



MAL SERIES LED DRIVER

DL-60Z-MAL SPEC V1.2



Features

- Class I type for insulation
- Input voltage range: 100-277 V ~ 50/60 Hz
- Efficiency :89%(Typ.)
- Constant current output ,with power limitation for control mode
- Metal case, protection grade against water and dust: IP67
 - differential mode :4kV
 - common mode :6kV
- Available version :
 - A version: Output current is dimmed by external potentiometer
 - S version: Output current is dimmed by Isolated 3 in 1 dimmer
- Guaranteed Lifetime: 5 years



Applications

Street lighting、Industrial lighting、Venue lighting
 Floodlight lighting、Landscape lighting 、Plant lighting



Model list

Model NO.	Input voltage	Output power	Output voltage	The default current	Eff.	T.H.D	PF
DL-60Z-58S-MAL	100-277V	60W	32-58Vdc	1.4A	≥89%	≤10%	≥0.95
DL-60Z-58A-MAL	50/60Hz						

- Note :**
1. Test conditions: Ta=25°C, under 230Vac input,after running for 30 minutes with full load.
 2. When the input is 100-277Vac, the rated power is 60W, and special attention must be paid to the application.Please refer to “THE OUTPUT POWER VS INPUT VOLTAGE” curve chart for details.

Input characteristics

Parameter	Min	Typ.	Max	remark
Rated input voltage	100Vac	-	277Vac	
Input voltage range	90Vac		305Vac	
Rated frequency range	47Hz	50/60Hz	63Hz	
Power factor	-	0.95	-	@230Vac input ,with full load
T.H.D.	-	-	10%	@230Vac input ,with full load
T.H.D.	-	-	20%	@100-277Vac input ,with 75%-100%
Input current	-	-	0.77A	@100Vac input ,with full load
Inrush current	-	-	70A	230Vac, cold start (25°C)

Output characteristics

Parameter	Min	Typ.	Max	remark
Rated current DL-60Z-58A/S-MAL	-	1.03A	-	With loading 58VDC
Output current range DL-60Z-58A/S-MAL	0.86A	-	1.43A	
Output voltage range DL-60Z-58A/S-MAL	32V	-	58V	Constant power output range: 42-58VDC
Rated power(100-277Vac)	-	60W	-	
No-load voltage DL-60Z-58A/S-MAL	-	-	75V	
Efficiency@100Vac DL-60Z-58A/S-MAL	86%	87%	-	Full load@58VDC
Efficiency@230Vac DL-60Z-58A/S-MAL	88%	89%	-	Full load@58VDC
Accuracy of output current	-5%	-	+5%	For constant-power range ,with full load
Line regulation	-3%	-	+3%	Full load
Load regulation	-3%	-	+3%	Full load
Starting time	-	-	500ms	Full load@230Vac

Note: The output current is limited by the input and output voltage, please refer to “I-V WORKING AREA” for details;

Dimming characteristics

Dimming function		Min	Typ.	Max	Instructions
0-10V Dimming (Optional)	Safe operation voltage range	0V	-	12V	-
	Dimming output range	0	-	100%	Refer to note 2.
	Rated operation voltage range	0V	-	10V	-
	Turn-on voltage	0.8V	1.0V	1.2V	
	Turn-off voltage	0.3V	0.5V	0.7V	
PWM Dimming (Optional)	PWM high level	9.5V	-	10.5V	-
	PWM low level	0V	-	0.3V	-
	Rated dimming frequency	300Hz	-	2000Hz	-
	PWM duty cycle	0	-	99%	Output full power at 99% duty cycle
	Turn-on duty cycle	8%	10%	12%	
	Turn-off duty cycle	3%	5%	7%	
Resistor Dimming (Optional)	Rated external resistance value	0KΩ	-	100KΩ	
	Dimming output range	0	-	100%	-

- Note:**
1. Output current of dimming port: 100uA (typical value).
 2. Dimmer default 0-10V, it can be dim-off ,but can not reach 0.5W standby power consumption.
 3. The maximum voltage applied to the dimming port is suggested below 12V,but it also is protected against wrong voltage up to 230VAC or 300VDC.Please don’ t keep the wrong voltage apply to the port for a long time. Otherwise,it is possible to be damaged.
 4. The floating voltage at the dimming port may be up to 14.5V, please notice it.

