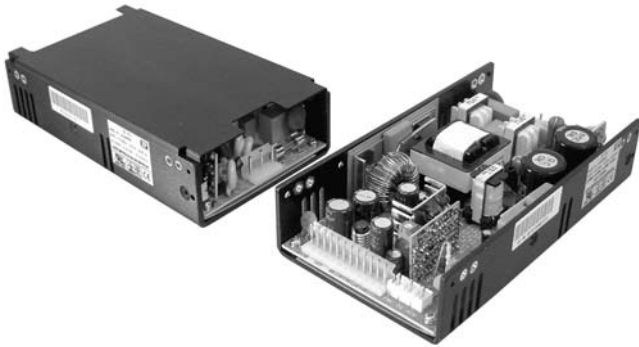


## HUL Series



- Compact Size, Low Profile
- Up to 5.85 W/in<sup>3</sup> Power Density
- Single & Multiple Outputs
- Convection-cooled Ratings
- Remote On/Off
- Power Fail Detect
- 12 V Fan Supply

## Specification

## Input

Input Voltage	• 90-132 VAC, 180-264 VAC (auto-ranging)
Input Frequency	• 47-63 Hz
Input Current	• HUL175: 4.4 A max at 115 VAC, 2.2 A max at 230 VAC • HUL200: 5.0 A max at 115 VAC, 2.5 A max at 230 VAC • HUL300: 6.3 A max at 115 VAC, 3.15 A max at 230 VAC
Inrush Current	• 35 A at 115 VAC, 70 A max at 264 VAC +25 °C cold start
Power Factor	• Passive PFC, meets EN6100-3-2, -3
Earth Leakage Current	• <1.5 mA at 230 VAC / 50 Hz

## Output

Output Voltage	• See tables
Output Voltage Trim	• ±5% on output 1
Initial Set Accuracy	• ±1% max for single/main output • ±5% for auxiliary outputs
Minimum Load	• See tables & note 1 for 175 W model
Start Up Delay	• 1 s max
Start Up Rise Time	• 20 ms max
Hold Up Time	• >15 ms at 115 VAC
Total Regulation	• ±1% max for single output models, • ±5% max for multiple output models
Over/Undershoot	• <5% max
Transient Response	• 5% max deviation, recovery to within 1% in 500 µs for a 50% load change
Ripple & Noise	• 1% pk-pk (50 mV max for 3.3 V output)
Overvoltage Protection	• 130% on output 1 only, recycle input to reset
Overtemperature Protection	• Shuts down when ambient temperature exceeds +85 °C, auto recovery
Overload Protection	• 110-135% of total power, auto recovery
Short Circuit Protection	• Trip and restart (Hiccup mode)
Temperature Coefficient	• ±0.1%/°C
Remote Sense	• HUL175 only. Compensates for 0.5 V drop on 3.3 V output
Remote On/Off	• On = Logic High or Open • Off = Logic Low or Short • Not available on HUL175
Fan Output	• 12 V, 300 mA

## General

Efficiency	• 80% typical
Isolation	• 3000 VAC Input to Output, • 1500 VAC Input to Ground, • 500 VAC Output to Ground
Switching Frequency	• 42 kHz typical
Power Density	• HUL175: 4.51 W/In <sup>3</sup> , HUL200: 5.85 W/In <sup>3</sup> , • HUL300: 4.41 W/In <sup>3</sup>
Power Fail Detect	• On = Logic high 100-500 ms after outputs with regulation • Fail = Logic low at least 1 ms prior to loss of output
MTBF	• 100 kHrs per MIL-HDBK-217F

## Environmental

Operating Temperature	• 0 °C to +60 °C, derate linearly from 100% at +40 °C to 50% at +60 °C
Cooling	• See notes
Operating Humidity	• 5-90% RH, non-condensing
Storage Temperature	• -20 °C to +85 °C
Operating Altitude	• 3000 m
Shock	• 15 g (non-operation), 11 ms (half sine wave), 3 times for each axis
Vibration	• 10-55 Hz (non-operation) 2 g, sweep time 3 mins, 60 mins/axis

