



MAX17115 Evaluation Kit

General Description

The MAX17115 evaluation kit (EV kit) is a fully assembled and tested surface-mount PCB that provides the voltages and features required for thin-film transistor (TFT), liquid-crystal display (LCD) applications. The EV kit contains a high-performance step-up regulator, a high-accuracy, high-voltage low-dropout (LDO) linear regulator, a positive single-stage charge pump, a negative single-stage charge pump with a shunt voltage regulator, and a high-performance buffer amplifier.

Features

- ◆ **+4.5V to +5.5V Input Range**
- ◆ **Output Voltages**
 - +16V at 500mA (Step-Up Switching Regulator)**
 - +15V at 20mA (High-Voltage LDO Linear Regulator)**
 - +30V at 20mA (Positive Charge Pump)**
 - 6.8V at 20mA (Negative Charge Pump with a Shunt Voltage Regulator, D5)**
- ◆ **Adjustable Output Voltages (External Resistors)**
- ◆ **Selectable Frequency (640kHz/1.2MHz)**
- ◆ **Two High-Speed Operational Amplifiers**
- ◆ **Low-Profile Surface-Mount Components**
- ◆ **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX17115EVKIT+	EV Kit

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

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	10 μ F $\pm$ 10%, 6.3V X5R ceramic capacitors (0805) Murata GRM21BR60J106K
C3, C4	2	10 μ F $\pm$ 20%, 25V X5R ceramic capacitors (1206) Murata GRM31CR61E106K TDK C3216X5R1E106M
C5	0	Not installed, through-hole capacitor (OSCON-B)
C6	0	Not installed, capacitor (1206)
C7, C8, C11, C14, C19, C20	6	0.1 μ F $\pm$ 10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H104K TDK C1608X7R1H104K
C9, C10	2	1 μ F $\pm$ 10%, 25V X5R ceramic capacitors (0805) Murata GRM216R61E105K TDK C2012X5R1E105K

DESIGNATION	QTY	DESCRIPTION
C12, C18	2	.033 μ F $\pm$ 10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H333K TDK C1608X7R1H333K
C13	1	2.2 μ F $\pm$ 10%, 25V X5R ceramic capacitor (0805) Murata GRM219R61E225K TDK C2012X5R1E225K
C15	0	Not installed, capacitor (0603)
C16	1	1 μ F $\pm$ 10%, 16V X5R ceramic capacitor (0603) Murata GRM188R61C105K TDK C1608X5R1C105K
C17	1	560pF $\pm$ 5%, 50V X7R ceramic capacitor (0603) Murata GRM1885C1H561J TDK C1608C0G1H561J

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Component List (continued)

DESIGNATION	QTY	DESCRIPTION
D1	1	3A, 30V Schottky diode (M-Flat) Toshiba CMS01 Toshiba CMS02
D2, D3	2	200mA, 100V dual diodes (SOT23) Fairchild MMBD4148SE (Top Mark: D4) Central Semi CMPD7000 Lead Free (Top Mark: C5C)
D5	1	6.8V zener diode (SOT23) Diodes, Inc BZX84C6V8 (Top Mark: KZ5)
EN, FREQ, HVS_EN, VDET	4	PCB mini test points
JU1–JU4	4	2-pin headers
L1	1	3 μ H, 3A inductor Sumida CDRH6D28-3R0
Q1	1	-20V, 0.063 Ω p-channel MOSFET (SC70 PowerPAK) Vishay SiA443DJ Vishay SiA411DJ

DESIGNATION	QTY	DESCRIPTION
R1, R7	2	150k Ω $\pm$ 1% resistors (0603)
R2, R9, R12	3	100k Ω $\pm$ 1% resistors (0603)
R3–R6	4	100k Ω $\pm$ 5% resistors (0603)
R8	1	20k Ω $\pm$ 5% resistor (0603)
R9, R11	2	110k Ω $\pm$ 1% resistors (0603)
R10	1	10k Ω $\pm$ 1% resistor (0603)
R13	1	137k Ω $\pm$ 1% resistor (0603)
R14	1	11.5k Ω $\pm$ 1% resistor (0603)
R15	1	1k Ω $\pm$ 5% resistor (0603)
R16	1	47.5k Ω $\pm$ 1% resistor (0603)
R17	1	5.6 Ω $\pm$ 5% resistor (0603)
R18	1	390 Ω $\pm$ 5% resistor (0603)
U1	1	Internal switch boost regulator (32 TQFN-EP*) Maxim MAX17115ETM+
—	4	Shunts (see Tables 1–4)
—	1	PCB: MAX17115 EVALUATION KIT+

*EP = Exposed pad.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Central Semiconductor Corp.	631-435-1110	www.centalsemi.com
Diodes, Inc.	805-446-4800	www.diodes.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
Sumida Corp.	847-545-6700	www.sumida.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

Note: Indicate that you are using the MAX17115 when contacting these component suppliers.

