Features

- Ultra High Efficiency (Up to 94%)
- Full Power at Wide Output Current Range (Constant Power)
- Thermal Sensing and Protection for LED Module
- 0-10V/PWM/ 3-Timer-Modes Dimmable
- Dim-to-Off with Standby Power ≤ 0.5 W
- Always-on Auxiliary Power: 12Vdc, 200mA (Transient Peak Current up to 400mA)
- Output Lumen Compensation
- Long Lifetime Over 100k Hours at 75°C Case Temperature
- Input Surge Protection: DM 6 kV, CM 10 kV
- All-Around Protection: OVP, SCP, OTP
- IP20 Design and Suitable for Outdoor Applications in Luminaires with IP>54
- Suitable for Luminaires with Protection Class I and II
- Complies with Zhaga Interface Specification Book 13
- 7 Years Warranty

Description

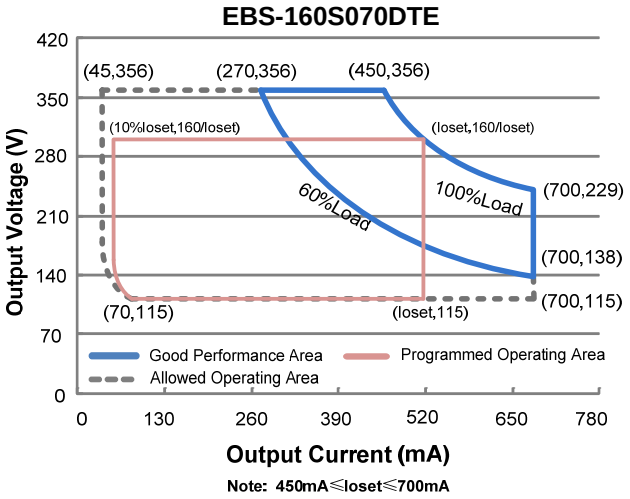
The *EBS-160SxxxDTE* series is a 160W, constant-current, programmable LED driver that operates from 176-305 Vac input with excellent power factor. Created for many lighting applications including street, tunnel and high bay, it provides a dim-to-off mode with low standby power. The high efficiency of these drivers and better thermal design enable them to run cooler, significantly improving reliability and extending product life. To ensure trouble-free operation, protection is provided against input surge, output over voltage, short circuit, and over temperature of both the driver and the external LED array.

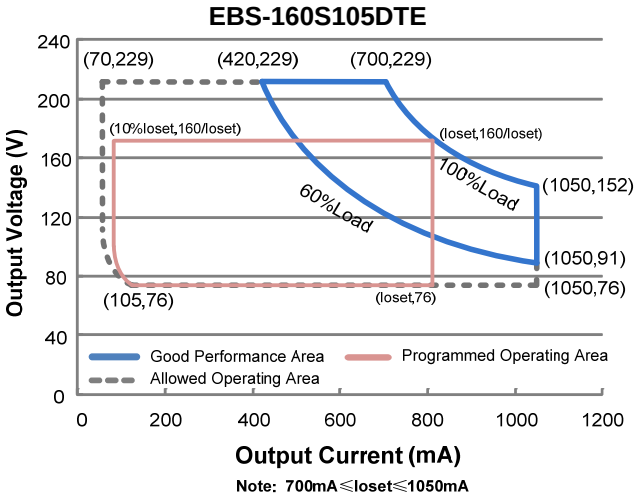
Models

Adjustable Output Current Range	Full-Power Current Range(1)	Default Output Current	Input Voltage Range(2)	Output Voltage Range	Max. Output Power	Typical Efficiency (3)	Power Factor (3)	Model Number (4)
45-700mA	450-700mA	530 mA	176~305Vac 190~250Vdc	115~356Vdc	160 W	93.5%	0.98	EBS-160S070DTE
70-1050mA	700-1050mA	700 mA	176~305Vac 190~250Vdc	76~229Vdc	160 W	94.0%	0.98	EBS-160S105DTE

Notes: (1) Output current range with constant power at 160W
(2) Certified input voltage range: 200-240Vac or 190-250Vdc (except CCC and KS)
(3) Measured at 100% load and 220Vac input (see below "General Specifications" for details).
(4) EBS-160S105DTE is certificated to KS.

