

# VMU095023RT9TWA

## 7.4"x4.7" RECTANGULAR DC MODULE, 950mA MAX CURRENT, CCT SELECTABLE

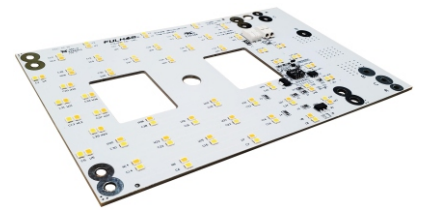
- CCT Selectable: 2700K, 3000K, 3500K, 4000K, 4500K, 5000K
- CRI90 standard
- Potassium Fluorosilicate (PFS) phosphor LEDs to achieve as high efficacy as today's CRI80 LEDs
- For use in UL Class 2 lighting systems
- Suitable for open or fully enclosed luminaires
- Suitable for luminaires with plastic and glass lenses
- Suitable for Energy Star and DLC applications
- Meets UL8750 recognized
- RoHS compliant

### General Specifications

Nominal Input Voltage @ Max. Input Current <sup>①</sup>	24.2VDC
Max. Input Current <sup>①</sup>	950mA
Nominal Input Power @ Max. Input Current <sup>①</sup>	23W
Initial Lumens @ Max. Input Current, 4000K/90CRI	3423 lumens
Initial Efficacy @ Max. Input Current, 4000K/90CRI	149 lm/W
Beam Angle	120°
Color Rendering Index	CRI (Ra) >=90 / R9 >=50 / TM-30 R <sub>f</sub> >=85 / TM-30 R <sub>g</sub> >=100
Storage Temperature Range	-35°C to 100°C / -31°F to 212°F
Operating Temperature Range (ta)	-35°C to 60°C / -31°F to 140°F
Maximum Case Temperature (Tc)	Safety: 105°C(221°F) L70(>60Khrs): 105°C(221°F) L90(36Khrs): 96°C(204.8°F)
Estimated Lumen Maintenance <sup>②</sup>	L70= >60,000 hours @ Tc max 105°C L90= 36,000 hours @ Tc max 96°C
Color Consistency	Binning per ANSI C78.377-2015 @ 25°C; Typ. 3 SDCM, Max. 5 SDCM
Overall Size	7.4" L x 4.7" W x 0.22" H (188.0mm L x 119.4mm W x 5.6mm H)
PCB Material / Thermal Conductivity	CEM1 / 1.0W/mK
LED Quantity	48pcs. CW + 48pcs. WW
Module Weight	48g / 0.106lb
PCB Part Number	PTL008CxxC1
Maximum Screw Installation Torque	25 inch - ounces
Connector Type	Wago 2060-452 (2 pin connector)
Packaging: Master Carton	40pcs.
Thermal Feedback	Not Available
Safety/Compliance	cURus (File # E351548) Suitable for UL Class 2 Lighting Systems RoHS Compliant Dry and Damp Location
Energy Efficiency Class per (EU) 2019/2015	E, @max. input current
Warranty	5 years @ Max. Tc from the date of manufacture

<sup>①</sup> Measured electrical data per UL file

<sup>②</sup> TM-21 Reported Numbers

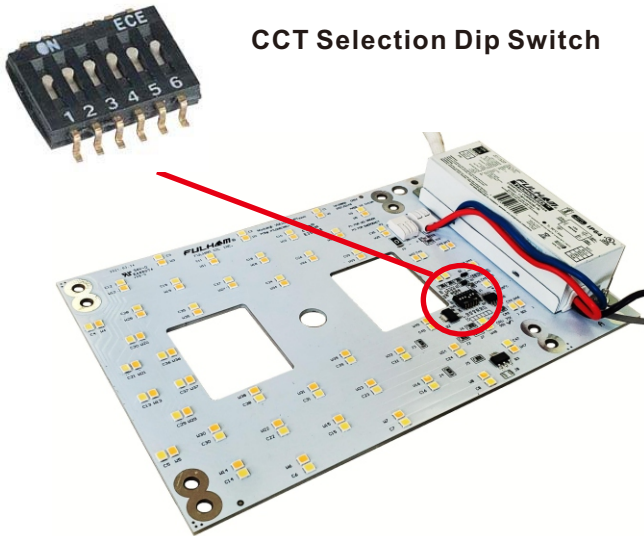


# VMU095023RT9TWA

## CCT Selection Indication

1. The VividHorse DC Engine Retrofit Kit is a dual-channel LED product, that allows for CCT selection via the dip switch on the PCB. Available CCTs include 2700K, 3000K, 3500K, 4000K, 4500K and 5000K.
2. A pre-set CCT will come from the factory. Check the product label or packaging to see the pre-set CCT level.
3. Change the dip switch position to “ON” (1~6) to set the desired CCT level; Mark the set CCT level on the retrofit kit warning label provided inside the accessory bag.

