# 650–3000 Watts
# HCP Series

- High Efficiency up to 91%
- High Power Density
- Programmable Output Voltage (30%–105%)
- Programmable Output Current (40%–105%)
- Parallel Operation
- Fully Featured Signals & Controls
- 3 Year Warranty

## Specification

### Input

| | |
|---|---|
| Input Voltage | • 90-264 VAC (127-370 VDC), see derating curves |
| Input Frequency | • 47-63 Hz |
| Input Current | • 650 W: 7.5 A/3.5 A typical, 1000 W: 12 A/5 A typical, 1500 W: 18 A/9 A typical, 3000 W: 36 A/18 A typical at 115/230 VAC |
| Inrush Current | • 650/1000 W: 27 A/54 A typical 1500 W: 30 A/45 A typical 3000 W: 60 A/90 A typical at 115/230 VAC |
| Power Factor | • 0.99/0.98, typical at 115/230 VAC full load |
| Earth Leakage Current | • <1.0 mA (3 kW: <2.5 mA) at 240VAC/60 Hz |

### Output

| | |
|---|---|
| Output Voltage | • See model table |
| Output Trim | • ±5.0% by potentiometer |
| Output Voltage Program | • 30-105% of rated output (see app. notes) |
| Output Current Program | • 40-105% of rated output (see app. notes) |
| Initial Set Accuracy | • ±1% |
| Minimum Load | • No minimum load required |
| Start Up Delay | • 650 W/1000 W: 800 ms max. 1500 W/3000 W: 1 s max. |
| Start Up Rise Time | • 650 W: 90 ms max. at full load 1000 W: 100 ms max. at full load 1500 W/3000 W: 350 ms max. at full load |
| Hold Up Time | • 16 ms (3000 W: 20 ms) typ. at 230 VAC and full load |
| Line Regulation | • ±0.5% |
| Load Regulation | • V1: ±0.5%, 5 V standby output: ±3% |
| Transient Response | • <1% for a 25% step load change |
| Ripple & Noise | • 150 mV pk-pk all voltages (see note 1) |
| Overvoltage Protection | • Tracks output voltage. 115-135% of set voltage. Recycle AC to reset |
| Overtemperature Protection | • Auto recovery |
| Overload Protection | • 105-125% of output power. Constant power to 75% of set output voltage then output shuts down, recycle AC to reset |
| Short Circuit Protection | • Output latches off, recycle AC to reset |
| Temp. Coefficient | • ±0.02%/°C (0-50 °C) |
| Remote Sense | • Compensates for 0.5 V max voltage drop. (see app. notes) |
| Enable | • Output must be enabled (see app. notes) |
| Current Share | • 5 supplies can share within 5% |
| Standby Output | • See model table |

### General

| | |
|---|---|
| Efficiency | • See model table |
| Isolation | • 3000 VAC Input to Output, 1500 VAC Input to Ground, 500 VDC Output to Ground |
| Isolation Resistance | • 100 M /500 VDC |
| Switching Frequency | • PFC 100 kHz typical, PWM 65 kHz typical |
| Power Density | • 650 W: 8.2 W/in³ 1000 W: 11.1 W/in³ 1500 W/3000 W: 10.8 W/in³ |
| Signals & Controls | • See app. notes |
| MTBF | • 650 W: 160 kHrs, 1000 W: 140 kHrs, 1500 W/3000 W: 100 kHrs to MIL-HDBK-217F at 25 °C, GB |

### Environmental

| | |
|---|---|
| Operating Temperature | • -25 °C to 60 °C, see derating curves |
| Cooling | • Internal fan fitted. Speed increases with load and internal temperature |
| Operating Humidity | • 20-90% R.H. non-condensing |
| Storage Temperature | • -40 °C to +85 °C |
| Storage Humidity | • 10-95% R.H. |
| Vibration | • 10-500 Hz, 5 g 10 min/cycle, 60 min period for each axis. Compliant to IEC68-2-16, IEC 68-2-64 |

### EMC & Safety

| | |
|---|---|
| Emissions | • EN55022 class B conducted & radiated |
| Harmonic Currents | • EN61000-3-2 class A, 650 & 1000 W: EN61000-3-2 class C for loads ≥10%, 1500 W: EN61000-3-2 class C for loads ≥40%, 3000 W: EN61000-3-2 class C for loads ≥30% |
| Voltage Flicker | • EN61000-3-3 |
| ESD Immunity | • EN61000-4-2, ±4 kV contact, ±8 kV air discharge, Perf Criteria A |
| Radiated Immunity | • EN61000-4-3, 3 V/m, Perf Criteria A |
| EFT/Burst | • EN61000-4-4, level 2, Perf Criteria A |
| Surge | • EN61000-4-5, installation class 3, Perf Criteria A |
| Conducted Immunity | • EN61000-4-6, Perf Criteria A |
| Magnetic Field | • EN61000-4-8, Perf Criteria A |
| Dips & Interruptions | • EN61000-4-11, 30% 10 ms, 60% 100 ms, >95% 5000 ms, Perf Criteria A, B, B |
| Safety Approvals | • UL60950-1, EN60950-1 (all models) CSA C22.2 No. 60950-1 (650 W/1000 W only) |

