

General Description

The ADPL76030 evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the features of the ADPL76030, a synchronous 4-switch buck-boost DC/DC controller in a 28-lead 4 mm x 5 mm QFN package. The proprietary peak-buck, peak-boost current-mode control scheme allows adjustable and synchronizable 600 kHz to 1.4 MHz fixed frequency operation, or internal 25% triangle spread-spectrum frequency modulation for low EMI. The board accepts a continuous 4 V to 25 V input voltage with transient voltage up to 55 V. Various test points are available for monitoring (PGOOD and ISMON) and control (EN/UVLO, CTRL, and SYNC). Optional EMI input, output, and gate resistor component placeholders are included to support the option of adding, if required.

Read the ADP76030 data sheet with this user guide for a proper understanding and operation of the controller and its numerous features. Component placement and board layout as part of the overall design is essential for proper electrical and thermal performance

The ADPL76030 provides input or output current monitor and power good flag. Fault protection is also provided to detect output short-circuit condition, during which the ADPL76030 retries, latches off, or keeps running.

Features and Benefits

- 4-Switch Single Inductor Architecture Allows V_{IN} Above, Below, or Equal to V_{OUT}
- Up to 95% Efficiency at 1.4 MHz
- Proprietary Peak-Buck, Peak-Boost Current-Mode
- Wide V_{IN} Range: 4 V to 55 V
- $\pm 2\%$ Output Voltage Accuracy: $1\text{ V} \leq V_{OUT} \leq 55\text{ V}$
- $\pm 3\%$ Input or Output Current Accuracy with Monitor
- Spread-Spectrum Frequency Modulation for Low EMI
- No Top MOSFET Refresh Noise in Buck or Boost
- Adjustable and Synchronizable: 600 kHz to 1.4 MHz
- V_{OUT} Disconnected from V_{IN} During Shutdown