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Quick Start

Recommended Equipment

- +4.5V to +5.5V DC power supply
- Voltmeter

Procedure

The MAX17115 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 (see the *Jumper Selection* section).
- 2) Connect the positive terminal of the power supply to the VIN pad. Connect the negative terminal of the power supply to the PGND pad.
- 3) Turn on the power supply and verify that the step-up switching regulator output (VMAIN) is +16V.
- 4) Verify that the LDO linear regulator output (VREF_O) is approximately +15V.
- 5) Verify that the gate-on supply (VGON) is approximately +30V.
- 6) Verify that the gate-off supply (VGOFF) is approximately -6.8V.
- 7) Verify that the buffer amplifier (OPO) is approximately +6.4V.

Detailed Description of Hardware

The MAX17115 EV kit contains a high-performance step-up regulator, a high-accuracy, high-voltage low-dropout (LDO) linear regulator, a positive single-stage charge pump, a negative single-stage charge pump with a shunt voltage regulator, and a high-performance buffer amplifier. The EV kit operates from a DC power supply between +4.5V and +5.5V.

Although the MAX17115 IC has a +2.5V to +5.5V input supply range, the EV kit is optimized to operate from a DC supply voltage of +4.5V to +5.5V. The step-up switching regulator is configured for a +16V output providing at least 500mA. The high-accuracy, high-voltage LDO linear regulator is configured for a +15V output providing at least 20mA. The gate-on (VGON) supply voltage is configured for a +30V output providing at

least 20mA. The gate-off (VGOFF) supply voltage is configured for a -6.8V output providing at least 20mA. The high-performance buffer amplifier is configured for a +6.4V output providing a 200mA output short-circuit current.

Step-Up Regulator Output-Voltage Selection (VMAIN)

The output voltage of the main step-up regulator is set by connecting a resistive voltage-divider from the output (VMAIN) to AGND with the center tap connected to FB. Select R14 in the 10kΩ to 50kΩ range. Calculate R13 with the following equation:

$$R13 = R14 \times \left(\frac{V_{VMAIN}}{V_{FB}} - 1 \right)$$

where V_{FB} , the step-up regulator's feedback set point, is 1.24V.

High-Voltage LDO Linear Regulator Output-Voltage Selection (VREF_O)

The output voltage of the high-accuracy LDO linear regulator is set by connecting a resistive voltage-divider from the output (VREF_O) to AGND with the center tap connected to VREF_FB. Select R10 in the 10kΩ to 50kΩ range. Calculate R9 with the following equation:

$$R9 = R10 \times \left(\frac{V_{VREF_O}}{V_{VREF_FB}} - 1 \right)$$

where V_{VREF_FB} , the LDO linear regulator's feedback set point, is 1.24V.

Buffer Amplifier Output-Voltage Selection (OPO)

The output voltage of the buffer amplifier is set by connecting a resistive voltage-divider from the output (VMAIN) to AGND with the center tap connected to OPI. Calculate R1 with the following equation:

$$R1 = R2 \times \left(\frac{V_{VMAIN}}{V_{OPI}} - 1 \right)$$

where V_{OPI} , the buffer amplifier's noninverting input, equals the desired buffer output (OPO).

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Jumper Selection

Several jumper settings in the following tables illustrate features of the MAX17115 EV kit.

Enable Control Input (EN)

Connect EN to AGND to disable the step-up switching regulator operation. Connect EN to VIN to enable the boost operation. See Table 1 for jumper JU1 functions.

Frequency Select Input (FREQ)

Connect FREQ to AGND to select the step-up regulator's 640kHz operating frequency. Connect FREQ to VIN to select the step-up regulator's 1.2MHz operating frequency. See Table 2 for jumper JU2 functions.

Table 1. Jumper JU1 Functions

SHUNT POSITION	EN PIN	EV KIT OUTPUTS
Installed	EN connected to AGND	Outputs disabled (VMAIN = 0V)
Not installed*	EN connected to VIN through R3	Outputs enabled (VMAIN = 16V)

*Default position.

Table 2. Jumper JU2 Functions

SHUNT POSITION	FREQ PIN	OPERATION OF FREQUENCY
Installed	FREQ connected to AGND	640kHz
Not installed*	FREQ connected to VIN through R4	1.2MHz

*Default position.

High-Voltage Stress Control Input (HVS_EN)

Connect HVS_EN to VIN to turn on the internal switch between RHVS and AGND. Connect HVS_EN to AGND to make the RHVS pin high-impedance. See Table 3 for jumper JU3 functions.

High-Voltage Switch Control Input (VFLK)

When VFLK is connected to VIN, the high-voltage switch between VGH and VGHM is on and the high-voltage switch between VGHM and DRN is off. When VFLK is connected to AGND, the switch between VGH and VGHM is off and the switch between VGHM and DRN is on. See Table 4 for jumper JU4 functions.

