EV3314A-C-00A

6-Channel, 80mA, 50V, Boost WLED Driver with I²C Interface Evaluation Board

DESCRIPTION

The EV3314A-C-00A evaluation board is designed to demonstrate the capabilities of the MP3314A, a boost converter with six channel current sources that drives WLED arrays for LCD panels in VR (virtual reality) backlighting applications.

The MP3314A supports a 3V to 30V input voltage (V_{IN}) range, and an output voltage (V_{OUT}) up to 43V. The device uses peak current mode control and pulse-width modulation (PWM) control to maintain boost converter regulation. The six integrated LED current source channels support up to 80mA per channel.

The MP3314A has two PWM input signals (PWM1 and PWM2) to control the brightness of LED channels 1–3 and LED channels 4–6, respectively.

The MP3314A employs a standard I²C digital interface to set the LED current, switching frequency (f_{SW}), spread spectrum, and various protection thresholds. The MP3314A supports configurable switching slope and spread spectrum function to improve EMI performance.

The MP3314A features high efficiency due to the low-headroom voltage for LED regulation and small switching MOSFET on resistance.

For system reliability, the MP3314A integrates rich protections, including LED open and short protection, over-current protection (OCP), over-voltage protection (OVP), and over-temperature protection.

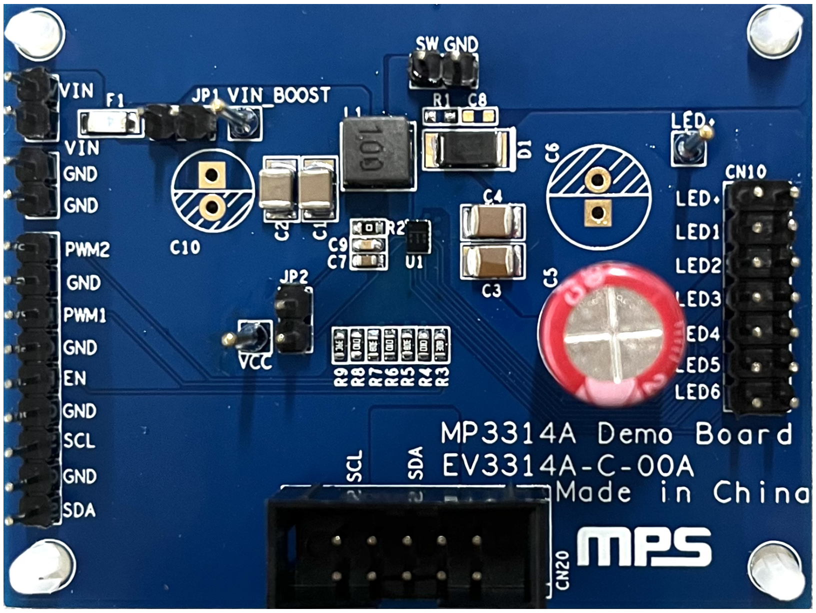
The MP3314A is available in a WLCSP-20 (1.7mmx2.45mm) package.

PERFORMANCE SUMMARY (1)

Specifications are at T_A = 25°C, unless otherwise noted.

Parameters	Conditions	Value
Input voltage (V_{IN}) range		3V to 30V
Output voltage (V_{OUT})	Over-voltage protection (OVP) can be configured via the I²C interface	Max V_{OUT} < 43V
LED string	Each channel can be enabled and disabled via the I²C interface	6 strings
Maximum LED current (I_{LED})	R_{ISET} = 25kΩ (ISET_EN = 1b) and IMAX[2:0] = 111b	80mA per channel

EV3314A-C-00A EVALUATION BOARD



LxWxH (6.35cmx4.8cmx2cm)

Board Number	MPS IC Number
EV3314A-C-00A	MP3314AGC

QUICK START GUIDE

The EV3314A-C-00A evaluation board is easy to set up and use to evaluate the performance of the MP3314A. To get started, follow the steps below:

1. Preset the voltage source placed between the VIN and PGND terminals to between 3V and 30V.
2. Connect the LED load terminals (6 strings) to:
   a. Positive (+): LED+
   b. Negative (-): LED1, LED2, LED3, LED4, LED5, and LED6
3. Pull the EN pin high to enable the device.
4. Connect the SCL, SDA, and GND pins of the evaluation board to the SCL, SDA, and GND pins of the I^2C communication kit, respectively. (1)
5. Configure the registers via the I^2C interface. (2)
6. Apply a pulse-width modulation (PWM) signal to the PWM1 terminal for channels 1–3 brightness control. Apply a PWM signal to the PWM2 terminal for channels 4–6 brightness control.

