

POWER

µMP Series GEN II

Up to 1800 Watts with New Product Enhancements

Data Sheet

Total Power: Up to 1800 Watts Peak*
Input Voltage: 85 - 264 Vac
 120 - 300 Vdc
of Outputs: Up to 12



SPECIAL FEATURES

- Full Medical EN60601 approval
- PMBus monitor/control of input functions
- High efficiency
- Constant current limit protection
- High power density.
 - µMP04: 10.8 W/cu-in
 - µMP09: 18.5 W/cu-in
 - µMP10: 15.1 W/cu-in
 - µMP16: 22.9 W/cu-in
- Low noise intelligent fan (speed control/fault status), 36% reduction from GEN I
- Downloadable GUI from website
- Optional conformal coating
- Industrial temp range (-40 °C to 70 °C)
- No preload required
- Military STD shock/vibration (40G's)
- Low cost
- IEC, terminal block or barrier strip input connection options
- Low profile 1U size
- Superior aesthetics over GEN I

CERTIFICATIONS

- UL UL/CSA 62368-1
ES60601-1 / CSA 22.2
No.60601-1
- TUV EN62368-1 / EN60601-1
- CB Certificate and Report
- CE Compliance to LVD and
RoHS Directives
- CQC Approved
- Medical 2x MOPP

** µMP tested according to the medical standard IEC 60601-1-2 4th Edition.

Electrical Specifications

| Input | |
|----------------------------|--|
| Input range | 85 - 264 Vac, 120 - 350 Vdc (limited to 300 Vdc in medical applications) |
| Frequency | 47 - 440 Hz |
| Inrush current | 40 A peak max. (soft start) |
| Efficiency | Up to 91.5% @ full case load |
| Power factor | 0.99 typ. meets EN61000-3-2 (n/a @ 440 Hz) |
| Standby power | µMP10/16 < 13 W µMP04/09 < 6 W |
| Turn-on time | AC on 2 sec for µMP16/10 and 1.5 sec for µMP04/09, inhibit/enable 250 ms typical |
| EMI: | CISPR 22/EN55022 Level "B" (Both Conducted and Radiated) |
| Leakage current | <200 uA using center-tapped xfmr measurement method. (<400 uA @ 264 VAC input) |
| Holdover storage | 16.7 ms minimum (independent of input Vac, 0 °C to 50 °C) At 1200 W for µMP16 |
| AC OK | Signal goes low indicating loss of AC input. Hold up = Full cycle ride thru (50 Hz); Open collector |
| Harmonic current emission | Meets EN61000-3-2 |
| Isolation | Meets EN62368 and EN60601 |
| Global inhibit/enable | TTL, Logic "1" and Logic "0"; fan off when unit is inhibited |
| Input fuse (internal) | µMP16/10: 16 A, 500 Vac, 400 Vdc, µMP04/09: 10 A / 250 V. (both lines fused) |
| Warranty | 3 years |
| Output | |
| Factory set point accuracy | ± 1% |
| Margining / V-Program | ± 3 - 7% nominal analog (single output module only). Contact factory for simple V-program modification (i.e. 0-5 V input = 0-100% output voltage). |
| Overall regulation | 0.4% or 30 mV which ever is greater |
| Ripple | RMS: 0.1% or 10 mV, whichever is greater Pk-Pk: 1.0% or 50 mV, whichever is greater. Bandwidth limited to 20 MHz |
| Dynamic response | < ± 5% or 250 mV, with 50% step load, Min 20% load condition |
| Recovery time | To within 1% in < 300 µsec |
| Reverse voltage protection | 100% of rated output current |

* Max output power for µMP16: 1000 W 90 - 100 VAC; 1200 W 100 - 180 VAC; 1600 W 180 - 200 W; 1800 W 200 - 264 VAC. Operational specs for EMI and Hold-up are valid to 1600 W max.

Electrical Specifications

| Output | |
|--------------------------|--|
| Thermal protection (OTP) | All outputs disabled when internal temp exceeds safe operating range |
| Remote sense | Up to 0.5 V total drop (not available on triple output module) |
| Single wire parallel | Current share to within 5% of total rated current from 20% to 100% rated load |
| DC OK | ± 5% of nominal Open collector |
| Minimum load | Not required |
| Housekeeping standby | 5 Vdc @ 2.0 A max whenever AC input is applied. 1.0 A (2.0 A for µMP04) max convection cooled (when output is inhibited off) |
| Module inhibit | Logic - output on with low or open. Different logic options available |
| Output/Output isolation | > 1 Megohm, 500 V |

