# Series AMLD-Z

## Up to 1000mA | LED Driver


### FEATURES:

- Step Down DC/DC LED driver
- Constant current output
- Ultra Wide (8:1) input voltage range
- High efficiency up to 97%
- Operating Temperature range -40ºC to +85ºC
- Open and Short LED Protection
- PWM/Digital and Analog Voltage dimming
- Built with MLCC Capacitors only

## Models
## Single output

| Model | Input Voltage (V) | Output Voltage (V) | Output Current (mA) | Efficiency (%) | Ripple & Noise (mV p-p) |
|---|---|---|---|---|---|
| AMLD-6015Z | 7-60 | 2-57 | 150 | 97 | 150 |
| AMLD-6025Z | 7-60 | 2-57 | 250 | 97 | 200 |
| AMLD-6030Z | 7-60 | 2-57 | 300 | 97 | 250 |
| AMLD-6035Z | 7-60 | 2-57 | 350 | 97 | 300 |
| AMLD-6050Z | 7-60 | 2-57 | 500 | 97 | 400 |
| AMLD-6070Z | 7-60 | 2-57 | 700 | 97 | 500 |
| AMLD-60100Z | 7-60 | 2-48 | 1000 | 97 | 800 |

NOTE: All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified.

## Input Specifications

| Parameters | Nominal | Typical | Maximum | Units |
|---|---|---|---|---|
| Voltage range | | 7-60 | | VDC |
| Filter | | Capacitor | | |
| Absolute Maximum Rating | | | 65 | VDC |
| Peak Input Voltage time | | | 500 | ms |
| DC/DC ON (Leave open if not used) | | ON –Open or 0.3V<Vadj<1.25 | | |
| DC/DC OFF | | OFF(shutdown) – Vadj<0.15 | | |
| Maximum Remote pin drive current | Vadj = 1.25V | | 1 | mA |
| Quiescent Current in Shutdown mode | Vin = 60V, Vadj <0.15 | | 0.1 | mA |
| On/Off Control (Digital Control) | | Max PWM Frequency 1KHz | | |
| Output current adjustment | PWM Frequency <300Hz | 0.1 to 100 | | % |
| Minimum Switch ON/OFF time | | 200 | | ns |
| On/Off Control (Analog Dimming Control) (Leave open if not used) | Input voltage range | 0.3-1.25 | | VDC |
| Output current adjustment* | Vin-Vout<30 | 25-100 | | % |
| Control Voltage Range limits | | ON – 0.2 – 0.3V (Vadj rise) | | |
| | | OFF – 0.15-0.25V (Vadj fall) | | |
| Maximum Analog pin drive current | Vadj = 1.25V | | 1 | mA |

**NOTE:** Vin –Vout must be less than 30V to maintain current adjustment range

## Output Specifications

| Parameters | Conditions | Typical | Maximum | Units |
|---|---|---|---|---|
| Current accuracy | | ±7 | | % |
| Output Voltage range | V input = 60V | 2-57 | | VDC |
| Output current | Vin – Vout > 3V | | | |
| Short Circuit protection | Regulated at the rated current for each model | | | |
| Output no load Protection | Continuously | | | |
| Max load capacitance | | | 47 | µF |
| Temperature coefficient | Ta = -40 to +85°C | ±0.03 | | %/°C |
| Ripple & Noise | 20MHz Bandwidth | See model table | | |

## General Specifications

| Parameters | Conditions | Typical | Maximum | Units |
|---|---|---|---|---|
| Switching frequency | 100% load | 20 - 500 | | KHz |
| Operating temperature | -40 to +85 | | | °C |
| Storage temperature | -40 to +150 | | | °C |
| Derating | See derating curve | | | |
| Maximum case temperature | | | 110 | °C |
| Thermal Impedance | Free air convection | +30 | | °C/W |
| Cooling | Free air convection | | | |
| Humidity | | | 95 | % RH |
| Case material | Non-Conductive Black Plastic (UL94-V0 rated) | | | |
| Weight | 12.5 | | | g |
| Dimensions (L x W x H) | 1.25 x 0.80 x 0.49 inches | 31.75 x 20.32 x 12.45 mm | | |
| MTBF | > 950 000hrs (MIL-HDBK-217 F at +25 °C) | | | |
| Maximum Soldering Temperature | 1.5mm from case for 10sec. | | 260 | °C |

NOTES:
1. Reversed polarity at the input power will damage the driver. The input ground must not be connected to the negative output.
2. Leave the pin VADJ opened if not used, grounding VADJ will shut the driver off, connecting VADJ to +Vin will damage the driver.
3. Maximum output open voltage is equal to input voltage.

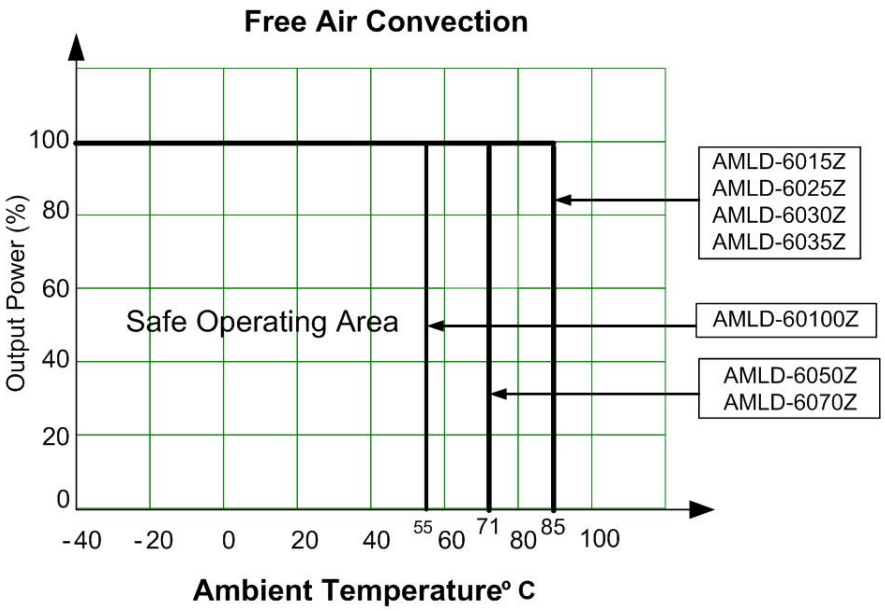
## Safety Specifications

| Parameters | |
|---|---|
| Agency approvals | CE |
| Standards | EN 55015 (CISPR22)<br>EN 61547<br>IEC 61000-4-2 (Perf. Criteria A)<br>IEC 61000-4-3 (Perf. Criteria A)<br>IEC 61000-4-4 (Perf. Criteria A)<br>IEC 61000-4-5 (Perf. Criteria A)<br>IEC 61000-4-6 (Perf. Criteria A)<br>IEC 61000-4-8 (Perf. Criteria A) |

