



# MIC2299 Evaluation Board

**3.5A  $I_{SWMIN}$ , 2MHz, High Power LED Driver w/ 3 Preset LED Current Settings**

## General Description

This board enables the evaluation of the 3.5A switch, High Power white LED driver MIC2299. 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 this to be programmed either with additional resistors or voltages on the DIM or BRT pins. A load disconnect switch prevents leakage and protects the battery against short circuits while in shutdown mode.

The evaluation board includes a push button switch which sends a one shot pulse of 300ms to the enable pin to prevent overheating when testing high power LEDs. Also the enable pin can be driven to force the part into low Iq mode.

The MIC2299, 2 MHz, Integrated Step-Up current regulator, allows the use of small and very few external components to create a compact boosted supply up to 13.5V with a core component footprint of just 0.25in<sup>2</sup> (1.61cm<sup>2</sup>). The evaluation board has been configured with 3 fixed current settings chosen using JP1 and all externally programmable inputs are accessible via board pins.

## Requirements

The MIC2299 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 VIN (J1) terminal may damage the device.

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

The MIC2299 has a maximum input voltage rating of 10V therefore the supply voltage should never exceed this value.

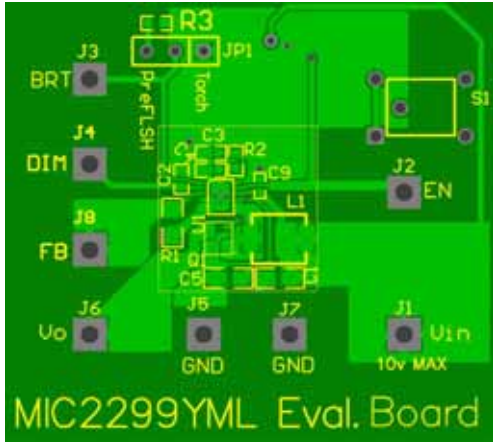
## Getting Started

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 left position (50% load), connect the load to the output terminals: +VO connects to the positive E-Load input or Anode of the test LEDs, FB connects to the negative E-Load input or the Cathode of the test LEDs.  
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. Switch on the E-Load (if using), 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 pulse tests only to prevent damage to the LED. LED manufacturers recommend <10% duty cycle and 3s period.

## Ordering Information

Part Number	Description
MIC2299-15YML EV	Evaluation Board with MIC2299YML 15V OVP Device

## Evaluation Board



### Board Description

By default, the board is set to give 500mA nominal current into 2 series connected Power LEDs (JP1 at pre-FLSH position). If the load is not present, the over voltage protection (OVP) will limit  $V_{OUT}$  to prevent damage to output devices. JP1 can be removed to set the load current higher to 1A (Flash) or moved to pins 1-2 to set a lower 200mA current (Torch). Care should be taken as removing the jumper sets the maximum current of 1A.

The push button switch is set to give a nominal 300ms pulse to the load to prevent damage to external LEDs. For testing continuous loading at lower currents, this mono-stable can be bypassed by driving the EN terminal with a voltage source above the enable threshold level.

The external pins can be driven to set any current between the minimum and maximum values. See table. 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:

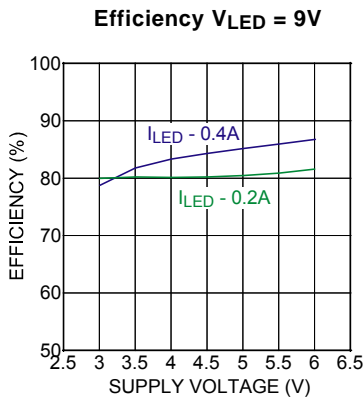
$$I_{LED100\%} = 0.2/R1$$

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.