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

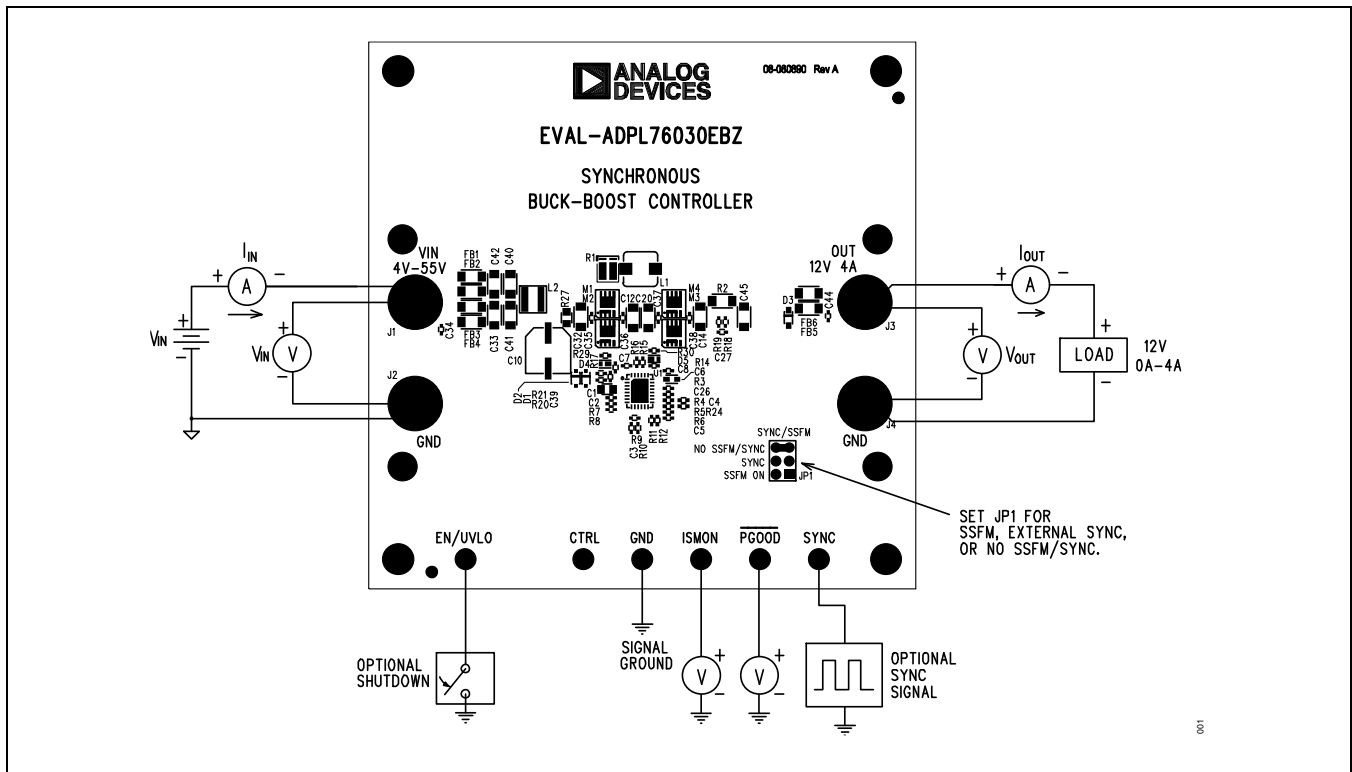


Figure 1. EVAL-ADPL76030EBV Kit Board Connections

Detailed Description of Hardware

Table 1. Performance Summary

Parameter	Condition	Min	Typical	Max
V_{IN}		4 V		55 V
V_{IN} at Full Load 4 A	< 60°C without Airflow	7 V		23 V
V_{OUT}			12 V	
Peak Current Limit	$R1 = 0.005 \Omega$		10 A	
Max Load Current	12 V_{IN} , 12 V_{OUT}		4.5 A	
Input UVLO Off	$R7 = 383 \text{ k}\Omega$, $R8 = 165 \text{ k}\Omega$		4 V	
Input UVLO On	$R7 = 383 \text{ k}\Omega$, $R8 = 165 \text{ k}\Omega$		5 V	
FSW	$R_T = 100 \text{ k}\Omega$		1.4 MHz	

Table 2. Jumper JP1 Connection Guide

JP1 Options	Default Connection	Feature
No SSFM/SYNC	No SSFM/SYNC	Disable Sync and Spread Spectrum
SYNC		Use External Sync
SSFM On		Enable Spread Spectrum

Required Equipment

- DC power supply (55 V, 10 A)
- Oscilloscope
- Two digital multimeters to measure V_{IN} and V_{OUT}
- Two digital multimeters to measure I_{IN} and I_{OUT}
- Electronic load (5 A)

Procedure

Follow these steps for the required hardware connections and to start the operation of the kit.

1. Connect the power supply. Optionally, a DVM can be placed in series to measure the input current. A DVM can also be placed across the input test points (E1 and E2) to measure V_{IN} delivered to the board to greater accuracy.
2. Connect the electronic load. Optionally, a DVM can be placed in series to measure the output current. A DVM can also be placed across the output test points (E9 and E10) to measure V_{OUT} to greater accuracy.
3. Connect the EN/UVLO test point (E3) to ground.
4. Configure JP1 as required (see Table 1). Default is for the external sync and spread spectrum to be off).
5. Ensure the DC power supply is set to output between 4 V and 24 V. Then, enable output.
6. Release the EN/ULVO pin and observe V_{OUT} rise to 12 V.