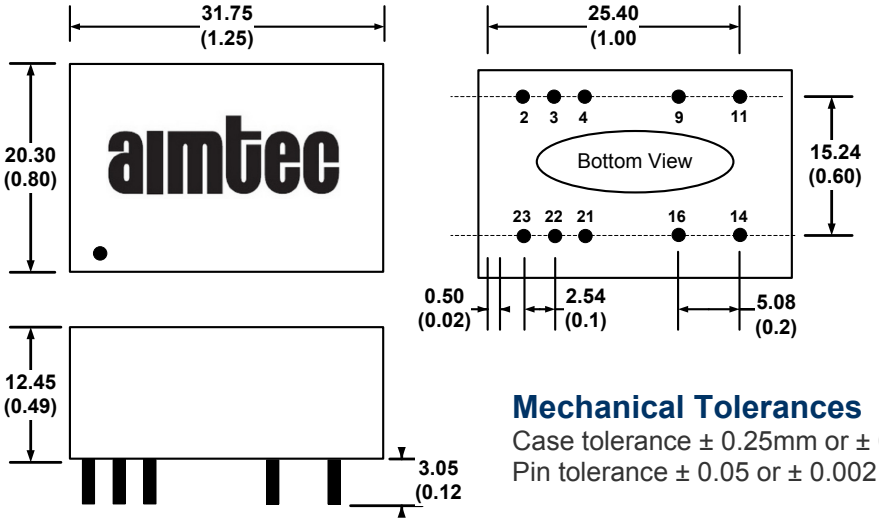
## Pin Out Specifications

| Pin | Single | |
|---|---|---|
| 2 | - V Input | - DC Supply |
| 3 | - V Input | - DC Supply |
| 4 | Vadj | PWM/ON/OFF or not used |
| 9 | - V Output | LED Cathode connection |
| 11 | - V Output | LED Cathode connection |
| 14 | + V Output | LED Anode connection |
| 16 | + V Output | LED Anode connection |
| 22 | + V Input | + DC Supply |
| 23 | + V Input | + DC Supply |

## Derating



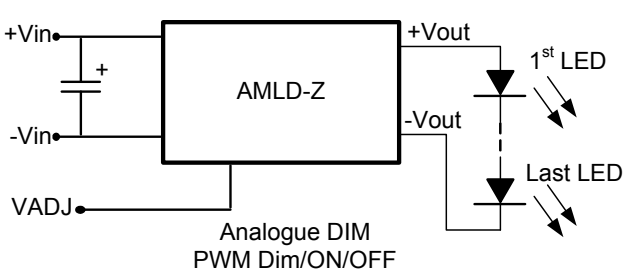

## Dimensions

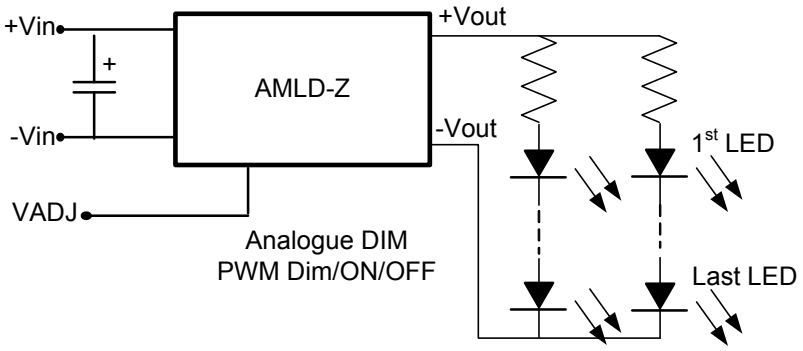



### Mechanical Tolerances

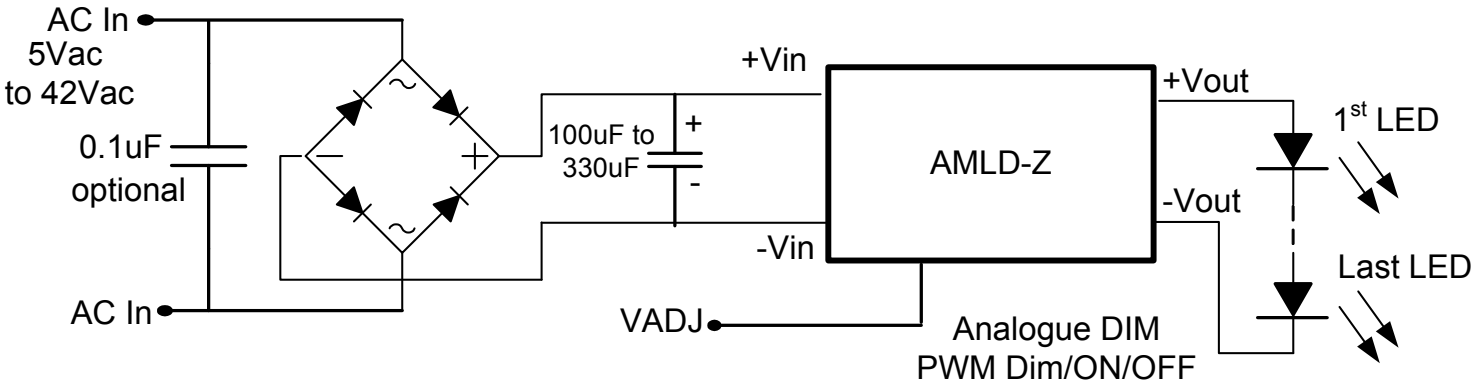
Case tolerance ± 0.25mm or ± 0.01 inches
Pin tolerance ± 0.05 or ± 0.002