Environmental Specifications

| | |
|--------------------------------|--|
| Operating temperature | -40 °C to 70 °C ambient. Derate each output 2.5% per degree from 50 °C to 70 °C. Cold start soak -20 °C, allow 10 min warm-up before all outputs are within specification. Reverse air to 40 °C Max due to fan derating. |
| Storage temperature | -40 °C to +85 °C |
| Electromagnetic susceptibility | Designed to meet EN61000-4:-3,-5,-6,-11 Class 3 Performance Criteria A |
| Humidity | Operating; non-condensing 10% to 95% RH |
| Vibration | MIL-STD-810E |
| MTBF demonstrated | > 350,000 hours at full load, one µMP04 case + two modules, Telcordia SR-332 calculated MTBF |
| Altitude | Up to 10 K feet; derate linear to 50% from 10 K - 30 K feet |

| Vout | Full load (A) | OVP trip max (V) | OCP trip typ (Iout%) | SCP trip max (Iout%) | Overshoot (max mV) | Peak Deviation (max mV) |
|---------------------|---------------|------------------|----------------------|----------------------|--------------------|-------------------------|
| 3 V 3 Module | | | | | | |
| 0.9 | 40 | 2.00 V | 130% | 160% | 150 | ± 250 |
| 3.3 | 40 | 5.96 V | 130% | 160% | 250 | ± 250 |
| 3.6 | 40 | 6.31 V | 130% | 160% | 250 | ± 250 |
| 5 V Module | | | | | | |
| 3.2 | 36 | 5.76 V | 130% | 160% | 250 | ± 250 |
| 5 | 36 | 9.0 V | 130% | 160% | 250 | ± 250 |
| 6 | 30 | 10.80 V | 130% | 160% | 300 | ± 300 |
| 12 V Module | | | | | | |
| 6 | 25 | 10.80 V | 130% | 160% | 300 | ± 300 |
| 12 | 20 | 15.60 V | 130% | 160% | 600 | ± 600 |
| 15 | 16 | 19.50 V | 130% | 160% | 750 | ± 750 |
| 24 V Module | | | | | | |
| 12 | 13 | 15.60 V | 130% | 160% | 600 | ± 600 |
| 24 | 10 | 31.20 V | 130% | 160% | 120 | ± 1200 |
| 30 | 8 | 39.00 V | 130% | 160% | 1500 | ± 1500 |
| 48 V Module | | | | | | |
| 28 | 7 | 36.40 V | 130% | 200% | 1400 | ± 1400 |
| 48 | 5 | 62.40 V | 130% | 160% | 2400 | ± 2400 |
| 60 | 4 | 78.00 V | 130% | 200% | 3000 | ± 3000 |

Case Line-Up

| Case | Max Output | | Dimensions | Connections | Max Continuous Current |
|----------------|------------|-------------|--|---------------------------------------|------------------------|
| | 85-180 VAC | 180-263 VAC | | | |
| μMP04 - 4 Slot | 400 W | 600 W | 256.9 x 88.9 x 40.0 (10.11" x 3.5" x 1.57") | IEC, Terminal-Block, Barrier-Strip | 9.91 |
| μMP09 - 4 Slot | 550 W | 1100 W | 256.9 x 88.9 x 40.0 (10.11" x 3.5" x 1.57") | IEC, Terminal-Block, Barrier-Strip | 9.91 |
| μMP10 - 6 Slot | 1000 W | 1200 W | 256.9 x 127 x 40.0 (10.11" x 5.0" x 1.57") | IEC, Terminal-Block, Barrier-Strip | 13.87 |
| μMP16 - 6 Slot | 1000 W | 1800 W | 256.9 x 127 x 40.0 (10.11" x 5.0" x 1.57") | IEC, Terminal-Block, Barrier-Strip | 13.87 |

Output Module Line-Up S2*

| Output Range (Vdc) | Max Current (Amps) | Max Power (Watts) | Module Codes Standard Outputs |
|--------------------|--------------------|-------------------|---|
| 0.9 - 3.6 | 40 | 144 | A, B, C, D - 2, 2.2, 3, 3.3 |
| 3.2 - 6.0 | 36 | 180 | E, F, G, H - 5, 5, 2, 5.5, 6.0 |
| 6.0 - 15.0 | 25 | 240 | I, J, K, L, M, N - 8, 10, 11, 12, 14, 15 |
| 12.0 - 30.0 | 13 | 240 | O, P, Q, R, S - 18, 20, 24, 28, 30 |
| 33.0 - 60.0 | 7 | 240 | T, U, V, W, X, Y - 33, 36, 42, 48, 54, 60 |
| 3.3 - 30.0 | 4/4 | 96/96 | Dual Output Module. Each output is rated to 96 W (192 Watts total). Wide range is adjustable. |

DC OUTPUT MODULE RATING (SK*) 3-SLOTS

| Output (Vdc) | MAX Current (Amps) | MAX Power (Watts) | Modules Codes (*) Standard Outputs |
|--------------|--------------------|-------------------|--|
| 6.0 - 15.0 | 84 | 1000 | H, I, J, K, L, M, N - 6, 8, 10, 11, 12, 14, 15 |
| 12.0 - 30.0 | 42 | 1000 | O, P, Q, R, S - 18, 20, 24, 28, 30 |
| 28.0 - 60.0 | 21 | 1000 | T, U, V, W, X, Y - 33, 36, 42, 48, 54, 60 |

Internal Part Number Reference Table

| Part # | Where X = | Description | Module Code |
|-----------------|------------------------|------------------|-------------|
| 73-951-0001X-G2 | T, C, S | μMP10 Cases | μMP10 |
| 73-956-0001X-G2 | T, C, S | μMP16 Cases | μMP16 |
| 73-963-XXXX | 0012, 0024, 0048, 04XX | uMP 1000W Module | SKL - SKZ |
| 73-963-00XX-G2 | 0012, 0024, 0048, 04XX | uMP 1000W Module | SKL - SKZ |