Notes:

1) Contact an MPS FAE to obtain the I^2C communication kit.
2) Contact an MPS FAE to obtain the MP3314 GUI configuration tool for more details on configuring the registers during evaluation.

EVALUATION BOARD SCHEMATIC

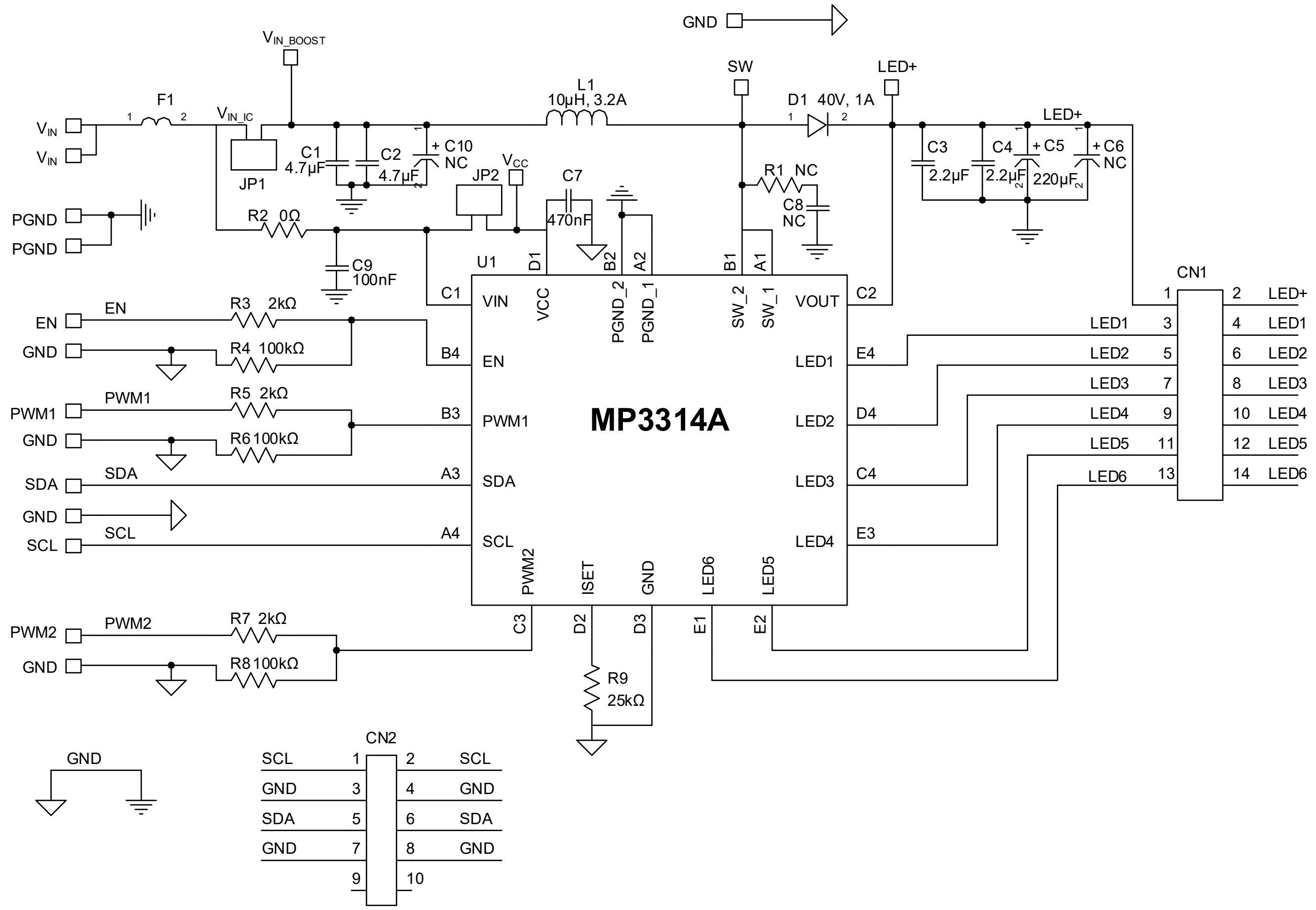


Figure 1: Evaluation Board Schematic

EV3314A-C-00A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
2	C1, C2	4.7μF	Capacitor, 50V, X7R	1210	Murata	GCM32ER71H475KA55L
2	C3, C4	2.2μF	Capacitor, 100V, X7R	1210	Taiyo	HMK325B7225KN-T
1	C5	220μF	Capacitor, 50V	DIP	Wurth	860020675020
1	C6	NC	Capacitor, 50V	DIP		
1	C7	470nF	Capacitor, 16V, X7R	0603	Murata	GRM188R71C474KA88D
1	C8	NC	Capacitor, 50V, X7R	0603		
1	C9	100nF	Capacitor, 50V, X7R	0603	Murata	GRM188R71H104KA93D
1	C10	NC	Capacitor, 16V	DIP		
1	D1	40V	Diode, 1A	DO-214AC	Fullpower	SS14
1	F1	4A	Fuse, 32V	1206	Cooper Bussmann	TR/3216FF4-R