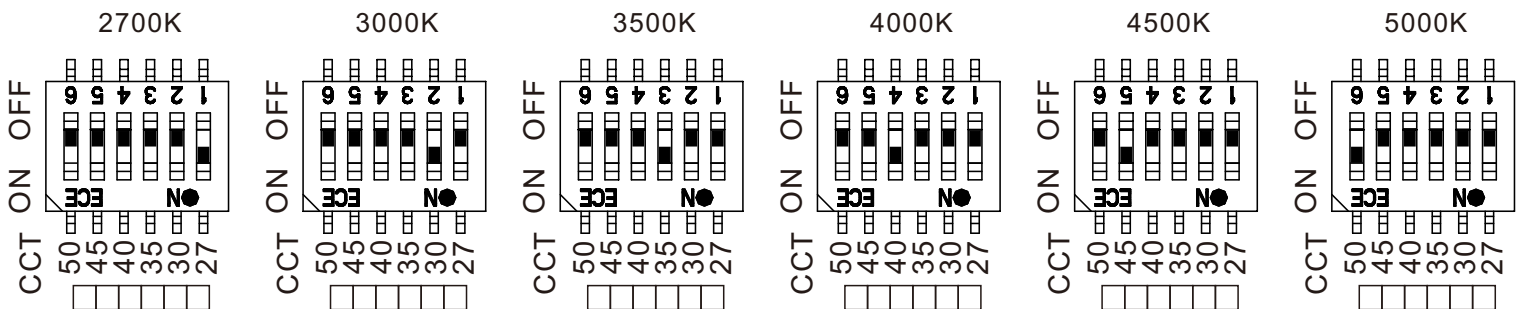
**NOTE: ONLY keep one dip switch in the “ON” position, not doing so may result in an undesired CCT.**



CCT Selection Dip Switch

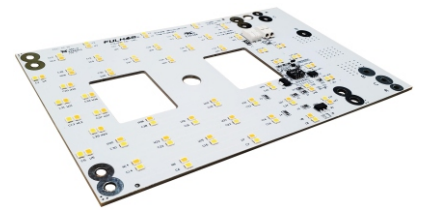
CCT Indication Table

	1	2	3	4	5	6
2700K	ON	OFF	OFF	OFF	OFF	OFF
3000K	OFF	ON	OFF	OFF	OFF	OFF
3500K	OFF	OFF	ON	OFF	OFF	OFF
4000K	OFF	OFF	OFF	ON	OFF	OFF
4500K	OFF	OFF	OFF	OFF	ON	OFF
5000K	OFF	OFF	OFF	OFF	OFF	ON



① Measured electrical data per UL file

② TM-21 Reported Numbers



# VMU095023RT9TWA

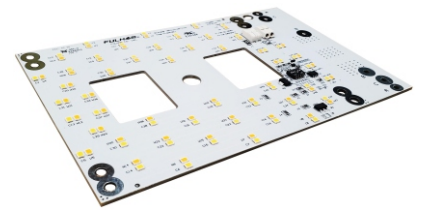
## Electrical and Optical Specifications

### 2700K

LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @2700K/90 CRI	Nom. Efficacy @2700K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	364 lm	170 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	577 lm	178 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	786 lm	180 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	989 lm	180 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1188 lm	178 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1381 lm	176 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1570 lm	174 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1754 lm	171 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	1934 lm	169 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2108 lm	166 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2278 lm	163 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2443 lm	161 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2604 lm	158 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2760 lm	155 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	2911 lm	153 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3058 lm	150 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3200 lm	148 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3337 lm	145 lm/W		

### 3000K

LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @3000K/90 CRI	Nom. Efficacy @3000K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	367 lm	172 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	582 lm	180 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	793 lm	181 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	998 lm	181 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1198 lm	180 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1393 lm	178 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1584 lm	175 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1770 lm	173 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	1950 lm	170 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2127 lm	167 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2298 lm	165 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2465 lm	162 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2626 lm	159 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2784 lm	157 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	2936 lm	154 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3084 lm	152 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3227 lm	149 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3366 lm	146 lm/W		



# VMU095023RT9TWA

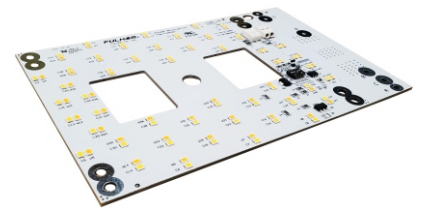
## Electrical and Optical Specifications

### 3500K

LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @3500K/90 CRI	Nom. Efficacy @3500K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	371 lm	173 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	587 lm	181 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	799 lm	183 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	1006 lm	183 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1208 lm	181 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1405 lm	179 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1597 lm	177 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1785 lm	174 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	1967 lm	172 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2145 lm	169 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2318 lm	166 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2486 lm	163 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2649 lm	161 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2808 lm	158 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	2961 lm	155 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3111 lm	153 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3255 lm	150 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3395 lm	148 lm/W		

### 4000K

LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @4000K/90 CRI	Nom. Efficacy @4000K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	374 lm	175 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	592 lm	183 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	806 lm	185 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	1014 lm	184 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1218 lm	183 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1417 lm	181 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1610 lm	178 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1799 lm	176 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	1983 lm	173 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2162 lm	170 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2337 lm	168 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2506 lm	165 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2671 lm	162 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2830 lm	159 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	2986 lm	157 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3136 lm	154 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3282 lm	151 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3423 lm	149 lm/W		



