MAX17575 3.3V Output Evaluation Kit

Evaluates: MAX17575 in 3.3V Output-Voltage Application

General Description

The MAX17575 3.3V output evaluation kit (EV kit) provides a proven design to evaluate the MAX17575 high-voltage, high-efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 3.3V output at load currents up to 1.5A and features a 500kHz switching frequency for optimum efficiency and component size. The EV kit features adjustable input undervoltage lockout, adjustable soft-start, open-drain active-low RESET signal, and external frequency synchronization.

Features

- Operates from a 4.5V to 60V Input Supply
- 3.3V Output Voltage
- Up to 1.5A Output Current
- 500kHz Switching Frequency
- Enable/UVLO Input, Resistor-Programmable UVLO Threshold
- Adjustable Soft-Start Time
- Open-Drain $\overline{\text{RESET}}$ Output
- External Frequency Synchronization
- Overcurrent and Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Recommended Equipment

- MAX17575 3.3V output EV kit
- 4.5V to 60V, 2A DC input power supply
- Load capable of sinking 1.5A
- Digital voltmeter (DVM)

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify the board operation. **Caution: Do not turn on power supply until all connections are completed.**

1) Set the power supply at a voltage between 4.5V and 60V. Disable the power supply.
2) Connect the positive terminal of the power supply to the V_{IN} PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the 1.5A load to the V_{OUT} PCB pad and the negative terminal to the nearest PGND PCB pad.
3) Connect the DVM across the V_{OUT} PCB pad and the nearest PGND PCB pad.
4) Verify that shunts are installed across pins 1-2 on jumper JU1 (see Table 1 for details).
5) Turn on the DC power supply.
6) Enable the load.
7) Verify that the DVM displays 3.3V

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Detailed Description of Hardware

The MAX17575 3.3V output EV kit provides a proven design to evaluate the MAX17575 high-voltage, high-efficiency, synchronous step-down DC-DC converter. The EV kit is preset for 3.3V output from 4.5V to 60V input at load currents up to 1.5A and features a 500kHz switching frequency for optimum efficiency and component size. The EV kit includes an EN/UVLO PCB pad and jumper JU1 to enable the output at a desired input voltage. An additional RESET PCB pad is available for monitoring whether the converter output is in regulation.

Soft-Start capacitor selection

The device implements adjustable soft-start operation to reduce inrush current. A capacitor connected from the SS pin to GND programs the soft-start time. The selected output capacitance (C_{SEL}) and the output voltage (V_{OUT}) determine the minimum required soft-start capacitor as follows:

$$C_{SS} \geq 56 \times 10^{-6} \times C_{SEL} \times V_{OUT}$$

The soft-start time (t_{SS}) is related to the capacitor connected at SS (C_{SS}) by the following equation:

$$t_{SS} = \frac{C_{SS}}{5.55 \times 10^{-6}}$$

For example, to program a 2ms soft-start time, a 12nF capacitor should be connected from the SS pin to GND.

Setting the Undervoltage-Lockout Level

The device offers an adjustable input undervoltage-lockout level. Set the voltage at which the device turns on with a resistive voltage-divider connected from V_{IN} to SGND (Figure 1). Connect the center node of the divider to EN/UVLO. Choose R1 to be 3.3MΩ and then calculate R2 as follows:

$$R2 = \frac{1.215 \times R1}{(V_{INU} - 1.215)}$$

where V_{INU} is the voltage at which the device is required to turn on. Ensure that V_{INU} is higher than 0.8 x V_{OUT}.

If the EN/UVLO pin is driven from an external signal source, a series resistance of minimum 1kΩ is recommended to be placed between the signal source output and the EN/UVLO pin, to reduce voltage ringing on the line.

