

MAXIM

MAX1714A Evaluation Kit

General Description

The MAX1714A evaluation kit (EV kit) demonstrates a standard 4A application circuit. This DC-DC converter steps down high-voltage batteries and/or AC adapters, generating a precision, low-voltage rail for use as chipset, DRAM, and other low-voltage supplies. For higher current applications up to 12A, refer to the MAX1714A data sheet.

The MAX1714A EV kit provides a 2.5V output voltage from a +5V to +24V battery input range. It delivers up to 4A output current with greater than 90% efficiency while operating at a 300kHz switching frequency, and has superior line- and load-transient response.

This EV kit is a fully assembled and tested circuit board. It also allows evaluation of other output voltages in the 1.0V to 5.5V range by changing feedback resistors R1 and R2.

Features

- ◆ +5V to +24V Input Voltage Range
- ◆ Preset 2.5V Output Voltage
- ◆ 1.0V to 5.5V Adjustable Output
- ◆ 4A Output Current
- ◆ 94% Efficient ($V_{OUT} = 2.5V$, $V_{BATT} = 7V$, $I_{LOAD} = 2A$)
- ◆ 300kHz Switching Frequency
- ◆ No Current-Sense Resistor
- ◆ Power-Good Output
- ◆ Low-Profile Components
- ◆ Fully Assembled and Tested

Ordering Information

PART	TEMP. RANGE	IC PACKAGE
MAX1714AEVKIT	0°C to +70°C	20 QSOP

Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	10 μ F, 25V ceramic capacitor (1812) Taiyo Yuden TMK432BJ106KM or Tokin C34Y5U1E106Z
C2	1	330 μ F, 6.3V, 45m Ω C100M low-ESR capacitor Sanyo 6TPB330M or Kemet T510X337M010AS
C3	1	0.1 μ F ceramic capacitor (0805)
C4	1	0.22 μ F ceramic capacitor (1206)
C5	1	4.7 μ F, 10V, X5R ceramic cap (1206) Taiyo Yuden LMK316BJ475ML
C6	1	3.3 μ F, 10V, X5R ceramic cap (1206) Taiyo Yuden LMK316BJ335ML
C7	1	2200pF ceramic capacitor (0805)
D1	1	1A, 30V Schottky diode Nihon EP10QY03 or EC10QS03 or Motorola MBRS130LT3
D2	1	100mA, 30V Schottky diode Central Semiconductor CMPSH-3

DESIGNATION	QTY	DESCRIPTION
JU1, JU2	2	2-pin headers
L1	1	4.7 μ H power inductor Sumida CDRH124-4R7MC (shielded), Coiltronics UP2B-4R7 (unshielded)
N1A, N1B	1	Dual N-channel MOSFET Fairchild FDS6982A
R1, R2, R3, R8, R9	0	Not installed
R4	1	100k Ω $\pm$ 5% resistor (0805)
R5, R6	2	1M Ω $\pm$ 5% resistors (0805)
R7	1	20 Ω $\pm$ 5% resistor (0805)
R8	1	200 Ω $\pm$ 5% resistor (0805)
U1	1	MAX1714AEEP (20-pin QSOP)
None	1	Shunt (JU1)
None	1	MAX1714A PC board
None	1	MAX1714A data sheet
None	1	MAX1714A EV kit data sheet

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Component Suppliers

SUPPLIER	PHONE	FAX
AVX	803-946-0690	803-626-3123
Central Semiconductor	516-435-1110	516-435-1824
Coilcraft	708-639-6400	708-639-1469
Coiltronics	561-241-7876	561-241-9339
Fairchild	408-721-2181	408-721-1635
Kemet	408-986-0424	408-986-1442
Motorola	602-303-5454	602-994-6430
Nihon	847-843-7500	847-843-2798
Sanyo	619-661-6835	619-661-1055
Sumida	708-956-0666	708-956-0702
Taiyo Yuden	408-573-4150	408-573-4159
Tokin	408-432-8020	408-434-0375

Note: Please indicate that you are using the MAX1714A when contacting these component suppliers.