Protection

Protection	description
Output over-voltage protection	hiccup mode,and recovers automatically when the fault condition is removed.
Output short circuit protection	Hiccup mode,and recovery automatically when the fault condition is removed.
Over temperature protection	when the temperature of the case is greater than $95\pm5^{\circ}\text{C}$, the output power decreases to a half.
Output over-power protection	Protection mode: Hiccup mode or clamped in output highest voltage, the product is not damaged,LED driver works normally after fault condition is removed.

Note: Unless otherwise specified, all parameters should be measured at the condition of 230Vac (50Hz) input ,with rated load ,and ambient temperature of 25°C.

Environmental characteristics

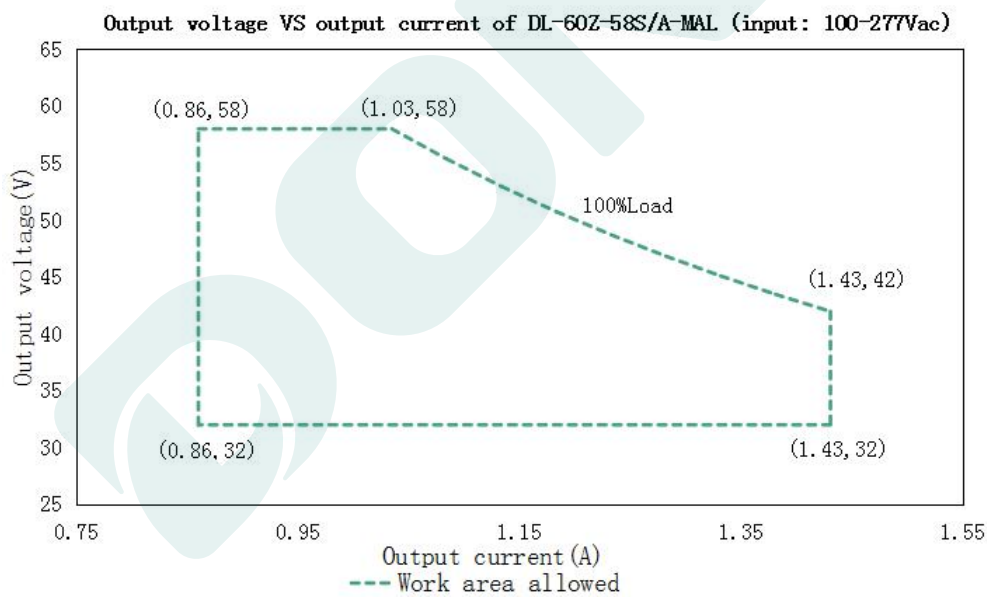
Environmental categories	Parameter
Working temperature	-40 ~ +55°C@100-277Vac
Max.Case Temp.	-40 ~ 90°C
Working humidity	20 ~ 95% RH
Storage temperature、 humidity	-40~+80°C, 10 ~ 95% RH
Resistant to vibration	10 ~ 500Hz, 5G 12 min/cycle, X, Y, Z axis 72 min each
MTBF	230Khrs min. MIL-HDBK-217F (Ta=25°C)
Lifetime	50000 hours @Tcase=75°C,refer to" Tcase VS Lifetime " curve