Adjusting Output Voltage

Set the output voltage with a resistive voltage-divider connected from the positive terminal of the output capacitor (V_{OUT}) to SGND (Figure 2). Connect the center node of the divider to the FB pin. Use the following procedure to choose the resistive voltage-divider values:

Calculate resistor R3 from the output to the FB pin as follows:

$$R3 = \frac{1850}{C_{OUT\_SEL}}$$

Where C_{OUT_SEL} (in µF) is the actual derated value of the output capacitance used and R3 is in kΩ. The minimum allowable value of R3 is (5.6 x V_{OUT}), where R3 is in kΩ. If the value of R3 calculated using the above equation. is less than (5.6 x V_{OUT}), increase the value of R3 to at least (5.6 x V_{OUT}).

$$R4 = \frac{R3 \times 0.9}{(V_{OUT} - 0.9)}$$

R4 is in kΩ.

Table 1. Regulator Enable (EN/UVLO) Description (JU1)

SHUNT POSITION	EN/UVLO PIN	MAX17575_ OUTPUT
1-2*	Connected to VIN	Enabled
Not installed	Connected to the center node of resistor-divider R1 and R2	Enabled, UVLO level set through the R1 and R2 resistors
2-3	Connected to SGND	Disabled

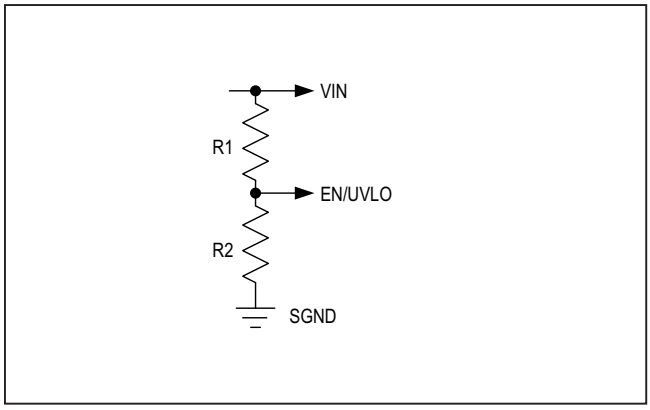


Figure 1. Setting the Input Undervoltage Lockout

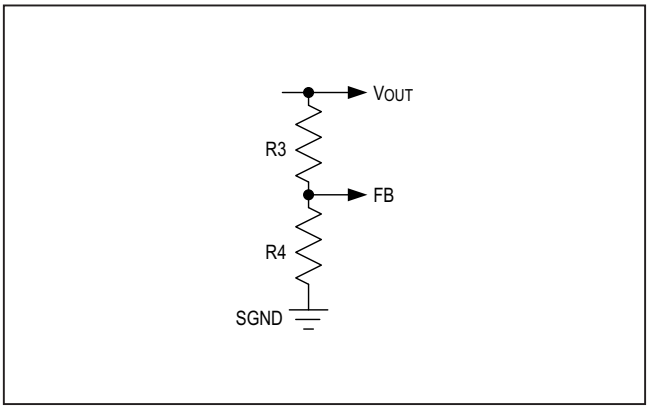
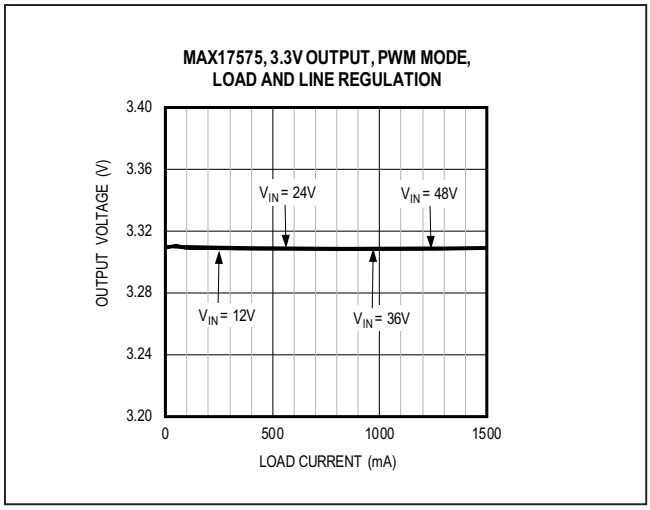
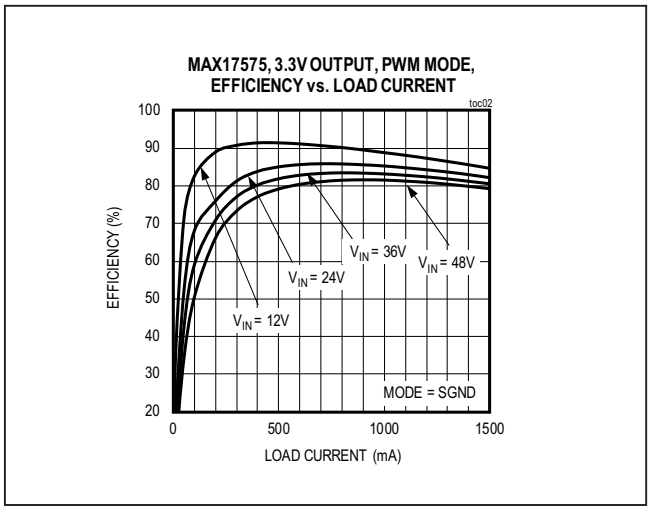


