

### General Description

This AL8116 demonstration board utilizes a flexible dimming signal interface controller that converts the three different inputs of dimmer types, including 0 to 10V DC linear dimming, 0 to 100% duty cycle PWM (Pulse Width Modulation) signal, and a simple resistive potentiometer to an output PWM signal. It is easy to provide an isolation dimming control via an opto-coupler to the primary-side LED driver.

The included bill of materials (BOM), schematic, and layout describes the parts used on this demonstration board, along with measured performance characteristics. These materials can be used as a reference design.

### Key Features

- Wide VCC Operating Range 10V-56V
- Low Operation Current (typical 600uA)
- Precision Dimmer Type with:
  - Voltage Potential: 0/1V to 10V
  - PWM Dimming: 0.2k to 10kHz
  - Potentiometer: 0 to 100kΩ

### Applications

- 0V to 10V dimming luminaires
- Dimmable LED power supplies
- Dimming control devices
- Commercial LED lighting
- Smart LED lighting

### Specifications

Parameter	Value
VCC1	20V <sub>DC</sub>
VCC2	10~56V <sub>DC</sub>
0-10V DIM/ PWM Signal	0~10V (0-10V dimming)
	0.2~10kHz (PWM dimming)
R <sub>DIM</sub>	0~100KΩ
XYZ Dimension	45 x 29 x 15mm
ROHS Compliance	Yes

### Evaluation Board



Figure 1: Top View



Figure 2: Bottom View

### Terminal Instructions

- VCC1: Primary opto-coupler pull-up voltage
- VCC2: AL8116 power supply
- 0-10V DIM/PWM signal: 0-10V/PWM signal input
- PWM: Output PWM signal
- OUT: AL8116 OUT Pin signal
- RDIM: For potentiometer dimming
- PGND: Primary GND
- GND: AL8116 GND
- J1 and J2: Jumpers for setting isolated/non-isolated output
- J3 and J4: Jumpers for setting dimming mode

### Board Layouts

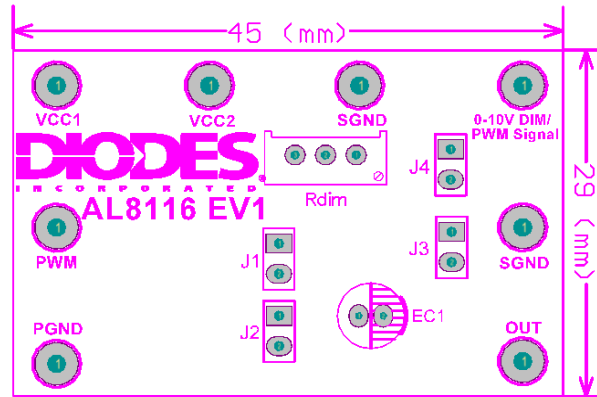


Figure 3: PCB Layout Top View

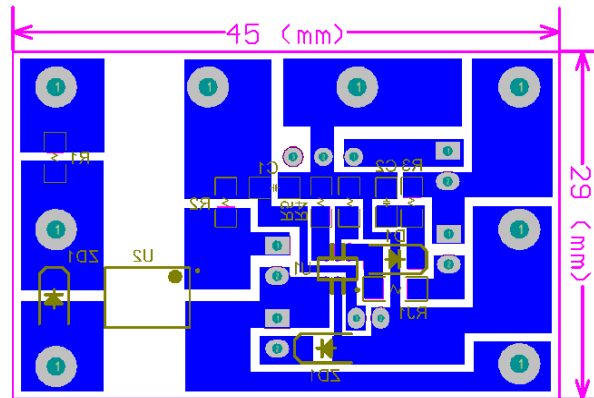


Figure 4: PCB Layout Bottom View

### Quick Start Guide

1. Preset DC source 1 to 20V for VCC1, and DC source 2 to 30V for VCC2. VCC1 is the pull-up voltage of the opto-coupler's connector, and VCC2 is the AL8116's power supply.
2. Ensure that the DC source is switched OFF or disconnected.
3. The evaluation board can convert the three different inputs of dimmer types, including 0 to 10V DC linear dimming, 0 to 100% duty cycle PWM signal, and a simple resistive potentiometer to an output PWM signal by setting up the jumpers J3 and J4. The output PWM signal is isolated with an opto-coupler when jumpers J1 and J2 are open; non-isolated when J1 and J2 short.
4. For 0-10V dimming: open both J3 and J4, then connect 0-10V analog signal to the 0-10V DIM/PWM signal terminal.
5. For PWM dimming: short J3 and open J4, then connect input PWM signal to the 0-10V DIM/PWM signal terminal.
6. For potentiometer dimming: open J3 and short J4, then adjust R<sub>DIM</sub> to change the output PWM duty.