Ordering Information

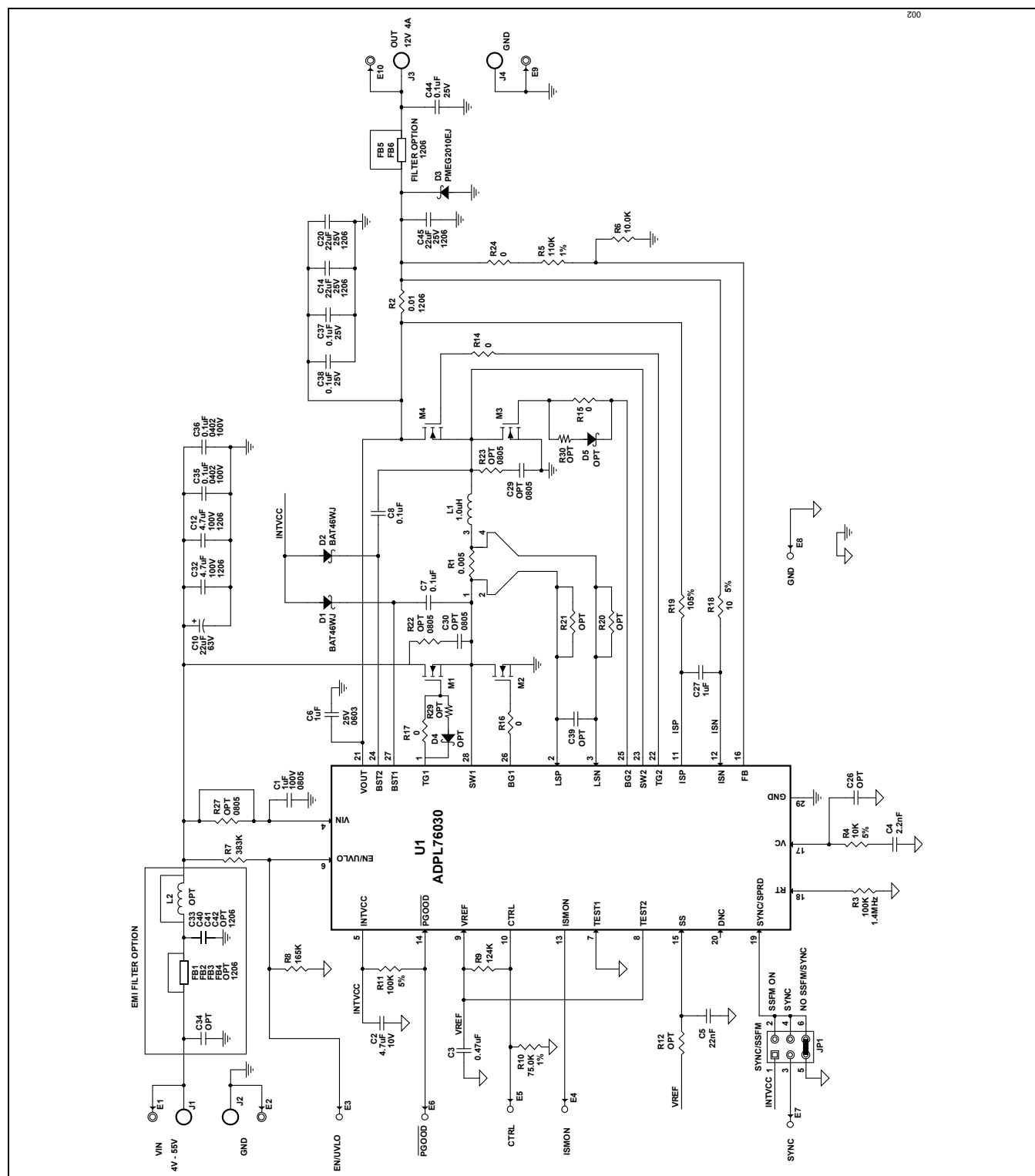
PART	TYPE
EVAL-ADPL76030EBZ	EV Kit

ADPL76030EBZ EV Kit Bill of Materials

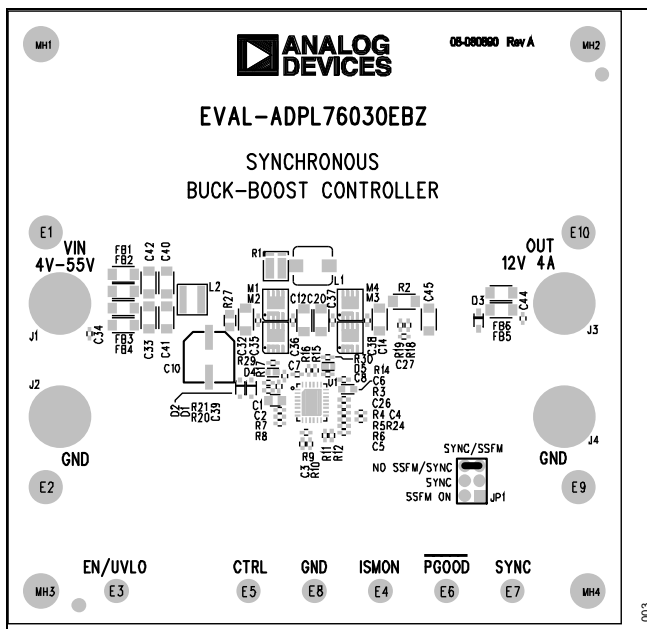
Reference Designator	Qty	Description	Manufacturer	Part Number
C1	1	1 μ F, X7S, 100 V, 10%, 0805	MURATA TDK	GRJ21BC72A105KE11L C2012X7S2A105K125AE
C2	1	4.7 μ F, X5R, 10 V, 10%, 0402	TDK	C1005X5R1A475K050BC
C3	1	0.47 μ F, X5R, 16 V, 10%, 0402	KYOCERA AVX MURATA TAIYO YUDEN	0402YD474KAT2A GRM155R61C474KE01D EMK105ABJ474KV-F
C4	1	2200 pF, X7R, 25 V, 10%, 0402	KYOCERA AVX MURATA	04023C222KAT2A GRM155R71E222KA01D
C5	1	0.022 μ F, X7R, 25 V, 10%, 0402	MURATA TDK	GRM155R71E223KA61D C1005X7R1E223K050BB
C6	1	1 μ F, X7R, 25 V, 10%, 0603	KEMET TAIYO YUDEN TDK	C0603C105K3RACTU TMK107B7105KA-T C1608X7R1E105K080AB
C7, C8, C37, C38, C44	5	0.1 μ F, X7R, 25 V, 10%, 0402	KYOCERA AVX TAIYO YUDEN	04023C104KAT2A TMK105B7104KV-FR
C10	1	22 μ F, Aluminium, 63 V, 20%, Surface-Mount Device, 6.3 mm x 7.7 mm	SUN Electronic Industries	63CE22FS
C12, C32	2	4.7 μ F, X7S, 100 V, 20%, 1206	KYOCERA AVX MURATA	12061Z475MAT2A GRM31CC72A475ME11L
C14, C20, C45	3	22 μ F, X5R, 25 V, 10%, 1206	KYOCERA AVX SAMSUNG YAGEO	12063D226KAT2A CL31A226KAHNNNE CC1206KKX5R8BB226
