



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 -40°C to +85°C
- 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.

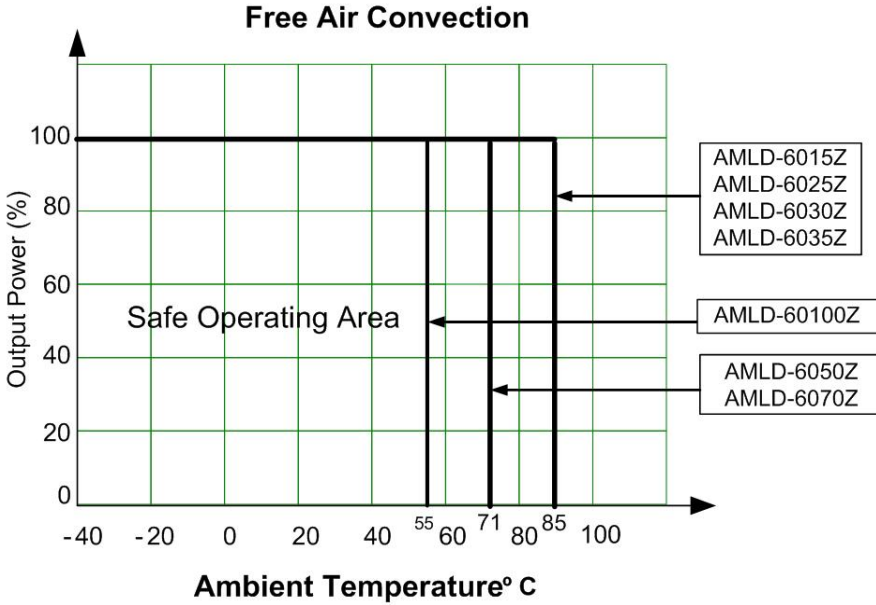
Safety Specifications

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

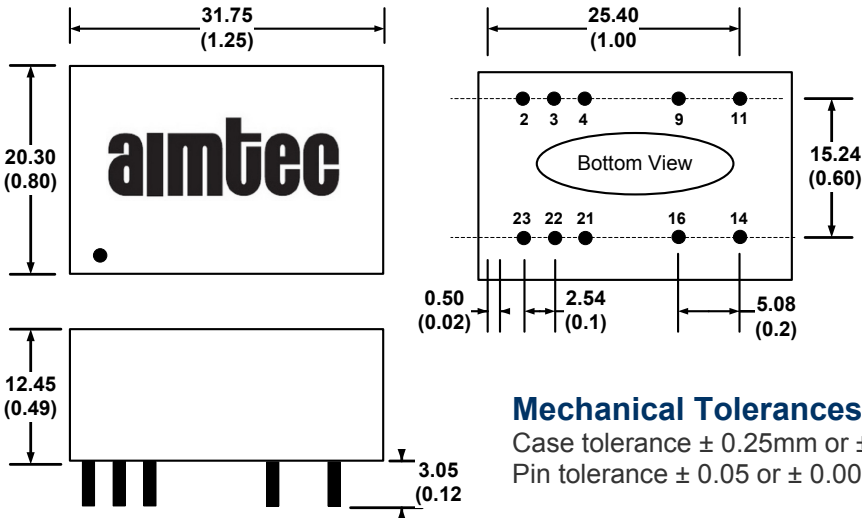
Pin Out Specifications

| 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 |

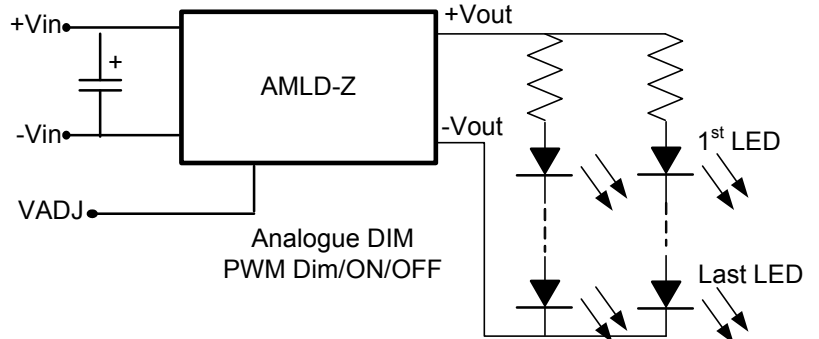
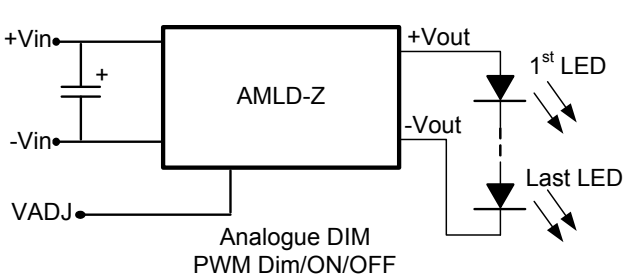
Derating



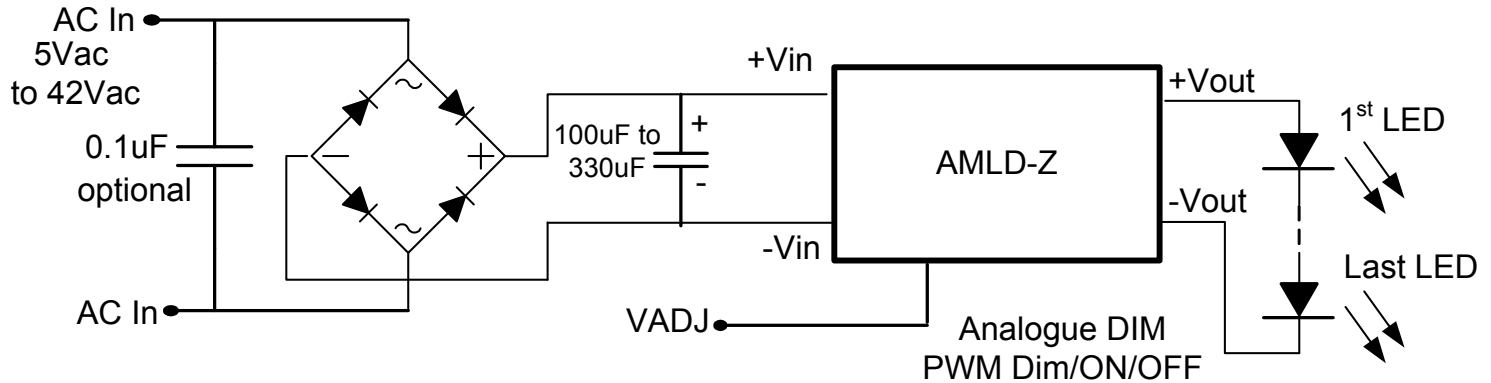
Dimensions



Application circuit examples:

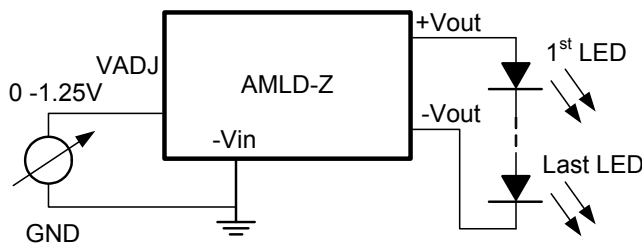


Application circuit examples (continued):

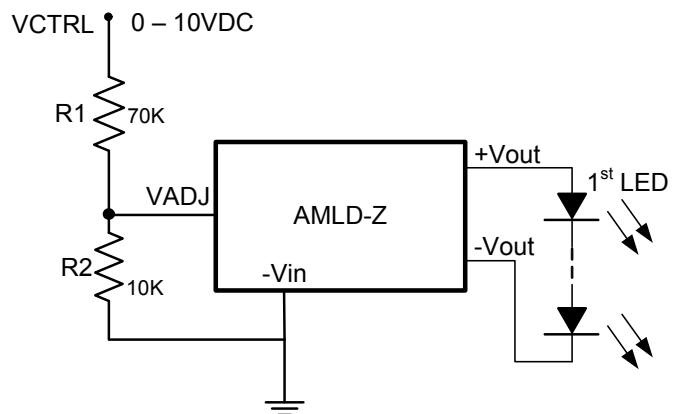
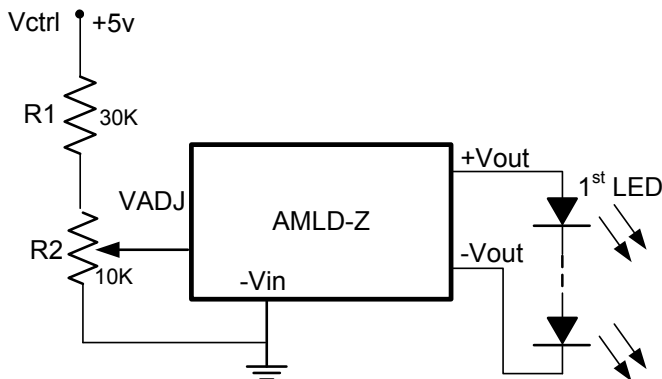


Output Current Adjustment by External DC Control Voltage (VCTRL):

$VCTRL = VADJ$ (if $VCTRL = 0-1.25V_{dc}$)



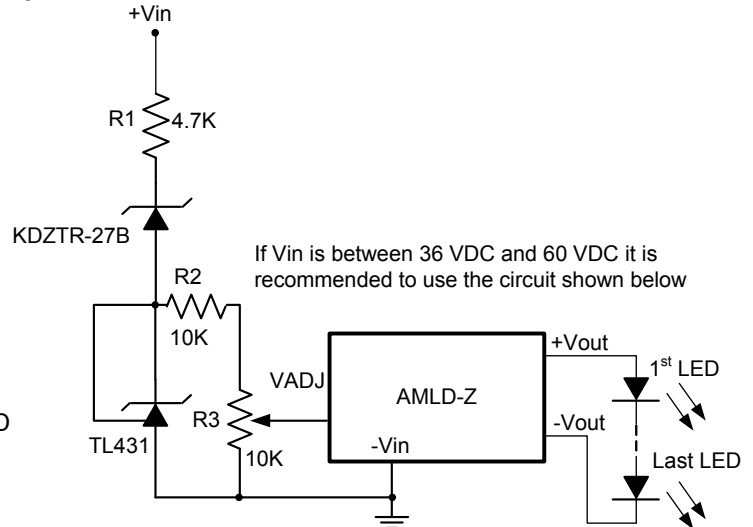
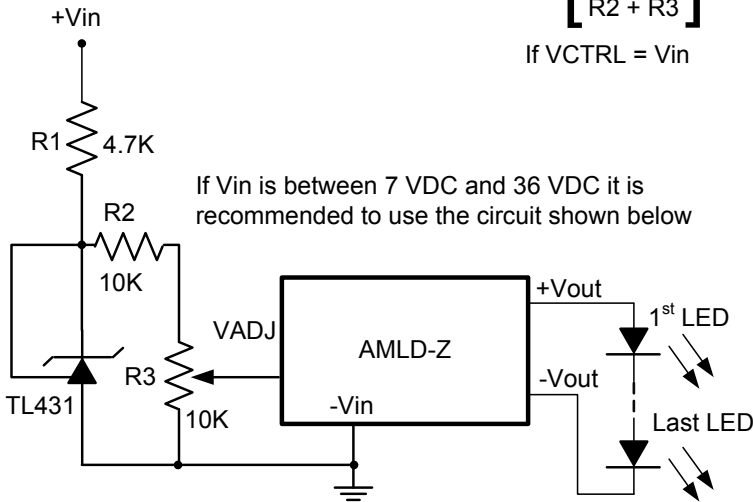
$$VADJ = \left[\frac{R2}{R1 + R2} \right] \times VCTRL \quad (\text{if } VCTRL > 1.25V_{dc})$$