**Schematic**

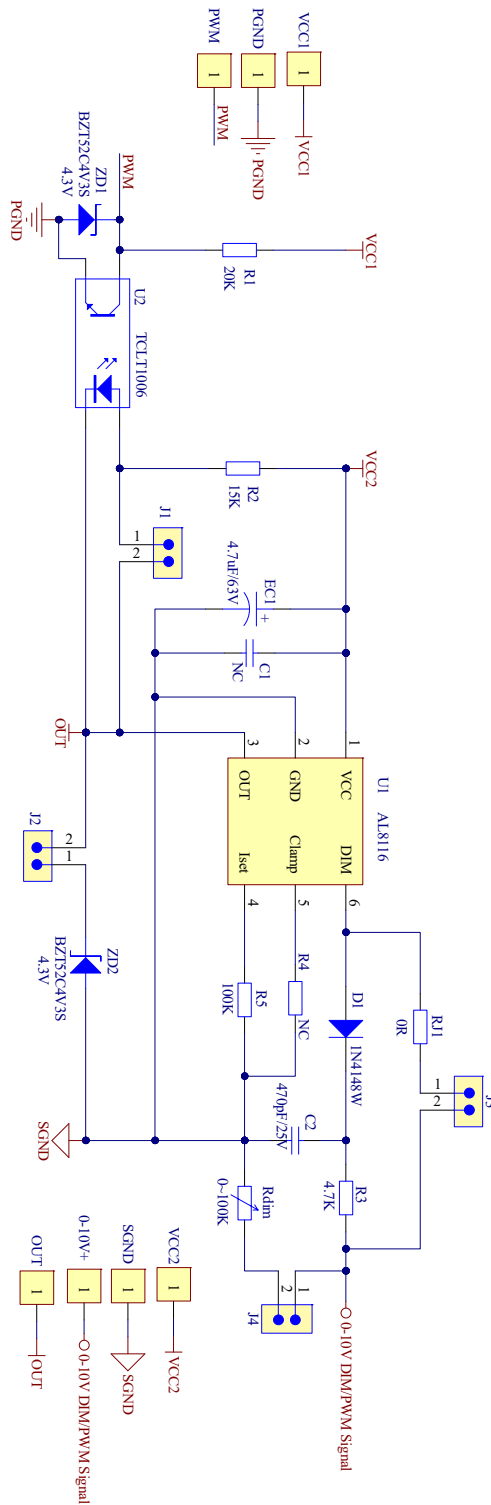
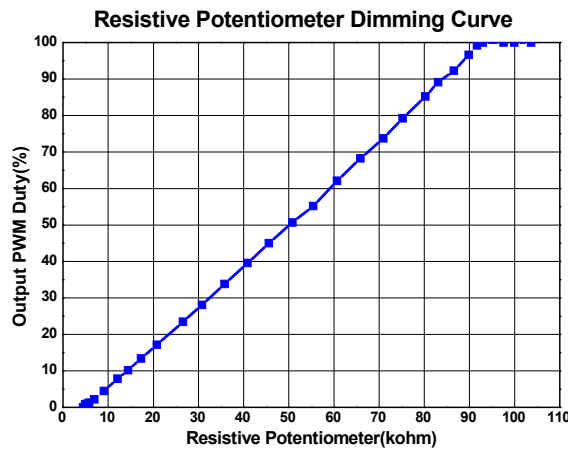
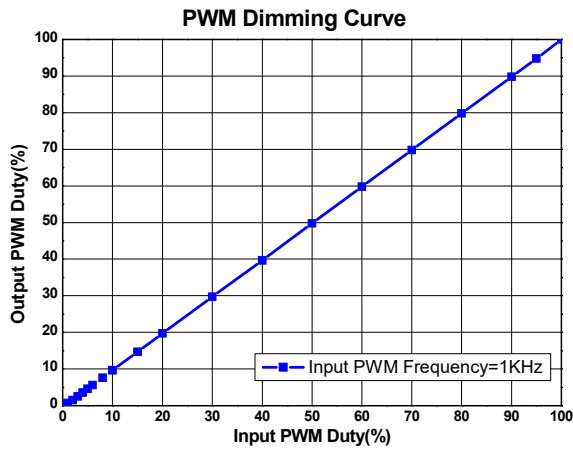
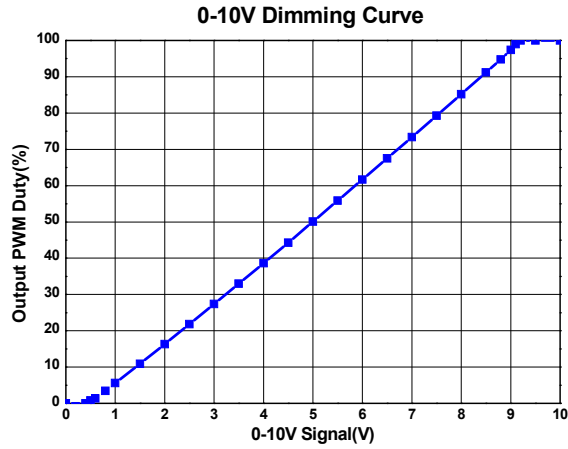