## EMC &amp; Safety

Emissions	• EN55022 and FCC, level B (level A - 300 W) conducted
Harmonic Currents	• EN61000-3-2
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, level 4 Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 3 Perf Criteria A
EFT/Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, level 3 Perf Criteria A
Conducted Immunity	• EN61000-4-6, 10 V Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 70% 100 ms, 95% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN60950, UL60950, CSA22.2 No. 950 per cUL, CE Mark

**Models and Ratings**

Output 1			Output 2			Output 3			Output 4			Model Number
Voltage Nom	Conv Cooled	Max 18.7 CFM	Voltage Nom	Conv Cooled	Max 18.7 CFM	Voltage Nom	Conv Cooled	Max 18.7 CFM	Voltage Nom	Conv Cooled	Max 18.7 CFM	
5.0 V	10.0 A	15.0 A	3.3 V	10.0 A	20.0 A	12.0 V	2.2 A	3.0 A	-5.0 V	0.7 A	1.0 A	HUL175-40-3†
5.0 V	10.0 A	15.0 A	3.3 V	10.0 A	20.0 A	12.0 V	2.2 A	3.0 A	-12.0 V	0.7 A	1.0 A	HUL175-42-3†
5.0 V	10.0 A	15.0 A	3.3 V	10.0 A	20.0 A	24.0 V	1.5 A	2.0 A	-12.0 V	0.7 A	1.0 A	HUL175-45-3†
5.0 V	10.0 A	15.0 A	3.3 V	10.0 A	20.0 A	15.0 V	2.2 A	3.0 A	-15.0 V	0.7 A	1.0 A	HUL175-46-3†

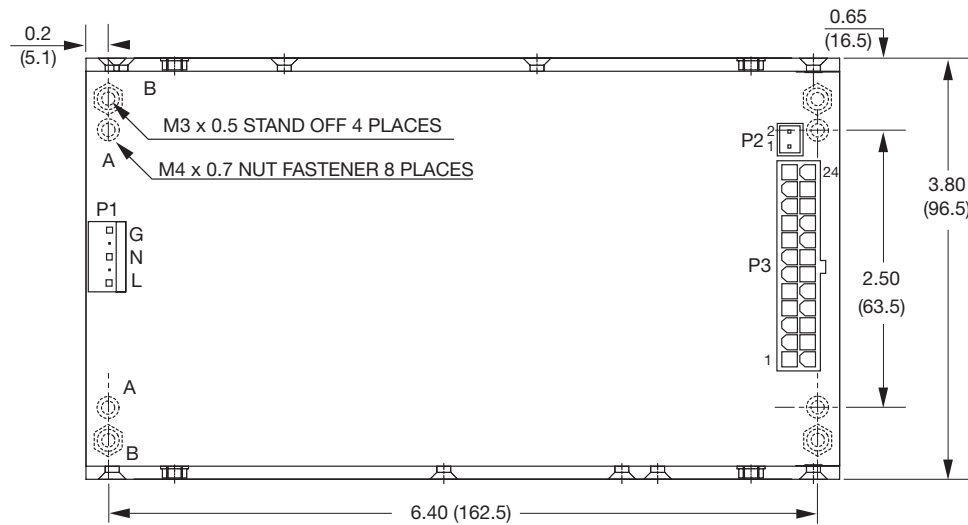
**Notes**

1. Minimum load is 2.0 A for V1, 0.0 A for V2 & V4, and 0.3 A for V3.
2. Total regulation for V1, V2 and V3 = ±5%; V4 = ±3%. Total regulation includes tolerance, line regulation and load regulation.
3. Total combined output power for the 3.3 V and 5.0 V not to exceed 126 W with 18.7 CFM or 70 W with convection cooling.
4. Maximum load continuous output power is 175 W with minimum 18.7 CFM forced air cooling or 100 W with convection cooling.
5. Outputs are fully isolated.

† Available from Farnell. See pages 204-206.

