



ZD1680DM-n 10W to 150W
Driver Module Manual

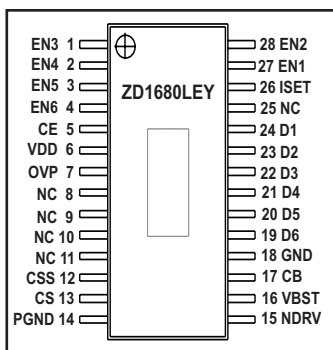
General Description

ZD1680DM-n

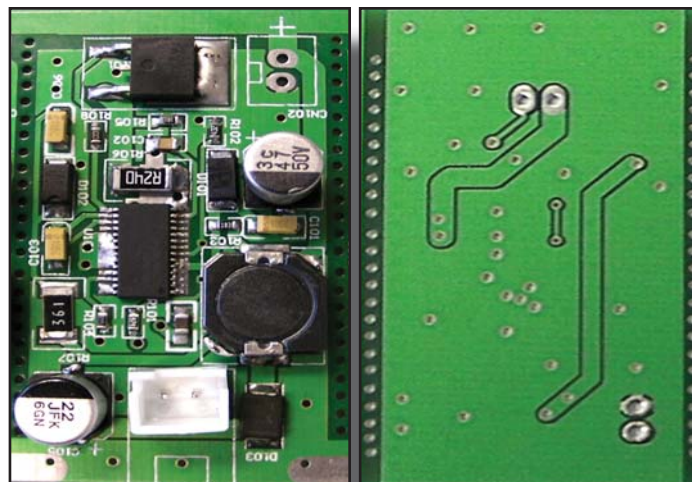
The ZD1680 is a high efficiency step-up controller especially designed for driving multiple strings of serially connected LEDs. 6 channels of low dropout current sinks are included to provide excellent matching of currents for each LED string. The boost converter control loop regulates the current source outputs to 0.3V for maximum efficiency. All 6 channel LED current outputs are set by a resistor RSET to ground at the ISET pin. A CHIP ENABLE (CE) input provides an enable or shutdown function to the IC and the ISET pin can be used to adjust the LED string current (dimming control) with a PWM signal or an analog DC voltage. In this ZD1680DM board, all 6 LED channels are tied together and controlled by a single EN pin (with EN1~EN6 tied together to allow the max driving current of 360mA). Also included is an Under Voltage Lockout (UVLO) circuit to discontinue operation when input VDD falls below 2.7V and automatic soft start to limit inrush currents during power start-up or following a re-CHIP ENABLE function. Output Over-Voltage Protection (OVP) is available by user-defined resistor network setting to protect the LEDs, the IC, and the port module.

Default Configuration: The ZD1680DM-n is a 29mm x (26.6mm x n) port module where n=1 to 10 ports. It is available as a single port (n=1) or up to a 10 port (n=10) driver module. The ZD1680DM-n is configured using n ports (n=1 to 10) of ZD1680 to operate with a single power supply with an input of 24VDC at the VBATT, providing a voltage source to the VDD and VBST of the device, with R103 and R107 connected in series respectively. Each port can drive up to 15 x 1W LEDs in series with all 6 channels tied together. (Details of a single port are shown in Figure 1 and details of 10 port are in Figure 2).

Pin Configuration



28-Exposed-TSSOP



Ordering Information

Part Number	Temperature Range	Board Dimensions
ZD1680DM-n	n/a	29mm x (26.6mm x n)

The number of port modules (n = 1 to 10) is specified by customer's request.

