MIC2298 Evaluation Board

3.5A I_{SWMIN},1MHz, High Power LED Driver 3 Preset LED Current Setting

General Description

This board enables the evaluation of the MIC2298, a fully integrated 7W net output minimum High Power white LED driver. The board includes components necessary to set the LED current to 20%, 50% and 100% of the nominal LED current (1A). The external inputs also allow the LED current to be programmed either with additional resistors or voltages on the DIM or BRT pins. Also the enable pin can be driven to force the part into low I_Q mode.

The MIC2298, 1MHz, Integrated Step up current regulator, allows the use of small and very few external components to create a compact boosted supply up to 30V. The evaluation board has been configured with three fixed current settings chosen using JP1 and all externally programmable inputs are accessible via board pins.

Requirements

The MIC2298 evaluation board requires an input power source that is able to deliver at least 5A over the desired input voltage range. For the load, an electronic load (E-Load) capable of constant voltage testing is required or a high power LED mounted on a fan cooled heat sink. Note that stability measurements must be carried out on an LED load as E-Loads do not have the same dynamic characteristics of a high power LED.

Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the V_{IN} (J1) terminal may damage the device.

The load current is only regulated if connected between V_{OUT} and FB terminals, the GND terminal close to the V_{OUT} terminal is provided for voltage measurements only.

The MIC2298 has a maximum input voltage rating of 10V therefore, the supply voltage should never exceed this value.

Getting Started

1. Connect the input supply to the input terminals. Take note of the polarity to prevent damage. An ammeter can be used in-line with the VIN terminal to measure input current. The Input voltage should be measured at the input terminals to account for any drops in test leads and amp meter.
2. Ensuring the jumper JP1 is at the top position (50% load), connect the load to the output terminals: +VO connects to the positive E-Load input or Anode of the test LED, FB connects to the negative E-Load input or the Cathode of the test LED.

   A low impedance ammeter can be connected in-line with the +VO terminal for current measurements. The output voltage should be measured between the evaluation board terminals +VO and GND (to measure converter efficiency) or +VO and FB (to measure the voltage of the LED load).
3. Connect a normally closed (NC) momentary switch between enable and GND or alternatively, connect a pulse generator set to output a 2V pulse of 300ms every 3s to the enable input.
4. Switch on the E-Load (if using), pulse generator and then the input supply. Measurements can now be taken of efficiency, switching waveform and output current regulation. When testing 1A load (JP1 open), ensure that these are only pulse tests to prevent damage to the LED. LED manufacturers recommend <10% duty cycle and 3s period.

Ordering Information

Part Number	Description
MIC2298-15YML EV	Evaluation Board with MIC2298-15YML 15V OVP Device

Evaluation Board

Board Description

By default, the board is set to give 500mA nominal current into two series connected Power LEDs (JP1 at 50% position). If the load is not present, the over voltage protection (OVP) will limit V_{OUT} to prevent damage to the MIC2298. JP1 can be removed to set the load current higher to 1A (Flash) or moved to 20% to set a lower 200mA current (Torch). Care should be taken as removing the jumper will result in the maximum LED drive current of 1A.

The external pins can be driven to set any current between the minimum and maximum values. See Table 1 below.

The nominal current setting can be reduced by choosing a larger value for R1 (current sense resistor). The 100% current level can be set by using the following equation:

$$I_{LED100\%} = 0.2V/R1$$

The values in the table will scale with the nominal 100% current setting. So for example, if the 100% current is set to 500mA, 0Ω on BRT will set LED current to 100mA, 50kΩ to 250mA etc.

DIM Voltage		LED Current
0V to 200mV	BRT = Open	40mA to 1A
	BRT = GND	0 to 200mA
BRT Voltage		**LED Current**
0V to 1V	DIM = 200mV	200mA to 1A
BRT Resistance		**LED Current**
0Ω to 100kΩ	DIM = 200mV	200mA to 1A

