



The Future of Analog IC Technology®

# EV3313

## 3-Channel, Max 38V Output, Linear/Exponential, Analog Dimming, Step-Up WLED Driver with I<sup>2</sup>C

### DESCRIPTION

The MP3313 is a step-up, white, LED converter. The MP3313 uses peak-current mode and a 3-channel current sink to regulate the LED current with up to 25mA on each channel (100mA at flash mode) with 2.7 - 5.5V input voltage.

The MP3313 integrates a 300mΩ, 42V MOSFET and supports selectable over-voltage protection (17/23/30/38V). The MP3313 can drive up to 10 LEDs in series for LCD panels greater than 5”.

The MP3313 achieves ultra-high resolution analog dimming by converting the pulse-width input signal or internal register code to an 11-bit brightness code. The MP3313 is designed with two types of LED current dimming mapping: linear and exponential mapping.

An auto-switching frequency function is integrated to optimize efficiency performance. Full protection features include LED open and short protection, cycle-by-cycle current-limit protection, and thermal shutdown.

The I<sup>2</sup>C interface can set the internal register to program the MP3313 for flexible applications, such as dimming mode, LED current slope, and protection threshold.

The MP3313 is available in a small WLCSP-12 (1.3mmx1.7mm) package.

### ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V <sub>IN</sub>	2.7-5.5	V
Output Voltage	V <sub>LED</sub>	<38	V
LEDs #		3 string	
LED Current /string	I <sub>LED</sub>	25	mA

### FEATURES

- 2.7 - 5.5V Input Voltage
- 300mΩ, 42V Internal MOSFET
- 3-Channel Current Sink, Each Channel Enable/Disable Respectively
- LED Current up to 25mA in Backlighting Mode
- LED Current up to 100mA in Flash Mode
- 250μA - 25mA LED Current with ±3% Accuracy
- ±1% Typical Current Matching
- Linear or Exponential Analog Dimming
- 11-Bit Dimming Resolution
- Selectable Switching Frequency: 500kHz or 1MHz with Optional -12% Shift
- Auto-Switching Frequency (250kHz, 500kHz, 1MHz)
- High-Speed I<sup>2</sup>C Interface (1.2MHz)
- I<sup>2</sup>C Address External Selectable (A0 Pin)
- Internal Soft Start (SS) to Reduce Inrush Current
- Current-Limit Protection (0.75/1/1.25/1.5A)
- LED Open Protection (17/23/30/38V)
- LED Short Protection (2/3/5V)
- Available in a WLCSP-12 (1.3mmx1.7mm) Package

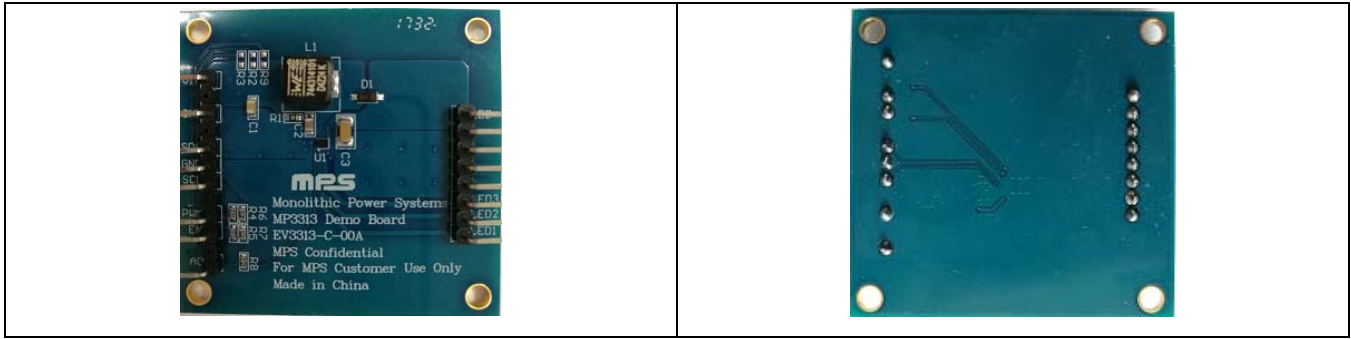
### APPLICATIONS

- Smart Phones
- Tablets
- GPS Receivers
- LCD Video Displays with One-Cell Li-Ion Battery

All MPS parts are lead-free and adhere to the RoHS directive. For MPS green status, please visit MPS website under Products, Quality Assurance page.