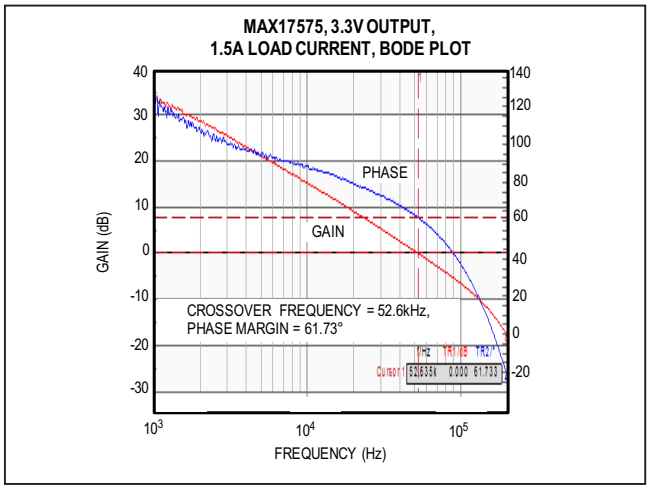
Figure 2: Adjusting Output Voltage

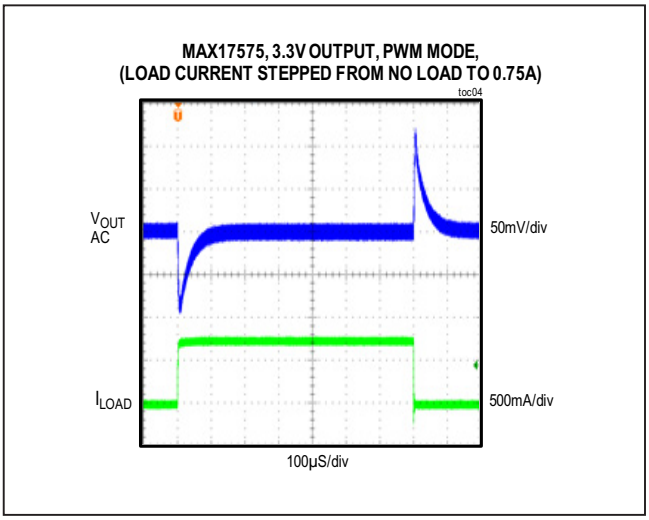
EV Kit Performance Report

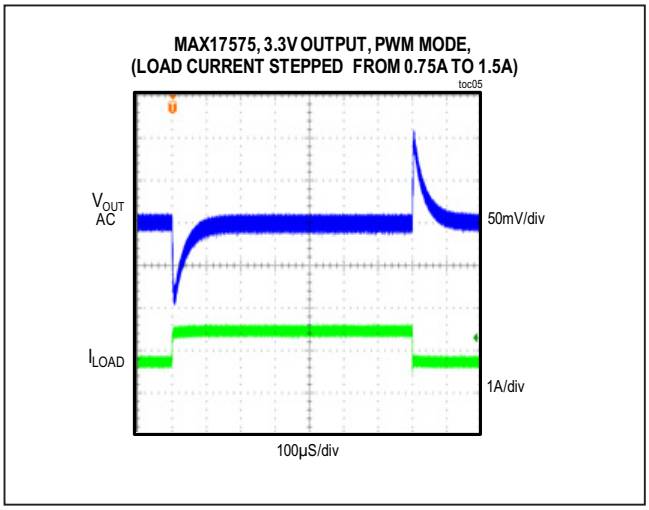




EV Kit Performance Report (continued)