Figure 5: Schematic Circuit

### Bill of Materials

#	Item	Description	Manufacturer	Package	Quantity
1	C1	NC	Yageo	0805	-
2	C2	Ceramic Cap, 470pF/25V, X7R	Yageo	0805	1
3	EC1	E-Cap, 105°C, 4.7uF/63V, 5*9mm	Aishi	Through-hole	1
4	R1	SMD Resistor, 20K, 5%, 1/8W	Yageo	0805	1
5	R2	SMD Resistor, 15K, 5%, 1/8W	Yageo	0805	1
6	R3	SMD Resistor, 4.7K, 5%, 1/8W	Yageo	0805	1
7	R4	NC	Yageo	0805	-
8	R5	SMD Resistor, 100K, 5%, 1/8W	Yageo	0805	1
9	RJ1	Optional, SMD Resistor, 0R, 5%, 1/4W	Yageo	1206	1
10	Rdim	Potentiometer, 5%, 100K	Yageo	Through-hole	1
11	D1	1N4148W, Switching diode, 100V/0.3A	Diodes Incorporated	SOD-123	1
12	ZD1, ZD2	BZT52C4V3S, Zener Diode, 4.3V	Diodes Incorporated	SOD-123	2
13	U1	AL8116W6-7, Flexible dimming interface IC	Diodes Incorporated	SOT23-6	1
14	U2	TCLT1006, Opto-coupler	Vishay	SOP-4L	1
15	J1, J2, J3, J4	2 Pin Connector	-	Through-hole	4
16	VCC1, VCC2	PC test point, 0.06inch(1.6mm), Red	-	Through-hole	2
17	PGND, SGND	PC test point, 0.06inch(1.6mm), Black	-	Through-hole	3
18	PWM, OUT	PC test point, 0.06inch(1.6mm), White	-	Through-hole	2
19	0-10V DIM	PC test point, 0.06inch(1.6mm), Orange	-	Through-hole	1
20	PCB	FR4 Single layer, 45*29mm	-	-	1
<b>Total</b>					<b>26</b>