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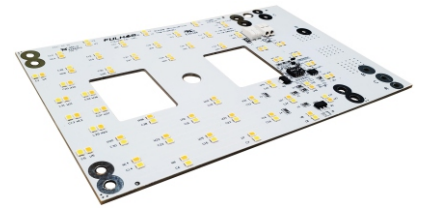
## Electrical and Optical Specifications

### 4500K

LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @4500K/90 CRI	Nom. Efficacy @4500K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	376 lm	176 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	596 lm	184 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	811 lm	186 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	1021 lm	185 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1226 lm	184 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1426 lm	182 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1621 lm	179 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1811 lm	177 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	1996 lm	174 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2176 lm	171 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2352 lm	169 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2522 lm	166 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2688 lm	163 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2849 lm	160 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	3005 lm	158 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3156 lm	155 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3303 lm	152 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3445 lm	150 lm/W		

### 5000K

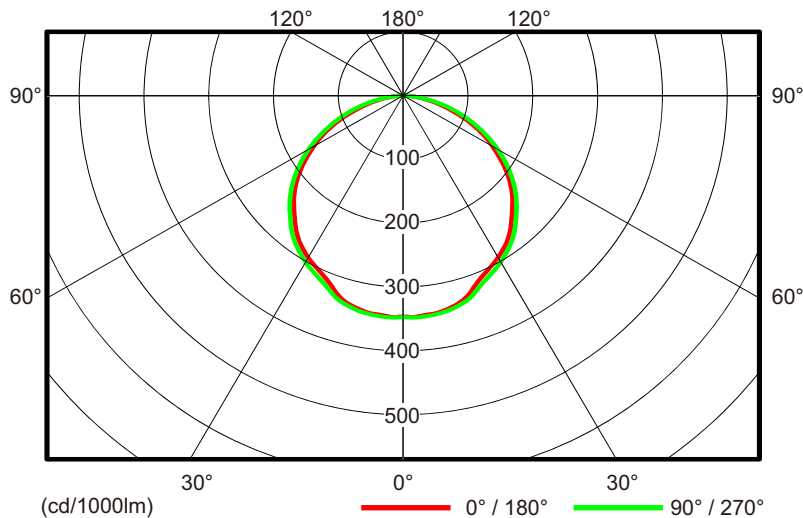
LED Module Part Number	Number of LED	Input Current	Nom. Forward Voltage	Nom. Rated Power	Max. Fwd. Voltage	Max. Rated Power	Nom. Lum. Flux @5000K/90 CRI	Nom. Efficacy @5000K/90 CRI
VMU095023RT9TWA	48 WW + 48 CW	100 mA	21.4 V	2.1 W	23 V	2 W	378 lm	177 lm/W
		150 mA	21.6 V	3.2 W	23 V	3 W	599 lm	185 lm/W
		200 mA	21.8 V	4.4 W	23 V	5 W	815 lm	187 lm/W
		250 mA	22.0 V	5.5 W	24 V	6 W	1026 lm	186 lm/W
		300 mA	22.2 V	6.7 W	24 V	7 W	1232 lm	185 lm/W
		350 mA	22.4 V	7.8 W	24 V	8 W	1433 lm	183 lm/W
		400 mA	22.6 V	9.0 W	24 V	10 W	1629 lm	180 lm/W
		450 mA	22.8 V	10.2 W	24 V	11 W	1820 lm	178 lm/W
		500 mA	22.9 V	11.5 W	25 V	13 W	2006 lm	175 lm/W
		550 mA	23.1 V	12.7 W	25 V	14 W	2188 lm	172 lm/W
		600 mA	23.2 V	13.9 W	25 V	15 W	2364 lm	169 lm/W
		650 mA	23.4 V	15.2 W	25 V	16 W	2535 lm	167 lm/W
		700 mA	23.5 V	16.5 W	25 V	18 W	2702 lm	164 lm/W
		750 mA	23.7 V	17.8 W	25 V	19 W	2864 lm	161 lm/W
		800 mA	23.8 V	19.1 W	25 V	20 W	3021 lm	159 lm/W
		850 mA	23.9 V	20.4 W	26 V	22 W	3173 lm	156 lm/W
900 mA	24.1 V	21.7 W	26 V	23 W	3320 lm	153 lm/W		
950 mA	24.2 V	23.0 W	26 V	25 W	3463 lm	151 lm/W		



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## Light Distribution

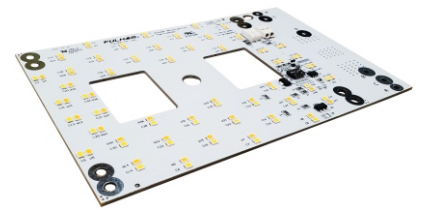
Zone	Zone Flux	Zone Flux%	Sum Zone Flux	Sum Zone Flux%
0 ~ 10	83.2	3.3%	83.2	3.3%
10 ~ 20	239.9	9.5%	323.1	12.7%
20 ~ 30	358.0	14.1%	681.1	26.9%
30 ~ 40	439.8	17.4%	1120.9	44.2%
40 ~ 50	463.2	18.3%	1584.1	62.5%
50 ~ 60	415.1	16.4%	1999.2	78.9%
60 ~ 70	308.6	12.2%	2307.8	91.1%
70 ~ 80	167.7	6.6%	2475.5	97.7%
80 ~ 90	44.4	1.8%	2519.9	99.4%
90 ~ 180	14.7	0.6%	2534.6	100.0%



