

PKB2020 WPKB3030 WPKB5050 WPKB6565 WPKB8585 W

20 to 85 W Programmable Constant Current Class 2 LED Driver with 0-10 V Dimming

	Input Voltage	Max. Output Power	Efficiency	Max. Case Temperature	THD	Power Factor	Dimming Method	Dimming Range	Startup Time		
	<mark>120 - 277 Vac</mark>	85 W	up to 90% typical	90°C (measured at the hot spot)	< 20%	> 0.9	Programmable 0 - 10 V	1 - 100%	300 ms typical	-	
	PKB +LED Beries +LED LEDS +LED LEDS -LEDS										
• UL Cl • Class • Lifetir • 90°C • Surge • IE • 2. ca • Comp	 FEATURES UL Class P Class 2 output Lifetime: 5 years @ Tc ≤ 75°C 90°C maximum case hot spot temperature Surge protection: IEC61000-4-5: 2 kV line to line/2 kV line to earth 2.5 kV ring wave: ANSI/IEEE c62.41.1-2002 & c62.41.2-2002 category A Complies with ENERGY STAR®, DLC (DesignLight Consortium®), and CA Title 24 technical requirements 										
Audi Curr 0-10 Data	Complies with ENERGY STAR®, DLC (DesignLight Consortium®), and										
				CULUSTED US NO	<u>M</u> F©		Decla	are. [*]	RoHS		



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1 - ORDERING INFORMATION										
Part Number	Nominal Input Voltage (Vac)	Max Output Power (W)	lout (mA)	Default Programmed Current (mA)	Vout Min. (Vdc)	Nom.	Vout Max. (Vdc)*	Open Loop (No Load) Voltage (Vdc)	Notes	
				PKB20W						
PKB20W-0700-55-TN	<mark>120 - 277</mark>	20	100 to 700	350	10	49.5	55	60	Terminal Blocks	
PKB30W										
PKB30W-1050-55-TN	<mark>120 - 277</mark>	30	275 to 1050	700	10	49.5	55	60	Terminal Blocks	
				PKB50W						
PKB50W-1400-55-TN	<mark>120 - 277</mark>	50	500 to 1400	1050	10	49.5	55	60	Terminal Blocks	
				PKB65W						
PKB65W-1800-55-TN	<mark>120 - 277</mark>	65	600 to 1800	1200	10	49.5	55	60	Terminal Blocks	
PKB85W										
PKB85W-2300-55-TN	<mark>120 - 277</mark>	85	700 to 2300	1400	10	49.5	55	60	Terminal Blocks	
PKB85W-2300-55-TNZ	<mark>120 - 277</mark>	85	700 to 2300	1400	10	49.5	55	60	Terminal Blocks, Dim- to-off, Aux Power	

* The forward voltage (Vf) of the LED load should not exceed Vout Max. of the driver under worst case field operating conditions which are the Vf max. of the LED load under lowest temperature and highest forward current conditions. As a general design guideline, the nominal LED load Vf measured at the operating current and at room temperature should be \leq Vout Nom. of the driver.

Notes:

• Please order the programming wand using the part number PROG-JACK-USB.

Programming Cable Part number: PROG-JACK-USB

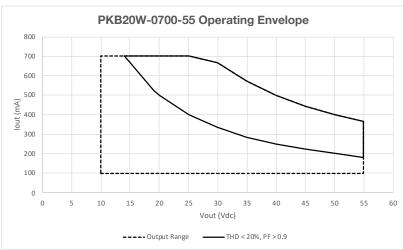


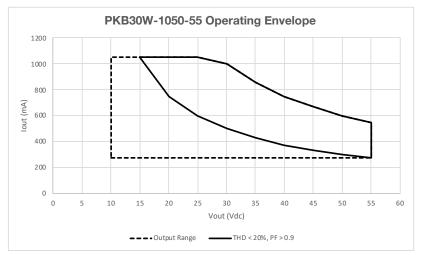


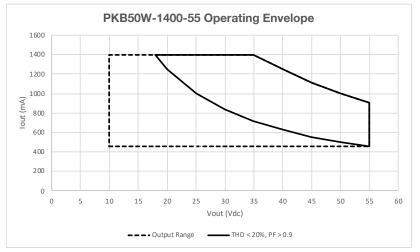
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2 – OPERATING ENVELOPES









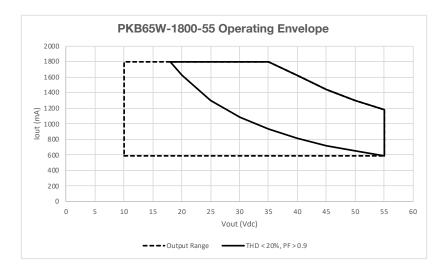
PKB20 20 W PKB30 30 W PKB50 50 W PKB65 65 W PKB85 85 W