Ordering Information

| | | | | |
|---|---|--|--|--------------|
| μMPXY | - SKW - S2E - S2Q - ILL - | 00 | - A | - ### |
| <p>Case Size</p> <p>1-Phase Input where X = 04 = 1.57" x 3.5" x 10.0"; 400W - 600W 4 Slots 09 = 1.57 x 3.5 x 10.0, 550W-1100W 4 Slots 10 = 1.57 x 5.0" x 10.0", 1000W-1200W, 6 Slots 16 = 1.57" x 5.0" x 10.0", 1200W-1800W**, 6 Slots ** See Output derating table below for uMP16</p> <p>Input Type where Y = T = Terminal Block C = IEC Connector C14 S = Barrier Strip</p> | <p>Module Codes: S2 = 200 W Single O/P (1 Slot) SK = 1000 W Single O/P (3 Slot) I = 96 W Dual O/P ISO GND (1 Slot) HUP = Hold-Up Module (10ms for 500W /1 Slot)</p> <p>Voltage Codes: See voltage code table</p> | <p>First digit 0-9 = Parallel Code</p> <p>Second Digit 0 = No Options 1 = Reverse Air 2 = Not Used 3 = Global Enable 5 = Opt 1 + Opt 3</p> | <p>Factory assigned for modified standards</p> | |

μMP16 OUTPUT POWER DERATING

| Parameter | 85 - 99 Vac | 100 - 140 Vac | 180 - 199 Vac | 200 - 264 Vac |
|-----------------------------|-------------|---------------|---------------|---------------|
| Designed For | 1000 W | 1200 W | 1600 W | 1800 W |
| QAV Evaluation | 1000 W | 1200 W | 1600 W | 1800 W |
| Safety Label and Evaluation | 1000 W | 1000 W | 1600 W | 1600 W |

Parallel Codes

| Code | Slots in Parallel | Code | Slots in Parallel | Code | Slots in Parallel | Code | Slots in Parallel |
|------|-------------------|------|-------------------|------|-------------------|------|-----------------------|
| 1 | 1&2 | 6 | 1&2&3 | A | 1&2; 3&4 | 0 | no module in parallel |
| 2 | 2&3 | 7 | 1,2,3&4 | B | 1,2&3; 4&5 | H | 3,4&5 |
| 3 | 3&4 | 8 | 1,2,3,4&5 | C | 1,2,3&4; 5&6 | J | 3,4,5&6 |
| 4 | 4&5 | 9 | 1,2,3,4,5&6 | D | 1&2; 3&4; 5&6 | K | 4,5&6 |
| 5 | 5&6 | | | E | 1,2&3; 4,5&6 | | |

Notes:

Parallel between SK* (1000 W Modules) and S2* (240 W Modules) will use the codes as follows

Code 3 to parallel 2 SK* modules

Code 3 to parallel 1 SK* module and 1 S2* module

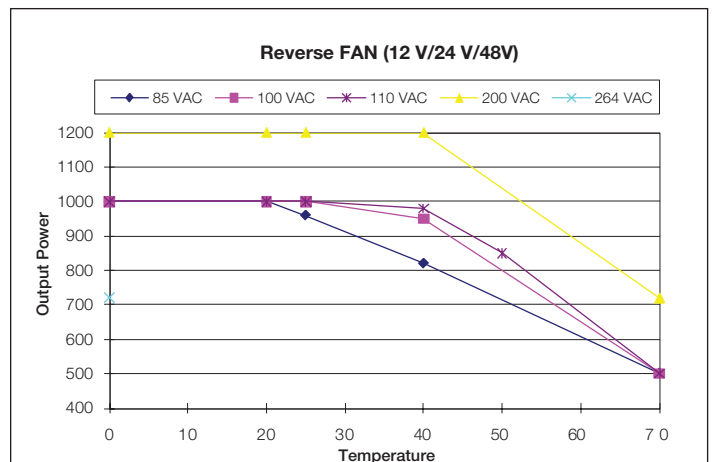
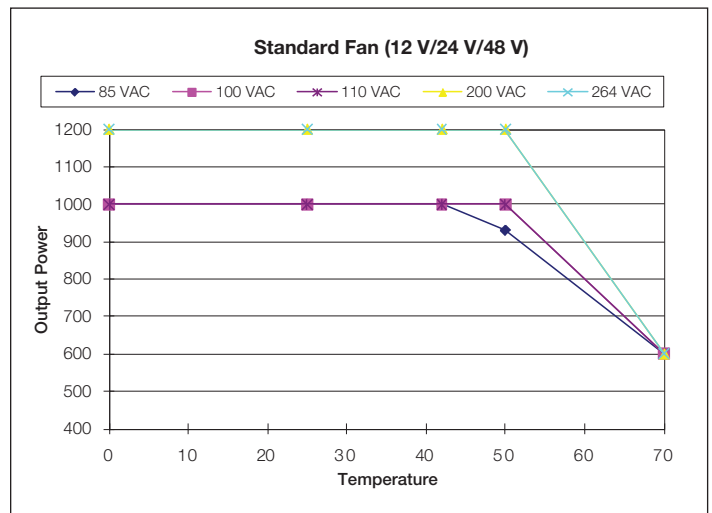
Code H to parallel 1 SK* module and 2 S2* modules