I-V Operating Area





Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	176 Vac	-	305 Vac	190~250 Vdc
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.70 mA	IEC60598-1; 240Vac/ 60Hz
Input AC Current	-	-	0.88 A	Measured at 100% load and 220 Vac input.
Inrush Current(I^2t)	-	-	1.93 A^2s	At 220Vac input, 25°C cold start, duration=1.14 ms, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details.
PF	0.9	-	-	At 200-240Vac, 50-60Hz, 60%-100% Load (96-160W)
THD	-	-	20%	
THD	-	-	10%	At 220-240Vac, 50-60Hz, 70%-100% Load (112-160W)

Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%Ioset	-	5%Ioset	At 100% load condition
Output Current Setting(Ioset) Range EBS-160S070DTE EBS-160S105DTE	 45 mA 70 mA	 - -	 700 mA 1050 mA	
Output Current Setting Range with Constant Power EBS-160S070DTE EBS-160S105DTE	 450 mA 700 mA	 - -	 700 mA 1050 mA	
Total Output Current Ripple (pk-pk)	-	5%Iomax	10%Iomax	At 100% load condition, 20 MHz BW
Output Current Ripple at < 200 Hz (pk-pk)	-	2%Iomax	-	At 100% load condition. Only this component of ripple is associated with visible flicker.

Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Startup Overshoot Current	-	-	10%Iomax	At 100% load condition
No Load Output Voltage EBS-160S070DTE EBS-160S105DTE	- -	- -	400 V 270 V	
Line Regulation	-	-	±0.5%	Measured at 100% load
Load Regulation	-	-	±1.5%	
Turn-on Delay Time	-	-	0.5 s	Measured at 220Vac input, 60%-100% Load
Temperature Coefficient of loset	-	0.03%/°C	-	Case temperature = 0°C ~Tc max
12V Auxiliary Output Voltage	10.8 V	12 V	13.2 V	
12V Auxiliary Output Source Current	0 mA	-	200 mA	Return terminal is “Return“
12V Auxiliary Output Transient Peak Current	-	-	400 mA	400mA peak for a maximum duration of 300ms in a 2s period during which time the average should not exceed 200mA.

Note: All specifications are typical at 25°C unless otherwise stated.

General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency at 220 Vac input: EBS-160S070DTE Io= 450 mA Io= 700 mA EBS-160S105DTE Io= 700 mA Io=1050 mA	 91.5% 90.5% 92.0% 90.5%	 93.5% 92.5% 94.0% 92.5%	 - - - -	Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.)
Standby power	-	-	0.5 W	Measured at 230Vac/50Hz; Dimming off
MTBF	-	222,000 Hours	-	Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	102,000 Hours	-	Measured at 220Vac input, 80%Load and 75°C case temperature; See lifetime vs. Tc curve for the details
Operating Case Temperature for Safety Tc_s	-40°C	-	+90°C	
Operating Case Temperature for Warranty Tc_w	-40°C	-	+75°C	Case temperature for 7 years warranty. Please see Inventronics Warranty Statement for complete details. No condensation.
Storage Temperature	-40°C	-	+85°C	Humidity: 5%RH to 85%RH; No condensation.
Dimensions Inches (L × W × H) Millimeters (L × W × H)	6.70 × 3.94 × 1.58 170 × 100 × 40			
Net Weight	-	750 g	-	

Note: All specifications are typical at 25°C unless otherwise stated.

Dimming Specifications

Parameter		Min.	Typ.	Max.	Notes
Absolute Maximum Voltage on the Vdim (+) Pin		-20 V	-	20 V	
Source Current on Vdim (+)Pin		200 uA	300 uA	450 uA	Vdim(+) = 0 V
Dimming Output Range	EBS-160S070DTE EBS-160S105DTE	10%Ioset	-	Ioset	450 mA ⩽ Ioset ⩽ 700 mA 700 mA ⩽ Ioset ⩽ 1050 mA
	EBS-160S070DTE EBS-160S105DTE	45 mA 70 mA	-	Ioset	45 mA ⩽ Ioset ＜ 450 mA 70 mA ⩽ Ioset ＜ 700 mA
Recommended Dimming Input Range		0 V	-	10 V	Default 0-10V dimming mode.
Dim off Voltage		0.35 V	0.5 V	0.65 V	
Dim on Voltage		0.55 V	0.7 V	0.85 V	
Hysteresis		-	0.2 V	-	
PWM_in High Level		3 V	-	10 V	Dimming mode set to PWM in PC interface.
PWM_in Low Level		-0.3 V	-	0.6 V	
PWM_in Frequency Range		200 Hz	-	3 KHz	
PWM_in Duty Cycle		1%	-	99%	
PWM Dimming off (Positive Logic)		2%	5%	8%	
PWM Dimming on (Positive Logic)		4%	7%	10%	
PWM Dimming off (Negative Logic)		92%	95%	98%	
PWM Dimming on (Negative Logic)		90%	93%	96%	
Hysteresis		-	2%	-	

Note: All specifications are typical at 25 °C unless stated otherwise.