## Models and Ratings

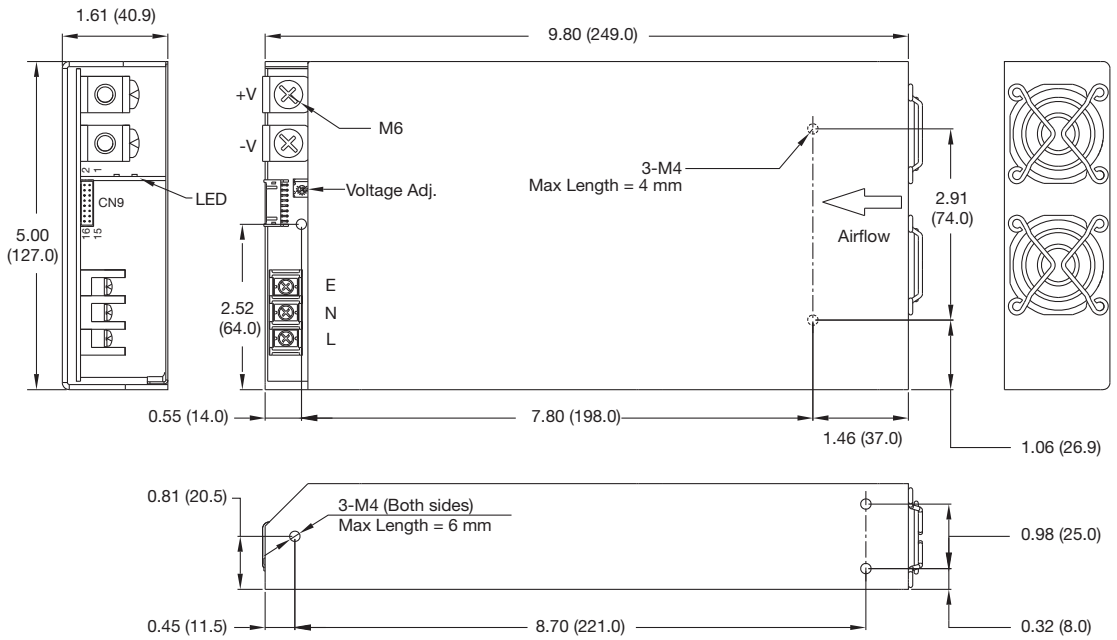


| Output Power | Output Voltage V1 | Output Current | | Standby Output[3] | Efficiency[2] | Model Number |
|---|---|---|---|---|---|---|
| | | Min | Max | | | |
| 500 W | 5.0 VDC | 0.0 A | 100.0 A | 5 V/0.5 A | 83% | HCP650PS05 |
| 600 W | 12.0 VDC | 0.0 A | 50.0 A | 5 V/0.5 A | 88% | HCP650PS12 |
| 600 W | 15.0 VDC | 0.0 A | 40.0 A | 5 V/0.5 A | 88% | HCP650PS15 |
| 650 W | 24.0 VDC | 0.0 A | 27.0 A | 5 V/0.5 A | 90% | HCP650PS24 |
| 650 W | 27.0 VDC | 0.0 A | 24.0 A | 5 V/0.5 A | 90% | HCP650PS27 |
| 650 W | 48.0 VDC | 0.0 A | 13.6 A | 5 V/0.5 A | 91% | HCP650PS48 |

### Notes

*1. Ripple & noise is measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 µF & 47 µF capacitors in parallel.*
*2. Measured with 230 VAC input and full load.*
*3. Present whenever AC is applied.*

## Mechanical Details



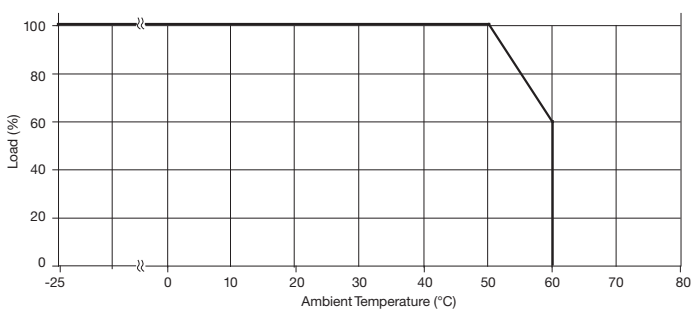

| Control Pin Connections | | | | | |
|---|---|---|---|---|---|
| Pin | Function | Description | Pin | Function | Description |
| 1 | VS+ | Remote Sense (+) | 9 | EN- | Enable ON/OFF (-) |
| 2 | VO+ | Local Sense (+) | 10 | GND | Signal Ground |
| 3 | VS- | Remote Sense (-) | 11 | PWM (P-OK) | PWM is Switching |
| 4 | VO- | Local Sense (-) | 12 | GND | Signal Ground |
| 5 | 5 V SB (Aux) | 5 V Standby Output (+) | 13 | VCI | V Program |
| 6 | 5 V SB (Aux) | 5 V Standby Output (+) | 14 | GND | Signal Ground |
| 7 | EN+ | Enable ON/OFF (+) | 15 | CS | Current Share |
| 8 | GND | Signal Ground | 16 | ACI | I Program |

### Notes

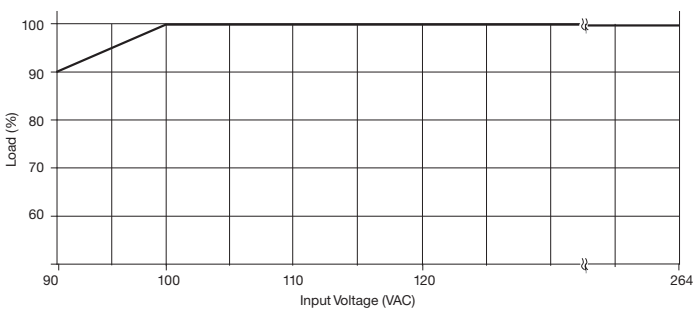
1. All dimensions are in inches (mm).
2. Weight 4.0 lb (1.8 kg)
3. Signals mating connector: PHDR-16VS housing, SPHD-002T-P05 contacts

