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Your Power Partner

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

CE RoHS

Models
Single output

Model	Input Voltage (V)	Output Voltage (V)	Maximum Rated Current (mA)	Max Capacitive Load (uF)	Efficiency (%)	Ripple & Noise (mV p-p)
AMLD-6015Z	7-60	2-57	150	470	97	150
AMLD-6025Z	7-60	2-57	250	470	97	200
AMLD-6030Z	7-60	2-57	300	470	97	250
AMLD-6035Z	7-60	2-57	350	470	97	300
AMLD-6050Z	7-60	2-57	500	470	97	400
AMLD-6060Z	7-60	2-57	600	470	97	500
AMLD-6070Z	7-60	2-57	700	470	97	500
AMLD-60100Z	7-60	2-48	1000	470	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	48	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			
Quiescent Current in Shutdown	Vin = 60V, Vadj <0.15		0.1	mA
Vadj pin input voltage range	Input voltage range	0-1.25		VDC
Vadj pin drive current	Vadj = 1.25V		1	mA
PWM dimming	Max PWM Frequency 1KHz, adjust output current from 0% to 100%			
Analog dimming	Vin - Vout < 30V, 0.3V < Vadj < 1.25V to adjust output current from 25% to 100%			

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

Output Specifications

Parameters	Conditions	Typical	Maximum	Units
Current accuracy	150mA model		±8	%
	250mA model		±7	%
	300mA model		±6	%
	Other models		±5	%
Output Voltage range	V input = 60V	2-57		VDC
Output current	Vin – Vout > 3V	See model table above		
Short Circuit protection	Regulated at the rated current for each model			
Output no load Protection	Continuously			
Temperature coefficient	Ta = -40 to +85°C		±0.03	%/°C
Ripple & Noise	20MHz Bandwidth	See model table above		

General Specifications

Parameters	Conditions	Typical	Maximum	Units
Switching frequency	100% load	20 - 500		KHz
Operating temperature	1000mA model	-40 to +55		°C
	700, 600, 500mA models	-40 to +71		°C
	Other models	-40 to +85		°C

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Storage temperature			-40 to +150	°C
Maximum case temperature			110	°C
Cooling	Free air convection			
Humidity			95	% RH
Case material	Non-Conductive Black Plastic (UL94-V0 rated)			
Weight			17.7	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 (CISPR 22) with the recommended EMI circuit 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)

Derating

Free Air Convection
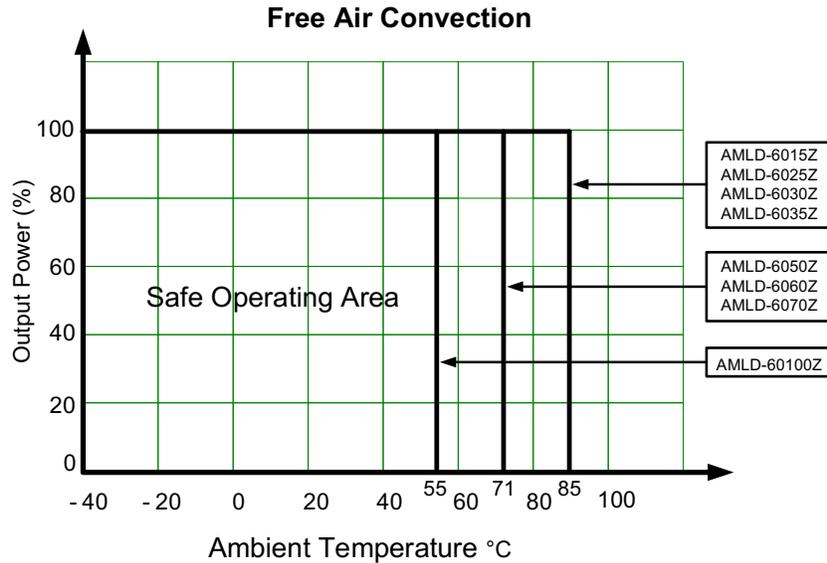
Pin Out Specifications

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

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Dimensions

31.75
(1.25)

20.32
(0.80)

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22.86
(0.90)

2 3 4   9   11

Bottom view

23 22   16   14

15.24
(0.60)

2.54
(0.10)

5.08
(0.20)

12.45
(0.49)

3.00
(0.12)
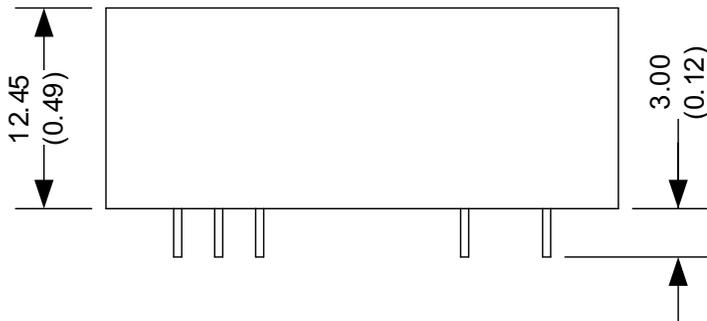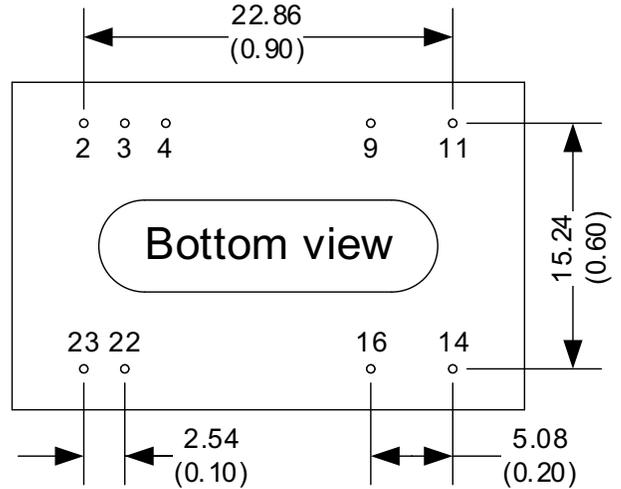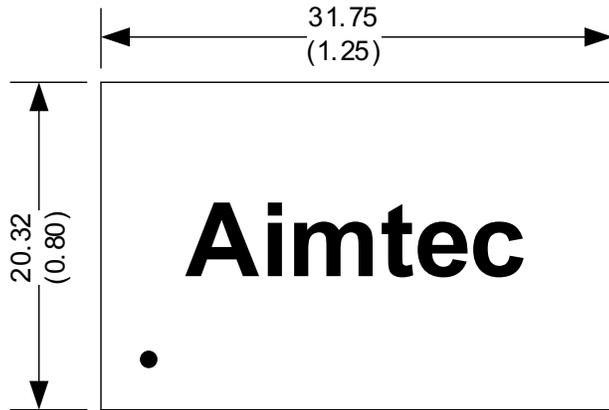
Unit: mm(inch)
Case tolerance: ±0.5(0.02)
Pin diameter: 0.5±0.05(0.02±0.002)
Pin pitch and length tolerance: ±0.35(0.014)