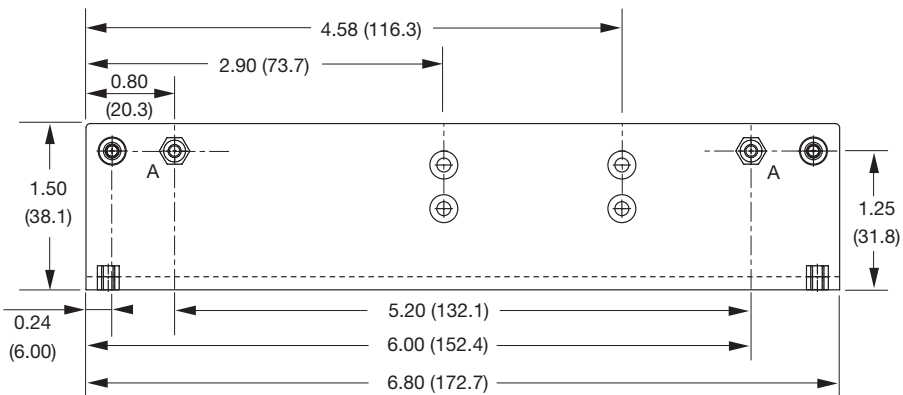
**Mechanical Details**

All dimensions are in inches (mm). Tolerance: 0.02 (0.5) max. Weight: 1.32 lbs (600 g) approx.



P2 Connector	
Pin	Function
1	Fan +
2	Fan -

P3 Connector	
Pin	Function
1	+3.3 V Sense+
2, 14	Output 2
3, 15	Output 2
4, 16	Return
5, 17	Return
6, 18	Return
7, 19	Output 1
8, 20	Output 1
9, 21	Output 3
10, 22	Return
11, 23	Output 4
12	Power Fail Detect
13	+3.3 V Sense-
24	Return



**Notes**

1. Input connector P1 mates with Molex housing 09-91-0500 and Molex 2478/2578/8818 series crimp terminal.
2. Output connector P3 mates with Molex housing 39-01-2240 and Molex 44476 series crimp terminal.
3. Fan connector P2 mates with JST housing XHP-2 and JST SXH-002T-P0.6 crimp terminals. Fan output is 12 V/160 mA.
4. Covered versions are available,
  - add suffix: '-C' to model number for cover only, dimensions: 3.80" x 6.80" x 1.66" (96.5 x 172.7 x 42.1 mm),
  - add suffix: '-FC' to model number for fan cover, dimensions: 3.80" x 6.80" x 2.48" (96.5 x 172.7 x 63.0 mm).
5. Cable harnesses with 11.81" (300 mm) wire available, order part HUL175 LOOM KIT†. For mating connectors only, order part HUL175 CONN KIT†.
6. Covers are available separately. Order part HUL175 COVER† or HUL175 F/COVER† for Fan Cover.
7. Max penetration of screws 0.12" (3.0 mm).