## Derating Curve

### Thermal Derating Curve




### Input Derating Curve



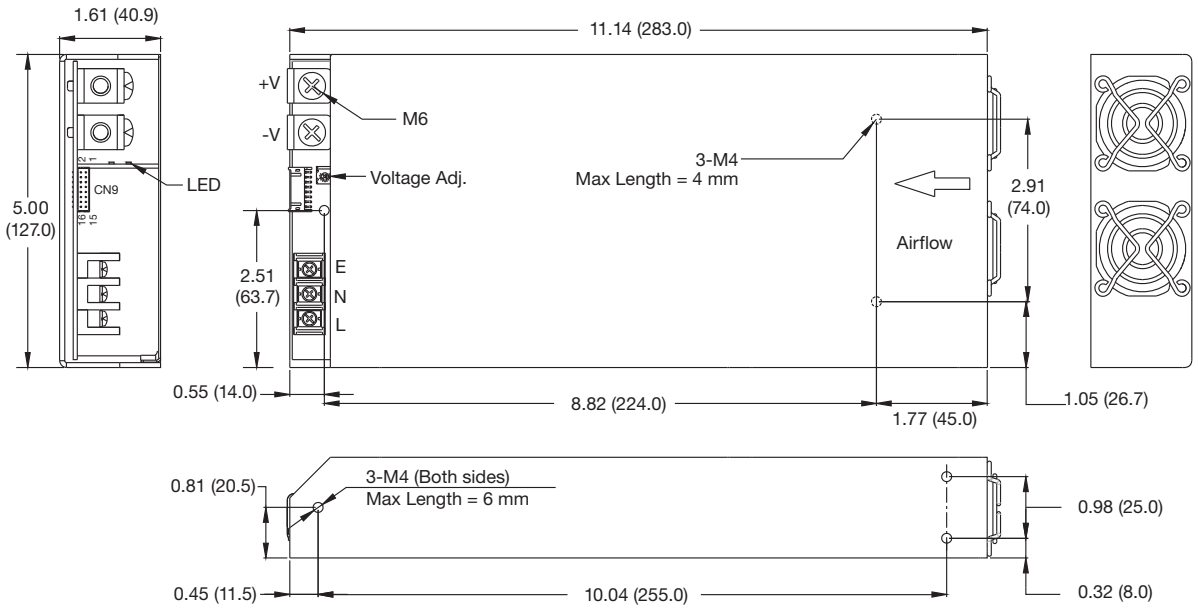
## Models and Ratings

| Output Power | Output Voltage V1 | Output Current | | Standby Output[3] | Efficiency[2] | Model Number |
|---|---|---|---|---|---|---|
| | | Min | Max | | | |
| 750 W | 12.0 VDC | 0.0 A | 62.0 A | 5 V/0.5 A | 87% | HCP1000PS12 |
| 750 W | 15.0 VDC | 0.0 A | 50.0 A | 5 V/0.5 A | 88% | HCP1000PS15 |
| 960 W | 24.0 VDC | 0.0 A | 40.0 A | 5 V/0.5 A | 89% | HCP1000PS24 |
| 1000 W | 27.0 VDC | 0.0 A | 37.0 A | 5 V/0.5 A | 89% | HCP1000PS27 |
| 1000 W | 48.0 VDC | 0.0 A | 21.0 A | 5 V/0.5 A | 90% | HCP1000PS48 |

### Notes

*1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 µF & 47 µF capacitors in parallel.*
*2. Measured with 230 VAC input and full load.*
*3. Present whenever AC is applied.*

## Mechanical Details



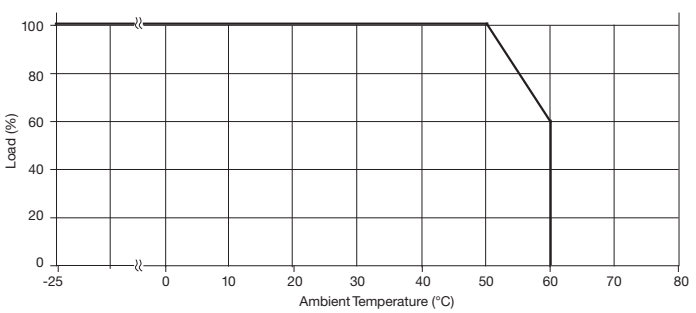

| Control Pin Connections | | | | | |
|---|---|---|---|---|---|
| Pin | Function | Description | Pin | Function | Description |
| 1 | VS+ | Remote Sense (+) | 9 | EN- | Enable ON/OFF (-) |
| 2 | VO+ | Local Sense (+) | 10 | GND | Signal Ground |
| 3 | VS- | Remote Sense (-) | 11 | PWM (P-OK) | PWM is Switching |
| 4 | VO- | Local Sense (-) | 12 | GND | Signal Ground |
| 5 | 5 V SB (Aux) | 5 V Standby Output (+) | 13 | VCI | V Program |
| 6 | 5 V SB (Aux) | 5 V Standby Output (+) | 14 | GND | Signal Ground |
| 7 | EN+ | Enable ON/OFF (+) | 15 | CS | Current Share |
| 8 | GND | Signal Ground | 16 | ACI | I Program |