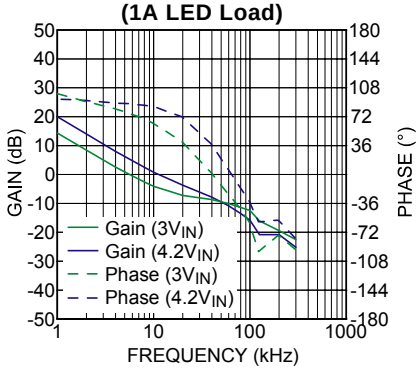
Table 1. MIC2298 Dimming Methods

Board Performance

High Power White LED Driver

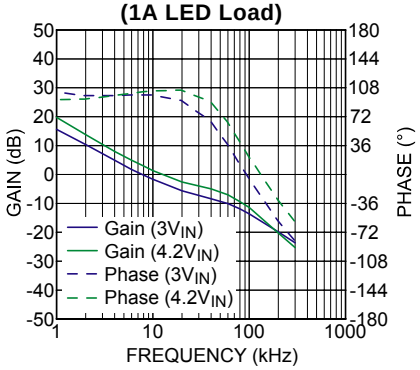
V_{IN} = 3.6V; Efficiency ~ 85% at full load (Peak > 87%)

Bode Plot 4.7µH (1A LED Load)

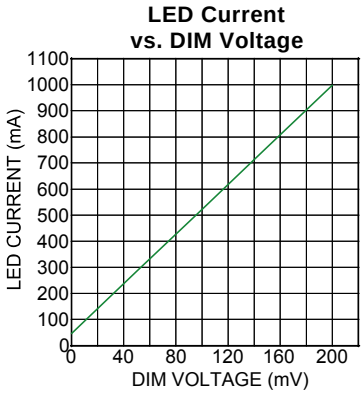


Stability 4.7µH Inductor

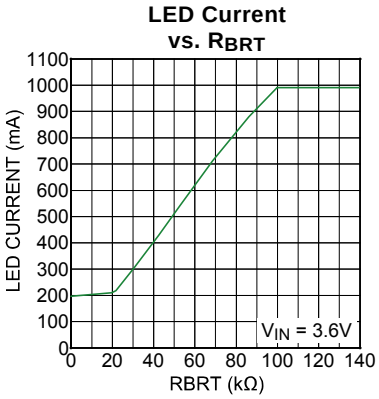
Bode Plot 2.2µH (1A LED Load)



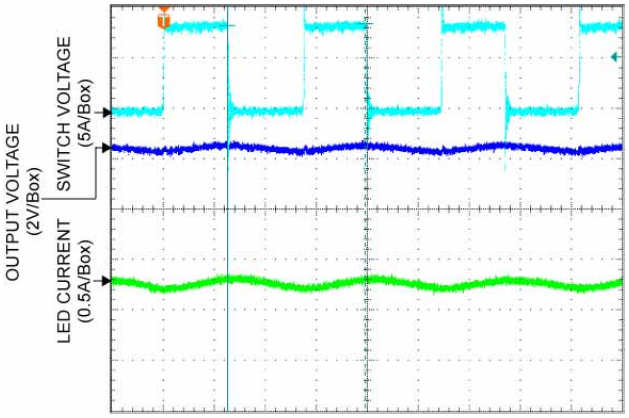
Stability 2.2µH Inductor



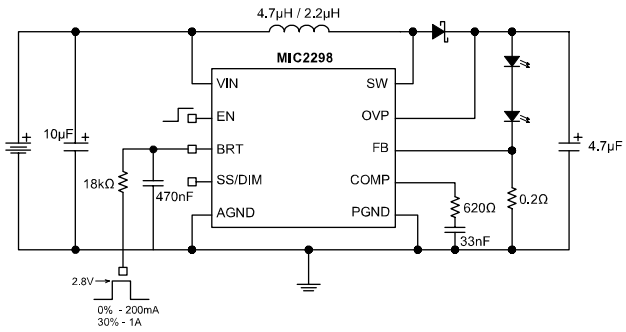
LED Current Programming (VDIM)



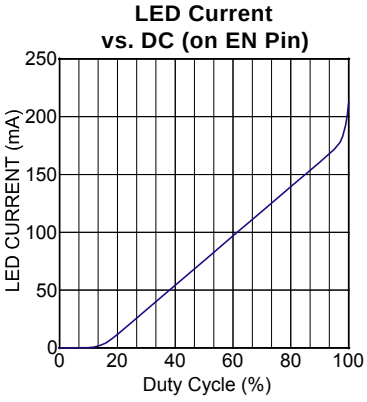
LED Current Programming (BRT)