Voltage Codes

Standard Output Ratings

| Module Output Voltage Code | | Single Output One Slot 240 Watts Max | Single Output Three Slots 1000 Watts Max | Dual Output One Slot 96 Watts | |
|----------------------------|-------|--------------------------------------|--|-------------------------------|-----|
| Module Identification | | S2 | SK | I | |
| Code | Volts | Output Current V1 | Output Current V1 | Output Current | |
| | | | | V1 | V2 |
| A | 2.0 | 40.0 | - | NA | |
| B | 2.2 | 40.0 | - | NA | |
| C | 3.0 | 40.0 | - | NA | |
| D | 3.3 | 40.0 | - | 4.0 | 4.0 |
| E | 5.0 | 36.0 | - | 4.0 | 4.0 |
| F | 5.2 | 34.0 | - | 4.0 | 4.0 |
| G | 5.5 | 32.0 | - | 4.0 | 4.0 |
| H | 6.0 | 30.0 | 84.0 | 4.0 | 4.0 |
| I | 8.0 | 25.0 | 84.0 | 4.0 | 4.0 |
| J | 10.0 | 24.0 | 84.0 | 4.0 | 4.0 |
| K | 11.0 | 22.0 | 84.0 | 4.0 | 4.0 |
| L | 12.0 | 20.0 | 84.0 | 4.0 | 4.0 |
| M | 14.0 | 17.0 | 71.4 | 4.0 | 4.0 |
| N | 15.0 | 16.0 | 66.7 | 4.0 | 4.0 |
| O | 18.0 | 13.0 | 42.0 | 4.0 | 4.0 |
| P | 20.0 | 12.0 | 42.0 | 4.0 | 4.0 |
| Q | 24.0 | 10.0 | 42.0 | 4.0 | 4.0 |
| R | 28.0 | 8.6 | 35.7 | 3.4 | 3.4 |
| S | 30.0 | 8.0 | 33.3 | 3.2 | 3.2 |
| T | 33.0 | 7 | 21.0 | NA | |
| U | 36.0 | 6.7 | 21.0 | NA | |
| V | 42.0 | 5.7 | 21.0 | NA | |
| W | 48.0 | 5.0 | 21.0 | NA | |
| X | 54.0 | 4.4 | 18.5 | NA | |
| Y | 60.0 | 4.0 | 16.7 | NA | |

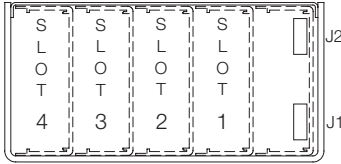
Derating Curves - µMP10



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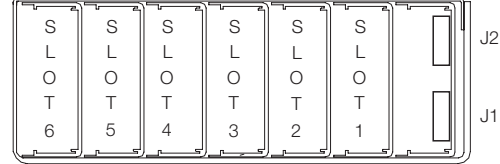
µMP04/09 (AC input on opposite side)



µMP04 = 4 available slots
 µMP09 = 4 available slots

| | |
|--------------|---------------|
| 85 - 264 Vac | 200 - 264 Vac |
| 400 W max. | 600 W max. |
| 550 W max. | 1100 W max. |

µMP10/16 (AC input on opposite side)



µMP10 = 6 available slots
 µMP16 = 6 available slots

| | |
|--------------|---------------|
| 85 - 264 Vac | 200 - 264 Vac |
| 1000 W max. | 1200 W max. |
| 1200 W max. | 1800 W max. |

Pin Connectors

Figure 1. AC Input



IEC Connector



Terminal Block

| AC Input | |
|----------|------------------------|
| Pin | Function |
| 1 | AC neutral |
| 2 | AC line (hot) |
| 3 | Chassis (earth) ground |

Mates with
 Landwin 2050S1000 Housing
 2053T011V Pin
 or
 JST PHDR-10VS Housing
 JST SPHD-002T-P0.5 (28-24)
 JST SPHD-001T-P0.5 (26-22)

Connector Kit Part No.:
 70-841-023

J2 I²C Bus Output Connector

| Pin | Function |
|-----|---------------------------|
| 1 | 5 Vcc bus |
| 2 | Serial data signal (SDA) |
| 3 | Secondary return (COM) |
| 4 | Serial clock signal (SCL) |
| 5 | Address bit 2 (A2) |
| 6 | No connection |
| 7 | Address bit 1 (A1) |
| 8 | No connection |
| 9 | Address bit 0 (A0) |
| 10 | No connection |

J1 PFC Input Connector (control & signals)

| Pin | Function |
|-----|--|
| 1 | Input AC OK - "emitter" |
| 2 | Input AC OK - "collector" |
| 3 | Global DC OK - "emitter" |
| 4 | Global DC OK - "collector" |
| 5 | Spare |
| 6 | Global inhibit/optional enable logic "1" |
| 7 | Global inhibit/optional enable logic "0" |
| 8 | Global inhibit/optional enable return |
| 9 | +5 VSB housekeeping |
| 10 | +5 VSB housekeeping return |