## Application circuit examples:



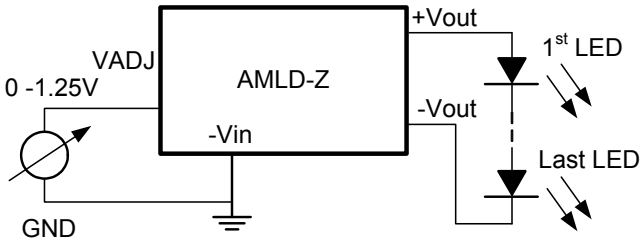



## Application circuit examples (continued):



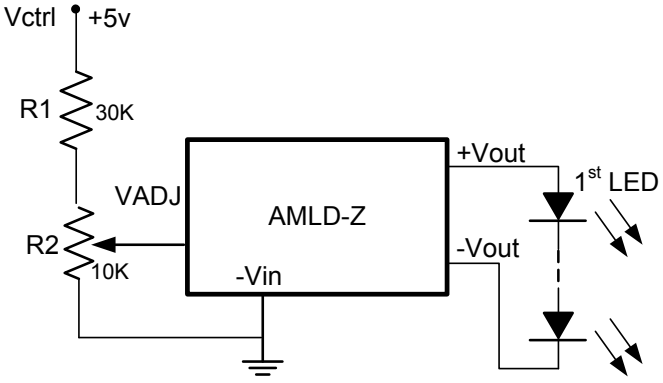

## Output Current Adjustment by External DC Control Voltage (VCTRL):

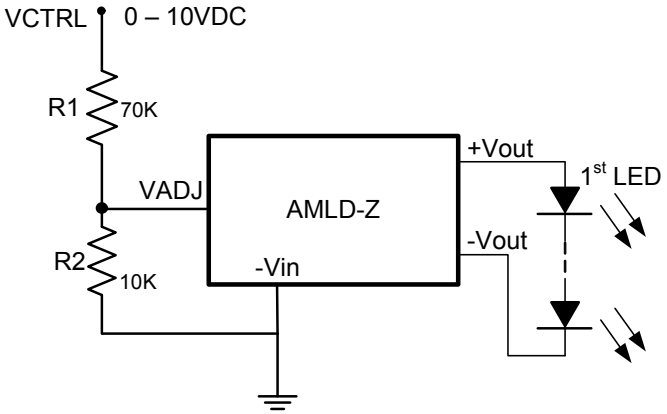
**VCTRL= VADJ (If VCTRL=0-1.25Vdc)**




$$VADJ = \left[\frac{R2}{R1 + R2}\right] X\ VCTRL$$

**(If VCTRL> 1.25Vdc)**

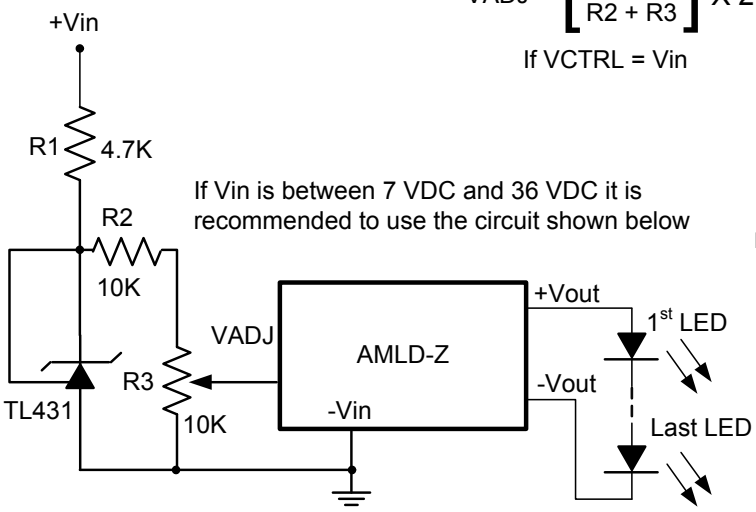


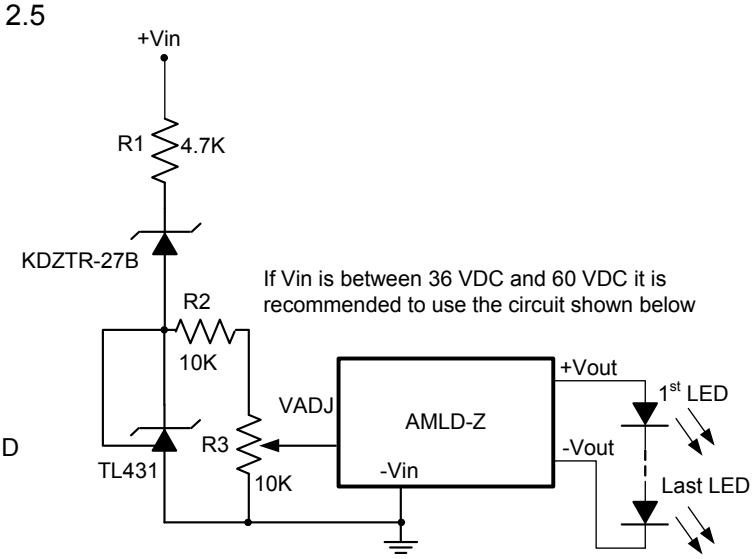



## Output Current Adjustment by External DC Control Voltage (VCTRL) (continued):

$$VADJ = \left[\frac{R3}{R2 + R3}\right] X\ 2.5$$

If VCTRL = Vin




## Resistive Dimming Control

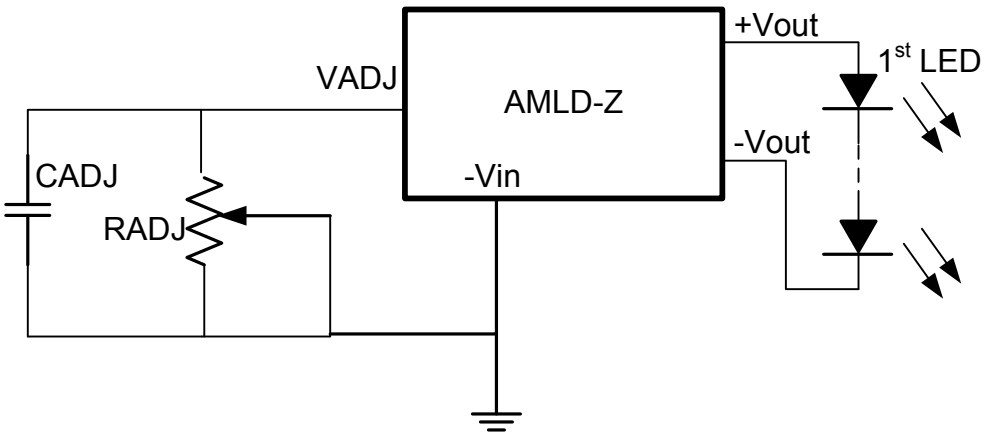
A simplified dimming control can be achieved using a variable resistor connected between VADJ and GND. Capacitor CADJ is optional, it is installed to limit AC mains interference and high frequency noise. The recommended value of CADJ is 0.22µF.

NOTE: Typical error is ±10% with resistive dimming control

The output current is given by:

$$Ioutnom \approx \frac{Iout \times Radj}{(Radj + 50K)}$$

If RADJ is between 0 and 2M ohm, the maximum adjustment range of Iout is 25% to 90% (for Vin – Vout < 20V)

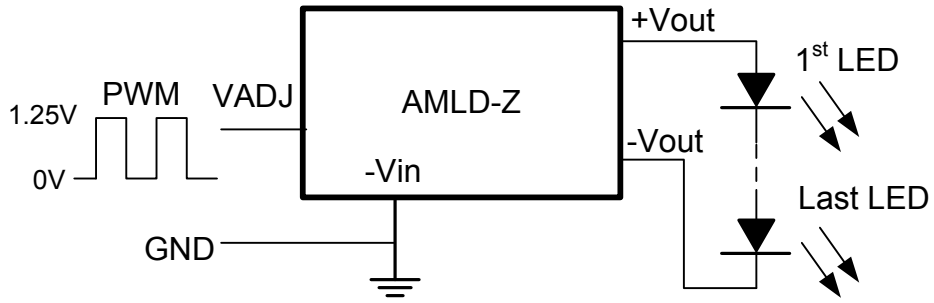


## Output Current Adjustment by PWM Control: Driving VADJ Directly

A Pulse Width Modulation (PWM) signal with a duty cycle DPWM can be applied to the ADJ pin as shown below.