Safety and EMC

Safety categories	Standard
Safety	GB/T19510.1,GB/T19510.213、 EN61347-1、 EN61347-2-13、 IEC61347-1、 IEC61347-2-13、 AS/NZS61347.1、 AS61347.2.13、 EN 62384
EMC	EN 55015、 EN 61547、 EN 61000-3-2、 GB/T 17743、 GB17625.1、 EN 61000-3-3
Surge level	Differential mode L-N $\pm 4\text{KV}$ (2 ohm) ,common mode L , N-PE $\pm 6\text{KV}$ (12 ohm) ; Refer to IEC61000-4-5 2014 Criterion B
High-pot test	I/P-O/P:3.858KVac I/P-PE :1.554KVac I/P-DIM:1.554KVac O/P-PE : 1.15KVac O/P-DIM:1.15KVac
Insulation impedance	I/P-PE:100M Ω / 500VDC; I/P-O/P:100M Ω / 500VDC / 25°C/ 70% RH
Leakage current	<0.7mA@277Vac

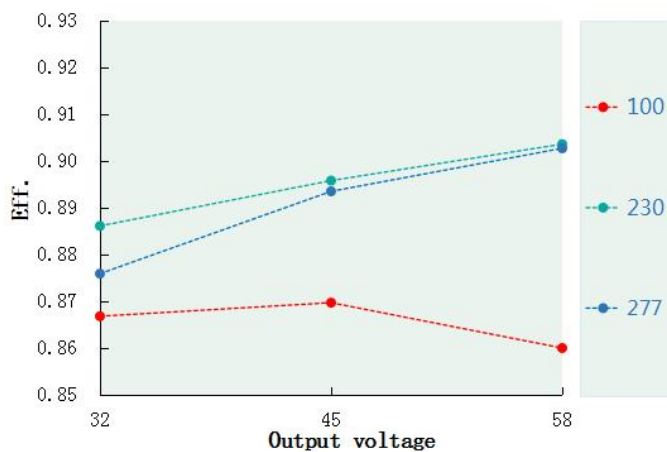
Note: Attention! As a component of the whole, the EMC performance of the final product is not only decided by the driver, even if the driver is well-designed and fulfil all the required compliance. The final equipment manufacturers must re-qualify EMC Directive on the complete product.

I-V Working area

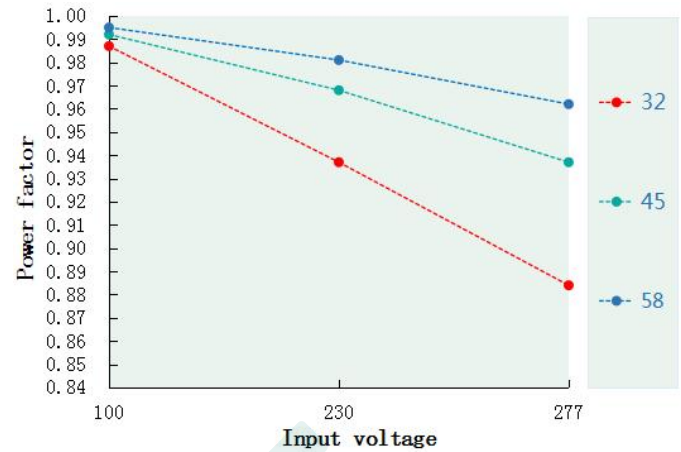


Load	Output								
Load working Voltage	32V	36V	39V	42V	46V	49V	52V	55V	58V
Io_MAX	1.43A	1.43A	1.43A	1.43A	1.3A	1.22	1.15A	1.09A	1.03A
Po_MAX	45.76W	51.48W	55.77W	60W	60W	60W	60W	60W	60W

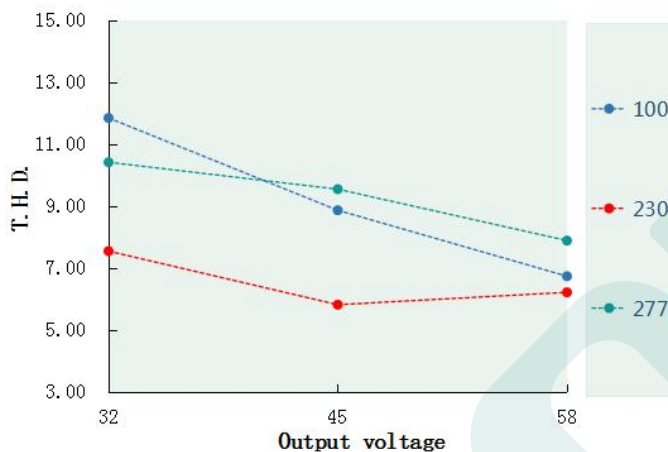
Eff. VS Output voltage(DL-60Z-MAL)