### Notes

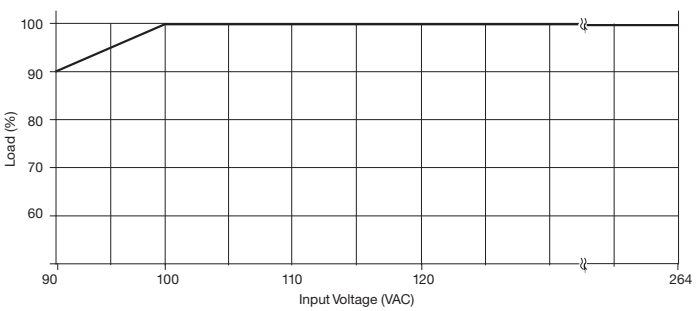
1. All dimensions are in inches (mm).
2. Weight 4.6 lb (2.1 kg)
3. Signals mating connector: PHDR-16VS housing, SPHD-002T-P05 contacts

## Derating Curve

### Thermal Derating Curve




### Input Derating Curve



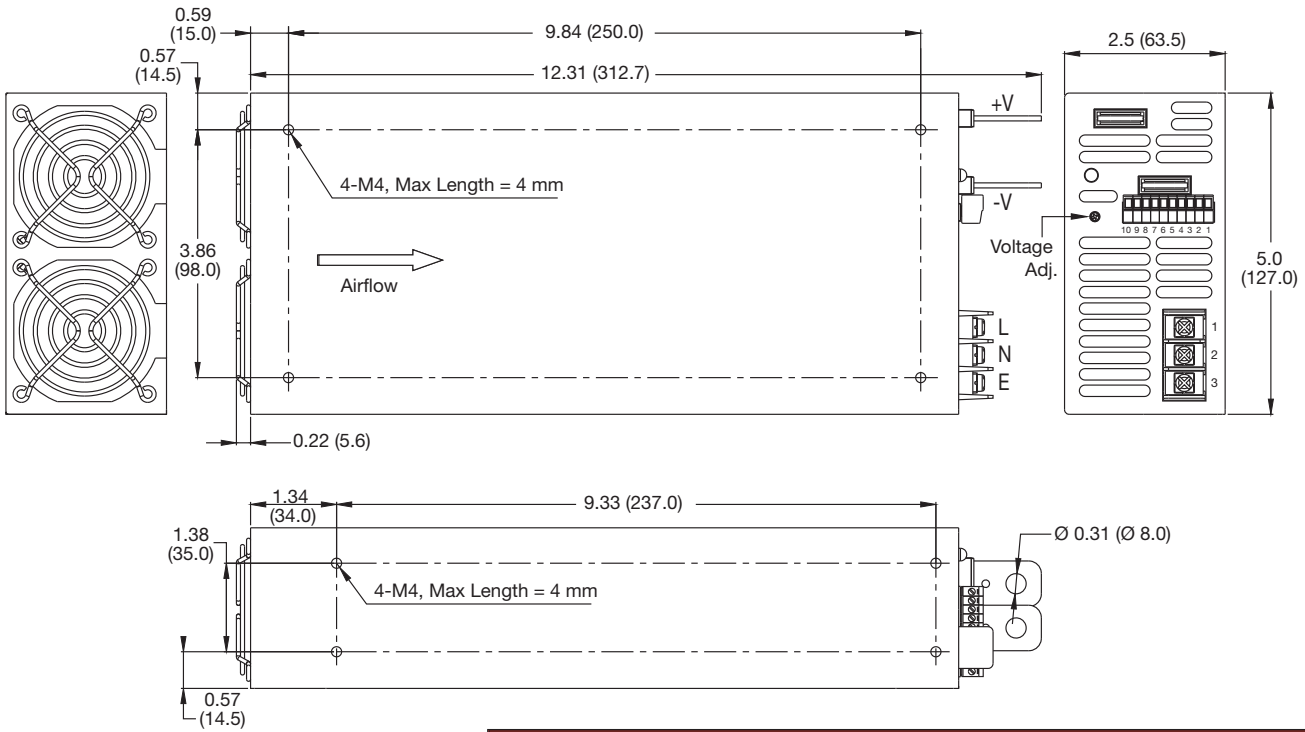
## Models and Ratings

| Output Power | Output Voltage V1 | Output Current | | Standby Output[3] | Efficiency[2] | Model Number |
|---|---|---|---|---|---|---|
| | | Min | Max | | | |
| 1500 W | 12.0 VDC | 0.0 A | 125.0 A | 5 V/0.5 A | 87% | HCP1500PS12 |
| 1500 W | 15.0 VDC | 0.0 A | 100.0 A | 5 V/0.5 A | 88% | HCP1500PS15 |
| 1500 W | 24.0 VDC | 0.0 A | 62.5 A | 5 V/0.5 A | 89% | HCP1500PS24 |
| 1500 W | 27.0 VDC | 0.0 A | 55.5 A | 5 V/0.5 A | 89% | HCP1500PS27 |
| 1500 W | 48.0 VDC | 0.0 A | 31.3 A | 5 V/0.5 A | 90% | HCP1500PS48 |

### Notes

*1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 µF & 47 µF capacitors in parallel.*
*2. Measured with 230 VAC input and full load.*
*3. Present whenever AC is applied.*

## Mechanical Details



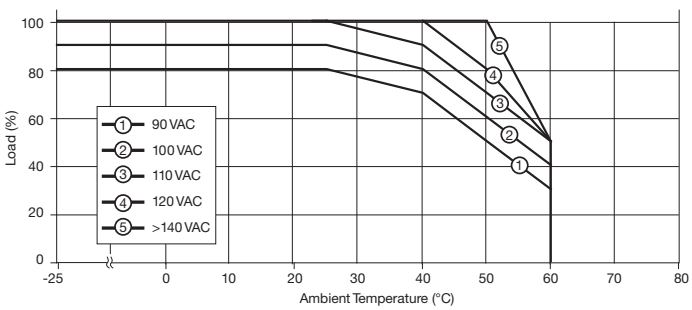

### Notes

1. All dimensions are in inches (mm).
2. Weight 7.1 lb (3.2 kg)
3. Signals mating connector is Dinkle EC350V-10P or equivalent. Wire gauge 28-14 AWG.