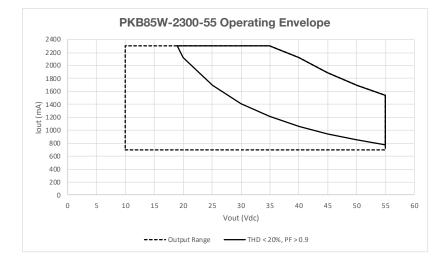
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PKB

Series

2 – OPERATING ENVELOPES (CONTINUED)







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3 - INPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Input Voltage Range (Vin)	Vac	90	120, 277	305	 The rated output current for each model is achieved at Vin≥108 Vac, & at Vin≥249 Vac. At nominal load
Input Frequency Range	Hz	47	50/60	63	
Input Current (lin)	А			0.7 A @ 120 Vac 0.34 A @ 277 Vac	
Power Factor (PF)		0.9	> 0.9		•At nominal input voltage (120 & 277 Vac) and no dimmer •From 100% to 50% of output power
Inrush Current	A		Meets NEMA-410 requir	ements	•At any point on the sine wave and 25°C
Leakage Current	mA			0.4 mA @ 120 Vac 0.75 mA @ 277 Vac	Measured per IEC60950-1
Input Harmonics		Complies	with IEC61000-3-2 for Class	C equipment	
Total Harmonics Distortion (THD)				20%	 At nominal input voltage (120 & 277 Vac) From 100% to 50% of output power Complies with DLC (Design Light Consortium) technical requirements
Efficiency	%	-	up to 90%	-	Measured with nominal input voltage, a full sinusoidal wave form and without dimmer attached.
Isolation	The A	C input to th	e main DC output is isolated		

4 - MAIN OUTPUT SPECIFICATION (@25°C ambient temperature)

	Units	Minimum	Typical	Maximum	Notes
Output Voltage (Vout)	Vdc				See ordering information for details
Output Current (lout)	mA				 See ordering information for details Output voltage and current combination cannot exceed max power output. See page 3 for operating window The rated output current for each model is achieved at Vin≥108 Vac & Vin≥249 Vac.
Output Current Regulation	%	-3	±2	3	•At nominal AC line voltage (120 & 277 Vac) •Includes load and current set point variations
Output Current Overshoot	%	-	-	20	The driver does not operate outside of the regulation requirements for more than 500 ms during power on with nominal LED load and without dimmer.
Ripple Current	Current ≤ 20% of rated output current for each model			current for	 Measured at nominal LED voltage and nominal input voltage without dimming Calculated in accordance with the IES Lighting Handbook, 9th edition
Dimming Range	%	1		100	 The dimming range is dependent on each specific dimmer. It may not be able to achieve 1% dimming with some dimmers. When testing, if light is measured, dimming range is based on light output. If no light is measured, dimming range is based on percentage of output current. Dimming performance is optimal when the driver is operated at its nominal output voltage matching the LED nominal Vf (forward voltage). Dimming performance may vary when the driver is operated near its minimum output voltage.
Start-up Time	ms		300	500	 Without any dimmer attached, and at nominal input voltages and nominal load Measured from application of AC line voltage to 100% light output Complies with ENERGY STAR® luminaire specification and CA Title 24
Isolation	The m	nain DC ou	tput is c	ertified and	d tested per UL8750 Class 2 or LED Class 2.



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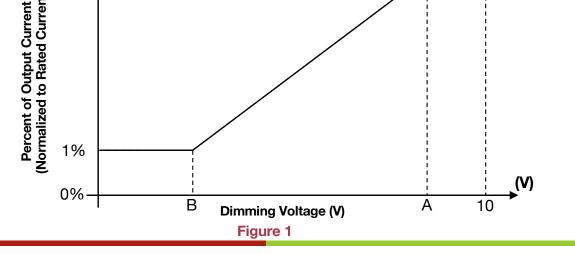
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5 - 0-10 V DIMMING CONTROL (@25°C ambient temperature)

In the PKB series, several 0-10V dimming profiles can be selected, such as a logarithmic profile, a non-linear profile with 1% minimum dimming, and a non-linear profile with 10% minimum dimming. Furthermore, every point in the non-linear dimming profile can be programmed using the programming software.

By default, the non-linear profile with 1% minimum dimming (shown in figure 1) is pre-loaded in the PKB series.