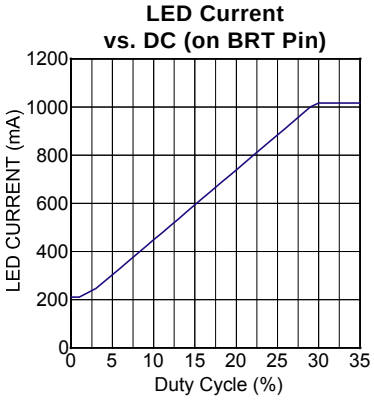
Switching Waveforms (BRT – GND)



PWM Programming

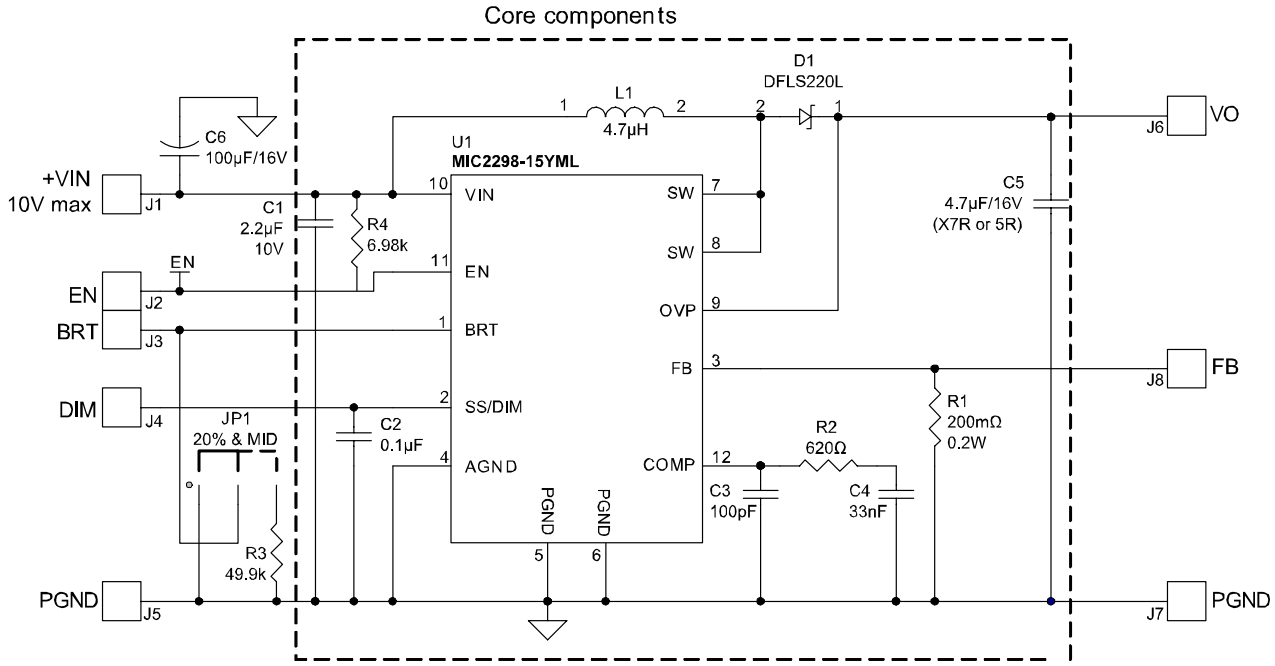


LED Current Programming (100Hz PWM on Enable)



LED Current Programming (1kHz PWM on BRT)