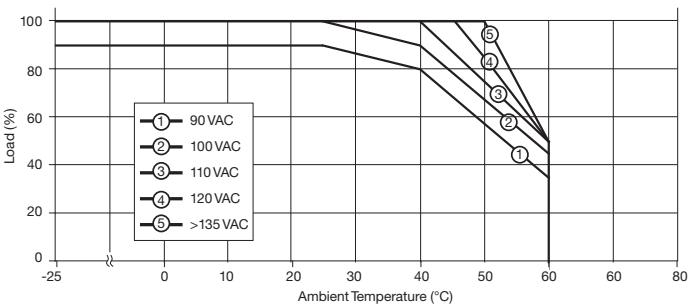
| Control Pin Connections | | | | | |
|---|---|---|---|---|---|
| Pin | Function | Description | Pin | Function | Description |
| 1 | VS+ | Remote Sense (+) | 6 | GND | Signal Ground |
| 2 | VS- | Remote Sense (-) | 7 | PWM (P-OK) | PWM is Switching |
| 3 | 5 V SB (Aux) | 5 V Standby Output (+) | 8 | VCI | V Program |
| 4 | EN+ | Enable (+) | 9 | ACI | I Program |
| 5 | EN- | Enable (-) | 10 | CS | Current Share |

## Thermal Derating Curve

### For HCP1500PS12/15




### For HCP1500PS24/27/48



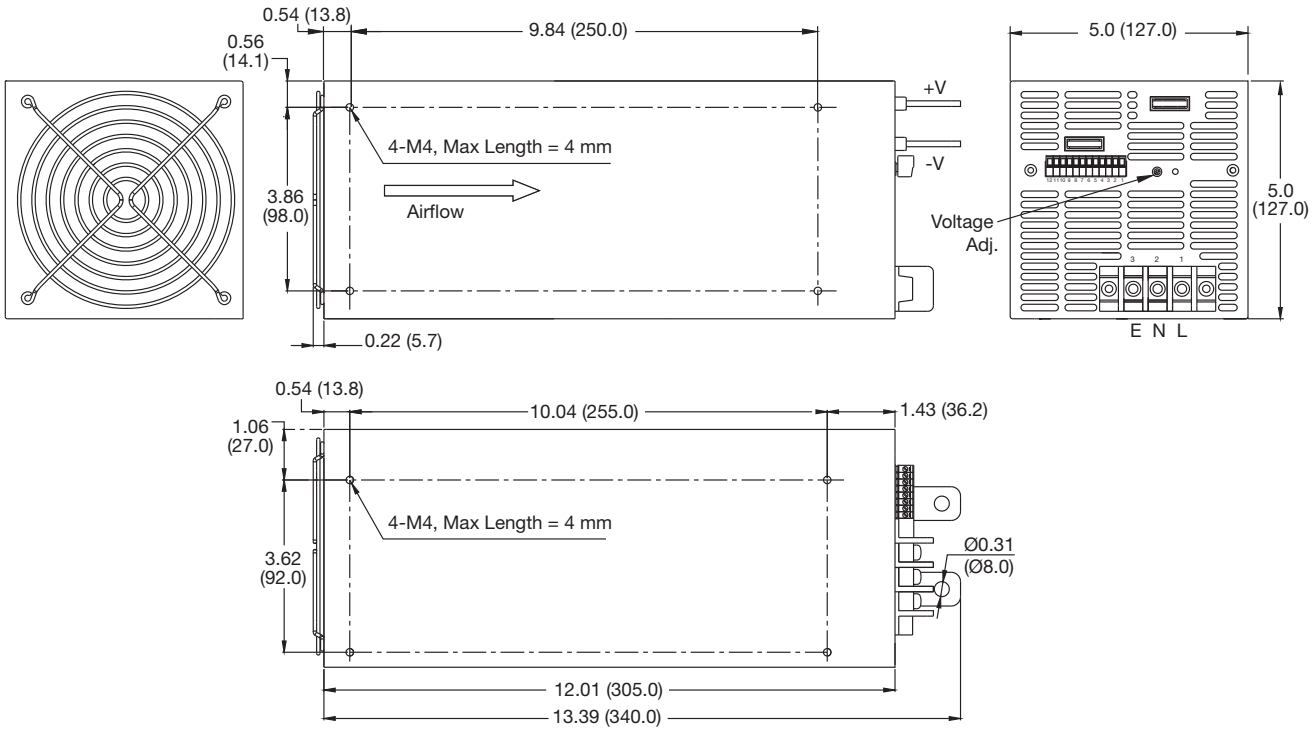
## Models and Ratings

| Output Power | Output Voltage V1 | Output Current | | Standby Output[3] | Efficiency[2] | Model Number |
|---|---|---|---|---|---|---|
| | | Min | Max | | | |
| 3000 W | 12.0 VDC | 0.0 A | 250.0 A | 5 V/0.5 A | 87% | HCP3000PS12 |
| 3000 W | 15.0 VDC | 0.0 A | 200.0 A | 5 V/0.5 A | 88% | HCP3000PS15 |
| 3000 W | 24.0 VDC | 0.0 A | 125.0 A | 5 V/0.5 A | 89% | HCP3000PS24 |
| 3000 W | 27.0 VDC | 0.0 A | 111.1 A | 5 V/0.5 A | 89% | HCP3000PS27 |
| 3000 W | 48.0 VDC | 0.0 A | 62.5 A | 5 V/0.5 A | 90% | HCP3000PS48 |