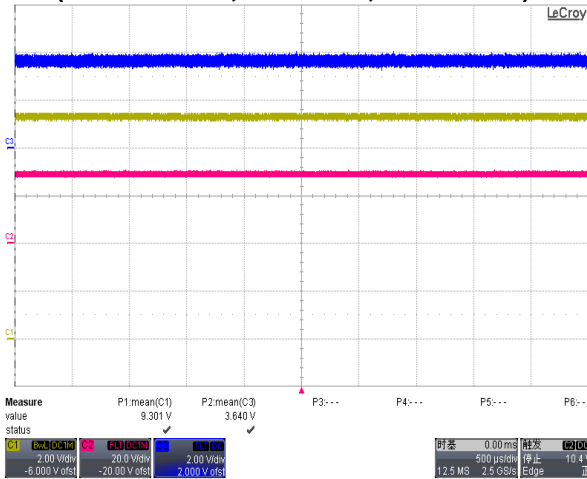
**Dimming Curve**



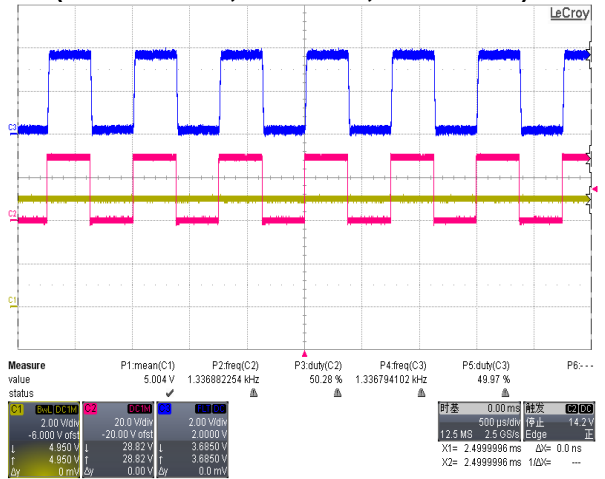
**Functional Waveform (VCC1=20V, VCC2=30V)**

**0-10V Dimming**

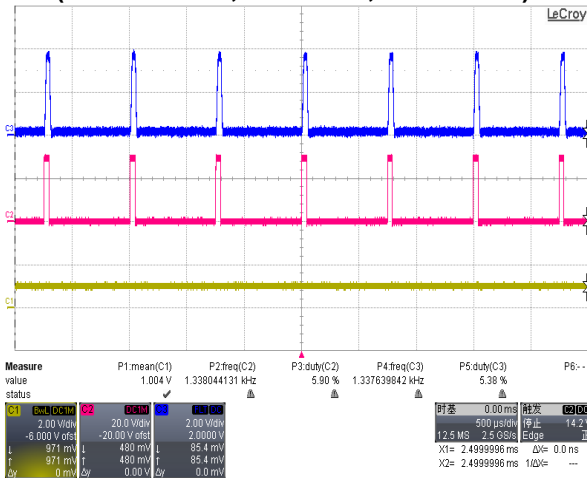
**V<sub>0-10V</sub>=9.3V (0-10V Dimming)**  
**(Yellow-V<sub>0-10V</sub>, Red-OUT, Blue-PWM)**



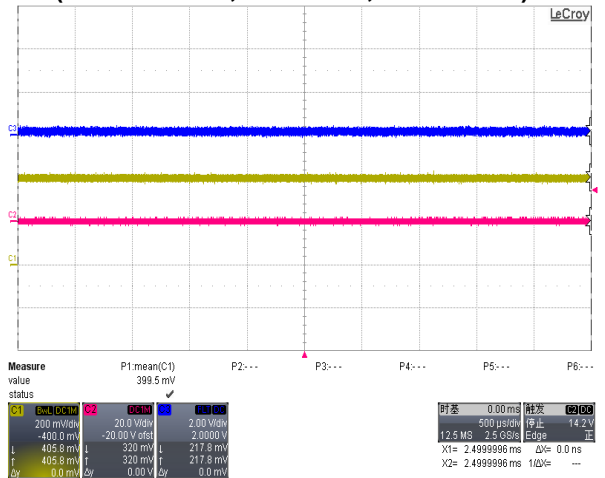
**V<sub>0-10V</sub>=5V (0-10V Dimming)**  
**(Yellow-V<sub>0-10V</sub>, Red-OUT, Blue-PWM)**



