

**Evaluates: MAX25239, MAX25240****MAX25240 Evaluation Kit**

## General Description

The MAX25240 evaluation kit (EV kit) is a fully assembled and tested application circuit that simplifies the evaluation of the MAX25240 400kHz, 36V buck-boost converter. All installed components are rated for the automotive temperature range. Various test points and jumpers are included for evaluation.

The standard EV kit comes with the MAX25240AFFF/VY+ installed (11.5V, 400kHz) and can also be used to evaluate other MAX25240 variants with minimal component changes shown in the [MAX25240 EV Kit Bill of Materials](#).

## Features

- High-Voltage Step-Down Converters with Integrated Power FETs to Minimize Board-Area-Occupancy
- Seamless Transition Across buck and Boost Operating Regions
- 4.5V to 40V Input Supply Range
- Extended Input Range Down to 2V After Initial Startup
- Provides 11.5V Output up to 4.5A Output Current
- Output Voltages Adjustable Between 3.3V and 20V Through External Resistors
- $\pm 2\%$  Output Voltage Accuracy
- Skip-Mode Operation to Maximize Efficiency During Light Load Conditions
- Frequency-Synchronization Input
- Spread Spectrum Enable Input
- Buck-Boost Enable Input
- Voltage-Monitoring PGOOD Output
- Jumpers and Test Points on Key Nodes for Simplified Evaluation
- Proven PCB Layout
- Fully Assembled and Tested

## Quick Start

### Required Equipment

- MAX25240 EV kit
- 15V, 10A DC power supply (PS)
- Voltmeters (VM)
- Electronic loads (EL)

### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation.

**Caution: Do not turn on the power supply until all connections are completed.**

- 1) Verify that all jumpers are in their default positions as shown in [Table 1](#).
- 2) Preset the power supply, PS to 14V. Turn off the PS.
- 3) Preset the electronic loads, EL to 3A. Turn off the EL.
- 4) Connect the positive terminal of EL to OUT; connect the negative terminal of EL to GND4.
- 5) Connect the positive terminal of PS to SUP; connect the negative terminal of PS to GND.
- 6) Connect the positive terminal of VM to OUT; connect the negative terminal of VM to GND2.
- 7) Turn on the power supply.
- 8) Verify that the voltmeter on VOUT1 measures approximately 11.5V.
- 9) Enable the electronic loads, EL.
- 10) Verify that the voltmeter on VOUT1 measures approximately 11.5V.

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

**Table 1. Default Jumper Settings**

JUMPER	SHUNT POSITION	FUNCTION
JU1	1–2	Buck-boost converter enabled
JU2	1–2	Forced-pulse-width-modulation (FPWM) mode enabled
JU3	2–3	Spread spectrum disabled
JU4	1–2	PGOOD pull-up connected

**Detailed Description**

The MAX25240 EV kit provides a fully developed and proven layout for evaluating all variants of the MAX25240 family of current-mode-controlled buck converter ICs. Each converter accepts input supply voltages as high as 36V and input supply transients up to 40V.

**Operation Modes**

The IC can operate in two modes, forced-PWM or skip mode. Skip mode offers improved efficiency over PWM during light-load conditions. When FSYNC is pulled low, the device operates in skip mode for light loads, and in PWM mode for larger loads. When FSYNC is pulled high, the device is forced to operate in PWM across all load conditions.

**Switching Frequency and External Synchronization**

The FSYNC pin can be used to synchronize the switching frequency of the IC to an external source by applying an external clock signal. The device is forced to operate in PWM when FSYNC is connected to a clock source.

**Ordering Information**

PART	TYPE
MAX25240EVKIT#	11.5V/400kHz EV Kit

#Denotes RoHS compliance.

**Output Voltage Monitoring (PGOOD)**

The EV kit provides output test points (PGOOD) to monitor the status of the buck-boost output voltage on OUT. PGOOD is high impedance when the output voltage rises above its 95% (typ) of regulation voltage. PGOOD pulls low when the respective output voltage drops below 93.5% (typ) of its nominal regulated voltage.

To obtain logic signals, pull PGOOD up to VCC by installing the shunts on jumpers on JU\_.

**Setting the Output Voltage in Buck Converters**

The EV kit comes assembled to provide a fixed 11.5V output regulation on OUT. To externally adjust the voltage at OUT, remove R<sub>fb</sub> and place appropriate resistors in positions Ry and Rx according to the following equation:

$$R7 = R8 \left[ \left( \frac{VOUT1}{VFB} \right) - 1 \right]$$

where VFB = 0.8V (typ) and R8 is between 10kΩ and 50kΩ.