		Minimum			n Notes					
+Dim Signal, -Dim Signal	done v comm	PKB series operate only with 0-10 V dimmers that sink current. The method to dim the output current of the driver is e via the +Dim/-Dim Signal pins. The +Dim/-Dim signal pins can be used to adjust the output setting via a standard imercial wall dimmer, an external control voltage source (0 to 10 Vdc), or a variable resistor when using the recommended other of LEDs. The dimming input permits 1% to 100% dimming.								
Dimming Profile (see figure 1)	Linear	% of output current between 10 V and 8.2 V, ar between 8.2 V and 1.5 V, of output current below 1.5 V.								
Dimming Range	%	1		100	When testing, if light is measured, dimming range is based on light output. If no light is measured, dimming range is based on percentage of output current.					
High Level Voltage - A	V		8.2	8.5						
Low Level Voltage - B	V	0.5	1.5							
Current Supplied by the +Dim Signal Pin	mA			1						
Dimming Voltage Sensing Tolerance	mV			100	The tolerance of the difference between the 0-10 V signal supplied by the dimmer and sensed by the driver.					
Output Current Tolerance While Being Dimmed	%		±8		In the linear region of the dimming curve (Between points A and B in Figure 1).					
Output Current Tolerance at Minimum Dimming	%		±8		The tolerance of the output current at minimum dimming is +/-8% of 1% of the maximum output current of each driver.					
Minimum Dimming Tolerance	%	0.8	1	2						
Isolation	The 0-	10 V circu	it is isolat	ed from th	ne AC input and meets UL8750 supplement SF requirements.					
rent	Ŧ	0%								





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6 - ENVIRONMENTAL CONDITIONS

	Units	Minimum	Typical	Maximum	Notes		
Operating Ambient Temperature (Ta)	°C	-20		50	50°C is the non-derated temperature (Refer to section 9 'Output power de-rating at elevated temperatures'.)		
Maximum Case Temperature (Tc)	°C			+90	Case temperature measured at the hot spot •tc (see label on page 16)		
Storage Temperature	°C	-40		+85			
Humidity	%	5	-	95	Non-condensing		
Cooling		Conve	ection cooled				
Acoustic Noise	dBA			24	Measured at a distance of 1 foot, without dimmer		
Mechanical Shock Protection	per EN	60068-2-27					
Vibration Protection	per EN	60068-2-6 & E	N60068-2-64				
MTBF	> 200,0	000 hours whe	en operated at	nominal input	and output conditions, and at $Tc \le 75^{\circ}C$		
Lifetime	50,000	hours at Tc ≤	75°C maximu	m case hot sp	case hot spot temperature (see hot spot •tc on label on page 16)		
Warranty	-			-	ment techniques to ensure proper thermal conductivity ple-sided tape to mount the driver voids the warranty.		

7 - EMC COMPLIANCE, SAFETY, AND ENVIRONMENTAL APPROVALS

				EMC	C Compliance				
Conducted and Radiated EMI	•Complian	Compliant with FCC CFR Title 47 Part 15 Class A at 120 & 277 Vac							
Harmonic Curren	t Emissions		11	EC61000-3-2	For Class C e	quipment			
			EC61000-3-3						
Immunity Compliance	•	ESD (Electrostatic Discharge)			6 kV contact discharge, 8 kV air discharge, level 3				
	RF Electr Suscepti	•	tic Field	EC61000-4-3	3 V/m, 80 - 10	000 MHz, 80% modulated at a distance of 3 meters			
	Electrica	l Fast Tra	ansient II	EC61000-4-4	± 2 kV on AC	power port for 1 minute, ±1 kV on signal/control lines			
	Summe	Surge			± 2 kV line to line (differential mode) /± 2 kV line to common mode ground				
	Surge				1.1-2002 & c62.41.2-2002 category A, 2.5 kV ring wave				
		Conducted RF Disturbances			3V, 0.15-80 MHz, 80% modulated				
	Voltage E	Dips	II	EC61000-4-11	>95% dip, 0.5 period; 30% dip, 25 periods; 95% reduction, 250 periods				
				Safety & Env	vironmental Ap	oprovals			
UL	UL8750 I	isted Cla	ss 2, supplen						
cUL	CAN/CS/	A C22.2 N	No. 250.13-1	4 LED equipmer	nt for lighting a	pplications			
NOM									
Declare	LBC (Livi	na Buildi	na Challenae	e) Red List Appro	oved				
				,	Safety				
		Units	Minimum	Typical	Maximum	Notes			
		Offics	Winning	Typical	INIGAIITIUTT	Notes			
Hi Pot (High Potential) or Vdc 2200		2200			•Tested at the RMS voltage equivalent of 1555 Vac				
						1			



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8 - PROTECTION FEATURES

Input Over Current Protection

The PKB series incorporates a primary AC line fuse for input over current protection to prevent damage to the LED driver and meet product safety requirements as outlined in Section 6.