### Notes

*1. Ripple & noise are measured with 20 MHz bandwidth and using 12" twisted pair-wire terminated with 0.1 µF & 47 µF capacitors in parallel.*
*2. Measured with 230 VAC input and full load.*
*3. Present whenever AC is applied.*

## Mechanical Details



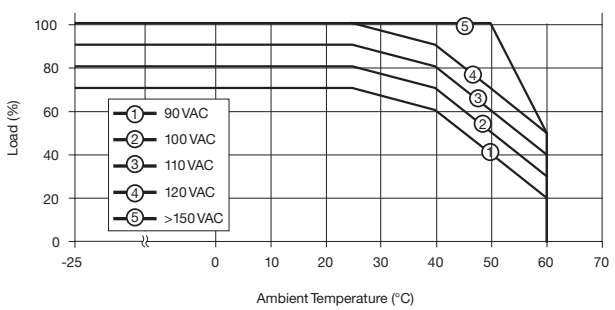

### Notes

1. All dimensions are in inches (mm).
2. Weight 14.6 lb (6.6 kg)
3. Signals connector is Dinkle EC350V-12P or equivalent. Wire gauge 28-14 AWG.

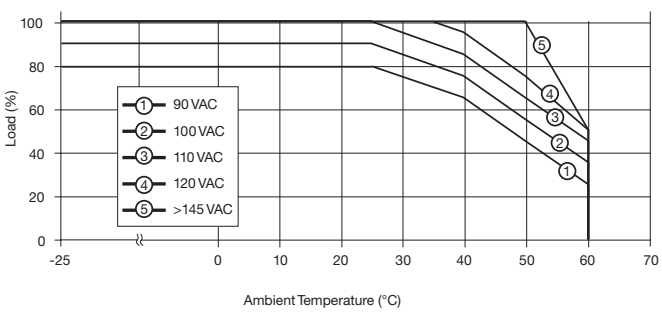
| Control Pin Connections | | | | | |
|---|---|---|---|---|---|
| Pin | Function | Description | Pin | Function | Description |
| 1 | VO+ | Local Sense (+) | 7 | EN- | Enable (-) |
| 2 | VS+ | Remote Sense (+) | 8 | GND | Signal Ground |
| 3 | VS- | Remote Sense (-) | 9 | PWM (P-OK) | PWM is Switching |
| 4 | VO- | Local Sense (-) | 10 | VCI | V Program |
| 5 | 5 V SB (AUX) | 5 V Standby Output(+) | 11 | ACI | I Program |
| 6 | EN+ | Enable (+) | 12 | CS | Current Share |

## Derating Curve

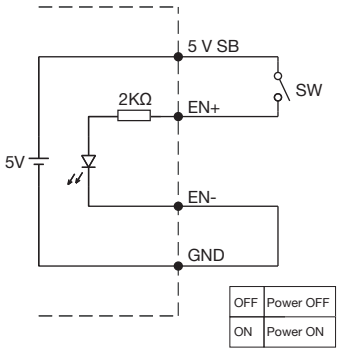
### For HCP3000PS12/15



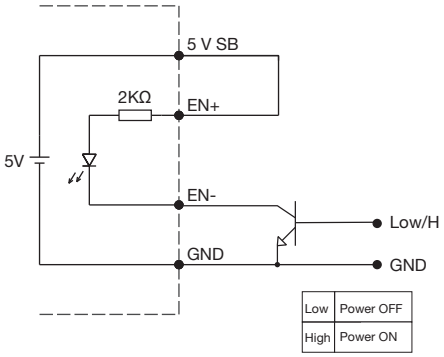

### For HCP3000PS24/27/48



## Remote Enable (unit supplied enabled)

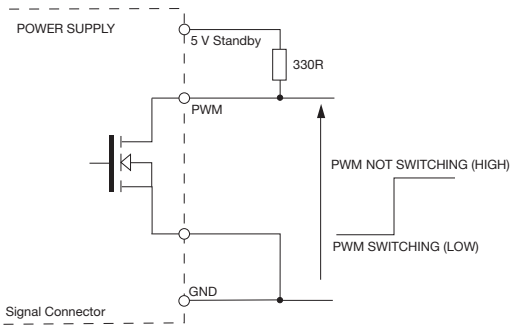



(A) Using internal 5 V standby

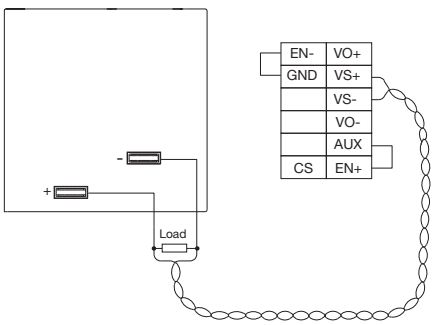



(B) Using external by transistor

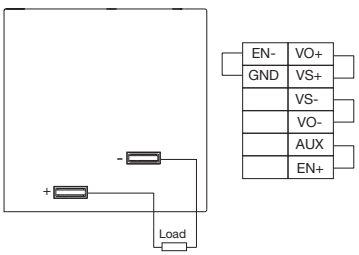
## PWM Signal




## Remote Sense




## Local Sense



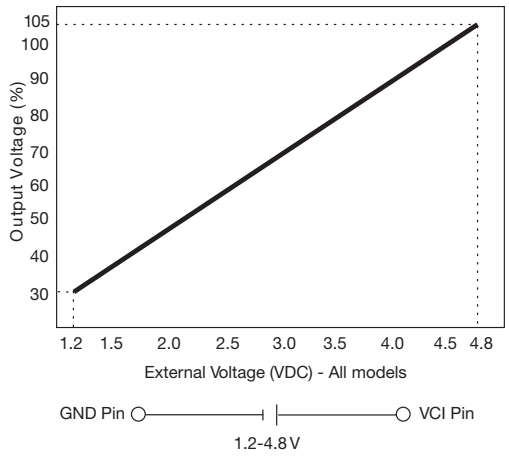

Must be used if remote sense is not required.