**Evaluating Other Variants**

The MAX25240EVKIT# comes installed with the 11.5V/400kHz variant (MAX25240AFFF/VY+)

Analog Devices offers additional variations including those that operate at higher switching frequency of 2MHz for smaller component size. See [MAX25240 EV Kit Bill of Materials](#) to select components for evaluating 2MHz variants.

Refer to the MAX25240 IC data sheet for part variant details and contact the factory to request additional variants of MAX25240.

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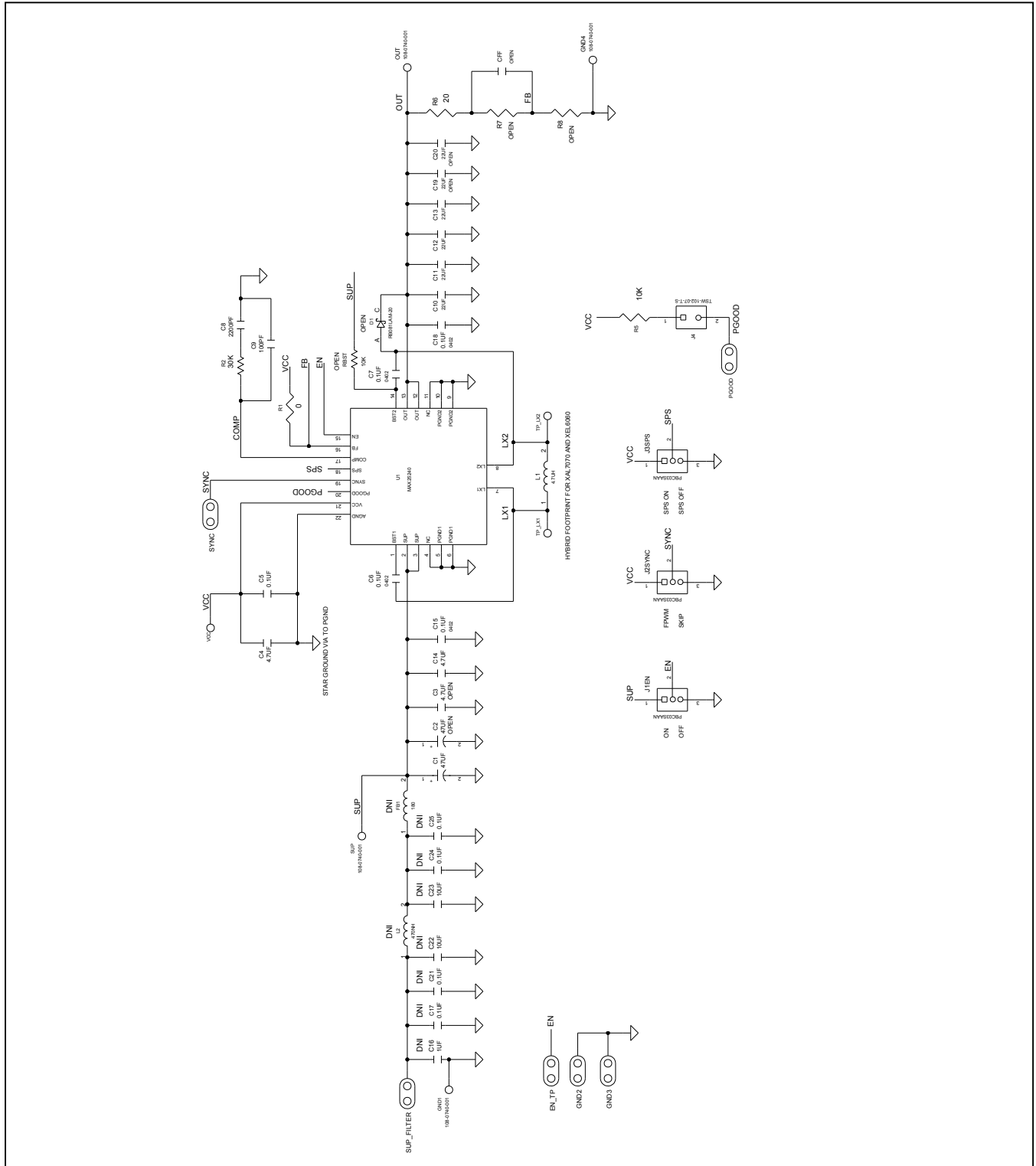
## MAX25240 EV Kit Bill of Materials