**Models and Ratings**

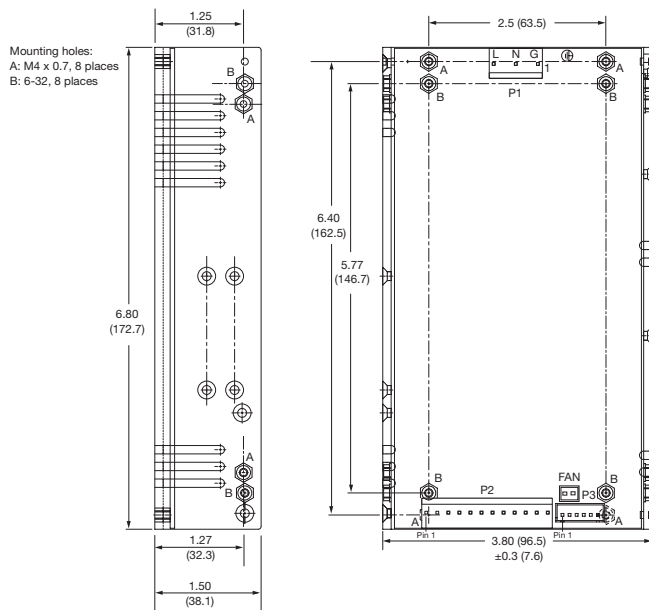
Output 1			Output 2			Output 3			Output 4 <sup>(6)</sup>			Model Number <sup>(1)</sup>
Voltage Nom	Current		Voltage Nom	Current		Voltage nom	Current		Voltage nom	Current		
	Min	Max		Min	Max		Min	Max		Min	Max	
3.3 V	0.5 A	30.0 A										HUL200-10-1†
5.0 V	0.5 A	40.0 A										HUL200-10†
12.0 V	0.5 A	16.7 A										HUL200-12†
15.0 V	0.5 A	13.3 A										HUL200-13†
24.0 V	0.5 A	8.3 A										HUL200-14†
48.0 V	0.5 A	4.1 A										HUL200-18†
+5.0 V	0.5 A	20.0 A	+12.0 V	0.0 A	8.0 A							HUL200-23†
+5.0 V	0.5 A	20.0 A	+15.0 V	0.0 A	6.6 A							HUL200-24†
+5.0 V	0.5 A	20.0 A	+24.0 V	0.0 A	4.2 A							HUL200-25†
+5.0 V	0.5 A	20.0 A	+12.0 V	0.0 A	8.0 A				F 12.0 V	0.0 A	1.0 A	HUL200-31†
+5.0 V	0.5 A	20.0 A	+15.0 V	0.0 A	5.0 A				F 15.0 V	0.0 A	1.0 A	HUL200-32†
+5.0 V	0.5 A	20.0 A	+12.0 V	0.0 A	6.0 A	-5.0 V	0.0 A	1.0 A	F 12.0 V	0.0 A	1.0 A	HUL200-40†
+5.0 V	0.5 A	20.0 A	+24.0 V	0.0 A	3.0 A	-12.0 V	0.0 A	1.0 A	F 12.0 V	0.0 A	1.0 A	HUL200-45†
+5.0 V	0.5 A	20.0 A	+15.0 V	0.0 A	5.0 A	-5.0 V	0.0 A	1.0 A	F 15.0 V	0.0 A	1.0 A	HUL200-46†
+12.0 V	0.5 A	3.0 A	+36.0 V	0.0 A	5.0 A	+5.0 V	0.0 A	3.0 A	-12.0 V	0.0 A	1.0 A	HUL200-47
+5.0 V	0.5 A	5.0 A	+36.0 V	0.0 A	2.5 A	+12.0 V	0.0 A	1.0 A	-12.0 V	0.0 A	1.0 A	HUL200-47-2
+5.0 V	0.5 A	3.0 A	+24.0 V	0.0 A	8.0 A	+12.0 V	0.0 A	0.1 A	-12.0 V	0.0 A	0.1 A	HUL200-47-3
+5.0 V	0.5 A	5.0 A	+12.0 V	0.0 A	2.5 A	+24.0 V	0.0 A	2.5 A	-12.0 V	0.0 A	1.0 A	HUL200-47-1

**Notes**

1. Use part number UL200-XX for product without harmonic correction. e.g.: UL200-10.
  2. Total output power for HUL200-10-1 is 73 W convection-cooled, 100 W with 18.7 CFM forced air cooling.
  3. Output 4 is floating except for -47 models. It can be connected externally for positive or negative output.
  4. Total output power for HUL200 single output models is 150 W convection-cooled, 200 W with 18.7 CFM forced air cooling.
  5. Total output power for HUL200 multi output models is 100 W convection-cooled, 200 W with 18.7 CFM forced air cooling.
  6. Tolerance 5% all outputs, except single output units - tolerance 2%.
- † Available from Farnell. See pages 204-206.

**Mechanical Details**

All dimensions are in inches (mm). Tolerance: 0.02 (0.5) max. Weight: 1.76 lbs (800 g) approx.