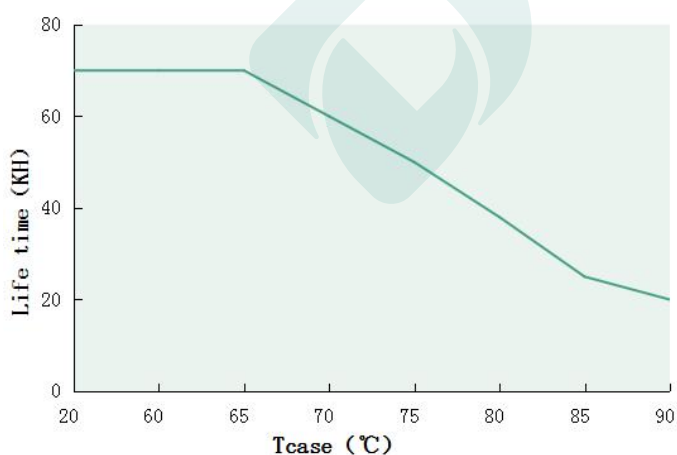
Power factor VS Input voltage(DL-60Z-MAL)



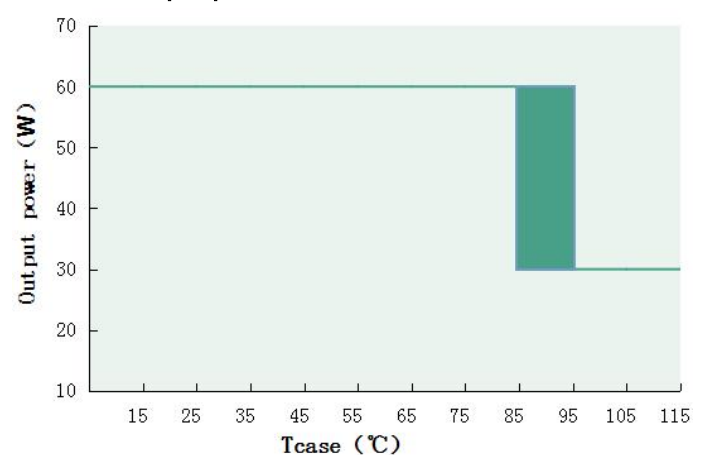
T.H.D. VS Output voltage(DL-60Z-MAL)



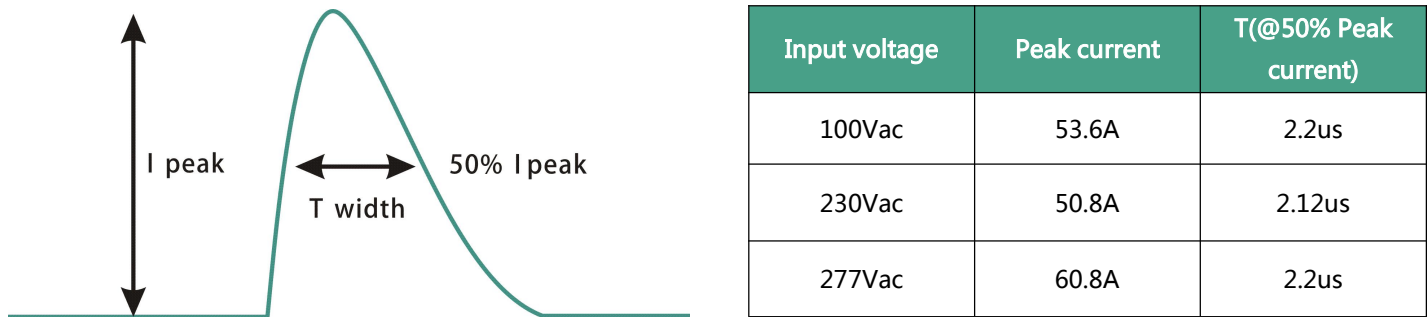
Tcase VS Lifetime(DL-60Z-MAL)