ITEM	QTY	REF DES	VAR STATUS	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	2	C1, C2	Pref	EC111000003722	EEH-ZC1H470	PANASONIC	47UF	CAP; SMT(CASE_F); 47UF; 20%; 50V; ALUMINUM-ELECTROLYTIC	(C2:OPEN)
2	1	C4	Pref	20-004U7-11D	GRM188Z71C475KE21	MURATA	4.7UF	CAP; SMT (0603); 4.7UF; 10%; 16V; X7R; CERAMIC	
3	5	C5-C7, C15, C18	Pref	20-000U1-04A	C1005X7R1H104K050BB; GRM155R71H104KE14; C1005X7R1H104K050BE; UMK105B7104KV-FR	TDK; MURATA; TDK; TAIYO YUDEN	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 50V; X7R; CERAMIC	
4	1	C8	Pref	20-2200P-E5	CD603C222K1RAC	KEMET	2200PF	CAP; SMT (0603); 2200PF; 10%; 100V; X7R; CERAMIC	
5	1	C9	Pref	20-0100P-DA94	06033C101MAT2A	AVX	100PF	CAP; SMT (0603); 100PF; 20%; 25V; X7R; CERAMIC	
6	2	C3, C14	Pref	20-004U7-72	GRM31CR71H475KA12; GRJ31CR71H475KE11; GXM31CR71H475KA10; UMK316AB7475KL; GRM31CR71H475KA12L	MURATA; MURATA; MURATA; TAIYOYUDEN; MURATA	4.7UF	CAP;SMT(1206);4.7UF;10%;50V;X7R;CERAMIC	(C3:OPEN)
7	6	C10-C13, C19, C20	Pref	EC111000006843	CGA6P3X7R1E226M250AB	TDK	22UF	CAP; SMT (1210); 22UF; 20%; 25V; X7R; CERAMIC; NOTE:PURCHASE DIRECT FROM THE MANUFACTURER	(C19, C20:OPEN)
8	1	CFF	Pref	20-0022P-15	06035C220JAT	AVX	22PF	CAP; SMT (0603); 22PF; 5%; 50V; X7R; CERAMIC	OPEN
9	6	EN_TP, GND2, GND3, PGOOD, SUP_FILTER, SYNC	Pref	01-9020BUSS20AWG-00	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG	
10	4	GND1, GND4, OUT, SUP	Pref	01-10807400011P-80	108-0740-001	EMERSON NETWORK POWER	108-0740-001	CONNECTOR; MALE; PANELMOUNT; BANANA JACK; STRAIGHT; 1PIN	
11	3	J1-J3	Pref	01-PBC03SAAN3P-21	PBC03SAAN	SULLINS	PBC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS; -65 DEGC TO +125 DEGC	
12	1	J4	Pref	01-TSW10207TS2P-17	TSW-102-07-T-S	SAMTEC	TSW-102-07-T-S	CONNECTOR; THROUGH HOLE; TSW SERIES; SINGLE ROW; STRAIGHT; 2PINS; -55 DEGC TO +105 DEGC	
13	1	L1	Pref	50-004U7-0IF	XAL7070-472ME	COILCRAFT	4.7UH	INDUCTOR; SMT; SHIELDED; 4.7UH; TOL=+-20%; 13.6A	
14	4	MH1-MH4	Pref	02-SOM35016H-00	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON	
15	1	R1	Pref	80-0000R-AA6	CRCW06030000Z0	VISHAY DALE	0	RES; SMT (0603); 0; JUMPER; JUMPER; 0.1000W	
16	1	R2	Pref	80-0030K-24	CRCW060330K0FK	VISHAY DALE	30K	RES; SMT (0603); 30K; 1%; +/-100PPM/DEGC; 0.1000W	
17	1	R5	Pref	80-0010K-53	CRCW060310K0JN; ERJ-3GEYJ103	VISHAY DALE; PANASONIC	10K	RES; SMT (0603); 10K; 5%; +/-200PPM/DEGC; 0.1000W	
18	1	R6	Pref	80-0020R-24	CRCW060320R0FK; ERJ-3EKF20R0	VISHAY DALE; PANASONIC	20	RES; SMT (0603); 20; 1%; +/-100PPM/DEGC; 0.1000W	
19	1	R7	Pref	80-0294K-19	ERJ-3EKF2943	PANASONIC	294K	RES; SMT (0603); 294K; 1%; +/-100PPM/DEGC; 0.1000W	OPEN
20	1	R8	Pref	80-0021K-24	CRCW060321K0FK	VISHAY DALE	21K	RES; SMT (0603); 21K; 1%; +/-100PPM/DEGC; 0.1000W	OPEN
21	4	SU1-SU4	Pref	02-JMPSNT100BKG-00	SNT-100-BK-G	SAMTEC	SNT-100-BK-G	TEST POINT; SHUNT AND JUMPER; STR; TOTAL LENGTH=6.10MM; BLACK; INSULATION-GLASS FILLED POLYESTER; CONTACT=PHOSPHOR BRONZE	
22	1	U1	Pref	00-SAMPLE-01	MAX25240	MAXIM	MAX25240	EVKIT PART - IC; AUTOMOTIVE 2V TO 36V WIDE VIN; 2.1MHZ; 3.0A; BUCK-BOOST CONVERTER; PACKAGE DRAWING NUMBER: 21-100399; LAND PATTERN NUMBER: 90-100137; PACKAGE CODE: F222A4FY-1	
23	1	VCC	Pref	02-TPCOMP5007-00	5007	KEYSTONE	N/A	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.35IN; BOARD HOLE=0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; RECOMMENDED FOR BOARD THICKNESS=0.062IN; NOT FOR COLD TEST	
24	1	PCB	-	EPCB25240	MAX25240	MAXIM	PCB	PCB:MAX25240	-
TOTAL	51								