1	R1	NC	Film resistor 1%	0603		
1	R2	0Ω	Film resistor 1%	0603	Yageo	RC0603FR-070RL
3	R3, R5, R7	2kΩ	Film resistor 1%	0603	Yageo	RC0603FR-072KL
3	R4, R6, R8	100kΩ	Film resistor 1%	0603	Yageo	RC0603FR-07100KL
1	R9	24.9kΩ	Film resistor 1%	0603	Yageo	RC0603FR-0724K9L
1	VIN, GND, JP1, JP2, VCC, SW, LED+, EN, SDA, SCL, PWM1, PWM2, CN10, CN20	2.54mm	Connector, 180°	CONN/TP	Custom (3)	
1	L1	10μH	Inductor, 56mΩ, 3.2A	SMD	MPS	MPL-SE5040-100
1	U1	MP3314A	6-channel, 50V, boost WLED driver with I²C	WLCSP-20 (1.7mmx2.45 mm)	MPS	MP3314AGC

Note:

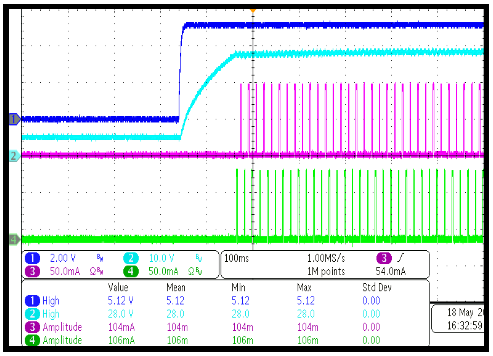
3) MPS custom produces these pins. Contact an MPS FAE for details.

EVB TEST RESULTS

Performance waveforms are tested on the evaluation board, V_{IN_BOOST} = 2.5V, V_{IN_IC} = EN = 5V, f_{PWM} = 60Hz, duty cycle = 13%, LED = 4P8S, I_{SET} = 45mA/channel, L = 3.3µH, T_A = 25°C, unless otherwise noted.