P2 Connector		
Pin	Single Output	Multi Output
1	Output 1	Output 3
2	Output 1	Return
3	Output 1	Return
4	Output 1	Return
5	Output 1	Return
6	Output 1	Output 1
7	Return	Output 1
8	Return	Output 1
9	Return	Output 1
10	Return	Output 2
11	Return	Output 4
12	Return	Output 4 Return

P3 Connector		
Pin	Single Output	Multi Output
1	Fan +	Multi-outputs have 3 separate 2 pin connectors for Fan, Power Good and Remote ON/OFF. These are clearly marked on the PCB.
2	Return	
3	Return	
4	Power Fail Detect	
5	Remote On/Off <sup>(7)</sup>	
6	Return -	

**Notes**

1. Input connector P1 mates with Molex housing 09-91-0500 and Molex 2478/2578/8818 series crimp terminal.
2. Output connector P2 mates with Molex housing 09-91-1200 and Molex 2478/2578/8818 series crimp terminal.
3. Fan connector mates with JST housing XHP-2 and JST SXH-002T-P0.6 crimp terminals.
4. Signals connector P3 mates with JST housing XHP-6 and JST SXH-002T-P0.6 crimp terminals or 3 off JST housing XHP-2 and JST SXH-002T-P0.6 crimp terminals.
5. Covered versions are available:  
 add suffix: '-C' to model number for cover only - dimensions: 3.80" x 6.80" x 1.66" (96.5 x 172.7 x 42.1 mm),  
 add suffix: '-FC' to model number for fan cover - dimensions: 3.80" x 6.80" x 2.48" (96.5 x 172.7 x 63.0 mm).
6. Covers are available separately. Order part HUL200 COVER† or HUL200 F/COVER† for Fan Cover.
7. Output is turned off by taking the Remote On/Off pin low (connect to Return).
8. Cable harnesses with 11.81" (300 mm) wire available, order part number HUL200 LOOM-S for single output models, HUL200 LOOM-D for dual output models, HUL200 LOOM-T for triple output models or HUL200 LOOM-Q for quad output models.
9. For mating connectors only, order part HUL200 CON KT†.
10. Max penetration of screws 0.12" (3.0 mm)



**Models and Ratings**

Output 1			Output 2			Output 3			Output 4 <sup>(2)</sup>			Model Number <sup>(1)</sup>
Voltage Nom	Current		Voltage Nom	Current		Voltage nom	Current		Voltage nom	Current		
	Min	Max		Min	Max		Min	Max		Min	Max	
3.3 V	0.5 A	60.00 A										HUL300-10-1†
5.0 V	0.5 A	60.00 A										HUL300-10†
12.0 V	0.5 A	25.00 A										HUL300-12†
15.0 V	0.5 A	20.00 A										HUL300-13†
24.0 V	0.5 A	12.50 A										HUL300-14†
48.0 V	0.5 A	6.25 A										HUL300-18†
+5.0 V	0.5 A	30.00 A	+12.0 V	0.0 A	12.5 A							HUL300-23†
+5.0 V	0.5 A	30.00 A	+15.0 V	0.0 A	10.0 A							HUL300-24†
+5.0 V	0.5 A	30.00 A	+24.0 V	0.0 A	6.3 A							HUL300-25†
+5.0 V	0.5 A	30.00 A	+12.0 V	0.0 A	10.5 A				F 12.0 V	0.0 A	2.0 A	HUL300-31†
+5.0 V	0.5 A	30.00 A	+15.0 V	0.0 A	8.0 A				F 15.0 V	0.0 A	2.0 A	HUL300-32†
+5.0 V	0.5 A	30.00 A	+12.0 V	0.0 A	10.0 A	-5.0 V	0.0 A	2.0 A	F 12.0 V	0.0 A	2.0 A	HUL300-40†
+5.0 V	0.5 A	30.00 A	+24.0 V	0.0 A	4.3 A	-12.0 V	0.0 A	2.0 A	F 12.0 V	0.0 A	2.0 A	HUL300-45†
+5.0 V	0.5 A	30.00 A	+15.0 V	0.0 A	7.4 A	-5.0 V	0.0 A	2.0 A	F 15.0 V	0.0 A	2.0 A	HUL300-46†