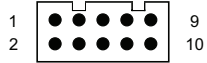
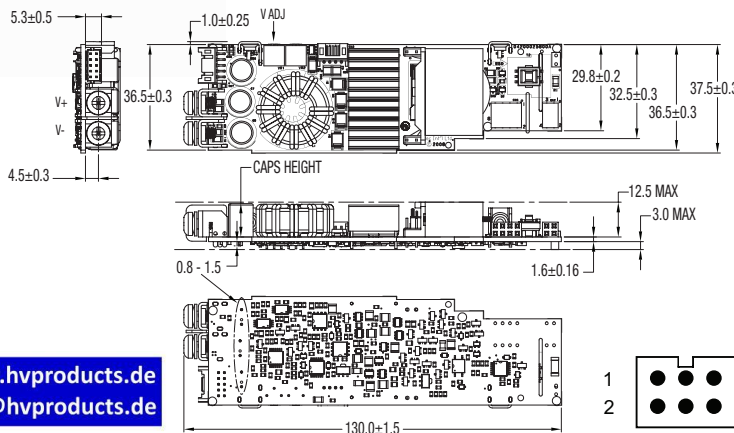
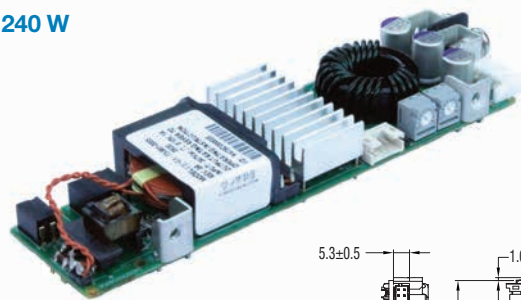


Figure 2. Connector J1 & J2

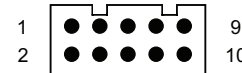
S2 Module

240 W



DC Output Control & Signals (Single output)

| Pin | Function |
|-----|-------------------------|
| 1 | No connection |
| 2 | No connection |
| 3 | Current share |
| 4 | Module inhibit return |
| 5 | Module ISO inhibit |
| 6 | SCOM |
| 7 | -RMT sense |
| 8 | Margin |
| 9 | Remote margin / V prog. |
| 10 | +RMT sense |

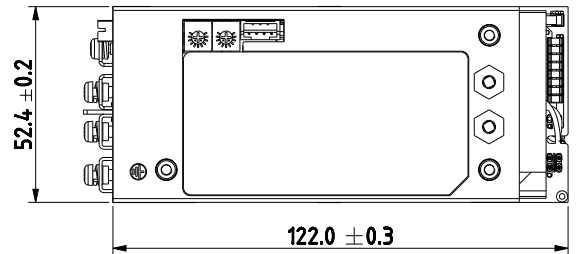
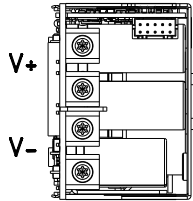


SK Module

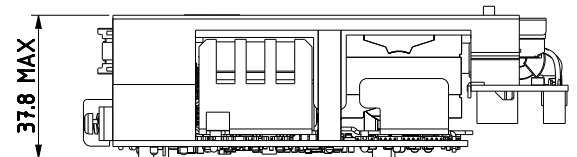
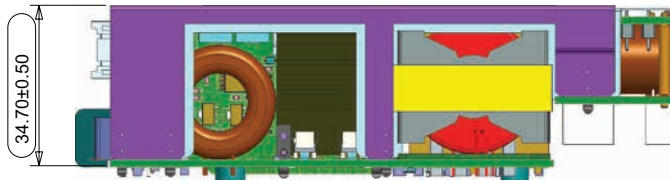
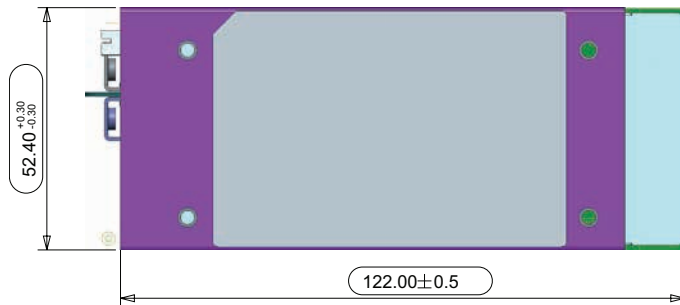
1000 W



12/24 Volt Output:



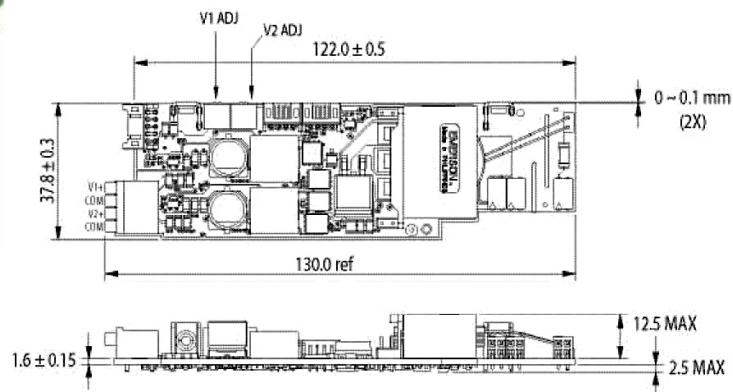
48 V Output:



DC Output Control & Signals (Single output)

| Pin | Function |
|-----|-------------------------|
| 1 | No connection |
| 2 | No connection |
| 3 | Current share |
| 4 | Module inhibit return |
| 5 | Module ISO inhibit |
| 6 | SCOM |
| 7 | -RMT sense |
| 8 | Margin |
| 9 | Remote margin / V prog. |
| 10 | +RMT sense |