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

$$V_{ADJ} = \left[\frac{R_3}{R_2 + R_3} \right] \times 2.5$$

If VCTRL = Vin



Resistive Dimming Control

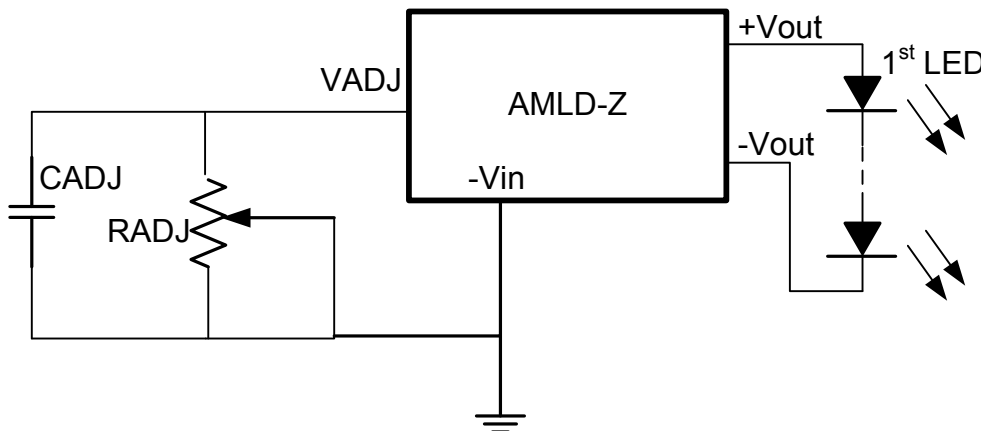
A simplified dimming control can be achieved using a variable resistor connected between VADJ and GND. Capacitor CADJ is optional, it is installed to limit AC mains interference and high frequency noise. The recommended value of CADJ is 0.22μF.

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

The output current is given by:

$$I_{outnom} \approx \frac{I_{out} \times R_{adj}}{(R_{adj} + 50K)}$$

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

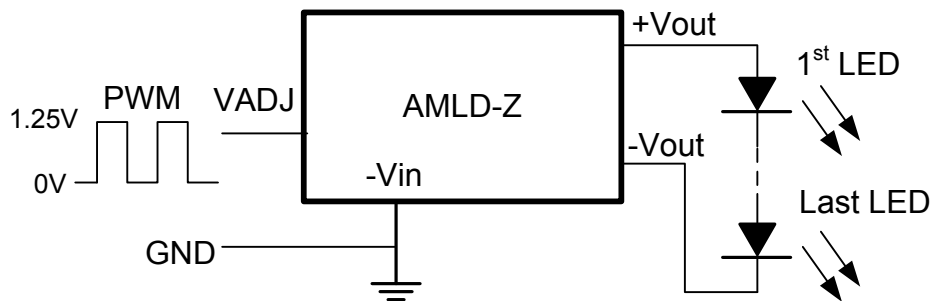


Output Current Adjustment by PWM Control: Driving VADJ Directly

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:

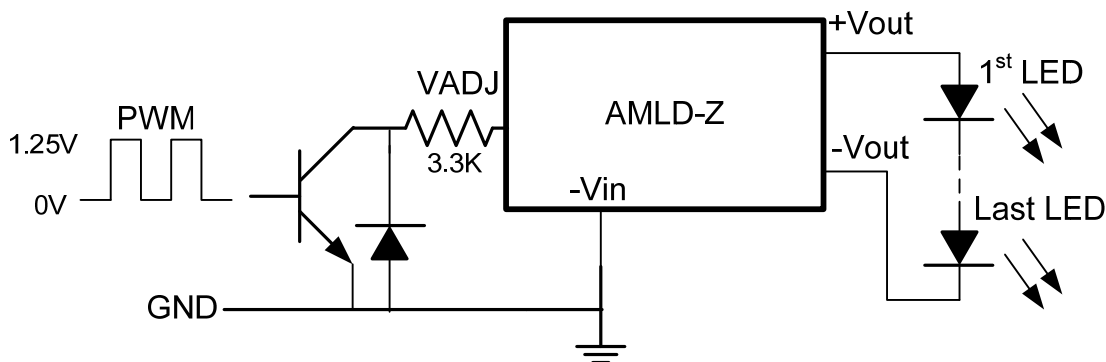
$$I_{out} \approx I_{outnom} \times DPWM \quad \left[\begin{array}{l} \text{if PWM frequency} < 300\text{Hz,} \\ \text{for } 0.1 < DPWM < 1 \end{array} \right]$$



Driving VADJ Via Open Collector Transistor

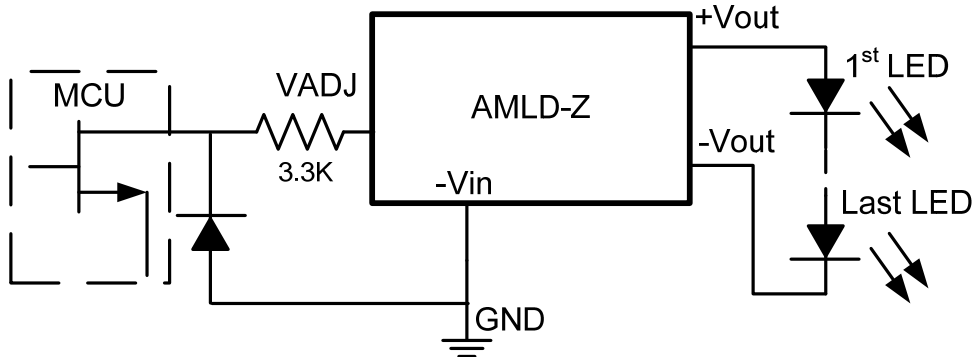
The VADJ can also be driven via an open collector transistor as shown below.

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.



