

## Features

- Leading Edge and Trailing Edge AC Dimmable
- Constant Current Output
- High Efficiency (Up to 86%)
- Active Power Factor Correction (Up to 0.93)
- All-Around Protection: OTP, SCP and OLP
- UL8750 Safety Standards Approved



## Description

The LLC-028SxxxRSP series operates from a 90 ~ 132 Vac input range. They are designed to be highly efficient and reliable. Features include dimming control with leading edge and trailing edge, open lamp, short circuit and thermal protections.

## Model List

Output Current	Input Voltage Range	Output Voltage Range	Max. Output Power	Efficiency (1)	Power Factor (1)	Model Number
350 mA	90 ~ 132 Vac	40-80 Vdc	28 W	86%	0.93	LLC-028S035RSP
500 mA	90 ~ 132 Vac	28-56 Vdc	28 W	85%	0.93	LLC-028S050RSP <sup>(2)</sup>
700 mA	90 ~ 132 Vac	20-40Vdc	28 W	84%	0.93	LLC-028S070RSP <sup>(2)(3)</sup>
1050 mA	90 ~ 132 Vac	13-26 Vdc	28 W	83%	0.93	LLC-028S105RSP <sup>(2)(3)</sup>

**Notes:** (1) Measured in 120 Vac input with full conduction angle at full load.  
 (2) UL Class 2 (US).  
 (3) cUL Class 2 (Canada).

## Input Specifications

Parameter	Min.	Typ.	Max.	Notes
Input Voltage	90 V	-	132 V	
Input Frequency	47 Hz	-	63 Hz	
Leakage Current	-	-	0.5 mA	At 120Vac, 60Hz input.
Input AC Current	-	-	0.4 A	Measured at full load and 120 Vac input.
Inrush Current	-	-	15 A	At 120Vac input Ta=25°C cold start, duration = 10us

## Output Specifications

Parameter	Min.	Typ.	Max.	Notes
Output Current Tolerance	-5%	-	5%	Full load condition
Startup Overshoot Current	-	-	10%	Full load condition
Output Current Ripple(pk-pk)	-	30%Io	50%Io	Full load condition
Line Regulation	-	-	2%	Input voltage from 110Vac to 132Vac
	-	-	20%	Input voltage from 90Vac to 110Vac

## Output Specifications (Continued)

Parameter	Min.	Typ.	Max.	Notes
Load Regulation	-	-	5%	/
Turn-on Delay Time	-	0.6 s	1.0 s	Measured at 120Vac input.
Dimming Range	10%lo	-	100%lo	

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

## Protection Functions

Parameter	Min.	Typ.	Max.	Notes
No Load Voltage	Vomax	120% Vomax	140% Vomax	Vomax is the maximum operation output voltage
Over Temperature Protection	-	100 °C	-	Case Temperature
Short Circuit Protection	Latch mode. The power supply shall return to normal operation only after the short is removed and the power is recycled.			

## General Specifications

Parameter	Min.	Typ.	Max.	Notes
Efficiency I <sub>o</sub> = 350 mA I <sub>o</sub> = 500 mA I <sub>o</sub> = 700 mA I <sub>o</sub> = 1050 mA	85% 84% 83% 82%	86% 85% 84% 83%	- - - -	Measured at full load and 120 Vac input with full conduction angle.
Power Factor I <sub>o</sub> = 350 mA I <sub>o</sub> = 500 mA I <sub>o</sub> = 700 mA I <sub>o</sub> = 1050 mA	0.90 0.90 0.90 0.90	0.93 0.93 0.93 0.93	- - - -	Measured at maximum output voltage and 120 Vac input with full conduction angle.
No Load Power Dissipation	-	-	3 W	
MTBF	200,000 Hours	-	-	Measured at 120Vac input, 80%load and 25°C ambient temperature (MIL-HDBK-217F)
Lifetime	-	51,700 Hours	-	Measured at 120Vac input, 80%load Case temperature=60°C @ Tc point. See life time vs. Tc curve for the details
Case temperature	-	-	90°C	
Dimensions Inches (L × W × H) Millimeters (L × W × H)	3.74 × 2.76 × 1.26 95 × 70 × 32			
Net Weight		210 g		