Short Circuit and Over Current Protection

The PKB series is protected against short-circuit such that a short from any output to return shall not result in a fire hazard or shock hazard. The driver shall hiccup as a result of a short circuit or over current fault. Removal of the fault will return the driver to within normal operation. The driver shall recover, with no damage, from a short across the output for an indefinite period of time.

Internal Over temperature Protection

The PKB series is equipped with internal temperature sensor on the primary power train. Failure to stay within the convection power rating will result in the power supply reducing the available current (fold back) below the programmed amount. The main output current will be restored to the programmed value when the temperature of the built-in temperature sensor cools adequately.

Output Open Load Protection

When the LED load is removed, the output voltage of the PKB series is typically limited to 1.3 times the maximum output voltage of each model.

9 - OUTPUT POWER DE-RATING AT ELEVATED TEMPERATURES

The PKB series can be operated with cooling air temperatures above 50°C by linearly de-rating the total maximum output power (or current) by 2.5%/°C until internal over temperature protection activates.



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📕 10 - 0-10 V DIMMING

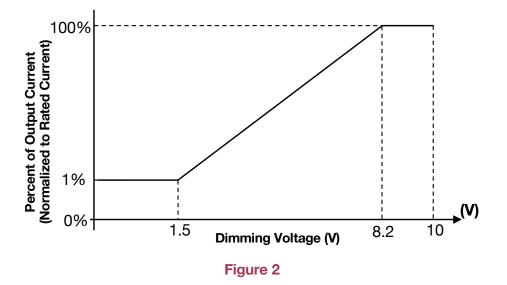
The PKB series operate only with 0-10 V dimmers that sink current. They are not designed to operate with 0-10 V control systems that source current, as used in theatrical/entertainment systems. Developed in the 1980's, the 0-10 V sinking current control method is adopted by the International Electrotechnical Commission (IEC) as part of its IEC Standard 60929 Annex E.

The method to dim the output current of the driver is done via the +Dim/-Dim Signal pins. The +Dim/-Dim Signal pins respond to a 0 to 10 V signal, delivering 1% to 100% of the output current based on rated current for each model. A pull-up resistor is included internal to the driver. If the +Dim input is > 10 V or open circuited, the output current is programmed to 100% of the rated current.

The maximum source current (flowing from the driver to the 0-10 V dimmer) supplied by the +Dim Signal pin is \leq 1 mA. The tolerance of the output current while being dimmed shall be +/-8% typical until down to 1.5 V.

In the PKB series, several 0-10 V dimming profiles can be selected, such as a logarithmic profile, a non-linear profile with 1% minimum dimming, and a non-linear profile with 10% minimum dimming.

By default, the non-linear profile with 1% minimum dimming (shown in figure 2) is pre-loaded in the PKB series. In this non-linear 0-10 V dimming profile, 10 V to 8.2 V=100% of the output current, <1.5 V =1%,



11 - COMPATIBLE 0-10 V DIMMERS

- Lutron, Nova series (part number NFTV)
- Lutron, Diva series (part number DVTV)
- Leviton, IllumaTech series (part number IP710-DL)



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12 - PROGRAMMING

The PKB series can be programmed by inserting the audio jack of the cable shown in figure 3 into the driver and by plugging the USB other end of the cable into a computer. *The driver should not be powered on during the programming process.*

When ordering the PKB series, please make sure you order a programming cable. The part number for the programming cable is "PROG-JACK-USB".

Programming is done by using the ERP GUI (Graphical User Interface), which enables the user to adjust output current and dimming profile.

Please note that, for each model, the **default output current setting is listed on page 2 of this datasheet**.

Furthermore, when connecting the driver to a computer using the programming cable, you can access the driver's internal data log and read the following information: SKU, serial number, manufacturing lot code, hours of operation, firmware revision, and power cycles.

While programming drivers in a lot, the ERP GUI can interface with a label printer, which enables the user to add configuration labels to driver labels in order to highlight programmed output current. Listed below is the equipment needed to print labels.