Safety & EMC Compliance

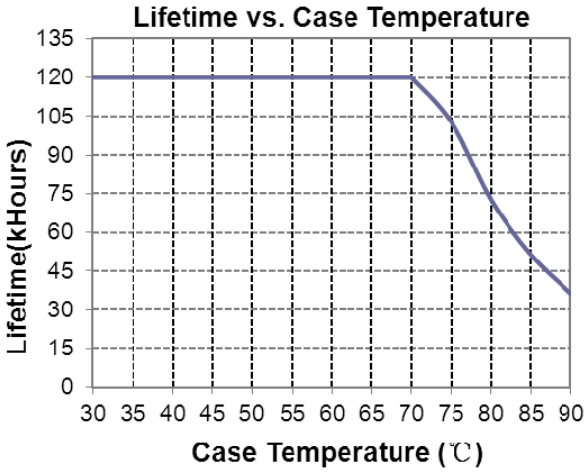
Safety Category	Standard
ENEC & TUV & CE	EN 61347-1, EN61347-2-13
CCC	GB 19510.1, GB 19510.14
KS	KS C 7655
Performance	**Standard**
ENEC	EN 62384
EMI Standards	**Notes**
EN 55015/GB 17743(1)	Conducted emission Test &Radiated emission Test
EN 61000-3-2/GB 17625.1	Harmonic current emissions
EN 61000-3-3	Voltage fluctuations & flicker

Safety & EMC Compliance (Continued)

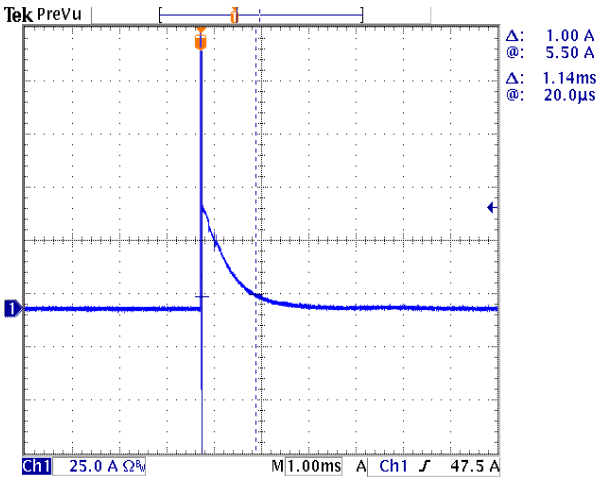
EMS Standards	Notes
EN 61000-4-2	Electrostatic Discharge (ESD): 8 kV air discharge, 4 kV contact discharge
EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test-RS
EN 61000-4-4	Electrical Fast Transient / Burst-EFT
EN 61000-4-5	Surge Immunity Test: AC Power Line: Differential Mode 6 kV, Common Mode 8 kV
EN 61000-4-6	Conducted Radio Frequency Disturbances Test-CS
EN 61000-4-8	Power Frequency Magnetic Field Test
EN 61000-4-11	Voltage Dips
EN 61547	Surge Immunity Test: AC Power Line: Differential Mode 6 kV, Common Mode 10 kV
	Electromagnetic Immunity Requirements Applies To Lighting Equipment

