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 ºC to 70 ºC)
- 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	uMP10/16 < 13 W uMP04/09 < 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 Continous 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** - **###**

Case Size

1-Phase Input where X =
4 = 1.57" x 3.5" x 10.0"; 400W - 600W 4 Slots*
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
1 = 1.57 x 5.0" x 10.0", 1000W-1200W, 6 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
* Not Recommended for new designs
** See Input Derating table below for uMP16

Input Type where Y =
T = Terminal Block
C = IEC Connector C14
S = Barrier Strip

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)

Voltage Codes: See voltage code table

First digit
0-9 = Parallel Code

Second Digit
0 = No Options
1 = Reverse Air
2 = Not Used
3 = Global Enable
5 = Opt 1 + Opt 3

Factory assigned for modified standards

µMP16 INPUT POWER DERATING

Paramater	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

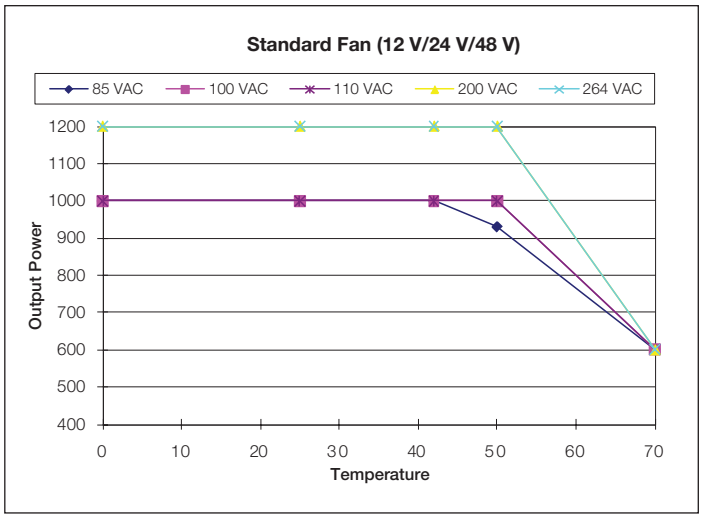
Code H to parallel 1 SK* module and 2 S2* modules

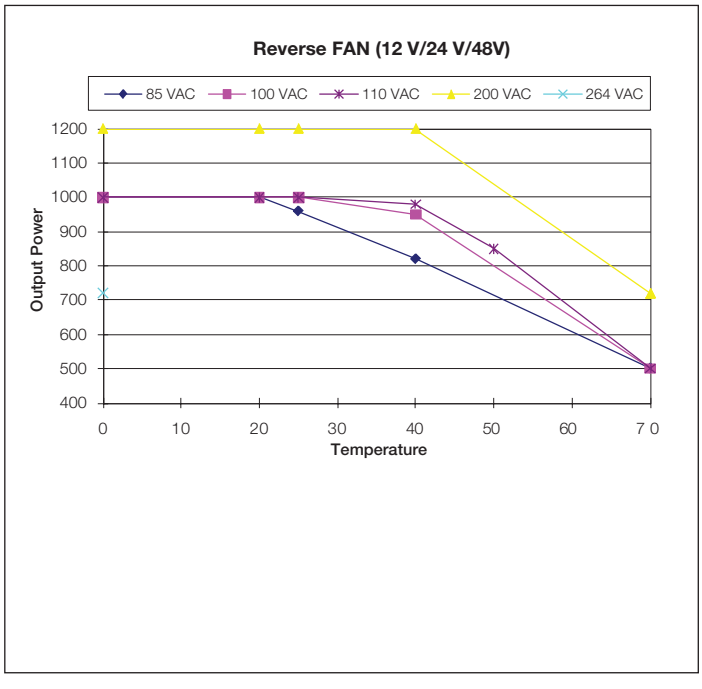
Voltage Codes

Standard Output Ratings

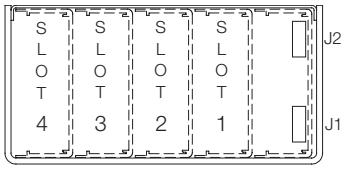
Module Output Voltage Code		Single Output One Slot 240 Watts Max	Single Output Three Slots 1000 Watts Max	Dual Output One Slot 96 Watts	
Module Identification		S2	SK	I	
Code	Volts	Output Current V1	Output Current V1	Output Current V1	Output Current V2
A	2.0	40.0	-	NA	
B	2.2	40.0	-	NA	
C	3.0	40.0	-	NA	
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





