

### General Description

The AL1783 is a three-channel linear LED driver with PWM dimming control designed to target for three-channel smart connected lighting applications. Each channel can drive up to 250mA with a total driving current up to 750mA. Each channel current of the AL1783 can be independently set by the corresponding reference resistor connected to the REFX pin.

The AL1783 regulates LED current from each channel, accurate to  $\pm 4\%$ , with excellent dimming performance. The AL1783 enters standby mode to save power if no PWM signal is detected.

The AL1783 monitors the temperature and reduces the LED current if the chip temperature exceeds the threshold temperature. And the input under voltage lock-out (UVLO), input over voltage protection, LED string open/short protection, and over temperature protection (OTP) are designed to improve system robustness. The FAULTB pin is pulled low if the protections happen.

The AL1783 is available in TSSOP-16EP package.

### Applications

- Architecture Lighting
- Industrial Lighting
- Wall Washer
- Ceiling Light
- Panel Light

### Key Features

- Wide Input Voltage Range from 6.5V to 60V
- PWM Dimming Control for Each Channel
- Output Current Adjustable by an External Reference Resistor for Each Channel
- Automatic Enter and Exit Standby Mode without Enable Pin
- PWM Dimming Capable
- Internal Protections: Input Under Voltage Lock-out (UVLO), Input Over Voltage Protection, LED String Open/Short Protection
- Over Temperature Protection (OTP): Thermal Fold-back, Thermal Shut-down and Automatically Thermal Recovery
- Fault Reporting: UVLO, OTP, LED Open, and LED Short

### AL1783EV1 Specifications

| Parameter      | Value                        |
|----------------|------------------------------|
| Input Voltage  | 6.5~60Vdc                    |
| LED Current    | 250mA/Channel,<br>3 Channels |
| Number of LEDs | 1~17pcs                      |
| XYZ Dimension  | 32mm x 32mm x 12mm           |



