

General Description

The AL5873Q is a three-channel linear LED driver with PWM dimming and analog dimming control. Each channel can drive up to 250mA with a total driving current up to 750mA. The LED channel current of the AL5873Q can be set through two reference resistors connected to the REF1 and REF2 pins.

The AL5873Q regulates LED current for each channel, accurate down to $\pm 4\%$, with excellent dimming performance. The AL5873Q enters standby mode to save power if no PWM signal is detected.

The AL5873Q monitors the temperature and reduces the LED current if the chip temperature exceeds the threshold temperature. Moreover, the input under voltage lockout (UVLO), LED string open/short protection, overtemperature protection (OTP), and fault indicator (FAULTB) are designed to improve system robustness.

Applications

- Automotive aftermarket LED inner lamps
- Aftermarket rear lights – tail and stop lights, rear turn indicators, parking lights, fog lights, reverse lights

Key Features

- Wide Input Voltage Range from 5V to

55V

- Each Channel up to 250mA Current Capability
- Set Stop and Tail Current Independently Through Two Resistors
- Switch LED Current Between Stop and Tail Function Automatically via FULL Input
- PWM Dimming via Both PWM Input and Power Supply
- Analog Dimming via ADIM Input
- Automatically Enter and Exit Standby Mode Without Enable Pin
- Internal Protections:
 - Input Undervoltage Lockout (UVLO)
 - LED String Open Protection
 - LED String Short Protection
 - Over Temperature Protection (OTP)
- Thermal Fold-Back if Chip Temperature Exceeds the Threshold
- Fault Reporting: UVLO, OTP, LED Open, and LED Short

AL5873QEV1 Specifications

| Parameter | Value |
|-------------------------|--------------------|
| Input Voltage | 5VDC to 55VDC |
| LED Current (STOP mode) | 126mA x 3Channels |
| LED Current (TAIL mode) | 31.6mA x 3Channels |
| Number of LEDs | 1~17pcs |
| XY Dimension | 70mm x 43mm |