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

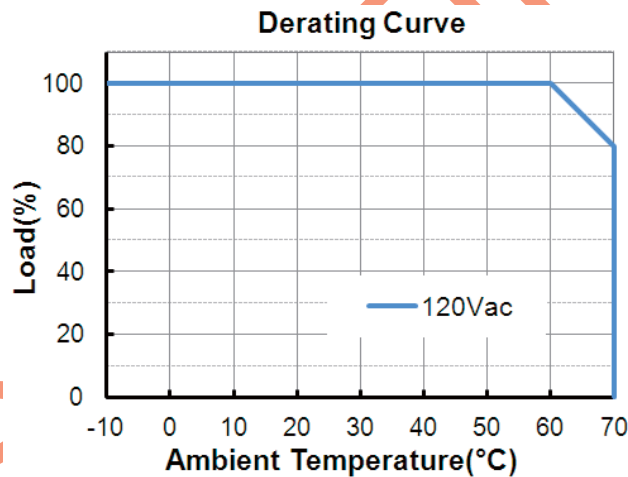
## Environmental Specifications

Parameter	Min.	Typ.	Max.	Notes
Operating Temperature	-10 °C	-	+70 °C	Humidity: 10% RH to 90% RH; No Condensation See Derating Curve for more details
Storage Temperature	-20 °C	-	+85 °C	Humidity: 5% RH to 90% RH

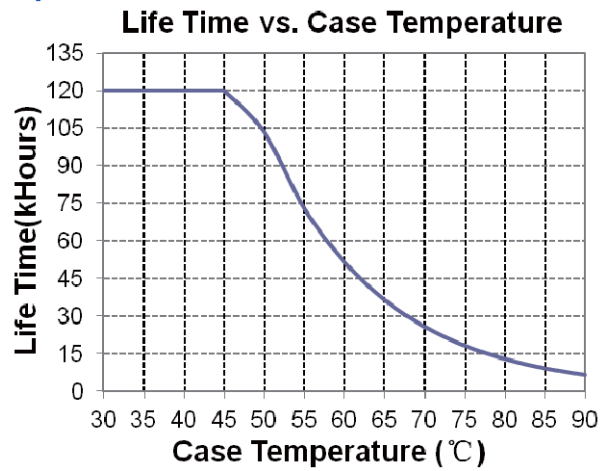
## Safety & EMC Compliance

Safety Category	Standard
UL	UL8750, UL1310, UL1012, CAN/CSA-C22.2 No. 223-M91, CSA C22.2 No. 107.1-01
EMI Standards	Notes
FCC Part 15	Class B This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