Note: (1)This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

Lifetime vs. Case Temperature

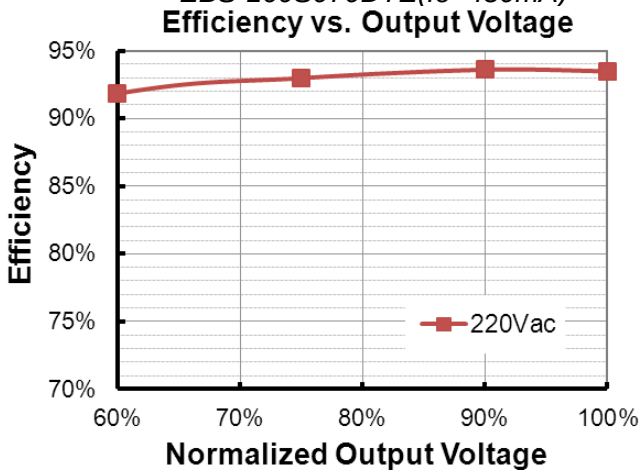


Inrush Current Waveform

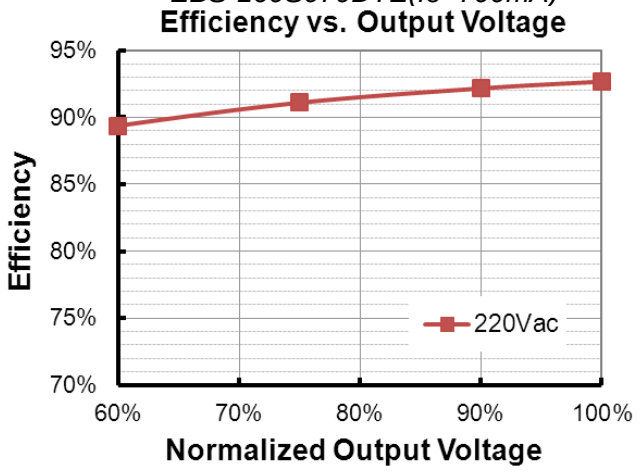


Efficiency vs. Load

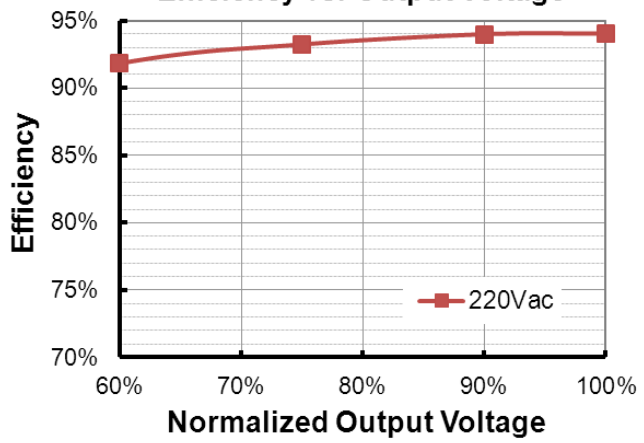
EBS-160S070DTE(Io=450mA)



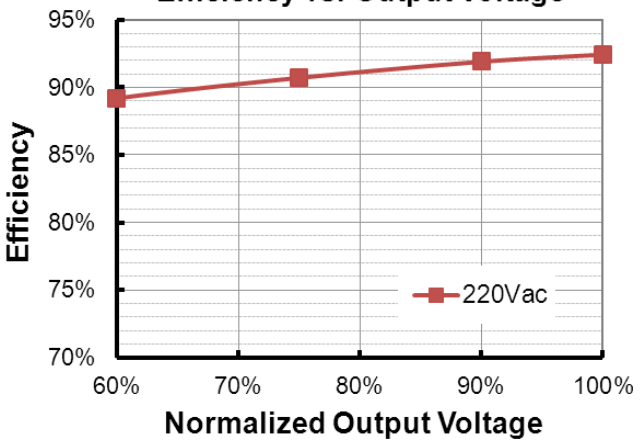
EBS-160S070DTE(Io=700mA)



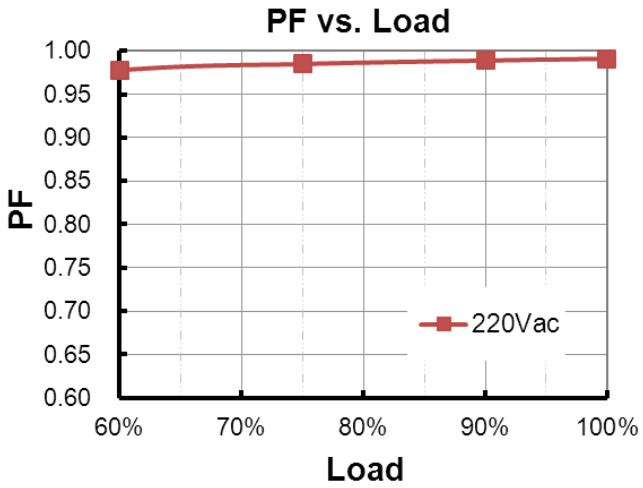
EBS-160S105DTE(Io=700mA)



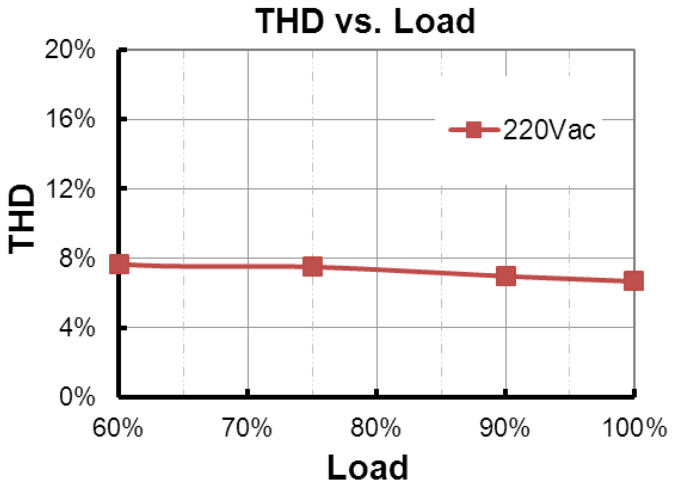
EBS-160S105DTE(Io=1050mA)