Application circuit examples:

+Vin
-Vin
AMLD-Z
+Vout
-Vout
1st LED
Last LED
Vadj
Analogue DIM
PWM Dim/ON/OFF

+Vin
-Vin
AMLD-Z
+Vout
-Vout
1st LED
Last LED
Vadj
Analogue DIM
PWM Dim/ON/OFF

AC In
5Vac
to 42Vac
0.1uF
optional
AC In
100 to 330uF
+Vin
-Vin
AMLD-Z
+V output
-V output
+LED
1st LED
Last LED
-LED
Vadj
PWM/Analog
Dimming Control

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

VADJ = VCTRL (if VCTRL >1.25V)
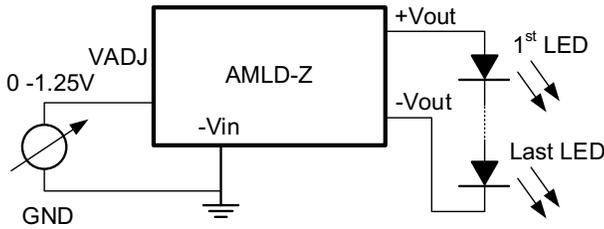
$$VADJ = \left[\frac{R2}{R1 + R2} \right] \times VCTRL \ (if \ VCTRL > 1.25V)$$
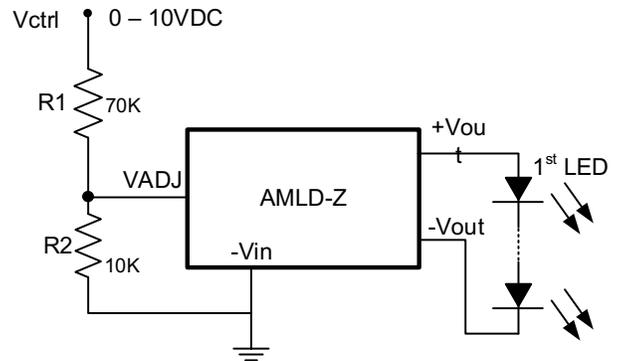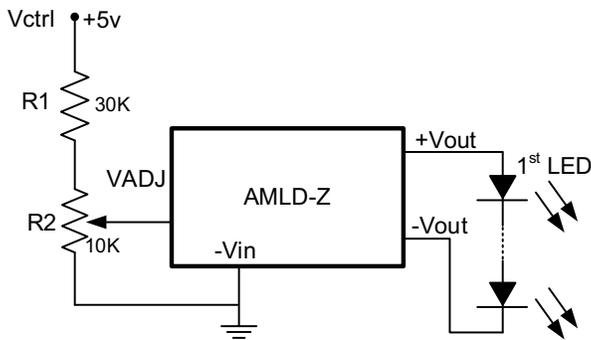
$$VADJ = \left[\frac{R3}{R2 + R3} \right] \times 2.5 \ (if \ VCTRL = VIN)$$

If Vin is between 7 VDC and 36 VDC it is recommended to use the circuit shown below

If Vin is between 36 VDC and 60 VDC it is recommended to use the circuit shown below
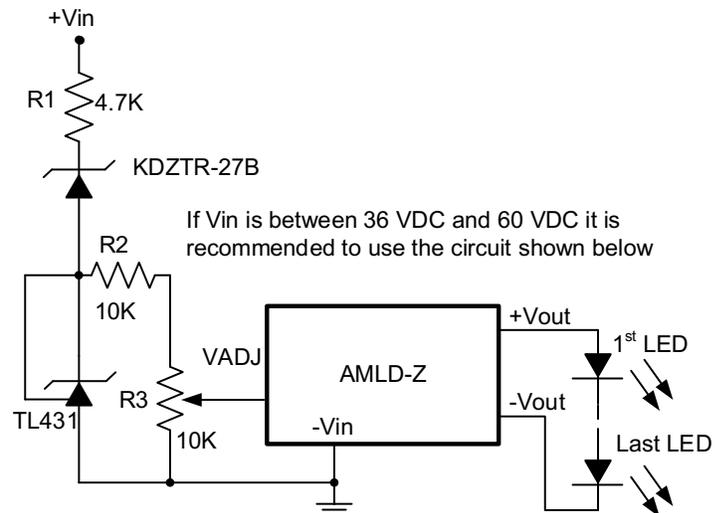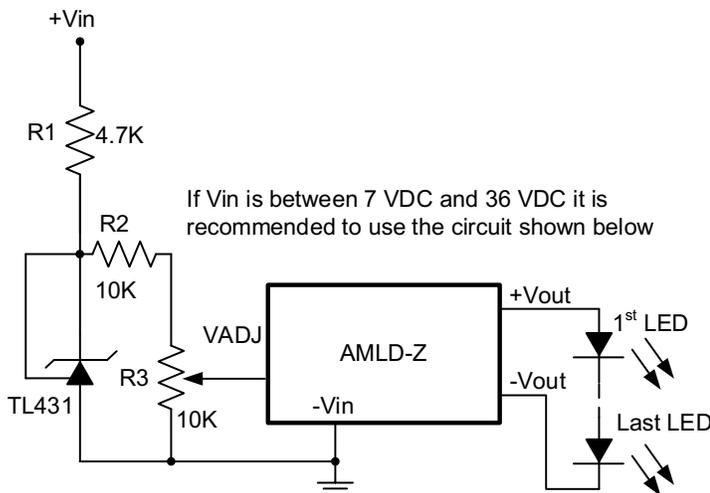
The nominal output current is given by:

$$Ioutnom = Iout \ \frac{Vadj}{1.25}$$

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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.

