



July 27, 2009

# LED MODULES

## SPECIFICATION



USA patent pending (US 12/473,468) / International Patent

cULus recognized  US E301137

RoHS Compliant  

World-class optoelectronic device manufacturing facility since 1969  
25 million products manufactured daily  
ISO14001 / ISO9001 / TS16949 Certified  
White Licensed



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## Introduction

### Applications

- Channel Letters
- Road Signs
- Decoration
- Cool Lighting
- Architecture
- Restaurant
- Convention
- Grocery
- Strip Mall
- Billboard
- Retail
- Swimming Pool

### Benefits

**Complete Weatherproof Technology.** The special professional packaging technique reaches IP68 standard so that the VaOpto LED system works in all weather condition. VaOpto LED systems work within  $-40^{\circ} \sim 180^{\circ} \text{ F}$  ( $-40^{\circ} \sim 80^{\circ} \text{ C}$ ) perfectly.

**Quick Heat Dissipation Technology.** Special professional heat sink structure design, low heat resistance, and transcalent.

**Stable Voltage and Consistent Current Technology.** The unique consistent voltage and current technique guarantee LEDs work stably.

**High Brightness Technology.** By using one of the best LED chips in the world and the low heat resistance technology, VaOpto LED systems work with high brightness.

**Energy Efficient.** VaOpto LED systems are up to 80% more efficient than standard neon tubes, resulting in lower energy costs. VaOpto LED systems produce 100% efficient light and 100% environment protective illumination without mercury.

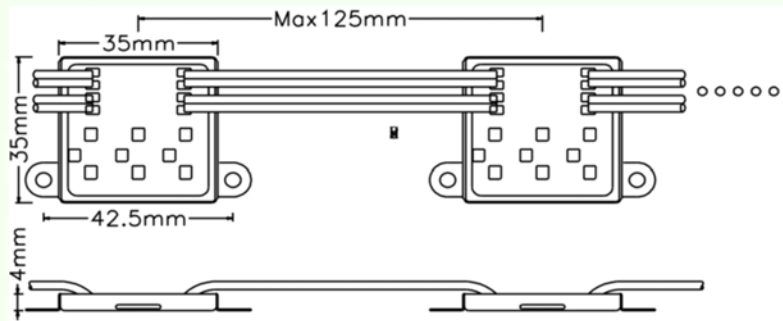
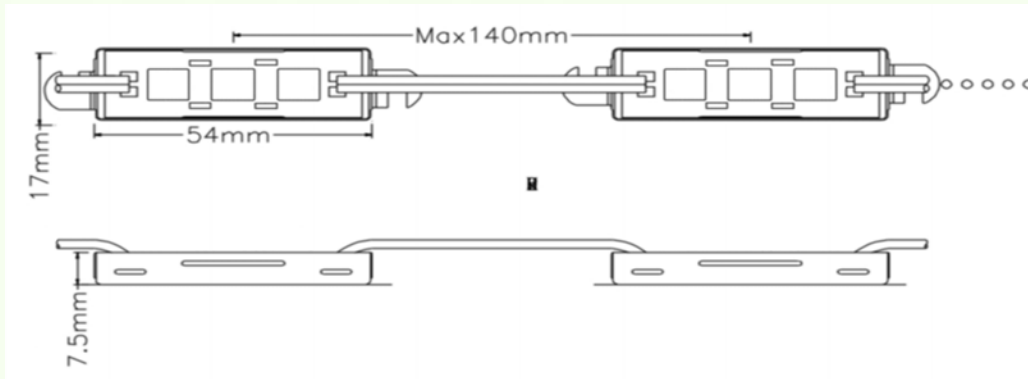
**Extra Long Life.** VaOpto LED systems have limited warranties for up to 5 years and can last up to 100,000 hours while delivering maximum efficiency and the same high light output as neon. Longer life means fewer system changes, lower maintenance costs, and fewer disruptions due to burned out tubes, broken tubes, failed transformers, or nuisance tripping.

**RGB Color Change.** Full-color RGB is available with the customized color change either dependently or independently.

**Easy Installation.** Patented design enables the system to be used in new or retrofit applications with sign script fonts.