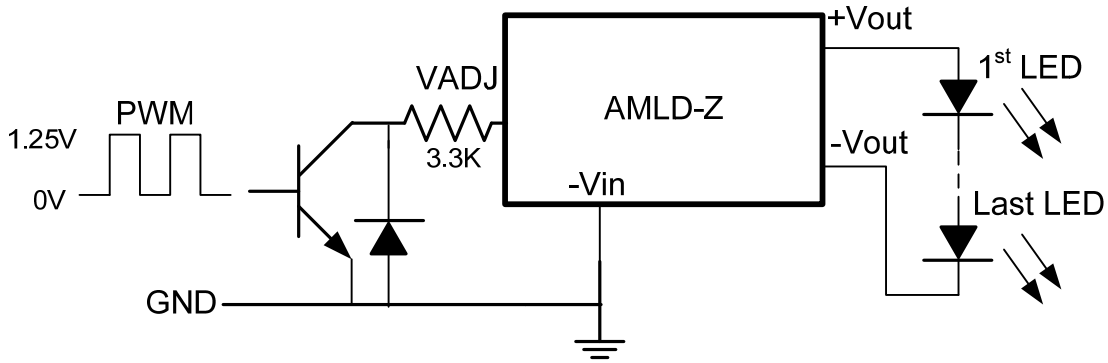
The output current is given by:

$$I_{out} \approx I_{outnom} \times DPWM \quad \text{[if PWM frequency < 300Hz, for 0.1<DPWM<1]}$$



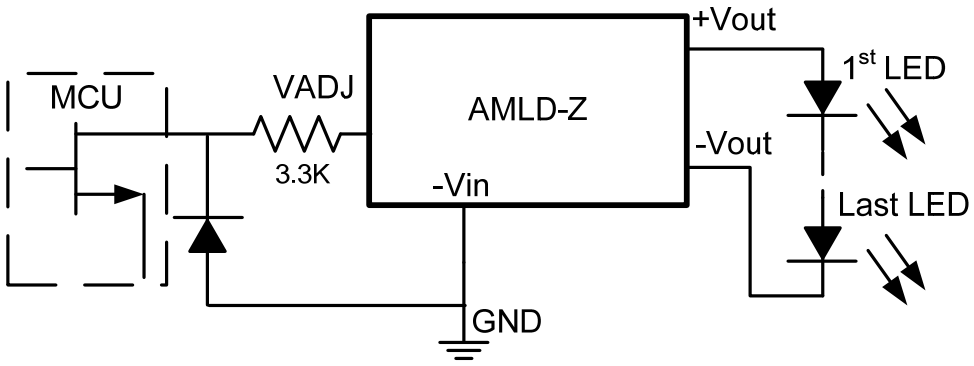

## Driving VADJ Via Open Collector Transistor

The VADJ can also be driven via an open collector transistor as shown below.
The diode and resistor serve to suppress any possible high amplitude negative voltage spikes to the VADJ input resulting from the collector to emitter capacitance of the transistor. Any negative voltage spikes will cause errors in output current and/or unstable driver operation.



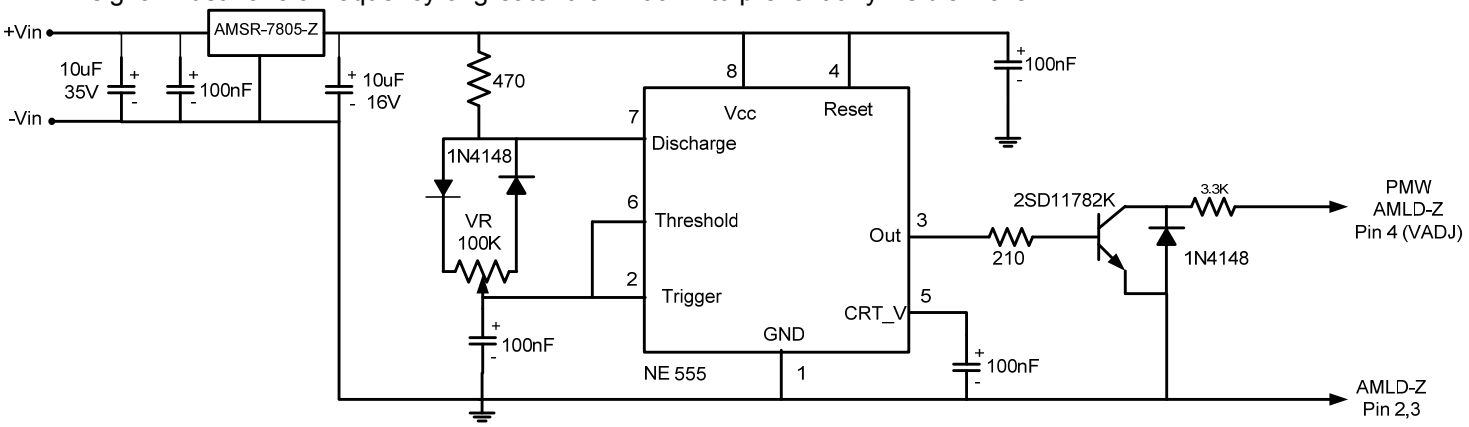
## Driving the VADJ from a Microcontroller

The VADJ can be driven from an open drain output of a microcontroller as shown below. The diode and resistor serve to suppress any possible high amplitude negative voltage spikes to the VADJ input resulting from the drain to source capacitance of the FET. Any negative voltage spikes will cause errors in output current and/or unstable driver operation.