Equipment	Part Number	Where to buy
Printer	TSC TC210	barcodefactory.com/tsc/printers/tc210/99-059a001-54lf
Ribbon	TSC Prem. Resin, 60mm x 110mm	barcodefactory.com/tsc/35-r060110-23cf
Labels	BAR81x.28-1-TT	barcodefactory.com/barcodefactory/labels/bar81x_28-1-tt

For more information, please refer to the GUI user's manual at: <u>erp-power.com/our-products/programming-software/</u>



Figure 3



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20 to 85 W Programmable Constant Current Class 2 LED Driver with 0-10 V Dimming

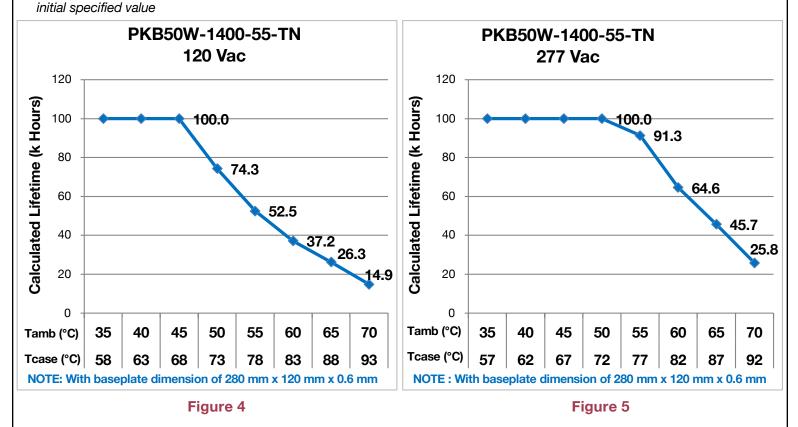
13 - PREDICTED LIFETIME VERSUS CASE AND AMBIENT TEMPERATURE

Lifetime is defined by the measurement of the temperatures of all the electrolytic capacitors whose failure would affect light output under the nominal LED load and worst case AC line voltage. The graphs in figures 4 and 5 are determined by the electrolytic capacitor with the shortest lifetime, among all electrolytic capacitors. It represents a worst case scenario in which the LED driver is powered 24 hours/day, 7 days/week. The lifetime of an electrolytic capacitor is measured when any of the following changes in performance are observed:

1) Capacitance changes more than 20% of initial value

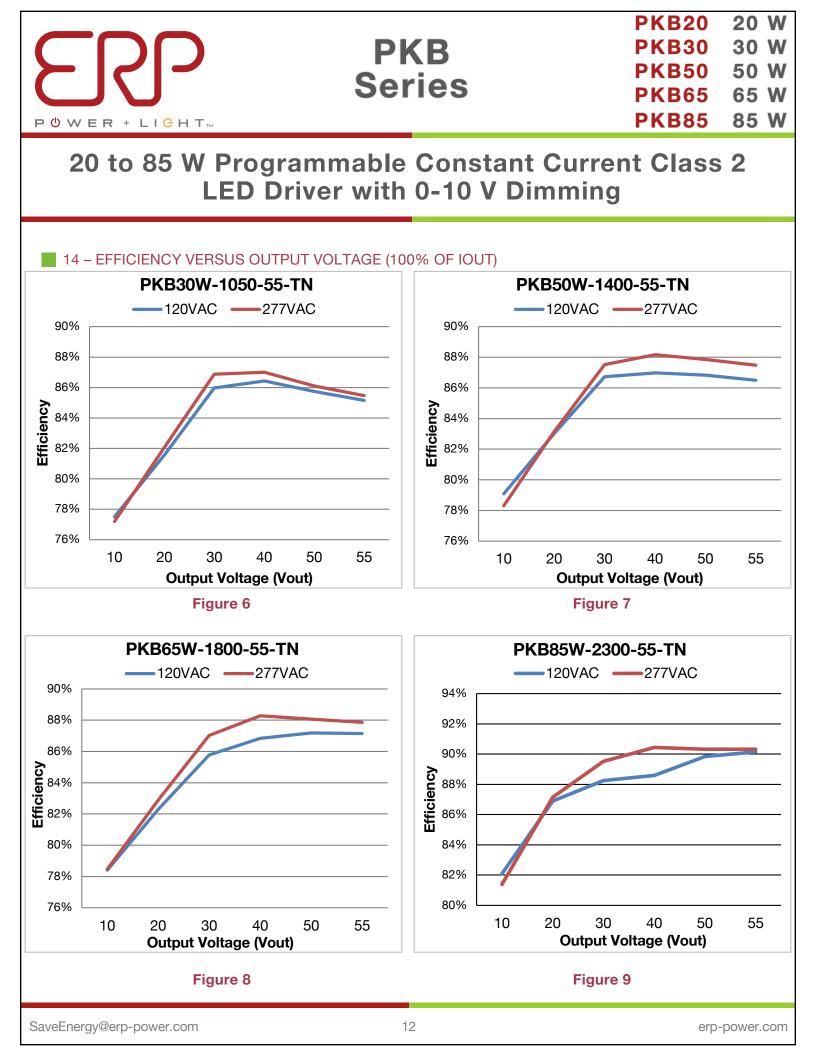
3) Equivalent Series Resistance (ESR): 150% or less of