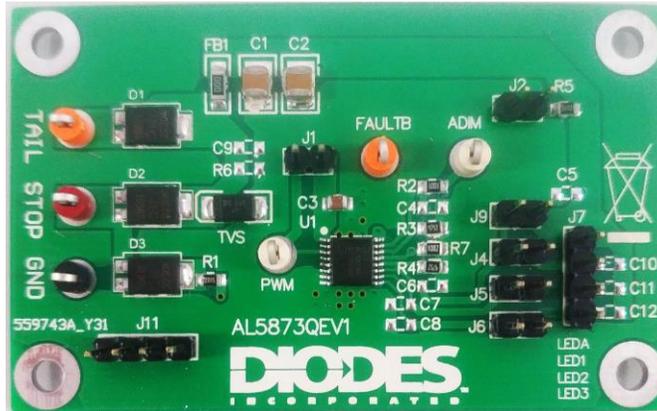


Figure 1. Top View

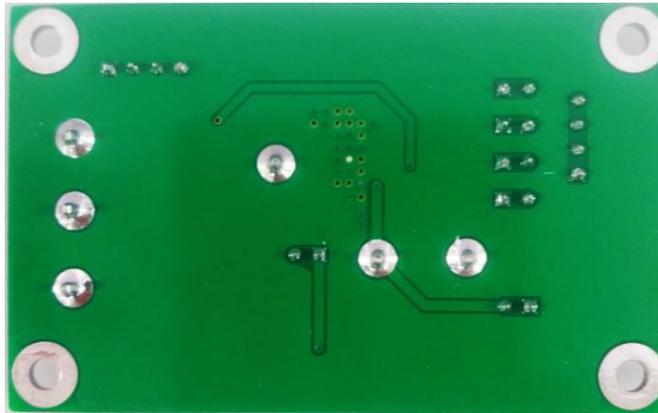


Figure 2. Bottom View

Connection Instructions & Quick Start Guide

1. Ensure that the DC source is switched OFF or disconnected before soldering or connecting.
2. By default, the LED current of evaluation board is preset at 125mA per channel.
3. Connect the anode wire of external LED string to LEDA of J7 connector.
4. Connect the cathode wire of external LED string to LED1~LED3 of J7 connector.
5. Power Supply Input: 5~55VDC between **TAIL** and GND for **TAIL mode**;
6. Power Supply Input: 5~55VDC between **STOP** and GND for **STOP mode**
7. Ensure that the area around the board is clear and safe, and preferably that the board and LEDs are enclosed in a transparent safety cover.
8. Turn on the main switch. LED string should light up.
9. For PWM dimming operation, remove the jumper on J1, and supply 200Hz~2kHz PWM signal on PWM terminal. **PWM dimming operation is available in STOP mode.**
10. For analog dimming operation, ensure J1 is shorted by jumper; supply a 0-1.5VDC signal on ADIM terminal. This operation is available both in STOP mode and TAIL mode.
11. This board supports FAULTB signal output. Pull FAULTB to VIN by short J2 with a jumper, otherwise FAULTB is pulled high by AL5873Q internal block.