### NOTES:

- Performance data (pg. 3~5) based on Tc mod = 25°C. See thermal de-rating chart (pg. 7) for higher temperature operation.
- Zone Flux and light distribution data (pg. 6) based on Input Current 700mA, 2700K sample, thermal stable (Ts\_LED ~ 55°C).
- Specifications are subject to change without notice.
- The LED DC Module can be configured with different LED chip quantities, series and parallel design configurations to meet a specific design requirement. Contact Fulham for further assistance.
- Modules need to be operated at a current less than the max. 950mA, below the Tc rating.
- 90CRI standard.





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## Thermal Specifications

### DC Module

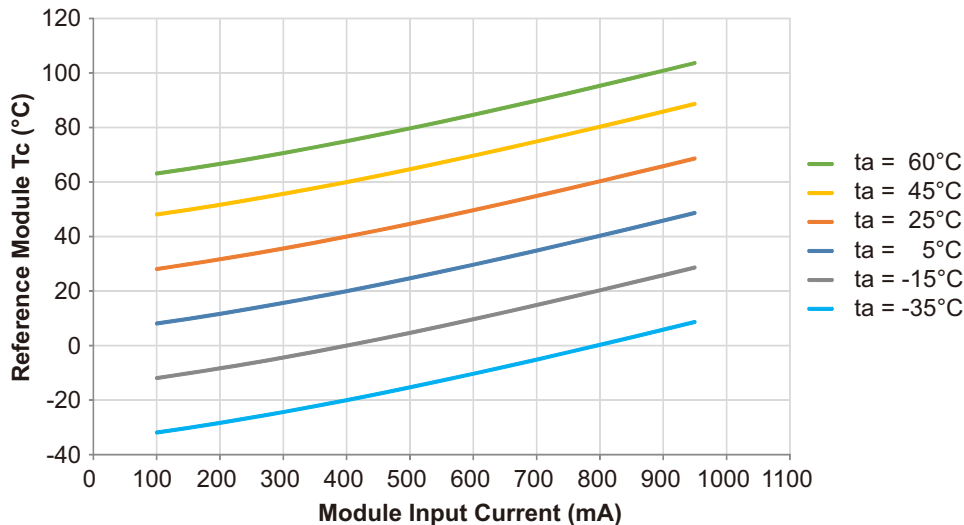
Storage Temperature Range	-35 to 100°C / -31 to 212°F
Operating Ambient Temperature Range (ta)	-35 to 60°C / -31 to 140°F
Maximum Case Temperature (Tc)	Safety: 105°C(221°F) / L70(>60Khrs): 85°C(221°F) / L90(36Khrs): 96°C(204.8°F)

## Thermal De-Rating

### Module Tc vs. Luminous Flux vs. Forward Voltage

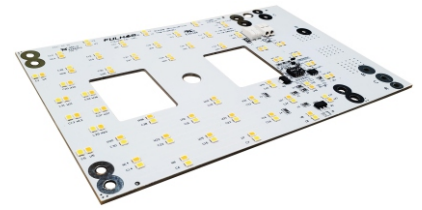
Module Case Temperature (Tc)	Total Vf Multiplier	Luminous Flux Multiplier
25°C	1.000	1.000
30°C	0.998	0.992
35°C	0.995	0.984
40°C	0.993	0.976
45°C	0.990	0.967
50°C	0.988	0.958
55°C	0.986	0.949
60°C	0.984	0.940
65°C	0.982	0.931
70°C	0.980	0.922
75°C	0.978	0.913
80°C	0.977	0.904
85°C	0.976	0.895
90°C	0.974	0.886
95°C	0.973	0.877
100°C	0.971	0.867
105°C	0.969	0.858

### Module Tc vs. Ambient (ta) vs. Module Input Current (mA)



**Note:**

Chart "Module Tc vs. Ambient (ta) vs. Module Input Current (mA)" for reference only in an open ambient. The performance with in a luminaire will vary depending on the size and material of luminaire.