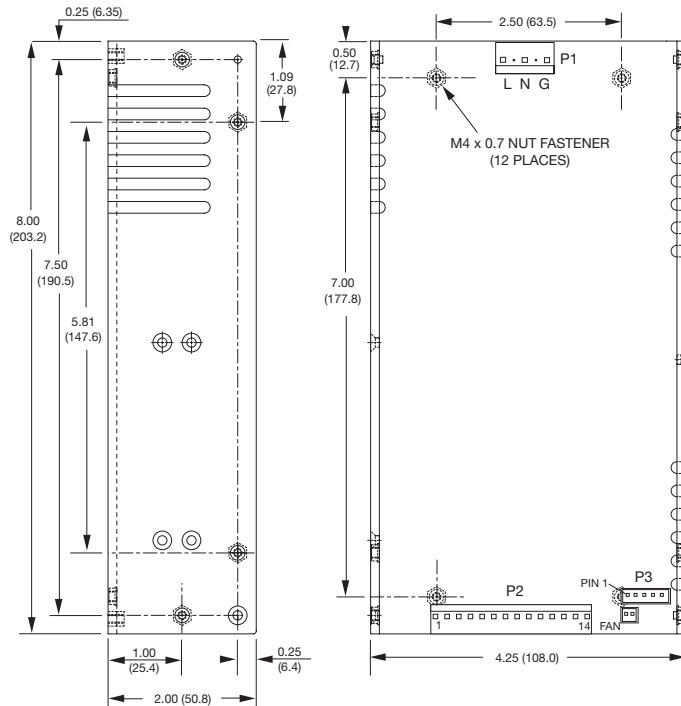
**Notes**

1. Use part number UL300-XX for product without harmonic correction. e.g. UL300-10.
2. Output 4 is floating. It can be connected externally for positive or negative output.
3. Total output power for HUL300-12,13,14,18 models is 200 W convection-cooled, 300 W with 30 CFM forced air cooling.
4. Total output power for all other HUL300 models is 150 W convection-cooled, 300 W with 30 CFM forced air cooling.
5. Tolerance 5% all outputs, except single output units - tolerance 2%.

† Available from Farnell. See pages 204-206.

**Mechanical Details**

All dimensions are in inches (mm). Tolerance: 0.02 (0.5) max. Weight: 2.20 lbs (1.0 kg) approx.



P2 Connector		
Pin	Single Output	Multi Output
1	Output 1	Output 3
2	Output 1	Output 1
3	Output 1	Output 1
4	Output 1	Output 1
5	Output 1	Output 1
6	Output 1	Return
7	Output 1	Return
8	Return	Return
9	Return	Return
10	Return	Return
11	Return	Output 2
12	Return	Output 2
13	Return	Output 4
14	Return	Output 4 Return

P3 Connector		
Pin	Single Output	Multi Output
1	Fan +	Return
2	Return	DC OK <sup>(7)</sup>
3	DC OK	Return
4	Power Fail Detect	Remote On/Off <sup>(8)</sup>
5	Remote On/Off <sup>(9)</sup>	Return
6	Return	Power Fail Detect

**Notes**

1. Input connector P1 mates with Molex housing 09-91-0500 and Molex 2478/2578/8818 series crimp terminal.
2. Output connector P2 mates with Molex housing 09-91-1400 and Molex 2478/2578/8818 series crimp terminal.
3. Fan connector mates with JST housing XHP-2 and JST SXH-002T-P0.6 crimp terminals. Multiple outputs only.
4. Signals connector P3 mates with JST housing XHP-6 and JST SXH-002T-P0.6 crimp terminals.
5. Covered versions are available,
  - add suffix: '-C' to model number for cover only, dimensions: 4.25" x 8.00" x 2.16" (108.0 x 203.2 x 54.8 mm)
  - add suffix: '-FC' to model number for fan cover, dimensions: 4.25" x 8.00" x 3.00" (108.0 x 203.2 x 75.7 mm).
6. Output is turned off by taking the Remote On/Off pin low (connect to Return).
7. DC OK is an open collector output. Low = normal operation.
8. Cable harnesses with 11.81" (300 mm) wire available, order part number HUL300 LOOM-S for single output models, HUL300 LOOM-D for dual output models, HUL300 LOOM-T for triple output models or HUL300 LOOM-Q for quad output models. For mating connectors only, order part HUL300 CON KT†.
9. Covers are available separately. Order part HUL300 COVER† or HUL300 F/COVER† for Fan Cover.
10. Max penetration of screws 0.12" (3.0 mm).