Power Factor



Total Harmonic Distortion



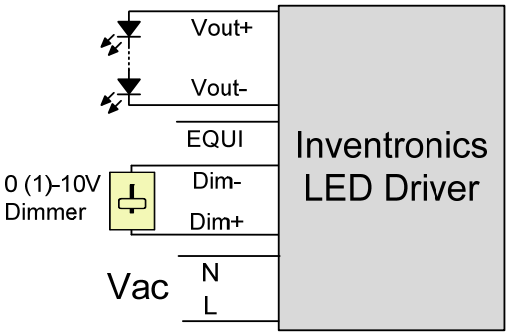
Protection Functions

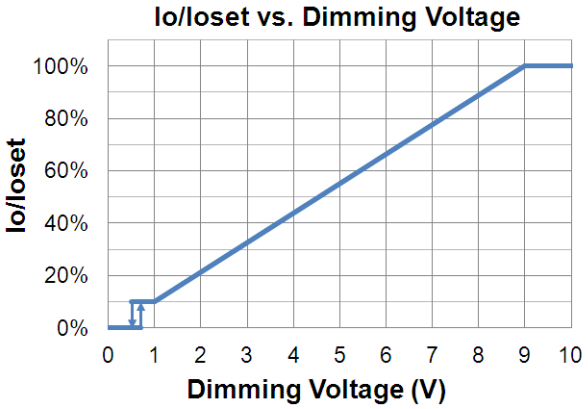
Parameter		Min.	Typ.	Max.	Notes
External Thermal Protection NTC	R1	-	7.81 kOhm	-	When R_NTC falls below R1, External Thermal Protection is triggered, reducing output current until R2 is reached.
	R2	-	4.16 kOhm	-	When R_NTC is less than R2, output current is reduced to the programmed “Protection Current Floor.”
	Protection Current Floor	10%Ioset	60%Ioset	100%Ioset	10%Ioset>Iomin (default setting is 60%)
		Iomin	60%Ioset	100%Ioset	10%Ioset≤Iomin (default setting is 60%)
Over Temperature Protection		Decreases output current, returning to normal after over temperature is removed.			
Short Circuit Protection		Auto Recovery. No damage will occur when any output is short circuited. The output shall return to normal when the fault condition is removed.			
Over Voltage Protection		Limits output voltage at no load and in case the normal voltage limit fails.			

Dimming

- **0-10V Dimming**

The recommended implementation of the dimming control is provided below.

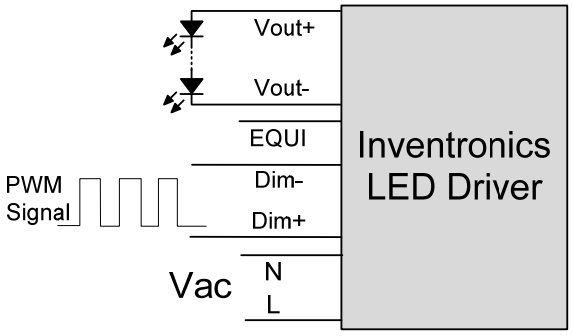


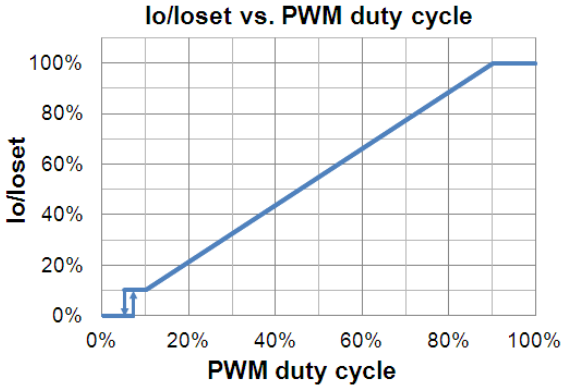


Implementation 1: DC Input

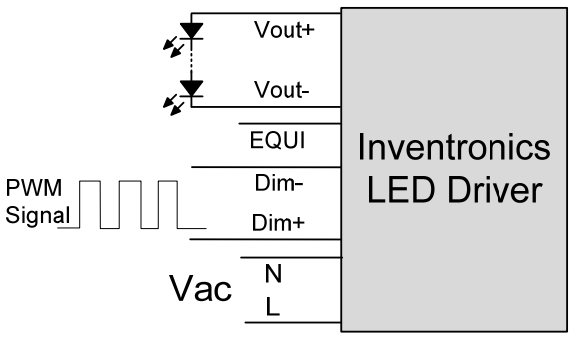
Note: The dimmer can also be replaced by an active 0-10V voltage source signal or passive components like resistors and zener.