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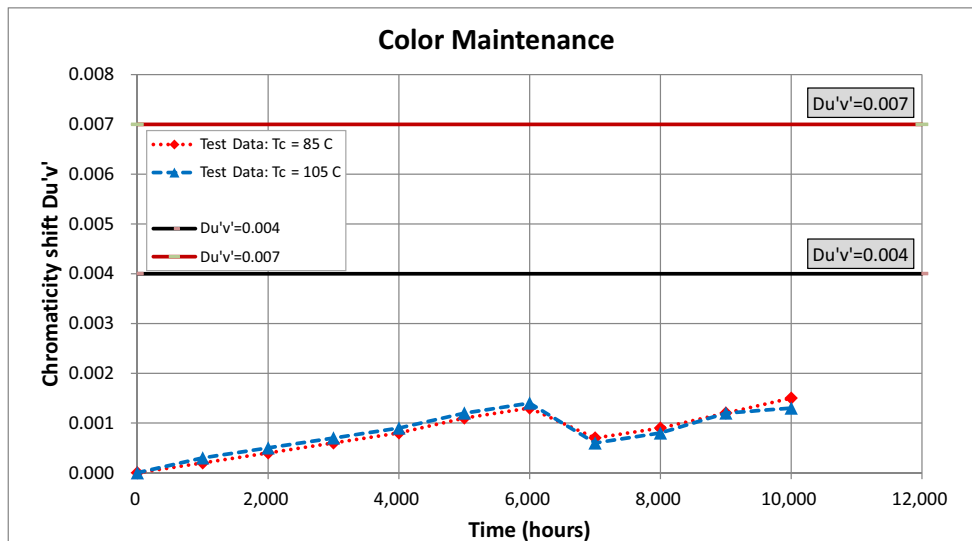
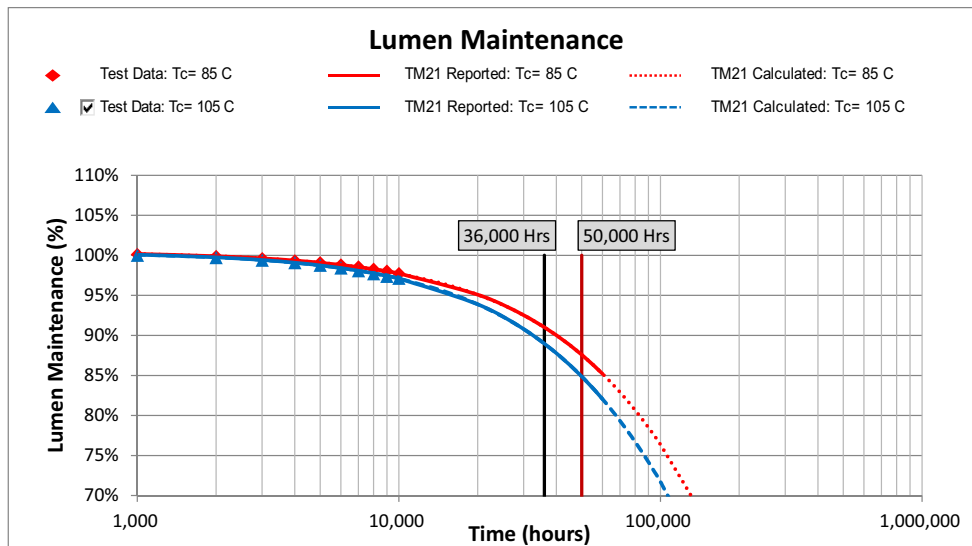
## Certification Chart

Classification	Model	VMU095023RT9TWA
		YES
		YES
Energy Efficiency Class per (EU) 2019/2015		E
Suitable for UL Class 2 Lighting System		YES

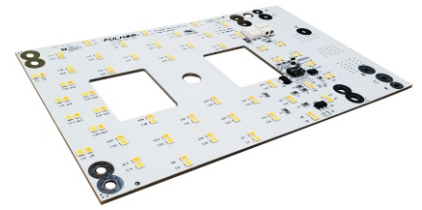
## Energy Star™ TM-21 Calculator Data

Tc Module	Reported L70	Reported L90
85°C	>60,000 Hrs	40,000 Hrs
96°C	>60,000 Hrs	36,000 Hrs
105°C	>60,000 Hrs	33,000 Hrs
Tc Module	Calculated L70	Calculated L90
85°C	131,000 Hrs	40,000 Hrs
96°C	117,000 Hrs	36,000 Hrs
105°C	106,000 Hrs	33,000 Hrs

