19-4882; Rev 0; 8/09

MAX17114 Evaluation Kit

Evaluates: MAX17114

General Description

The MAX17114 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that provides the voltages and features required for thin-film transistor liquid-crystal display (TFT LCD) TV panels. The EV kit includes a step-down and step-up regulator, positive and negative charge pump, op amp, high accuracy/high-voltage gamma reference, and high-voltage switch-control block.

The MAX17114 operates from input voltages from +8V to +16.5V and is optimized for an LCD TV panel running directly from +12V supplies. The step-up switching regulator is configured for a +16V output that provides at least 1A with an input voltage of +12V; the step-down regulator is configured for a +3.3V output that provides at least 1.5A; the positive charge pump is configured for a +35V output providing at least 50mA; and the negative charge pump is configured for a -6V output providing at least 50mA.

Features

- **+8V to +16.5V Input Range**
- **Selectable Switching Frequency (500kHz/750kHz)**
- **Output Voltages**
  - **+16V Output at 1A (Step-Up Switching Regulator)**
  - **+3.3V Output at 1.5A (Step-Down Switching Regulator)**
  - **+35V Output at 50mA (Positive Charge Pump)**
  - **-6V Output at 50mA (Negative Charge Pump)**
  - **+15.06V Output at 60mA (Gamma Reference, GREF)**
  - **+5V Output at 25mA (Linear Regulator, VL)**
- **±200mA High-Current Op-Amp Output**
- **Greater than 94% Efficiency (Step-Up Switching Regulator)**
- **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX17114EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2, C3, C5, C6, C18	6	10µF ±10%, 25V X5R ceramic capacitors (1206) Murata GRM31CR61E106K TDK C3216X5R1E106M
C4	1	2200pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H222K TDK C1608X7R1H222K
C7	0	Not installed, ceramic capacitor (1206)
C8	1	1000pF ±10%, 50V X7R ceramic capacitor (0603) Murata GRM188R71H102K TDK C1608X7R1H102K
C9, C11–C14, C19, C23, C26, C27, C28, C30, C32	12	0.1µF ±10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H104K TDK C1608X7R1H104K

DESIGNATION	QTY	DESCRIPTION
C10	1	150µF ±10%, 16V tantalum capacitor (D case) KEMET B45197A3157K409 KEMET T491D157K016AT AVX TAJD157M016R
C15	1	1µF ±10%, 50V X7R ceramic capacitor (0805) Murata GRM21BR71H105K Taiyo Yuden UMK212F105ZG
C17	0	Not installed, through-hole OSCON capacitor (OSCON-B)
C20	1	22µF ±10%, 6.3V X5R ceramic capacitor (0805) Murata GRM21BR60J226K TDK C2012X5R0J226K
C21	0	Not installed, ceramic capacitor (0805)

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
C22	1	82pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H820J Murata GRM1885C1H820G
C24	1	1µF ±10%, 10V X5R ceramic capacitor (0402) Murata GRM155R61A105K TDK C1005X5R1A105K
C25	1	0.22µF ±10%, 16V X7R ceramic capacitor (0603) Murata GRM188R71C224K TDK C1608X7R1C224K
C29	1	2.2µF ±10%, 25V X5R ceramic capacitor (0805) Murata GRM219R61E225KA TDK C2012X5R1E225K
C31	1	1µF ±20%, 25V X5R ceramic capacitor (0603) Murata GRM188R61E105K TDK C1608X5R1E105M
C33	0	Not installed, ceramic capacitor (0603)
C34	1	33pF ±5%, 50V C0G ceramic capacitor (0603) Murata GRM1885C1H330J TDK C1608C0G1H330J
D1, D2	2	30V, 3A Schottky diodes (M flat) Toshiba CMS02
D3, D4, D5	3	30V, 200mA dual diodes (3 SOT23) Zetex BAT54S Fairchild BAT54S
EN, DLY1, DRN, SS, SUPN, SUPP, VREF_FB	7	Test points
JU1, JU2, JU4, JU6	4	2-pin headers
JU3, JU5	2	3-pin headers