Evaluation Board Schematic

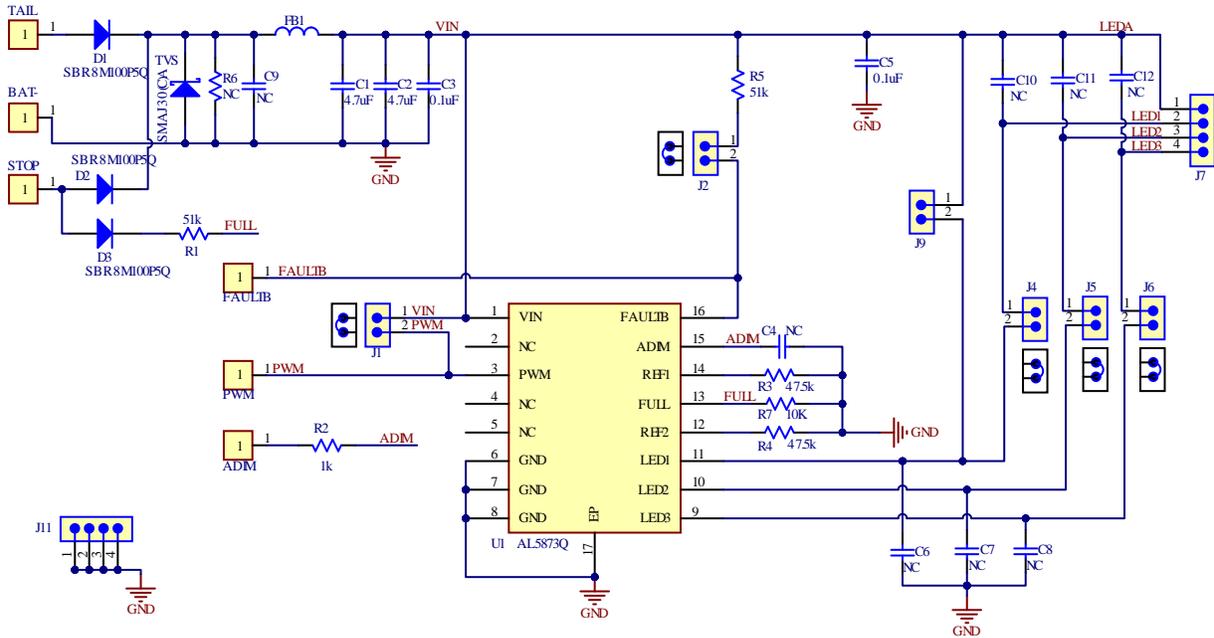


Figure 3. Evaluation Board Schematic

Evaluation Board Layout

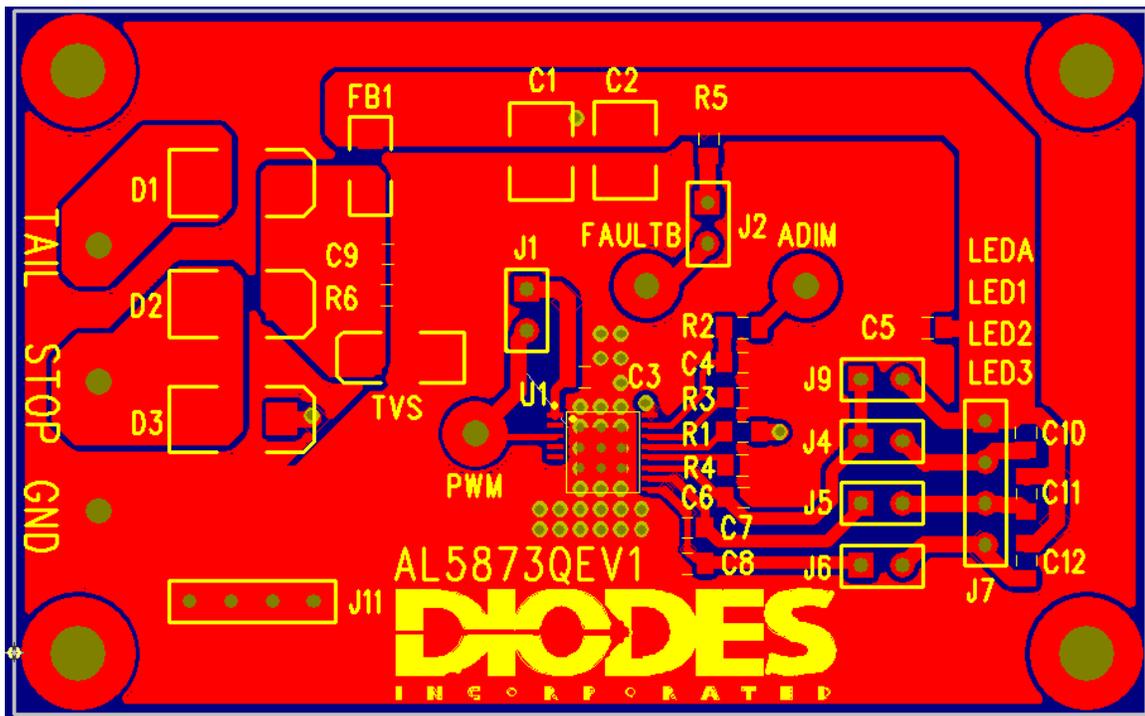


Figure 4. PCB Layout Top Layer View

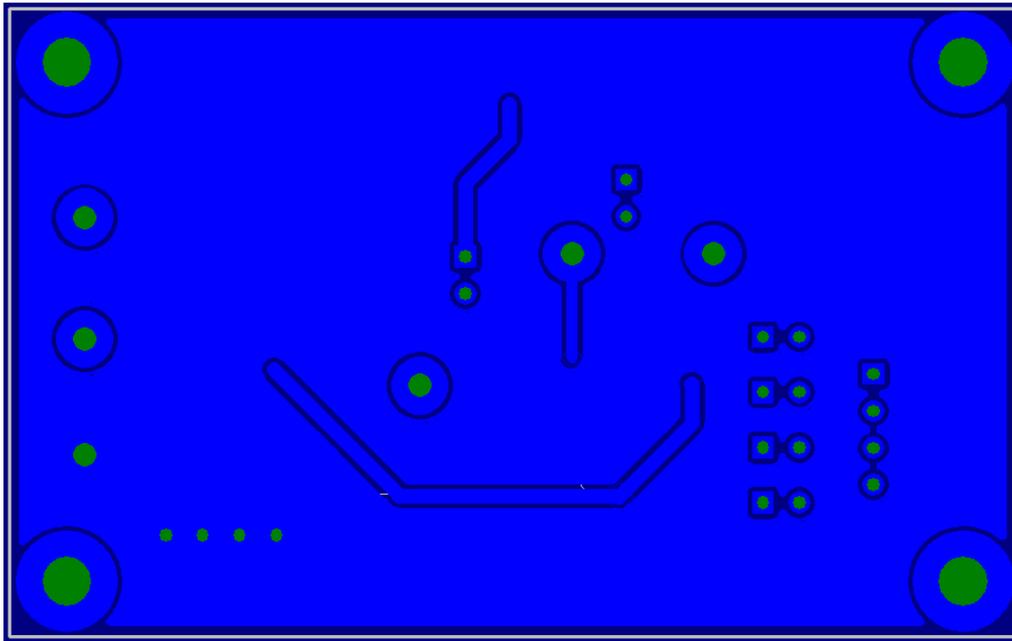


Figure 5. PCB Layout Bottom Layer View

Bill of Material

| Location | Description | Package |
|-------------------|---|------------|
| FB1 | Resistor, SMT, 0R, 1206, 5% | 1206 |
| R1 | Resistor, SMT, 10K,0805,1% | 0805 |
| R2 | Resistor, SMT, 1K,0805,1% | 0805 |
| R3,R4 | Resistor, SMT, 47.5K,0805,1% | 0805 |
| R5 | Resistor, SMT, 51K, 0805, 5% | 0805 |
| C1,C2 | Cap, Cer, GCJ32DC72A475KE01L, 4.7uF, 100V, X7S, 1210, -55°C~125°C, AEC-Q200, Murata | 1210 |
| C3 | Cap, Cer, CGA4J2X7R2A104K125AA, 100nF,100V,X7R, 0805,-55°C~125°C, AEC-Q200,TDK | 0805 |
| D1,D2,D3 | Diode,B260Q,SMB,60V,2A | SMB |
| TVS | SMAJ36(C)AQ | SMA |
| U1 | IC,AL5873Q, DIODES | TSSOP-16EP |
| TAIL,FAULTB | Connector, Orange color | DIP |
| GND | Connector, Black color | DIP |
| PWM,ADIM | Connector, White color | DIP |
| STOP | Connector, Red color | DIP |
| J1,J2,J4,J5,J6,J9 | Connector,2pin, pitch=2.54mm | DIP |
| J7,J11 | Connector,4pin, pitch=2.54mm | DIP |
| J4,J5,J6 | Jumper,2pin, pitch=2.54mm | DIP |

Operating Waveforms:

➤ **Turn On & Off**

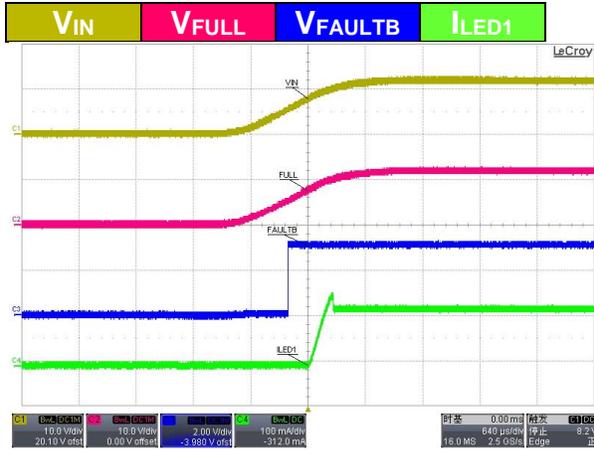


Figure 6. Turn on in STOP Mode

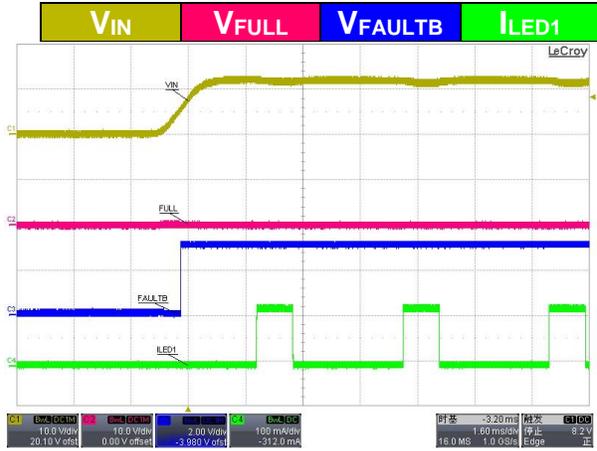


Figure 7. Turn on in TAIL Mode

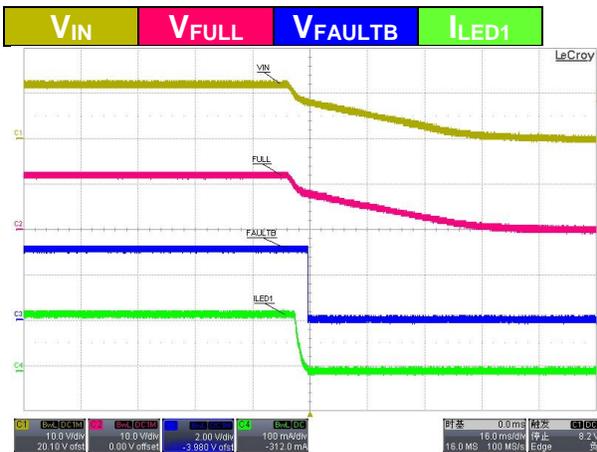


Figure 8. Turn off in STOP Mode

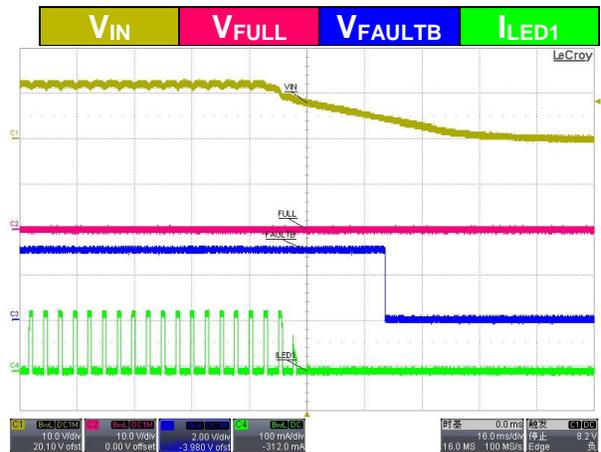


Figure 9. Turn off in TAIL Mode

➤ **Stable Operating**

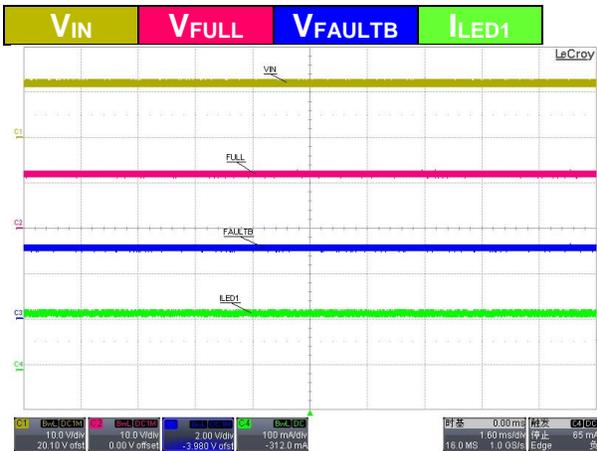


Figure 10. Stable waveform in STOP Mode

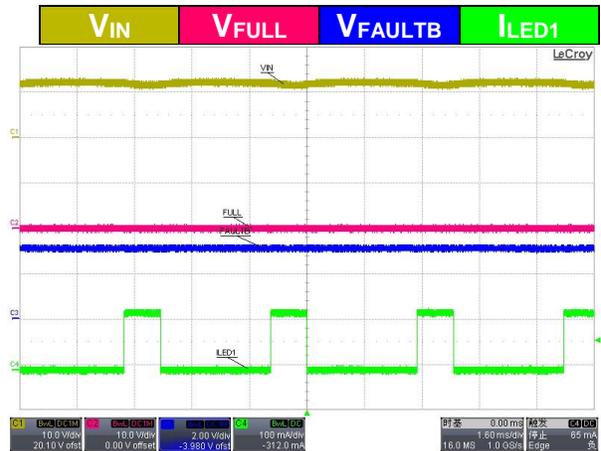


Figure 11. Stable waveform in TAIL Mode

➤ **PWM Dimming**

PWM dimming is only for STOP mode (FULL pin = high)