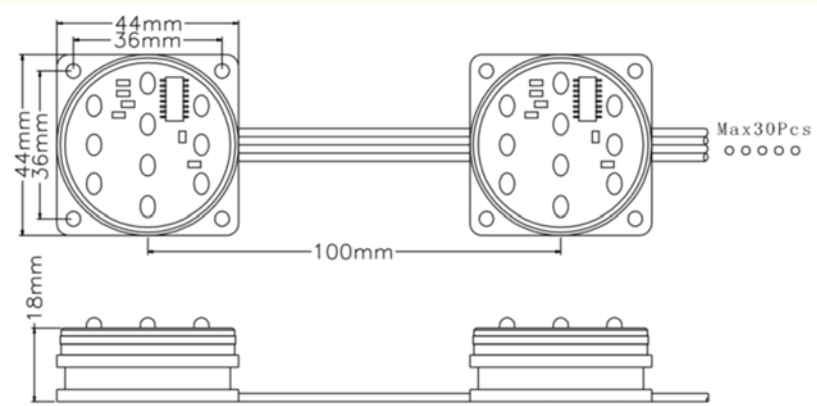
Specifications

RGB Series – Synchronous Control



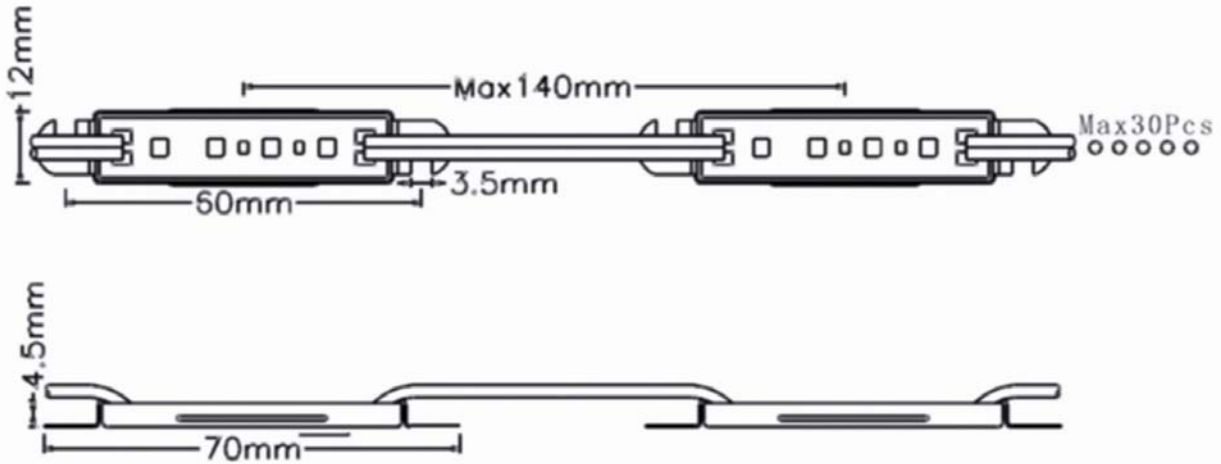
Part No.	Color	Size (mm)	LED Type & Quantity	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Luminosity (lm)
ZLS-PCB-RGB	RGB	54x12x5	3pcs 5050 RGB LED	110	12	75	0.9	12
ZLS-PMBC-C	RGB	35x35x5	9 pcs TOP LED	110	12	70	0.84	12

RGB Series – Asynchronous Control



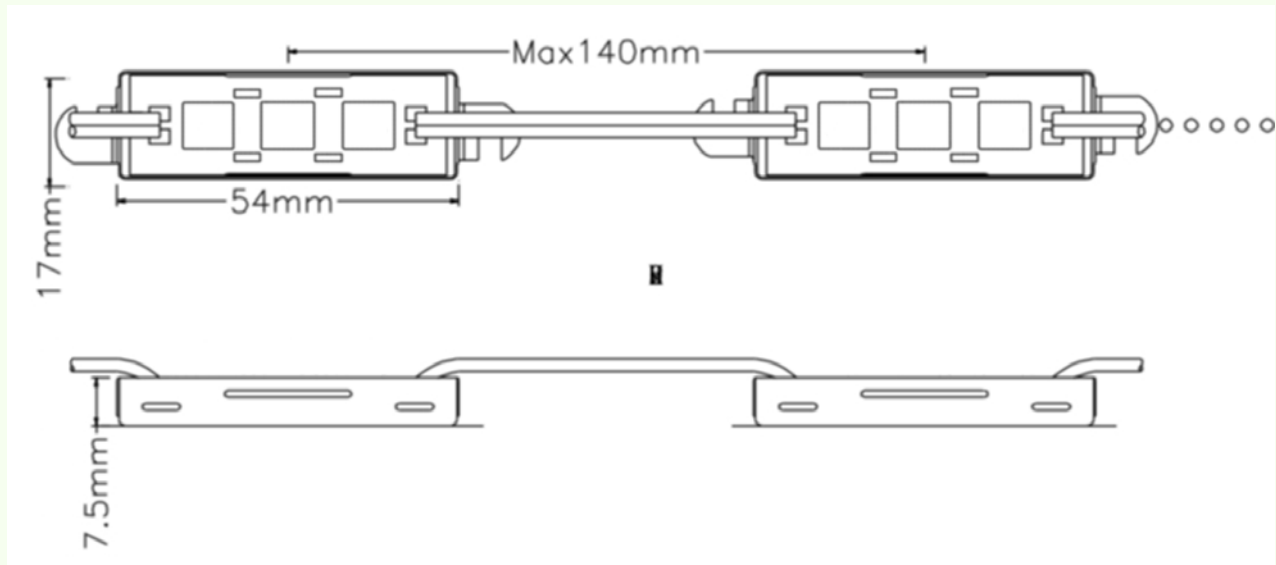
Part No.	Color	Size (mm)	LED Type & Quantity	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Luminosity (lm)
ZLS-PCBC-RGB	RGB	54x12x5	3pcs 5050 RGB LED	110	12	65	0.78	10
ZLS-PMBC-RGB	RGB	40	R: 4pcs G: 3pcs B: 3pcs TOP LED	110	12	50	0.6	8

ZLS-PCB-XT Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



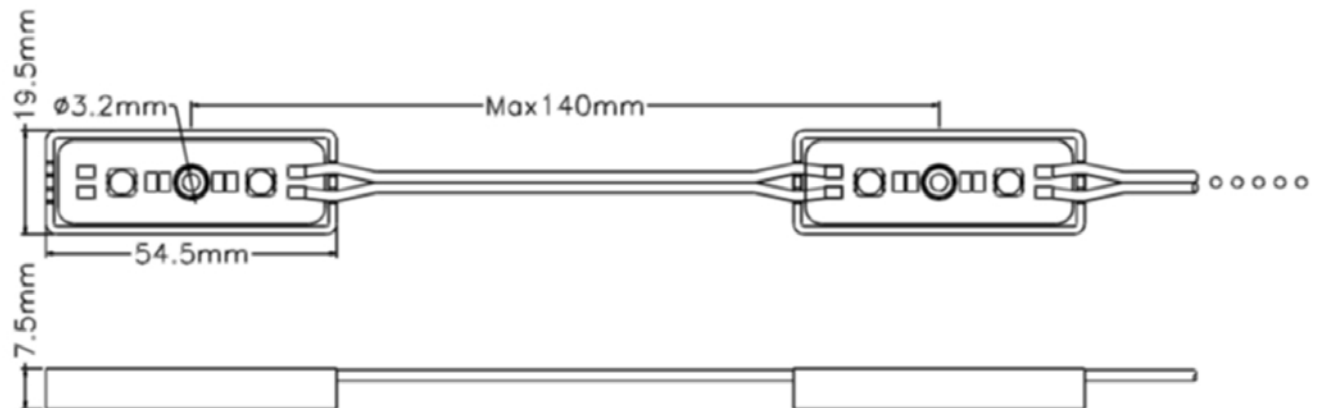
Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PCB-RT	Red	50×12×5	4	110	12	35	0.42	625nm	10
ZLS-PCB-OT	Orange	50×12×5	4	110	12	35	0.42	610nm	8
ZLS-PCB-YT	Yellow	50×12×5	4	110	12	35	0.42	589nm	7
ZLS-PCB-GT	Green	50×12×5	4	110	12	60	0.72	515nm	10
ZLS-PCB-BT	Blue	50×12×5	4	110	12	30	0.36	470nm	3
ZLS-PCB-WT	White	50×12×5	4	110	12	30	0.36	2600-10000K	10
ZLS-PCB-CWT	Cool White	50×12×5	4	110	12	30	0.36	5000-10000K	10
ZLS-PCB-NWT	Neutral White	50×12×5	4	110	12	30	0.36	3700-5000K	10
ZLS-PCB-WWT	Warm White	50×12×5	4	110	12	30	0.36	2600-3700K	10

