3X7R1H225K125AE	TDK
C8, C9	2	0.47 µF	CAP, CERM, 0.47 µF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0603	0603	CGA3E3X7R1H474K080AB	TDK
C10	1	22 µF	CAP, AL, 22 µF, 50 V, ±20%, 0.7 Ω, SMD	SMT Radial E	EEE-FC1H220P	Panasonic
C11	1	47 µF	Multilayer Ceramic Capacitor 47 µF 20% 10 V 1210 T/R	1210	CGA6P1X7S1A476M250AC	TDK
C14	1	1 µF	CAP, CERM, 1 µF, 16 V, ±10%, X7R, 0603	0603	885012206052	Wurth Elektronik
C15	1	22 pF	CAP, CERM, 22 pF, 50 V, ±5%, C0G/NP0, AEC-Q200 Grade 1, 0402	0402	CGA2B2NP01H220J050BA	TDK
C16	1	1000 pF	CAP, CERM, 1000 pF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0402	0402	CGA2B2X7R1H102K050BA	TDK
FID1, FID2, FID3, FID4, FID5, FID6	6		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4			Standoff	1902C	Keystone
J1, J2	2		Terminal Block, 5 mm, 2 × 1, Tin, TH	Terminal Block, 5 mm, 2 × 1, TH	691 101 710 002	Wurth Elektronik
L1	1		1-µH Shielded Molded Inductor 4-A 32-mΩ, Max 2-SMD	SMD2	74438336010	Wurth Electronics
L2	1	1.5 µH	Inductor, Shielded, Metal Composite, 1.5 µH, 5.8 A, 0.019 Ω, SMD	4.1 mm × 4.1 mm	74438356015	Wurth Elektronik
LBL1	1			PCB Label 0.650 inch × 0.200 inch	THT-14-423-10	Brady

Table 6-1. LM61430EVM-AS-2MHZ Bill of Materials (continued)

DESIGNATOR	QUANTITY	VALUE	DESCRIPTION	PACKAGEREFERENCE	PART NUMBER	MANUFACTURER
R1	1	0	RES, 0, 0%, 0.2 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0EDHP	Vishay-Dale
R2	1	5.9 k	5.9 kΩ, ±1% 0.1W, 1/10W Chip Resistor 0402 (1005 Metric) Automotive AEC-Q200 Thick Film	0402	ERJ-2RKF5901X	Panasonic
R3, R4	2	100 k	RES, 100 k, 0.5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100KDHEDP	Vishay-Dale
R5	1	100	RES, 100, 1%, 0.1 W, 0603	0603	RC0603FR-07100RL	Yageo
R6	1	24.9 k	24.9 kΩ ±1% 0.1 W, 1/10W Chip Resistor 0402 (1005 Metric) Automotive AEC-Q200 Thick Film	0402	ERJ-2RKF2492X	Panasonic
R7	1	255 k	RES, 255 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402255KFKED	Vishay-Dale
TP1, TP2	2		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone
TP3	1		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone
TP4, TP6	2		Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone
TP5	1		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
U1	1		3-V to 36-V, Low-EMI Synchronous Step-Down Converter	VQFN-HR14	LM61430AASQRJRRQ1	Texas Instruments
C12	0	47 µF	Multilayer Ceramic Capacitor 47-µF 20%, 10-V, 1210 T/R	1210	CGA6P1X7S1A476M250AC	TDK
R8	0	100 k	RES, 100 k, 0.5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100KDHEDP	Vishay-Dale

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