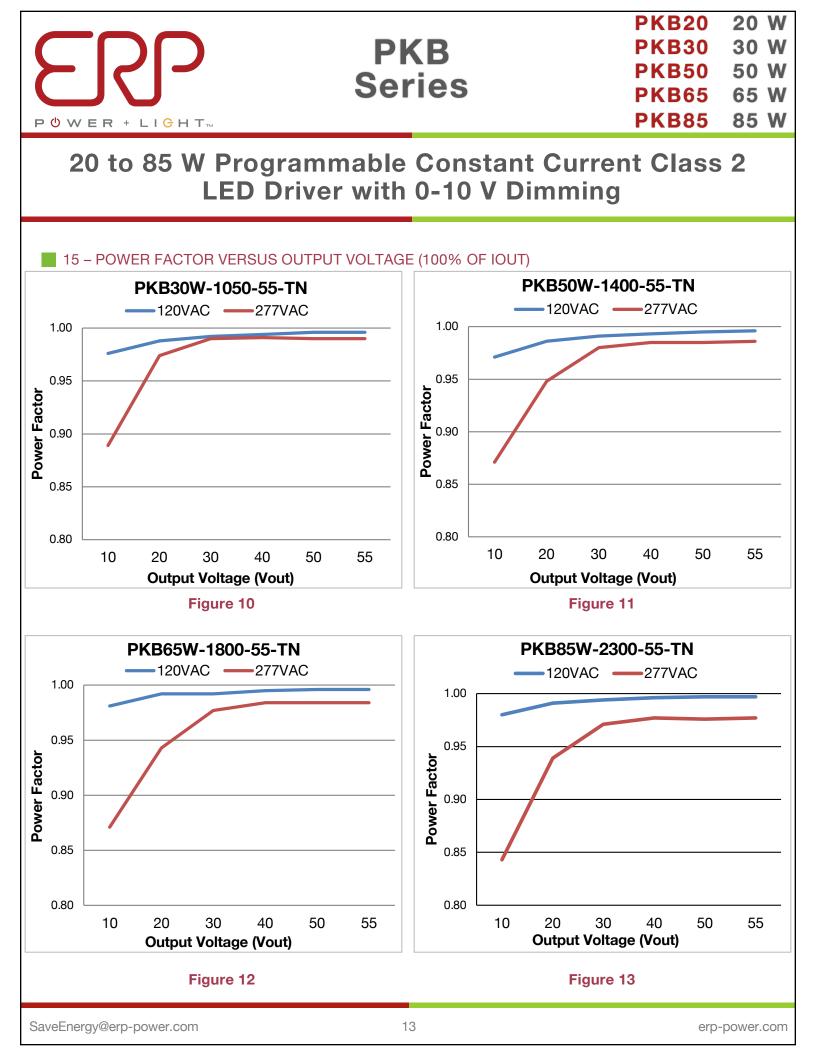
2) Dissipation Factor (tan δ): 150% or less of initial specified value 4) Leakage current: less of initial specified value