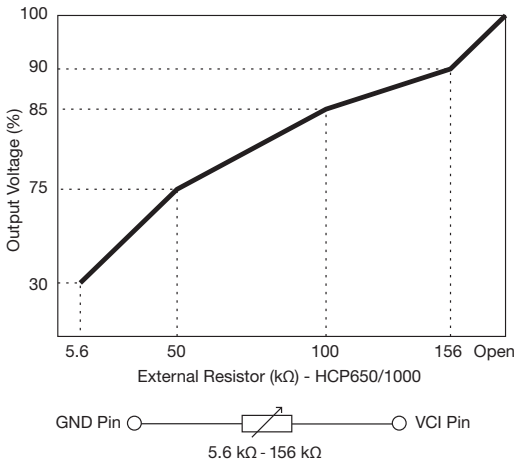
## LED Status

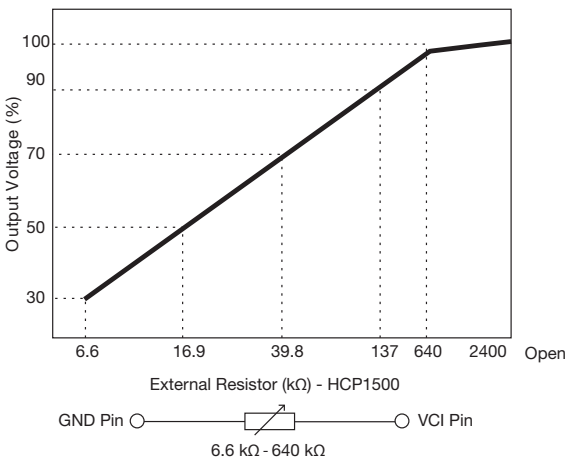
| LED Status | Output Status |
|---|---|
| Solid (Green) | DC Output OK |
| Slow Blink (Green) | Output Not Enabled |
| Fast Blink (Red) | Over Voltage |
| Solid (Red) | Over Loaded |
| | Short Circuited |
| | Under Voltage (<70% of output voltage) |
| Slow Blink (Red) | Over Temperature |
| Intermittent Blink (Red) | Fan Fail |
| Short & Long Blink (Red) | 5 V Standby Failure |