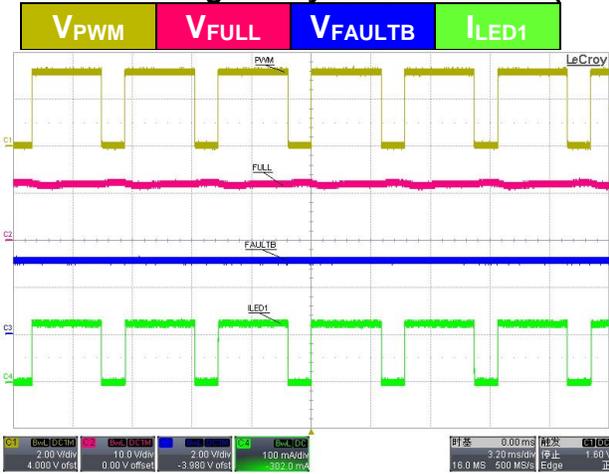


Figure 12. PWM Dimming in 200Hz 75% Duty

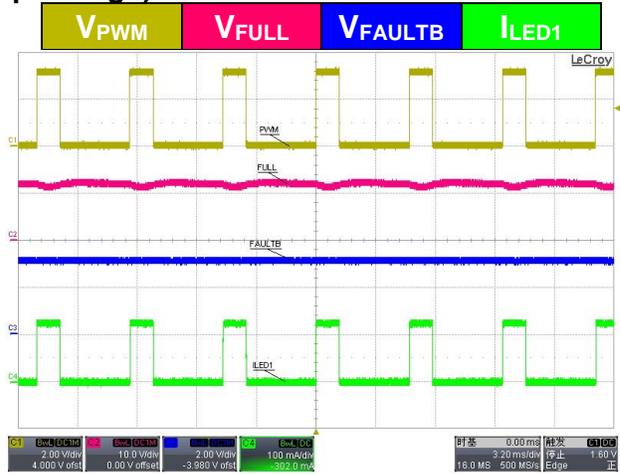


Figure 13. PWM Dimming in 200Hz 25% Duty

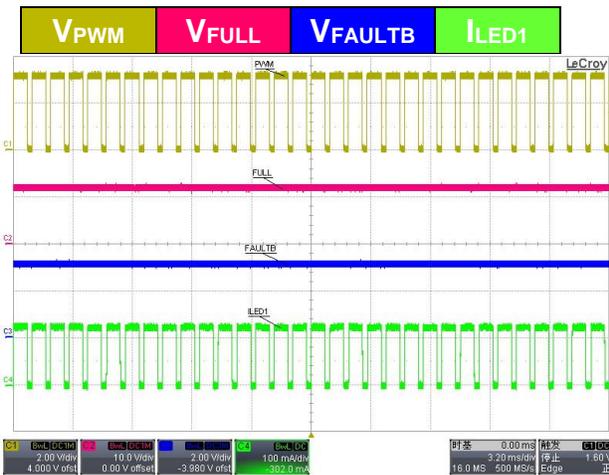


Figure 14. PWM Dimming in 1kHz 75% Duty

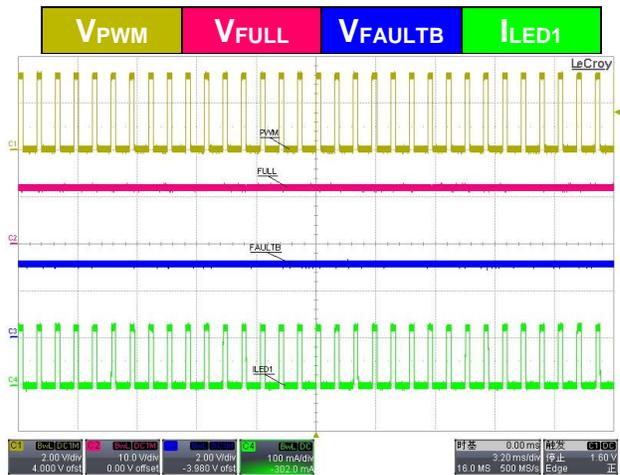


Figure 15. PWM Dimming in 1kHz 25% Duty