The nominal output current is given by:

$$Ioutnom = \frac{Iout \times Radj}{Radj + 50K}$$
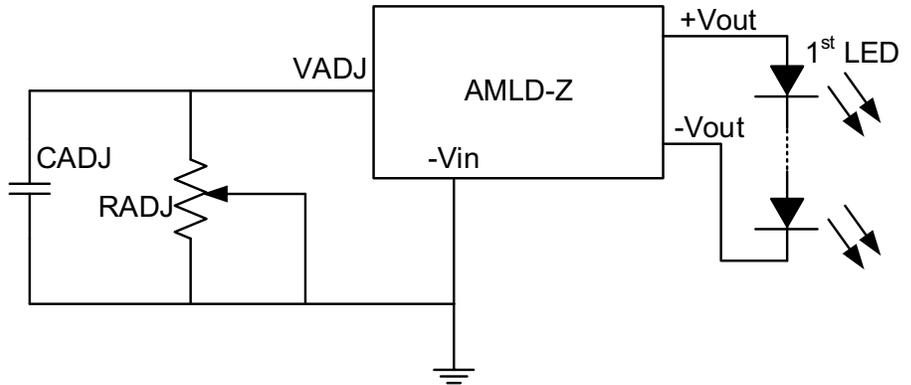
NOTE: Typical error is ±10% with resistive dimming control
If the value of Radj is between 0 to 2MΩ, the maximum adjustment range will be 25% to 90%, (for Vin –Vout <30VDC)

## 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:

Ioutnom = Iout x DPWM

[If PWM frequency <200Hz, for 0.1<DPWM<1]
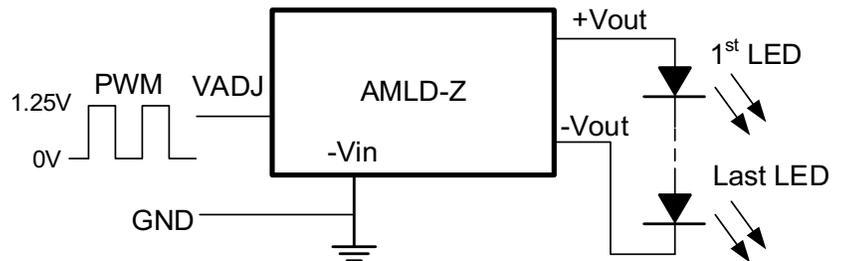
Driving VADJ Via Open Collector Transistor

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.

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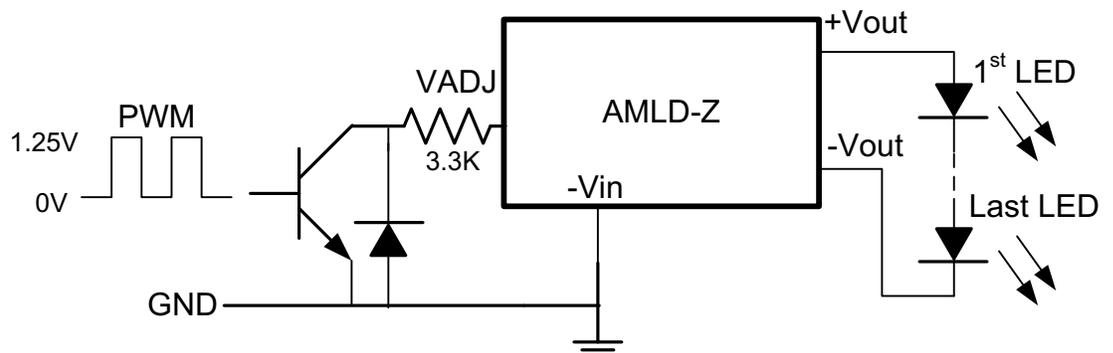
Driving the VADJ from a Microcontroller

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.
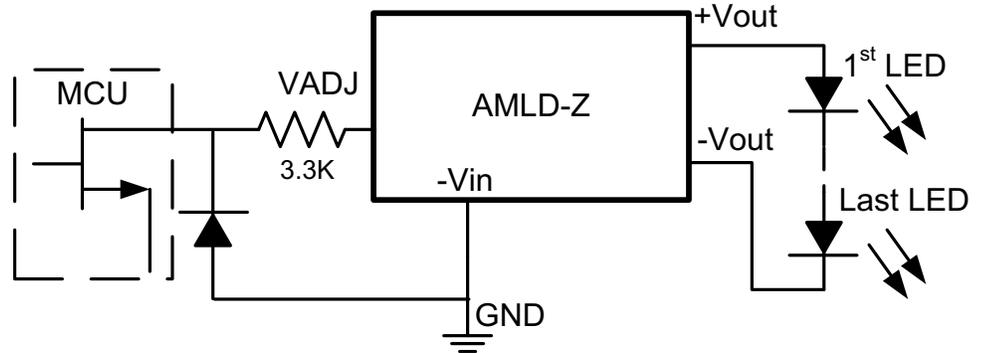

Output Current Adjustment by PWM Control (Dimming):

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


Output Current Adjustment by PWM Control (Flash):