DESIGNATION	QTY	DESCRIPTION
L1	1	10µH, 3A, 45mΩ inductor (8.3mm x 9.5mm x 3mm) Coiltronics (Cooper) SD8328-100-R Sumida CDRH8D38NP-100N (8.3mm x 8.3mm x 4mm)
L2	1	4.7µH, 3A, 24.7mΩ inductor (8.3mm x 9.5mm x 3mm) Coiltronics (Cooper) SD8328-4R7-R Sumida CDRH8D38NP-4R7N (8.3mm x 8.3mm x 4mm)
Q1	1	-30V, 0.056Ω p-channel MOSFET (6 SC70 PowerPAK) Vishay SiA421DJ
R1	1	24.9kΩ ±1% resistor (0603)
R2	1	34.8kΩ ±1% resistor (0603)
R3, R16	2	13.3kΩ ±1% resistors (0603)
R4	1	158kΩ ±1% resistor (0603)
R5, R19, R20	3	0Ω resistors (0603)
R6	1	10kΩ ±5% resistor (0603)
R7	1	124kΩ ±1% resistor (0603)
R8, R9, R10, R17, R18, R22	6	20kΩ ±1% resistors (0603)
R11	1	1kΩ ±5% resistor (0603)
R12	1	3Ω ±5% resistor (0603)
R13	1	33.2kΩ ±1% resistor (0603)
R14	1	2.21kΩ ±1% resistor (0603)
R15	1	357kΩ ±1% resistor (0603)
R21	1	221kΩ ±1% resistor (0603)
R23	1	150kΩ ±1% resistor (0603)
R24	1	23.7kΩ ±1% resistor (0603)
U1	1	Internal switch buck and boost regulator (48 TQFN-EP*) Maxim MAX17114ETM+
—	7	Shunts
—	1	PCB: MAX17114 EVALUATION KIT+

**EP = Exposed pad.*

Component Suppliers

SUPPLIER	PHONE	WEBSITE
AVX Corporation	843-946-0238	www.avxcorp.com
Cooper Bussmann	916-941-1117	www.cooperet.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
KEMET Corp.	864-963-6300	www.kemet.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Sumida Corp.	847-545-6700	www.sumida.com
Taiyo Yuden	800-348-2496	www.t-yuden.com
TDK Corp.	847-803-6100	www.component.tdk.com
Toshiba America Electronic Components, Inc.	949-623-2900	www.toshiba.com/taec
Vishay	402-563-6866	www.vishay.com
Zetex Semiconductors	631-543-7100	www.zetex.com

Note: *Indicate that you are using the MAX17114 when contacting these component suppliers.*

Quick Start

Recommended Equipment

- +8V to +16.5V, 3A DC power supply
- Voltmeter

Procedure

The MAX17114 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 shunts are not installed across jumpers JU1, JU2, JU4, and JU6.
2) Verify that a shunt is installed across pins 1-2 of jumper JU5 (enabled).
3) Connect the positive terminal of the power supply to the VIN pad. Connect the negative terminal of the power supply to the PGND pads closest to VIN.
4) Set the power supply VIN to +12V.
5) Turn on the power supply and verify that the step-up switching regulator output (AVDD) is +16V.
6) Verify that the step-down switching regulator (OUT) is +3.3V.
7) Verify that the positive charge-pump supply (VGON) is approximately +35V.
8) Verify that the negative charge-pump supply (VGOFF) is approximately -6V.
9) Verify that the output of the high-speed op amp (VCOM) is approximately+ 8V.
10) Verify that the output of the gamma reference (GREF) is approximately +15.06V.

Detailed Description of Hardware

Jumper Settings

Several jumper settings in the following tables illustrate features of the MAX17114 EV kit.

Frequency Selection FSEL (JU1)

The MAX17114 FSEL pin selects the switching frequency of the step-up and step-down regulators. When a shunt is installed across jumper JU1, the switching frequency is set to 500kHz. When jumper JU1 is left open, the switching frequency is set to 750kHz. See Table 1 for jumper JU1 configuration.

VCOM Loading (JU2)

The MAX17114 EV kit provides an optional load at the output of the high-current op amp. This typical load can be applied or removed by setting jumper JU2. See Table 2 for jumper JU2 configuration.