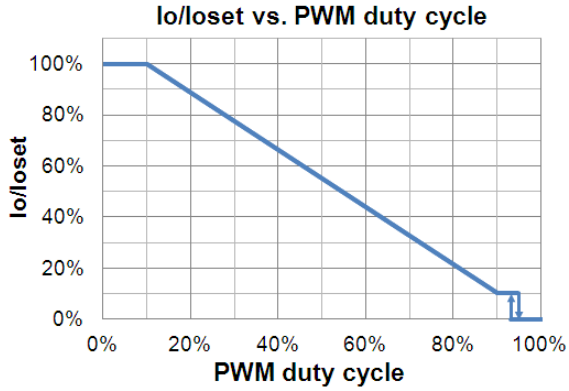
- **PWM Dimming**





Implementation 2: Positive logic





Implementation 3: Negative logic

- **Time Dimming**

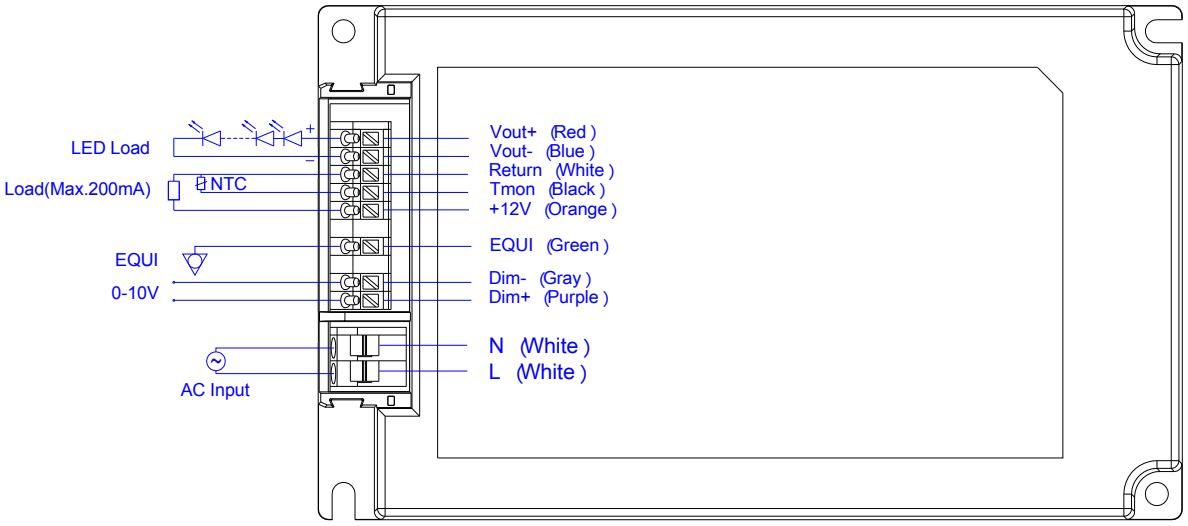
  Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.
  - **Self Adapting-Midnight**: Automatically adjusts the dimming curve based on the on-time of past two days (if difference <15 minutes), assuming that the center point of the dimming curve is midnight local time.
  - **Self Adapting-Percentage**: Automatically adjusts the on-time of each step by a constant percentage = (actual on-time for the past 2 days if difference <15 min) / (programmed on-time from the dimming curve).
  - **Traditional Timer**: Follows the programmed timing curve after power on with no changes.

- **Output Lumen Compensation**

  Output Lumen Compensation (OLC) may be used to maintain constant light output over the life of the LEDs by driving them at a reduced current when new, then gradually increasing the drive current over time to counteract LED lumen degradation.