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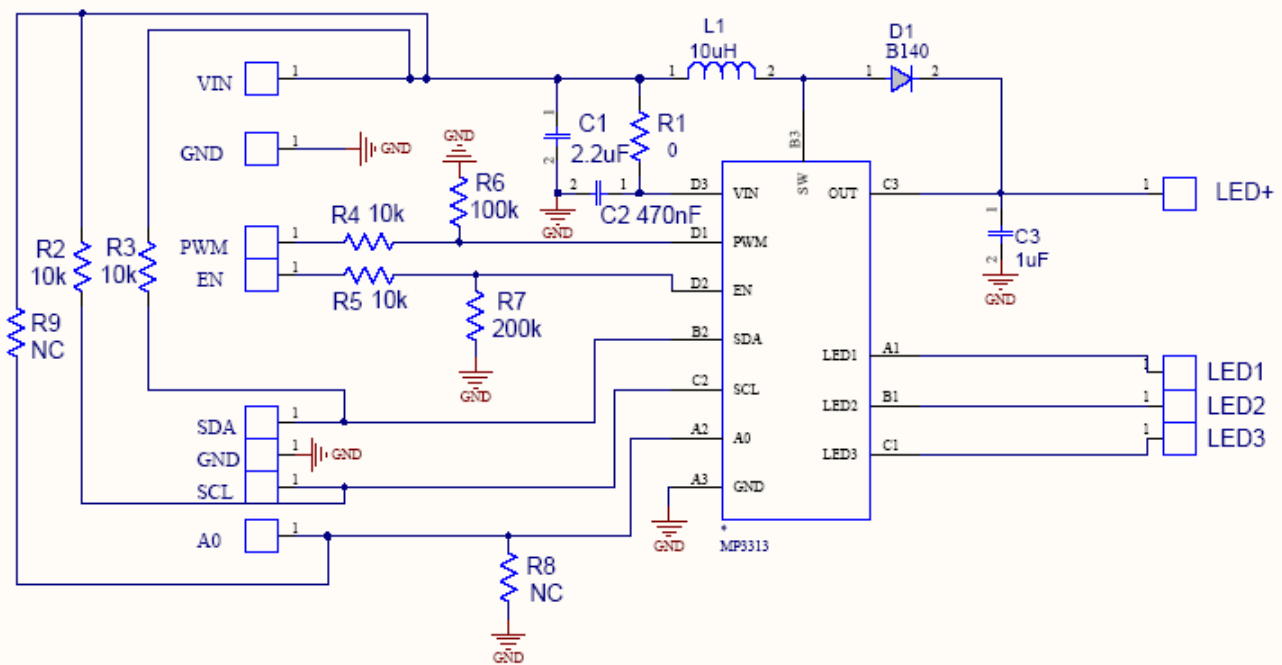
## EV3313-C-00A EVALUATION BOARD