Table 1. Jumper JU1 Functions

SHUNT POSITION	FSEL PIN	SWITCHING FREQUENCY (kHz)
Installed	Connected to GND	500
Not installed*	High impedance	750

**Default position.*

Table 2. Jumper JU2 Functions

SHUNT POSITION	VCOM OUTPUT
Installed	Optional load applied
Not installed*	No-load condition

**Default position.*

High-Voltage Switch-Control Block Timing-Control Input Supply (JU3)

The MAX17114's high-voltage switch-control block is controlled by GVOFF and XAO. XAO is pulled to VL by default and jumper JU3 controls GVOFF. When JU3 is set high, VGHM is connected to VGH. When GVOFF is set low, VGHM is connected to DRN. When XAO is triggered, VGHM pulls high to facilitate discharge to the panel until there's enough voltage on the VGH pin. See Table 3 for jumper JU3 configuration.

Step-Down Regulator Output Mode (JU4)

Jumper JU4 controls the output mode of the step-down regulator (OUT). When a shunt is not installed across JU4, the FB2 pin is pulled to GND through R18 and the regulator provides a fixed +3.3V output. When a shunt is installed across JU4, the FB2 pin is connected to the center of a resistive voltage-divider between OUT and GND to set the voltage at OUT. See Table 4 for jumper JU4 configuration.

Table 3. Jumper JU3 Function

SHUNT POSITION	GVOFF PIN	VGHM OUTPUT
1-2	Connected to VL	VGHM connected to VGH
2-3*	Connected to GND	VGHM connected to DRN

**Default position.*

Table 4. Jumper JU4 Function

SHUNT POSITION	FB2 PIN	STEP-DOWN OUTPUT MODE
Installed	Connected to center of a resistive voltage-divider between R17 and R18	Adjustable mode
Not installed*	Connected to GND through R18	Fixed 3.3V mode

**Default position.*

Enable Input EN (JU5)

The MAX17114's enable input can be configured through jumper JU5. When EN is high, the step-up regulator and positive charge pump are enabled. When EN is low, the step-up regulator and positive charge pump are disabled. See Table 5 for jumper JU5 configuration.

Soft-Start Input Capacitance (JU6)

The MAX17114's soft-start function can be done internally, when the capacitance on the SS pin is < 200pF, or externally, when capacitance on the SS pin is > 200pF. Jumper JU6 controls the soft-start function by giving the option to connect a 0.1µF capacitor (C27) to the SS pin. When a shunt is installed across JU6, C27 is connected and the soft-start time can be calculated at ~25ms. When there is not a shunt across JU6, the soft-start function is carried out internally at ~12ms. See Table 6 for jumper JU6 configuration.

Output-Voltage Selection

The MAX17114 EV kit's step-up switching-regulator output (AVDD) is set to +16V by feedback resistors R3 and R4. To generate output voltages other than +16V, select different external voltage-divider resistors, R3 and R4. Refer to the *Step-Up Regulator, Output-Voltage Selection* section in the MAX17114 IC data sheet for more information.

Table 5. Jumper JU5 Functions

SHUNT POSITION	EN PIN	AVDD, VGON OUTPUTS
1-2*	Connected to VIN	Enabled
2-3	Connected to GND	Disabled

**Default position.*

Table 6. Jumper JU6 Functions

SHUNT POSITION	SOFT START CAPACITANCE	SOFT START TIME
Installed	External	25ms
Not Installed	Internal	12ms