DO NOT PURCHASE(DNP)									
ITEM	QTY	REF DES	VAR STATUS	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	1	C16	DNP	20-0001U-14	UMK107AB7105KA; CC0603KRX7R9BB105	TAIYO YUDEN; YAGEO	1UF	CAP; SMT (0603); 1UF; 10%; 50V; X7R; CERAMIC	
2	4	C17, C21, C24, C25	DNP	20-000U1-04A	C1005X7R1H104K050BB; GRM155R71H104KE14; C1005X7R1H104K050BE; UMK105B7104KV-FR	TDK; MURATA; TDK; TAIYO YUDEN	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 50V; X7R; CERAMIC	
3	2	C22, C23	DNP	20-0010U-840	GRM32ER71H106KA12; CL32B106KBJNNN; UMJ325KB7106KMH; 12105C106K4Z2A	MURATA; SAMSUNG ELECTRONICS; TAIYO YU	10UF	CAP; SMT (1210); 10UF; 10%; 50V; X7R; CERAMIC	
4	1	FB1	DNP	EL111000007023	74279224181	WURTH ELECTRONICS INC.	180	INDUCTOR; SMT; FERRITE-BEAD; 180 OHMS AT 100MHZ; TOL=+-25%; 10A ;NOTE:PURCHASE DIRECT FROM THE MANUFACTURER	
5	1	L2	DNP	EL111000006365	IHLP2020B2ERR47M01	VISHAY	470NH	INDUCTOR; SMT; SHIELDED; 470NH; 20%; 2.8A	
TOTAL	9								

PACKOUT (These are purchased parts but not assembled on PCB and will be shipped with PCB)									
ITEM	QTY	REF DES	VAR STATUS	MAXINV	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	1	D1	DNI	ED111000007017	RB081LAM-20	ROHM SEMICONDUCTOR	RB081LAM-20	DIODE; SCH; SMT (SOD-128); PIV=20V; IF=80A	PACKOUT
2	1	RBST	DNI	80-0010K-D3	ERJ-6GEYJ103; RMCFO805JG10K0	PANASONIC; STACKPOLE ELECTRONICS	10K	RES; SMT (0805); 10K; 5%; +/-200PPM/DEGC; 0.1250W	PACKOUT
TOTAL	2								