(L x W x H) 4.7cm x 4.9cm x 1.56cm

Board Number	MPS IC Number
EV3313-C-00A	MP3313GC

## EVALUATION BOARD SCHEMATIC



**EV3313-C-00A BILL OF MATERIALS**

Qty	Ref	Value	Description	Package	Manufacture	Manufacture_PN
1	C1	4.7uF	Ceramic Capacitor;16V;X5R;0805;	0805	muRata	GRM21BR61C475KA88L
1	C2	470nF	'Ceramic Capacitor;10V;X7R;0805;	0805	muRata	GRM31CR71C106KAC7L
1	C3	2.2uF	'Ceramic Capacitor;10V;X7R;1206;	1206	muRata	GJ8319R61H225K
1	L1	10uH	Inductor;10uH;65.6m; 2.47A	SMD	Cooper	DR73-100-R
1	D1	B140	Diode, B140, 1A, 40V	SMA		
1	R1	0Ω	Resistor;5%;;	0603	Yageo	RTT03000JTP
3	R2,R3,R9	NC	Resistor;5%;	0603	Yageo	
2	R4,R5	10kΩ	Resistor;5%;	0603	Yageo	RC0603JR-0710KL
2	R6,R7	200kΩ	Resistor;5%;	0603	Yageo	RC0603JR-07200KL
1	R8	100kΩ	Resistor;5%;	0603	Yageo	RC0603JR-07100KL
12	VIN, GND, PWM, EN, SDA, GND, SCL, A0, LED+, LED1, LED2, LED3		TP	90 度弯针, 1*40, 2.54mm		
1	MP3313		WLCSP12-1.3mm*1.7mm		MPS, R1	

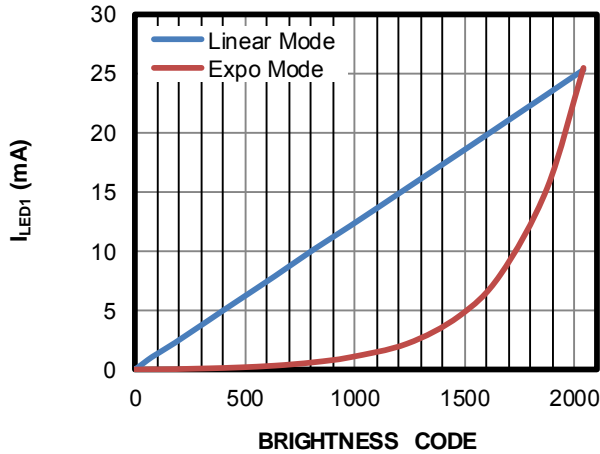
## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

V<sub>IN</sub> = 3.6V, 8\*LEDs/string, I<sub>LED</sub>/Ch = 20mA, L = 10μH, T<sub>A</sub> = 25°C, unless otherwise noted.

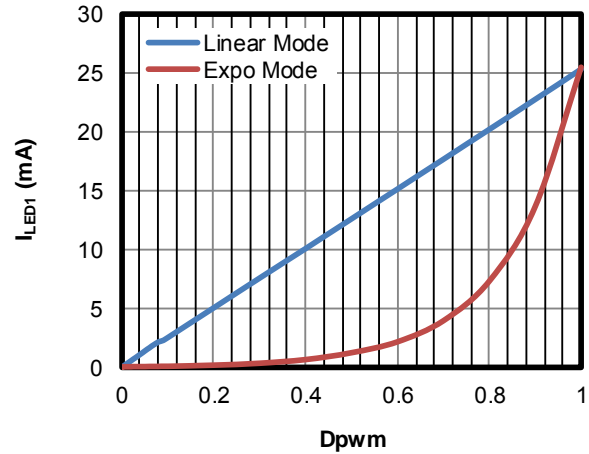
**LED Current for Each Channel with Register Code**

Current Curve (Dimming by Code only)



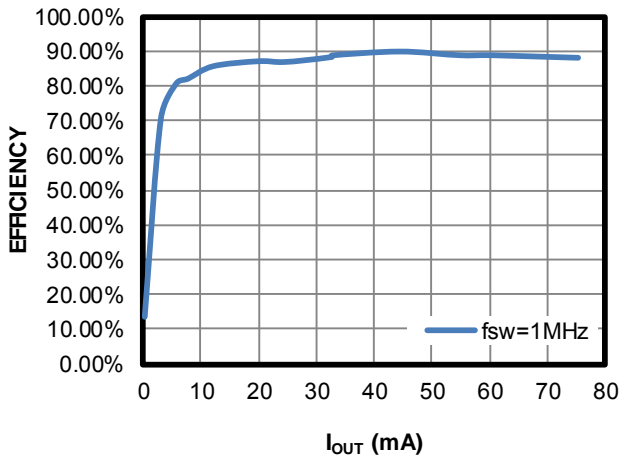
**LED Current for Each Channel with PWM Input Duty**