Dual Module



DC Output Control & Signals (Dual output)

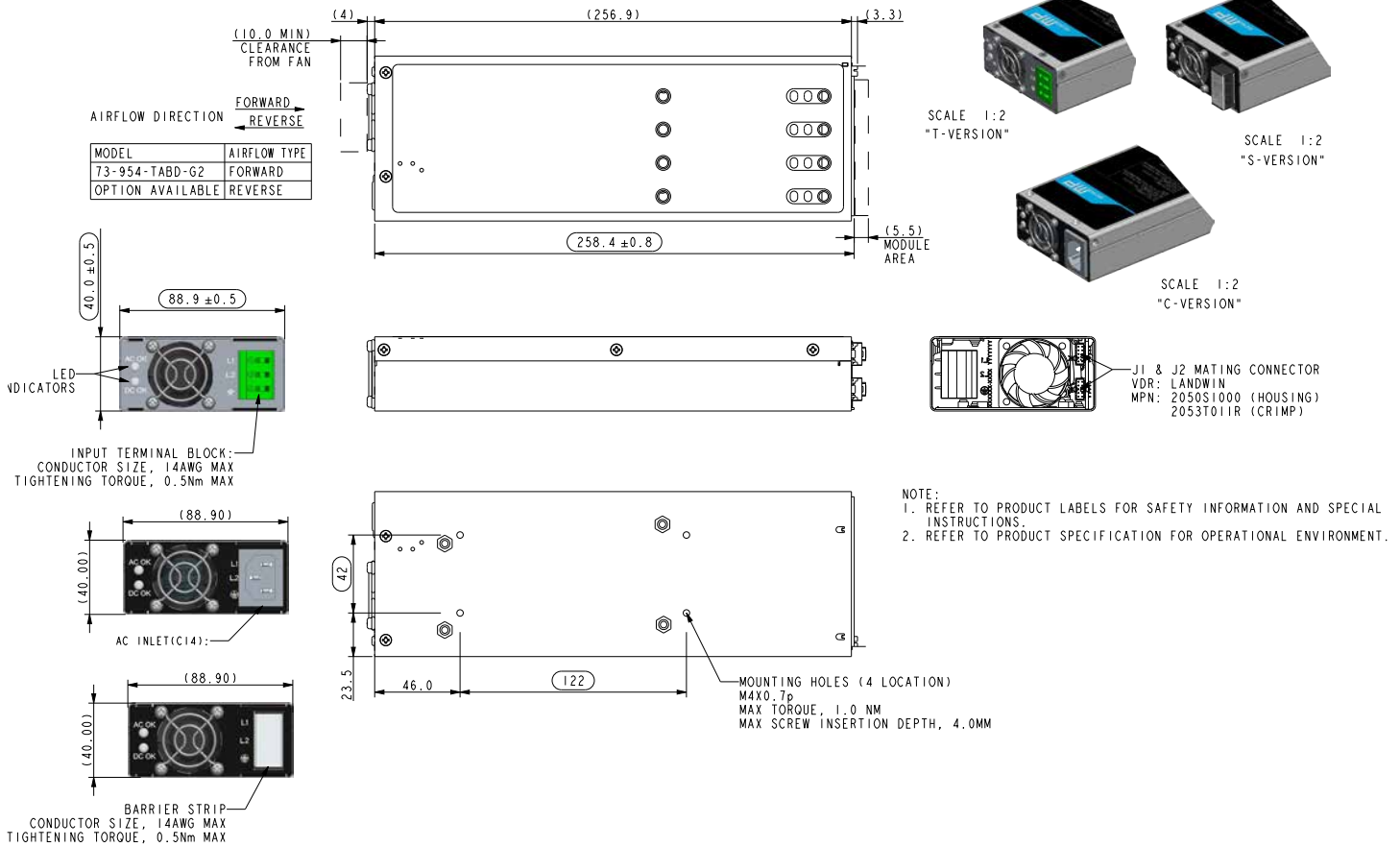
| Pin | Function |
|-----|--------------------|
| 1 | -RMT sense V2 |
| 2 | +RMT sense V2 |
| 3 | No connection |
| 4 | Module inhibit rtn |
| 5 | Module ISO inhibit |
| 6 | SCOM |
| 7 | -RMT sense V1 |
| 8 | No connection |
| 9 | No connection |
| 10 | +RMT sense V1 |

µMP Series

µMP04/09 (400/600; 550/1100 Watts Max)

Case Size: µMP04/09: 10.11" x 3.5" x 1.57" (256.9 mm x 88.9 mm x 40.0 mm)

Weight: µMP04/09 Case: 1.96 lbs • Single O/P: 0.22 lb.
 • Dual O/P: 0.16 lb. • Blank: 0.06 lb.