**V<sub>0-10V</sub>=1V (0-10V Dimming)**  
**(Yellow-V<sub>0-10V</sub>, Red-OUT, Blue-PWM)**

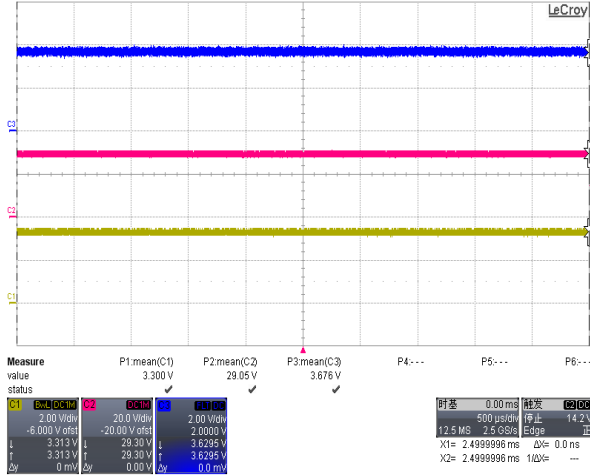


**V<sub>0-10V</sub>=0.4V (0-10V Dimming)**  
**(Yellow-V<sub>0-10V</sub>, Red-OUT, Blue-PWM)**

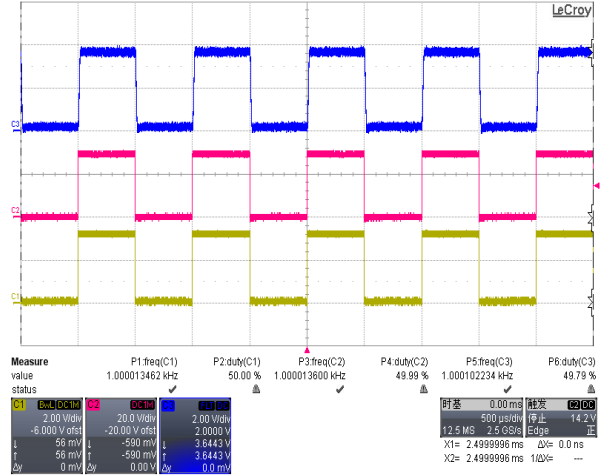


**PWM Dimming**

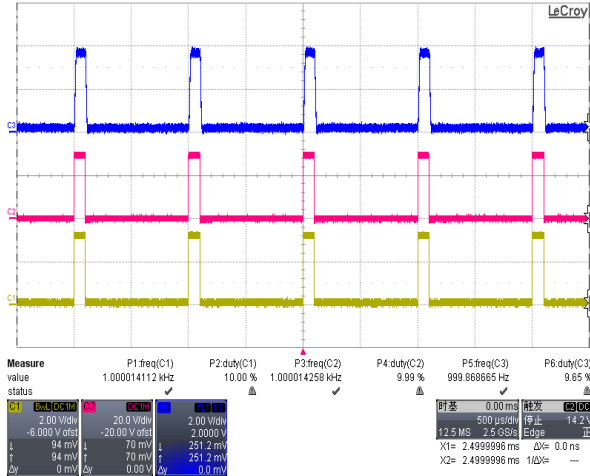
**100% PWM Duty (PWM Dimming, 1kHz)**  
(Yellow-Input PWM, Red-OUT, Blue-PWM)



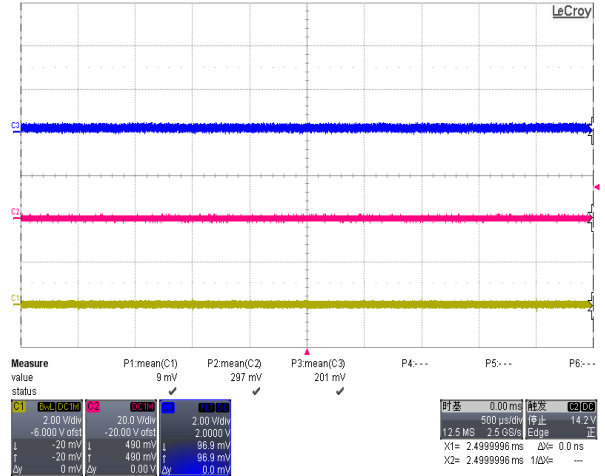
**50% PWM Duty (PWM Dimming, 1kHz)**  
(Yellow- Input PWM, Red-OUT, Blue-PWM)