Figure 1: Top View

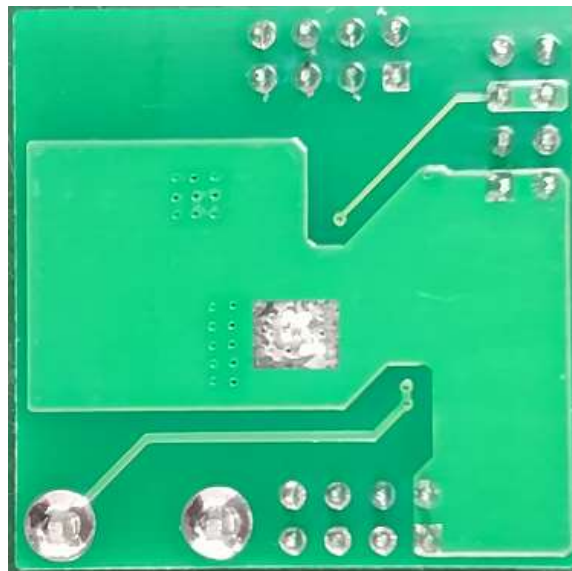


Figure 2: Bottom View

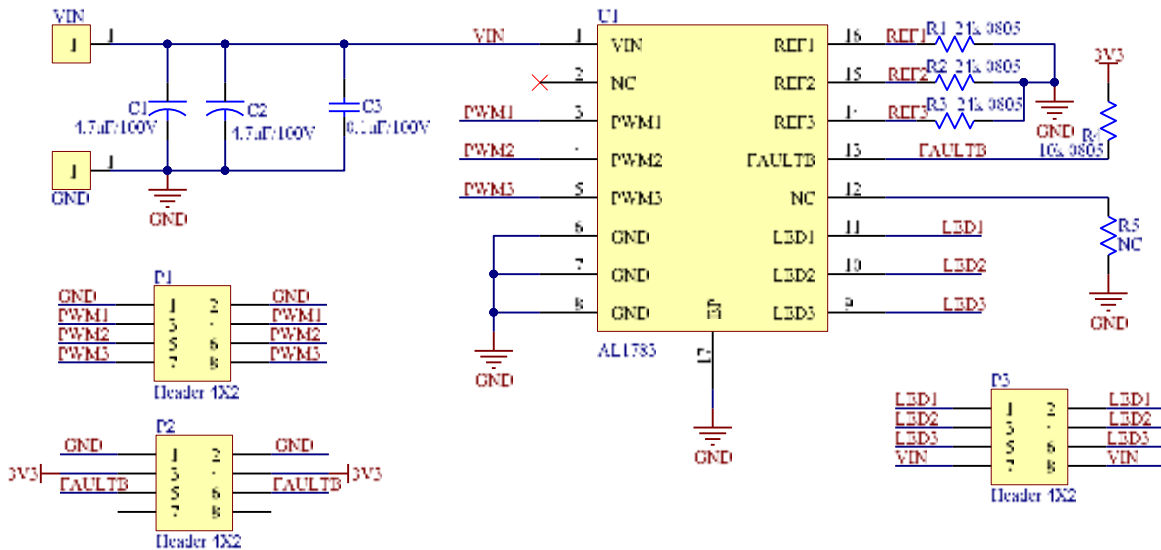
### Connection Instructions

Power Supply Input: 6.5~60VDC (VIN, GND)

External LED connection: VIN pin of connector P3 is for LED string anodes, and LED1~LED3 of connector P3 are for LED string cathodes

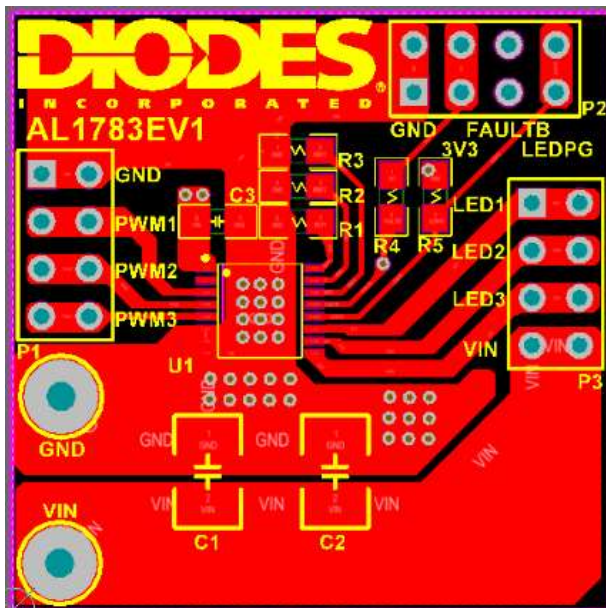
PWM dimming signal input: PWM1~PWM3 of connector P1 are for PWM signal inputs for LED strings corresponding to LED1~LED3