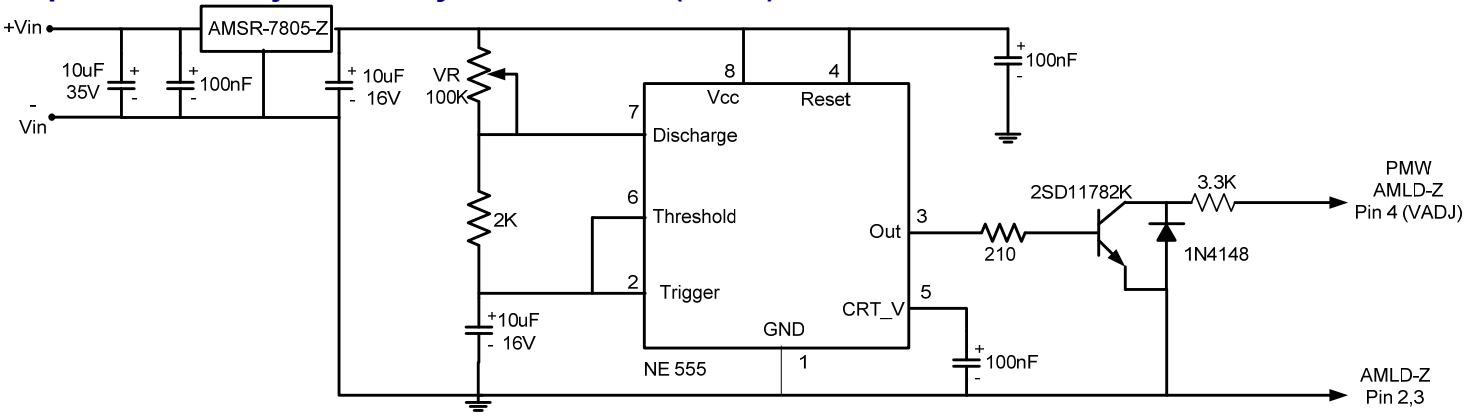



## Output Current Adjustment by PWM Control (Dimming):

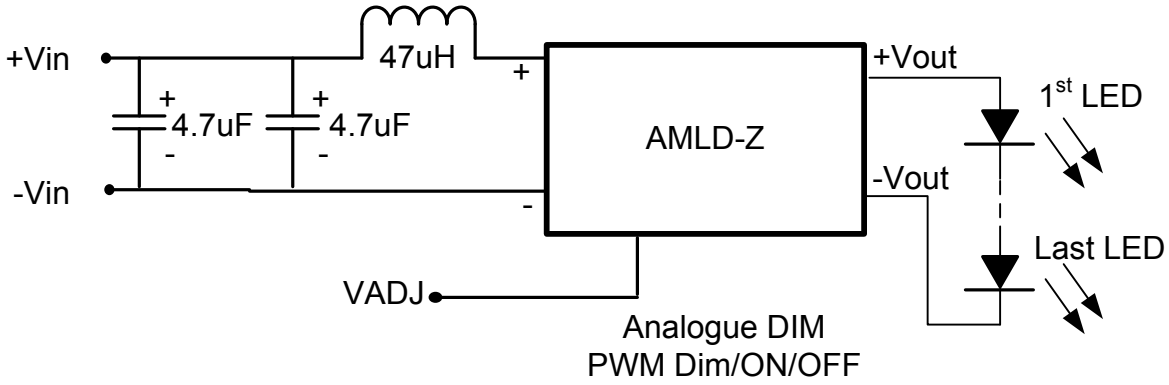
A PWM signal must have a frequency of greater than 100Hz to prevent any visible flicker.




## Output Current Adjustment by PWM Control (Flash):



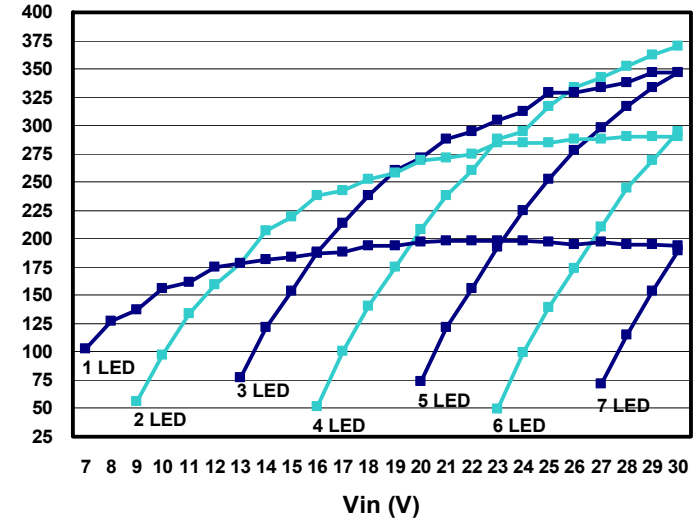
## Recommended Class B EMI Filter:



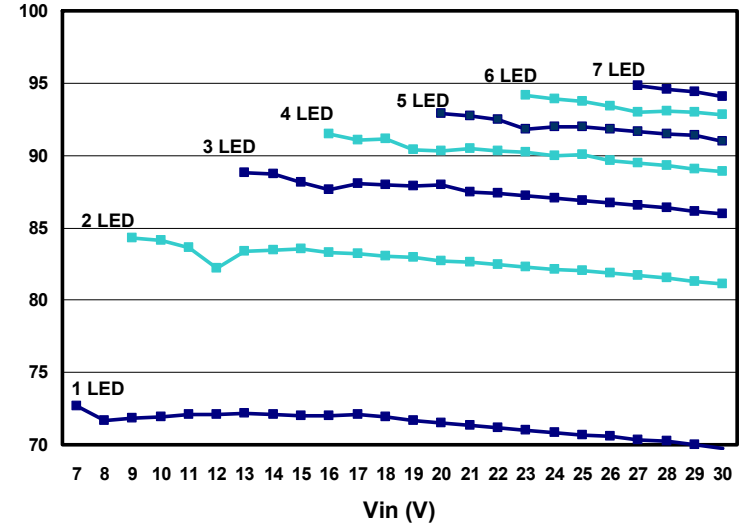

## Typical Characteristics:

### AMLD-6030Z

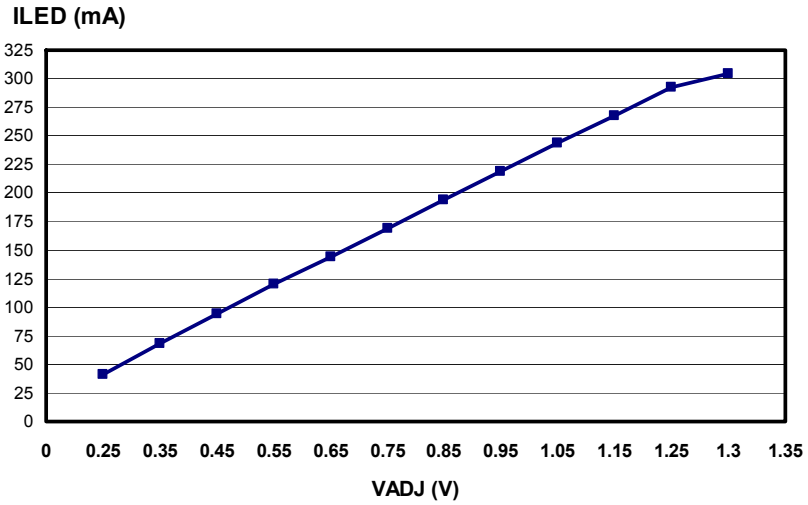
**Operating Frequency vs Input Voltage (Forward Voltage = 3.5V per LED)**