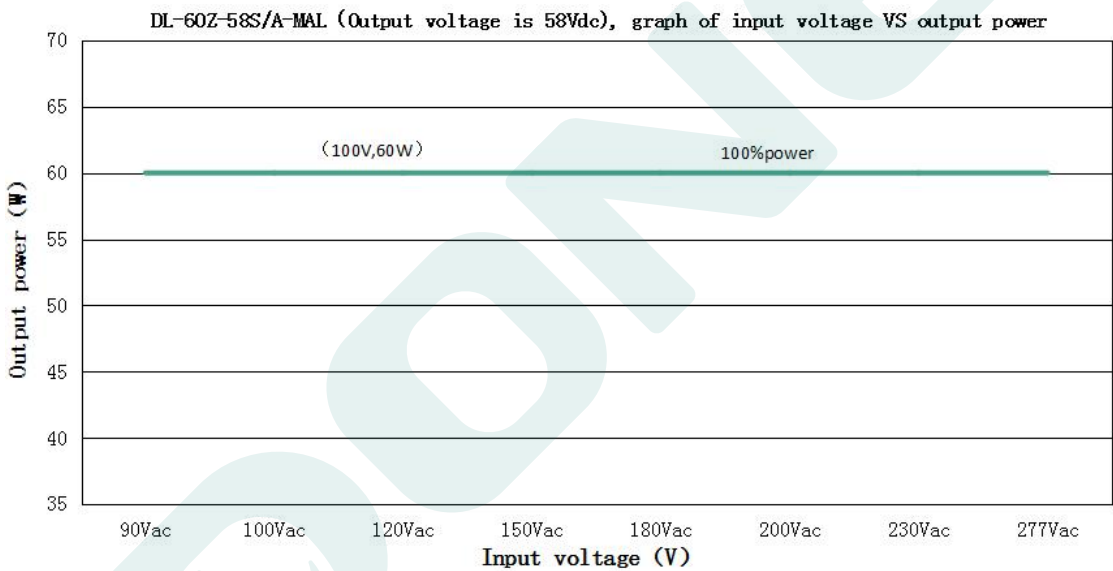
Output power VS Tcase (DL-60Z-MAL)



Inrush Current(DL-60Z-MAL)



Output power VS Input voltage



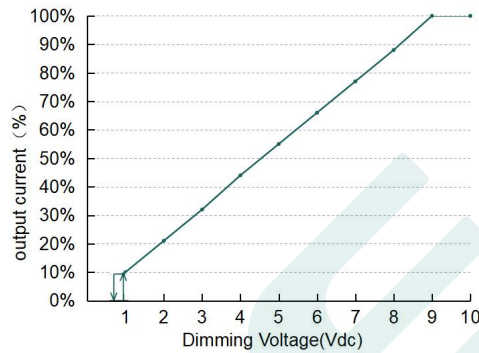
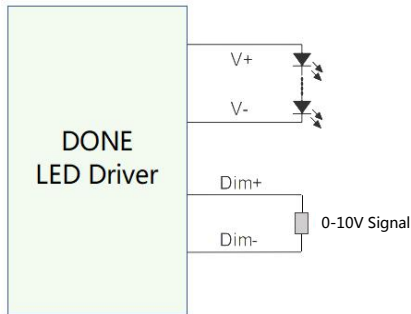
DL-60Z-58A/S-MAL (For output 58Vdc, the rated output current & power under different input voltage)							
Input Voltage	90Vac	100Vac	120Vac	150Vac	200Vac	230Vac	277Vac
Iout	1.03A	1.03A	1.03A	1.03A	1.03A	1.03A	1.03A
Pout	60W	60W	60W	60W	60W	60W	60W