Schematic



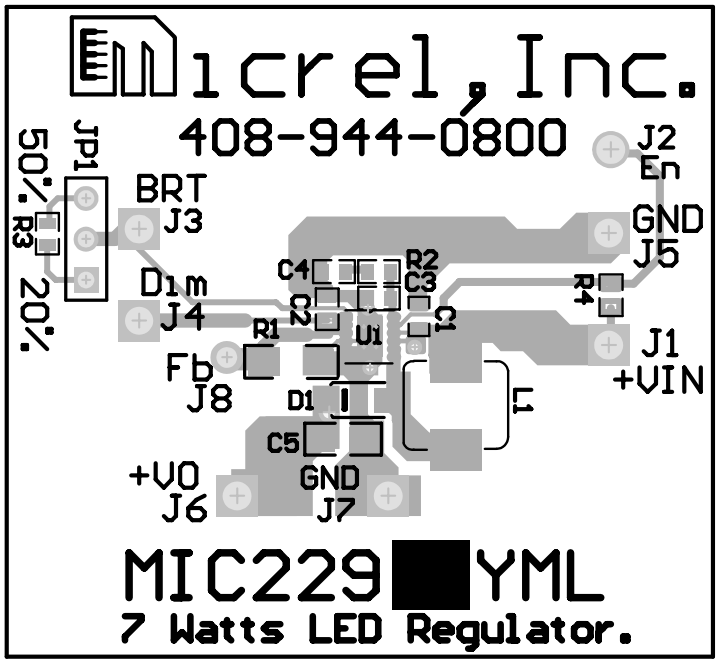
Bill of Materials

Item	Part Number	Manufacturer	Description	Qty
C1	C1608X5R1A225M	TDK[1]	2.2µF/10V, 0805 Ceramic Capacitor	1
C2	VJ0603Y104KXAAT	Vishay[2]	0.1µF/50V, 0603 Ceramic Capacitor	1
C3	C1608C0G1H101J	TDK[1]	100pF/50V, 0603 Ceramic Capacitor	1
C4	C1608X5R1H333K	TDK[1]	33nF/16V, 0603 Ceramic Capacitor	1
C5	C2012X5R1C475K	TDK[1]	4.7µF/16V (X7R or X5R), 0805 Ceramic Capacitor	1
C6	TPSD107M016R0100	AVX[3]	100µF/16V, TPSD size Tantalum Capacitor	1
D1	DFLS220L	Diodes, Inc.[4]	2A, 20V Schottky Diode	1
L1	IHLP2525AH-ER4R7M01	Vishay[2]	4.7µH, 8A, 7x7x1.2mm Inductor	1
R1	L0805M0R20FN	Vishay[2]	200mΩ, 0.2W, 0805 Metal film, 200mW Resistor	1
R2	CRCW0603620RFKTA	Vishay[2]	620Ω, 0603 Resistor	1
R3	CRCW060349K9FKEA	Vishay[2]	49.9KΩ, 0603 Resistor	1
R4	CRCW06036K98FKEA	Vishay[2]	6.98KΩ, 0603 Resistor	1
JP1	3 pin Header		Header for Current Setting	1
U1	**MIC2298-15YML**	**Micrel[5]**	**3.5A I_{SWMIN}, 1MHz High Power LED Driver**	**1**

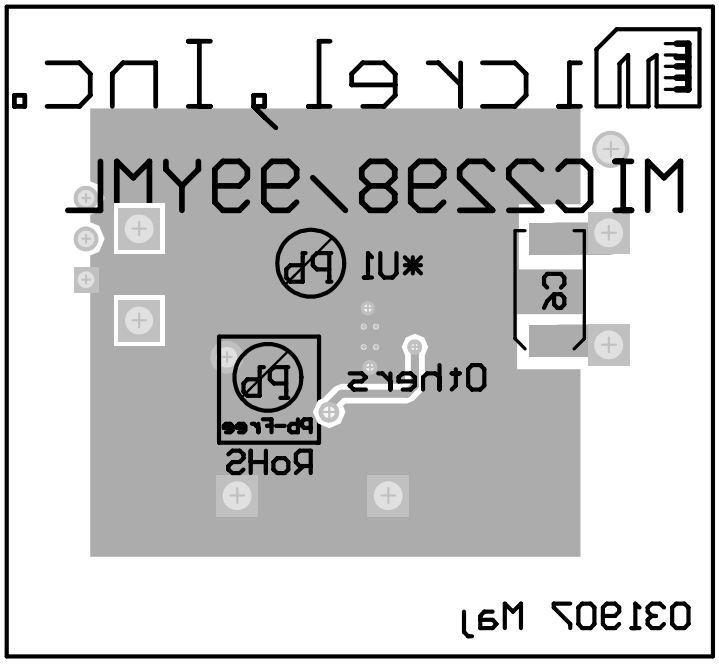
Notes:

1. TDK: www.tdk.com
2. Vishay: www.vishay.com
3. AVX: www.avx.com
4. Diodes, Inc.: www.diodes.com
5. **Micrel, Inc: www.micrel.com**

PCB Layout Recommendations



Top Layer



Bottom Layer

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA
TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB http://www.micrel.com