ZLS-PMBC-X Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



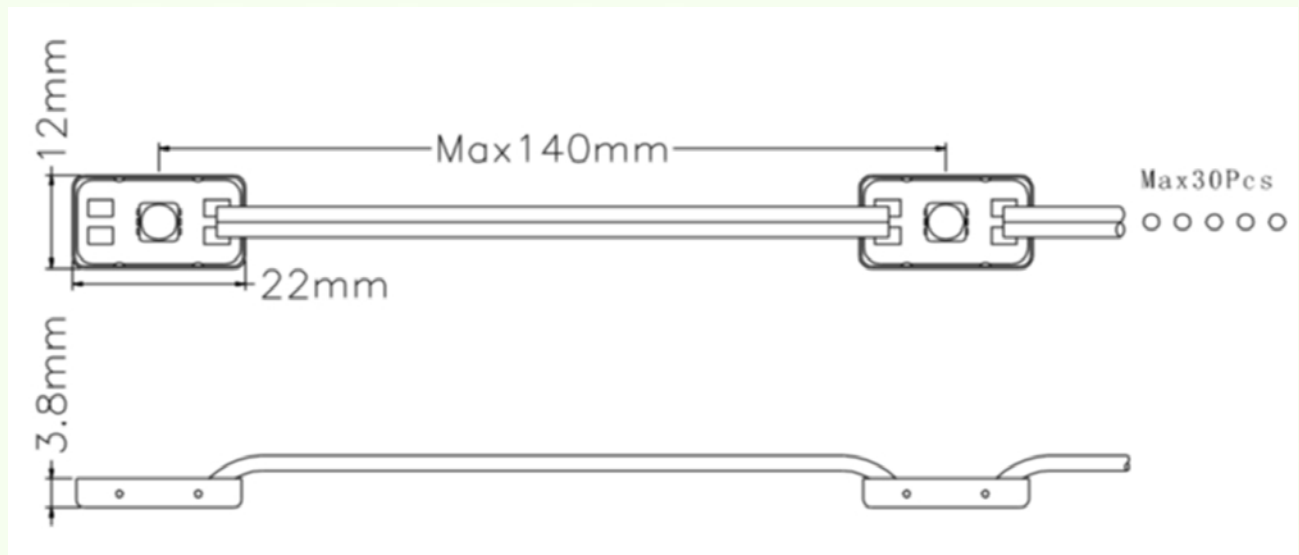
Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PMBC-R	Red	54×17×7.5	3	110	12	35	0.39	625nm	18
ZLS-PMBC-O	Orange	54×17×7.5	3	110	12	35	0.39	610nm	18
ZLS-PMBC-Y	Yellow	54×17×7.5	3	110	12	35	0.39	589nm	18
ZLS-PMBC-G	Green	54×17×7.5	3	110	12	60	0.72	515nm	12
ZLS-PMBC-B	Blue	54×17×7.5	3	110	12	60	0.72	470nm	6
ZLS-PMBC-W	White	54×17×7.5	3	110	12	60	0.72	2600-10000K	25
ZLS-PMBC-CW	Cool White	54×17×7.5	3	110	12	60	0.72	5000-10000K	28
ZLS-PMBC-NW	Neutral White	54×17×7.5	3	110	12	60	0.72	3700-5000K	25
ZLS-PMBC-WW	Warm White	54×17×7.5	3	110	12	60	0.72	2600-3700K	20

ZLS-PCB-X Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



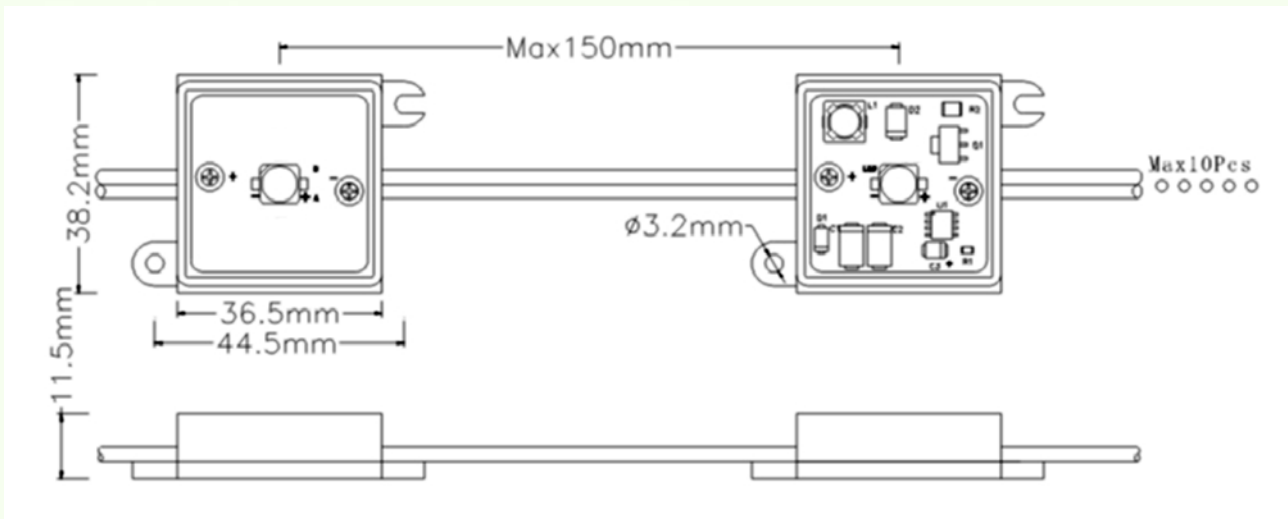
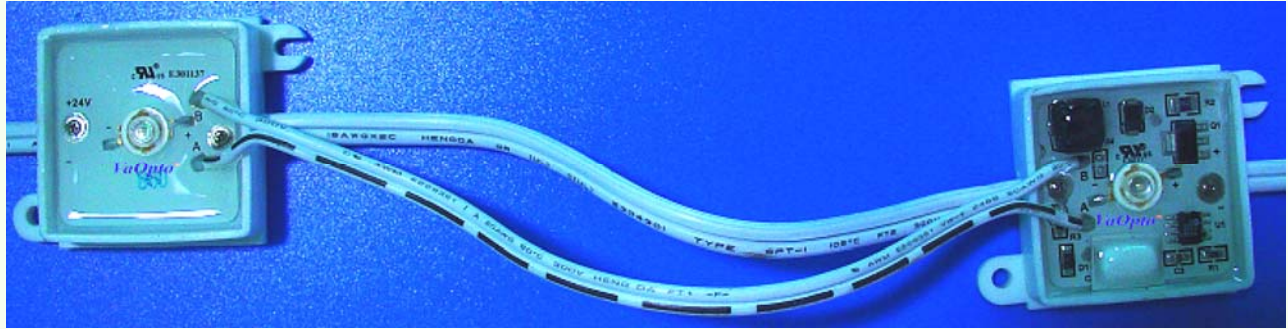
Part No.	Color	Size (mm)	LED Type	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PCB-R	Red	54×19×10	Super Bright LED	110	12	60	0.72	625nm	14
ZLS-PCB-O	Orange	54×19×10	Super Bright LED	110	12	60	0.75	610nm	14
ZLS-PCB-Y	Yellow	54×19×10	Super Bright LED	110	12	60	0.72	589nm	12
ZLS-PCB-G	Green	54×19×10	Super Bright LED	110	12	60	0.72	515nm	8
ZLS-PCB-B	Blue	54×19×10	Super Bright LED	110	12	45	0.54	470nm	4
ZLS-PCB-W	White	54×19×10	Super Bright LED	110	12	60	0.72	2600-10000K	20
ZLS-PCB-CW	Cool white	54×19×10	Super Bright LED	110	12	60	0.72	5000-10000K	20
ZLS-PCB-NW	Neutral white	54×19×10	Super Bright LED	110	12	60	0.72	3700-5000K	20
ZLS-PCB-WW	Warm white	54×19×10	Super Bright LED	110	12	60	0.72	2600-3700K	20