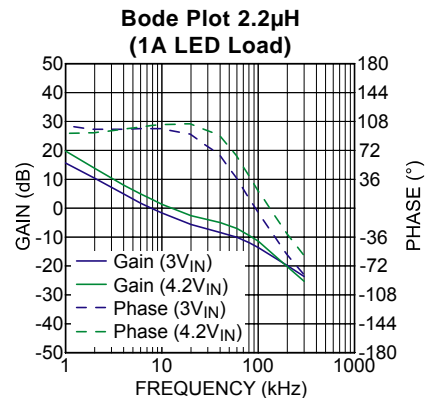
DIM Voltage		LED Current
0V to 200mV	RBRT = Open	40mA to 1A
	RBRT = GND	0 to 200mA
RBRT Voltage		LED Current
0V to 1V		200mA to 1A
RBRT Resistance		LED Current
0Ω to 100kΩ		200mA to 1A

### Board Performance

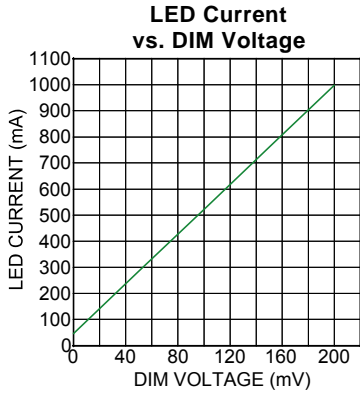
#### High Power White LED Driver



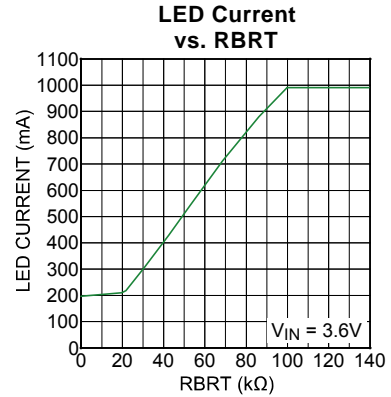
Efficiency



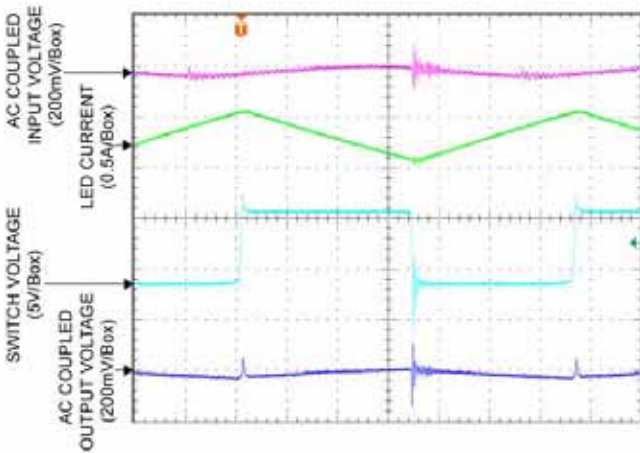
Stability 2.2μH Inductor



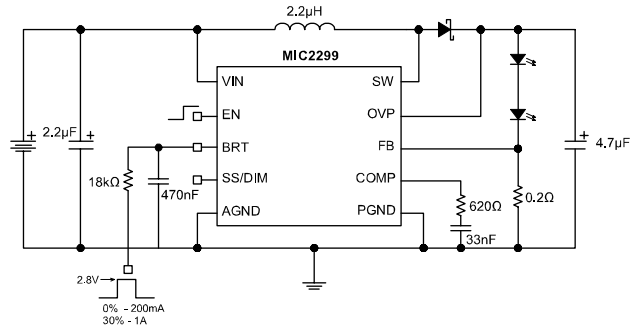
LED Current Programming (VDIM)



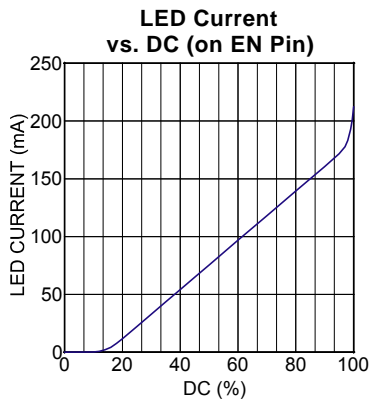
LED Current Programming (RBRT)