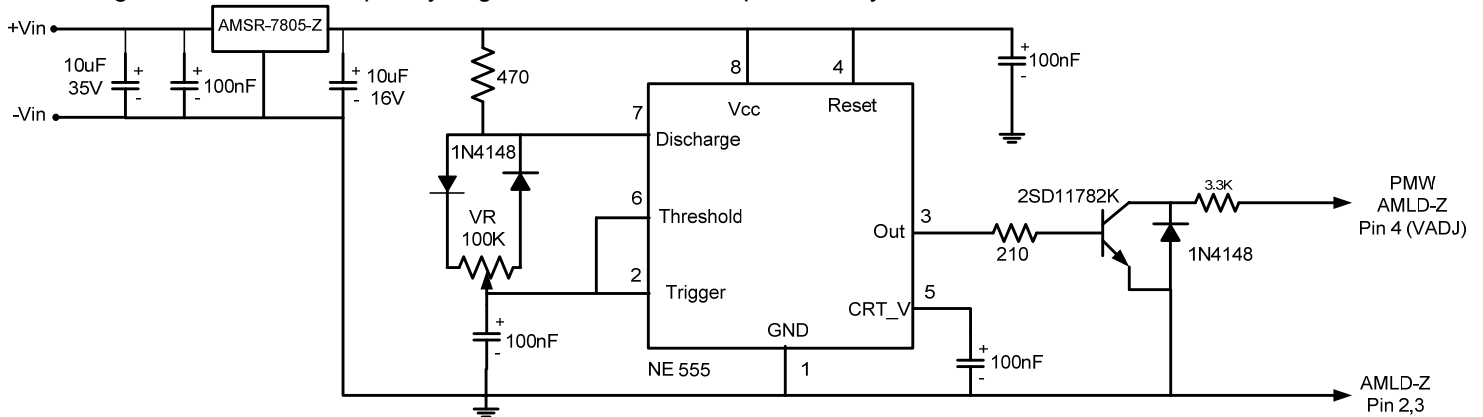
Driving the VADJ from a Microcontroller

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.

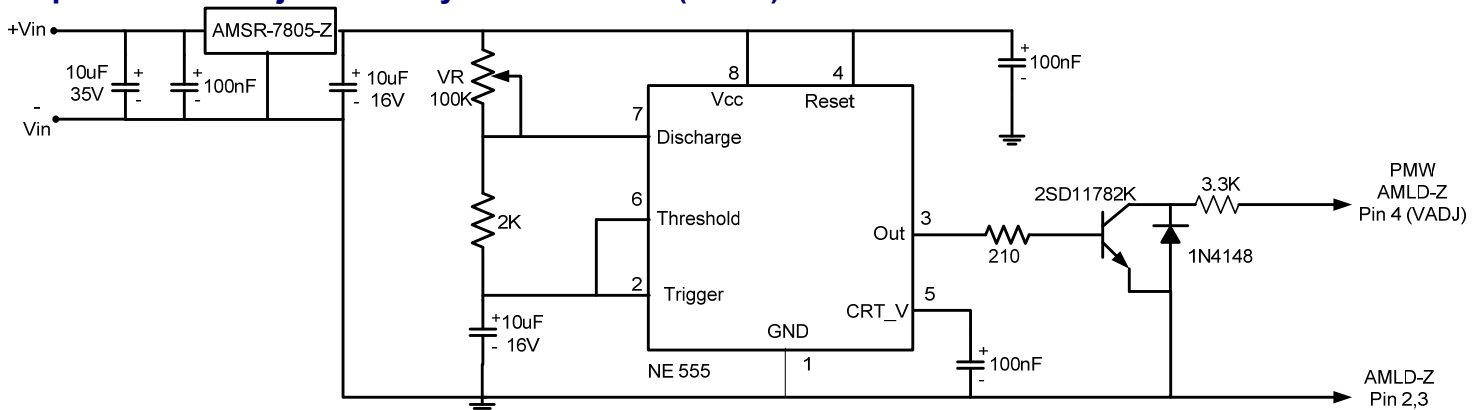


Output Current Adjustment by PWM Control (Dimming):

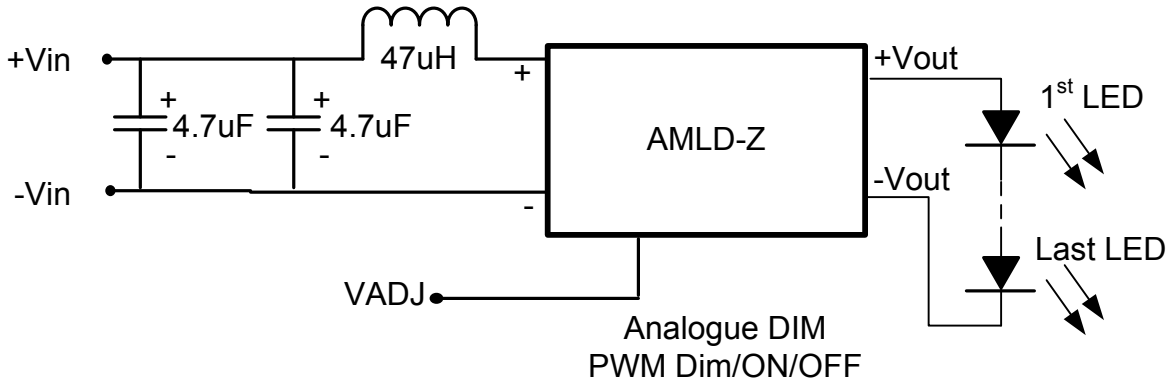
A PWM signal must have a frequency of greater than 100Hz to prevent any visible flicker.



Output Current Adjustment by PWM Control (Flash):