**Evaluation Board Schematic**

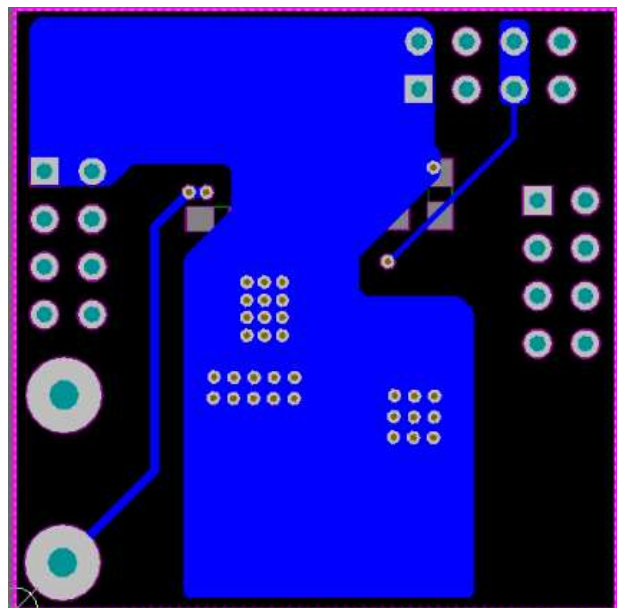


**Figure 4: Evaluation Board Schematic**

**Evaluation Board Layout**



**Figure 5: PCB Board Layout Top View**



**Figure 6: PCB Board Layout Bottom View**

### Quick Start Guide

1. Ensure that the DC source for VIN is switched OFF or disconnected, and the PWM signal generator is also switched OFF or not connected.
2. Connect the anode wires of external LED strings to VIN pin of connector P3 of the evaluation board.
3. Connect the cathode wires of external LED strings to LED1~LED3 of connector P3 of the evaluation board.
4. Connect two DC line wires to the VIN and GND terminals on the evaluation board.
5. Connect the PWM signals to the PWM1~PWM3 of connector P1 and set the frequency, amplitude and duty cycle of the PWM signal.
6. Turn on the main switch and the PWM signal. LED strings should light up.

### Bill of Material

| Item      | Description                         | Package    |
|-----------|-------------------------------------|------------|
| U1        | AL1783T16E-13, Diodes Inc.          | TSSOP-16EP |
| C1, C2    | Ceramic Cap,4.7uF/100V, X7R         | 1210       |
| C3        | Ceramic Cap,0.1uF/100V, X7R, murata | 0805       |
| R1,R2, R3 | SMD Resistor, 24K, 1%, 1/8W         | 0805       |
| R4        | SMD Resistor, 10K, 5%, 1/8W         | 0805       |
| R5        | NC                                  | 0805       |

### LED Current Setting

The AL1783 is designed to have individual channel current set by its corresponding current setting RSET resistor. The LED channel current level is expressed as below:

$$I_{LED1} = 4000 \times \frac{VREF}{RSET1}$$

$$I_{LED2} = 4000 \times \frac{VREF}{RSET2}$$

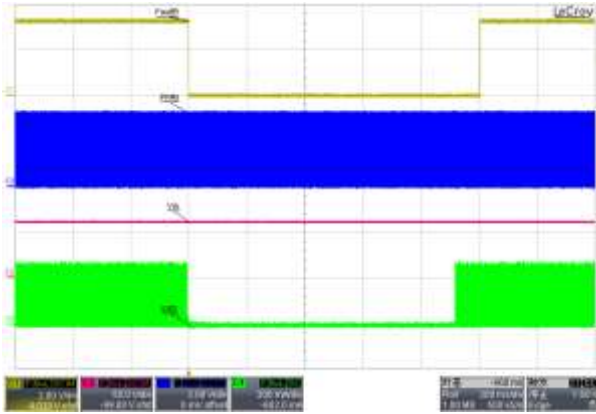
$$I_{LED3} = 4000 \times \frac{VREF}{RSET3}$$

Where VREF=1.5V nominally for all devices channels

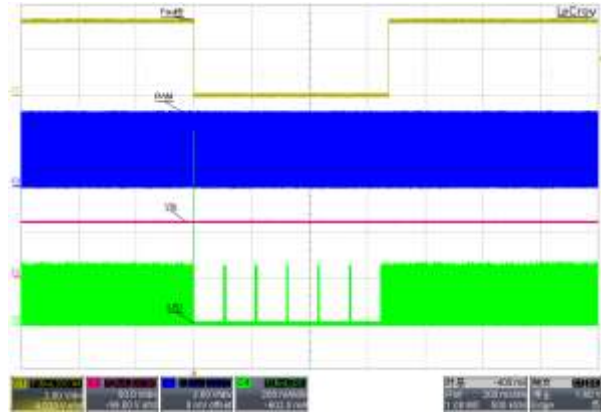
For example, when an RSET of 24KΩ is used, each channel of AL1783 provides the same output current of 250mA.