Dimming operation

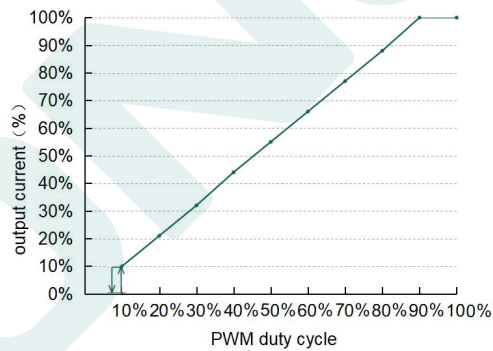
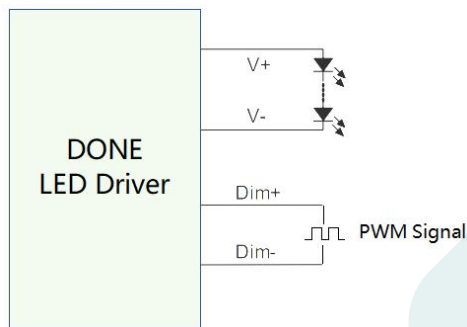
Three-in-one dimming function (S version only)

- A. To adjust the output current, applying one of the three methods between DIM+ and DIM- : a resistor of 0-100K, or any voltage of 0-10V , or a PWM signal with amplitude of 10V.
- B. output current of dimming port: 100uA (typical value).

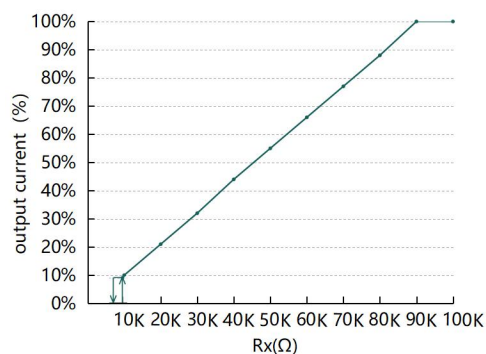
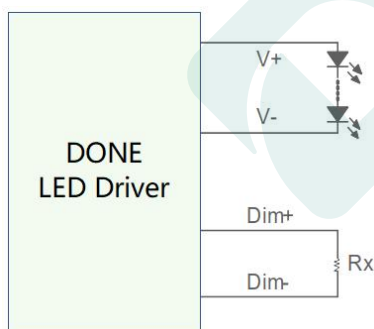
• 0-10V dimming:



• PWM dimming (300Hz-2kHz) :



• Resistor Dimming (0-100K) :