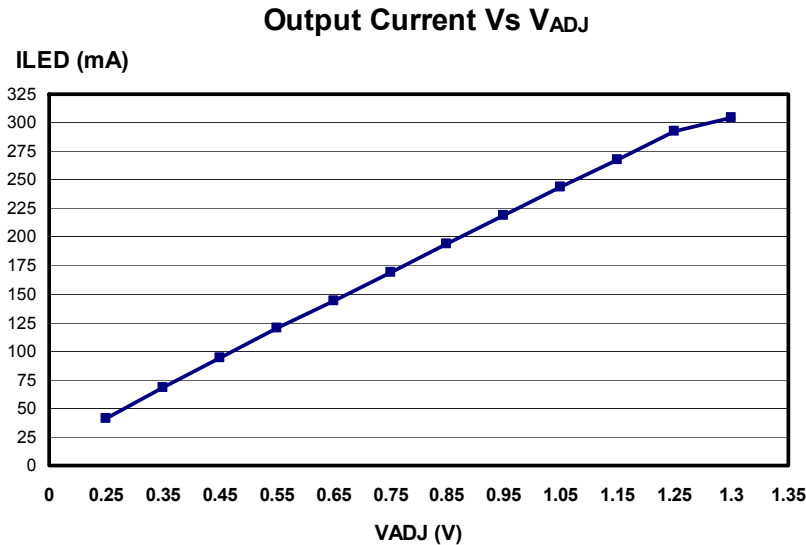
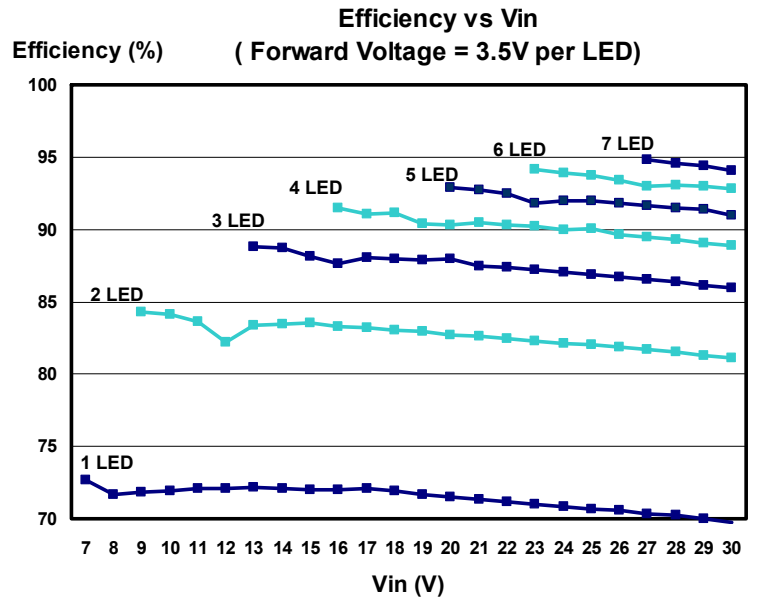
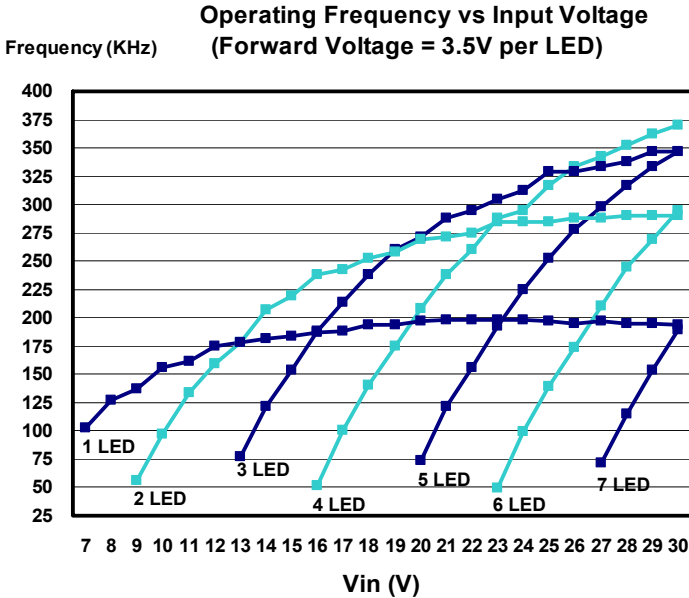


Recommended Class B EMI Filter:



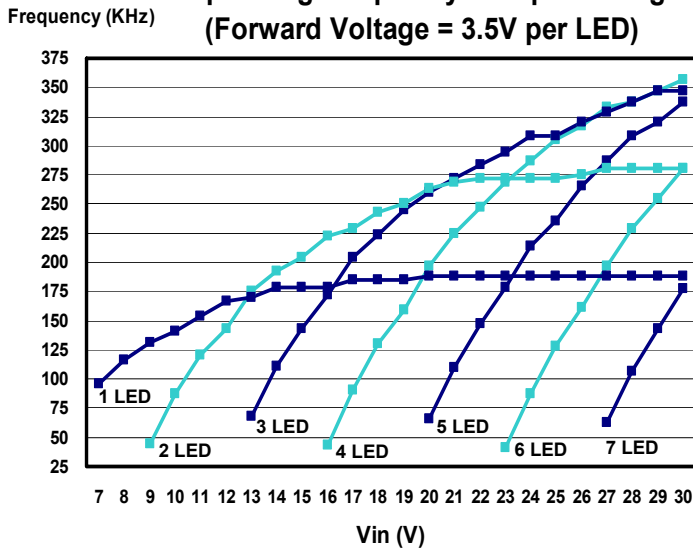
Typical Characteristics:

AMLD-6030Z

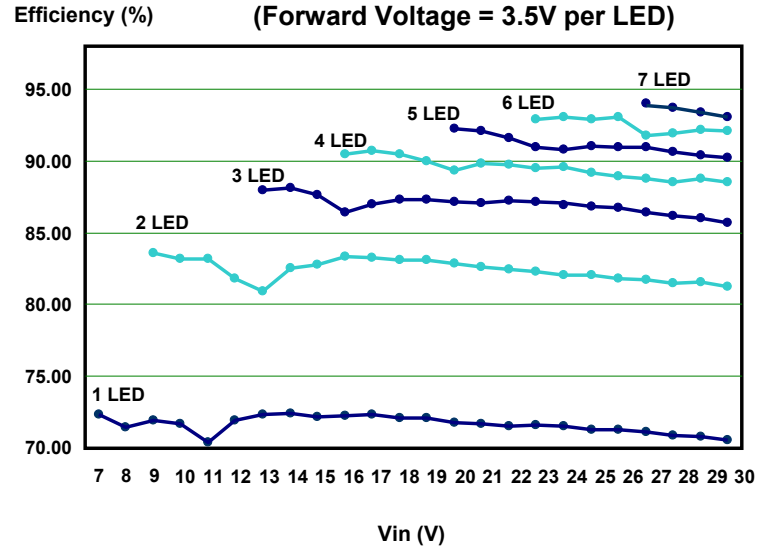


Typical Characteristics: AMLD-6035Z

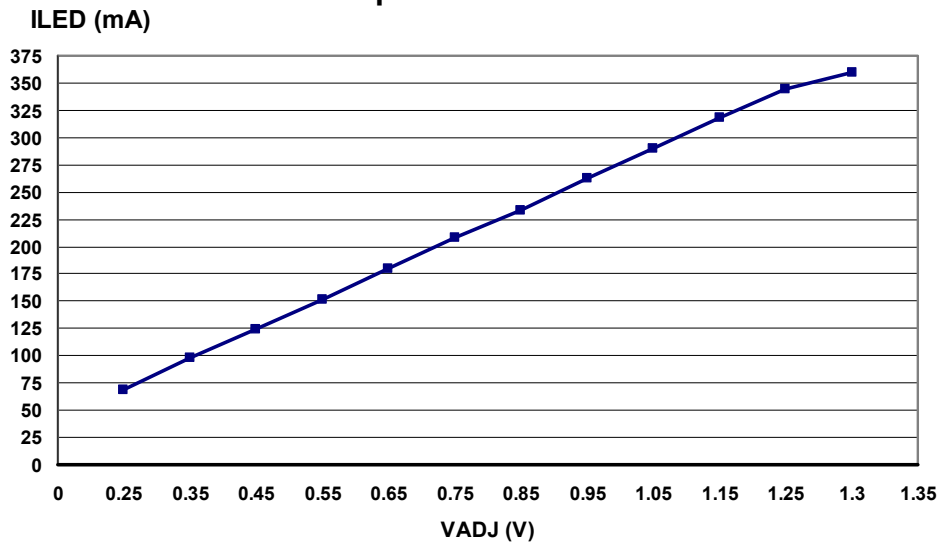
Operating Frequency vs Input Voltage
(Forward Voltage = 3.5V per LED)



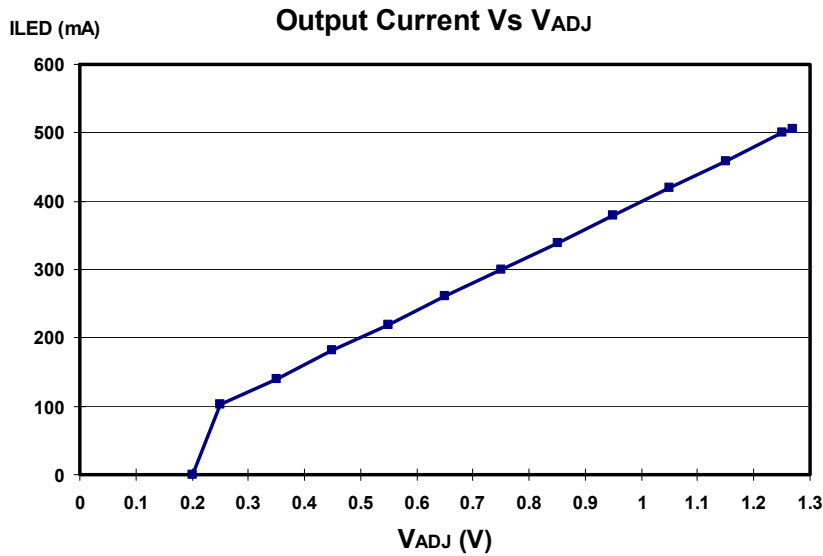
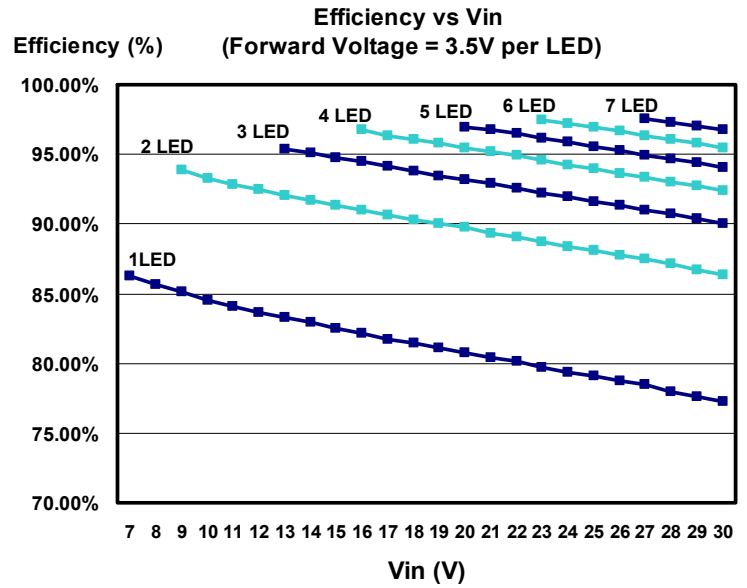
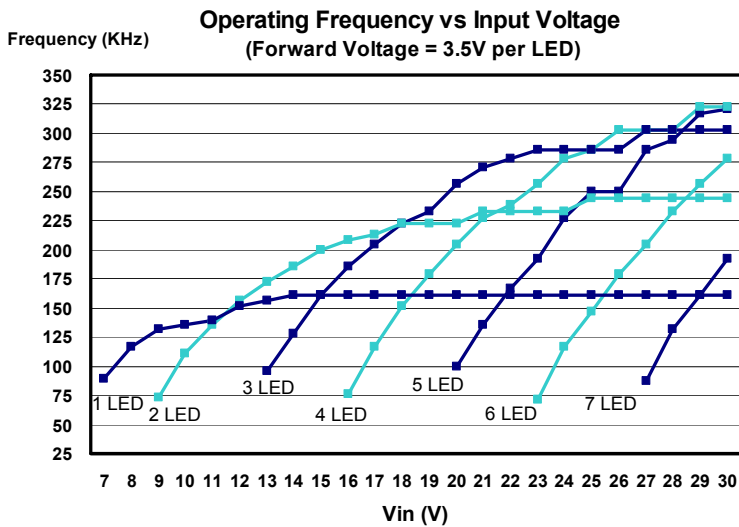
Efficiency vs Vin
(Forward Voltage = 3.5V per LED)