## LED Lumen & Color Maintenance Data per LM-80 report and TM-21 Calculator







# VMU095023RT9TWA

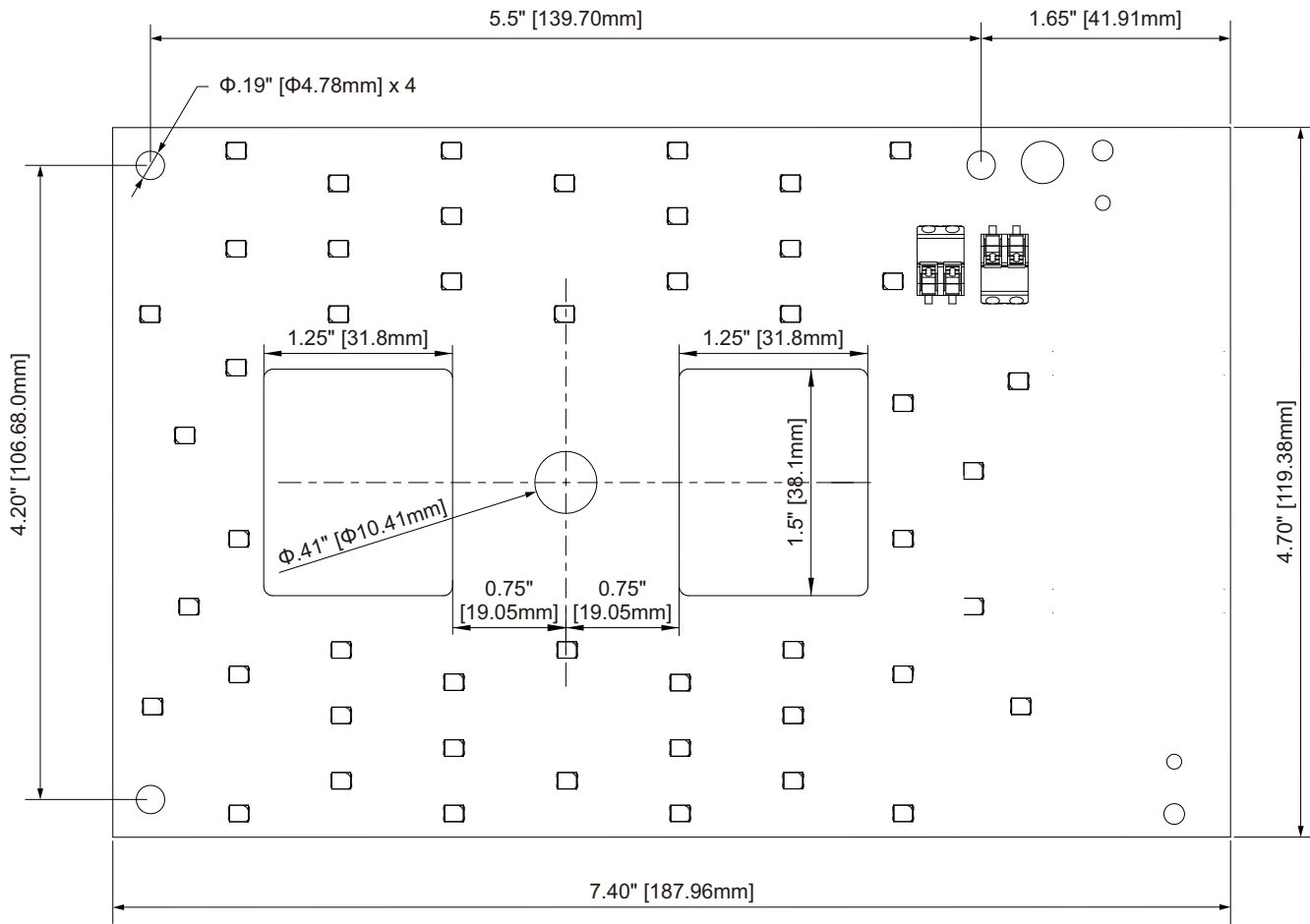
## Mechanical Drawings

(Scale 4:5)

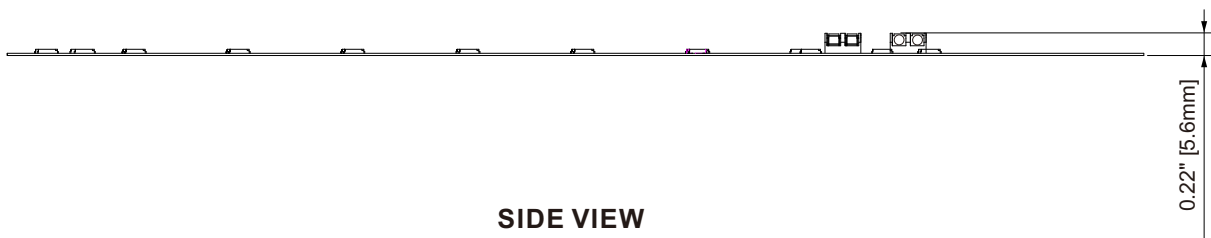
# 7.4" L x 4.7" W

[187.96mm L x 119.38mm W]

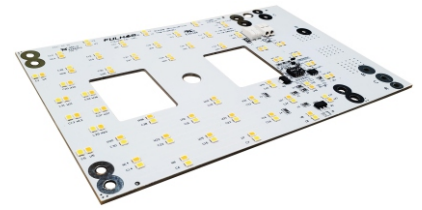
Overall Dimensions	
Length	7.4" [188.0mm]
Width	4.7" [119.4mm]
Height	0.22" [5.6mm]