Table 3. Jumper JU3 Functions

SHUNT POSITION	HVS_EN PIN	RHVS
Installed	HVS_EN connected to VIN	RHVS connected to AGND
Not installed*	HVS_EN connected to AGND through R5	RHVS at high impedance

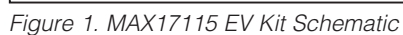
*Default position.

Table 4. Jumper JU4 Functions

SHUNT POSITION	VFLK	VGHM
Installed*	VFLK connected to VIN	VGHM = VGON
Not installed	VFLK connected to AGND through R6	VGHM = VDRN

*Default position.

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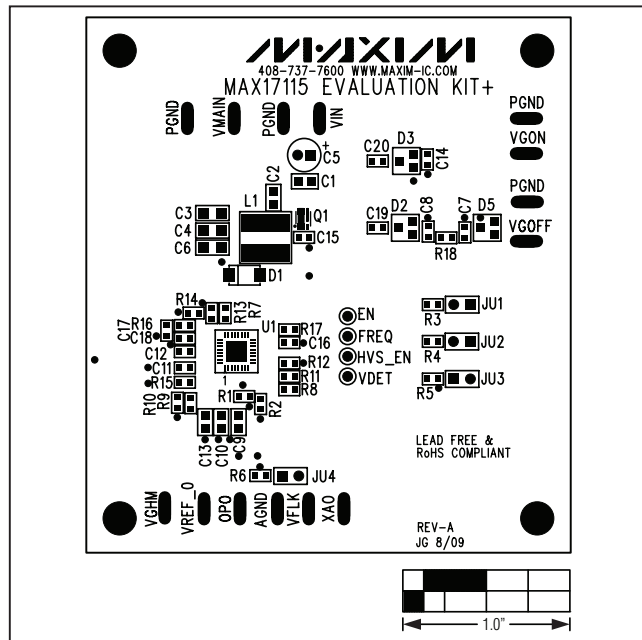


Figure 2. MAX17115 EV Kit Component Placement Guide—Component Side

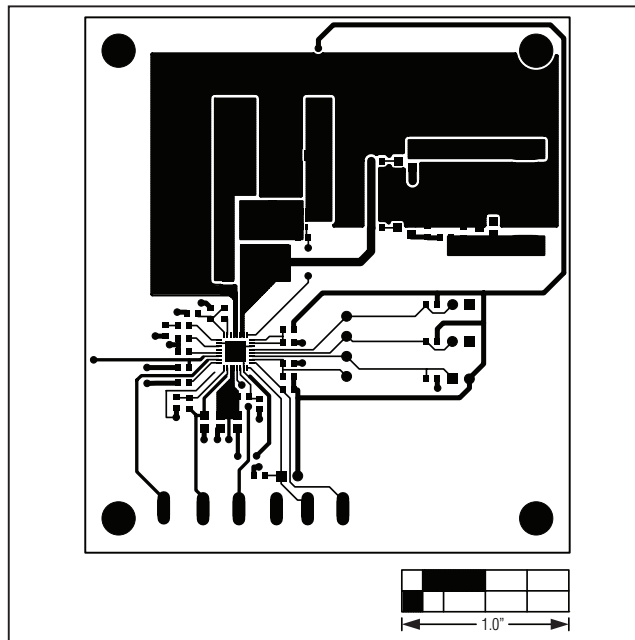


Figure 3. MAX17115 EV Kit PCB Layout—Component Side

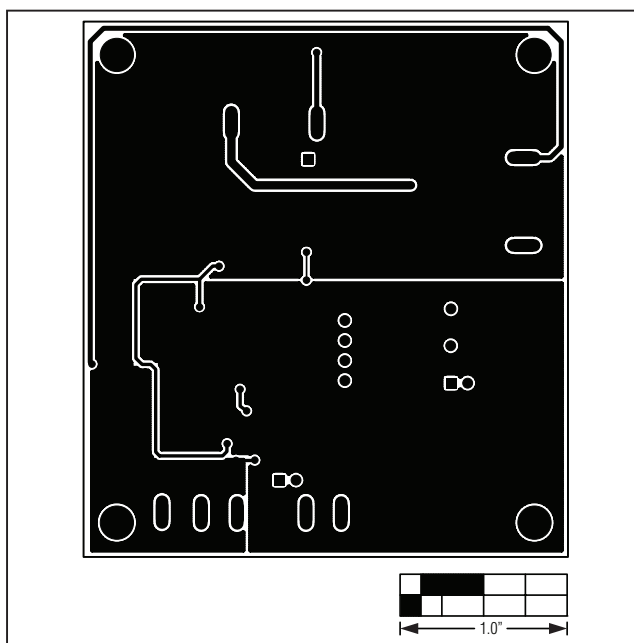


Figure 4. MAX17115 EV Kit PCB Layout—Solder Side

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