C27	1	1 μ F, X5R, 16 V, 10%, 0402	KYOCERA AVX TAIYO YUDEN YAGEO	0402YD105KAT2A EMK105BJ105KV-F CC0402KRX5R7BB105
C35, C36	2	0.1 μ F, X5R, 100 V, 10%, 0402, No Substitutes Allowed	MURATA	GRM155R62A104KE14D
D1,D2	2	Schottky Diode, 100 V, 250 mA, SOD-323F	NEXPERIA	BAT46WJ,115
D3	1	Schottky Diode, 20 V, 1 A, SOD-323F	NEXPERIA	PMEG2010EJ,115
E1, E2, E9, E10	4	Terminal Connector Single-End 5.56 mm	MILL-MAX	2501-2-00-80-00-00-07-0
E3, E4, E5, E6, E7, E8	6	Terminal Connector Single-End 3.96 mm	MILL-MAX	2308-2-00-80-00-00-07-0
JP1	1	2 mm x 3 mm, 2.00 mm Dual Pin Header	Wurth	62000621121
J1, J2, J3, J4	4	Banana Jack Connector	KEYSTONE	575-4
L1	1	1 μ H, Inductor, 20%, 7.3 A, 14 m Ω	Wurth	74437336010
M1, M2	2	N-Ch MOSFET, 60 V, 40 A, TSDSON-8	INFINEON	BSZ065N06LS5ATMA1
M3, M4	2	N-Ch MOSFET, 25 V, 19 A, TSDSON-8	INFINEON	BSZ031NE2LS5ATMA1
R1	1	Current-Sense Resistor, 0.005 Ω , 1%, 1.5 W, 1206	SUSUMU	KRL3216E-C-R005-F-T1
R2	1	Current-Sense Resistor, 0.01 Ω , 1%, 750 mW, 1206	SUSUMU	KRL1632E-M-R010-F-T5
R3, R11	2	100 k Ω , 5%, 1/16 W, 0402	NIC VISHAY Dale	NRC04J104TRF CRCW0402100KJNED
R4, R6	2	10 k Ω , 1%, 1/16 W, 0402	NIC VISHAY Dale	NRC04F1002TRF CRCW040210K0FKED
R5	1	110 k Ω , 1%, 1/16 W, 0402	VISHAY Dale	CRCW0402110KFKED
R7	1	383 k Ω , 1%, 1/16 W, 0402	VISHAY Dale	CRCW0402383KFKED