TOP VIEW

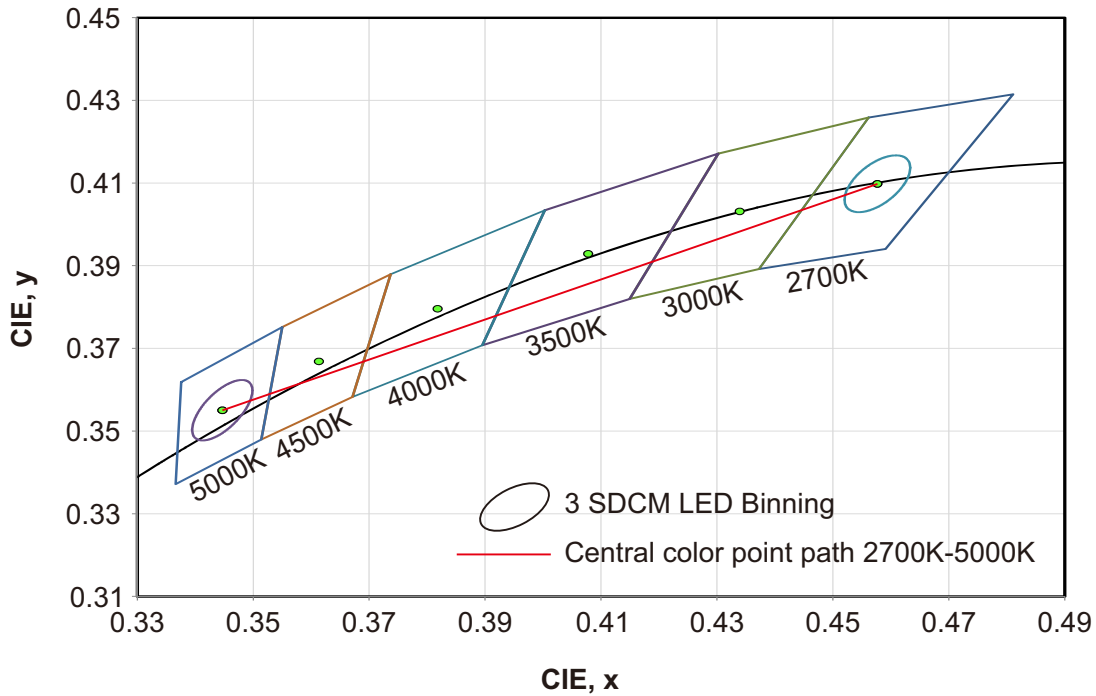


SIDE VIEW

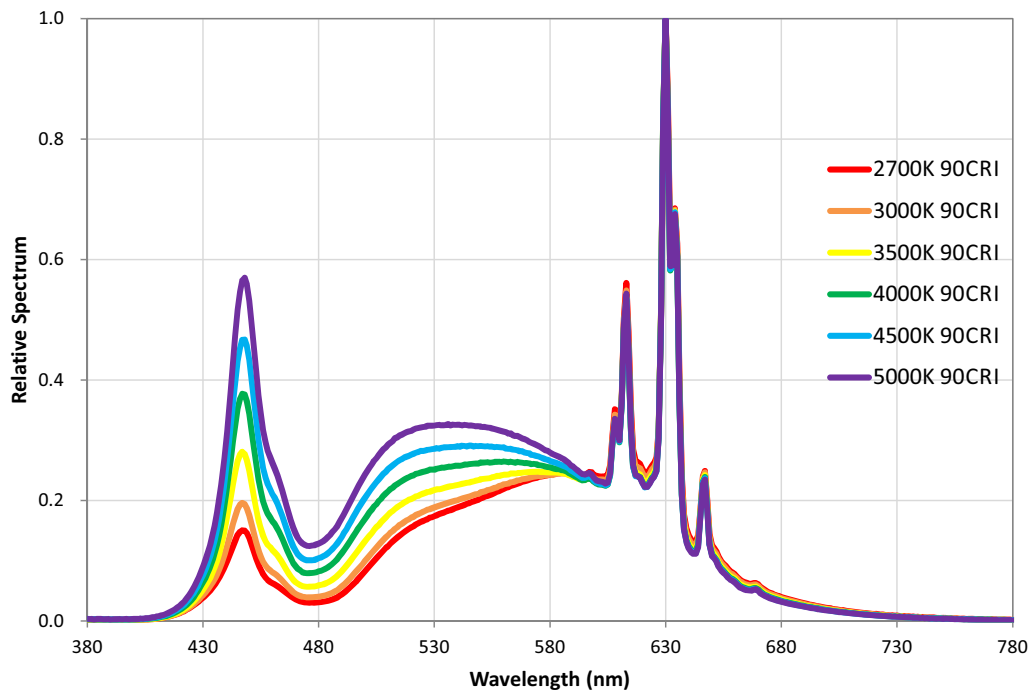


# VMU095023RT9TWA

## Color and Binning

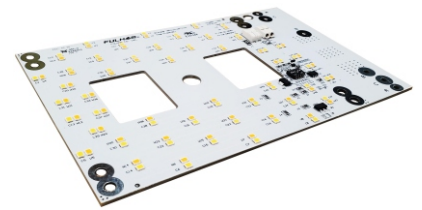


## Optical Spectrum



### NOTES:

- 1) The Color and Binning and Optical Spectrum charts are for reference only. For more detailed info, contact factory.
- 2) Reference Samsung Chromaticity Diagram for Color and Binning. Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM.
- 3) The Optical Spectrum values vary depending on product type and color rank.