➤ **Analog Dimming**

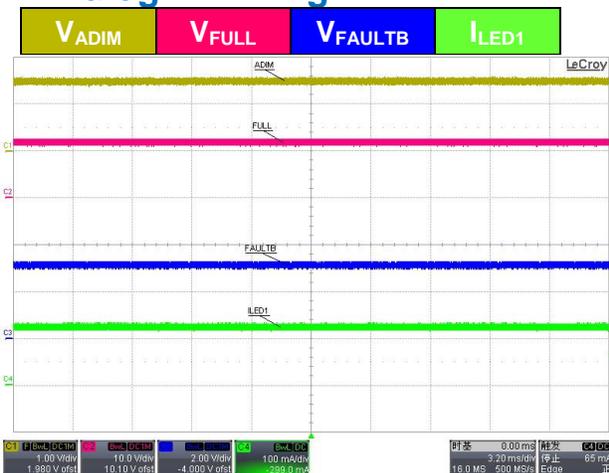


Figure 16. VADIM=1.5V in STOP Mode

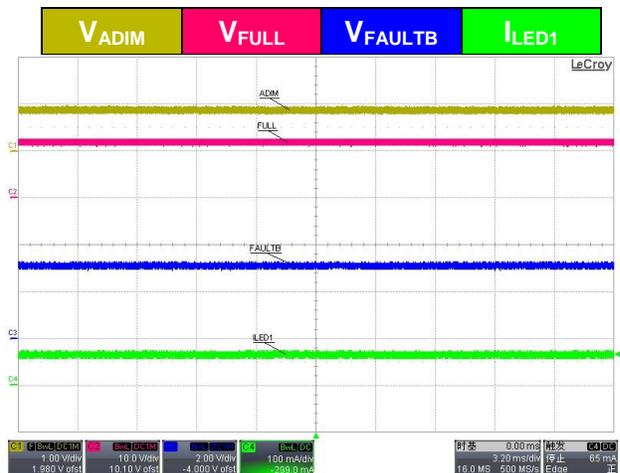


Figure 17. VADIM=0.9V in STOP Mode

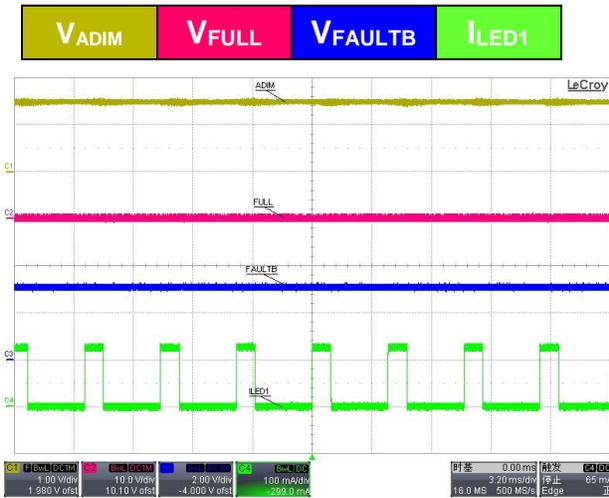


Figure 18. VADIM=1.5V in TAIL Mode

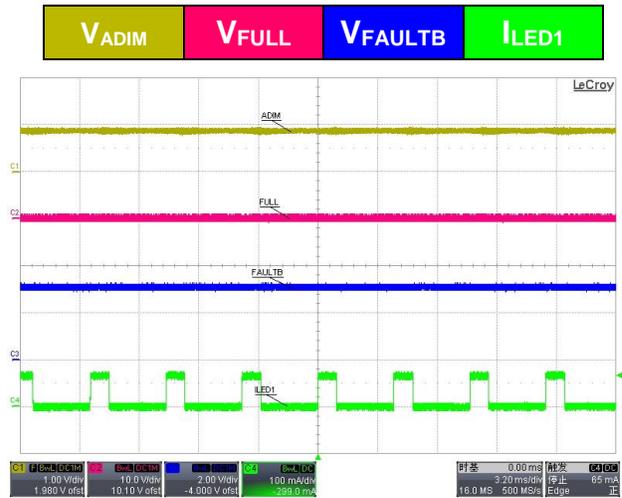


Figure 19. VADIM=0.9V in TAIL Mode