**Functional Performance**

**Fault Report**

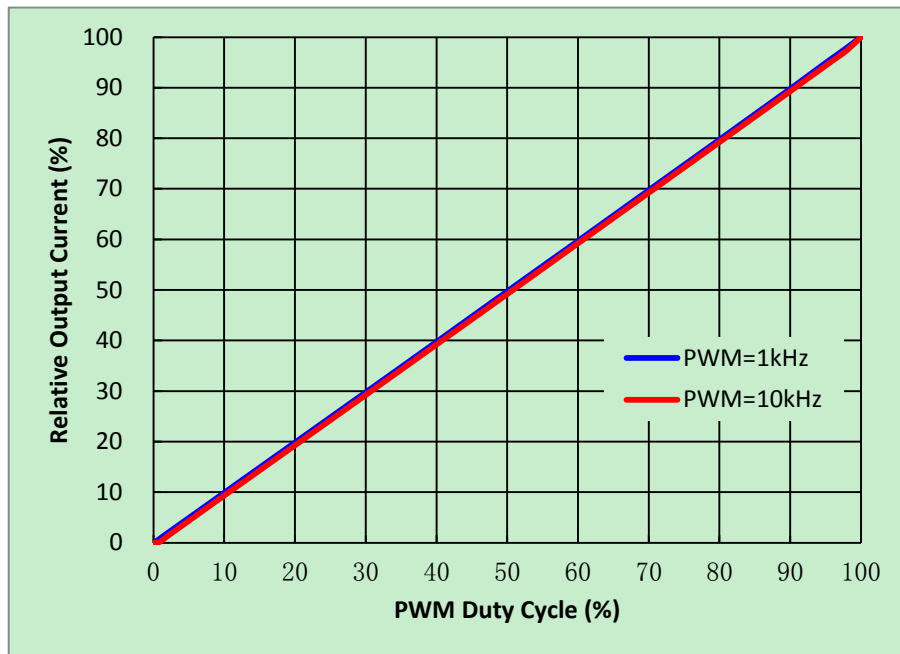


**LED open**



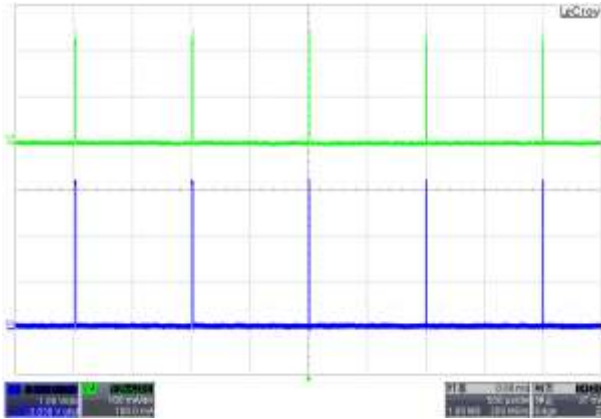
**LED Short**

**Dimming curve**

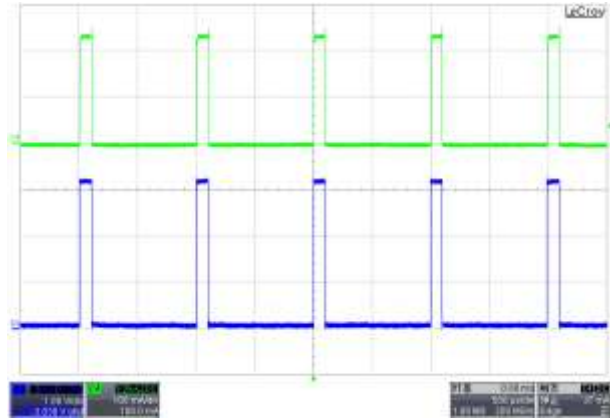


**Dimming Waveform**

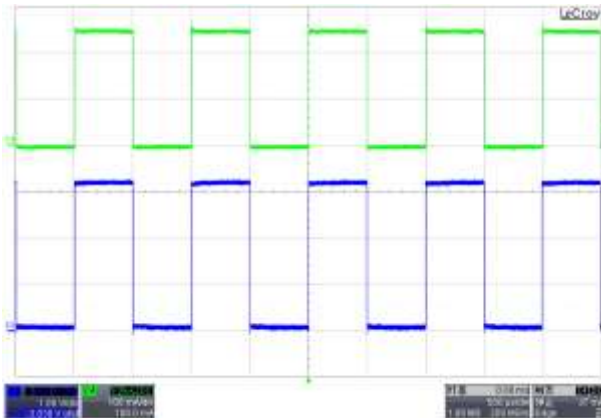
|             |              |
|-------------|--------------|
| <b>PWM1</b> | <b>ILED1</b> |
|-------------|--------------|