Current Curve (Dimming by PWM only)



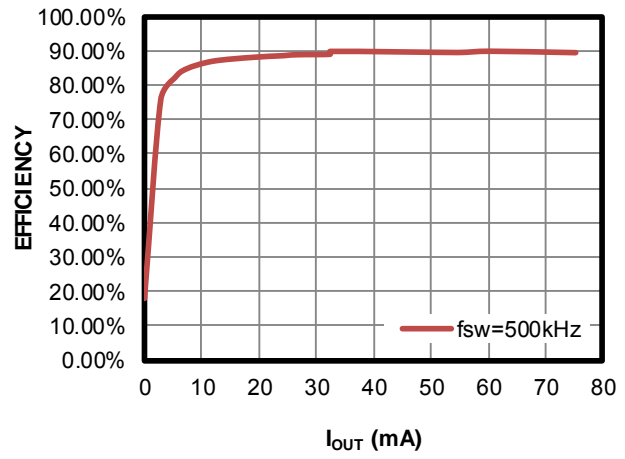
**Efficiency Curve E-I<sub>OUT</sub>**

1MHz, 10μH, DCR = 49mΩ



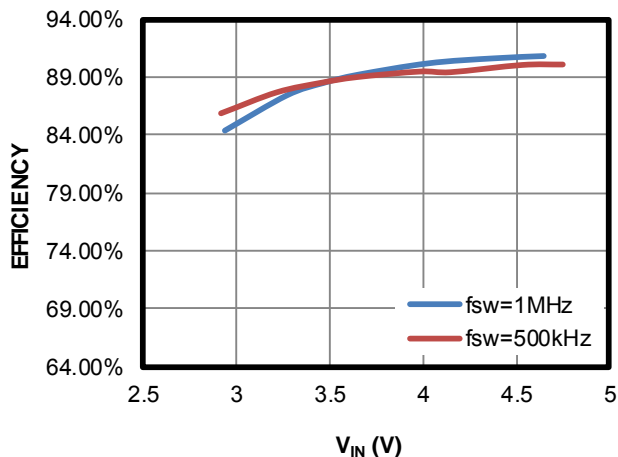
**Efficiency Curve E-I<sub>OUT</sub>**

500kHz, 10μH, DCR = 49mΩ

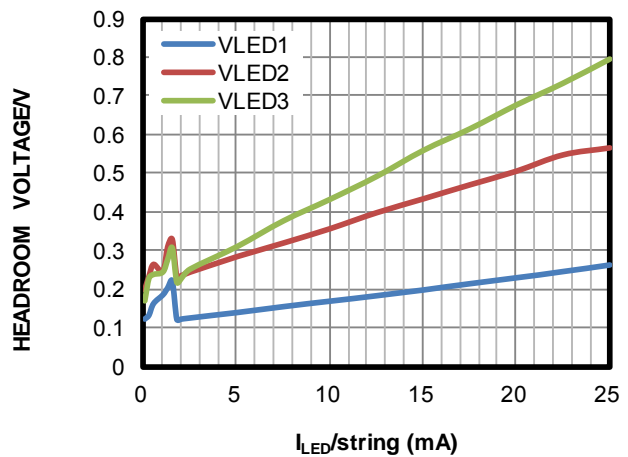


**Efficiency Curve E-V<sub>IN</sub>**

10μH, DCR = 49mΩ



**LEDx Voltage vs. LED Current**

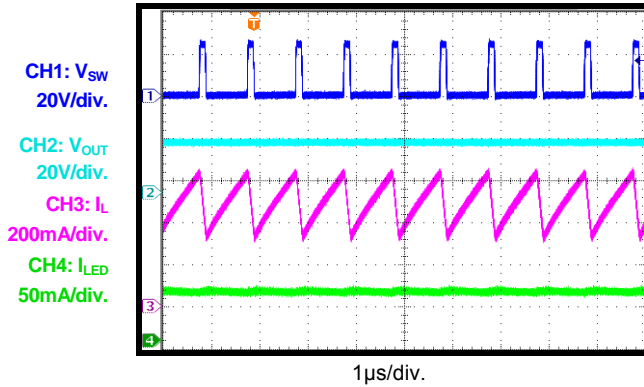


## EVB TEST RESULTS *(continued)*

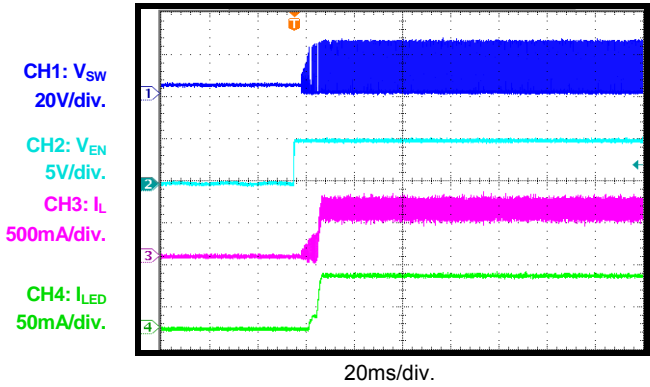
Performance waveforms are tested on the evaluation board.

VIN = 3.6V, 8\*LEDs/string, I<sub>LED</sub>/Ch = 20mA, L = 10μH, T<sub>A</sub> = 25°C, unless otherwise noted.