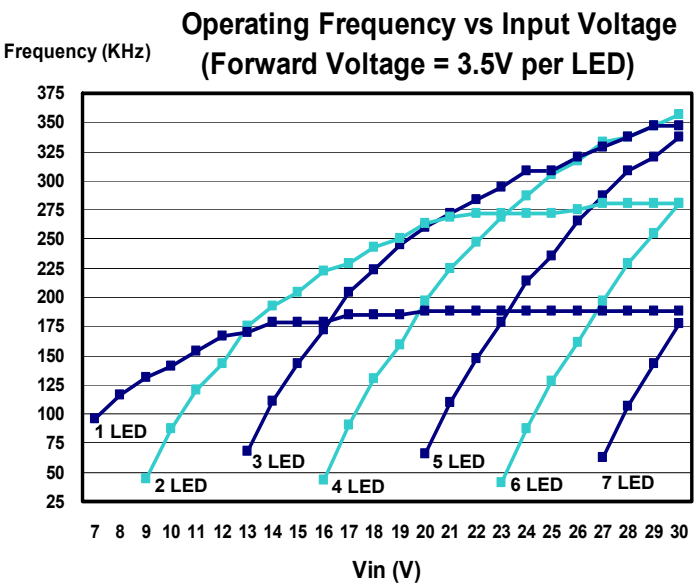

**Efficiency vs Vin ( Forward Voltage = 3.5V per LED)**

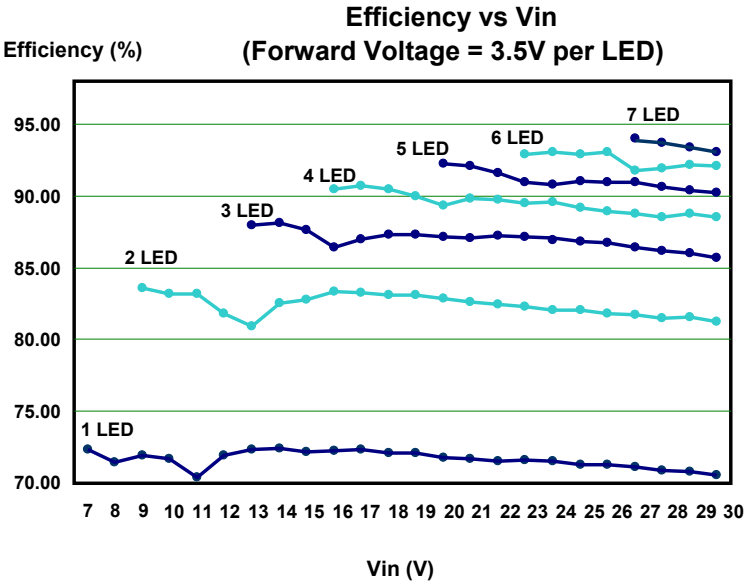


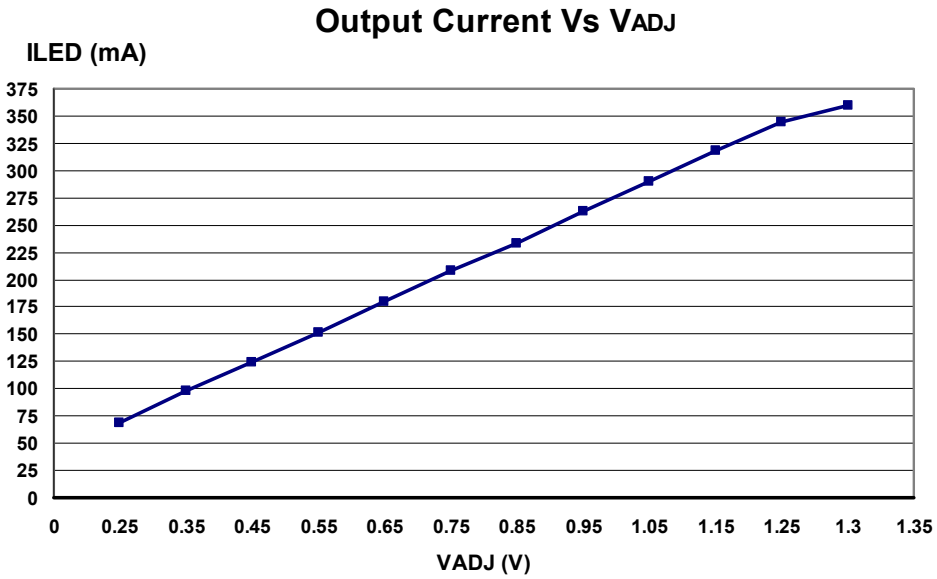

**Output Current Vs $V_{ADJ}$**



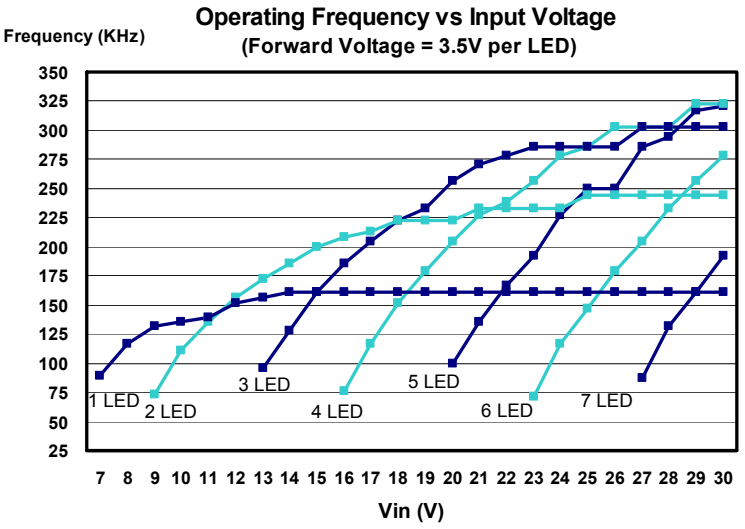
## Typical Characteristics: AMLD-6035Z

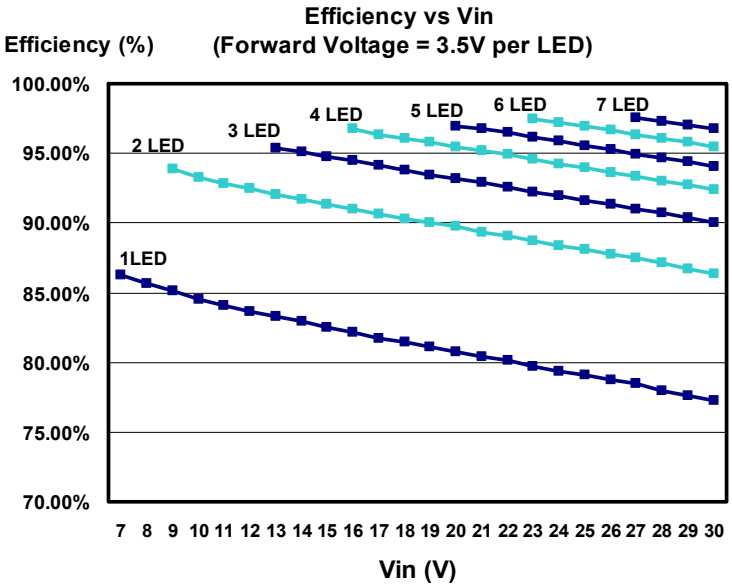


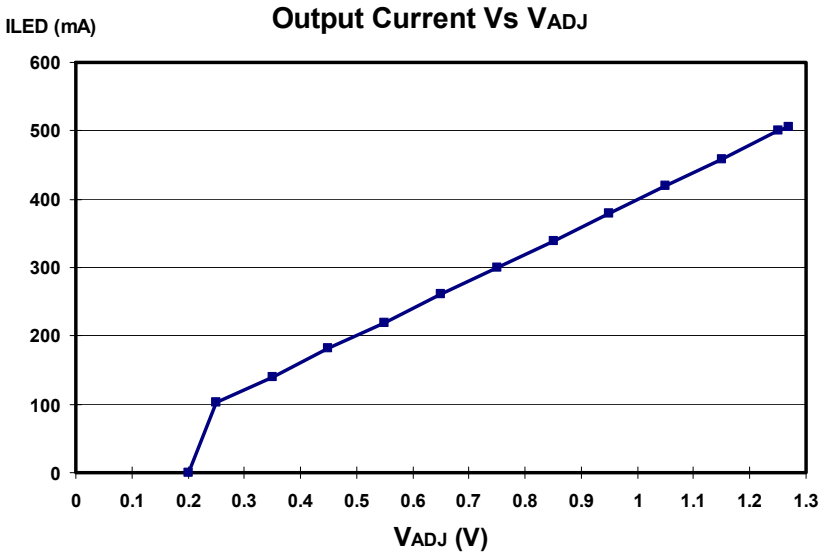



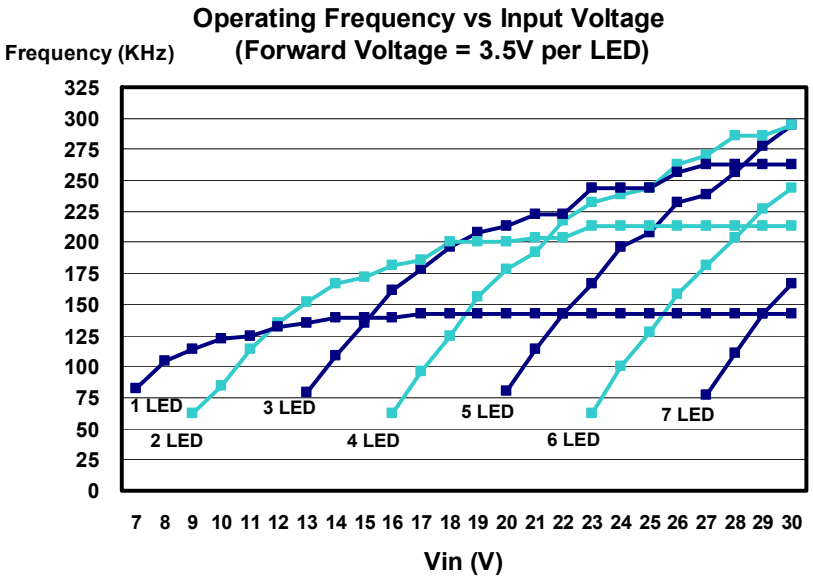
## Typical Characteristics: AMLD-6050Z

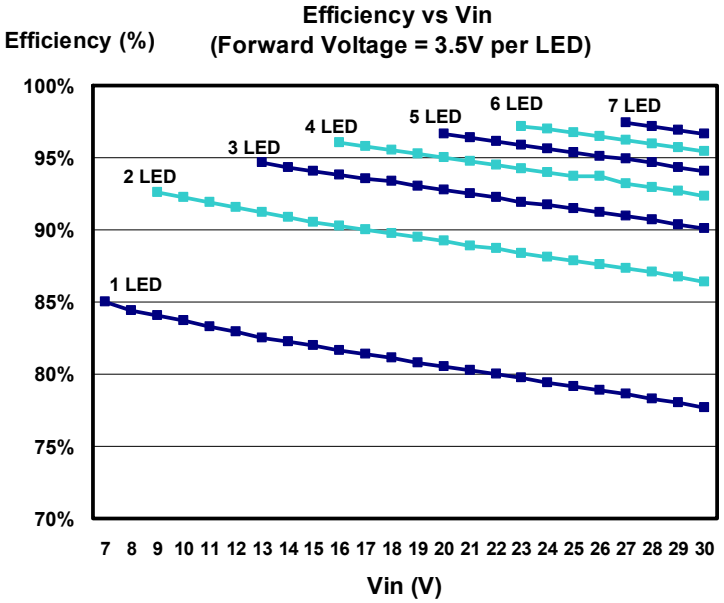


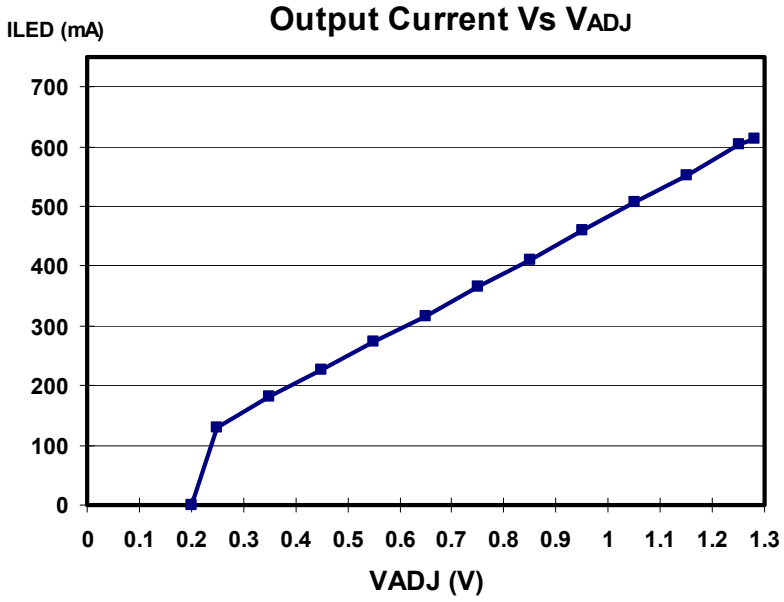



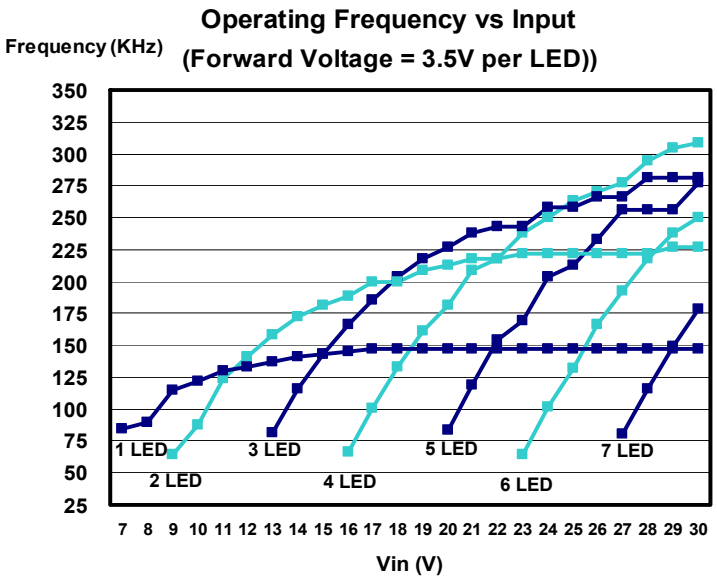
## Typical Characteristics: AMLD-6060Z

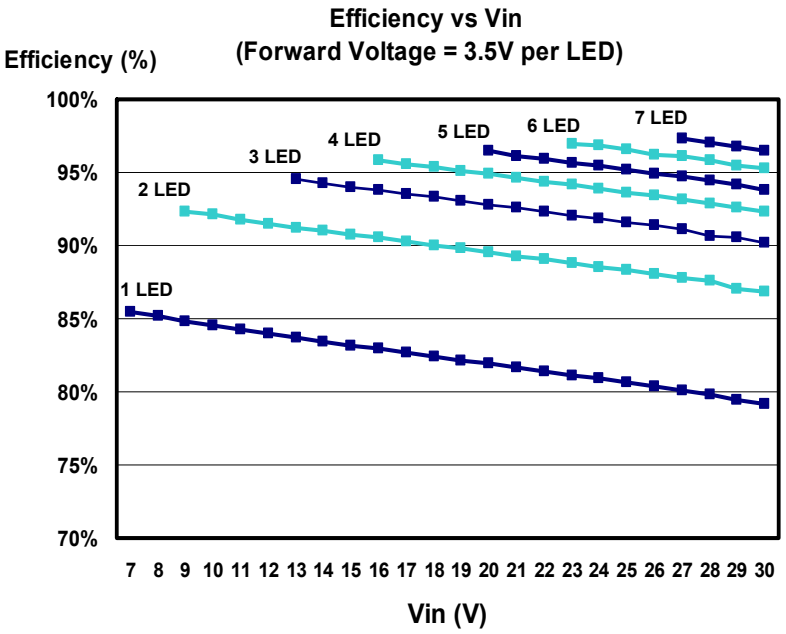