Equipment Needed

- +5V to +24V power supply, battery, or notebook AC adapter
- +5V (at 100mA) DC bias power supply
- Dummy load capable of sinking 4A
- Digital multimeter (DMM)
- 100MHz dual-trace oscilloscope

Quick Reference

- 1) Ensure that the circuit is connected correctly to the supplies and dummy load prior to applying any power.
- 2) Verify that the shunt is placed across JU1.
- 3) Turn on battery power prior to +5V bias power; otherwise, the output undervoltage protection timer will time out and the FAULT latch will be set, disabling the regulator until +5V power is cycled or shutdown is toggled (refer to the *Output Undervoltage Protection* section in the MAX1714A data sheet).
- 4) Observe the 2.5V output with the DMM and/or oscilloscope. Look at the LX switching-node and MOSFET gate-drive signals while varying the load current.

Detailed Description

Jumper Settings

Table 1. Jumper JU1 Functions (Shutdown Mode)

SHUNT LOCATION	$\overline{\text{SHDN}}$ PIN	MAX1714A OUTPUT
On	Connected to VCC	MAX1714A enabled
Off	Connected to AGND	Shutdown mode, V _{OUT} = 0

Table 2. Jumper JU2 Functions (Low-Noise Mode)

SHUNT LOCATION	$\overline{\text{SKIP}}$ PIN	OPERATIONAL MODE
On	Connected to VCC	Low-noise mode, forced fixed-frequency PWM operation
Off	Connected to AGND	Normal operation, allows automatic PWM/PFM switchover for pulse skipping at light load, resulting in highest efficiency

Table 3. Jumper JU3 Functions (Fixed/Adjustable Current-Limit Selection)

SHUNT LOCATION	ILIM PIN	CURRENT-LIMIT THRESHOLD
On	Connected to VCC	100mV (default)
Off	Connected to REF through voltage-divider R3/R9. Refer to the <i>Current-Limit Circuit</i> section in the MAX1714A data sheet for information on selecting R3/R9.	Adjustable from 50mV to 200mV

Evaluating Other Output Voltages

The EV kit output is preset to +2.5V. However, the output voltage can also be adjusted between 1.0V and 5.5V by selecting R1 and R2 values. Cut the PC board trace shorting R2, then select feedback resistor R2 in the 5k Ω to 100k Ω range. R1 is then given by:

$$R1 = R2 [(V_{OUT} / V_{FB}) - 1]$$

where V_{FB} = 1.0V.

If a 3.3V output is desired, cut the trace shorting R2, then short JU7.

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Table 4. Jumper JU4/JU5/JU6 Functions (Switching-Frequency Selection)

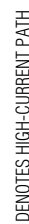
JUMPER	SHUNT LOCATION	TON PIN	FREQUENCY (kHz)
JU4, JU5, JU6	Off	Floating	300
JU4	On	Connected to VCC	200
JU5, JU6	Off		
JU5	On	Connected to REF	450
JU4, JU6	Off		
JU6	On	Connected to AGND	600
JU4, JU5	Off		

IMPORTANT: Don't change the operating frequency without first recalculating component values because the frequency has a significant effect on the preferred inductor value, peak current-limit level, MOSFET heating, PFM/PWM switchover point, output noise, efficiency, and other critical parameters.

Table 5. Troubleshooting Guide

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Circuit won't start when power is applied.	Power-supply sequencing: +5V bias supply was applied first	Cycle $\overline{\text{SHDN}}$ by removing and reinstalling JU1.
Circuit won't start when $\overline{\text{SHDN}}$ and +5V bias supply are cycled.	Output overvoltage due to shorted high-side MOSFET	Replace the MOSFET.
	Output overvoltage due to load recovery overshoot	Reduce the inductor value, raise the switching frequency, or add more output capacitance.
	Overload condition	Remove the excessive load or raise the ILIM threshold by changing R3/R9.
	Broken connection, bad MOSFET, or other catastrophic problem	Troubleshoot the power stage. Are the DH and DL gate-drive signals present? Is the 2V VREF present?
On-time pulses are erratic or have unexpected changes in period.	VBATT power source has poor impedance characteristic	Add a bulk electrolytic bypass capacitor across the bench-top power supply, or substitute a real battery.
Load-transient V_{OUT} waveform shows excess ringing. OR LX switching waveform exhibits double-pulsing (pulses separated only by a 400ns min off-time).	Instability due to output capacitors placed at the feedback point	Add parasitic PC board trace resistance between the feedback point and the output capacitor. OR Substitute a different capacitor type (OS-CONs, tantalums, or aluminum electrolytics work well).