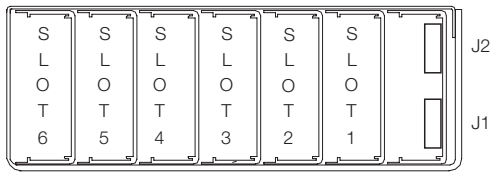
µMP04/09 (AC input on opposite side)



Input

	85 - 264 Vac	200 - 264 Vac
µ**MP**04 = 4 available slots	400 W max.	600 W max.
µ**MP**09 = 4 available slots	550 W max.	1100 W max.

µMP10/16 (AC input on opposite side)



Input

	85 - 264 Vac	200 - 264 Vac
µ**MP**10 = 6 available slots	1000 W max.	1200 W max.
µ**MP**16 = 6 available slots	1200 W max.	1800 W max.

Pin Connectors

Figure 1. AC Input

IEC Connector

Terminal Block

PEN L

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

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

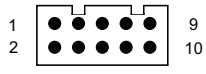


Figure 2. Connector J1 & J2

J2

Mates with
Landwin 2050S1000 Housing
2053T011V Pin

or

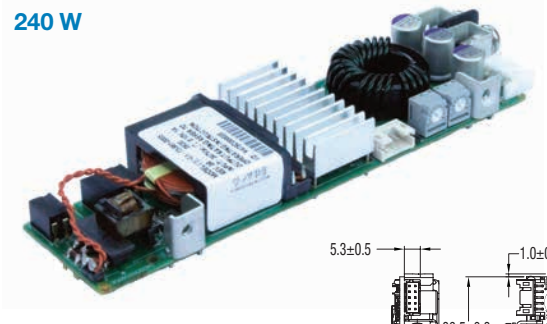
JST PHDR-10VS Housing
JST SPHD-002T-P0.5 (28-24)
JST SPHD-001T-P0.5 (26-22)

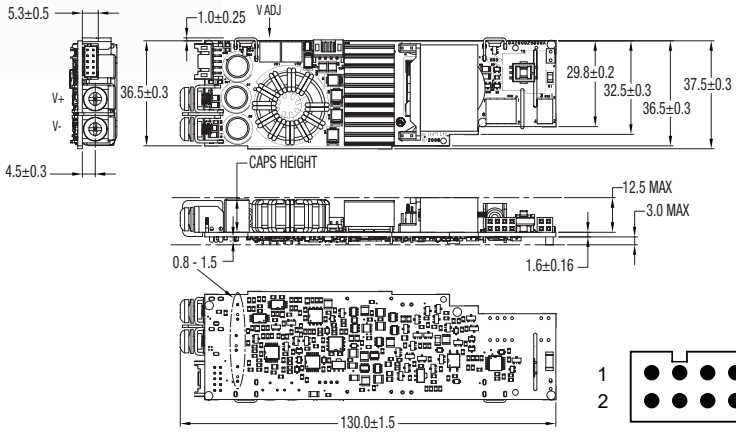
Connector Kit Part No.:
70-841-023

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

S2 Module

240 W



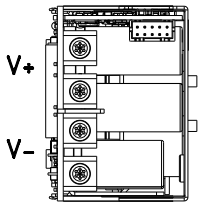


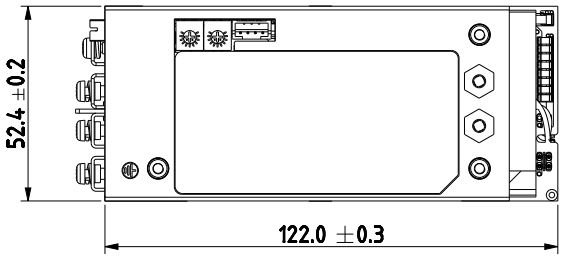
DC Output Control & Signals (Single output)	
Pin	*Function*
1	No connection
2	No connection
3	Current share
4	Module inhibit return
5	Module ISO inhibit
6	SCOM
7	-RMT sense
8	Margin
9	Remote margin / V prog.
10	+RMT sense