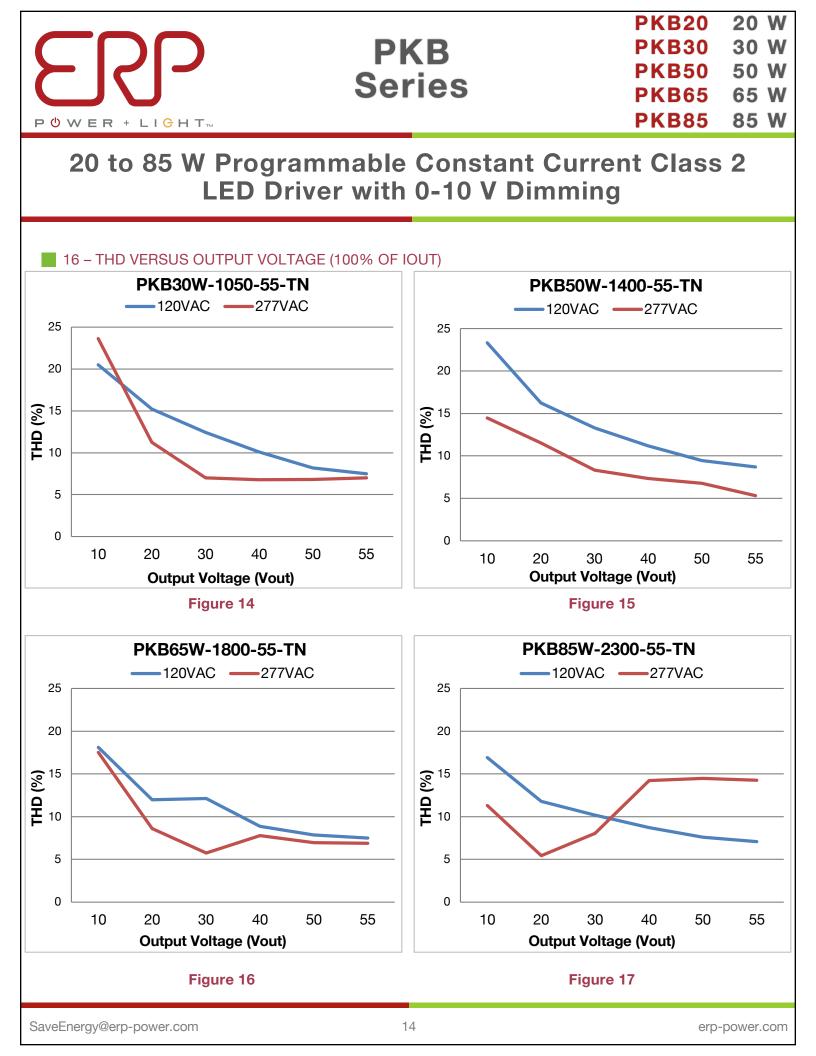


Notes:

- The ambient temperature $T_{ambient}$ and the differential between $T_{ambient}$ and T_{case} mentioned in the above graphs are relevant only as long as both the driver and the light fixture are exposed to the same ambient room temperature. If the LED driver is housed in an enclosure or covered by insulation material, then the ambient room temperature is no longer valid. In this situation, please refer only to the case temperature T_{case} .
- It should be noted the graph "Lifetime vs. Ambient Temperature" may have an error induced in the final application if the mounting has restricted convection flow around the case. For applications where this is evident, the actual case temperature measured at the Tc point in the application should be used for reliability calculations.
- Users must utilize proper thermal management techniques to ensure proper thermal conductivity between the driver and heat sink. The use of double-sided tape to mount the driver voids the warranty.









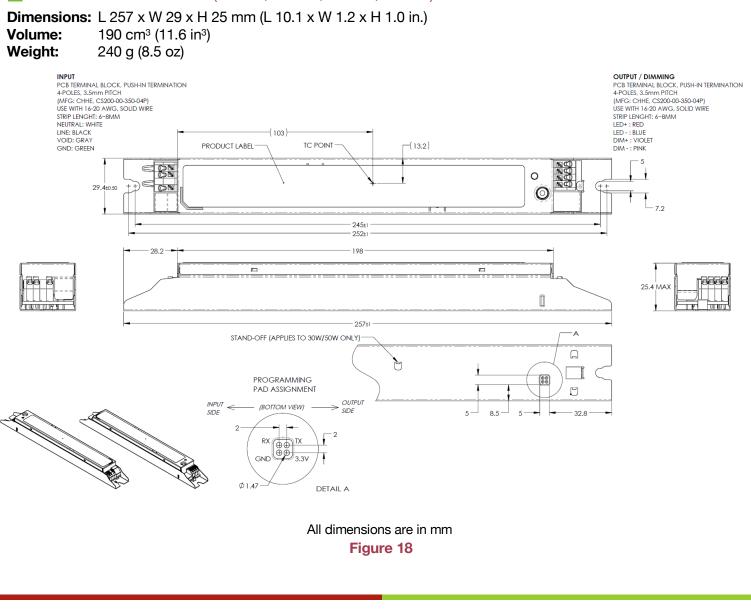
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17 - MECHANICAL DETAILS