PL-PMBC-XS Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



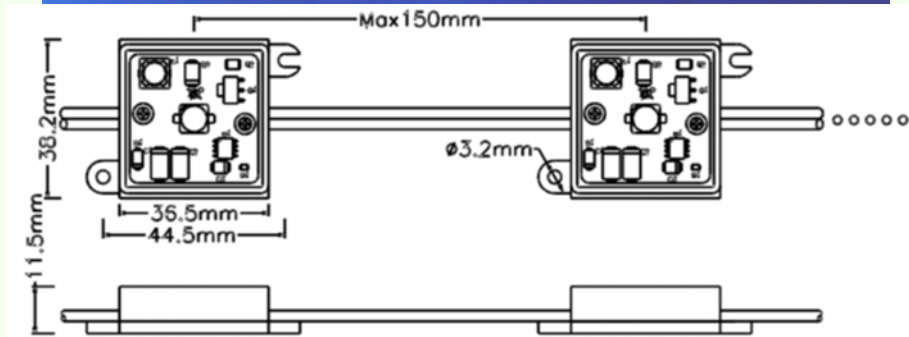
Part No.	Color	LED Type	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
PL-PMBC-RS	Red	1pcs TOP LED	110	12	60	0.72	625nm	14
PL-PMBC-OS	Orange	1pcs TOP LED	110	12	60	0.72	610nm	14
PL-PMBC-YS	Yellow	1pcs TOP LED	110	12	60	0.72	589nm	12
PL-PMBC-GS	Green	1pcs TOP LED	110	12	60	0.72	515nm	8
PL-PMBC-BS	Blue	1pcs TOP LED	110	12	45	0.54	470nm	4
PL-PMBC-WS	White	1pcs TOP LED	110	12	60	0.72	2600-10000K	20
PL-PMBC-CWS	Cool white	1pcs TOP LED	110	12	60	0.72	5000-10000K	20
PL-PMBC-NWS	Neutral white	1pcs TOP LED	110	12	60	0.72	3700-5000K	20
PL-PMBC-WWS	Warm white	1pcs TOP LED	110	12	60	0.72	2600-3700K	20

**PL1-PMBC-X Series; where X may be R, O, Y, G, B, W, CW, NW, or WW (Two modules in each unit)**



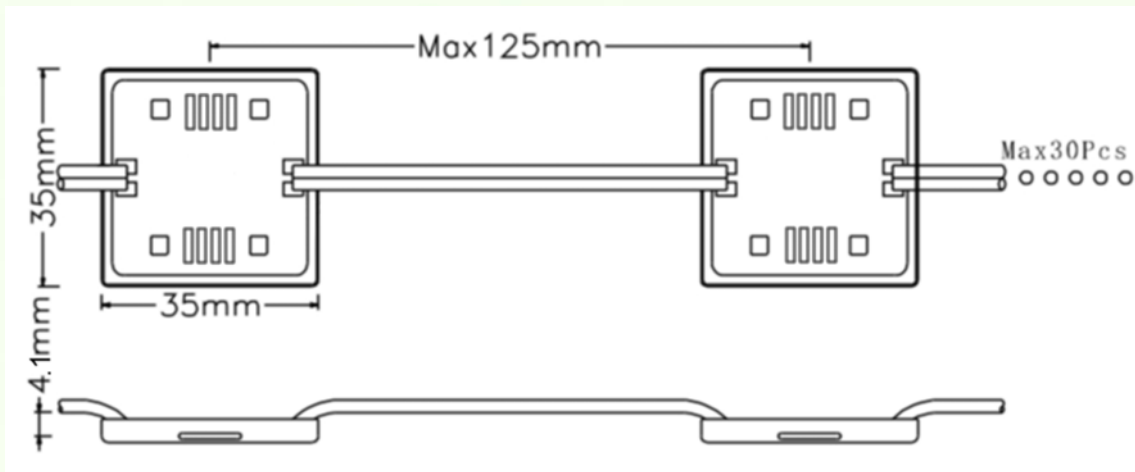
Part No.	Color	Size (mm)	LED Type	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W per unit)	Wavelength	Luminosity (lm)
PL1-PMBC-R	Red	35×35×17	1W Power LED	110	24	65	1.56	625nm	30
PL1-PMBC-O	Orange	35×35×17	1W Power LED	110	24	65	1.56	610nm	28
PL1-PMBC-Y	Yellow	35×35×17	1W Power LED	110	24	65	1.56	589nm	28
PL1-PMBC-G	Green	35×35×17	1W Power LED	110	24	95	2.28	515nm	33
PL1-PMBC-B	Blue	35×35×17	1W Power LED	110	24	95	2.28	470nm	9
PL1-PMBC-W	White	35×35×17	1W Power LED	110	24	95	2.28	2600-10000K	60
PL1-PMBC-CW	Cool white	35×35×17	1W Power LED	110	24	95	2.28	5000-10000K	60
PL1-PMBC-NW	Neutral white	35×35×17	1W Power LED	110	24	95	2.28	3700-5000K	55
PL1-PMBC-WW	Warm white	35×35×17	1W Power LED	110	24	95	2.28	2600-3700K	50