Wire Connection

Parameter		Min.	Typ.	Max.	Notes
L, N	Wire Cross-section	0.4 mm^2	-	2.5 mm^2	Push-in at 0° angle, solid and stranded wire
		20 AWG	-	12 AWG	
	Strip Length	10 mm	-	11 mm	
EQUI	Wire Cross-section	0.4 mm^2	-	1.5 mm^2	Push-in at 45° angle, solid and stranded wire
		20 AWG	-	16 AWG	
	Strip Length	8.5 mm	-	9.5 mm	
Vout+, Vout-, Return, Tmon, +12V, Dim-, Dim+	Wire Cross-section	0.2 mm^2	-	1.5 mm^2	Push-in at 45° angle, solid and stranded wire
		22 AWG	-	16 AWG	
	Strip Length	8.5 mm	-	9.5 mm	



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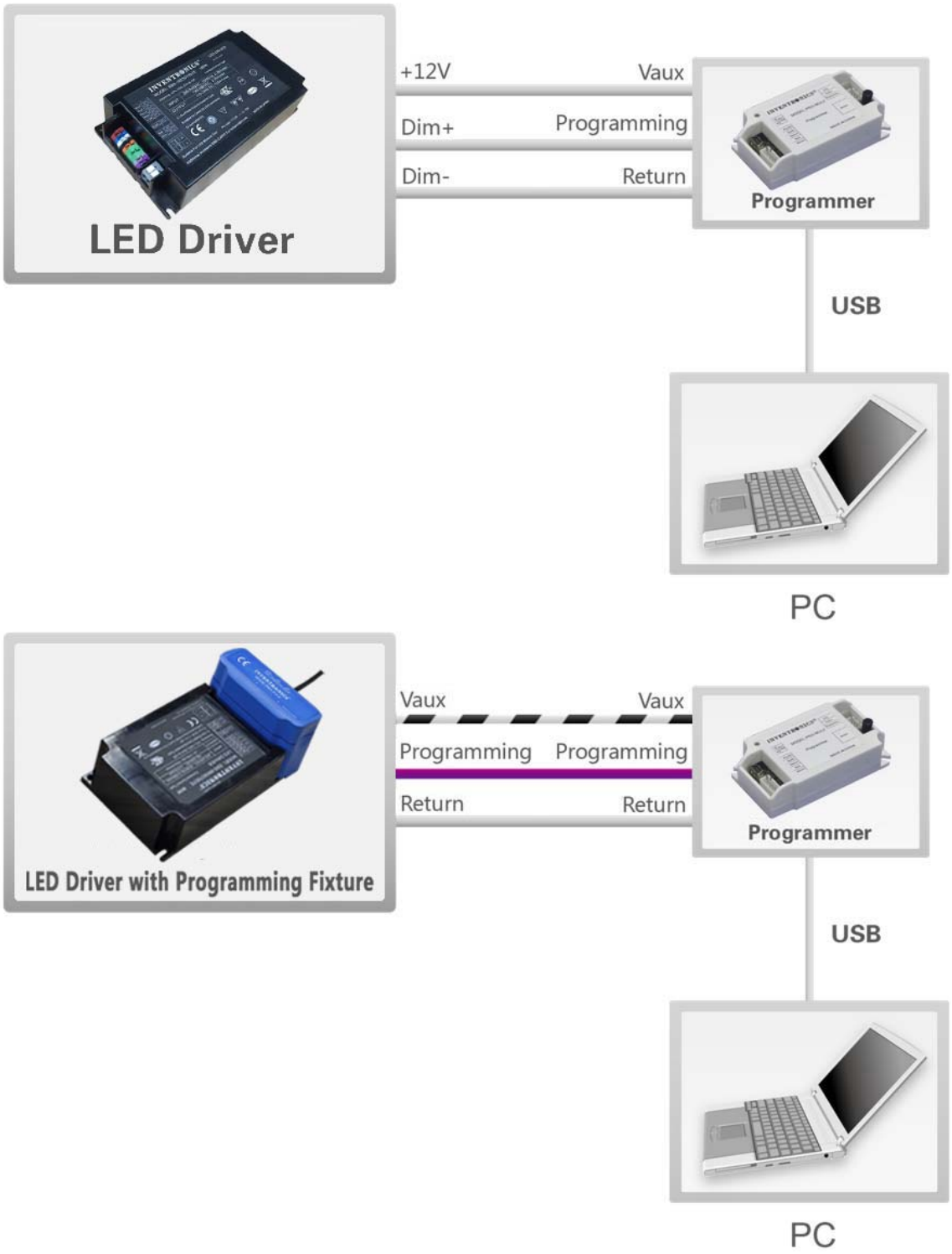
Programming Connection Diagram