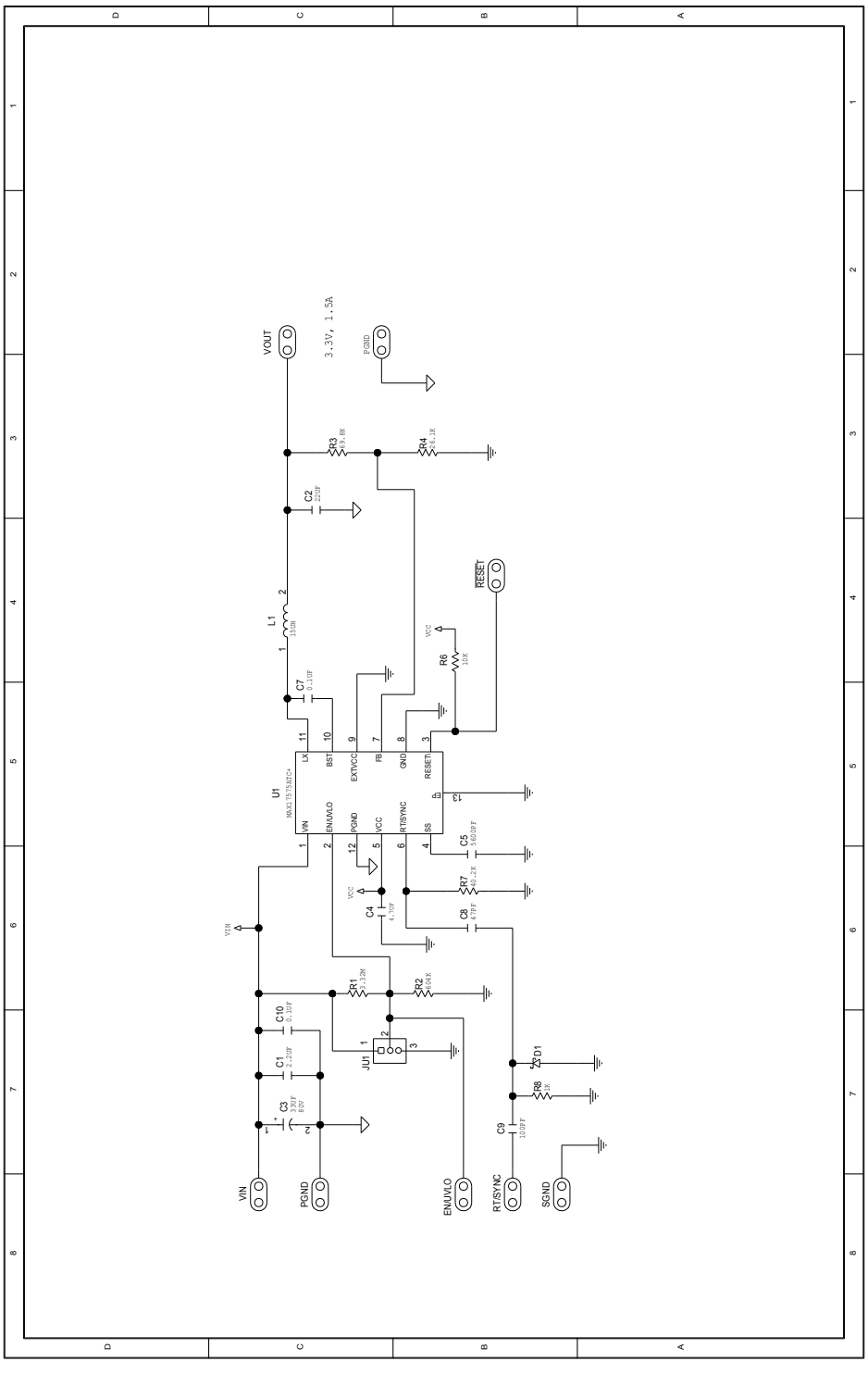
Component Suppliers

SUPPLIER	WEBSITE
Coilcraft, Inc.	www.coilcraft.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
Vishay	www.vishay.com
Onsemi	www.onsemi.com