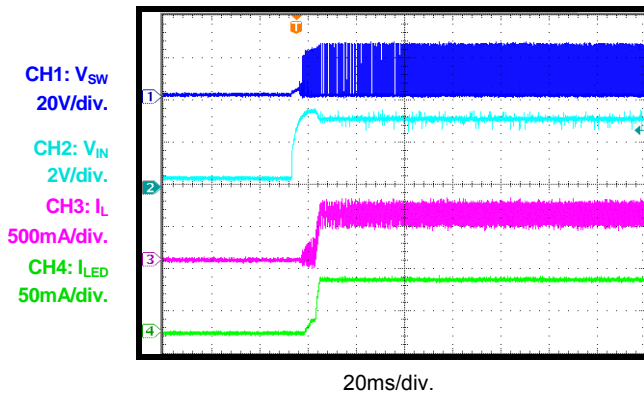
**Steady State**



**EN Power-On**

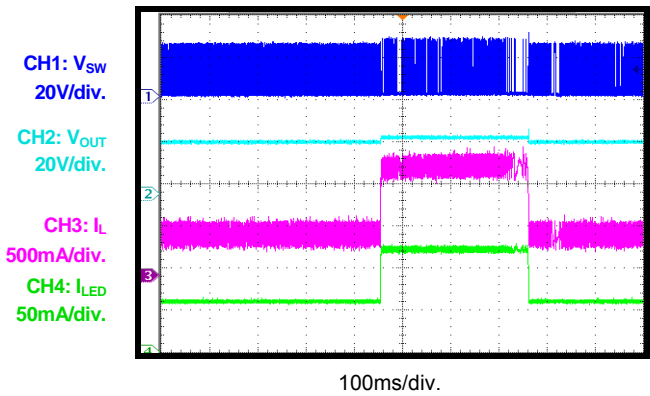


**VIN Power On**



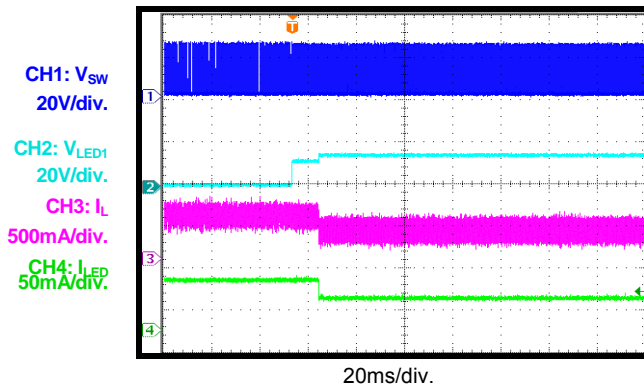
**Flash Mode**

Flash Time = 300ms, Flash Current = 40mA/ch



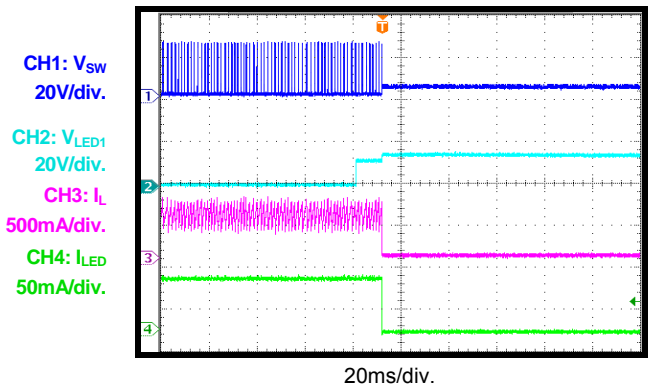