Output Current Vs VADJ

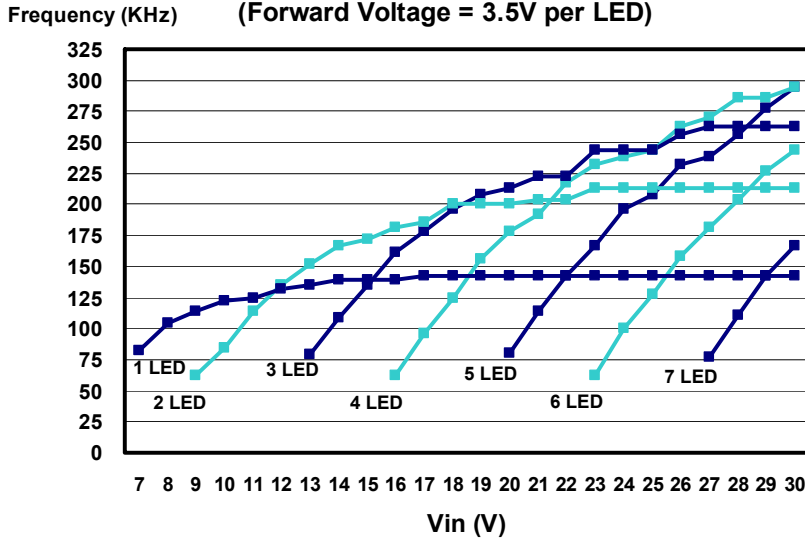


Typical Characteristics: AMLD-6050Z

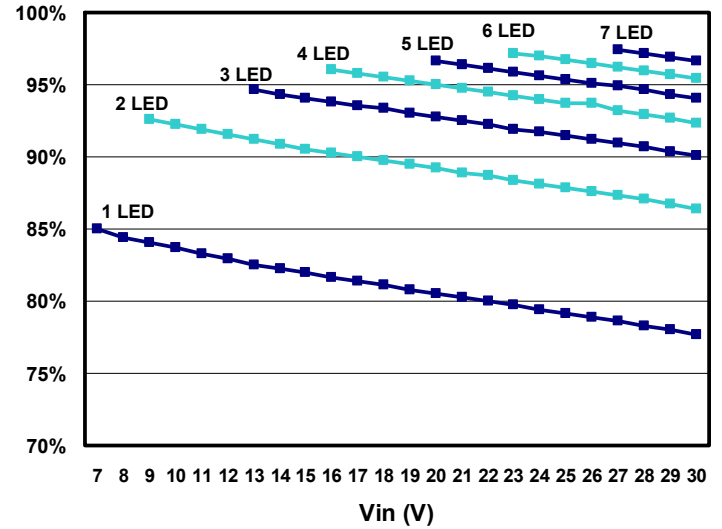


Typical Characteristics: AMLD-6060Z

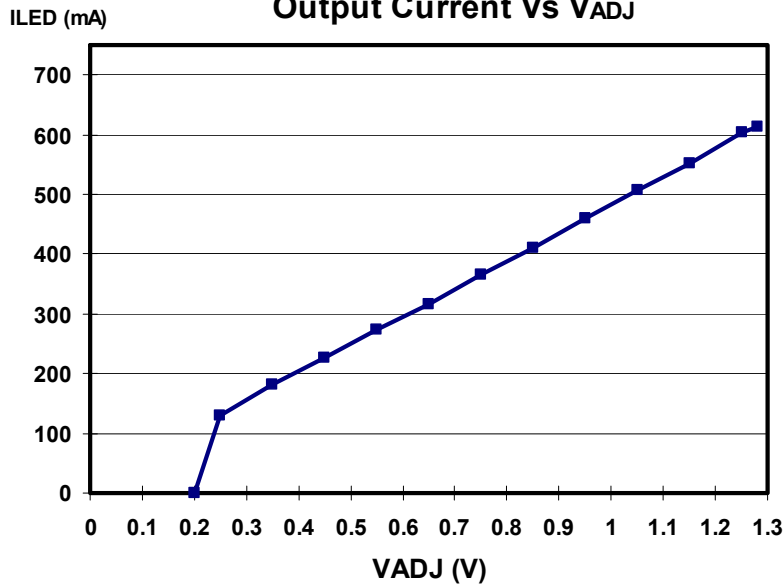
Operating Frequency vs Input Voltage
(Forward Voltage = 3.5V per LED)



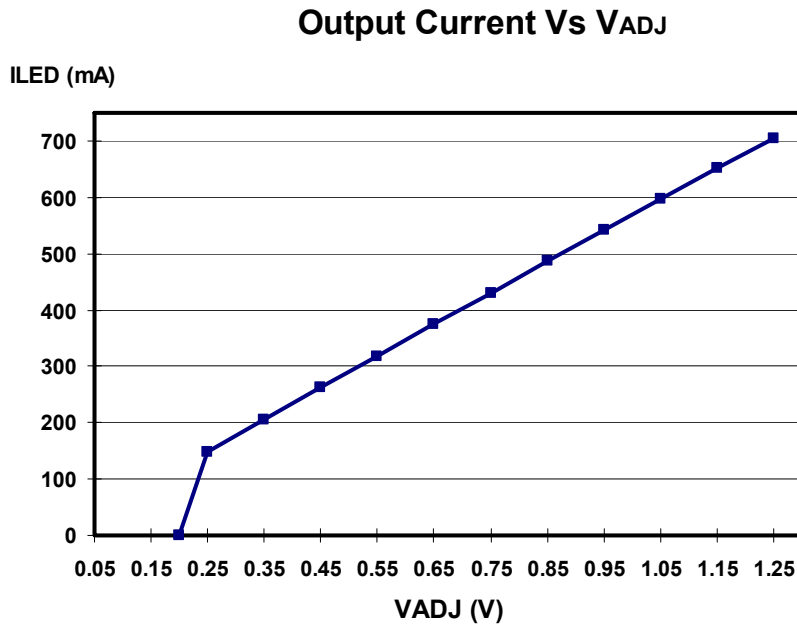
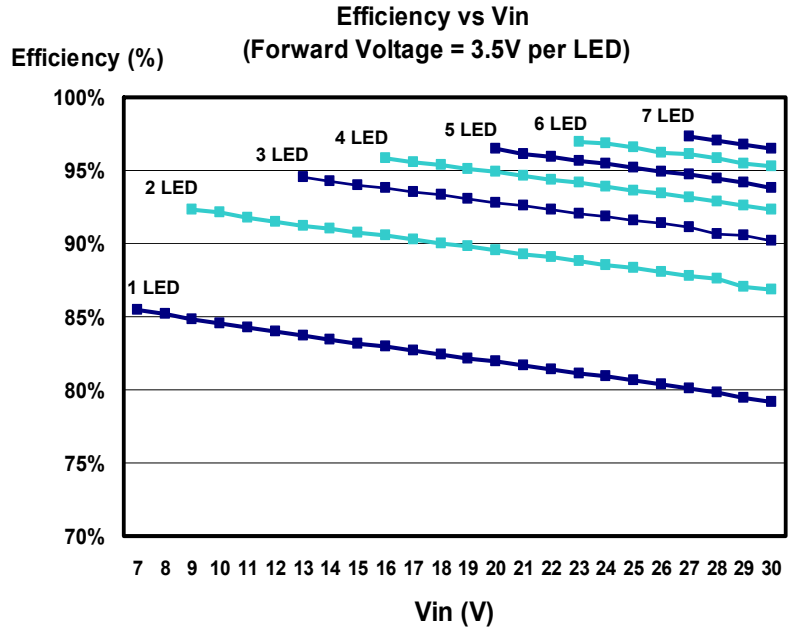
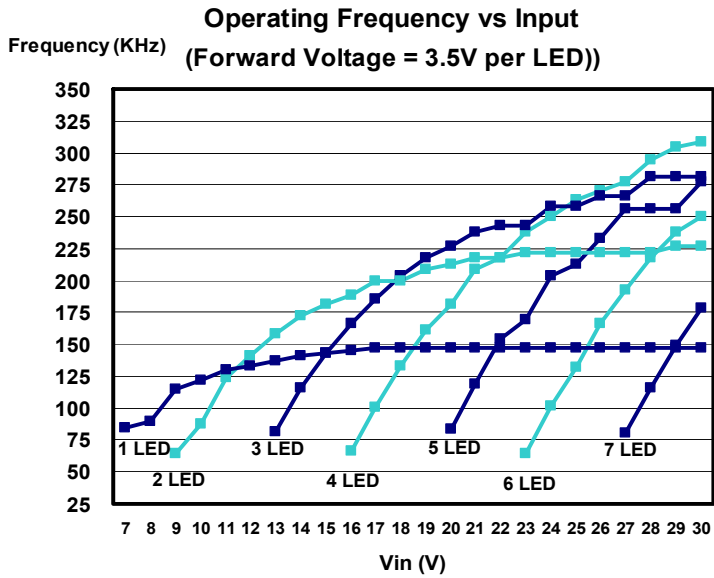
Efficiency vs Vin
(Forward Voltage = 3.5V per LED)