SK Module

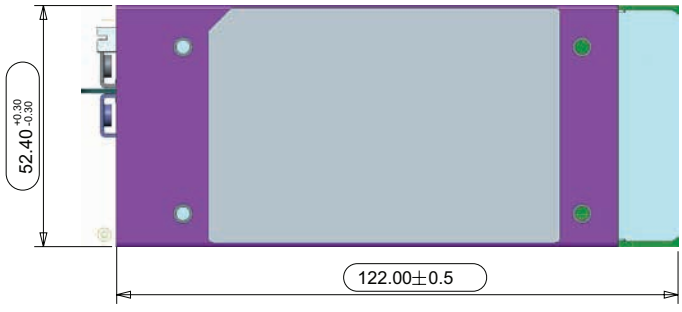
1000 W

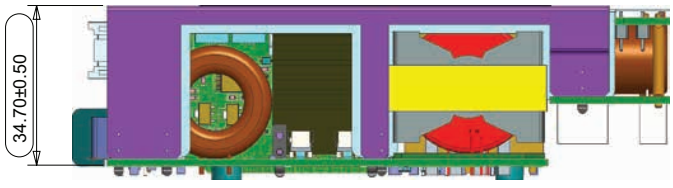
12/24 Volt Output:

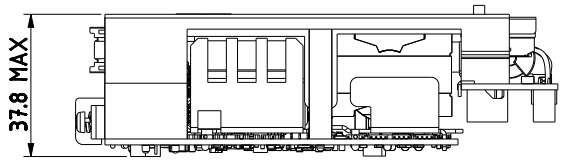




48 V Output:

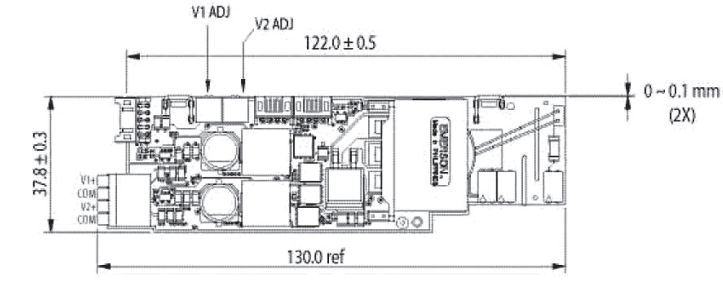


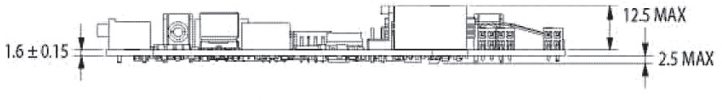


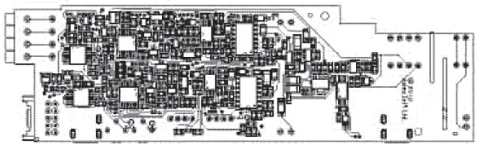


DC Output Control & Signals (Single output)	
Pin	*Function*
1	No connection
2	No connection
3	Current share
4	Module inhibit return
5	Module ISO inhibit
6	SCOM
7	-RMT sense
8	Margin
9	Remote margin / V prog.
10	+RMT sense