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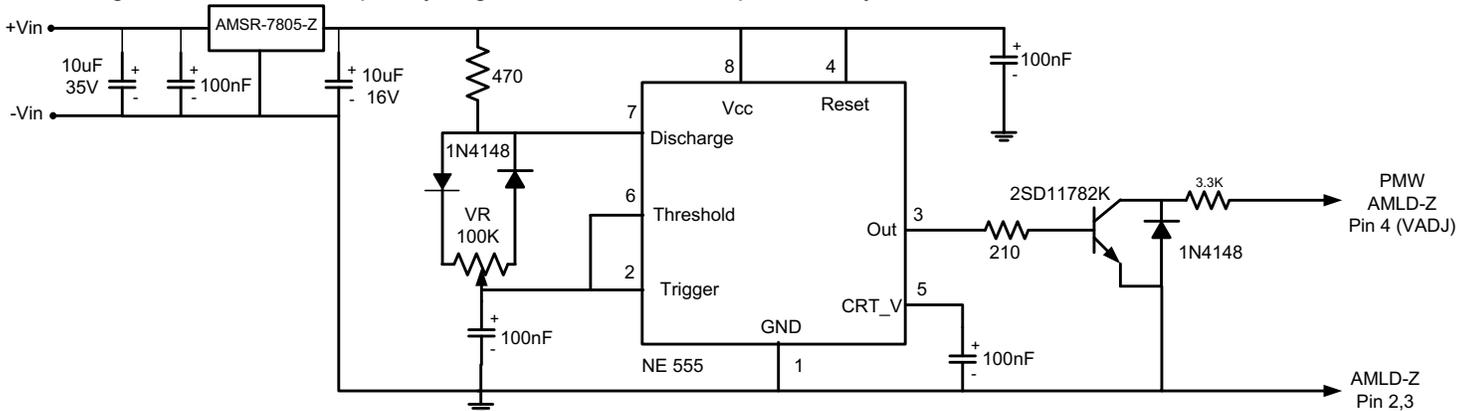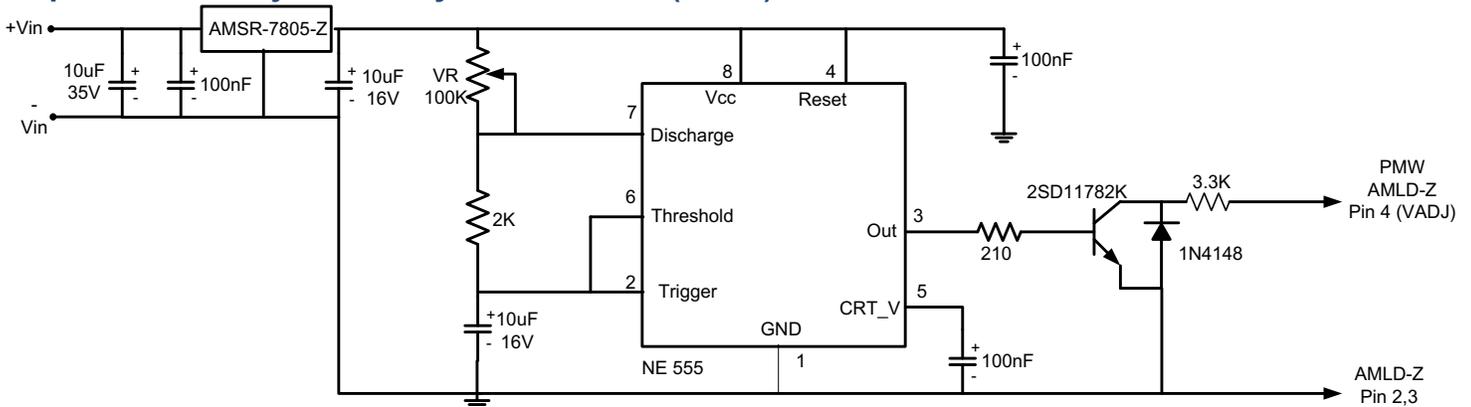
Recommended EMI Filter:
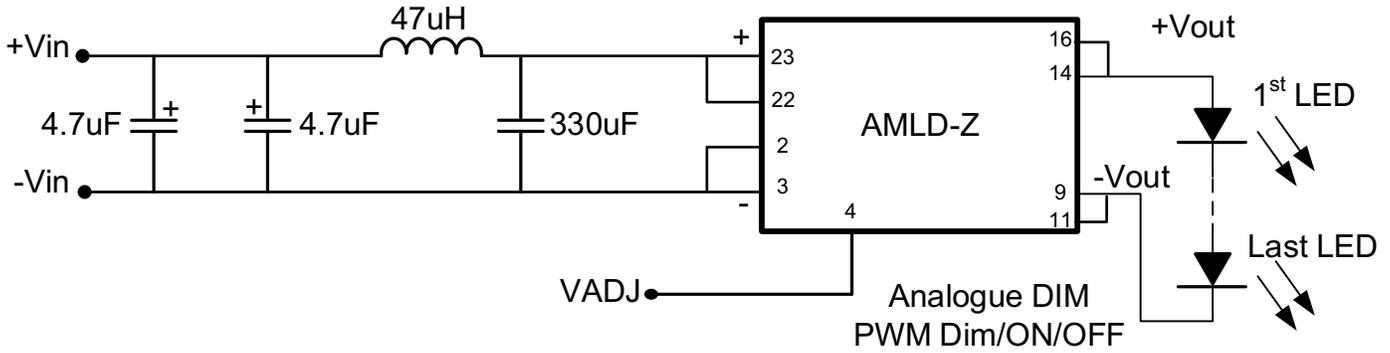
Typical Characteristics:

AMLD-6030Z

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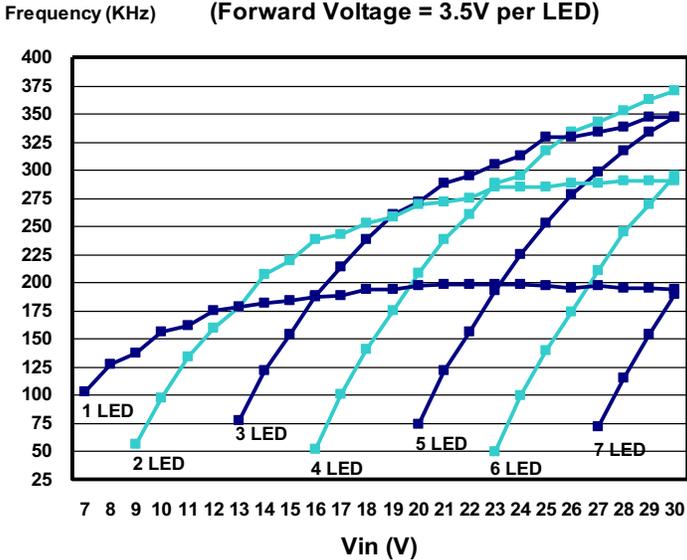
Efficiency vs Vin (Forward Voltage = 3.5V per LED)