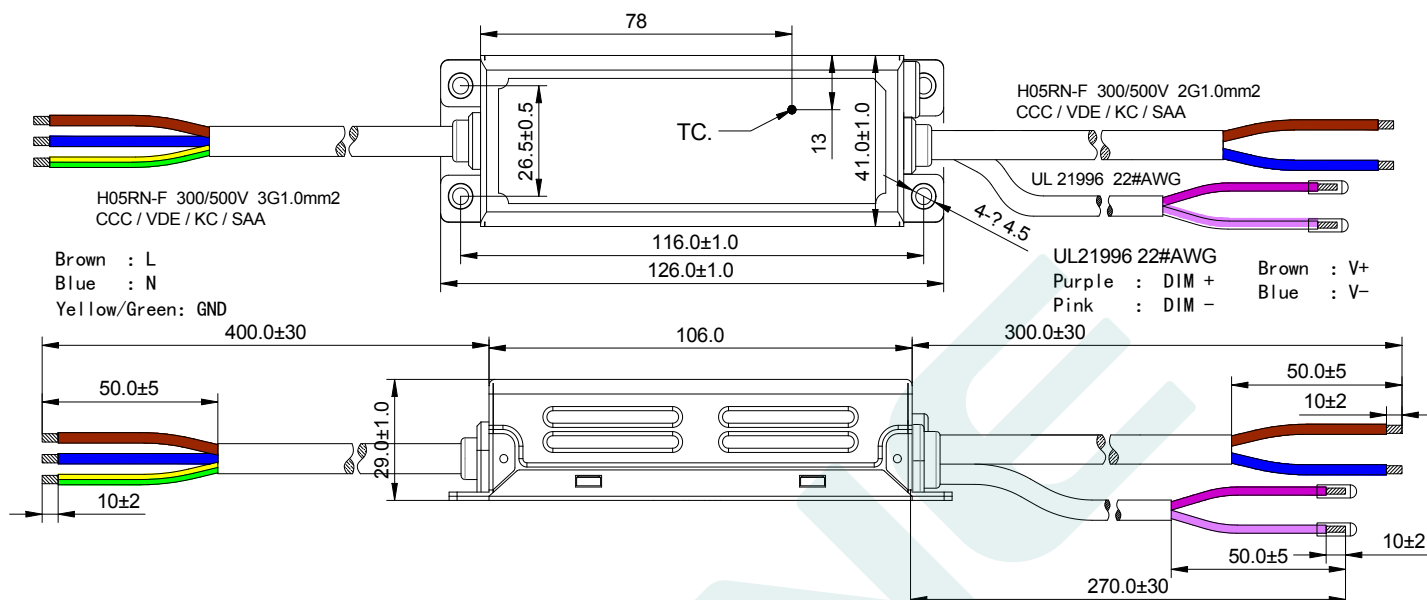


Note: It is recommended to use 0-10V and equivalent three-in-one dimming. By default, it can be dimmed off, but it cannot achieve 0.5W standby power.