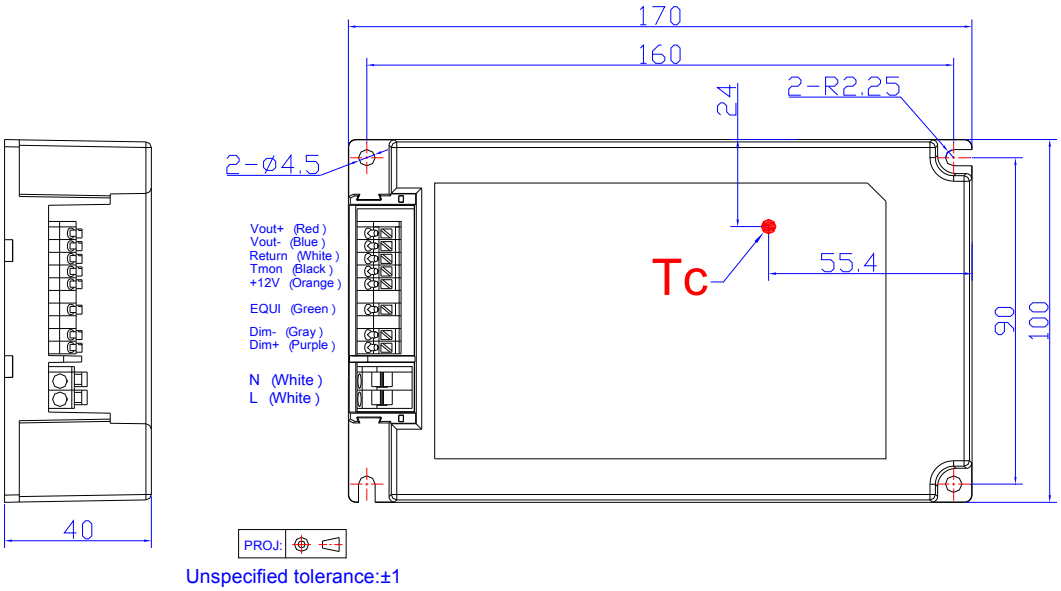


Note: The driver does not need to be powered on during the programming process.

- **P lease refer to PRG-MUL2 (Programmer) and PRG-FIX-E (Programming Fixture) datasheet for details.**

Mechanical Outline

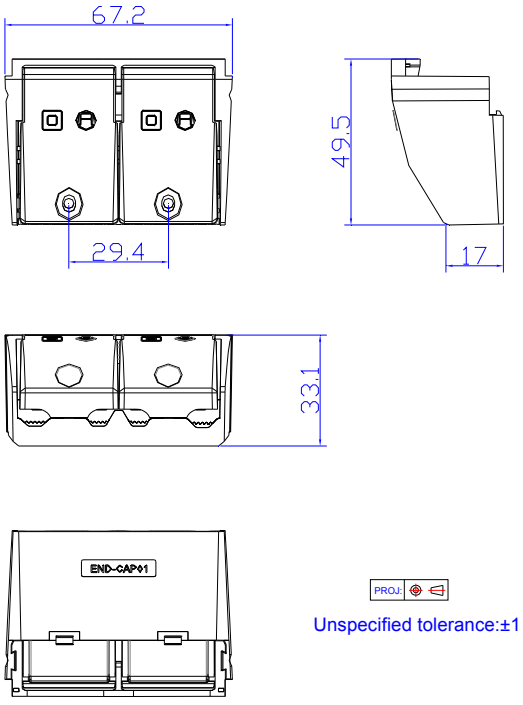
EBS-160SxxxDTE



Unspecified tolerance:±1

Optional Cable Clamp

END-CAP01



Unspecified tolerance:±1

Note: The cable clamp is to be installed with EBS-160SxxxDTE drivers for independent application. Please refer to **END-CAP01** datasheet for details

RoHS Compliance

Our products comply with the European Directive 2011/65/EC, calling for the elimination of lead and other hazardous substances from electronic products.

Revision History

Change Date	Rev	Description of Change		
		Item	From	To
2016-09-09	A	Datasheets Release	/	/
2017-10-24	B	KS	/	Added
		Features	7 Years Warranty	Added
		Features	Always-on Auxiliary Power	Added
		Models	Notes	Updated
		Input Specifications	PF/THD	Updated
		Output Specifications	Temperature Coefficient of Ioset	Updated
		Output Specifications	12V Auxiliary Output Transient Peak Current	Added
		General Specifications	Operating Case Temperature for Warranty Tc_w	Updated
2018-01-15	C	Description	/	Updated
		Models	Notes	Updated
		General Specifications	Operating Case Temperature for Warranty Tc_w	Updated
		Wire Connection Diagram	/	Updated
2019-04-25	D	Logo	CCC	Updated
		Features	/	Updated
		General Specifications - Net Weight	700g	750g
		Safety & EMC Compliance	/	Updated