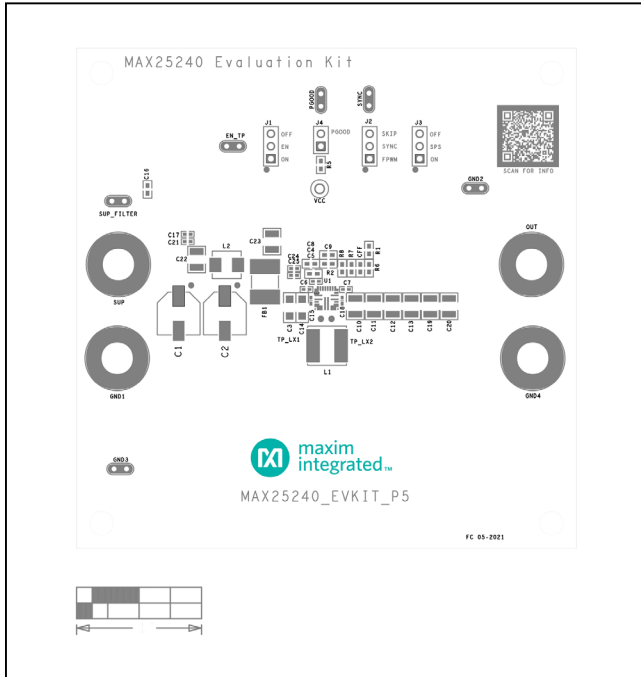
MAX25240 EV Kit Schematic



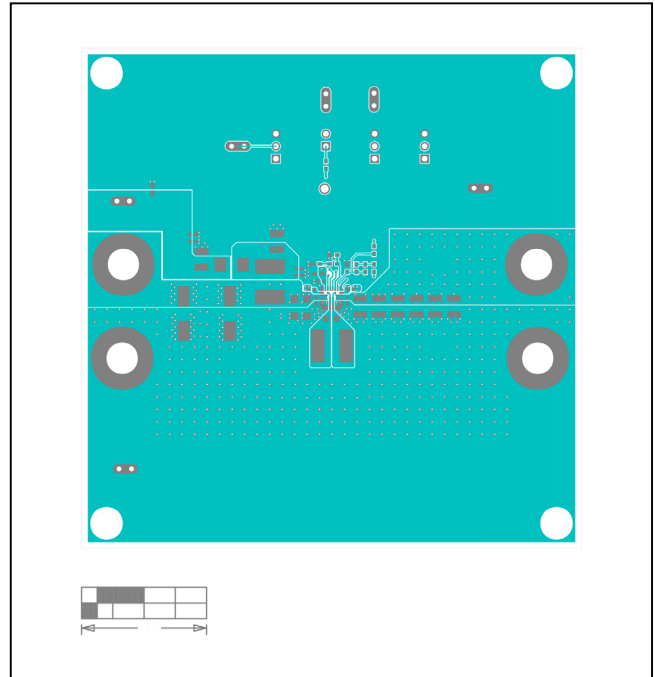
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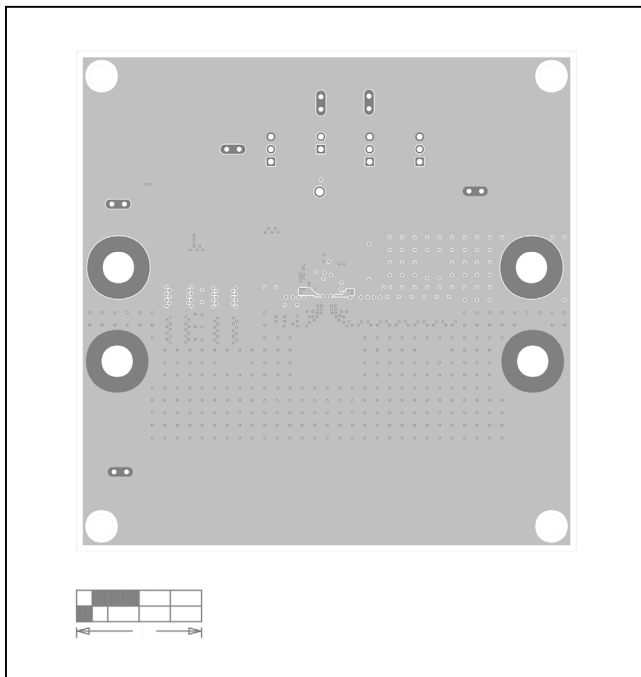
## MAX25240 EV Kit PCB Layouts