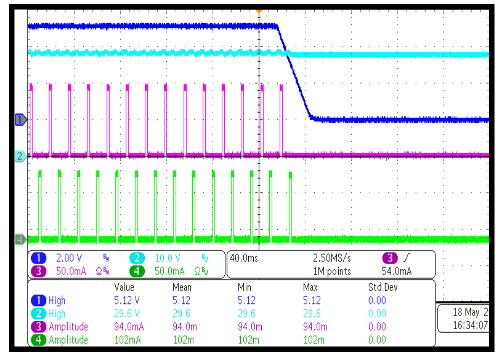
V_{IN_IC} Turns On

CH1: V_{IN_IC}
CH2: V_{OUT}
CH3: $I_{CH1+CH2}$
CH4: $I_{CH5+CH6}$



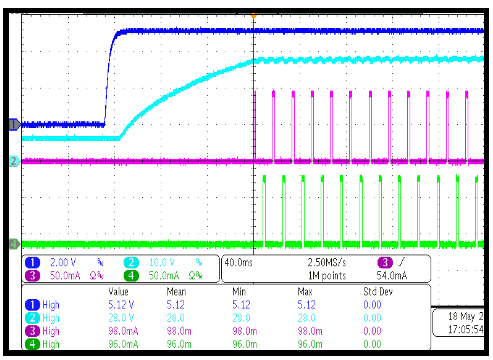
V_{IN_IC} Turns Off

CH1: V_{IN_IC}
CH2: V_{OUT}
CH3: $I_{CH1+CH2}$
CH4: $I_{CH5+CH6}$



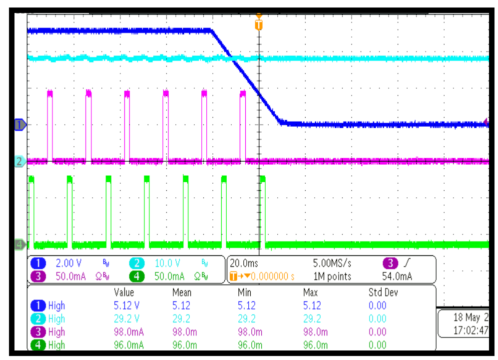
EN Turns On

CH1: EN
CH2: V_{OUT}
CH3: $I_{CH1+CH2}$
CH4: $I_{CH5+CH6}$



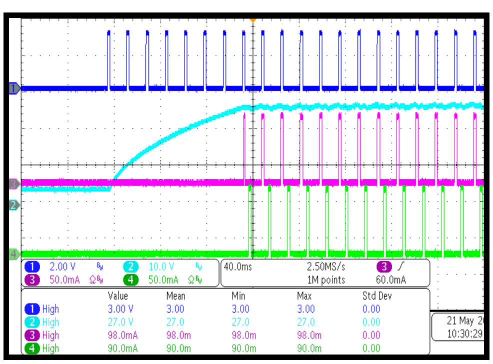
EN Turns Off

CH1: EN
CH2: V_{OUT}
CH3: $I_{CH1+CH2}$
CH4: $I_{CH5+CH6}$



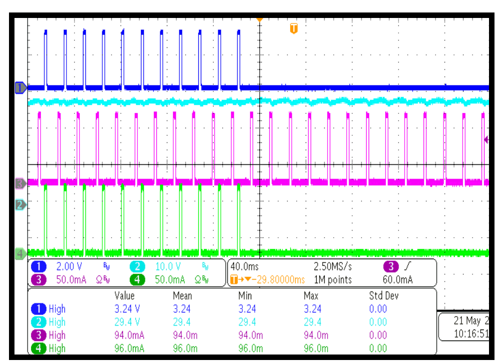
PWM2 Turns On then PWM1 Turns On

CH1: PWM1
CH3: $I_{CH1+CH2}$
CH2: V_{OUT}
CH4: $I_{CH5+CH6}$



PWM2 Turns Off

CH1: PWM2
CH3: $I_{CH1+CH2}$
CH2: V_{OUT}
CH4: $I_{CH5+CH6}$



EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN_BOOST} = 2.5V, V_{IN_IC} = EN = 5V, f_{PWM} = 60Hz, duty cycle = 13%, LED = 4P8S, I_{SET} = 45mA/channel, L = 3.3µH, T_A = 25°C, unless otherwise noted.