Output Current Vs V$_{ADJ}$

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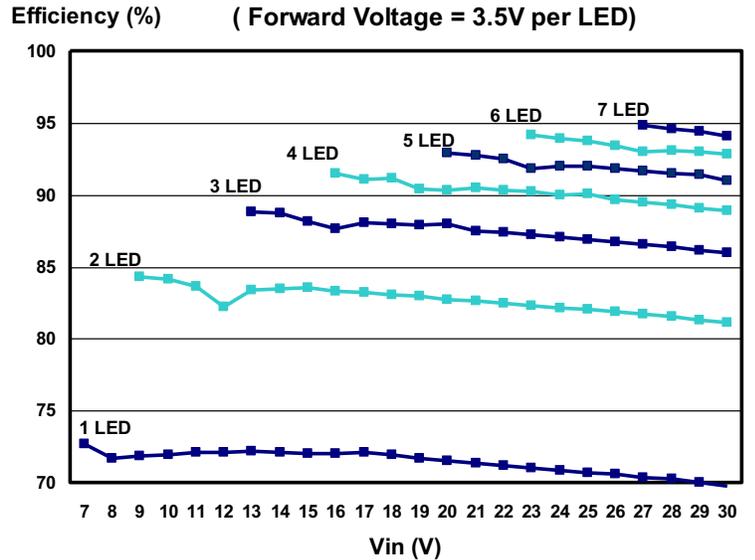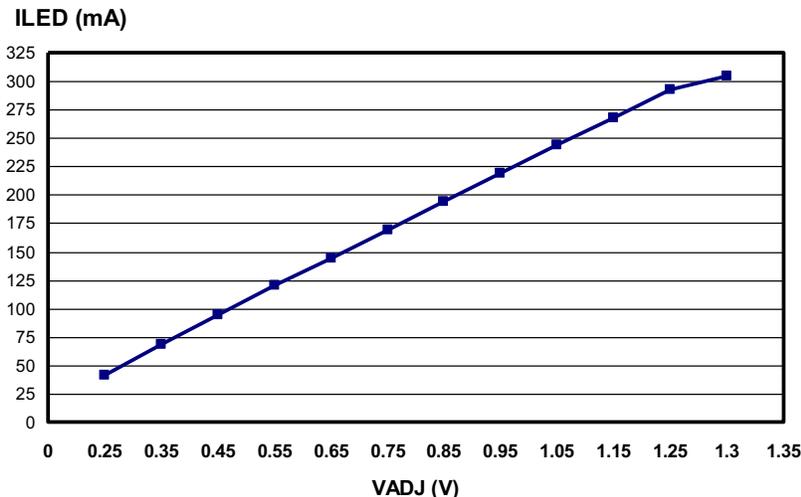
Typical Characteristics: AMLD-6035Z

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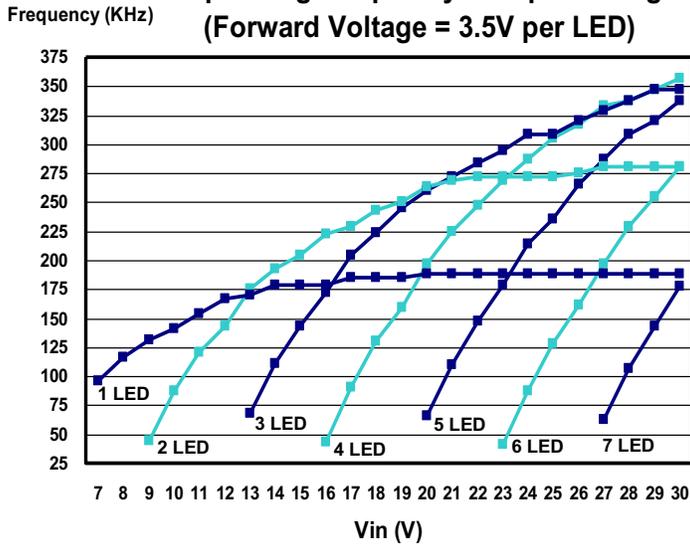
Efficiency vs Vin (Forward Voltage = 3.5V per LED)

Output Current Vs V_{ADJ}

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Typical Characteristics: AMLD-6050Z

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

Frequency (KHz)

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

Efficiency (%)

Output Current Vs V_ADJ

ILED (mA)