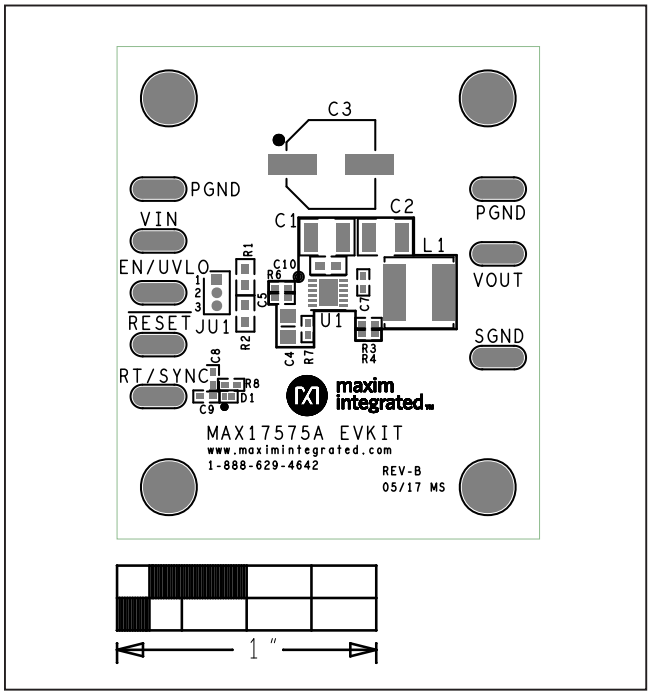
MAX17575 3.3V Output EV Kit Bill of Materials

No.	Description	Quantity	Designator	Part Number
1	2.2uF 10%, 100V ,X7R,Ceramic capacitor (1210)	1	C1	MURATA GRM32ER72A225KA35
2	22uF 10%, 10V ,X7R,Ceramic capacitor (1210)	1	C2	MURATA GRM32ER71A226K
3	33uF,20%,80V,ELECT,10mm	1	C3	PANASONIC EEE-FK1K330P
4	4.7uF 10%, 10V ,X7R,Ceramic capacitor (0805)	1	C4	TDK C2012X7R1A475K085AC
5	5600pF,10%,50V,X7R,0402,Ceramic capacitor(0402)	1	C5	KEMET C0402C562K5RAC
6	0.1uF,10%,50V,X7R, Ceramic capacitor(0402)	1	C7	MURATA GRM155R71H104KE14
7	47pF,10%,50V,X7R,0402,Ceramic capacitor(0402)	1	C8	MURATA GRM1555C1H470JA01
8	100pF,10%,50V,X7R,0402,Ceramic capacitor(0402)	1	C9	KEMET C0402C101K5GAC
9	0.1uF,10%,100V,X7R,0603,Ceramic capacitor(0603)	1	C10	MURATA GRM188R72A104KA35
10	Diode PIV=20V; IF=0.5A	1	D1	ON SEMICONDUCTOR NSR05F20NXT5G
11	3-pin header (36-pin header 0.1” centers)	1	JU1	Sullins: PTC36SAAN
12	INDUCTOR, 15uH, 6A	1	L1	COILCRAFT XAL6060-153ME
13	RES+,3.32MOHM,1%,0603	1	R1	Any
14	RES+,604K OHM,1%,0603	1	R2	Any
15	RES+,69.8K OHM,1%,0402	1	R3	Any
16	RES+, 26.1KOHM,1%,0402	1	R4	Any
17	RES+, 10KOHM,1%,0402	1	R6	Any
18	RES+,40.2K OHM,1%,0402	1	R7	Any
19	RES+,1K OHM,1%,0402	1	R8	Any
20	VIN, PGND, SGND, VOUT, PGND2, RESET, EN/UVLO, RT/SYNC	8	Test Loops	WEICO WIRE 9020 BUSS
21	Buck Converter MAX17575ATC+	1	U1	MAX17575ATC+