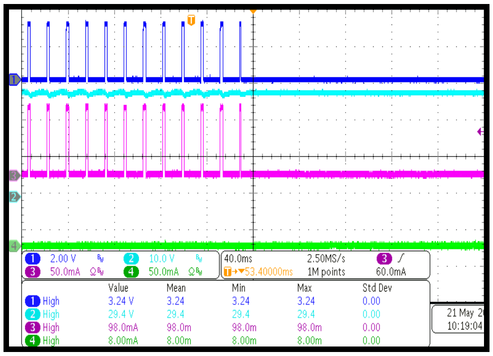
PWM1 Turns Off

CH1: PWM1

CH3: $I_{CH1+CH2}$

CH2: V_{OUT}

CH4: $I_{CH5+CH6}$



Direct PWM Dimming

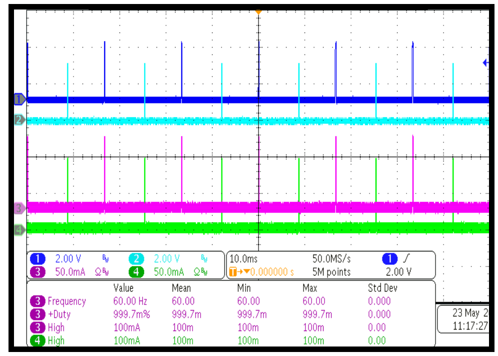
Duty cycle = 1%

CH1: PWM1

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



Direct PWM Dimming

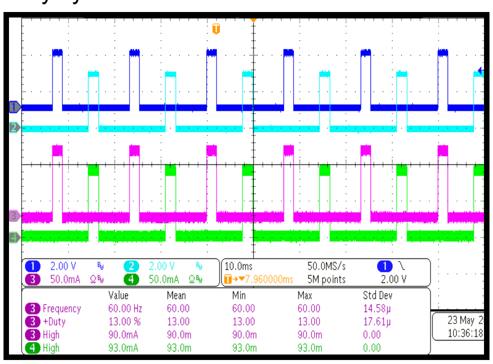
Duty cycle = 13%

CH1: PWM1

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



Direct PWM Dimming

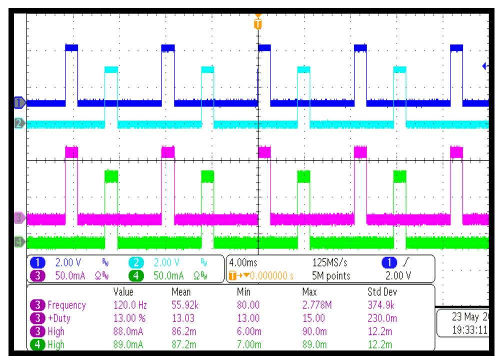
f_{PWM} = 120Hz

CH1: PWM1

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



Direct PWM Dimming

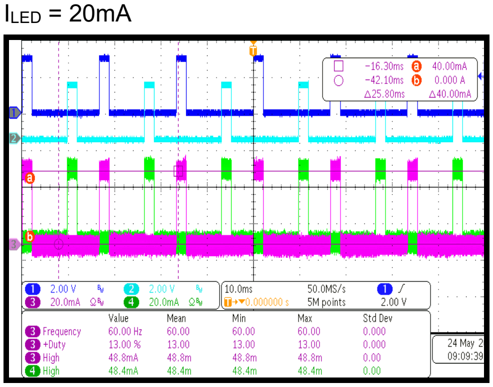
I_{LED} = 20mA

CH1: PWM1

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



Direct PWM Dimming

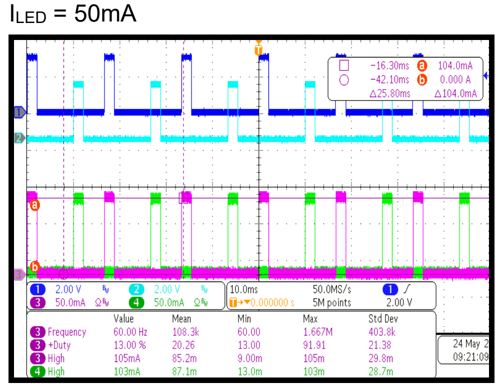
I_{LED} = 50mA

CH1: PWM1

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



EVB TEST RESULTS *(continued)*

Performance waveforms are tested on the evaluation board, V_{IN_BOOST} = 2.5V, V_{IN_IC} = EN = 5V, f_{PWM} = 60Hz, duty cycle = 13%, LED = 4P8S, I_{SET} = 45mA/channel, L = 3.3µH, T_A = 25°C, unless otherwise noted.