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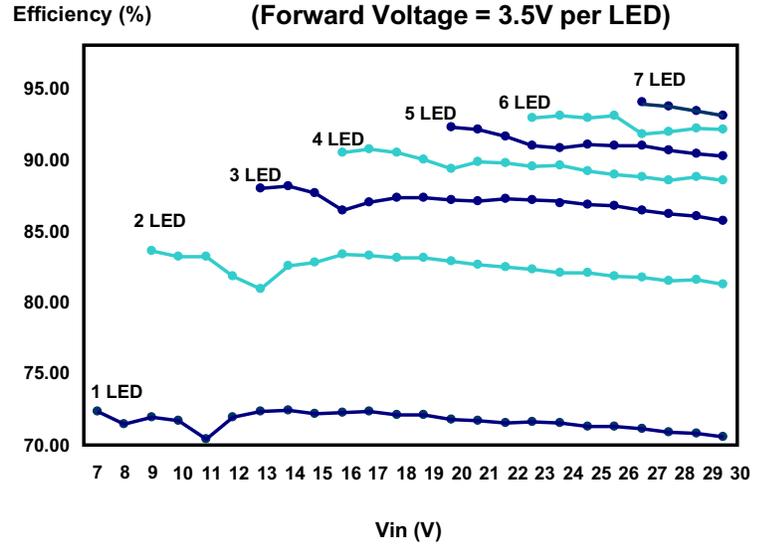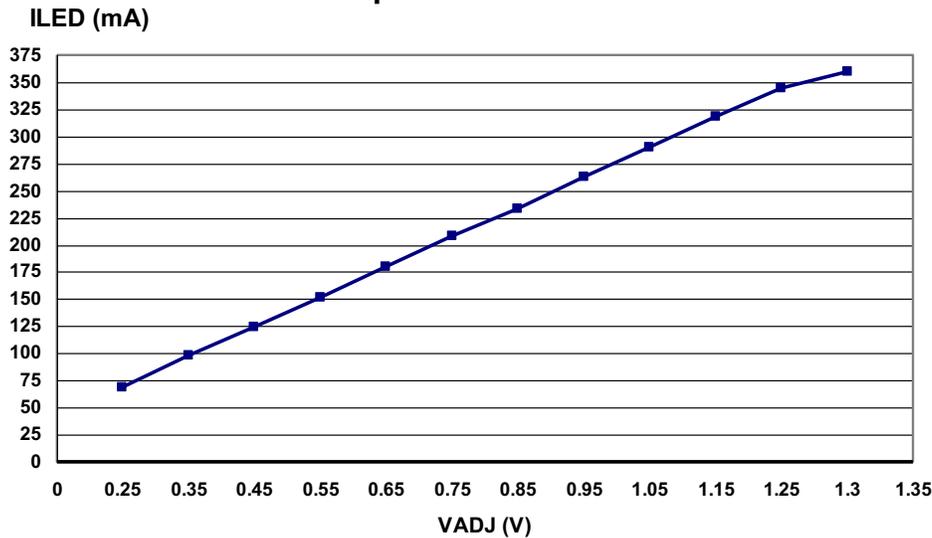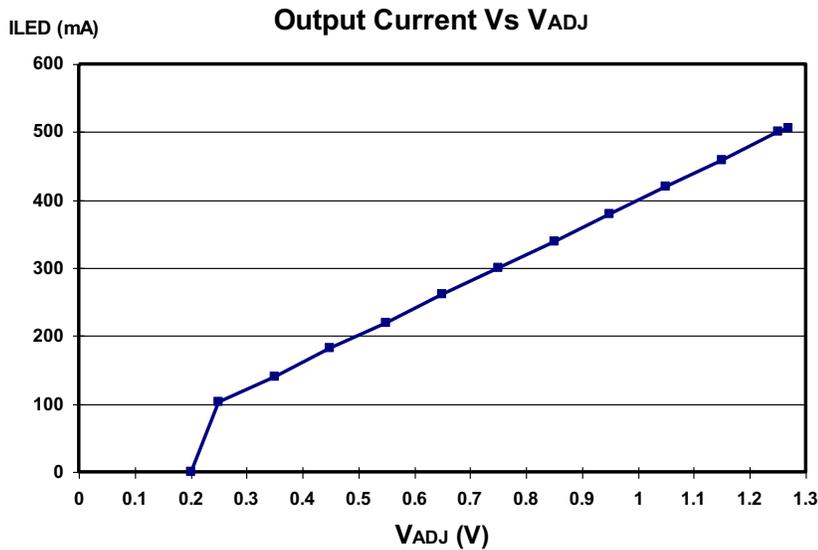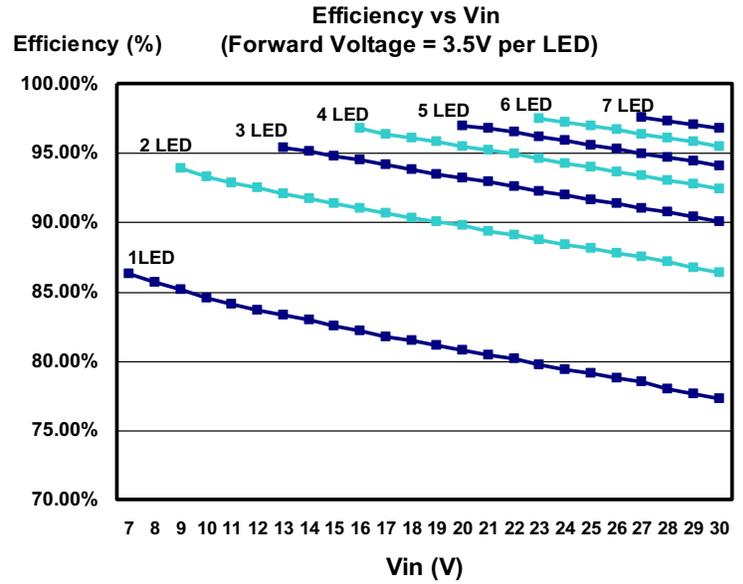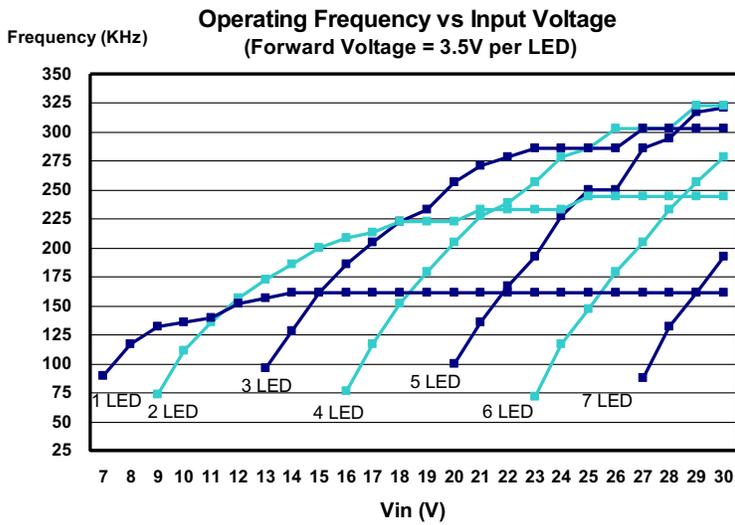
Typical Characteristics: AMLD-6060Z

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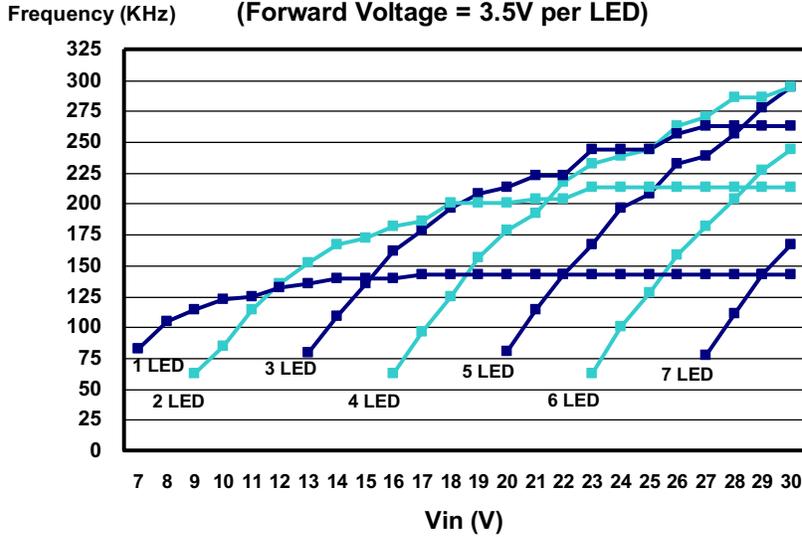
Frequency (KHz)