Output Current Vs VADJ

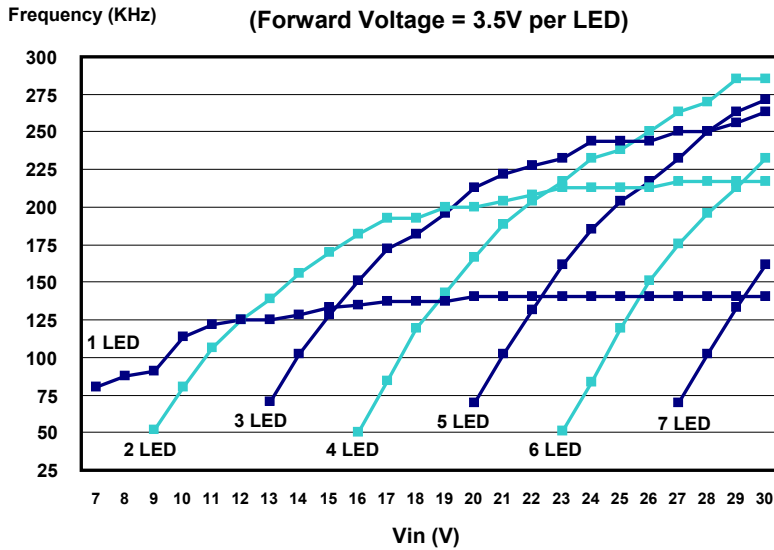


Typical Characteristics: AMLD-6070Z

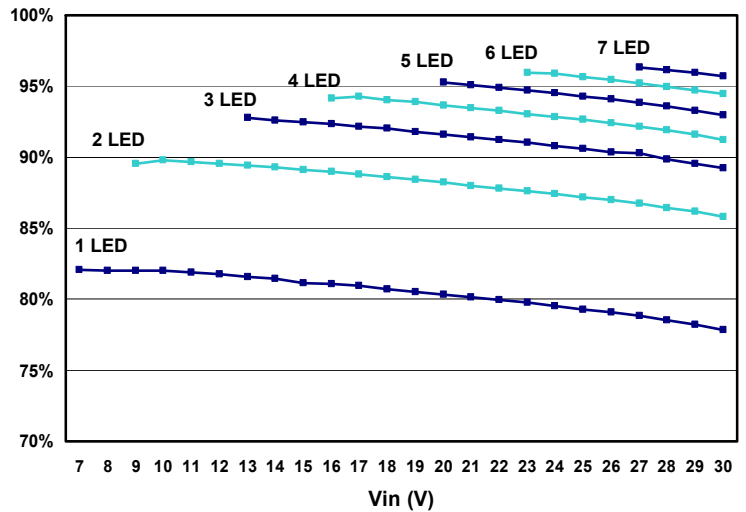


Typical Characteristics: AMLD-60100Z

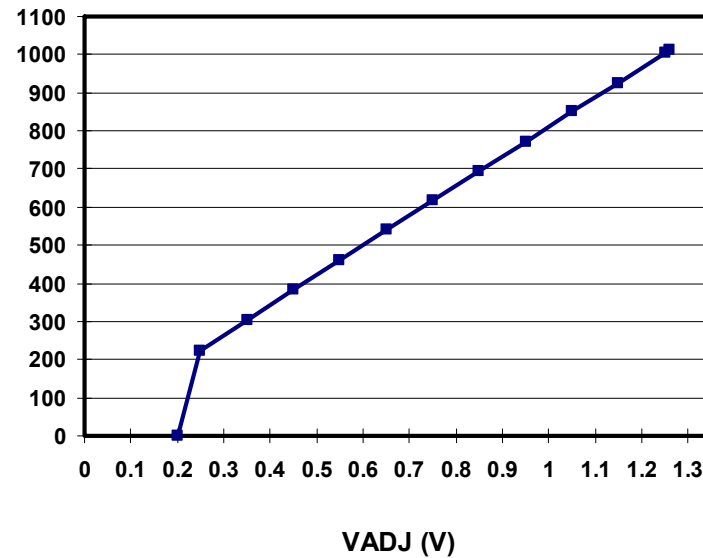
Operating Frequency vs Input Voltage
(Forward Voltage = 3.5V per LED)



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



Output Current vs V_{ADJ}



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