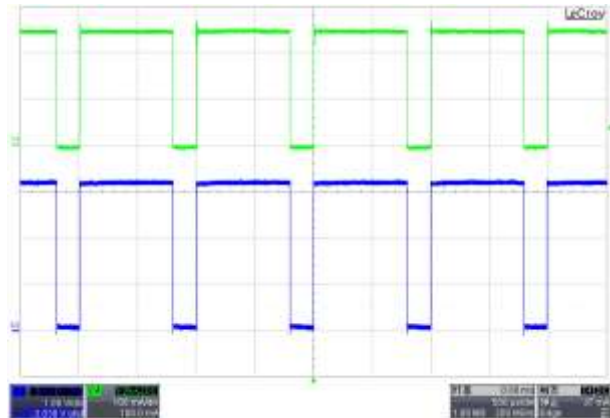
**3channels PWM duty=1% 1kHz**



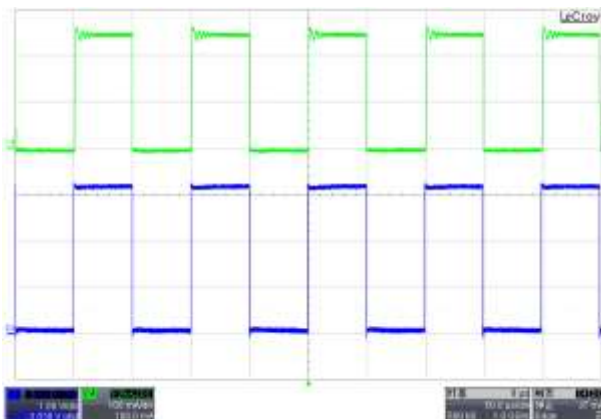
**3channels PWM duty=10% 1kHz**



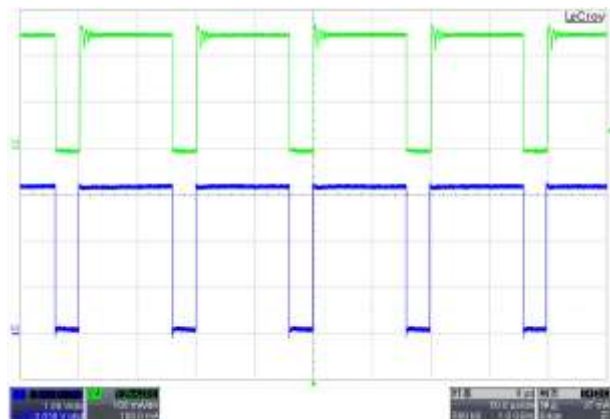
**3channels PWM duty=50% 1kHz**



**3channels PWM duty=80% 1kHz**



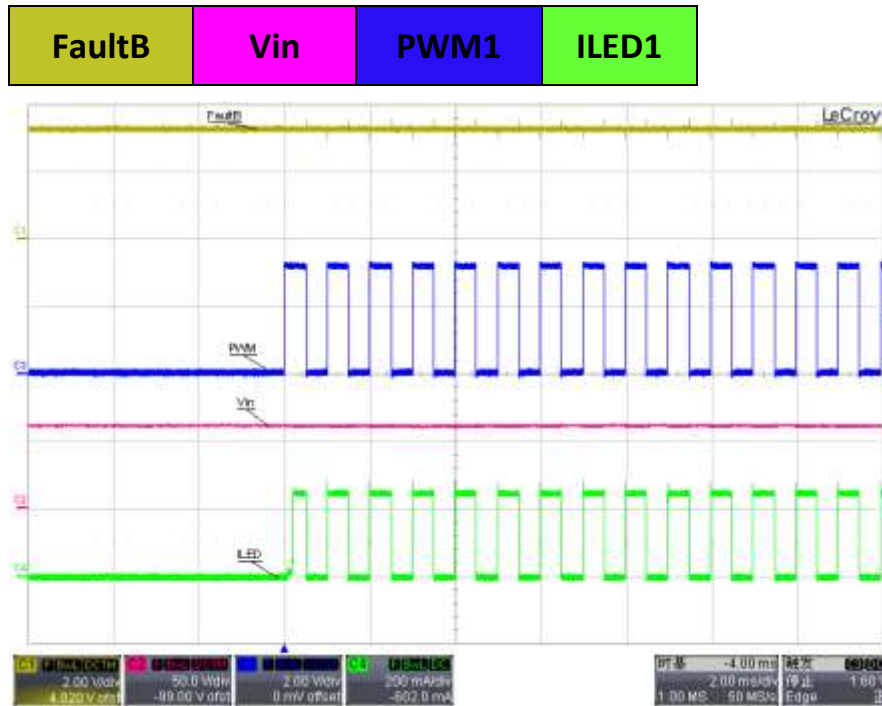