➤ **Dimming Curve**

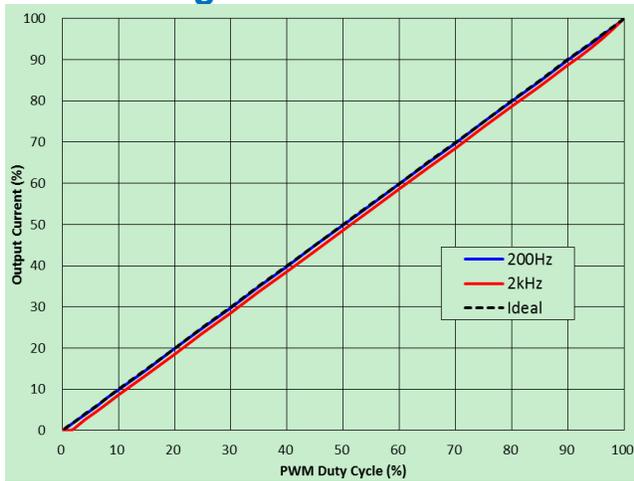


Figure 20. PWM Dimming Curve

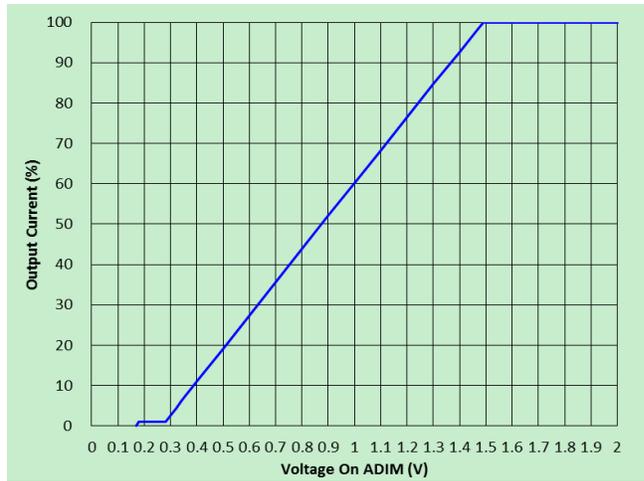


Figure 21. Analog Dimming Curve (Stop Mode)

BCI Test:

EVB can pass ISO11452-4 200mA BCI test without LED flicker and output current decrease.

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