Vin (V)

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

Efficiency (%)

Vin (V)

Output Current Vs V$_{ADJ}$

ILED (mA)

VADJ (V)

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Typical Characteristics: AMLD-6070Z

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

Frequency (KHz)

Vin (V)

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

Efficiency (%)

Vin (V)

Output Current Vs V$_{ADJ}$

ILED (mA)

VADJ (V)

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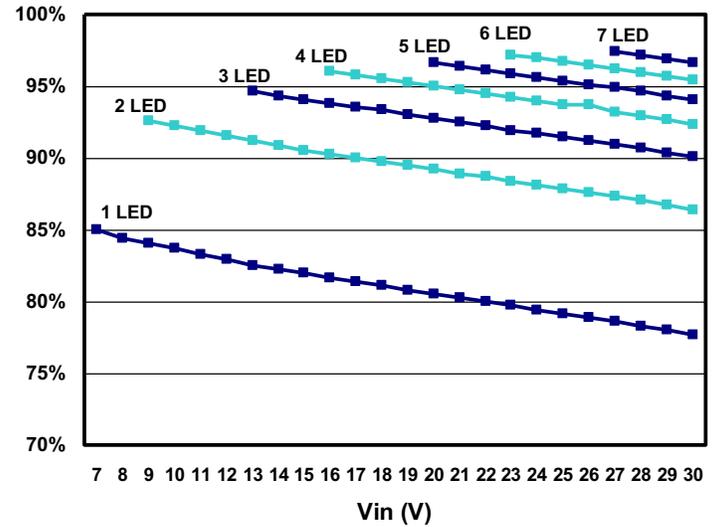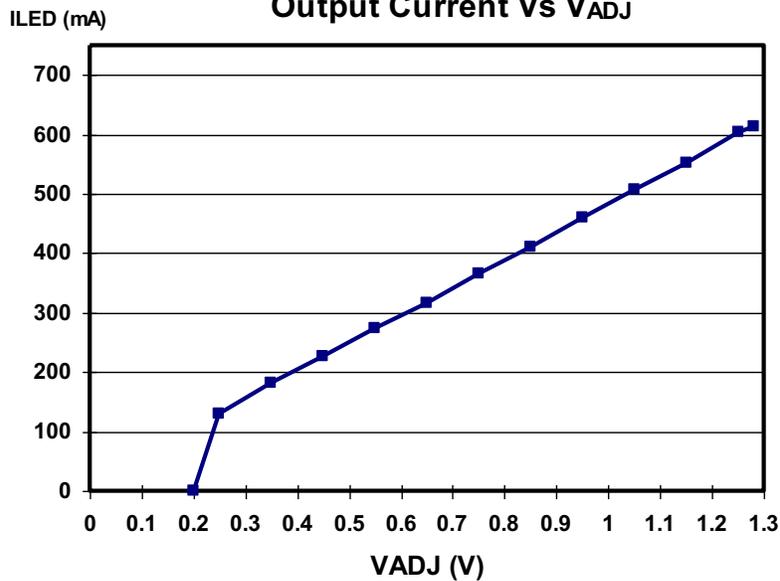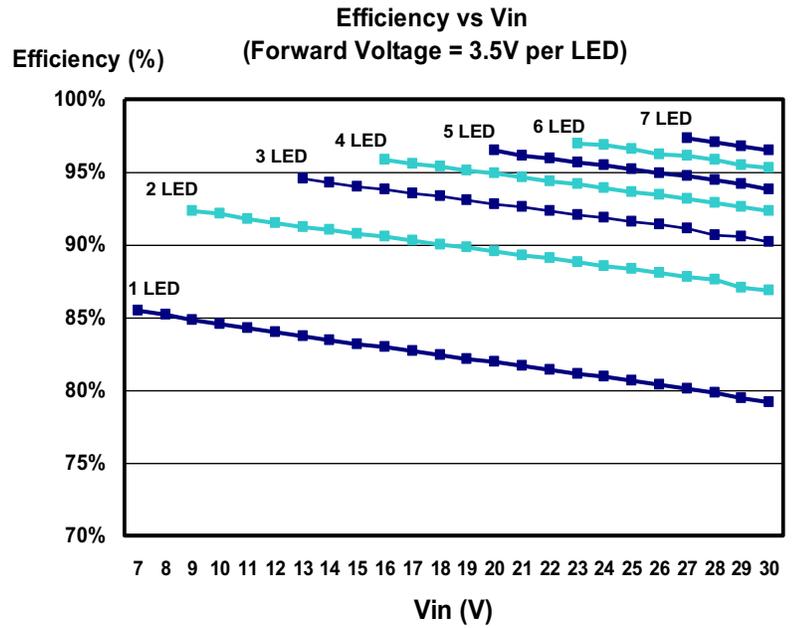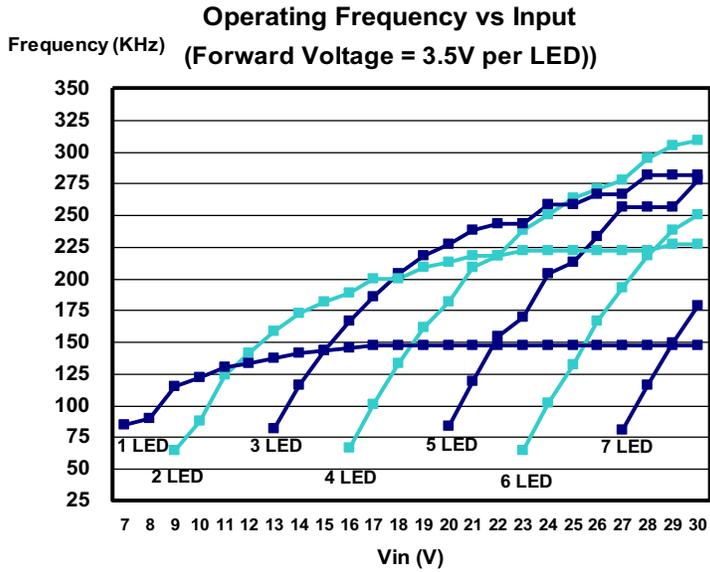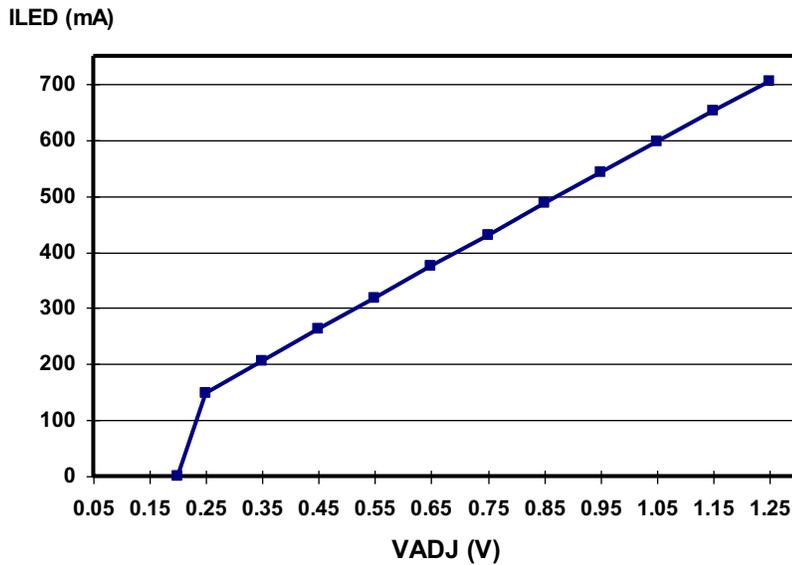
Typical Characteristics: AMLD-60100Z