R8	1	165 k Ω , 1%, 1/16 W, 0402	VISHAY Dale	CRCW0402165KFKED
R9	1	124 k Ω , 1%, 1/16 W, 0402	STACKPOLE ELECTRONICS VISHAY Dale	RMCF0402FT124K CRCW0402124KFKED
R10	1	75 k Ω , 1%, 1/16 W, 0402	STACKPOLE ELECTRONICS VISHAY Dale	RMCF0402FT75K0 CRCW040275K0FKED
R14, R15, R16, R17, R24	5	0 Ω , 1/16 W, 0402	NIC VISHAY Dale	NRC04ZOTRF CRCW04020000Z0ED
R18, R19	2	10 Ω , 5%, 1/16 W, 0402	VISHAY Dale YAGEO	CRCW040210R0JNED RC0402JR-0710RL
U1	1	ADPL76030EBZ Controller	Analog Devices	ADPL76030EUFD#PBF ADPL76030EUFD#TRPBF
		Optional Components Not Fitted	Footprint	
	2	D4, D5	U-DFN1608-2	
	9	FB1, FB2, FB3, FB4, FB5, C33, C40, C41, C42	1206	
	1	FB6	1206	
	1	L2	IND-XAL40XX	
	5	R22, R23, R27, C29, C30	0805	

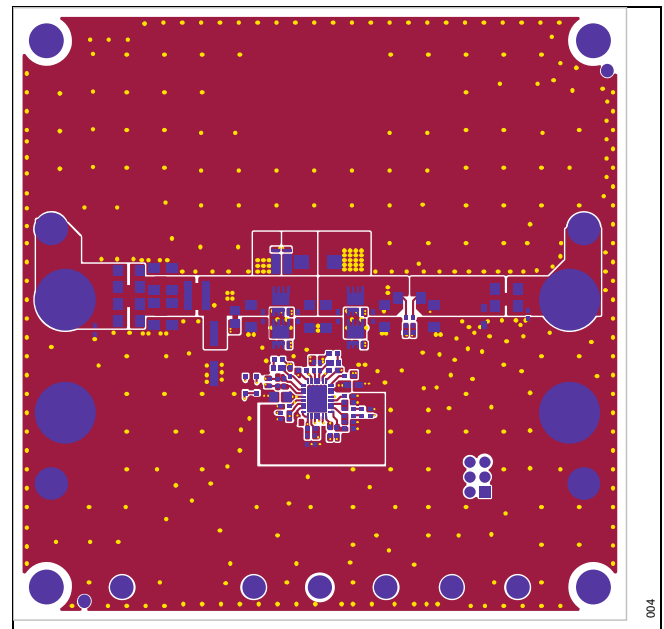
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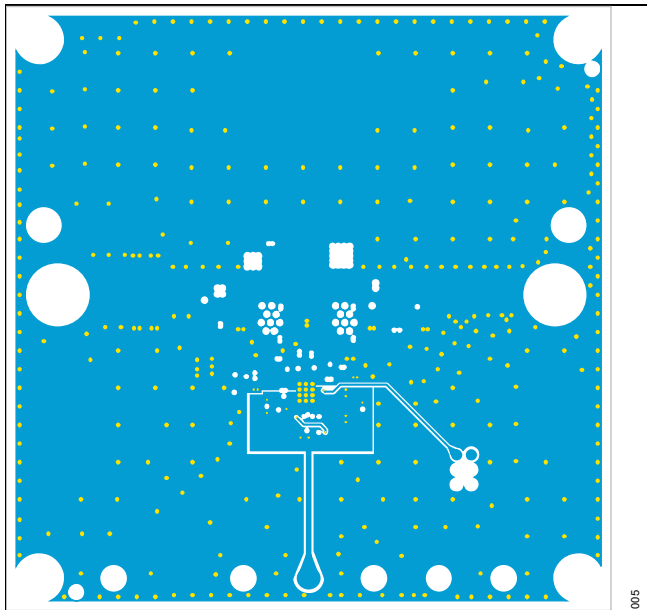
ADPL76030EBZ EV Kit PCB Layout