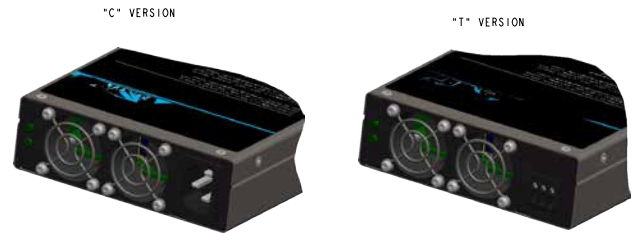
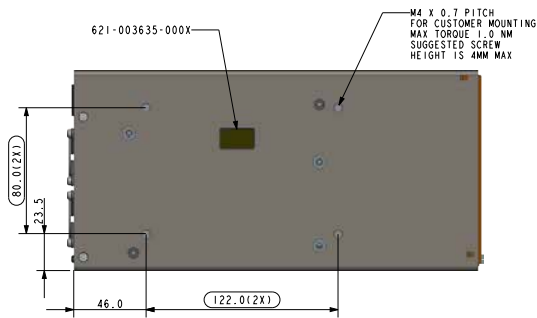
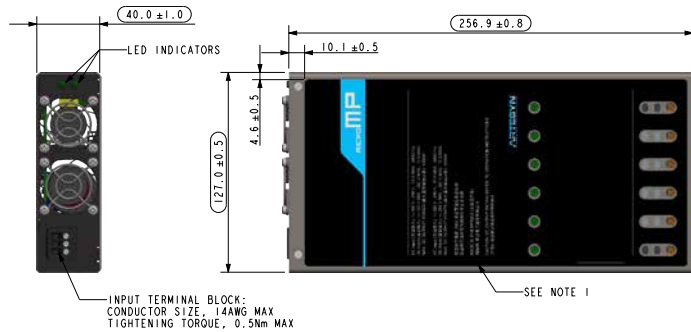


- Notes:**
1. Input: IEC 60320 C13 (for IEC connector)
 Barrier Type DECA Switchlab MT300-50003 (for terminal block connector); Max Torque: 4.0 lb-in (0.4 - 0.5 Nm); Wire: 12 - 16 AWG; Wire Strip Length: 0.354" (9.0 mm)
 2. Control Connectors (J1 and J2): 10-position housing, brass, matte tin-plated contacts. Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or housing PHDR-10VS (JST) and SPHD-002T-PO.5 (JST) pins.
 3. Output Module Connectors: All single O/P modules are M4 x 10 mm screws; tighten between 6.94 to 8.68 lb-in (8.0 to 10.0 kg-cm). Dual O/P module is PUSH IN conductor connector; Wire Strip Length: 0.315" (8.0 mm); Control signal connector: Refer to Item 2.
 4. Chassis Material: Steel with chemical film coating (conductive).
 5. Customer Mounting: Screw M4-type mounting holes; Max. Penetration is 0.138" (3.5 mm); Max. Torque: 8.85 lb-in (1.0 N-m)
 6. All dimensions are in millimeters and inches, and are typical.

μMP10 (1000/1200 Watts Max)
μMP16 (1200/1800 Watts Max)

Case Size: μMP10/16: 10.11" x 5" x 1.57" (256.9 mm x 127 mm x 40.0 mm)

Weight: μMP10/16 Case: 2.78 lbs • Single O/P: 0.22 lb.
 • Dual O/P: 0.16 lb. • Blank: 0.06 lb.



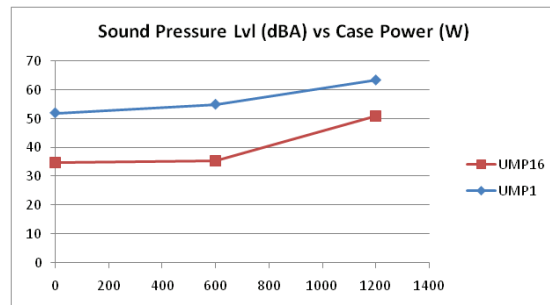
SCALE 1:2

SCALE 1:2



SCALE 1:2

NOTES
 1. BLACK TOP COVER LABEL, REFER TO IPN 534-000824-000X FOR DETAILS
 2. DIMENSIONS ARE IDENTIFIED FOR INSPECTION BY BEING ENCLOSED IN AN OBOUND.



- Notes:**
- Input: IEC 60320 C13 (for IEC connector)
 Barrier Type DECA Switchlab MT300-50003 (for terminal block connector); Max Torque: 4.0 lb-in (0.4 - 0.5 Nm); Wire: 12 - 16 AWG; Wire Strip Length: 0.354" (9.0 mm)
 - Control Connectors (J1 and J2): 10-position housing, brass, matte tin-plated contacts. Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or housing PHDR-IOVS (JST) and SPHD-002T-PO.5 (JST) pins.
 - Output Module Connectors: All single O/P modules are M4 x 10 mm screws; tighten between 6.94 to 8.68 lb-in (8.0 to 10.0 kg-cm). Dual O/P module is PUSH IN conductor connector; Wire Strip Length: 0.315" (8.0 mm); Control signal connector: Refer to Item 2.
 - Chassis Material: Steel with chemical film coating (conductive).
 - Customer Mounting: Screw M4-type mounting holes; Max. Penetration is 0.138" (3.5 mm); Max. Torque: 8.85 lb-in (1.0 N-m)
 - All dimensions are in millimeters and inches, and are typical.

μMP HUP Module

The μMP HUP module is intended for use on μMP09 with high efficiency module (SK*) configurations. In such case, only one HUP can be used per case. Its application is limited with μMP09 and μMP04 configurations and may have multiple HUP's inserted.

The HUP module shall provide additional 224μF bulk capacitance (typ.). Typical hold-up time increase with HUP module in μMP09 case and SK* module is 10ms at 500W load.