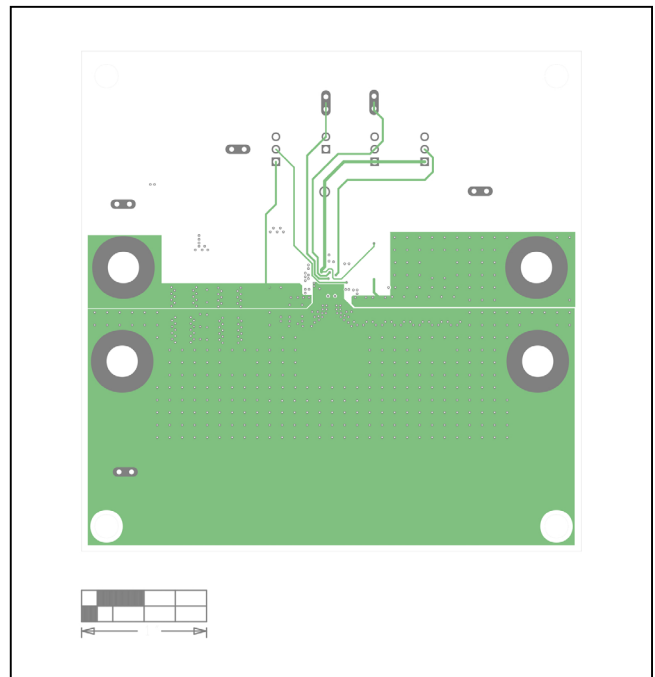
MAX25240 EV Kit PCB Layout—Silkscreen Top



MAX25240 EV Kit PCB Layout—Top

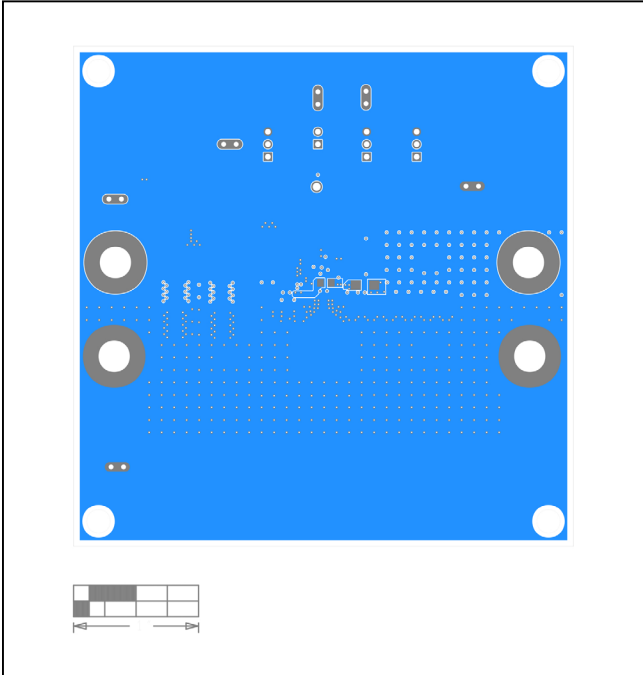


MAX25240 EV Kit PCB Layout—GND Signal

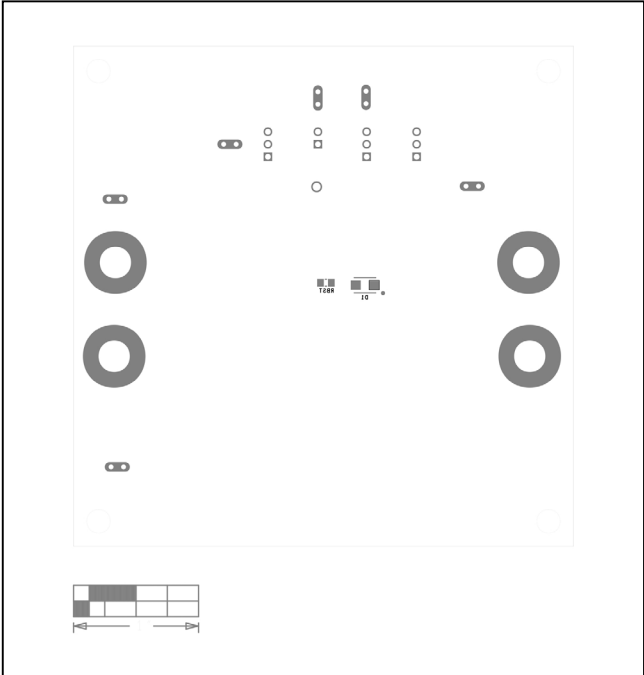


MAX25240 EV Kit PCB Layout—Signal

MAX25240 EV Kit PCB Layouts (continued)



MAX25240 EV Kit PCB Layout—Component Placement Bottom



MAX25240 EV Kit PCB Layout—Silkscreen Bottom

**Revision History**

<b>REVISION NUMBER</b>	<b>REVISION DATE</b>	<b>DESCRIPTION</b>	<b>PAGES CHANGED</b>
0	10/20	Initial release	—
1	7/22	Changed installed part to the 11.5V/400kHz variant (MAX25240AFFV/VY+)	All



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