Typical Application

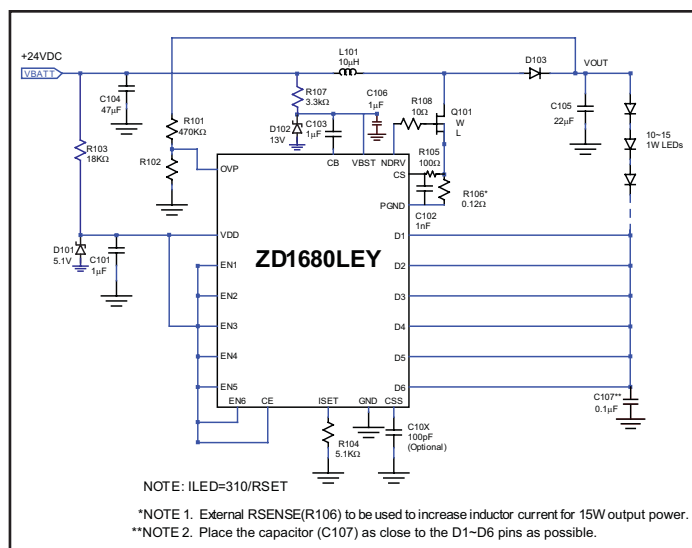


Figure 1. Single port of ZD1680DM-1 driving 10~15 x 1W LEDs.

Single power supply driving 10 ~ 150 X 1W LEDs

The ZD1680DM-n is designed to drive 1 string of 10~15 1W LEDs on each port, with a maximum of 10 ports. The ZD1680DM-n is driven by a single 12V or 24V power supply applied to the VBATT with the D1~D6 tied together to provide and output current of 360mA from each port. The values for the V_{OVP} resistors (see datasheet for details), will have $N = 10$ and $V_{Dmax} = 3.5V$ which will give $R101 = 470k\Omega$ and $R102 = 4.3k\Omega$ as the closest common resistors available for a $V_{OVP} = 56.3V$. The output current is calculated using the formula $I_{LED} = 310/RSET$.

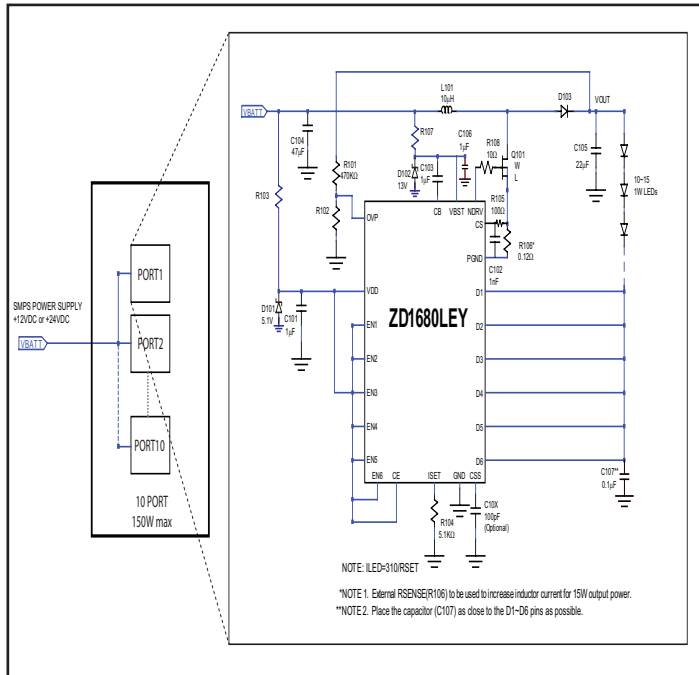


Figure 2. Block Diagram of 10 ports of ZD1680DM-n driving 10~15 x 1W LEDs each port

Bill of Materials Listing for driving a single port of ZD1680DM-1 with (10 ~ 15) x 1W LEDs application. (Up to 10 ports for ZD1680DM-10.)