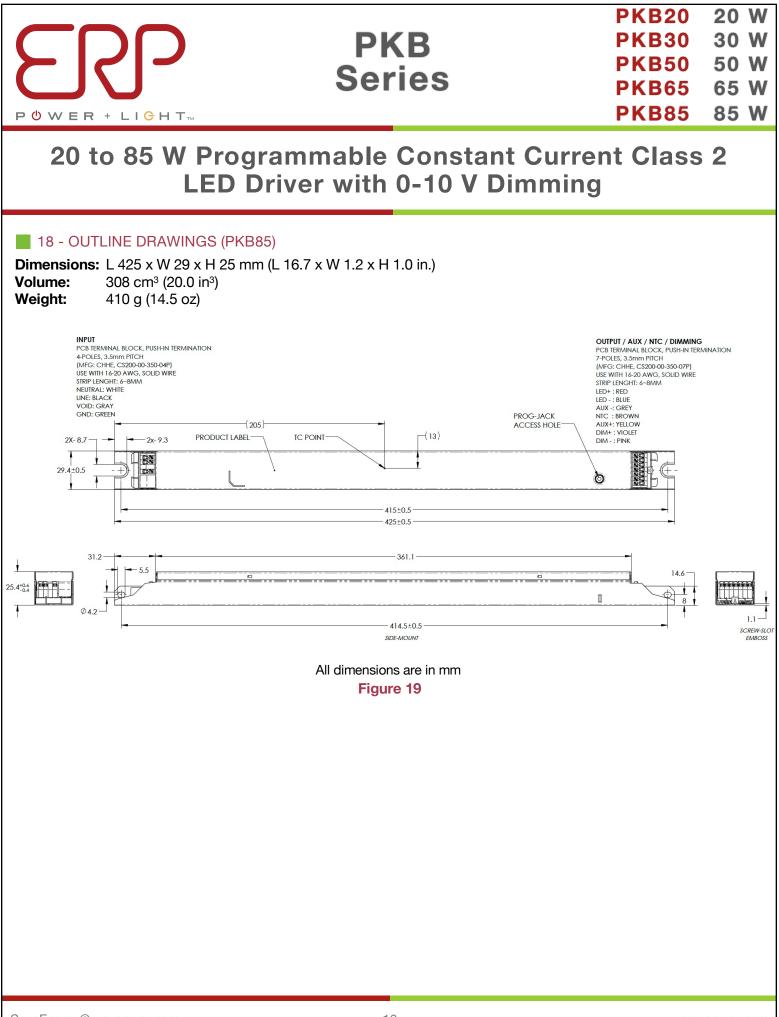
 Packaging: I/O Connections: 	Aluminum case
Models with "TN" suffix:	Terminal Blocks
Ingress Protection:	IP20 rated
Mounting Instructions:	The PKB driver case must be secured on a flat surface through the two mounting tabs, shown here below in the case outline drawings. The use of double-sided tape voids the warranty.

📕 18 - OUTLINE DRAWINGS (PKB20, PKB30, PKB50, PKB65)



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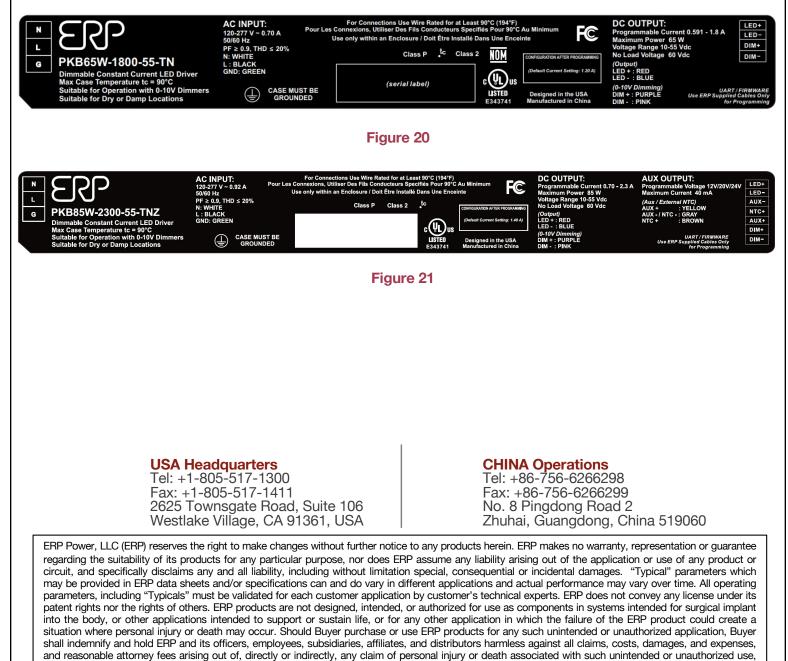


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19 - LABELING

The PKB65W-1800-55-TN and PKB85W-2300-55-TNZ are used in figures 20 and 21 as an example to illustrate a typical label.



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	Revision History	
Date	Comments	
20NOV2020	Initial Release	
11JAN2021	Pg3: correct Vin in output current section	
06APR2021	Added PKB65W characterization curves	
24SEP2021	Clarified input voltage	
07DEC2021	Added "-TN" part numbers	
19JAN2022	Added NOM Certification	
16MAR2022	Pg15: updated label	
28MAR2023	 Pg1: added RoHS logo Pg2: removed "-TD" part numbers Pg5,8: corrected dimming voltage values for default dimming profile Pg14: updated mechanical case outline 	
21SEP2023	Pg5: Added dimming voltage sensing tolerance	
14FEB2024	Added PKB20, PKB80	
17APR2024	Pg5: updated output current regulation	
22JUL2024	Added PKB85W-2300-55-TNZ	
03DEC2024	Corrected the AC input voltage range in section 1, Ordering Information	