**Default position.*

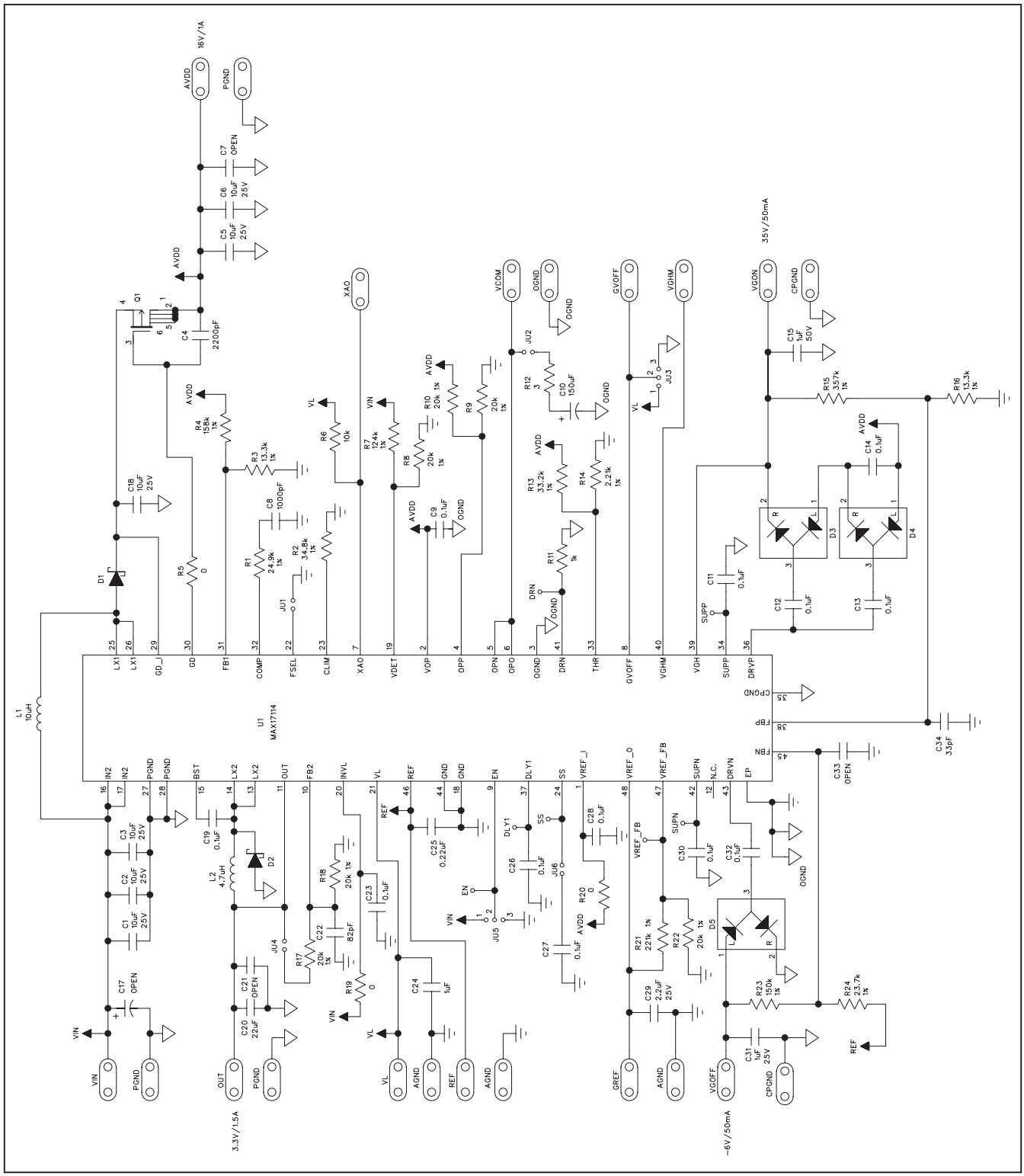

Figure 1. MAX17114 EV Kit Schematic

MAX17114 Evaluation Kit

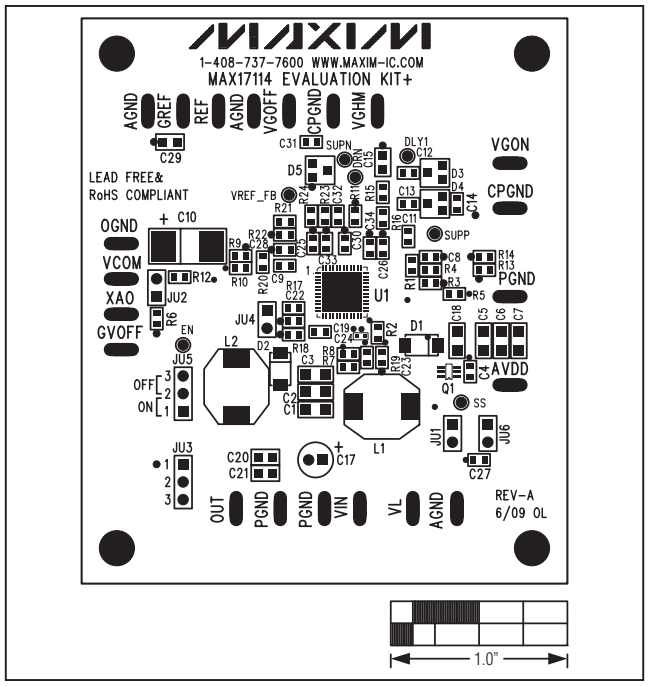

Figure 2. MAX17114 EV Kit Component Placement Guide—Component Side