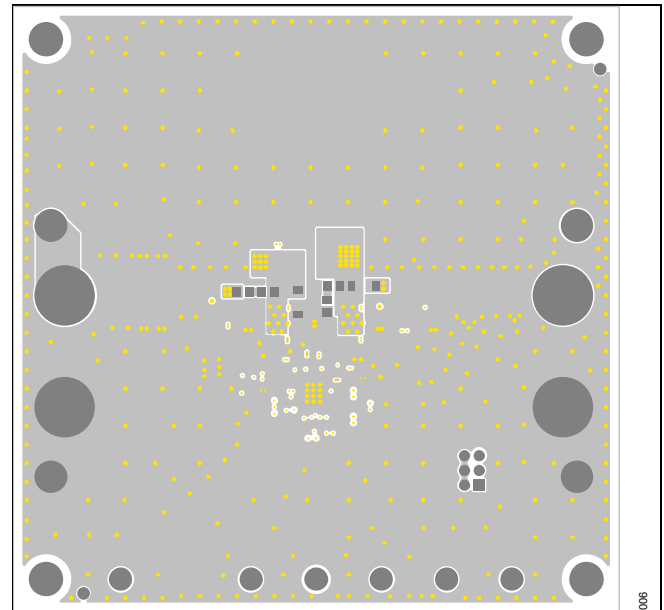
ADPL76030EBZ EV Kit Component Placement Guide—Top Silkscreen



ADPL76030EBZ EV Kit PCB Layout—Layer 2

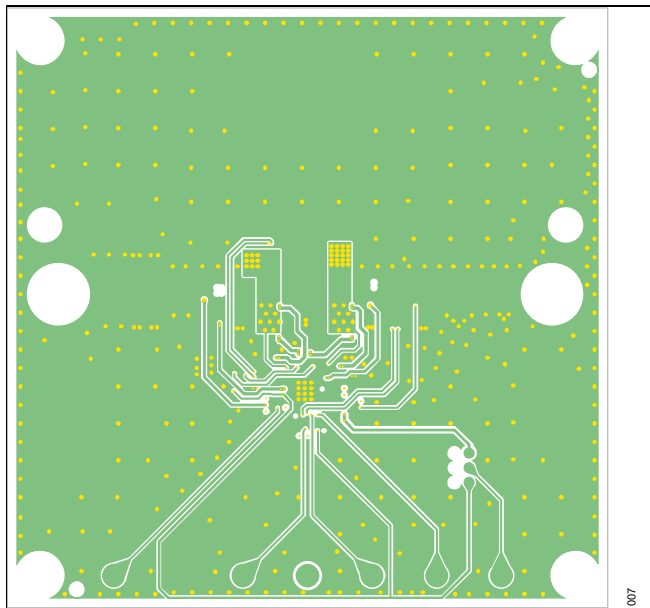


ADPL76030EBZ EV Kit PCB Layout—Top

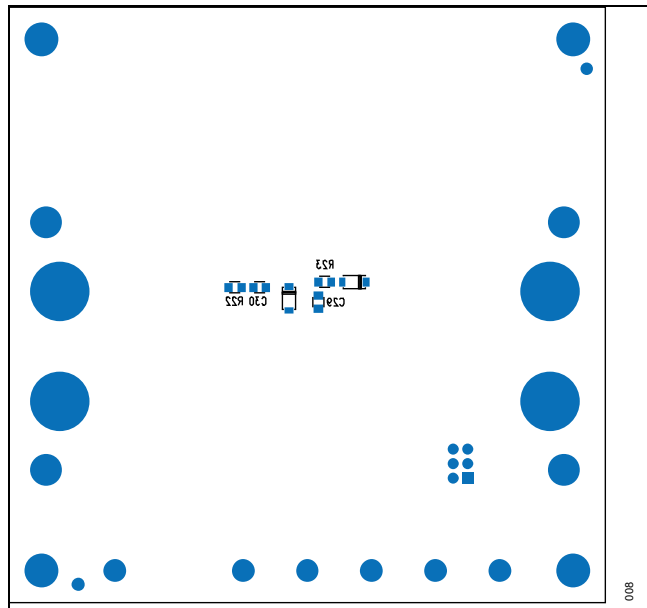


ADPL76030EBZ EV Kit PCB Layout—Layer 3

ADPL76030EBZ EV Kit PCB Layout (Continued)



ADPL76030EBZ EV Kit PCB Layout—Bottom



ADPL76030EBZ EV Kit Component Placement Guide—Bottom
Silkscreen

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