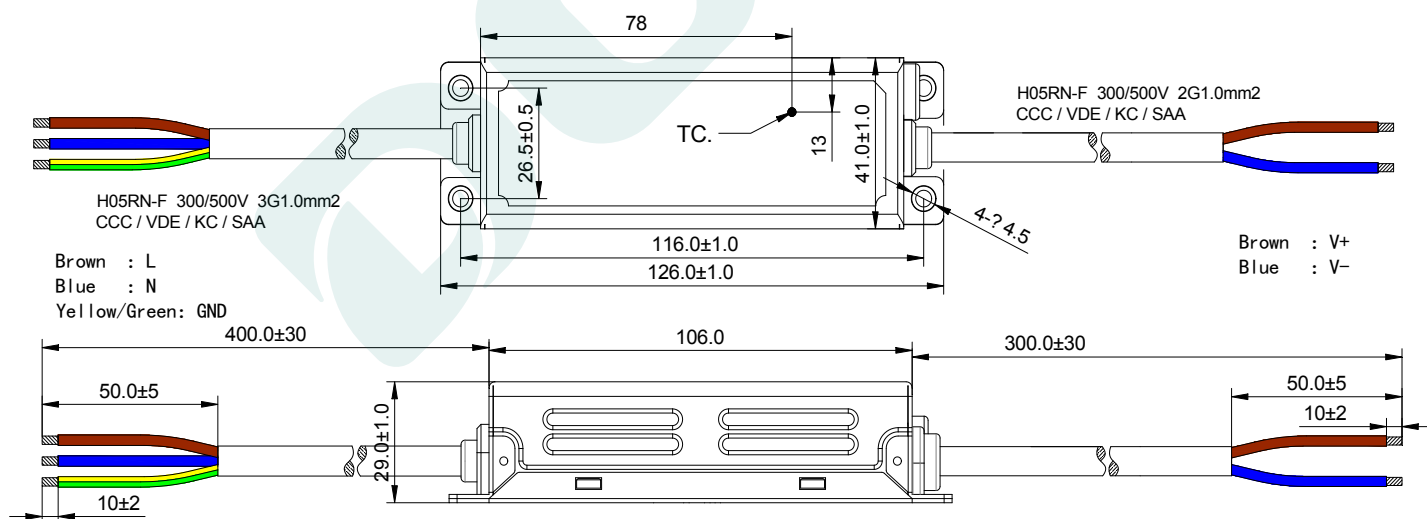
Mechanical specification

Size (mm) L126*W41*H29

DL-60Z-58S-MAL



DL-60Z-58A-MAL

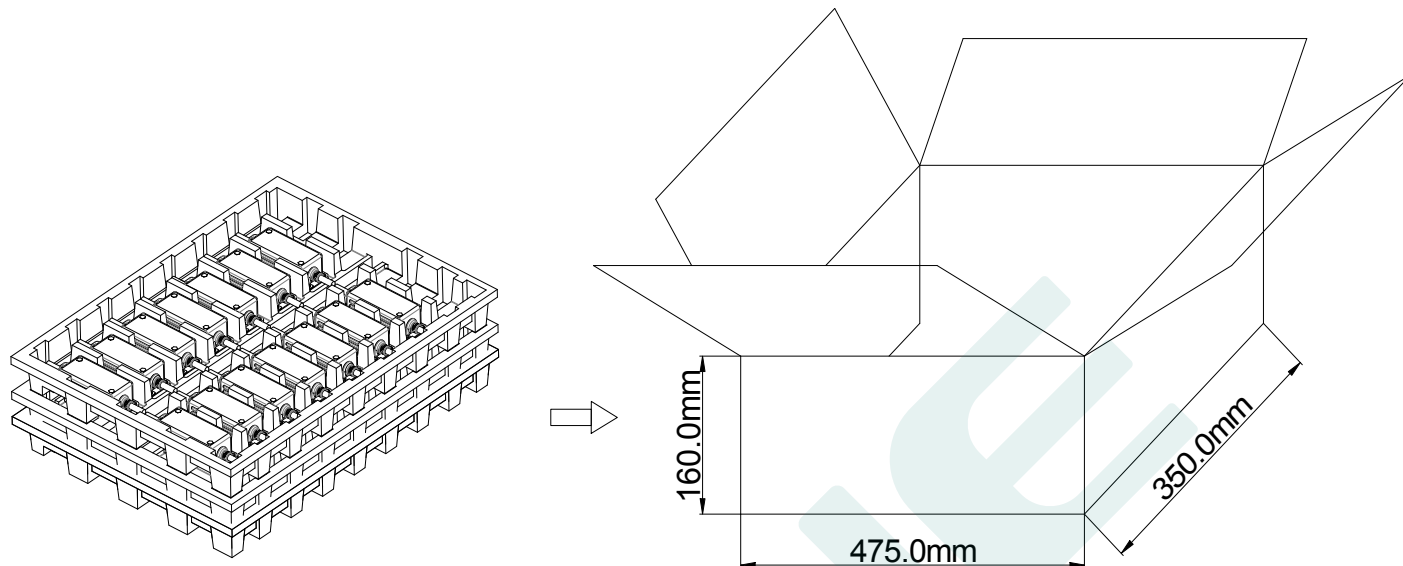


Weight

Weight 330 g

Packaging

Packaging (mm) L475*W350*H160



Note: One Carton 3 layers and 14 pcs each layer, total 42pcs/carton.

Note:

1. According to the qualified certificate of the LED DRIVER, that with English label is for sale in Europe, America and India.
2. That with Chinese label are used for Chinese market.

Version

DATE	DESCRIPTION	REV.	CHECK
2024.1.15	Initial version.	V1.0	
2024.12.31	1. Protection grade change to IP67 2. Modify the High-pot test section on page five	V1.1	
2026.4.13	1.Update the dimming function on page 4 from the 1-10V dimming feature to 0-10V. The maximum voltage at the dimming port when it is floating is now 14.5V instead of 13.5V, which is normal. 2.Update the dimming curve diagram on page 9.	V1.2	

MANUFACTRUER		
EDIT	CHECK	APPROVE