**10% PWM Duty (PWM Dimming, 1kHz)**  
(Yellow-Input PWM, Red-OUT, Blue-PWM)

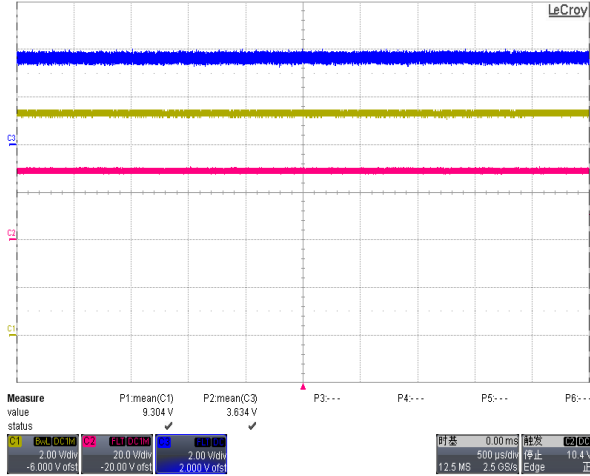


**0% PWM Duty (PWM Dimming, 1kHz)**  
(Yellow- Input PWM, Red-OUT, Blue-PWM)

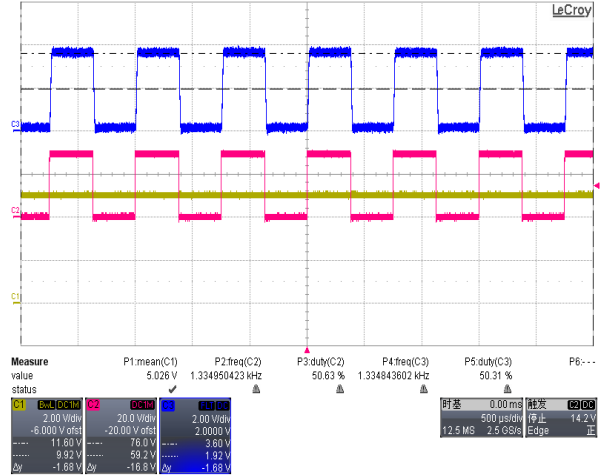


**Potentiometer Dimming**

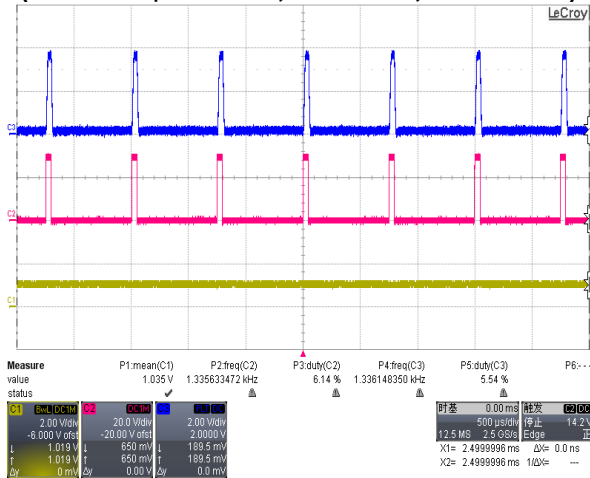
**Rdim=93KΩ (Potentiometer Dimming)**  
**(Yellow- V<sub>potentiometer</sub>, Red-OUT, Blue-PWM)**



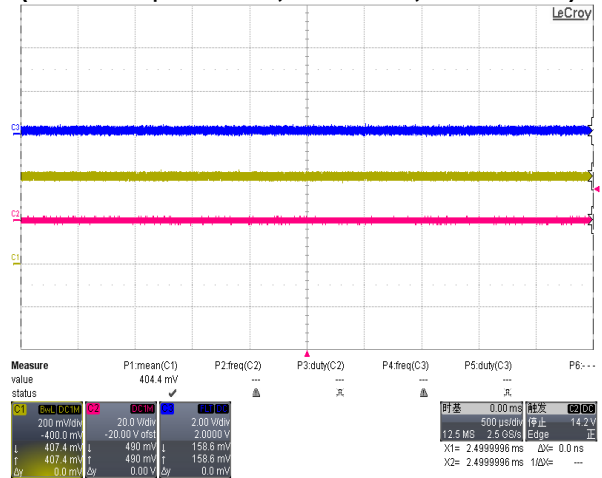
**Rdim=50KΩ (Potentiometer Dimming)**  
**(Yellow- V<sub>potentiometer</sub>, Red-OUT, Blue-PWM)**



**Rdim=10KΩ (Potentiometer Dimming)**  
**(Yellow- V<sub>potentiometer</sub>, Red-OUT, Blue-PWM)**



**Rdim=4KΩ (Potentiometer Dimming)**  
**(Yellow- V<sub>potentiometer</sub>, Red-OUT, Blue-PWM)**





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