**PL1-PMBC-XT Series; where X may be R, O, Y, G, B, W, CW, NW, or WW**



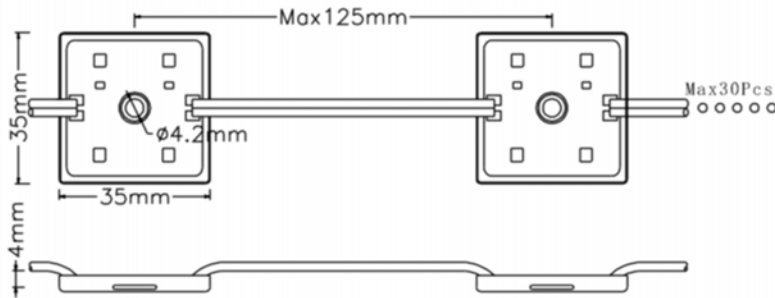
Part No.	Color	Size (mm)	LED Type	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
PL1-PMBC-RT	Red	35×35×11.5	1W Power LED	110	12	70	0.84	620-635nm	30
PL1-PMBC-OT	Orange	35×35×11.5	1W Power LED	110	12	100	1.2	610nm	28
PL1-PMBC-YT	Yellow	35×35×11.5	1W Power LED	110	12	70	0.84	590-595nm	28
PL1-PMBC-GT	Green	35×35×11.5	1W Power LED	110	12	100	1.2	515-535nm	33
PL1-PMBC-BT	Blue	35×35×11.5	1W Power LED	110	12	100	1.2	465-475nm	9
PL1-PMBC-WT	White	35×35×11.5	1W Power LED	110	12	100	1.2	2600-10000K	60
PL1-PMBC-CWT	Cool white	35×35×11.5	1W Power LED	110	12	100	1.2	5000-10000K	60
PL1-PMBC-NWT	Neutral white	35×35×11.5	1W Power LED	110	12	100	1.2	3700-5000K	55
PL1-PMBC-WWT	Warm white	35×35×11.5	1W Power LED	110	12	100	1.2	2600-3700K	50

ZLS-PMBC-XT Series; where X may be R, O, Y, G, B, CW, NW, or WW



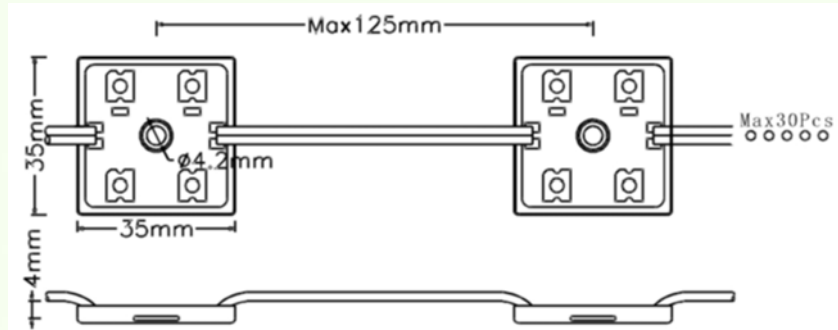
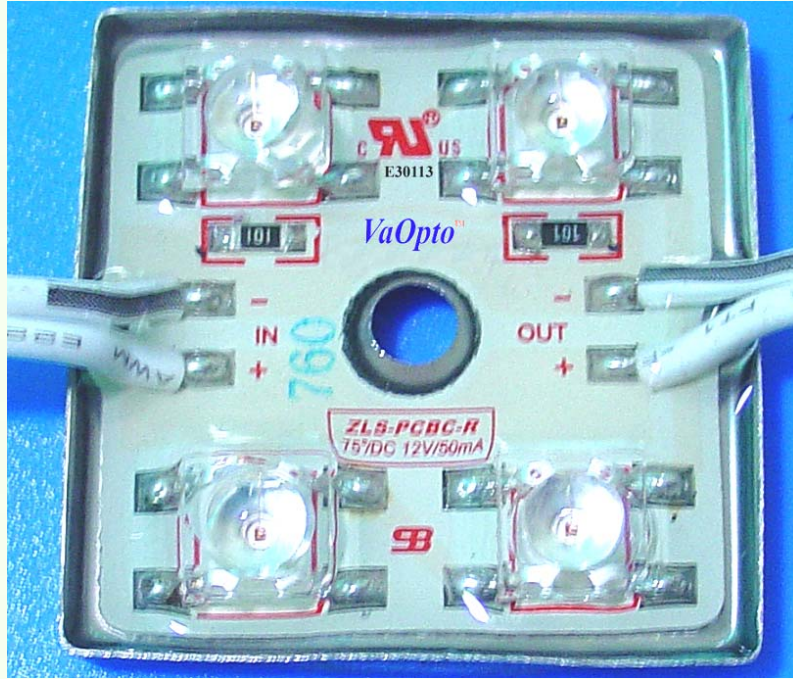
Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PMBC-RT	Red	35.3×35.3×4.1	4	110	12	120	1.44	625nm	20
ZLS-PMBC-OT	Orange	35.3×35.3×4.1	4	110	12	120	1.44	610nm	20
ZLS-PMBC-YT	Yellow	35.3×35.3×4.1	4	110	12	120	1.44	589nm	20
ZLS-PMBC-GT	Green	35.3×35.3×4.1	4	110	12	120	1.44	515nm	20
ZLS-PMBC-BT	Blue	35.3×35.3×4.1	4	110	12	120	1.44	470nm	8
ZLS-PMBC-CWT	Cool white	35.3×35.3×4.1	4	110	12	120	1.44	5000-10000K	36
ZLS-PMBC-NWT	Neutral white	35.3×35.3×4.1	4	110	12	120	1.44	3700-5000K	33
ZLS-PMBC-WWT	Warm white	35.3×35.3×4.1	4	110	12	120	1.44	2600-3700K	30