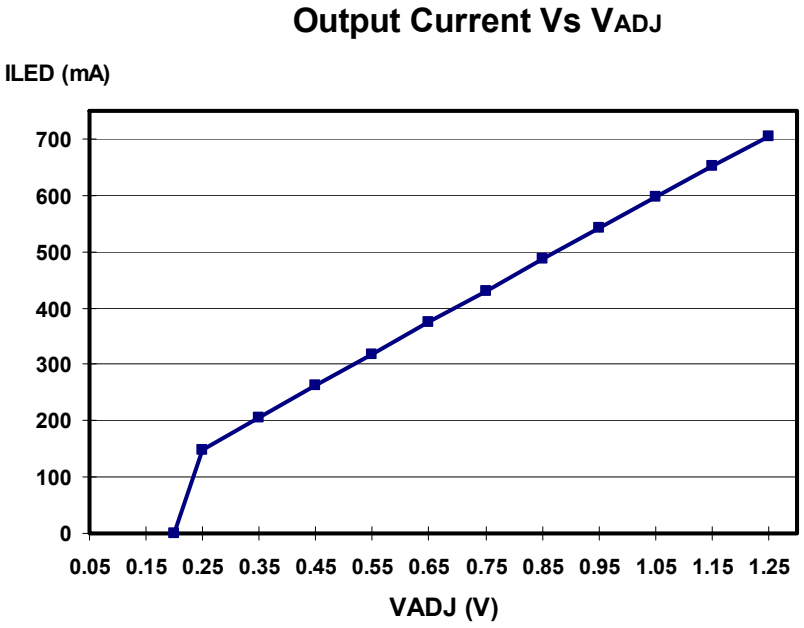



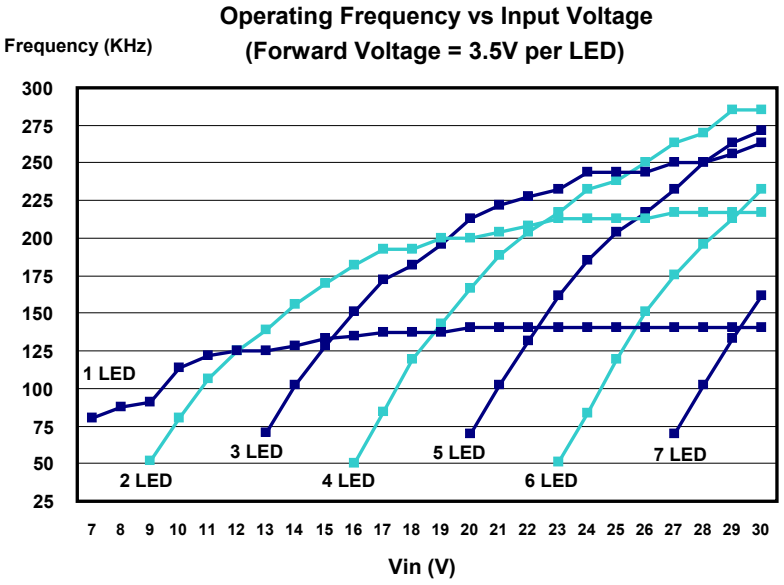
## Typical Characteristics: AMLD-6070Z

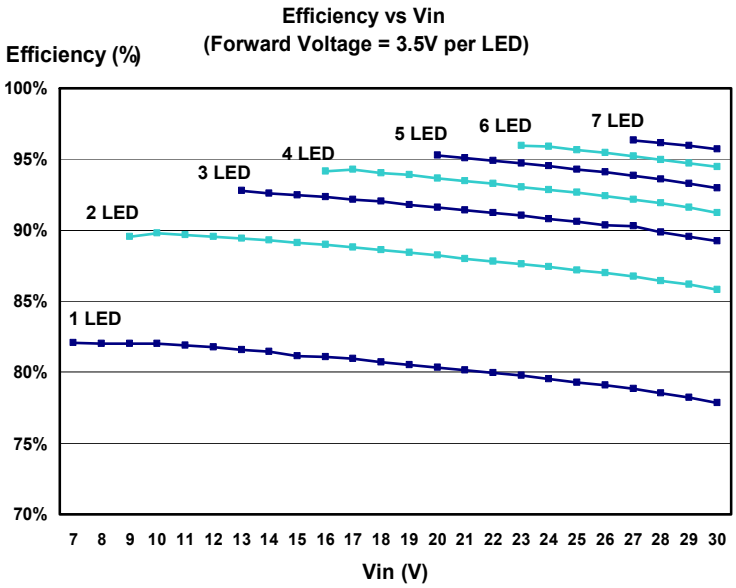


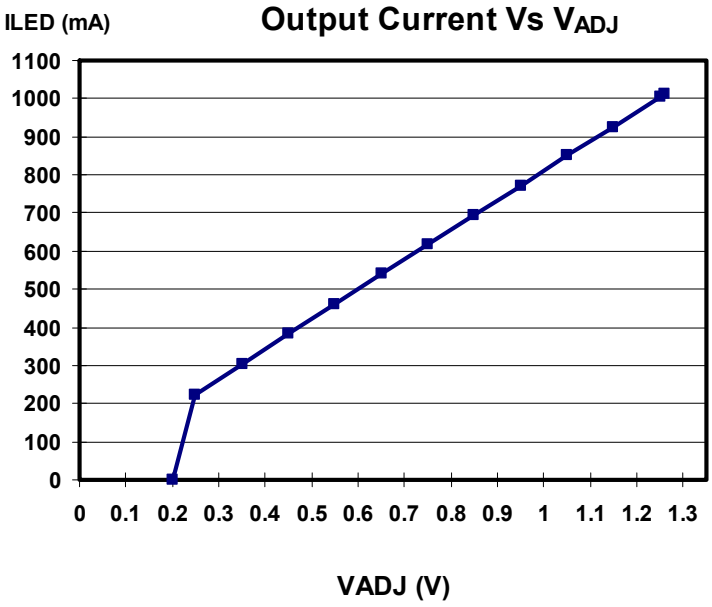



## Typical Characteristics: AMLD-60100Z




**NOTE: 1.** Datasheets are updated as needed and as such, specifications are subject to change without notice. Once printed or downloaded, datasheets are no longer controlled by Aimtec; refer to www.aimtec.com for the most current product specifications. **2.** Product labels shown, including safety agency certifications on labels, may vary based on the date manufactured. **3.** Mechanical drawings and specifications are for reference only. **4.** All specifications are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified. **5.** Aimtec may not have conducted destructive testing or chemical analysis on all internal components and chemicals at the time of publishing this document. CAS numbers and other limited information are considered proprietary and may not be available for release. **6.** This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications which necessitate specific safety and regulatory standards other the ones listed in this datasheet. **7.** Warranty is in accordance with Aimtec's standard Terms of Sale available at www.aimtec.com.