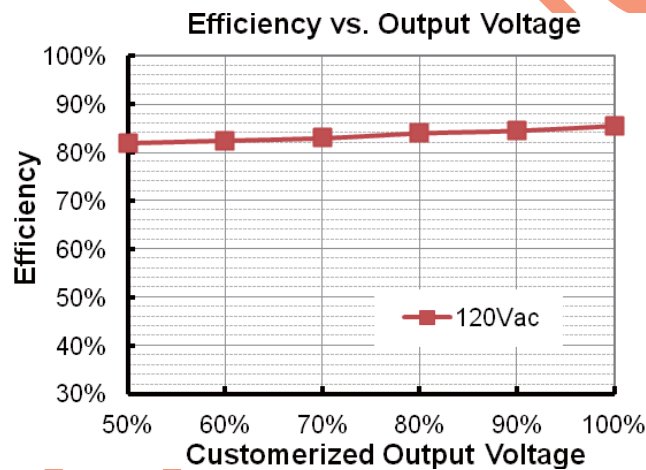
## Derating Curve



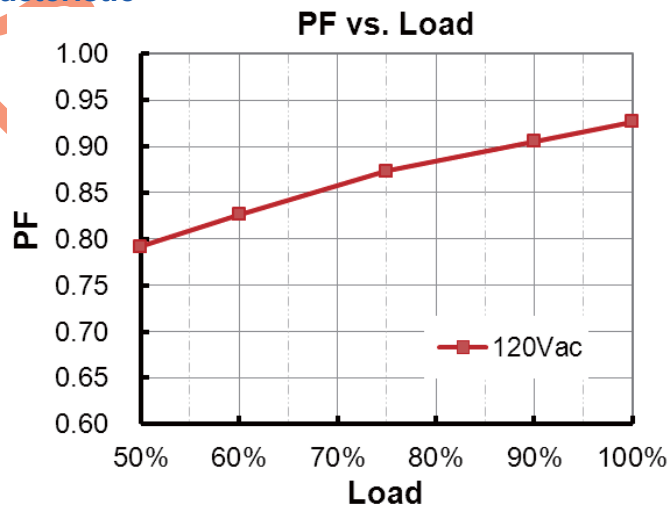
## Life Time vs. Case Temperature Curve



## Efficiency vs. Load (350 mA Model)



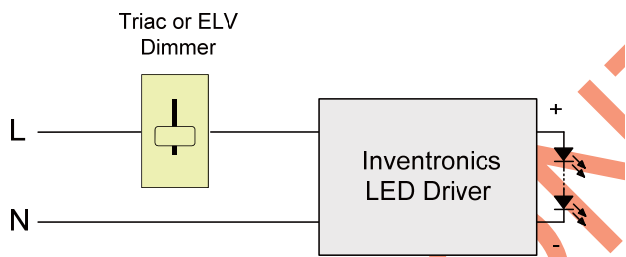
## Power Factor Characteristic



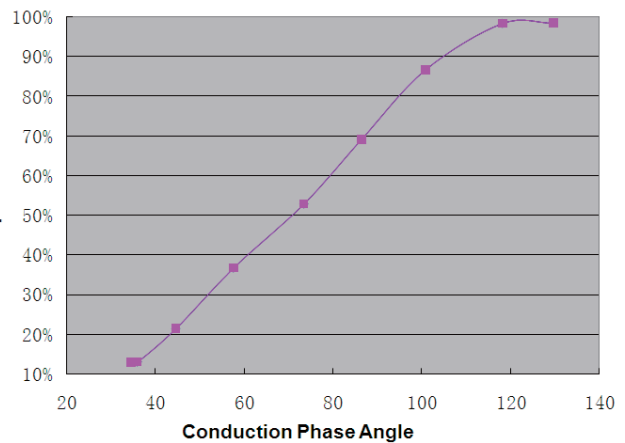
## Dimmer Recommendation

Manufacturer	Type	Applicable Voltage	Power Rating	Notes
LUTRON	SKYLARK CTCL-153PDH	120Vac	600W	
LUTRON	DIVA DVF-103P	120Vac	600W	
LUTRON	SKYLARK S-600P-WH	120Vac	600W	
LUTRON	SKYLARK CT-600PR-WH	120Vac	600W	
LUTRON	SKYLARK LX-103PL-WH	120Vac	1000W	
LUTRON	MAESTRO MA-1000-WH	120Vac	600W	
LEVITON	011-IP106-1LZ	120Vac	600W	
LEVITON	011-IP110-1LZ	120Vac	1000W	

## TRIAC Dimming Control



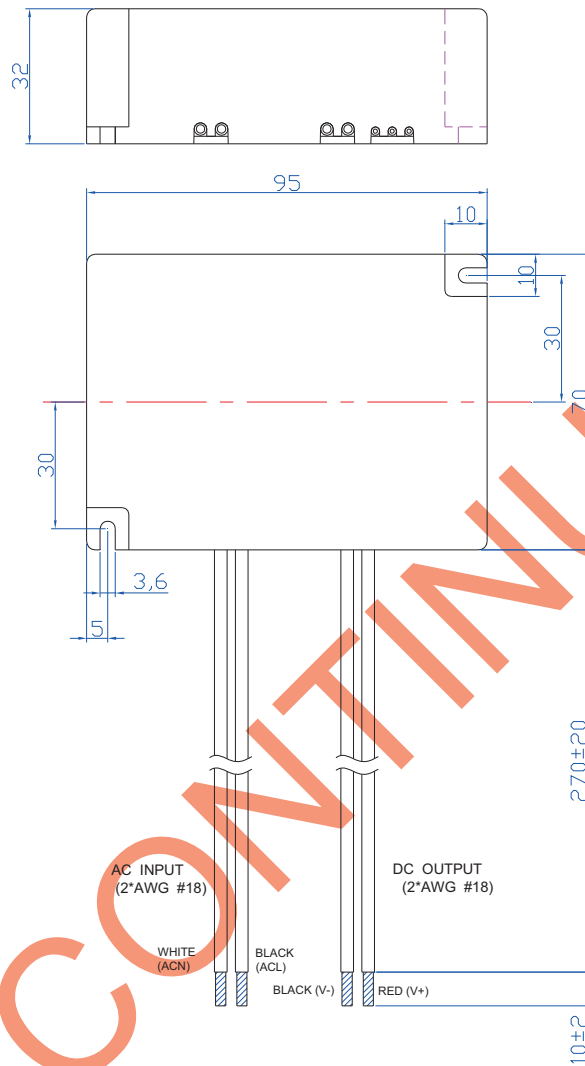
Output Current & Conduction Phase Angle



### Implementation: Dimming with Triac or ELV Dimmer

Parameter	Min.	Typ.	Max.	Notes
Dimming Range	10% $I_o$	-	100% $I_o$	Measured at 120 Vac input.
Conduction Angle	30°	-	180°	Measured at 120 Vac input.

## Mechanical Outline



## RoHS Compliance

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

## Revision History

Change Date	Rev.	Description of Change		
		Item	From	To
2011-12-12	A	Datasheets Release	/	/
2012-01-27	B	PF & Efficiency Curve	/	Added
2012-7-17	C	Max Case Temperature	/	Updated
2013-06-09	D	Life time and life time curve	/	Updated
2018-08-10	E	Features	Active Power Factor Correction (Up to 0.99)	Active Power Factor Correction (Up to 0.93)
		Model List - Power Factor	0.99	0.93
		Protection Functions - No Load Voltage - Typ.	110%Vomax	120%Vomax
		Protection Functions - No Load Voltage - Max.	120%Vomax	140%Vomax
		General Specifications - Power Factor Min.	0.98	0.90
		General Specifications - Power Factor Typ.	0.99	0.93
		Power Factor Characteristic	/	Updated