Item	Quantity	Location	Part	Outline
1	1	ZD1680	Zywyn ZD1680LEY	28-EX-TSSOP
2	1	R101	470kΩ	0603
3	1	R102	see tables for values on the following pages	0603
4	1	R103	see tables for values on the following pages	0603
5	1	R104	5.1kΩ	0603
6	1	R105	100Ω	0603
7	1	R106	0.12Ω/0.5W	1812
8	1	R107	see tables for values on the following pages	1812
9	1	R108	10Ω	0603
10	1	C101	1µF/16V	3216
11	1	C102	1nF, MLCC, ±5%/16V	0603
12	1	C103	1µF/16V	3216
13	1	C104	47µF/50V	6 x 7
14	1	C105	22µF/63V	6 x 7
15	1	C106	1µF/16V	3216
16	1	C107*	0.1µF/16V	3216
17	1	L101	22µH/2A	SMD 7.8mm
18	1	D101	5.1V Zener	SMA
19	1	D102	13V Zener	SMA
20	1	D103	Schottky Diode 10W: RB160M-60 15W: MBR5190T3	PMDU or SMA
21	1	Q101	10W: 2SK2782 15W: IRF520	SOT252
22	1	CN101	2 PIN terminal	2.5mm
23	1	CN102	2 PIN terminal	2.5mm
24	1	PCB	260 x 50 FR4, 1.2mm	29mm x 26mm x [1]
25	10~15	LED	CREE XLAMP® XR-E Series	
26	1	POWER SUPPLY	24VDC/5A SMPS	

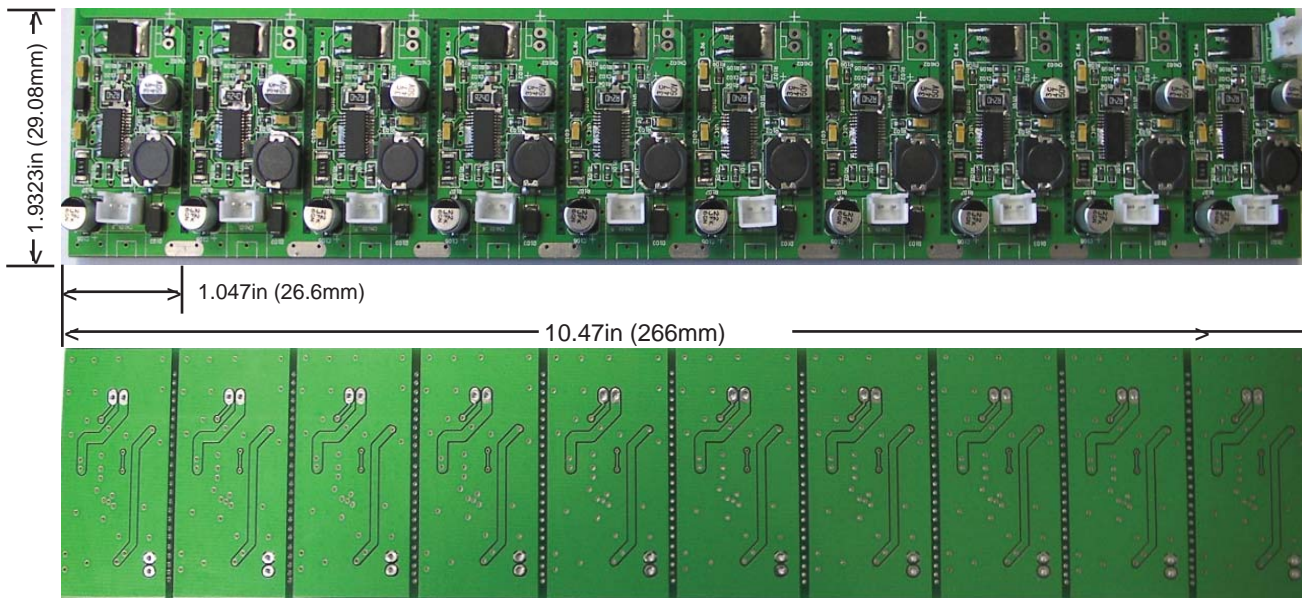
* - C107 is labeled (104) on the ZD1680-DM

Table 1. List of component changes for different number of LEDs (1W type) in series with VBATT = 12VDC. Assume the $V_F = 3.5V$ and driven by ZD1680DM-1, one port.