ZLS-PCBC-XT Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



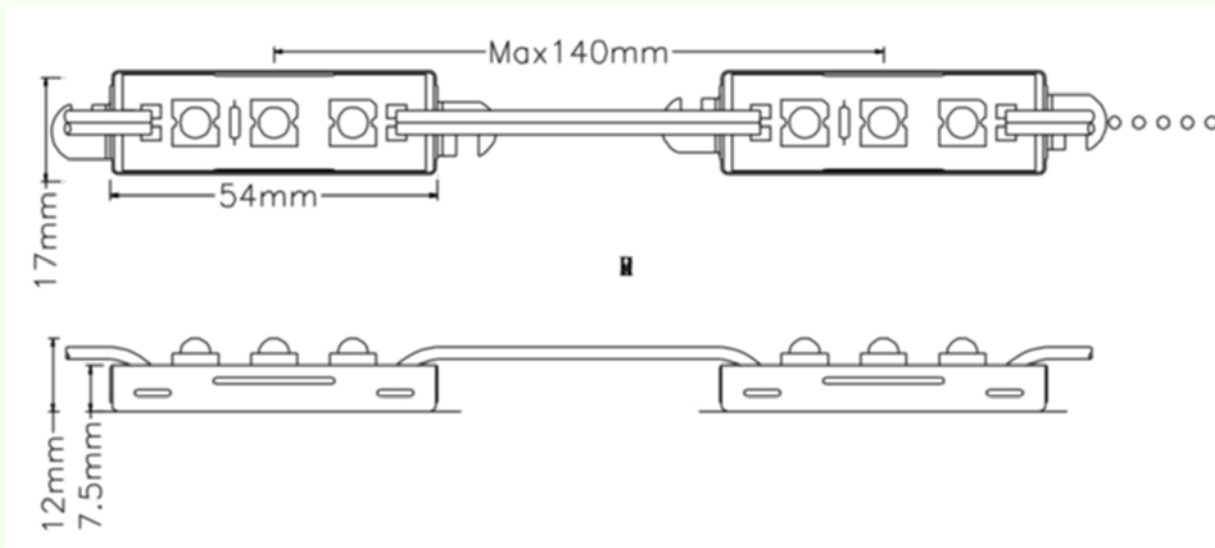
Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PCBC-RT	Red	35×35×5	4	110	12	50	0.6	625nm	15
ZLS-PCBC-OT	Orange	35×35×5	4	110	12	50	0.6	610nm	12
ZLS-PCBC-YT	Yellow	35×35×5	4	110	12	50	0.6	589nm	11
ZLS-PCBC-GT	Green	35×35×5	4	110	12	60	0.72	515nm	10
ZLS-PCBC-BT	Blue	35×35×5	4	110	12	30	0.36	470nm	3
ZLS-PCBC-WT	White	35×35×5	4	110	12	30	0.36	2600-10000K	10
ZLS-PCBC-CWT	Cool white	35×35×5	4	110	12	30	0.36	5000-10000K	10
ZLS-PCBC-NWT	Neutral white	35×35×5	4	110	12	30	0.36	3700-5000K	10
ZLS-PCBC-WWT	Warm white	35×35×5	4	110	12	30	0.36	2600-3700K	10

ZLS-PCBC-X Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PCBC-R	Red	35×35×10	4	75	12	50	0.6	625nm	15
ZLS-PCBC-O	Orange	35×35×10	4	75	12	50	0.6	610nm	12
ZLS-PCBC-Y	Yellow	35×35×10	4	75	12	50	0.6	589nm	11
ZLS-PCBC-G	Green	35×35×10	4	75	12	60	0.72	515nm	10
ZLS-PCBC-B	Blue	35×35×10	4	75	12	30	0.36	470nm	3
ZLS-PCBC-W	White	35×35×10	4	75	12	30	0.36	2600-10000K	10
ZLS-PCBC-CW	Cool White	35×35×10	4	75	12	30	0.36	5000-10000K	10
ZLS-PCBC-NW	Neutral White	35×35×10	4	75	12	30	0.36	3700-5000K	10
ZLS-PCBC-WW	Warm White	35×35×10	4	75	12	30	0.36	2600-3700K	10

ZLS-PCB-XS Series; where X may be R, O, Y, G, B, W, CW, NW, or WW



Part No.	Color	Size (mm)	LED Quantity (pcs)	Viewing Angle (°)	Work Voltage (V DC)	Work Current (mA)	Power (W)	Wavelength	Luminosity (lm)
ZLS-PCB-RS	Red	54×17×12	3	75	12	50	0.6	625nm	15
ZLS-PCB-OS	Orange	54×17×12	3	75	12	50	0.6	610nm	12
ZLS-PCB-YS	Yellow	54×17×12	3	75	12	50	0.6	589nm	11
ZLS-PCB-GS	Green	54×17×12	3	75	12	30	0.72	515nm	8
ZLS-PCB-BS	Blue	54×17×12	3	75	12	15	0.18	470nm	2
ZLS-PCB-WS	White	54×17×12	3	75	12	15	0.18	2600-10000K	8
ZLS-PCB-CWS	Cool White	54×17×12	3	75	12	30	0.36	5000-10000K	8
ZLS-PCB-NWS	Neutral White	54×17×12	3	75	12	30	0.36	3700-5000K	8
ZLS-PCB-WWS	Warm White	54×17×12	3	75	12	30	0.36	2600-3700K	8