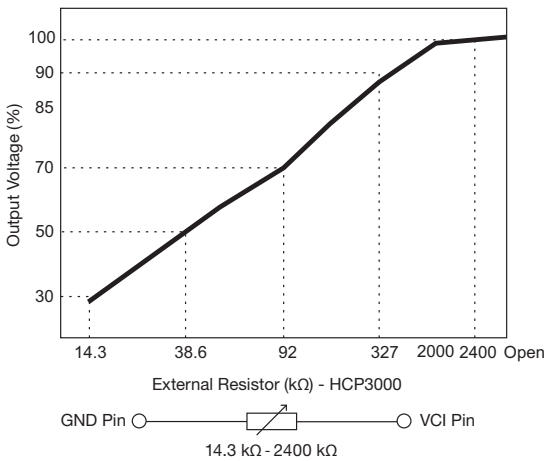
# Application Notes

## Output Voltage Program

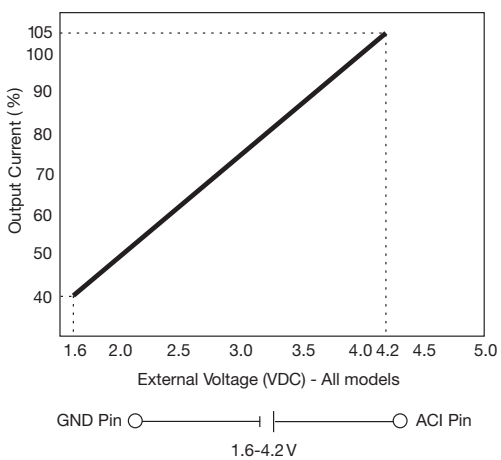


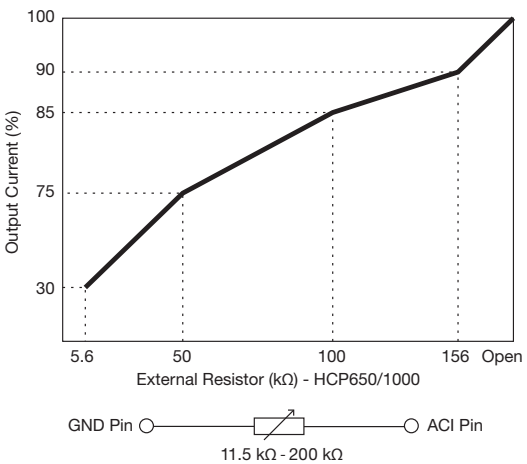



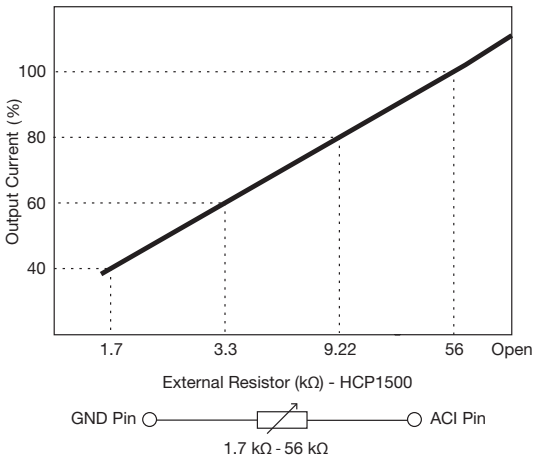

## Output Current Program

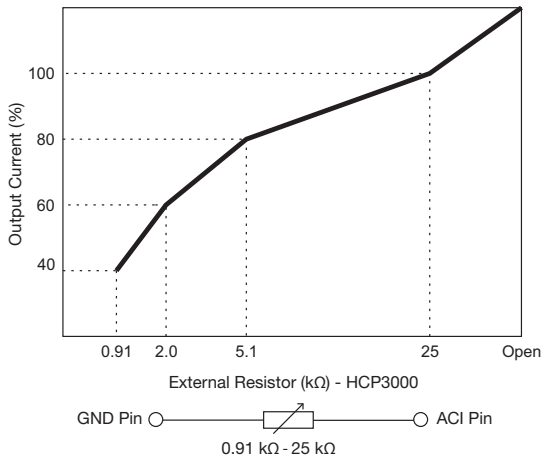


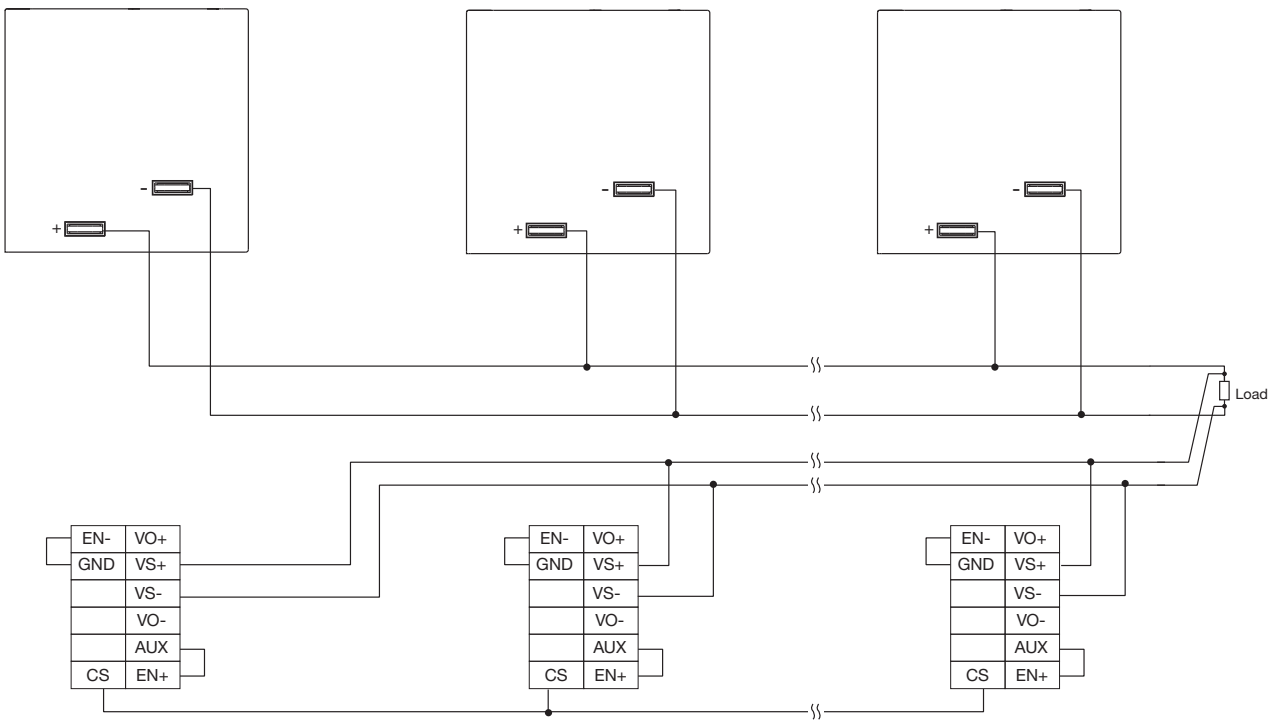
# Application Notes

## Output Current Program

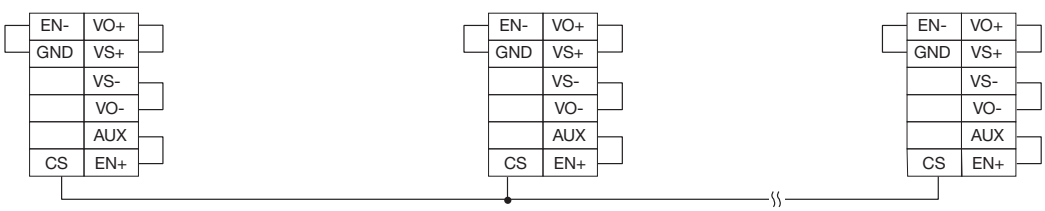



## Current Sharing with Remote Sensing




## Current Sharing with Local Sensing




## Notes

In parallel operation, it is possible that only one unit will operate if the load is less than 5% of the combined rated output load.
It is possible to have more than five units in parallel, contact sales for details.