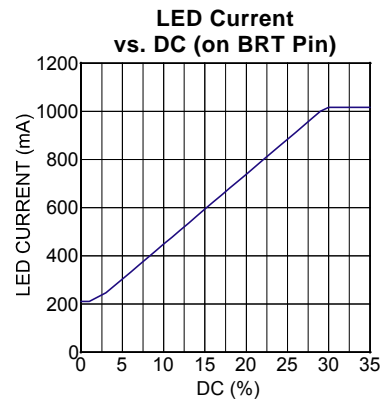
Switching Waveforms (BRT – GND)



PWM Programming

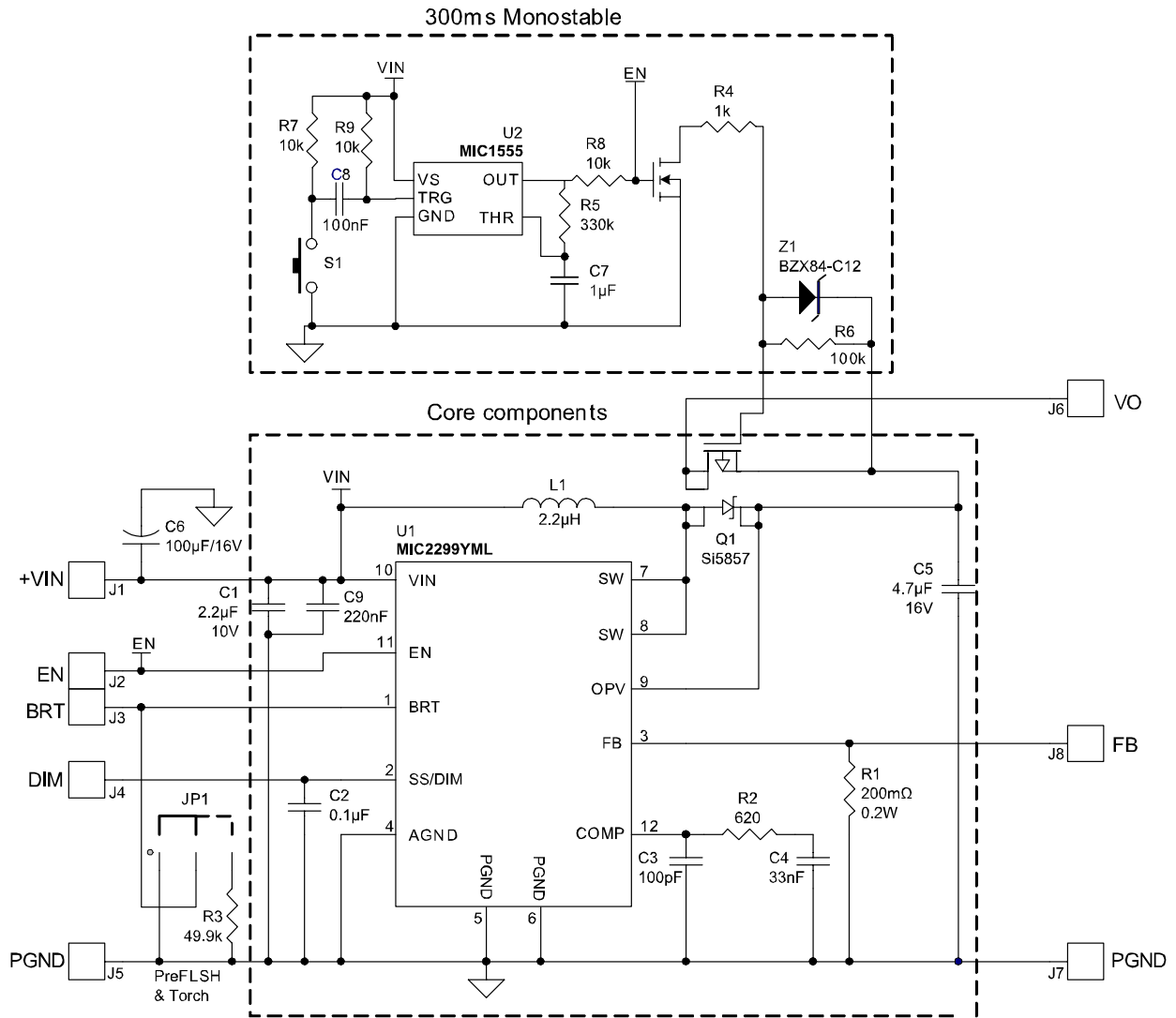


LED Current Programming (100Hz PWM on Enable)



LED Current Programming (1kHz PWM on BRT)

# Schematic



All non-core components are required only for testing with the evaluation board and are typically not needed for final applications.

**Bill of Materials**

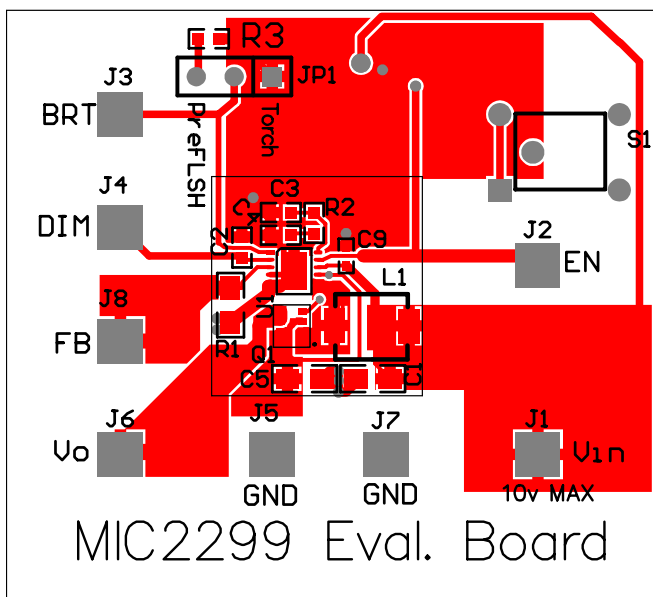
Item	Part Number	Manufacturer	Description	Qty
<b>Core Components</b>				
C1	C1608X5R1A225M	TDK <sup>(1)</sup>	2.2 $\mu$ F/10V, 0805 Ceramic Capacitor	1
C2	VJ0603Y104KXAAT	Vishay <sup>(2)</sup>	0.1 $\mu$ F/ 16V, 0603 Ceramic Capacitor	1