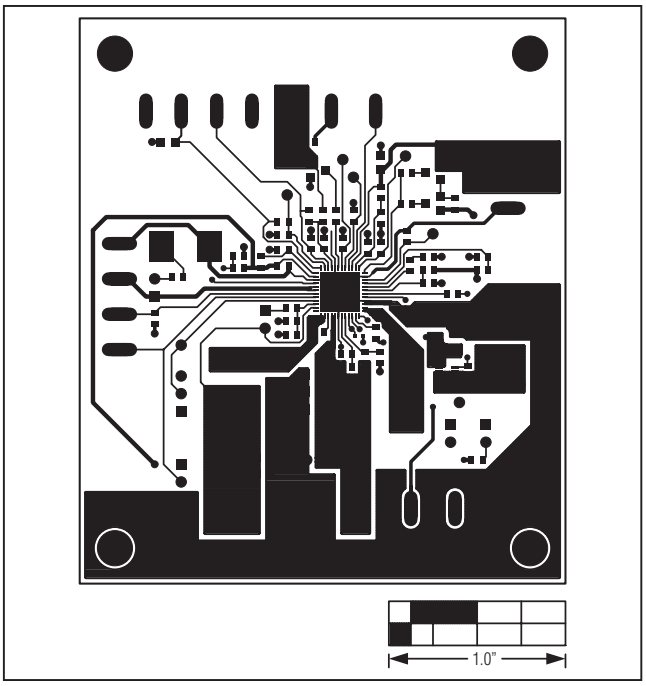

Figure 3. MAX17114 EV Kit PCB Layout—Component Side

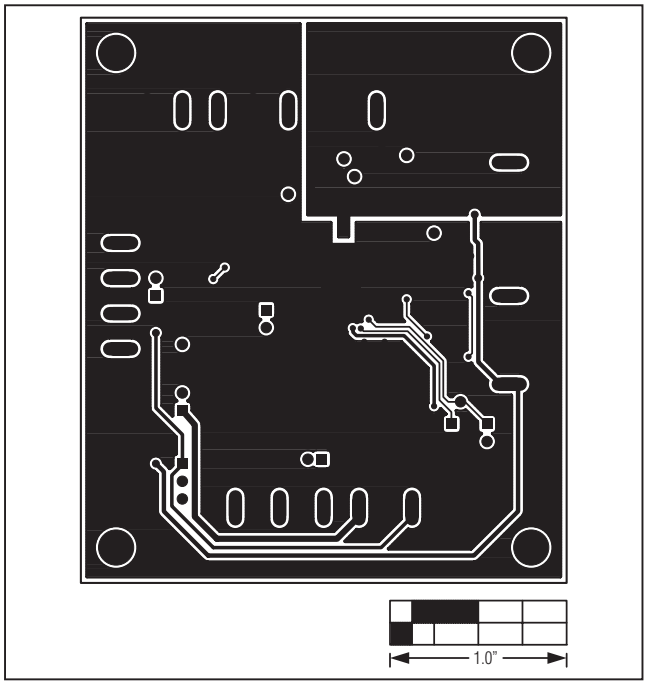

Figure 4. MAX17114 EV Kit PCB Layout—Solder Side