LED Open Protection

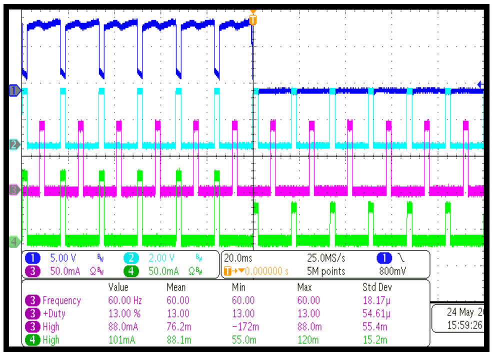
Open LED string 6

CH1: V_{LED6}

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



LED Short Protection

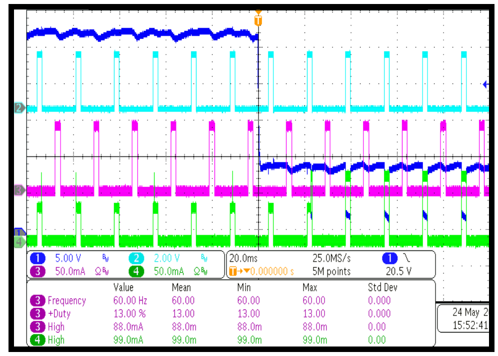
Short LED string 6

CH2: PWM2

CH3: $I_{CH1+CH2}$

CH1: V_{LED6}

CH4: $I_{CH5+CH6}$



Latch-Off Current-Limit Protection

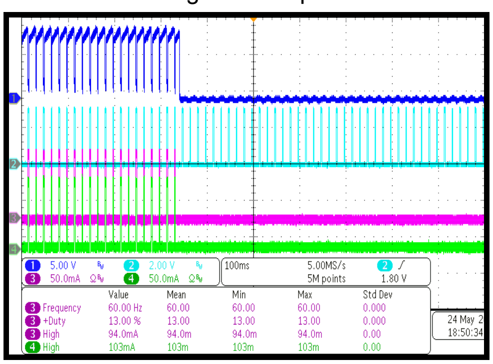
Short diode during normal operation

CH1: V_{LED6}

CH2: PWM1/2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



Over-Temperature Protection

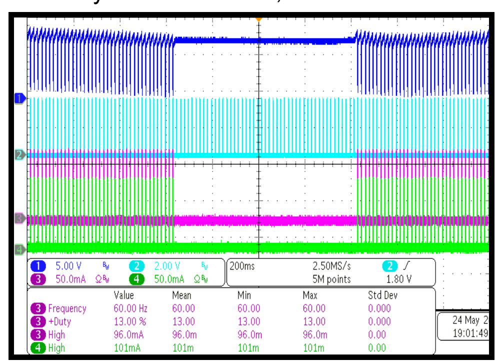
Manually overheat the IC, then allow to recover

CH1: V_{LED6}

CH2: PWM1/2

CH3: $I_{CH1+CH2}$

CH4: $I_{CH5+CH6}$



PCB LAYOUT

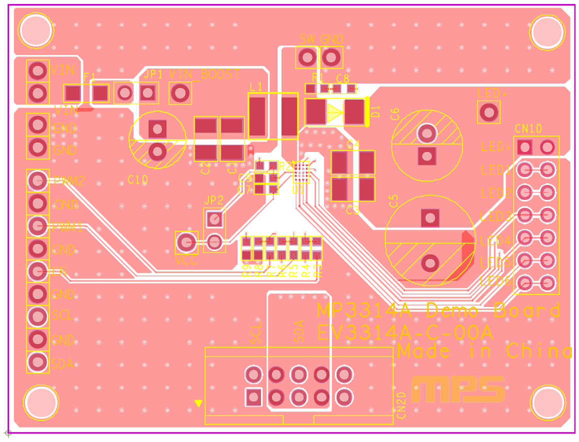


Figure 2: Top Layer

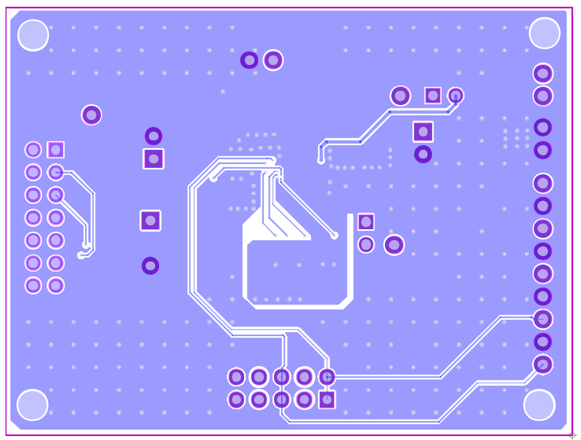


Figure 3: Bottom Layer

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	6/13/2024	Initial Release	-
1.1	1/16/2025	Updated IC package information to WLCSP-20 (1.7mmx2.45mm).	1, 5