C3	C1608C0G1H101J	TDK <sup>(1)</sup>	100 $\mu$ F/16V, 0603 Ceramic Capacitor	1
C4	C1608X5R1H333K	TDK <sup>(1)</sup>	33nF/6.3V, 0603 Ceramic Capacitor	1
C5	C2012X5R1C475K	TDK <sup>(1)</sup>	4.7 $\mu$ F/16V, 0805 Ceramic Capacitor	1
L1	IHLP1616BZ11-2R2	Vishay <sup>(2)</sup>	2.2 $\mu$ H, 3.3A, 2mm Inductor	1
	SD414-2R2	Coiltronics <sup>(3)</sup>	2.2 $\mu$ H, 2.8A, 1.4mm Inductor	
R1	L-0805M0R20FS	Vishay <sup>(2)</sup>	200m $\Omega$ , 0.2W, 0805 Metal film, 200mW Resistor	1
R2	CRCW0603620RFKTA	Vishay <sup>(2)</sup>	620 $\Omega$ , 0603 Resistor	1
Q1	Si5857DU	Vishay <sup>(2)</sup>	2A Schottky & P-Channel MOSFET, 1206 package	1
<b>U1</b>	<b>MIC2299YML</b>	<b>Micrel<sup>(4)</sup></b>	<b>3.5A 2MHz, High Power LED Driver</b>	<b>1</b>