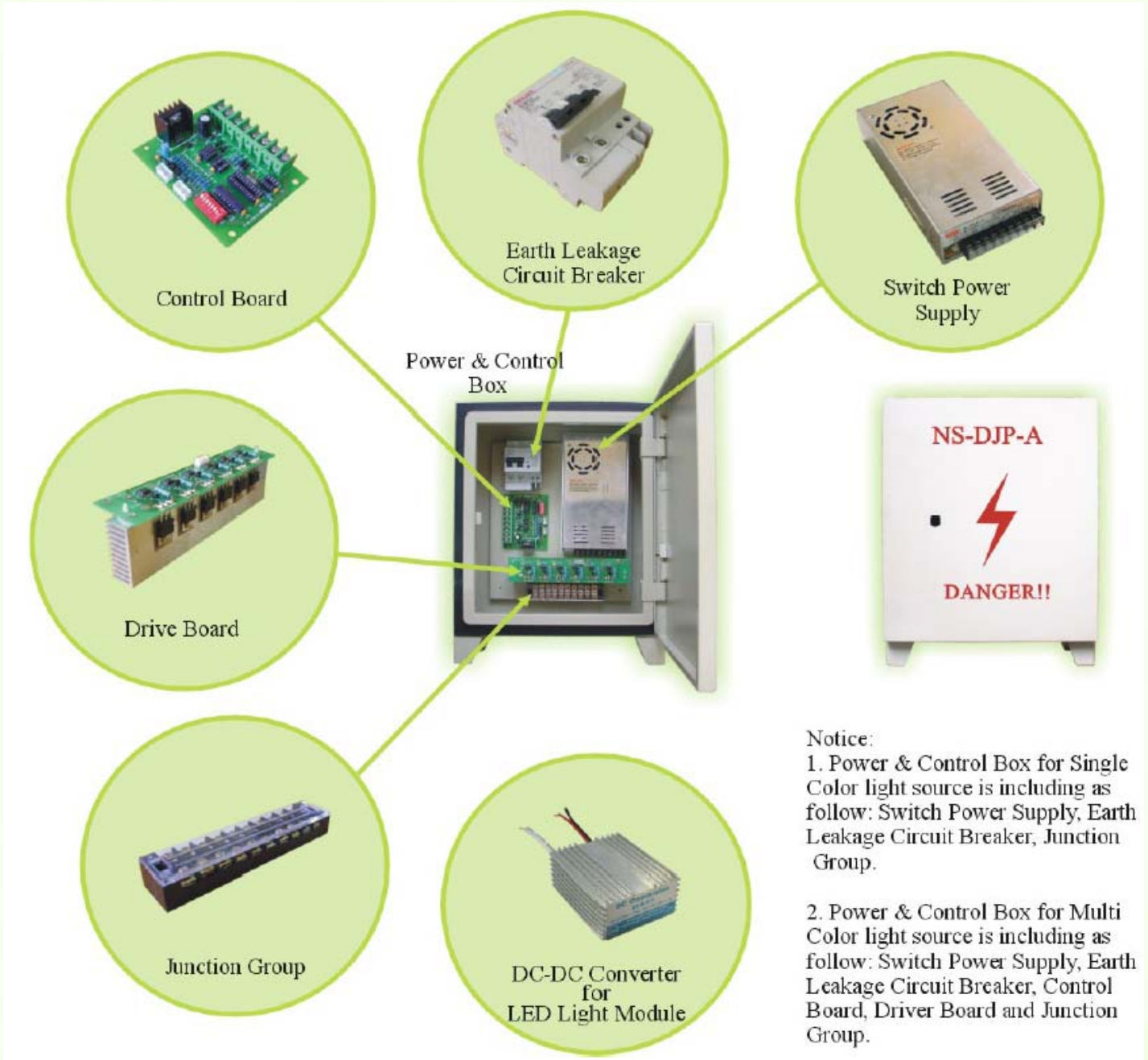
**Accessories**

Part No.	Description	Power (w)	Output Voltage (V DC)
VO-AC-PS-25-12	Power Supply	25	12
VO-AC-PS-25-24	Power Supply	25	24
VO-AC-PS-60-12	Power Supply	60	12
VO-AC-PS-60-24	Power Supply	60	24
VO-AC-PS-150-12	Power Supply	150	12
VO-AC-PS-150-24	Power Supply	150	24
VO-AC-PS-320-12	Power Supply	320	12
VO-AC-PS-320-24	Power Supply	320	24
VO-AC-PS-36-24	Top Switch Power Supply	36	24
VO-AC-PS-48-24	Top Switch Power Supply	48	24
VO-AC-SC-30-12	Sub-Controller/Waterproof, 12VDC	30	12
VO-AC-SC-60-24	Sub-Controller/remote, 24VDC	60	24
VO-AC-SC-60-12	Sub-Controller/remote, 12VDC	60	12
VO-AC-SC-120-24	Sub-Controller/remote, 24VDC	120	24
VO-AC-SC-600-12	Sub-Controller, 12VDC	600	12
VO-AC-SC-600-24	Sub-Controller, 24VDC	600	24
VO-AC-MS-12	Master Controller, 12VDC		
VO-AC-MS-24	Master Controller, 24VDC		
VO-LM-J	Joiner		
VO-LM-T	Double-side tape		
VO-LM-AS	Aluminum Strip		
VO-LM-PT	Plastic Tube		
VO-LM-Box	Outdoor Box		
VO-LM-Wire-RGB	1600ft/roll		

NOTE: The maximum working capacity of accessories depends on the powers of both accessories and parts.

		
<p>3M Jointer</p>	<p>Two-side Tape</p>	<p>DC Converter</p>
		
<p>Data Divider</p>	<p>Video Display Controller</p>	<p>Different Receiver</p>
		
<p>Strip Modules Controller</p>	<p>Power Supply</p>	<p>Distribution Equipment</p>
		
<p>Surface Frame for Strip Module</p>	<p>Frame for Strip Module</p>	<p>PC Tube for Strip Module</p>
		