no. of LED	Vin Min (VDC)	Vin Max (VDC)	R102 (k Ω)	OVP (V)	R103 (k Ω)	R106 (Ω 1%, 0.5W)	R107 (Ω)	L101	Q101	C105
5	8	16	10	24.0	6.8	0.12	820	22 μ H, 1.2A	2SK2782	22 μ F 50V
6	8	16	9	26.6	6.8	0.12	820	22 μ H, 1.5A	2SK2782	22 μ F 50V
7	8	16	8	29.9	6.8	0.12	820	22 μ H, 1.8A	2SK2782	22 μ F 50V
8	8	16	7	34.1	6.8	0.12	820	22 μ H, 2A	2SK2782	22 μ F 50V
9	8	16	6.5	36.7	6.8	0.075	820	22 μ H, 2.2A	2SK2782	22 μ F 75V
10	8	16	6	39.7	6.8	0.075	820	22 μ H, 2.5A	2SK2782	22 μ F 75V
11	8	16	5.5	43.2	6.8	0.075	820	22 μ H, 2.7A	2SK2782	22 μ F 75V
12	8	16	5	47.5	6.8	0.04	820	10 μ H, 3.0A	2SK2782	22 μ F 75V
13	8	16	4.5	52.7	6.8	0.04	820	10 μ H, 3.2A	HUF76629D3S	22 μ F 75V
14	8	16	4.2	56.5	6.8	0.04	820	10 μ H, 3.5A	HUF76629D3S	22 μ F 75V
15	9	16	3.9	60.8	6.8	0.02	820	10 μ H, 3.7A	HUF76629D3S	22 μ F 100V
16	9	16	3.7	64.0	6.8	0.02	820	10 μ H, 4.0A	HUF76629D3S	22 μ F 100V
17	9	16	3.4	69.6	6.8	0.02	820	10 μ H, 4.2A	HUF76629D3S	22 μ F 100V
18	9	16	3.3	71.7	6.8	0.02	820	10 μ H, 4.5A	HUF76629D3S	22 μ F 100V
19	9	16	3.1	76.3	6.8	0.02	820	10 μ H, 4.7A	HUF76629D3S	22 μ F 100V
20	9	16	2.9	81.5	6.8	0.02	820	10 μ H, 5.0A	HUF76629D3S	22 μ F 100V

Table 2. List of component changes for different number of LEDs (1W type) in series with VBATT = 24VDC. Assume the $V_F = 3.5V$ and driven by ZD1680DM-1, one port.

no. of LED	Vin Min (VDC)	Vin Max (VDC)	R102 (kΩ)	OVP (V)	R103 (kΩ)	R106 (1%, 0.5W)	R107 (kΩ)	L101	Q101	C105
8	20	28	7	34.1	18	0.12	3.3	22μH, 1.2A	2SK2782	22μF, 50V
9	20	28	6.5	36.7	18	0.12	3.3	22μH, 1.2A	2SK2782	22μF, 75V
10	20	28	6	39.7	18	0.12	3.3	22μH, 1.5A	2SK2782	22μF, 75V
11	20	28	5.5	43.2	18	0.12	3.3	22μH, 1.5A	2SK2782	22μF, 75V
12	20	28	5	47.5	18	0.12	3.3	22μH, 1.5A	2SK2782	22μF, 75V
13	20	28	4.5	52.7	18	0.12	3.3	22μH, 1.5A	HUF76629D3S	22μF, 75V
14	20	28	4.2	56.5	18	0.12	3.3	22μH, 1.7A	HUF76629D3S	22μF, 75V
15	20	28	3.9	60.8	18	0.12	3.3	22μH, 1.7A	HUF76629D3S	22μF, 100V
16	20	28	3.7	64.0	18	0.12	3.3	22μH, 2.0A	HUF76629D3S	22μF, 100V
17	20	28	3.4	69.6	18	0.12	3.3	22μH, 2.0A	HUF76629D3S	22μF, 100V
18	20	28	3.3	71.7	18	0.12	3.3	22μH, 2.0A	HUF76629D3S	22μF, 100V
19	20	28	3.1	76.3	18	0.12	3.3	22μH, 2.2A	HUF76629D3S	22μF, 100V
20	20	28	2.9	81.5	18	0.12	3.3	22μH, 2.2A	HUF76629D3S	22μF, 100V



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