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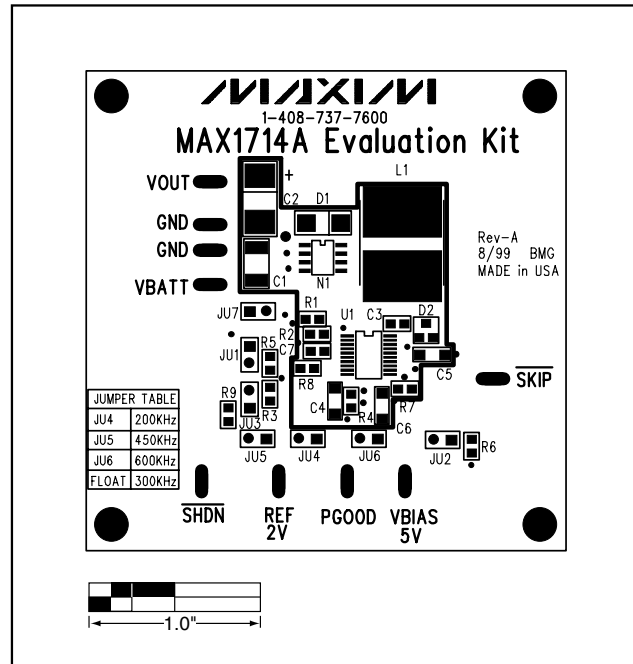


Figure 2. MAX1714A EV Kit Component Placement Guide—Component Side

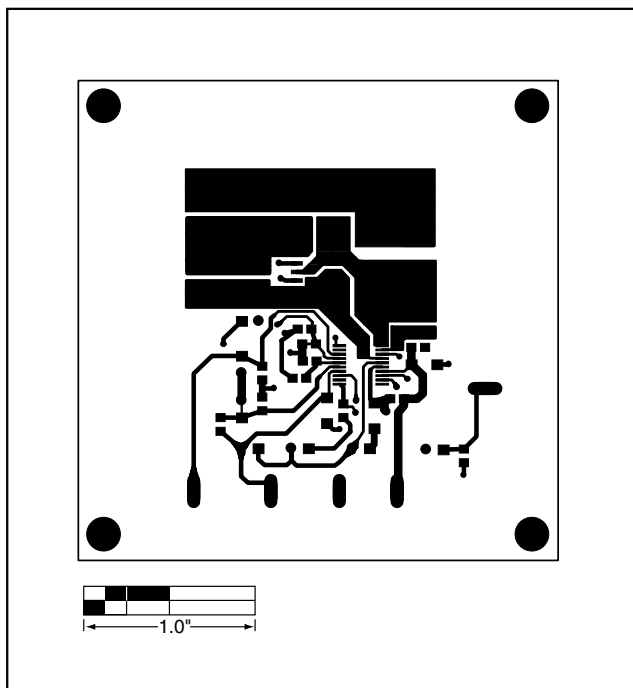


Figure 3. MAX1714A EV Kit PC Board Layout—Component Side

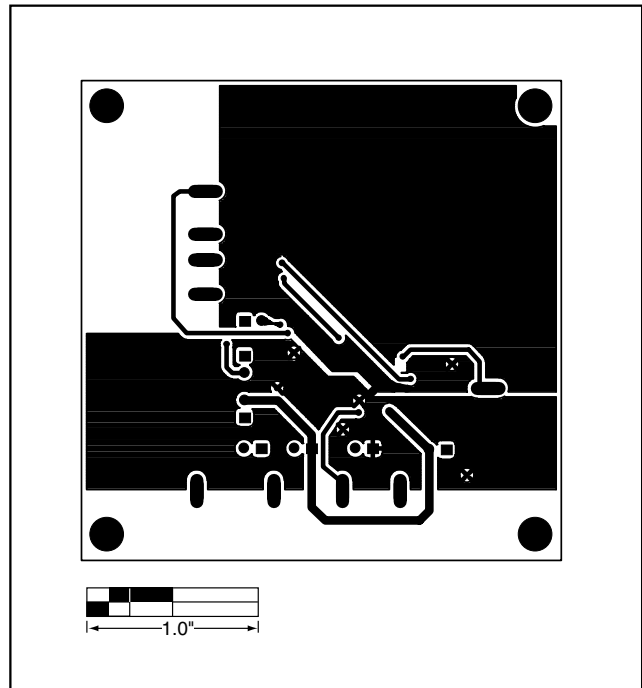


Figure 4. MAX1714A EV Kit PC Board Layout—Solder Side

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