**3channels PWM duty=50% 10kHz**



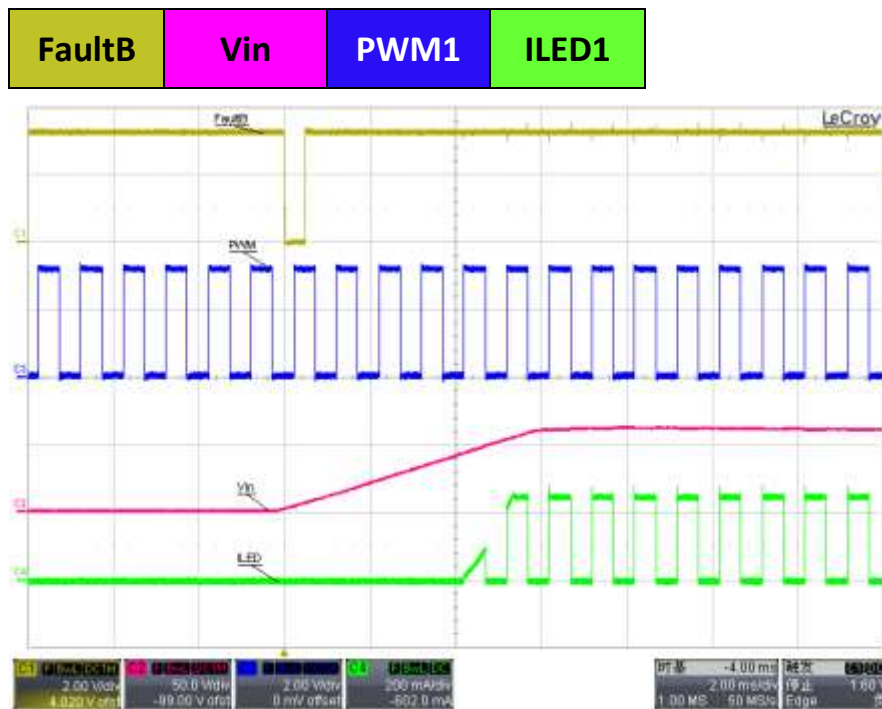
**3channels PWM duty=80% 10kHz**

Startup sequence

PWM Startup (VIN powered first)



VIN Startup (PWM powered first)



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