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

Frequency (KHz)

Vin (V)

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

Efficiency (%)

Vin (V)

ILED (mA)

Output Current Vs V$_{ADJ}$

V$_{ADJ}$ (V)
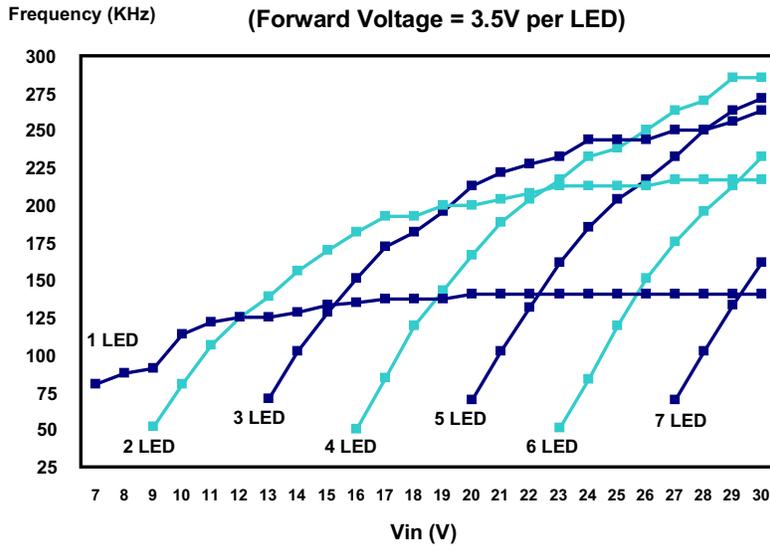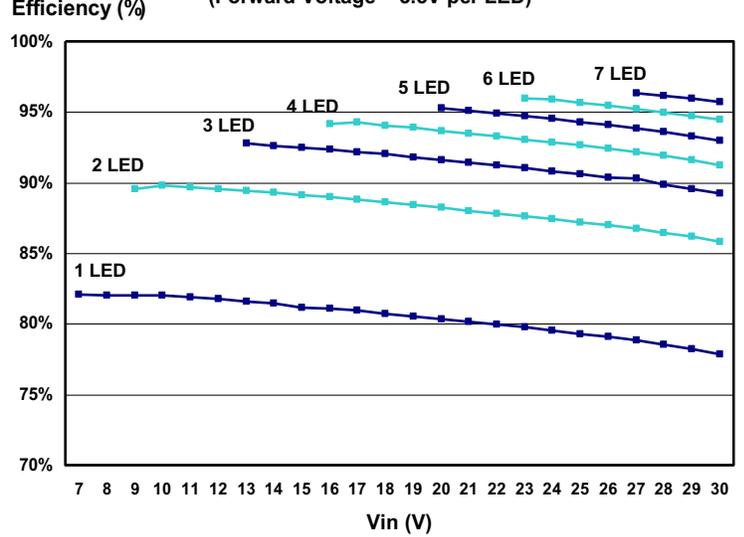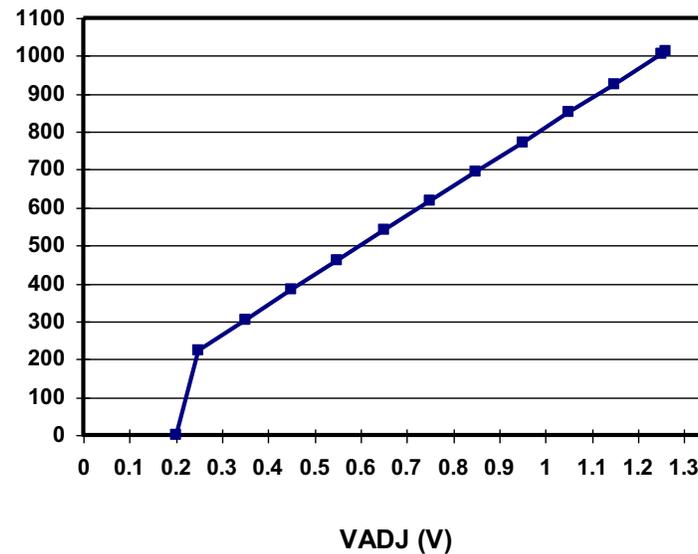
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