Dual Module







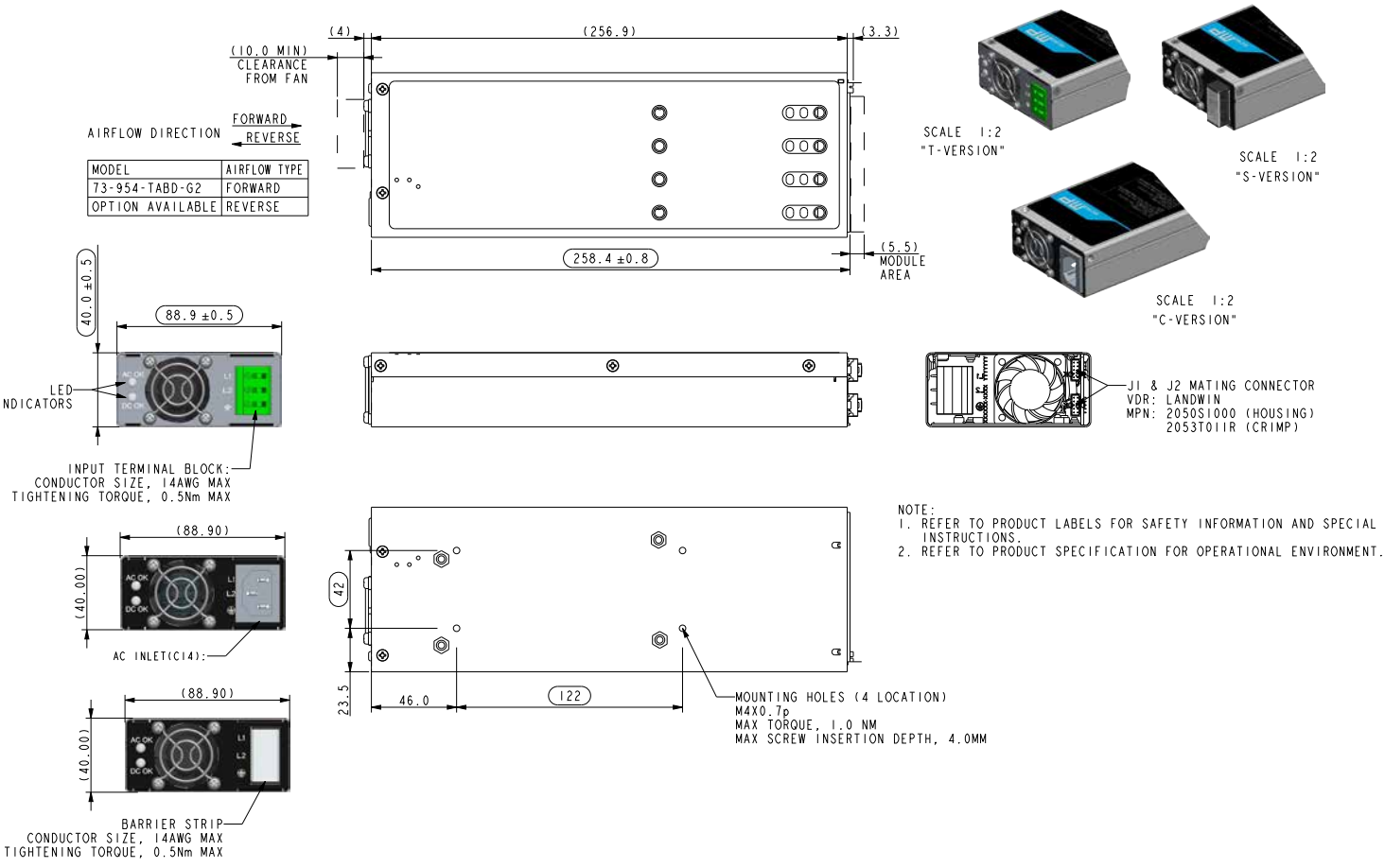
DC Output Control & Signals (Dual output)	
Pin	*Function*
1	-RMT sense V2
2	+RMT sense V2
3	No connection
4	Module inhibit rtn
5	Module ISO inhibit
6	SCOM
7	-RMT sense V1
8	No connection
9	No connection
10	+RMT sense V1

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.



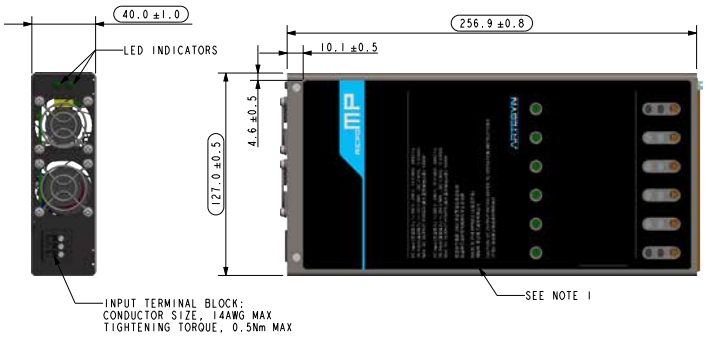
Notes:

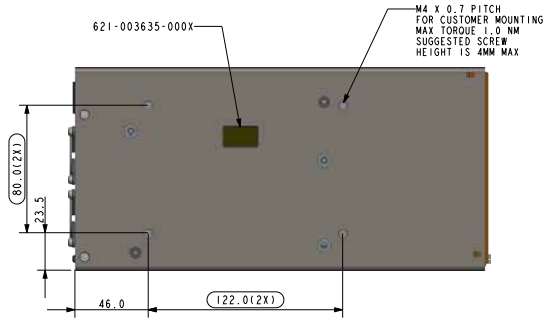
1. Input: IEC 60320 C13 (for IEC connector)
   Barrier Type DECA Switchlab MT300-50003 (for terminal block connector); Max Torque: 4.0 lb-in (0.4 - 0.5 Nm); Wire: 12 - 16 AWG; Wire Strip Length: 0.354" (9.0 mm)
2. Control Connectors (J1 and J2): 10-position housing, brass, matte tin-plated contacts. Mates with housing 2050S1000 (Landwin) with 2053T011P (Landwin) pins or housing PHDR-IOVS (JST) and SPHD-002T-P0.5 (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)

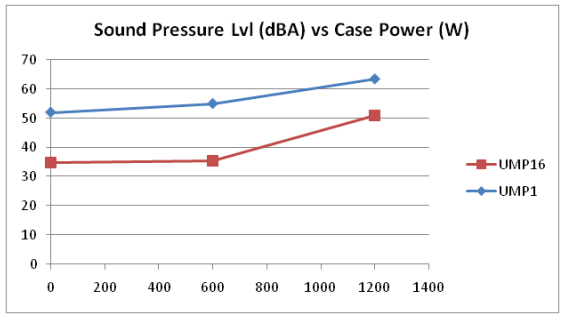
Case Size: µMP10/16: 10.11" x 5" x 1.57" (256.9 mm x 127 mm x 40.0 mm)

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





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



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   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-IOVS (JST) and SPHD-002T-P0.5 (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.

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.

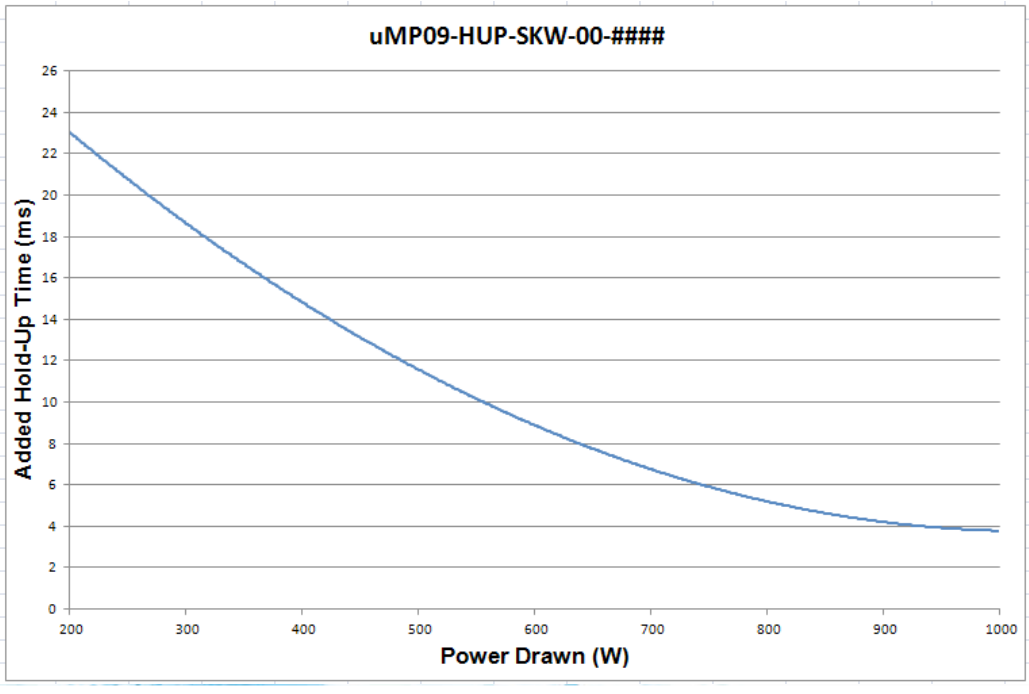
The HUP module shall provide additional 224µF bulk capacitance (typ.). Typical hold-up time increase with HUP module in µMP09 case and SK* module is 10ms at 500W load.

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