Item	Part Number	Manufacturer	Description	Qty
<b>Required for Evaluation Board Operation</b>				
C6	TPSD107M016R0100	AVX <sup>(5)</sup>	100 $\mu$ F/16V, Tantalum Capacitor	1
C7	C1608JB1E105K	TDK <sup>(1)</sup>	1 $\mu$ F/25V, 0603 Ceramic capacitor	1
C8	VJ0603Y104KXAAT	Vishay <sup>(2)</sup>	100nF/16V, 0603 Ceramic Capacitor	1
R3	CRCW060349K9RFKTA	Vishay <sup>(2)</sup>	49.9k, 0603 Resistor	1
R4	CRCW06031K0FKTA	Vishay <sup>(2)</sup>	1k, 0603 Resistor	1
R5	CRCW0603330KFKTA	Vishay <sup>(2)</sup>	330k, 0603 Resistor	1
R6	CRCW0603100KFKTA	Vishay <sup>(2)</sup>	100k, 0603 Resistor	1
R7, R8, R9	CRCW060310K0FKTA	Vishay <sup>(2)</sup>	10k, 0603 Resistor	3
Q2	2n7002	Vishay <sup>(2)</sup>	N-Channel MOSFET	1
S1	FES311161	Fujitsu <sup>(6)</sup>	SPNO Momentary Push Button	1
Z1	BZX84-C12	Infineon <sup>(7)</sup>	SOD323 signal diode	1
JP1	3 pin Header		Header for Current Setting	1
<b>U2</b>	<b>MIC1555</b>	<b>Micrel<sup>(4)</sup></b>	<b>SOT-23-5 Timer IC</b>	<b>1</b>

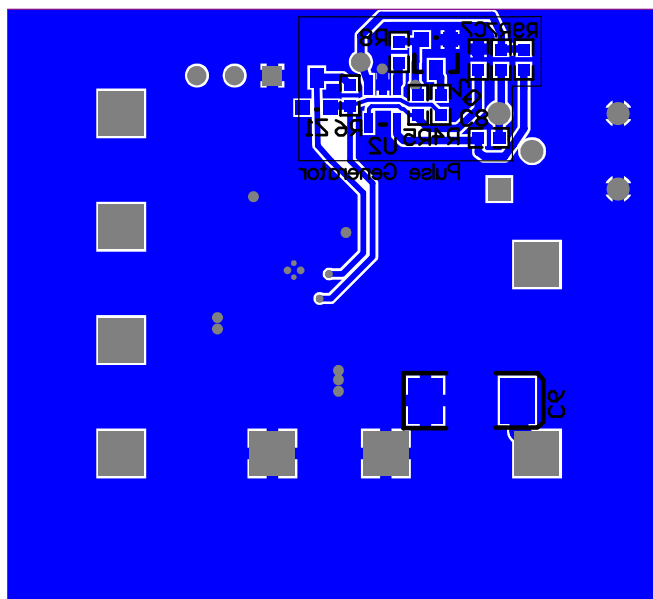
**Notes:**

1. TDK: [www.tdk.com](http://www.tdk.com)
2. Vishay: [www.vishay.com](http://www.vishay.com)
3. Coiltronics: [www.mouser.com/coiltronics](http://www.mouser.com/coiltronics)
4. **Micrel, Inc: [www.micrel.com](http://www.micrel.com)**
5. AVX: [www.avx.com](http://www.avx.com)
6. Fujitsu: [www.fujitsu.com](http://www.fujitsu.com)
7. Infineon: [www.infineon.com](http://www.infineon.com)

### PCB Layout Recommendations



Top Layer



Bottom Layer

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**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>

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