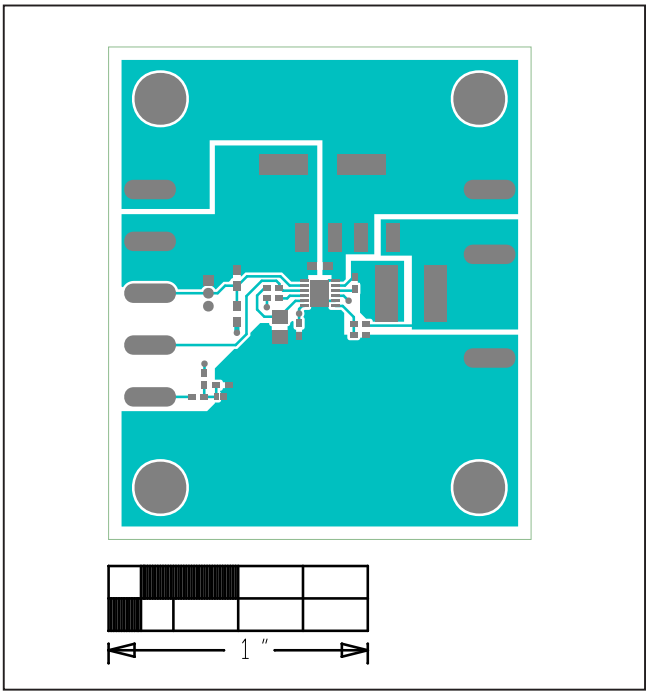
MAX17575 3.3V Output EV Kit Schematic



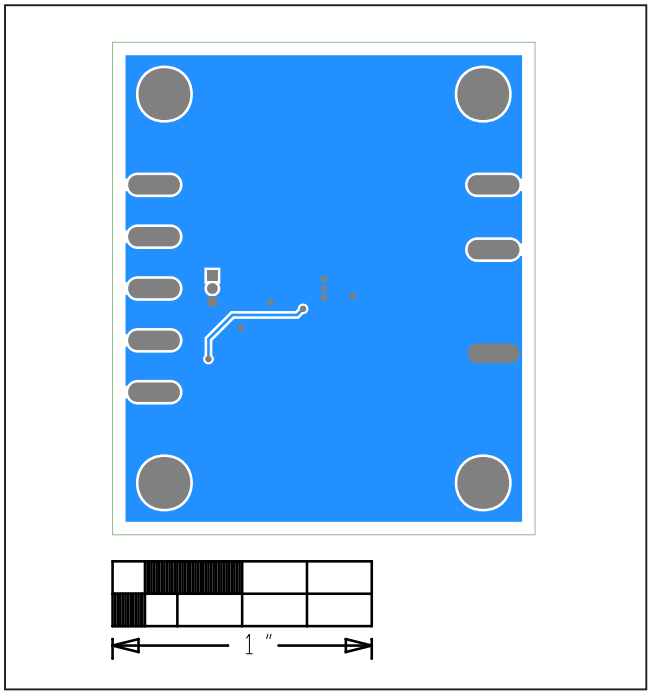
MAX17575 3.3V Output EV Kit PCB Layout Diagrams



MAX17575 3.3V EV Kit—Top Silkscreen



MAX17575 3.3V EV Kit—Top



MAX17575 3.3V EV Kit—Bottom

Ordering Information

PART	TYPE
MAX17575EVKITA#	EV KIT

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/17	Initial release	—
1	6/17	Updated the *Adjusting Output Voltage* section, *Bill of Materials*, *Schematics* and *PCB Layout*	2, 5–7

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