**Short LED Protection (Mark Off)**

Short one string



**Short LED Protection (IC Latch Off)**

Short LED1 String



## PRINTED CIRCUIT BOARD LAYOUT

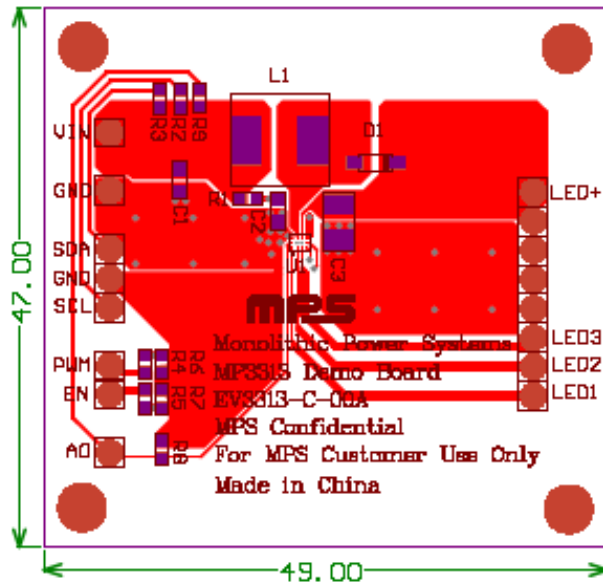


Figure 1—Top Layer

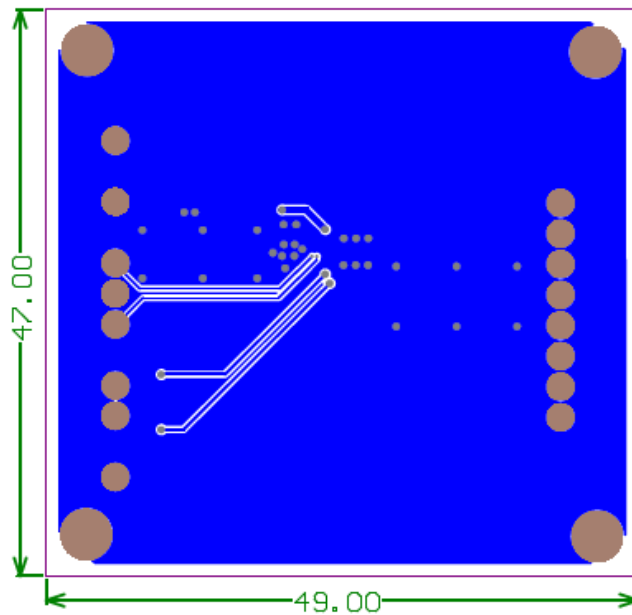


Figure 2—Bottom Layer