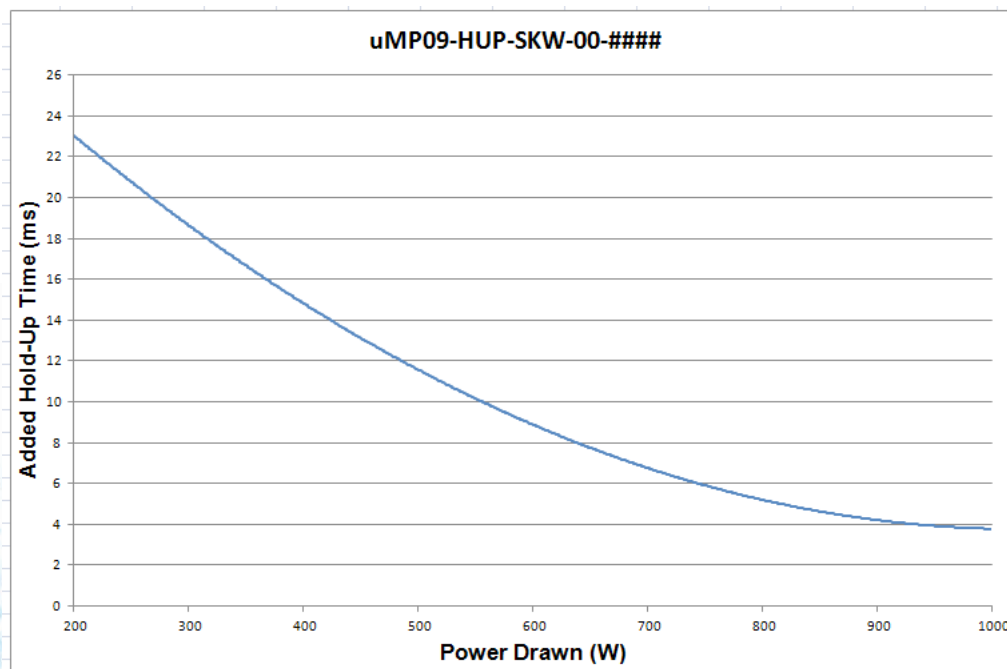
73-950-002

Actual μMP HUP Module and μMP09 Configuration

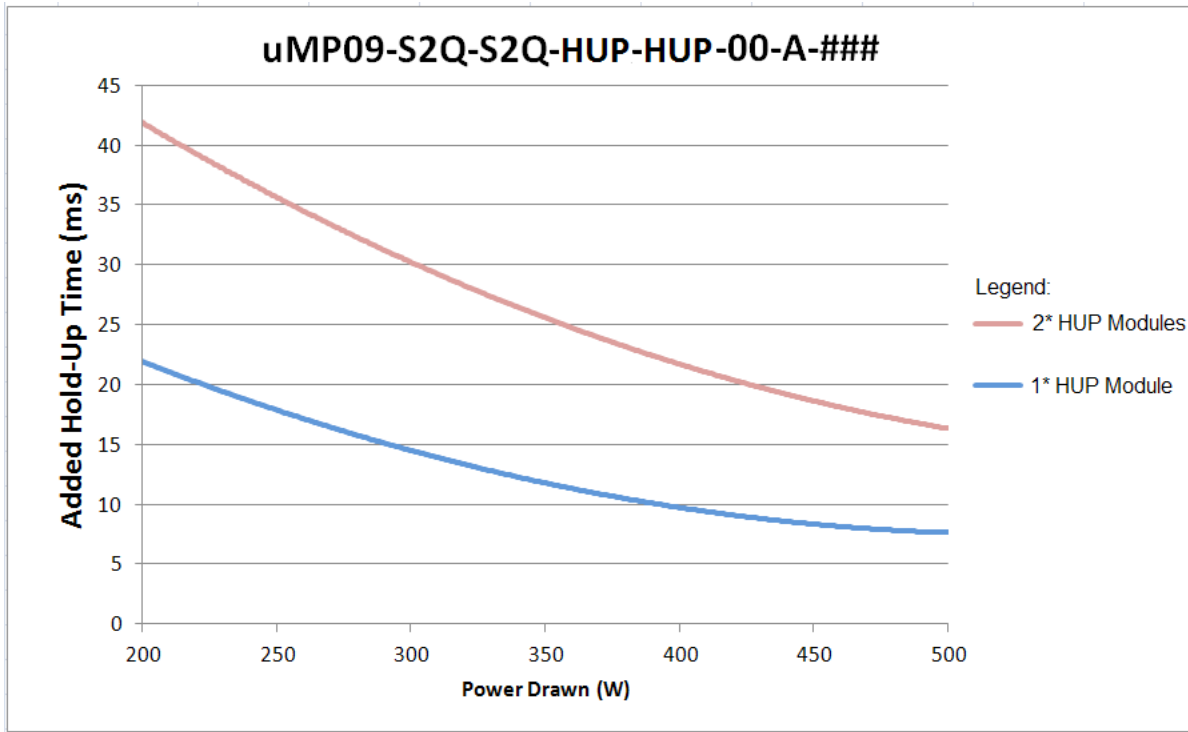


μMP09 Config with HUP at Slot1

Typical HUP Response with μMP09-SKW Configuration



Typical HUP Response with μMP09-S2* Configuration



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