<p>VO-LMC-B/VO-LMC-D</p>	<p>VO-LC-C</p>	<p>VO-LC-B</p>
		
<p>VO-DC-A</p>	<p>VO-DMC-B/VO-DC-B</p>	<p>VO-LDC-A</p>
		
<p>VO-MC-DMX-A/VO-SC-DMX-A</p>	<p>VO-VDC-A</p>	<p>VO-DD-A/VO-DD-B</p>
		
<p>VO-VDD-A/VO-VDD-B</p>	<p>VO-DR-A</p>	<p>VO-VDC-B</p>

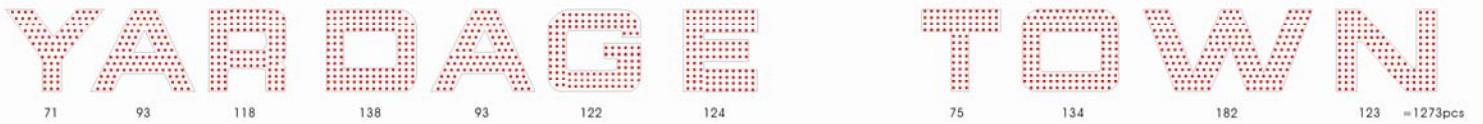
Statement of Distribution Equipment



Installation for Channel Letters Application

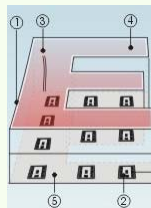
Step 1: Budget the quantity of LED modules

Simulate the arrangement of LED modules by computer to calculate the quantity of LED modules needed.



Step 2: Budget the power and the design power distribution

Based on the quantity in Step 1, calculate the total power needed. And then, design the power distribution.



1. PVC border
2. LED module
3. Power wire hole
4. PMMA cover
5. Aluminous alloy board

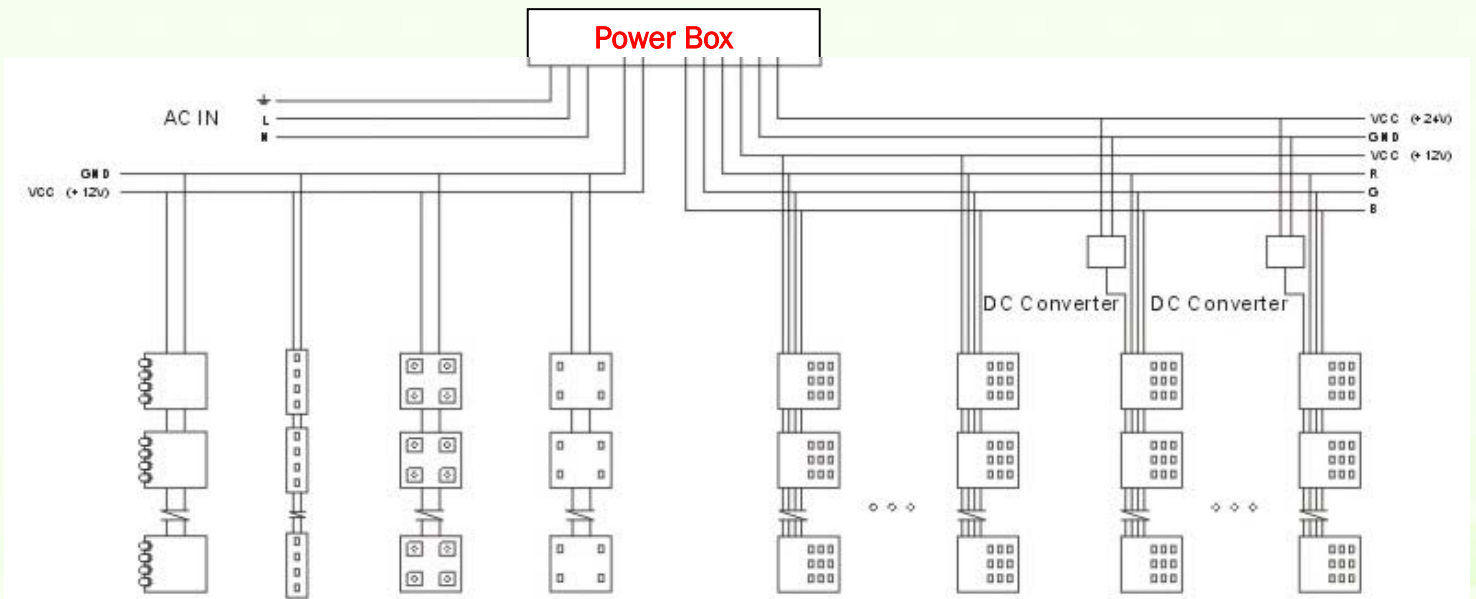


Diagram of LED Module System

**Step 3: The installation of LED modules (See the following sub-steps)**

**I. Paste installation**



1. Take the white paper from one face of the two-side tape;
2. Paste the LED module on the tape;
3. Take the white paper from the other face of the two-side tape;
4. Paste the tape on the bottom of channel letter;
5. Repeat the process with other LED modules;
6. Connect the wires of two modules using 3M connector if necessary;
7. Connect the modules with power supply and put the cover on. Then, turn the light on.

**II. Drill installation**



1. Use drill to make 4.5mm hole on the bottom of channel letter;
2. Fix module to channel letter with a screw and a nut;
3. Tighten;
4. Repeat the process with other LED modules;
5. Connect the wires of two modules using 3M connector if necessary;
6. Connect the modules with power supply and put the cover on. Then, turn the light on.

**Step 4: Testing.**



## General Precautions

- Good heat dissipation condition is necessary between LED modules and the frame of channel letters.
- The brightness and the mix-color performance of the channel letter covers are important because they affect the arrangement of LED module.
- Select the right modules depending on the size of channel letters.
- The maximum quantity of LED modules in one wire is 30 (10 for high power LED module) pcs. When more than 30 (10 for high power LED module) pcs of modules are needed, another wire should be used.
- When using 3M connectors, it is not necessary to peel off the skin of the wire. Simply put the end of the wires into the bottom of 3M connector and then press using a pincher.
- The wire end of the last module should be sealed with the waterproof tape.

## Warranty and Liability Information

- Five years limited warranty.
- The information contained herein is presented only as a guide for the applications of our products.
- No responsibility is assumed by VaOpto for any infringements of intellectual property or other infringements of the rights of third parties that may result from its use.
- VaOpto is committed to a process of continuous improvement of the quality and the features of its products and reserves the right to make changes that result in such improvements.
- VaOpto products are not intended for use in applications where extraordinarily high reliability is required to prevent the loss of human life or where failure could result in bodily injury.
- VaOpto limits the extent of our liability to the initial component cost and will, in the event of a failure, replace a failed component or refund the purchase price at VaOpto option.

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