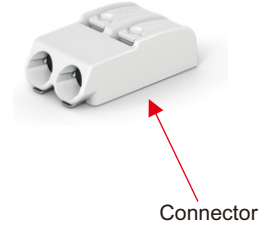


# VMU095023RT9TWA

## Guidelines

### Termination Notes

- Connector Type: WAGO #2060-452 / 998-404 (2 pin push wire connector)
  - AWG: 24...18 solid wire
  - Strip length: 7...9mm / 0.28...0.35in
  - Connector Max amp. rating: 9 Amps.



For more detail information, please visit Wago's website: <http://www.wago.com/infomaterial/pdf/51300133.pdf>

### Fastening Notes

- If fastening by screw hole a recommended screw size: 6-20 x 5/8" flat head drilling screws. Use all available screw holes to ensure good contact between back side of module and mounting surface. Refer to max specified torque for installation.
- BJB P2F (Push-to-Fix) fixing elements for PCBs can be used to fasten LED modules to mounting surface. Reference BJB's website for ordering information and specific model to use: <http://www.bjb.com/index.php?pid=376706&lid=10>.

### Environmental Rating

- The DC Modules have been evaluated for use in dry or damp locations only. If used in wet locations, acceptability and the need for additional evaluation shall be determined in the end product.

### Electrostatic Sensitive Product (ESD)

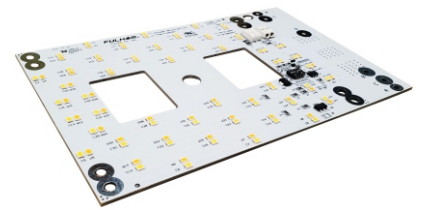
- Fulham LED products should be handled with proper measures to protect against any potential ESD damage.
- When servicing, personnel should be ground and direct contact with LED should be avoided.

### Thermal Management

- Proper thermal management should be employed to ensure life and reliability of product. Max Tc of module should not be exceeded.
- Use of thermal grease, paste, pad, or other material interface is highly recommended.

### Polarity Notes

- DC Modules are polarity sensitive.
- Ensure that "positive" from LED Driver is connected to "positive" of LED modules and that "negative" from LED Driver is connected to "negative" of LED modules.
- Polarities of modules are marked with "+" for positive and "-" for negative.



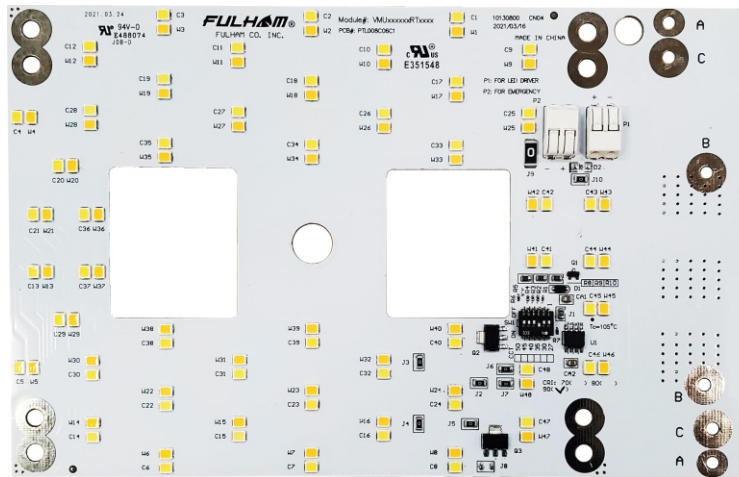
# VMU095023RT9TWA

## Part Number Matrix

# V M U 095 023 RT 9 TWA

**Product Line** V = VividHorse  
**Type** M = Module (UL Class 2)  
**Control Type** U = None  
**Input Current** 095 = 950mA  
**Max. Power** 023 = 23W  
**Shape** RT = Rectangular  
**CRI** 9 = 90  
**Color Temperature** TW = 2700K-5000K Selectable  
**Option** A = Standard

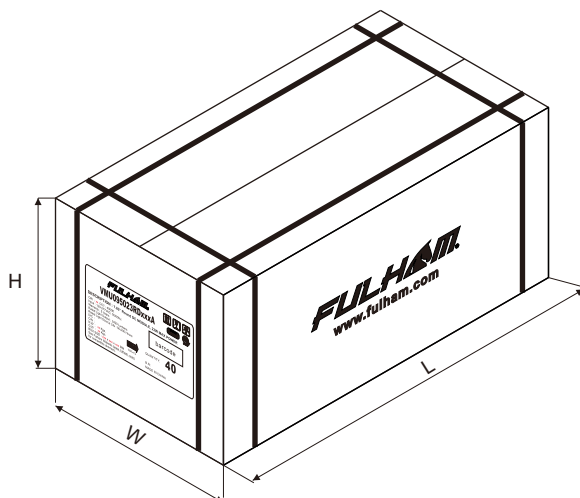
## Product Image: DC Module



TOP VIEW

## Packaging

## Master Carton



OUTER DIMENSION		
L	W	H
12.60"(320mm)	9.84"(250mm)	9.76"(248mm)
Net Weight	Gross Weight	QUANTITY
4.24 lbs. (1.92 kg)	11.28 lbs. (5.12 kg)	40pcs.